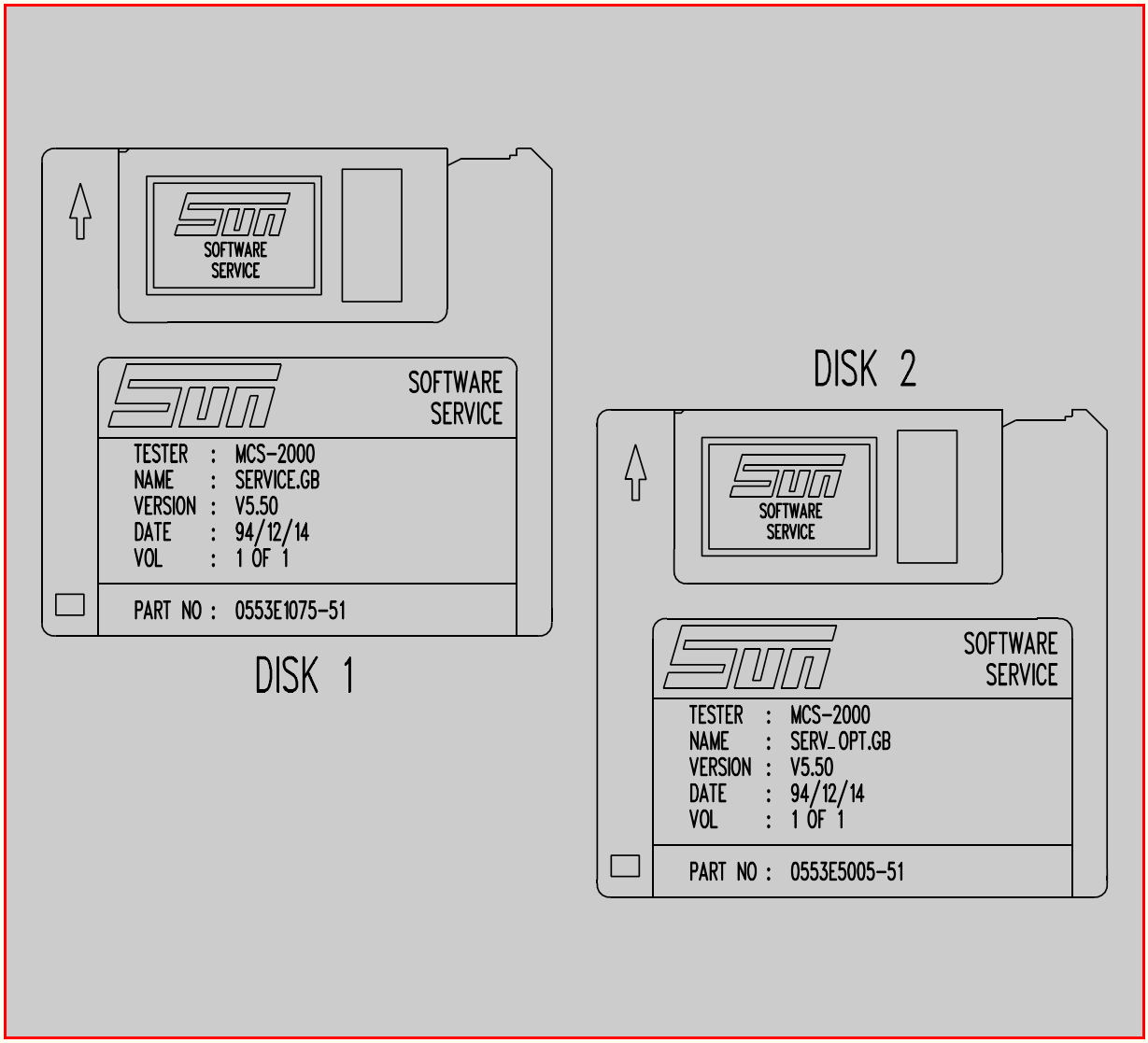
HIGH TECH SECURES YOUR FUTURE

MCS-2000: SOFTWARE
SERVICE DISKS, V5.50



● SERVICE DISK MANUAL

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S U N E L E C T R I C E U R O P E B . V .

THE MCS-2000 SERVICE DISK MANUAL

SERVICE DISK 1, P/N: 0553E1075-51

AND

SERVICE DISK 2, P/N: 0553E5005-51

JANUARY-1992

SOFTWARE VERSION: V5.50

PART NO: 0692E9308-17 REV: B, FEBRUARY-1995

REF FILE: MCS-SRVB.DOC REF: ERN 1323

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MCS-2000 SERVICE DISK MANUAL

SOFTWARE VERSION: V5.50

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1st EDITION JANUARY-1992

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REVISION: B, FEBRUARY-1995

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INTRODUCTION

This manual describes the operation and use of the MCS-2000 Service Disks:

1: SERVICE DISK 1, P/N: 0553E1075-51, SERVICE.GB, V5.50
2: SERVICE DISK 2, P/N: 0553E5005-51, SERV_OPT.GB, V5.50

These Service Disks are separate disks which are compatible with the MCS-2000 System software version: V5.2x or higher, and are intended to be used for the Configuration, Calibration and Field Testing of the MCS-2000, MCS-2000SL, MCS-2000SL-L, TECH-80 and other testers in the MCS-2000 series.

FUNCTIONAL DESCRIPTION

The following is a description of all functional changes of the Service Software for this released version (V5.50):

SERVICE DISK 1, P/N: 0553E1075-51, SERVICE.GB, V5.50, New Features:

1: A new Serial port Loop-back test has been added.
2: Negative gas values can be displayed in the Cal gas Check pages.
3: Two new printer options have been added; OKI-192E PRO and OKI-280.
4: A new MUX/ADC Channel test has been added which supports the new MUX/ADC Board.

Corrections:

1: This disk will work correctly on old testers containing only 448 kB of RAM.
2: Removed the unused TECH-15 option from the Tester Configuration Entry page.
3: General support for AU-II up-dated.
4: Removed automatic up-date/modifications of related options in the Tester Configuration and Option Entry pages.
5: Corrected and improved Memory Board Test.
6: Bug Fixed: The system locked-up for both the System and Service Disks if the tester was configured with the SDL-20, External Gas Bench and a Serial Keyboard set to DEFINED. In this situation, it was not possible to configure the system correctly with the old Service Disk. In this new version (V5.50), the Service Engineer will be prompted to leave this page by pressing the "P" key on the Keypad, then the correct Configuration Definitions can be re-entered.

SERVICE DISK 2, P/N: 0553E5005-51, SERV_OPT.GB, V5.50, New Features:

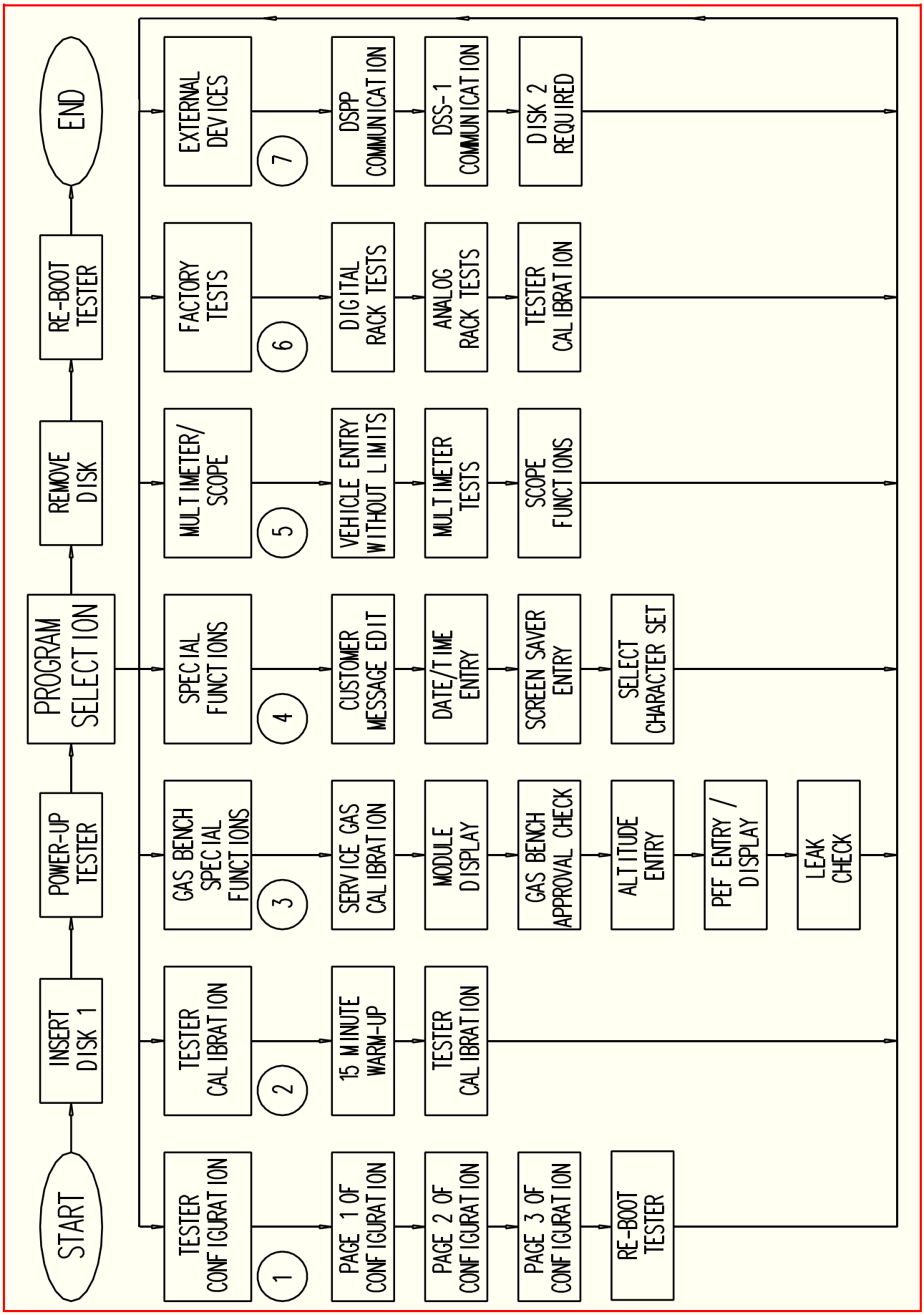
1: A new support program for serial communication with the DSPP/DSS-1 consisting of:

A: Calibration & Communication testing.
B: Monitor Mode for direct communication with the DSS-1.

Note: The Disk 2 requires Disk 1, P/N: 0553E1075-51, V5.50.

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MCS-2000 SERVICE DISK FLOW DIAGRAM



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OPERATION

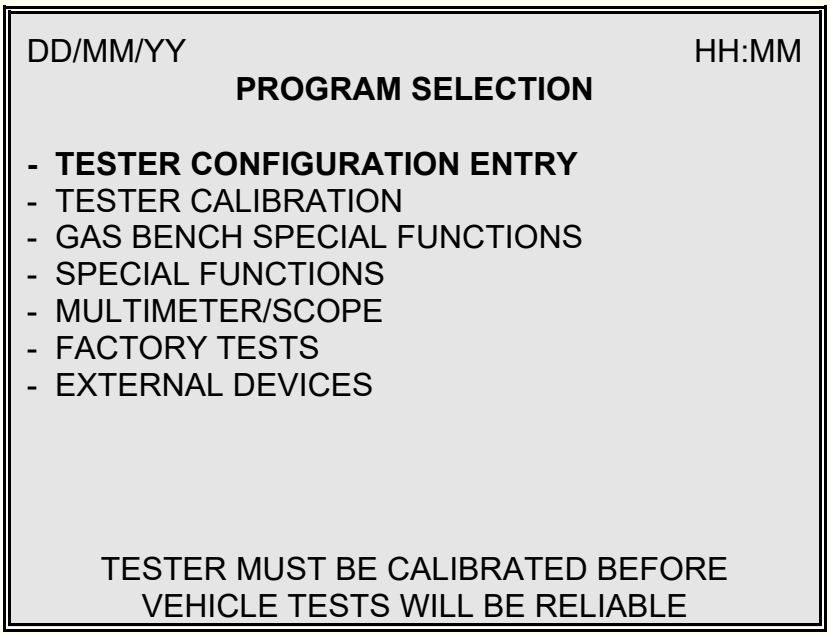
1: Plug the tester into the nearest mains outlet. Observing the Safety Precautions as described in the Operator's and Service Manuals.

2: Insert the Service Disk 1, SERVICE.GB, (P/N: 0553E1075-51) into the disk drive. Switch on the power to the unit.

3: The tester should perform the Self Tests and Memory Test routines.

When instructed, press **P** on the Keypad to enable the tester to detect the type of Keypad installed.

Then the tester will perform the Program Loading Sequence, after the tester Configuration and Calibration pages have been displayed, the "Program Selection" (Main Menu), page will be displayed:



Note: 1: Use the **>** key to move to a menu item and press the **#** key to select that item.

2: The Date and Time will only be displayed at the top of the screen when the "Real Time Clock" option is installed and enabled.

With reference to the Service Disk Flow Diagram, each Program Selection is divided into a number of Sub-Menus:

1: **TESTER CONFIGURATION ENTRY**:

A: Three (3) screen pages of Tester Configuration; two (2) pages for the tester Configuration Definitions and one (1) page for the installed Options Configuration and set-up.

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2: **TESTER CALIBRATION**:
- A: Gas Bench 15-Minute Warm-Up, Note: Press * to over-ride the Warm-Up. (External Gas Bench 2-Minute Warm-Up).
- B: Tester Calibration

3: **GAS BENCH SPECIAL FUNCTIONS**:
- A: Service Gas Calibration
- B: Module Display
- C: Gas Bench Approval Check / Test
- D: Altitude entry
- E: PEF Entry / PEF Display
- F: Leak Check

} Depending on Gas Bench Configuration

4: **SPECIAL FUNCTIONS**:
- A: Customer Message Editor
- B: Date/Time Entry
- C: Screen Saver Settings
- D: Select Character Set

5: **MULTIMETER/SCOPE**:
- A: Vehicle Entry Without Limits
- B: Multimeter Tests
- C: Scope Functions

Note: Also required for Factory Tests.

6: **FACTORY TESTS**:
- A: Digital Rack Tests
- B: Analog Rack Tests
- C: Tester Calibration

7: **EXTERNAL DEVICES:**
- A: DSPP Communication
- B: DSS-1 Communication
- C: DSS-1 Calibration Test

Note: AU-II Approval Type only.

Note: 1: The External Devices Selection is not operational, unless the DSPP and DSS-1 options are installed and the DSS-1 entry is set to DEFINED in the Tester Configuration Entry page.

2: Also, the External Devices Selection requires Service Disk 2, SERV_OPT.GB, P/N: 0553E5005-51.

****

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1: TESTER CONFIGURATION ENTRY

The Tester Configuration selection consists of three pages. The first two pages contain a number of items that can be set to DEFINED or NOT DEFINED depending on the hardware and software configuration of the tester. The third page is used to set-up the Options installed in the tester.

The configuration settings will be saved into the E-EPROM memory when these pages are exited.

Note: **RE-BOOT THE TESTER WHEN ANY CHANGES ARE MADE TO THE TESTER CONFIGURATION PAGES.**

TESTER CONFIGURATION ENTRY, PAGE 1:

1: Select "Tester Configuration Entry" from the "Program Selection Menu" by using the **>** key and press the **#** key, the first Tester "Configuration Entry" page will be displayed:

```
DD/MM/YY                                    HH:MM
          TESTER CONFIGURATION ENTRY

- PRINTER                          DEFINED
- GAS BENCH                        DEFINED
- DIESEL OPTION                    NOT DEFINED
- DIAGNOSTICS                      DEFINED
- DIGITAL SCOPE                    DEFINED
- BAROMETER                        DEFINED
- KEYBOARD                         NOT DEFINED




ENTER: > OR +/-,                            MENU: P
NEXT ENTRY: #
```

2: Use the **#** key to step through all items. Set each item to DEFINED / NOT DEFINED as required, by pressing the **>** key.

When the **#** key is pressed on the last line, the "Tester Configuration Entry" (Page 2) will be displayed:

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TESTER CONFIGURATION ENTRY, PAGE 2:

Note: For the moment the definition EXT. CRT DRIVER should be left as NOT DEFINED, but should be set to DEFINED when Greek, Hebrew, Polish or Hungarian languages are used.

```
DD/MM/YY                                    HH:MM
          TESTER CONFIGURATION ENTRY

- INTERNAL CLOCK                  DEFINED
- SDL-20                          NOT DEFINED
- OIML                            DEFINED
- EXT. CRT DRIVER                 NOT DEFINED
- DATE/TIME DISPLAYED             DEFINED
- DAYLIGHT SAVING                 DEFINED
- DSS-1                           NOT DEFINED




ENTER: > OR +/-,                            MENU: P
NEXT ENTRY: #
```

3: Use the **#** key to step through all items. Set each item to DEFINED / NOT DEFINED as required, by pressing the **>** key. When the **#** key is pressed on the last line, the "Tester Configuration Entry" (Page 3, Options) will be displayed:

TESTER CONFIGURATION ENTRY, PAGE 3, (OPTIONS):

This page provides the ability to configure the tester according to the Options installed.

```
DD/MM/YY                                    HH:MM
          TESTER CONFIGURATION ENTRY

- KEYPAD TYPE                     STANDARD
- PRINTER TYPE                    OKI-182E
- GAS BENCH TYPE                  SGM-2004
- GASES AVAILABLE                 HC/CO2/CO/O2
- GAS APPROVAL                    STANDARD
- LANGUAGE                        GREAT BRITAIN
- LAMBDA CALCUL.                  BRETTSCHNEIDER
- LEGAL TEST                      NONE




TO SAVE NEW OPTIONS PRESS: *
PRESS P TO ABORT
```


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4: Step through all lines by pressing the **#** key. Use the **>** key to set the Options, see below for details.

Press the **#** key on the last line. Then, press the ***** key to SAVE the new Configuration settings, the caption "Writing to Memory" will be displayed.

Note: **RE-BOOT THE TESTER WHEN ANY CHANGES ARE MADE TO THE TESTER CONFIGURATION PAGES.**

****

OPTION:	**TYPE:**
KEYPAD TYPE	STANDARD, MEA, KEYPAD 2, KEYPAD 3.
PRINTER TYPE	NOT INSTALLED, STANDARD, OKI-192 EPSON, OKI-182E, OKI-192E PRO, OKI-280, PRINTER 6, PRINTER 7.
GAS BENCH TYPE	NOT INSTALLED, SGM-2002/3, SGA-9000, SGM-2004, MGA-1200, SGM-2004AU, GAS BENCH 6, GAS BENCH 7.
GASES AVAILABLE	NONE, CO, CO_2, CO/CO_2, HC, CO/HC, CO_2/HC, CO/CO_2/HC, O_2, CO/O_2, CO_2/O_2, CO/CO_2/O_2, HC/O_2, CO/HC/O_2, CO_2/HC/O_2, CO/CO_2/HC/O_2.
GAS APPROVAL	NONE, STANDARD, APK, PTB, GAS CAL 4, GAS CAL 5, GAS CAL 6, GAS CAL 7.
LANGUAGE	DEVELOPMENT, AUSTRIA, BELGIUM, GERMANY, DENMARK, SPAIN, FRANCE, GREAT BRITAIN, ITALY, NETHERLANDS, PORTUGAL, SWEDEN, FINLAND, SWITZERLAND, TURKEY, GREECE, ISRAEL, POLAND, CZECHS., RUSSIAN, HUNGARIAN, COUNTRIES 21 - 31.
LAMBDA CALCUL.	BRETTSCHNEIDER, SPINDT
LEGAL TEST	NONE, AU-II

*** * * IMPORTANT * * ***

IT IS VITAL THAT THE COMBINATION OF "GAS BENCH TYPE", "GASES AVAILABLE", "GAS APPROVAL", "LANGUAGE", "LAMBDA CALCUL." AND "LEGAL TEST" CONFIGURATION SETTINGS ARE CORRECT FOR THE PROPER OPERATION OF THE TESTER.

****

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2: TESTER CALIBRATION

A: THE 15-MINUTE WARM UP

When the Tester Calibration is selected from the Main Menu, the three (3) Tester Configuration pages will be displayed followed by a 15 Minute Warm-Up period.

(Press * to over-ride the Warm-Up).

B: TESTER CALIBRATION

When the 15 minute warm-up is completed the tester calibration will start.

DD/MM/YY HH:MM

TESTER CALIBRATION

- ADC REFERENCE	PASS
- AMPS	PASS
- RIPPLE	PASS
- ANALOG KV	PASS
- VOLT/OHM	PASS
- VACUUM	PASS
- HC	PASS
- CO	PASS
- CO_2	PASS
- O_2	PASS
- BPC	PASS

CALIBRATION IN PROGRESS

This page will be displayed after any of the following:

Automatically when the tester is first powered up.

When the "Gas Bench Special Functions", "Gas Calibration" is selected.

When the "Analog Rack Test", "Tester Calibration" is selected.

If a calibration error has occurred the message CALIBRATION FAILURE will be displayed on the last line of the screen.

When the Tester Calibration has been successful the Program Selection (Main Menu) page will be displayed.

****

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3: GAS BENCH SPECIAL FUNCTIONS

```
DD/MM/YY                                    HH:MM
          GAS BENCH SPECIAL FUNCTIONS

- SERVICE GAS CALIBRATION
- MODULE DISPLAY
- PTB GAS ANALYSER CHECK, (See below)
- APK GAS BENCH APPROVAL TEST, (See below)
- ALTITUDE ENTRY, (See below)
- PEF DISPLAY, (See below)
- LEAK CHECK




MOVE CURSOR WITH > OR +/-
TO ENTER PRESS: #                           MENU: P
```

The layout of the GAS BENCH SPECIAL FUNCTIONS menu is dependant on the Configuration of the tester. The possible extra menu items are as follows:

1: When the Gas Approval Type is defined as STANDARD, this menu consists of the following entries: SERVICE GAS CALIBRATION, MODULE DISPLAY, LEAK CHECK.

2: When OIML is set to DEFINED and the selected gas bench is the SGM-2004, the PEF DISPLAY entry is added to this menu.

3: When the Gas Approval type is defined as APK, the APK GAS BENCH APPROVAL TEST entry is added to this menu.

4: When the Gas Approval type is defined as PTB, the PTB GAS ANALYSER CHECK entry is added to this menu.

5: When the Barometer option is not installed and/or set to NOT DEFINED, the ALTITUDE ENTRY is added to this menu.

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A: SERVICE GAS CALIBRATION:

Depending on the definition of the Barometer option configuration, one of two different pages is entered: ALTITUDE ENTRY or BPC CALIBRATION.

ALTITUDE ENTRY: This page is entered when the Barometer option is set to NOT DEFINED. This page provides the possibility to set the local altitude (0 to 5000 m) before entering the Service Gas Calibration pages.

```
DD/MM/YY                                    HH:MM
                    ALTITUDE ENTRY

- ALTITUDE  (M)     :        ....




> OR +/- = ENTER, 0 = CLEAR                 MENU: P
TO ENTER PRESS: #
```

BPC CALIBRATION: When the Barometer option is set to DEFINED, then calibration of the barometer can be performed. This page enables the user to correct the output voltage from the Pressure Transducer (also, the immediate calculated pressure is displayed), before entering the Service Gas Calibration pages.

```
DD/MM/YY                                    HH:MM
                    BPC CALIBRATION

- BAROMETER (VOLT)     :        .....

- PRESSURE  (MBAR)     :        ....




PRESS * TO START GAS CALIBRATION
PRESS P TO ABORT
```


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SERVICE GAS CALIBRATION PROCEDURE

After setting the Altitude or the Barometric Pressure, the Gas Calibration pages are entered. In these pages it is possible to perform a Hardware Gas Calibration, by following the simple instructions given on the screen.

BASIC EXAMPLE:

Note: **THIS IS ONLY A SIMPLE BASIC EXAMPLE TO DEMONSTRATE THE GAS CALIBRATION PROCEDURE, REFER TO THE MCS-2000 SERVICE MANUAL AND/OR LOCAL GAS CALIBRATION PROCEDURES FOR CORRECT GAS BENCH CALIBRATION.**

DD/MM/YY HH:MM

GAS CALIBRATION

	ZERO VOLTAGE	GAS VALUES	SPAN VOLTAGE
CO	 V	.... % VOL	 V
HC	 V	.... PPM VOL	 V
CO_2	 V	.... % VOL	 V
O_2	 V	.... % VOL	 V

WAIT 5 MINS BEFORE ADJUSTING
* = NEXT ENTRY, P= ABORT

1: Switch pump off, press **#** when ready. Wait 5 minutes before adjusting.

2: Set the ZERO VOLTAGES, when complete press *****.

3: Connect Calibration Gas to Calibration Inlet. Set the flow rate to 5 litres/min. Turn ON the Calibration Gas, when ready press **#**.

4: Allow the readings to stabilise. Set the GAS VALUES, when complete press *****.

5: Turn OFF the Calibration Gas and disconnect from the Calibration Inlet. When ready press **#**.

6: Set the SPAN VOLTAGES to 5.00 Volts, when complete press ***** to SAVE data.

7: The tester will enter the 15 Minute Warm-up. After the Warm-up period the tester will perform a Tester Calibration. After the Tester Calibration the GAS BENCH SPECIAL FUNCTIONS menu will be re-displayed.

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B: MODULE DISPLAY

The Module Display shows a number of characteristics of the Gas Module installed. The name and version number are derived directly from the Gas Bench Software. The Checksum displayed is (hard)coded into the Software. This Checksum is always the same for a certain released version of a particular gas bench.

```
DD/MM/YY                                    HH:MM
                    MODULE DISPLAY

- NAME          :          .....
- VERSION       :          .....

- CHECKSUM      :          .....









TO CONTINUE PRESS: #
```

C: GAS ANALYSER CHECK / GAS BENCH APPROVAL TEST

The page layout of this function is dependant on the Configuration of the tester. The following show the possible pages:

1: PTB GAS ANALYSER CHECK

```
DD/MM/YY                                    HH:MM
                PTB GAS ANALYSER CHECK

- GAS MODULE          :          .....
- VERSION             :          .....
- CHECK SUM SPEC      :          .....
- CHECK SUM           :          .....

- ALTITUDE  (M)       :          ....

- % VOL CO            :          ....




TO CONTINUE PRESS: #
PRESS P TO ABORT TEST
```


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2: APK GAS BENCH APPROVAL TEST

When an Andros (SGM-2004) Gas Bench is installed, the APK Gas Bench Approval Test is different when another gas bench is installed.

```
DD/MM/YY                                    HH:MM
        APK GAS BENCH APPROVAL TEST

      ADJUST VALUE WITH POTENTIOMETER

CO                  % VOL           .....
HC                  PPM VOL         .....
CO2                 % VOL           .....
REF. VOLTAGE        V               .....




PRESS: #
```

Page layout for APK Gas Bench Approval Test with an Andros Gas Bench.

```
DD/MM/YY                                    HH:MM
        APK GAS BENCH APPROVAL TEST

      ADJUST VALUE WITH POTENTIOMETER

CO ZERO             V               .....

CO                  % VOL           .....









PRESS P TO ABORT
```

Follow the instructions presented on the screen.

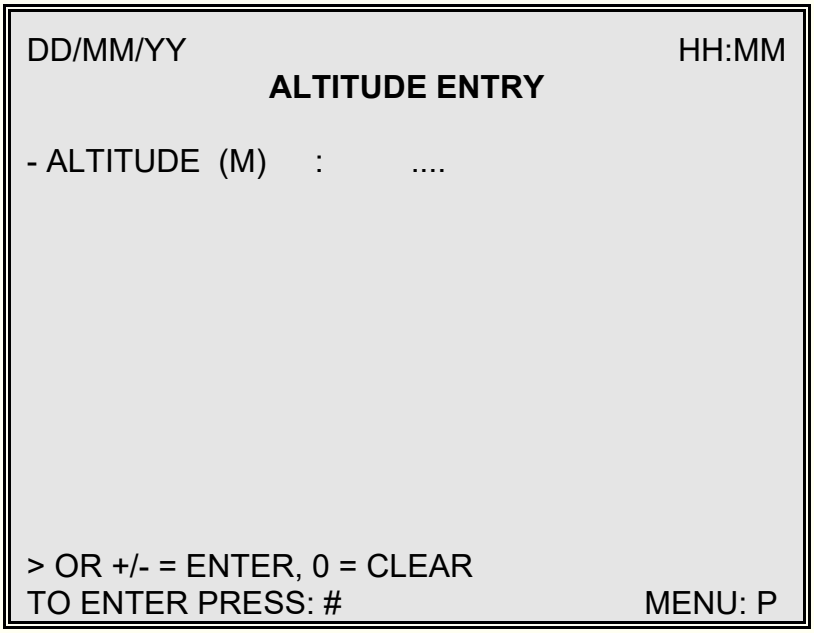
After the APK Gas Bench Approval Test, the tester will enter the 15 Minute Warm-up. After the Warm-up period the tester will perform a Tester Calibration. After the Tester Calibration the GAS BENCH SPECIAL FUNCTIONS menu will be re-displayed.

Note: If the gas bench is an MGA-1200 or an SGA-9000, then a 2 Minute Warm-up will be performed.

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D: ALTITUDE ENTRY:

This page is entered when the Barometer option is set to NOT DEFINED. This page provides the possibility to set the local altitude (0 to 5000 m) before entering the Service Gas Calibration pages.

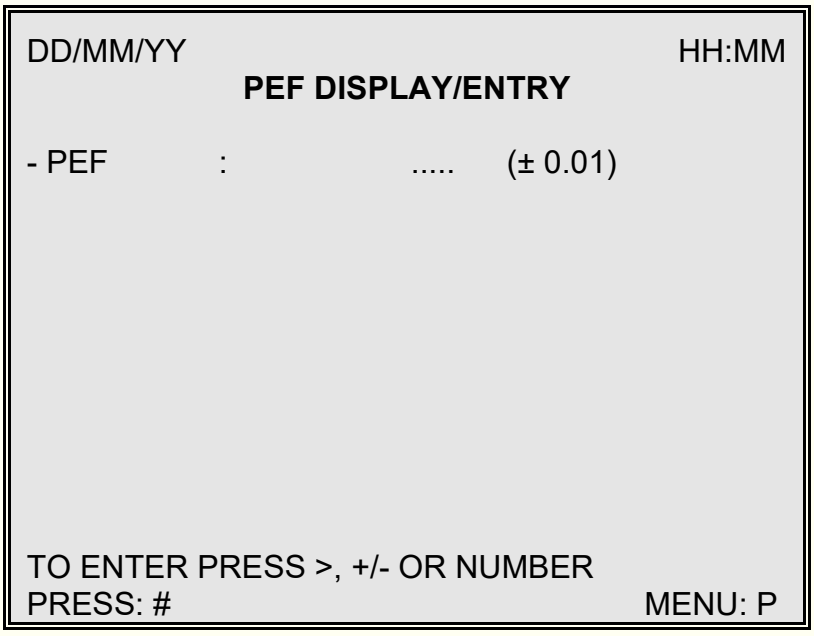


Note: Contact the nearest airport or airfield for the local altitude information.

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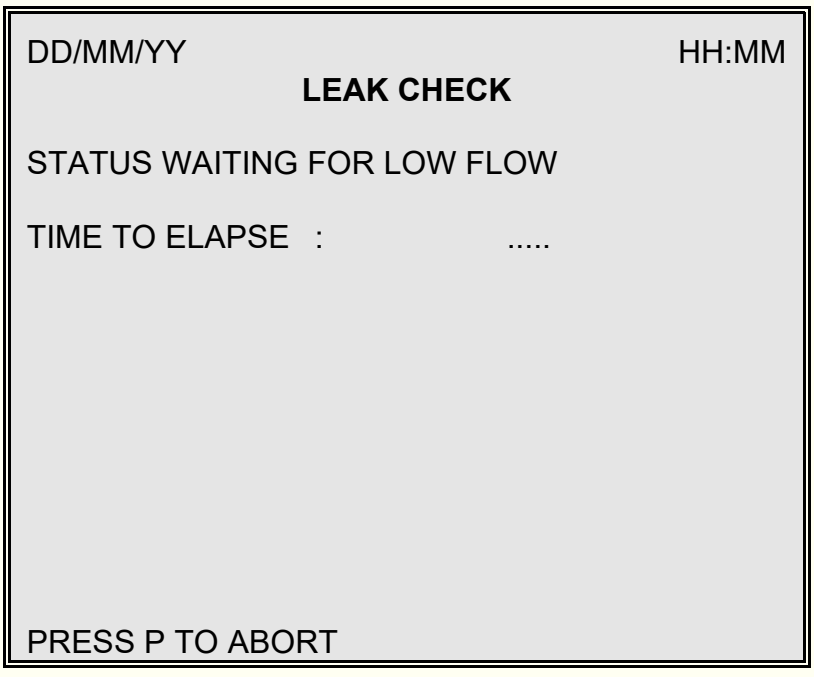
E: PEF DISPLAY / ENTRY

When OIML is set to DEFINED and the selected gas bench is the SGM-2004, the PEF DISPLAY entry is added to this menu. The "PEF Factor" is normally shown on a label attached to the Gas Bench chassis and must lie within the limits of 0.490 to 0.540.



1: Enter the PEF using **>**, **+/-** keys or the 0 to 9 keys on the keypad. Press **#** when complete.

F: LEAK CHECK:



1: Follow the instructions displayed on the screen.

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4: SPECIAL FUNCTIONS

```
DD/MM/YY                                    HH:MM
                  SPECIAL FUNCTIONS

- CUSTOMER MESSAGE EDITOR
- DATE/TIME ENTRY
- SCREEN SAVER ENTRY
- SELECT CHARACTER SET




MOVE CURSOR WITH > OR +/-
TO ENTER PRESS: #                          MENU: P
```

A: CUSTOMER MESSAGE EDITOR

In this page, a message can be entered on to the screen. This message will be saved into E-EPROM memory and can be retrieved and printed at a later stage.

```
DD/MM/YY                                    HH:MM
              CUSTOMER MESSAGE EDITOR

              SUN ELECTRIC EUROPE B.V.
                   SPAKLERWEG, 69
                1099 BB AMSTERDAM
                 THE NETHERLANDS

          * * * RESULTS OF VEHICLE TEST * * *




> OR +/- = ENTER, 0 TO CLEAR
* OR #    = MOVE,  P =  ABORT
```

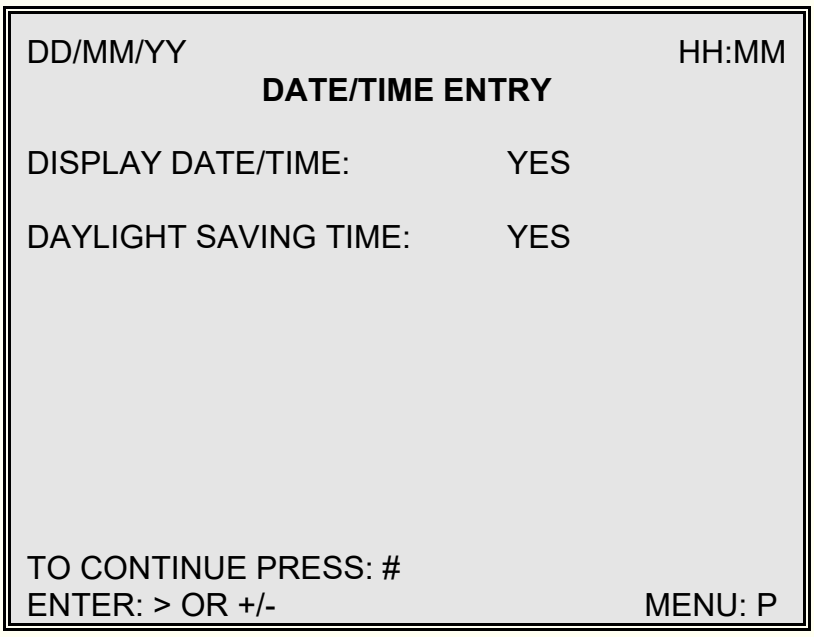
1: Press and hold the **>** key to select a character from the character set, press the ***** key to move to the next entry.

2: At the last character on the last line press the **#** key to save the Customer Message, the caption Writing To Memory will be displayed.

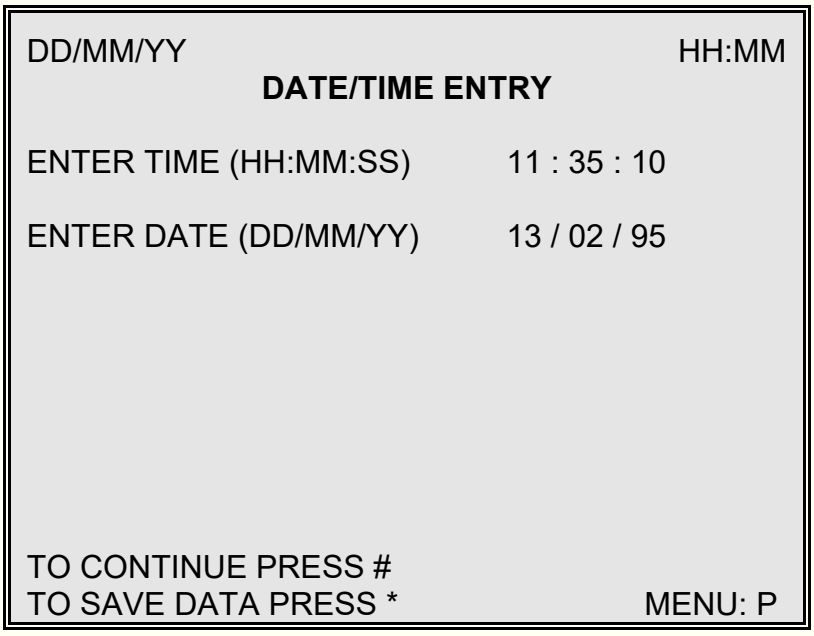
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B: DATE/TIME ENTRY

The Real Time Clock kit must be installed and DEFINED in order to enter the Date and Time.



1: To change the settings, press the **>** key and press the **#** key to move to the next setting. Press the **#** key to continue and the following will be displayed:



2: Use the **>** key to set the Hours, press the **#** key to move to the Minutes. Use the **>** key to set the Minutes, press the **#** key to move to the Seconds. Use the **>** key to set the Seconds, press the **#** key to move to the Date Setting. Enter the Date using the same method. Press the ***** key to save the data.

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C: SCREEN SAVER SETTINGS

```
DD/MM/YY                                    HH:MM
              SCREEN SAVER SETTINGS

TIMEOUT    :        ...

RANGE      :        0 TO 255 MINUTES


A ZERO VALUE TURNS SCREEN SAVER OFF.

RE-BOOT TESTER TO MAKE NEW TIMEOUT
ACTIVE.


TO ENTER PRESS >, +/- OR NUMBER
TO ENTER PRESS: #                      MENU: P
```

1: To enter press the **>**, **+/-** or number keys, when complete press the **#** key.

D: SELECT CHARACTER SET

```
DD/MM/YY                                    HH:MM
              SELECT CHARACTER SET

CHARACTER SET  :        STANDARD / BOLD









TO ENTER PRESS >, +/- OR NUMBER
TO ENTER PRESS: #                      MENU: P
```

1: To enter press the **>**, **+/-** or number keys, when complete press the **#** key.

If the screen of the tester is unreadable after selecting the Bold Character Set, press the **0** key followed by the **#** key.

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5: MULTIMETER/SCOPE

These pages lead the user through the Vehicle Entry Without Limits entry screen and give the ability to configure a type of engine for several tests:

```
DD/MM/YY                                    HH:MM
          VEHICLE ENTRY WITHOUT LIMITS

ENGINE TYPE:                  PETROL
NUMBER OF CYLINDERS:          4
FIRING ORDER:                 1- 3- 4- 2

CYLINDER STROKE:              4
MAG PROBE:                    YES
TDC OFFSET:                   -20.0




MOVE CURSOR WITH > OR +/-
TO CONTINUE PRESS: #
```

The next page that is entered is dependent on wether the Digital Scope is DEFINED or NOT DEFINED. If DEFINED, the next page shows the following options:

```
DD/MM/YY                                    HH:MM
                MULTIMETER/SCOPE

- MULTIMETER TESTS
- SCOPE FUNCTIONS









MOVE CURSOR WITH >, OR +/- KEYS
TO ENTER PRESS: #                          MENU: P
```

Otherwise the first option, "Multimeter Tests" are entered directly.

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A: MULTIMETER TESTS

The "Multimeter Test Pages" are identical to the pages that are in the MCS-2000 System Software.

MULTIMETER TEST 1

```
DD/MM/YY                                          HH:MM
                    MULTIMETER TEST 1
.......  !......  !......  !......  !......  !......      0
0        200      400      600      800      1000       RPM

ENGINE                          RPM          .....
BATTERY                         VOLTS        .....
ALT. RIPPLE                     %            .....
CURRENT                         AMPS         .....
COIL +/KL.15                    VOLTS        .....
COIL -/KL.1                     VOLTS        .....
DWELL                           °            .....
Peak Firing Voltage             KV           .....
HC                              PPM VOL      .....
Oil Temperature                 °C           .....

TO CONTINUE PRESS #
                              PRESS P TO ABORT TEST
```

MULTIMETER TEST 2

```
DD/MM/YY                                          HH:MM
              MULTIMETER TEST 2 (PAGE 1)
.......  !......  !......  !......  !......  !......      0
0        200      400      600      800      1000       RPM

ENGINE                          RPM          .....
TIMING                          °            .....
DWELL                           °            .....
Peak Firing Voltage             KV           .....
VACUUM                          MBAR         .....
Oil Temperature                 °C           .....



1 = NEXT PAGE, # = CONTINUE
                              PRESS P TO ABORT TEST
```


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```
DD/MM/YY                                          HH:MM
              MULTIMETER TEST 2 (PAGE 2)
.......  !.....  !.....  !.....  !.....  !.....      0
0        200     400     600     800     1000       RPM

ENGINE                          RPM          .....
CO                              % VOL        .....
HC                              PPM VOL      .....
CO2                             % VOL        .....
O2                              % VOL        .....
LAMBDA Calculated                            .....
Air Fuel Ratio                               .....
Oil Temperature                 °C           .....


TO CONTINUE PRESS #
                              PRESS P TO ABORT TEST
```

MULTIMETER TEST 3

```
DD/MM/YY                                          HH:MM
                    MULTIMETER TEST 3
.......  !.....  !.....  !.....  !.....  !.....      0
0        200     400     600     800     1000       RPM

FREQUENCY        HZ              .....
METER VOLTAGE    VOLTS           .....
RESISTANCE       OHMS            .....



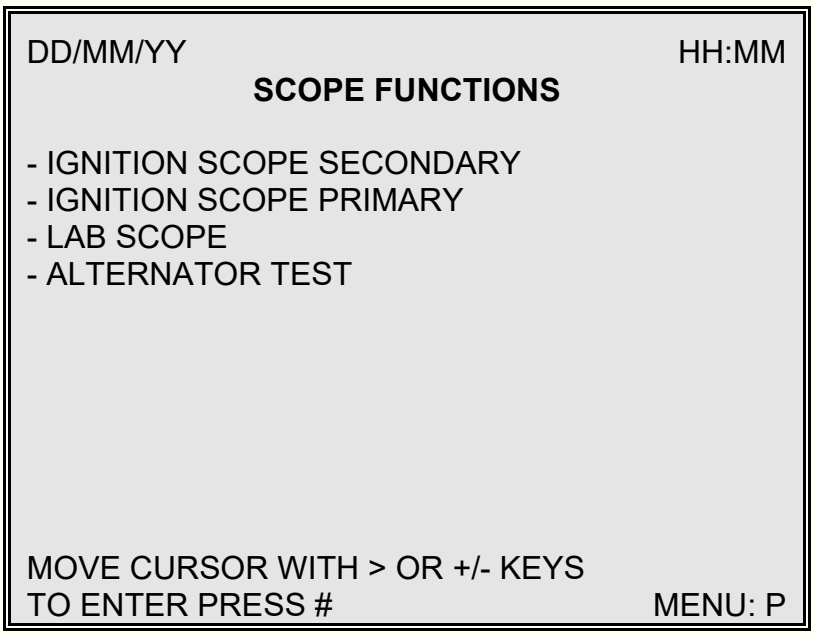

TO SELECT BETWEEN VOLTAGE AND
RESISTANCE PRESS >

TO CONTINUE PRESS #
                              PRESS P TO ABORT TEST
```


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B: SCOPE FUNCTIONS

The Scope Functions are identical to those in the MCS-2000 System Software.



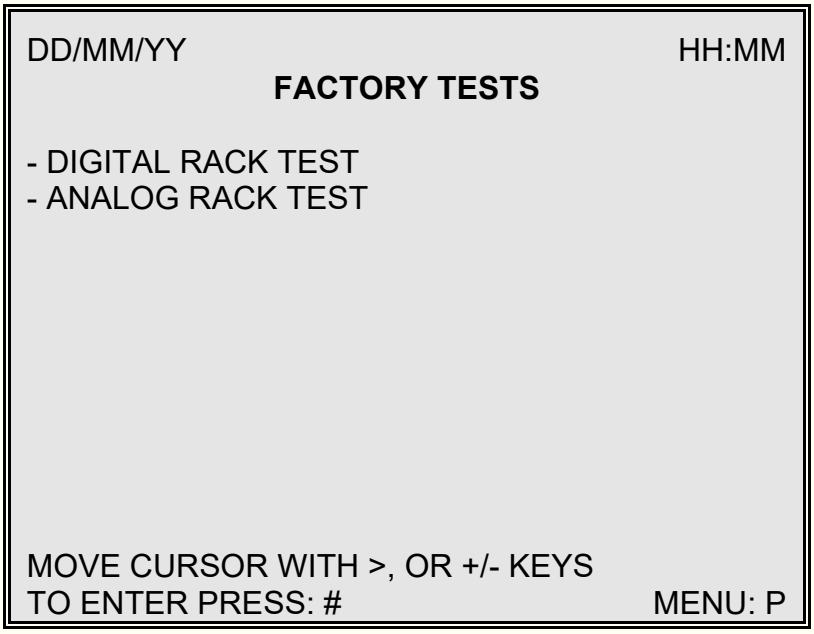
****

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6: FACTORY TESTS

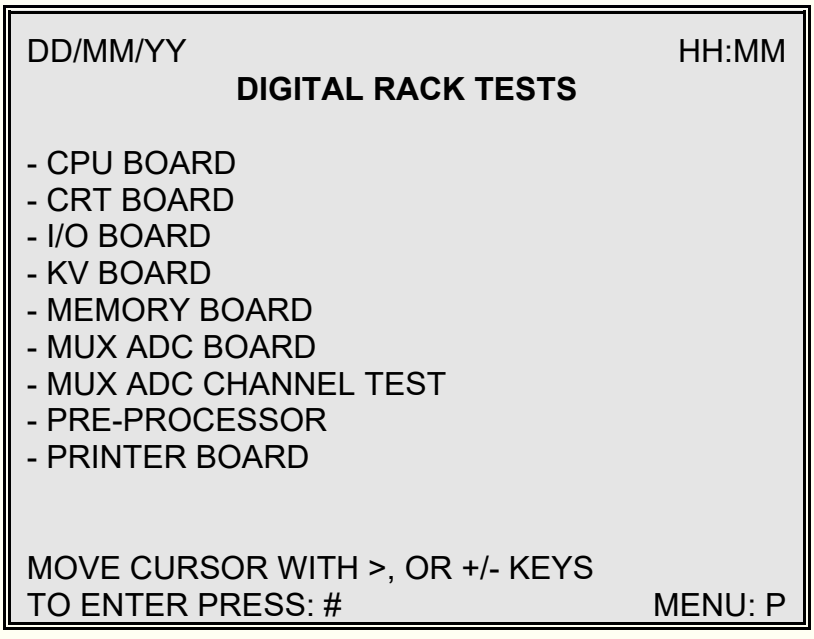
Before the Factory Test menu appears the "Vehicle Entry Without Limits" page is entered. The "Factory Test" menu is divided into two main categories:

A: Tests all Digital Functions of the Tester.
B: Test the Analog Circuitry of the Tester.



1: Select the Digital Rack Test, using the **>** key and press the **#** key, the following will be displayed:

A: DIGITAL RACK TESTS



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A.1: CPU BOARD

The CPU Board Test contains three entries. Each serves to monitor the functioning of a specific part of the Board.

```
DD/MM/YY                                HH:MM
                    CPU BOARD

- EPROM/E-EPROM
- LEDS
- INTERRUPTS




MOVE CURSOR WITH >, OR +/- KEYS
TO ENTER PRESS: #                       MENU: P
```

EPROM/E-EPROM TEST

This page shows the Checksums of the EPROM and the E-EPROM. The Checksums indicate if the information contained in the respective proms is reliable. For the EPROM the least significant byte should always be 0x55H.

```
DD/MM/YY                                HH:MM
                EPROM / E-EPROM TEST

CHECKSUMS:              CALC:       SPEC:

EPROM:
        LOW BYTE (E4)   ....        XX55
        HIGH BYTE (E2)  ....        XX55

E-EPROM:
        LOW BYTE (F4)   ....        ----
        HIGH BYTE (F2)  ....        ....



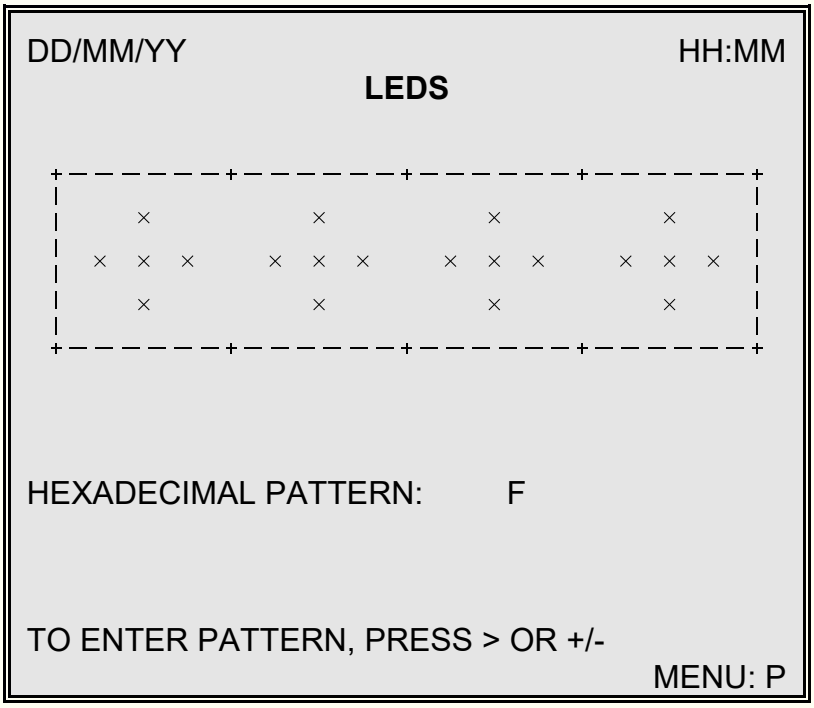
TO TEST PRESS: #                        MENU: P
```

Legend: XX = No Specification
---- = Specification not possible because low byte is not used in this Configuration.

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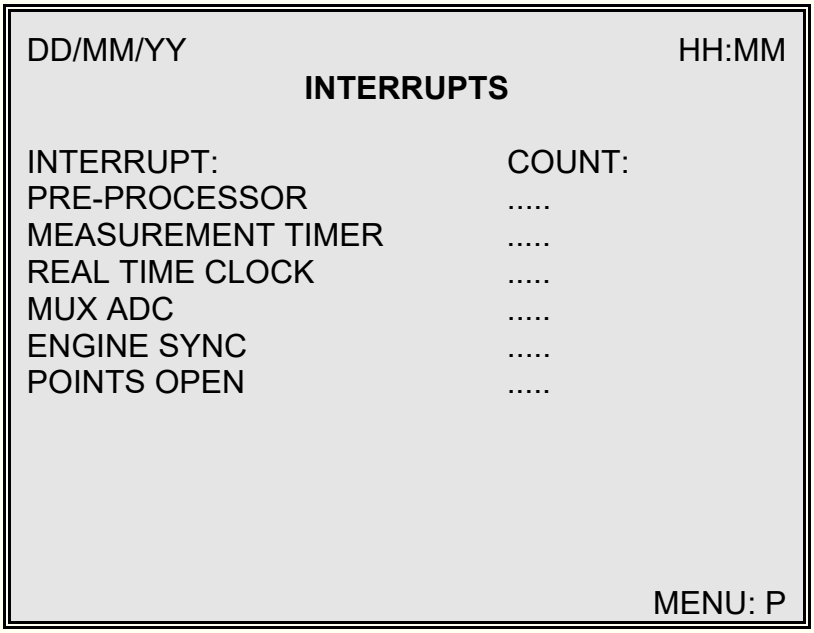
LEDS TEST

The LED Test enables the user to individually activate any of the four (4) LED's on the CPU Board. By stepping through the various input values, a different pattern is displayed. This pattern is from left to right the hexadecimal value that is entered. (LED On = 1).



INTERRUPTS

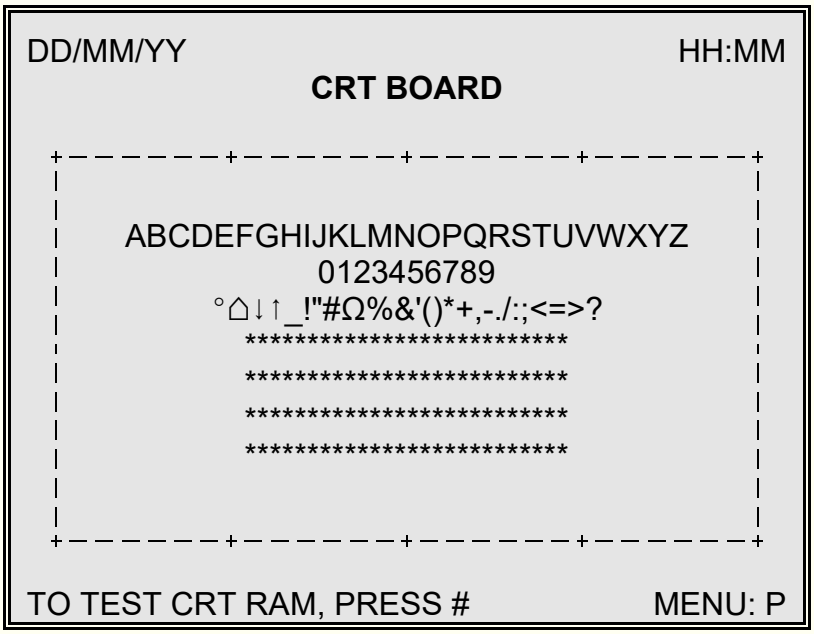
The Interrupts test continuously displays a number of counters. Each counter shows the total number of Interrupts that the CPU received since the test page was entered. While in the test page the counters are continuously updated. Each of the counters displays the number of Interrupts that a specific hardware device generates.



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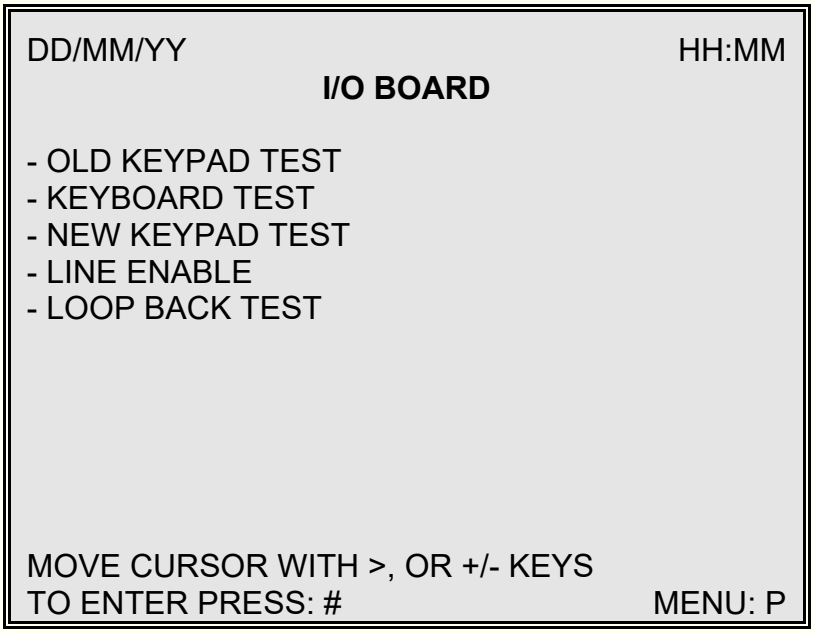
A.2: CRT BOARD TEST

The Cathode Ray Tube (CRT) test is designed to test the CRT Ram. The Ram is tested by writing a value to Ram and subsequently read that Ram location. Whenever different values are found, a CRT Failure Message will be displayed.



A.3: I/O BOARD

The Digital I/O Test contains tests that communicate through the Digital I/O Ports. These Ports/Lines can be tested directly.



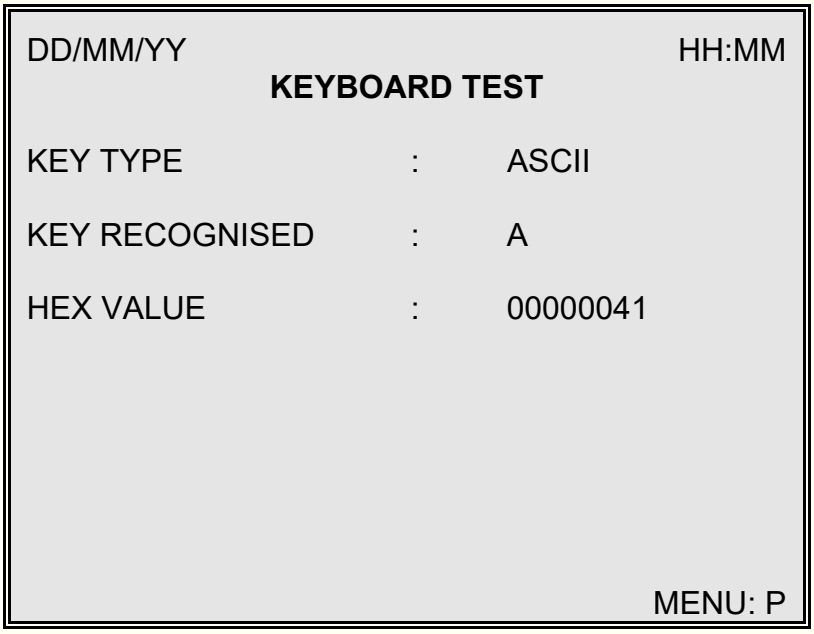
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OLD KEYPAD TEST

The display contains the layout of the standard MCS-2000 Keypad. By pressing a Key on the Keypad (except for "P"), the actual functioning of that Key can be checked.

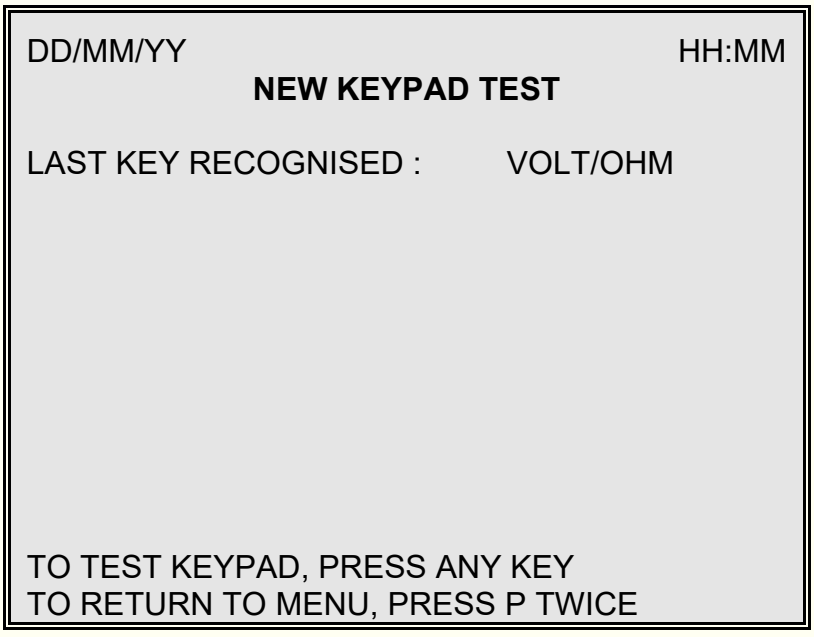
KEYBOARD TEST

When a Key on the Keyboard is pressed the display is updated. Some Keyboard functions have the same function as a Keypad Key. If the detected Key is of the Keypad type, then the display is the equivalent Keypad Key; the hex value will be cleared.



NEW KEYPAD TEST

When a Key is pressed, a text string that matches the function of that Key is displayed.



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LINE ENABLE

Test Digital I/O Lines. The Line can be tested by setting a "1" or a "0" on the output. Relays and Solenoids can be heard activating.

```
DD/MM/YY                                HH:MM
                  LINE ENABLE

SHORT CYLINDER:                         OFF
GAS SPAN RELAY:                         OFF
GAS PURGE RELAY:                        ON
OHMS RANGE RELAY:                       OFF
VOLT/OHM SELECT:                        ON
PRIMARY ENABLE:                         OFF
AMPS RANGE SELECT:                      OFF
ENGINE KILL:                            OFF
DIESEL SNAP DETECT:                     OFF


ENTER: > OR +/-
NEXT ENTRY: #                           MENU: P
```

LOOP BACK TEST

This test checks the serial ports for Transmission, Reception and Data Control lines. Internal and/or External Loop back connectors are required for this test, see Page 30 for details.

```
DD/MM/YY                                HH:MM
                  LOOP BACK TEST

            CHOOSE SERIAL PORT TO TEST
                SERIAL PORT: 1









PRESS +/- TO CHANGE SERIAL PORT NUMBER
TO CONTINUE PRESS #                     MENU: P
```

Note: THIS TEST WILL BE DESTRUCTIVE FOR ANY SERIAL PORT COMMUNICATION CURRENTLY IN USE.

1: Connect the Loop back connector to the serial port to be tested.

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```
DD/MM/YY                                    HH:MM
                    LOOP BACK TEST

TESTING PORT 1                  RESULT

BLOCK TRANSMIT/RECEIVE:         PASSED

DTR/DSR TOGGLE TEST:            PASSED

RECEIVE INTERRUPT TEST:         PASSED

SERIAL PORT PASSED


TO REPEAT TEST PRESS +/-
                                            MENU: P
```

If the Serial port test fails any of the three tests, a list of possible causes will be given:

The BLOCK TRANSMIT/RECEIVE transmits a block of 256 characters on a polling basis. This test can result in a few possible errors, only the first error found will be displayed. There are six errors possible:

TRANSMIT TIME-OUT ERROR:	Transmit buffer of the ACIA stays full.
RECEIVE TIME-OUT ERROR:	Receive buffer stays empty.
OVER RUN ERROR.	
FRAMING ERROR.	
PARITY ERROR.	
BLOCK MISMATCH ERROR:	Characters transmitted are not the same as those received.

The DTR/DSR TOGGLE TEST makes the DTR output of the ACIA inactive, (level is high). Then the DSR bit is tested, after this the DTR level is made active, (low level) and the DSR bit is tested again. When the bit is cleared the test result will be good. There are two errors possible:

DSR BIT NOT SET:	DSR bit will not set in the first part of the test.
DSR BIT NOT CLEARED:	DSR bit will not clear in the second part of the test.

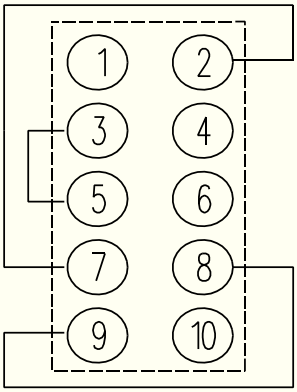
In the RECEIVE INTERRUPT TEST 10 interrupts are generated by transmitting 10 characters, (5 times 0xAA and 5 times 0x55). After a character is transmitted, an interrupt will be generated. The interrupt handler will try to read the same character transmitted and it counts the interrupt serviced. There are three errors possible:

TIME-OUT ERROR:	When no interrupt is generated within a certain time.
BAD CHARACTER RECEIVED:	Character received does not match the one transmitted.
IRQ NOT GENERATED:	When not all 10 interrupts are generated.

2: When complete, disconnect the Loop back connector.

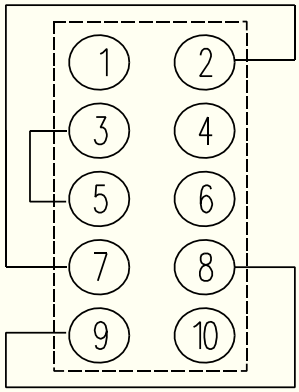
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FLOPPY DISK / RS-232 INTERFACE BOARD, P/N: 7001E9310-05



1: INT
2: DCD
3: DTR
4: SGND
5: DSR
6: CTS
7: RTS
8: RxD
9: TxD
10: NC

INTERNAL LOOP BACK CONNECTOR, P6, PORT 1



1: NC
2: DCD
3: DTR
4: SGND
5: DSR
6: CTS
7: RTS
8: RxD
9: TxD
10: NC

INTERNAL LOOP BACK CONNECTOR, P5, PORT 2

NOTE: PORT 1, DO NOT SHORT PINS 2 AND 7 IF THE SERIAL KEYBOARD IS INSTALLED.

EXTERNAL LOOP BACK CONNECTOR: DB25-PIN MALE
SHORT PINS: 2 AND 3, 5 AND 20

INTERNAL AND EXTERNAL LOOP BACK CONNECTORS

****

SERIAL PORTS ASSIGNMENT

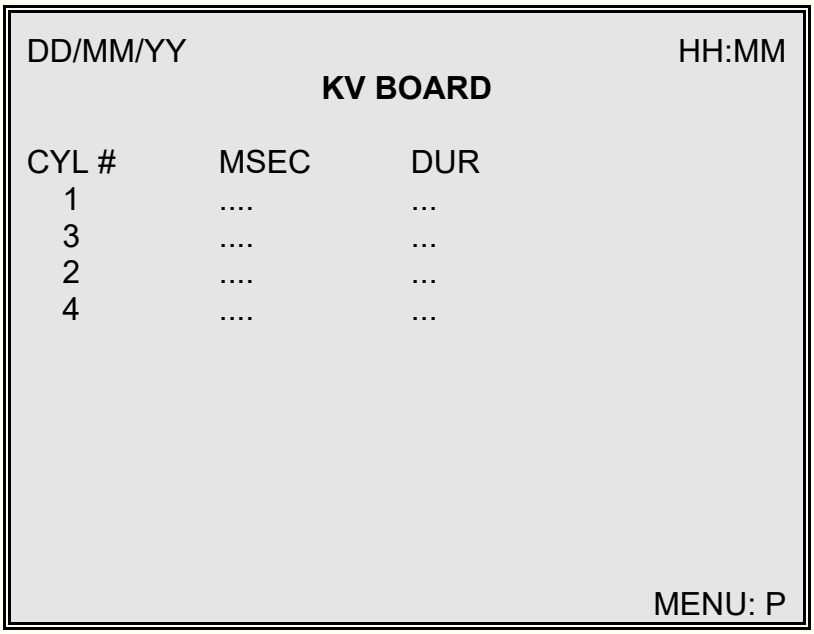
PORT 1, P6	PORT 2, P5	PARALLEL KEYBOARD
Serial Keyboard	- - -	NO
Serial Keyboard	SDL-20	NO
- - -	SDL-20	YES
- - -	SGA-9000 or MGA-1200	NO
- - -	SGA-9000 or MGA-1200	YES
Serial Keyboard	SGA-9000 or MGA-1200	NO
SDL-20	SGA-9000 or MGA-1200	YES
- - -	DSPP	YES
SDL-20	DSPP	YES

Note: When an entry shows "- - -", this means that the serial port must remain UNUSED.

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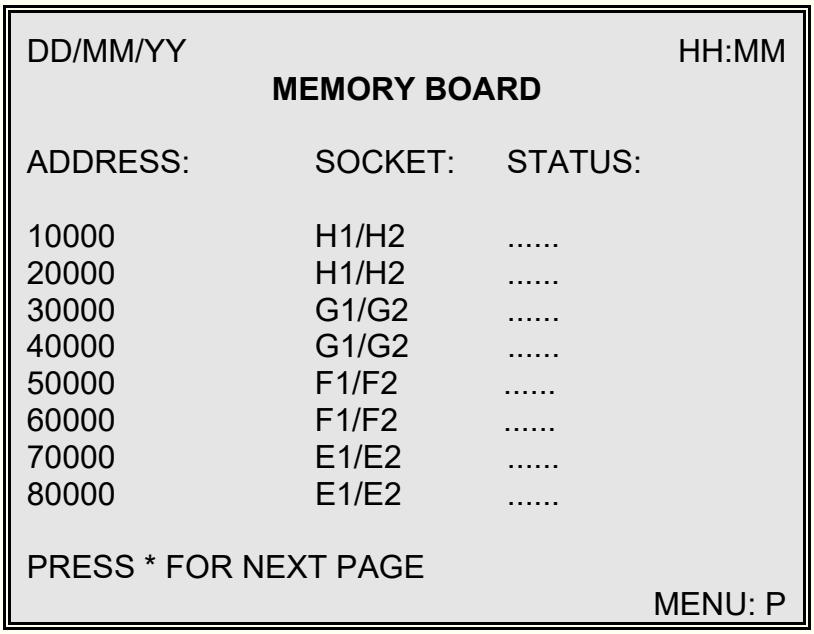
A.4: DIGITAL KV BOARD

Measurements of Interval (Dwell) after Cylinder Firing for each Cylinder. The Number of Cylinders and the Firing Order was selected before entering the Factory Test in the "Vehicle Entry Without Limits" page.



A.5: MEMORY BOARD

The System RAM Chips can be tested in this page. The number of sockets and addresses displayed depend upon the amount of RAM memory installed in the tester.



1: Press the * Key for the next page.

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```
DD/MM/YY                                    HH:MM
                    MEMORY BOARD

ADDRESS:        SOCKET:     STATUS:

90000           D1/D2       ......
A0000           D1/D2       ......
B0000           C1/C2       ......
C0000           B1/B2       ......
D0000           A1/A2       ......
E0000           C1/C2       ......
F0000           B1/B2       ......
100000          A1/A2       ......

PRESS * FOR NEXT PAGE
                                        MENU: P
```

The Status can be one of the following:

- TESTING	:	Busy testing the RAM Socket
- GOOD	:	RAM Socket Test successful
- INCOMPLETE	:	Testing RAM Socket skipped by pressing "#"
- ****:****:****	:	Failure detected at this Address.

A.6: MUX ADC BOARD

Test Zero (0) and Span (2000) of ranges 1.835 and 7.350 Volts each.

```
DD/MM/YY                                    HH:MM
                    MUX ADC BOARD

GAIN:       REF:        COUNTS:     ADJUST
                                    TO:

X1          ZERO        ...         ..... VOLTS
X1          SPAN        ...         ..... VOLTS
X4          ZERO        ...         ..... VOLTS
X4          SPAN        ...         ..... VOLTS

CONVERSION TIME:        ..... µS


                                        MENU: P
```


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A.7: MUX ADC CHANNEL TEST

This test supports the new MUX/ADC Board, P/N: 7001E9313-27. This test can be used to test the 32 Channels (only 25 are used) and the 8 Trigger levels on this board.

```
DD/MM/YY                                    HH:MM
                MUX ADC CHANNEL TEST

CHANNEL:   0
GAIN:      X1
TRIGGER:   INTERNAL, AUTOMATIC

_____________________________

MUX ZERO:          *
MUX SPAN:          *
VOLTAGE READ:      *


ENTER: > OR +/-, TO START PRESS *
TO CONTINUE PRESS: #                        MENU: P
```

The possible selections are:
CHANNEL: 0 to 31, see below for Channel Input Definition details.
GAIN: X1 or X4
TRIGGER: INTERNAL, AUTOMATIC, or EXTERNAL, CHANNELS 2 to 7, or INTERNAL, MANUAL

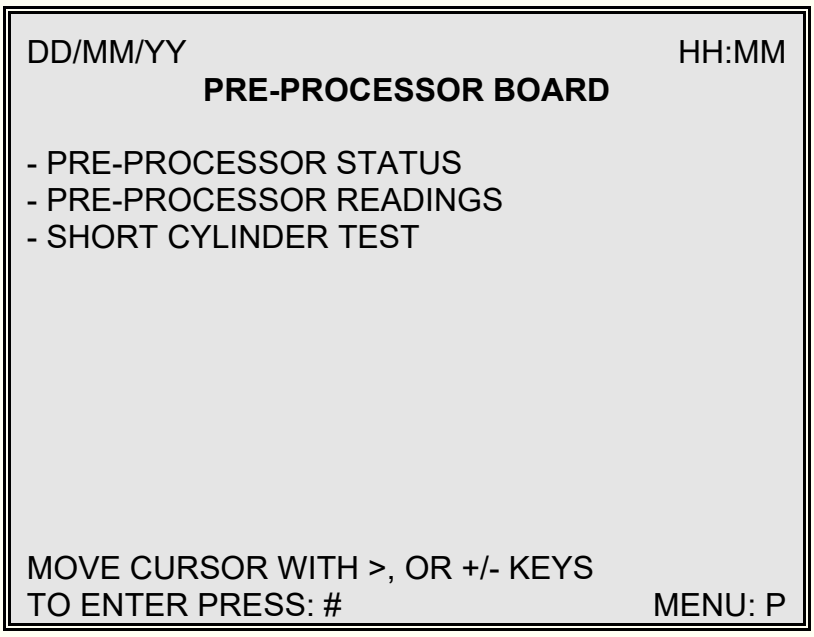
Note: Use "INTERNAL, AUTOMATIC" Triggering only.

NO	I/P DEFINITION	NO	I/P DEFINITION	NO	I/P DEFINITION
0	Zero Voltage Reference	14	Average Amps	25	Secondary peak
1	Volts Span Reference	16	Gas Bench, CO_2	26	Battery ripple
4	Coil-, KL.1	17	Gas Bench, O_2, Sensor	27	Gas Bench, HC Low
5	Volt/Ohm, Floating	18	Gas Bench, HC High	28	Gas Bench, CO
6	Amps, Instantaneous	19	Gas Bench, O_2, Andros Bench	29	Secondary Available
7	Vacuum	20	Gas Bench, Pressure Barometric	30	Coil+, KL.15
9	Battery Volts	21	Gas Bench, Ambient Temperature	31	Secondary spark, 1st sample
10	Oil Temperature	22	Gas Bench, Internal Vacuum		
12	Primary Available	24	Secondary spark, 2nd sample		

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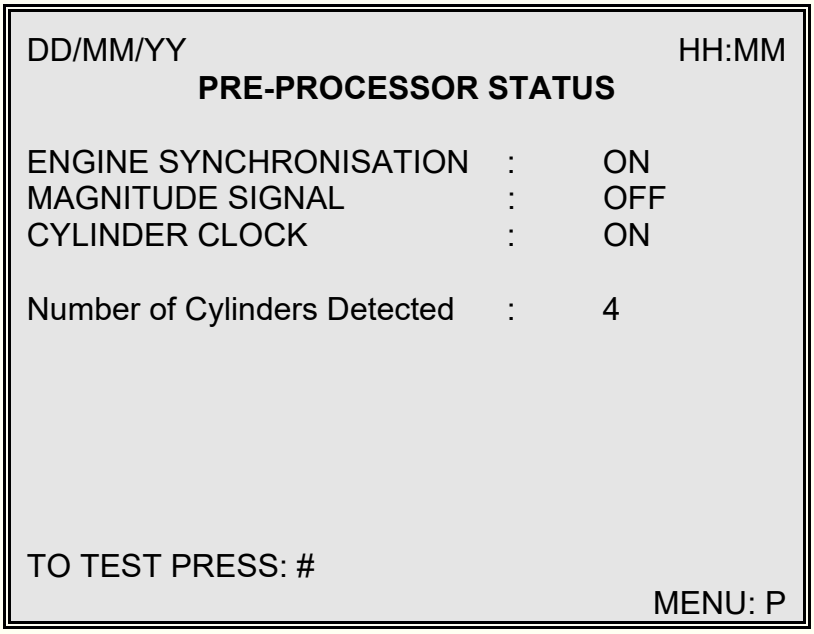
A.8: PRE-PROCESSOR BOARD

Three (3) Selections can be made in the Pre-Processor Board Test.



PRE-PROCESSOR STATUS

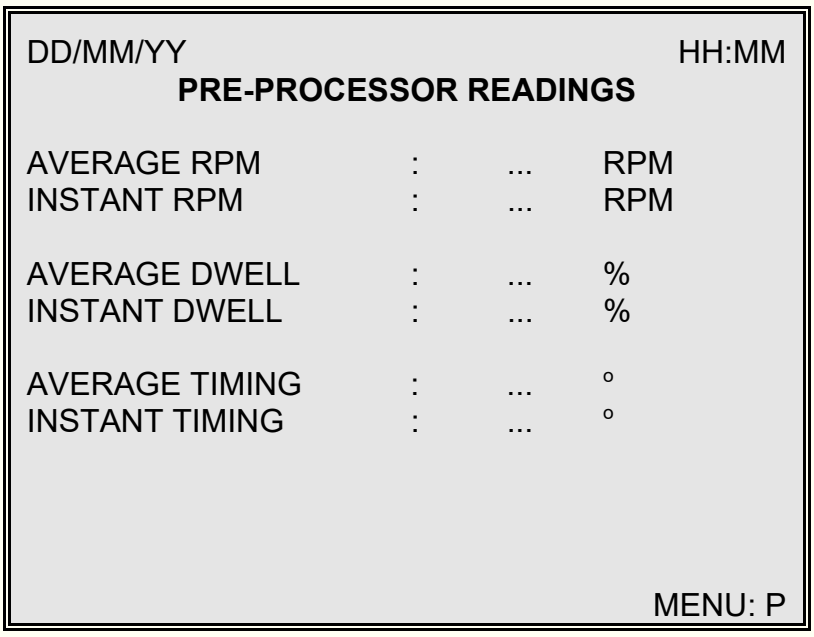
In this page the Status of the Pre-Processor is displayed.



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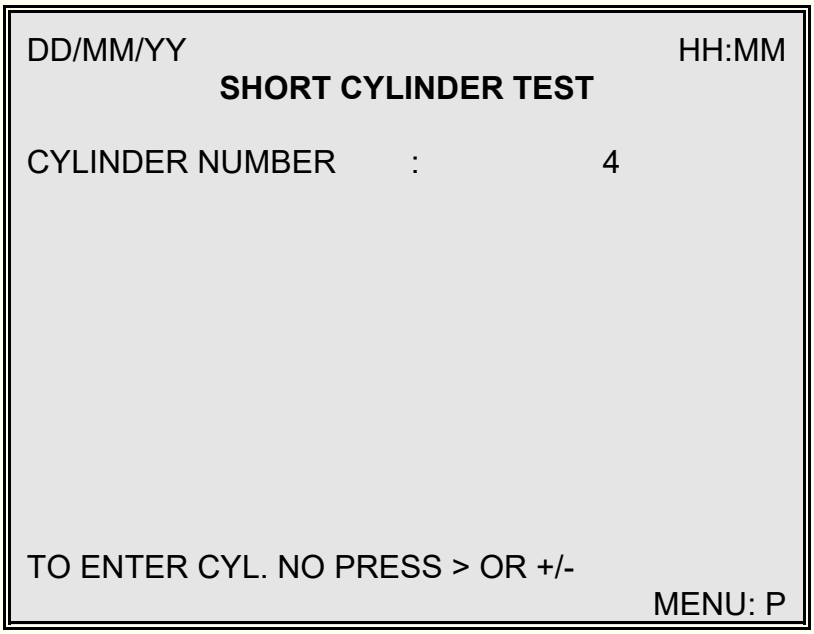
PRE-PROCESSOR READINGS

This page displays the current readings of the Pre-Processor.



SHORT CYLINDER TEST

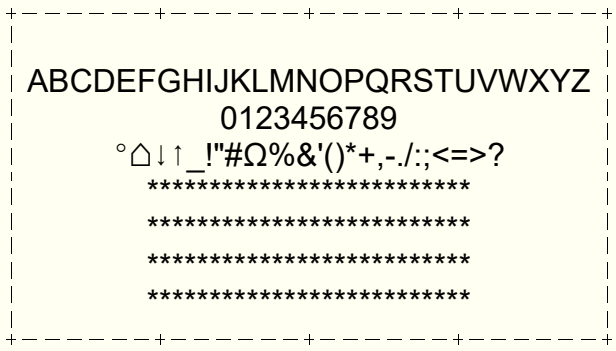
Enter Cylinder Numbers in Firing Order. The Cylinder selected will be instantly shorted.



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A.9: PRINTER BOARD

Test Printer Board. Pressing the Print key when in this page will send all characters from the display memory to the printer as shown below:



****

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B: ANALOG RACK TEST

Second sub-menu of Factory Testing. This page shows the possible entries of pages that lead to various tests of Analog parts of the tester.

```
DD/MM/YY                                    HH:MM
                    ANALOG RACK TEST

- AMPS BOARD
- VOLT/OHM BOARD
- PEAK KV/RIPPLE
- SPARK KV/SLOPE
- BOOM POD
- TESTER CALIBRATION




MOVE CURSOR WITH >, OR +/- KEYS
TO ENTER PRESS: #                           MENU: P
```

B.1: AMPS BOARD

Select AMPS 100 or AMPS 1k Range and Test MUX Voltage. The values read are displayed in two formats; a raw value read directly and an average value.

```
DD/MM/YY                                    HH:MM
                      AMPS BOARD

                        VALUE       MUX
                                    VOLTAGE

AMPS 100 ZERO                       .......
AMPS  1K ZERO                       .......

AVERAGE AMPS      .....
AMPS RANGE        .....




                                            MENU: P
```


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B.2: VOLT/OHM BOARD

Select mVolts or Ohms and Test MUX Voltage.

```
DD/MM/YY                                        HH:MM
                    VOLT/OHM BOARD

                  VALUE        MUX          VOLTAGE
                               ZERO         READ

VOLTS V           ...          ....         .......
OHMS  Ω                                     .......
OHMS OPEN                                   .......
OHMS SPAN                                   .......
OHMS ZERO                                   .......

MEASUREMENT TYPE    VOLTS/OHMS

TO SELECT MEAS. TYPE, PRESS #
                                            MENU: P
```

B.3: PEAK KV/RIPPLE

Test MUX Voltages for the Peak KV Test.

```
DD/MM/YY                                        HH:MM
                   PEAK KV/RIPPLE

                  VALUE        MUX          VOLTAGE
                               ZERO         READ

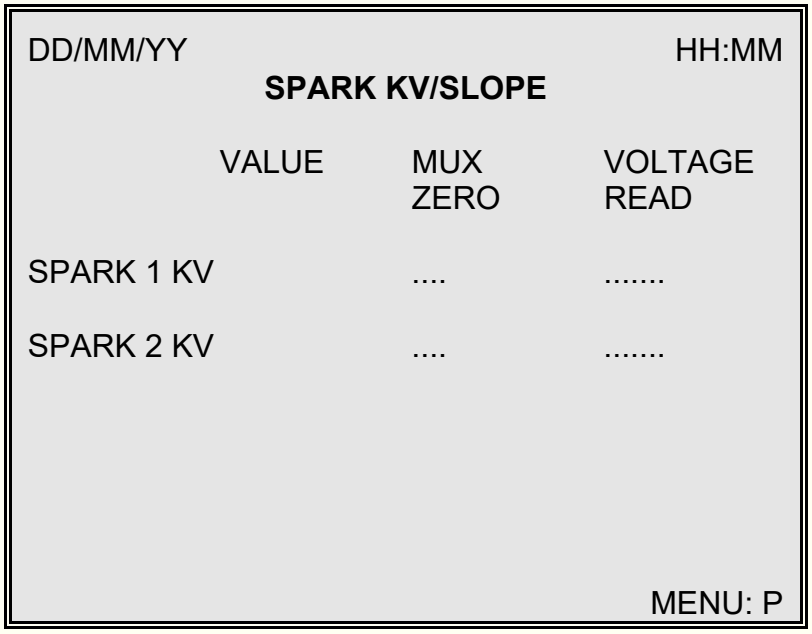
PKKV   KV         ...          ....         .......
RIPPLE  V         .....        ....         .......
%                 ...          ....         .......
BATTERY V         ...                       .......




                                            MENU: P
```

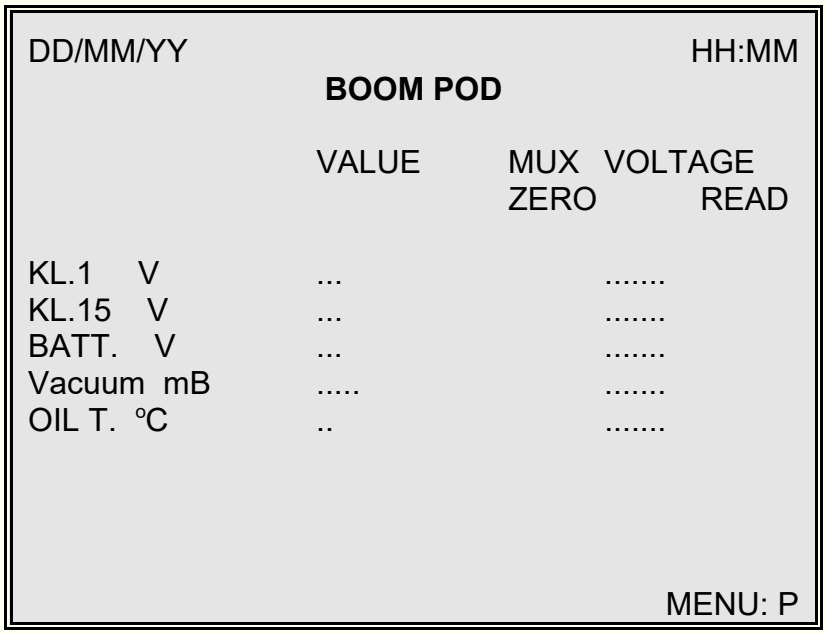

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B.4: SPARK KV/SLOPE



B.5: BOOM POD TEST

Test the Boom Pod. The values are read from the Inputs and displayed directly on the screen.



B.6: TESTER CALIBRATION

This page is identical to the "Tester Calibration" function in the "Program Selection" page (Main Menu) and to last page of the "Gas Bench Special Functions" menu.

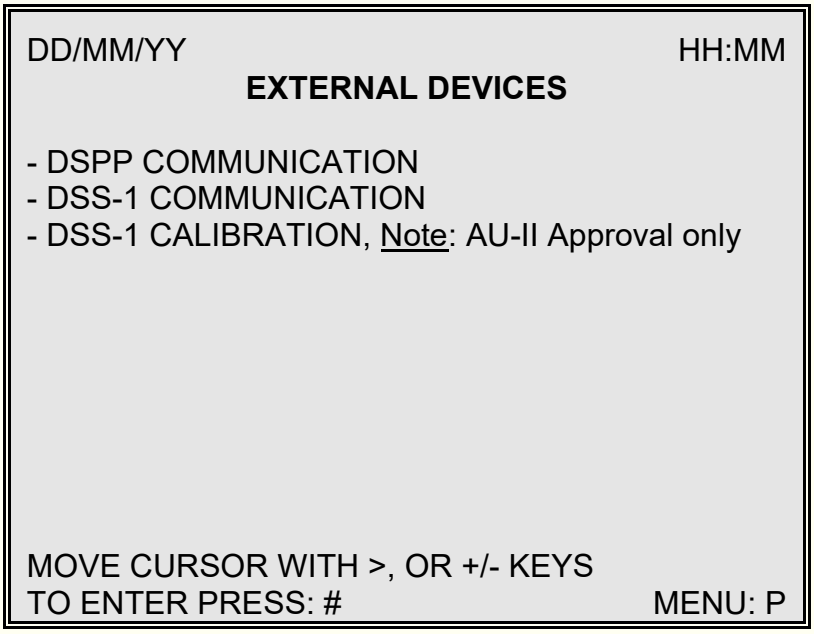
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7: EXTERNAL DEVICES

Note: 1: The External Devices Selection is not operational, unless the DSPP and DSS-1 options are installed and the DSS-1 entry is set to DEFINED in the Tester Configuration Entry page.

2: Also, the External Devices Selection requires Service Disk 2, SERV_OPT.GB, P/N: 0553E5005-51.

1: Select EXTERNAL DEVICES from the Program Selection menu, using the **>** key to move to a menu item and press the **#** key to select that item.



2: Select DSPP COMMUNICATION from the EXTERNAL DEVICES menu.

3: When instructed remove the Service Disk 1 from the floppy disk drive and insert the Service Disk 2, SERV_OPT.GB, P/N: 0553E5005-51. Press the **#** key when ready.

4: After a few seconds the DSPP Communication menu will be displayed.

A: DSPP COMMUNICATION

This test can be used to test the configuration and to check if the communication between the MCS-2000, the DSPP and the DSS-1 is operating correctly.

This test consists of two pages, the first page shows the commands which the Service Engineer can select and execute:

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```
DD/MM/YY                                    HH:MM
              DSPP COMMUNICATION MENU

- DSPP CALIBRATION
- STATUS REQUEST
- K VALUE REQUEST
- MAXIMUM K REQUEST
- TEMPERATURE REQUEST




MOVE CURSOR WITH >, OR +/- KEYS
TO CONTINUE PRESS: #                        MENU: P
```

CALIBRATION REQUEST:	Calibrate the DSS-1
STATUS REQUEST:	Displays the status from the DSPP and DSS-1
K VALUE REQUEST:	Displays the instantaneous opacity value.
MAXIMUM K REQUEST:	Displays the maximum opacity value measured during a period of six seconds.
TEMPERATURE REQUEST:	Displays the DSS-1 tube temperature.

The second page shows the status from the DSPP, the DSS-1 and the returned value(s) of the command(s) executed:

```
DD/MM/YY                                    HH:MM
                DSPP COMMUNICATION

COMMAND SENT:          DSPP CALIBRATION
STATUS:                CMD BEING SERVICED

DSS-1:          - - - -
DSPP:           - - - -

K VALUE:        *      1/M
K MAX VALUE:    *      1/M
TEMP VALUE:     *      °C




                                            MENU: P
```

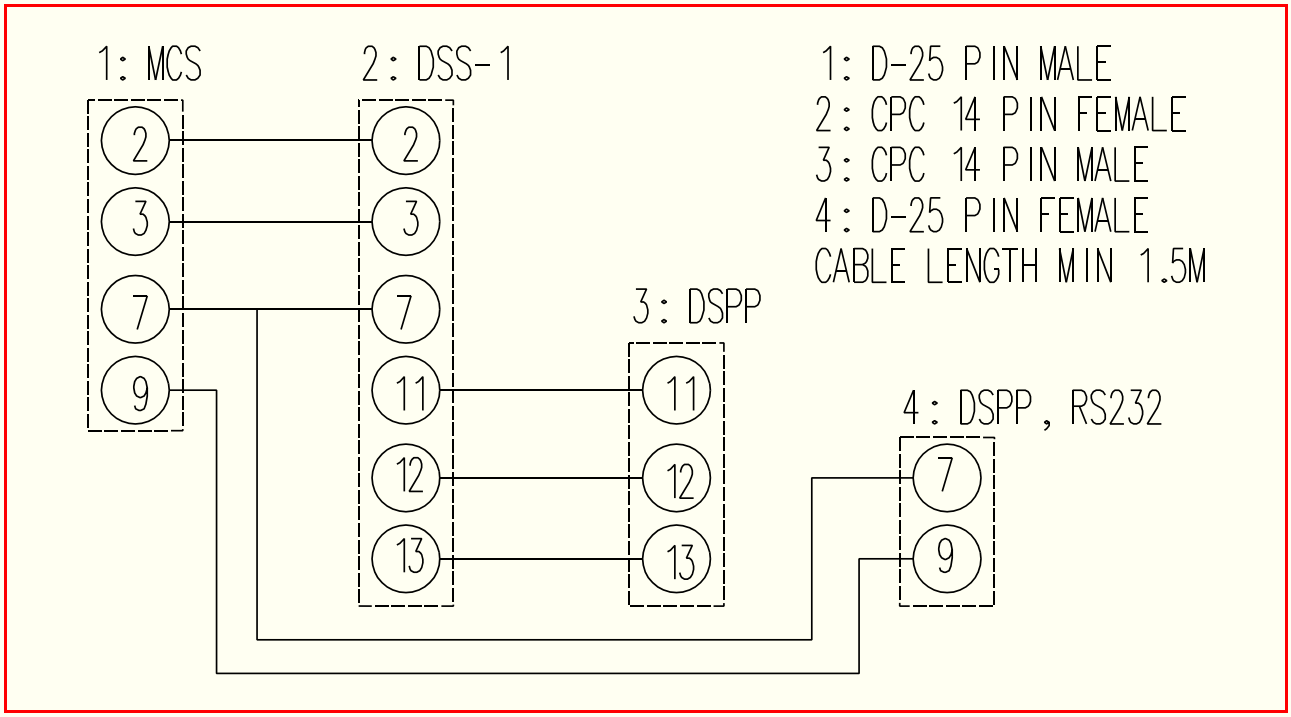
The first request to execute is the CALIBRATION REQUEST to calibrate the DSS-1. The calibration can only be accomplished when the opacity filter is removed from the DSS-1 and the opacity probe is removed from the vehicle's tailpipe.

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B: DSS-1 COMMUNICATION

For this test the DSS-1 option must be set to DEFINED. In this test the Service Engineer can communicate directly with the DSS-1 by setting the MCS-2000 into the VT220 monitor mode.

The MCS-2000 Serial Port 2, must be connected to both the DSPP Port 2 and the DSS-1, see below for connection details:



Connection between the MCS, DSPP & DSS-1 to communicate directly with the DSS-1.

1: Select the DSS-1 COMMUNICATION, the following will be displayed:

```
DD/MM/YY                                    HH:MM
                  DSS-1 COMMUNICATION

          BE SURE SDL-20 IS NOT ACTIVE !!

TO START THE DSS-1 COMMUNICATION
PRESS THE DIAMOND KEY, TO EXIT
PRESS CE.




TO CONTINUE PRESS: #                        ABORT: P
```


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2: Pressing the DIAMOND key on the Keypad or the "S" key on the Keyboard will set the MCS-2000 into the VT220 Monitor mode and a Command List will be displayed, see "Command Set VT220 Monitor Mode" below for details.

Pressing the **CE** key on the Keypad or the "M" key on the Keyboard, the VT220 Monitor mode will be terminated.

Note: Before setting the MCS-2000 into the VT220 Monitor mode, one should be aware that the SDL-20 option is not active, i.e. No communication between the MCS-2000 and the SDL-20.

If the SDL-20 is still active, leave the pages by pressing **P** on the Keypad or the "ESC" key on the Keyboard to terminate the test and to stop SDL-20 communication.

COMMAND SET VT220 MONITOR MODE

This command set is mainly for service and allows the Service Engineer use the VT220 Monitor Program to service the unit. This is the Command interface between the VT220 Monitor, Keyboard and the DSS-1. The Monitor acts as master, initiating all transactions. All data is exchanged in ASCII. All commands sent to the sampling unit DSS-1 conform to this format. These are upper case commands:

Transmit: <command character>
Bytes: 1

COMMAND "?": Display Command List

This instructs the DSS-1 to display the commands used by the Monitor. Press <SPACE> to resume previous screen.

KEYPAD	KEYBOARD	DESCRIPTION
?	?	Help
1	A	Channel Data
2	B	Linearise
3	C	Linearise Data
4	D	Set Cleaning Threshold
5	E	Toggle UNITS <to> COUNTS
6	F	Start Real-time Collection
7	G	View Real-time Data
"- - -"	Space	Resume Previous Screen

Note: "- - -" = not possible on the Keypad.

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COMMAND "A": Send Data

This command instructs the DSS-1 to send channel and status data to the monitor. The numbers represent converted values (UNITS) or raw A/D Converter counts (COUNTS).

SCREEN OUTPUTS			
Data:	UNITS	Data:	COUNTS
Intensity:	= nnn.n%	Diff ct	= nnnn
T (tube):	= nnn	Lt/Dk ct:	= nnnn/nnnn
T (amb):	= nnn	T (tube):	= nnnn
T (detect):	= nnn	T (amb):	= nnnn
P (diff):	= nnn	T (detect):	= nnnn
V (line):	= nn.n	P (diff):	= nnnn
V (ref):	= n.nn	V (line):	= nnnn
Status:	xx xx xx	V (ref):	= nnnn
Freq:	nn (Hz)	Status:	xx xx xx
****		Freq:	nn (Hz)
		****	

Note: Diff ct = (Light counts - Dark counts), Lt ct = Light counts, Dk ct = Dark counts

Status Bits Definitions:

Bit 0:	Ambient Temperature out-of-tolerance	0 to 45 ºC
Bit 1:	Detector Temperature out-of-tolerance	30 to 45 ºC
Bit 2:	Tube Temperature out-of-tolerance	70 to 130 ºC
Bit 3:	Line voltage out-of-tolerance	200 to 250 V~
Bit 4:	5 Volt reference out-of-tolerance	4.95 to 5.05 V
Bit 5:	Line synchronisation error	
Bit 6:	8 Bit A/D Converter input railed	0 or 255 counts
Bit 7:	12 Bit A/D Converter input railed	0 or 4095 counts
Bit 8:	Calibration in progress	
Bit 9:	Windows need cleaning	
Bit 10:	Armed 10 second data collection	
Bit 11:	Trigger 10 second data collection	
Bit 12:	(Not used)	
Bit 13:	(Not used)	
Bit 14:	(Not used)	
Bit 15:	(Internal Error)	

COMMAND "B": Linearise

This command instructs the DSS-1 to sequence through the linearisation routine. It measures Light & Dark and uses this data to calculate the coefficients of a linearisation curve.

Screen outputs: None.

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COMMAND "C": Send Linearisation Data

This command instructs the DSS-1 sampling unit to send data from the most recent linearisation. Min, Ave and Max Cts are the opacity readings during calibration. Calibration factor is a temperature correction coefficient of the linearisation equation. Thresh is the minimum acceptable full opacity reading after calibration, and chksum is it's checksum value.

SCREEN OUTPUT	
Min cts:	= nnnn
Ave cts:	= nnnn
Max cts:	= nnnn
Calibration factor:	= nnnn
Det:	= nnnn
Det A:	= nnnn
Det B:	= nnnn
Det C:	= nnnn
Thresh:	= nnnn
Chksum:	= nnnn

COMMAND "D": Set Cleaning Threshold

This command instructs the DSS-1 sampling unit to set the minimum acceptable opacity level to 50% of the present full opacity. Each time the unit is linearised, this level is compared to the full opacity to determine if the lenses need cleaning, i.e. Soot build-up.

Screen output: None.

COMMAND "E": Toggle UNITS to COUNTS

This command instructs the DSS-1 sampling unit to output data of Command "A" formatted as COUNTS (Raw A/D Values) or UNITS (Offset and scaled or Linearised values).

Screen output: None.

COMMAND "F: Start Real-time Collection

This command instructs the DSS-1 sampling unit to buffer opacity readings for 500 iterations, (repeats). Sampling occurs synchronous to the AC line frequency.

Screen output: None.

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COMMAND "G": View Real-time Data

This command instructs the DSS-1 sampling unit to display the real-time opacity readings.

SCREEN OUTPUT										
CY#	0	1	2	3	4	5	6	7	8	9
000	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn
010	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn
020	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn
030	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn
			-							
			-							
			-							
470	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn
480	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn
490	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn	nnnn

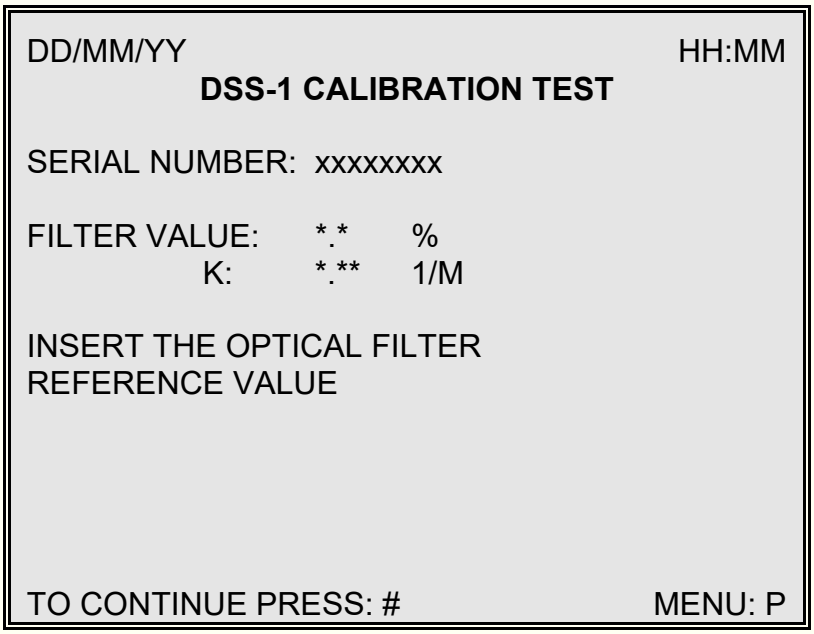
****

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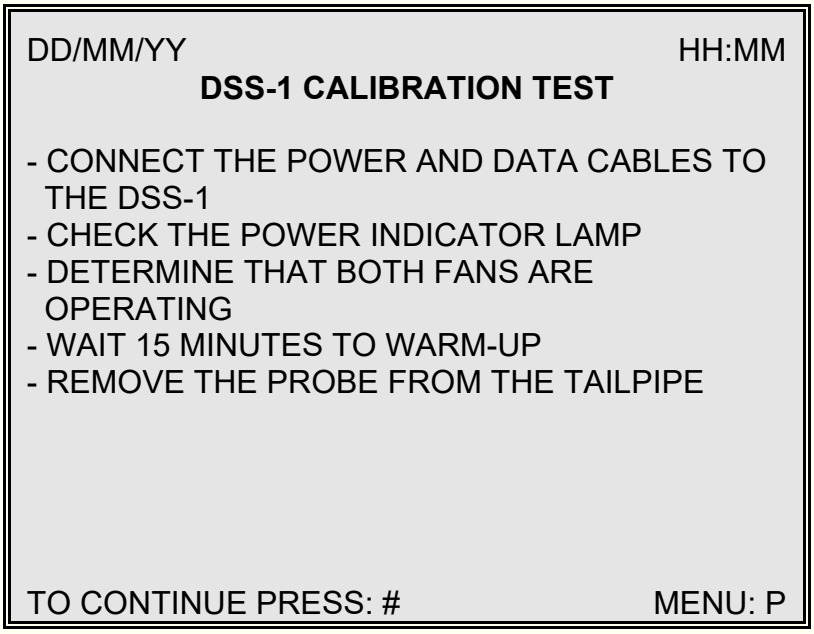
C: DSS-1 CALIBRATION TEST

This test is only available in the AU-II Approval and the DSS-1 must be DEFINED. This test is also available on the MCS-2000 System disk, V5.41.

The DSS-1 Calibration Test is used to test the DSS-1 for zero calibration and the total test consists of five pages. In the first page the DSS-1 serial number and opacity value must be entered, this opacity value is used to calculate the corresponding Filter Value.



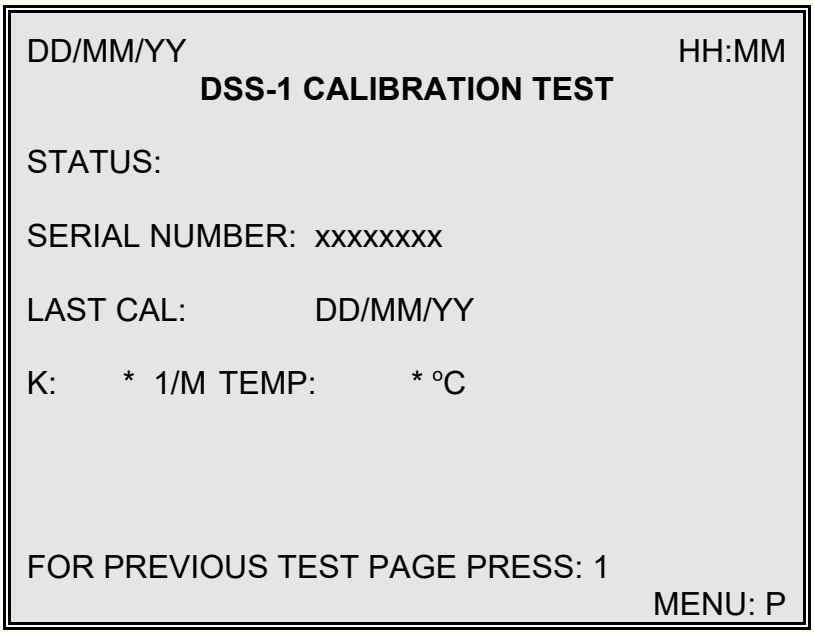
The second test page consists of a check list:



After proceeding through the Check List the communication between the MCS-2000, the DSPP and the DSS-1 is tested.

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It is only possible to continue, when the communication between the MCS-2000, the DSPP and the DSS-1 test has passed. If an error has occurred, then go back to the previous test page to try again or quit the test.



Continuing the test will execute a zero calibration and a DSS-1 temperature request. After following the instructions to insert the filter into the DSS-1, (one way possible only). The filter value is determined by the DSS-1. If the filter value read is within ± 5% of the given filter value at the start, the Calibration Date and the DSS-1 Serial Number will be saved.

Remove the filter from the DSS-1. The DSS-1 Calibration test is now completed.

****

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BASIC AU-II HARDWARE REQUIREMENTS

The tester must be an MCS-2000-AU-II or a modified MCS-2000-SL with the following minimum hardware options installed:

1: MCS-2000-AU-II, minimum requirements:

A:	GAS BENCH	P/N: SGM-2004-AU
B:	PRINTER	P/N: 7096E4056-95
C:	PRINTER PAPER	P/N: 0528-0994-00
D:	PRINTER COVER	P/N: 7009E9313-44
E:	PRINTER MOUNTING KIT	P/N: 7009E9314-70
F:	PRINTER CONNECTION KIT 2	P/N: 7009E9317-83
G:	REAL TIME CLOCK KIT	P/N: 7009E9316-57
H:	KEYBOARD KIT (D)	P/N: 7009E9316-56

2: MCS-2000-SL, modified for ASU-11 with minimum requirements:

A:	GAS BENCH	P/N: SGM-2004
B:	ASU-II FIELD UPGRADE KIT *	P/N: 7009E9317-79
C:	PRINTER	P/N: 7096E4056-95
D:	PRINTER PAPER	P/N: 0528-0994-00
E:	PRINTER COVER	P/N: 7009E9313-44
F:	PRINTER MOUNTING KIT	P/N: 7009E9314-70
G:	PRINTER CONNECTION KIT 2	P/N: 7009E9317-83
H:	REAL TIME CLOCK KIT	P/N: 7009E9316-57
I:	KEYBOARD KIT (D)	P/N: 7009E9316-56

3: MCS-2000-AU with DIESEL, minimum requirements:

A:	GAS BENCH	P/N: SGM-2004-AU
B:	PRINTER	P/N: 7096E4056-95
C:	PRINTER PAPER	P/N: 0528-0994-00
D:	PRINTER COVER	P/N: 7009E9313-44
E:	PRINTER MOUNTING KIT	P/N: 7009E9314-70
F:	PRINTER CONNECTION KIT 2	P/N: 7009E9317-83
G:	REAL TIME CLOCK KIT	P/N: 7009E9316-57
H:	KEYBOARD KIT (D)	P/N: 7009E9316-56
I:	DSS-1 SUPPORT KIT	P/N: 7009E9318-01
J:	D.O.M.B. KIT	P/N: 7009E9318-12
K:	RS-232 INT. OPTION KIT **	P/N: 7009E9315-11
L:	DIESEL SMOKE HEAD	P/N: DSS-1

Notes: * Includes OIML Kit and Barometer Kit.

** RS-232 INT. OPTION KIT, must be Rev: C or higher.

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4: MCS-2000-SL, modified for ASU-11 DIESEL with minimum requirements:

A:	GAS BENCH	P/N: SGM-2004	
B:	ASU-II FIELD UPGRADE KIT *	P/N: 7009E9317-79	
C:	PRINTER	P/N: 7096E4056-95	
D:	PRINTER PAPER	P/N: 0528-0994-00	
E:	PRINTER COVER	P/N: 7009E9313-44	
F:	PRINTER MOUNTING KIT	P/N: 7009E9314-70	
G:	PRINTER CONNECTION KIT 2	P/N: 7009E9317-83	
H:	REAL TIME CLOCK KIT	P/N: 7009E9316-57	
I:	KEYBOARD KIT (D)	P/N: 7009E9316-56	
J:	DSS-1 SUPPORT KIT	P/N: 7009E9318-01	OR A DSS-1 FIELD
K:	D.O.M.B. KIT	P/N: 7009E9318-12	INSTALLATION KIT
L:	RS-232 INT. OPTION KIT **	P/N: 7009E9315-11	P/N: 7009E9318-32
M:	DIESEL SMOKE HEAD	P/N: DSS-1	

Notes: * Includes OIML Kit and Barometer Kit.

** RS-232 INT. OPTION KIT, must be Rev: C or higher.

****

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BASIC AU-II TESTER CONFIGURATION ENTRY

The Tester Configuration selection consists of three pages. The first two pages contain a number of items that can be set to DEFINED or NOT DEFINED depending on the hardware and software configuration of the tester. The third page is used to set-up the Options installed in the tester.

The configuration settings will be saved into the E-EPROM memory when these pages are exited.

Note: **RE-BOOT THE TESTER WHEN ANY CHANGES ARE MADE TO THE TESTER CONFIGURATION PAGES.**

BASIC AU TESTER CONFIGURATION ENTRY, PAGE 1:

1: Select "Tester Configuration Entry" from the "Program Selection Menu" by using the **>** key and press the **#** key, the first Tester "Configuration Entry" page will be displayed:

```
DD/MM/YY                                    HH:MM
            TESTER CONFIGURATION ENTRY

- PRINTER                          DEFINED
- GAS BENCH                        DEFINED
- DIESEL OPTION                    NOT DEFINED
- DIAGNOSTICS                      DEFINED
- DIGITAL SCOPE                    DEFINED
- BAROMETER                        DEFINED
- KEYBOARD                         DEFINED




ENTER: > OR +/-,                            MENU: P
NEXT ENTRY: #
```

2: Use the **#** key to step through all items. Set each item to DEFINED / NOT DEFINED as required, by pressing the **>** key.

When the **#** key is pressed on the last line, the "Tester Configuration Entry" (Page 2) will be displayed:

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BASIC AU TESTER CONFIGURATION ENTRY, PAGE 2:

Note: For the moment the definition "EXT. CRT DRIVER" should be left as NOT DEFINED.

```
DD/MM/YY                                    HH:MM
          TESTER CONFIGURATION ENTRY

- INTERNAL CLOCK                  DEFINED
- SDL-20                          NOT DEFINED
- OIML                            DEFINED
- EXT. CRT DRIVER                 NOT DEFINED
- DATE/TIME DISPLAYED             DEFINED
- DAYLIGHT SAVING                 DEFINED
- DSS-1                           NOT DEFINED




ENTER: > OR +/-,                            MENU: P
NEXT ENTRY: #
```

3: Use the **#** key to step through all items. Set each item to DEFINED / NOT DEFINED as required, by pressing the **>** key.

When the **#** key is pressed on the last line, the "Tester Configuration Entry" (Page 3, Options) will be displayed:

BASIC AU TESTER CONFIGURATION ENTRY, PAGE 3, (OPTIONS):

This page provides the ability to configure the tester according to the Options installed.

```
DD/MM/YY                                    HH:MM
          TESTER CONFIGURATION ENTRY

- KEYPAD TYPE                     STANDARD
- PRINTER TYPE                    OKI-182E
- GAS BENCH TYPE                  SGM-2004-AU
- GASES AVAILABLE                 HC/CO2/CO/O2
- GAS APPROVAL                    PTB
- LANGUAGE                        GERMANY
- LAMBDA CALCUL.                  BRETTSCHNEIDER
- LEGAL TEST                      AU-II




TO SAVE NEW OPTIONS PRESS: *
PRESS P TO ABORT
```


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4: Step through all lines by pressing the **#** key. Use the **>** key to set the Options, see below for details.

Press the **#** key on the last line. Then, press the ***** key to SAVE the new Configuration settings, the caption "Writing to Memory" will be displayed.

Note: **RE-BOOT THE TESTER WHEN ANY CHANGES ARE MADE TO THE TESTER CONFIGURATION PAGES.**

****

*** * * IMPORTANT * * ***

IT IS VITAL THAT THE COMBINATION OF "GAS BENCH TYPE", "GASES AVAILABLE", "GAS APPROVAL", "LANGUAGE", "LAMBDA CALCUL." AND "LEGAL TEST" CONFIGURATION SETTINGS ARE CORRECT FOR THE PROPER OPERATION OF THE TESTER.

*** * * * * * * * * * ***

****

AU-II GAS BENCH CALIBRATION

FOR THE GAS BENCH CALIBRATION PROCEDURES REFER TO LOCAL AU-II GAS CALIBRATION REQUIREMENTS AND PROCEDURES.

****

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EXHAUST GAS ANALYSER CALIBRATION

GAS ZERO VOLTAGE SETTINGS

STEP 17 PRESS #TO ENTER THE "GAS CALIBRATION" PAGE. RUN THE PUMP FOR 5 MINUTES TO ALLOW THE READINGS TO STABILIZE (PRESS "*" TO SKIP THE 5 MINUTE DELAY) THE GAS CALIBRATION SHOWS THE ZERO VOLTAGE READINGS.

STEP 18 ADJUST THE ZERO VOLTAGE READINGS FOR 0.000 V, +/- 0.01 VOLT WITH:

R34	R35	R36	R37	R12
HC	CO	FINE C02	COARSE CO2	O_2

ON CALIBRATION INTERFACE BRD.

NOTE: R37 IS INTENDED FOR "COARSE" ADJUSTMENT, WHILE R36 IS FOR "FINE" ADJUSTMENT. USE THE "COARSE" ADJUSTMENT ONLY IF THE ZERO SETTING CAN, NOT BE ADJUSTED WITH THE "FINE" CONTROL.
ALL POTS GIVE INCREASING VALUES WHEN ADJUSTED CLOCKWISE.

```
*****************************************
*              GAS CALIBRATION          *
*       ZERO          GAS         SPAN  *
*  CO  0.000  v          %          v   *
*  HC   0.000 v         PPM         v   *
*  CO2 0.000  v          %          v   *
*  02  0.000  v          %          v   *
*                                       *
*    SET ZERO VOLTAGE, THEN PRESS "*",  *
*    PRESS "P" TO ABORT                 *
*****************************************
```

STEP 19 WHEN THE ZERO VOLTAGES HAVE BEEN SET PRESS "*" TO SAVE DATA.

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GAS VALUE SETTINGS

STEP 20 CONNECT THE GAS CALIBRATION CYLINDER TO THE PURGE INLET AND ADJUST THE GAS FLOW TO 5 L/MIN.

STEP 21 PRESS # TO SELECT THE GAS VALUES SET-UP. THE "GAS CALIBRATION" PAGE SHOWS THE GAS VALUES.

STEP 22 ALLOW THE GAS VALUES TO STABILIZE AND ADJUST THE POTS ON CALIBRATION INTERFACE BOARD TO AGREE WITH THE GAS VALUES ON THE CYLINDER.
FOR THE SUGGESTED COCKTAIL THIS SHOULD BE AS FOLLOWS:

R26	R27	R28	R29
		FINE	COARSE
HC	CO	CO2	CO2
312	1.5	11.0	
PPM	%	%	

(02 NO ADJUSTMENT REQUIRED)

NOTE: ALL POTS GIVE INCREASING VALUES WHEN ADJUSTED CLOCKWISE.
FOR THE HC VALUE MULTIPLY THE C3H8 VALUE ON THE GAS CYLINDER BY THE P.E.F. FACTOR. (LABEL ON THE BACK OF THE SGM-2004).
E.G.: IF P.E.F. IS 0.52: THEN (600ppm C3H8) X 0.52 = 312 PPM HC

```
*****************************************
*                GAS CALIBRATION          *
*        ZERO          GAS          SPAN  *
*  CO  0.000v        1.50 %            v  *
*  HC  0.000v        312 PPM           v  *
*  CO2 0.000v          11.00 %           v *
*  02    0.000v       .    %           v  *
*                                         *
*     SET GAS VALUES, THEN PRESS "*",     *
*     PRESS "P" TO ABORT                  *
*****************************************
```


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NOTE: R29 IS INTENDED FOR "COARSE" ADJUSTMENT, WHILE R28 IS FOR "FINE" ADJUSTMENT. USE THE "COARSE" ADJUSTMENT ONLY IF THE GAS SETTING CAN NOT BE ADJUSTED WITH THE "FINE" CONTROL.
02 VALUE WILL BE LOWER THAN 20.8% BECAUSE OF THE CALIBATION GAS.

STEP 23 PRESS "*" TO INITIALIZE THE NEW SETTINGS AND PRESS # TO RETURN TO THE "GAS CALIBRATION" PAGE.

STEP 24 DISCONNECT THE GAS CYLINDER FROM THE PURGE INLET.

SPAN ADJUSTMENT

GENERALLY THE SPAN SHOULD NOT REQUIRE ADJUSTMENT. HOWEVER, A CHANGE IN SPAN VOLTAGE IS A INDICATION THAT THE OPTICAL PATH NEEDS CLEANING (SAMPLE CELL WINDOWS). IF SPAN VOLTAGE ADJUSTMENT IS STILL NECESSARY, PROCEED AS FOLLOWS:

STEP 25 PRESS # TO SELECT THE "SPAN VOLTAGE" SET UP PAGE.
ALLOW THE VOLTAGE READINGS TO STABILIZE AND ADJUST THE HC (R30), CO (R31), CO2 (R32/R33) AND 02 (R14) READINGS TO 5.000 V.
(SLIDE OUT THE SGM-2004 TO LOCATE TRIM-POTS R31, R32 OR R33 ON THE CALIBRATION INTERFACE BOARD).

```
*****************************************
*                GAS CALIBRATION        *
*        ZERO          GAS         SPAN *
*  CO   0.000 v      1.50 %      5.000 v *
*  HC   0.000 v       312 PPM    5.000 v *
*  CO2  0.000 v     11.00 %      5.000 v *
*  02   0.000 v     20.80 %      5.000 v *
*                                         *
* SET SPAN VOLTAGE TO 5.000 V, PRESS      *
*   "*" TO SAVE DATA, PRESS "P" TO ABORT  *
*****************************************
```

STEP 26 PRESS "*" TO RETURN TO THE "TESTER WARM-UP" PAGE

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ONCE THE "*" KEY HAS BEEN PRESSED THE TESTER AUTOMATICALLY GOES INTO A "WARM-UP" PERIOD (2 MINS) TO LET THE GAS ANALYSER STABLIZE, THEN IT GOES INTO THE "TESTER CALIBRATION" PAGE:

```
*********************************
*       TESTER  CALIBRATION     *
*  ADC REFERENCE          PASS  *
*  AMPS                   PASS  *
*  RIPPLE                 PASS  *
*  ANALOG KV              PASS  *
*  VOLT/OHM               PASS  *
*  VACUUM                 PASS  *
*  HC                     PASS  *
*  CO                     PASS  *
*  CO2                    PASS  *
*  02                     PASS  *
*********************************
```

IF NO ERRORS ARE DETECTED, THE "SERVICE UTILITY" PAGE WILL BE DISPLAYED.
PRESS "P" TO RETURN TO THE "PROGRAM SELECTION" PAGE.
THE MCS-2000 WITH THE SGM-2004 EXHAUST GAS ANALYSER IS NOW READY FOR USE.

STEP 27 SELECT "VEHICLE TESTING" FROM THE "PROGRAM SELECTION" PAGE. SELECT "VEHICLE ENTRY WITHOUT LIMITS". TO MOVE THE CURSOR THROUGH THIS PAGE PRESS THE # KEY. PRESSING THE # KEY ON THE LAST LINE RETURNS TO THE "TESTER LOADING VEHICLE DATA" SEQUENCE.

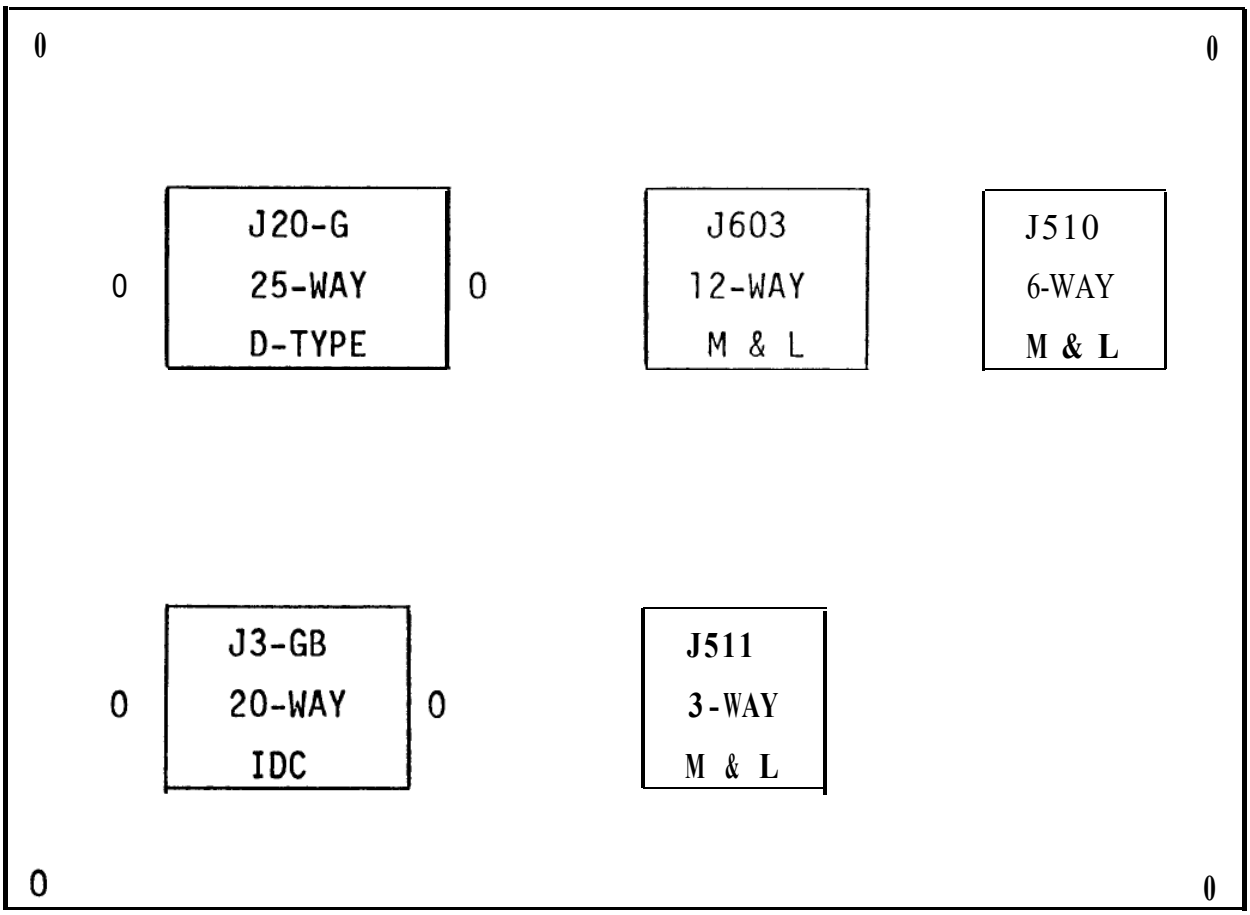
STEP 28 THE LEADS CONNECT CHECK PAGE IS DISPLAYED AFTER THE LOADING ROUTINE. TEST A VEHICLE IN THE USUAL MANNER TO ENSURE CORRECT OPERATION.

STEP 29 REFER TO NOTE (1) ON THE INSTALLATION DRAWING AND COVER THE TRIM-POT ACCESS HOLE WITH THE APPROPIATE PLATE ON THE GAS ANALYSER.

THIS COMPLETES THE CALIBRATION AND CHECKOUT PROCEDURE FOR THE SGM-2004

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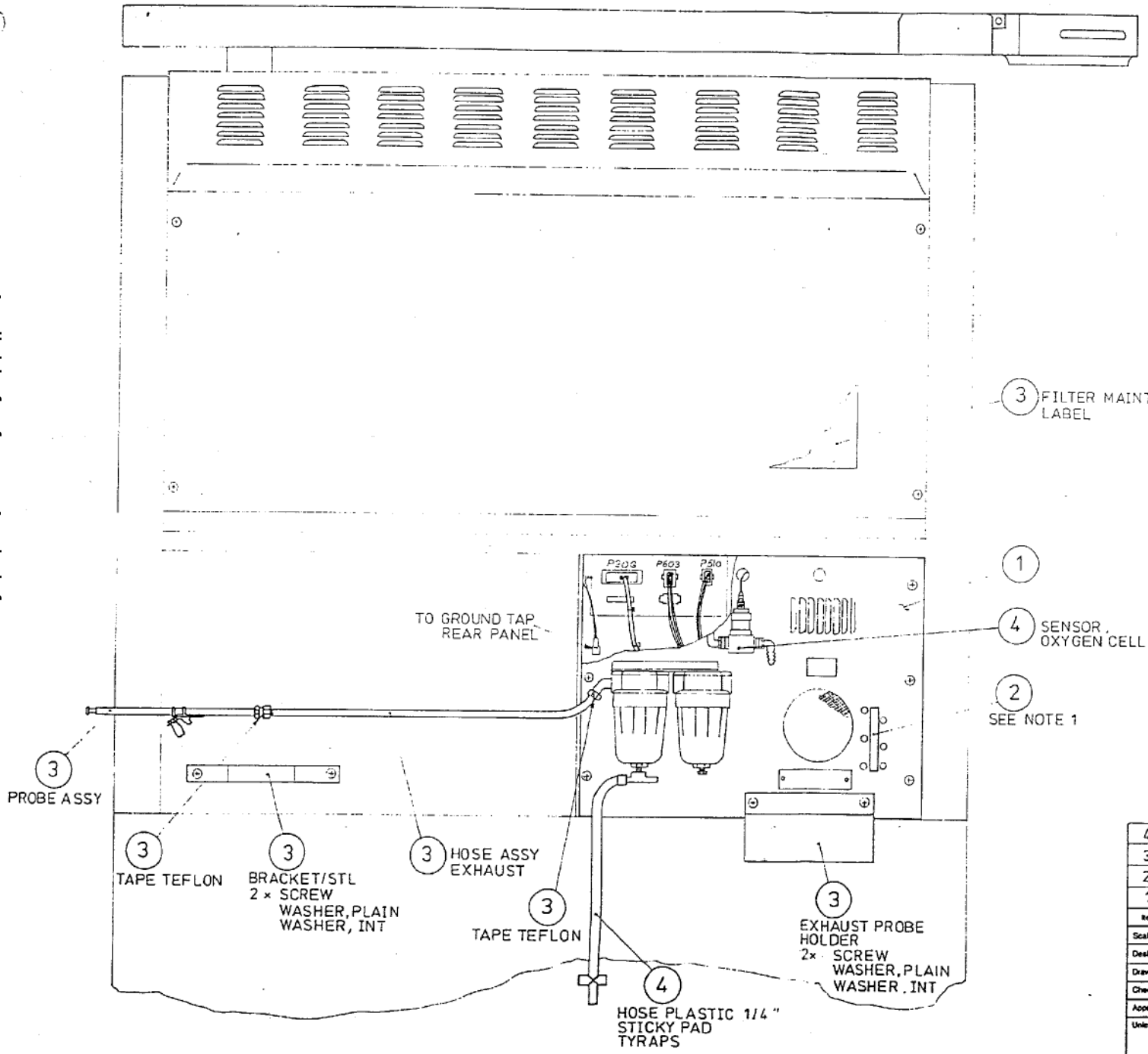
PART NO: 7005E9313-69



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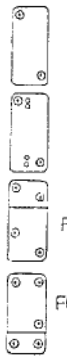
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Revisions				
Rev	Date	ECN	Description	Check
A	08-89		ERN# 0349.	P.T.



NOTES:

1) MOUNT COVER PLATE WITH ROUND BUTTON HEAD SCREWS.



Item	Qty.	Dwg./Part no	Description	Rem
4	1	7009E9314-16	ACCESSORY KIT 2 APK/PTB/SIM	
3	1	7009E9315-22	ACCESSORY KIT	
2	1	70C9E9315-20	COVER PLATES KIT	
1	1	7009E9315-15	EXHAUSTGAS ANALYZER ASSY	

Scale		Date	Used in SGM 2004
Designed by			Material
Drawn by	Heleena v/d Nieuwendijk	08.08.89	
Checked by	Peter Tel	10.08.89	
Approved	A Wouter	11.08.89	Finish

Unless otherwise specified: Dimensions are in mm; Tolerances are: Angles ± 0.5°, Holes ± 0.1, Rest ± 0.5

Remove all sharp corners and remove burrs

Description: INSTALLATION DRAWING
EXHAUSTGAS ANALYZER KIT SGM2004

Dwg. no. 0692E9306-

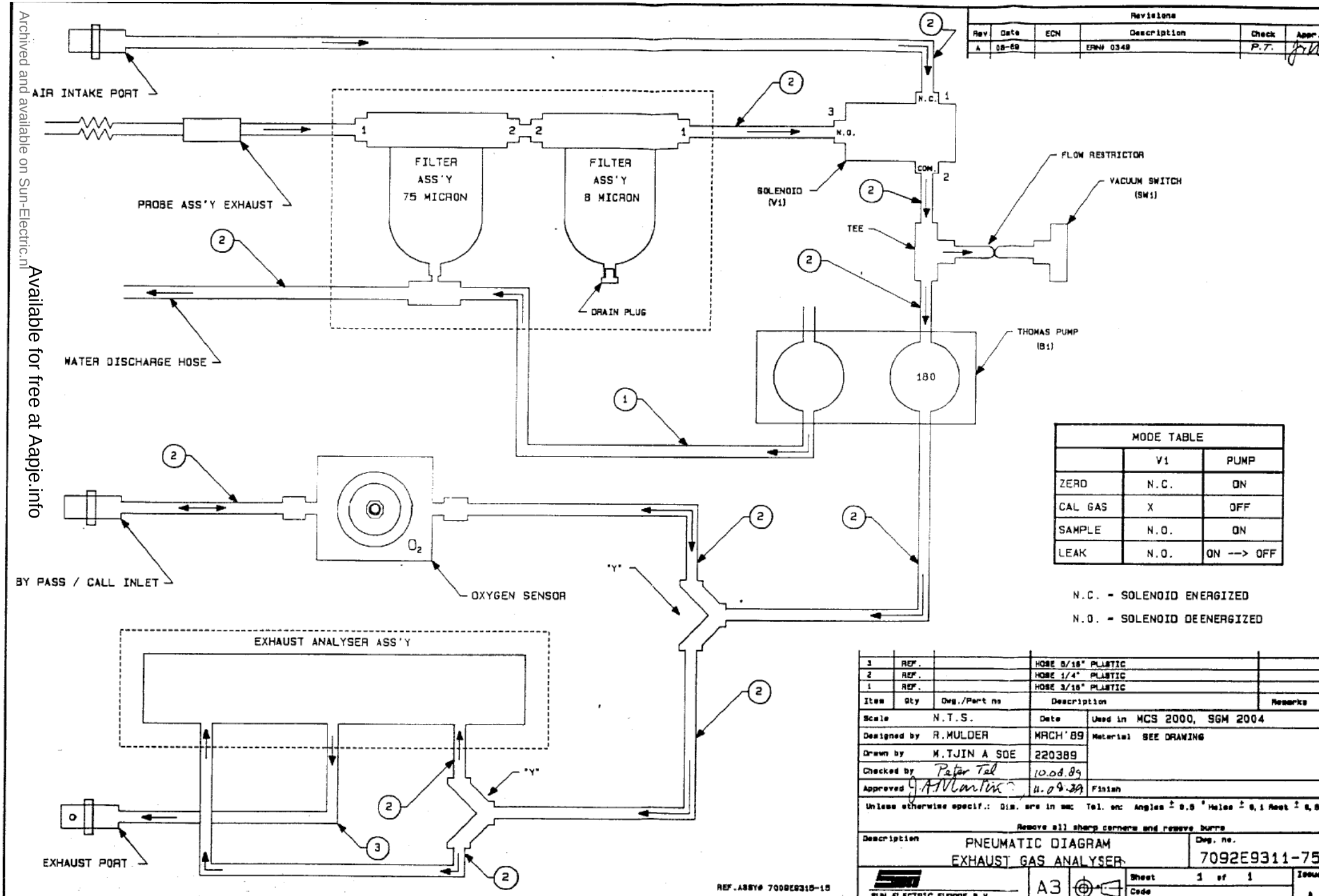
Sun

A2

Sheet 1 of 1

Code

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Revisions					
Rev	Date	ECN	Description	Check	Appr.
A	08-89		ERN# 0349	P.T.	

MODE TABLE		
	V1	PUMP
ZERO	N.C.	ON
CAL GAS	X	OFF
SAMPLE	N.O.	ON
LEAK	N.O.	ON --> OFF

N.C. = SOLENOID ENERGIZED

N.O. = SOLENOID DEENERGIZED

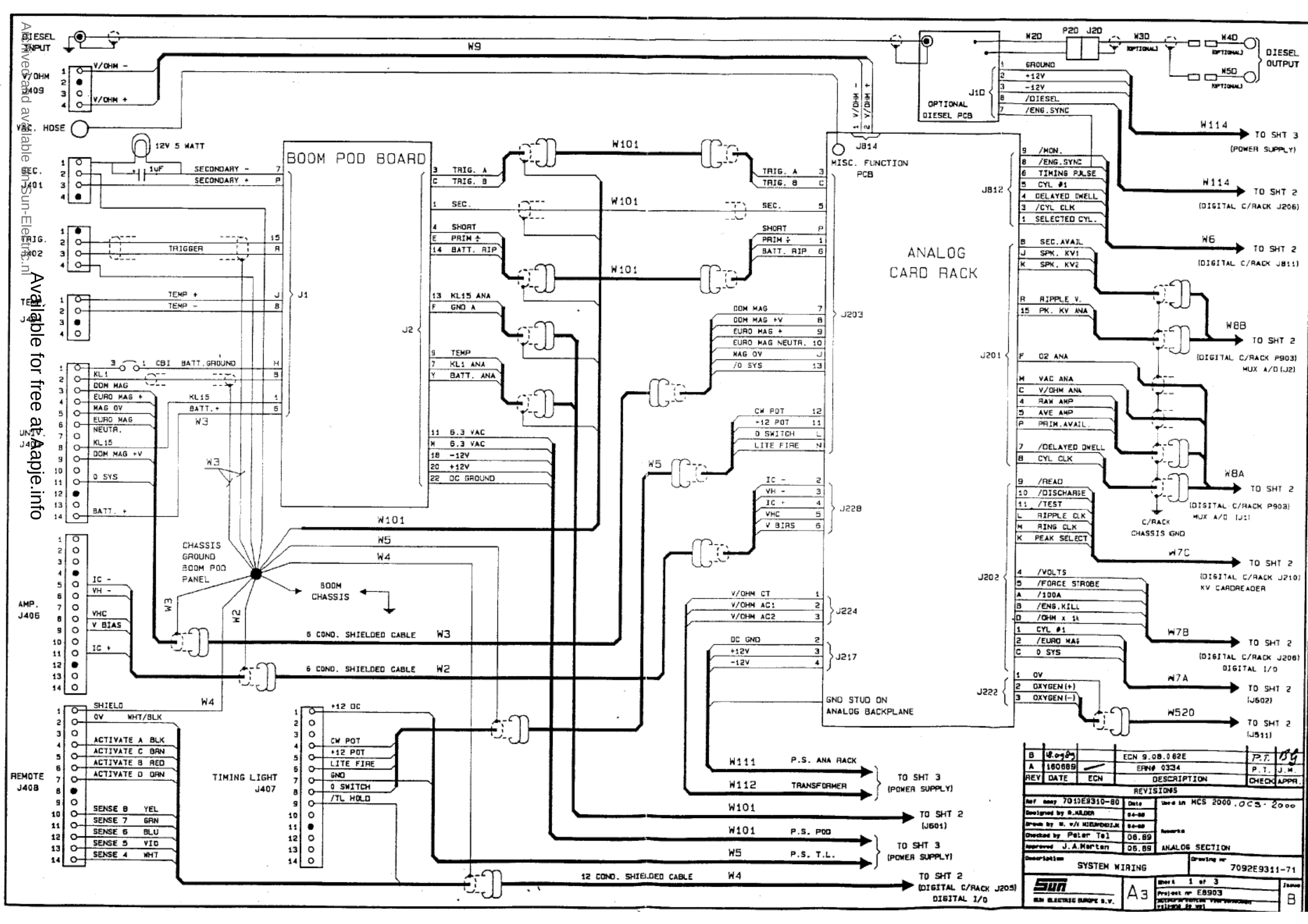
Item	Qty	Dwg./Part no	Description	Remarks
3	REF.		HOSE 5/16" PLASTIC	
2	REF.		HOSE 1/4" PLASTIC	
1	REF.		HOSE 3/16" PLASTIC	

Scale	N.T.S.	Date	Used in MCS 2000, SGM 2004
Designed by	R.MULDER	MRCH'89	Material SEE DRAWING
Drawn by	M.TJIN A SOE	220389	
Checked by	Peter Tel	10.08.89	
Approved	J.A.Vlantin	11.09.89	Finish

Unless otherwise specif.: Dim. are in mm; Tol. on: Angles ± 0.5 °; Holes ± 0,1; Rest ± 0,5

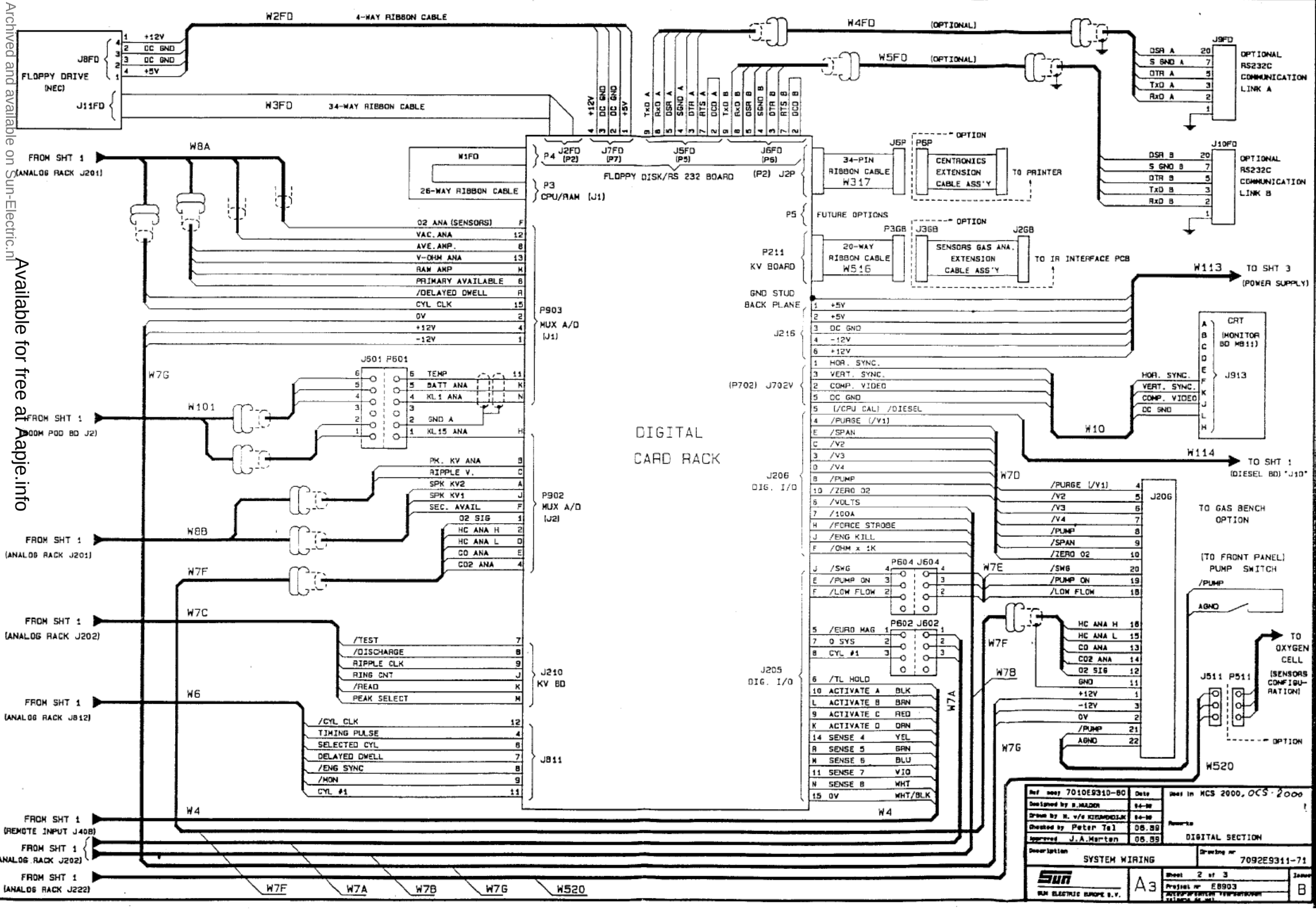
Remove all sharp corners and remove burrs

Description	PNEUMATIC DIAGRAM EXHAUST GAS ANALYSER	Dwg. no. 7092E9311-75
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 1
		Code
		Project no. E8903
		Issue A



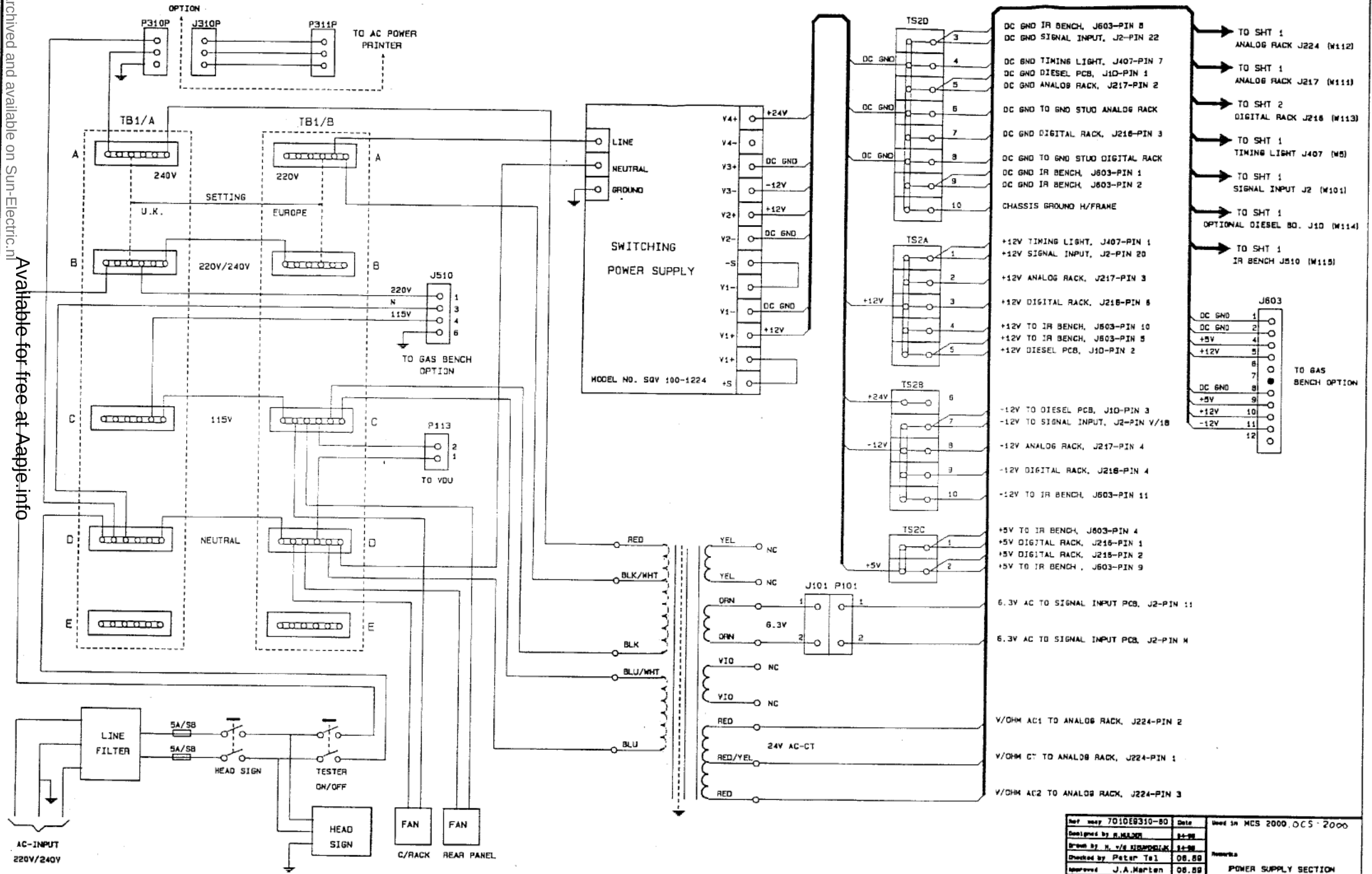
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Ref assy 7010E9310-80	Date	Used in MCS 2000, OCS-2000	
Designed by B.MAJOR	04-88		
Drawn by H. v/d KIEUWBOOM	04-88		
Checked by Peter Tel	06.89		
Approved J.A.Marten	06.89	DIGITAL SECTION	
Description SYSTEM WIRING		Drawing nr 7092E9311-71	
Sun ELECTRIC EUROPE B.V.	A3	Sheet 2 of 3	Issue B
		Project nr E8903	

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SUN ELECTRIC EUROPE

INSTALLATION INSTRUCTIONS

OXYGEN OPTION KIT

FOR THE MCS-2000 TESTER

KIT NO: 7009E9314-86

OCTOBER-1989

PART NO: 0692E9306-20

REF NO: 0036A-HM

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OXYGEN OPTION KIT

KIT NO: 7009E9314-86

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CALIBRATION AND CHECKOUT PROCEDURE ..... (6)

REFERENCE DRAWINGS:

INSTALLATION DWG. OXYGEN OPTION KIT
(TWO SHEETS) ..... DWG. NO: 0692E9306-21

PNEUMATIC DIAGRAM EXHAUST ANALYSER ..... DWG. NO: 7092E9311-63

HOSE, ONE END SEALED ..... DWG. NO: 7096E9057-22

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INTRODUCTION

GREAT CARE HAS BEEN TAKEN IN THE PREPARATION OF THIS INSTALLATION BOOKLET TO ENSURE THE SUCCESSFUL INSTALLATION OF THE OXYGEN OPTION KIT INTO THE MCS-2000 TESTER WHILST MINIMISING THE TIME AND MANPOWER REQUIRED.

THIS BOOKLET IS DESIGNED TO ENABLE THE INSTALLATION TO BE CARRIED OUT USING ONLY THE EQUIPMENT SPECIFIED IN THE EQUIPMENT REQUIRED SECTION.

BEFORE INSTALLATION MAKE SURE THAT THE TESTER IS EQUIPPED WITH THE LATEST SOFTWARE (V4.00 OR HIGHER).

THE FOLLOWING PROCEDURE MUST BE CARRIED OUT IN THE SEQUENCE AS SPECIFIED IN THE TABLE OF CONTENTS, NO SECTIONS MAY BE SKIPPED. DO NOT TOUCH ANY PART OF THE TESTER UNLESS INSTRUCTED TO DO SO.

THESE RULES SHOULD BE ADHERED TO DURING THE INSTALLATION PROCEDURE:

RULES

1: ALWAYS SWITCH OFF THE MAINS SUPPLY WHEN WORKING INSIDE THE CABINET.

2: BE CAREFUL NOT TO DISTURB THE DIGITAL RACK FRONT CONNECTORS AND WIRING.

3: WHEN ROUTING WIRES AND CABLES, ALWAYS KEEP THEM AWAY FROM NOISY COMPONENTS SUCH AS MAINS TRANSFORMERS ETC.

4: DO NOT OPEN THE SEALED BAG CONTAINING THE OXYGEN SENSOR UNTIL IT IS REQUIRED.

5: REMEMBER THAT THERE SHOULD BE NO SCREWS AND WASHERS ETC. LEFTOVER WHEN THE INSTALLATION PROCEDURE HAS BEEN COMPLETED.

NOTE: THE CALIBRATION AND CHECK-OUT PROCEDURE MUST BE CARRIED OUT EVERY TIME THE OXYGEN SENSOR IS REPLACED.

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KIT CONTENTS

THE OXYGEN OPTION KIT COMES COMPLETE WITH ALL OF THE PARTS NECESSARY TO INSTALL THE OXYGEN OPTION KIT (PART NO: 7009E9314-86) INTO THE MCS-2000 TESTER:

ITEM	PART NUMBER	QTY.	DESCRIPTION
1	7009E9315-41	1	BLOCK OXYGEN SENSOR ASSY
2	0400-0400-503	2	WASHER M4 PLAIN
3	0404-0412-533	2	SCREW M4 * 12
4	0400-0400-303	2	WASHER M4 S/C
5	7049-0004	1	OXYGEN SENSOR (IN SEALED BAG)
6	7076E9313-73	1	WIRING HARNESS OPT. BKT-SENSOR
7	7076E9313-78	1	WIRING HARNESS C/R-SENSOR
8	7076E9313-79	1	WIRE OXYGEN ANALOG
9	0501-0023	1	GROMMET
10	5878-0015	4	TY-RAP
11	0669-0220	0.75 M	HOSE
12	0669-0220	0.1 M	HOSE
13	7096E9057-22	1	HOSE, ONE END SEALED. (BASE MAT. 0.04 M HOSE 0669-0220)
14	4600E9309-14	1	STICKER GAS OUTPUT SYMBOL
15	0692E9306-20	1	INSTALLATION INSTRUCTIONS
16	0692E9306-21	REF	INSTALLATION DRAWINGS

NOTE: SOFTWARE (FLOPPY) IS NOT PART OF THE HARDWARE KIT.
(MCS-SYSTEM DISK VER:V4.00 AND UPWARDS).

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TOOLS AND EQUIPMENT REQUIRED

THE FOLLOWING TOOLS, EQUIPMENT AND REFERENCE DOCUMENTATION ARE REQUIRED TO CORRECTLY INSTALL THE OXYGEN OPTION KIT INTO THE MCS-2000 TESTER:

1: A SOLDERING IRON
2: AN ELECTRIC DRILL WITH BIT SIZES (4.5 MM & 10.0 MM)
3: A CROSSHEAD SCREWDRIVER
4: A CALIBRATION SCREWDRIVER
5: A SNIPE NOSE PLIERS
6: A SIDE CUTTER
7: A DIGITAL MULTIMETER (FLUKE 8060A OR EQUIVALENT)
8: AN MCS SYSTEM DISK VERSION (V4.00 AND HIGHER) NOT PART OF THE KIT

9:	INSTALLATION DWG. OXYGEN OPTION KIT (TWO SHEETS)	0692E9306-21
10:	BLOCK OXYGEN SENSOR ASSY.	7009E9315-41
11:	HOSE, ONE END SEALED	7096E9057-22
12:	PNEUMATIC DIAGRAM EXHAUST ANALYSER	7092E9311-63
13:	WIRING HARNESS: OXYGEN SENSOR, PRE-WIRED MCS-2000	7076E9313-73
14:	WIRING HARNESS: OXYGEN SENSOR, NON PRE-WIRED MCS-2000	7076E9313-78
15:	WIRING HARNESS: OXYGEN ANALOG	7076E9313-79
16:	SCHEMATIC: KV/02 SIGNAL PROCESSOR BOARD MODIFIED	7092E9311-62

PRE-INSTALLATION CHECKOUT PROCEDURE

BEFORE BEGINNING THE INSTALLATION OF THE OXYGEN OPTION KIT, IT IS IMPORTANT TO VERIFY THE CORRECT OPERATION OF THE TESTER:

A: SWITCH ON THE UNIT AND ALLOW IT TO WARM UP IN THE USUAL MANNER.

B: AFTER THE WARM-UP PERIOD PROCEED THROUGH THE SELF TEST AND CALIBRATION.

C: ANY FAULTS SHOULD BE NOTED AND CORRECTED BEFORE STARTING THE INSTALLATION PROCEDURE. REFER TO THE SERVICE MANUALS FOR TROUBLESHOOTING ETC.

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INSTALLATION PROCEDURE

****

* NOTE: *

* DO NOT OPEN THE BAG CONTAINING THE OXYGEN SENSOR UNTIL IT IS REQUIRED. *

****

STEP 1 AFTER PERFORMING THE INITIAL CHECKOUT AND ANY NECESSARY REPAIRS ARE CARRIED OUT, SWITCH OFF THE UNIT AND DISCONNECT IT FROM THE MAINS POWER SOURCE.

STEP 2 CHECK THE MAINS CABLE AND PLUG FOR ANY DAMAGE AND REPAIR /REPLACE AS NECESSARY.

STEP 3 CHECK THE CONDITION OF ALL LEADS AND PICK-UPS CONNECTED TO THE BOOM FOR ANY DAMAGE AND REPAIR /REPLACE AS NECESSARY.

STEP 4 REMOVE THE FRONT PANEL. TAKE CARE NOT TO DAMAGE THE EARTH LEAD. REMOVE THE GAS BENCH ASSY. TAKE CARE NOT TO DAMAGE THE FILTER ASSY., TUBING, CABLING AND THE EARTH LEAD.

STEP 5 IF NECESSARY DRILL TWO HOLES (4.5 MM) FOR MOUNTING THE SENSOR ASSY. ALSO A HOLE FOR THE HOSE (10.0 MM) AND ALSO DRILL A HOLE FOR THE CABLE GROMMET (10.0 MM) IN THE GAS BENCH REAR PANEL.

STEP 6 PLACE THE GROMMET PART NO: 0501-0023 INTO THE HOLE DRILLED IN THE GAS BENCH REAR PANEL.

STEP 7 WITH REFERENCE TO DRAWING NO: 7092E9311-63.
DISCONNECT THE BY-PASS HOSE BETWEEN "A" AND "B". CONNECT THE HOSE PART NO: 0669-0220 BETWEEN THE OXYGEN SENSOR ASSY. AND THE EXHAUST ANALYSER GAS ASSY. AS SHOWN (POINT "A").
INSERT THE HOSE (ONE END SEALED) PART NO: 7096E9057-22 INTO THE EXHAUST ANALYSER ASSY. AS SHOWN (POINT "B").

STEP 8 CONNECT 0.1 M LENGTH OF HOSE TO THE OUTPUT OF THE SENSOR BLOCK ASSY.

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STEP 9 WITH REFERENCE TO DRAWING NO: 0692E9306-21 TWO SHEETS.

SHEET 1: IF THE OPTIONAL BRACKET HAS THE 02 WIRING INSTALLED; INSTALL THE WIRING HARNESS OPT BKT-SENSOR PART NO: 7076E9313-73, PHONE-PLUG END TO SENSOR REMEMBER TO FEED THE CABLE THROUGH THE GROMMET (IF NECESSARY DE-SOLDER THE PHONE PLUG) AND CONNECT THE OTHER END TO THE OPTIONAL BRACKET P-511.

SHEET 2: IF THE OPTIONAL BRACKET HAS NOT THE 02 WIRING INSTALLED; INSTALL THE WIRING HARNESS C/R-SENSOR PART NO: 7076E9313-78, PHONE-PLUG END TO SENSOR REMEMBER TO FEED THE CABLE THROUGH THE GROMMET (IF NECESSARY DE-SOLDER THE PHONE PLUG) AND OTHER END TO THE ANALOG CARD RACK BACKPLANE J-222.

CONNECT WIRING HARNESS OXYGEN ANALOG PART NO: 7076E9313-79, BETWEEN THE ANALOG RACK BACKPLANE J-201 PIN F AND TO THE MUX A/D BOARD (SLOT 3 DIGITAL RACK) J-903 PIN F. REMEMBER TO REMOVE THE LEAF CONTACTS (IF INSTALLED) FROM J-201 PIN F AND FROM J-903 PIN F.

NOTE: TAKE CARE WHEN ROUTING THE CABLES IN ORDER TO AVOID INTERFERENCE FROM MAINS TRANSFORMERS AND OTHER NOISY COMPONENTS BECAUSE THE SIGNAL FROM THE OXYGEN SENSOR IS IN THE ORDER OF 20.00 mV. INSTALL TY-RAPS AS REQUIRED.

STEP 10 REPLACE THE GAS BENCH ASSY. TAKE CARE NOT TO DAMAGE THE FILTER ASSY. TUBING, CABLING AND THE EARTH LEAD.

STEP 11 OPEN THE BAG CONTAINING THE OXYGEN SENSOR AND CAREFULLY INSTALL IT (SCREW FITTING) INTO THE BLOCK ASSY.
ACCORDING TO THE DRAWING NO: 0692E9306-21 TWO SHEETS (VIEW A-A ON SHEET 2). CONNECT PHONE PLUG TO OXYGEN SENSOR.

STEP 12 PLACE THE STICKER PART NO: 4600E9309-14 BESIDE THE SENSOR ASSY. ON THE GAS BENCH REAR PANEL SHOWING THE DIRECTION OF GAS OUTPUT FLOW-

THIS COMPLETES THE INSTALLATION OF THE OXYGEN OPTION KIT

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CALIBRATION AND CHECKOUT PROCEDURE

NOTE: THIS PROCEDURE MUST BE CARRIED OUT EVERY TIME THE OXYGEN SENSOR IS REPLACED.

STEP 1 ONCE THE INSTALLATION PROCEDURE HAS BEEN COMPLETED, PLUG THE TESTER INTO THE NEAREST MAINS OUTLET. SWITCH ON THE POWER TO THE UNIT.

STEP 2 INSERT THE FLOPPY DISK WHICH CONTAINS THE OXYGEN OPTION SOFTWARE:
MCS SYS DISK (V4.00 AND UPWARDS) NOT PART OF THE KIT.
THE TESTER SHOULD PERFORM THE SELF TEST ROUTINE, PROGRAMME LOADING SEQUENCE, WARM-UP PERIOD AND THE CALIBRATION SEQUENCE APPROX 15 MIN. AFTER THE TESTER CALIBRATION SEQUENCE HAS BEEN COMPLETED, THEN THE "PROGRAM SELECTION" PAGE WILL BE DISPLAYED ON THE MONITOR.

STEP 3 SELECT "SERVICE UTILITY" FROM THE "PROGRAM SELECTION" PAGE.
ENTER THE PASSWORD CODE (1 2 3 1 2 3 # (HASH KEY)) AND SELECT "TESTER CONFIGURATION ENTRY" PAGE.

STEP 4 ONCE IN THE "TESTER CONFIGURATION ENTRY" PAGE SELECT THE PROPER SETTINGS FOR ALL OPTIONS INSTALLED AS DEFINED.

STEP THROUGH ALL LINES BY SETTING "DEFINED /NOT DEFINED" AS REQUIRED BY PRESSING THE # (HASH) KEY.
PRESSING THE# (HASH) KEY ON THE LAST LINE, THE CAPTION "WRITING TO MEMORY" WILL BE DISPLAYED. THEN THE CONFIGURATION ENTRY PAGE 2 WILL BE DISPLAYED. SELECT "GASES AVAILABLE" AND ADJUST DEPENDING ON WHICH GAS BENCH IS INSTALLED, SELECT "02".

SELECT "GAS APPROVAL" AS REQUIRED. AFTER PRESSING THE # (HASH) KEY ON THE LAST LINE. AGAIN, THE CAPTION "WRITING TO MEMORY" IS DISPLAYED AND THE PROGRAMME RETURNS TO THE "SERVICE UTILITY" PAGE.

STEP 5 THEN SELECT "GAS CALIBRATION" PAGE, SELECT "ALTITUDE ENTRY" AND ADJUST IF NECESSARY. THEN THE FOLLOWING IS DISPLAYED ON THE MONITOR:

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OXYGEN SENSOR ZERO ADJUSTMENT

```
*****************************************
*                GAS CALIBRATION          *
*        ZERO          GAS          SPAN  *
*  CO    0.000 v         %            v   *
*  HC    0.000 v        PPM           v   *
*  CO2   0.000 v         %            v   *
*  02    0.000 v         %            v   *
*                                         *
* SET ZERO VOLTAGE, THEN PRESS * TO SAVE  *
* PRESS "P" TO ABORT                      *
*****************************************
```

STEP 6 ADJUST GAS BENCH 'ZERO" SETTINGS IF NECESSARY.

ON THE KV-PROCESSOR BRD ADJUST THE POTENTIOMETER "R64" UNTIL 02 ZERO SETTING OF 0.000 V IS DISPLAYED. PRESS "*" TO SAVE ZERO SETTINGS. ONCE "*" HAS BEEN PRESSED THE 'GAS" SETTINGS PAGE WILL BE DISPLAYED. PRESS "*" AGAIN. THEN, THE FOLLOWING PAGE IS DISPLAYED:

OXYGEN SENSOR SPAN ADJUSTMENT

```
*****************************************
*                GAS CALIBRATION          *
*        ZERO          GAS          SPAN  *
*  CO    0.000 V     **.**  %      *.***  V *
*  HC    0.000 V       *** PPM     *.***  V *
*  CO2   0.000 V     **.**  %      *.***  V *
*  02    0.000 V     20.80  %      5.000  V *
*                                         *
* SET SPAN VOLTAGE, THEN PRESS * TO SAVE  *
* PRESS "P" TO ABORT                      *
*****************************************
```


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STEP 7 ADJUST GAS BENCH "SPAN" SETTINGS IF NECESSARY.

ON THE KV-PROCESSOR BRD ADJUST THE POTENTIOMETER "R63' UNTIL 02 SPAN 5.000 V IS DISPLAYED UNDER NORMAL ATMOSPHERIC CONDITIONS OF 20.8% OXYGEN WITH THE GAS PUMP RUNNING. PRESS "*" TO SAVE SPAN SETTINGS.

NOTE: DUE TO THE NATURE OF THE OXYGEN SENSOR AN OFFSET OF +/- 1.250 V ON THE ZERO AND THE SPAN SETTINGS IS ACCEPTABLE, THIS IS TO ALLOW FOR THE SHORT LIFE SPAN OF THE OXYGEN SENSOR.

FOR EXAMPLE, UNDER WORST CASE CONDITIONS:
THE ZERO = -1.250 V AND THE SPAN AT 20.8% OXYGEN = +6.250 V.
(MAX. DIFFERENCE BETWEEN THE ZERO AND SPAN SETTINGS IS 7.000 V).

THE 02 OUTPUT SIGNAL CAN BE CHECKED BY CONNECTING A DVM BETWEEN GND AND J-903 PIN F ON THE MUX A/D BRD IT SHOULD READ 5.00 V +/- 1.25 V.

ONCE THE "*" KEY HAS BEEN PRESSED THE TESTER AUTOMATICALLY GOES INTO A "WARM-UP" PERIOD (2 MINS) TO LET THE GAS BENCH STABLIZE, THEN IT GOES INTO THE "TESTER CALIBRATION" PAGE:

```
**************************************
*          TESTER CALIBRATION        *
*  ADC REFERENCE            PASS     *
*  AMPS                     PASS     *
*  RIPPLE                   PASS     *
*  ANALOG-KY                PASS     *
*  VOLT/OHM                 PASS     *
*  VACUUM                   PASS     *
*  HC                       PASS     *
*  CO                       PASS     *
*  CO2                      PASS     *
*  02                       PASS     *
**************************************
```


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IF NO ERRORS ARE DETECTED AND IF ALL FUNCTIONS HAVE BEEN CALIBRATED THEN THE TESTER WILL DISPLAY THE "PROGRAM SELECTION" PAGE. THE MCS-2000 TESTER IS NOW READY FOR OPERATION.

STEP 8 SELECT "VEHICLE TESTING" FROM THE "PROGRAM SELECTION" PAGE. SELECT "VEHICLE ENTRY WITHOUT LIMITS" MOVE THE CURSOR THROUGH THIS PAGE BY PRESSING THE # (HASH) KEY TO STEP FROM LINE TO LINE. PRESSING THE # (HASH) KEY ON THE LAST LINE RETURNS THE DISPLAY TO THE "TESTER LOADING VEHICLE DATA" SEQUENCE.

STEP 9 AFTER THE LOADING SEQUENCE THE "LEADS CONNECT CHECK" PAGE IS DISPLAYED. THEN TEST A VEHICLE IN THE NORMAL MANNER TO ENSURE CORRECT OPERATION.

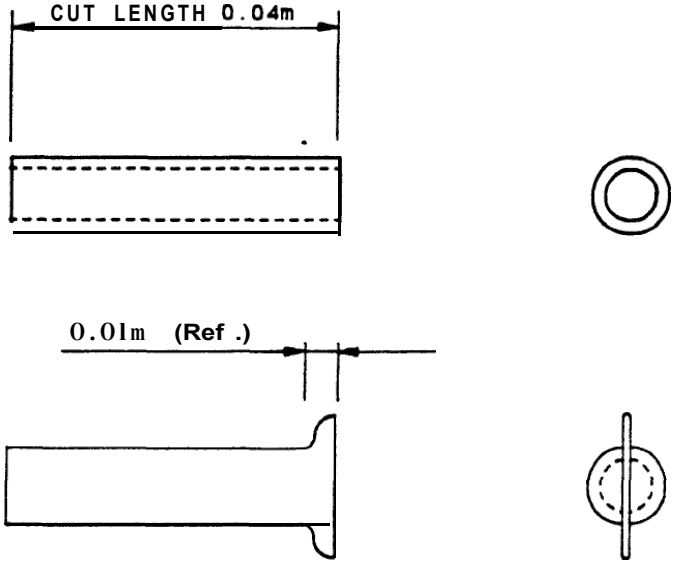
THIS COMPLETES THE CALIBRATION AND CHECKOUT PROCEDURE

NOTE: THE CALIBRATION AND CHECK-OUT PROCEDURE MUST BE CARRIED OUT EVERY TIME THE OXYGEN SENSOR IS REPLACED.

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Revisions

Rev	Date	ECN	Description	Check	APPr.
A	SEP '69		ERNI 0256.	BS	BG



NOTES :

1. CLEAN INSIDE SURFACE OF TUBE WITH PERCHLORETHYLENE FLUID, AND DRY WITH CLEAN,OIL-FREE COMPRESSED AIR.
2. TUBE MUST BE HEATED BEFORE IT CAN BE FLATTENED.
   APPLY A VERY LIGHT FILM OF SILICON GREASE 70 JAWS OF CLAMP BEFORE CLAMPING. HEAT SHOULD BE APPLIED WITH A HEAT GUN.
   THE EDGE OF HEAT GUN MUST BE 2 INCHES FROM THE OUTSIDE EDGE OF TUBE WHEN APPLYING HEAT.
   HEAT TUBE FOR ONE MINUTE & APPLY CLAMP TO FLATTEN TUBE.
   WITH CLAMP INPLACE ALLOW TUBE TO COOL FOR 5 MINUTES.
   REMOVE CLAMP AND ALLOW TUBE TO COOL FOR 10 MINUTES.

Item	QtY	Dwg./Part no	Description	Remarks

Scale	N.T.S.	Date	Used in OXYGEN KIT FOR SGM 2003
Designed by	P.TEL	AUG '89	Material HOSE, PART# 0669-0220.
Drawn by	M.TJIN A SOE	05 SEPT 89	POLYURETHANE CLEAR, I/4"=ID. & 3/8'OD.
Checked by	O.Brunoma	21/09/89	
Approved	Renaud Gee	21 . 9. 89	Finish

Unless otherwise specif fed: Dimensions are in mm; tolerances on: Angles ± 0.50 Holes ± 0. i Rest ± 0.5

Remove all sharp corners and remove burrs

Description	Dwg. no.
HOSE, ONE END SEALED	7096E9057-22

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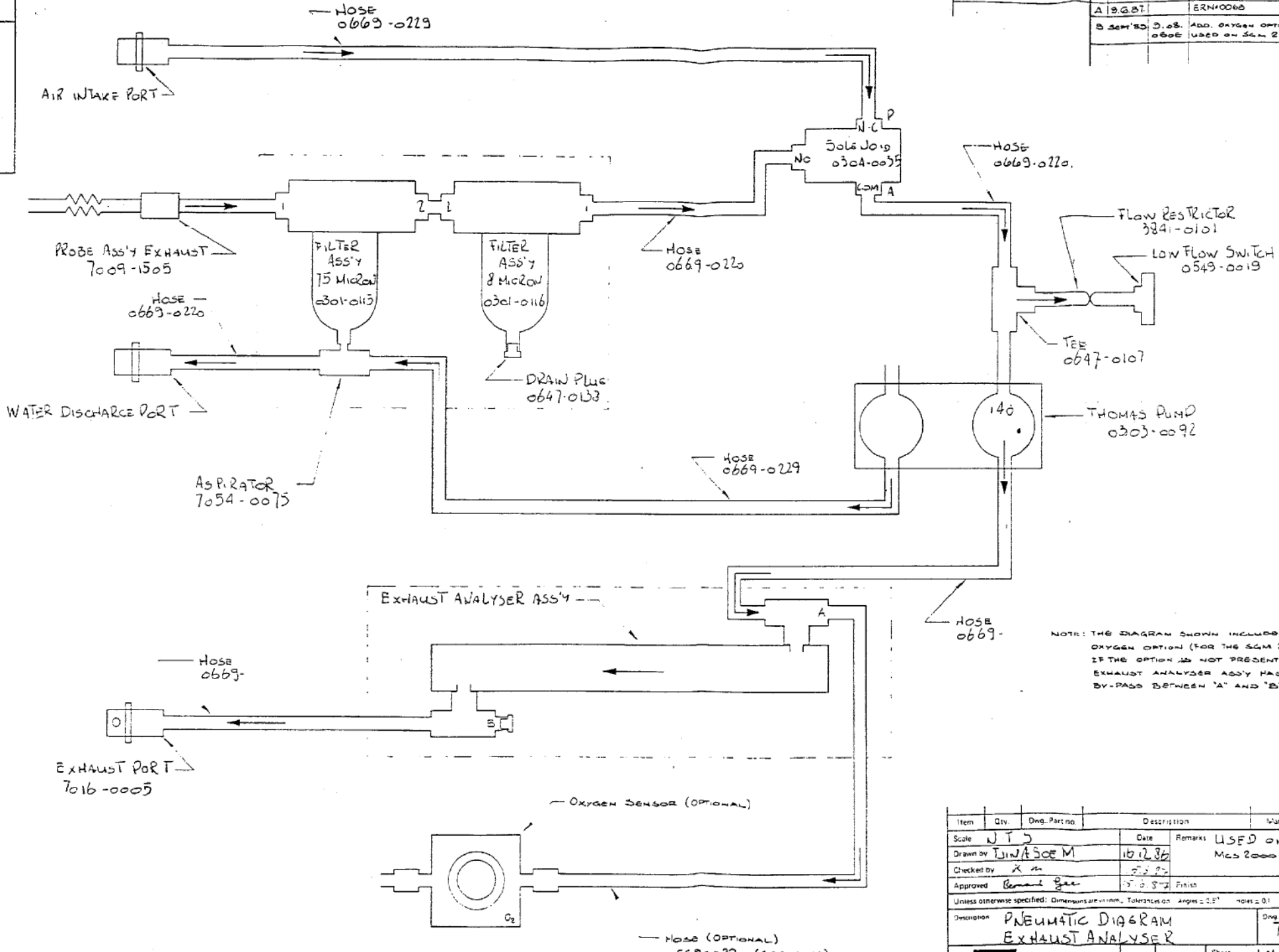
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Code	A
Project no. E8922	

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NOTE: THE DIAGRAM SHOWN INCLUDES THE OXYGEN OPTION (FOR THE SAM 2003). IF THE OPTION IS NOT PRESENT THE EXHAUST ANALYSER ASS'Y HAS A BY-PASS BETWEEN "A" AND "B".

Hose Schedule		
Code	Qty.	Dia.

Revisions					
Sym	Date	ECN	Description	Check	Appr.
A	9.6.87		ERN#0068		RJ
B	SEPT'88	3.08.0606	ADD. OXYGEN OPTION USED ON SAM 2003.		BJ

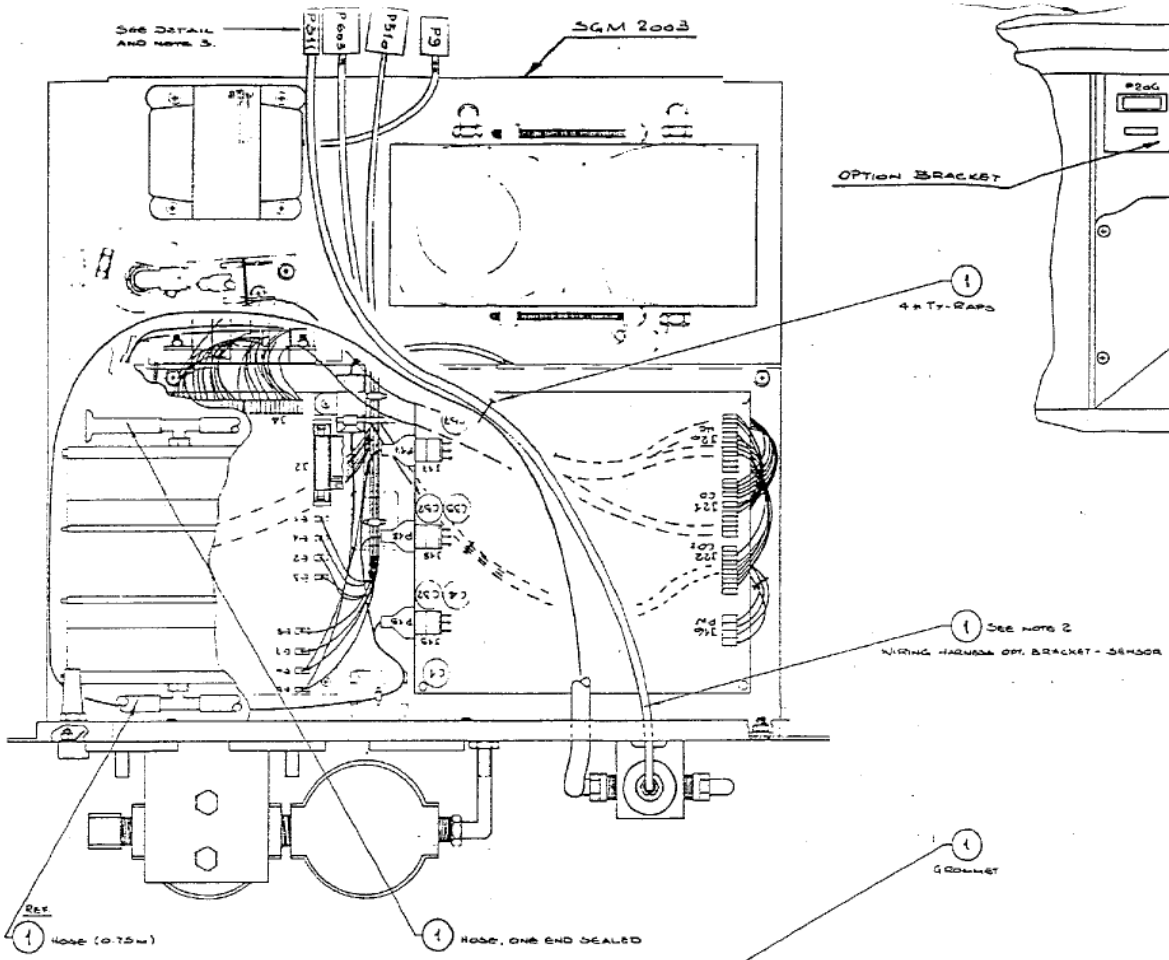
Item	Qty.	Dwg. Part no.	Description	Mat'l Spec.	Remarks

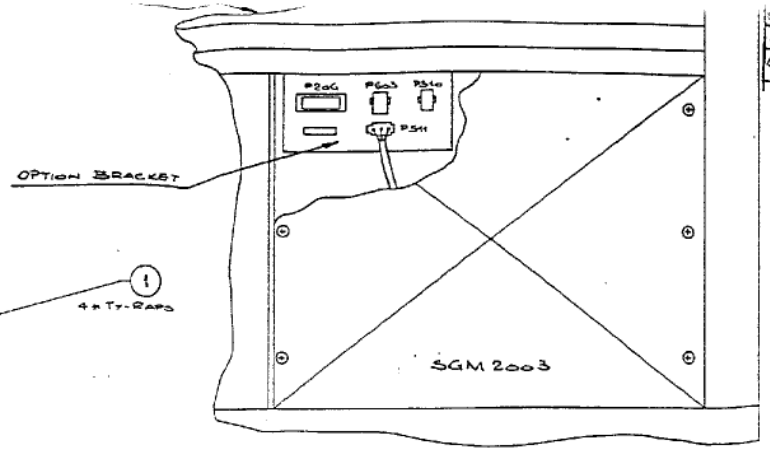
Scale N.T.S
Drawn by TINA SOEM — Date 16.12.86 — Remarks USED ON SAM 4000, MCS 2000 (SAM 2002/SAM 2003)
Checked by
Approved — Finish
Unless otherwise specified: Dimensions are in mm. Tolerances on Angles ± 0.5° Holes ± 0.1 Rest ± 0.5

Description: PNEUMATIC DIAGRAM EXHAUST ANALYSER
Dwg. no. 7092F9311-03

SUN ELECTRIC EUROPE B.V.
A2
Sheet 1 of 1
Code
Project no.
Issue B

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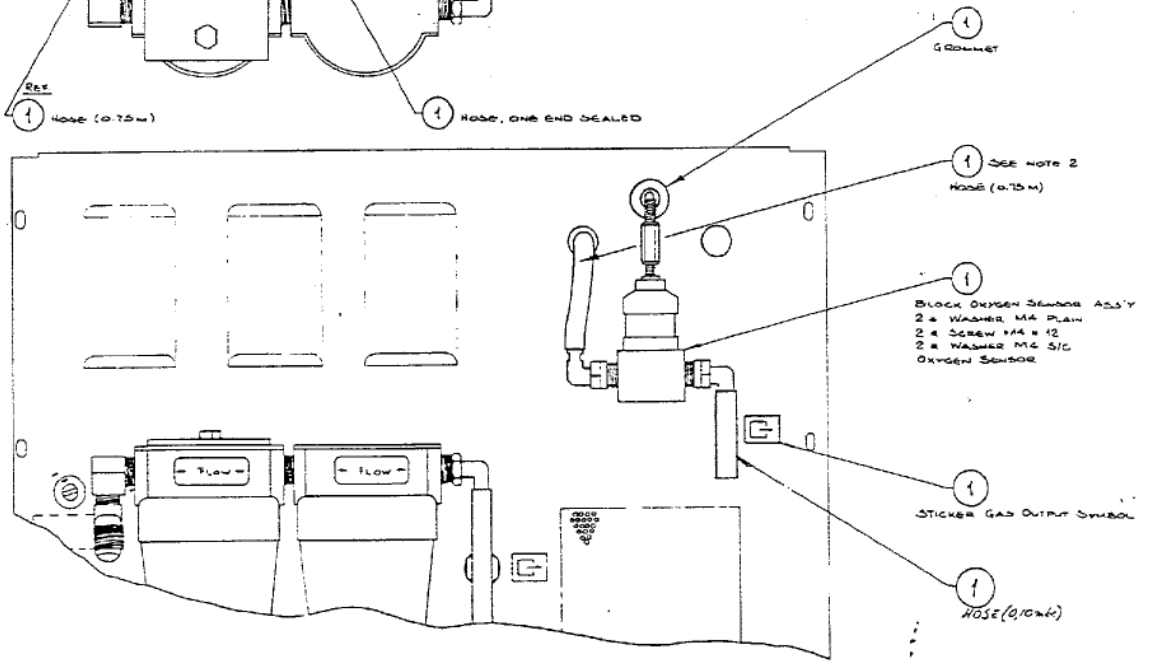


Sym	Date	ECN	Description	Check'd	Appr'd
A	09-89	—	ERN # 02.56	GS	BC
B	10-89	ECN 910.077E Added hose 0 min. to OXYGEN SENSOR-outlet P.T.			BC

NOTES: 1. INSTALLATION INSTRUCTION PART # 06926 9306-20 (PART OF ITEM-1) IS NOT SHOWN.

2. TIER WIRING HARNESS AND HOSE AT APPROPRIATE POSITIONS WITH USE OF TY-RAPS.

3. FIT P511 IN MATCHING CONTRA CONNECTOR AT OPTION BRACKET.



Item	Nr.	Dwg. Part no.	Description	Remarks
1	1	7005E9314-86	OXYGEN OPTION KIT	

Scale: N.T.S. Date: Issued to: SGM 2003
Designed by: Peter Tel 21.09.'89 Material:
Drawn by: M.Tjin A Soe 19.09.'89 REMARK: PREWIRED MCS 2000
Checked by: A Brouwer 21/09/89
Approved: B... 21.9.89 Finish:

Unless otherwise specified: Dimensions are in mm. Tolerances: Angles ±1°. Fractions ±1/32". Remove all sharp corners and remove burrs.

Drawing number: INSTALLATION DRAWING OXYGEN OPTION KIT
Dwg. no.: 06926 9306-21

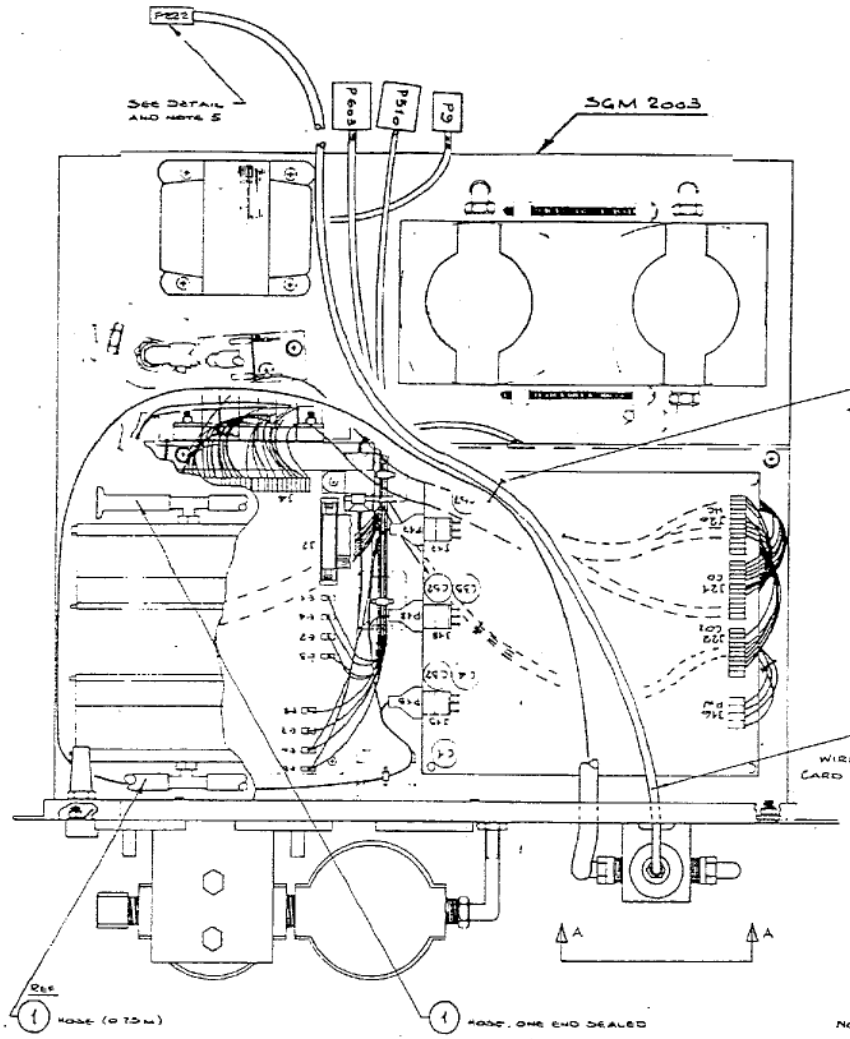
SUN Microsystems Computer Corporation. A Sun Microsystems, Inc. business.

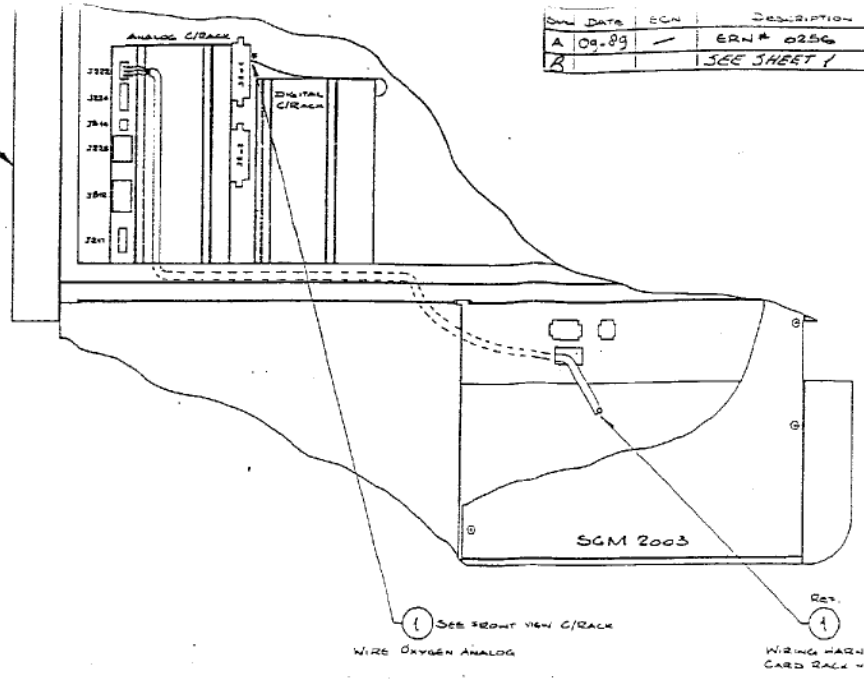
A2 | Sheet 1 of 2 | Issue B | Code | Project no. E8922

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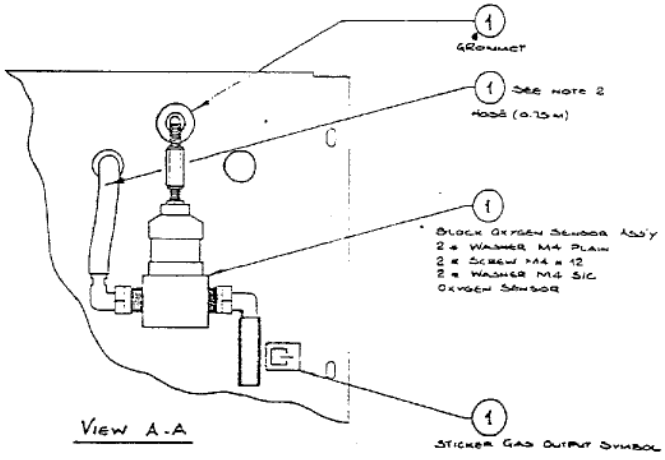
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Dwg	Date	ECN	Description	Check	Appr.
A	09-89	—	ERN# 02566	BS	BJ
B			SEE SHEET 1	P.T.	BJ

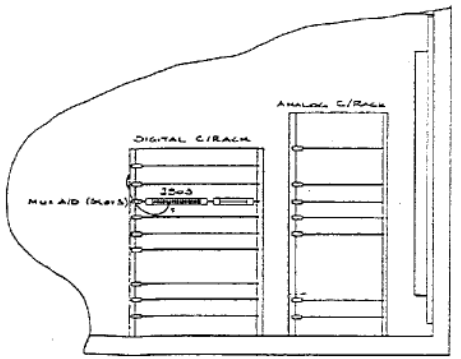




NOTES :
4. SEE SHEET 1 OF 2 FOR NOTES 1 THROUGH 3.
5. FIT P222 IN MATCHING CONTRA CONNECTOR AT REAR OF ANALOG C/RACK. DRILLING MAY BE NEEDED



VIEW A-A



FRONT VIEW CARD/RACK

Item	Qty	Dwg/Part no	Description	Remarks
Scale N.T.S.			Date	Used in SGM 2003
Designed by Peter Tel			21.09.89	Material
Drawn by M TJIN A SOE			20.03.90	REMARK: NON PREWIRED MCS 2000
Checked by O. Drummond			21/09/89	
Approved Bernard Yan				Finish

Unless otherwise specified: Dimensions are in mm. Tolerances on: Angles ± 0.5, Holes ± 0.1, Rest ± 0.5
Remove all sharp corners and remove burrs

Description: INSTALLATION DRAWING OXYGEN OPTION KIT
Dwg no: 0692E9306-21

Sun — Sun Electric B.V. WATERLOOPWEG 8, 3905 PG VEENENDAAL
Aansprakelijkheid uitgesloten volgens de wet

A2 | Sheet 2 of 2 | Code | Project no. E8922 | Issue B

6.2.2

ANDROS ANALYZERS INCORPORATED

EXHAUST ANALYZER

THEORY AND DESIGN

Model 257E Three-Gas EXHAUST-ANALYZER

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EXHAUST-GAS COMPONENTS FOUND IN VARIOUS CHEMICAL ANALYSES

NORMAL COMBUSTION PRODUCTS

N2
H2O
CO2
CO

HYDROCARBONS

methane
ethane
hexane
ethylene
acetylene
propylene
propadiene
1,3-butadiene
n-butane
2-butene
pentane
butyl benzene
1-methyl-4-ethyl benzene
2-methyl-1-butane
n-pentane
isoprene
2-methyl-2-butane
cyclopente
benzene
2,3-dimethyl pentane
toluene
ethyl benzene
xylene
propyl benzene
dodecane

OXIDES OF NITROGEN

nitrous oxide N20
nitric oxide NO
nitrogen trioxide N203
nitrogen dioxide NO2
nitrogen pentoxide N205

TRACE COMPOUNDS

aldehydes
alcohols
phenols
various acids (sulfuric, etc.)
carbon

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INTRODUCTION

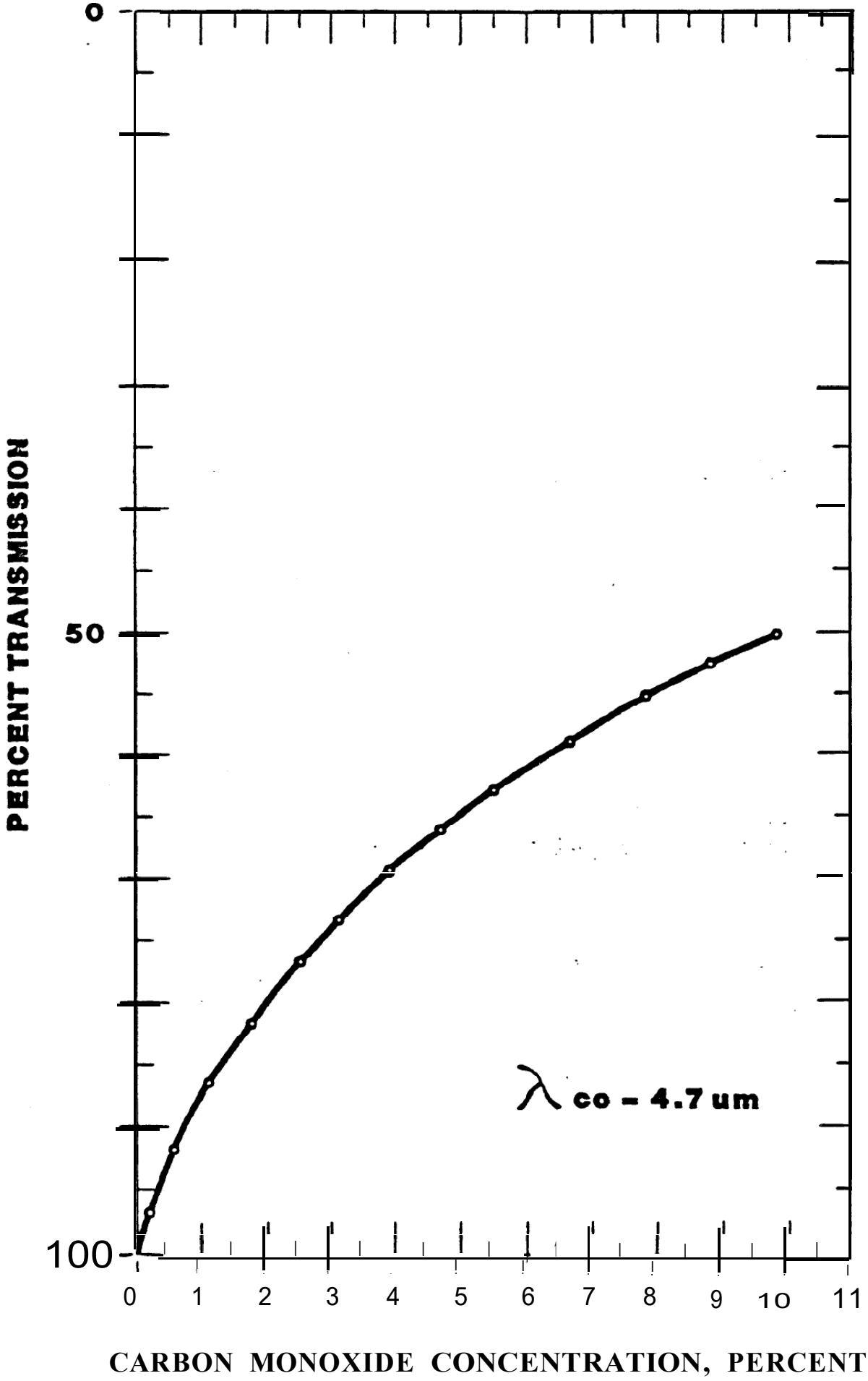
In principle, the internal combustion engine burns hydrocarbons to produce energy plus carbon dioxide and water vapor.

$$(CH) + O2 - CO2 + H2O.$$

In practice, the exhaust of a typical automobile contains many other gases. Analysis of an exhaust-gas sample is shown in **TABLE 1**. The predominate gases include carbon monoxide, carbon dioxide, a variety of hydrocarbons, sulfur compounds, oxides of nitrogen and water vapor.

The Andros EXHAUST ANALYZER measures the concentration of three gases in the exhaust-gas mixture: Carbon monoxide (CO); carbon dioxide (CO2) and hexane (C6H14). Hexane is a good indicator of the mixture hydrocarbon content and is readily obtained for instrument calibration. Normally the output of the instrument is carbon-monoxide

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PERCENT TRANSMISSION VERSUS CO CONCENTRATION

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concentration in percent, carbon-dioxide concentration in percent and hydrocarbon concentration (HC) in parts-per-million (ppm).

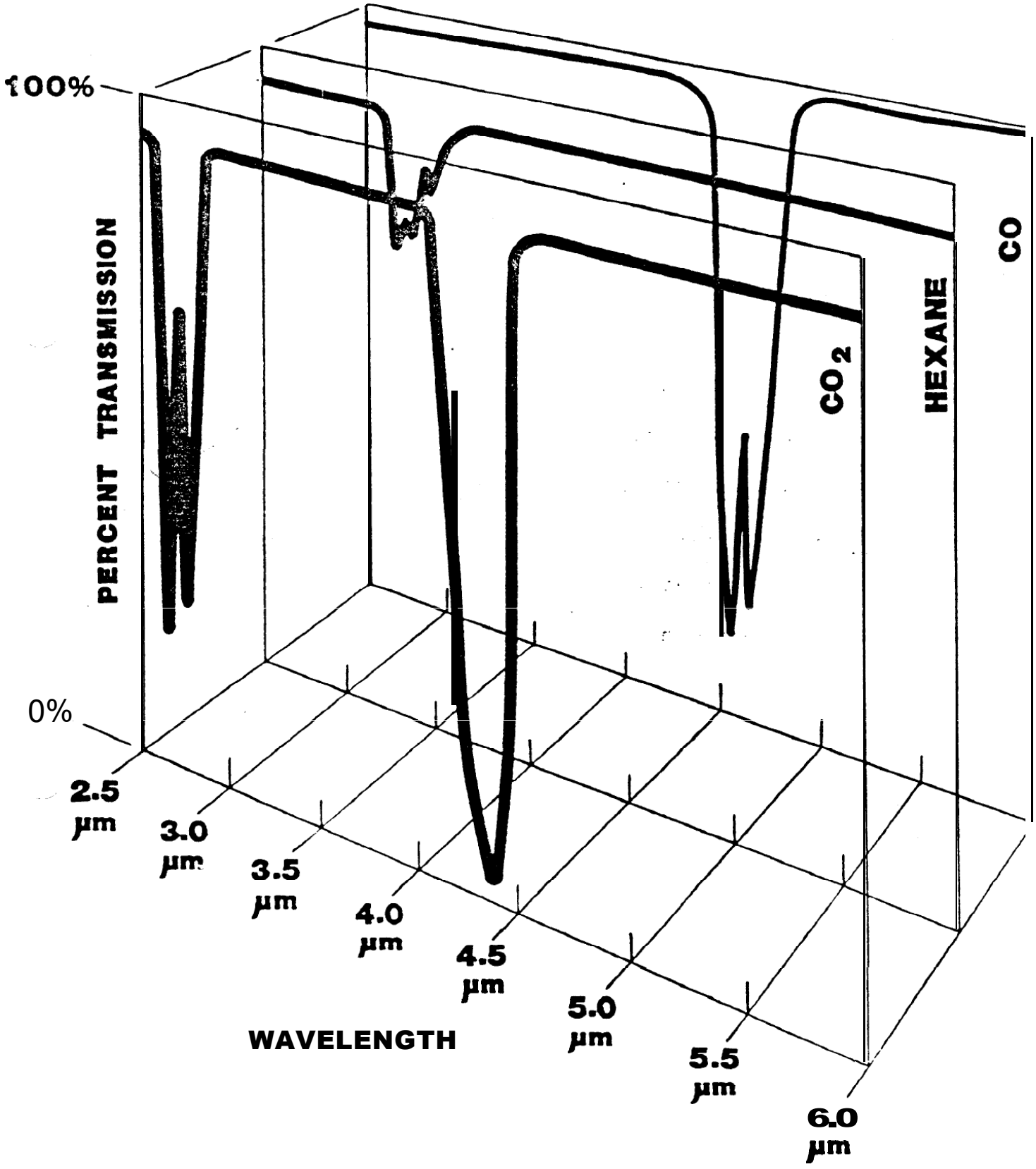
The Andros EXHAUST ANALYZER is a spectrophotometric gas analyzer. It uses a beam of infrared light to probe the exhaust-gas sample and its operation depends upon the way gas molecules interact with light.

When a beam of light passes through a gas some of the light is absorbed. For a specific gas, the amount of light absorbed at any givenwavelength is proportional to the concentration of the gas. This is shown for carbon monoxide in **Figure 2**. The curve of percent-transmission versus CO concentration provides a means of determining the concentration of CO in a gas sample by measuring the absorption of **(λ = 4.7µm)** light by the sample.

When the concentration of gas is fixed, it can be seen that the light absorption is also a function of wavelength. A graph of wavelength versus absorption is called an absorption spectrum. The infrared absorption spectra for carbon monoxide, carbon dioxide and hexane (CO, CO2 and C6H14) are shown in

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③ INFRARED ABSORPTEON SPECTRA



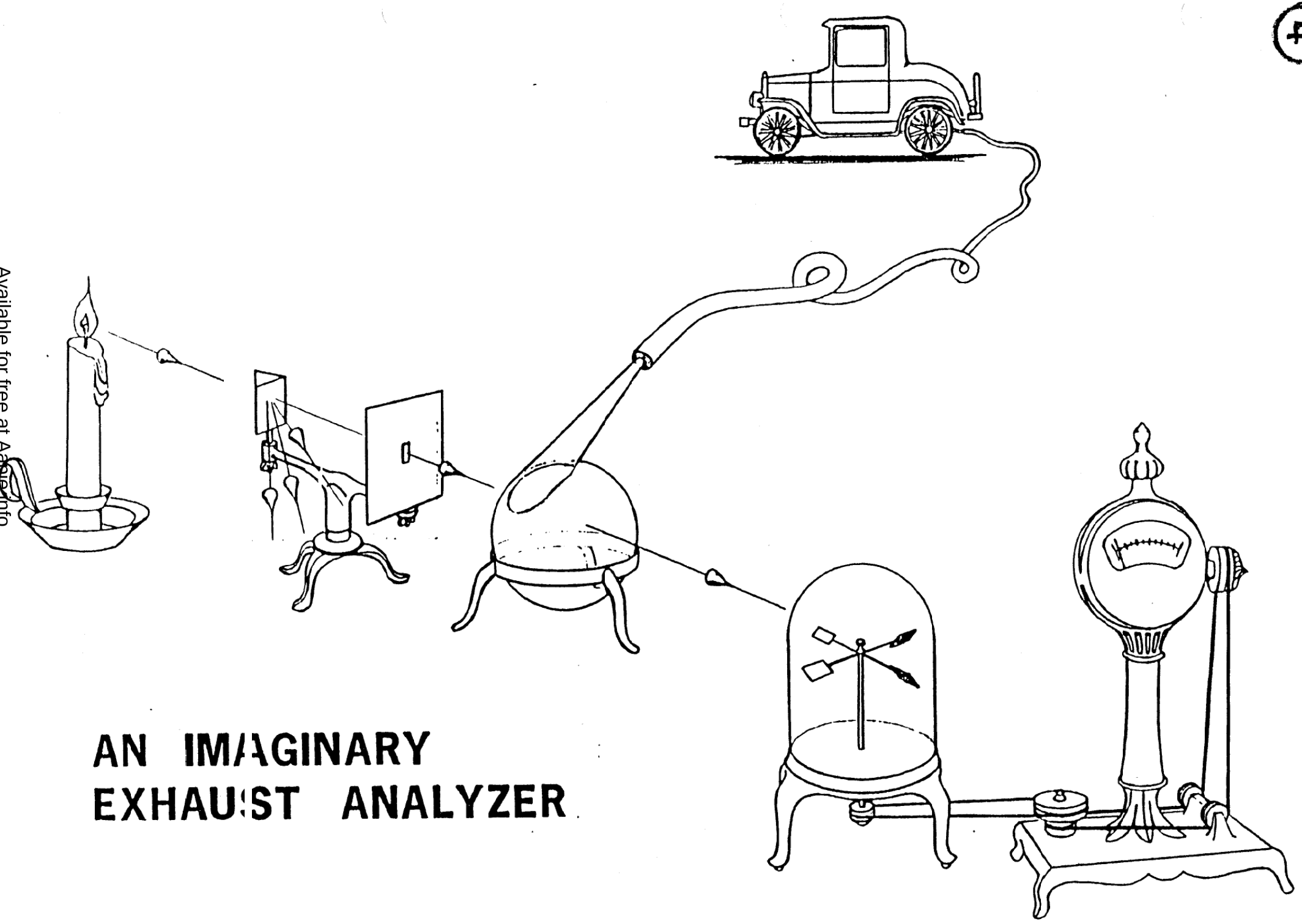
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Figure 3. Each gas absorbs larger amounts of light at certain wavelengths called absorption maxima. For carbon monoxide there are two absorption maxima in the infrared spectrum,one at 4.62um and one at **4.70µm.** CO2 absorbs very little light at these wavelengths; its absorption maxima are at **4.25µm** and between 2.6 and **2.8µm.**

A mixture of gases can be analyzed by taking advantage of the different absorption maxima of different gases. One simply measures the absorption of specific wavelengths of light passed through the mixture. The amount of absorption at each wavelength enables determination of the concentration of gases in the mixture which absorb at that wavelength. Consider a mixture of hexane and carbon monoxide. From **Figure 3**, we deduce that measurement of absorption at about **3.4µm** would enable us to determine the hexane concentration in the mixture and measurement of absorption at about **4.7µm** would enable the determination of carbon monoxide concentration in the mixture.

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AN IMAGINARY EXHAUST ANALYZER

In principle, a gas analyzer need only consist of a light source, and optical band-pass filter, a sample cell and a light detector. Such a gas analyzer is diagramed in **Figure 4**. In practice, there are many problems which must be overcome to produce a convenient and reliable gas-mixture analyzer.

These problems fall into certain broad categories, each illustrated by the imaginary gas analyzer in **Figure 4**,

- SOURCE DESIGN - The light source must have an emission spectrum that is relatively uniform over the wavelengths of analysis and the SOURCE output must be stable under the conditions of measurement.

- FILTER DESIGN - The wavelengths of analysis must be chosen so as to avoid interference between gases with near absorption maxima. For an exhaust-gas analyzer this means we must examine the absorption spectra of other gases present, as well as the gases of interest, before designing the filters. Related to this problem is the band-width of the filter; sufficient light must be passed for the measurement, yet the band-width must be narrow enough to avoid

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interference between gases. Multiple-gas analysis means multiple filters, presenting problems of changing filters and calibration. Finally, the transmission of the filters must be stable under the conditions of measurement.

- LIGHT-PATH AND SAMPLE-CELL DESIGN - An open light path, such as the one shown in **Figure 4**, presents problems of absorption and interference by atmospheric gases. Both the environment and sample nature of an exhaust analyzer bring special problems of vibration, sample-cell contamination and calibration.

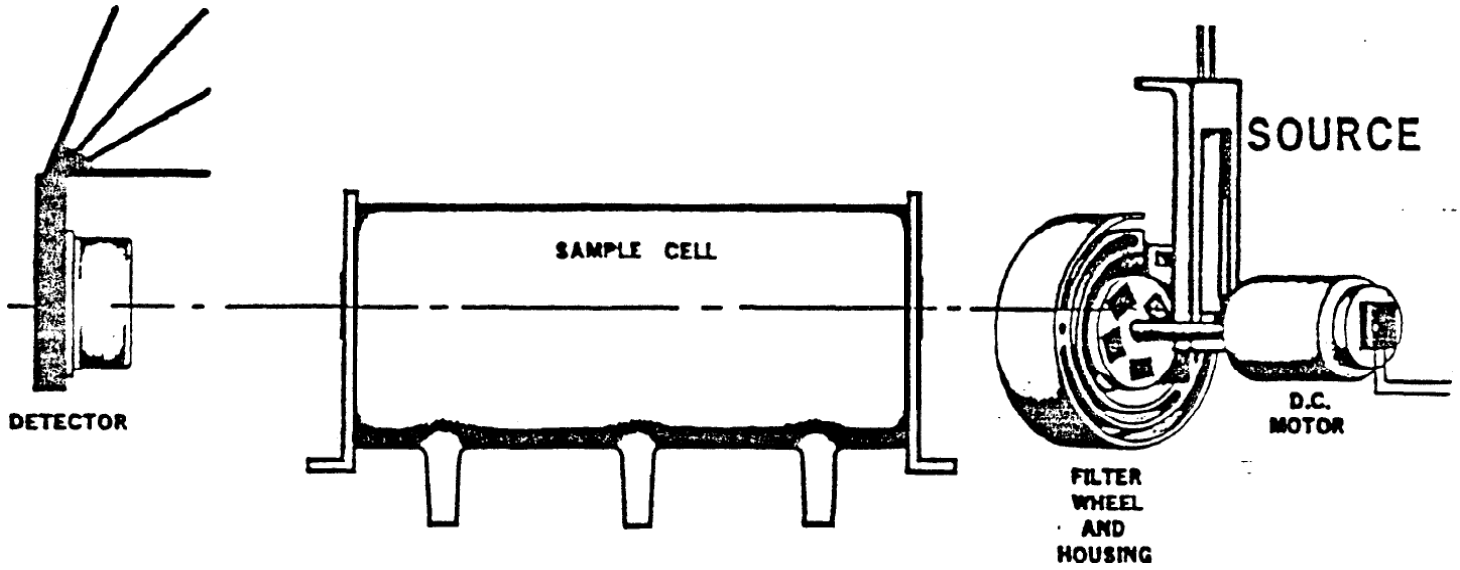
- DETECTOR DESIGN - In a broad sense, the detector consists of the entire mechanism for translating light information into gas-concentration values. This is easily seen in **Figure 4**, where the imaginary detector converts the incident light to motion, then converts that motion into the movement of a pointer on a scale calibrated in gas-concentration numbers. In this simple system we can appreciate the problems of temperature and time stability, setting the "zero" of the system and calibrating the scale. In the

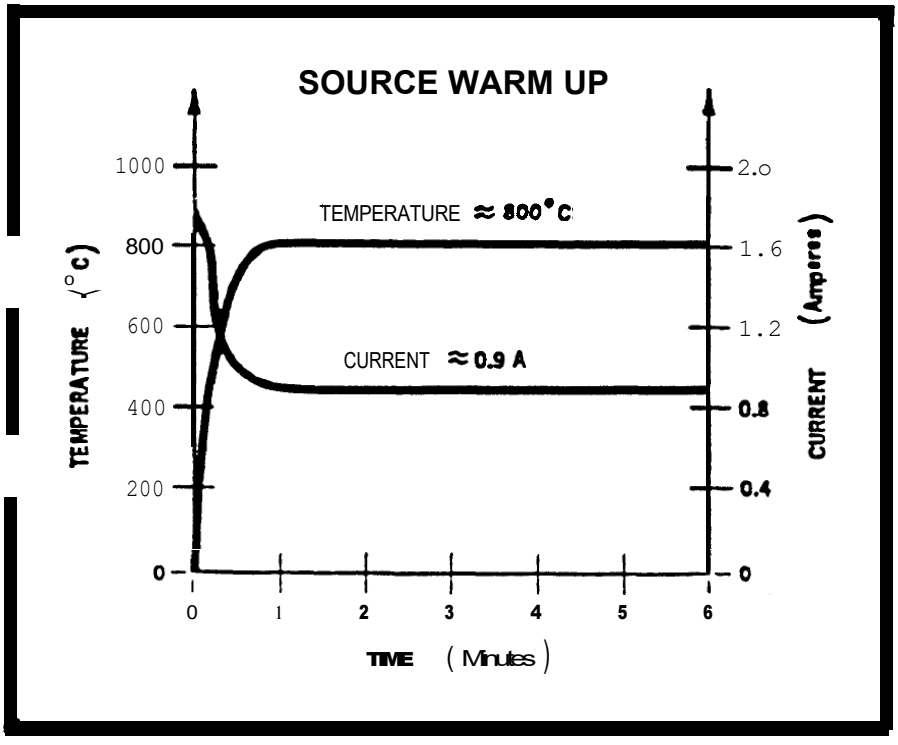
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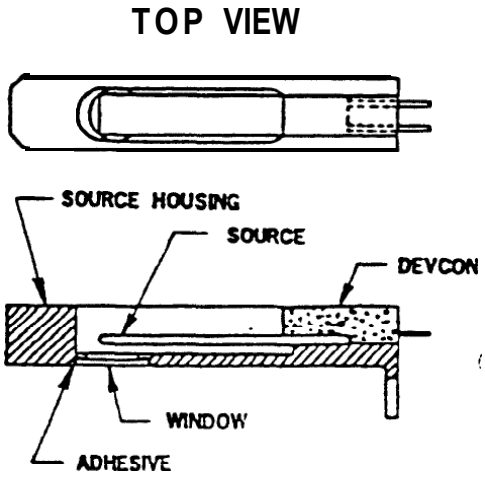
remainder of this discussion, let us agree that "detector" refers to the device which translates light information into an electrical signal and "processor" refers to the device which converts this electrical signal into gas-concentration values, The problems described, plus some electronics problems, exist for the actual EXHAUST ANALYZER.

The Andros EXHAUST ANALYZER design solves these problems in a number of unique and effective ways.

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EXHAUST ANALYZER
INFRARED SOURCE

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Examination of the infrared spectra in **Figure 3** suggests that exhaust-gas spectrophotometric analysis should take place in the infrared region of wavelengths between **3µm** and **5µm.**

The flow of information in the EXHAUST ANALYZER begins with the infrared SOURCE (**see Figure 5**). The SOURCE is a metalized ceramic heater operated at 7.8 VDC. The tip of the SOURCE operates at 700° to 800° C. This heat is dissipated by a heat sink and radiator.

Figure 6 shows the emission spectrum of the SOURCE. The emission is relatively flat between the wavelengths of analysis. Because the SOURCE output is voltage dependent, the power supply is carefully regulated to within +0.05V of the 7.8V required for operation. Infrared radiation from the SOURCE exits via a sapphire window.

The analysis wavelengths selected are:

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- λ_{HC} = 3.43µm;
- λ_{REF} = 3.86µm;
- λ_{CO2} = 4.25µm:
- λ_{CO} = 4.70um.

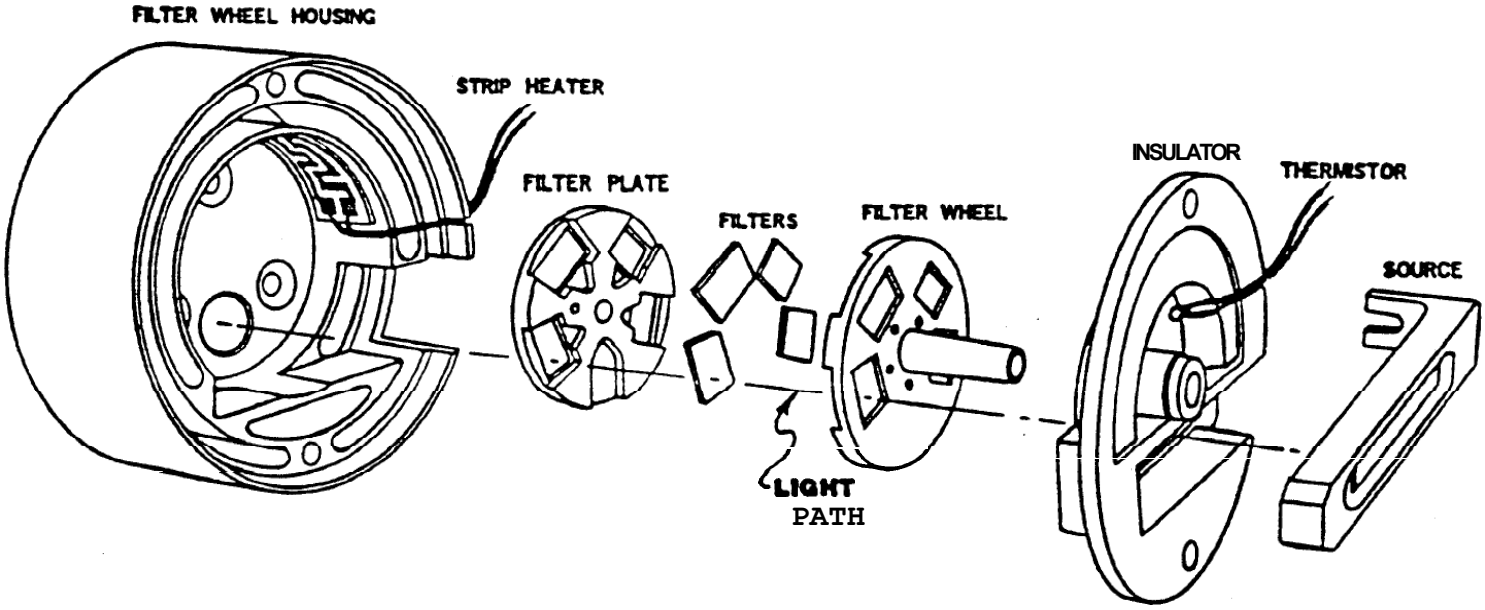
From **Figure 3**, observe that three of these wavelengths correspond closely to the absorption maxima of CO, CO2 and C6H14. At the fourth wavelength, λ_{REF} = 3.86µm, there is very little absorption by any of the three gases. This wavelength was chosen for the zero-absorption reference. The rationale for λ_{REF} will be explained in a subsequent discussion.

Careful analysis of absorption spectra indicates that at the analysis wavelengths there is very little interference between the gases of interest or other gases in the exhaust-gas mixture. At the reference wavelength there is very little absorption by any gas likely to be found in the exhaust-gas mixture.

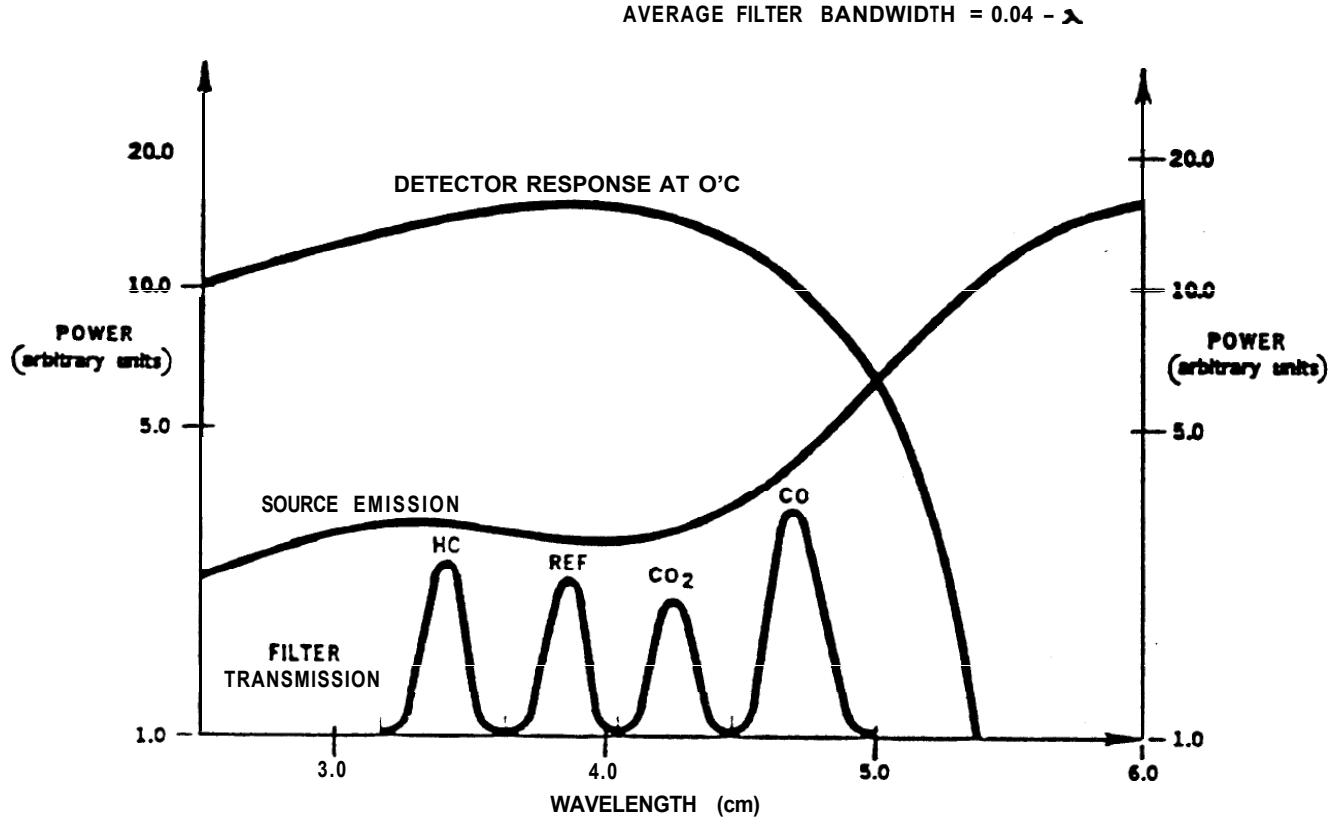
The band-pass filters designed by Andros are constructed on silicon or germanium and have transmission characteristics accurate to within +/-0.02-wavelength. The average bandwith

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FILTER-WHEEL ASSEMBLY



SOURCE-EMISSION, FILTER-TRANSMISSION AND DETECTOR-RESPONSE SPECTRA



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through which the filters allow light to pass is less than 0.04-wavelength. This is shown on **Figure 6**.

In the imaginary analyzer of **Figure 4**, it would be necessary to insert a single filter (say λ_{CO} = 4.70μm), set the detector to zero with no sample in the sample cell, calibrate the detector with a known sample, then measure a single gas-concentration value in the unknown exhaust sample. This sequence of operations would have to be repeated with a different filter to determine each gas concentration in the mixture to be analyzed.

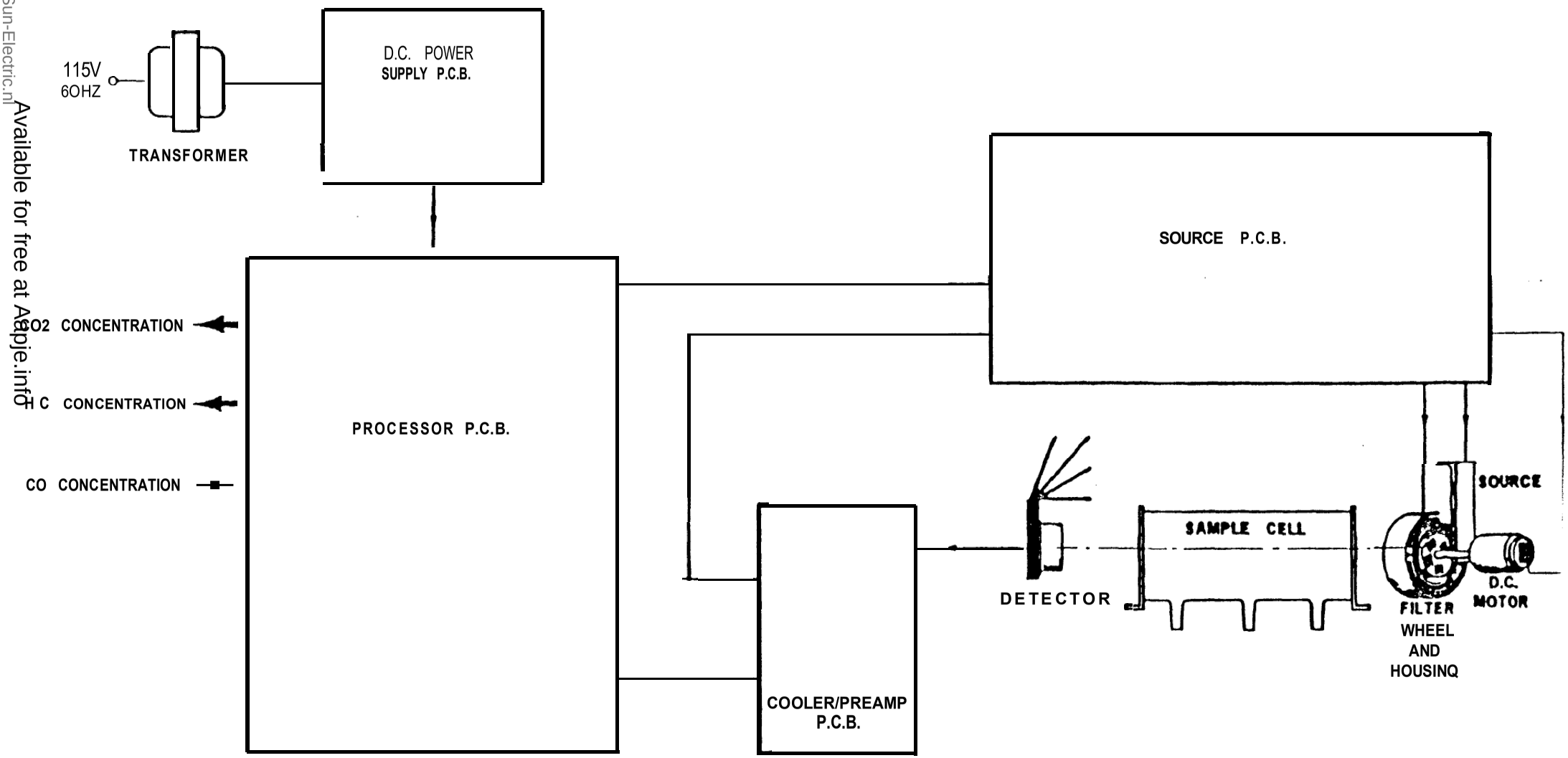
Some of this tedium could be reduced by using multiple light paths with multiple detectors. Instruments using this technique are called split-beam instruments. There are a number of technical and cost problems associated with this approach.

Andros avoided these problems by using a single SOURCE, a single light beam, a single SAMPLE CELL and a single DETECTOR. The light path in the Andros EXHAUST ANALYZER is shown in **Figure 6**. The problem of combining multiple filters with a single SAMPLE CELL and DETECTOR was solved by using

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EXHAUST ANALYSER BLOCK DIAGRAM

filters mounted on a rotating wheel. As the FILTER WHEEL rotates, light from the SOURCE passes through each optical band-pass filter in succession.

Because all of the analysis wavelengths are quite close together and the SOURCE emission is relatively flat over this interval, it is possible to have a single "zero"-reference filter at λ_{REF} = **3.86µm.** This is equivalent to..."setting the detector to zero with no sample in the sample cell...".

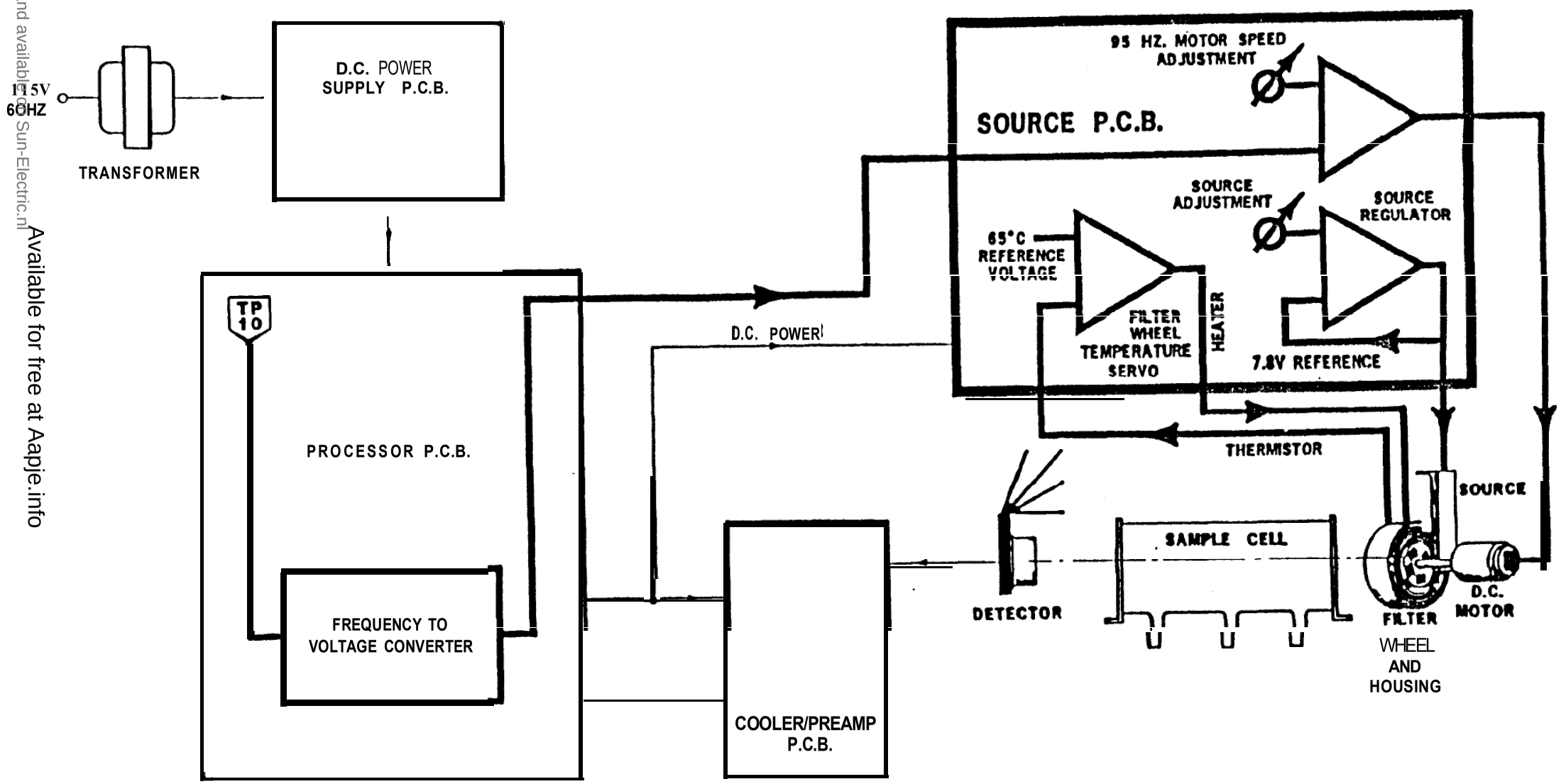
The FILTER WHEEL gives rise to a sequential train of infrared pulses, each of a specified wavelength (**See Figure 6**). The sequence of pulses is:

DARK → **REF** (3.86um) → CO2 **(4.25um)** → HC **(3.43µm)** → CO **(4.7µm).**

Each pulse passes into the SAMPLE CELL, interacts with the exhaust-gas sample in the CELL and passes out of the CELL to be converted into an electrical pulse by the DETECTOR. The output of the DETECTOR, therefore, consists of a train of electrical pulses corresponding to the light pulses. The problem of the PROCESSOR is to resolve this train of pulses into three output channels: CO2 concentration; hydrocarbon concentration; CO concentration (**see Figure 7**).

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SOURCE P.C.B.

This design possesses a number of advantages, some of which are not immediately obvious. One clear advantage is that the EXHAUST ANALYSER can continuously measure three gas concentrations in an exhaust sample without suffering from the design problems of multiple light paths and multiple detectors. A less obvious advantage is that the information to be processed is contained in one AC signal of relatively high frequency. This has certain processing advantages which will become clear in the subsequent discussion.

The FILTER WHEEL is driven by a 3.89 watt electrical MOTOR operated at a nominal voltage of 3.5 VDC. At this voltage the MOTOR speed is about 6,000 rpm. The MOTOR speed is precisely controlled by a MOTOR DRIVER circuit located on the SOURCE PCB (**Figure 8**). This circuit uses a tachometer signal from the PROCESSOR to set the MOTOR speed. This signal triggers a pulse generator, the output of which is averaged by a low-pass filter. The time-constant of the filter is compatible with the transcient response of the DC MOTOR. The DC tachometer voltage is used to drive the MOTOR via a linear amplifier with DC-offset adjustment which is used to set the nominal operating speed of 5,700 rpm (95 Hz). This frequency was chosen to avoid power-line and detector noise components. The MOTOR current is limited to about 40mA by a current-limit circuit. This limits MOTOR RPM during instrument warm-up.

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Surrounding the FILTER WHEEL is a FILTER HOUSING constructed of a special nylon-based plastic with high thermal-insulation qualities. The FILTER HOUSING is maintained at 65° C by a resistance heater and temperature-sensing thermistor. The FILTER HOUSING temperature-control servo is contained on the SOURCE PCB (**Figures 6** and **8**). The purpose of the temperature control is to eliminate FILTER transmission changes associated with ambient temperature variations.

Exhaust-gas mixtures contain water vapor and tend to deposit hydrocarbons on the SAMPLE-CELL walls. This. requires a SAMPLE-CELL design which permits water to drain out of the out ports and which reduces light reflections off the CELL walls into the DETECTOR. Internal reflections would introduce substantial inaccuracy into the system. For this reason, the walls of the SAMPLE CELL are well removed from the light path and the SAMPLE CELL is baffled.

The configuration of the SOURCE, FILTER WHEEL 2nd SAMPLE CELL is such that there is virtually no "free atmosphere" in the light path. The "windows" between the components are composed of sapphire sealed with an O-ring, except for the exit-Gindow of the SAMPLE CELL. Because of its large climeter it is composed of mica.

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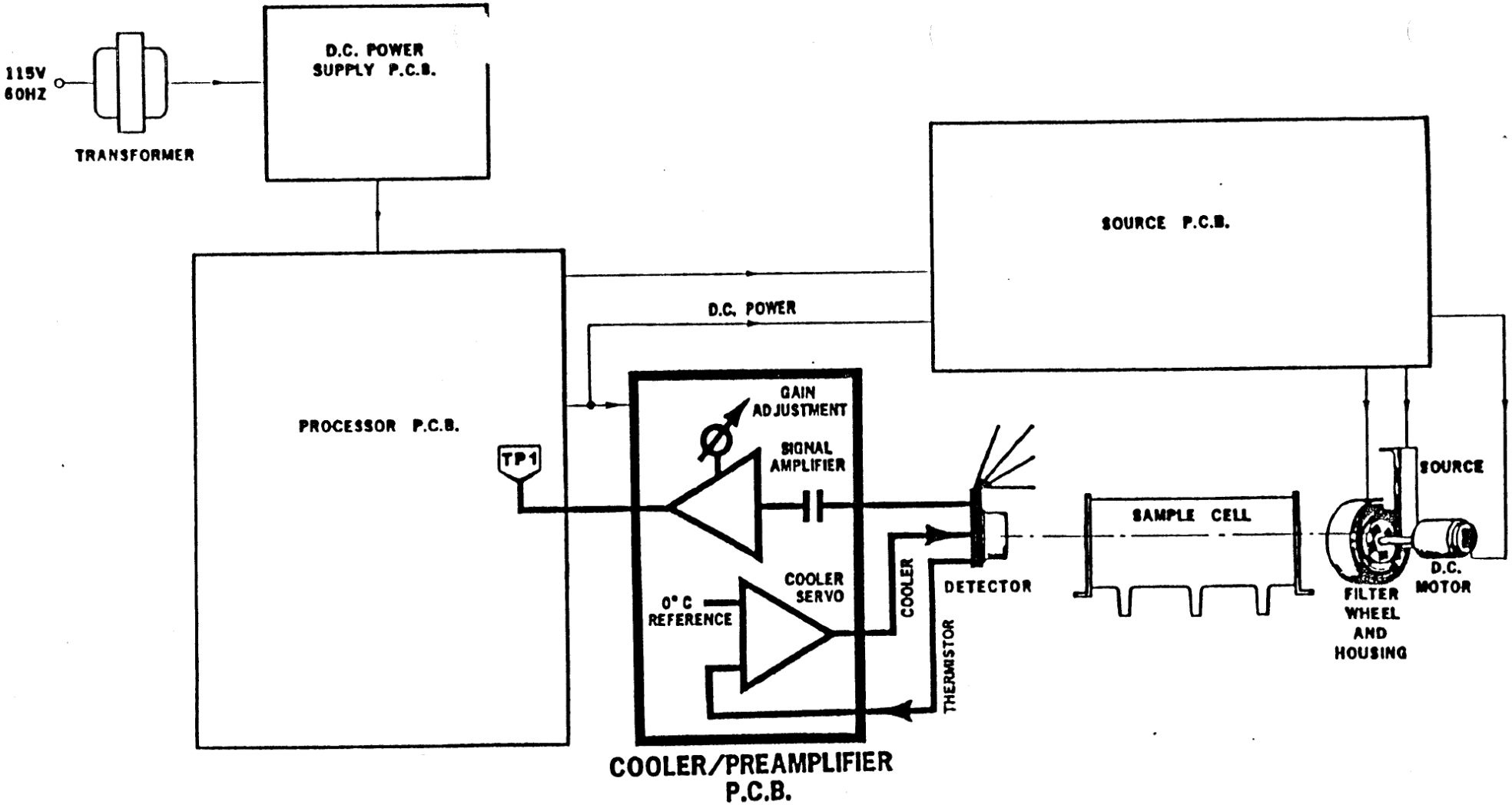
DETECTOR AND PROCESSOR DESIGN

A block-diagram representation of the EXHAUST ANALYZER is shown in **Figure 7**.

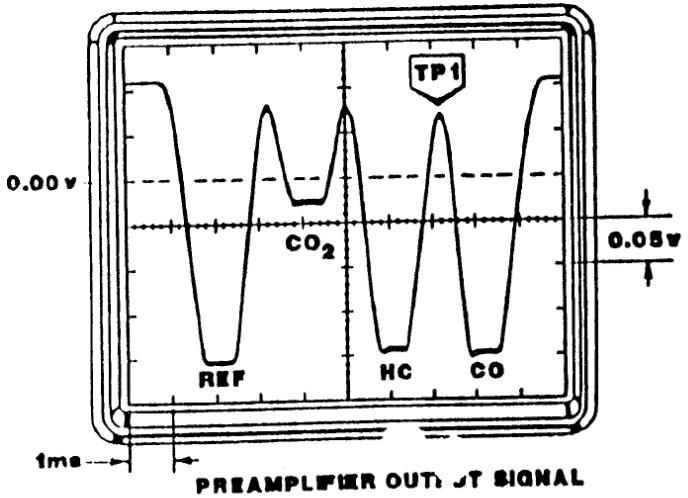
The DETECTOR is a Lead Selenide (PbSe) photoresistor with peak response and spectral range covering the analysis wavelengths. The bias (dark) resistance is about 300 **KΩ.** Because the response of the DETECTOR element is temperature sensitive and its signal-to-noise ratio is significantly improved at low temperatures, the DETECTOR is maintained at 0ºC. This is accomplished by a temperature-sensing thermistor controlling a thermoelectric cooler mounted under the PbSe chip. The DETECTOR-temperature control servo is located on the COOLER/PREAMPLIFIER PCB. It consists of an error amplifier which senses the detector-thermistor resistance and switches a pair of high-current drivers capable of either cooling or heating the DETECTOR.

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COOLER/PREAMPLIFIER
P.C.B.



PREAMPLIFIER OUTPUT SIGNAL

COOLER/PREAMPLIFIER P.C.B.

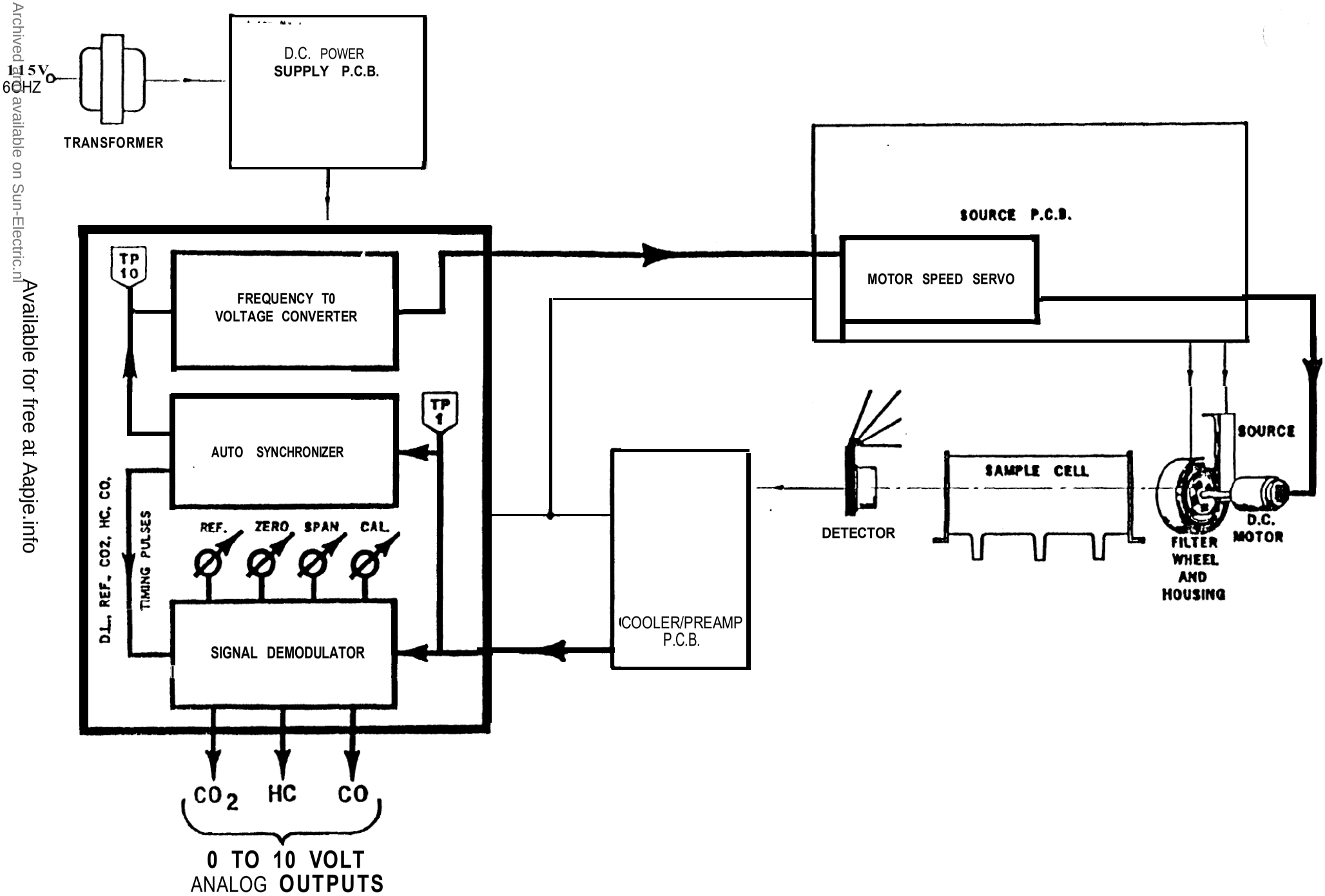
The DETECTOR is hermetically sealed; infrared radiation enters through a sapphire window. Between the DETECTOR and the SAMPLE CELL-exit window is an aluminized plastic collector which serves to direct as much light as possible to the DETECTOR. The DETECTOR is mounted on a heat sink and radiator.

The signal from the DETECTOR is AC-coupled to a linear PREAMPLIFIER, where it is amplified to about 0.3V. This is controlled by setting the PREAMPLIFIER gain for 0.3V peak-to-peak for the highest output pulse (**see Figure 9**). Potentiometer R23 on the COOLER/PREAMPLIFIER PCB controls the PREAMPLIFIER gain.

The signal from the PREAMPLIFIER can be probed at TEST POINT 1 (TP1) on the PROCESSOR PCB. An oscilloscope display of this signal is shown in **Figure 9**. The signal consists of four electrical pulses corresponding to the four light pulses generated by the FILTER WHEEL. In the circuit analysis, the signals and pulses will be identified by the TEST POINT from which they can be sampled. TP1 identifies the signal from the PREAMPLIFIER, called the TP1-signal and each pulse in that signal is a TP1-pulse.

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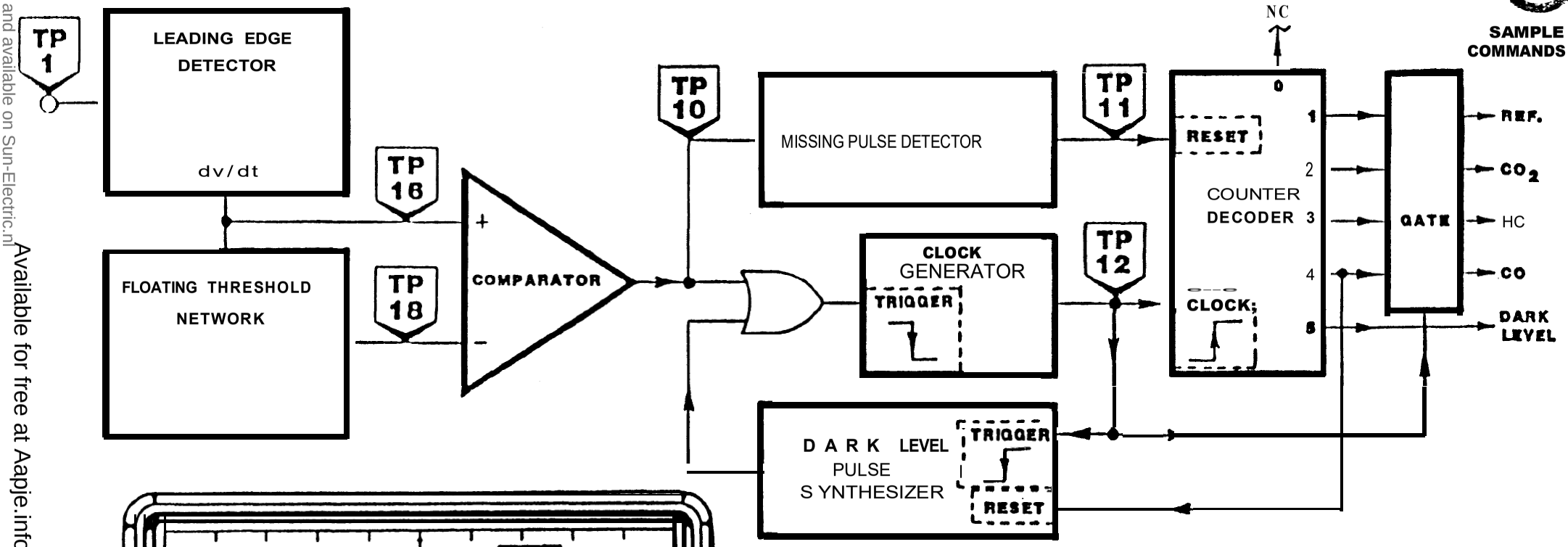


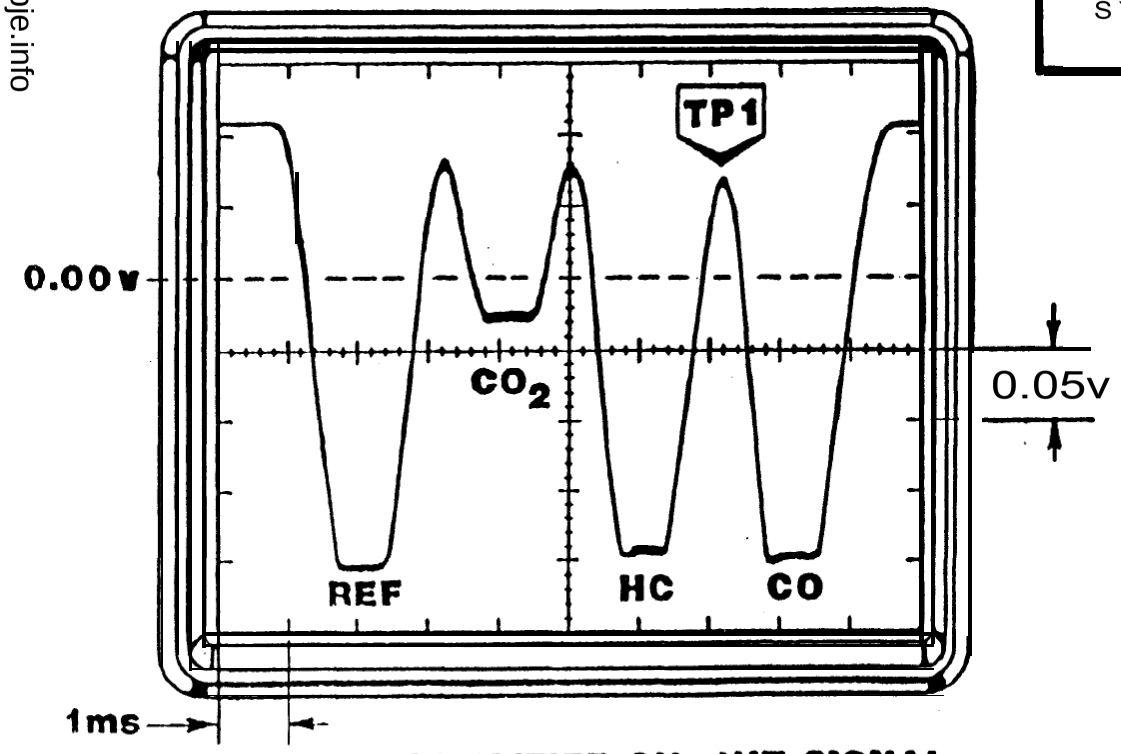
PROCESSOR P.C.B.

The output of the PREAMPLIFIER is AC-coupled to the PROCESSOR (**see Figure 10**). The PROCESSOR circuitry is located on the PROCESSOR PCB, Here the TP1-signal is split into two paths. One path leads to the AUTO SYNCHRONIZER and the other to the demodulating circuit of the PROCESSOR. The AUTO SYNCRHONIZER enables the PROCESSOR to identify which FILTER is in the light path at any instant. The demodulating circuit resolves the AC-signal from the PREAMPLIFIER into three output DC-voltages corresponding to CO2 concentration, HC concentration and CO concentration.

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PREAMPLIFIER OUTPUT SIGNAL

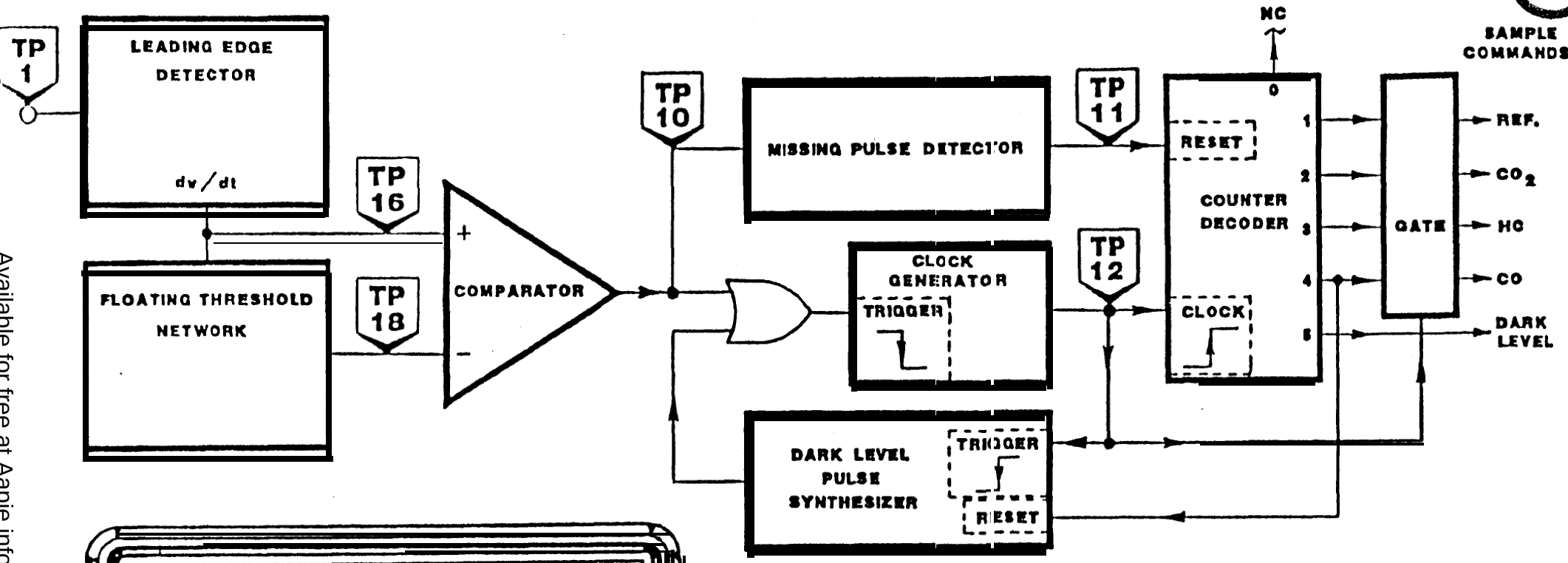
BLOCK DIAGRAM OF AUTO SYNCHRONIZER.

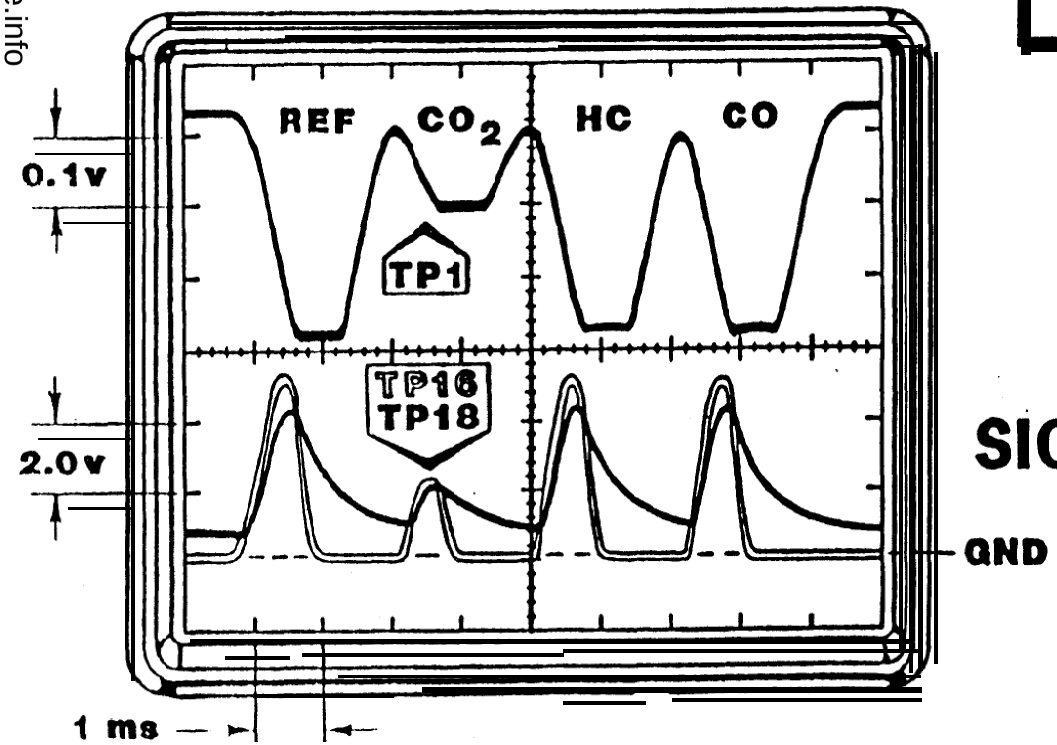
In most filter-wheel analyzer designs, synchronization is accomplished with an optical "cam". This technique requires an extra light source, detector and a shaft encorder - making it difficult to design a simple, reliable and compact filter-wheel system that is also temperature stabilized.

In the Andros EXHAUST ANALYZER synchronization is. accomplished by keying and phase-matching circuits which operate on the TPl-signal itself. **Figure 11** shows a block diagram of the AUTO SYNCHRONIZER circuit.

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AUTO SYNCHRONIZER SIGNALS AT TP 18 AND TP 16

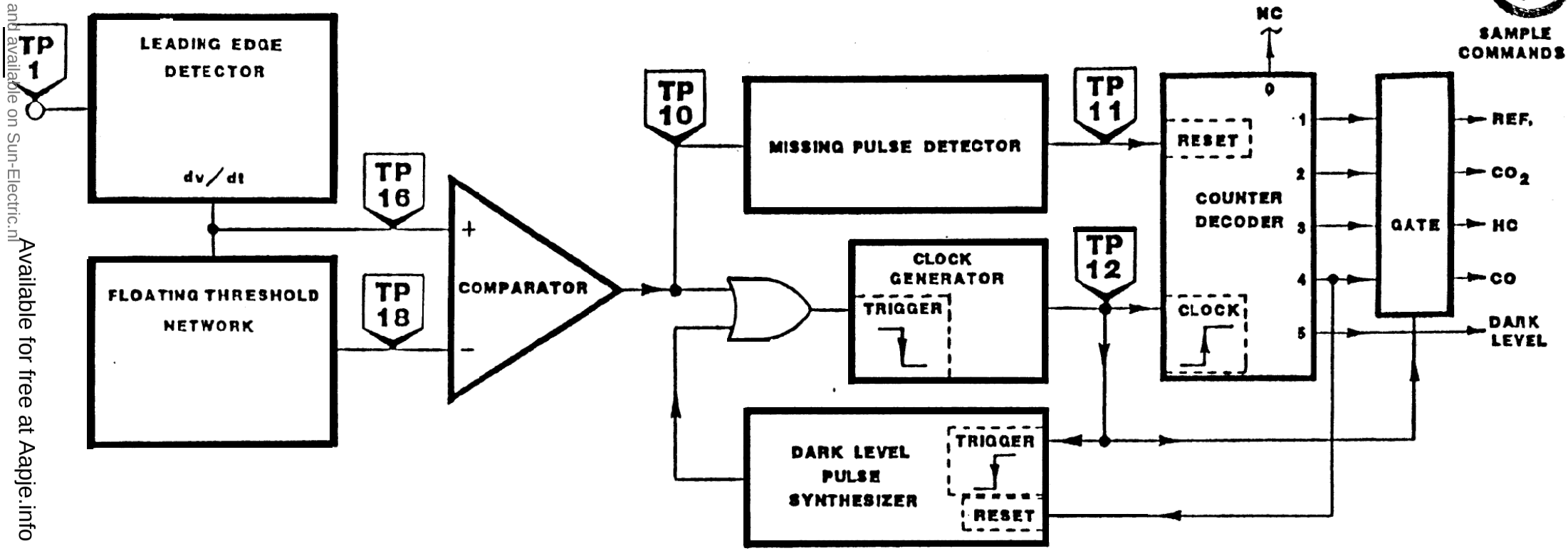
The TP1-signal goes into the LEADING-EDGE DETECTOR. This is a band-limited half-wave differentiator that produces a positive-going pulse coincident with each TP1-pulse. The output of the LEADING-EDGE DETECTOR is observed at TP16 (see **Figure 12**). Each TP16-pulse is proportional to the slope and amplitude of the original TP1-pulse. A TP16-pulse indicates initiation of a new TP1-pulse and has a specific maximum that corresponds to the beginning of the flat portion of each TP1-pulse.

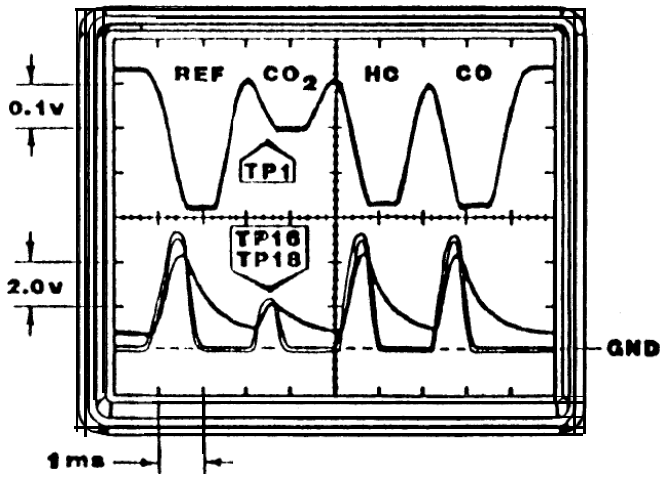
Another signal is generated from this TP16-signal. This signal may be measured at TP18 and is the output of the FLOATING-THRESHOLD NETWORK. The FLOATING-THRESHOLD NETWORK is an attenuating peak detector with controlled decay characteristics chosen so that amplitude equality between each TP16-pulse and TP18-pulse occurs at a point corresponding to the beginning of the flat-portion of a TP1-pulse.

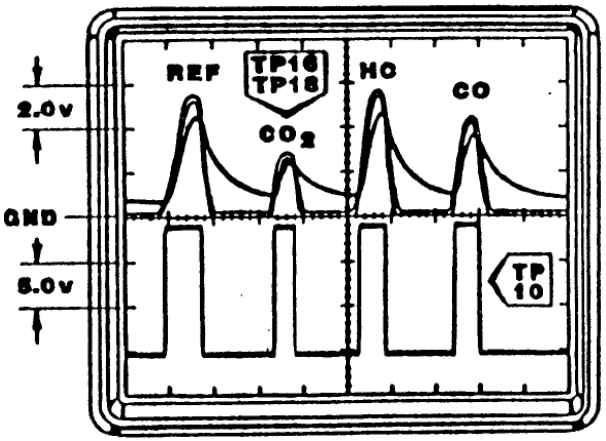
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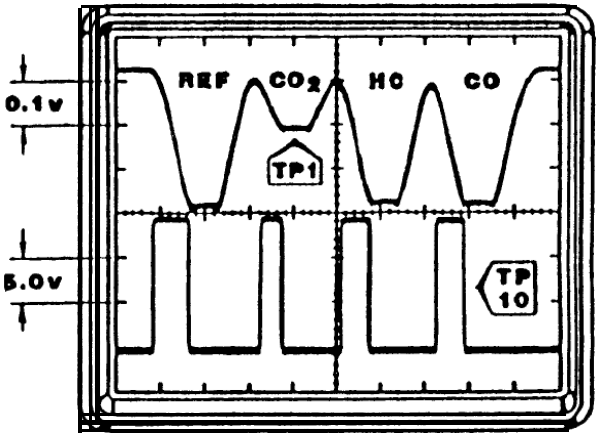
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SAMPLE COMMANDS







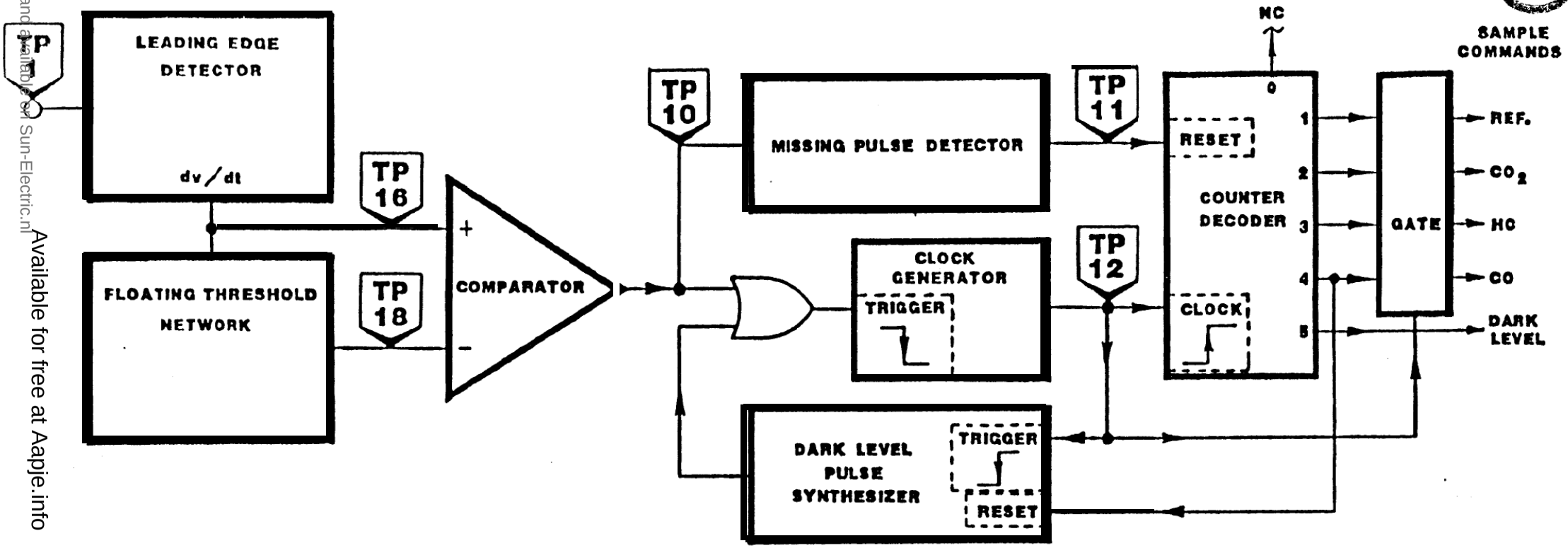


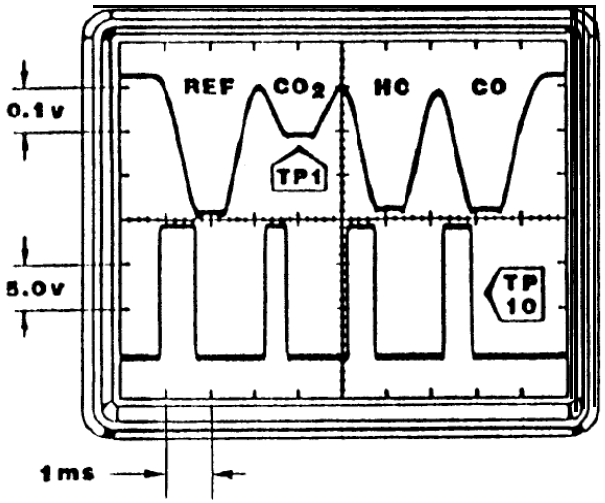
AUTO SYNCHRONIZER TP 10 SIGNALS

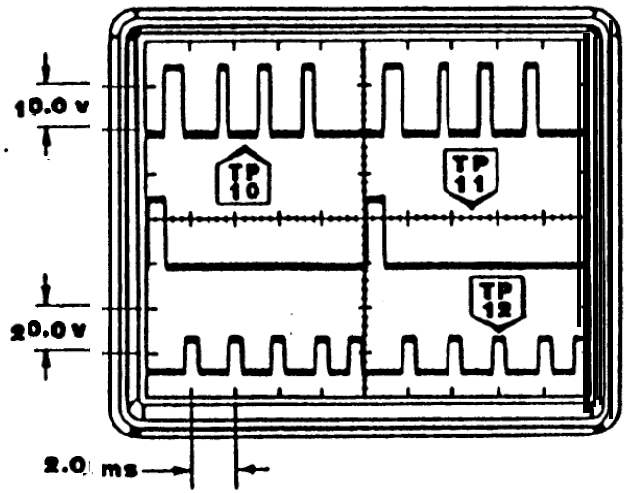
A COMPARATOR compares the TP16-signal and TP18-signal and generates a timing pulse whose negative edge corresponds in time to the beginning of the flat-portion of each TP1-pulse. This signal may be measured at TP10 and is called the TP10-signal (**see Figure 13**). The TP10-signal enables the subsequent logic and timing circuits to derive actual switch-control commands for sampling the information in each TP1-pulse.

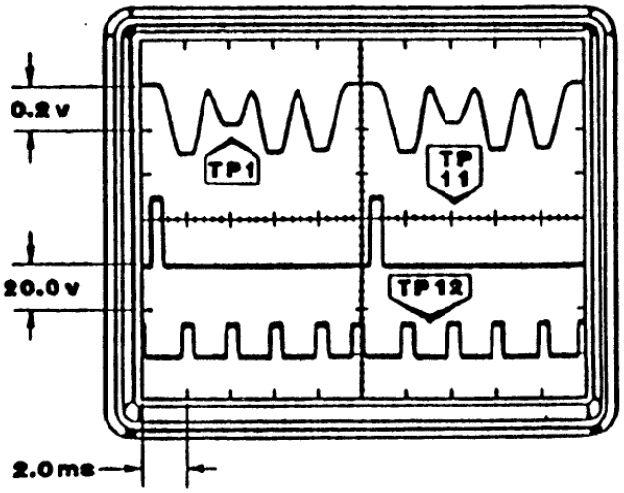
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AUTO SYNCHRONIZER TP 11 AND TP 12 SIGNALS

A MISSING-PULSE DETECTOR locates the "blank" portion of the FILTER WHEEL (physically, the space between FILTERS CO and REF). The output of the MISSING-PULSE DETECTOR, TPll (**see Figure 14**), resets the COUNTER DECODER to "0".

The CLOCK GENERATOR increments the COUNTER DECODER for each low-to-high transition of its output. This output may be measured at TP12. The TP12-signal also determines how long each TPl-pulse is sampled, because it forms a logical "and"-function with the outputs of the COUNTER DECODER. This occurs in the GATE block. Finally, the CLOCK GENERATOR triggers the DARK-LEVEL PULSE SYNTHIZER.

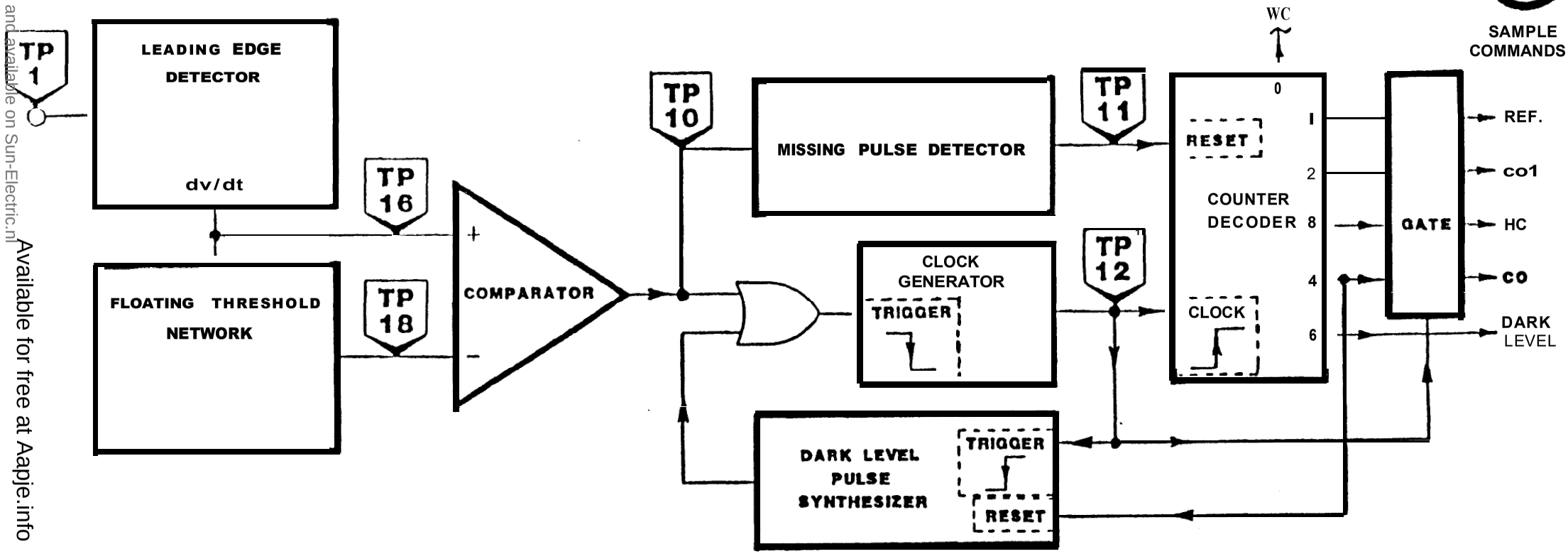
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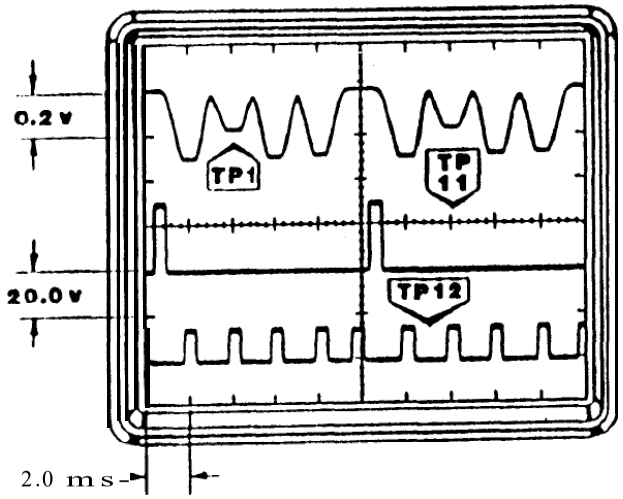
The DARK-LEVEL PULSE SYNTHESIZER is held "reset until the CO-output of the COUNTER DECODER goes high (a decoded "4" count). Subsequently, the output oi the CLOCK GENERATOR will go from high to low, triggering the DARK-LEVEL PULSE SYNTHESIZER. The resultant pulse retriggers the CLOCK GENERATOR on its high-to-low transition. This event increments the COUNTER DECODER to its final state, DARK LEVEL. Approximately 0.5-ms later the MISSING PULSE DETECTOR resets the COUNTER DECODER to "0", starting the cycle over again.

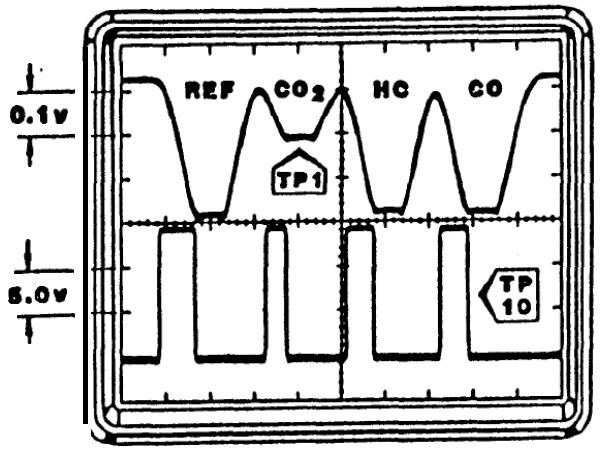
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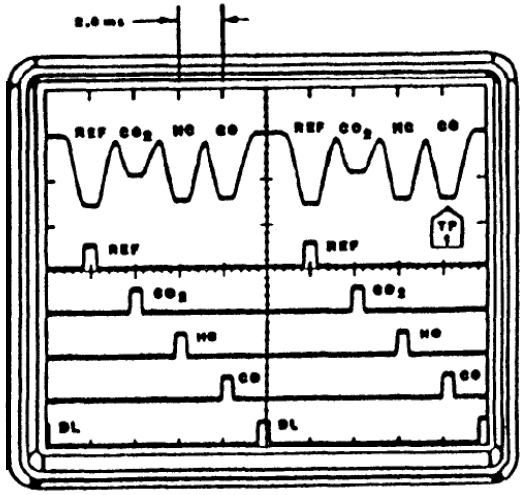
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SAMPLE COMMANDS









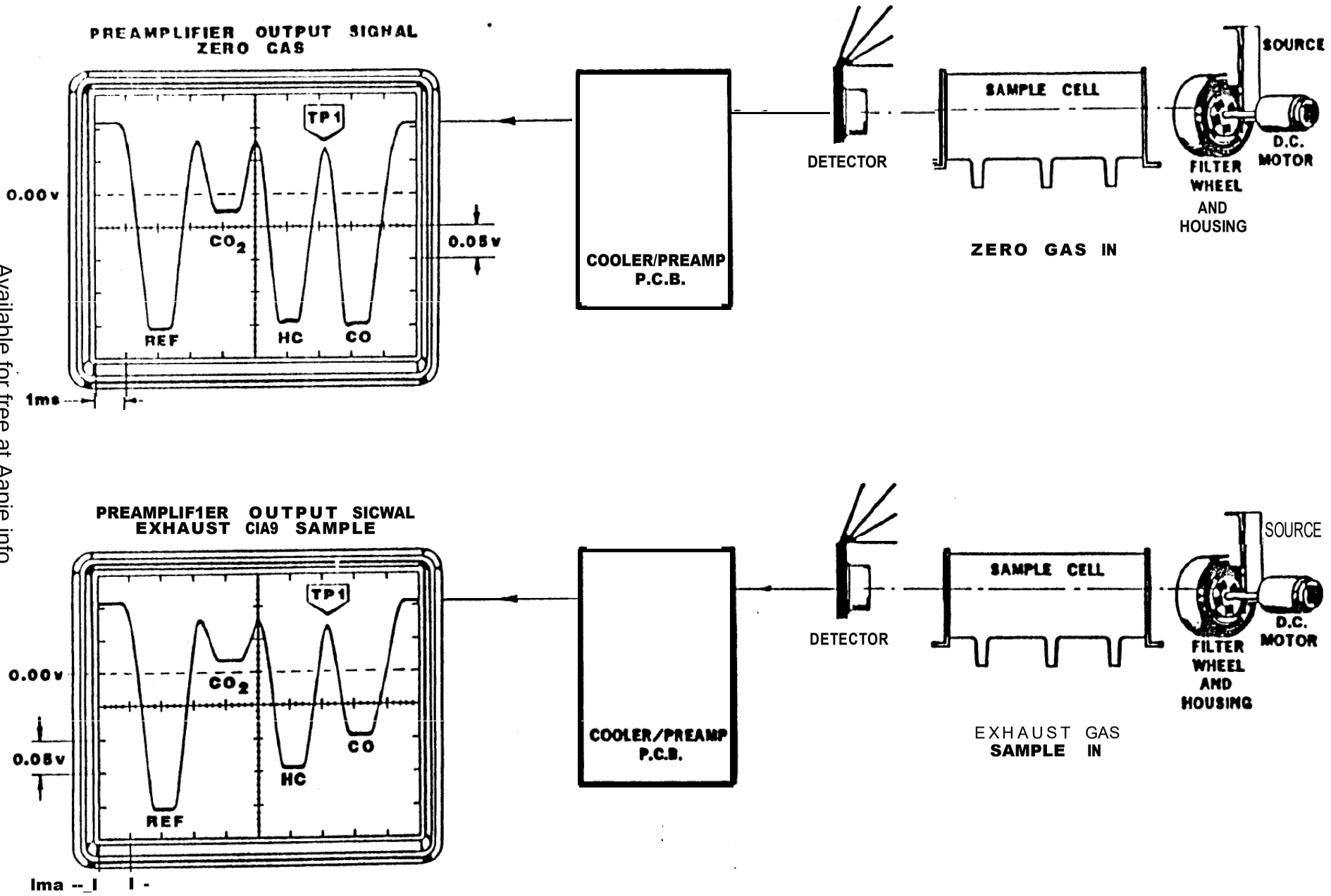
OUTPUTOF THE AUTO SYNCHRONIZER

AUTO SYNCHRONIZER OUTPUT

The output of the AUTO SYNCHRONIZER is in the form of five commands: Sample REF, sample C02, sample HC, sample CO and sample DARK LEVEL. These commands are +15V timing pulses approximately 0.5 ms wide occurring every 10.5 ms (95 Hz). They are identified on the Processor PCB as TP REF, TPC02, TPHC, TPCO and PPDL.

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TP 1-SIGNAL WITH AN EXHAUST-GAS SAMPLE

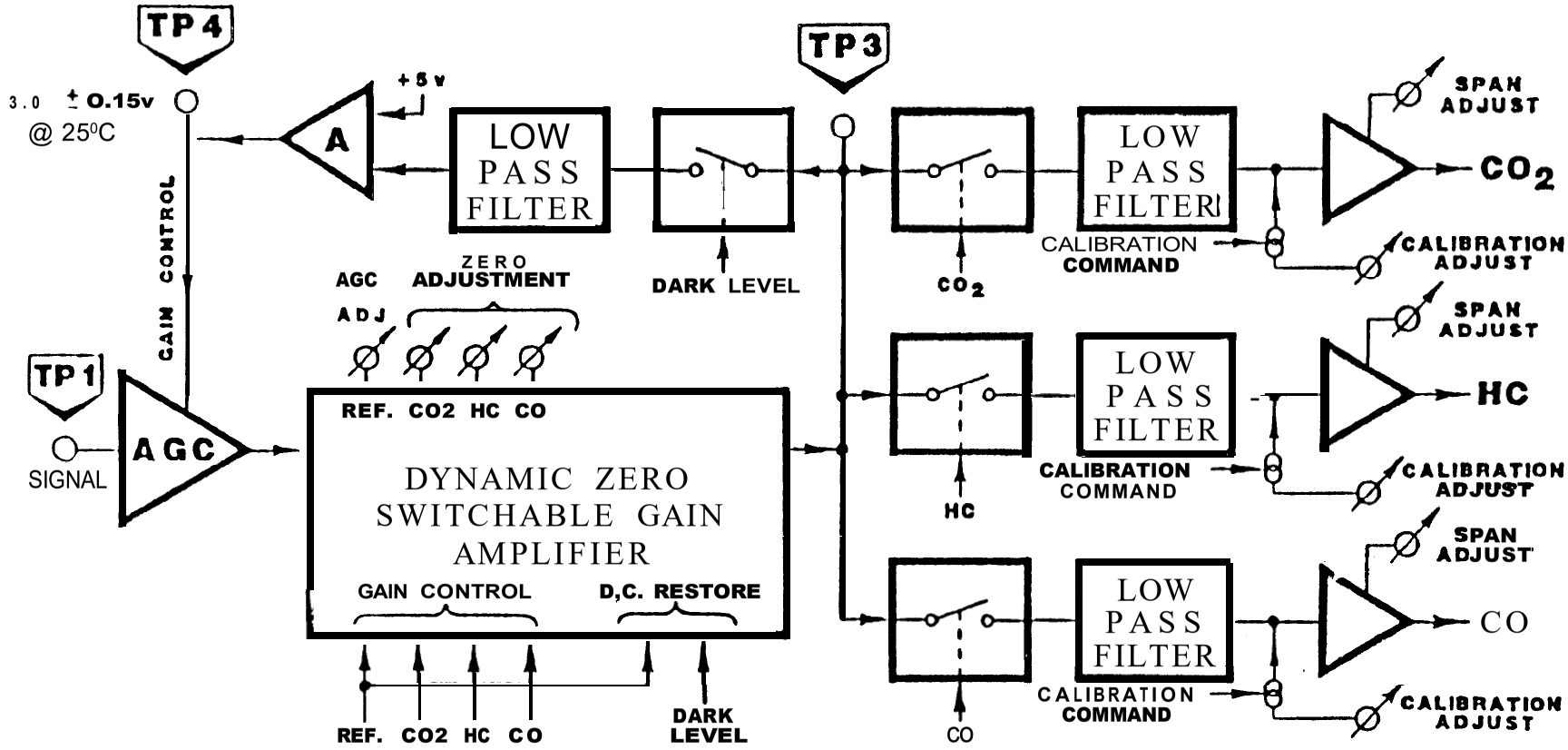
Up to this point we have seen only a "zero-gas" signal (e.g., **Figure 7**). To fully understand the operation of the PROCESSOR, we need to look at signal amplitudes as well as the time at which signal events occur. **Figure 16** shows the "zero-gas" TP1-signal compared to a TP1-signal when an exhaust gas containing CO, CO2 and HC is present in the SAMPLE CELL. Normally the REF-pulse amplitude remains the same, since the REFERENCE-FILTER wavelengths do not "see" any of the species of gas present in the sample. The amplitudes of the C02- HC- and CO-pulses change according to the concentrations of the various gases in the sample.

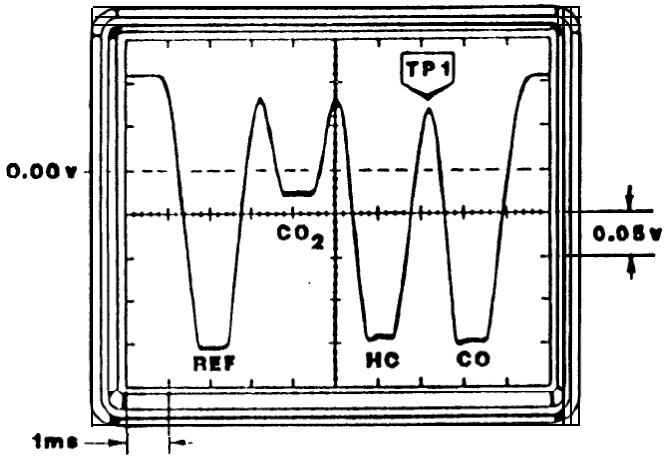
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Earlier in this disucssion, it was observed that the TPl-signal split into two paths upon entering the PROCESSOR PCB. We will now consider the second path: the demodulcting circuit of the PROCESSOR. Here the AC-signal from the PREAMPLIFIER is resolved into three output DC-voltages corresponding to CO2 concentration, HC concentration and CO concentration.

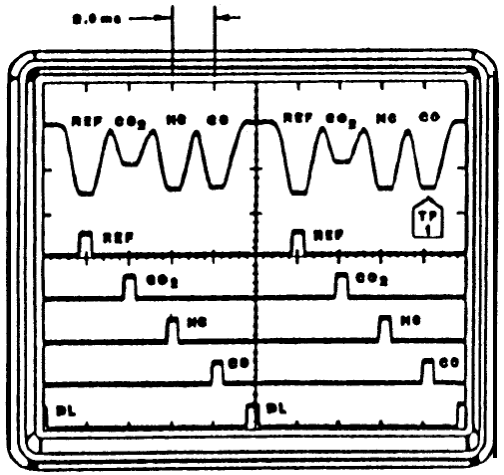
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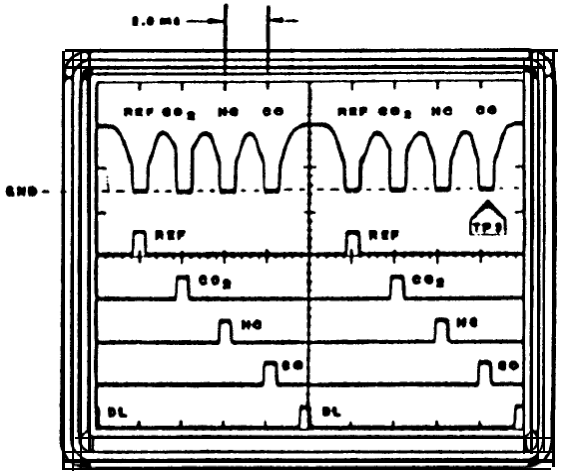




PREAMPLIFIER OUTPUT SIGNAL



AUTO SYNCHRONIZER OUTPUT SIGNALS



COMPOSITE GAS SIGNAL TP3

DEMODULATOR BLOCK DIAGRAM WITH ZERO GAS SIGNAL

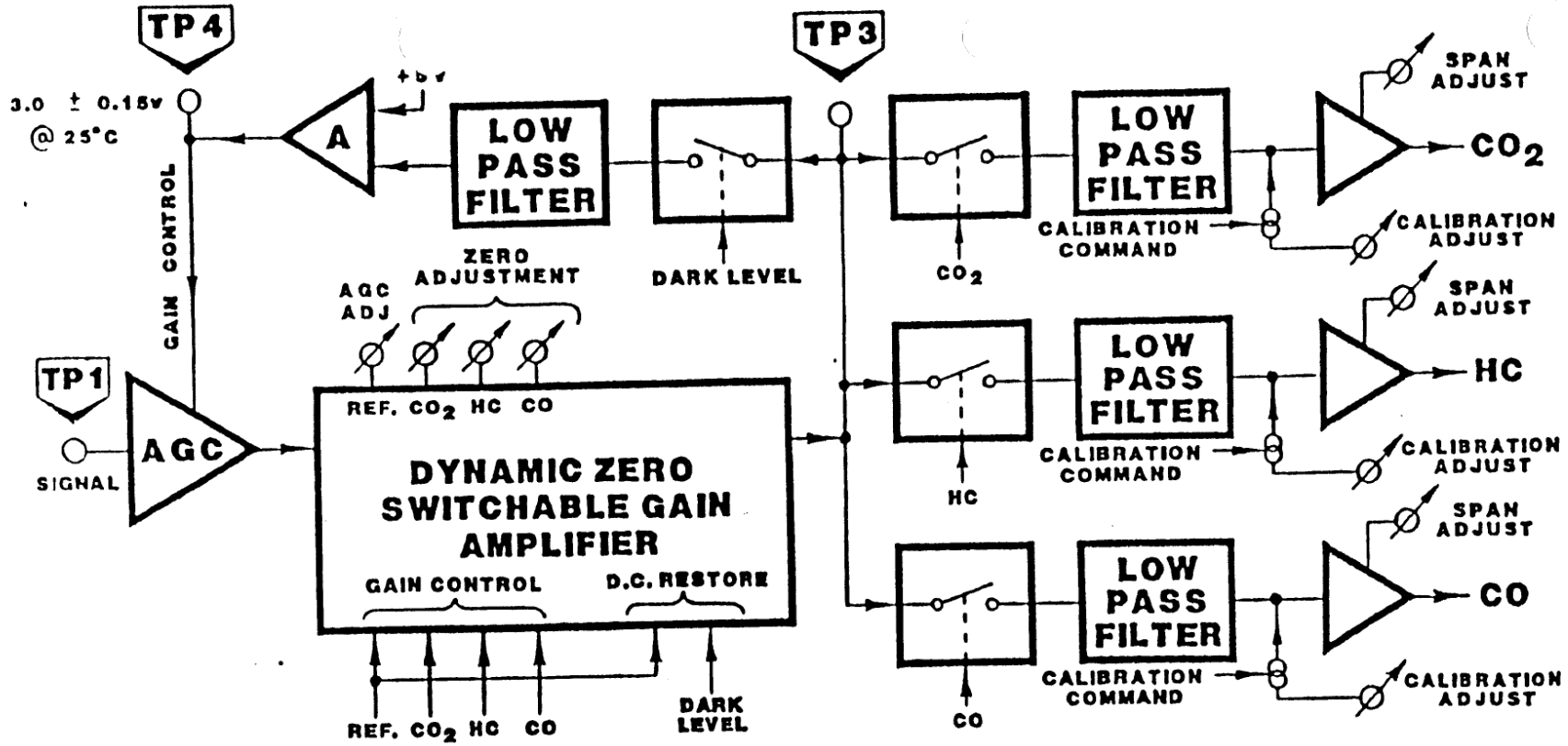
Figure 17 shows a block diagram of the demodulating circuit of the PROCESSOR. This circuit consists of three basic components: An AUTOMATIC-GAIN CONTROL AMPLIFIER with its gain control synchronized to a DARK-LEVEL pulse; a DYNAMIC ZERO SWITCHABLE GAIN AMPLIFIER which is switched by the signals from the AUTO SYNCHRONIZER; and, a DEMODULATOR circuit which separates the three-component gas signal into three separate gas-concentration voltages.

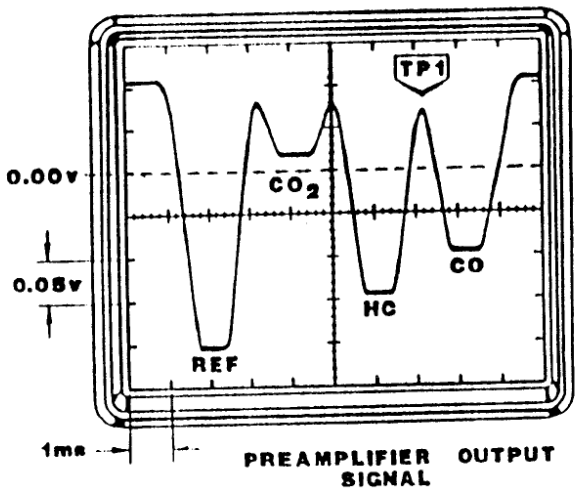
For the moment, let us treat the AGC AMPLIFIER as if it were only a linear amplifier with fixed gain.

In the DYNAMIC ZERO SWITCHABLE GAIN AMPLIFIER there are five different gains. The transitions from one gain to another are initiated by commands from the AUTO SYNCHRONIZER (**see Figure 17**). The DARK-LEVEL gain is the lowest and is a circuit parameter. The REF gain is set to a value such that the gain-control voltage to the AGC AMPLIFIER is +3.0 V +/- 0.15 V at 25° C. This setting is accomplished by the reference-adjustment potentiometer. The CO2 gain, HC gain and CO gain are each set by appropriate "zero-gas" *adjustments on the EXHAUST ANALYZER. For each gain there are two adjustments: A "coarse" adjustment set by the manufacturer and a "zero-gas" control adjusted by the operator of the instrument.

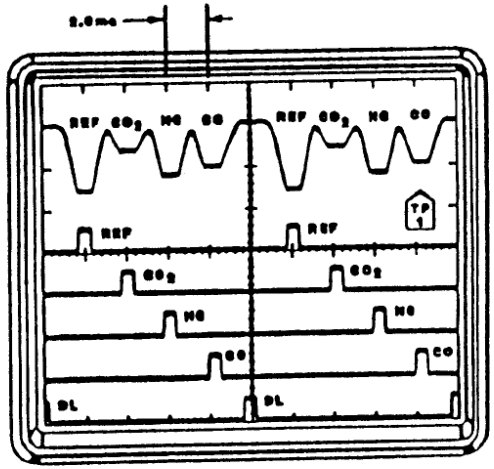
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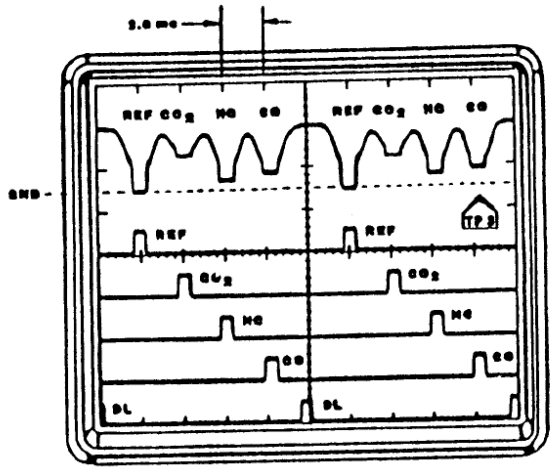




PREAMPLIFIER OUTPUT SIGNAL



AUTO SYNCHRONIZER OUTPUT SIGNALS



COMPOSITE GAS SIGNAL TP

DEMODULATOR BLOCK DIAGRAM WITH EXHAUST GAS SAMPLE

The output of the DYNAMIC ZERO SWITCHABLE GAIN AMPLIFIER is shown in **Figures 17** and **18**. This output is the TP3-signal and it can be understood by first comparing it to the "zero-gas" TPl-signal (**Figure 17**). With the correct "zero-gas" adjustments, the amplitude of each "zero-gas" TP3-pulse equals the amplitude of the TP3-REF-pulse. Any variations in the broad-band light intensity will be reflected in variations in the amplitude of the REF-pulse and will. be compensated for when the gas-pulses are "zero-adjusted" to the REF-pulse.

Now imagine that an exhaust-gas sample is introduced into the SAMPLE CELL. At TPl each gas-pulse varies in amplitude according to the concentration of the gas being measured by that pulse. At TP3 this change is reflected by a deviation from the "zero-gas" amplitude of each gas-pulse. The REF TP3-pulse, however, remains at the fixed amplitude. This is because there is virtually no absorption at the REFERENCE-FILTER wavelengths and because the feedback loop from TP3 to TP4 to the gain-control of the AGC AMPLIFIER compensates for instrument variations (**see Figure 18**).

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Consider the AGC AMPLIFIER (**Figure 18**): The amplification factor of this amplifier is inversely proportional to the voltage at the gain control (TP4). When the gain control goes UP, the amplification of the TPl-signal goes down. When the voltage decreases, the amplification qoes up.

The AGC AMPLIFIER feedback loop is completed every time a DARK-LEVEL pulse from the AUTO SYNCHRONIZER closes the gating switch in the loop. The voltage through the loop at that instant is the DARK-LEVEL pulse output from the DYNAMIC ZERO SWITCHABLE GAIN AMPLIFIER (TP3). Because of the low-pass filter in the loop, the signal at the input of amplifier "A" is a DC-voltage. "A" is a differential amplifier which drives the gain control of the AGC AMPLIFIER until the "A" signal input equals the 5 V "A" offset input.

To see how the feedback loop controls the circuit, imagine a variation in the REF-pulse amplitude, This might result from materials present in the gas sample or it might reflect changes (such as SAMPLE-CELL window contamination) in the EXHAUST ANALYZER itself. Momentarily, the output of the AGC AMPLIFIER will decrease. This decreases the signal voltage at the input of "A" and the output of "A" (TP4) decreases. This change increases the gain of the AGC AMPLIFIER so that the steady-s tate response at TP3 results in the REF-pulse amplitude remaining constant. The time constant of this adjustment is in the order of 1/2-second.

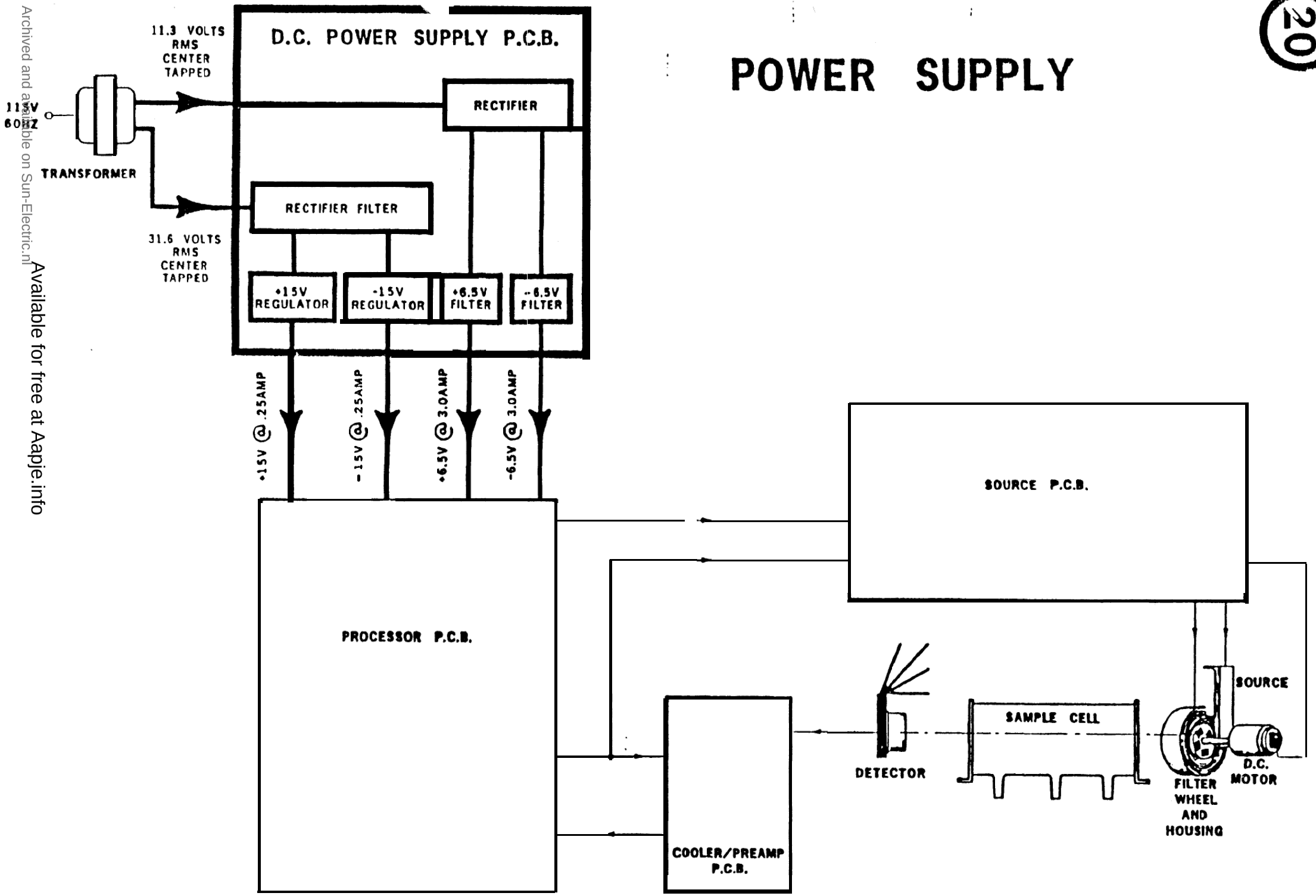
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The DEMODULATOR circuits begin, for each gas-concentration output, with a gating switch triggered by the AUTO SYNCHRONIZER. A low-pass filter follows, smoothing the pulses from the gate into a DC-signal that is a function of the gas concentration. This DC-signal is amplified by a final linear amplifier with a span-adjustinq potentiometer controlling its gain. The span adjustment is set by the instrument operator when the SAMPLE CELL is filled with a calibration gas of known analysis.

The DEMODULATOR circuits are also equipped with an "electronic calibration" feature. A constant-current generator that is temperature independent is the source for an "electronic span" which can be turned on by a logic calibration command, The current value is set when the instrument is calibrated against a known gas standard. Subsequently the "electronic calibration" serves as an interim "calibration" for checking span and meter integrity with zero gas between regular gas calibrations.

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POWER SUPPLY



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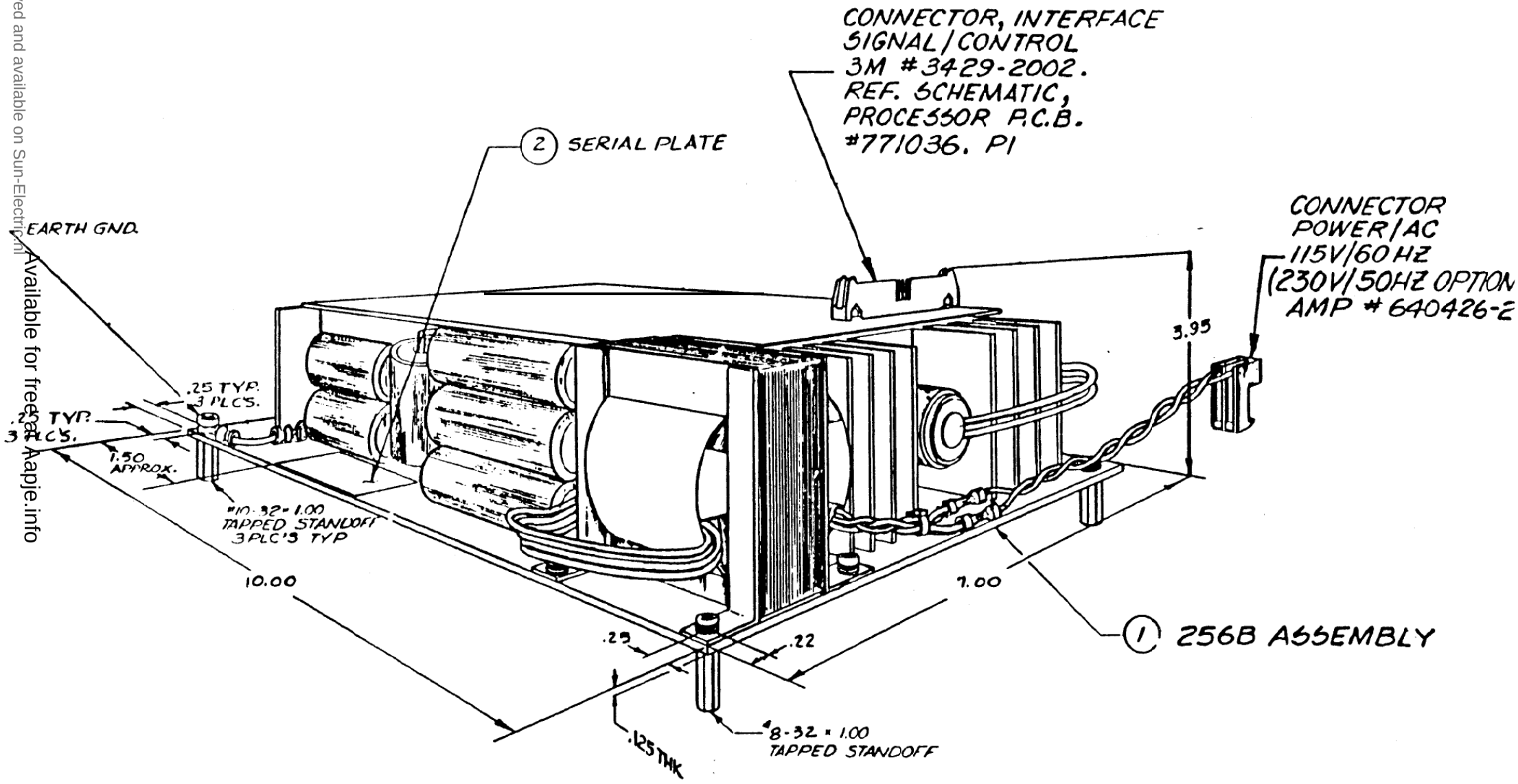
The EXHAUST ANALYZER power supply is designed to provide U.S. and foreign mains compatibility. It puts out two sets of supply voltages,

The voltage references and operational amplifier power are supplied by a low-current split-supply regulated +15 VDC ±0.75 V at 250 mA maximum.

Power for the SOURCE, FILTERWHEEL heating element, FILTERWHEEL drive motor and DETECTOR cooler is supplied by a low-voltage high-current unregulated split supply. This output can vary from 25.5 to 27.5 V with a ripple component of up to one volt peak-to-peak at 3 amps maximum.

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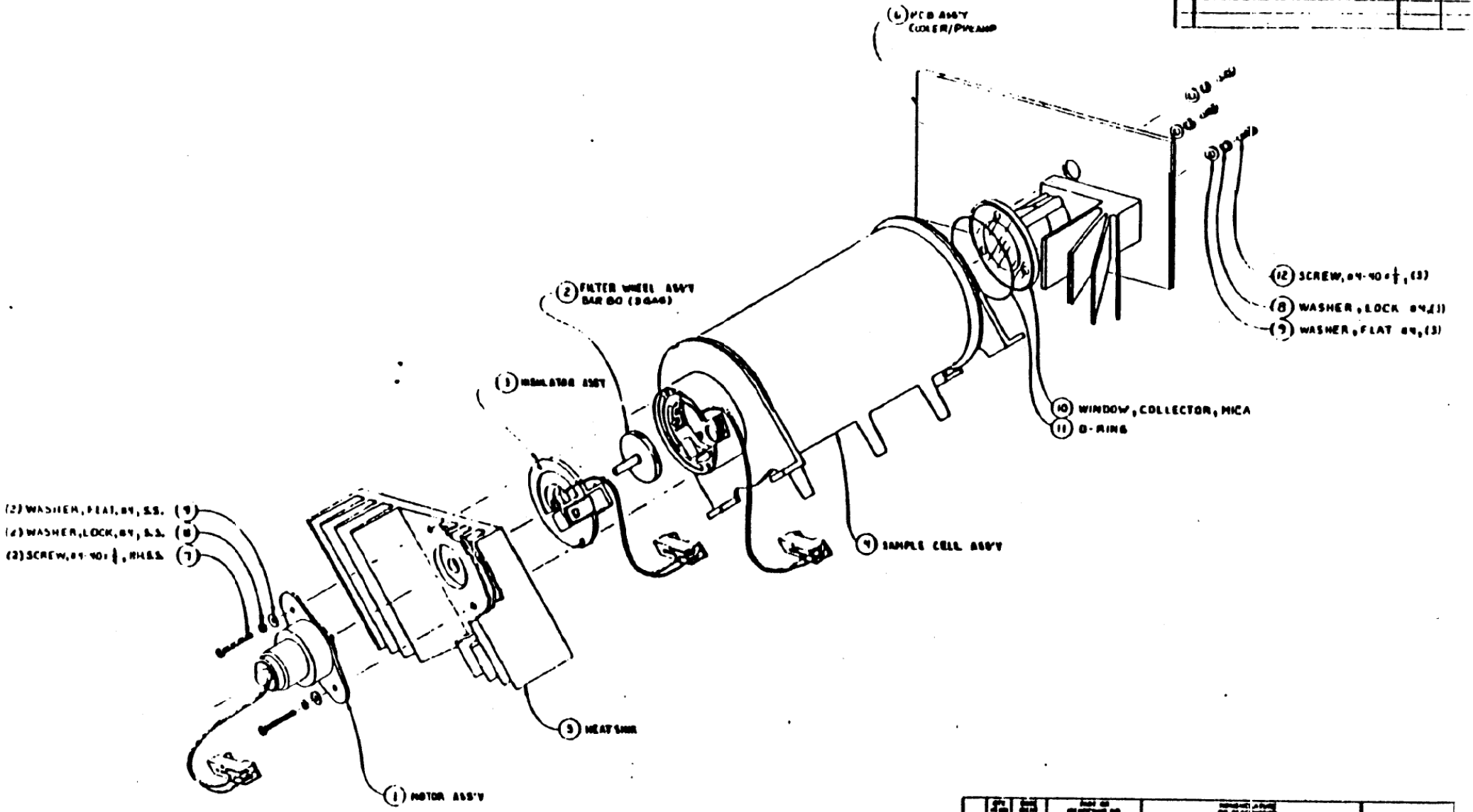
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MODEL [redacted] EXHAUST ANALYZER

257E

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		D 50367	151068-001

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6.2.3

Functional Description

Calibration Interface Board 700139311-69

SGM-2004

Part number: 0692E9306-13

FROM : SEE Engineering-R. Mulder
Approved: J. A. Martens
checked : Peter Tol 10/8/'89
Date : July 1989
ERN : 0349
ECN :
Rev. : A
Ref.nr. : 1741E/sg

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1. General

The Calibration Interface board 7001E9311-69 is designed to interface the &c+2000 with several functions in the gas bench module built around the 257E gas bench frcm Andros.

For detailed information refer to:

- Schematic Calibration Interface 7092E9311-69
- Assy Calibration Interface 7001E9311-69
- PCB Calibration Interface 7025E9311-69

2. Circuit Descriptions

The circuitry can be divided into several functions.
Part of the circuitxy is built up around U4 (74C14) and provides 5 channels with open collector outputs.
These outputs are used to switch solenoid valves and a pump relay.
An optical indication will give the status of each output (LED 1-5).
To prevent that the current through the outputs can influence the analog circuitry on the board, a separate peer connection is present (+ Vs and SGND).

The variable resistors R26-37 are used to adjust the proper zero, gain and electrical span voltages of the Andros gasbench.
Adjustmant of the gas bench for CO2 and CO are in a 10 volt range (0-10% CO, 0-20% CO2) and for HC (0 - 2000 ppm) in a 5 Volt range.
These analog output signals of the gas bench are converted to acceptable values for the MCS-2000.
The following outputs are available (measurable at Tp4-7) at J8G-13 through J86-16:

a. J8G-14 (TP4) - CO2 : 0 - 20%
scale : 0 - 5 Volt

b. J8G-13 (TP5) - CO : 0 - 10%
scale :0 - 5 Volt

c. J8G-15 (TP7) - HC low : 0 - 2000 ppm
scale : 0 - 5 Volt

d. J8G-16 (TP6) - HC high: 0 - 5000 pm
scale : 0 - 5 Volt

The oxygen sensor signal is connected to J9G and amplified to a level of 5 Volt with 20.8% 02 (ambient air).
Controlled by the analog switch (U1) it is possible to adjust for a zero volts output (0% 02) without using a calibration gas.

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Other functions which are routed through this board are:

a. Lof flow (/LOF) switch signal.
b. Feedback signal to sense if the pump is switched "on or off" (/PUMP. ON).
c. A general switch signal (/SWG).
d. Connection (J11G) for expansion possibility (air pressure sensing).
e. Electrical span voltage activation signal (/CAL).

Jumper functions:

W1 This jumper selects an output mode for Andros gas analyzer on the HC channel.

W2 If a floating power supply is used for powering the solenoids and relay then this jumper can connect the board ground with the floating ground.

W3 Jumpers W3-1 to W3-6 provide a possibility to select and test the switchable outputs and the offset from the 02 circuitry.

W4 With this jumper it is possible to select the "pump on" status signal directly from the input signal /pump or from a separate switch from the pump relay.

Power consumption:

+12 Volt 50 mA
-12 Volt 20 mA

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3. Signal Description

Connector J1G:

CO GAIN I (1)	Input gain feedback for CO channel.
CO GAIN 0 (2)	Adjustable output gain feedback for CO channel.
HC GAIN 0 (3)	Adjustable output gain feedback for HC channel.
HC GAIN I (4)	Input gain feedback for HC channel.
CO2 zero (5)	Zero calibration input for CO2 channel.
CO zero (6)	Zero calibration input for CO channel.
HC zero (7)	Zero calibration input for HC channel.
COM GND (8)	Common 0 volt connection of Andros gas analyzer.
/CAL (9)	Activation output signal for the electrical span voltages.
SIG GND (10, 24, 25)	Signal 0 volt connection from Andros gas analyzer.
HC SIG (11)	Analog output signal from Andros gas analyzer HC channel.
CO SIG (12)	Analog output signal from Andros gas analyzer CO channel.
CO2 SIG (13)	Analog outputsignal from Andros gas analyzer CO2 channel.
CO2 GAIN I (14)	Input gain feedback for C02 channel
CO2 GAIN 0 (15)	Adjustable output gain feedback for C02 channel.

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HC ELSP I (16)	Input electrical span adjustmnt for HC channel.
HC ELSP 0 (17)	Output electrical span adjustment for HC channel.
CO ELSP I (18)	Input electrical span adjustment for CO channel.
CO EXSP 0 (19)	Output electrical span adjustment for CO channel.
CO2 EXSP I (20)	Input electrical span adjustment for CO2 channel.
CO2 ELSP 0 (21)	Output electrical span adjustment CO2 channel.
NC (22, 23, 26)	No connection to board circuitry.

Connector J2G:

+VS (1)	Power connection for solenoid V1.
/V1S (2)	Control output for solenoid V1.

Connector J3G:

+vs (1)	Power connection for solenoid V2 (if present).
/V2S (2)	Control output for solenoid V2 (if present).

Connector J4G:

+Vs (1)	Power connection for solenoid V3 (if present).
/V3S (2)	Control output for solenoid V3 (if present).

Connector J5G:

+Vs (1)	Power connection for solenoid V4 (if present).
/V4S (2)	Control output for solenoid V4 (if present).

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Connector J6G:

+Vs (1)	Power connection for pump relay.
/pumps (2)	Control output for pump relay. .

Connector J7G:

+Vs (1)	Common power input connection (+12V) for solenoids and relay.
SGND (2)	0 Volt connection for solenoids and relay control outputs

Connector J8G:

+12V (1)	+12Volt power input.
A GND (2, 11, 17, 22,25)	Analog 0 volt connnection.
-12v (3)	-12Volt power input.
/V1 (4)	Control input for solenoid V1.
/V2 (5)	Control input for solenoid V2 (if present).
/V3 (6)	Control input for solenoid V3 (if present).
/V4 (7)	Control input for solenoid V4 (if preesent).
/PUMP (8, 21)	Control input for pump relay.
/CAL (9)	Activation signal input for the electrical span voltages.
/ZERO O2 (10)	Activation input to simlate 0% 02,

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Archived and available on Sun-Electric.nl

O2 **SIG** (12)	Oxygen analog output signal.
CO **SIG B** (13)	CO buffered analog output signal.
CO2 **SIG B** (14)	CO2 buffered analog output signal.
HC SIGL B (15)	**HC** buffered analog output signal for low range (0 - 2000 ppm).
HC SIGH B (16)	**HC** buffered analog output signal for high range (0 - 5000 ppm).
/LOF (18)	Low flow output signal.
/PUMP ON (19)	Pump status signal.
/SWG (20)	Switch controlled output.
P SIG (24)	Expansion signaloutput (NU)

Connector J9G:

SHIELD (1)	Shielding conntion for 02 signal cable.
+O2 (2)	0 Volt connection for 02 sensor.
-O2 (3)	Input signal connection for 02 sensor.

Connector J10G:

/LOF (1)	Input connection for low flow switch.
A GND (2, 4)	0 Volt connection.
/pump ON (3)	Input connection for status of pump.

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Connector J11G:

A GND (1, 5)	**0 Volt connection**
+12v (2)	**+12 Volt power connection.**
- 12v (3)	**-12 Volt per connection.**
P SIG (4)	**Expansion signal input.**

****

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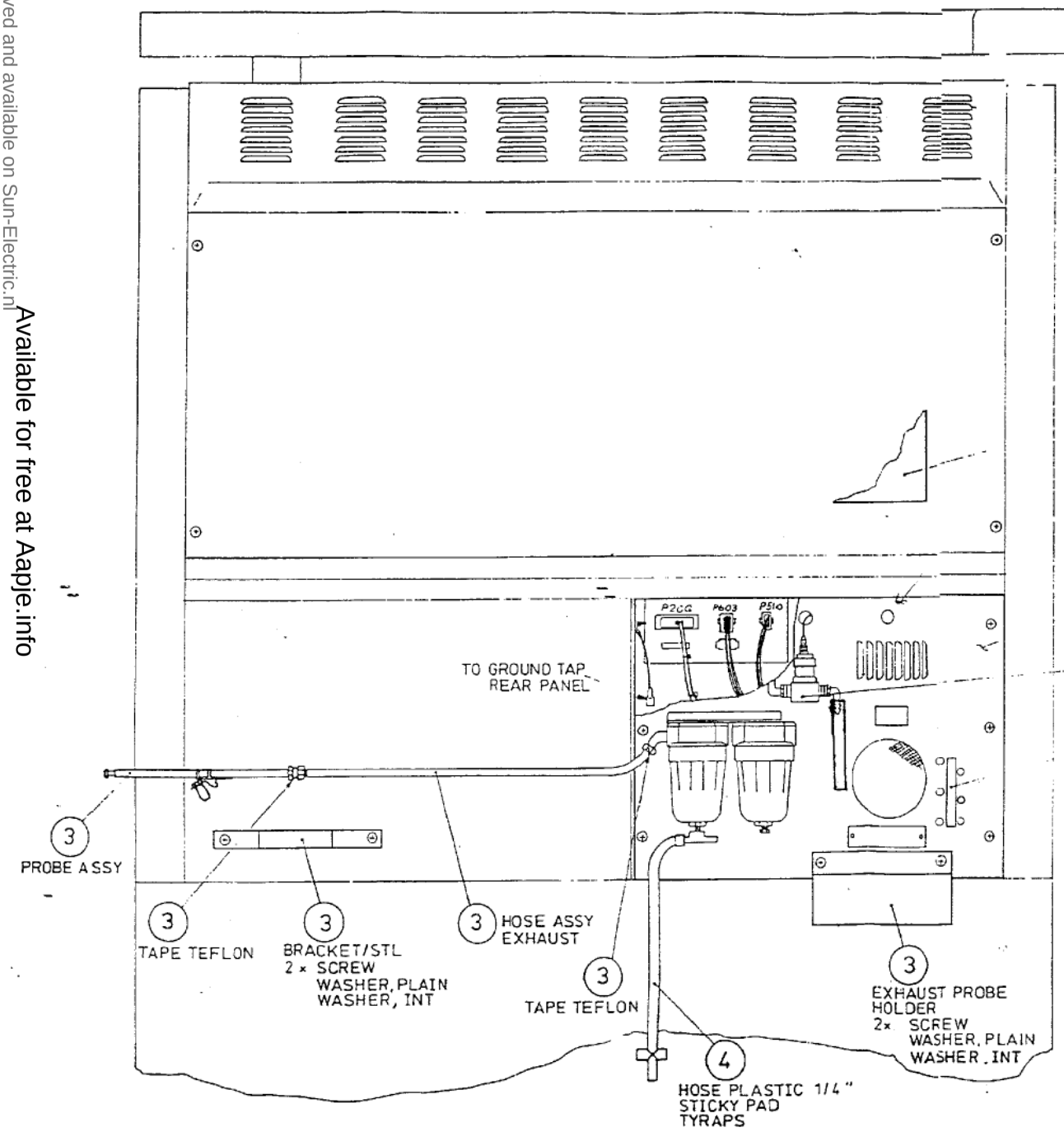
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6.2.4 DRAWINGS AND DIAGRAMS

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Available for free at Aapje.info

Revisions					
Rev	Date	ECN	Description	Check	Ap
A	08-89		ERN# 0349.	P.T.	



NOTES:
1) MOUNT COVER PLATE WITH ROUND BUTTON HEAD SCREWS.



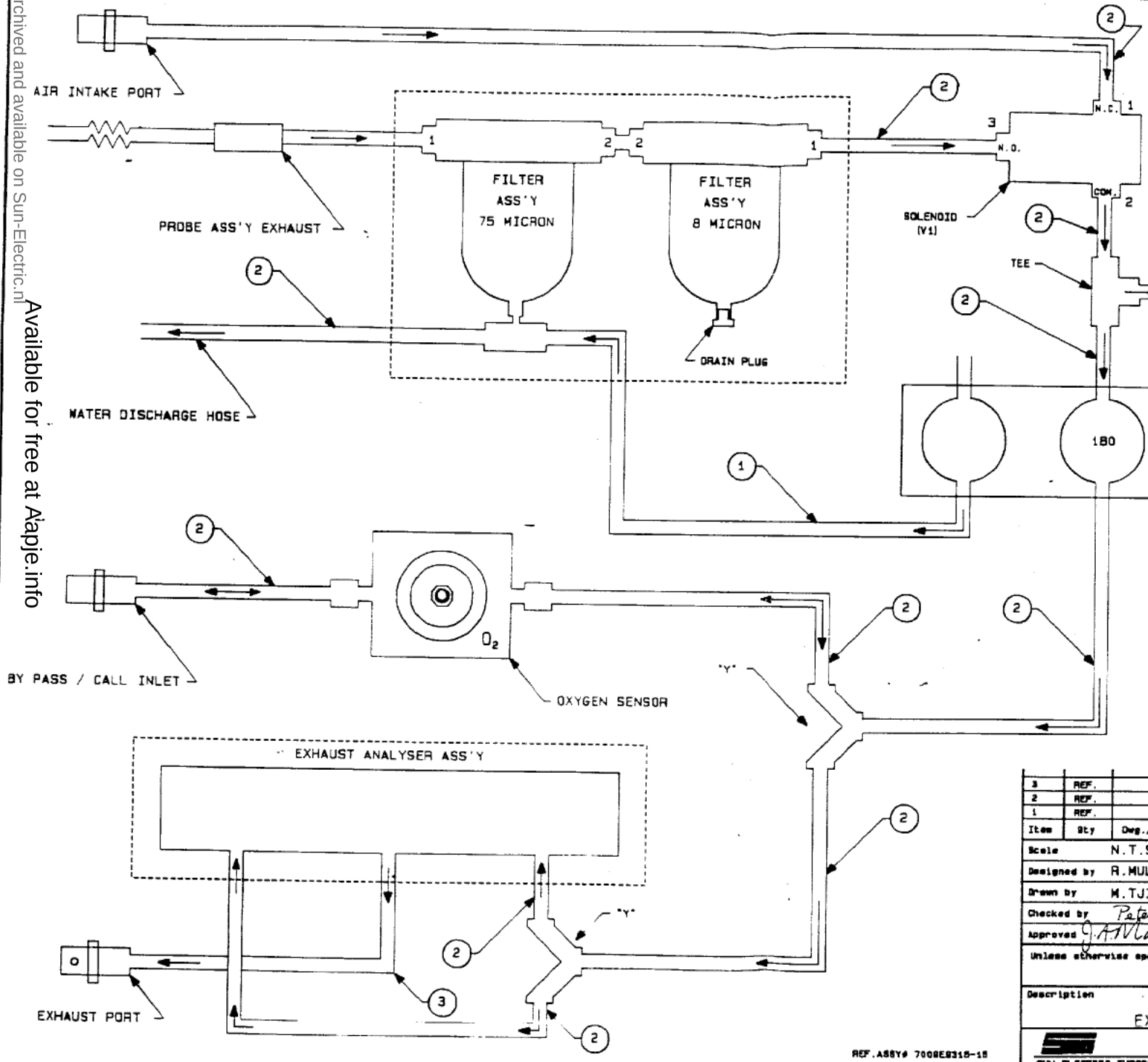
Item	Qty	Dwg / Part no	Description	Remarks
4	1	7009E9314-16	ACCESSORY KIT 2 APK/PTB/SIM	
3	1	7009E9315-22	ACCESSORY KIT	
2	1	7009E9315-20	COVER PLATES KIT	
1	1	7009E9315-15	EXHAUSTGAS ANALYZER ASSY	

Scale 1:2 | Date | Used on SGM 2004
Designed by
Drawn by Hakeena v/d Nieuwendijk | 08.08.89 | Material
Checked by Peter Tol | 10.08.89
Approved | 11.08.89 | Finish
Unless otherwise specified, Dimensions are in mm. Tolerances on Angles ± 0.5 Holes ± 0.1 Rest ± 0.5
Remove all sharp corners and remove burrs

Description: INSTALLATION DRAWING EXHAUSTGAS ANALYZER KIT SGM 2004
Dwg no 0692E9306-1

SUN ELECTRONICS EUROPE B.V. | A2 | Sheet 1 of 1 | Code

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Available for free at Aapje.info



Revisions					
Rev	Date	ECN	Description	Check	Appr.
A	08-89		ERN# 0349	P.T.	

MODE TABLE		
	V1	PUMP
ZERO	N.C.	ON
CAL GAS	X	OFF
SAMPLE	N.O.	ON
LEAK	N.O.	ON --> OFF

N.C. = SOLENOID ENERGIZED

N.O. = SOLENOID DEENERGIZED

Item	Qty	Dwg./Part no	Description	Remarks
3	REF.		HOSE 5/16" PLASTIC	
2	REF.		HOSE 1/4" PLASTIC	
1	REF.		HOSE 3/16" PLASTIC	

Scale	N.T.S.	Date	Used in MCS 2000, SGM 2004
Designed by	R.MULDER	MARCH '89	Material SEE DRAWING
Drawn by	M.TJIN A SOE	220389	
Checked by	Peter Tel	10.08.89	
Approved	J.A.Martin	11.09.89	Finish

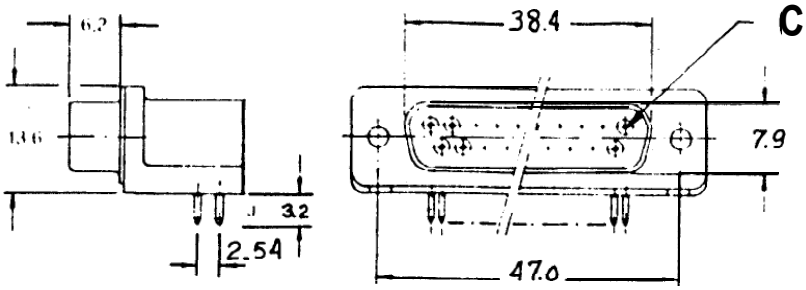
Unless otherwise specif.: Dim. are in mm: Tol. on: Angles ± 0.5 ° Holes ± 0.1 Rest ± 0.5

Remove all sharp corners and remove burrs

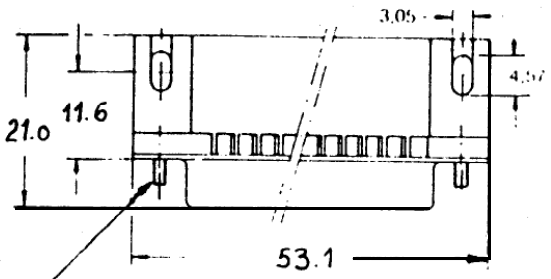
Description	PNEUMATIC DIAGRAM EXHAUST GAS ANALYSER	Dwg. no. 7092E9311-75
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 1
		Code
		Project no. E8903
		Issue A

REF.ASSY# 7009E9315-15

Revisions					
Rev	Date	ECN	Description	Check	Appr.
A	08- 89		ERN # 0343	P.T.	

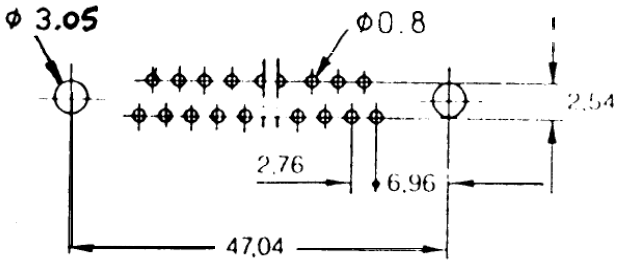


Contacts: Phosphor bronze
Contact finish:
0.8µm **Au**
over 1.3µm Ni



Screw lock
4-40 UNC

PC6 mounting specifications



MFG. : AMP
PIN : 215499-3
TYPE : HDP-20

ttem	oty.	DwgJPart no	Oescription	Remarks
Scale			Date	Used in
Designed by				Material
Drawn by Heleena v/d Nieuwendijk			05.06.89	
Checked by Peter Tel-			10.08.89	
Approved C.A.M. van ten			11.08.89	Finish

Unless othe&ise specified: Dimensions are in mm.; Tolerances on: Angles ±0,5° Holes ± 0'1 Rest ±0,5

Remove all sharp corners and remove burrs

Descrtptran
RECEPTACLE,RIGHT ANGLE,25 POS., with female screw lock

Dwg.7096E3056-81

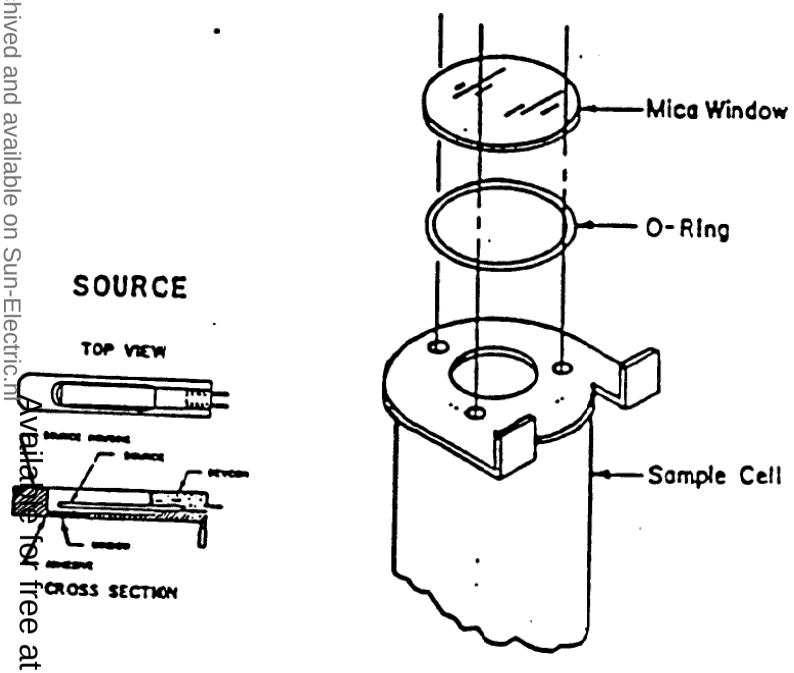
SUN ELECTRIC EUROPE B.V.

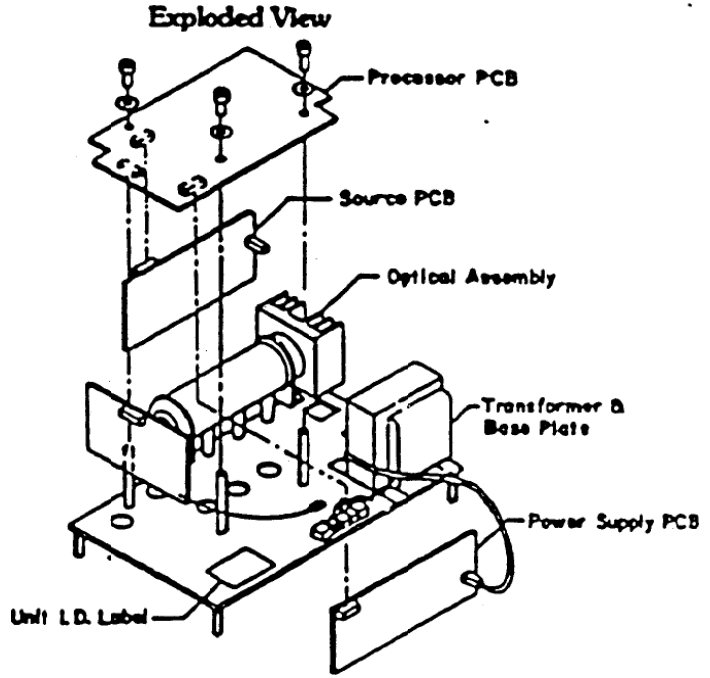
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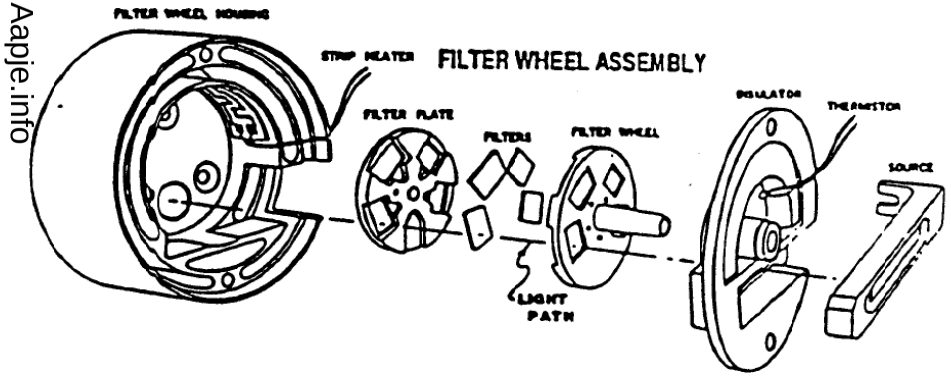
Sheet / of / Issue
Code A
Project no. E8903

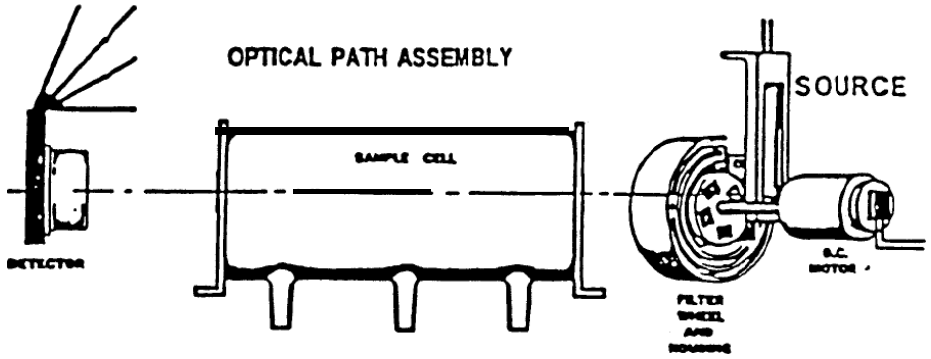
Auteumcht voorbehwderl volgerls de Wet
Available for free at Vapje.info
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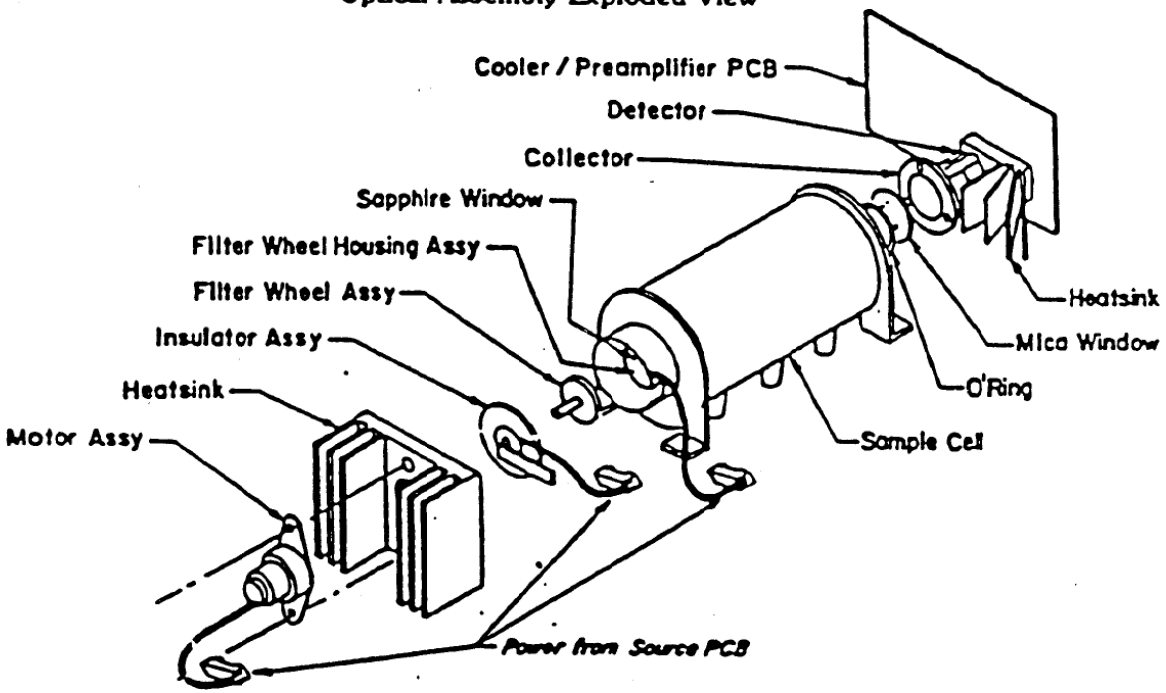
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Available for free at Aapje.info



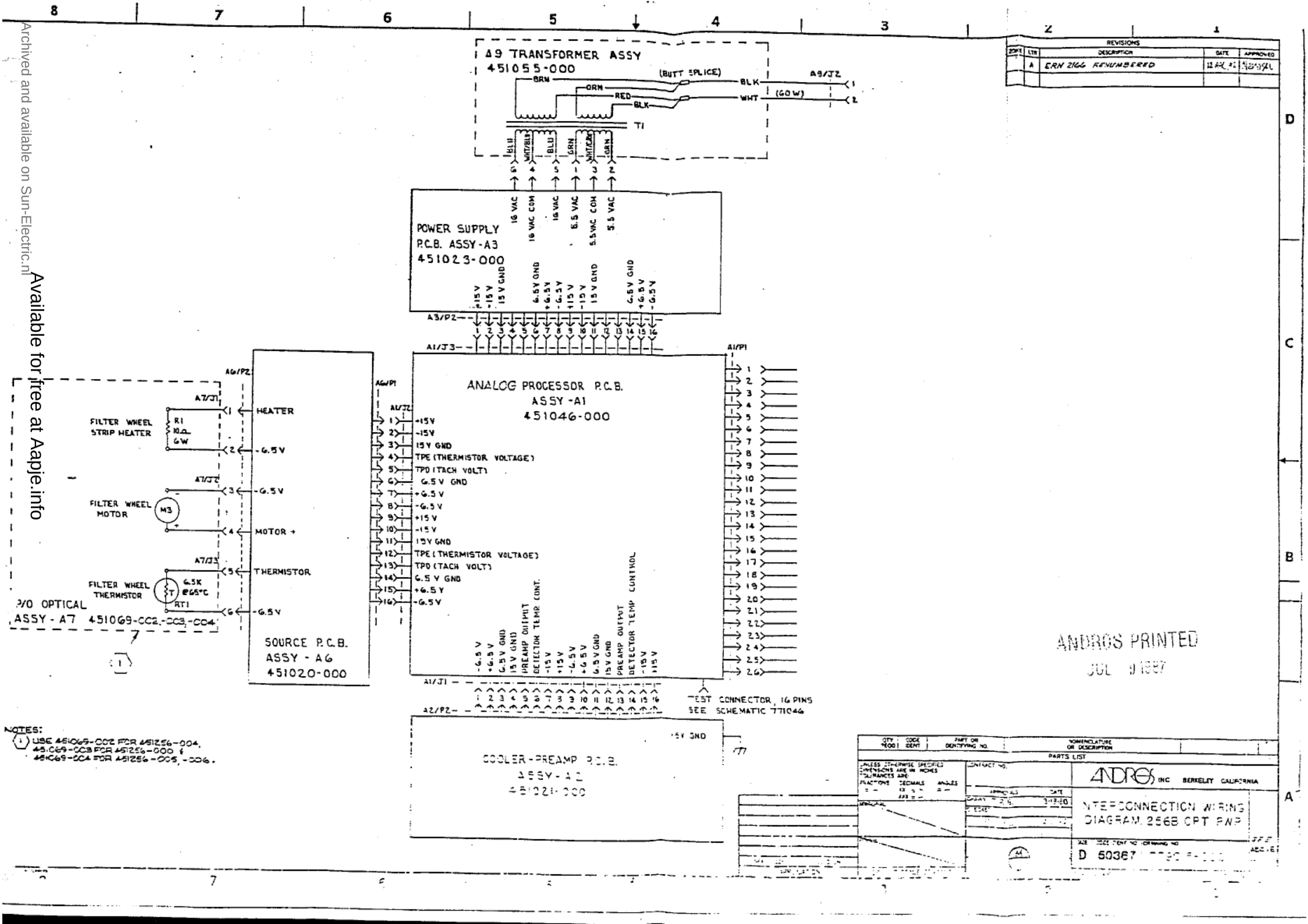








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6.2.5 SCHEMATICS

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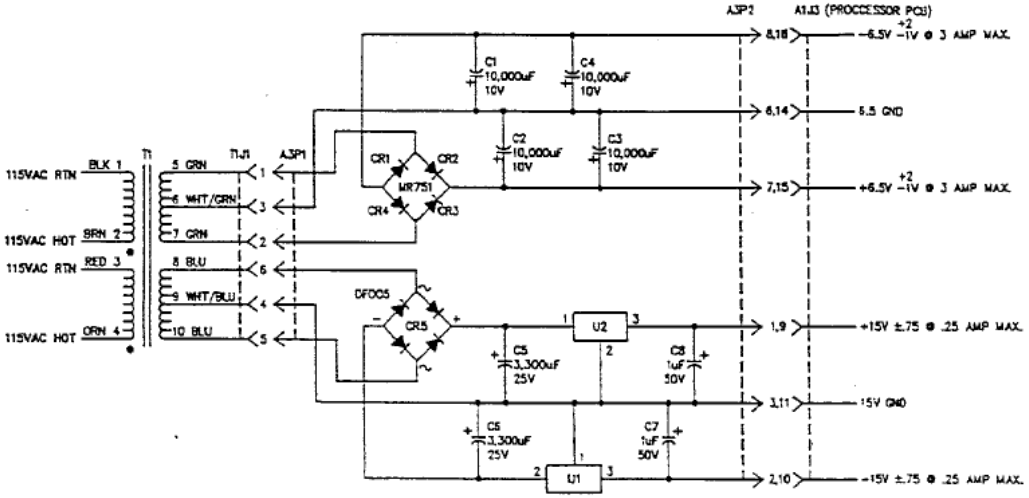
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REVISION HISTORY

ZONE	REV	DESCRIPTION	SIGNATURES	DATES
	A	ORIGINATED	SEE HISTORY	12/4/78
	B	DC #054		7/10/79
	C	ECO #224		4/28/80
	D	ECO #232		5/13/80
	E	ECN #276		10/24/81
	E1	ECN #686	SEE HISTORY	7/7/86
	F	ECN #724	[illegible]	6/8/87

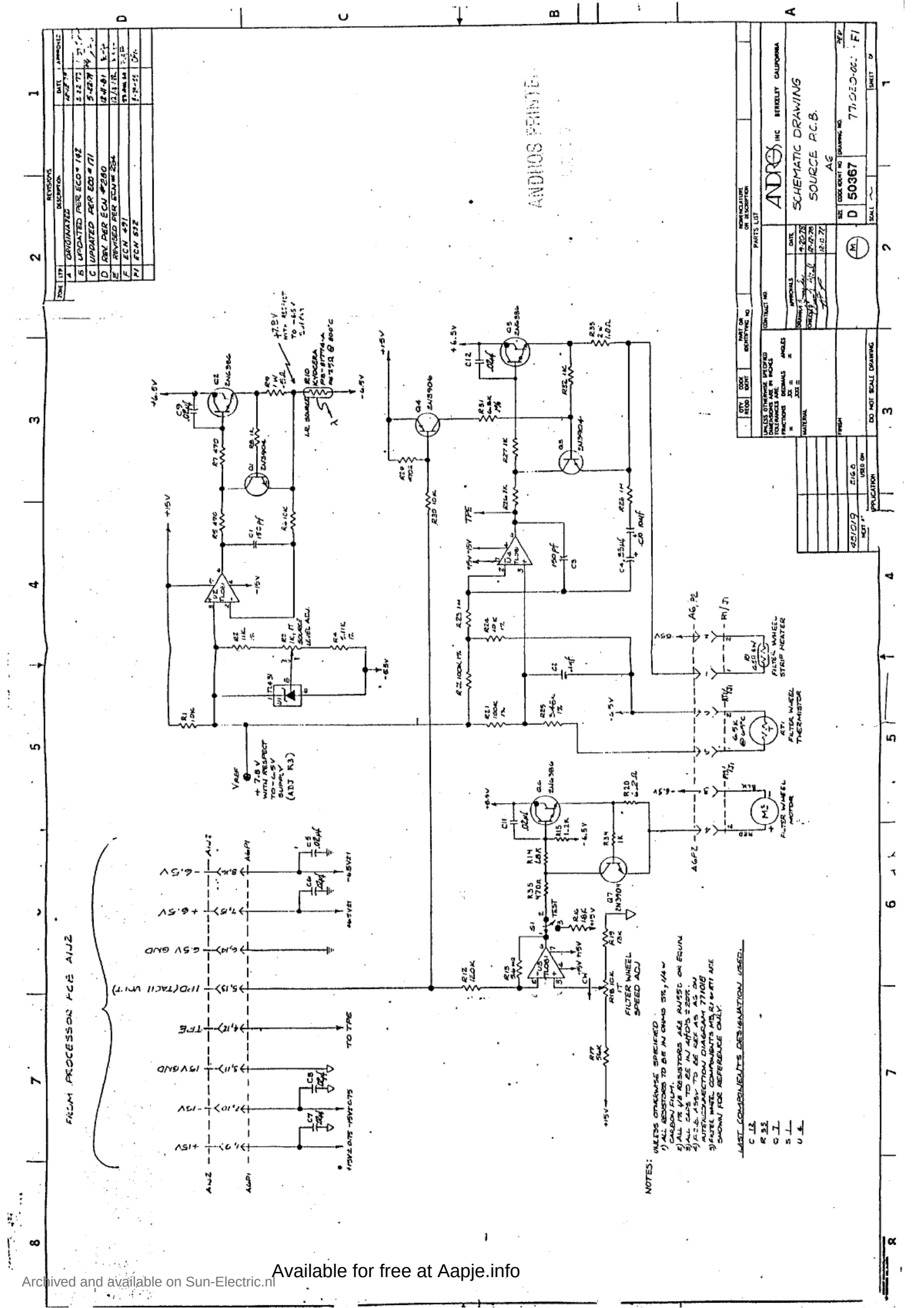


NOTES: UNLESS OTHERWISE SPECIFIED

1. P.C.B. ASSY TO BE REF AS A3 ON INTERCONNECTION DIAGRAM NUMBER 771016.
2. IT SHOWN FOR REFERENCE ONLY

LAST COMPONENT DESIGNATIONS USED
CR5
C8
U2

TOLERANCE(S):	SCALE: NONE Do not scale drawing	ANDROS ANALYZERS INCORPORATED Berkeley, CA	
MATERIAL(S):	SIGNATURES / DATES: DRN L.SANTOS 4/10/87; CKD [illegible]; APD SEE HISTORY 12/7/78; APD [illegible]	SCHEMATIC, POWER SUPPLY PCB	
FINISH:		FORMAT D	DRAWING # 771023-000 REVISION F
SEE M.L.S. / DWG / NEXT ASSY / TOP ASSY		©COPYRIGHT 1981	SHEET 1 OF 1



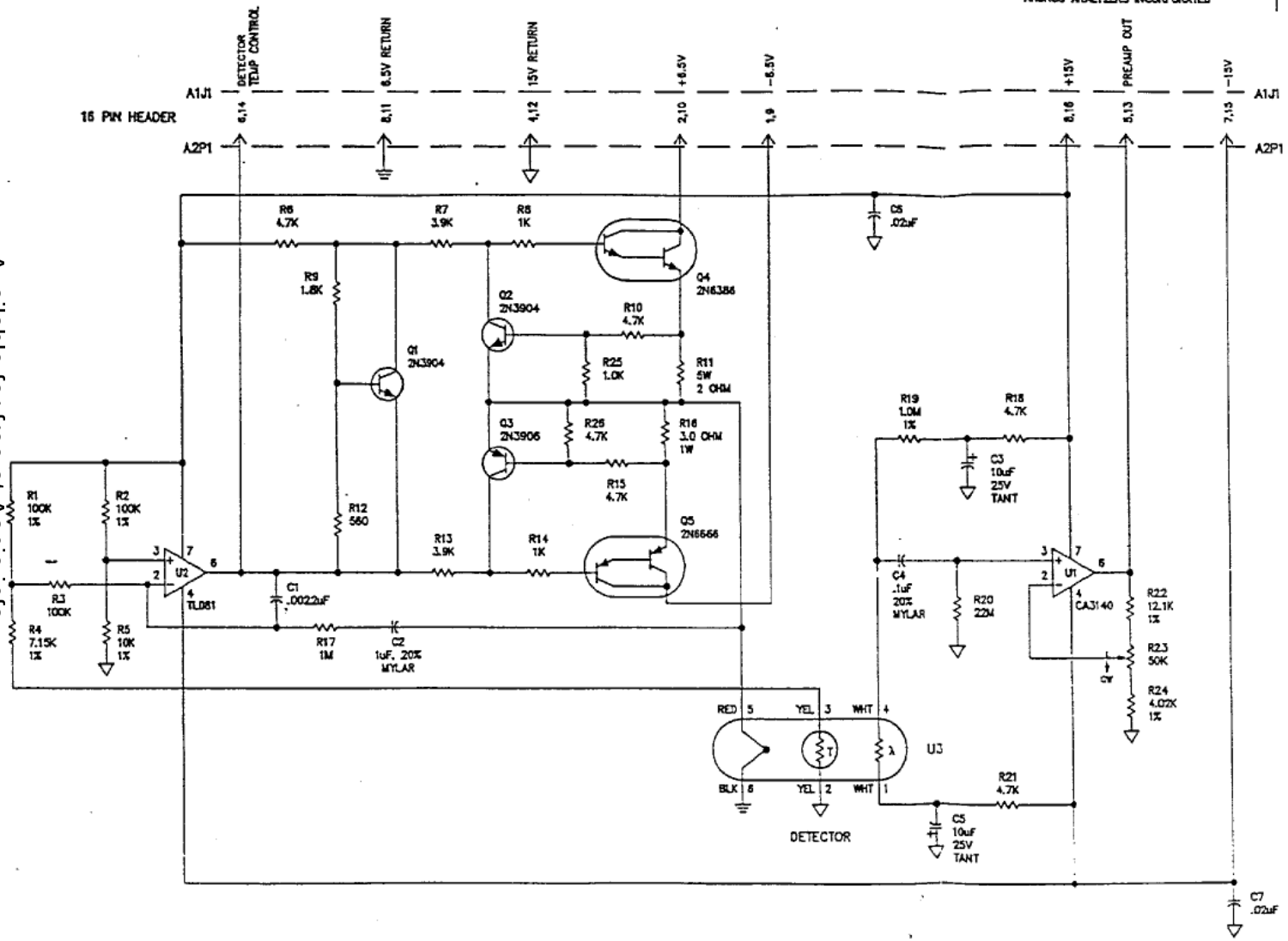
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REVISION HISTORY

ZONE	REV	DESCRIPTION	SIGNATURES	DATES
	A	ERN #1057	SEE HISTORY	6/26/82
	B	ECN #301	SEE HISTORY	7/12/82
	C	ECN #307	SEE HISTORY	8/30/82
	D	ECN #732, REDRAWN.	[illegible]	5/24/87



NOTES: UNLESS OTHERWISE SPECIFIED

1) ALL RESISTORS TO BE IN OHMS, 5%, 1/4W, CARBON FILM.
2) ALL 1% 1/8W RESISTORS ARE RN55D OR EQUIV.
3) ALL CAPS TO BE IN MICROFARAD'S, ± 20%.
4) P.C.B. ASSY TO BE REF AS A2 ON INTERCONNECTION DIAGRAM #771018.

ANDROS PRINTED [illegible]

SEE MFG	
SEE MFG	882576-000
451021-001	882166-002
461021-001	882166-001
NEXT ASSY	PCP ASSY
WHERE USED	

TOLERANCE(S):
MATERIAL(S):
FINISH:

SCALE: NONE
Do not scale drawing

SIGNATURES	DATES
ORN S. PEREDA	6/8/87
CKD [illegible]	
APD [illegible]	
APD	

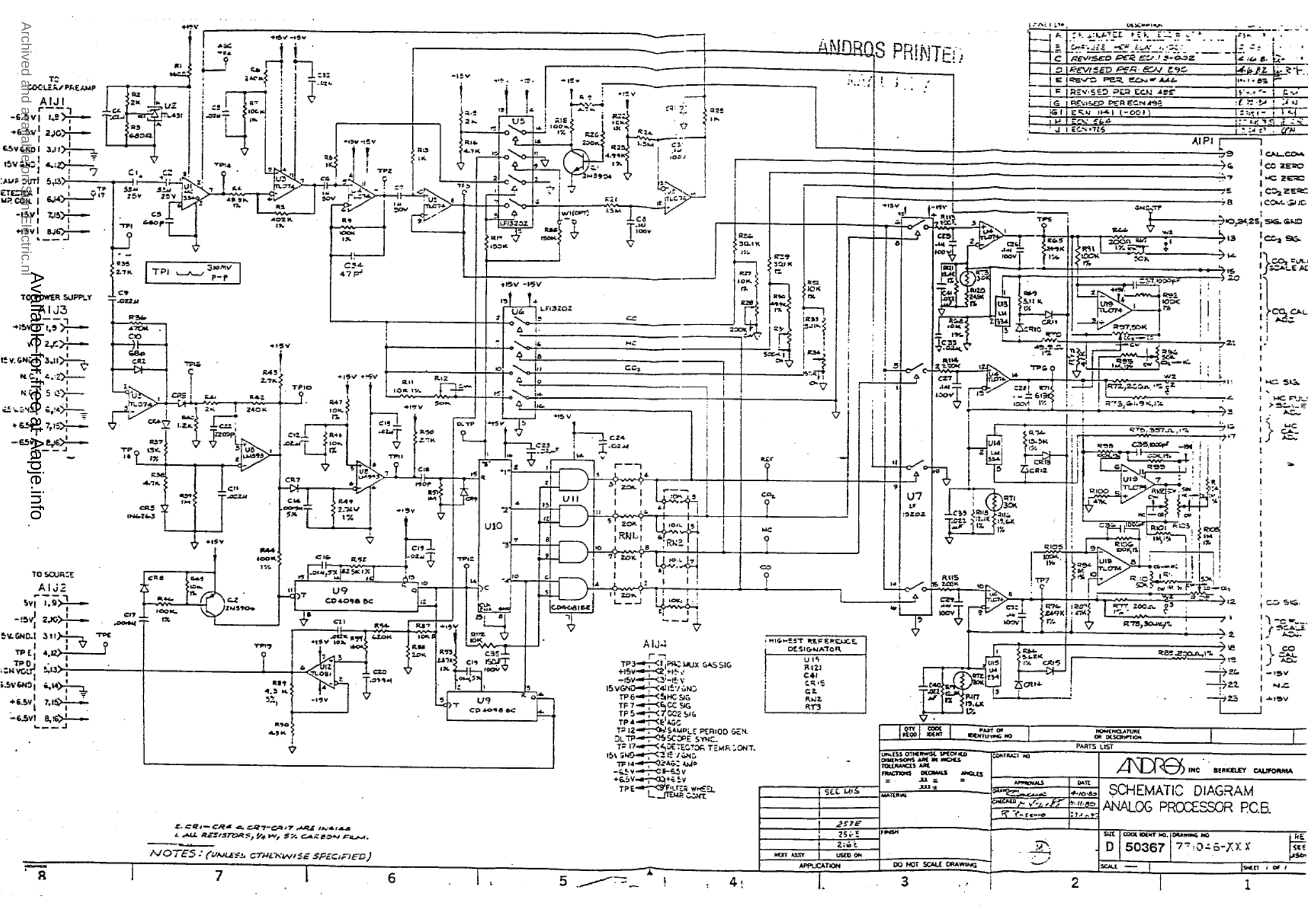
ANDROS® ANALYZERS INCORPORATED
BERKELEY, CA

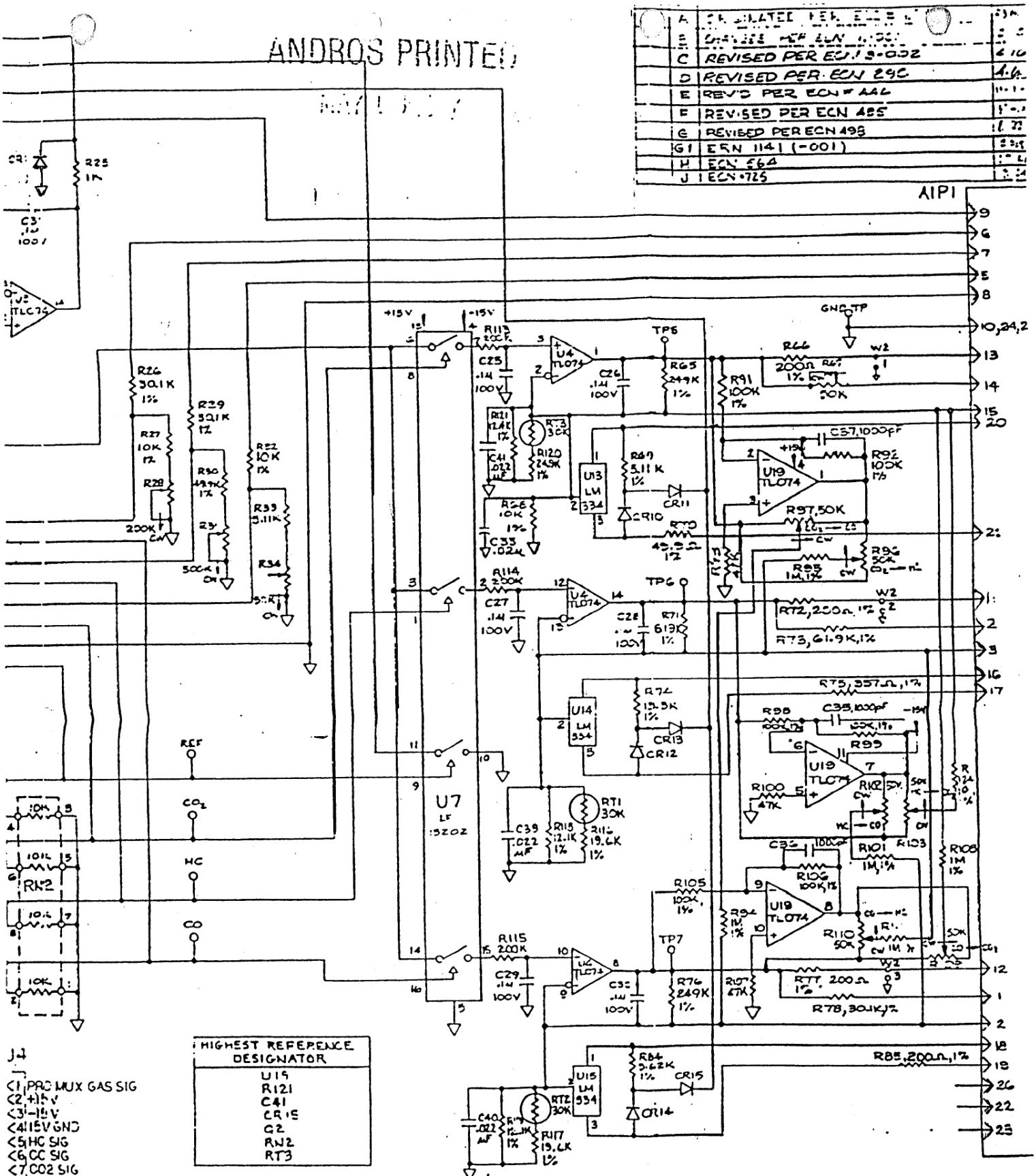
SCHEMATIC,
PREAMP/COOLER PCB, BIPOLAR

FORMAT: D
DRAWING #: 771021-001
REVISION: D

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SHEET 1 OF 1

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DESCRIPTION	PART NUMBER	QTY/10 UNITS
1, EXHAUST GAS ANALYZER ASSY	7009E9315-15	
2, EXHAUST GAS ANALYZER, HC/CO/CO2	7049-0120	1
3. MOUNT, RESILIENT	0003-7000-850	8
4. CAL. INTERFACE BOARD ASSY	70O1E9311-69	1
5. OXYGEN (02) SENSOR	7049-0004	5
6. PUMP ASSY, VACUUM	7009E9315-16	
7. PUMP, VACUUM	0303-0099	1
8. RELAY, 12 VDC	7096E4056-03	2
Q. SOCKET, RELAY	7096E4056-04	2
10. SOLENOID VALVE, 3 WAY	0304-0040	1
11. DIODE ASSY, SOLENOID	7009E9313-54	2
12. PRESSURE SWITCH, LOW FLOW	0549-0017	2
13. FLOW RESTRICTOR	3841-0101	2
14. FILTER ASSY, COMPLETE	7009E9310-03	
15. FILTER ASSY, PRIMARY	0301-0115	1
16. FILTER ASSY, SECONDARY	0301-0116	1
17. BOWL, FILTER	0301-0931	2
18. ASPIRATOR ASSY	7009-0728	5
19. "D" RING, SEAL	0617-0199	5
20. FILTER ELEMENT, 75 MICRON	0301-0926	10
21. FILTER ELEMENT, 8 MICRON	0301-0908	50
23. FUSE HOLDER	7096E4055-14	2
24. FAN, AXIAL	0587-0507-01	1
25. AIR FILTER	7096E9056-23	5
26. RC FILTER, INTERFERENCE	7009E9314-10	2
27. CABLE ASSY, INTERFACE (W3G)	7076E9314-21	1
28, CABLE ASSY, ANALYZER (W4G)	7076E9314-18	1
29. PROBE ASSY, EXHAUST	7009-0511	5
30. PROBE HOLDER, EXHAUST	7012E9316-77	2
31. HOSE ASSY, EXHAUST	3988-0202	2

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ANDROS BENCH PARTS LIST

It has come to our attention that many custaners are changing the ccmplete Andros Bench instead of repairing it. In order to lower inventory and increase profit by repairing the bench, we are now offering again a parts breakdown for the Andros Bench. As always, inform your service personnel.

7049-1000-01	Retrofit Kit, includes: Chopper motor Processor PCB Filter wheel Filter housing
7049-1000-02	Motor and Heat Sink Assembly
7049-1000-03	Cooler Pre Amp PCB W/Detector Assenbly
7049-1000-04	Power Supply PCB Assembly
7049-1000-05	Source PCB Assembly
7049-1000-06	Source Assembly
7049-1000-07	Sample cell Assembly
7049-1000-08	Window, Mica
7049-1000-09	Window, Saphire
7049-1000-10	"0" Ring
7049-1000-11	"0" Ring
7049-1000-17	Transformer Assembly
7049-1000-19	Detector, lead Selenide

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6.3 DIGITAL SCOPE

6.3.1 INSTALLATION & CALIBRATION PROCEDURE

6.3.2 FUNCTIONAL DESCRIPTION DIGITAL SCOPE BOARD

6.3.3 SCHEMATICS

6.3.4 SPARE PARTS

0692E9305-94

INSTALLATION INSTRUCTION FOR

DIGITAL SCOPE HARDWARE KIT

KIT 1 7009E9314-94
KIT 2 7009E9314-93

ORIGINATOR : G. KOK 920217
CHECKED :
APPROVED : B.Lee 17.2.92
DATE : FEBRUARY 1992
ERN. : 0274
ECN. : 2.02.019E
Ref.nr. : A3002

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INTRODUCTION

This procedure describes how to install a DIGITAL SCOPE hardware kit into a MCS2000 system.
There are two different kits :

Kit 1 (7009E9314-94) is used for MC20000 systems which do not include an ECPU68K board (7001E9311-44) and a RAM board (7001E9311-48)
The kit contains these two boards. These two boards replace the CPU/RAM board (7001E9004) and the MEMORY board (7001E9311-12).
The rest of the kit 1 content is equal to kit 2.

Kit 2 (7009E9314-93) is used for MCS2000 systems which already contain the ECPU68K board and the RAM board. This kit does not contain these two boards.

PARTS LIST

P/N	Description	Kit 1 quantity	Kit 2 quantity
7001E9311-54	digital scope board modified	1	1
7076-0607	interconnect wiring harness	1	1
7076-0606-01	KV/02 wiring harness Pk	1	1
7076-0606-02	trigger wiring harness Pt	1	1
7076-0605	Volt/Ohm wiring harness PΩ	1	1
7076-0608	CRT wiring harness P1	1	1
0680-2024	resistor 180 ohm 5% .25W	1	1
0680-2045	resistor 1000 ohm 5% .25W	1	1
0664-0090	wire grn 26 AWG	10 cm	10 cm
7001E9311-44	ECPU68K board aesy	1	0
7001E9311-48	RAM board assy	1	0
3-0673-563	sticker	4	4
0703E028*-01	EPROM firmware (see note)	1	1
0703E028*-02	EPROM firmware (see note)	1	1
0692E9305-94	installation instruction dig.sc.	1	1
0692E9305-95	functional description dig.sc.	Ref. only	
7092E9311-60	schematic trigger primary modified	Ref. only	
7092E9311-61	schematic Volt/Ohm brd. modified	Ref. only	
7092E9311-62	schematic KV/02 brd. modified	Ref. only	
7092E9311-63	schematic CRT contr. brd. modified	Ref. only	
7092E9004	schematic REV.C digital I/O b	Ref. only	
709289311-59	schematic dig.sc.brd modified	Ref. only	
7092E9311-47	schematic ECPU68K board	Ref. only	
7092E9311-52	schematic RAM board	Ref. only	
7076E9314-14	video cable ECRT-DIGISCOPE	1	1

Note: * = 2 or up.

Software (floppy) is not part of the hardware kit's !

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REQUIRED TOOLS

soldering iron
crosshead screwdriver
calibration screwdriver
snipe nose pliers
side cutter
multimeter
oscilloscope and :10 probe
IS-100 ignition simulator
Digital scope software diskette (not part of hardware kit)

PRE-UPDATE CHECKOUT PROCEDURE

Before beginning the installation of the scope option, it is necessary to first verify the operation of the MCS2000. Turn the unit "on" and allow it to warm-up. After warm-up is complete proceed through self-test and calibration.

Any failures in the above steps should be noted and corrected before beginning this installation procedure. Refer to the service manuals for troubleshooting.

INSTALLATION PROCEDURE

1 After performing checkout and any necessary repairs, turn "Off" the unit and unplug from AC power source.

2 Remove the front plexiglass and front panel.

Trigger primary board (REV.C) modification

3 Remove the trigger primary board 7001E9019 from slot 12 of the analog card rack.

4 Using a soldering iron, attach wiring harness marked PT, 7076-0606-02 to the trigger primary board.
Solder the white wire to the feed-through located at empty position of C39. (GND)
Solder the red wire to the feed-through which is connected to edge connector pin 2.
Refer to appendix A for help.
Route wires close to the board.

5 Add sticker to board.

6 Write 7001E9311-55 REV.A on sticker.

7 Replace the primary trigger board back into slot 12 of the analog card rack.

8 Hake sure that connector PT is accessible at the front of the primary trigger board.

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KV/02 signal processor board (REV.B) modification

9 Remove the KV/02 signal processor board (7001-9310-44) from slot 4 of the analog card rack.
10 Using a soldering iron attach wiring harness **marked** PK, (7076-0606-01) to the KV/02 signal processor board.
11 Solder the white wire to the ground lug.
Solder the red wire to the lead of C8 which is closest to u3.
Refer to appendix B for help.
12 Route wires close to the board.
13 Add sticker to the board.
14 Write 7001E9311-57 REV. A on sticker.
15 Replace the KV/02 signal processor board into slot 4 of the analog card rack.
16 Hake sure that connector PK is accessible at the front of the KV/02 signal processor board,

Volt/Ohm board (REV, A) modification

17 Remove the Volt/Ohm board (7001E9044) from slot 5 of the analog card rack.
18 Using a soldering iron, attach the wiring harness marked PΩ (7076-0605) to the Volt/Ohm board in the following fashion:
19 Solder the white and the black wires to the ground lug closest to Cl.
Solder the red wire to the side of resistor R2, that is closest to relay Kl.
Refer to appendix C for help.
20 Remove capacitors C10 and C11 from the Volt/Ohm board.
21 Route wires close to the board.
22 Add sticker to the board.
23 Write 7OOlE9311-56 REV. A on sticker.
24 Replace the Volt/Ohm board into slot 5 of the analog card-rack.
25 Hake sure that connector PΩ is accessible at the front of the Volt/Ohm board.

SKIP NEXT LINES 26-39 IF **AN** ECRT-board IS INSTALLED.
CRT controller board (REV.C and up) modification,

26 Remove the CRT controller board (7001E9311-14) from slot 9 of the digital card rack.
27 Using a soldering iron, attach the wiring harness marked Pl 7076-0608 to the CRT controller board in the following fashion:
28 Solder the brown wire into the left most feed-through hole of a group of three located in front of U22.
Solder the red wire into the feed-through hole located between U8 and U16.
Solder the yellow wire to IC UlO pin 1.
Solder the green wire to the side of resistor R3 closest to R17.
Refer to appendix D for help.

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31 Remove capacitor C2 from the CRT controller board.
32 Remove resistor R7, 270 ohm and replace it with a 180 ohm resistor (brown-gray-brown)
33 Add resistor R25, 1k ohm (brown-black-red) from the collector of transistor Q1 to side of old capacitor C2 closest to transistor Q1.
34 Cut copper trace between IC U17 pin 2 and IC U34 pin 12.
35 Solder a wire between IC U17 pin 2 and IC U20 pin 12.
36 Route the wires close to the board.
37 For MCS 2000 systems with KME-monitor only :
set jumper W4 to B-B position.
set jumper W5 to B-B position
This setting makes a positive hor. and vert. sync pulse.
38 Add sticker to board.
Write 7001E9311-58 REV. A on sticker.
39 Replace the CRT controller board into slot 9 of the digital card rack. Make sure that connector P1 is accessible at the front of the CRT controller board.

Modifications on Digital I/O (REV. B) board.

40 Remove the digital I/O-board (7001E9010) from slot 1 of the digital card rack.
41 Remove wire connected to edge connector pin 7.
42 Remove R52 (located in position C1)
Remove CR6 (located near to old R52)
Refer to appendix E for help.
43 Change revision level of board from B to C by use of a waterproof pen.
44 Replace the digital I/O-board into slot 1 of the digital card rack.

45 Remove any connector key from slot 7 of the digital card rack.
46 Install Digital scope board (7001E9311-54) into slot 7 of the digital card rack.
47 Kit 1 only :
Remove CPU/RAM board (7001E9004) from slot 6 of the digital card rack.
Remove any board key from slot 6.
Install ECPU68K board (7001E9311-44) into slot 6. ***
Remove MEMORY board (7001E9311-12) from slot 5 of the digital card rack.
Remove any board key from slot 5
Install RAM board (7001E9311-48) into slot 5. ***

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***

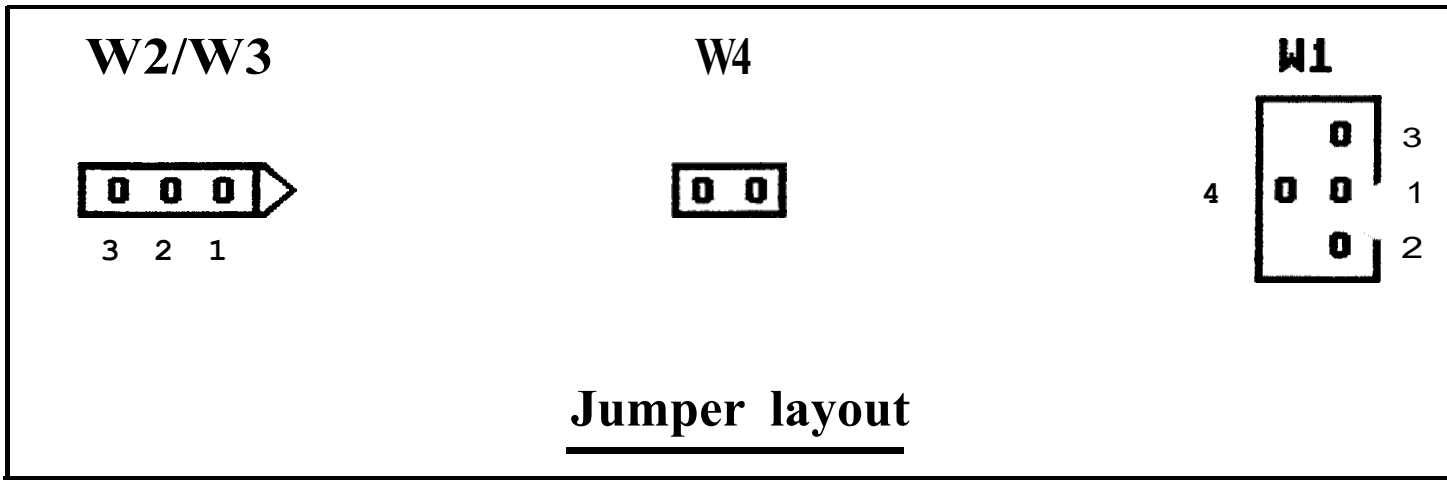
JUMPER SETTINGS AND FIRMWARE

(Kit 1 and Kit 2)

Check ECPU68K board for following jumpers :
Wl installed for SGA 9000, W2 default in copper
W3 1-2, W4 1-2, W5 1-2, W6 1-2, W7 out, W8 in.
Install/remove jumpers if required.

Install firmware 0703E028*-01 and 0703E028*-02 on ECPU68K board. (* = 2 or up) (EPROMS E3 and E4)

Check RAM board for following jumpers :
Wl 1-4, W2 2-3, W3 2-3, W4 in.
Install/remove jumpers if required.



Jumper layout

48 Connect Pl of the CRT controller wiring harness to Jl of the digital scope board.
IF AN ECRT-board IS INSTALLED : USE VIDEO CABLE 7076E9314-14 TO CONNECT P2 (ECRT) TO Jl (DIGITAL SCOPE BOARD)

NOTE: in either case twist the slack cable, so that it is not hanging In a loop. Failure to do this can lead to instability of the picture.

49 Using the interconnect wiring harnesses, make the following interconnections :

Connect PT of the interconnection harness (7076-0607) to primary trigger board's wiring harness connector.

Connect PΩ of the Interconnection harness to Volt/Ohm board's wiring harness connector

Connect PK of the interconnection harness to KV/02 board's wiring harness connector.

Connect J2 of the interconnection harness to P2 on the digital scope board.

50 This ends the installation of the digital scope hardware kit.

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Checkout and calibration

Turn the unit on. Insert the floppy disk which contains the digital scope software . (not part of the hardware kit) The tester should perform the self-test, program-loading sequence, warm-up period and calibration sequence.

After the tester calibration sequence the tester comes up with the PROGRAM SELECTION page.
Select SERVICE UTILITY entry.
Press the password code (1 2 3 1 2 3 #)
Now select TESTER CONFIGURATION ENTRY.
Once in the tester configuration page select the proper settings for all options installed and set the DIGITAL SCOPE as defined.
Step through all lines by setting defined/not defined as required and pressing the # key.
Pressing the # key on the last line returns the display to the SERVICE UTILITY page. Select ALTITUDE ENTRY reep. SERVICE GAS CALIBRATION if required. Press P to return to the PROGRAM SELECTION page.

Once back in the PROGRAM SELECTION page select VEHICLE TESTING
Select VEHICLE ENTRY WITHOUT LIMITS.
Move cursor through this page by pressing the # key to step from line to line.
Pressing the # key on the last line returnes the MCS2OOO to the TESTER LOADING VEHICLE DATA sequence.

After the loading sequence the LEADS CONNECT CHECK page appears.
Press P. The VEHICLE TEST SELECTION page appears.
Select SCOPE FUNCTIONS.
Select LAB SCOPE.
Select STANDARD.
When pressing the 0 key a HELP page appears which shows several key-definitions.
Pressing P returns display back to LAB SCOPE page.
Select 40 V vertical scale.
Using a jumper wire connect TPl on digital scope board to ground test point.(near ta TP1)
Make sure that PIN-POINT TEST leads (Volt/Ohm Test-leads) are shorted. Select INTERNAL TRIGGER.
Adjust ZERO POT. Rll for 0 Volt on display.
Remove jumper wire. (PIN-POINT LEADS still shorted)
Change vertical scale to 1 Volt.
Adjust ZERO PP POT. R42 for 0 Volt on display.
(Displayed line can be a little noisy)
Connect PIN-POINT LEADS to a voltage source.(e.g. BATTERY)
Measure voltage with a Voltmeter.
Select Proper vertical scale. (e.g. 20 Volt for battery)
Adjust PIN PT POT. R26 until displayed voltage on digital

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scope corresponds with previous voltmeter reading.

Above steps complete the zero and gain adjustments for the LAB SCOPE signals.
Adjusting the gain for SECONDARY and PRIMARY signals requires a IS-100 ignition simulator. Eventual a vehicle with a known stable ignition can be used.
There is no zero adjustment for SECONDARY and PRIMARY signals.

Go to VEHICLE TEST SELECTION page.
Select MULTIMETER TEST. Display shows MULTIMETER 1 TEST.
Press # key. Display shows MULTIMETER 2 TEST.
Connect IS-100 to test leads.(RED and CHOME clamp and KL1 and KL15)
A very stable secondary signal can be taken from the IS-100 when the SECONDARY clamp is removed from its cable and the cable is connected to the PATTERN output of the IS-100.
Power IS-100 on. Set ignition on.
Read the PEAK FIRING VOLTAGE in MULTIMETER 2 page and keep this value in mind.
Press P. The VEHICLE TEST SELECTION page appears.
Select SCOPE FUNCTIONS.
Select IGNITION SCOPE.
Select SECONDARY pattern with proper scale.
With IS-100 still running, adjust SEC POT. R14 until displayed peak value on digital scope corresponds with the previous measured peak value in multimeter 2 page.

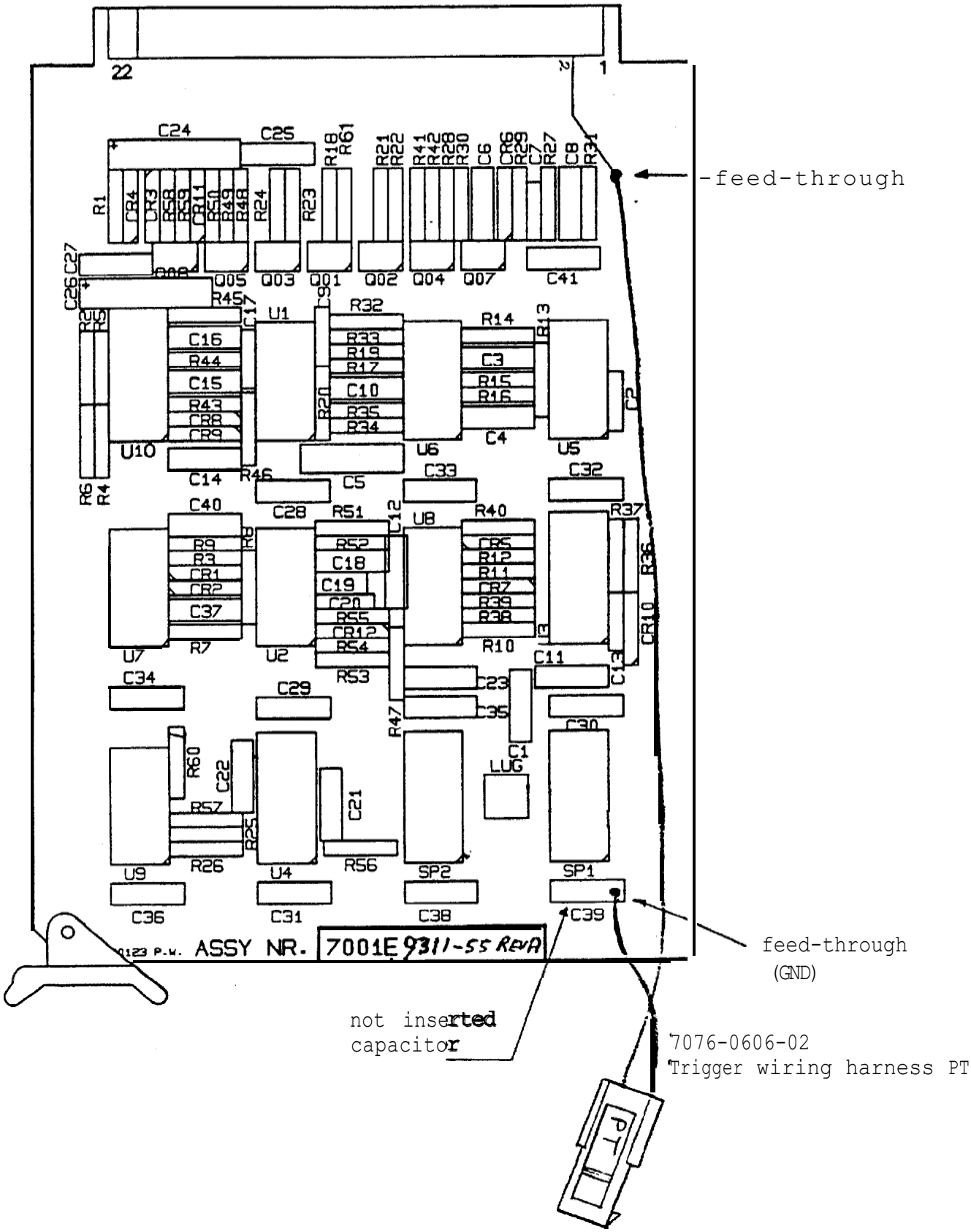
With IS-100 still running, measure with an analog scope and a **-divide** by 10- probe the KL1 (green) voltage against ground. Keep measured value in mind.
On digital scope select PRIMARY pattern and select proper vertical scale.
With IS-100 still running adjust PRI POT. R18 until peak value on digital scope corresponds with the peak value measured with the analog scope.

This completes the digital scope adjustments.

note; The secondary signal on the pattern output of the IS-100 is always present, even when switch ignition is set to off position. When the IS-100 is connected to the MCS2000 leads during a power on sequence, the IS-100 ignition simulator must be in 'power off' position. When the MCS2000 is powered on while the IS-100 simulator generates ignition signals a failure occurs during the self-test sequence.

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APPENDIX A

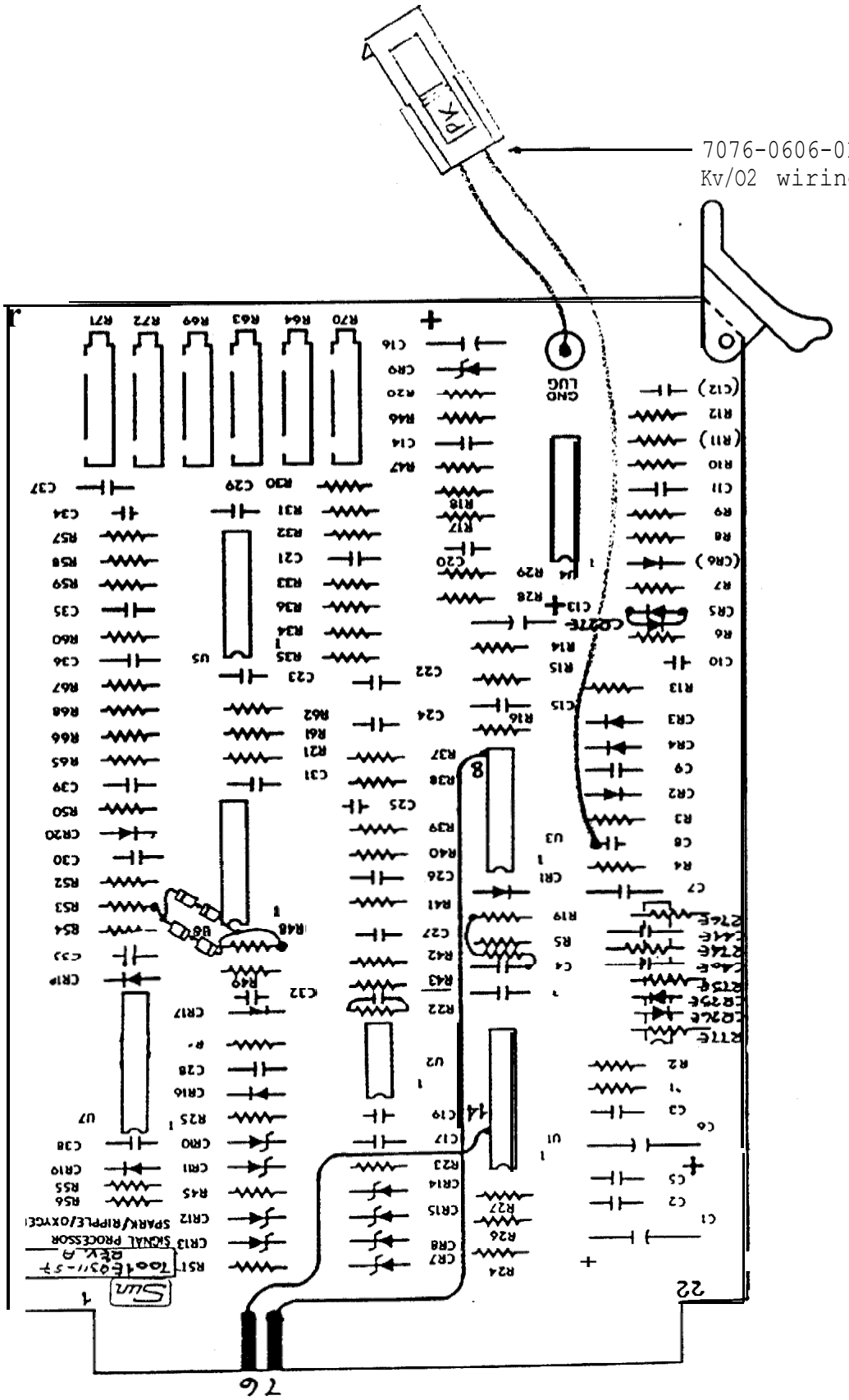


Trigger Primary Board Modification

Assy nr. without mod. 7001E9019-000 REV. C
Assy nr. with mod. 7001E9311-55 REV. A

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APPENDIX B

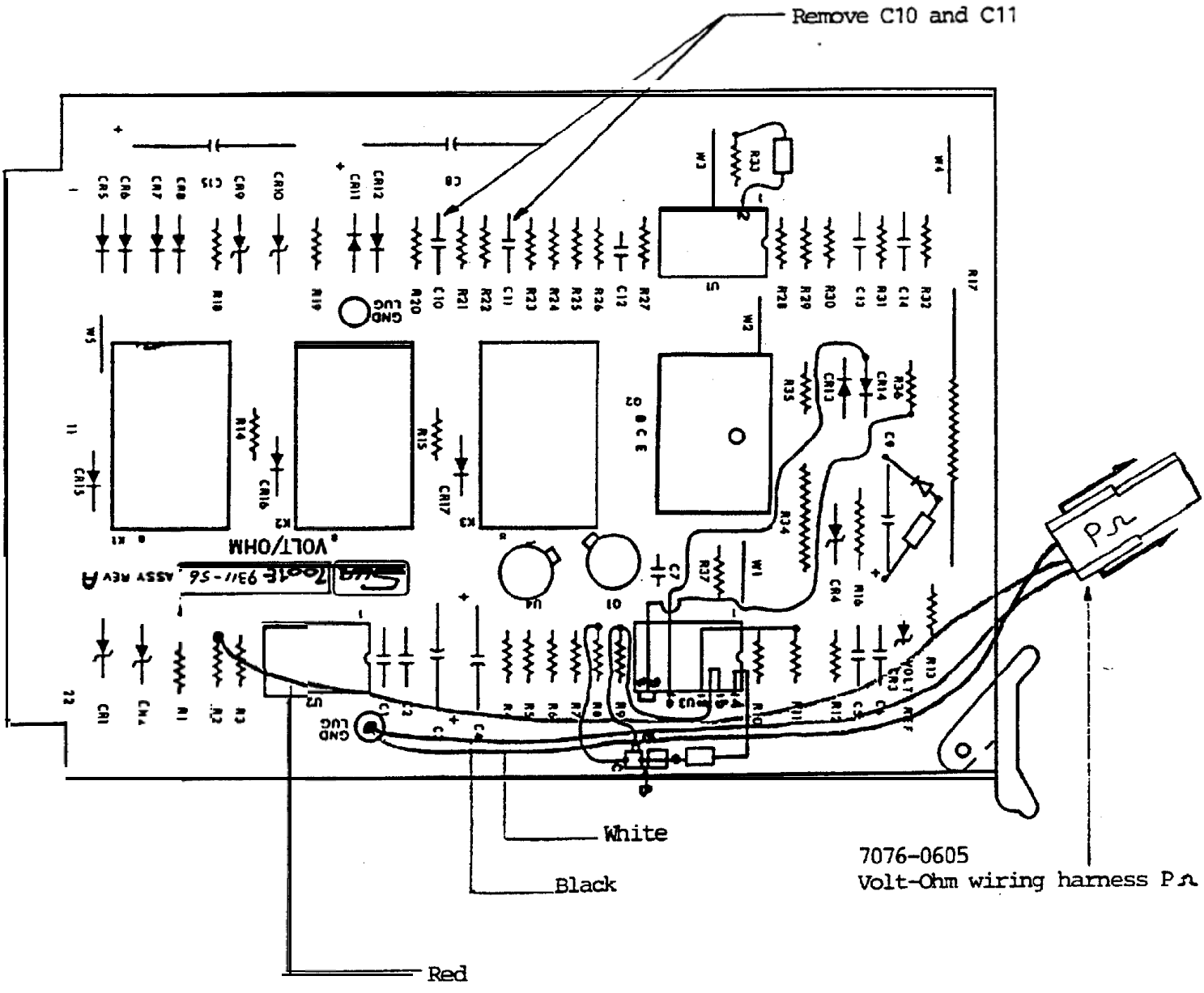


KV/02 signal processor Board Modification.

Assy nr. without mod. 7001E9310-44 REV. B
Assy nr. with mod. 7001E9311-57 REV. A

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APPENDIX C

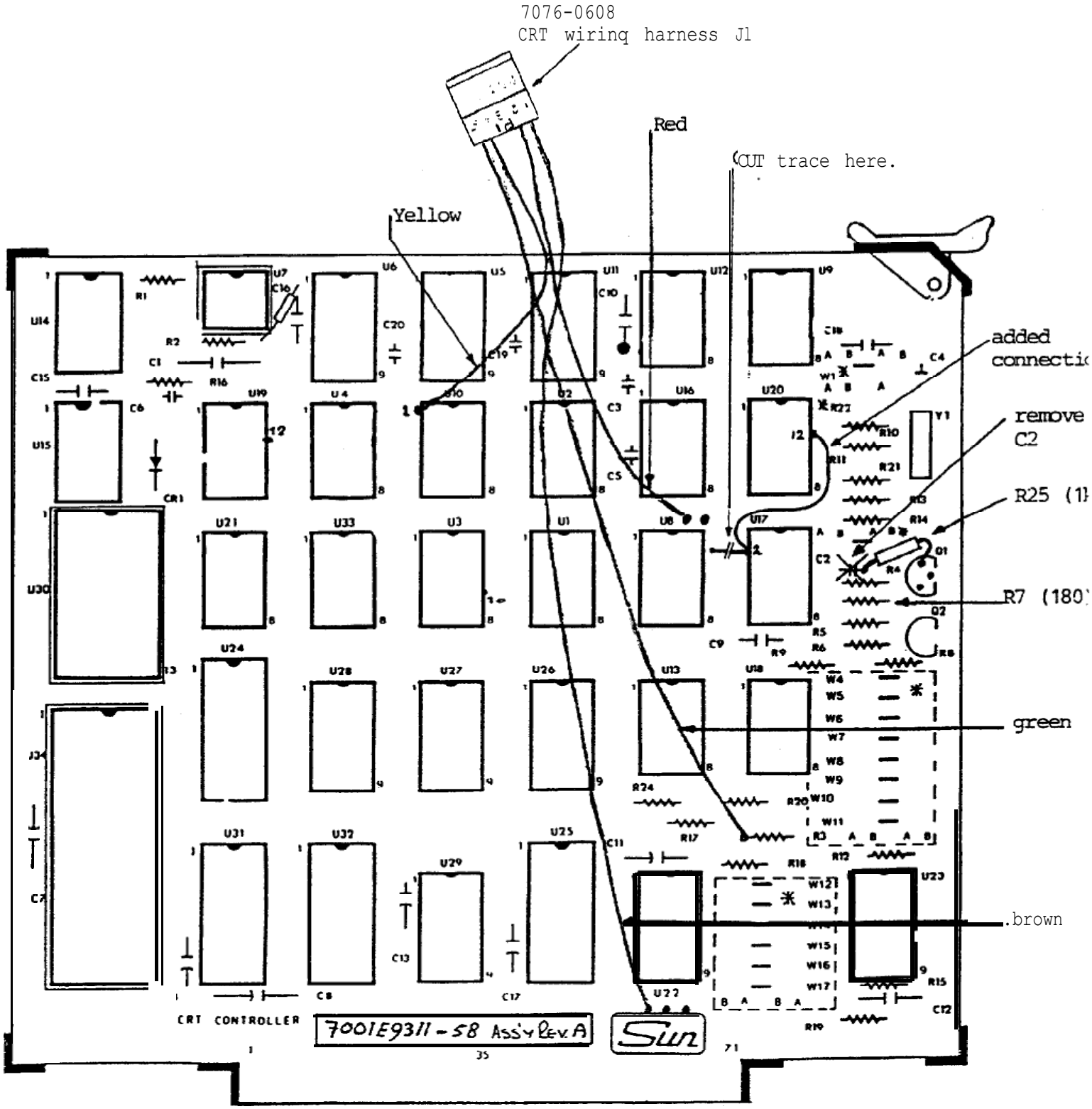


Volt-Ohm Board Modification.

Assy nr. without mod. 7001E9044 REV. A
Assy nr. with mod. 7001E9311-56 REV. A

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APPENDIX D

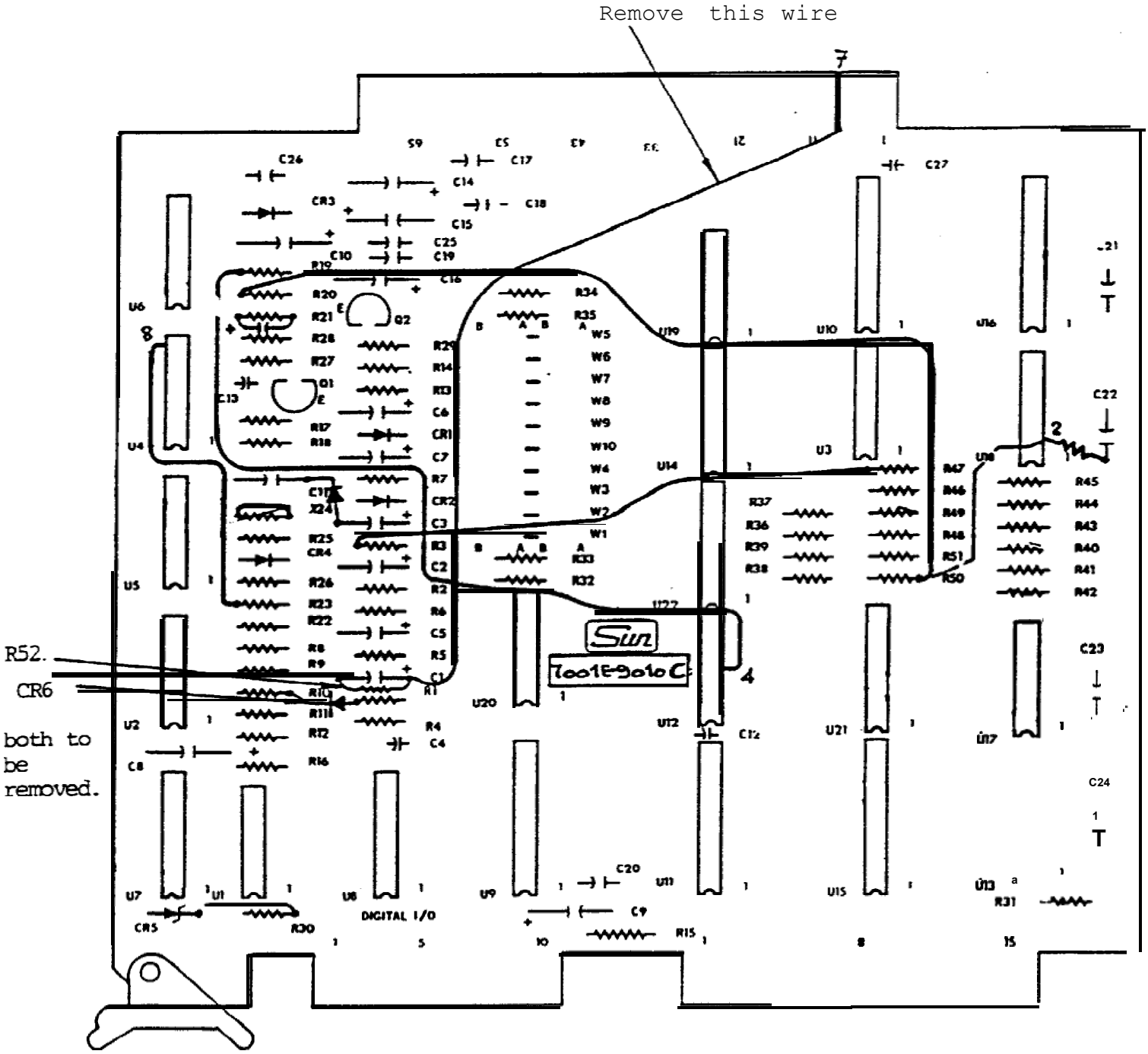


CRT controller Board Modification.

Assy nr. without mod. 7001E9311-14 REV. C
Assy nr. with mod. 7001E9311-58 REV. A

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APPENDIX E



Digital I/O Board Modification.

Assy nr. without mod. 7001E9010 REV B
Assy nr. with red. 7001E9010 REV C

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6.3-2

0692E9305-95

FUNCTIONAL DESCRIPTION OF
DIGITAL SCOPE BOARD FOR MCS2000
ASSY 7001E9311-54
SCHEMATIC 7092E9311-59

ORIGINATOR : G KOK
APPROVED : B Gee
DATE : 11 88
ERN : 0 2 8 5 5
ECN :
REF. NR. : A3003

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INTRODUCTION

This functional description describes the technique for digitizing an analog voltage waveform and displaying it on a raster-scan CRT monitor. The basic technique is described below. Let us assume that we want to display a waveform on a raster-scan CRT screen which has a resolution of Y horizontal scan lines and X vertical columns, as shown *in* figure 1. Figure 2 shows a generalized block diagram for a system which will digitize and display an analog signal. The amplitude of the signal is converted from analog to digital format by the Analog to Digital Converter (ADC) at regular time intervals, and stored in the RAM memory. The Video Logic retrieves this data from the RAM and uses it to generate a video signal which is fed to the CRT monitor.

In order to make optimum use of the vertical resolution of the CRT, the ADC must have a resolution of 1 in Y. Thus, for a screen with 256 horizontal scan lines, an 8-bit ADC would be required. This would ensure that the circuit would be capable of placing a dot on every horizontal scan line. In order to make optimum use of the horizontal resolution of the screen , the signal must be sampled X times for each complete 'snapshot' of the signal. The sample rate will determine the width of the snapshot in time. For example, if the sample rate is 1 KHz (period of 1 millisecond) and X is 256, a snapshot will represent a time of 256 milliseconds. By varying the sample rate, the horizontal time scale can be varied, making it possible to view signals at different frequencies.

The signal will be displayed on the CRT as a consecutive series of snapshots, each of which will be captured and displayed as described below. Each snapshot will display the amplitude of the signal at X evenly spaced intervals. Figure 3 is a block diagram of a circuit which will implement this concept. The sequence for capturing a single snapshot begins with the arrival of the TRIGGER signal. The origin of this signal is not relevant to this discussion. TRIGGER will clear the SAMPLE COUNTER and starts the SAMPLE CLOCK. The SAMPLE CLOCK will generate a series of evenly spaced pulses, each of which will initiate an ADC conversion. Each time an ADC conversion is complete, the data from the ADC is stored in the RAM at the address given by the SAMPLE COUNTER. After the data is stored in RAM, SAMPLE COUNTER is incremented. When SAMPLE COUNTER reaches a count of X, SNAPSHOT COMPLETE signal becomes active, stopping SAMPLE CLOCK and indicating completion of one snapshot.

The display hardware operates as follows. The VERTICAL COUNTER is preset to Y by VERTICAL SYNC, and decremented by HORIZONTAL SYNC. The HORIZONTAL COUNTER is cleared by HORIZONTAL SYNC and incremented by DOT CLOCK. Thus, VERTICAL COUNTER and HORIZONTAL COUNTER keep track of the position of the CRT beam as it traverses the screen. As the beam sweeps horizontally, the count in the HORIZONTAL COUNTER is used as an address into the RAM to fetch one stored ADC conversion for each pixel. This value is compared to the value of the VERTICAL COUNTER in order to determine whether or not the pixel is to be illuminated. This determination is made by DECISION LOGIC, which is shown in detail in figure 4. The main component of DECISION LOGIC is a

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comparator which compares the data from the RAM to the count in VERTICAL COUNTER. The comparator has two outputs, as indicated in the diagram. If the RAM data is equal to the VERTICAL COUNTER, (A=B) will be HIGH. If the RAM data is greater than VERTICAL COUNTER, (A>B) will be HIGH. The output of DECISION LOGIC is VIDEO OUT, which is HIGH if a pixel is to be illuminated, and LOW otherwise. VIDEO OUT is the logical OR of two terms.. The first term is the (A=B) output of the comparator. This term will be HIGH once for each vertical column when the measured voltage for the corresponding point in time is equal to VERTICAL COUNT. When this condition is TRUE, the pixel at x=HORIZONTAL COUNTER and y=VERTICAL COUNTER will be illuminated. This term will draw a continuous waveform as long as the amplitude of the signal does not change by more than one LSB (Least Significant Bit) between successive ADC conversions. If the change is more than 1 LSB, the horizontally adjecent dots will be separated by more than one vertical scan lines, resulting in a discontinuity in the image. The second term in the OR circuit will eliminate this problem by drawing a vertical line to connect the two dots. The second term is the EXCLUSIVE OR of the (A>B) output of the comparator for two consecutive values of HORIZONTAL COUNTER, at a given value of VERTICAL COUNTER. The LATCH is used to remember the state of (A>B) from one HORIZONTAL COUNTER position to the next.

The circuit In figure 3 makes use of a dual-port RAM. A dual-port RAM is required *only* If it is necessary to continue updating the display *screen* while data capture is *in* process. If the display circuit is disabled (display blanked) during data capture, a standard RAM can be used. If the snapshot time is sufficiently short and the TRIGGER rate not too frequent, this will result only in a momentary flicker and will not pose a problem.
The MCS2000 DIGITAL SCOPE makes use of a standard RAM.

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DESCRIPTION OF SCHEMATIC DIGITAL SCOPE BOARD

Refer to 7092E9311-59

The digital scope board is fitted in the digital card rack of the MCS2000. It receives addresses and data signals from ECPU68K board via the backplane, It also receives trigger signal (CYLCLK) via the backplane.
The digital scope board also requires signals to synchronize with the text dispay. These signals are derived from the CRT controller board:
DOTCLOCK (6.225 MHz) ; increments the HORIZONTAL COUNTER
HORIZONTAL SYNC (positive puls) ; synchronizes the HOR. COUNTER
VERTICAL SYNC (negative puls) ; synchronizes the VERT. COUNTER
VIDEO OUT : This output signal is mixed on the CRT controller board with the text video signal.
Signals from and to CRT controller board are routed via connector Jl on the digital scope board.
The analog signals to be measured are fed to the digital scope board via connector J2.
These analog signals are:
SECONDARY PATTERN (J2-l) This signal represents the voltage measured with the chrome clamp and is derived from the KV/02-board.
PRIMARY PATTERN (J2-5) This signal represents the voltage measured with the KL-1 clamp and is derived from the TRIGGER-PRIMARY board.
PIN POINT (J2-6) This signal represents the voltage measured with the VOLT/OHM leads and is derived from the VOLT/OHM-board.

The digital scope board is fully controlled by software.
By writing data to addresses on the digital scope board, several condition6 can be set. Following conditions/modes can be set by writing data bytes/words to the appropriate addresses:

- Capture or Display mode
- Display enable or disable
- Arm (when set, the mode returns to 'capture' directly after receiving a trigger).
- Primary / Secondary or Pinpoint as input to ADC
- Vertical scale range (Volts)
- Horizontal scale range (milli seconds)
- RAM-page (32 pages are available, each of 256 bytes)
- Trigger select (can be CYLCLOCK / internal or pinpoint)
- Trigger polarity
- Trigger level (.5 3 10 or 2OV)

Above mentioned modes are set depending on the output status of latches U18 and U19. These two IC's form a 16-bit write only CONTROL REGISTER. This 16 bit register is enabled when data (word) is written to address 800210(hex). PAL DECODER U2O decodes that specific address and makes LD CONTROL REG signal active. When this signal is active the outputs of U18 and U19 take over the input pattern. For example when OOOO(hex) is written to address 800210(hex) all outputs of U18 and U19 go low and when FFFF(hex) is written to address 800210(hex) all outputs go high.

(PAL DECODER U20 also decodes other addresses for other purposes)

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THE RAM U5 (8K X 8)

The central part of the scope board is the RAM chip U5. This is a memory chip which can store 8K bytes. This enables us to store 32 snapshots. Each snapshot consists of 256 samples. Each sample takes one RAM location. During a sample mode the addresses are generated by U11, U12 and U7. U7 controls the must significant address bits of the RAM. By these bits the page'number is determined. U7 is a latch. U11 and U12 are presettable 4 bit binary counters. To select a particular address several steps must be done by software:

Write page number to CONTROL REGISTER (address 800210hex)
Write page address to RAM ADDRESS REGISTER (U7 U11 U12)
(address of RAM ADDRESS REGISTER is 800201hex and is decoded by PAL DECODER U20)

At the start of a snapshot, only the page number is selected by software. The page address is generated then by U11 and U12, which combination acts as a 8 bit binary counter. The counter starts with zero and is incremented each time a sample is stored into RAM. When the counter reaches 255 the signal COL255 becomes active, which indicates that the page is written completely . After a page is completed the scope board returns to display mode.This is done by the EP 900 PAL which contains the scope timing logic.

Resume: In case of a snapshot the software determines the page number and the scope hardware generates the page address.
The software can also select each single address. This is done when the RAM must be cleared or when a particular value must be written in (or read from) each RAM location.

Data to be stored in RAM comes either from the ADC converter (U6) or from bidirectional buffer U13.
In case of a snapshot data comes from the ADC converter.
Data is clocked then into RAM after each completed ADC conversion by ADC TRIG signal.
When the RAM must be cleared (all addresses loaded with OOhex) or a specific value must be written to it, the data comes from U13.
Data is then clocked into RAM by CPU WRT STRB signal.
U13 (RAM DATA REGISTER) is activated when the software program reads or writes to address 800209hex.
For example : let us fill RAM page 5, address 8 with value 255dec.
The program must do :

1 Write page number to CONTROL REGISTER;
Page number is 5 (00101) The page select bits corresponds to D11 - D15, so D11 and D13 must be high, D12, D14 and D15 must be low and other data bits are don't cares. This data pattern must be written to address 800210hex
2 Write page address to RAM ADDRESS REGISTER .
So write data byte 08 to address 800201hex
3 Write data (255=FFhex) to RAM DATA REGISTER.
So write FF to address 800209hex.

To read data from RAM by the CPU (e.g. when RAM data must be printed) the same steps are required; the difference is that data is not written to the RAM DATA REGISTER but read from RAM DATA REGISTER.

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The data lines of the RAM are connected to U6, U13 and U14. During a snapshot (sample mode) data comes from U6, The output of U13 is in high-impedance state. After 256 samples the scope board returns automatically to the DISPLAY MODE. This brings the output of U6 also in a high impedance. Data is read now from RAM. The RAM addresses are generated by Ull and U12. These counters are incremented by RAM ADDR CLK signal. This signal is derived from DOT CLOCK and *runs* at 6.225MHz. (U11 and U12 act as HORIZONTAL COUNTER)

RAM data is latched by U14 and then goes to U15. U15 is a comparator and compares RAM data with VERTICAL COUNTER data. The EP 900 PAL contains the VERTICAL COUNTER. The comparator has two outputs P=Q and P>Q. These two signals go to the rest of the DECISION LOGIC which is also in the EP900. The DECISION LOGIC determines wether a pixel is to be illuminated or not. The DECISION LOGIC also prevents discontinuties in the image.(Refer to introduction), The DECISION LOGIC also generates /VIDEO OUT signal.

Once in the DISPLAY MODE the scope board remains in this mode. Each time a VERTICAL SYNC is received the selected RAM page is read and displayed

Since the scope board logic is fully synchrone with VERTICAL SYNC HORIZONTAL SYNC and DOT CLOCK the video image generated by the scope board can overlay the text image which is generated by the CRT controller board. If we look to the monitor then we see text and graphics ; the text (and axis and grid) is generated by the CRT controller board while the graphic is generated by the scope board. Both video signals are 'EXCLUSIVE ORed' on the CRT controller board.

THE 8254 COUNTER (U17)

U17 is a programmable counter and is fully controlled by software. In fact the chip contains three counters. The purpose of the counters depends on the mode in which the scope board is. In sample mode counter 1 acts as a PEAK CAPTURE WINDOW generator. The PEAK CAPTURE circuit is around Ul, U9 and C43. (upper left corner of schematic> Since the scope board takes samples of the analog signal it can happen that a fast peak in the analog signal falls between two samples. In that case the digital representation of the analog signal does not contain the peak, Since the digital scope is used to measure ignition signals it is very important to catch the very fast and high peaks during the spark. The PEAK CAPTURE CIRCUIT contains a capacitor C43 which is charged by the analog signal. The capacitor can not discharge when the FET switch (U9) is open. The capacitor will. be charged to the peak value of the analog signal and will hold this value until FET switch U9 is closed. The content of counter 1 determines how long the PEAK CAPTURE CIRCUIT is active. That time must be at least the duration of the spark peak voltage. The EP9OO PAL takes care that the PEAK CAPTURE CIRCUIT is active during the time that output of counter 1 is low and takes also care that the circuit is disactivated not before the first ADC conversion following on a

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positive transition of counter 1 output. (see Figure 5)
The time that counter 1 output is low depends on the countvalue which is written by software to that specific counter.
The counter 1 starts on the CYLCLOCK signal and is decremented by DOTCLOCK. When the counter is loaded with the count 10000 the output of counter 1 will be low for 10000 dotclocks. (1 dotclock is about 160 nsec) The PEAK CAPTURE CIRCUIT is active then for at least 160 us. In fact the circuit is activated longer since it is released after the next ADC conversion.

Counter 2 is used to generate the ADC sample start pulses.
Counter 3 is used to generate the RAM DATA REQUEST frequency.
In fact one counter can do both tasks because of the fact that we want to store each ADC conversion in RAM. Both counters are programmed to generate the same frequency and are gated by the same signal and are both decremented by DOTCLOCK. The counters generate pulses at evenly spaced time intervals. The time between two pulses depends on the countvalue which is loaded into the counters by the program software. Suppose the counters are loaded with the count 10000. The time between two pulses is then 10000 times the DOTCLOCK i.e. 1.6 ms. A total snapshot contains 256 samples, so the time of the horizontal (time) axis is 255*1.6ms This is 408 ms. By varying the count written to the counters the horizontal time scale can be choosen.
The counters start (down)counting when the GATE signal is high. GATE signal is controlled by the EP900 PAL and is generated after the trigger flipflop (within the EP900) is cleared by the ARM signal (which is controlled by software) and clocked by a TRIGGER signal (EVENT).

During DISPLAY MODE there is no need for an ADC conversion start signal and *no* need for a RAM DATA REQUEST signal. The counters 2 and 3 are used now to generate the cursors 1 and 2. The cursors are vertical lines which can be placed on every monitor location. Counter 2 can generate cursor 1 and counter 3 can generate cursor 2. The place where the cursors come depends on the countvalue which is loaded into the counters. In display mode the gate signal of the counters 2 and 3 is derived from HORIZONTAL SYNC. When counter 2 is loaded with the count 15 the cursor 1 will occur in column 15 of the scope display. etc.

The 8254 chip contains also a control register. Software can also write bytes to this register. To set up the counters the software must do several steps:

- Writing bytes to the control register to determine in which mode each counter must act.
- Writing bytes to the three counters to load them with the appropriate countvalue.

Writing to address 80021Fhex affects the control register
Writing to address 80021Bhex affects the counter 2
Writing to address 80021Dhex affects the counter 3
Writlng to address 800219hex affects the counter 1
Address decoding is done by U20 in combination with A1 and A2.

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THE TRIGGER CIRCUIT U9, U4, U10

Each snapshot is started by a trigger signal.
The trigger signal can be CYLCLOCK, PINPOINT TRIGGER or INTERNAL TRIGGER. When measuring ignition signals like PRIMARY and SECONDARY patterns the CYLCLOCK signal will start the snapshot. When measuring signals with the VOLT/OHM leads the internal trigger or the pinpoint trigger can be used. Also the CYLCLOCK trigger can be used for pin point tests.
The FET switch U9 (lower left corner in schematic) selects either CYLCLOCK or other trigger source. This FET is controlled by one bit of the CONTROL REGISTER. The trigger polarity is selected by use of EXCLUSIVE OR gate U16. This EXCLUSIVE OR gate is also controlled by the CONTROL REGISTER.
When pinpoint trigger is selected the trigger level can be choosen with help of the circuit around U10. By setting the three trigger level bits a DC voltage is fed to one side of comparator u4. Depending on the voltage set to that side of the comparator, the comparator will switch on a higher or lower voltage of the signal to be measured. The trigger level bits are coming from the CONTROL REGISTER and are fully controlled by software.

Internal trigger is used for DC voltages. On a DC voltage the hardware can not trigger. When the trigger polarity bit is toggled 3 times the output of U16 (pin 6) will go high at least once.
A positive going signal on U16 pin 6 (EVENT) will start the snapshot.

Triggering is only posible when the trigger flip flop in the EP900 is cleared by the ARM bit. (part of CONTROL REGISTER)
The program software can activate this ARM bit.

MULIPLEXER U8

U8 is a multiplexer with 8 inputs and one output. One input is connected to the output at a time. Which input is connected to the output is controlled by the mux 0, mux 1, mux 2 signals.
These are generated by the CONTROL REGISTER.
The multiplexer takes care that the appropriate input is fed to the ADC converter.

ANALOG CIRCUITRY

The operational amplifiers in the left corner of the schematic are used as input buffers for SECONDARY,PRIMARY and PINPOINT signals. They offer also a zero and gain adjustment for the signals.
ZERO potmeter R11 adjusts the OV line for all inputs.
ZERO potmeter R42 adjusts the OV line for PIN POINT signals
GAIN potmeter R14 adjusts the SECONDARY signal gain
GAIN potmeter R18 adjusts the PRIMARY signal gain
GAIN potmeter R26 adjusts the PIN POINT signal gain

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The PIN POINT signal is also fed via capacitor C12 and a high-gain amplifier (11*) to multiplexer input U8 pin 7 (ALT). This multiplexer input is selected for ALTERNATOR mesurements.
Only the AC component of the signal can pass capacitor C12.

The selected signal goes through the multiplexer and goes to the PEAK CAPTURE CIRCUIT.(upper left corner of schematic)
The peak capture circuit can be on or off. When the circuit is off the signal is not affected by this circuitry. The circuitry acts as a voltage-follower in 'off' position.
When the PEAK CAPTURE CIRCUIT is in 'on' position, the FET SWITCH across diode D1 is open. Capacitor C43 is charged by the output voltage of Ul pin 14, The capacitor can not discharge and will be charged until the output of U1 (pin 14) is at its maximum. When the output voltage of Ul pin 14 decreases the Capacitor C43 will hold the maximum voltage. This voltage is buffered by an OPAMP. and then goes to the 'divide by 2 circuitry'.
The 'divide by 2' circuitry is on or off. In 'off' position the gain is -1 and in on position (FETSWITCH CLOSED) the gain is -0.5.
The last stage before the ADC converter is a buffer with -1 gain.
The PEAK CAPTURE CIRCUIT is controlled by the EP900 PAL and the time during the circuit is active (PEAK CAPTURE WINDOW) depends on the count which is loaded into counter 1 (8254).

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INTERFACE SPECIFICATIONS

I/O Registers. Operations of the scope are controlled thru a set of I/O ports. These ports along with their addresses are listed below:

Control register	800210
	800211
RAM Address register	800201
RAM Data register	800209
8254 counter 1	000219
8254 counter 2	80021B
8254 counter 3	80021D
8254 Control register	80021F (hex)

Control register. The control register is a 16-bit write-only port. The bit assignment is show below:

DO (lsb)	Divide by 2
D1-D312	Analog mux channel select
D4	Trigger select
D5	Trigger slope
D6-D8	Threshold select for signal trigger
D9	Arm
D10	Display enable
D11-D15	RAM page select

Mux channel selection and scales. The scope circuit contains an 8 channel analog mux followed by an optional divider, resulting in a total of 16 selectable scales. D1-D3 of the control register select the mux channel' DO is used to enable/disable the divide by 2 circuit. The scale selections are shown in the table below:

D3	D2	D1	DO	Scale selection
0	0	0	0	Secondary 50 KV
0	0	0	1	,, 25 KV
1	1	1	0	,, 10 KV
1	1	1	1	,, 5 KV
0	0	1	0	Primary 500 v
0	0	1	1	,, 250 V
0	1	0	0	,, 50 v
0	1	0	1	,, 25 V
0	1	1	0	Ripple high scale
0	1	1	1	Ripple low scale
1	0	0	0	Pinpoint 40 v
1	0	0	1	,, 20 v
1	0	1	0	,, 10 v
1	0	1	1	,, 5 v
1	1	0	0	,, 2 v
1	1	0	1	,, 1v

It should be noted that the MUX channel numbers for the Secondary scales are not sequential. The reason for this is purely historical.

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Trigger control. A snapshot capture *sequence* begins with a trigger signal. The trigger signal is generated in one of several ways, as specified in bits D4-D8 of the control register. The bit assignment is shown below:

D8	D7	D6	D5	D4	I	Trigger Type
X	X	X	0	1	:	Leading edge of CYLCLOCK
x	x	x	1	1		Trailing edge of CYLCLOCK
1	1	1	s	0	:	Signal trigger 2OV threshold
1	1	0	s	0	:	,, ,, .5V ,,
1	0	1	s	0	:	,, ,, 3V ,,
0	1	1	s	0	:	,, ,, 10V ,,

Note 1: X = don't care condition
Note 2: S is the slope specifier, where 0 = positive Trigger
1 = negative Trigger

There are three trigger modes: Engine Trigger, Signal Trigger, and Internal Trigger.

The Engine Trigger mode causes the start of a snapshot capture sequence to be synchronized with the leading/trailing edge of the CYLCLOCK signal. Engine Trigger is selected by setting the Trigger select bit (D4) of the control register to a logical 1. D5 of the control register selects the leading/trailing edge of CYLCLK, as shown in the table above.

Signal trigger mode causes a snapshot capture sequence to begin when the input signal on the pinpoint leads crosses the selected trigger threshold voltage. Signal triggering is enabled by setting D4 of the control register to a logical 0. D5 selects the slope of the input signal, D6-D8 select the trigger threshold as indicated above.

The internal trigger mode can be used to trigger a snapshot at any time, regardless of external events. This is accomplished by toggling the trigger slope bit (D5) at least twice, while the ARM bit of the control register (D9) is set. Operation of the ARM bit will be described below.

ARM bit (D9). This bit of the control register is used for arming the trigger circuit in preparation for capturing a snapshot. To arm the trigger circuit, the arm bit must be brought LOW in order to clear the trigger flipflop inside the EP9OO PAL. Bringing ARM HIGH will enable the trigger flipflop.

DISPLAY ENABLE bit (DlO). Setting this bit high will enable the display circuitry. The data in the selected page of RAM will be displayed on the CRT. Clearing this bit will disable display.

Display page selection. The scope PC board contains 8K bytes of RAM which is organized as 32 pages of 256 bytes each (256 bytes is required to store one snapshot). Thus a total of 32 snapshots can be stored on the digital scope board. The page selection is determinated by a 5-bit address which is supplied to the 5 most

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significant address bits of the RAM. This 5-bit address is latched into the page select register, which is a 74LS174 (latch U7 on the schematic). The input of the page select register comes from the page select bits of the control register (D11-D15).
The page select register (U7) is clocked in one of two ways:

a Loading the RAM address register will cause the page select bits of the control register to be latched into the page select register.

b A trigger (start of snapshot) will also clock the page select register.

Programming the 8254. The digital scope circuit makes use of an 8254 multi-purpose counter. The 8254 contains 3 independant counters which are used to implement various functions *of* the scope, as described below. In general, programming any one of the counters is accomplished by writing a control byte to the control register of the 8254, followed by a 1 or 2 byte count written to the desired counter. To write a 2-byte count, the least significant (LS) byte must be written first. If a control word is written without a count, the specified counter will be disabled, Refer to 8254 specifications.

Counter 1. Generates the PEAK CAPTURE WINDOW (PCW), which is used to capture the peak value of primary and secondary waveforms.
The PCW is a pulse generated by the leading edge of CYLCLK. The peak capture circuit will be enabled for the duration of the PCW pulse. (disabled after first ADC conversion following on the trailing edge of PCW).
In order to generate the PCW, counter 1 is programmed as a hardware triggered one-shot **(mode 1).** The counter is programmed by writing a control byte followed by a count. The count specifies the duration of the PCW in clock pulses. (clock period is 160.64 ns).

The peak capture circuit may be disabled by writing a control byte but not writing a count.

Counter 2. The use of this counter depends on the state of the ARM bit of the control register.

a ARM = 0. In this case the counter is **used** to generate Cursor 1. The counter must be programmed as a hardware triggered (mode **5)** This is accomplished by writing the control byte followed by an 8-bit count,specifying the position of the cursor.
If the control byte is written but the count is omitted, no cursor will appear.

b ARM = 1. In this case counter 2 is used to generate the ADC sample clock, which determines the rate at which the ADC samples the signal. The counter must be programmed as a Rate Generator (mode 2) by writing the control byte followed by a 2-byte count. The count will determine the number of clocks between ADC samples (clock period = 160.64 ns).

Counter 3. As with counter 2, the use of this counter depends on the state of the ARM bit of the control register.

a ARM = 0. In this case counter 3 is used to generate Cursor 2 (refer to counter 1)

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b ARM = 1. In this case counter 3 is used to generate the Data acquisition clock, which determines the rate at which the RAM address counter is incremented. Incrementing the RAM address counter is equivalent to storing a new data point. Counter 3 must be programmed as a rate generator (mode 2) by writing the control byte followed by a 2 byte count. The count will determine the number of clocks between data points (clock = 160.64 ns)

Use of counters 2 and 3 during data capture. As described above, when ARM = 1, counter 2 sets the ADC sample rate, and counter 3 sets the data acquisition rate. The data acquisition rate must be smaller or equal to the ADC sample rate. The data acquisition rate determines the horizontal time scale. For example, if data acquisition rate is once every 100µs, then the complete snapshot which consists of 256 data points, will represent a period of 25.6 ms.
Thus, the horizontal time scale on the scope may be varied by adjusting the data acquisition rata (and the ADC sample rate, if necessary). There are 2 types of time scales, as described below.

a Fixed time scales (e.g. 5 ms, 10ms). For fixed time scales, best results will be obtained by setting the ADC sample rate equal to the data acquisition rate.
b Constant-width time scales. A constant-width time scale is one of which the data acquisition rate is adjusted as a function of engine RPM to display a fixed portion of an engine-related waveform. This is used for single cylinder and parade displays. Constant width time scales are achieved by adjusting the data acquisition rate as a function of RPM. The ADC sample rate can be set to a fixed (as high as possible) value or can be equal to data acquisition rate.

Initializing the digital scope hardware. The following steps are recommende to place the hardware in a known initialized state.

a Clear control register. This will disarm the trigger, disable display and select page 0.
b Disable counters 1,2,3. of the 8254 by writing control bytes but no count values
C Fill all 256 locations in page 0 with the zero offset value. This will result in a horizontal line at level zero to be stored in page 0.

Reading/writing from RAM. The CPU may access any location in any page of RAM by performing the following steps.

a Make sure the scope is not in sample mode. If in sample mode,either wait for scope to return to display mode Or abort sample mode by clearing ARM bit of the control register.
b Clear ARM bit of control register to disable trigger.
c Clear display enable bit of control register to prevent the address counter from being incremented or cleared. This action will cause the display to blank.
d Write the desired page number to the page select bits of the control register.

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e Write the 8-bit address of the desired RAM location (within the selected page) to the Ram address register.
f Read/write from/to the RAM data register.
g Repeat steps (d) thru (f) for additional read/write operations
Step (d) need not be repeated if the page number remains the same.

Note : steps (a) thru (d) may be combined into a single write operation.

Resuming scope display after read/write from RAM.
a Set the RAM address register to 255. This will have the effect of synchronizing the start of the display with the horizontal sync signal.
b Write the desired page number to the page select bits of the control register
C Set the display enable bit of the control register.

Note 1: failure to perform step (a) will result in a momentary glitch on the CRT screen.
Note 2: steps (b) and (c) may be combined.

Capturing and displaying waveforms. In general. a snapshot of a waveform is captured by performing the following steps:
a Program counter 1 of 8254 to enable/disable peak-capture.
b Program counters 2 and 3 for desired time scale
C Select mux channel (vertical scale).
d Select RAM page.
e Arm trigger.

The digital scope is always in one of two modes: Sample mode or Display mode. When a trigger occurs, the hardware enters the Sample mode until completion of the snapshot. The length of time it takes to complete a snapshot depends on the data acquisition rate (counters 2 and 3). When 256 data points are captured, the snapshot is complete and the hardware returns to the Display mode. While in the sample mode, the display is blanked. As soon as the hardware returns to the display mode, the newly captured snapshot will be displayed.

Due to the fact that during Sample mode the display is blanked, it is important that enough time be allowed between snapshots so that the Image can easily be observed. Furthermore, the length of time between the completion of one snapshot and the start of the next one must not be less than the time it takes for the monitor to complete one vertical scan. For a 50 Hz monitor this time is 20 ms. This minimum display time assures that the snapshot will be completely painted at least once on the screen.

In order to measure display time between snapshots it is necessary to detect occurrence of a trigger, and completion of a snapshot. These events are detected as follows. One of the steps in arming the trigger is to initialize counter 3 and to write an initial count into it. If the count in counter 3 is read back at any time after its initialization and prior to the occurrence of a trigger, the value read back will be the initial count. When the trigger occurs, the scope enters the sample mode and counter 3

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will start counting down to zero. When it reaches zero, the counter will be reloaded to the initial count and will count down again. This process will be repeated 255 times until the snapshot is complete and the scope returns to the display mode. At this point counter 3 will stop counting. If the count in counter 3 is read back after completion of the snapshot, the value read back will be other than the initial count, and will remain unchanged. Based on the description above, the following algorithm holds true:

```
Take two consecutive readings from counter 3
If the two readings are equal to each other then
      if the readings are equal to Initial count then
            trigger has not yet occurred
      Else
            Snapshot is complete
Else
      Snapshot capture is in progress (mode = sample)
End
```

It should be noted that the discussion above is also applicable to counter 2.

Primary and secondary waveforms. Primary and secondary waveforms are captured by use of Engine Trigger, with Peak-capture enabled. The trigger circuit must be armed prior to the firing of the desired cylinder, but after the previous cylinder has fired. The arming sequence should Include the following steps:

a Program counter 1 of 8254 for PCW.

b Program counters 2 and 3 for desired ADC sample rate and data acquisition rate.

C Output the following bit pattern to control register:

D3-DO	Desired scale selection
D4	=1 (CYLCLK trigger)
D5	=0 (trig on leading edge of CYLCLK)
	1 (,, trailing ,, ,,)
D8-D6	=0,0,0 (don't care bits)
D9	=0 (disarm trigger)
DlO	=1 (display enabled)
D15-Dll	Desired page number

d Output a second bit pattern to control register:

D9	=I (arm trigger)
all other bits	same as in step (c) above.

Pin-point waveforms. Three types of trigger modes are possible in displaying Pinpoint waveforms. These are described below.

Engine trigger. This trigger mode is used to synchronize the start of a snapshot capture sequence with the firing of a particular cylinder. The trigger must be armed prior to the firing of the desired cylinder, but after the previous cylinder has fired. The arming sequence should include the following steps:

a Initialize counter 1 of 8254 to disable PCW

b Program counters 2 and 3 of 8254 for desired ADC sample rate and data acquisition rate.

C Output the following bit pattern to control register :

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D3-DO Desired scale selection
D4 =1 (CYLCLK trigger)
D5 =O (trig on leading edge of CYLCLK)
1 (,, trailing ,, ,, ,)
D8-D6 =O,O,O (don't care bits)
D9 =O (disarm trigger)
D1O =1 (display enabled)
D15-D11 desired page number

d Output a second bit pattern to control register:
D9 =1 (arm trigger)
all other bits same as in step (c) above.

Signal trigger. This trigger mode is used to start a snapshot capture when the signal crosses a selected threshold votage. There are four selectable thresholds: 0.5V 3V 1OV and 2OV. Furthermore, the slope of the signal as it crosses the threshold is also selectable. The arming sequence is as follows:

a Initialize counter 1 of 8254 to disable PCW
b Program counters 2 and 3 for desired ADC sample rate and data acquisition rate.
c Output following bit pattern to control register:
D3-DO desired scale selection
D4 =O (signal trigger)
D5 =0 (trig on positive slope)
1 (,, negative ,,)
D8-D6 threshold Selection
D9 =O (disarm trigger)
D10 =1 (display enabled)
D15-D11 desired page number
d **Output** a second bit pattern to control register:
D9 =1 (arm trigger)
all other bits same as in step (c) above.

Internal trigger. This trigger mode allows the CPU to start a snapshot capture sequence whenever it wishes to do so. The arming sequence should be as follows:

a Initialize counter 1 of 8354 to disable PCW
b Program counters 2 and 3 of 8254 for desired ADC sample rate and data acquisition rate.
c Output following bit pattern to control register:
D3-DO desired scale selection
D4 =0 (don't care)
D5 =0
D8-D6 =O,O,O (don't cares)
D9 =0 (disarm trigger)
D10 =1 (display enabled)
D15-D11 desired page number
d Output a second bit pattern to control register:
D9 =1 (arm *trigger)*
all other bits same as in step (c) above.
e Output three more times to control register, each time changing the state of the trigger slope bit (D5), but keeping all other bits the same as in step (d) above. Toggling the Trig Slope bit has the same effect as the signal crossing the trigger threshold voltage in signal-trigger mode.

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Operation of Cursors. As mentioned earlier, counters 2 and 3 of the 8254 have a dual purpose. During data' capture (ARM = 1) they are used to set the data capture rate. When ARM = 0, they can be used to generate two cursor lines on the screen. A cursor line is a vertical line one pixel wide which runs from the top to the bottom of the screen. The positions of the cursors are controlled via the courters, as described earlier. The following steps should be followed to generate the cursors:

a Initialize counter 1 to disable PCW.

b Initialize counter 2 and 3 to generate cursor 1 and cursor 2 respectively as described above. Do not yet write cursor position to the counters.

c Write the following bit pattern to the control register:

D8-DO	all O's (don't cares)
D9	=O (disarm)
DlO	=l (enable display)
D15-Dll	desired page number

d Write position of cursor 1 and cursor 2 to counters 2 and 3,resp. If only one cursor is desired, write to only one of the counters.

e To change the position of either cursor, write new cursor position to the corresponding counter.

ADJUSTMENTS

Refer to installation instruction 0692E9305-94 for adjustment procedure.

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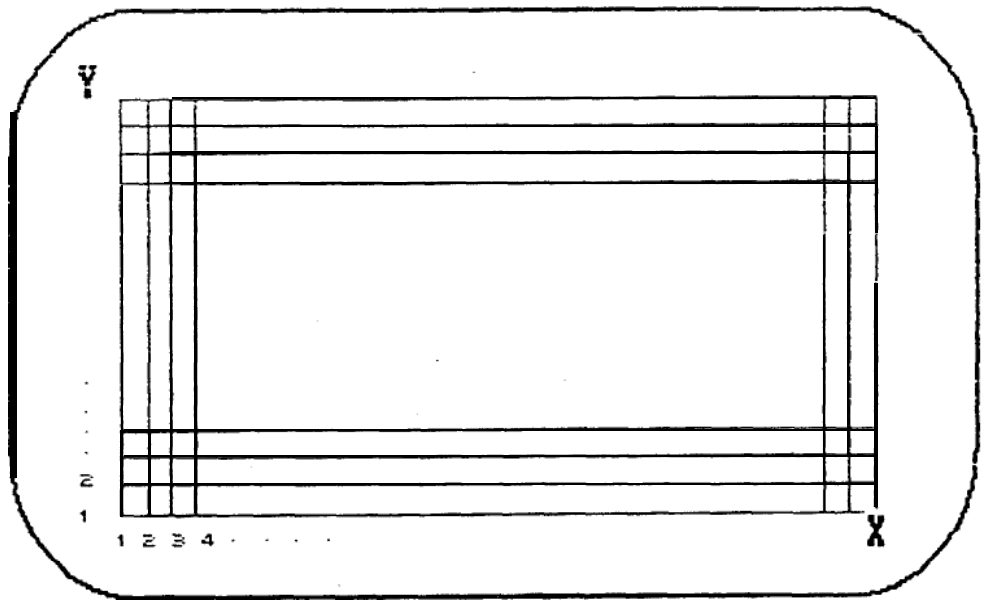


figure 1. The screen on a raster-scan CRT can be regarded as a matrix of Y horizontal scan lines by X vertical columns. The intersection of each row and column is called a pixel.

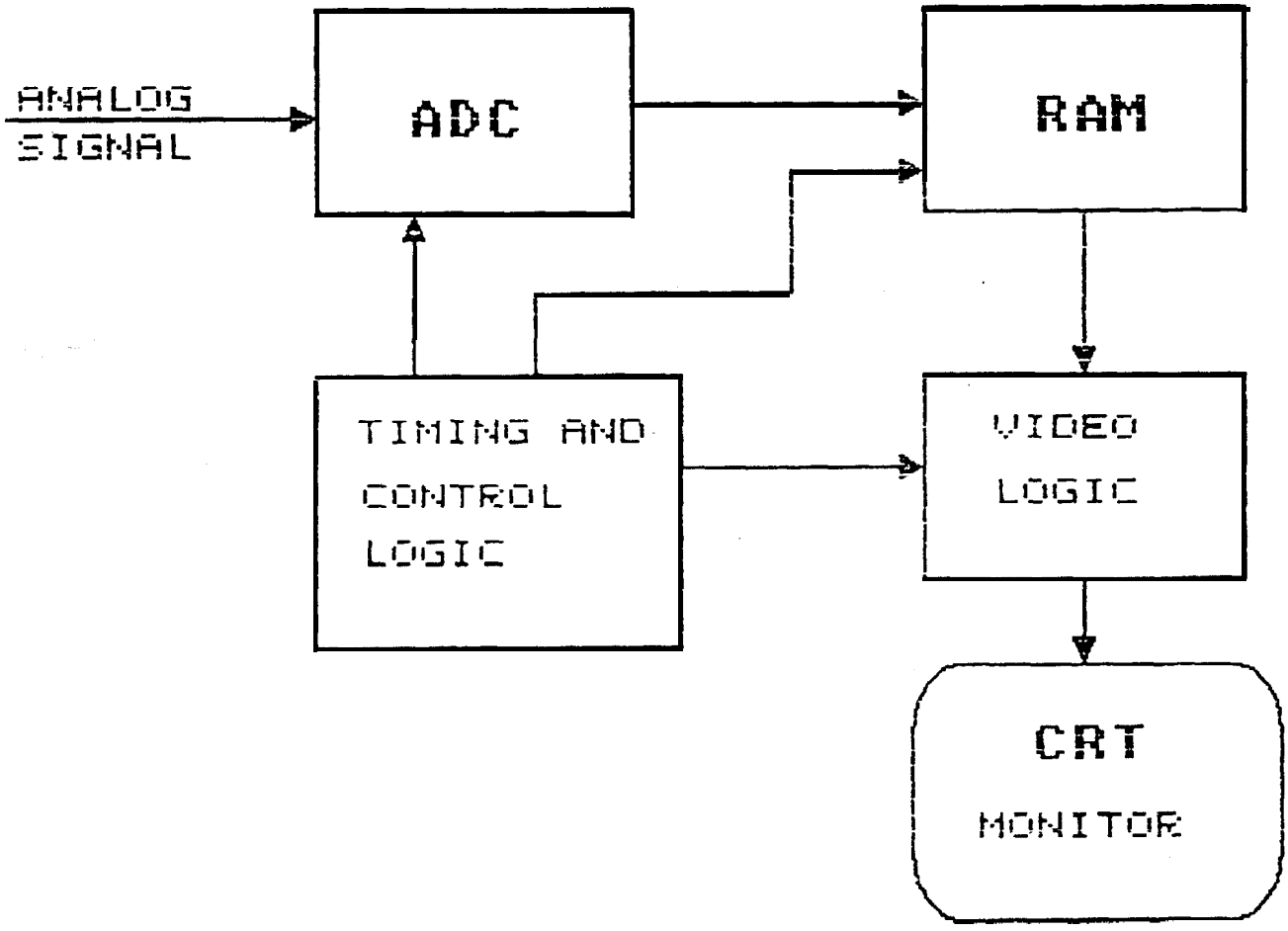


Figure 2. Block diagram of a signal digitizer and display system.

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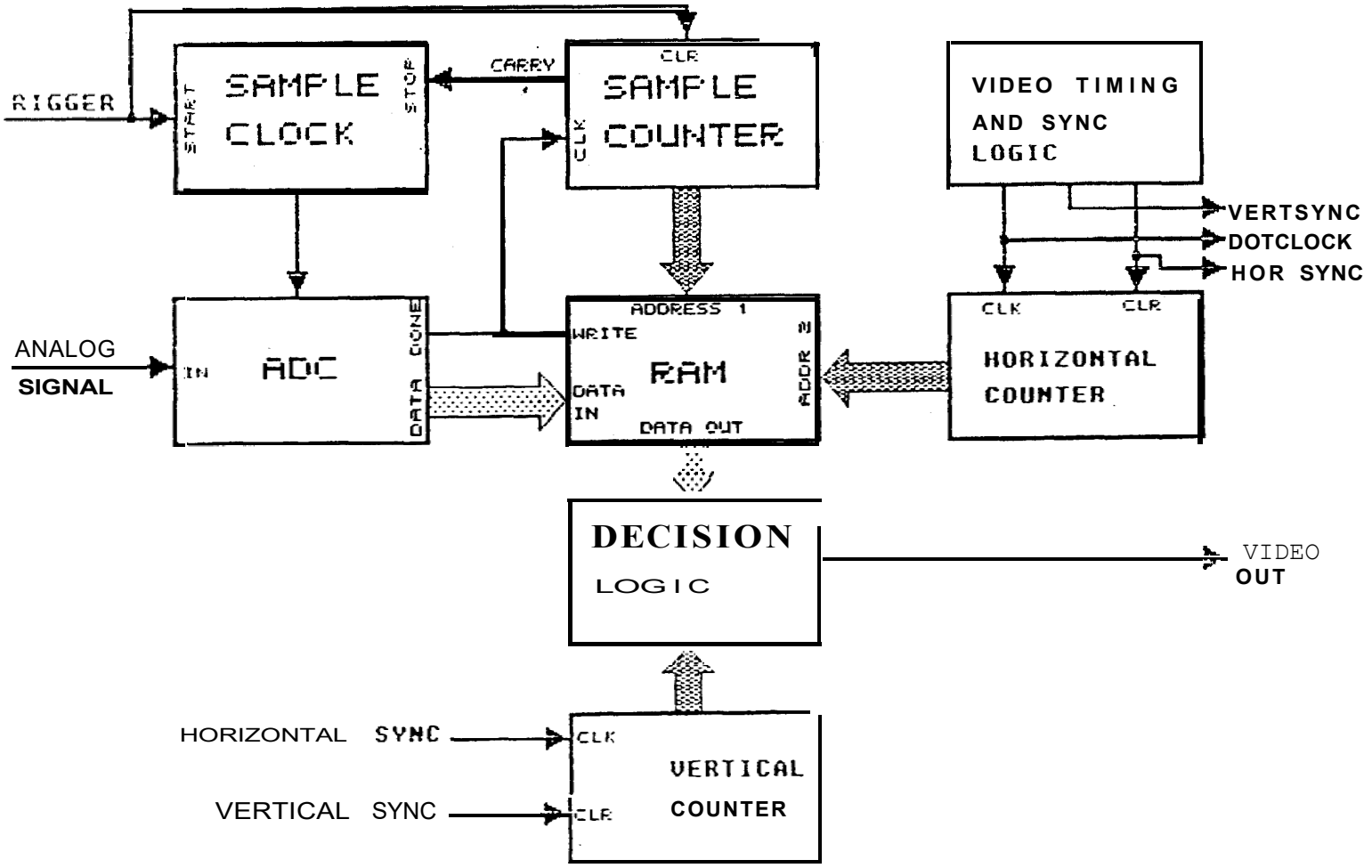


Figure 3.

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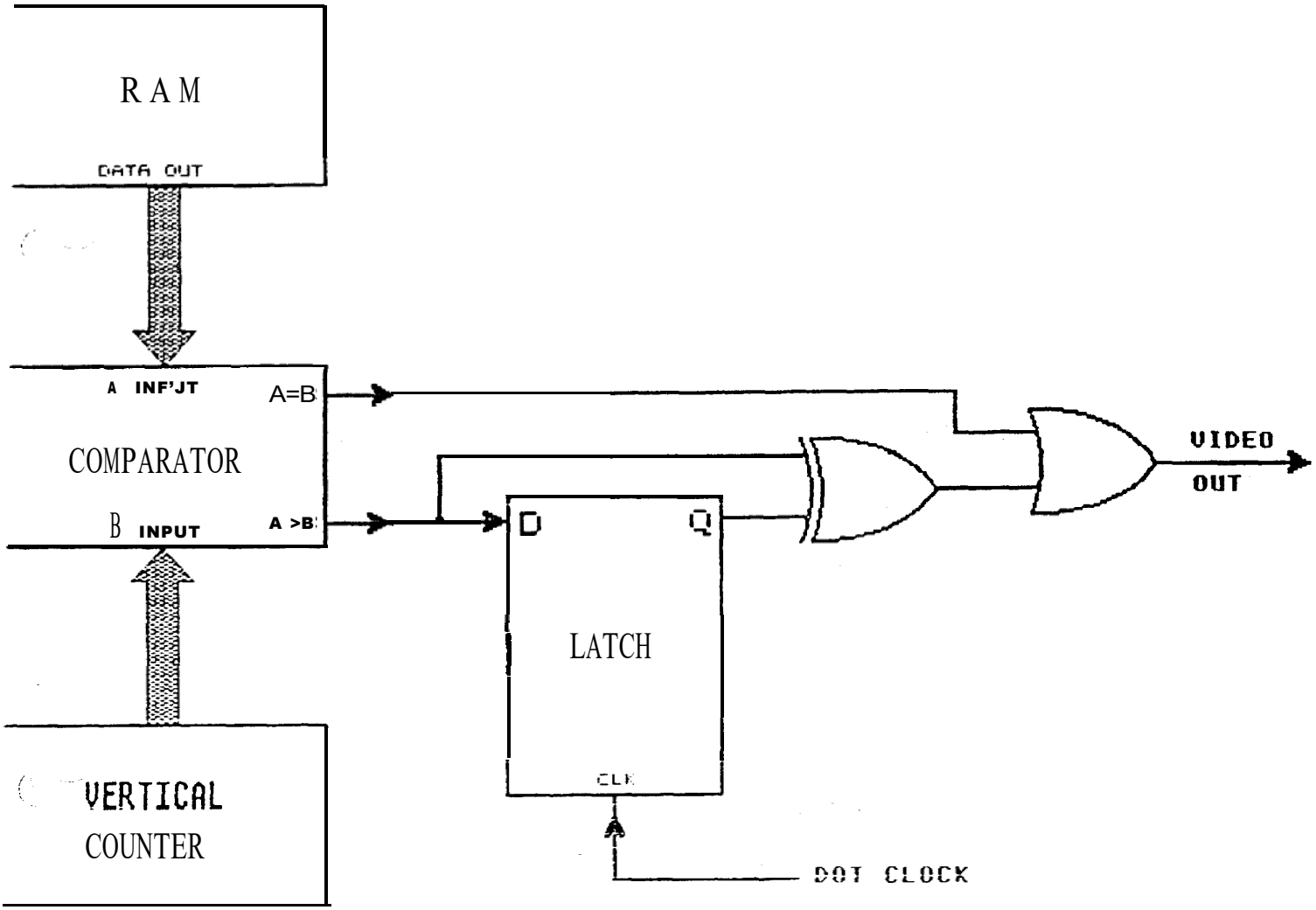


Figure 4. Details of DECISION LOGIC, shown in Figure 3.

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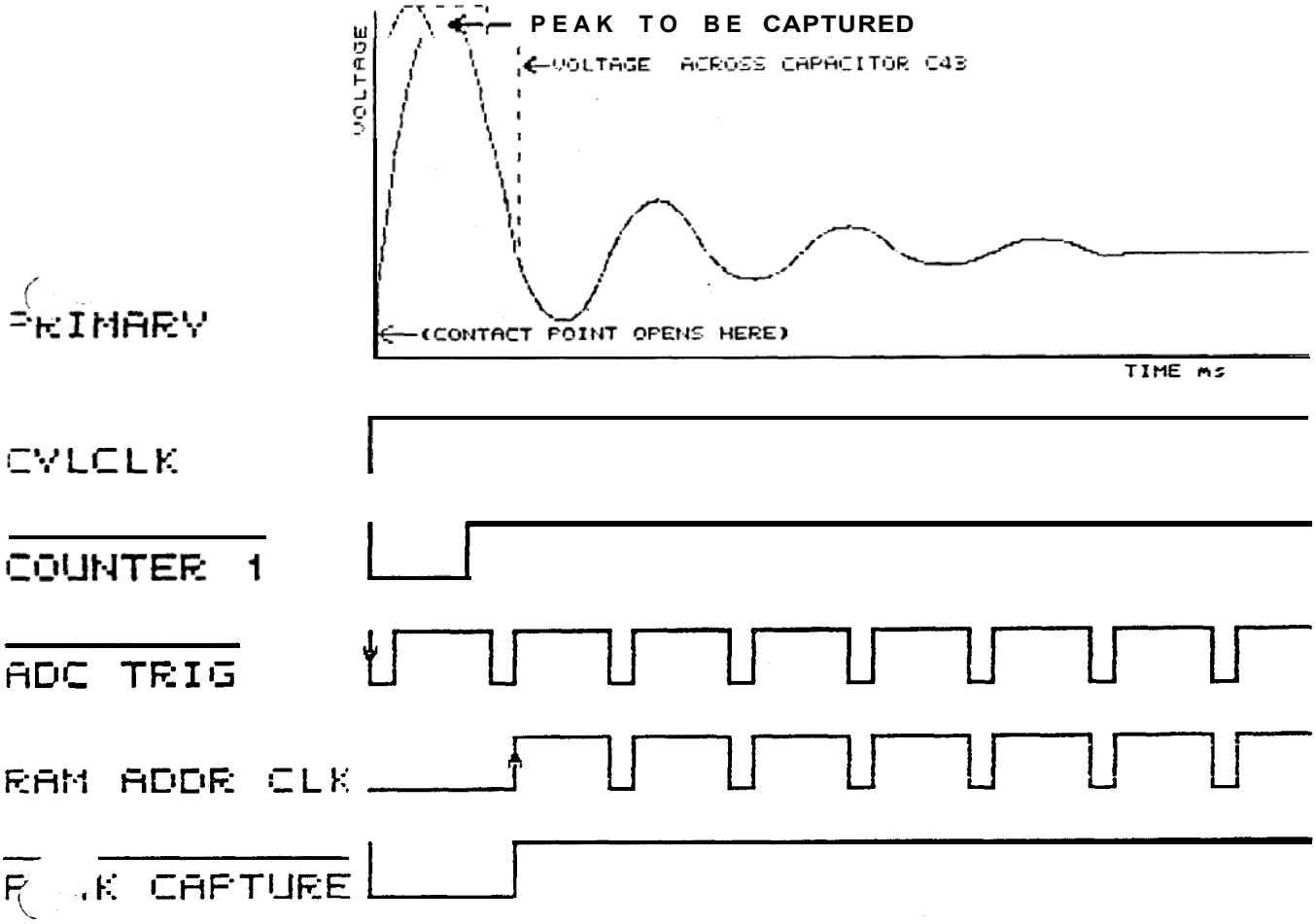


Figure 5.

Peak capture signal is released on a positive ADC TRIGGER signal transition, but not before counter 1 signal is high.
note that only one ADC conversion is stored into RAM during Peak Capture is active.

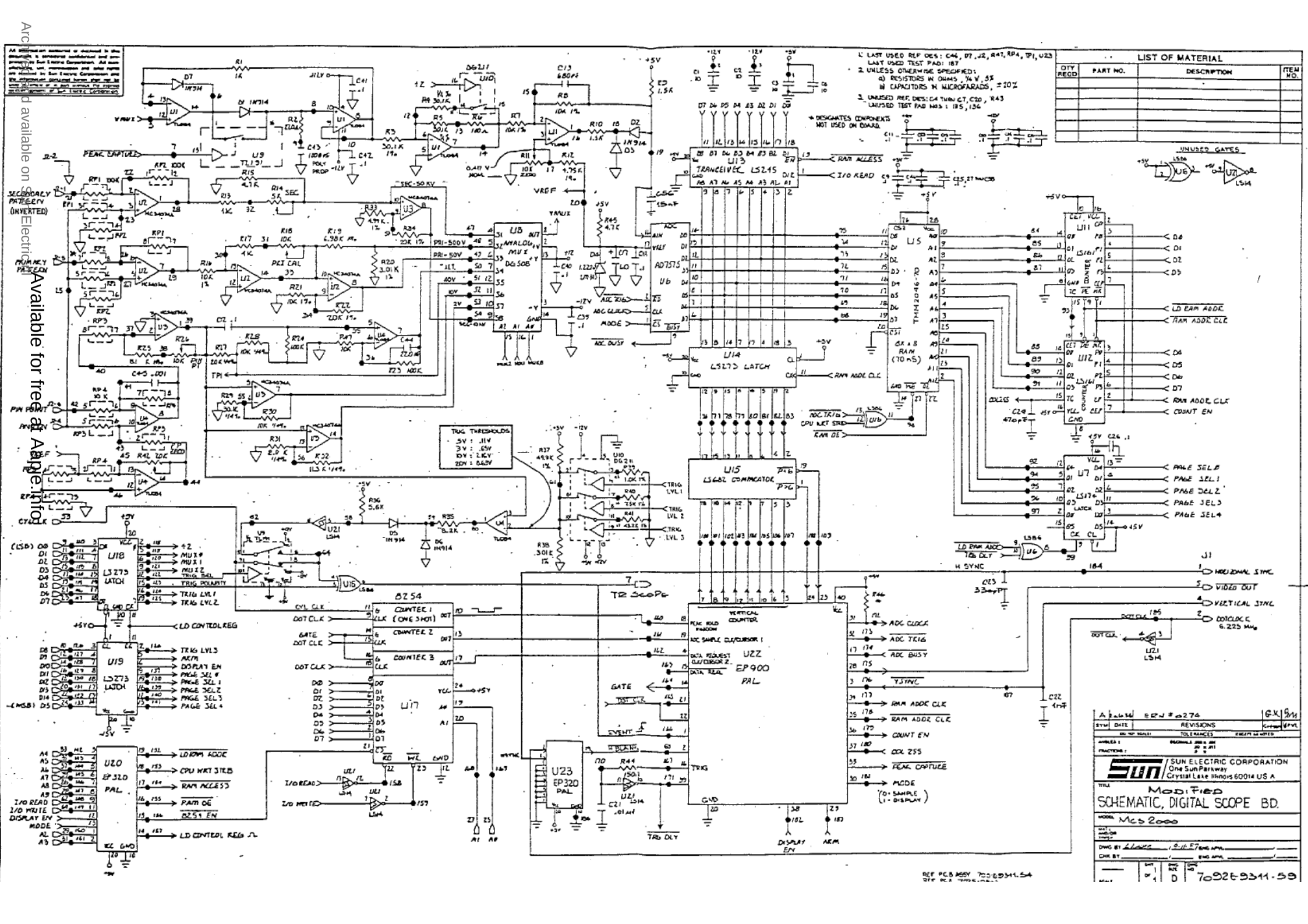
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6.3.3 SCHEMATICS

Archive found available on ElectricStuff
Available for free at Apple.info



6.3.4 PARTS LIST

P/N	Description
7001E9311-54	digital scope board modified
7076-0607	interconnect wiring harness
7076-0606-01	KV/02 wiring harness Pk
7076-0606-02	trigger wiring harness Pt
7076-0605	Volt/Ohm wiring harness PΩ
7076-0608	CRT viring harness P1

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DIESEL OPTION

THE MCS 2000 IS CAPABLE OF MEASURING DIESEL ENGINE RPM AND POINT OF INJECTION TIMING.

THIS IS ACHIEVED USING A PIEZO ELECTRIC TRANSDUCER CONNECTED AROUND THE NUMBER ONE CYLINDER FUEL LINE. THIS TRANSDUCER DETECTS THE CHANGE OF DIAMETER OF THE FUEL PIPE DUE TO THE PRESSURE CHANGE DURING THE START OF DELIVERY TIME FROM THE FUEL PUMP.

THIS PRESSURE WAVEFORM IS TRANSMITTED TO THE DIESEL BD. ALONG THE CO-AXIAL CABLE.

THE DIESEL BOARD PROCESSES THE WAVEFORM TO PRODUCE A NEGATIVE GOING DIESEL OUTPUT PULSE. THIS PULSE IS SOURCED FROM AN OPEN COLLECTOR OUTPUT AND CAN THEREFORE BE CONNECTED DIRECTLY IN PARRALEL WITH THE OPEN COLLECTOR ENGINE SYNC. OUTPUT FROM THE TRIGGER PRIMARY BD. FROM THIS POINT ON THE DIESEL SIGNAL HAS THE SAME FUNCTION AS THE ENGINE SYNC. PULSE GENERATED FROM THE RED TRIGGER PICK-UP, WHICH IS USED TO GENERATE RPM AND MAG OR STROBE TIMING.

A DIESEL SELECT LINE IS USED TO PREVENT SPURIOUS OUTPUTS FROM THE DIESEL BOARD DURING PETROL ENGINE TESTING.
THIS LINE MUST BE PULLED LOW FOR THE DIESEL BOARD TO OUTPUT PULSES.

THE LINE IS CONTROLLED VIA AN OUTPUT FROM THE DIGITAL I/O WHICH IS AUTOMATICALLY PULLED LOW IF DIESEL IS SELECTED IN THE VEHICLE SELECTION PAGE.

THE WIRING FOR THE DIESEL OPTION IS STANDARD IN THE MCS 2000. THE KIT CONTAINS ONLY THE DIESEL BD., PIEZO PICK-UP AND CABLE AND THE MOUNTING HARDWARE.

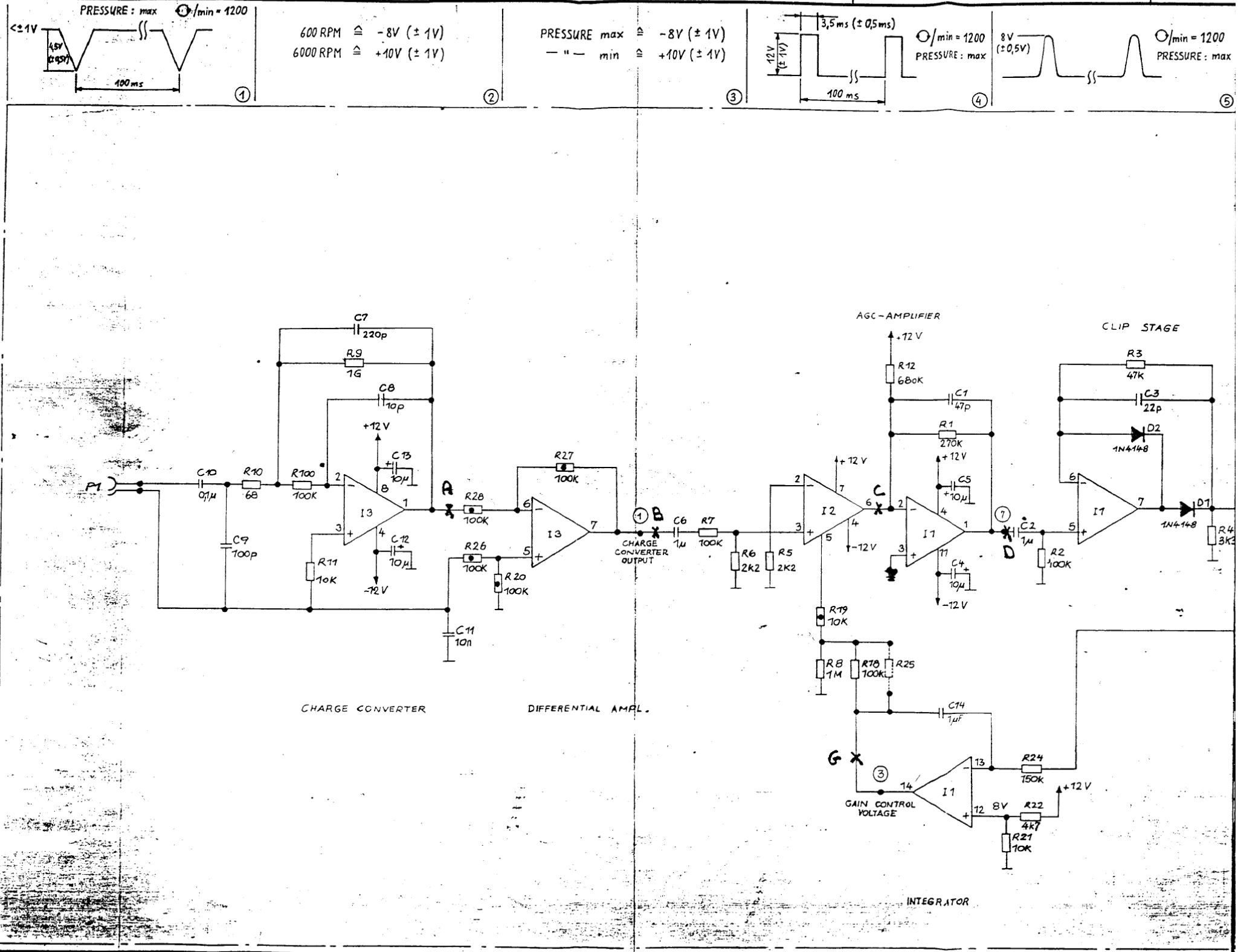
FOR INSTALLATION INSTRUCTIONS SEE KIT CONTENTS.

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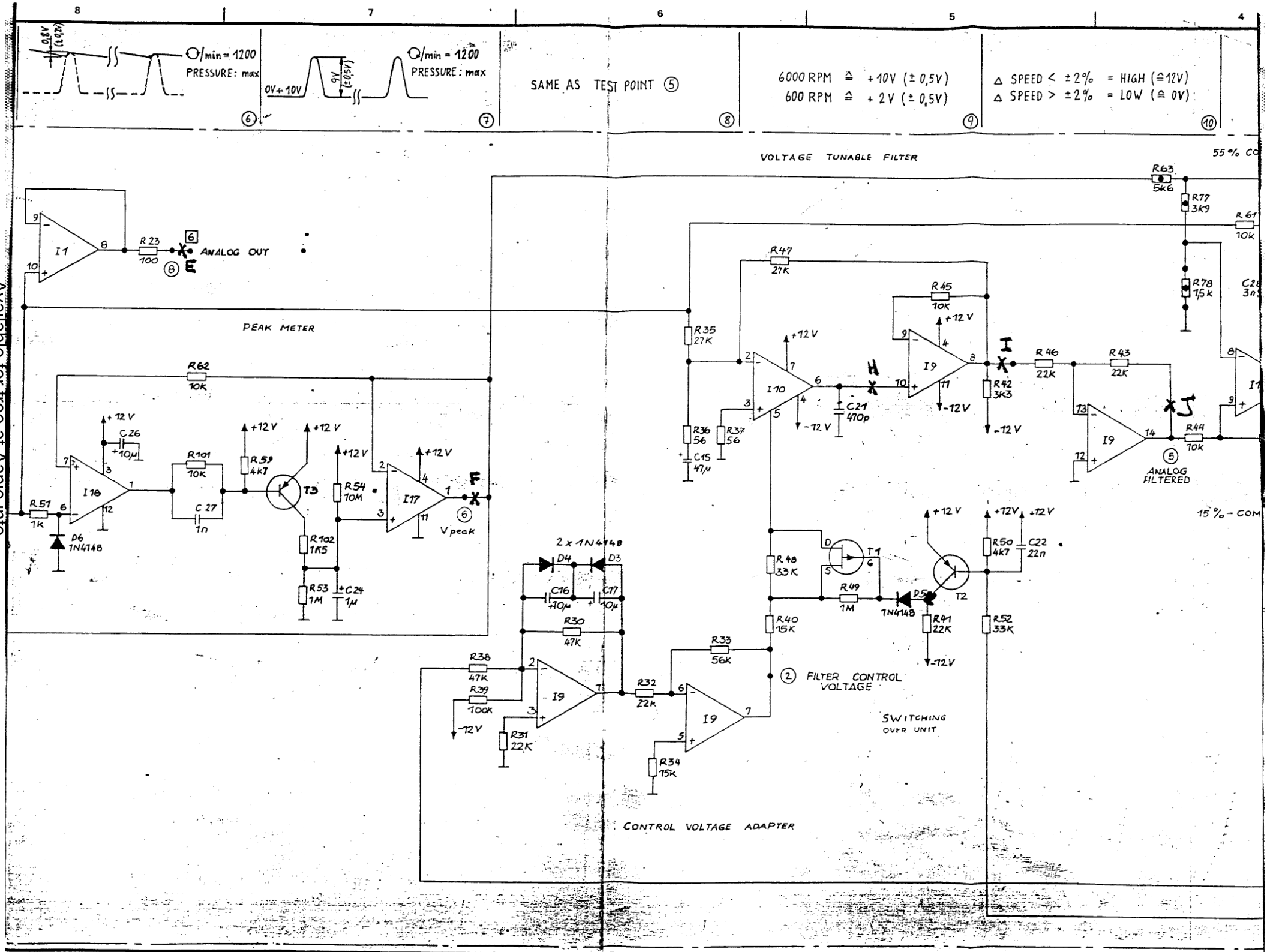
6.4.3 SCHEMATICS

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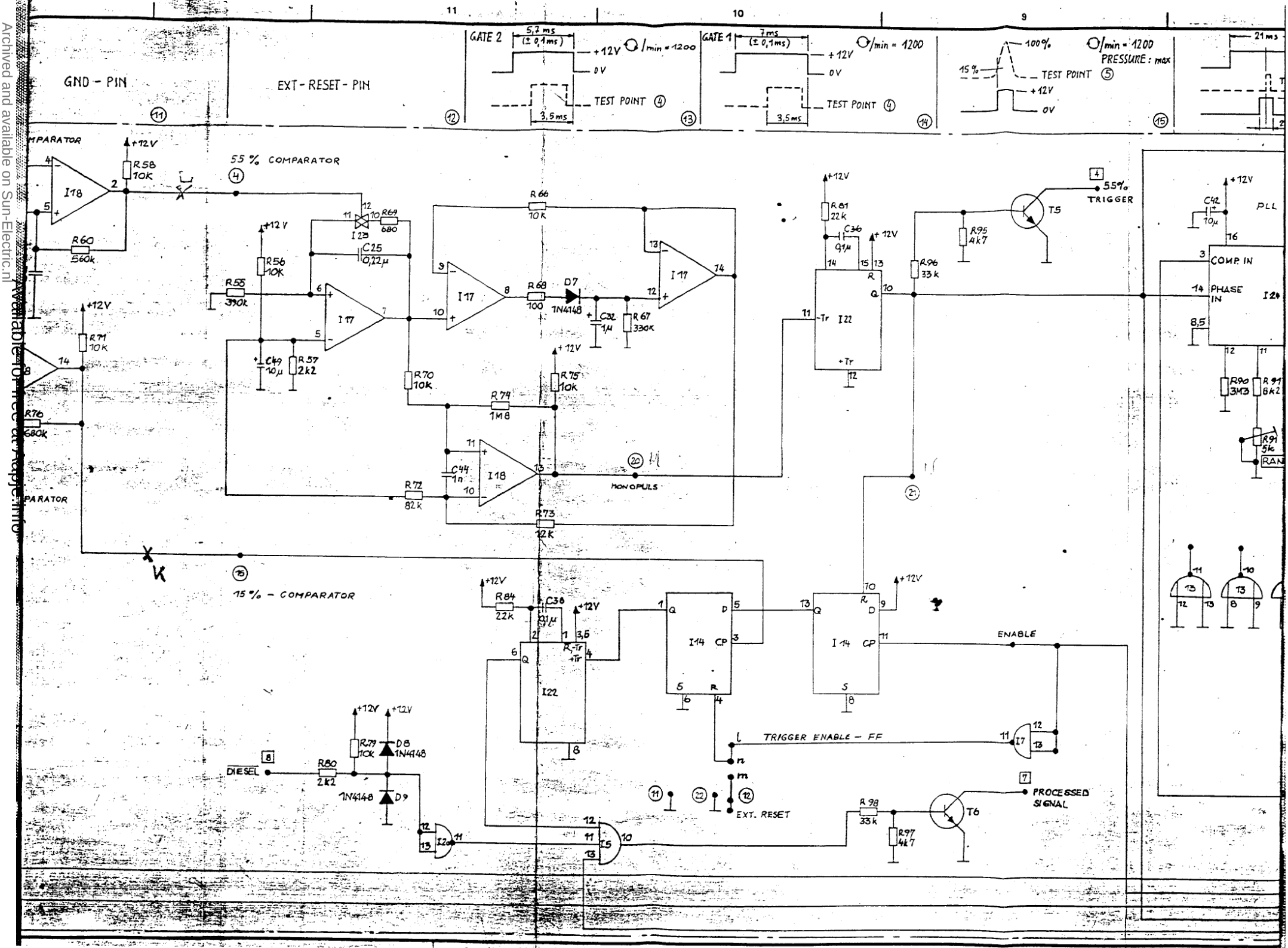
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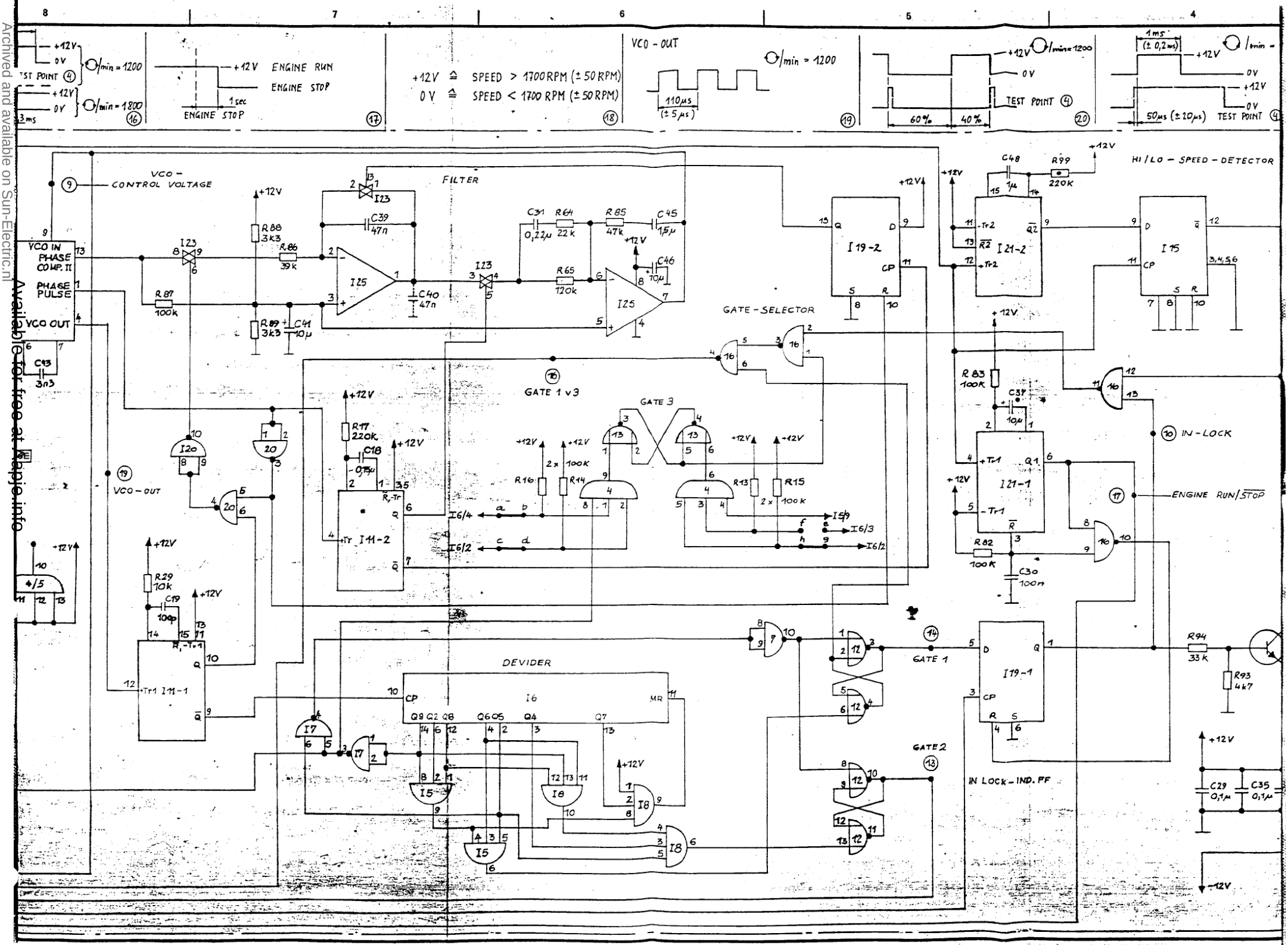
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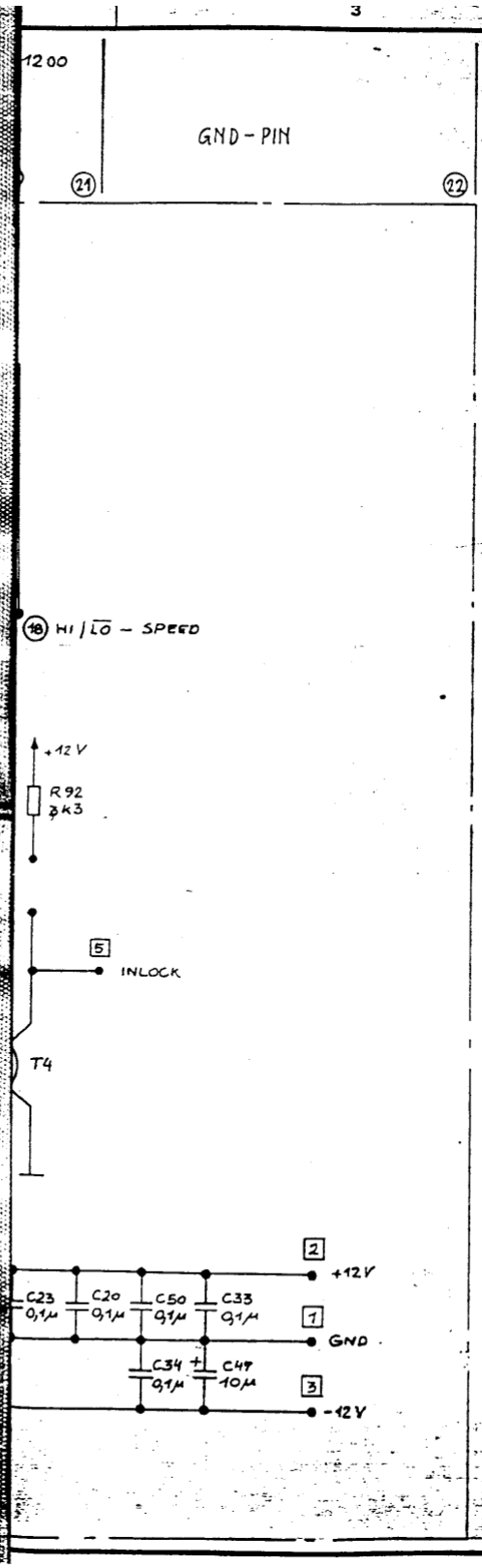


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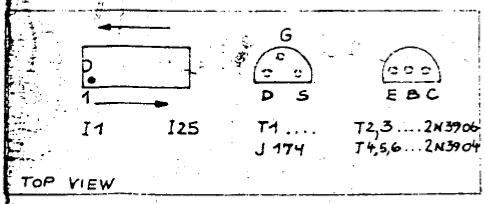
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IC-Nr.	TYPE	PINS	+12V	⊥	-12V
I1	LM324 N	14	4		11
I2	LM3080N	8	7		4
I3	LF 353	8	8		4
I4	4073	14	14	7	
I5	4073	14	14	7	
I6	4040	16	16	8	
I7	4011	14	14	7	
I8	4073	14	14		7
I9	LM324 N	8	7		4
I10	LM3080N	8	7		4
I11	4098	16	16	8	
I12	4001	14	14	7	
I13	4001	14	14	7	
I14	4013	14	14	7	
I15	4013	14	14	7	
I16	4011	14	14	7	
I17	LM324N	14	4	11	
I18	LM339N	14	3	12	
I19	4013	14	14	7	
I20	4011	14	14	7	
I21	4098	16	16	8	
I22	4098	16	16	8	
I23	4066	14	14	7	
I24	4046	16	16	8	
I25	LF 353 N	8	8	4	

a-b	c/d	25.6 u. FB
a-b	c-d	78.8 n. FB
a/b	c-d	51.2 n FB
e-f	g/h	89.6 v. FB
e/f	g-h	76.8 v. FB
e-f	g-h	64 v. FB
e/f	g/h	102.4 v. FB



CARBON FILM RESISTOR 5% 0,25W

METAL FILM RESISTOR 1% 0,25W

ALL OTHER RESISTORS ARE SPECIFIED

S/N	Ä. M.	Tag	Name	S/N	Ä. M.	Tag	Name	S/N	Ä. M.	Tag	Name

Das Urheberrecht an diesen Zeichnungen und allen Beilagen, die dem Empfänger persönlich anvertraut sind, verbleibt jederzeit unserer Firma. Ohne unsere schriftliche Genehmigung dürfen sie nicht kopiert oder vervielfältigt, auch niemals dritten Personen mitgeteilt oder zugänglich gemacht werden.

	Tag	Name
Gez.	7511-08	Nagel
Gepr.		Wallisch

Z.-Nr. 17043-L03/01.01

AVL GRAZ-AUSTRIA

Gerät

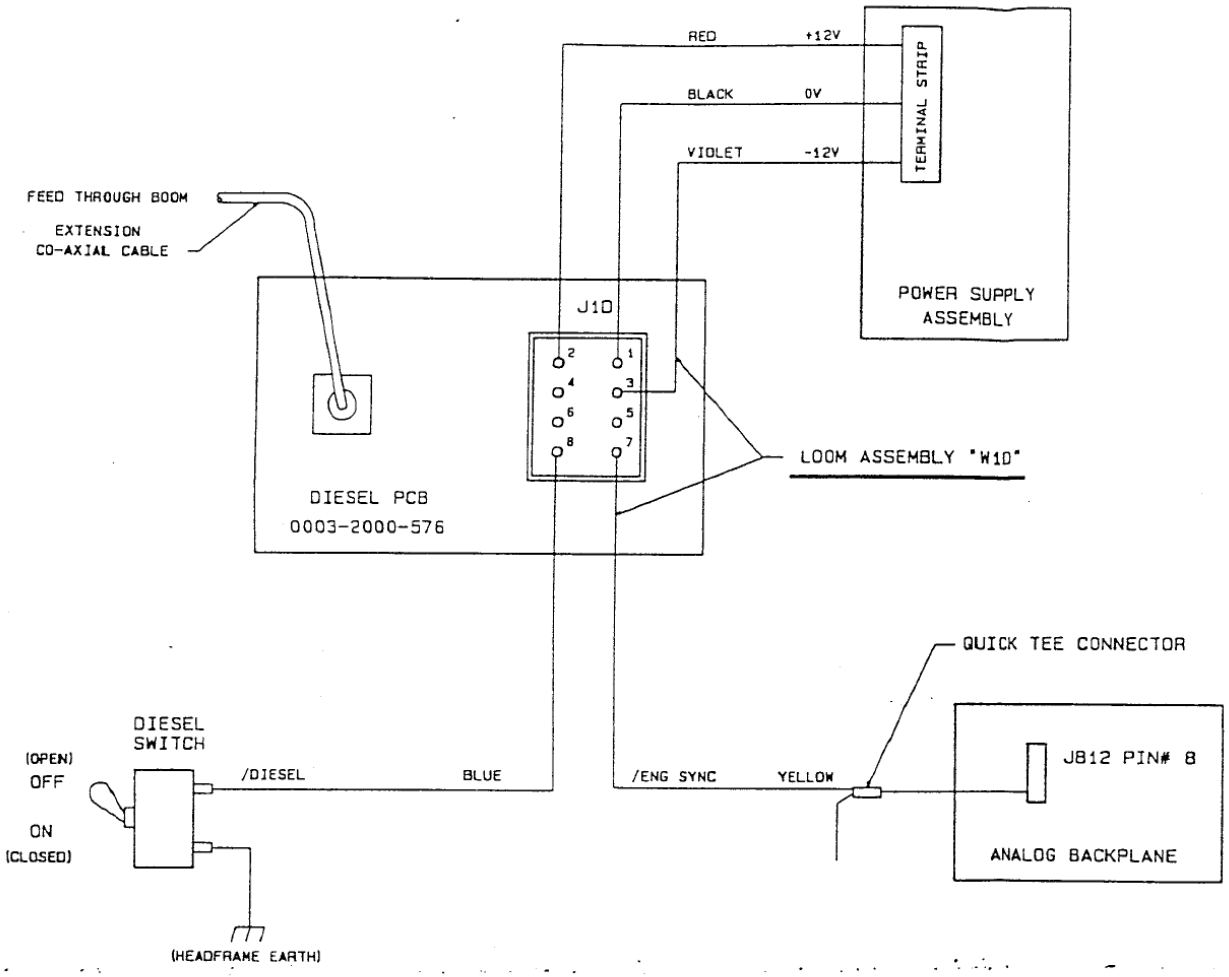
Benennung: CIRCUIT DIAGRAM SUN INJECTION MODULE

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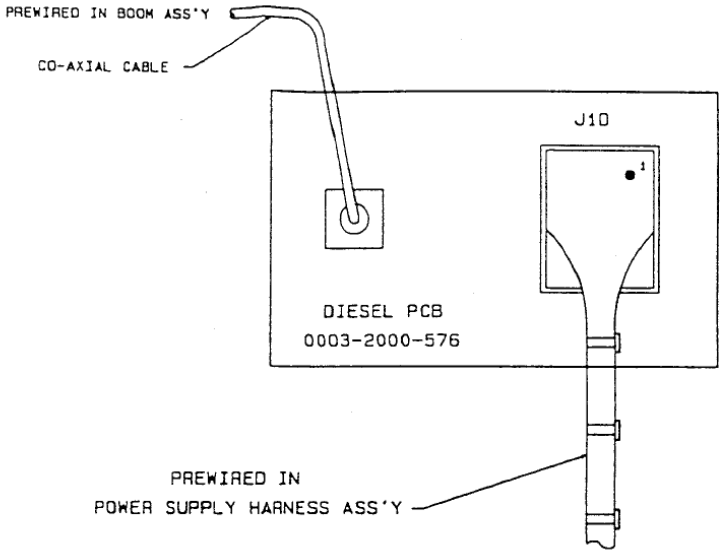
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Revisions					
Rev	Date	ECN	Description	Check	Appr
B	121288		ERN# 0293	P.T.	



SAM 4000 & SUN 2014 CONNECTION DETAILS



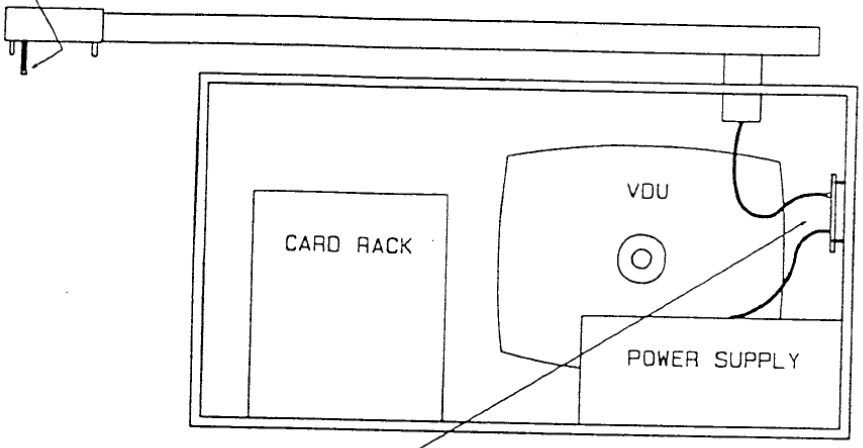
MCS 2000 CONNECTION DETAILS

Ref assy	Date	Used in
Designed by P. TEL	DEC '88	
Drawn by M.TJIN A SOE	160189	
Checked by	190189	
Approved		
Description CONNECTION DETAILS INSTALLATION INSTRUCTIONS UDK		Drawing nr 0692E9305-27
SUN ELECTRIC EUROPE B.V.	A3	Sheet 8 of 13
		Project nr E8724
		Issue B

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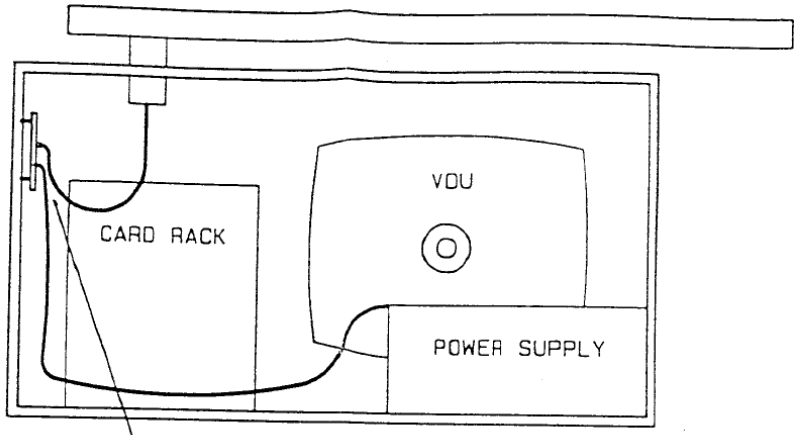
Revisions					
Rev	Date	ECN	Description	Check	Appr
B	121288		ERN# 0293	P.T.	

FEED EXTENSION CO-AXIAL CABLE FROM
DIESEL BOARD THROUGH BOOM WITH
CONNECTOR PROJECTING FROM END OF BOOM.



FIT DIESEL PCB ASS'Y TO SIDE PANEL
WITH NUTS AND SPACERS PROVIDED.

REAR VIEW



FIT DIESEL PCB ASS'Y TO SIDE PANEL
WITH NUTS AND SPACERS PROVIDED.

NOTE: DIESEL LOOMS ARE INTEGRATED
IN FINAL ASSEMBLY.

DIESEL BOARD MOUNTING SAM 4000.

DIESEL BOARD MOUNTING MCS 2000.

Ref assy	Date	Used in
Designed by P.TEL	DEC'88	
Drawn by M.TJIN A SOE	170189	
Checked by Peter Tel	190189	
Approved	24-01-89	

Description MOUNTING DETAILS
INSTALLATION INSTRUCTIONS UDK

Drawing nr 0692E9305-27

SUN ELECTRIC EUROPE B.V. | A3 | Sheet 12 of 13 | Project nr E8724 | Issue B

6.4.4 SPARE PARTS

DESCRIPTION	PART NUMBER
UNIVERSAL DIESEL BOARD	003-2000-576
DIESEL LEAD	003-2000-578
DIESEL PICK-UP 6 MM	0008-0472

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6.5.1

INSTALLATION INSTRUCTIONS

STL-2

SUN ELECTRIC EUROPE B.V.
Spaklerweg 69,1099 BB AMSTERDAM.
Tel: (20) 5682622

0692E9306-05

MARCH 1989

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INDEX

1. GENERAL INTRODUCTION

2. EOUIPMENT REOUIRED

3. KIT CONTENTS

4. PRE-TEST OF MCS-2000

5. STL-2 INSTALLATION PROCEDURE

6. POST INSTALLATION CHECKOUT PROCEDURE

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1. GENERAL INTRODUCTION

GREAT CARE HAS BEEN TAKEN WHEN WRITING THIS INSTALLATION BOOK TO ENSURE A SUCCESSFUL INSTALLATION WHILST MINIMISING THE TIME AND MANPOWER REQUIRED.

THIS BOOKLET IS DESIGNED TO ENABLE THE INSTALLATION TO BE CARRIED OUT USING ONLY THE EQUIPMENT SPECIFIED IN SECTION 2 EQUIPMENT REQUIRED.

BEFORE INSTALLATION MAKE SURE THAT YOUR MCS-2000 IS EQUIPPED WITH VERSION 3.00 EPROMS (REFER TO SERVICE INFORMATION 121).

IT IS RECOMMENDED THAT THE MODIFICATIONS FOR THE CPU AND MEMORY BOARD AS DESCRIBED IN SERVICE BULLETIN 160 HAVE BEEN IMPLEMENTED.

THE FOLLOWING PROCEDURE MUST BE FOLLOWED IN THE SEQUENCE AS LAID DOWN IN THE INDEX, NO PARTS MAY BE SKIPPED. DO NOT TOUCH ANY PARTS OF THE TESTER UNLESS INSTRUCTED TO DO SO.

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2. EQUIPMENT REQUIRED

TOOLS :

ELECTRIC DRILL
DRILL BIT 5 MM
PHILLIPS SCREWDRIVER MEDIUM
SOCKET SET (METRIC 7, 8, 10 MM)
CUTTER
RULER
LIGHT GREASE
BAHCO (CARD RACK)
FILE

TEST EQUIPMENT:

FULL ASCII KEYBOARD.
MCS-SYSTEM DISK V3.00 AND UP.
STL-2 ECU MONITOR PROGRAM DISK V1.04 AND UP.

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3. KIT CONTENTS

THE STL-2 KIT COMES COMPLETE WITH ALL THE NECESSARY PARTS REQUIRED TO INSTALL THE UNIT. THE MAJORITY OF THE KIT HAS BEEN PRE-ASSEMBLED AT THE FACTORY. THE FOLLOWING ITEMS MAKE UP THE KIT.

ITEM	PART NUMBER	QTY.	DESCRIPTION
1	7009E9314-09	1	REMOTE CONTROL ASSY
2	7001E9311-39	1	VIDEO SWITCH BOARD
3	7009E9314-50	1	FLOPPY DRIVE SUB ASSY
4	7009E9314-58	1	FRONT PANEL DISK DRIVE
5	7009E9314-60	1	BASE PLATE
6	7009E9314-72	1	REAR PANEL ASSY
7	7009E9314-85	1	FLOPPY STORAGE ASSY
8	6004E9310-44	1	OPEL COMMUNICATIONS CABLE W8
9	6004E9310-41	1	EXTENSION CABLE W9
10	_7076E9313-23	1	VIDEO-SWITCHBOARD CABLE W24
11	7076E9313-62	1	MCS INTERCONNECTION CABLE W50
12	7076E9313-63	1	MONITOR CABLE W51
13	0536-506	4	INSULATOR SUPPORT PCB
14	7012E9315-75	1	MTG BRACKET VIDEO-SWITCHBOARD
	7009E9314-73		HARDWARE KIT 1, rear panel
1	0404-0412-530	9	SCREW M4*12 BLACK
2	0400-0400-500	9	WASHER PLAIN M4 BLACK
3	0400-0500-503	1	WASHER PLAIN M5
4	0400-0500-203	2	WASHER LOCK M5
5	0409-0500-103	1	NUT M5

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KIT CONTENTS (continued)

ITEM	PART NUMBER	QTY.	DESCRIPTION
	7009E9314-74		HARDWARE KIT 2, floppy storage
1	0404-0412-530	2	SCREW M4*12 BLACK
2	0400-0400-500	2	WASHER PLAIN M4
	7009E9314.75		HARDWARE KIT 3, cover plate mcs
1	7012E9315-76	2	COVER PLATE
2	7012E9315-77	2	BRACKET COVER PLATE
3	7096E9056-74	2	GASKET FOAM
4	0400-0500-503	2	WASHER PLAIN M5
5	0400-0500-203	2	WASHER LOCK M5
6	0409-0500-103	2	NUT M5
	7009E9314-76		HARDWARE KIT 4, floppy drive
1	0409-0500-103	1	NUT M5
2	0409-0600-103	4	NUT M6
3	0400-0500-503	1	WASHER PLAIN M5
4	0400-0600-503	4	WASHER PLAIN M6
5	0400-0500-203	2	WASHER LOCK M5
6	0400-0600-203	4	WASHER LOCK M6
	7009E9314-91		HARDWARE KIT 5. stickers
1	4600E9309-15	1	STICKER ENGLISH VERSION
2	4600E9309-16	1	STICKER GERMAN VERSION
3	4600E9309-17	1	STICKER FRENCH VERSION
4	0692E9305-89	1	INSTALLATION INSTRUCTION STICKER

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4. PRE-TEST OF MCS-2000

THIS PRE-TEST IS NOT INTENDED TO BE A FULL FUNCTIONAL TEST OF THE MCS-2000. IT IS ONLY TO CONFIRM THAT NO MAJOR PROBLEMS EXIST PRIOR TO INSTALLATION.

ANY PROBLEMS FOUND WITH THE MCS-2000 BOTH DURING THIS PRE-TEST AND THE POST INSTALLATION CHECKOUT PROCEDURE SHOULD BE REPORTED TO THE OWNER AND DEALT WITH ACCORDING TO NORMAL PRACTICES.

THE PRE-TEST PROCEDURE MUST BE CARRIED OUT PRIOR TO ANY INSTALLATION WORK.

NOTE: THIS PROCEDURE IS BASED UPON A MCS-2000 FITTED WITH A 20" MONITOR ,THREE GAS EMISSION ANALYSER AND A PRINTER.
EPROM VERSION 3.00.

STEP 1 CHECK MAINS CABLE AND PLUG FOR DAMAGE.

STEP 2 CHECK CONDITION OF ALL LEADS AND PICK-UPS CONNECTED TO THE BOOM.

STEP 3 CONNECT THE TESTER TO AN APPROPRIATE MAINS OUTLET.

STEP 4 INSERT THE MCS-SYSTEM DISK VERSION 3.00 INTO THE MCS-2000 DISK DRIVE.

STEP 5 POWER ON TESTER AND CHECK:

- COOLING FANS RUN
- GREEN LIGHT ON DISK DRIVE LIGHTS

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- TESTER DISPLAYS :

```
**************************************
*       SELFTEST V1.1                *
*                                    *
*       CPU TEST      -- PASSED      *
*       EPROM TEST    -- PASSED      *
*       RAM TEST      -- ...K AVAILABLE *
*       EEPROM TEST -- PASSED        *
*       TIMER TEST    -- PASSED      *
*                                    *
*       BOOTLOADER V1.1              *
*       BOOT DRIVE 0 -- LOADING PROGRAM *
**************************************
```

STEP 6 AFTER +/- 1 MINUTE THE TESTER DISPLAYS:

```
**************************************
*                                    *
*          SSSSSSSSSSSS              *
*         S                          *
*        SSSSS  U  U  NNN    ELECTRIC *
*           S   UU   NN       EUROPE *
*       SSSSS  UUU  N  N             *
*                                    *
*                        NAME  VERSION *
*     SYSTEM DISK     :  MCS   v 3.00 *
*                                    *
*     LOADING CONF. DEPENDENT DATA   *
**************************************
```

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STEP 7 AFTER COMPLETION OF DISK LOADING CHECK TESTER DISPLAYS THE TESTER CONFIGURATION PAGE.

```
**************************
*      TESTER CONFIGURATION      *
*                                *
* PRINTER          CENTRONICS    *
* GAS BENCH          SENSORS     *
* GASES AVAILABLE   CO/C02/HC    *
* CAL ROUTINE            PTB     *
* DIESEL OPTION    NOT DEFINED   *
* DIAGNOSTICS        DEFINED     *
* TECH-15          NOT DEFINED   *
* DIGITAL SCOPE    NOT DEFINED   *
**************************
```

THE CONFIGURATION CAN BE CHANGED IN THE SERVICE UTILITY PAGE.
THE PASSWORD IS : 123123#

STEP 8 THE TESTER AUTOMATICALLY PROCEEDS TO THE WARM-UP PAGE:

```
* ********************* *****
*      TESTER WARM UP            *
*                                *
*   TESTER READY IN 15.00 MIN.   *
*                                *
*      COPYRIGHT (C) 1988        *
*    SUN ELECTRIC EUROPE BV      *
*     ALL RIGHTS RESERVED        *
*                                *
*                                *
* DISCONNECT TESTS LEADS         *
* FROM VEHICLE                   *
**************************
```

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STEP 9 AFTER ALLOWING 5 MINUTES TO LET THE GAS BENCH STABILIZE PRESS P. CHECK TESTER DISPLAYS THE SELFTEST FOR A MOMENT AND CONTINUES WITH THE CALIBRATION PAGE:

```
* * * * * * * * * * * * * * * * * * * * * * * * *
*                TESTER CALIBRATION               *
* ADC REFERENCE                          PASS     *
* AMPS                                   PASS     *
* RIPPLE                                 PASS     *
* ANALOG KV                              PASS     *
* VOLT/OHM                               PASS     *
* VACUUM                                 PASS     *
* HC                                     PASS     *
* CO                                     PASS     *
* CO2                                    PASS     *
* * * * * * * * * * * * * * * * * * * * * * * * *
```

IF NO ERRORS ARE DETECTED AND IF ALL FUNCTIONS HAVE CALIBRATED THE TESTER WILL DISPLAY THE MENU PAGE::

```
* * * * * * * * * * * * * * * * * * * * * * * * *
*                PROGRAM SELECTION                *
* VEHICLE TESTING                                 *
* TESTER CALIBRATION                              *
* SERVICE UTILITY SELECTION                       *
* CUSTOMER MESSAGE EDITOR                         *
* GAS BENCH SPECIAL FUNCTIONS                     *
* LANGUAGE SELECTION                              *
* * * * * * * * * * * * * * * * * * * * * * * * *
```

STEP10 IF THE PRINTER OPTION IS INSTALLED PRESS PRINT BUTTON ON REMOTE CONTROL AND CHECK IF TEXT ON VDU IS PRINTED ON PAPER.

STEP 11 SWITCH OFF TESTER AND DISCONNECT IT FROM THE MAINS SOURCE.

PRE-TEST COMPLETED

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A - HOST TESTER PREPARATION

B - UNPACKING AND MECHANICAL FITTING OF STL-2

C - SYSTEM CONNECTIONS

D - JUMPER SETTING

E - ASCII KEYBOARD (OPTION)

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5A. HOST TESTER PREPARATION

STEP 1 REMOVE THE MCS-2000 REAR PANEL.

STEP 2 REMOVE THE REAR PANEL COVERING THE STL-2 COMPARTMENT. (LEFT FROM GAS BENCH ASSY).

STEP 3 REMOVE THE SCREWS SECURING THE MCS-2000 CONTROL PANEL AND PLACE THE PANEL WITH ITS FRONT FACING DOWNWARDS ON THE CABINET.

STEP 4 REMOVE THE DISK DRIVE FRONT PANEL AND DISCONNECT THE EARTH LEAD CONNECTED TO IT. (NUTS AND WASHERS WILL BE USED AGAIN).

STEP 5 PULL OFF THE METAL STRIP LOCATED ON THE PLASTIC FRONT PANEL AND REMOVE THE FRONT PANEL.

STEP 6 REMOVE THE METAL PLATE WHICH COVERS THE CARD RACKS.

STEP 7 DRILL TWO HOLES FOR MOUNTING THE FLOPPY STORAGE ASSY IN THE LEFT CABINET DOOR AS SHOWN IN FIGURE 1 AT THE END OF THIS BOOKLET.

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5B. UNPACKING AND MECHANICAL FITTING OF STL-2

STEP 1 CAREFULLY REMOVE ALL PARTS FROM THE PACKING AND CHECK THEM OFF AGAINST THE KIT CONTENTS IN SECTION 3.

NOTE: ALL OPTIONS FOR THE STL-2 WILL BE SUPPLIED IN SEPARATE PACKING

STEP 2 **COVER THE LEFT** AND RIGHT HOLE IN THE RIGHT FRONT SIDE OF THE MCS-2000 USING HARDWARE KIT 3 (EXCEPT FOR THE GASKET FOAM).

STEP 3 UNTIGHT THE 4 ROLLERS UNDERNEETH THE STL-2 BASE PLATE ASSY AND PUT SOME LIGHT GREASE ON THE ROLLERS.

STEP 4 LOCATE THE FOLLOWING CABLES IN THE STL-2 ASSY AND BUNDLE THEM TOGETHER:

MAINS CABLE	W23
VIDEO INTERFACE CABLE	W12
FLOPPY DATA-CABLE	W16
FLOPPY POWER CABLE	W18
DDB INTERCONNECTION CABLE	W17
PRINTER INTERFACE CABLE	W13

STEP 5 BEND THE BUNDLE OF LEADS TOWARDS THE REAR OF THE STL-2 BASE PLATE.

STEP 6 LIFT THE BASE PLATE AND SLIDE IT INTO THE STL-2 COMPARTMENT IN THE MCS-2000 AS SHOWN IN FIGURE 2 AT THE END OF THIS BOOKLET.

STEP 7 PULL THE BASE PLATE OUT TO ITS END STOP.

STEP 8 FEED THE CABLE BUNDLE THROUGH THE MIDDLE HOLE AT THE FRONT OF THE MCS-2000.

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STEP 9 IF FITTING THE KEYBOARD OPTION, SEE 5E.

STEP 10 PULL THE CABLE BUNDLE TIGHT FROM THE FRONT OF THE MCS-2000 AND CLOSE THE OPEN SPACE WHICH SURROUNDS THE CABLES USING THE RUBBER GASKET OF HARDWARE KIT 3.

STEP 11 PLACE THE OTHER RUBBER GASKET ON THE SQUARE SLOT AT THE LOWER RIGHT SIDE OF THE MCS-2000 HEADFRAME.
THE REASON FOR CLOSING ALL THE HOLES IS TO PREVENT DIRT ENTERING THE TESTER.

STEP 12 MOUNT THE VIDEO SWITCH BOARD USING THE BRACKET AND STAND-OFFS PROVIDED TO THE TOP OF THE DIGITAL CARD RACK AS SHOWN IN FIGURE 3 AT THE END OF THIS BOOKLET.

STEP 13 MOUNT THE FLOPPY STORAGE ASSY IN THE LEFT DOOR FROM THE MCS-2000 USING THE HOLES DRILLED DURING TESTER PREPARATION AND HARDWARE KIT 2.

STEP 14 PLACE THE APPROPRIATE STICKER FROM HARDWARE KIT 5 ON THE PLASTIC MCS-2000 FRONT PANEL AS PER ENCLOSED INSTRUCTIONS.

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5C. SYSTEM CONNECTIONS

ROUTE CABLES W23 AND W12 FROM THE STL-2 TO THE REAR OF THE MCS-2000 FOLLOWING THE WIRING CONNECTED TO THE ON/OFF SWITCH.

1. MAINS CABLE

STEP 1 CONNECT THE STL MAINS CABLE W23 TO THE MAINS DISTRIBUTION BLOCK IN THE REAR OF THE MCS-2000.

CONNECT BROWN LEAD TO TERMINAL "220V".
CONNECT BLUE LEAD TO TERMINAL "NEUTRAL".

STEP 2 CONNECT THE YELLOW/GREEN EARTH LEAD TO THE NEAREST GROUND STUD.

2. VIDEO

STEP 1 REMOVE P702 FROM THE DIGITAL BACKPLANE.

STEP 2 CONNECT P702S OF CABLE W24 TO J702 ON THE DIGITAL BACKPLANE.

STEP 3 CONNECT J331 OF CABLE W24 SUPPLIED TO P331 ON THE VIDEO-SWITCH BOARD.

STEP 4 REMOVE THE EDGE CONNECTOR LOCATED ON THE KME MONITOR BOARD WHICH IS SITUATED BEHIND THE CRT TUBE.

STEP 5 CONNECT J702 OF CABLE W51 SUPPLIED TO THE EDGE CONNECTOR.

STEP 6 CONNECT J332 OF CABLE W51 TO P332 ON THE VIDEO-SWITCH BOARD.

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STEP 7 CONNECT THE FASTON OF CABLE W51 TO FA1 ON THE VIDEO-SWITCH BOARD. FA1 IS SITUATED NEAR CONNECTOR P332.

STEP 8 CONNECT J330, OF CABLE W12 TO P330 ON THE VIDEO-SWITCH BOARD.

STEP 9 CONNECT J333 OF CABLE W50 SUPPLIED TO P333 ON THE VIDEO-SWITCH BOARD.

STEP 10 CONNECT J5 OF CABLE W50 TO P5 ON THE CENTRONICS-SWITCH BOARD WHICH IS LOCATED IN SLOT J19 OF THE DIGITAL CARDRACK.

STEP 11 REMOVE CONNECTORS J4 AND J6 FROM THE CENTRONICS-SWITCH BOARD. (VIDE0 SWITCHING IS NOW DONE ON THE VIDEO-SWITCH BOARD).

3. FLOPPY DRIVE/DIAGNOSTIC DISPLAY BOARD (DDB)

STEP 1 ROUTE CABLES W16, W17 AND W18 FROM THE STL-2 TO THE COMPARTMENT NEXT TO THE MCS-2000 FLOPPY DRIVE ASSY.

STEP 2 CONNECT JD0 OF CABLE W16 TO THE STL-2 FLOPPY DRIVE DATA CONNECTOR.

STEP 3 CONNECT JDO OF CABLE W18 TO THE STL-2 FLOPPY DRIVE POWER CONNECTOR.

STEP 4 MOUNT THE STL-2 FLOPPY DRIVE ASSY NEXT TO AND EXACTLY AS THE MCS-2000 FLOPPY DRIVE, USING THE M6 NUTS AND WASHERS FROM HARDWARE KIT 4.

STEP 5 CONNECT THE FLOPPY DRIVE EARTH LEAD TO THE NEAREST WELDSTUD.

STEP 6 CONNECT J310 OF CABLE W17 TO P310 ON THE DIAGNOSTIC DISPLAY BOARD, WHICH IS MOUNTED ON THE DISK DRIVE FRONT PANEL (USE THE NUT AND WASHERS REMOVED FROM THE OLD PANEL).

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STEP 7 MOUNT THE DISK DRIVE FRONT PANEL USING THE EXISTING SCREWS AND WASHERS.

4. PRINTER (PRE-WIRING)

STEP 1 ROUTE RIBBON CABLE W13 TO THE FRONT OF THE DIGITAL CARDRACK IN THE MCS-2000 FOLLOWING THE WIRING CONNECTED TO THE ON/OFF SWITCH.

STEP 2 REMOVE THE CENTRONICS-SWITCH BOARD FROM SLOT J19 IN THE DIGITAL CARDRACK AND CONNECT J3MCS OF CABLE W13 TO P3.

STEP 3 RE-MOUNT THE CONTROL PANEL IN ITS ORIGINAL PLACE.

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5D. JUMPER SETTING

BEFORE PERFORMING THE CHECKOUT PROCEDURE THE FOLLOWING BOARDS SHOULD BE CHECKED FOR THEIR CORRECT JUMPER SETTING.

CENTRONICS-SWITCH BOARD (SLOT J19 MCS-2000):

OPTION PRESENT	W1	W2	W3	
NONE	OUT	OUT	2-4	5-6
PRINTER ONLY	IN	OUT	2-4	5-6
STL-2 ONLY	OUT	IN	3-4	5-6
* PRINTER + STL-2	IN	IN	3-4	5-6

JUMPER W4 SHOULD BE OUT.
JUMPER W5 SHOULD BE OUT.

CRT CONTROLLER BOARD (SLOT J14 MCS-2000):

JUMPER W4 SHOULD BE INSTALLED IN POSITION B-B (VDU SYNCHRONISATION).

BUFFER BOARD (SLOT 07 STL-2):

JUMPER W7C SHOULD BE OUT.
JUMPER W7D SHOULD BE INSTALLED (TESTER CONFIGURED AS STL-2).
JUMPER W7E SHOULD BE IN IF A PRINTER IS INSTALLED.

VIDEO-SWITCH BOARD (ON TOP OF DIGITAL CARDRACK):

JUMPERS W1, W2 AND W3 SHOULD BE INSTALLED.
JUMPER W 4 SHOULD BE INSTALLED IN POSITION 1-2.

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5E. ASCII KEYBOARD (OPTION) (PN 7009E9314-42)

THE ASCII KEYBOARD IS SUPPLIED WITH THE STL-2 SYSTEM AS AN OPTION.

KIT CONTENTS

ITEM	PART NUMBER	QTY.	DESCRIPTION	USED IN STL-2
1	7009E9314-13	1	KEYBOARD	1
2	0718-0105	3	"P" CLIPS	1
3	0404-0408-533	2	SCREW M4*8	NONE
4	0400-0400-503	3	WASHER PLAIN M4	1
5	0400-0400-203	2	WASHER LOCK M4	NONE
6	0501-0046	1	GROMMET	1

INSTALLATION PROCEDURE

STEP 1 CUT THE RUBBER GROMMET SUPPLIED IN HALF.

STEP 2 PLACE THE KEYBOARD ON THE MCS-2000, RIGHT FROM THE PRINTER COMPARTMENT.

STEP 3 MAKE A HALF ROUND HOLE OF THE GROMMETS SIZE IN THE LOWER PART OF THE CONTROL PANEL AT THE POSITION WHERE THE SPIRAL CABLE ENTERS THE KEYBOARD AND FIT THE GROMMET.

STEP 4 ROUTE THE SPIRAL CABLE TO THE KEYBOARD INTERFACE BOARD WHICH IS LOCATED ON THE SIDE OF THE STL-2 CARDRACK AND CONNECT THE KEYBOARD PLUG TO J300.

STEP 5 CLAMP ONE OF THE "P" CLIPS SUPPLIED AROUND THE SPIRAL CABLE AND MOUNT THE CLIP UNDERNEED THE NEAREST SCREW IN THE CARDRACK.

STEP 6 PROCEED WITH STEP 10 PAGE 5.4.

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6. POST INSTALLATION CHECKOUT PROCEDURE

NOTES THIS CHECKOUT PROCEDURE CAN ONLY BE DONE USING A FULL ASCII KEYBOARD. IF DURING CHECKOUT AN ERROR(CODE) SHOULD APPEAR REFER TO THE STL-2 SERVICE INFORMATION.

STEP 1 CONNECT THE STL's REMOTE CONTROL TO THE LEFT 14-PIN CONNECTOR ON THE REAR PANEL.

STEP 2 PERFORM STEP 3 THRU 9 ON PAGE 4.1 OF THE PRE-TEST.

STEP 3 DEFINE THE PRINTER AS CENTRONICS IN THE OPTION ENTRY PAGE.

PROCEED AS FOLLOWS:

FROM THE "PROGRAM SELECTION" MENU, SELECT "SERVICE UTILITY", ENTER PASSWORD "123123", AN0 PRESS # TO PROCEED.
FROM THE "SERVICE UTILITY" MENU, SELECT "TESTER CONFIGURATION ENTRY" AND PRESS # TO PROCEED. FOLLOW THE VDU INSTRUCTIONS AND ENTER THE TESTER CONFIGURATION.
PERFORM A TESTER CALIBRATION (NECESSARY FOR RECOGNIZING PRINTER).

STEP 4 PRESS PRINT BUTTON ON REMOTE CONTROL AND CHECK IF TEXT ON VDU IS PRINTED.

STEP 5 CHECK DIAGNOSTIC DISPLAY (LOCATED BETWEEN DISK DRIVES), DISPLAYS: "S50".

STEP 6 CHECK L1. L2. L3 AND L4 ON THE VIDEO-SWITCHBOARD LIGHT UP BRIGHT.

STEP 7 PRESS THE RED PUSH BUTTON LOCATED ON THE STL-2 CPU BOARD.

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STEP 8 PRESS "F4" ON THE KEYBOARD.

CHECK L1, L2, L3, L4 AND L5 ON THE VIDEO-SWITCH BOARD LIGHT UP BRIGHT.

CHECK BOTTOM LINES ON TESTER DISPLAYS:

```
**************************************
*       STL-2 MONITOR V1.1           *
*       PASSWORD:                    *
**************************************
```

STEP 9 PRESS "RETURN". TESTER WILL ASK FOR PASSWORD AGAIN.

STEP 10 PRESS "F" "S" "E" "RETURN".

CHECK TESTER DISPLAYS:

```
**************************************
*  MON                               *
**************************************
```

STEP 11 PRESS "Z" "RETURN" AND CHECK TESTER DISPLAYS:

```
**************************************
* STL-2 DIAGNOSTICS V1.1             *
*                                    *
* TESTING CHECKSUMS -- PASSED        *
* TESTING E2PROM(S) -- PASSED        *
* TESTING DRAMBANKO -- PASSED        *
* TESTING DRAMBANK1 -- NOT INSTALLED *
* TESTING PI/T -- PASSED             *
* TESTING SBI -- PASSED              *
* TESTING BB -- PASSED               *
*. TESTING WRC -- PASSED             *
* TESTING LPT -- PASSED              *
* TESTING AC -- PASSED               *
* TESTING TMP -- PASSED              *
**************************************
```

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STEP 12 PRESS "N" "RETURN".
CHECK: TESTER GOES INTO SUN BUS MONITOR AND DISPLAYS:

```
**************************************
*        STL-2 SUN BUS MONITOR V1.1      *
*                                        *
**************************************
```

STEP 13 PRESS "B" "8" "Ø" "Ø" "Ø" "Ø" "Ø" "RETURN".

STEP 14 PRESS "M" "RETURN".
CHECK TESTER DISPLAYS:

```
* **********************************
* SUN-85 MONITOR V1.0                *
* MODULE :CPB      V1.0              *
* **********************************
```

STEP 15 PRESS "Z" "RETURN" AND CHECK TESTER DISPLAYS:

```
**************************************
* TESTING ROM -- PASSED              *
* TESTING RAM -- PASSED              *
* TESTING RIOT -- PASSED             *
* TESTING PIC  -- PASSED             *
* TESTING PPI1 -- PASSED             *
* TESTING PPI2 -- PASSED             *
* TESTING PIT1 -- PASSED             *
* TESTING PIT2 -- PASSED             *
* TESTING SIO1 -- PASSED             *
**************************************
```

STEP 16 PRESS "E" "RETURN" "E" "RETURN" AND CHECK TESTER RETURNS TO THE MAIN MONITOR PROGRAM.

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STEP 17 PRESS "A" "0" "=" "B" "RETURN"_

STEP 18 PRESS "X" "7" "RETURN" .

CHECK:

- DIAGNOSTIC DISPLAY DISPLAYS: "D07".
- A FULL CHARACTER SET IS DISPLAYED ON THE VDU.

STEP 19 PRESS "ESC" TO STOP TEST.

CHECK TESTER DISPLAYS THE SCREEN TEST PAGE.

STEP 20 PRESS "ESC" "E" "RETURN" "A" "0" "=" "C" "RETURN" "F2".

CHECK TESTER DISPLAYS:

```
**************************
*  MON                   *
**************************
```

STEP 21 PRESS "X" "9" "RETURN"

CHECK TESTER DISPLAYS:

```
**************************************
*      PRINTER STATUS LINES          *
*      W7E   BSY   PE    /FLT        *
*       0     0     0     1          *
**************************************
```

STEP 22 PRESS "ESC" .

CHECK PRINTER STARTS PRINTING A FULL CHARACTER SET.

STEP 23 PRESS"ESC" AND SWITCH PRINTER OFF AND ON TO STOP PRINTING

STEP 24 INSTALL THE PROGRAM DISK IN THE STL-2 DISK DRIVE.

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STEP 25 PRESS "E" "RETURN" "E" "RETURN".
CHECK GREEN LIGHT ON DISK DRIVE LIGHTS.

STEP 26 AFTER COMPLETION OF DISK LOADING CHECK IF THE ILLUMINATED SUN LOGO ON THE REMOTE CONTROL EXTINGUISHES AND COMES ON AGAIN.

STEP 27 PRESS THE VIDEO SELECT BUTTON WHICH IS LOCATED BETWEEN THE HOLD AND PROCEED BUTTON ON THE REMOTE CONTROL.
CHECK TESTER DISPLAYS THE STL MENU PAGE.

STEP 28 FOLLOW INSTRUCTIONS ON THE VDU AND CHECK COMMUNICATION WITH A CAR.
MAKE SURE THAT THE CIRCUIT BREAKER ON THE REAR OF THE STL IS "ON".

STEP 29 SWITCH THE TESTER OFF AND DISCONNECT IT FROM THE MAINS SUPPLY.

STEP 30 SLIDE THE STL-2 UNIT INTO THE MCS-2000.
THE CONNECTOR PANEL SHOULD ALIGN WITH THE MCS-2000 REAR PANEL.

STEP 31 CONNECT THE EARTH LEAD ATTACHED TO THE STL-2 BASE PLATE TO THE STL-2 REAR PANEL SUPPLIED, USING THE M5 NUTS AND WASHERS FROM HARDWARE KIT 1.

STEP 32 MOUNT THE REAR PANEL TO THE STL-2 USING THE BLACK SCREWS AND'WASHERS FROM HARDWARE KIT 1.

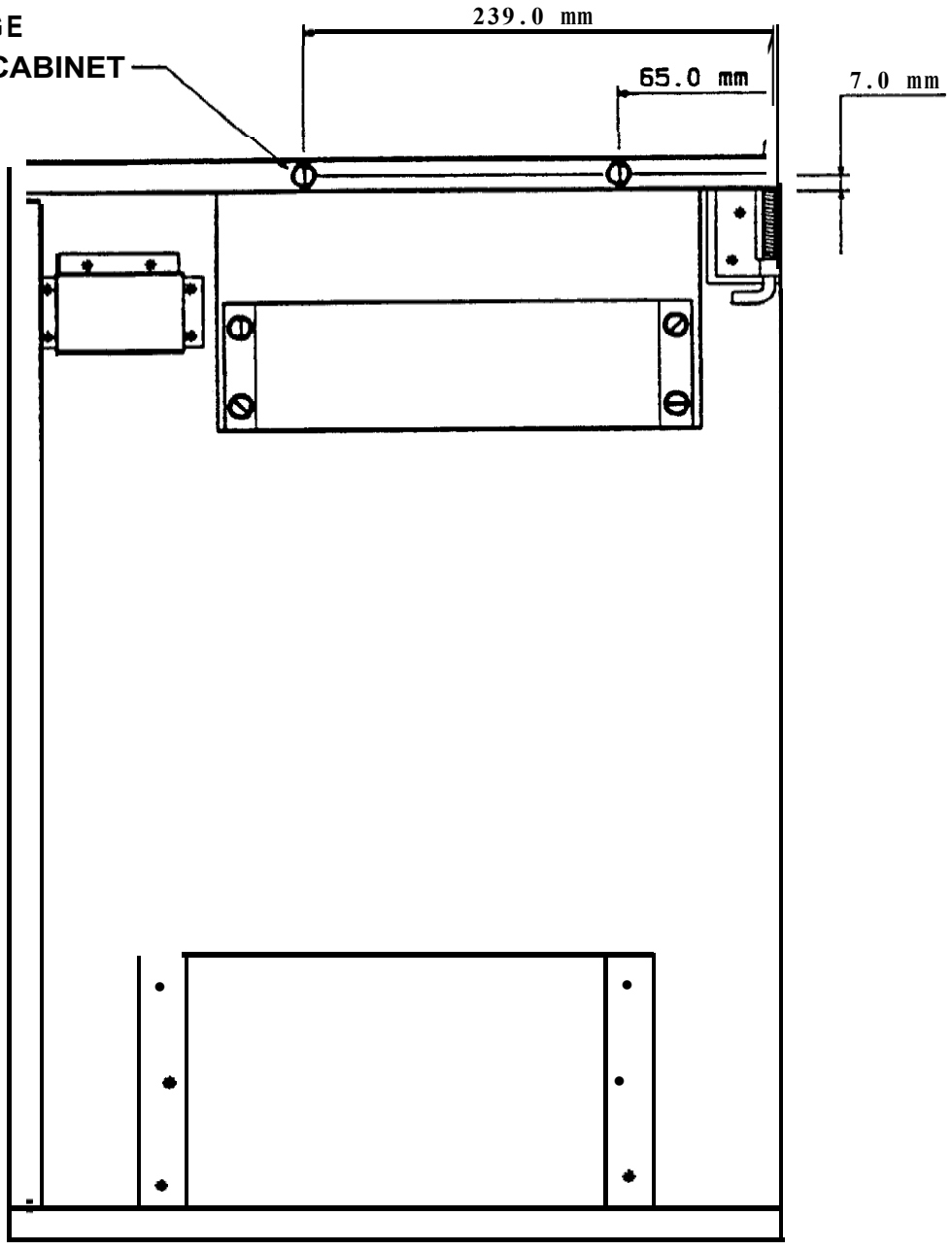
STEP 33 RE-MOUNT THE METAL PLATE WHICH COVERED THE CARDRACKS IN THE MCS-2000.

STEP 34 RE-MOUNT THE PLASTIC FRONT PANEL AND THE METAL STRIP.

STEP 35 DEMONSTRATE THE STL-2 TO THE CUSTOMER.

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DRILL 2 HOLES 5.0 mm DIA.
TO MOUNT FLOPPY STORAGE
BRACKET ON L.H. DOOR CABINET



VIEWED FROM INSIDE OF CABINET

FIGURE 1

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Archived and available on Sun-Electric.nl

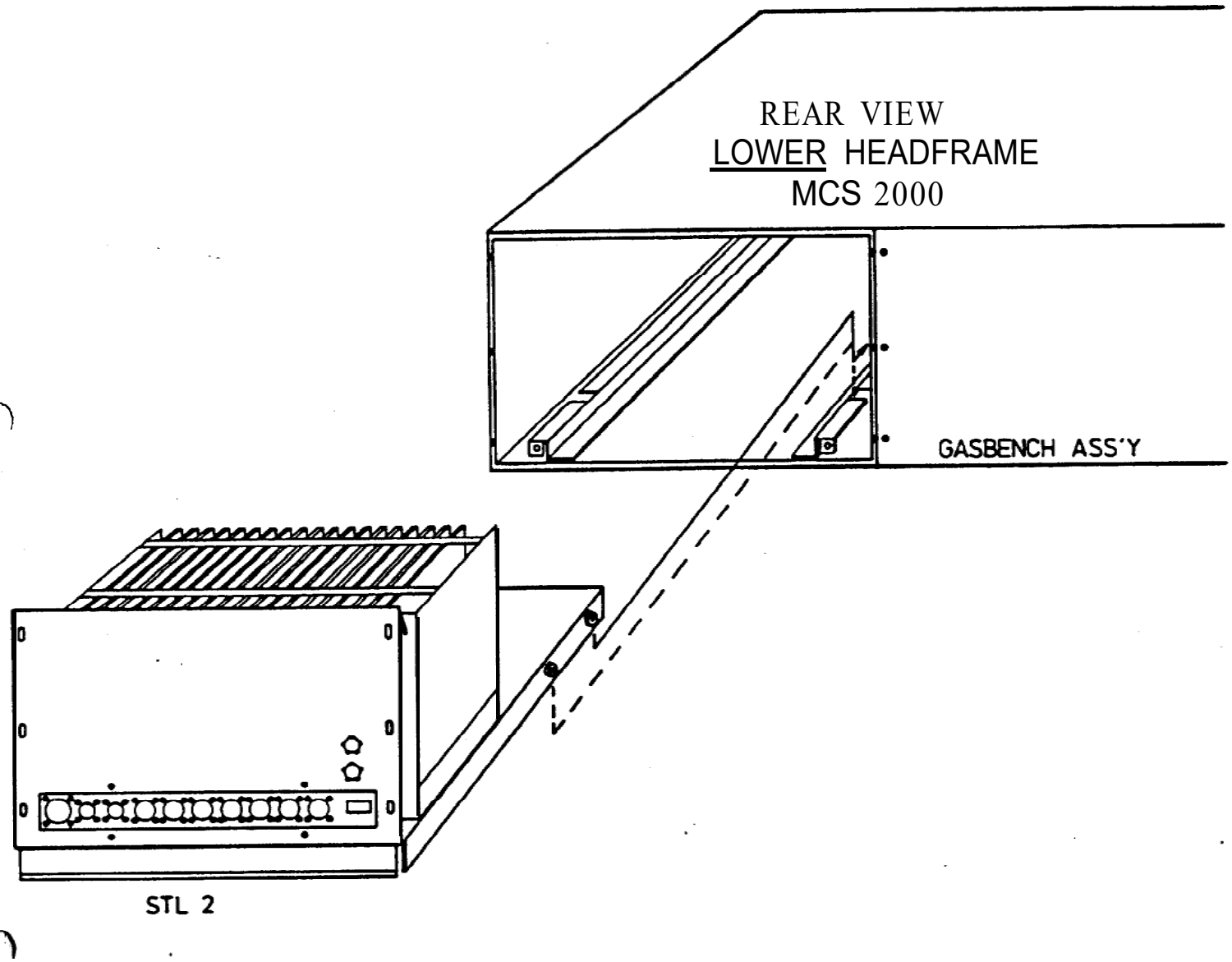
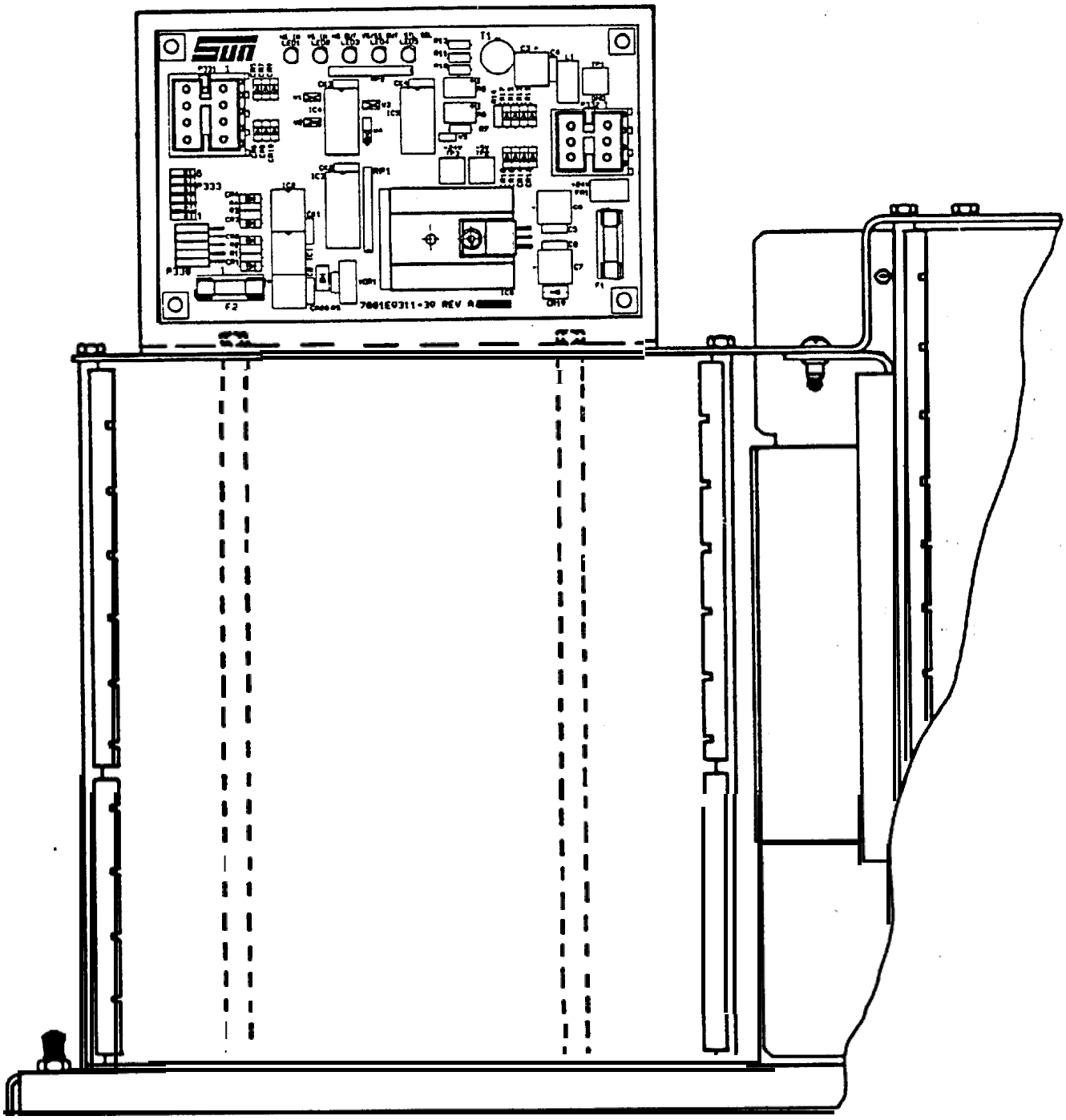


FIGURE 2

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Archived and available on Sun-Electric.nl



FRONT VIEW OF CARDRACK

FIGURE 3

Available for free at Appje.info
Archived and available on Sun-Electric.nl

6.5.2

SET OF SCHEMATICS

OTL-2

STL-2

SUN ELECTRIC EUROPE B.V.
Spaklerweg 69.1099 BB AMSTERDAM
Telephone: (20) 5682622

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Available for free at Aapje.info

LIST OF SCHEMATICS FOR OTL-2/STL-2/ESA 5100

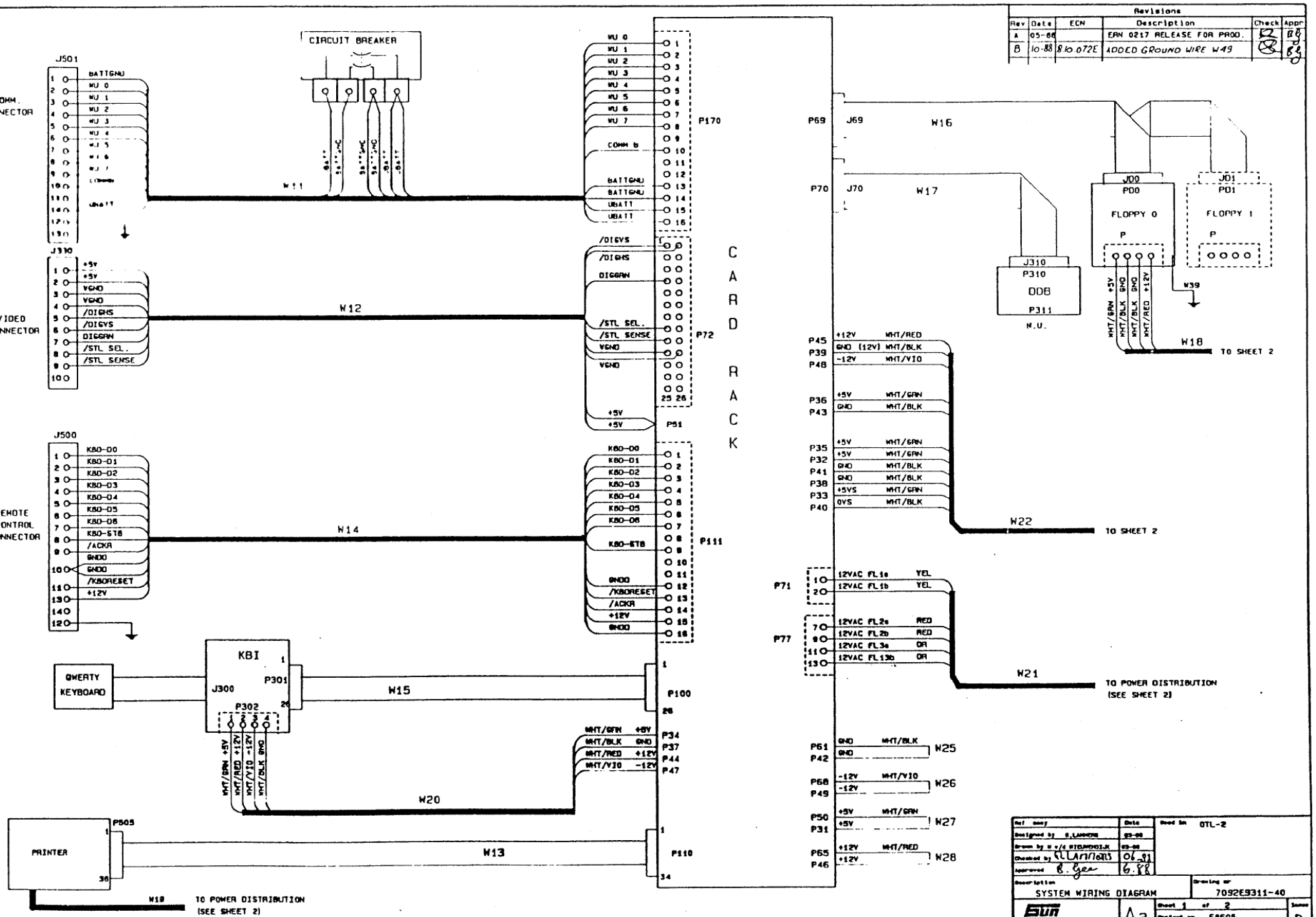
	DESCRIPTION	PART NUMBER	SHEET	ISSUE
1	SYSTEM WIRING DIAGRAM OTL-2	7092E9311-40	1	B
2	SYSTEM WIRING DIAGRAM OTL-2	7092E9311-40	2	B
3	SYSTEM WIRING DIAGRAM STL-2	7092E9311-46	1	A
4	SYSTEM WIRING DIAGRAM STL-2	7092E9311-46	2	A
5	POWER SUPPLY BOARD +/-12 V	7092E9311-35	1	A
6	POWER SUPPLY BOARD +/-12 V	7092E9311-35	2	A
7	SUN BUS 1 BACKPLANE	7092E9311-04	1	A
8	SUN BUS 1 BACKPLANE	7092E9311-04	2	A
9	I/0 BACKPLANE	7092E9310-93	1	A
10	I/O BACKPLANE	7092E9310-93	2	A
11	I/O BACKPLANE	7092E9310-93	3	A
12	CPU 68 K BOARD	7092E9311-06	1	B
13	CPU 68 K BOARD	7092E9311-06	2	B
14	CPU 68 K BOARD	7092E9313-06	3	B
15	CPU 68 K BOARD	7092E9311-06	4	B
16	CPU 68 K BOARD	7092E9311-06	5	B
17	CPU 68 K BOARD	7092E9311-06	6	B
18	CPU 68 K BOARD	7092E9311-06	7	B
19	CPU 68 K BOARD	7092E9311-06	8	B
20	CPU 68 K BOARD	7092E9311-06	9	B
21	BUFFER BOARD	7092E9310-87	1	B
22	BUFFER BOARD	7092E9310-87	2	B
23	BUFFER BOARD	7092E9310-87	3	B
24	BUFFER BOARD	7092E9310-87	4	B
25	BUFFER BOARD	7092E9310-87	5	B

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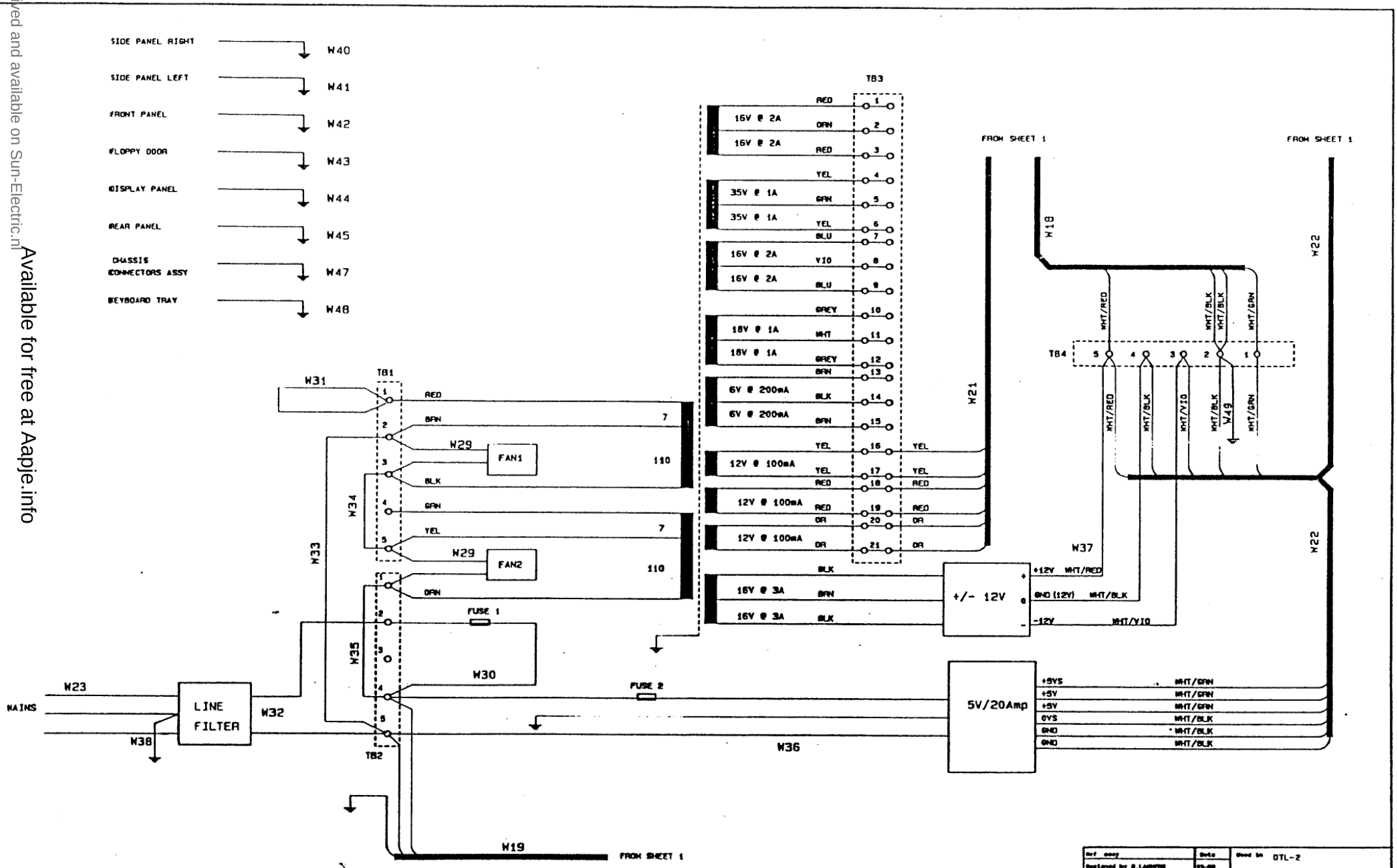
	DESCRIPTION	PART NUMBER	SHEET	ISSUE
26	COLOR GRAPHICS CRT INTERFACE	7092E9310-84	1	D
27	COLOR GRAPHICS CRT INTERFACE	7092E9310-84	2	D
28	COLOR GRAPHICS CRT INTERFACE	7092E9310-84	3	D
29	COLOR GRAPHICS CRT INTERFACE	7092E9310-84	4	D
30	COLOR GRAPHICS CRT INTERFACE	7092E9310-84	5	D
31	COLOR GRAPHICS CRT INTERFACE	7092E9310-84	6	D
32	COMMUNICATION PROCESSOR BOARD	7092E9311-15	1	C
33	COMMUNICATION PROCESSOR BOARD	7092E9311-15	2	C
34	COMMUNICATION PROCESSOR BOARD	7092E9311-15	3	C
35	COMMUNICATION PROCESSOR BOARD	7092E9311-15	4	C
36	COMMUNICATION PROCESSOR BOARD	7092E9311-15	5	C
37	COMMUNICATION PROCESSOR BOARD	7092E9311-15	6	C
38	COMMUNICATION INT. BOARD	7092E9311-12	1	B
39	COMMUNICATION INT. BOARD	7092E9311-12	2	B
40	COMMUNICATION INT; BOARD	7092E9311-12	3	B
41	COMMUNICATION INT. BOARD	7092E9311-12	4	B
42	COMMUNICATION INT. BOARD	7092E9311-12	5	B
43	DIAGNOSTIC DISPLAY BOARD	7092E9310-90	1	A
44	DIAGNOSTIC DISPLAY BOARD	7092E9310-90	2	A
45	KEY BOARD INTERFACE	7092E9310-96	1	A
46	KEY BOARD INTERFACE	7092E9310-96	2	A
47	REMOTE CONTROL PROCESSOR BD.	7092E9311-00	1	B
48	REMOTE CONTROL PROCESSOR BD.	7092E9311-00	2	B
49	REMOTE CONTROL PROCESSOR BD.	7092E9311-00	3	B
50	VIDEO WITCH BOARD	7092E9311-41	1	A
51	VIDEO WITCH BOARD	7092E9311-41	2	A
52	COMMUNICATION CABLE W8	6004E9310-44	1	A

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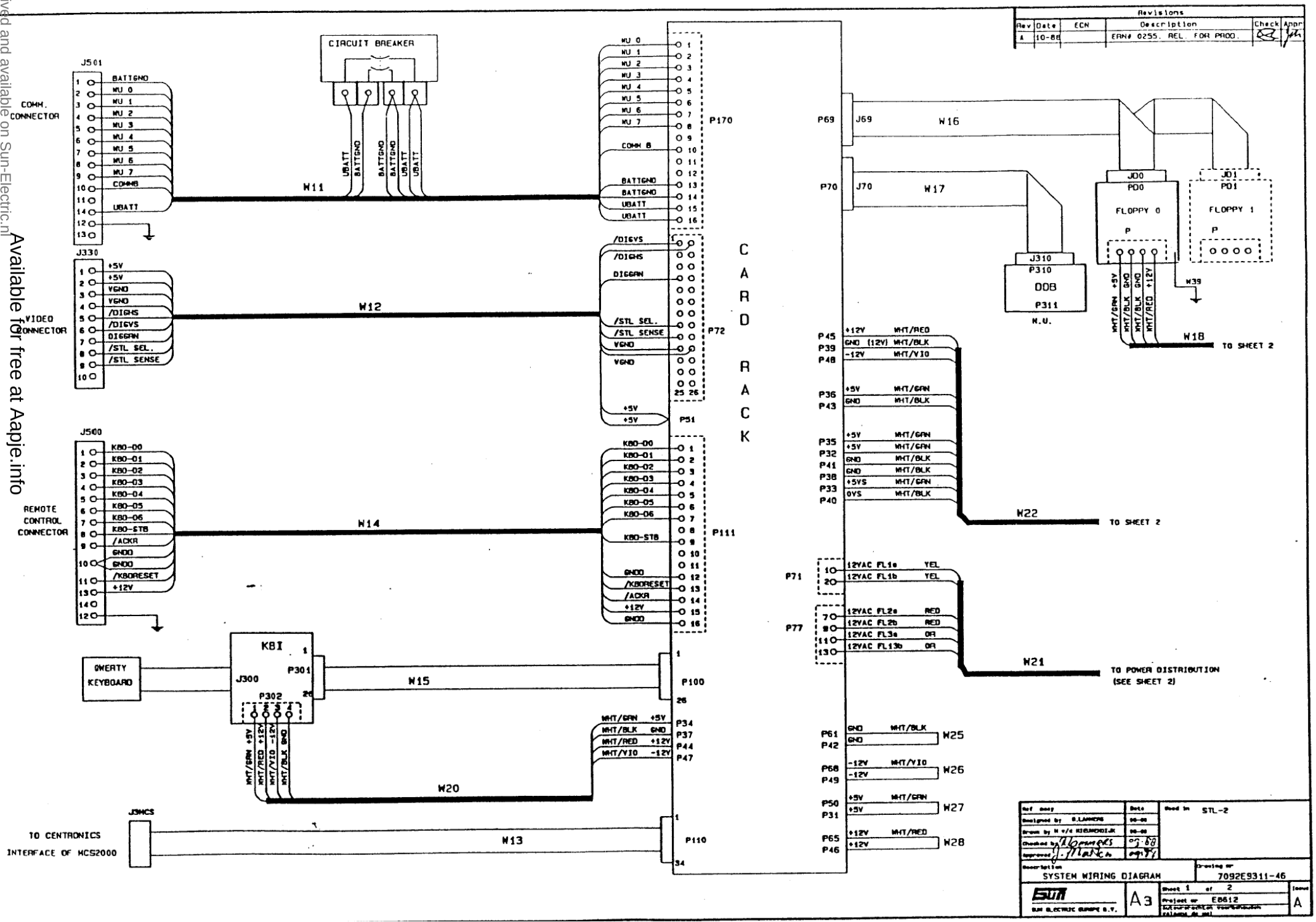
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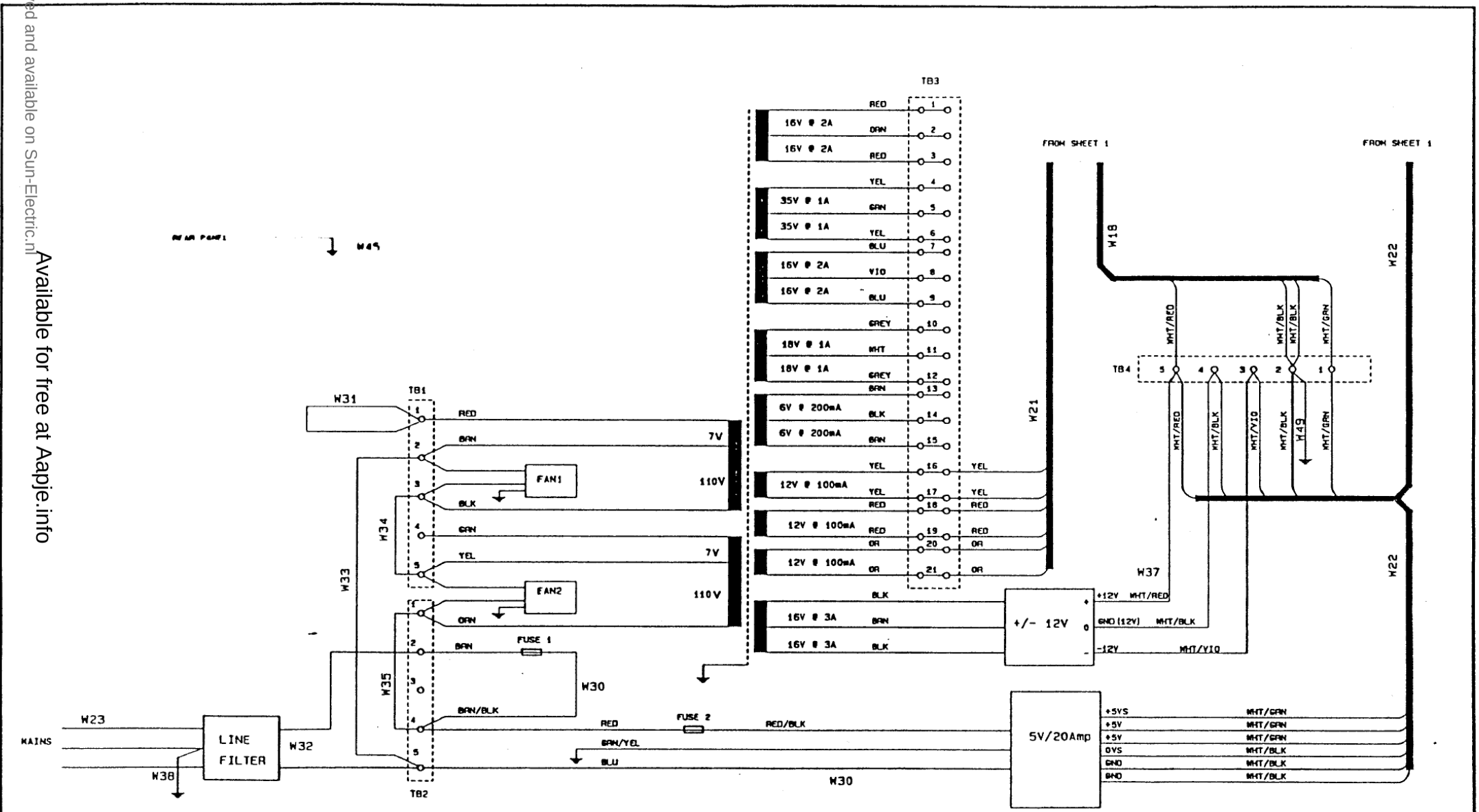
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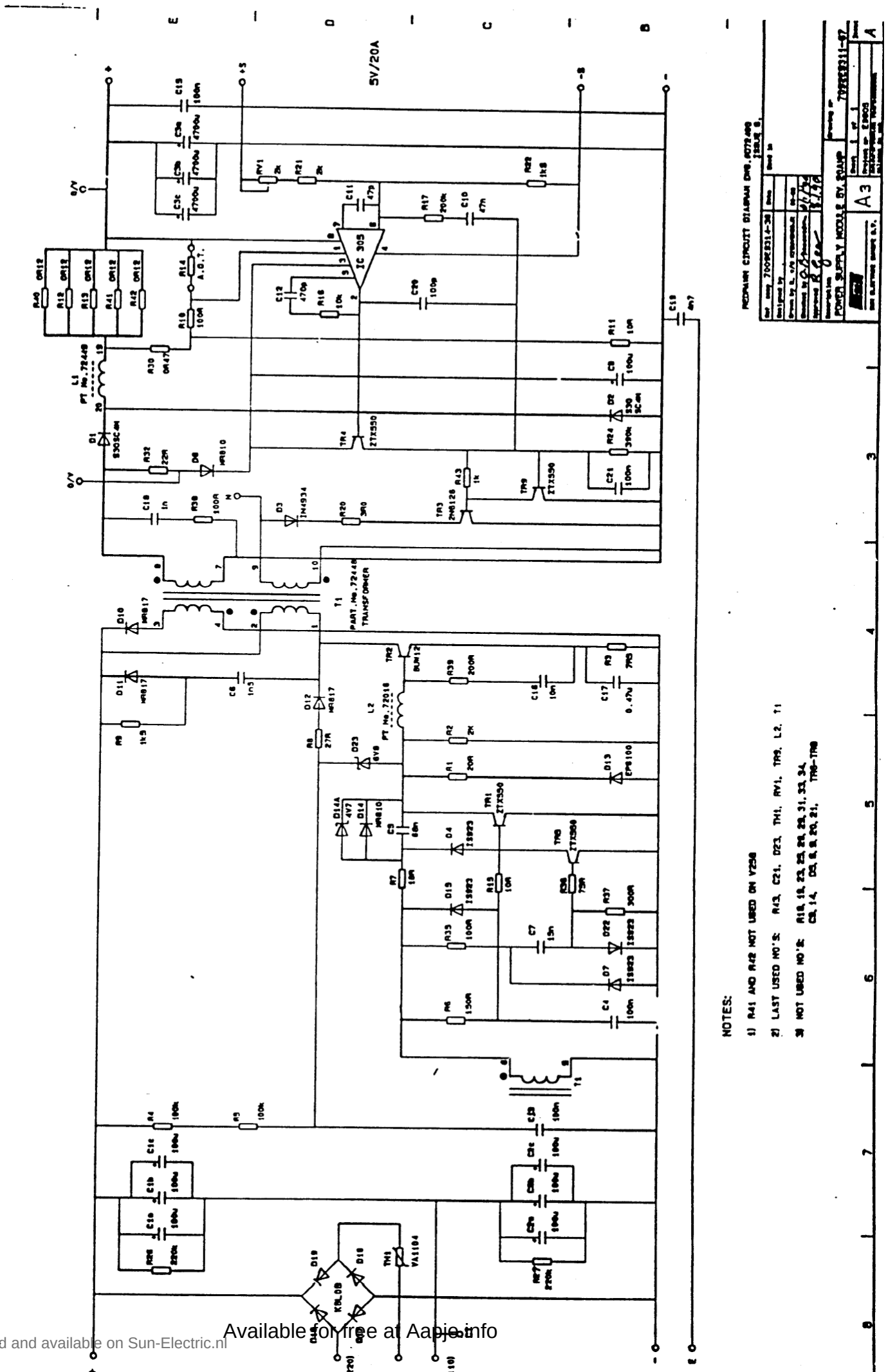


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Ref. assy	Date	Based on	STL-2
Designed by B.LAMMERS	06-00		
Drawn by B.v/d RIJSMOOSJK	06-00		
Checked by	09-01		
Approved	09-01		
Description: SYSTEM WIRING DIAGRAM		Drawing nr: 7092E9311-46	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 2 of 2	Issue A
		Project nr E8612	

4A



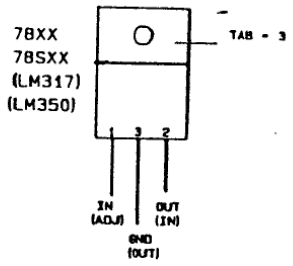
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Available for free at Aapje.info

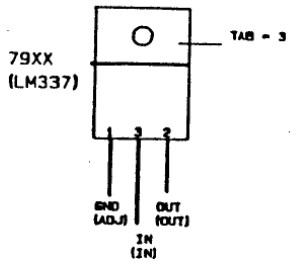
Revisions					
Rev	Date	ECN	Description	Check	Appr
A	05-88		ERN# 0217. RELEASE FOR PROD		

FOR REFERENCE ONLY:

POSITIVE REGULATOR



NEGATIVE REGULATOR



NOTES:
1/ UNLESS OTHERWISE SPECIFIED:
- A/ ALL RESISTORS ARE IN OHMS, 1/4W, 5%
- B/ ALL CAPACITORS ARE IN MICRO-FARADS
- C/ ALL DIODES ARE 1N4004
- D/ ALL IC'S ARE 74LS-SERIES TYPE
- E/ ALL POLARIZED CAPACITORS ARE 16V

2/ LAST USED NO'S: CR18, R22, LED3, C12, Z2, T4, F2, FA10

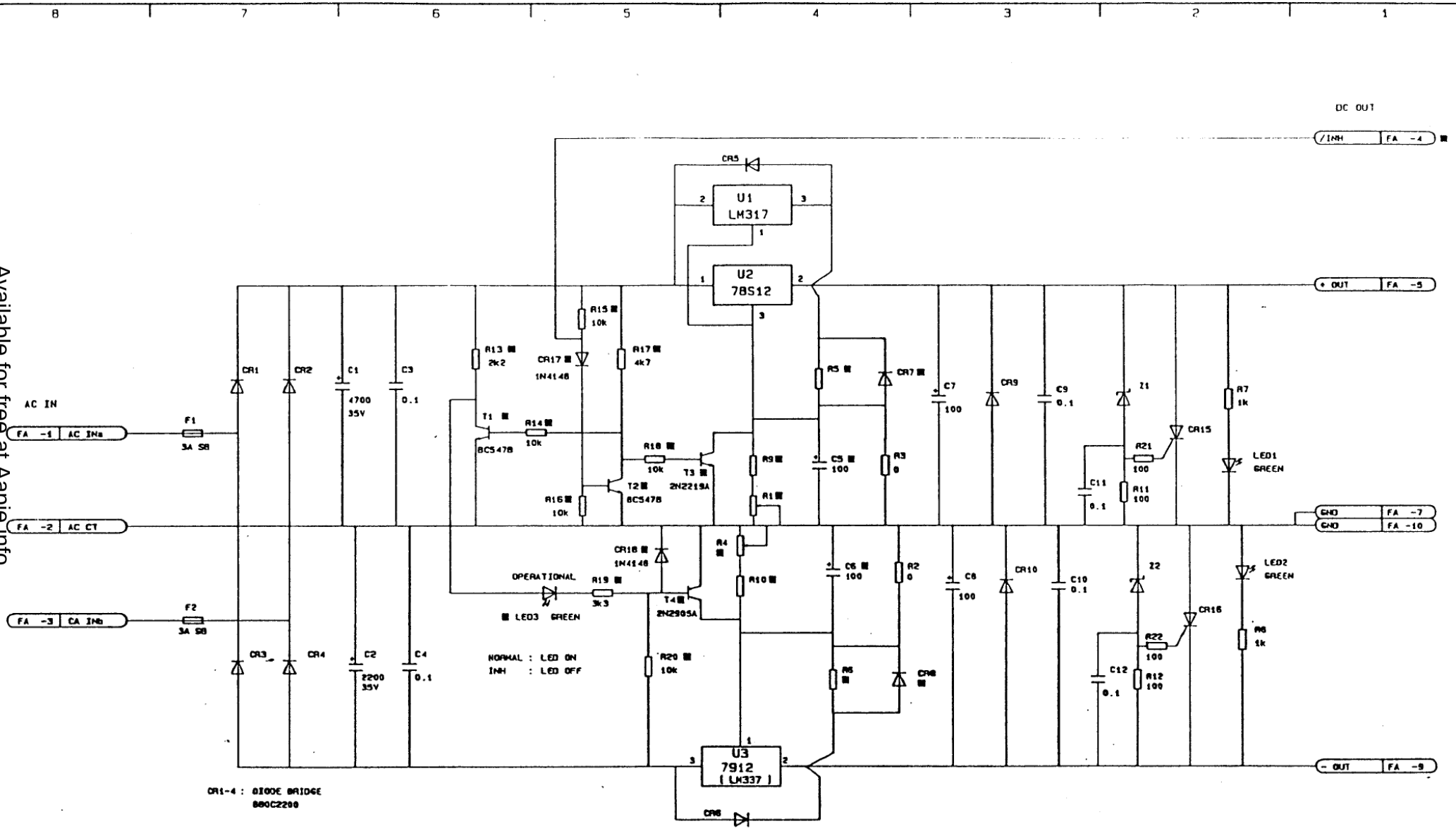
3/ NOT USED NO'S: CR11, CR12, CR13, CR14, FA6, FA8

4/ COMPONENTS MARKED WITH ■ ARE NOT INSTALLED.
5/ ON SILKSCREENING FLAT SIDE OF LED'S IS CATHODE

REF.PCB 7025E9310-47

Ref assy 7001E9311-37	Date	Used on	ESA 5100
Designed by B.MAATOR	15-07		STL-2
Drawn by R.v/d[illegible]	15-07		OTL-2
Checked by R.LANNERS	06-88		
Approved B. Egan	6.88		
Description · POWER SUPPLY BOARD +12V@2A -12V@1A		Drawing nr	7092E9311-35
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 2	Issue A
		Project nr E8605	

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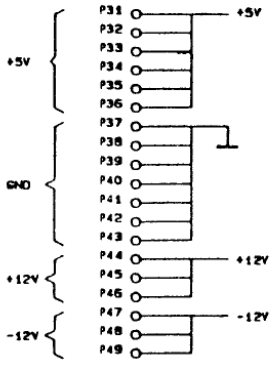


REF.PCB 7025E9310-47

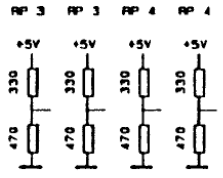
Ref assy 7001E9311-37	Date	Board for ESA 5100 STL-2 OTL-2	
Designed by R.ANTON	10-87		
Drawn by R.v/d BERGH	10-87		
Checked by P.LAMMERS	06-88		
Approved	6.88		
Description POWER SUPPLY BOARD +12V02A -12V01A		Drawing nr 7092E9311-35	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 2 of 2	Issue A
		Project nr E8605	

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Revisions					
Rev	Date	ECN	Description	Check	Appr
A	100186		EAN# 0171. REL.FOR PROD.		



SPARES



NOTES:

1/ UNLESS OTHERWISE SPECIFIED:
- A/ ALL RESISTORS ARE IN OHMS, 1/4W, 5%
- B/ ALL CAPACITORS ARE IN MICRO-FARADS
- C/ ALL DIODES ARE 1N914 OR 1N4148
- D/ ALL IC'S ARE 74LS-SERIES TYPE
- E/ ALL POLARIZED CAPACITORS ARE 16V

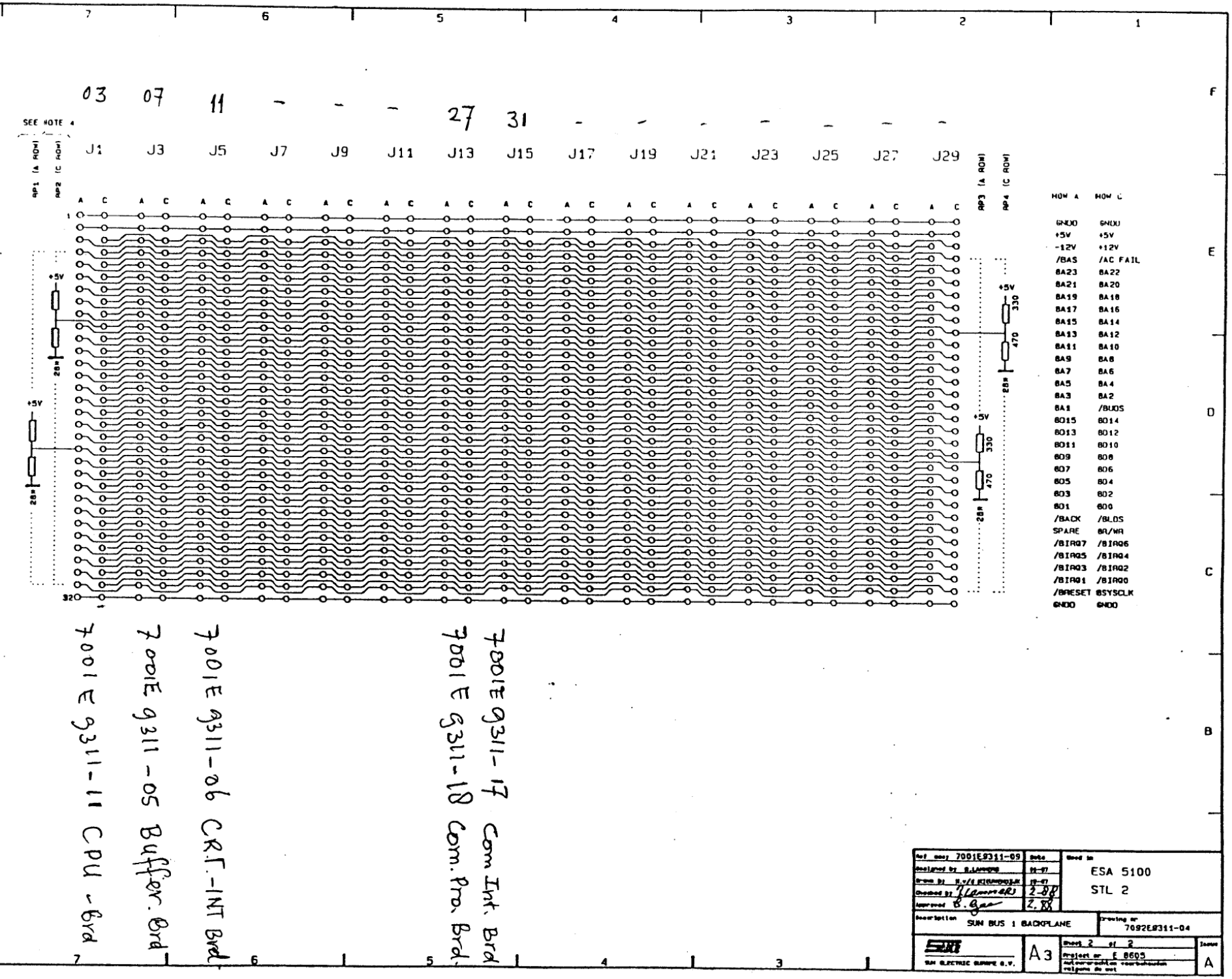
2/ LAST USED NO'S: RP4

3/ NOT USED NO'S:

4/ RP1 AND RP2 ARE NOT INSERTED

Ref. comp 7001E9311-09	Date	Used in ESA 5100 STL-2	
Designed by B.LAMMERS	10-87		
Drawn by R.v/d KIEBOOMSLAK	10-87		
Checked by Wammers	2-88		
Approved B. Gan	2-88		
Description SUN BUS 1 BACKPLANE		Drawing nr 7092E9311-04	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 2	Issue A
		Project nr E8605	

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7001E 9311-06 CRT.-INT Brd.

7001E 9311-05 Buffer. Brd

7001E 9311-11 CPU - Brd

7001E 9311-17 Com Int. Brd

7001E 9311-18 Com. Pro. Brd.

Ref assy 7001E9311-09	Date	Used in ESA 5100 STL 2
Designed by B.Lammers	19-87	
Drawn by B.v/d Klomboezem	19-87	
Checked by Klammers	2-88	
Approved B.Gan	2.88	
Description SUN BUS 1 BACKPLANE		Drawing nr 7092E9311-04
SUN ELECTRIC EUROPE B.V.	A3	Sheet 2 of 2 Project nr E 8605 Issue A

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Revisions					
Rev	Date	ECN	Description	Check	Appr
A	180486		EAN # 0171. REL. FOR PROD.		

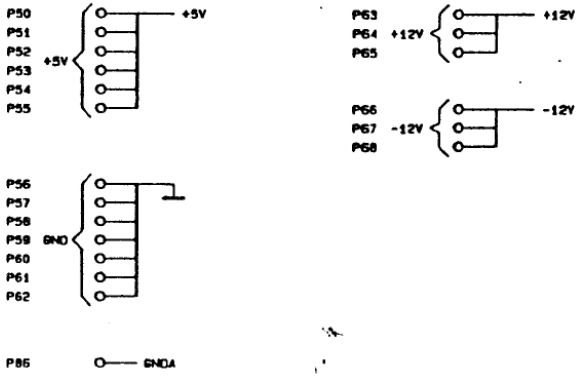
P69 - CONNECTOR	
PIN NO	SIGNAL
1	NC
2	NC
3	GND
4	/INUSE
5	GND
6	/DS3
7	GND
8	/INDEX
9	GND
10	/DS0
11	GND
12	/DS1
13	GND
14	/DS2
15	GND
16	/MOTOR ON
17	GND
18	/DIR
19	GND
20	/STEP
21	GND
22	/WDATA
23	GND
24	/WGATE
25	GND
26	/TRACK 0
27	GND
28	/WRPRT
29	GND
30	/RDDATA
31	GND
32	/SIDESEL
33	GND
34	NC

P70 - CONNECTOR	
PIN NO	SIGNAL
1	/SEGMENT A
2	/SEGMENT B
3	/SEGMENT C
4	/SEGMENT D
5	/SEGMENT E
6	/SEGMENT F
7	/SEGMENT G
8	/DEC POINT
9	NC
10	DISPLAY 1
11	DISPLAY 1
12	DISPLAY 2
13	DISPLAY 2
14	DISPLAY 3
15	DISPLAY 3
16	GNDD
17	GNDD
18	TLO TH A
19	TLO TH B
20	GNDD
21	GNDD
22	DISPLBO SENSE
23	+5V FL POWER
24	+5V FL POWER
25	+12V FL POWER
26	+12V FL POWER

P85 - CONNECTOR	
PIN NO	SIGNAL
1	UBATT-
2	UBATT+

P71 - CONNECTOR	
PIN NO	SIGNAL
1	12VAC FL 1a
2	12VAC FL 1b

P72-84: SEE SHEET 2



NOTES:

1/ UNLESS OTHERWISE SPECIFIED:
- A/ ALL RESISTORS ARE IN OHMS, 1/4W, 5%
- B/ ALL CAPACITORS ARE IN MICRO-FARADS
- C/ ALL DIODES ARE 1N914 OR 1N4148
- D/ ALL IC'S ARE 74LS-SERIES TYPE
- E/ ALL POLARIZED CAPACITORS ARE 16V

2/ LAST USED NO'S:

3/ NOT USED NO'S:

Ref assy 7001E9311-00	Date	Used in	ESA 5100 STL-2
Designed by R.LANDERS	10-87		
Drawn by R.V/d KIEBOOMEN	11-87		
Checked by	2.88	Remarks	
Approved	2.88		
Description: I/O BACKPLANE		Drawing nr: 7092E9310-93	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 3	Issue A
		Project nr E8605	

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P72 - CONNECTOR	
PIN NO	SIGNAL
1	/DIGVS
2	/DIGHS
3	DIGOPT
4	/DIGSYNC
5	DIGRED
6	LPSTB
7	DIGGRN
8	/TOUCH
9	DIGBLU
10	COMPB/W
11	SPOUT 2
12	ANARED
13	SPOUT 1
14	ANAGRN
15	/STL SELECT
16	ANABLU
17	/STL SENSE
18	VGND
19	VGND
20	VGND
21	NU
22	NU
23	NU
24	NU
25	GNDD
26	GNDD

P73 - CONNECTOR	
PIN NO	SIGNAL
1	
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P74 - CONNECTOR	
PIN NO	SIGNAL
1	
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P75 - CONNECTOR	
PIN NO	SIGNAL
1	
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P76 - CONNECTOR	
PIN NO	SIGNAL
1	A HYST 1
2	MX0
3	/PDB 5
4	MX1
5	A HYST 2
6	MX2
7	/PDBX
8	ENMUX
9	A THL 2
10	A THL 1
11	B HYST 2
12	B HYST 1
13	B THL 2
14	B THL 1
15	/PUA 1
16	/PDA X
17	/PUA 2
18	/PDA 5
19	RES
20	/PDA 10
21	RES
22	/PDA 20
23	/UPBON
24	/UPAON
25	/LOBON
26	/LOAON

P77 - CONNECTOR	
PIN NO	SIGNAL
1	/PDB 10
2	NC
3	NU
4	NC
5	NU
6	NC
7	12VAC FL 2a
8	NC
9	12VAC FL 2b
10	NC
11	12VAC FL 3a
12	NC
13	12VAC FL 3b
14	NC
15	NU
16	NC
17	NU
18	NC
19	COMM A
20	GNDD
21	COMM B
22	GNDD
23	UBATT+
24	UBATT+
25	UBATT+
26	UBATT+

P78 - CONNECTOR	
PIN NO	SIGNAL
1	/PDB 10
2	NC
3	NU
4	NC
5	NU
6	NC
7	NU
8	NC
9	NU
10	NC
11	NU
12	NC
13	NU
14	NC
15	NU
16	NC
17	NU
18	NC
19	COMM A
20	GNDD
21	COMM B
22	GNDD
23	UBATT+
24	UBATT+
25	UBATT+
26	UBATT+

P79 - CONNECTOR	
PIN NO	SIGNAL
1	
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P80 - CONNECTOR	
PIN NO	SIGNAL
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P81 - CONNECTOR	
PIN NO	SIGNAL
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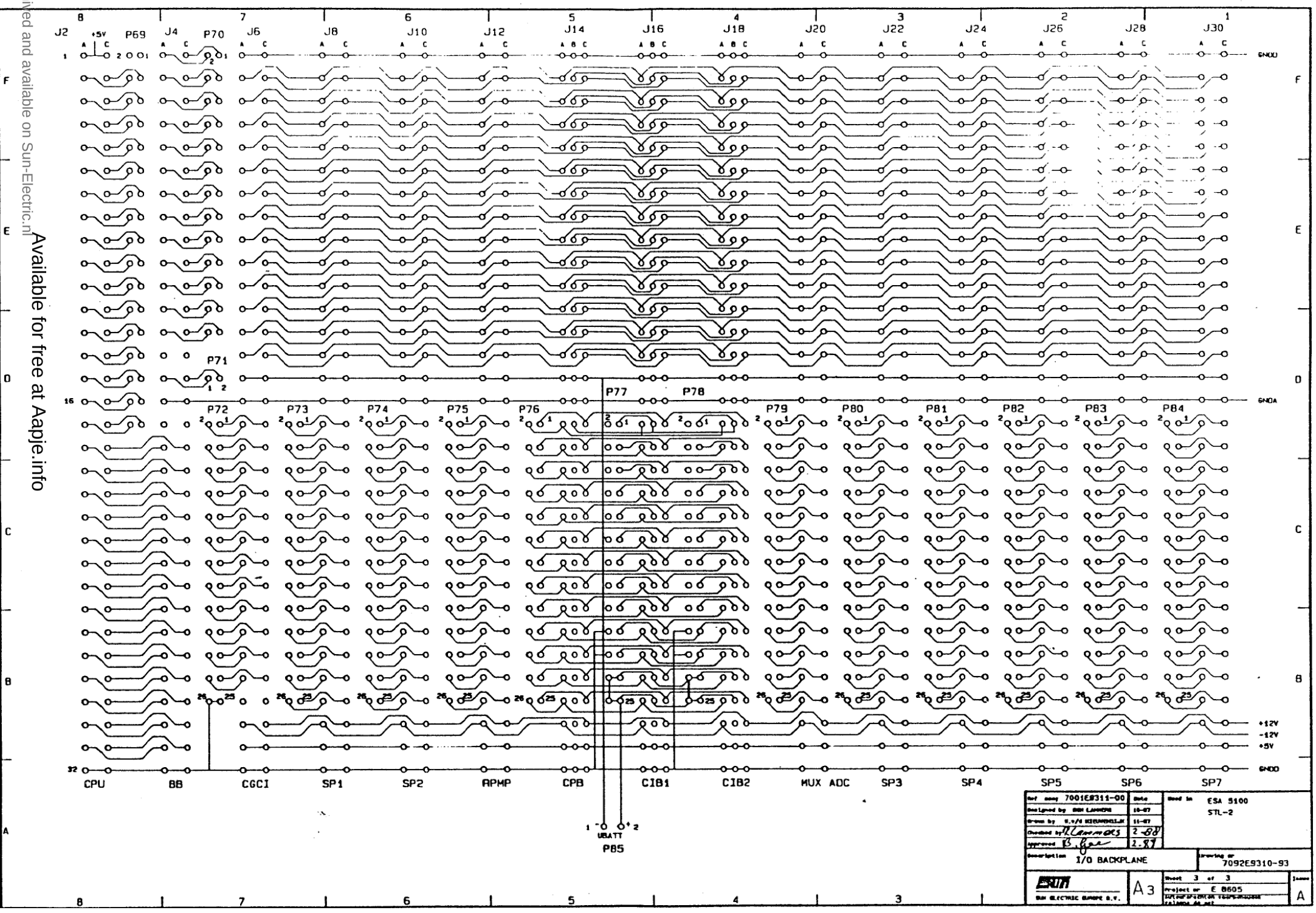
P82 - CONNECTOR	
PIN NO	SIGNAL
1	
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P83 - CONNECTOR	
PIN NO	SIGNAL
1	
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P84 - CONNECTOR	
PIN NO	SIGNAL
1	
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24	
25	
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Ref assy 7001E9311-00	Date	Used in	ESA 5100
Designed by R.LAMERS	10-87		STL-2
Drawn by R.v/d NIEUWDIJK	11-87	Remarks	
Checked by R. Lamers	2.88		(CONTINUE FROM SHEET1)
Approved R. Lamers	2.88		
Description I/O BACKPLANE		Drawing nr 7092E9310-93	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 2 of 3	Issue A
		Project nr E8605	
		INFORMATION TOO SENSITIVE FOR PUBLIC RELEASE	

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Revisions					
Rev	Date	ECN	Description	Check	Appr
A	[illegible]		ERN# 0121 RELEASE FOR PROD	RL	BG
B	05-88	8.05.033E	CHANG.DTACK GEN AND INT PAL TO REV. 2		

SB P1-CONNECTOR

PIN NO	SIGNAL	PIN NO	SIGNAL
1A	GND D	1C	GND D
2A	+5V	2C	+5V
3A	-12V	3C	+12V
4A	/BAS	4C	/AC FAIL
5A	BA23	5C	BA22
6A	BA21	6C	BA20
7A	BA19	7C	BA18
8A	BA17	8C	BA16
9A	BA15	9C	BA14
10A	BA13	10C	BA12
11A	BA11	11C	BA10
12A	BA9	12C	BA8
13A	BA7	13C	BA6
14A	BA5	14C	BA4
15A	BA3	15C	BA2
16A	BA1	16C	/BUDS
17A	BD15	17C	BD14
18A	BD13	18C	BD12
19A	BD11	19C	BD10
20A	BD9	20C	BD8
21A	BD7	21C	BD6
22A	BD5	22C	BD4
23A	BD3	23C	BD2
24A	BD1	24C	BD0
25A	/BACK	25C	/BLDS
26A	RESERVED	26C	BR/W
27A	/IRQ7	27C	/IRQ6
28A	/IRQ5	28C	/IRQ4
29A	/IRQ3	29C	/IRQ2
30A	/IRQ1	30C	/IRQ0
31A	/BRESET	31C	BSYSCLK
32A	GND D	32C	GND D

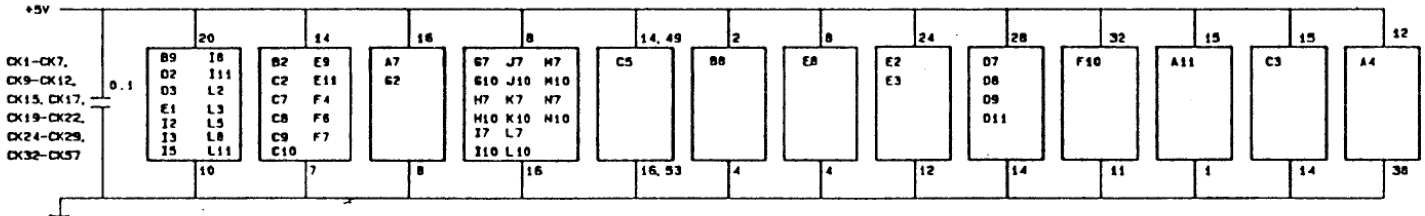
SB P2-CONNECTOR

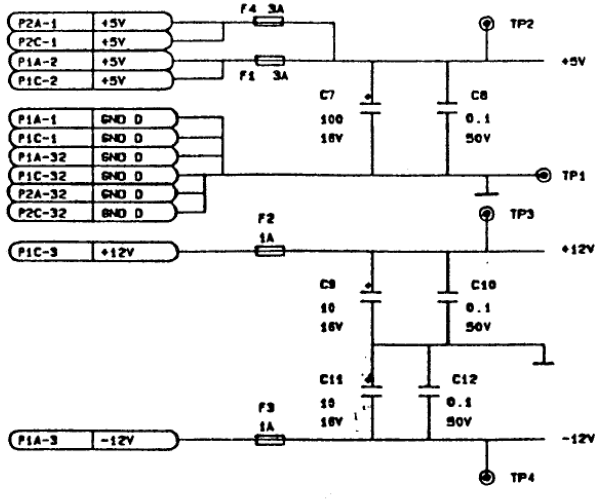
PIN NO	SIGNAL	PIN NO	SIGNAL
1A	+5V	1C	+5V
2A	/INUSE	2C	GND
3A	/DS3	3C	GND
4A	/INDEX	4C	GND
5A	/DS0	5C	GND
6A	/DS1	6C	GND
7A	/DS2	7C	GND
8A	/MOTOR ON	8C	GND
9A	/DIR	9C	GND
10A	/STEP	10C	GND
11A	/WDATA	11C	GND
12A	/WGATE	12C	GND
13A	/TRACK 0	13C	GND
14A	/WRPRT	14C	GND
15A	/RDDATA	15C	GND
16A	/SIDESEL	16C	GND
17A	N.C.	17C	GND
18A	PA0	18C	PA1
19A	PA2	19C	PA3
20A	PA4	20C	PA5
21A	PA6	21C	PA7
22A	H1	22C	H2
23A	H3	23C	H4
24A	PB0	24C	PB1
25A	PB2	25C	PB3
26A	PB4	26C	PB5
27A	PB6	27C	PB7
28A	PC0	28C	PC1
29A	PC2	29C	PC3
30A	PC4	30C	PC5
31A	PC6	31C	PC7
32A	GND D	32C	GND D

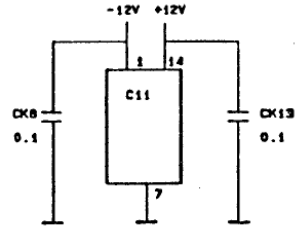
P100 RS232

PIN NO	SIGNAL
1	FG
2	N.C.
3	RxD
4	N.C.
5	TxD
6	N.C.
7	RTS
8	N.C.
9	DTR
10	N.C.
11	DSR
12	CTS
13	SG
14	CTS
15	DCD
16	N.C.
17	HIGH
18	N.C.
19	N.C.
20	N.C.
21	N.C.
22	N.C.
23	N.C.
24	N.C.
25	N.C.
26	N.C.

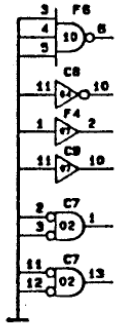
POWER CONNECTIONS







SPARES:



NOTES:

1/ UNLESS OTHERWISE SPECIFIED:
- A/ ALL RESISTORS ARE IN OHMS, 1/4W, 5%
- B/ ALL CAPACITORS ARE IN MICRO-FARADS
- C/ ALL DIODES ARE 1N914 OR 1N4148
- D/ ALL IC'S ARE 74LS-SERIES TYPE
- E/ ALL POLARIZED CAPACITORS ARE 16V

2/ LAST USED NO'S: C16, R7, RP9, W9, LED11, F4, TP4, S1, X2, CK57.

3/ NOT USED NO'S: CK14, CK16, CK18, CK23, CK30, CK31, W6, W7

4/ DO NOT INSERT

5/ JUMPER TABLE :

- W1 : 1-2 FOR 27256
- W2 : 1-2 FOR 27256
- W3 : NOT INSTALLED
- W4 : 1-2
- W5 : DEFAULT IN COPPER
- W6 : 1-2 FOR X2864
- W9 : DEFAULT IN COPPER

Ref assy 7001E9311-11	Date	Used in	ESA 5100 STL-2
Designed by B.AMATER	00-07		
Drawn by H.v/d HEIJNDIJK	00-07		
Checked by R.LANGEVELD	01-00		
Approved EDWARD DEE	01-00		
Description CPU68K BOARD		Drawing nr 7092E9311-06	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 9	Issue B
		Project nr. E8606	

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SIGNAL WHERE USED LIST

NAME	GENERATED (SHT-GRO)	USED (SHT-GRO)
A1	3 -5E	3-2E, 4F; 4-4F, 4C, 2F, 2D; 5-7E; 6-6E, 6C; 7-5F; 8-5C;
A2	3 -5E	3-2E, 4F; 4-4E, 4C, 2E, 2C; 5-7E; 6-6E, 6C; 7-5F/E; 8-5C;
A3	3 -5E	3-2E/D, 4F; 4-4E, 4C, 2E, 2C; 5-7E; 7-5E; 8-5C
A4	3 -5E	3-2D, 4F; 4-4E, 4C, 2E, 2C; 5-7E; 7-5E;
A5	3 -5E	3-2D, 4F; 4-4E, 4C, 2E, 2C; 5-7D; 7-5E;
A6	3 -5E	3-2D, 4F; 4-4E, 4C, 2E, 2C; 5-7D;
A7	3 -5E	3-2D, 4F; 4-E, 4C, 2E, 2C; 5-7D;
A8	3 -5E/D	3-2D, 4F; 4-4E, 4C, 2E, 2C; 5-7D;
A9	3 -5D	3-2D, 3F; 4-4F, 4C, 2E, 2C; 5-7D;
A10	3 -5D	3-2D, 3F; 4-4E, 4C, 2E, 2C; 5-7D;
A11	3 -5D	3-2D, 3F; 4-4E, 4C, 2E, 2C; 5-7D;
A12	3 -5D	3-2D, 3F; 4-4E, 4C, 2E, 2C; 5-7D;
A13	3 -5D	3-2D/C, 3F; 4-4E, 4C, 2E, 2C; 5-7D;
A14	3 -5D	3-2C, 3F; 4-4E, 4C, 3B; 5-7D;
A15	3 -5D	3-2C, 2B, 3F; 4-5E, 2B, 3B; 5-7D;
A16	3 -5D	3-2C, 3F; 4-7E, 5B; 5-7D;
A17	3 -5D	3-2C, 2F; 4-7E; 5-D;
A18	3 -5D	3 -2C, 2F; 4-7E; 5-7C;
A19	3 -5D	3-2C, 2F; 4-7E; 5-7C;
A20	3 -5D	3-2C, 2F; 4-7E;
A21	3 -5D/C	3-2C, 2F; 4-7E;
A22	3 -5C	3-2C, 2F; 4-7F/E;
A23	3 -5C	3-2C/B, 2F; 4-7F;
/AC FAIL	8-1D	8-3D;
AS	3-6C	3-7C;
/AS	3 -6C	3-3B, 6B, 4C, 7F; 4-7E; 8-5C;
BA1	3 -2E	3-1E;
BA2	3 -2E	3-1E;
BA3	3 -2E/D	3-1E/D;
BA4	3 -2D	3-1D;
BA5	3 -2D	3-1D;
BA6	3 -2D	3-1D;
BA7	3 -2D	3-1D;
BA8	3 -2D	3-1D;
BA9	3 -2D	3-1D;
BA10	3 -2D	3-1D;
BA11	3 -2D	3-1D;
BA12	3 -2D	3-1D;
BA13	3 -2D/C	3-1D/C;
BA14	3 -2C	3-1C;
BA15	3 -2C	3-1C;
BA16	3 -2C	3-1C;
BA17	3 -2C	3-1C;
BA18	3 -2C	3-1C;
BA19	3 -2C	3-1C;
BA20	3 -2C	3-1C;
BA21	3 -2C	3-1C;
BA22	3 -2C	3-1C;
BA23	3 -2C/B	3-1C/B;
/BACK	3 -1B	3-2B;
/BAS	3 -2B	3-1B;
BD0	3 -8E	3-7E;
BD1	3 -8E	3-7E;
BD2	3 -8E	3-7E;
BD3	3 -8E	3-7E;
BD4	3 -8E	3-7E;
BD5	3 -8E	3-7E;
BD6	3 -8E	3-7E;
BD7	3 -8E/D	3-7E/D;
BD8	3 -8D	3-7D;
BD9	3 -8D	3-7D;
BD10	3 -8D	3-7D;
BD11	3 -8D	3-7D;
BD12	3 -8D	3-7D;
BD13	3 -8D	3-7D;
BD14	3 -8D	3-7D;
BD15	3 -8D	3-7D;
/BLDS	3 -2E	3-1E;
/BRESET	3 -4B	3-2B, 4B, 7B, 1B; 5-6C; 8-6E, 5B; 7-5D, 5B;

SIGNAL WHERE USED LIST

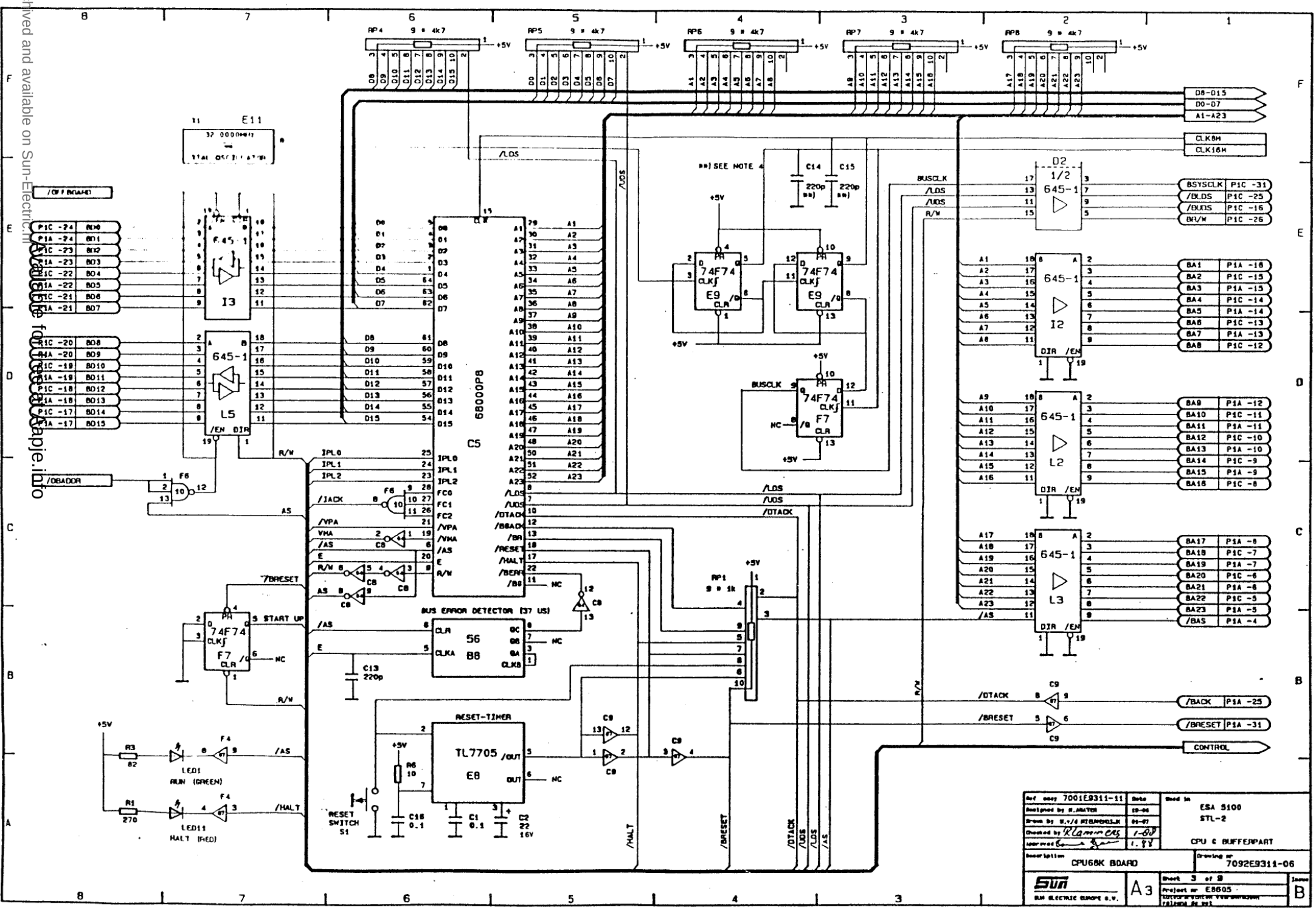
NAME	GENERATED (SHT-GRO)	USED (SHT-GRO)
BR/W	3-2E	3-1C;
BSYSCLK	3-3E	3-1E;
/BUDS	3-2E	3-1C;
BUSCLK	3-4D	3-2E
/BUSINT	8-6E	8-3E, 5C;
/CEACIA	4-7E	6-6E; 8-5C;
/CEBOOT	4-7E	4-4D, 4B, 7C;
/CEEEPROM	4-7E	4-2E/D, 2C/B, 7C;
/CEFDC	4-7E	4-7C; 8-6C;
/CEPIT	4-7E	7-5D;
CLK8M	3-3E	3-2E, 6E; 4-7B; 6-6C; 7-5D;
CLK16M	3-4E	3-3D, 4E; 5-6E;
CTS	8-1E	8-3E;
D0	3-8E	3-7E, 5E; 4-4E, 2E; 5-3F, 3D; 6-6F, 8D, 6B; 7-5E, 5B; 8-5E;
D1	3-8E	3-7E, 5E; 4-4E, 2E; 5-3F, 3D; 6-6F, 8D, 6B; 7-5E, 5B; 8-5E;
D2	3-8E	3-7E, 5E; 4-4E, 2E; 5-3F, 3D; 6-6F, 8D, 6B; 7-5E, 5B; 8-5E;
D3	3-8E	3-7E, 5E; 4-4E, 2E; 5-3F, 3D; 6-6F, 8D, 6B; 7-5E, 5B; 8-5E;
D4	3-8E	3-7E, 5E; 4-4E, 2E; 5-3F, 3D; 6-6F, 8D, 6B; 7-5E, 5B; 8-5E;
D5	3-8E	3-7E, 5E; 4-4E, 2E; 5-3F, 3D; 6-6F, 8D, 6B; 7-5E, 5B; 8-5E;
D6	3-8E	3-7E, 5E; 4-4E, 2E; 5-3F, 3D; 6-6F, 8D, 6B; 7-5E, 5B; 8-5E;
D7	3-8E/D	3-7E/D, 5E; 4-4E, 2E; 5-3F, 3D; 6-6F, 8D, 6B; 7-5E, 5B; 8-5E;
D8	3-8D	3-6F, 7D; 4-4C, 2C; 5-3C, 3A;
D9	3-8D	3-6F, 7D; 4-4C, 2C; 5-3C, 3A;
D10	3-8D	3-6F, 7D; 4-4C, 2C; 5-3C, 3A;
D11	3-8D	3-6F, 7D; 4-4C, 2C; 5-3C, 3A;
D12	3-8D	3-6F, 7D; 4-4C, 2C; 5-3C, 3A;
D13	3-8D	3-6F, 7D; 4-4C, 2C; 5-3C, 3A;
D14	3-8D	3-6F, 7D; 4-4C, 2C; 5-3C, 3A;
D15	3-8D	3-6F, 7D; 4-4C, 2C; 5-3C, 3A;
DCD	8-1F/E	8-3F/E;
/DIR	8-4D	8-1D;
/DRAMSEL	4-7F/E	4-7C; 5-7E;
/DRAMWRH	4-7C	5-5A;
/DRAMWRL	4-7C	5-5D;
/DRBUFRD	4-7C	5-3D, 3B;
/DRBUFWR	4-7C	5-3E, 3B;
/DS0	8-4B	8-1C;
/DS1	8-4B	8-1C;
/DS2	8-4B	8-1C;
/DS3	8-4B	8-1C;
DSR	8-1E	8-3E;
/DTACK	3 -9C	3 -2B; 4-8C; 7-5D;
DTR	8-3E	8-1E;
E	3-8C	8-8E;
F8		8-1E
H1	7-5E	7-2E;
H2	7-5E	7-2E;
H3	7-5E	7-2E;
H4	7-5E	7-2E;
/HALT	3-5C	3-5B, 7F;
/HBRD	8-5C	4-4C, 2C;
/HBWR	8-5C	4-2B;
HIGH	8-3D	8-1E;
/IACK	3-8C	4-7E; 8-5C;
/INDEX	8-1C	8-4C;
/INUSE	8-4B	8-1C;
IPL0	8-3D	3-8D/C;
IPL1	8-3D	3-8D/C;
IPL2	8-3D	3-8D/C;
IR00	8-8E	8-7E;
IR01	8-8E	8-7E;
IR02	8-8E	8-7E;
IR03	8-8E	8-7E;
IR04	8-8E	8-7E;
IR05	8-8E	8-7E;
IR06	8-8E/D	8-7E/D;
IR07	8-8D	8-7D;
/IRBACIA	8-8E	8-3E, 3D;

SIGNAL WHERE USED LIST

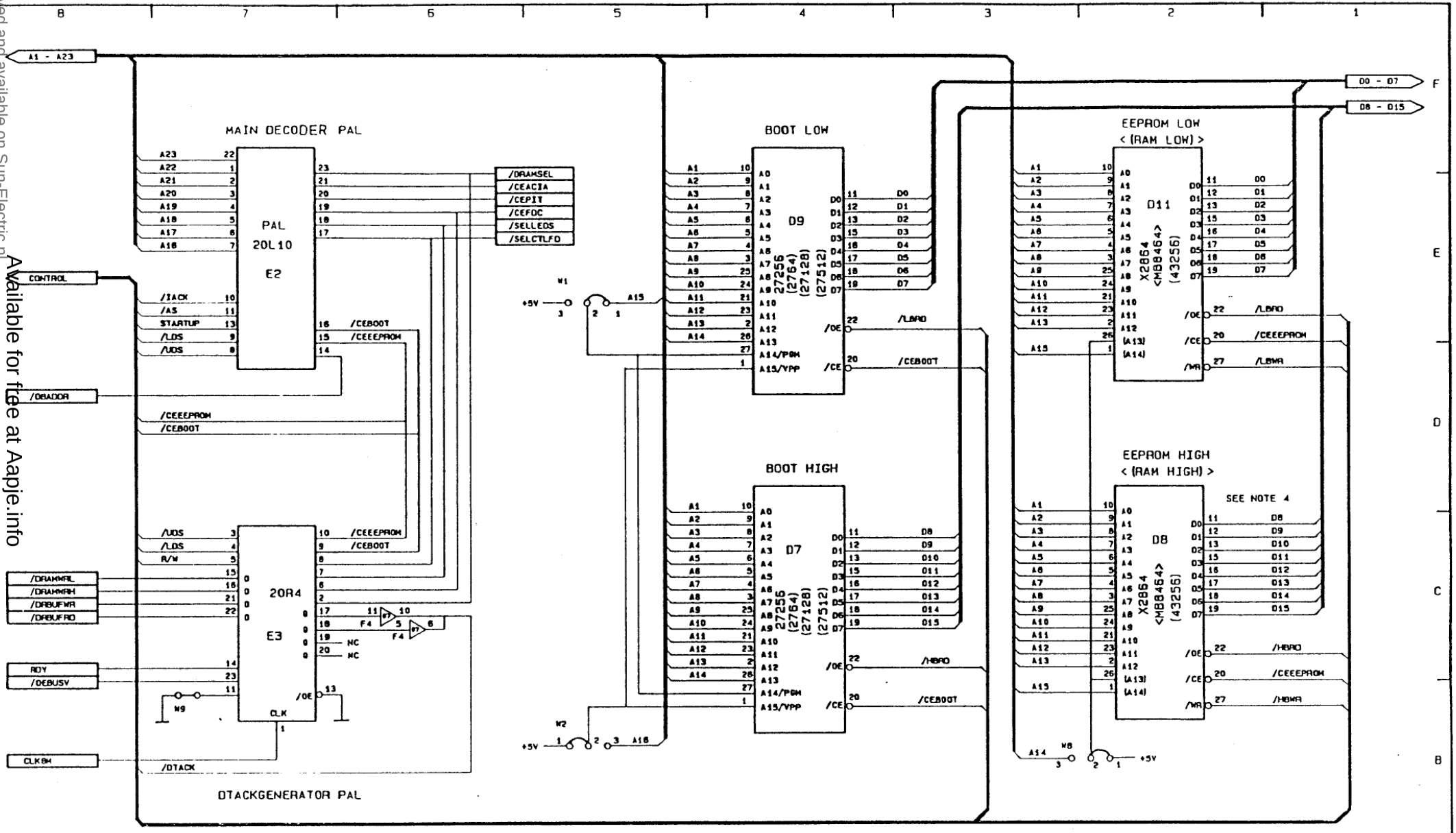
NAME	GENERATED (SHT-GRO)	USED (SHT-GRO)
/IRQFDC	8-7C	8-3E, 3D;
/LBRD	8-5C	4-4E, 2E;
/LBWR	8-5C	4-2D; 6-6B; 7-6A;
/LDS	3-5C	3 -2E, 6F; 4-7E/D, 7C; 8-5C;
/MOTOR ON	6-4D	6-1D;
/OBADDR	4-7D;	3-7C;
/OEBUSV	8-5C	4-7C/B; 8-5D;
/OFFBOARD	3-7C	3 -7D, 7E; 7-5C;
PA0	7-5F	7-2F;
PA1	7-5F	7-2F;
PA2	7-5F/E	7-2F/E;
PA3	7-5E	7-2E;
PA4	7-5E	7-2E;
PA5	7-5E	7-2E;
PA6	7-5E	7-2E;
PA7	7-5E	7-2E;
PB0	7-5E	7-2E;
PB1	7-5E/D	7-2E/D;
PB2	7-5D	7-2D;
PB3	7-5D	7-2D;
PB4	7-5D	7-2D;
PB5	7-5D	7-2D;
PB6	7-5D	7-2D;
PB7	7-5D	7-2D;
PC0	7-5D	7-2D;
PC1	7-5D	7-2D;
PC2	7-5D	7-2D;
PC3	7-5D	7-2D;
PC4	7-5D	7-2D;
PC5	7-5D	7-2D;
PC6	7-5C	7-2D;
PC7	7-5C	7-2D;
/PITPIACK	8-5C	7-5C;
/PITPIRQ	7-5C	8-3E, 3D;
/PITTIACK	8-5C	7-5C;
/PITTOUT	7-5D	8-3E, 3D;
/RDDATA	8-1C	8-4C;
RDY	5-6E	4-7C;
RxD	8-1F	8-3F;
RTS	6-3D	8-1E;
R/W	3-8C	3-2E, 7B, 7D, 7E; 4-7C; 6-6E, 6D; 7-5D; 8-5C;
/SELCTLFD	4-7E	4-7C; 6-6A;
/SELLEDS	4-7E	4-7C; 7-6A;
S6		8-1E;
/SIOESEL	8-4B	8-1C;
START UP	3-7B	4-7E;
/STEP	8-4D	8-1D;
/TRACK 0	8-1C	8-4C;
TxD	8-3E	8-1E;
/UDS	3-5C	3-2E, 5F; 4-7D, 7C; 8-5C
VMA	3-8C	8-8E;
/VPA	8-5C	3-8C;
/WDATA	8-4D	8-1D;
/WGATE	8-4D	8-1D;
/WPRT	8-1C	8-4C;

Ref assy 7001E9311-11	Date	Board No	
Designed by B.JANSEN	88-07	ESA 5100	
Drawn by B.v/d SIJPKOGEL	88-07	STL-2	
Checked by [illegible]	7-88	Remarks	
Approved [illegible]	8.88	SIGNAL WHERE USED LISTING	
Description CPU68K BOARD		Drawing nr 7092E9311-06	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 2 of 9	Issue B
		Project nr E8605	
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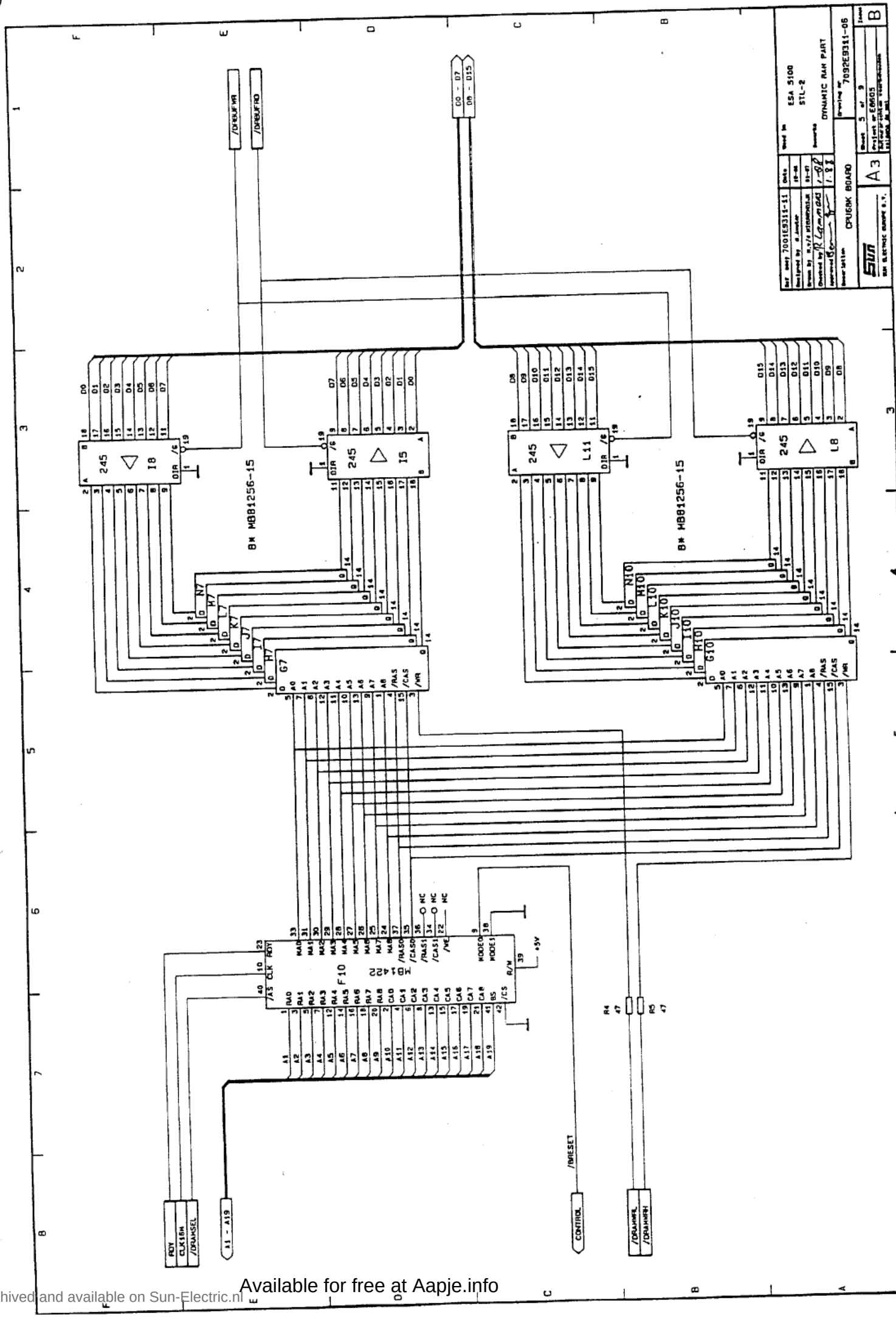
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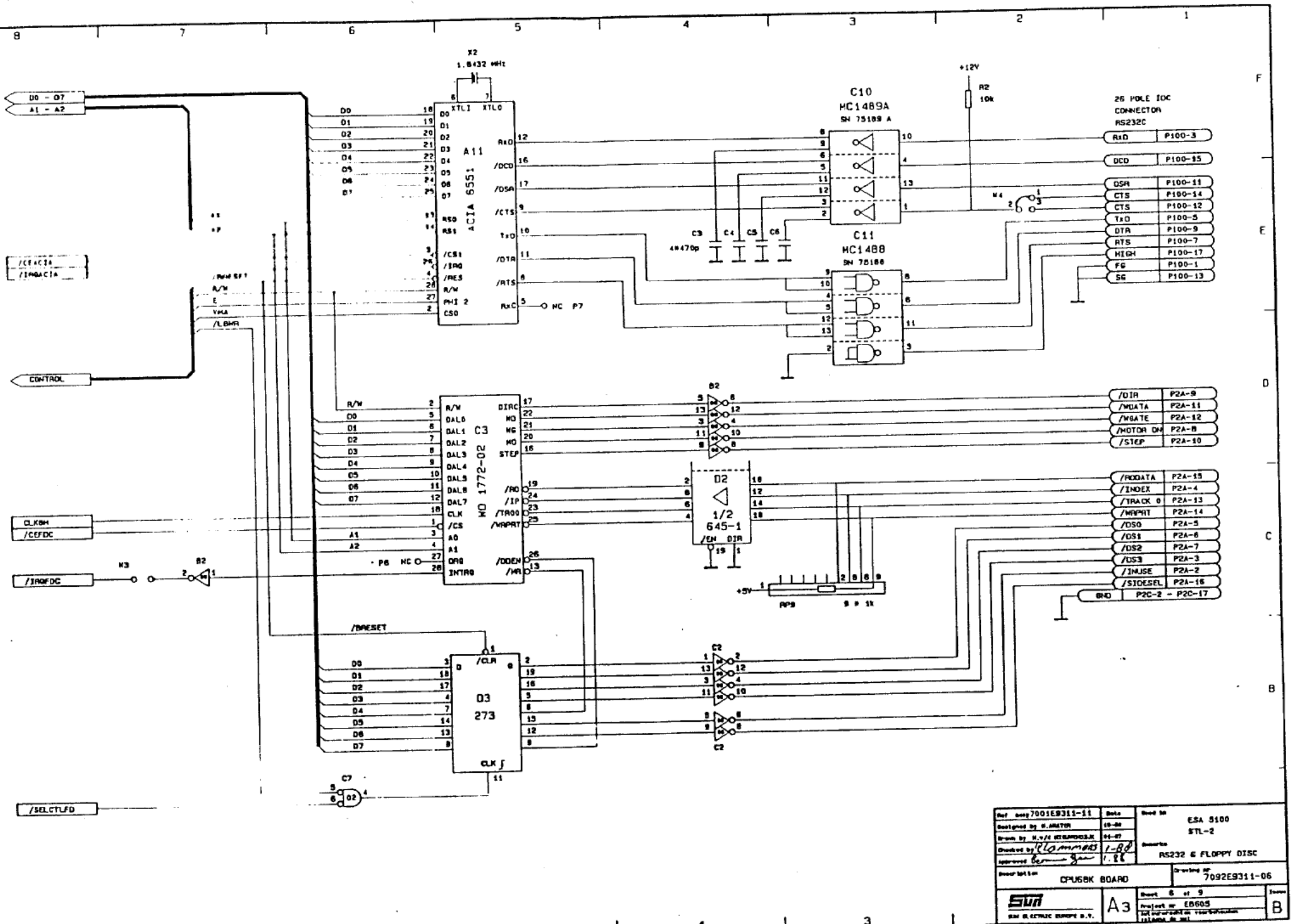
Ref assy 7001E9311-11	Date	Board for ESA 5100 STL-2	
Designed by E.AMATOR	01-87		
Drawn by H.v/d KIEBOOMKLIK	01-87		
Checked by W.Cammers	1-88	Remarks DECODER & (E)EPROM	
Approved	1-89		
Description CPU68K BOARD		Drawing nr 7092E9311-06	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 4 of 9	Issue B
		Project nr E8605	

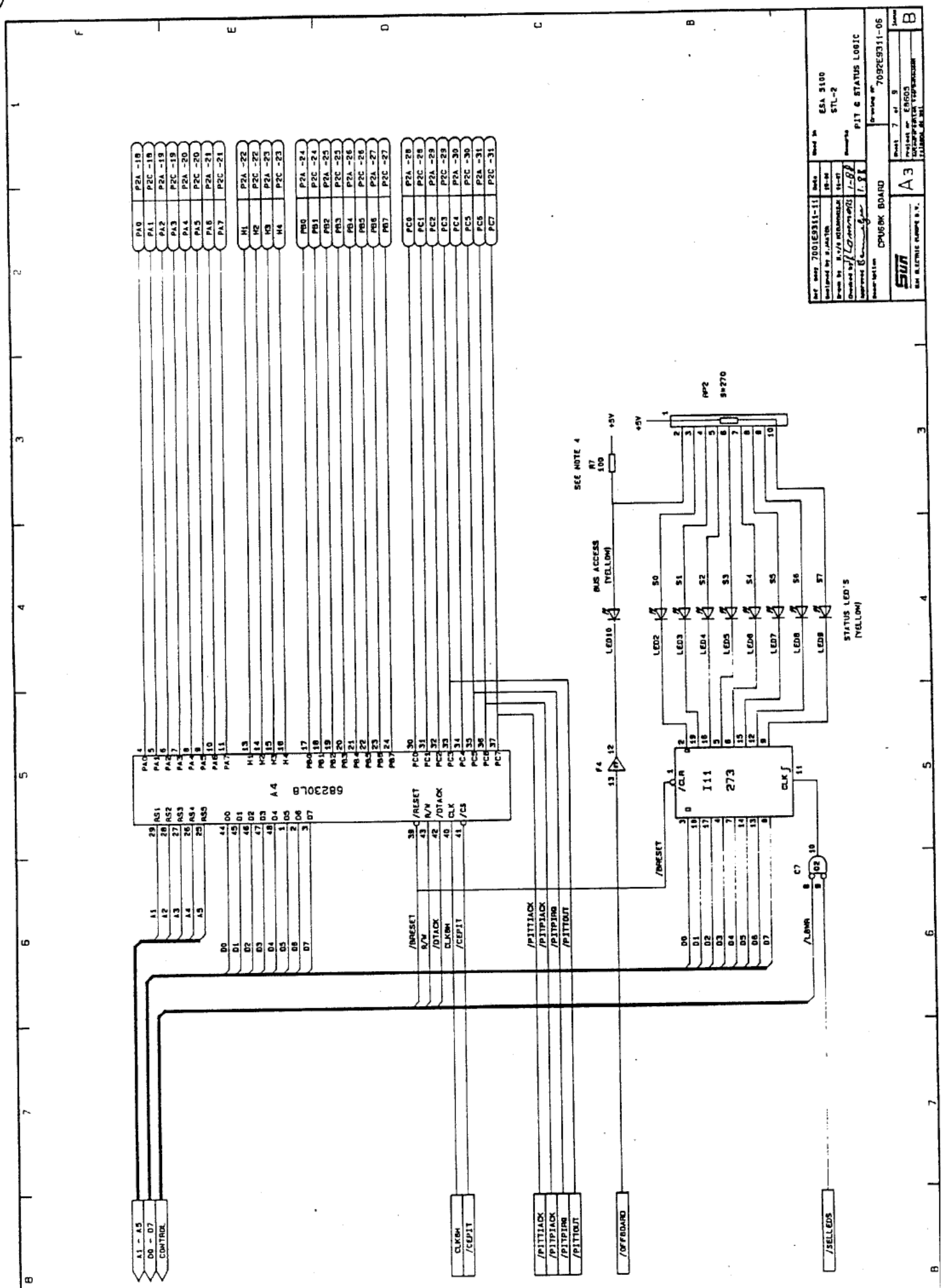


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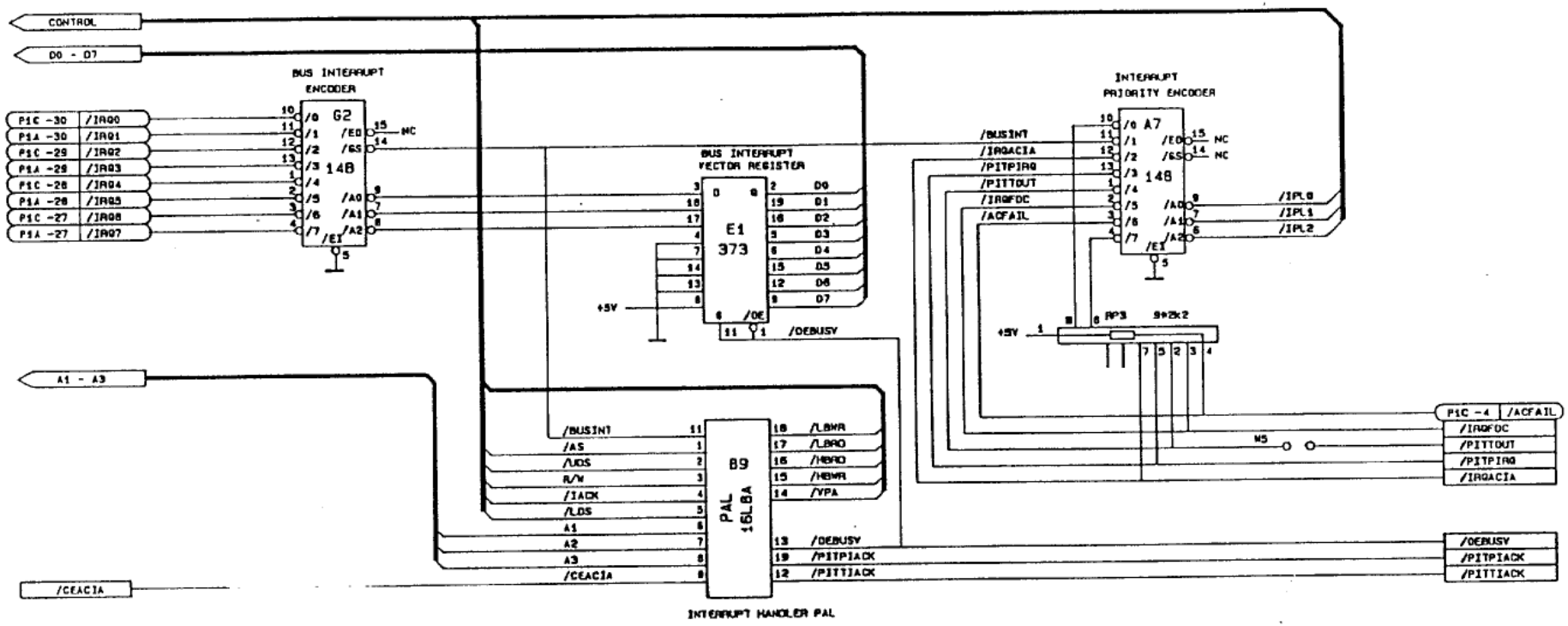
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Ref. copy 7001E9311-11	Date	Used in	ESA 5100 STL-2
Designed by P.AMATOR	10-88		
Drawn by H.v/d MEIJDRECHT	11-87	Remarks	INTERRUPTLOGIC
Checked by R.Lammers	1-88		
Approved	1.88		
Description CPU68K BOARD		Drawing nr. 7092E9311-05	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 8 of 9	Issue B
		Project nr. E8605	

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```
PART NO  : 0733E0151-10
REVISION : 1.0

PART ID  : DECODER PAL MMI 20L10A


          ** PINOUT **

A22     01          24    VCC
A21     02          23    /DRAM
A20     03          22    A23
A19     04          21    /CEACIA
A18     05          20    /CEPIT
A17     06          19    /CEFDC
A16     07          18    /LEDS
/UDS    08          17    /CTLFD
/LDS    09          16    /CEBOOT
/IACK   10          15    /CEE2
/AS     11          14    /DBAOOR
GND     12          13    STARTUP


** FORMULA'S **

IF (VCC) /CEBOOT =/IACK*AS*A23*A22*A21*A20*/A19
                    */A18*/A17
                  ;F00000H-F1FFFFH
                  +/IACK*AS*STARTUP*/A23*/A22*/A21
                    */A20*/A19*/A18*/A17
                  ;000000H-01FFFFH, STARTUP (DOWNMAPPED)

IF (VCC) /CEE2  =/IACK*AS*A23*A22*A21*A20*/A19*A18
                    *A17*A16
                  ;F70000H-F7FFFFH

IF (VCC) /DRAM  =/IACK*AS*/STARTUP*/A23*/A22*/A21*/A20
                    */A19*/A18*/A17
                  +/IACK*AS*/A23*/A22*/A21*/A20*/A19
                    */A18*A17
                  +/IACK*AS*/A23*/A22*/A21*/A20*/A19*A18
                  ;000000H-07FFFFH

IF (VCC) /CEFDC =/IACK*AS*LDS*A23*A22*A21*A20*/A19*A18
                    */A17*A16
                  +/IACK*AS*UDS*A23*A22*A21*A20*/A19*A18
                    */A17*A16
                  ;F50000H

IF (VCC) /CEACIA =/IACK*AS*LDS*A23*A22*A21*A20*/A19*A18
                    */A17*/A16
                  +/IACK*AS*UDS*A23*A22*A21*A20*/A19*A18
                    */A17*/A16
                  ;F40000H

IF (VCC) /CEPIT  =/IACK*AS*LDS*A23*A22*A21*A20*/A19
                    */A18*A17*/A16
                  +/IACK*AS*UDS*A23*A22*A21*A20*/A19
                    */A18*A17*/A16
                  ;F20000H

IF (VCC) /CTLFD  =/IACK*AS*A23*A22*A21*A20*/A19*/A18
                    *A17*A16
                  ;F30000H

IF (VCC) /LEDS   =/IACK*AS*A23*A22*A21*A20*/A19*A18
                    *A17*/A16
                  ;F60000H

IF (VCC) /DBAOOR  =/A23*/A22*/A21*/A20*/A19
                   +A23*A22*A21*A20*/A19
                   +IACK
```

```
PART NO  : 0733E0162-10
REVISION : 2.0

PART ID  : DTACK GEN. PAL MMI 20R4A


          ** PINOUT **

CLK8M   01          24    VCC
/DRAM   02          23    /DEBUSY
/UDS    03          22    /DRBUFRD
/LDS    04          21    /DRBUFWR
READ    05          20    /DELDT
/CEFDC  06          19    /DRRDY
/LEDS   07          18    /DTACKB
/CTLFD  08          17    /DTACKA
/CEBOOT 09          16    /DRAMWRH
/CEE2   10          15    /DRAMWRL
SPARE   11          14    READY
GND     12          13    /OE


** FORMULA'S **

/DTACKA: =DEBUSY*READ*LDS
         +DRAM*DRRDY*READY*LDS
         +DRAM*DRRDY*READY*UDS
         +CEFDC*LDS
         +CEFDC*UDS
         +LEDS
         +CTLFD

/DTACKB: =CEBOOT*READ
         +CEE2*LDS*/DELDT
         +CEE2*UDS*/DELDT

/DELDT: =CEBOOT*READ     ;EXAMPLE I NOT USED
                         ;ONLY FOR SLOW DEVICES
/DRRDY: =CEE2*LDS
         +CEE2*UDS       ;TO ALLOW THE USE
                         ;OF 375NSec EEPROMS

IF (VCC) /DRAMWRL=DRAM*LDS*/READ

IF (VCC) /DRAMWRH=DRAM*UDS*/READ

IF (VCC) /DRBUFWR=DRAM*/READ

IF (VCC) /DRBUFRD=DRAM*READ
```

```
PART NO  : 0733E0172-10
REVISION : 2.0

PART ID  : INT HANDLER PAL MMI 16L8A


          ** PINOUT **

/AS     01          20    VCC
/UDS    02          19    /PIACK
READ    03          18    /LBWR
/IACK   04          17    /LBRD
/LDS    05          16    /HBRD
A1      06          15    /HBWR
A2      07          14    /VPA
A3      08          13    /DEBUSY
/CEACIA 09          12    /TIACK
GND     10          11    /BUSINT


** FORMULA'S **

IF (VCC) /LBWR=AS*LDS*/READ

IF (VCC) /HBWR=AS*UDS*/READ

IF (VCC) /LBRD=AS*LDS*READ

IF (VCC) /HBRD=AS*UDS*READ

IF (VCC) /VPA=CEACIA
              +AS*IACK*LDS*/A1*A2*A3 ; ACFAIL (6)
              +AS*IACK*LDS*A1*/A2*A3 ; FDC (5)
              +AS*IACK*LDS*/A1*A2*/A3; ACIA (2)
              +AS*IACK*LDS*A1*A2*A3  ; DEBUG (IR07)

IF (VCC) /DEBUSY  =AS*IACK*LDS*READ*A1*/A2*/A3  ;BUS (1)

IF (VCC) /PIACK   =AS*IACK*LDS*READ*A1*A2*/A3   ;IOPIT (3)

IF (VCC) /TIACK   =AS*IACK*LDS*READ*/A1*/A2*A3  ;TIMERPIT (4)
```

Ref. assy 7001E9311-11	Date	Used in	ESA 5100 STL-2
Designed by S.ANTER	91-06		
Drawn by H.v/d STEENHOVEN	91-06		
Checked by S.LAMERS	91-06	Remarks	PAL-LISTINGS
Approved BERNARD BEE	91-06		
Description CPU68K BOARD		Drawing nr 7092E9311-06	
Sun ELECTRIC EUROPE B.V.	A3	Sheet 9 of 9	Issue B
		Project nr E8605	

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P3-CONNECTOR SUN BUS			
PIN NO	SIGNAL	PIN NO	SIGNAL
1A	GNDD	1C	GNDD
2A	+5V	2C	+5V
3A	-12V	3C	+12V
4A	/BAS	4C	/AC FAIL
5A	BA23	5C	BA22
6A	BA21	6C	BA20
7A	BA19	7C	BA18
8A	BA17	8C	BA16
9A	BA15	9C	BA14
10A	BA13	10C	BA12
11A	BA11	11C	BA10
12A	BA9	12C	BA8
13A	BA7	13C	BA6
14A	BA5	14C	BA4
15A	BA3	15C	BA2
16A	BA1	16C	/BUOS
17A	BD15	17C	BD14
18A	BD13	18C	BD12
19A	BD11	19C	BD10
20A	BD9	20C	BD8
21A	BD7	21C	BD6
22A	BD5	22C	BD4
23A	BD3	23C	BD2
24A	BD1	24C	BD0
25A	/BACK	25C	/BLDS
26A	RESERVED	26C	BR/W
27A	/BIR07	27C	/BIR06
28A	/BIR05	28C	/BIR04
29A	/BIR03	29C	/BIR02
30A	/BIR01	30C	/BIR00
31A	/BRESET	31C	BSYSCLK
32A	GNDD	32C	GNDD

P4-CONNECTOR I/O			
PIN NO	SIGNAL	PIN NO	SIGNAL
1A	/SEGMENT B	1C	/SEGMENT A
2A	/SEGMENT D	2C	/SEGMENT C
3A	/SEGMENT F	3C	/SEGMENT E
4A	/DEC POINT	4C	/SEGMENT G
5A	DISPLAY 1	5C	NC
6A	DISPLAY 2	6C	DISPLAY 1
7A	DISPLAY 3	7C	DISPLAY 2
8A	GNDD	8C	DISPLAY 3
9A	TLO TH A	9C	GNDD
10A	GNDD	10C	TLO TH B
11A	DISPL80 SENSE	11C	GNDD
12A	+5V FLPOWER	12C	+5V FLPOWER
13A	+12V FLPOWER	13C	+12V FLPOWER
14A		14C	
15A	12VAC FL1a	15C	12VAC FL1b
16A	GND A	16C	GND A
17A		17C	
18A	PA0	18C	PA1
19A	PA2	19C	PA3
20A	PA4	20C	PA5
21A	PA6	21C	PA7
22A	H1	22C	H2
23A	H3	23C	H4
24A	PB0	24C	PB1
25A	PB2	25C	PB3
26A	PB4	26C	PB5
27A	PB6	27C	PB7
28A	PC0	28C	PC1
29A	PC2	29C	PC3
30A	PC4	30C	PC5
31A	PC6	31C	PC7
32A	GNDD	32C	GNDD

PRINTER

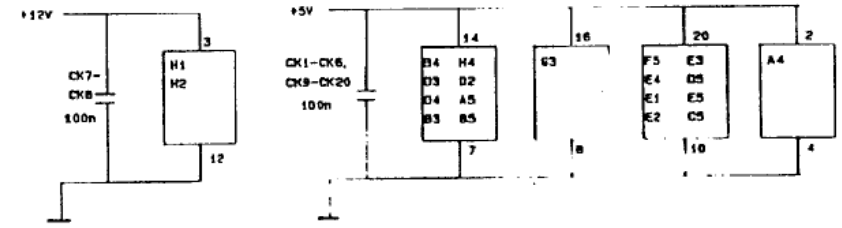
P110 CONNECTOR	
PIN NO	SIGNAL
1	/DATA STROBE
2	GNDD
3	DATA 0
4	GNDD
5	DATA 1
6	GNDD
7	DATA 2
8	GNDD
9	DATA 3
10	GNDD
11	DATA 4
12	GNDD
13	DATA 5
14	GNDD
15	DATA 6
16	GNDD
17	DATA 7
18	GNDD
19	/ACKP
20	GNDD
21	BUSY
22	GNDD
23	PAPER END
24	GNDD
25	SELECT
26	/PRIME
27	/AUTOFEED XT
28	/PRINTER ERROR
29	NC
30	SIGNAL GND
31	SIGNAL GND
32	NC
33	FRAME GND
34	NC

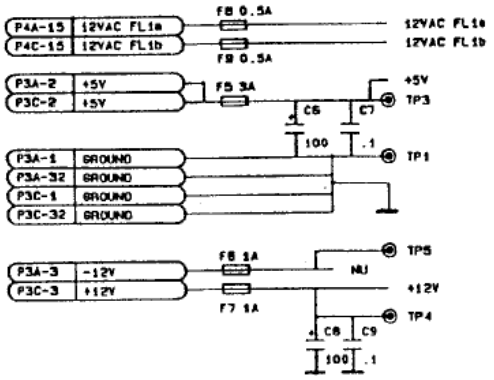
REMOTE

P111 CONNECTOR	
PIN NO	SIGNAL
1	KB0-00
2	KB0-01
3	KB0-02
4	KB0-03
5	KB0-04
6	KB0-05
7	KB0-06
8	KB0-07
9	KB0 STB
10	+5V
11	NC
12	GNDD
13	/KBORESET
14	/ACKR
15	+12V
16	GNDD

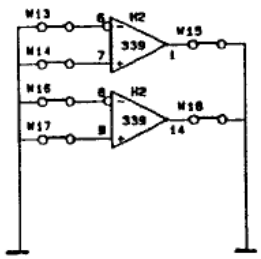
Revisions					
Rev	Date	ECN	Description	Check	Appr
A	10-87		EAN# 0121 RELEASE FOR PROD.	RL	BG
B	05-88	8.02.012E	ADDED W10 . R42 WAS Rk2, R44 WAS 1M . R18 WAS 39K DELETED CR1 AND CR8 CHANGED W1 AND W3 SETTING. ADDED C11 ... C19.		

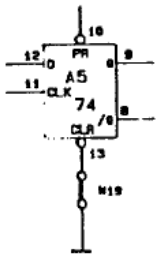
POWER CONNECTIONS

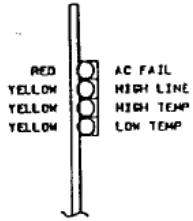




SPARES:







NOTES:

1/ UNLESS OTHERWISE SPECIFIED:
- A/ ALL RESISTORS ARE IN OHMS, 1/4W, 5%
- B/ ALL CAPACITORS ARE IN MICRO-FARADS
- C/ ALL DIODES ARE 1N914 OR 1N4148
- D/ ALL IC'S ARE 74LS-SERIES TYPE EXCEPT 07 [7407]
- E/ ALL POLARIZED CAPACITORS ARE 16V

2/ LAST USED NO'S: W19, RP6, R47, C19, RB1, CR28, LED4, T3, F9, JP10, CK20

3/ NOT USED NO'S: W11, W12, R1-R9, CR1, CR6.

4/ JUMPERSETTING:
- W1: 2-3 DEFAULT: KBSTB HIGH ACTIVE
- W2: 2-3 DEFAULT
- W3: B DEFAULT
- W4: 1-2 DEFAULT IN COPPER
  2-3 : USED ONLY WHEN PRINTER DOES NOT GENERATE AN ACK - SIGNAL
- W5: DEFAULT INSTALLED: REMOVE ONLY FOR TEST
- W6: DEFAULT INSTALLED: REMOVE ONLY FOR TEST
- W7: CONFIGURATION PATCHES :

A	B	NUMBER OF FLOPPY DRIVES
IN	IN	1 DEFAULT
IN	OUT	2
OUT	IN	3
OUT	OUT	4

  E: IN: LINE PRINTER PRESENT
  OUT: NO LINE PRINTER

- W8: FRAME GROUND - SIGNAL GROUND CONNECTION DEFAULT NOT INSTALLED
- W9: /AUTO FEED XT DEFAULT NOT INSTALLED
- W10: DEFAULT IN COPPER 88 RECOGNITION
- W13 - W18 : DEFAULT IN COPPER

5/ A4-7456 FOR ASSY 7001E9311-05
A4-7457 FOR ASSY 7001E9311-21

NOTE: REF. ASSY 7001E9311-05 50Hz
REF. ASSY 7001E9311-21 60Hz

Ref assy 7001E9311-05/21	Date	Used in	
Designed by B.MATER	8-88	ESA 5100	
Drawn by H.VANDENHOUT	11-88	STL 2	
Checked by B.LAMMERS	01-89		
Approved BERNARD REE	01-89		
Description BUFFERBOARD		Drawing nr 7092E9310-07	
Sun ELECTRIC EUROPE B.V.	A3	Sheet 1 of 5	Issue B
		Project nr E8605	

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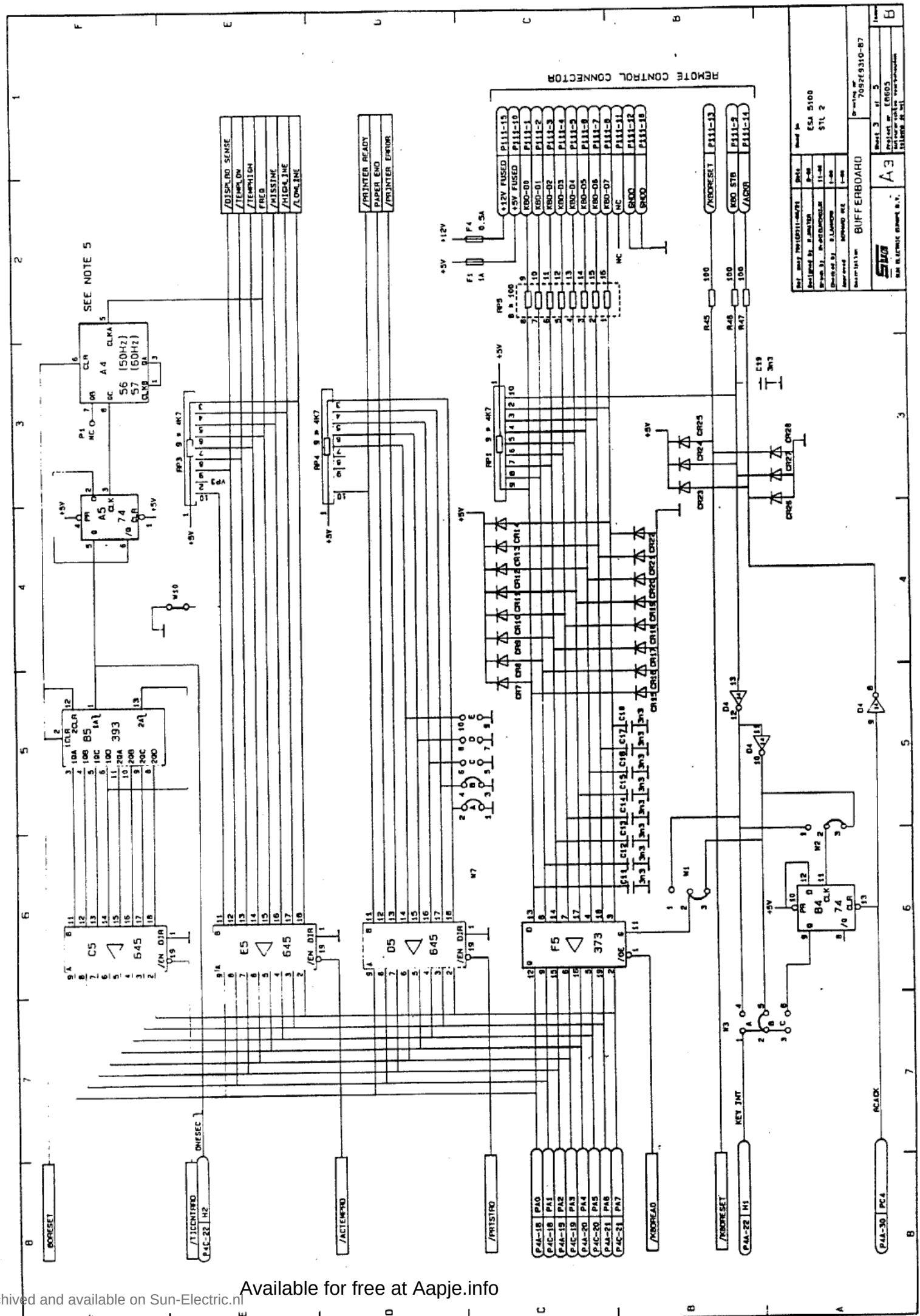
SIGNAL WHERE USED LIST

NAME	GENERATED (SHT-GRD)	USED (SHT-GRD)
/AC FAIL	5 -3E	5 -1E;
/ACKP		4 -1F, 6F;
/ACKR	3 -5A	3 -1B;
/ACKNOWLEDGE	4 -6F	4 -8F
/ACTEMPRD	4 -7A	3 -6D, -8D; 4 -8A;
/AUTOFEED XT		4 -1E; 4-3E;
BUSY		4 -1F, 4F;
BORESET	4 -5F	3 -3F, -5F; 4- 4F, -5F;
/BORESET	4- 5F	5 -2E;
/BRESET		4 -5F, -8F;
DATA 0	4 -5E	4 -1E;
DATA 1	4 -5E	4 -1E;
DATA 2	4 -5E	4 -1E;
DATA 3	4 -5E	4 -1E;
DATA 4	4 -5E	4 -1E;
DATA 5	4 -5E	4 -1E;
DATA 6	4 -5E	4 -1E;
DATA 7	4 -5E	4 -1E;
/DATA STROBE	4 -4E	4 -1E;
DISPLAY 1	4 -3C	4 -1C;
DISPLAY 2	4 -3C	4 -1C;
DISPLAY 3	4 -3C	4 -1C;
DISPLBD SENSE		3 -1/2E, -6E; 4-1B;
/DEC POINT	4 -6B, C, D	4 -1D
FREQ	5 -5E	3 -2F, -6E; 5-1/2D;
H1	3 -5B	3 -8B;
H2	3 -4F	3 -5F, -8E;
H3	4 -6F	4 -8F;
H4		4 -5E, -8E;
/HIGHLINE	5 -6D	3 -6E; 5 -1D, -2D;
KBD-D0		3 -1C, -6C;
KBD-D1		3 -1C, -6C;
KBD-D2		3 -1C, -6C;
KBD-D3		3 -1C, -6C;
KBD-D4		3 -1C, -6C;
KBD-D5		3 -1C, -6C;
KBD-D6		3 -1C, -6C;
KBD-D7		3 -1C, -6C;
/KBDRESET	4 -6F	3 -1B, -8B;
/KBDREAD	4 -7A	3 -6B, -8B; 4 -8A;
KBD STB		3 -1B, -5B;
KEY INT	3 -5B	3 -8B;
/LOWLINE	5-6E	3 -1/2E, -6E; 5 -3E, -3F;
/MISSINE	5-6F	3-1/2E, -6E; 5-1D, -3F, -3F;
ONESEC 1	3 -4F	3 -5F, -7E;
PA0	3 -6C, D, E, F	3 -8C;
PA1	3 -6C, D, E, F	3 -8C;
PA2	3 -6C, D, E, F	3 -8C;
PA3	3 -6C, D, E, F	3 -8C;
PA4	3 -6C, D, E, F	3 -8C;
PA5	3 -6C, D, E, F	3 -8C;
PA6	3 -6C, D, E, F	3 -8C;
PA7	3 -6C, D, E, F	3 -8C;
PAPER END		3 -1/2D, 6D; 4 -1E, 8E;
PB0		4 -6E, -6B, C, D, -8E;
PB1		4 -6E, -6B, C, D, -8E;
PB2		4 -6E, -6B, C, D, -8E;
PB3		4 -6E, -6B, C, D, -8E;
PB4		4 -6E, -6B, C, D, -8E;
PB5		4 -6E, -6B, C, D, -8E;
PB6		4 -6E, -6B, C, D, -8E;
PB7		4 -6E, -6B, C, D, -8E;

SIGNAL WHERE USED LIST

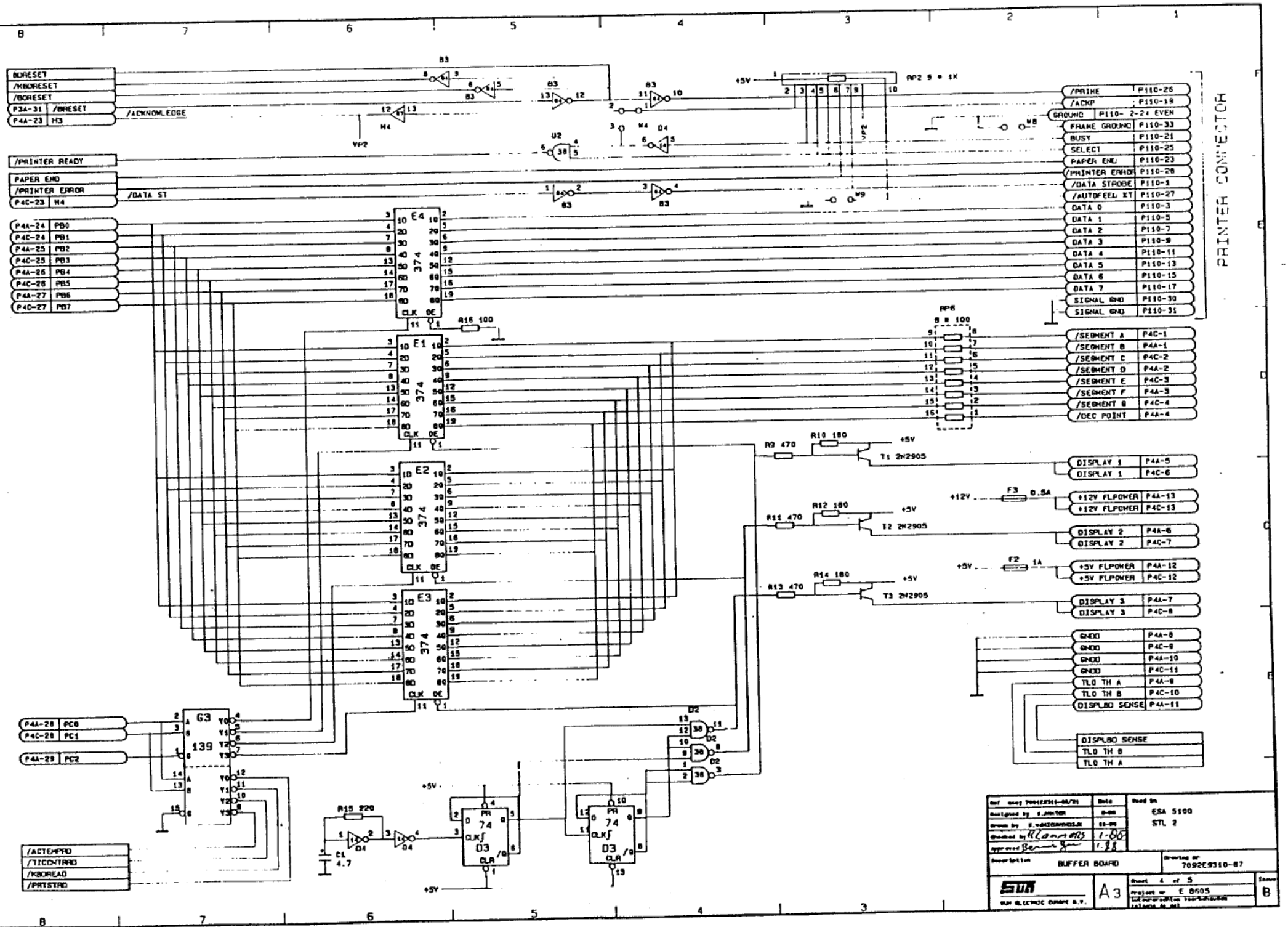
NAME	GENERATED (SHT-GRD)	USED (SHT-GRD)
PC0		4 -7B, -8B;
PC1		4 -7B, -8B;
PC2		4 -7B, -8B;
PC4		3 -5A, -8A, -6A;
/PRIME	4 -4F	4 -1F;
/PRINTER ERROR		3 -1/2D, 6D; 4 -8E, -1E;
/PRINTER READY	4 -5F	3 -1/2D, 6D; 4 -8F;
/PRTSTRD	4 -7A	3 -6D, -8C; 4 -8A;
RCACK		3 -6A, -5A, -8A;
/SEGMENT A	4 -6B, C, D	4 -1D
/SEGMENT B	4 -6B, C, D	4 -1D
/SEGMENT C	4 -6B, C, D	4 -1D
/SEGMENT D	4 -6B, C, D	4 -1D
/SEGMENT E	4 -6B, C, D	4 -1D
/SEGMENT F	4 -6B, C, D	4 -1D
/SEGMENT G	4 -6B, C, D	4 -1D
SELECT		4 -1F, 5F;
/TEMPHIGH	5 -6C	3 -1/2E, 6E; 5 -1/2D, -2C;
/TEMPLOW	5 -6B	3 -1/2E, -6E; 5 -1/2C, -2B;
/TICCNTRD	4 -7A	3 -6F; -8E; 4 -8A;
TLO TH A	4 -1B	4 -1B; 5 -8C;
TLO TH B	4 -1B	4 -1B; 5 -8C;
12VAC FL1a		5 -8F;
12VAC FL1b		5 -7F, -8E;
+5V FLPOWER	4 -2C	4 -1C;
+12V FLPOWER	4 -2C	4 -1C;
+5V FUSED	3 -2C	3 -1C;
+12V FUSED	3 -2C	3 -1C;

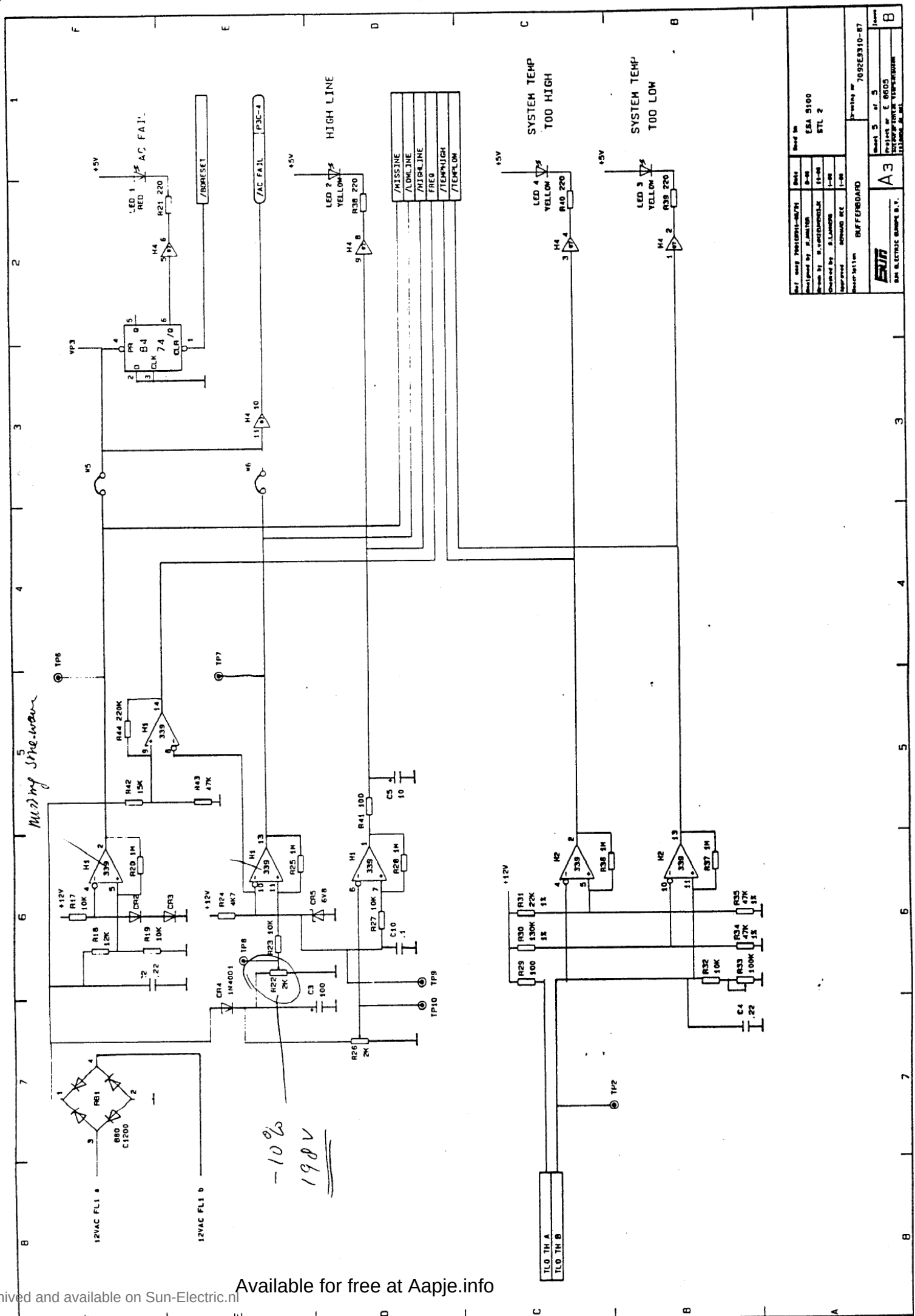
Drawn by		Date	ESA 5100 STL 2
Designed by			
Checked		1-88	
Approved		1.88	SIGNAL WHERE USED LIST
Description: BUFFERBOARD			Drawing nr: 7092E9310-87
SUN ELECTRIC EUROPE B.V.	A3	Sheet 2 of 5	Issue B
		Project nr E8605	



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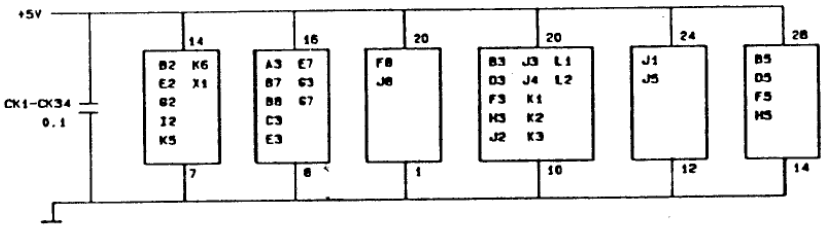
Archived and available on Sun-Electric.nl

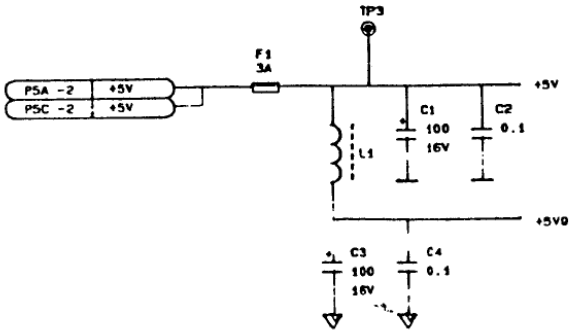
Available for free at Aapje.info

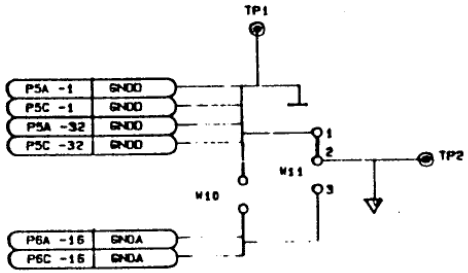
P5-CONNECTOR			
PIN NO	SIGNAL	PIN NO	SIGNAL
1A	GNDD	1C	GNDD
2A	+5V	2C	+5V
3A	-12V	3C	+12V
4A	/BAS	4C	/AC FAIL
5A	BA23	5C	BA22
6A	BA21	6C	BA20
7A	BA19	7C	BA18
8A	BA17	8C	BA16
9A	BA15	9C	BA14
10A	BA13	10C	BA12
11A	BA11	11C	BA10
12A	BA9	12C	BA8
13A	BA7	13C	BA6
14A	BA5	14C	BA4
15A	BA3	15C	BA2
16A	BA1	16C	/BUDS
17A	BD15	17C	BD14
18A	BD13	18C	BD12
19A	BD11	19C	BD10
20A	BD9	20C	BD8
21A	BD7	21C	BD6
22A	BD5	22C	BD4
23A	BD3	23C	BD2
24A	BD1	24C	BD0
25A	/ACK	25C	/BLDS
26A	RESERVED	26C	BR/W
27A	/BIRQ7	27C	/BIRQ6
28A	/BIRQ5	28C	/BIRQ4
29A	/BIRQ3	29C	/BIRQ2
30A	/BIRQ1	30C	/BIRQ0
31A	/BRESET	31C	BSYSCLK
32A	GNDD	32C	GNDD

P6-CONNECTOR			
PIN NO	SIGNAL	PIN NO	SIGNAL
1A	GND_D	1C	GND_D
2A		2C	
3A		3C	
4A		4C	
5A		5C	
6A		6C	
7A		7C	
8A		8C	
9A		9C	
10A		10C	
11A		11C	
12A		12C	
13A		13C	
14A		14C	
15A		15C	
16A	GNDA	16C	GNDA
17A	/DIGHS	17C	/DIGVS
18A	/DIGSYNC	18C	DIGOPT
19A	LPSTB	19C	DIGRED
20A	/TOUCH	20C	DIGGRN
21A	COMPB/W	21C	DIGBLU
22A	ANARED	22C	SPOUT 2
23A	ANAGRN	23C	SPOUT 1
24A	ANABLU	24C	/STL SELECT
25A	VGND	25C	/STL SENSE
26A	VGND	26C	VGND
27A		27C	
28A		28C	
29A		29C	
30A	-12V	30C	+12V
31A	+5V	31C	+5V
32A	GND_D	32C	GND_D

POWER CONNECTIONS:







Revisions					
Rev	Date	ECN	Description	Check	Appr
A	06-1987		ERN# 0113 RELEASE FOR PROD.	RL	BG
B	8-11-87	7.11.061E	CHANG.PART.NO'S FOR PAL'S.	RL	BG
C	03-1988	8.02.007E	R13 WAS 2k2, R12 WAS 2k, R14 WAS NOT INSTALLED, R11 WAS 4k6, VIDEO PAL WAS REV.1.0	RL	BG
D	05-88	8.05.036E	WRONG P/N OF VIDEO PAL REV.2 . IT WAS 0733E141-10.		BG

NOTES:

1/ UNLESS OTHERWISE SPECIFIED:
- A/ ALL RESISTORS ARE IN OHMS, 1/4W, 5%
- B/ ALL CAPACITORS ARE IN MICRO-FARADS
- C/ ALL DIODES ARE 1N914 OR 1N4148
- D/ ALL IC'S ARE 74LS-SERIES TYPE
- E/ ALL POLARIZED CAPACITORS ARE 16V

2/ LAST USED NO'S: R28, RP4, C4, TP3 W11 X1, T4, F1, L1 , CK34

3/ NOT USED NO'S:

4/ COMPONENTS MARKED WITH ■■ ARE NOT INSTALLED

5/ JUMPER TABLE:
- W1 : DEFAULT INSTALLED IN COPPER
  FOR FUTURE USE ONLY
- W2 : CONFIGURATION JUMPERS
  - W2A : IN : MONOCHROME VERSION
    OUT : COLOR VERSION
  - W2B : IN : DEFAULT INSTALLED
    OUT :
  - W2C : IN : DEFAULT INSTALLED
    OUT :
  - W2D : IN : DEFAULT INSTALLED
    OUT :
- W3 : INTERRUPT JUMPER
  A : DEFAULT INSTALLED
- W4 : DOTCLOCK JUMPER
  1-2 : FOR COLOUR ONLY
  2-3 : FOR B/W PURPOSE
  DEFAULT INSTALLED
- W5 : LIGHT PEN STROBE JUMPER
  DEFAULT INSTALLED
- W6 : CLOCK SPEED JUMPER
  1-2 : FOR FUTURE USE
  2-3 : DEFAULT INSTALLED
- W7 : SYNCH JUMPERS
  FOR FUTURE USE
  DEFAULT NOT INSTALLED
- W8 : BRIGHTNESS JUMPER
  DEFAULT NOT INSTALLED
- W9 : BRIGHTNESS JUMPER
  DEFAULT NOT INSTALLED
- W10 : VIDEO GROUND JUMPER
  DEFAULT NOT INSTALLED
- W11 : VIDEO GROUND JUMPER
  1-2 : DEFAULT INSTALLED IN COPPER
  2-3 : FOR FUTURE USE

6/ GROUND SYMBOL'S:
- — : DIGITAL GROUND
- ▽ : ANALOG GROUND
- ▬ : CHASSIS GROUND
- ▽ : VIDEO GROUND

Ref assy 7001E8311-06	Date	Board type STL-2	
Designed by B.ANKTER	03-87		
Drawn by M.v/d KIEUWENDIJK	03-87		
Checked by B.LAMMERS	10-87	Remarks	
Approved BERNARD WIE	8-11-87		
Description COLOR GRAPHICS CRT INTERFACE		Drawing nr 7092E9310-84	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 6	Issue D
		Project nr E8605	

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SIGNAL WHERE USED LIST

NAME	GENERATED (SHT-GRO)	USED (SHT-GRO)
A1	3 -7B/A	3-4E/F; 4-7C, 8E;
A2	3 -7B	3-4E; 4-8E;
A3	3 -7B	3-4E; 4-8E/D;
A4	3 -7B	3-4E; 4-6D
A5	3 -7B	4-6D
A6	3 -7B	4-6D/E;
A7	3 -7B	4-8C;
A8	3 -7B	4-8C;
A9	3 -7B/C	4-8C;
A10	3 -7C;	4-8C;
A11	3 -7C	4-8C/B;
A12	3 -7C	4-8B;
A13	3 -7C	4-8B;
A14	3 -7C	4-8B/A;
A15	3 -7C	4-8A;
A16	3 -7C	3-7D, 9E, 9D; 4-8A;
A17	3 -7C/D	3-7D, 9E, 9D;
A18	3 -7D	3-7D, 9D, 9C;
/AC FAIL	N.U.	N.U.
/ACK	N.U.	N.U.
ANABLU	5-4C	5-1C;
ANAGRN	5-4D	5-1D;
ANARED	5-4F	5-1F;
BA1	3-8B/A	3-7B/A;
BA2	3-8B	3-7B;
BA3	3-8B	3-7B;
BA4	3-8B	3-7B;
BA5	3-8B	3-7B;
BA6	3-8B	3-7B;
BA7	3-8B	3-7B;
BA8	3-8B	3-7B;
BA9	3-8B/C	3-7B/C;
BA10	3-8C	3-7C;
BA11	3-8C	3-7C;
BA12	3-8C	3-7C;
BA13	3-8C	3-7C;
BA14	3-8C	3-7C;
BA15	3-8C	3-7C;
BA16	3-8C	3-7C;
BA17	3-8C/D	3-7C/D;
BA18	3-8D	3-7D;
BA19	3-8D	3-7D;
BA20	3-8D	3-7D;
BA21	3-8D	3-7D;
BA22	3-8D	3-7D;
BA23	3-8D	3-7D;
/BACK	3-7E	3-8E;
/BAS	3-8D	3-7D;
BD0	3-8F	3-7F;
BD1	3-8F	3-7F;
BD2	3-8F	3-7F;
BD3	3-8F/E	3-7F/E;
BD4	3-8E	3-7E;
BD5	3-8E	3-7E;
BD6	3-8E	3-7E;
BD7	3-8E	3-7E;
BD8	N.U.	N.U.
BD9	N.U.	N.U.
BD10	N.U.	N.U.
BD11	N.U.	N.U.
BD12	N.U.	N.U.
BD13	N.U.	N.U.
BD14	N.U.	N.U.
BD15	N.U.	N.U.
/BDSEL	3-7E	3-7E, 8D, 8B; 4-7F;
/BJA00	3-2C	3-1C;
/BJA01	N.U.	N.U.
/BJA02	3-2C	3-1C;

SIGNAL WHERE USED LIST

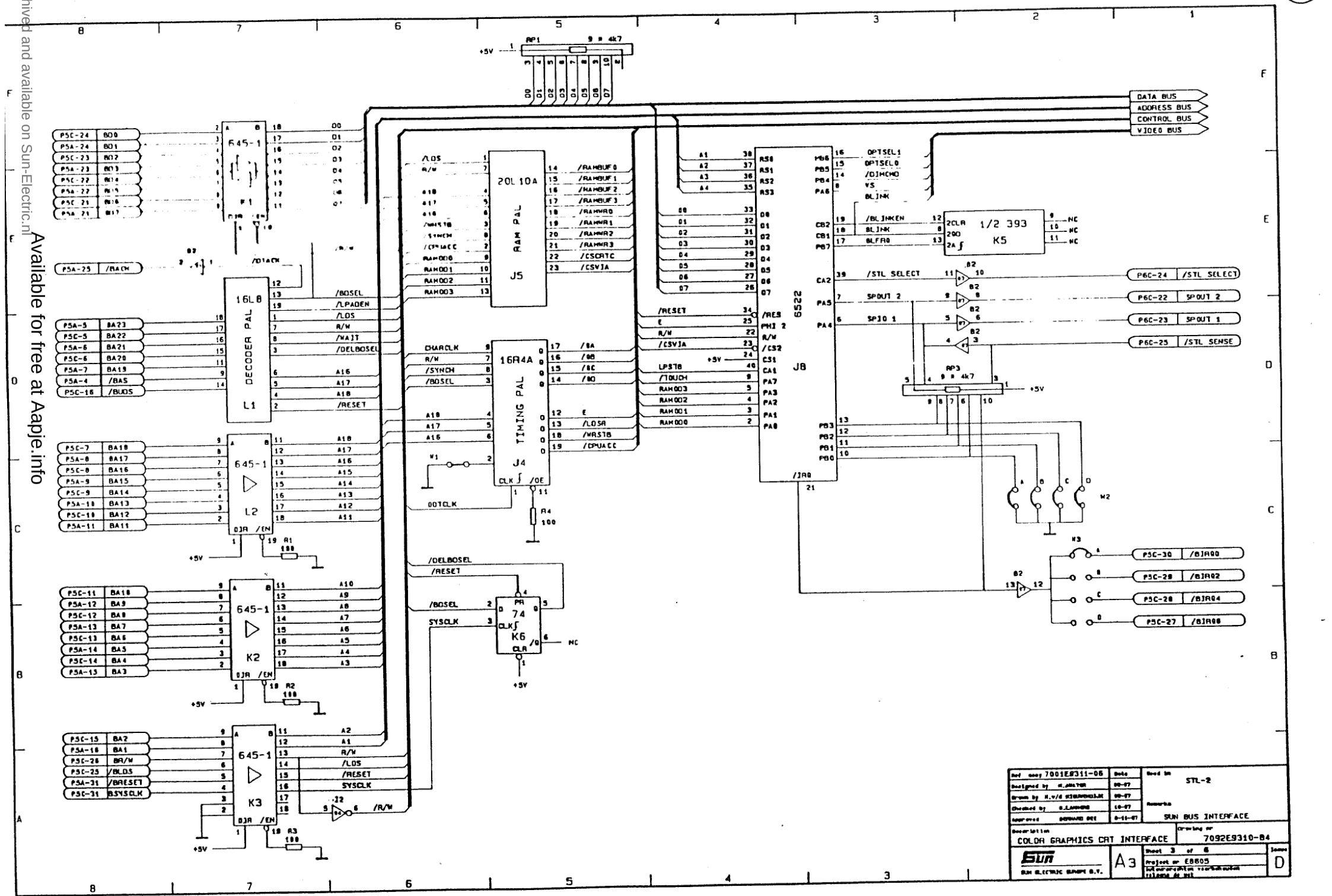
NAME	GENERATED (SHT-GRO)	USED (SHT-GRO)
/BJA03	N.U.	N.U.
/BJA04	3-2C	3-1B;
/BJA05	N.U.	N.U.
/BJA06	3-2C	3-1B;
/BJA07	N.U.	N.U.
/BLDS	3-8A	3-7A;
BLFRQ	3-3E	3-2E;
BLINK	3-8E	3-3E; 4-2E;
/BLINKEN	3-3E	3-2E;
/BRESET	3-8A	3-7A;
BR/W	3-8A	3-7A;
BSYSCLK	3-8A	3-7A;
/BUDS	3-8D	3-7D;
CHARCLK	4-2C	3-5D; 4-7F, 7D, 7C;
CLKB	4-2C;	4-7C;
CLKC	4-2C;	4-7C;
COMPB/N	5-4C/B	5-1B;
/CPUACC	3-5D	3-5E; 4-8D, 8B;
/CSCRTC	3-5E	4-7D;
/CSVIA	3-5E	3-4D;
CU	4-7E	4-7F;
/CUSYN	4-7F	4-2F;
D0	3-7F	3-4E, 9F; 4-7E, 7C, 4E, 4C, 4B;
D1	3-7F	3-4E, 9F; 4-7E, 7C, 4E, 4C, 4B;
D2	3-7F	3-4E, 9F; 4-7E, 7C, 4E, 4C, 4B;
D3	3-7F/E	3-4E, 9F; 4-7E, 7C/B, 4E, 4C, 4B;
D4	3-7E	3-4E, 9F; 4-7E/D, 7B, 4E, 4C, 4B;
D5	3-7E	3-4E, 9F; 4-7D, 7B, 4E, 4C, 4B;
D6	3-7E	3-4E, 9F; 4-7D, 7B, 4E, 4C, 4B;
D7	3-7E	3-4E, 9F; 4-7D, 7B, 4E, 4C, 4B;
DE	4-7E	4-7F;
/DELBOSEL	3-5B	3-7D;
/DESYN	4-7F/E	4-2F;
DIGBLU	4-2F	4-1F; 5-5C, 7C;
/DIGBLU	4-2F	4-1E, 2F;
DIGGRN	4-2F	4-1F; 8-8D, 7C/B;
/DIGGRN	4-2F	4-1E, 2F;
/DIGHS	4-2F	4-1F;
DIGOPT	4-2F	4-1F;
/DIGOPT	4-2F	4-1E, 2F;
DIGRED	4-2F	4-1F, 5-9F, 7B;
/DIGRED	4-2F	4-1E, 2F;
/DIGSYNC	4-2F	4-1F; 5-7E;
/DIGVS	4-2F	4-1F;
/DIM	4-2F	9-9E, 9D, 9C, 2*7B;
/DIMCMD	3-3E	4-2E;
DOTCLK	4-2C	4-2F, 2E; 3-5C;
/DOTCLK	4-2C	4-3F, 3D, 3C, 3B/A;
/DTACK	3-7E	3-7E
E	3-5D	3-4D; 4-7D;
HS	4-7E	4-2F;
/LDS	3-7A	3-7D, 8F/E;
/LDSR	3-5D	4-3F, 3D, 3C, 3A;
/LPADEN	3-7E/D	4-7B;
/LPSTB	4-1E/D	3-4D; 4- 2*7C, 1E/D;
MA0	4-7D	4-8D;
MA1	4-7D	4-8D;
MA2	4-7D	4-8D;
MA3	4-7D	4-8D;
MA4	4-7D	4-8C;
MA5	4-7D	4-8C;
MA6	4-7D	4-8C;
MA7	4-7D	4-8C;
MA8	4-7D	4-8B;
MA9	4-7D	4-8B;
MA10	4-7D	4-8B;
MA11	4-7D	4-8B;
/DERAM	4-7F	4- 2*9E, 9C, 9B;

SIGNAL WHERE USED LIST

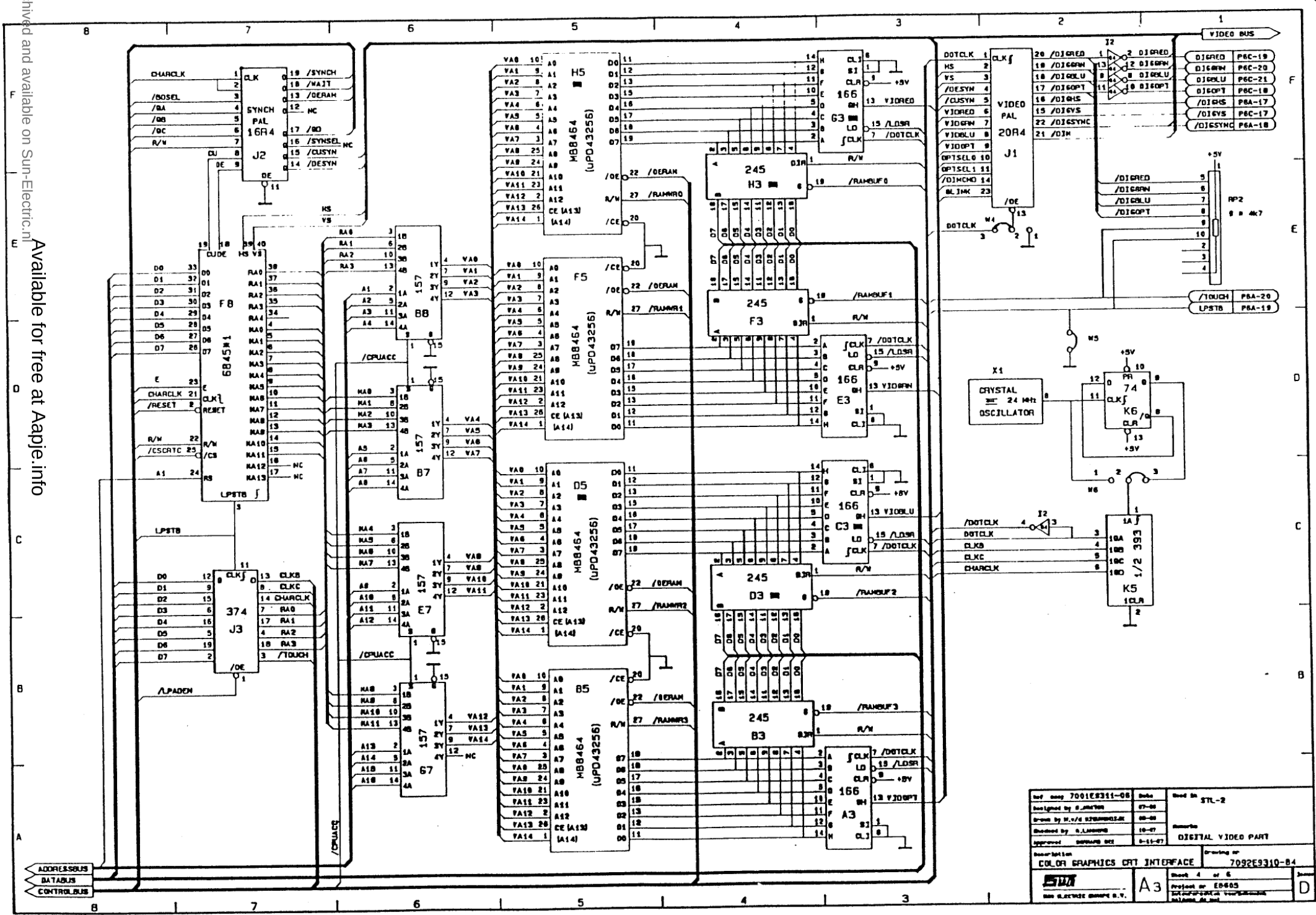
NAME	GENERATED (SHT-GRO)	USED (SHT-GRO)
OPTSEL0	3-3E	4-2F/E;
OPTSEL1	3-3F/E	4-2E;
/RA	3-5D	4-7F;
/RB	3-5D	4-7F;
/RC	3-5D	4-7F;
/RD	3-5D	4-7F;
RA0	4-7E	4-8E, 7C/B;
RA1	4-7E	4-8E, 7B;
RA2	4-7E	4-8E, 7B;
RA3	4-7E	4-8E, 7B;
/RAMBUF0	3-5E	4-4E;
/RAMBUF1	3-5E	4-4E;
/RAMBUF2	3-5E	4-4C;
/RAMBUF3	3-5E	4-4B;
RAMDI0	3-4D	3-5E;
RAMDI1	3-4D	3-5E;
RAMDI2	3-4D	3-5E;
RAMDI3	3-4D	3-5E;
/RAMWR0	3-5E	4-5E;
/RAMWR1	3-5E	4-5E/D;
/RAMWR2	3-5E	4-5C/B;
/RAMWR3	3-5E	4-5B;
/RESET	3-7A	3-7D, 8C/B, 4D; 4-7D;
R/W	3-7A	3-8A, 7D, 9F/E, 9D, 4D; 4-7F, 7D, 4F/E, 4E/D, 4C, 4B;
/R/W	3-8A	3-7E;
/STL SENSE	3-1D	3- 2*2D;
SPI01	3-3D	3-2D, 3D;
SPOUT1	3-2D	3-1D;
SPOUT2	3-3E/D	3-2E/D, 2D, 1E/D;
/STL SELECT	3-3E	3-2E, 1E;
/SYNCH	4-7F	3-5E, 5D;
SYNSEL	4-7F	N.U.
SYSCLK	3-7A	3-5B;
/TOUCH	4-1E	3-4D; 4-7B;
VA0	4-8E	4-5F, 5E, 5C, 5B;
VA1	4-8E	4-5F, 5E, 5C, 5B;
VA2	4-8E	4-5F, 5E, 5C, 5B;
VA3	4-8E	4-5F, 5E, 5C, 5B;
VA4	4-8D	4-8F, 9E/D, 9C, 9B;
VA5	4-8D	4-9F, 9D, 9C, 9B;
VA6	4-8D	4-9F, 9D, 9C, 9B;
VA7	4-8D	4-9F, 9D, 9C, 9B/A;
VA8	4-8C	4-9F, 9D, 9C, 9A;
VA9	4-8C	4-9F/E, 9D, 9C, 9A;
VA10	4-8C	4-9E, 9D, 9C, 9A;
VA11	4-8C	4-9E, 9D, 9C, 9A;
VA12	4-8B	4-9E, 9D, 9C/B, 9A;
VA13	4-8B	4-9E, 9D, 9B, 9A;
VA14	4-8B	4-9E, 9D, 9B, 9A;
VBND	SHEET 1	5-4E; -4D; -4C; -4B; -6A;
VJOBLU	4-3C	4-2F;
VJOGRN	4-3D	4-2F;
VJOOPT	4-3A	4-2F;
VJORED	4-3F	4-2F;
VS	4-7E	3-3E, 8F;
/WAIT	4-7F	3-7D;
/WRSTB	3-5D	3-5E;

Ref copy 7001E9311-06	Date	Used in STL-8	
Designed by F.AMATEN	23-07		
Drawn by H.v/d HEIJDEMEIJER	23-07		
Checked by R.LAMMENS	10-07	Remarks SJIGNAL WHERE USED LIST	
Approved BERNARD PEE	6-11-87		
Description COLOR GRAPHICS CRT INTERFACE		Drawing nr 7092E9310-B4	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 2 of 8	Issue D
		Project nr E8605	
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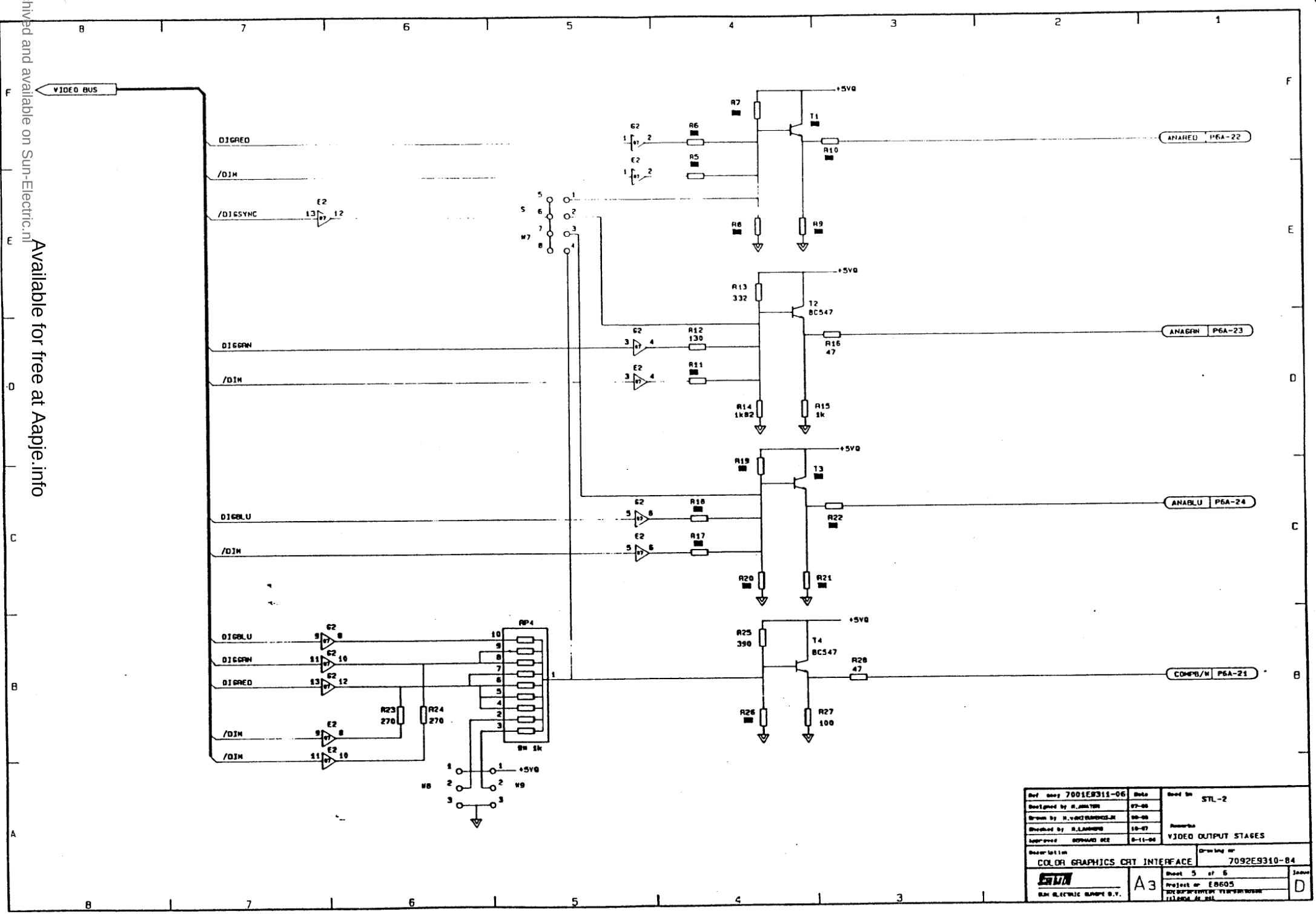
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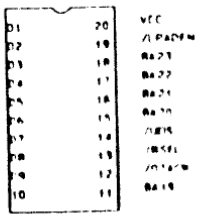


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PART NO : 0733E0101-10
REVISION : 1.0

PART ID : DECODER PAL MMI 16L8A

** PINOUT **



** FORMULA'S **

IF (VCC) /BSEL=/BA23*BA22*BA21*BA20
/BA19/RESET*BAS*LDS
+/BA23*BA22*BA21*BA20*/BA19
*/RESET*BAS*UDS
; 700000H-77FFFFH

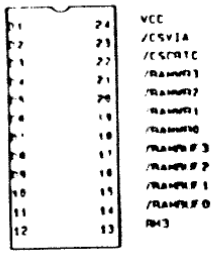
IF (VCC) /LPADEN=/BA23*BA22*BA21*BA20
/BA19/RESET*BAS
*A18*A17*A16*LDS*READ
; 770001H

IF (VCC) /OTACK=BSEL*DBSEL*/WAIT

PART NO : 0733E0111-10
REVISION : 1.0

PART ID : RAMPAL MMI 20L10A

** PINOUT **



** FORMULA'S **

IF (VCC) /CSVIA=SYNCH*LDS*A18*A17*/A16
; 760001H

IF (VCC) /CSCRTC=SYNCH*LDS*A18*/A17
*A16
; 750001H

IF (VCC) /RAMBUF0 =CPUACC*LDS*/A18*/A17*/A16
; 700001+N*2
+CPUACC*LDS*A18*/A17*/A16*/READ*RM0
; 740001

IF (VCC) /RAMBUF1 =CPUACC*LDS*/A18*/A17*A16
; 710001+N*2
+CPUACC*LDS*A18*/A17*/A16*/READ*RM1
; 740001

IF (VCC) /RAMBUF2 =CPUACC*LDS*/A18*A17*/A16
; 720001+N*2
+CPUACC*LDS*A18*/A17*/A16*/READ*RM2
; 740001

IF (VCC) /RAMBUF3 =CPUACC*LDS*/A18*A17*A16
; 730001+N*2
+CPUACC*LDS*A18*/A17*/A16*/READ*RM3
; 740001

IF (VCC) /RAMWR0 =CPUACC*LDS*/A18*/A17*/A16*WRSTB
+CPUACC*LDS*A18*/A17*/A16*/READ*WRSTB
*RM0

IF (VCC) /RAMWR1 =CPUACC*LDS*/A18*/A17*A16*WRSTB
+CPUACC*LDS*A18*/A17*/A16*/READ*WRSTB
*RM1

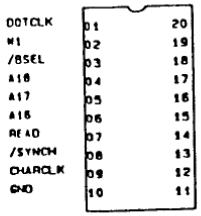
IF (VCC) /RAMWR2 =CPUACC*LDS*/A18*A17*/A16*WRSTB
+CPUACC*LDS*A18*/A17*/A16*/READ*WRSTB
*RM2

IF (VCC) /RAMWR3 =CPUACC*LDS*/A18*A17*A16*WRSTB
+CPUACC*LDS*A18*/A17*/A16*/READ*WRSTB
*RM3

PART NO : 0733E0121-10
REVISION : 1.0

PART ID : TIMING PAL MMI 16R4A

** PINOUT **



** FORMULA'S **

/QA: =CHARCLK

/QB: =QA

/QC: =QB

/QD: =QC

IF (VCC) /CPUACC=QA*SYNCH

IF (VCC) /LDSR=/QA*/QD

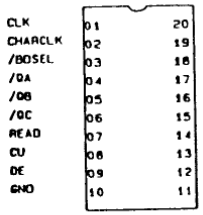
IF (VCC) /E=QD
+/QC*/QA
+QC*/SYNCH
+QC*/READ

IF (VCC) /WRSTB=QB*/QC*/READ*SYNCH

PART NO : 0733E0131-10
REVISION : 1.0

PART ID : SYNCHPAL MMI 16R4A

** PINOUT **



** FORMULA'S **

IF (VCC) /OERAM=READ
+/QA
+/SYNCH

/DESYN: =DE

/CUSYN: =CU

/SYNSEL: =BOSEL

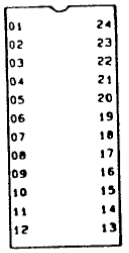
IF (VCC) /SYNCH=SYNSEL*CHARCLK*BOSEL

IF (VCC) /WAIT=BOSEL*/SYNSEL
+BOSEL*/CHARCLK
+BOSEL*/QA*/QD
+BOSEL*SYNCH*/QB

PART NO : 0733E0142-10
REVISION : 2.0

PART ID : VIDEO PAL MMI 20R4A

** PINOUT **



** FORMULA'S **

DIGHS=/HS ;HIGH ACTIVE HORIZONTAL SYNC

DIGVS=/VS ;HIGH ACTIVE VERTICAL SYNC

DIM=/DIGOPT

DIGSYNC=VS ;LOW ACTIVE VERTICAL SYNC

DISRED: =OPTSEL1*DESYN*/DIMCHO*VIDGRN
+/OPTSEL1*DESYN*/DIMCHO*VIDGRN*/VIDOPT
+/OPTSEL1*DESYN*/DIMCHO*VIDGRN*VIDOPT
*/BLINK*OPTSEL0
+CUSYN*DESYN

DIGGRN: =OPTSEL1*DESYN*/DIMCHO*VIDGRN
+/OPTSEL1*DESYN*/DIMCHO*VIDGRN*/VIDOPT
+/OPTSEL1*DESYN*/DIMCHO*VIDGRN*VIDOPT
*/BLINK*OPTSEL0
+CUSYN*DESYN

DIGBLU: =OPTSEL1*DESYN*/DIMCHO*VIDGRN
+/OPTSEL1*DESYN*/DIMCHO*VIDGRN*/VIDOPT
+/OPTSEL1*DESYN*/DIMCHO*VIDGRN*VIDOPT
*/BLINK*OPTSEL0
+CUSYN*DESYN

DIGOPT: =OPTSEL1*DESYN*/DIMCHO*VIDOPT
+CUSYN*DESYN*/DIMCHO
+/OPTSEL1*DESYN*/DIMCHO*VIDGRN*/VIDOPT
+/OPTSEL1*DESYN*/DIMCHO*VIDGRN*VIDOPT
*/BLINK*OPTSEL0

MONOCHROME VERSION: RED AND BLUE OUTPUTS ARE
CONTROLLED BY GREEN-RAM
ANA GREEN VIDEO OUTPUT GIVES
BLACK OR GREEN ONLY

Ref assy 7001E9311-06	Date	Used in STL-2	
Designed by B.AMATER	10-87		
Drawn by E.v/d WIELENHOUK	10-87		
Checked by G.LAMMERS	10-87	Remarks PAL-LISTINGS	
Approved EXPAND SEE	11-87		
Description COLOR GRAPHICS CRT INTERFACE		Drawing nr 7092E9310-B4	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 6 of 6	Issue D
		Project nr E8605	
		DISCLAIMER: This drawing is the property of SUN ELECTRIC EUROPE B.V. Reproduction, transmission or use without permission is prohibited. Offenders will be liable for damages. All rights reserved.	

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Revisions					
Rev	Date	ECN	Description	Check	Appr
A	[illegible]		EAN # 0181, REL. FOR PROD.		
B	21 NOV 88	8.05.0534E	ADDED R.15		
C	05 DEC 88	8.10.0676	C1 NOT INSTALLED. R3 WAS 100K.		

P13-CONNECTOR			
PIN NO	SIGNAL	PIN NO	SIGNAL
1A	GND D	1C	GND D
2A	+5V	2C	+5V
3A	-12V	3C	+12V
4A	/BAS	4C	/AC FAIL
5A	BA23	5C	BA22
6A	BA21	6C	BA20
7A	BA19	7C	BA18
8A	BA17	8C	BA16
9A	BA15	9C	BA14
10A	BA13	10C	BA12
11A	BA11	11C	BA10
12A	BA9	12C	BA8
13A	BA7	13C	BA6
14A	BA5	14C	BA4
15A	BA3	15C	BA2
16A	BA1	16C	/BUOS
17A	BD15	17C	BD14
18A	BD13	18C	BD12
19A	BD11	19C	BD10
20A	BD9	20C	BD8
21A	BD7	21C	BD6
22A	BD5	22C	BD4
23A	BD3	23C	BD2
24A	BD1	24C	BD0
25A	/BACK	25C	/BLOS
26A	RESERVED	26C	BR/WR
27A	/BIRQ7	27C	/BIRQ6
28A	/BIRQ5	28C	/BIRQ4
29A	/BIRQ3	29C	/BIRQ2
30A	/BIRQ1	30C	/BIRQ0
31A	/BRESET	31C	BSYSCLK
32A	GND D	32C	GND D

P14 -CONNECTOR					
PIN NO	SIGNAL	PIN NO	SIGNAL	PIN NO	SIGNAL
1A		1B		1C	
2A		2B	SVSEL	2C	
3A		3B	RESOL	3C	
4A		4B	/UBATTOK	4C	
5A		5B	COLB	5C	
6A		6B	COLA	6C	
7A		7B	/COND B	7C	
8A		8B	/COND A	8C	
9A		9B	DECJB	9C	
10A		10B	RES	10C	
11A		11B	RES	11C	
12A		12B	/PUB 2	12C	
13A		13B	/POB 20	13C	
14A		14B	/PUB 1	14C	
15A	BATTGND	15B	BATTGND	15C	BATTGND
16A	GNDA	16B	GNDA	16C	GNDA
17A	MX0	17B	/POB 10	17C	A HYST 1
18A	MX1	18B		18C	/POB 5
19A	MX2	19B		19C	A HYST 2
20A	ENMUX	20B		20C	/POBX
21A	ATHL 1	21B		21C	ATHL 2
22A	B HYST 1	22B		22C	B HYST 2
23A	BTHL 1	23B		23C	BTHL 2
24A	/POAX	24B		24C	/PUA 1
25A	/POA 5	25B		25C	/PUA 2
26A	/POA 10	26B		26C	RES
27A	/POA 20	27B		27C	RES
28A	/UPAON	28B		28C	/UPBON
29A	/LOADN	29B		29C	/LOBON
30A	-12V	30B		30C	+12V
31A	+5V	31B	+5V	31C	+5V
32A	GNDD	32B	GNDD	32C	GNDD

NOTES:
1/ UNLESS OTHERWISE SPECIFIED:
- A/ ALL RESISTORS ARE IN OHMS, 1/4W, 5%
- B/ ALL CAPACITORS ARE IN MICRO-FARADS
- C/ ALL DIODES ARE 1N914 OR 1N4148
- D/ ALL IC'S ARE 74LS-SERIES TYPE EXCEPT D7 (7407)
- E/ ALL POLARIZED CAPACITORS ARE 16V

2/ LAST USED NO'S: R13 C6 CK37 F2 RP4
CR2 W10 LED3 TP4

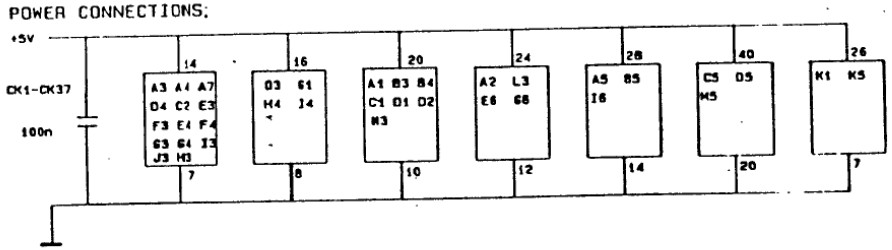
3/ NOT USED NO'S:

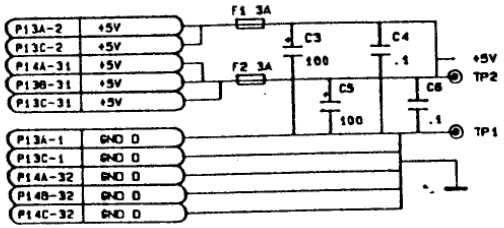
4/ JUMPERLOCATION AND SETTINGS:

W1	3-A8	H
W2	3-D6	OUT
W3	3-D6	OUT
W4	3-C3	OUT
W5	3-C8	IN COPPER
W6	4-B6	IN COPPER
W7	4-A6	IN COPPER
W8	4-A6	IN COPPER
W9	5-C6	2-3
W10	5-C6	2-3

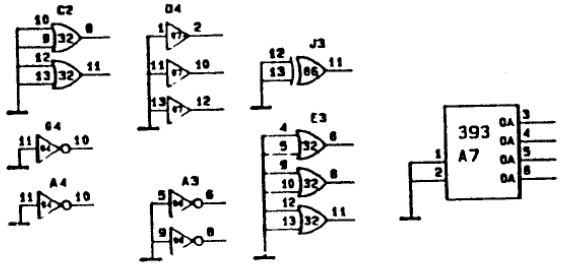
S/ITEMS MARKED WITH ■
ARE NOT INSTALLED

POWER CONNECTIONS:





SPARES:



Ref assy 7001E9311-18	Date	Used On	
Designed by R.LAMMERS	11-87	ESA 5100	
Drawn by H.v/d KEUKHOF	11-87	STL 2	
Checked by R.Lammers	2-88	POWER DISTRIBUTION	
Approved R. Lammers	2.88		
Description COMMUNICATION PROCESSOR BOARD		Drawing nr 7092E9311-15	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 6	Issue C
		Project nr E8605	

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SIGNAL WHERE USED LIST

NAME	GENERATED (SHT-GRO)	USED (SHT-GRO)
A0		3-7E, 4F, 3F, 3D; 4-7E, 7C, 7A; 5-7C, 7A, 3E;
A1		3-7E, 4F, 3F, 3D; 4-7E, 7C; 5-7C, 7A, 3E;
A2		3-7E, 4F, 3F, 3D;
A3		3-7E, 4F, 3F, 3D;
A4		3-7E, 4F, 3F, 3D; 5-7F;
A5		3-7E, 4F, 3F, 3D; 5-7F;
A6		3-7E, 4F, 3F, 3D; 5-7F;
A7		3-7E, 4F, 3F, 3D;
A8		3-7D, 4E, 3E, 3D/C, 5E;
A9		3-7D, 4E, 3E, 3C, -5E;
A10		3-7D, 4E, 3E, 3C, 5E;
A11		3-7D, 7C, 4E, 3E, 3C, 2F, 5E;
A12		3-7D, 7C, 4E, 3E, 3C, 5E;
A13		3-7D, 7C, 4E, 3E, 3C, 5E;
A14		3-7D, 7C, 4E, 3E, 3C, 5E;
A15		3-7D, 7C, 4E, 3E, 3C, 5E;
A16	3-8D	3-7D, 3B;
AD0		3-7F, 3F, 3D, 4F, 5E, 5F, 2E; 4-7F, 7C, 7B; 5-7E, 7C, 3F;
AD1		3-7F, 3F, 3D, 4F, 5F, 5E, 2E; 4-7F, 7C, 7B; 5-7E 7C, 3F;
AD2		3-7F, 3F, 3D, 4F, 5F, 5E, 2E; 4-7F, 7C, 7B; 5-7E 7CB, 3F;
AD3		3-7F, 3FE, 3D, 4F, 5F, 5E, 2E; 4-7FE, 7C, 7B; 5-7E, 7B, 3F;
AD4		3-7F, 3E, 3DC, 4F, 5F, 5E, 2E; 4-7E, 7C, 7B; 5-7E, 7B, 3F;
AD5		3-7F, 3E, 3C, 4F, 5F, 5E, 2E; 4-7E, 7C, 7BA; 5-7ED, 7B, 3F;
AD6		3-7F, 3E, 3C, 4F, 5F, 5E, 2E; 4-7E, 7C, 7A; 5-7D, 7B, 3F;
AD7		3-7F, 3E, 3C, 4F, 5F, 5E, 2E; 4-7E, 7C, 7A; 5-7D, 7B, 3F;
BACFAIL	3-8B	3-6D;
B HYST 1	5-2E	5-1E;
B HYST 2	5-2E	5-1E;
BALE	3-5E	3-4E (2x), -2D;
B THL 1	5-2E/D	5-1E/D;
B THL 2	5-2D	5-1D;
BA1	3-8E	3-7E;
BA2	3-8E	3-7E;
BA3	3-8E	3-7E;
BA4	3-8E	3-7E;
BA5	3-8E	3-7E;
BA6	3-8E	3-7E;
BA7	3-8E	3-7E;
BA8	3-8E	3-7E;
BA9	3-8D	3-7D;
BA10	3-8D	3-7D;
BA11	3-8D	3-7D;
BA12	3-8D	3-7D;
BA13	3-8D	3-7D;
BA14	3-8D	3-7D;
BA15	3-8D	3-7D;
BA16	3-8D	3-8D;
BA17	3-8B	3-7B;
BA18	3-8B	3-7B;
BA19	3-8B	3-7B;
BA20	3-8B	3-7B;
BA21	3-8B	3-7B;
BA22	3-8B	3-7B;
BA23	3-8C	3-7C;
/BACK	3-8B	3-5B;
/BAS	3-8B	3-7B;
BD0	3-8F	3-7F;
BD1	3-8F	3-7F;
BD2	3-8F	3-7F;
BD3	3-8F	3-7F;
BD4	3-8F	3-7F;
BD5	3-8F	3-7F;
BD6	3-8F	3-7F;
BD7	3-8F	3-7F;
/BIRQ	3-3A	3-7A;
/BIRQ0		3-8A;
/BIRQ1		3-8A;
/BIRQ2		3-8A;
/BIRQ3		3-8A;
/BIRQ4		3-8A;
/BIRQ5		3-8A;
/BIRQ6		3-8A
/BIRQ7		3-8A;
BITA	5-8C	5-5D;

SIGNAL WHERE USED LIST

NAME	GENERATED (SHT-GRO)	USED (SHT-GRO)
BITB	5-6B	5-5D;
B HYST 1	5-2D	5-1D;
B HYST 2	5-2D	5-1D;
/BLOS	3-8B	3-6B;
BRCA	4-7E	4-5E, 1F; 5-5E, 5D, 1B;
BRCB	4-7D	4-5D, 1C; 5-5E, 5D, 1B;
BRCAEN	5-6B	5-5D;
BRCBEN	5-6A	5-5D;
/BRESET	3-8B	3-6C;
BR/W	3-8A	3-7A;
BSEL	3-1D	3-1D, -3C;
BSYSCLK	3-8B	3-6B, -6E, -6C;
B THL 1	5-2D	5-1D;
B THL 2	5-2D	5-1D;
/BUOS	3-8B/A	3-6B/A;
CLK	3-5D	3-4B, 2D; 5-7D;
/CLK	3-4B	3-3B;
CLK/2	3-1D	N.U.
CLK/4	3-1D/C	N.U.
CLK/8	3-1C	N.U.
CLK/16	3-1C	3-2D;
/CLRINT	3-1D	3-1D, -3B;
COLA	5-1C	4-7B, 1B; 5-8C, -5D, -1C;
COLB	5-1C	4-7B, 1B; 5-8C, -5D, -1C;
/CONOA	5-1C	4-4C, 1C; 5-1C, 4C;
/CONOB	5-1C	4-4C, 1C; 5-1C, -4C;
/CSEPROM	3-7C	3-3C;
/CSPER	3-7C	5-7E;
/CSPIC	5-6F	4-7B;
/CSPIT1	5-6F	4-7F;
/CSPIT2	5-6F	4-7D;
/CSPPI1	5-6F	5-3E;
/CSPPI2	5-6F	5-7B;
/CSRAM	3-7C	3-3E;
/CSRIOT	3-7C	3-2D;
DEL 25 A	5-6B	4-4E, 1E; 5-1B;
DEL 50 A	5-6B	4-4E, 1E; 5-1B;
DEL 75 A	5-6B	4-4E, 1E; 5-1B;
DEL 25 B	5-6A	4-4D, 1C; 5-1B;
DEL 50 B	5-6A	4-4D, 1C; 5-1B;
DEL 75 B	5-6A	4-4D, 1C; 5-1B;
/EDA	5-6B	5-5D;
/EDB	5-6A	5-5D;
ENMUX	4-2B	4-1B
/ESA	5-6B	5-5D;
/ESB	5-6A	5-5D;
MLDA	3-5D	3-6A, 3B, 7C;
MLOADEL	3-3B	3-4E, 4D;
MOLDRQ	3-3B	3-5D;
MOST	3-3B	3-2B;
/MOSTREQ	3-5B	3-3B;
MOSTACK		3-6A;
MRQ		3-3A;
/INTA	3-8F	4-7B;
INTR	4-7B	3-8E;
/INTSEL	3-7B	3-6B, 3A;
/INVA	5-8C	5-4C;
/INVB	5-6B	5-4C;
IO/M	3-5D	3-7C, 4D, 4C; 5-7E;
/IORD	3-4C	3-4C; 4-7F, 7D, 7B; 5-7D, 7B, 3E;
/IOWR	3-4C	3-4C; 4-7F, 7D, 7B; 5-7D, 7B, 3E;
/IRQSET	3-3A	3-5D, 3A;
/LOAON	5-5D	5-1D;
/LOBON	5-5D	5-1D;
MX0		4-1B;
MX1		4-1B;
MX2		4-1B;
/MEMRD	3-4C	3-4C, 5B, 3C, 3E;
/MEMWR	3-4D	3-4D, 5B/A, 3C, 3E;
OBRESET	3-5D	3-6A, 3B, 2E; 5-7B, 7D, 3E;
OECIB		5-1C;
PA0		3-1F; 5-2C;
PA1		3-1F; 5-2C;
PA2		3-1E/F; 5-2C;

SIGNAL WHERE USED LIST

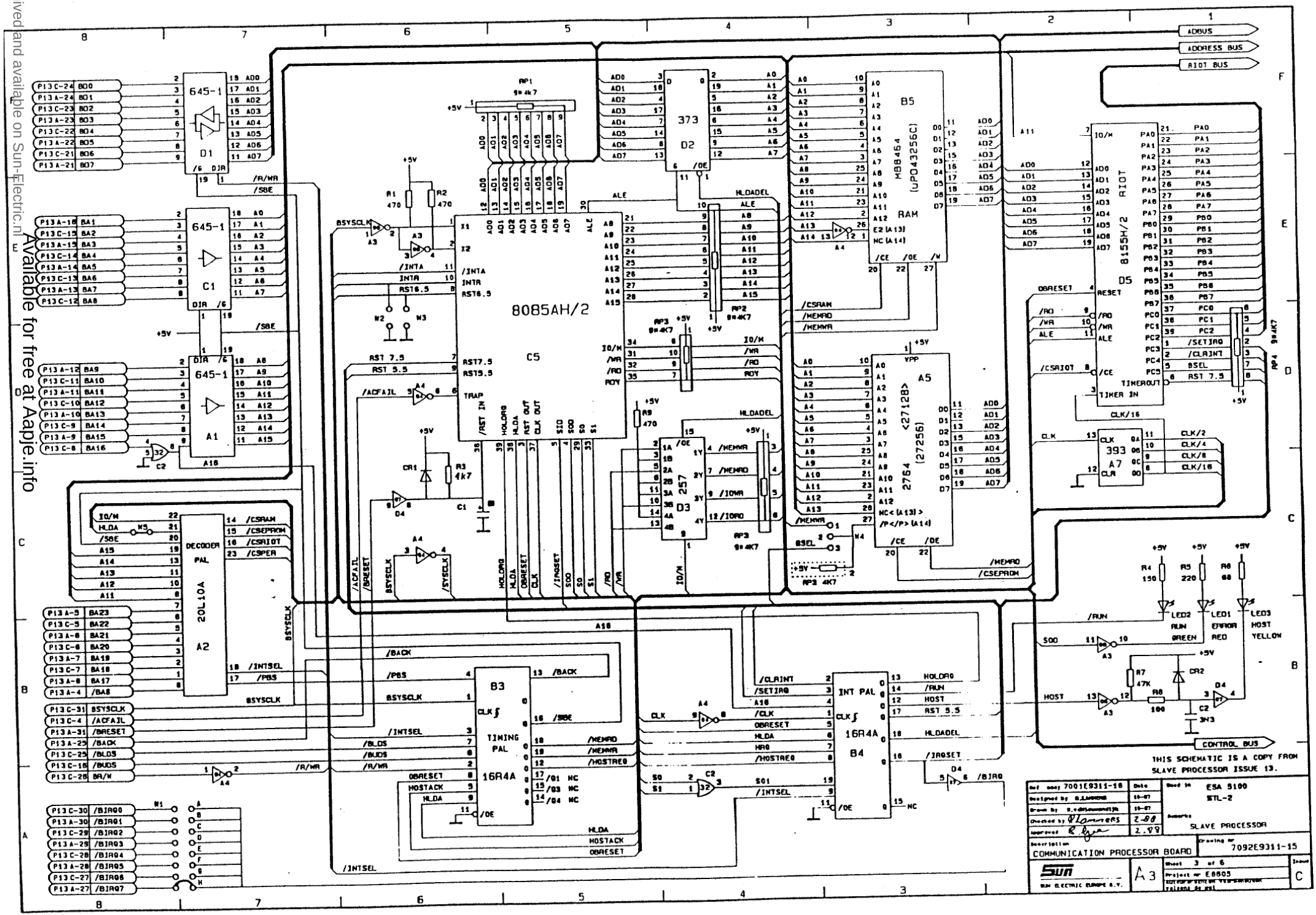
NAME	GENERATED (SHT-GRO)	USED (SHT-GRO)
PA3		3-1E; 5-2C;
PA4		3-1E;
PA5		3-1E;
PA6		3-1E;
PA7		3-1E; 5-2C;
PB0	3-1E	5-2C;
PB1	3-1E	5-2C;
PB2	3-1E	5-2C;
PB3	3-1E	4-3B;
PB4	3-1E	4-3B;
PB5	3-1E	4-3B;
PB6	3-1E	4-3B;
PB7	3-1E/D	4-3B;
/PBS	3-7B	3-6B;
PC0	3-1D	3-1D;
PC1	3-1D	3-1D;
PC2	3-1D	3-1D;
/PDA 5	5-2F	5-1F;
/PDA 10	5-2F	5-1F;
/PDA 20	5-2F	5-1F;
/PDAX	5-2F/E	5-1F/E;
/PDB 5	5-2E	5-1E;
/PDB 10	5-2E	5-1E;
/PDB 20	5-2E	5-1E;
/PDBX	5-2E	5-1E;
/PUA1	5-2F	5-1F;
/PUA2	5-2F	5-1F;
/PUB1	5-2E	5-1E;
/PUB2	5-2E	5-1E;
/RD	3-5D	3-4C, 2D;
RDY	3-5D	3-4D;
RESOL		5-1C;
RST 5.5	3-3B	3-6D;
RST 6.5	5-7D	3-6E;
RST 7.5	3-1D	3-6D, 1D;
/R/WR	3-7A	3-7F, 6A;
/RUN	3-3B	3-1B;
S0	3-5D	3-4A;
S1	3-5D	3-4A;
S01	3-4A	3-3A;
/S8E	3-5B	3-7E, 7D, 7C;
SEL B/A	5-6B	4-4C, 1C; 5-1B;
SELRxCA	5-8A	5-5E;
SELRxCB	5-8A	5-5E;
SELTxCA	5-8B/A	5-5E;
/SETIRQ	3-1D	3-3B, 1D;
SOD	3-5D	3-2B;
/SYSCLK	3-8C	4-7F, 7C;
/RxCA	5-5E	5-8E;
/RxCB	5-5E	5-6E;
/TxCA	5-5E	5-6E;
/TxCB	5-5E	5-6E;
/RxDA	5-4C	5-6C, 5E;
/RxDB	5-4C	5-6C, 5E;
/TxDA	5-6D	5-5D;
/TxDB	5-8D	5-5D;
TRIA	5-8D	5-5D;
TRIB	5-8D	5-5D;
/UBATTOK		5-1C;
/UPAON	5-5D	5-1D;
/UPBON	5-5D	5-1D;
/WR	3-5D	3-4C, 2D, 4D;

SIGNAL WHERE USED LIST

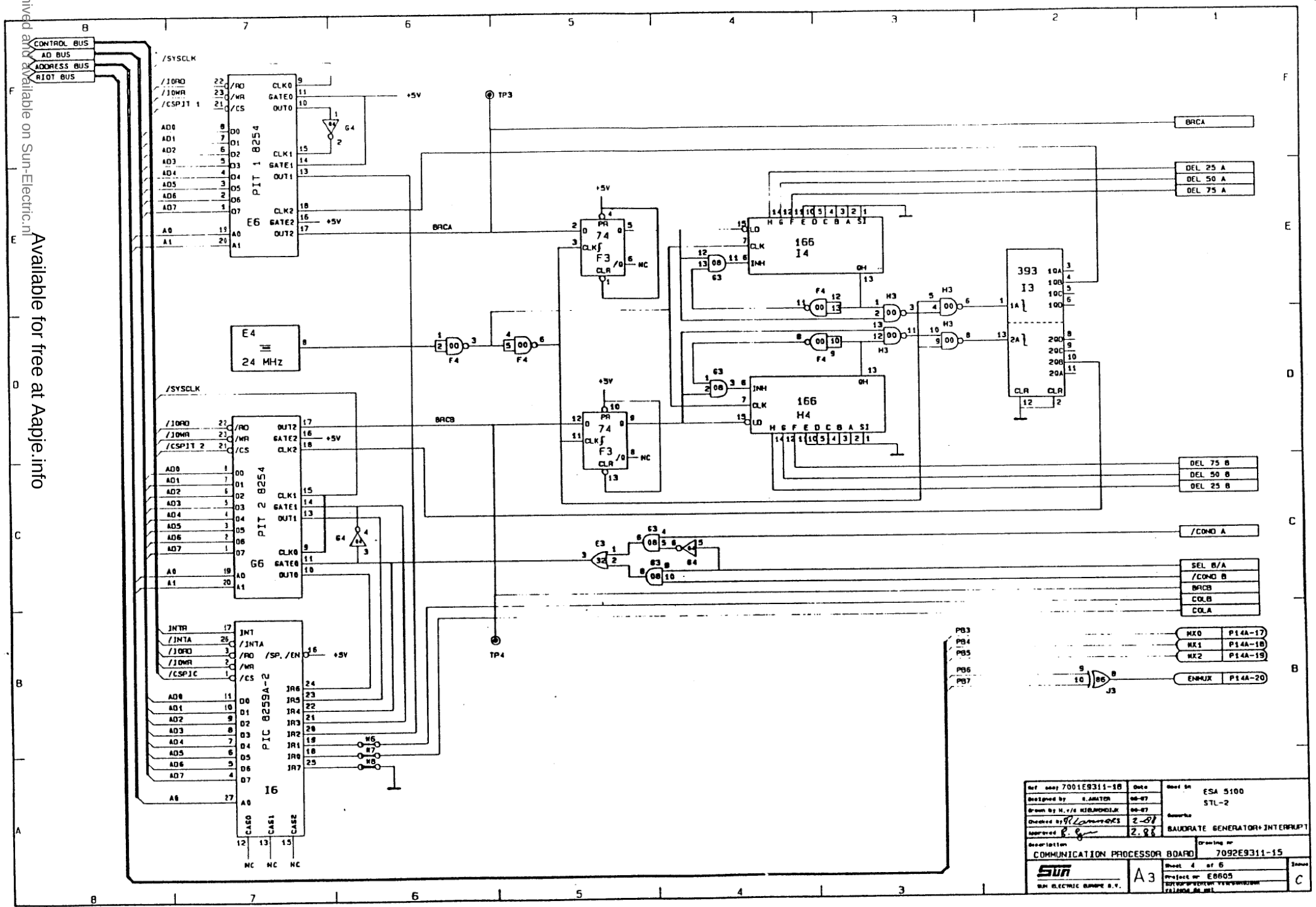
NAME	GENERATED (SHT-GRO)	USED (SHT-GRO)
5V SELECT		5-1C;
/AINV	5-6C	5-5E, 5D;
/BAINV	5-6B	5-5E, 5D;

Ref assy 7001E9311-1B	Date	Used in ESA 5100	
Designed by B.AMATER	08-87	STL-2	
Drawn by R.v/d WIELANDSIJK	08-87	Remarks	
Checked by R.Lammers	2-88		
Approved B. Bar	2.88	SIGNAL LISTING	
Description COMMUNICATION PROCESSOR BOARD		Drawing nr 7092E9311-15	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 2 of 6	Issue C
		Project nr E8605	

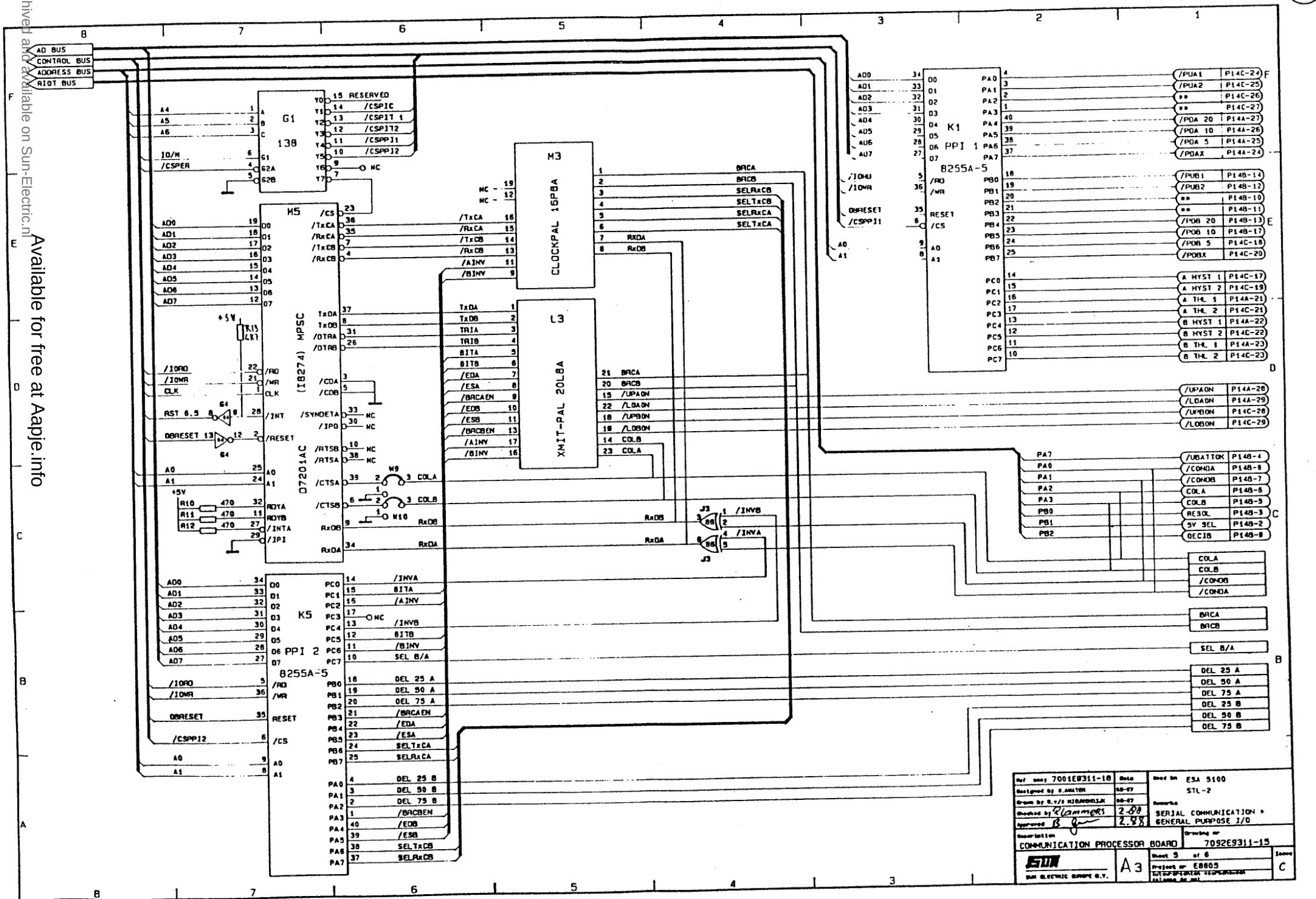
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```
PART NO  : 0733E0211-10
REVISION : 1.0

 PART ID  : DECODER PAL MMI 20L10A


BA17   | 01      24 |  VCC
BA18   | 02      23 |  /CSPER
BA19   | 03      22 |  IO
BA20   | 04      21 |   HLDA
BA21   | 05      20 |  /SBE
BA22   | 06      19 |  A15
BA23   | 07      18 |  /INTSEL
/BAS   | 08      17 |  /PBS
A11    | 09      16 |  /CSRIOT
A12    | 10      15 |  /CSEPROM
A13    | 11      14 |  /CSRAM
GND    | 12      13 |  A14

 STRING BASE ' BAS=BA23*/BA22*/BA21
                 */BA20*/BA19*/BA18'

 'BOARDADDRESS ******* 800000 hex *******

EQUATIONS

 CSERAM=A15;  8085, 8237 > 8000H - FFFFH
           ; HOST > BASE+10000H - BASE+1FFFFH

 CSEPROM=/A15*/A14; 8085, 8237 > 0000H - 3FFFH
                 ' ; HOST > BASE - BASE+7FFFFH

 PBS=BASE
    ; HOST > BASE=800000H, RANGE 800000H - 83FFFFH

  CSPER=A15*/A11*IO*/HLDA; 8085 > IO 80H-FFH

 INTSEL=BASE*BA17
       ; HOST > 820000H - 82FFFFH >> RESET BIRQ
       ; HOST > 830000H - 83FFFFH >> SET RST5.5

 CSRIOT=/A15*A14*/A13*/A12*/IO; 8085 > MEM 4000H - 4FFFH
       +/A15*/A14*/A13*/A12*A11*IO; 8085 > 08H - 0FH
      ; NOT ACCESSABLE FOR DMAC OR HOST
```

```
PART NO  : 0733E0221-10
REVISION : 1.0

 PART ID  : TIMING PAL MMI 16R4A


BSYSCLK | 01      20 |  VCC
MR68K   | 02      19 |  /MR
/INT    | 03      18 |  /RD
/PBS    | 04      17 |  /Q1
HOSTACK | 05      16 |  /SBE
/BUDS   | 06      15 |  /Q3
/BLDS   | 07      14 |  /Q4
RST     | 08      13 |  /ACK
HLDA    | 09      12 |  /HOSTREQ
GND     | 10      11 |  /OE

EQUATIONS

 Q1: -PBS*BLDS*/RST*HLDA*/Q4*/INT
    +PBS*BUDS*/RST*HLDA*/Q4*/INT

 SBE: -Q1*/Q4*/RST

 Q3: -SBE*/RST
    +INT*BLDS*/Q3*/RST*/Q4
    +INT*BUDS*/Q3*/RST*/Q4

 HOSTREQ=PBS*/Q4*/INT

 Q4: -Q3*/RST
    +Q4*HLDA*/RST
    +Q4*INT*BLDS*/RST
    +Q4*INT*BUDS*/RST

 MR.TRST=SBE*BLDS*/RST

 MR=Q3*/Q4*MR68K

 RD.TRST=SBE*BLDS*/RST

 RD=/MR68K*Q3

 ACK.TRST=PBS

 ACK=PBS*Q3*/Q4*BLDS*/INT
    +PBS*Q3*/Q4*BUDS*/INT
    +PBS*ACK ;HOLD UNTIL HOST TERMINATES CYCLE
    +INT*BLDS*Q4
    +INT*BUDS*Q4
```

```
PART NO  : 0733E0231-10
REVISION : 1.0

 PART ID  : INTERRUPT PAL MMI 16R4A


CLK     | 01      20 |  VCC
/CLRINT | 02      19 |  S01
/SETIRQ | 03      18 |  /HLDAON
A18     | 04      17 |  /RST55N
RST     | 05      16 |  /IRQSET
HLDA    | 06      15 |  /Q3
HRQ     | 07      14 |  /RUN
/HOSTREQ| 08      13 |  /HOLDRQN
/INTSEL | 09      12 |  /HOSTN
GND     | 10      11 |  /OE

EQUATIONS

 RST55N: -RST
        +CLRINT*/SETIRQ
        +/INTSEL*RST55N
        +/A18*RST55N

 /RST55: -/RST*/(CLR*/SETIRQ)*INTSEL*A18
        +/RST*/(CLR*/SETIRQ)*RST55

 IRQSET: -/RST*/INTSEL*SETIRQ*/CLRINT
        +/RST*A18*SETIRQ*/CLRINT
        +/RST*/INTSEL*IRQSET
        +/RST*A18*IRQSET

 RUN: -/RST*/HLDA*S01

 Q3: -HLDA

 HLDAON=/Q3
        +/HLDA

 HOSTN=/HLDA
      +/HOSTREQ

 HOLDRQN=/HOSTREQ
```

```
PART NO  : 0733E0241-10
REVISION : 1.0

 PART ID  : CLOCK PAL MMI 16P8A


BRCA    | 01      20 |  VCC
BRCB    | 02      19 |  NC
SELRXCB | 03      18 |  NC
SELTXCB | 04      17 |  NC
SELRXCA | 05      16 |  /TXCA
SELTXCA | 06      15 |  /RXCA
RXDA    | 07      14 |  /TXCB
RXDB    | 08      13 |  /RXCB
/BINV   | 09      12 |  NC
GND     | 10      11 |  /AINV

EQUATIONS

 TXCA=SELTXCA*BRCA
     +/SELTXCA*RXDB

 RXCA=SELRXCA*BRCA
     +/SELRXCA*RXDB

 TXCB=SELTXCB*BRCB
     +/SELTXCB*RXDA

 RXCB=SELRXCB*BRCB
     +/SELRXCB*RXDA

 ; THE SIGNALS /AINV AND /BINV ARE
      CURRENTLY NOT USED IN THIS PAL >
 ;    THEY ARE PUT IN FOR POSSIBLE USE
      IN FUTURE
```

```
PART NO  : 0733E0251-10
REVISION : 1.0

 PART ID  : XMIT PAL MMI 20L8A


TXDA    | 01      24 |  VCC
TXDB    | 02      23 |  COLA
TRIA    | 03      22 |  /LOAON
TRIB    | 04      21 |  BRCA
BITA    | 05      20 |  BRCB
BITB    | 06      19 |  /LOBON
/EDA    | 07      18 |  /UPBON
/ESA    | 08      17 |  /AINV
/BRCAEN | 09      16 |  /BINV
/EDB    | 10      15 |  /UPAON
/ESB    | 11      14 |  COLB
GND     | 12      13 |  /BRCBEN

EQUATIONS

 UPAON.TRST=/TRIA*/COLA*ESA

 UPAON=/BRCAEN*TXDA*BITA
      +BRCAEN*BRCA

 LOAON.TRST=/TRIA*/COLA*EDA

 LOAON=/BRCAEN*/TXDA
      +/BRCAEN*/BITA
      +BRCAEN*/BRCA

 UPBON.TRST=/TRIB*/COLB*ESB

 UPBON=/BRCBEN*TXDB*BITB
      +BRCBEN*BRCB

 LOBON.TRST=/TRIB*/COLB*EDB

 LOBON=/BRCBEN*/TXDB
      +/BRCBEN*/BITB
      +BRCBEN*/BRCB

 ; THE SIGNALS /AINV AND /BINV ARE
 ; CURRENTLY NOT USED, BUT ARE PUT IN
 ; THIS PAL FOR FUTURE USE:
```

Ref assy 7001E9311-18	Date	Used in ESA 5100 STL-2	
Designed by R.AMATOR	19-08		
Drawn by R.v/d HEIJKOOIJK	19-08	Remarks	
Checked by: M.Lammers	2-89	PAL-LISTINGS	
Approved R. Gee	2.88		
Description COMMINICATION PROCESSOR BOARD		Drawing nr 7092E9311-15	
Sun SUN ELECTRIC EUROPE B.V.	A3	Sheet 6 of 6	Issue C
		Project nr E8605	

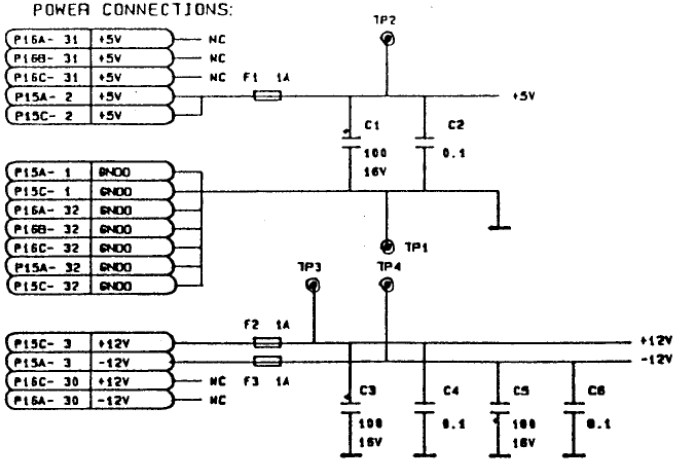
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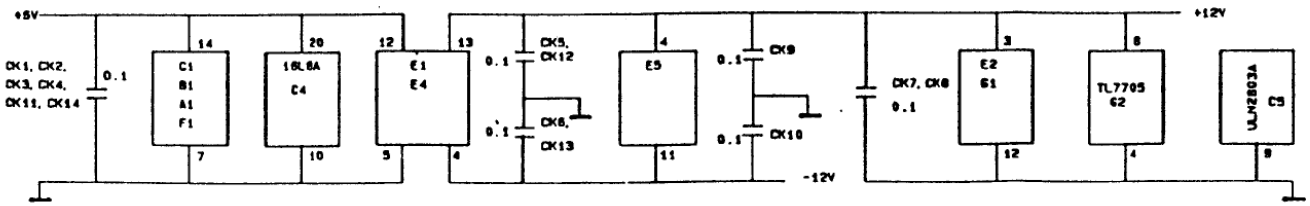
P15-CONNECTOR			
PIN NO	SIGNAL	PIN NO	SIGNAL
1A	GND D	1C	GND D
2A	+5V	2C	+5V
3A	-12V	3C	+12V
4A	/BAS	4C	/AC FAIL
5A	BA23	5C	BA22
6A	BA21	6C	BA20
7A	BA19	7C	BA18
8A	BA17	8C	BA16
9A	BA15	9C	BA14
10A	BA13	10C	BA12
11A	BA11	11C	BA10
12A	BA9	12C	BA8
13A	BA7	13C	BA6
14A	BA5	14C	BA4
15A	BA3	15C	BA2
16A	BA1	16C	/BUDS
17A	BD15	17C	BD14
18A	BD13	18C	BD12
19A	BD11	19C	BD10
20A	BD9	20C	BD8
21A	BD7	21C	BD6
22A	BD5	22C	BD4
23A	BD3	23C	BD2
24A	BD1	24C	BD0
25A	/BACK	25C	/BLDS
26A	RESERVED	26C	BR/W
27A	/IR07	27C	/IR06
28A	/IR05	28C	/IR04
29A	/IR03	29C	/IR02
30A	/IR01	30C	/IR00
31A	/BRESET	31C	BSYSCLK
32A	GND D	32C	GND D

P16 -CONNECTOR					
PIN NO	SIGNAL	PIN NO	SIGNAL	PIN NO	SIGNAL
1A		1B		1C	
2A		2B	SVSEL	2C	
3A		3B	RESOL	3C	
4A		4B	/UBATTOK	4C	
5A		5B	COLB	5C	
6A		6B	COLA	6C	
7A		7B	/COND B	7C	
8A		8B	/COND A	8C	
9A		9B	DECIB	9C	
10A		10B	RESERVED	10C	
11A		11B	RESERVED	11C	
12A		12B	/PUB 2	12C	
13A		13B	/PUB 20	13C	
14A		14B	/PUB 1	14C	
15A	BATTGND	15B	BATTGND	15C	BATTGND
16A	GNDA	16B	GNDA	16C	GNDA
17A	MX0	17B	/PUB 10	17C	A HYST 1
18A	MX1	18B		18C	/PUB 5
19A	MX2	19B		19C	A HYST 2
20A	ENMUX	20B	12VAC FL2a	20C	/PUBX
21A	ATHL 1	21B	12VAC FL2b	21C	ATHL 2
22A	B HYST 1	22B	12VAC FL3a	22C	B HYST 2
23A	BTHL 1	23B	12VAC FL3b	23C	BTHL 2
24A	/PDAX	24B		24C	/PUA 1
25A	/PDA 5	25B		25C	/PUA 2
26A	/PDA 10	26B	COMM A	26C	RESERVED
27A	/PDA 20	27B	COMM B	27C	RESERVED
28A	/UPADN	28B	UBATT	28C	/UPBDN
29A	/LOADN	29B	UBATT	29C	/LOBDN
30A	-12V	30B		30C	+12V
31A	+5V	31B	+5V	31C	+5V
32A	GNDD	32B	GNDD	32C	GNDD

P170 -CONNECTOR	
PIN NO	SIGNAL
1	MU0
2	MU1
3	MU2
4	MU3
5	MU4
6	MU5
7	MU6
8	MU7
9	COMM A
10	COMM B
11	
12	
13	BATTGND
14	BATTGND
15	UBATT
16	UBATT

POWER CONNECTIONS:





SPARES:

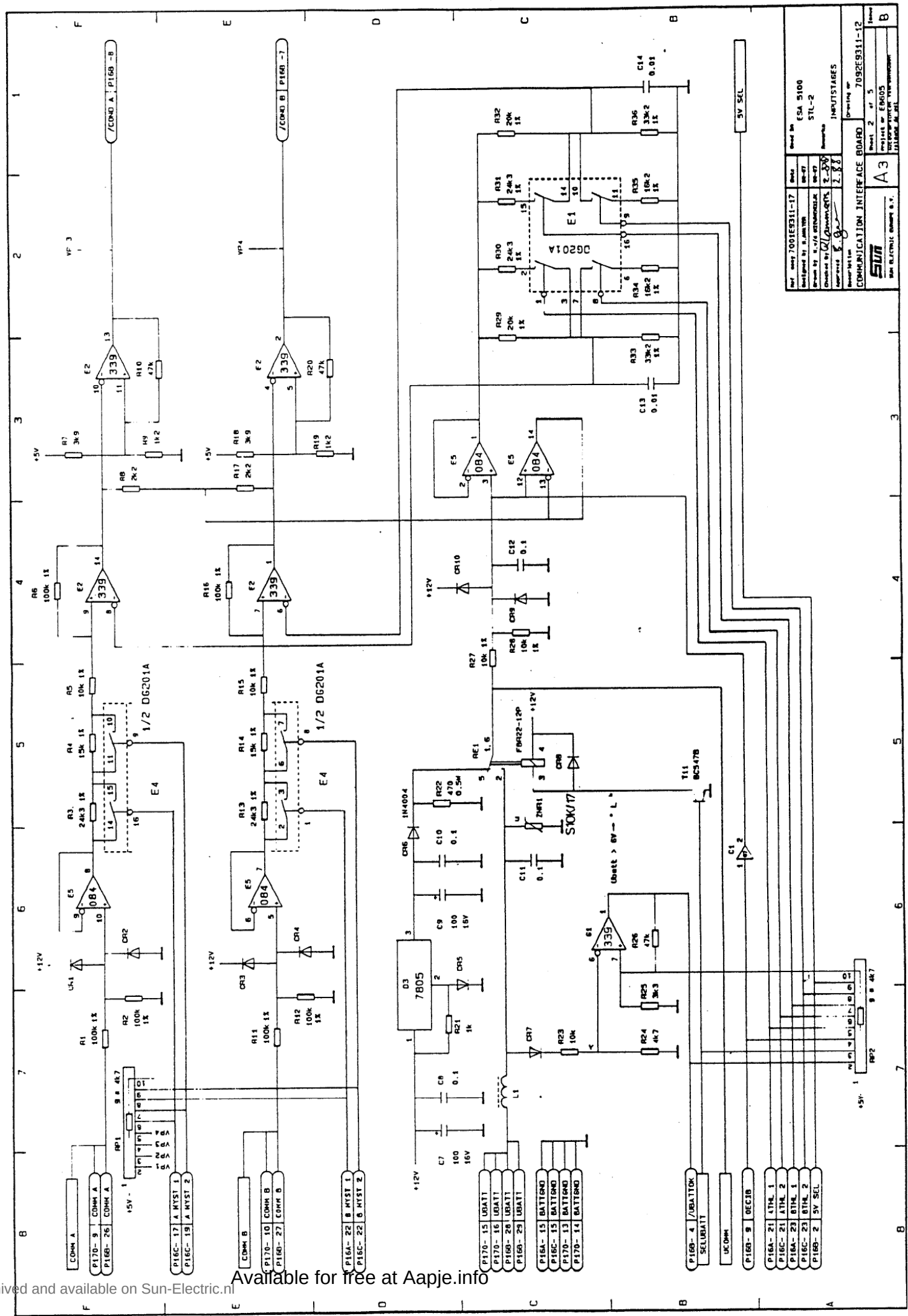


SIGNAL WHERE USED LIST		
NAME	GENERATED (SHT-BRD)	USED (SHT-BRD)
A HYST 1	2-8E	2-7F, 5F;
A HYST 2	2-8E	2-7F, 5F;
ATLH 1	2-8A	2-7A, 2C;
ATLH 2	2-8A	2-7A, 2C/B;
BATTGND	2-8C	
B HYST 1	2-8D	2-7F, 5E;
B HYST 2	2-8D	2-7F, 5E;
/BRESET	4-8D	4-5D, 5E;
BTLH 1	2-8A	2-7A, 2B;
BTLH 2	2-8A	2-7A, 2B;
COLA	4-5E	4-6C;
COLB	4-5D	4-6C;
COMM A	3-5E/F	2-6F, 8F;
COMM B	3-5C	2-6E, 8F;
/COND A	2-3F	2-1F;
/COND B	2-3E	2-1E;
ENMUX	4-8E	4-7E;
/LOADN	3-8E	3-7D, 8E;
/LOBDN	3-8B	3-7B, 8B;
MX0	4-8E	4-7E;
MX1	4-8E	4-7E;
MX2	4-8E	4-7E;
DECIB	2-8B	2-7A, 8B;
/PDA 5	3-8D	3-7D, 8D;
/PDA 10	3-8D	3-7D, 8D;
/PDA 20	3-8D	3-7D, 8D;
/PDAX	3-8D	3-7D, 8D;
/PDB 5	3-8A	3-7B, 8A;
/PDB 10	3-8A	3-7B, 8A;
/PDB 20	3-8A	3-7B, 8A;
/PDBX	3-8A	3-7B, 8A;
/PUA 1	3-8F	3-2F;
/PUA 2	3-8F	3-3F;
/PUB 1	3-8D	3-2C;
/PUB 2	3-8D/C	3-3C;
RESOL	4-8D	4-5D, 5E;
SELUBATT	4-5B	4-1B; 2-8B, 5B;
UBATT	2-8C	2-5C, 6C;
/UBATTOK	2-6C/B	2-8B, 7A;
UCOMM	2-5C	2-5C; 3-2, 3, 4F; 2D; 2, 3, 4C; 2B
/UPADN	3-8E	3-6E, 7D;
/UPBDN	3-8B	3-6B, 7B;
MU0	4-1F	4-3F
MU1	4-1E	4-3E
MU2	4-1E	4-3E
MU3	4-1E	4-3E
MU4	4-1E	4-3E
MU5	4-1E	4-3E
MU6	4-1E	4-3E
MU7	4-1E/D	4-3E/D
SVSEL	2-8A	2-7/6A, 1B; 4-6A;
12VAC FL2a	3-8F	3-7F;
12VAC FL2b	3-8E	3-7F;
12VAC FL3a	3-8C	3-7C;
12VAC FL3b	3-8C/B	3-7C;

NOTES:
1/ UNLESS OTHERWISE SPECIFIED:
A/ ALL RESISTORS ARE IN OHMS, 1/4W, 5%
B/ ALL CAPACITORS ARE IN MICRO-FARADS
C/ ALL DIODES ARE 1N914 OR 1N4148
D/ ALL IC'S ARE 74LS-SERIES TYPE
E/ ALL POLARIZED CAPACITORS ARE 16V
2/ LAST USED NO'S: R88 ,C24 ,LED2 ,T11 ,V4 ,TP4 ,CR34 , Z2 ,F5 ,RP4 ,DC3 ,DB4 ,ZNR1 ,L1 ,RE9 ,CK14 ,
3/ NOT USED NO'S:
4/ NOT INSERTED

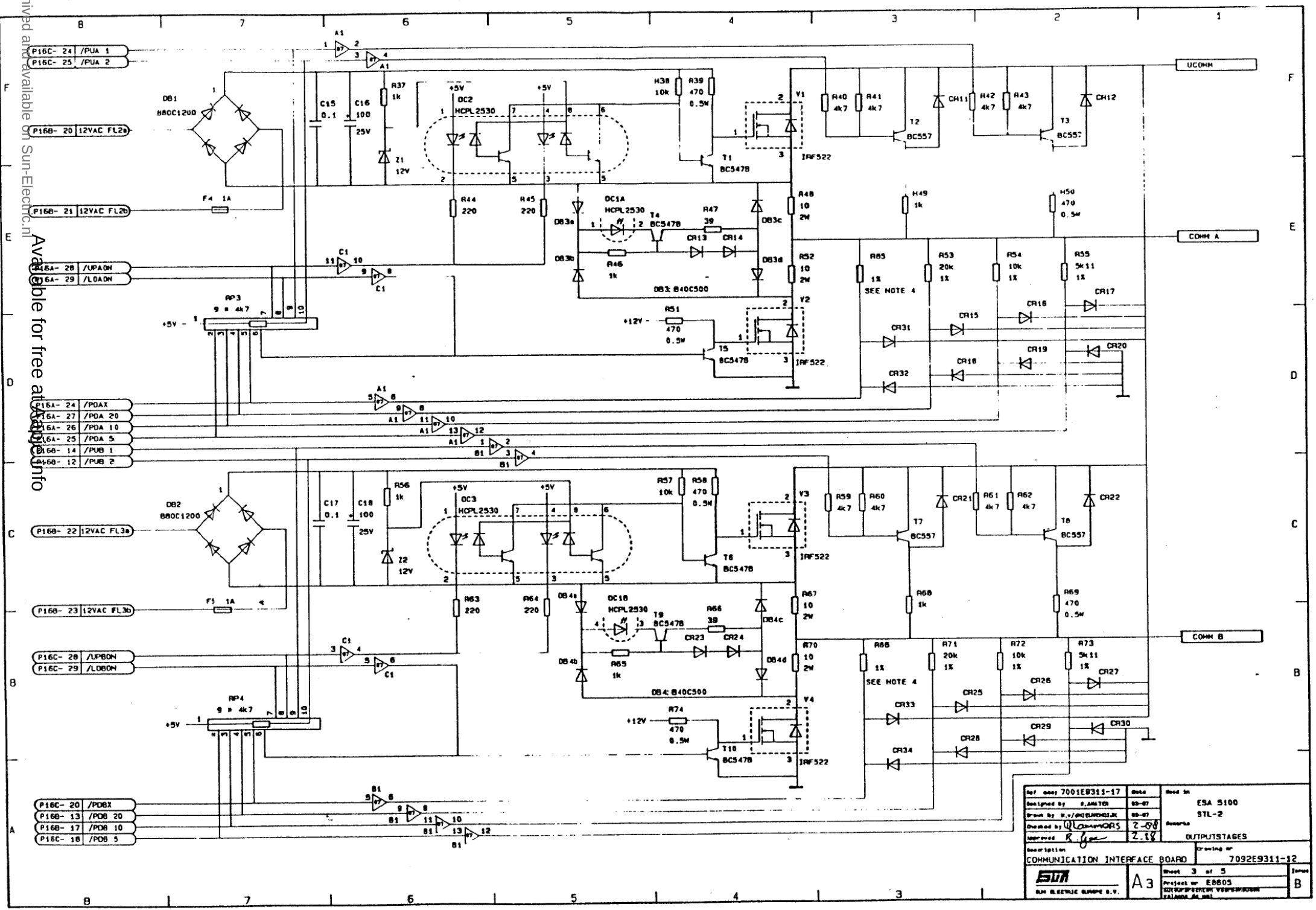
Revisions					
Rev	Date	ECN	Description	Check	Appr
A	000000		ERN # 0181. REL. FOR PROD.		
B	170588	8 02. 013E	ZNR1 WAS 20k 270		

Ref assy 7001E9311-17	Date	Used On	ESA 9100 STL-2
Designed by R.ANATER	5-87		
Drawn by H.v/d HIGHWAY	5-87		
Checked by R Cummers	2-88	Remarks	
Approved B. Gan	2.88		
Description COMMUNICATION INTERFACE BOARD		Drawing no 7092E9311-12	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 5	Issue B
		Project no E8605	

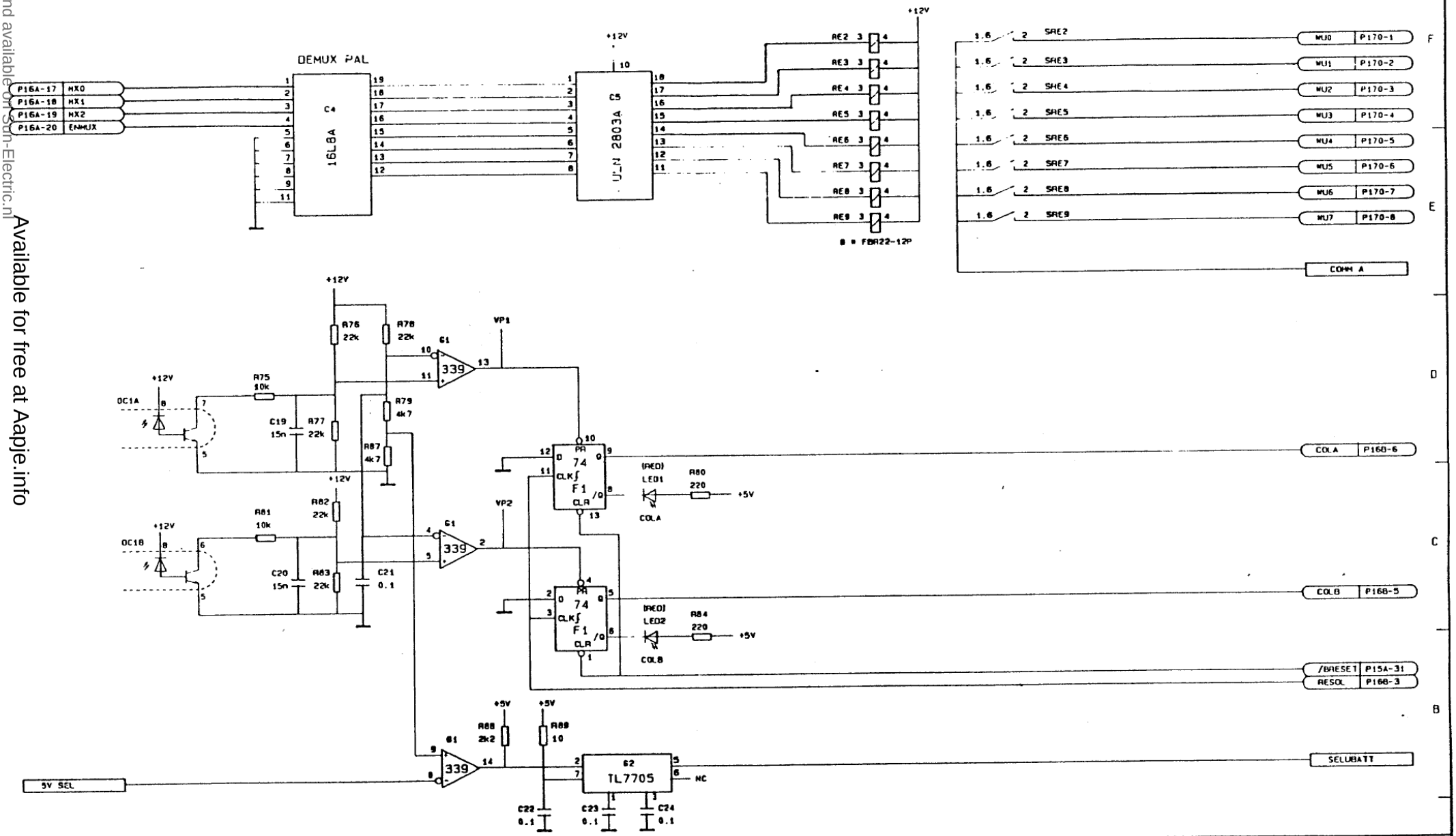


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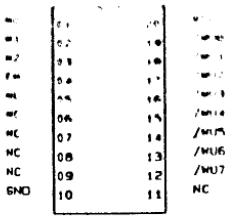


Ref assy 7001E9311-17	Date	Used in ESA 5100 STL-2	
Designed by P.MATER	03-87		
Drawn by H.v/[illegible]	03-87		
Checked by [illegible]	2-88	Remarks	
Approved [illegible]	2.88	OVERLOAD CIRCUIT	
Description COMMUNICATION INTERFACE BOARD		Drawing nr 7092E9311-12	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 4 of 5	Issue B
		Project nr E8605	

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PART NU 0733E0261-10
REVISION 1.0



EQUATIONS

MU0=/EM+MO+M1+M2
; /MU0=EM*/MO*/M1*/M2

MU1=/EM+/MO+M1+M2
; /MU1=EM*MO*/M1*/M2

MU2=/EM+MO+/M1+M2
; /MU2=EM*/MO*M1*/M2

MU3=/EM+/MO+/M1+M2
; /MU3=EM*MO*M1*/M2

MU4=/EM+MO+M1+/M2
; /MU4=EM*/MO*/M1*M2

MU5=/EM+/MO+M1+/M2
; /MU5=EM*MO*/M1*M2

MU6=/EM+MO+/M1+/M2
; /MU6=EM*/MO*M1*M2

MU7=/EM+/MO+/M1+/M2
; /MU7=EM*MO*M1*M2

Ref. copy 7001E9311-17	Date	Board Nr.	ESA 5100 STL-2
Designed by P.SMETER	02-88		
Drawn by H.v/MEIJBOOM J.M	02-88		
Checked by R.Lammers	2-88		
Approved B. Gan	2.88		
Description: COMMINICATION INTERFACE BOARD		Drawing nr: 7092E9311-12	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 5 of 5	Issue B
		Project nr E8605	

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Revisions					
Rev	Date	ECN	Description	Check	Appr
A	[illegible]		ERN# 0113. RELEASE FOR PROD.	[illegible]	[illegible]

P311 CONNECTOR	
PIN NO	SIGNAL
1	+5V
2	GND
3	GND
4	+12V

P310 CONNECTOR	
PIN NO	SIGNAL
1	/SEGMENT A
2	/SEGMENT B
3	/SEGMENT C
4	/SEGMENT D
5	/SEGMENT E
6	/SEGMENT F
7	/SEGMENT G
8	/DEC POINT
9	
10	DISPLAY 1
11	DISPLAY 1
12	DISPLAY 2
13	DISPLAY 2
14	DISPLAY 3
15	DISPLAY 3
16	GND
17	GND
18	TLO TH A
19	TLO TH B
20	GND
21	GND
22	DISPBO SENSE
23	+5V FLPOWER
24	+5V FLPOWER
25	+12V FLPOWER
26	+12V FLPOWER

NOTES:

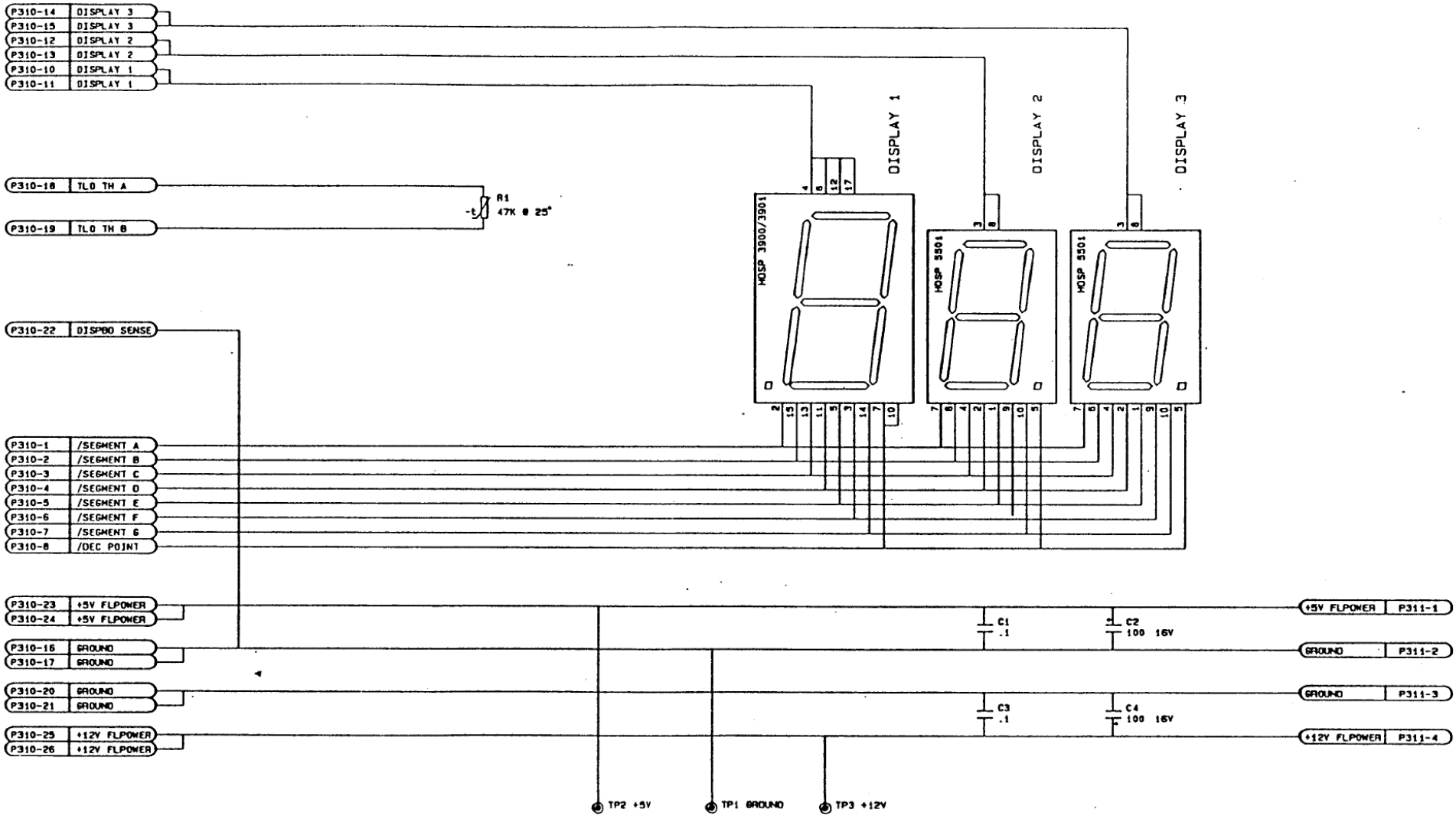
1/ UNLESS OTHERWISE SPECIFIED:
- A/ ALL RESISTORS ARE IN OHMS, 1/4W, 5%
- B/ ALL CAPACITORS ARE IN MICRO-FARADS
- C/ ALL DIODES ARE 1N914 OR 1N4148
- D/ ALL IC'S ARE 74LS-SERIES TYPE
- E/ ALL POLARIZED CAPACITORS ARE 16V

2/ LAST USED NO'S: D3, R1, C4, TP3

3/ NOT USED NO'S:

Ref assy 7001E9310-99	Date	Used in	ESA 5100 STL-2
Designed by O.LAMMERS	10-87		
Drawn by H.V/D HEUVEL	10-87		
Checked by O.LAMMERS	10-87		
Approved [illegible]	6.11.87		
Description: DIAGNOSTIC DISPLAY BOARD		Drawing nr: 7092E9310-90	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 2	Issue A
		Project nr E8605	

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Ref assy 7001E9310-99	Date	Used in
Designed by N. Awater	9-86	ESA 5100
Drawn by N. Awater	9-86	STL 2
Checked by N. Awater	11-86	
Approved Bernadyn	6.11.87	
Description DIAGNOSTIC DISPLAY BOARD		Drawing nr 7092E9310-90
SUN ELECTRIC EUROPE B.V.	A3	Sheet 2 of 2
		Project nr E 8605
		Issue A

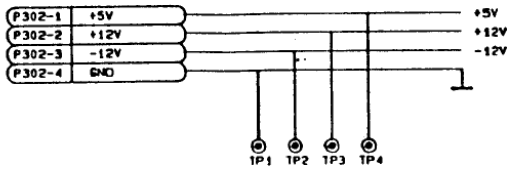
Archived and available on Sun-Electric.nl
Available for free at Aapje.info

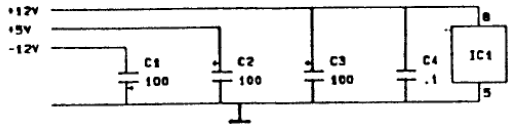
Revisions					
Rev	Date	ECN	Description	Check	Appr
A	901007		EAN# 0113. RELEASE FOR PROD.	GK	BG

J300 CONNECTOR	
PIN NO.	SIGNAL
1	DATA-
2	DATA+
3	/KBDRESET
4	GND
5	+5V
6	TxD
7	DSR

P301 CONNECTOR	
PIN NO.	SIGNAL
1	GND
2	
3	RxD
4	
5	TxD
6	
7	RTS
8	
9	CTS
10	
11	DSR
12	
13	GND
14	CTS
15	+12V
16	
17	
18	
19	
20	
21	
22	
24	
25	
26	

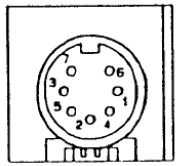
P302 CONNECTOR	
PIN NO.	SIGNAL
1	+5V
2	+12V
3	-12V
4	GND





LAY-OUT OF J300 CONNECTOR

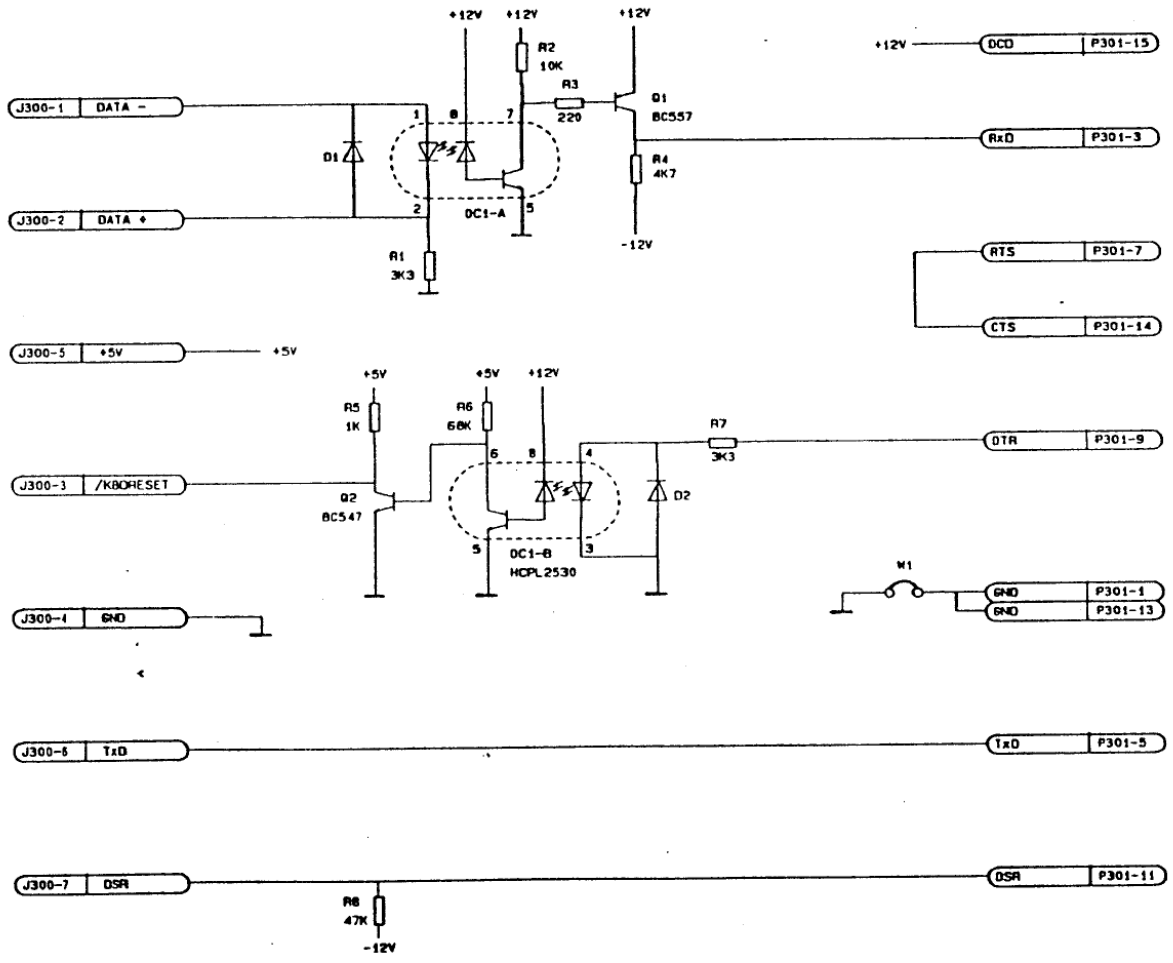
FRONT VIEW



NOTES:
1/ UNLESS OTHERWISE SPECIFIED:
A/ ALL RESISTORS ARE IN OHMS, 1/4W, 5%
B/ ALL CAPACITORS ARE IN MICRO-FARADS
C/ ALL DIODES ARE 1N914 OR 1N4148
D/ ALL IC'S ARE 74LS-SERIES TYPE
E/ ALL POLARIZED CAP. ARE 16V MINIMUM
2/ LAST USED NO'S: R8 IC1 C4 W1 Q2
D2
3/ NOT USED NO'S:

Ref assy 7001E9311-02	Date	Used in	
Designed by BARD AMATOR	10-86	ESA 5100	
Drawn by RON LAMMERS	10-86	STL 2	
Checked by R.LAMMERS	10.87		
Approved	6.11.87		
Description KEY BOARD INTERFACE		Drawing no 7092E9310-96	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 2	Issue A
		Project no E8605	

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Ref assy 7001E9311-02	Date	Used in	ESA 5100 STL 2
Designed by			
Drawn by			
Checked by R. LAMPERS	10-87		
Approved	6.11.87		
Description KEY BOARD INTERFACE		Drawing nr 7092E9310-96	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 2 of 2	Issue A
		Project nr E 8605	

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Revisions					
Rev	Date	ECN	Description	Check	Appr
A	1986		EAN# 0171, REL. FOR PROD.		
B	21 05 86	8.02.0142	STB WAS /STB		

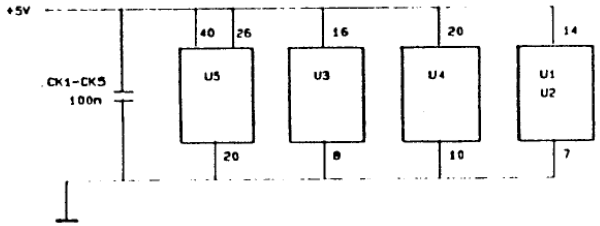
P320 CONNECTOR			
PARALLEL CONFIGURATION		SERIAL CONFIGURATION	
PIN NO	SIGNAL	PIN NO	SIGNAL
1	D0	1	
2	D1	2	
3	D2	3	
4	D3	4	
5	D4	5	
6	D5	6	
7	D6	7	
8	D7	8	/DATA
9	STB	9	DATA
10	+5V	10	+5V
11	SHIELD	11	SHIELD
12	GND	12	GND
13	/RESET	13	
14	/ACK	14	ATTN
15	+12V	15	+12V
16		16	/CTS

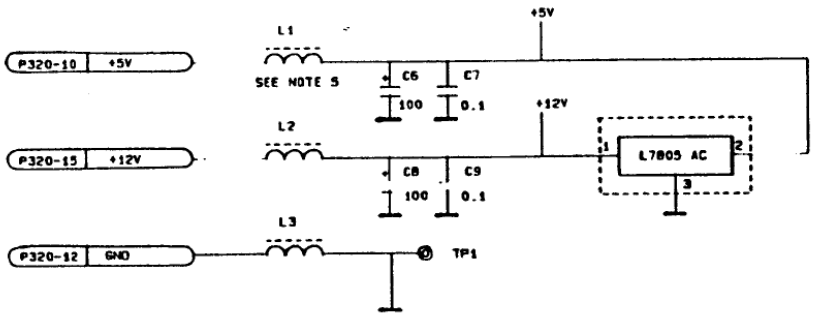
P321 CONNECTOR	
PIN NO	SIGNAL
1	/SENSE 0
2	/SENSE 1
3	/SENSE 2
4	/SENSE 3
5	/SENSE 4
6	/SENSE 5
7	/ACT1
8	/ACT2
9	/ACT3
10	/ACT4
11	/ACT5
12	SHIELD

P322 CONNECTOR	
PIN NO	SIGNAL
1	/SENSE 6
2	/SENSE 7
3	/ACT6
4	/ACT7

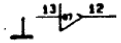
SIGNAL WHERE USED LIST		
NAME	GENERATED (SH1-6A0)	USED (SH1-6A0)
/ACK	2 -8C	2 -6C, 7C;
/ACT0	2 -4D	2 -3D/E;
/ACT1	2 -4D;	2 -2/3D;
/ACT2	2 -4D;	2 -2/3D;
/ACT3	2 -4D;	2 -2/3D;
/ACT4	2 -4D;	2 -2/3D;
/ACT5	2 -4D;	2 -2/3D;
/ACT6	2 -4D;	2 -2/3D;
/ACT7	2 -4D;	2 -2/3D;
ATTN	2 -8B	2 -6B, 7C;
/CTS	2 -8B	2 -6B, 7C;
D0	2 -8E	2 -7/8E;
D1	2 -8E	2 -7/8E;
D2	2 -8E/D	2 -7/8E/D;
D3	2 -8D	2 -7/8D;
D4	2 -8D	2 -7/8D;
D5	2 -8D	2 -7/8D;
D6	2 -8D	2 -7/8D;
D7	2 -8D	2 -7/8D;
DATA	2 -8B	2 -5B, 7C;
/DATA	2 -8B	2 -6B, 7C;
/RESET	2 -8D	2 -5D;
SENSE 0	2 -5E	2 -3/2E, 4F;
SENSE 1	2 -5E	2 -3/2E, 4F;
SENSE 2	2 -5E	2 -3/2E, 4F;
SENSE 3	2 -5E	2 -3/2E, 4F;
SENSE 4	2 -5E	2 -3/2E, 4F;
SENSE 5	2 -5E	2 -3/2E, 4F;
SENSE 6	2 -5E/D	2 -3/2E/D, 3F;
SENSE 7	2 -5D	2 -3/2D, 3F;
SHIELD	2 -8C	2 -3/2C, 8B;
STB	2 -8C	2 -7B;

POWER CONNECTIONS

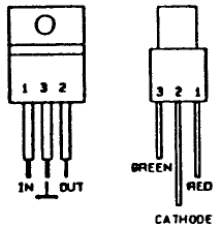




SPARES:



FOR REFERENCE ONLY



NOTES:

1/ UNLESS OTHERWISE SPECIFIED:
- A/ ALL RESISTORS ARE IN OHMS, 1/4W, 5%
- B/ ALL CAPACITORS ARE IN MICRO-FARADS
- C/ ALL DIODES ARE 1N914 OR 1N4148
- D/ ALL IC'S ARE 74LS-SERIES TYPE EXCEPT 06 (7406)
- E/ ALL POLARIZED CAPACITORS ARE 16V

2/ LAST USED NO'S: R8, C13, W6, RP2, LED4, CR10, L3, U5, CK5, TP1

3/ NOT USED NO'S: C1, C2, C3, C4, C5,

4/

W1: IN: RS422 SERIAL OUTPUT
OUT: 8 BIT PARALLEL OUTPUT ; DEFAULT

W2: DEFAULT NOT INSTALLED
INSTALL ONLY IF HOST DOES NOT SUPPLY A CTS-SIGNAL

W3: SYSTEM CONFIGURATION : DEFAULT NO JUMPERS INSTALLED
TRANSMISSION-SPEED IN SERIAL MODE

1	2	
OUT	OUT	9600 BAUD
IN	OUT	1200 BAUD
OUT	IN	600 BAUD
IN	IN	110 BAUD

3	4	
OUT	OUT	7 DATABITS, ODD PARITY
IN	OUT	7 DATABITS, EVEN PARITY
OUT	IN	7 DATABITS, NO PARITY
IN	IN	8 DATABITS, NO PARITY

FORMAT: 1 STARTBIT
1 STOPBIT

5: IN: AC BEEPER
OUT: DC BEEPER ; DEFAULT

6: IN: BEEPER DISABLED
OUT: BEEPER ENABLED ; DEFAULT

7: IN: NO AUTO REPEAT
OUT: AUTO REPEAT ; DEFAULT

8: IN: NO ACKNOWLEDGE FROM HOST
OUT: ACKNOWLEDGE FROM HOST ; DEFAULT

W4: IN: DISABLE ATTN ; DEFAULT
OUT: ENABLE ATTN

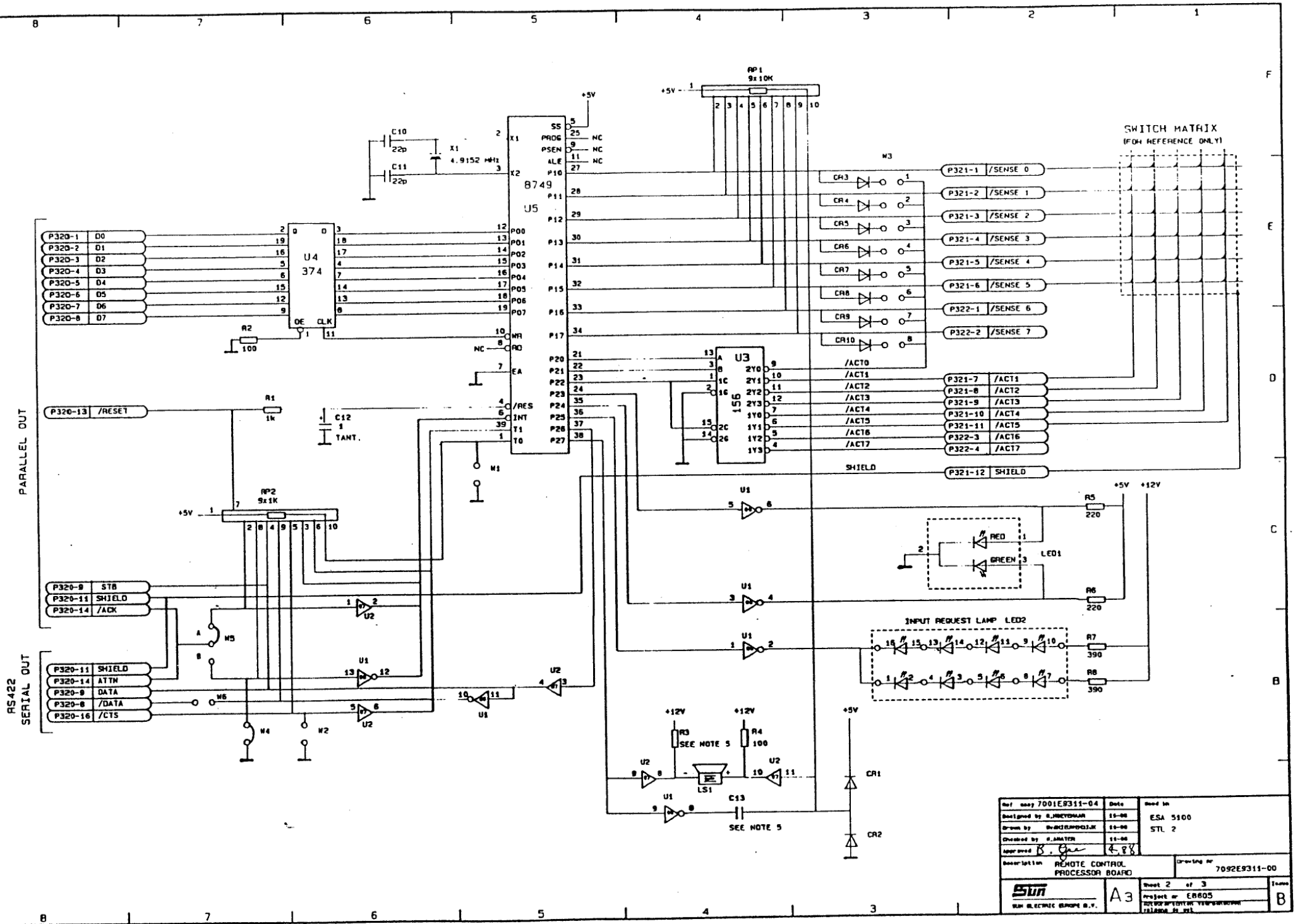
W5: "A" POSITION PARALLEL ; DEFAULT
"B" POSITION SERIAL

W6: IN: IN SERIAL
OUT: PARALLEL ; DEFAULT

5/ NOT INSTALLED

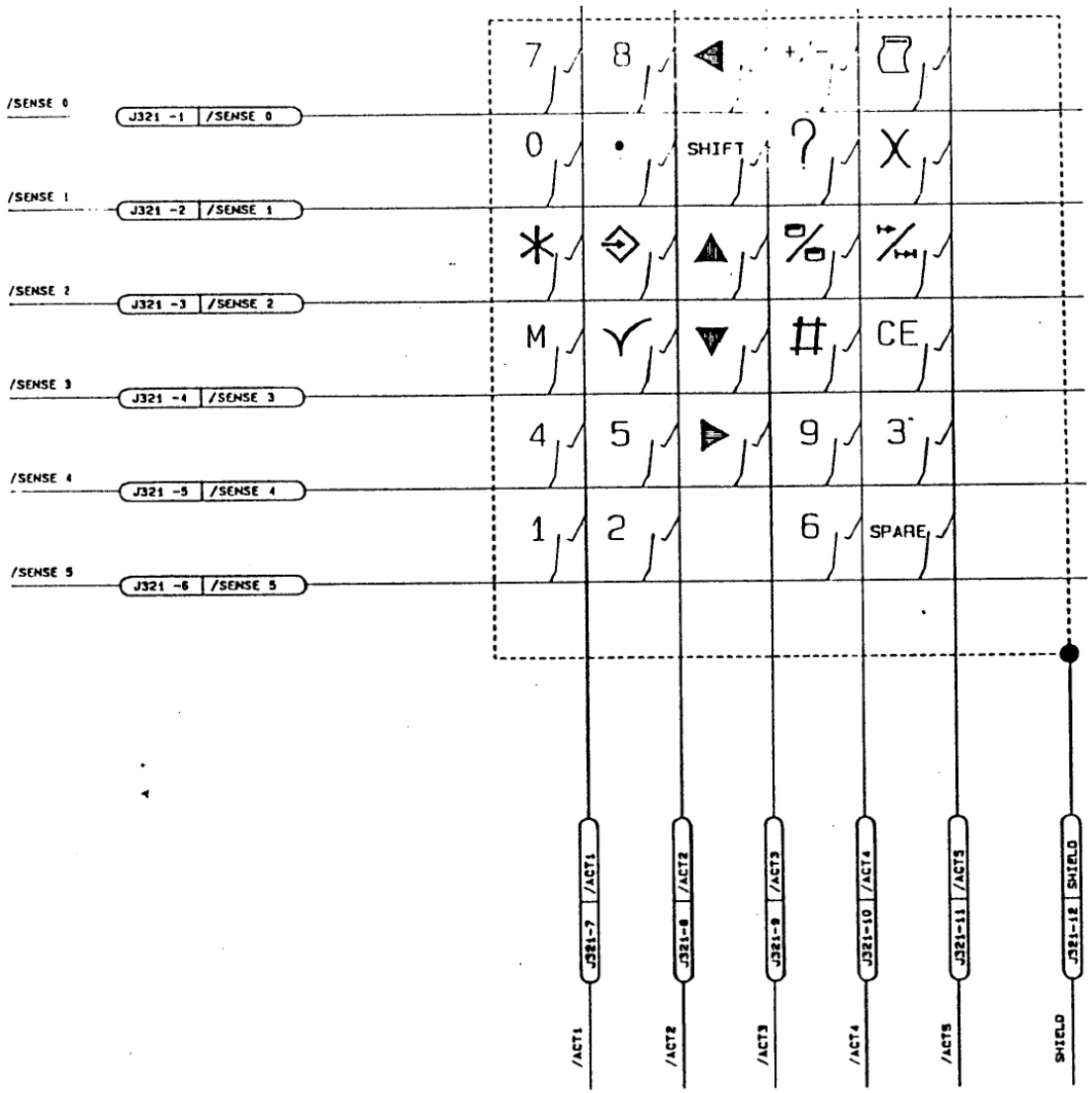
Ref. spec 7001E9311-04	Date	Used in	
Designed by R.HEEVERHAAR	15-08	ESA 5100	
Drawn by R.v/d BIEZENBOSJE	15-08	STL 2	
Checked by R.MAATER	15-08	OTL 2	
Approved B.Ga	2.88		
Description REMOTE CONTROL PROCESSOR BOARD		Drawing nr 7092E9311-00	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 3	Issue B
		Project nr E8605	

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Ref. assy 7001E9311-04	Date	used in ESA 5100 STL 2	
Designed by B.LAMMERS	07-07		
Drawn by B.v/d KIEBOOMDIJK	07-07		
Checked by Nord	2.88		
Approved B. Gar	2.88		
Description REMOTE CONTROL PROCESSOR BOARD		Drawing nr 7092E9311-00	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 3 of 3 Project nr E8605	Issue B

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Available for free at Aapje.info

Revisions					
Rev	Date	ECN	Description	Check	Appr
A	06-88		ERN# 0223 RELEASE FOR PROD.		

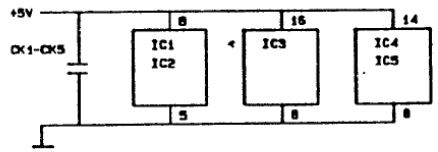
P330 - CONNECTOR	
PIN NO	SIGNAL
1	+5V-TL
2	+5V-TL
3	VID GND-TL
4	VID GND-TL
5	HS
6	VS
7	DIG GRN
8	/STL SEL
9	/STL SENSE
10	N.U.

P331 - CONNECTOR	
PIN NO	SIGNAL
1	HS
2	TTL VID
3	VS
4	N.U.
5	VID GND
6	N.U.
7	N.C.
8	N.C.

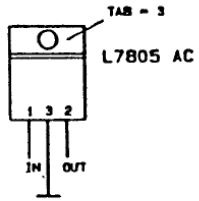
P332 - CONNECTOR	
PIN NO	SIGNAL
1	HS
2	TTL VID OUT
3	VS
4	COMP VID OUT
5	VID GND
6	N.U.

P333 - CONNECTOR	
PIN NO	SIGNAL
1	N.U.
2	N.U.
3	N.U.
4	/STL SEL
5	/STL SENSE
6	VID GND-TL

POWER CONNECTIONS:



FOR REFERENCE ONLY :



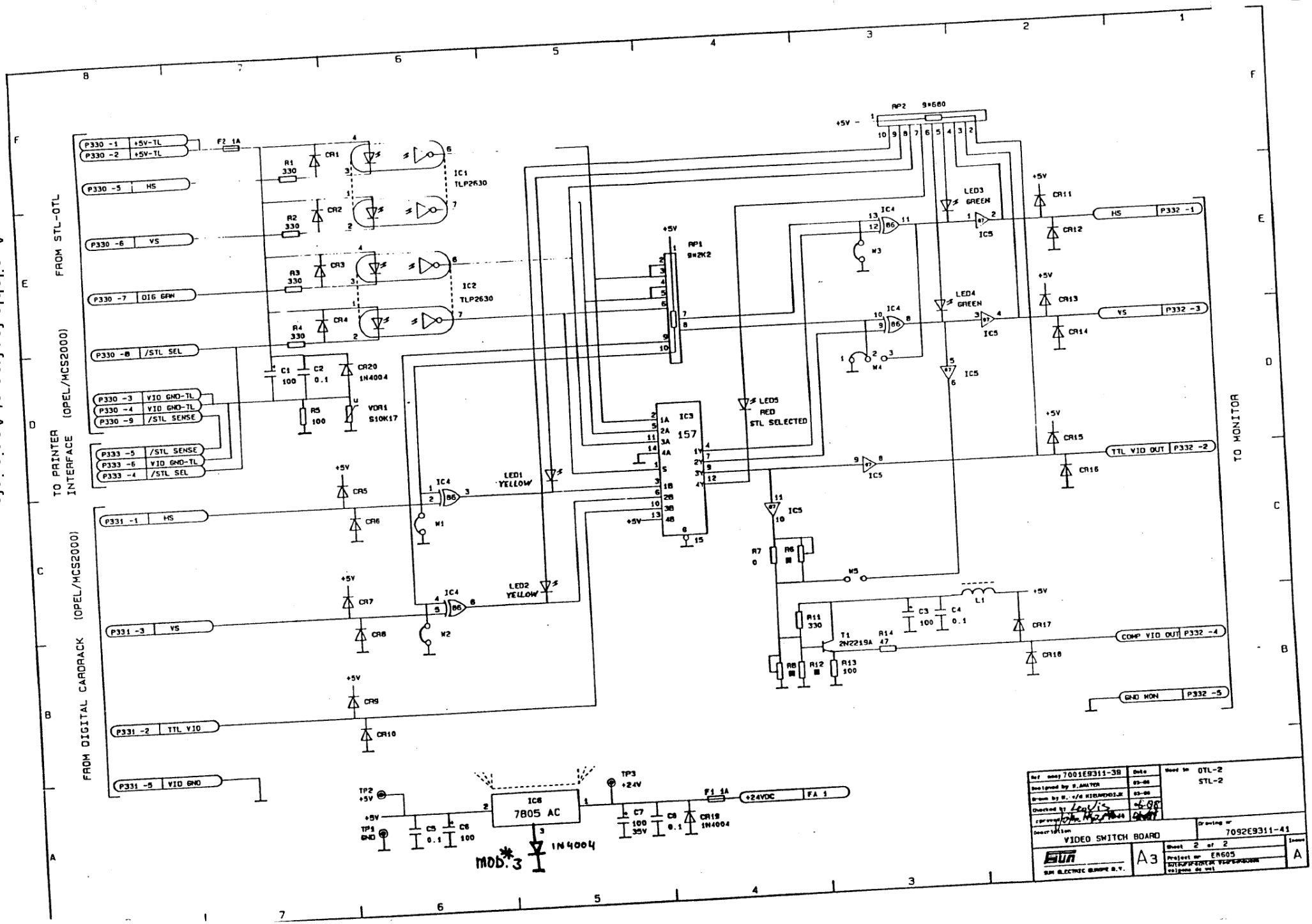
SPARES:



NOTES:
1/ UNLESS OTHERWISE SPECIFIED:
A/ ALL RESISTORS ARE IN OHMS, 1/4W, 5%
B/ ALL CAPACITORS ARE IN MICRO-FARADS
C/ ALL DIODES ARE 1N914 OR 1N4148
D/ ALL IC'S ARE 74LS-SERIES TYPE
E/ ALL POLARIZED CAPACITORS ARE 16V
2/ LAST USED NO'S: R14 , CR20 , C8 , LED5 , L1 , RP2 , T1 , W5 , VDR1 , F2 , TP3 , ZNR1 .
3/ NOT USED NO'S: R9, R10
4/ ITEMS MARKED WITH ■ ARE NOT INSTALLED

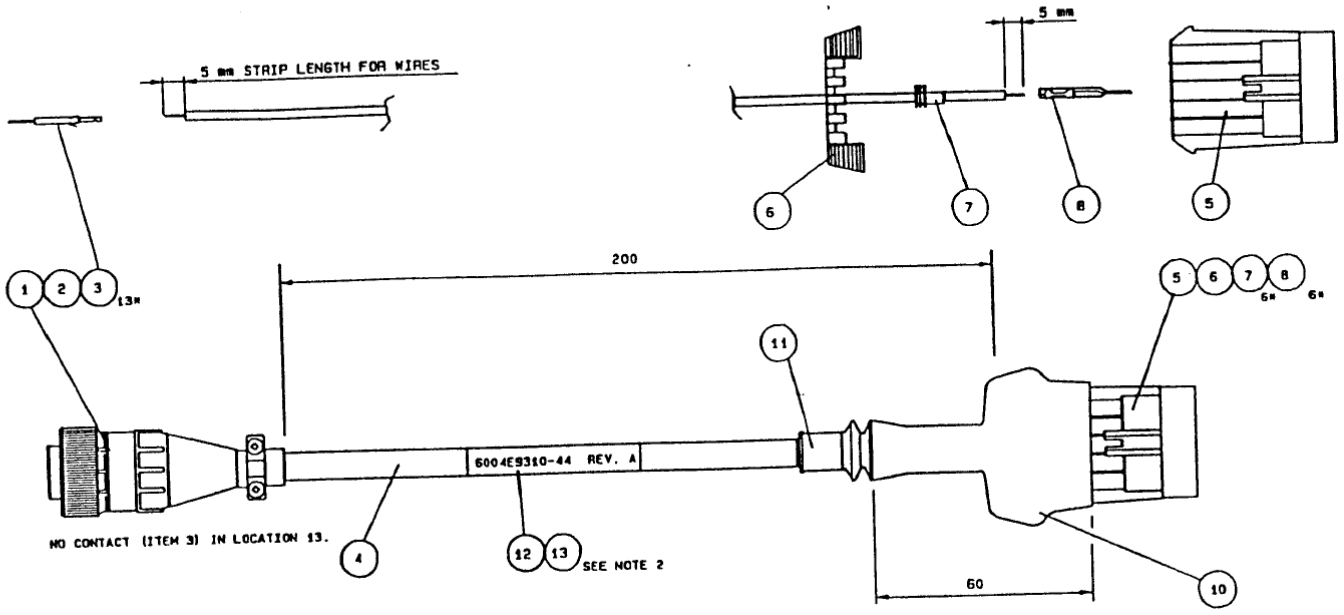
Ref assy 7001E9311-39	Date	Used in	OTL-2 STL-2
Designed by B.AALTEN	03-88		
Drawn by			
Checked by	06-88		
Approved			
Description VIDEO SWITCH BOARD		Drawing nr 7092E9311-41	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 2	Issue A
		Project nr E8605	

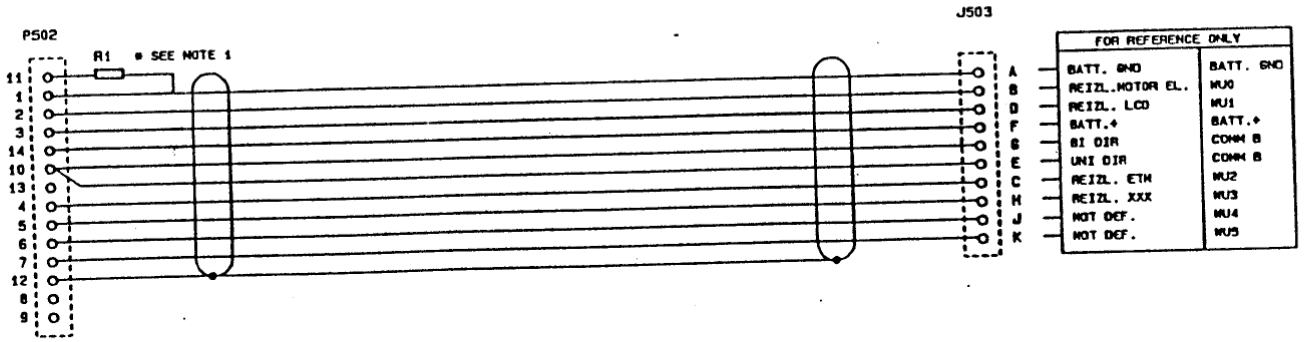
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Revisions					
Rev	Date	ECN	Description	Check	Appr
A	10-88		EAN# 0269.RELEASE FOR PROD.	RL	BG





FOR REFERENCE ONLY	
BATT. GND	BATT. GND
REIZL.MOTOR EL.	WU0
REIZL. LCD	WU1
BATT.+	BATT.+
BI DIR	COMM B
UNI DIR	COMM B
REIZL. ETH	WU2
REIZL. XXX	WU3
NOT DEF.	WU4
NOT DEF.	WU5

NOTES :

1) R1 NOT USED.
2) WRITE ON STICKER PART. NO AND REV. NO

DIMENSIONS ARE IN mm.

Item	Qty	Part No	Description	Remarks
13	1	3-0673-563	STICKER	
12	0.04	3-0667-547	SHRINK TUBING, CLEAR	
11	1	0190-0104	BOOT INSULATOR	J503
10	0.06	7096E4055-54	SHRINK TUBING	J503
9	1		RESISTOR	R1
8	10	7096E3056-26	CONTACT PIN	J503
7	10	7096E3056-24	CORNET	J503
6	1	7096E3056-25	CONNECTOR COVER	J503
5	1	7096E3056-27	CONNECTOR PIN HOUSING	J503
4	13	4162-0939	PIN, CONTACT	P502
3	1	4162-0902	CABLE CLAMP, NYLON	P502
2	1	4162-0808	CON.PLUG HSG CPC 14-WAY	P502
1	0.26	7096E3075-09	CABLE	

Ref. spec		Used on	ESA 5100 STL-2 OTL-2
Designed by R.LANNERS	10-88		
Drawn by M.v/d RIEMSDIJK	10-88		
Checked by R.LANNERS	10-88		
Approved	10.88		
Description: OPEL COMMUNICATION CABLE W8		Drawing nr: 6004E9310-44	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 1	Issue A
		Project nr: E6605	

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6.6 SERIAL LINK

DESCRIPTION	PART NUMBER.
SERIAL CONNECTION AND SUPPORT TRAY	SGK2009

FOR MORE INFORMATION PLEASE REFER TO THE

MGA-1200 OR SGA-9000

SERVICE MANUAL

6.7 BAROMETRIC PRESSURE SEN.

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S U N E L E C T R I C E U R O P E

FIELD INSTALLATION INSTRUCTIONS

THE BAROMETRIC PRESSURE KIT

PART NO: 7009E9316-26

FOR

THE MCS-2000 SL / OCS-2000 SL TESTERS

MARCH-1992

PART NO: 0692E9307-35

REV: A

REF FILE: MCS-BPC.DOC

REF: ERN 0527
ECN 1.02..021E

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FIELD INSTALLATION INSTRUCTIONS

THE BAROMETRIC PRESSURE KIT

FOR

THE MCS-2000 SL / OCS-2000 SL TESTERS

TABLE OF CONTENTS

INTRODUCTION	PAGE 1
KIT CONTENTS	PAGE 2
TOOLS AND EQUIPMENT REQUIRED	PAGE 2
INSTALLATION PROCEDURE	PAGE 3
SET-UP & CHECK OUT PROCEDURE	PAGE 5

DRAWINGS

INSTALLATION DRAWING, (REV: A)	DWG NO: 0692E9307-34 (3 SHEETS)
BAROMETER ASSEMBLY DRAWING, (REV: A)	DWG NO: 7009E9316-27 (1 SHEET)
WIRING DIAGRAM EXHAUST GAS ANALYSER, (REV: C)	DWG NO: 7092E9311-70 (1 SHEET)
SYSTEM WIRING DIAGRAM, (REV: F)	DWG NO: 7092E9311-71 (SHEET 2 OF 3)

* * * C O N F I D E N T I A L * * *

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REVISION: A, MARCH-1992

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INTRODUCTION

EVERY EFFORT HAS BEEN TAKEN IN THE PREPARATION OF THIS INSTALLATION BOOKLET TO ENSURE THE SUCCESSFUL FIELD INSTALLATION OF THE BAROMETRIC PRESSURE KIT FOR THE MCS-2000 AND THE OCS-2000 TESTERS WHILE MINIMISING THE TIME AND MANPOWER REQUIRED.

THIS BOOKLET IS DESIGNED TO ENABLE THE INSTALLATION TO BE CARRIED OUT USING ONLY THE TOOLS AND EQUIPMENT SPECIFIED IN THE EQUIPMENT SPECIFIED SECTION.

MAKE SURE THE LATEST SOFTWARE IS INSTALLED (V5.00 OR HIGHER), REFER TO THE LATEST SERVICE BULLETINS FOR DETAILS.

THE BAROMETRIC PRESSURE KIT

THE PRIMARY FUNCTION OF THE BAROMETRIC PRESSURE SENSING KIT IS TO MEASURE THE AMBIENT ATMOSPHERIC PRESSURE SO THAT THE GAS VALUES CAN BE COMPENSATED FOR ALTITUDE. THEREFORE, WHEN THE PRESSURE SENSING OPTION IS SELECTED (INSTALLED) IT IS NO LONGER POSSIBLE TO ENTER THE ALTITUDE SETTING MANUALLY.

WHEN THE BAROMETRIC PRESSURE KIT IS INSTALLED THE "TESTER CONFIGURATION" MUST BE ALTERED USING THE SERVICE DISK (V5.03 OR HIGHER) AND A COMPLETE GAS CALIBRATION MUST BE PERFORMED.

GENERAL NOTES

THE FOLLOWING PROCEDURE MUST BE CARRIED OUT IN THE SEQUENCE AS SPECIFIED IN THE TABLE OF CONTENTS.

DO NOT TOUCH ANY PART OF THE TESTER UNLESS INSTRUCTED TO DO SO.

THESE RULES SHOULD BE ADHERED TO DURING THE INSTALLATION PROCEDURE:

1: ALWAYS SWITCH OFF THE MAINS SUPPLY WHEN WORKING INSIDE THE CABINET.

2: WHEN UP-GRADING THE SOFTWARE LEVEL BE CAREFUL TO AVOID HANDLING THE INDIVIDUAL EPROMS MORE THAN ABSOLUTELY NECESSARY.

3: WHILE HANDLING THE EPROMS TRANSFER THEM AS QUICKLY AS POSSIBLE FROM THE ANTI-STATIC TUBE TO THEIR CORRECT LOCATION ON THE PRINTED CIRCUIT BOARD.

DO NOT TOUCH THE EPROM PINS AND PCB CONTACTS

4: WHEN ROUTING WIRES AND CABLES, ALWAYS KEEP THEM AWAY FROM NOISY COMPONENTS SUCH AS TRANSFORMERS ETC.

5: REMEMBER THAT THERE SHOULD BE NO SCREWS OR WASHERS ETC. LEFTOVER WHEN THE INSTALLATION PROCEDURE IS COMPLETED.

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KIT CONTENTS

THE BAROMETRIC PRESSURE KIT (P/N: 7009E9316-26) FOR THE MCS-2000 AND THE OCS-2000 TESTERS COMES COMPLETE WITH ALL OF THE PARTS NECESSARY TO CORRECTLY INSTALL THE KIT IN THE FIELD.

THE BAROMETRIC PRESSURE KIT (PART NO: 7009E9316-26)

ITEM	PART NO:	Q T Y	DESCRIPTION
1	7009E9316-27	1	BAROMETER ASSEMBLY
2	7076E9321-58	1	CABLE, W1 BAR, (ATTACHED TO BAROMETER ASSEMBLY)
3	7076E9321-59	1	CABLE, W2 BAR
4	7076E9321-60	1	CABLE, W3 BAR
5	5878-0015	8	TY-RAP
6	0692E9307-35	1	INSTALLATION INSTRUCTIONS
7	0692E9307-34	REF	INSTALLATION DRAWING

TOOLS, EQUIPMENT AND DOCUMENTATION REQUIRED

THE FOLLOWING TOOLS, EQUIPMENT AND REFERENCE DOCUMENTATION ARE REQUIRED TO CORRECTLY INSTALL THE BAROMETRIC PRESSURE KIT IN THE FIELD:

1: A CROSS-HEAD SCREWDRIVER

2: A FLATHEAD SCREWDRIVER

3: A SNIPE NOSE PLIERS

4: A SIDE CUTTER

5: A BAROMETER, TO MEASURE ATMOSPHERIC PRESSURE CALIBRATED IN mbar

6: DIGITAL MULTIMETER FLUKE 77 OR EQUIVALENT

7: CALIBRATION GAS, TO CONFORM TO LOCAL REGULATIONS

8: MCS-2000 SYSTEM DISK, V5.00 OR HIGHER

9: MCS-2000 SERVICE DISK, V5.03 OR HIGHER P/N: 0553E1075-01

10: INSTALLATION DRAWING (REF) **DWG NO: 0692E9307-34**

11: THE MCS-2000 SERVICE MANUAL, FOR V5.00 OR HIGHER

12: THE MCS-2000 SERVICE DISK MANUAL, V5.03 OR HIGHER
P/N: 0692E9308-17

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PRE-INSTALLATION CHECKOUT PROCEDURE

BEFORE BEGINNING THE INSTALLATION OF THE BAROMETRIC PRESSURE KIT INTO THE MCS/OCS-2000, IT IS IMPORTANT TO VERIFY THE CORRECT OPERATION OF THE TESTER:

A: SWITCH ON THE UNIT AND ALLOW IT TO WARM-UP IN THE USUAL MANNER.

B: AFTER THE WARM-UP PROCEED THROUGH THE SELF TEST AND CALIBRATION.

C: ANY FAULTS SHOULD BE NOTED AND CORRECTED BEFORE STARTING THE INSTALLATION PROCEDURE. REFER TO THE SERVICE MANUAL FOR TROUBLESHOOTING INFORMATION ETC.

INSTALLATION PROCEDURE

STEP: 1 AFTER PERFORMING THE INITIAL CHECKOUT AND ANY NECESSARY REPAIRS ARE CARRIED OUT, SWITCH OFF THE UNIT AND DISCONNECT IT FROM THE MAINS POWER SOURCE.

STEP: 2 CHECK THE MAINS CABLE AND PLUG FOR ANY DAMAGE AND REPAIR OR REPLACE AS NECESSARY.

STEP: 3 CHECK THE CONDITION OF ALL EXTERNAL LEADS, TUBING AND PICK-UPS CONNECTED TO THE UNIT FOR DAMAGE AND REPAIR OR REPLACE AS NECESSARY.

STEP: 4 REMOVE THE PLASTIC FRONT PANEL FROM THE MCS/OCS-2000 AND THE METAL PLATE FROM IN FRONT OF THE RACK ASSEMBLY.

STEP: 5 WITH REFERENCE TO THE INSTALLATION DRAWING (**0692E9307-34**):

SHEET 2: REMOVE THE SIX (6) MOUNTING SCREWS FROM THE GAS ANALYSER ASSEMBLY DRAWER AND SLIDE IT OUT.

SHEET 3: REMOVE THE AIR DIVIDER BRACKET AND REPLACE IT WITH THE BAROMETER ASSEMBLY (P/N: **7009E9316-27**), REMOVE THE PROTECTIVE CAP FROM THE PRESSURE TRANSDUCER.

CONNECT THE CABLE "W1 BAR" FROM THE BAROMETER ASSEMBLY TO THE CONNECTOR MARKED "J-11G" ON THE GAS CALIBRATION INTERFACE BOARD.

STEP: 6 IF NECESSARY, DISCONNECT THE CABLE "W3G" (CONNECTOR J-8G) FROM THE GAS CALIBRATION INTERFACE BOARD. INSERT ONE END OF CABLE "W3 BAR" (P/N: 7076E9321-60) INTO CONNECTOR "P-8G":

1: W3 BAR, SIGNAL WIRE (CLEAR) - P-8G, PIN 24
2: W3 BAR, SCREEN WIRE (BLACK) - P-8G, PIN 25

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STEP: 7 DISCONNECT THE CABLE "W3G" (CONNECTOR P-20G) FROM THE CONNECTOR MOUNTING PLATE.

INSERT THE OTHER END OF CABLE "W3 BAR" (P/N: 7076E9321-60) INTO CONNECTOR "P-20G":

1: W3 BAR, SIGNAL WIRE (CLEAR) - P-20G, PIN24
2: W3 BAR, SCREEN WIRE (BLACK) - P-20G, PIN 25

SECURE THE NEW CABLE "W3 BAR' TO CABLE "W3G" USING FOUR (4) TY-RAPS.

STEP: 8 WITH REFERENCE TO THE INSTALLATION DRAWING (0692E9307-34):

SHEET 1: IF NECESSARY, REMOVE CONNECTOR "J-20G" FROM THE CONNECTOR MOUNTING PLATE.

INSERT ONE END OF CABLE "W2 BAR" (P/N: 7076E9321-59) INTO CONNECTOR "J-20G":

1: W2 BAR, SIGNAL WIRE (CLEAR) - J-20G, PIN24
2: W2 BAR, SCREEN WIRE (BLACK) - J-20G, PIN25

ROUTE THE CABLE "W2 BAR" UP TO THE FRONT OF THE TESTER.

STEP: 9 RE-INSTALL CONNECTOR "J-20G" INTO THE CONNECTOR MOUNTING PLATE AND CONNECT "W3G + W3 BAR" TO CONNECTOR MOUNT PLATE "P-20G AND THE GAS CALIBRATION INTERFACE BOARD "J-8G".

STEP: **10** WITH REFERENCE TO THE INSTALLATION DRAWING (0692E9307-34):

SHEET 1: DISCONNECT CONNECTOR "J-902" (J2) FROM THE "MUX A/D BOARD" (SLOT 3) IN THE DIGITAL RACK AND REMOVE THE DUMMY LEAF CONTACT FROM POSITION 7.

INSERT THE OTHER END OF CABLE "W2 BAR" (P/N: 7076E9321-59) INTO CONNECTOR "J-902":

1: W2 BAR, SIGNAL WIRE (CLEAR) - J-902, PIN 7

SECURE THE NEW CABLE "W2 BAR" TO CABLE HARNESS "W7" USING FOUR (4) TY-RAPS.

RECONNECT "J-902" TO THE "MUX A/D BOARD" (J2).

STEP: 11 REINSTALL THE METAL PLATE IN FRONT OF THE CARD RACK ASSEMBLY AND REINSTALL THE PLASTIC FRONT PANEL OF THE MCS/OCS-2000.

****

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SET-UP AND CHECKOUT PROCEDURE

1: CHECK ALL ELECTRICAL CONNECTIONS ARE CORRECT AND PROPERLY SECURED. PLUG THE TESTER INTO THE NEAREST MAINS OUTLET.

2: INSERT THE SERVICE DISK WHICH CONTAINS THE BAROMETRIC PRESSURE SOFTWARE, (V5.03 OR HIGHER). SWITCH ON THE POWER TO THE UNIT.

THE TESTER SHOULD PERFORM THE MEMORY TEST ROUTINE, PROGRAMME LOADING SEQUENCE, AFTER THE TESTER CONFIGURATION AND CALIBRATION PAGES HAVE BEEN DISPLAYED, THE "MAIN MENU" PAGE WILL BE DISPLAYED:

PROGRAMME SELECTION
- TESTER CONFIGURATION ENTRY
- TESTER CALIBRATION
- GAS BENCH SPECIAL FUNCTIONS
- SPECIAL FUNCTIONS
- LANGUAGE SELECTION
- VEHICLE QUICK TESTS
- FACTORY TESTS

3: SELECT THE "TESTER CONFIGURATION ENTRY" PAGE FROM THE MAIN MENU. THE "TESTER CONFIGURATION ENTRY" (PAGE 1) SHOULD BE DISPLAYED:

TESTER CONFIGURATION ENTRY	
- DIESEL OPTION	NOT DEFINED
- DIAGNOSTICS	NOT DEFINED
- TECH-15	NOT DEFINED
- DIGITAL SCOPE	DEFINED
- BAROMETER	"DEFINED"
- KEYBOARD	NOT DEFINED
- DATE AND TIME	DEFINED
- SDL-20	NOT DEFINED
- OIML	NOT DEFINED

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4: STEP THROUGH ALL LINES BY SETTING "DEFINED/NOT DEFINED" AS REQUIRED, BY PRESSING THE # KEY. SET THE "BAROMETER" TO "DEFINED".

WHEN THE # KEY IS PRESSED ON THE LAST LINE, THE "TESTER CONFIGURATION ENTRY" (PAGE 2) WILL BE DISPLAYED:

TESTER CONFIGURATION ENTRY	
- EXT. CRT DRIVER	NOT DEFINED
- BIT 13	NOT DEFINED
- BIT 14	NOT DEFINED
- BIT 15	NOT DEFINED

NOTE: THE DEFINITIONS "BIT 13, BIT 14 & BIT 15" ARE INTENDED FOR FUTURE USE AN SHOULD BE LEFT AS "NOT DEFINED".

PRESSING THE # KEY ON THE LAST LINE, THE CAPTION "WRITING TO MEMORY" WILL BE DISPLAYED.

5: NEXT THE "TESTER OPTIONS ENTRY" PAGES (2 PAGES) WILL BE DISPLAYED, IF OTHER OPTIONS HAVE BEEN INSTALLED AT THIS TIME ADJUST THESE PAGES AS REQUIRED.

6: WHEN COMPLETE, (LEAVE THE SERVICE DISK IN THE DISK DRIVE) AND RE-BOOT THE TESTER.

7: WHEN THE "MAIN MENU" PAGE IS BE DISPLAYED, SELECT "GAS BENCH SPECIAL FUNCTIONS" FROM THE MAIN MENU:

GAS BENCH SPECIAL FUNCTIONS
- GAS CALIBRATION
- MODULE DISPLAY

8: SELECT "GAS CALIBRATION" WHEN THE DEFINITION OF THE BAROMETER CONFIGURATION IS SET TO DEFINED THE FOLLOWING PAGE IS ENTERED:

BPC CALIBRATION	
- BAROMETER (VOLT):	.....
- PRESSURE (MBAR):	....

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9: THE PRESSURE READING FROM THE PRESSURE TRANSDUCER WILL BE DISPLAYED (MBAR).

USING A BAROMETER, MEASURE THE CURRENT AMBIENT PRESSURE, IF THE DISPLAYED PRESSURE READING IS NOT WITHIN +/- 2 MBAR, THEN ADJUST "VR 1" ON THE BAROMETER BOARD (P/N: 7001E9312-26).

10: AFTER PROCEEDING THROUGH THE PREVIOUS PAGE, THE GAS CALIBRATION PAGE IS ENTERED.

11: WITH REFERENCE TO THE MCS-2000 SERVICE MANUAL PERFORM A COMPLETE HARDWARE GAS CALIBRATION, USING THE REQUIRED CALIBRATION GAS AND BY FOLLOWING THE INSTRUCTIONS GIVEN ON THE MONITOR.

12: WHEN COMPLETED SLIDE THE GAS ANALYSER ASSEMBLY BACK INTO PLACE REMEMBER TO RECONNECT THE EARTH STRAP, OTHERWISE A SAFETY HAZARD WILL OCCUR. SECURE THE GAS ANALYSER IN PLACE WITH SIX (6) MOUNTING SCREWS.

13: REBOOT THE TESTER. THE TESTER SHOULD PERFORM THE SELF TEST ROUTINE, PROGRAMME LOADING SEQUENCE, WARM-UP PERIOD AND THE CALIBRATION SEQUENCE APPROX 15 MIN.

AFTER THE TESTER CALIBRATION SEQUENCE HAS BEEN COMPLETED, THE "PROGRAM SELECTION" PAGE WILL BE DISPLAYED:

PROGRAMME SELECTION

- VEHICLE TESTING
- TESTER CALIBRATION
- SPECIAL FUNCTIONS
- GAS BENCH SPECIAL FUNCTIONS
- LANGUAGE SELECTION

14: SELECT "VEHICLE TESTING" AND PERFORM AN ENGINE TEST TO ENSURE THE SYSTEM IS OPERATING CORRECTLY.

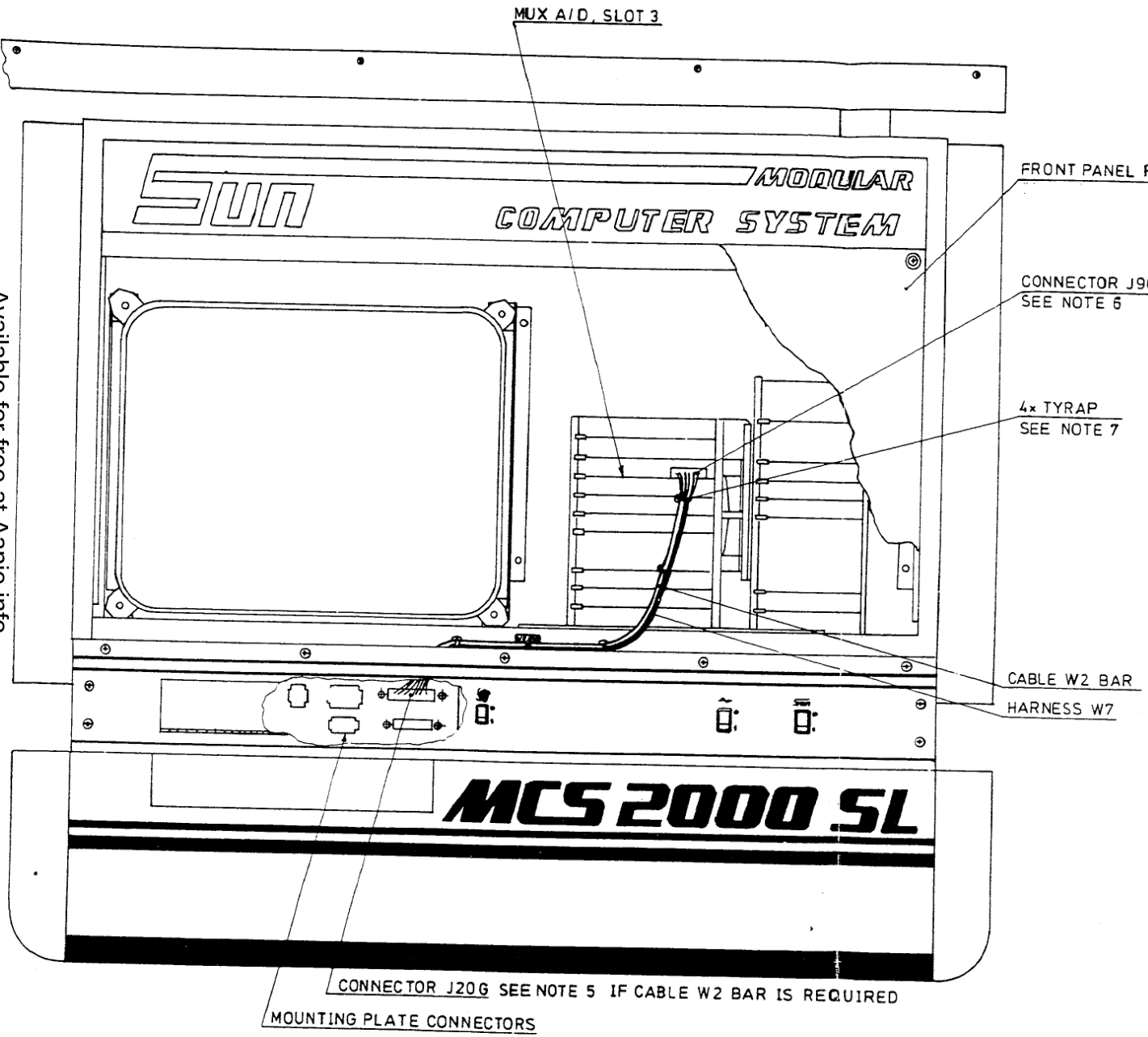
THIS COMPLETES THE BAROMETRIC PRESSURE KIT INSTALLATION

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Revisions					
Rev	Date	ECN	Description	Check.	Appr.
A	03-91		ERN #0527. REL FOR PROD	P.T.	BG



NOTES:

1) SHEET 3 : REPLACE AIR DIVIDER BRACKET BY BARO-METER ASS'Y AND REMOVE PROTECTION CAP.

2) SHEET 3 : CONNECT CABLE W1 BAR TO IR CALIBRATION INTERFACE PCB ASS'Y CONNECTOR J11G.

3) SHEET 3 : DISCONNECT CABLE W3G FROM IR CALIBRATION INTERFACE PCB ASS'Y (CONNECTOR P8G) AND FROM MOUNTING PLATE CONNECTORS (CONNECTOR P20G). FIT FROM CABLE W3 BAR THE CLEAR CONDUCTOR INTO POS'N 24 AND SCREEN INTO POS'N 25 OF CONNECTORS P8G AND P20G.

4) SHEET 3 : TIGHTEN CABLE W3 BAR TO CABLE W3G WITH FOUR TY-RAPS.

5) SHEET 1 : FIT FROM CABLE W2 BAR THE CLEAR CONDUCTOR INTO POS'N 24 AND SCREEN INTO POS'N 25 OF CONNECTOR J20G.

6) SHEET 1 : REMOVE LEAF CONTACT FROM POS'N 7 OF CONNECTOR J902.
FIT FROM CABLE W2 BAR THE CLEAR CONDUCTOR INTO POS'N 7 OF CONNECTOR J902.

7) SHEET 1 : TIGHTEN CABLE W2 BAR TO HARNESS W7 WITH FOUR TY-RAPS.

Item	Qty.	Dwg./Part no	Description	Remarks
Scale ~			Date	Used in MCS-2000
Designed by				Material
Drawn by Heleena v/d Nieuwendijk			20.02.91	
Checked by Peter Tal			13.3.91	
Approved Bernard Lee			13.3.91	Finish

Unless otherwise specified: Dimensions are in mm; Tolerances on: Angles ± 0,5° Holes ± 0,1 Rest ± 0,5

Remove all sharp corners and remove burrs

Description: INSTALLATION DRAWING, BAR. KIT

Dwg. no. 0692E9307-34

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A2

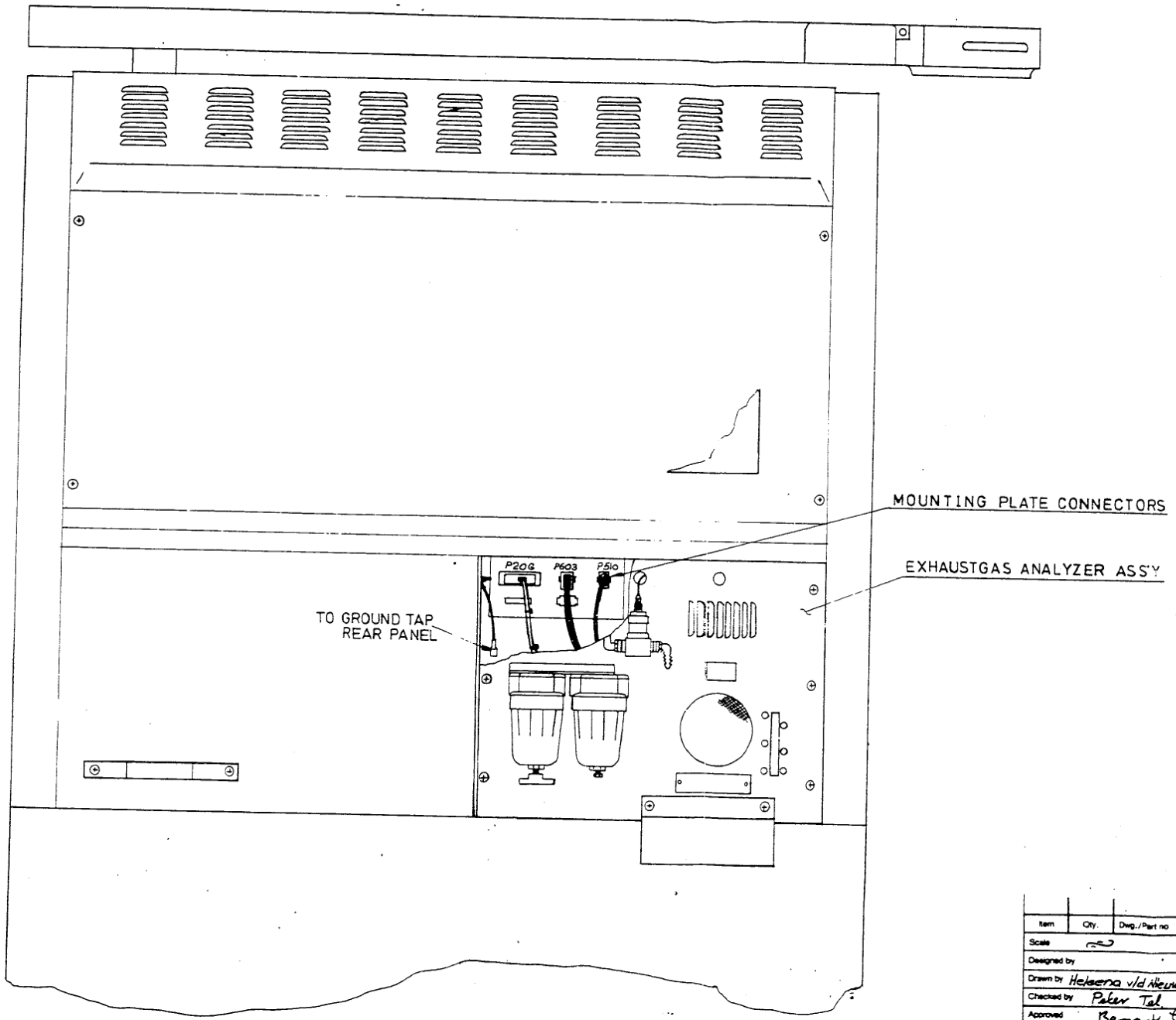
Sheet 1 of 3

Code

Project no. E9037

Issue A

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Item	Qty.	Dwg./Part no	Description		Remarks
Scale			Date	Used in MCS-2009	
Designed by				Material	
Drawn by Heksena v/d Heuvendijk			22.02.91		
Checked by Peter Tal			13.3.91		
Approved Bernard Gee			13.3.91	Finish	

Unless otherwise specified: Dimensions are in mm; Tolerances on: Angles ± 0.5° Holes ± 0.1 Rest ± 0.5

Remove all sharp corners and remove burns

Description: INSTALLATION DRAWING, BAR. KIT

Dwg. no. 0692E9307-34

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Auteursrecht voorbehouden volgens de wet

A2

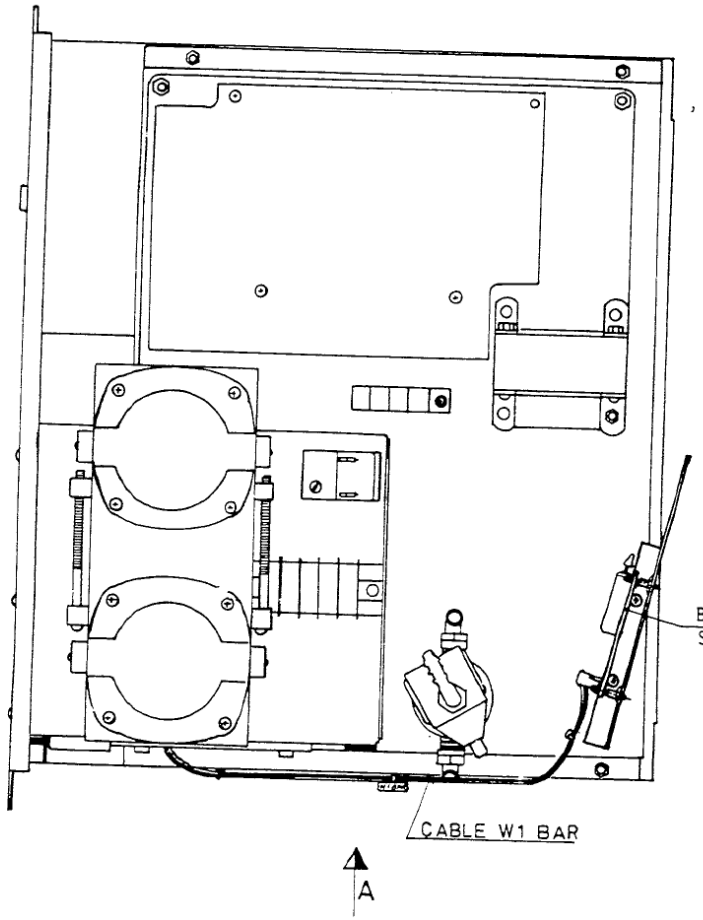
Sheet 2 of 3

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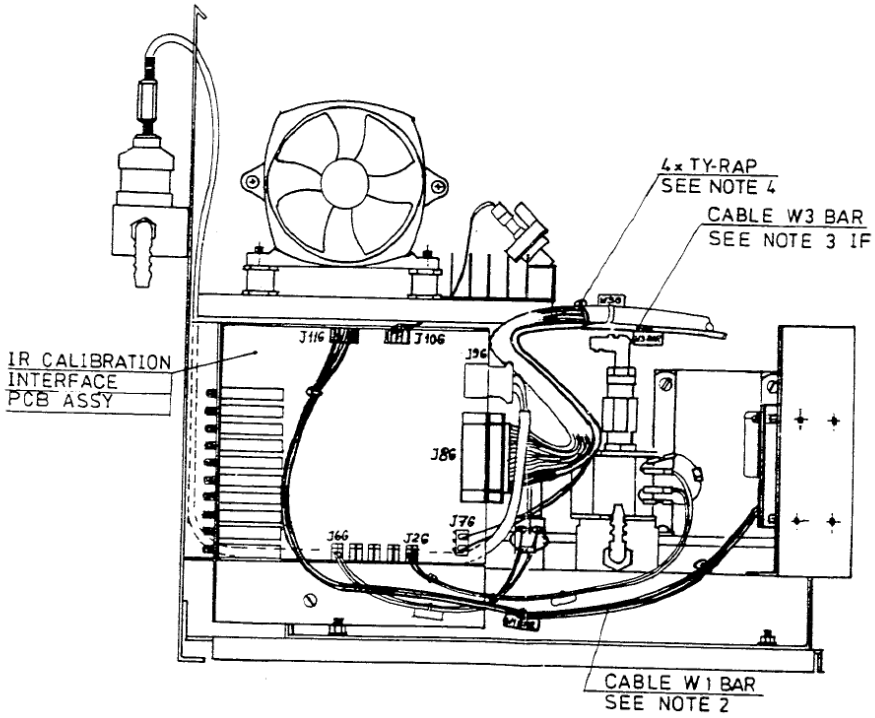
Project no. E 9037

Issue 4

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DETAIL A



Item	Qty.	Dwg./Part no	Description		Remarks
Scale			Date	Used in MCS-2000	
Designed by				Material	
Drawn by Heleen a v/d Nieuwendijk			22.02.91		
Checked by Peter Tol			13.3.91		
Approved Bernard Jan				Finish	

Unless otherwise specified: Dimensions are in mm. Tolerances on: Angles ± 0.5° Holes ± 0.1 Rest ± 0.5

Remove all sharp corners and remove burns

Description: INSTALLATION DRAWING, BAR. KIT

Dwg no: 0692E9307-34

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A2

Sheet 3 of 3

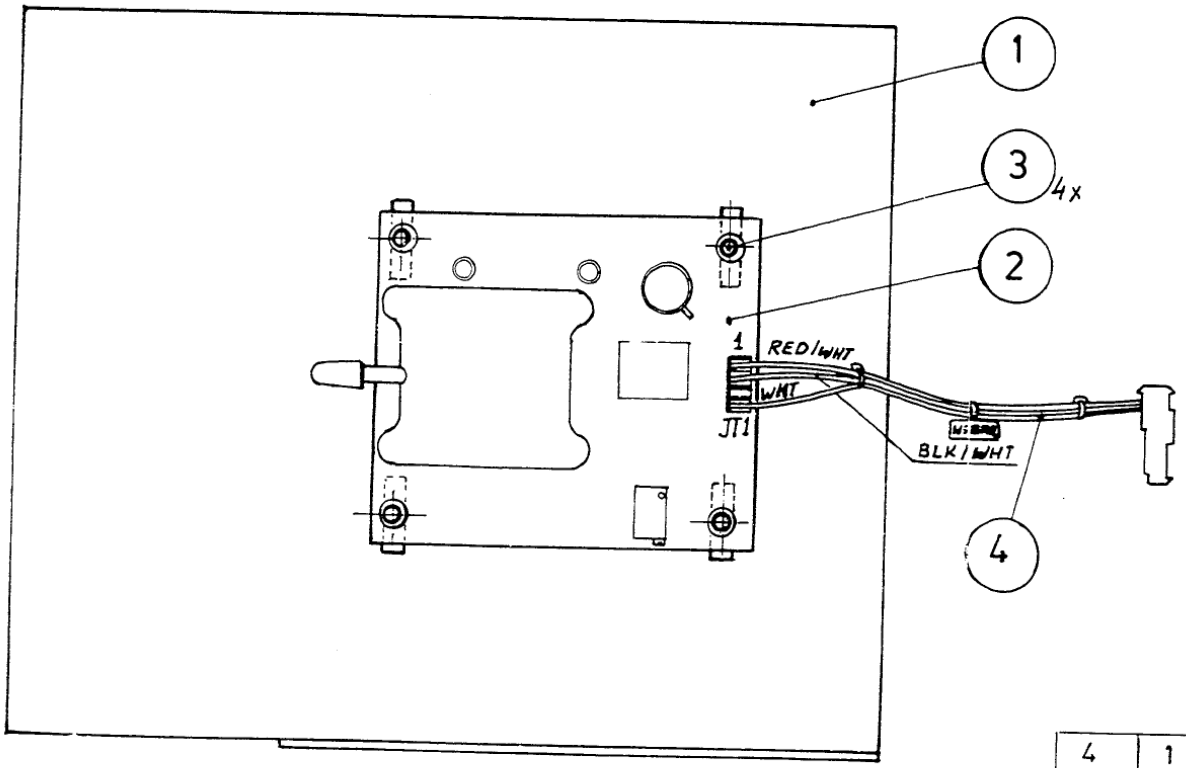
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Project no. E9037

Issue A

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Revisions					
Rel.	Date	ECN	Description	Check	Appr.
A	03-91		ERN #0527. REL. FOR PROD.	P.T.	BG



Item	Qty.	Dwg./Part no	Description	Remarks
4	1	7076E9321-58	CABLE W1 BAR	
3	4	0536-0514	INSULATION SUPPORT	
2	1	7001E9312-26	PCB ASSY BAROMETER BOARD	
1	1	7012E9316-70	AIR DIVIDER BRACKET	

Scale 1:1		Date	Used in MCS-2000
Designed by			Material
Drawn by Heleena v/d Nieuwendijk		19.02.91	
Checked by Peter Tel		13.3.91	
Approved		13.3.91	Finish

Unless otherwise specified: Dimensions are in mm.; Tolerances on: Angles ± 0,5° Holes ± 0,1 Rest ± 0,5

Remove all sharp corners and remove burrs

Description: BAROMETER ASSY

Dwg. no. 7009E9316-27

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A3

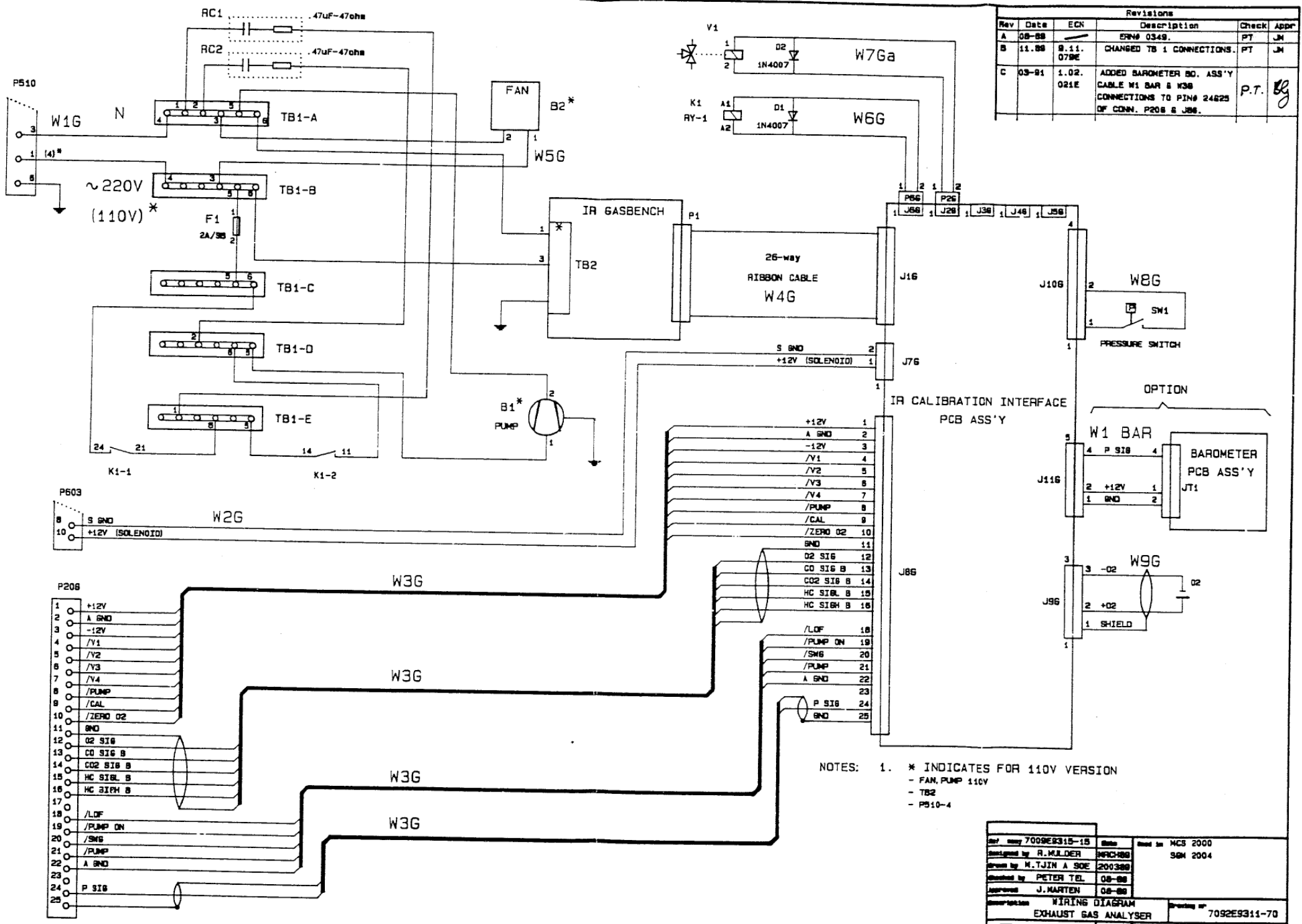
Sheet 1 of 1

Code

Project no. E9037

Issue A

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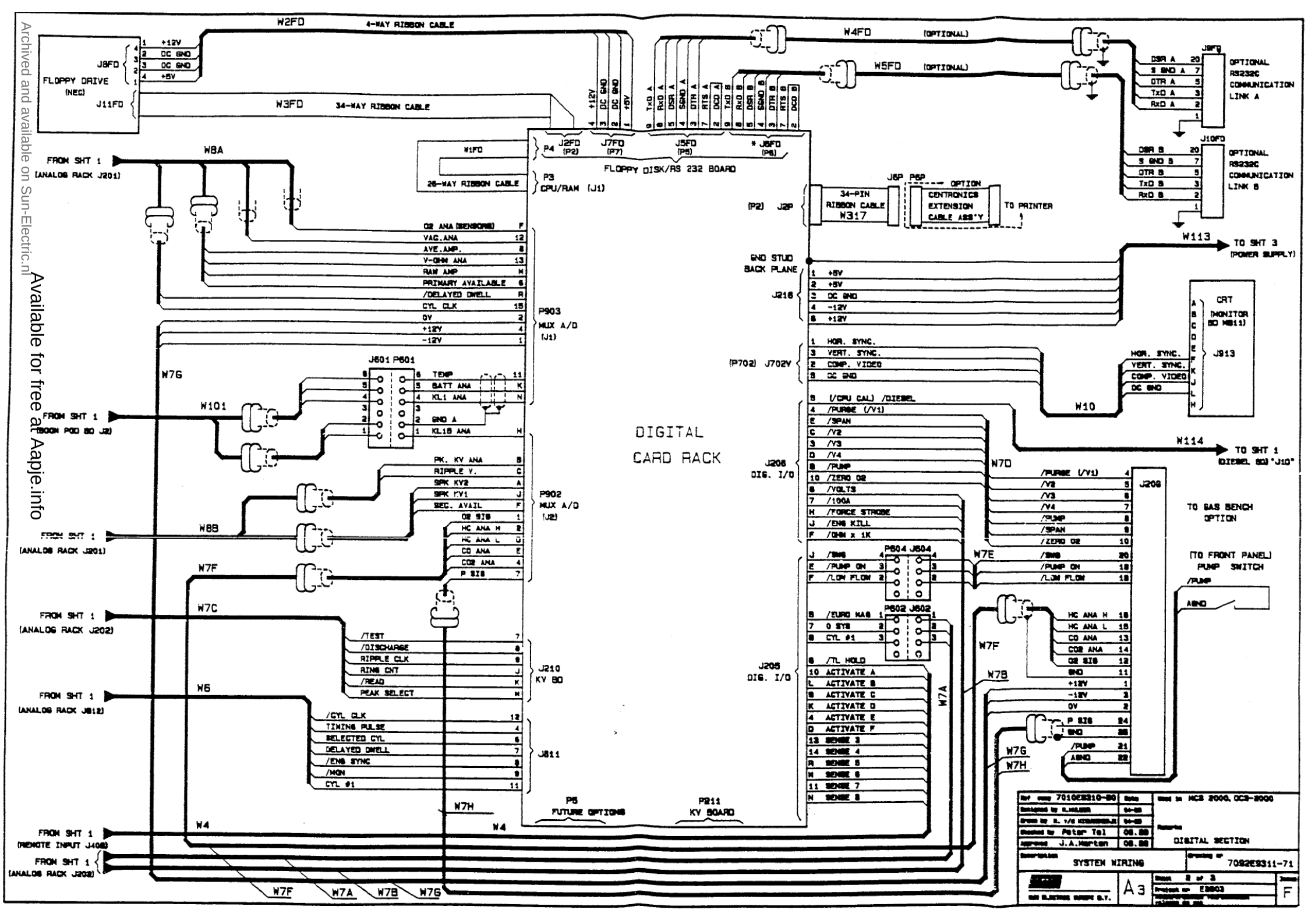


Revisions					
Rev	Date	ECN	Description	Check	Appr
A	08-88		ERN# 0349.	PT	JM
B	11.88	8.11. 079E	CHANGED TB 1 CONNECTIONS.	PT	JM
C	03-91	1.02. 021E	ADDED BAROMETER BD. ASS'Y CABLE W1 BAR & W3B CONNECTIONS TO PIN# 24&25 OF CONN. P206 & J86.	P.T.	

NOTES: 1. * INDICATES FOR 110V VERSION
- FAN, PUMP 110V
- TB2
- P510-4

Ref assy 7009E9315-15	Date	Used in MCS 2000	
Designed by R.WULDER	MRCH89	SGM 2004	
Drawn by M.TJIN A SOE	200389		
Checked by PETER TEL	08-89		
Approved J.MARTEN	08-89		
Description WIRING DIAGRAM EXHAUST GAS ANALYSER		Drawing nr 7092E9311-70	
	A3	Sheet 1 of 1	C
		Project nr ES903	

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Ref comp 7010E8310-80	Date	Used in HCS 2000, DCS-2000
Designed by K.HOLDEN	04-88	
Drawn by K. v/d HEUVEL	04-88	Remarks
Checked by Peter Tel	08.88	DIGITAL SECTION
Approved J.A.Horton	08.88	
Description SYSTEM WIRING		Drawing nr 7032E8311-71
	A3	Sheet 2 of 3
		Revision nr E8803
		F

6.8 REALTIME CLOCK

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6.9 OIML-KIT

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S U N E L E C T R I C E U R O P E

FIELD INSTALLATION INSTRUCTIONS

FOR THE OIML KITS

FOR THE MCS-2000SL. PART NO: 700939317-32

AND

FOR THE OCS-2OOOSL, PART NO: 700939317-44

NOVEMBER-1992

PART NO : 069239308-74

REV: A

REF FILE: OIML.DOC

REF: ERN 0822
ERN 0866

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FIELD INSTALLATION INSTRUCTIONS

THE OIML KIT

FOR

THE MCS-2000SL / OCS-2000SL TESTERS

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TOOLS AND EQUIPMENT REQUIRED	PAGE 3
INSTALLATION PROCEDURE	PAGE 4
SET-UP & CHECK OUT PROCEDURE	PAGE 8

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DRAWINGS

INSTALLATION DRAWING, (REV: A)	**DWG NO: 0692E9308-75** (5 SHEETS)
SYSTEM WIRING DRAWING, (REV: K)	**DWG NO: 7092E9311-71** (4 SHEETS)
WIRING DIAGRAM EXHAUST GAS ANALYSER, (REV: D)	**DWG NO: 7092E9311-70** (1 SHEET)
PNEUMATIC DIAGRAM EXHAUST GAS ANALYSER, (REV: B)	**DWG NO: 7092E9311-75** (1 SHEET)
WIRING HARNESS W101-SIGNAL INPUT, (REV: B)	**DWG NO: 7076E9312-69** (2 SHEETS)
SCHEMATIC PIGGY BACK FILTER BOARD, (REV: A)	**DWG NO: 7092E9312-60** (1 SHEET)
PRINTED CIRCUIT BOARD ASSEMBLY PIGGY BACK FILTER, (REV: A)	**DWG NO: 7001E9312-60** (1 SHEET)
SCHEMATIC AC FAIL BOARD, (REV: A)	**DWG NO: 7092E9312-13** (1 SHEET)
PRINTED CIRCUIT BOARD ASSEMBLY AC FAIL BOARD, (REV: B)	**DWG NO: 7001E9312-13** (1 SHEET)
SCHEMATIC P603 FILTER BOARD, (REV: A)	**DWG NO: 7092E9312-67** (1 SHEET)
P603 FILTER ASSEMBLY, (REV: A)	**DWG NO: 7009E9317-35** (1 SHEET)
SCHEMATIC CALIBRATION INTERFACE BOARD, (REV: C)	**DWG NO: 7092E9311-69** (3 SHEETS)
PRINTED CIRCUIT BOARD ASSEMBLY CALIBRATION INTERFACE, (REV: C)	**DWG NO: 7001E9311-69** (1 SHEET)
SCHEMATIC P9G FILTER BOARD, (REV: A)	**DWG NO: 7092E9312-68** (1 SHEET)
02 CABLE / FILTER ASSEMBLY, (REV: A)	**DWG NO: 7009E9317-34** (1 SHEET)

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REVISION: A, NOVEMBER-1992

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INTRODUCTION

EVERY EFFORT HAS BEEN TAKEN IN THE PREPARATION OF THIS INSTALLATION BOOKLET TO ENSURE THE SUCCESSFUL FIELD INSTALLATION OF THE OIML KIT FOR THE MCS-2OOOSL AND THE OCS-2OOOSL TESTERS WHILE MINIMISING THE TIME AND MANPOWER REQUIRED.

THIS BOOKLET IS DESIGNED TO ENABLE THE INSTALLATION TO BE CARRIED OUT USING ONLY THE TOOLS AND EQUIPMENT SPECIFIED IN THE EQUIPMENT SPECIFIED SECTION.

THE FUNCTION OF THE OIML KITS IS TO UPGRADE THE MCS-2OOOSL AND OCS-2000SL TO OIML SPECIFICATIONS. OIML STANDS FOR "ORGANISATION INTERNATIONALE DE METROLOGIE LEGALE". THIS ORGANISATION, AMONG OTHER THINGS, RECOMMENDS SPECIFICATION FOR EXHAUST GAS ANALYZERS.

BEFORE STARTING THIS PROCEDURE BE SURE THE BAROMETRIC PRESSURE SENSING KIT (PART NO: **7009E9316-26**) IS INSTALLED AND FUNCTIONING. THE OIML OPTION IS ONLY FUNCTIONAL WITH SYSTEM SOFTWARE VERSION 5.20 OR HIGHER.

WHEN THE OIML KIT IS INSTALLED THE "TESTER CONFIGURATION" MUST BE ALTERED USING THE SERVICE DISK (V5.03 OR HIGHER) AND ALTHOUGH NOT NECESSARY, WE ADVICE TO DO A COMPLETE GAS CALIBRATION.

GENERAL NOTES

THE FOLLOWING PROCEDURE MUST BE CARRIED OUT IN THE SEQUENCE AS SPECIFIED IN THE TABLE OF CONTENTS.

DO NOT TOUCH ANY PART OF THE TESTER UNLESS INSTRUCTED TO DO SO.

THESE RULES SHOULD BE ADHERED TO DURING THE INSTALLATION PROCEDURE:

1: ALWAYS SWITCH OFF THE MAINS SUPPLY WHEN WORKING INSIDE THE CABINET.

2: WHEN UP-GRADING THE SOFTWARE LEVEL BE CAREFUL TO AVOID HANDLING THE INDIVIDUAL EPROMS MORE THAN ABSOLUTELY NECESSARY.

3: WHILE HANDLING THE EPROMS TRANSFER THEM AS QUICKLY AS POSSIBLE FROM THE ANTI-STATIC TUBE TO THEIR CORRECT LOCATION ON THE PRINTED CIRCUIT BOARD.

DO NOT TOUCH THE EPROM PINS AND PCB CONTACTS

4: WHEN ROUTING WIRES AND CABLES, ALWAYS KEEP THEM AWAY FROM NOISY COMPONENTS SUCH AS TRANSFORMERS ETC.

5: REMEMBER THAT THERE SHOULD BE NO SCREWS OR WASHERS ETC. LEFTOVER WHEN THE INSTALLATION PROCEDURE IS COMPLETED.

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KIT CONTENTS

THE OIML KITS FOR THE MCS-2000SL AND THE OCS-2000SL TESTERS COME COMPLETE WITH ALL OF THE PARTS NECESSARY TO CORRECTLY INSTALL THE KIT IN THE FIELD.

THE OIML KIT FOR THE MCS-2000SL, PART NO: 700939317-32

THE OIML KIT FOR THE OCS-2OOOSL, PART NO: 7009E9317-44

ITEM	PART NO:	QTY	DESCRIPTION
1	7009E9317-33	1	AC FAIL ASS'Y
2	7076E9322-74	1	AC SENCE CABLE W1AC
3	7076E9322-73	1	CABLE W2AC
4	7076E9322-75	1	CABLE W3AC
5	7009E9317-34	1	02 CABLE/FILTER ASS'Y
6	7009E9317-35	1	P603 FILTER ASS'Y
7	7001E9312-60	1	PCB ASS'Y PIGGY BACK FILTER
8	7096E2070-32	1	IC AD711CQ
9	7096E3062-63	1	PLUG RECEPTACLE ADAPTER 25W
10	4600E9309-96	1	OIML INDENTIFICATION PLATE MCS
			OR
	4600E9310-12	1	OIML INDENTIFICATION PLATE OCS
11	003-0608-511	2	BRIV. RIVET
12	0301-0125-00	1	FILTER PARTICULATE
13	3994-0008-04	2	CLAMP HOSE
14	7076E9057-00	1	FILTER ELEMENT (8 MICRON)
15	7012E9319-60	1	02 SHIELDING BOX
16	7005E9315-57	1	SHIELDING PLATE LOWER
17	7005E9315-58	1	SHIELDING PLATE UPPER
18	7096E3055-63	2	T-SPLICE (BLUE)
19	7096E4056-74	1	SHRINK TUBING, 25mm (L=60mm)
20	003-0669-522	3	SLEEVING (L=45mm)
21	0664-0090-00	4	WIRE GREEN, 26 AWG (L=12mm)
22	003-3931-823	3	RING TERMINAL M4
23	5878-0015-00	25	TY-RAP
24	003-1000-964	3	SPACER M4*9.6mm
25	0694-0484-00	1	LABEL
26	400-0400-203	5	WASHER INT. S/P, M4
27	400-0400-503	1	WASHER PLAIN, M4
28	0403-1251-16	2	SCREW 4-40*1.0"
29	0403-1351-10	3	SCREW 6-32*5/8"
30	407-0406-240	1	SEM SCREW INT. S/P W. M4*6
31	407-0412-240	6	SEM SCREW INT. S/P W. M4*12
32	408-0400-143	10	BARB NUT M4
33	0610-0047-00	5	SCREW S/T #6*3/8" PAN HEAD
34	0692E9308-74	1	INSTALLATION INSTRUCTIONS
35	0692E9308-75	REF	INSTALLATION DRAWING

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TOOLS, EQUIPMENT AND DOCUMENTATION REQUIRED

THE FOLLOWING TOOLS, EQUIPMENT AND REFERENCE DOCUMENTATION ARE REQUIRED TO CORRECTLY INSTALL OIML KIT IN THE FIELD:

1: A CROSS-HEAD SCREWDRIVER

2: A FLATHEAD SCREWDRIVER

3: A SNIPE NOSE PLIERS

4: A SIDE CUTTER

5: A HEAD GUN, FOR SHRINK TUBING

6; DIGITAL MULTIMETER, FLUKE 77 OR EQUIVALENT

7; ELECTRICAL DRILL WITH DRILL BIT 2.9mm (3.0mm)

8: MCS-2000 SYSTEM DISK, V5.20 OR HIGHER

9: MCS-2000 SERVICE DISK, V5.03 OR HIGHER P/N: 0553E1075-01

10: INSTALLATION DRAWING (REF) DWG NO: 0692E9308-75

11: THE MCS-2000 SERVICE MANUAL, FOR V5.00 OR HIGHER

12: SERVICE DISK MANUAL, V5.03 OR HIGHER, P/N: 0692E9308-17

13: TEMPERATURE CONTROLLED SOLDERING IRON

14: SOLDER SUCKER

15: ANTI-STATIC FIELD SERVICE KIT, P/N: 0552-0032-09

16: CRIMPING TOOL

17: RIVET GUN

PRE-INSTALLATION CHECKOUT PROCEDURE

BEFORE BEGINNING THE INSTALLATION OF THE OIML KIT BE SURE THE BAROMETRIC PRESSURE SENSING KIT (PART NO: 7009E9316-26) IS INSTALLED INTO THE MCS/OCS-2000.

IT IS IMPORTANT TO VERIFY THE CORRECT OPERATION OF THE TESTER:

A- SWITCH ON THE UNIT AND ALLOW IT TO WARM-UP IN THE USUAL MANNER.

B- AFTER THE WARM-UP PROCEED THROUGH THE SELF TEST AND CALIBRATION.

C- ANY FAULTS SHOULD BE NOTED AND CORRECTED BEFORE STARTING THE INSTALLATION PROCEDURE. REFER TO THE SERVICE MANUAL FOR TROUBLESHOOTING INFORMATION ETC.

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INSTALLATION PROCEDURE

NOTE: THIS INSTALLATION MUST BE PERFORMED BY QUALIFIED SUN SERVICE PERSONNEL ONLY.

STEP: 1 AFTER PERFORMING THE INITIAL CHECKOUT AND NECESSARY REPAIRS ARE CARRIED OUT, SWITCH OFF THE UNIT AND DISCONNECT IT FROM THE MAINS POWER SOURCE.

STEP: 2 CHECK THE MAINS CABLE AND PLUG FOR ANY DAMAGE AND REPAIR OR REPLACE AS NECESSARY. CONNECT THE PLUG INTO THE MAINS POWER SOURCE.

STEP: 3 CHECK THE CONDITION OF ALL EXTERNAL LEADS, TUBING AND PICK-UPS CONNECTED TO THE UNIT FOR DAMAGE AND REPAIR OR REPLACE AS NECESSARY.

STEP: 4 REMOVE THE PLASTIC FRONT PANEL FROM THE MCS, OCS-2000 AND THE METAL PLATE FROM IN FRONT OF THE CARD RACK ASSEMBLY. REMOVE THE TOP REAR PANEL.

STEP: 5 WITH REFERENCE TO THE INSTALLATION DRAWING (REF **0692E9308-75**): REMOVE THE SIX (6) MOUNTING SCREWS FROM THE GAS ANALYZER ASSEMBLY DRAWER AND SLIDE IT OUT.

STEP: 6 INSTALL YOUR ANTI-STATIC FIELD SERVICE KIT ON THE FRONT OF THE TESTER NEXT TO THE PRINTER. CONNECT THE GROUND CORD TO A GROUND STUD OF THE TESTER AND PUT ON THE WRIST STRAP.

STEP: 7 TAKE THE PIGGY BACK FILTER BOARD (PART NO: 7001E9312-60) FROM THE OIML KIT.
TAKE THE MUX-A/D BOARD (PART NO: 7001E9012) FROM THE THIRD SLOT OF THE DIGITAL RACK.

STEP: 8 WITH REFERENCE TO THE INSTALLATION DRAWING (REF **0692E9308-75, SHEET 4** OF 5): REMOVE Ul TILL U4 FROM THE MUX-A/D BOARD AND REPLACE THEM ON THE PIGGY BACK FILTER BOARD (Ul0l TILL U104).

STEP: 9 MOUNT THE PIGGY BACK FILTER BOARD ON THE MUX-A/D BOARD AS SHOWN ON DETAIL 'B' AND REPLACE THE MUX-A/D BOARD INTO THE THIRD SLOT OF THE DIGITAL RACK.

STEP: 10 WITH REFERENCE TO THE INSTALLATION DRAWING (REF **0692E9308-75, SHEET 1** AND **4** OF 5): SEE NOTE 2 AND DETAIL 'C' AND 'D'. STRIP OUTER COVERS CORE CABLES OF HARNESS Wl0l AND W8 50mm AND CUT BACK GREEN CONDUCTORS.

STEP: 11 FIT SLEEVINGS (3*45mm) OVER THE DRAIN WIRES.
PLACE AND CRIMP 3* RING TERMINAL M4 ONTO THESE WIRES.

STEP: 12 MOUNT THE THREE GROUND WIRES OF HARNESS Wl0l AND W8 WITH TWO WASHERS INT. S/P UNDER THE SCREW OF THE CHANNEL SUPPORT.

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STEP: 13 WITH REFERENCE TO THE INSTALLATION DRAWING (REF **069239308-75, SHEET 3** AND **4** OF 5): SEE DETAIL 'E'. REMOVE THE IR CALIBRATION INTERFACE BOARD (PART NO: 700139311-69) IF THE REVISION LEVEL IS "B" OR LOWER AND PLACE IT ON THE ANTI-STATIC WORK MAT.
FOR REVISION LEVEL "C" OR HIGHER NO CHANGES HAVE TO BE MADE TO THIS BOARD.

STEP: 14 REMOVE IC2 AND IC5 BY CUTTING ALL THE PINS AS NEAR TO THE IC AS POSSIBLE AND DESOLDERING THEM ONE BY ONE. USE THE SOLDER SUCKER TO CLEAN THE HOLES.

STEP: 15 TAKE IC AD711CQ (PART NO: 709632070-32) FROM THE KIT AND INSTALL IT AS IC2. TAKE THE FOUR WIRES FROM THE KIT AND SOLDER THEM AS JUMPERS:
U5-1_5-3 / U5-5_U5-7 / U5-8_U5-10 / U5-12_U5-14.

STEP: 16 TAKE THE LABEL FROM THE KIT, MARK IT "REV. C" AND PLACE IT ON THE BOARD.

STEP: 17 REPLACE THE BOARD. FIT THE 25-WAY RECEPTACLE ADAPTER PLUG (PART NO: 709633062-63) BETWEEN CONNECTOR J8G OF THE IR CALIBRATION INTERFACE BOARD AND CABLE ASSEMBLY W3G. MOUNT THEM WITH TWO SCREWS 4-40*1.0".

STEP: 18 DISCONNECT THE MAINS CABLE PLUG FROM THE MAINS POWER SOURCE. YOU CAN TAKE OFF THE WRIST STRAP NOW.

STEP: 19 WITH REFERENCE TO THE INSTALLATION DRAWING (REF **0692E9308-75) SHEET 1** AND **3** OF 5: REPLACE THE 02 CABLE ASSEMBLY (W9G) BY THE 02 CABLE/FILTER ASSEMBLY (PART NO: 7009E9317-34) AND MOUNT THE GROUND WIRE AND ONE WASHER INT, S/P UNDER THE SCREW OF THE OXYGEN SENSOR BLOCK.

STEP: 20 WITH REFERENCE TO THE INSTALLATION DRAWING (REF **0692E9308-75) SHEET 5** OF 5: FIND THE HOSE FROM THE AIR INTAKE PORT TO THE SOLENOID.
CUT THE HOSE 270mm FROM THE AIR INTAKE PORT AND MOUNT FILTER PARTICULATE (PART NO: 0301-0125-00) BETWEEN THE HOSES USING TWO (2) HOSE CLAMPS, WITH THE ARROW IN THE DIRECTION OF THE SOLENOID.

STEP: 21 IF REQUIRED, PLACE THE 02 SHIELDING BOX (PART NO: 7012E9319-60) OVER THE OXYGEN SENSOR BLOCK AND MARK FOUR (4) HOLES ON THE CHASSIS GASBENCH WELD ASSEMBLY. DRILL FOUR (4) HOLES 2.9mm (3.0mm) INTO THE CHASSIS AND MOUNT THE 02 SHIELDING BOX WITH FOUR (4) SCREWS S/T #6*3/8" PAN HEAD.

STEP: 22 MOUNT ONE (1) SCREW S/P W. M4*6 TO THE OXYGEN SENSOR BLOCK, IF POSSIBLE.

STEP: 23 REPLACE THE SECONDARY FILTER ELEMENT (PART NO: 7096E9057-00).

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STEP: 24 WITH REFERENCE TO THE INSTALLATION DRAWING (REF **0692E9308-75) SHEET 3** OF 5: REMOVE THE THREE (3) SCREWS FROM THE IR ANALYZER BOARD. PLACE THE LOWER SHIELDING PLATE (PART NO: 7005E9315-57) AND THE UPPER SHIELDING PLATE (PART NO: 7005E9315-58) WITH BETWEEN THEM CABLE W4G, WITH THREE (3) SPACERS (PART NO: 003-1OOO-964), THREE (3) SCREWS 6-32*5/8 AND FIVE (5) BARB NUTS M4 TO THE IR ANALYZER BOARD AS SHOWN.

STEP: 25 WITH REFERENCE TO THE INSTALLATION DRAWING (REF **0692E9308-75) SHEET 2** AND **4** OF 5: CUT CABLE W2G 1OOmm FROM CONNECTOR P603 AND STRIP THESE WIRES 5mm.

STEP: 26 SOLDER ONTO THE P603 FILTER BOARD (PART NO: 7009E9317-35) THAT COMES WITH THE KIT:
THE WHITE/BLACK WIRES AT LOCATION C AND G AND
THE WHITE/RED WIRES AT LOCATION D AND H.

STEP: 27 CONNECT THE BLUE WIRES FROM THE P603 FILTER BOARD INTO THE CONNECTOR P603:
WIRE FROM LOCATION A TO POSITION 3 AND
WIRE FROM LOCATION B TO POSITION 6.

STEP: 28 FIT THE 60mm SHRINK TUBING (PART NO: 7096E4056-74) OVER THE P603 FILTER BOARD ASSEMBLY AND SHRINK.

STEP: 29 IF REQUIRED DRILL A HOLE 2.9mm (3.0mm) INTO THE SUPPORT HEADFRAME. MOUNT THE GROUND WIRE FROM THE P603 FILTER BOARD WITH TWO (2) WASHERS INT S/P, ONE (1) WASHER PLAIN AND A SELF TAPPING SCREW TO THE SUPPORT HEADFRAME.

STEP: 30 IF REQUIRED CONNECT CABLE W3AC (PART NO: 7076E9322-75) TO THE BLUE SECONDARY WIRES OF THE TRANSFORMER LOCATED IN THE GAS ANALYZER DRAWER, BY USING TWO (2) T-SLICES (PART NO: 7096E3055-63). CONNECT CABLE W3AC, CONNECTOR PP3 TO THE P603 FILTER ASSEMBLY, CABLE CONNECTOR JP3.

STEP: 31 WITH REFERENCE TO THE INSTALLATION DRAWING (REF **0692E9308-75) SHEET 1** AND **2** OF 5: MOUNT THE AC FAIL ASSEMBLY (PART NO: 7076E9322-74) BETWEEN THE POWER SUPPLY BASE PLATE AND THE POWER SUPPLY COVER PLATE.

STEP: 32 CONNECT CABLE WBAC (PART NO: 7076E9322-73), CONNECTOR JP2 TO THE AC FAIL ASSEMBLY CONNECTOR PP2 AND CONNECT THE OTHER SIDE TO THE TERMINAL BLOCK ON THE POWER SUPPLY ASSEMBLY:
WHITE/RED WIRE TO TS2A-4 AND
WHITE/BLACK WIRE TO TS2D-6

STEP: 33 ROUTE THE WHITE WIRE TO THE FRONT OF THE DIGITAL CARD RACK AND FIT IT INTO POSITION 12 OF CONNECTOR J205 OF THE DIGITAL I/O BOARD (SLOT ONE).

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STEP: 34 CONNECT CABLE W1AC (PART NO: 7076E9322-74) CONNECTOR JP1 TO THE AC FAIL ASSEMBLY CONNECTOR PP1.

STEP: 35 ROUTE CABLE, AS SHOWN ON **SHEET 1**, TO CONNECTOR J205. FIT THE WIRES INTO 5205 POSITION 3 AND 6.

STEP: 36 TIGHTEN CABLES WITH TY-RAPS AT POSITIONS AS NECESSARY.

STEP: 37 REFER TO THE INSTALLATION DRAWING (REF 069239308-75) **SHEET 5** OF 5: MOUNT THE OIML-IDENTIFICATION PLATE,
PART NO: 4600E9309-96 FOR THE MCS-2000SL OR
PART NO: 4600E9310-12 FOR THE OCS-2000SL,
USING TWO (2) BRIV. RIVETS,
STAMP THE YEAR OF MANUFACTURE ON OIML PLATE USING THE SECOND DIGIT OF THE SERIAL NUMBER:
IF 7 STAMP 87, IF 8 STAMP 88, ... IF 2 STAMP 92.

STEP: 38 CALIBRATION OF THE AC FAIL BOARD:
REFIT THE PLUG OF THE MAINS CABLE TO THE MAINS POWER SOURCE AND POWER ON THE UNIT.
ADJUST VR1 ON THE AC FAIL BOARD SO THAT THE DC-VOLTAGE ON TEST POINT 1 IS:

Vtp = 6.000 + (Vmains - 220) * 0.028 + (Va - 12) * 0.5

NOTE: Vtp = DC-VOLTAGE ON TEST POINT 1,
Vmains = MAINS AC-VOLTAGE,
Va = 12 VOLT FROM POWER SUPPLY OF THE UNIT.

END OF CALIBRATION, SWITCH OFF THE UNIT AND DISCONNECT IT FROM THE MAINS POWER SOURCE.

STEP: 39 REINSTALL THE METAL PLATE IN FRONT OF THE CARD RACK ASSEMBLY AND REINSTALL THE PLASTIC FRONT PANEL OF THE MCS/OCS-2000.

STEP: 40 REINSTALL THE TOP REAR PANEL, SLIDE THE GAS ANALYZER ASSEMBLY BACK INTO PLACE REMEMBER TO RECONNECT THE EARTH STRAP, OTHERWISE A SAFETY HAZARD WILL OCCUR. SECURE THE GAS ANALYZER IN PLACE WITH SIX (6) MOUNTING SCREWS.

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SET-UP AND CHECKOUT PROCEDURE

1: CHECK ALL ELECTRICAL CONNECTIONS ARE CORRECT AND PROPERLY SECURED. PLUG THE TESTER INTO THE NEAREST MAINS OUTLET.

2: INSERT THE SERVICE DISK (V5.03 OR HIGHER).
SWITCH ON THE POWER TO THE UNIT.

THE TESTER SHOULD PERFORM THE MEMORY TEST ROUTINE, PROGRAMME LOADING SEQUENCE, AFTER THE TESTER CONFIGURATION AND CALIBRATION PAGES HAVE BEEN DISPLAYED, THE "MAIN MENU" PAGE WILL BE DISPLAYED:

PROGRAMME SELECTION
- TESTER CONFIGURATION ENTRY
- TESTER CALIBRATION
- GAS BENCH SPECIAL FUNCTIONS
- SPECIAL FUNCTIONS
- LANGUAGE SELECTION
- VEHICLE QUICK TESTS
- FACTORY TESTS

3: SELECT THE "TESTER CONFIGURATION ENTRY" PAGE FROM THE MAIN MENU, THE "TESTER CONFIGURATION ENTRY" (PAGE 1) SHOULD BE DISPLAYED:

TESTER CONFIGURATION ENTRY	
- DIESEL OPTION	NOT DEFINED
- DIAGNOSTICS	DEFINED
- TECH-15	NOT DEFINED
- DIGITAL SCOPE	NOT DEFINED
- BAROMETER	"DEFINED"
- KEYBOARD	NOT DEFINED
- DATE AND TIME	NOT DEFINED
- SDL-20	NOT DEFINED
- OIML	"DEFINED"

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4: STEP THROUGH ALL LINES BY SETTING "DEFINED/NOT DEFINED" AS REQUIRED, BY PRESSING THE # KEY. SET THE "BAROMETER" AND "OIML" TO "DEFINED".

WHEN THE # KEY IS PRESSED ON THE LAST LINE, THE "TESTER CONFIGURATION ENTRY" (PAGE 2) WILL BE DISPLAYED:

TESTER CONFIGURATION ENTRY	
- EXT. CRT DRIVER	NOT DEFINED
- BIT 13	NOT DEFINED
- BIT 14	NOT DEFINED
- BIT 15	NOT DEFINED

NOTE: THE DEFINITIONS "BIT 13, BIT 14 & BIT 15" ARE INTENDED FOR FUTURE USE AN SHOULD BE LEFT AS "NOT DEFINED".

PRESSING THE # KEY ON THE LAST LINE, THE CAPTION "WRITING TO MEMORY" WILL BE DISPLAYED.

5: NEXT THE "TESTER OPTIONS ENTRY" PAGES (2 PAGES) WILL BE DISPLAYED, IF OTHER OPTIONS HAVE BEEN INSTALLED AT THIS TIME ADJUST THESE PAGES AS REQUIRED.

6: WHEN COMPLETE, ALTHOUGH NOT NECESSARY, WE ADVICE YOU TO PERFORM THE CALIBRATION AS DESCRIBED IN THE INSTALLATION PROCEDURE FOR THE BAROMETRIC PRESSURE SENSING KIT (PART NO: **0692E9307-35), PAGE 6-6** ONWARDS,

7: REBOOT THE TESTER. THE TESTER SHOULD PERFORM THE SELF TEST ROUTINE, PROGRAMME LOADING SEQUENCE, WARM-UP PERIOD AND THE CALIBRATION SEQUENCE APPROX 15 MIN.
AFTER THE TESTER CALIBRATION SEQUENCE HAS BEEN COMPLETED, THE "PROGRAM SELECTION" PAGE WILL BE DISPLAYED.

8: SELECT "VEHICLE TESTING" AND PERFORM AN ENGINE TEST TO ENSURE THE SYSTEM IS OPERATING CORRECTLY.

THIS COMPLETES THE OIML KIT INSTALLATION

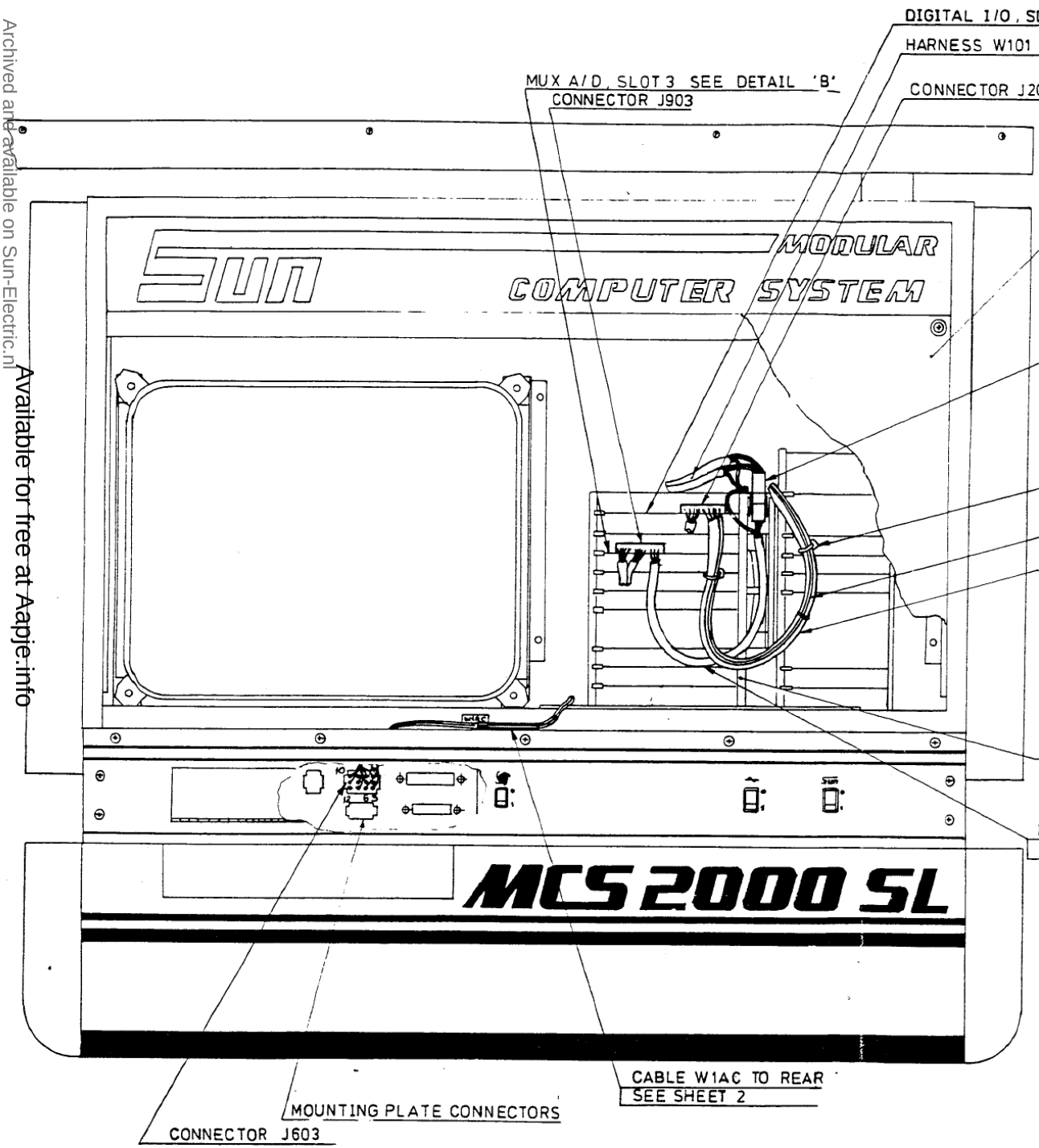
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Revisions					
Rev	Date	ECN	Description	Check	Appr
A	09-92		ERN #0822. REL. FOR PROD	P.T.	



NOTES:

1) SHEET 3 : IF NOT INSTALLED, INSTALL BAROMETER PRESS. SENS. KIT FIRST.
2) SHEET 1 : MOUNT GROUND WIRES OF HARNESS W8 AND HARNESS W101 WITH 2 WASHERS INT. S/P UNDER SCREW OF CHANNEL SUPPORT (SEE ALSO DETAIL "C" & "D")
3) SHEET 2 : CONNECT CABLE W2AC CONNECTOR JP2 TO AC FAIL ASS'Y CONNECTOR PP2 AND CONNECT OTHER SIDE TO TERMINAL BLOCK ON POWER SUPPLY ASS'Y:
WHITE/RED CONDUCTOR TO TS2A-4
WHITE/BLACK CONDUCTOR TO TS2D-6
AND FIT WHITE CONDUCTOR INTO POS'N 12 OF CONNECTOR J205 (SEE SHEET 1).
4) SHEET 2 : CONNECT CABLE W1AC CONNECTOR JP1 TO AC FAIL ASS'Y CONNECTOR PP1 AND CONNECT OTHER SIDE INTO POS'N 3 AND POS'N 6 OF CONNECTOR J603 (SEE SHEET 1).
5) SHEET 2 : IF REQUIRED DRILL A HOLE 2.9mm INTO SUPPORT HEADFRAME. MOUNT GROUND WIRE FROM P603 FILTER ASS'Y WITH 2 WASHERS INT. S/P, 1 WASHER PLAIN AND SELF TAPPING SCREW (OR 1 BARB NUT M4 AND 1 WASHER INT. S/P) TO SUPPORT HEADFRAME (SEE ALSO DETAIL "A").
6) SHEET 3 : IF REQUIRED CONNECT CABLE W3AC TO BLUE SECONDARY WIRES OF THE TRANSFORMER BY USING 2 T-SPLICES.
7) SHEET 3 : CONNECT CABLE W3AC CONNECTOR PP3 TO P603 FILTER ASS'Y CABLE CONNECTOR JP3.
8) SHEET 3 : REPLACE CABLE ASS'Y O2 (W9G) BY O2 CABLE/FILTER ASS'Y. MOUNT GROUND WIRE AND 1 WASHER INT. S/P UNDER SCREW OF OXYGEN SENSOR BLOCK.
9) SHEET 3 : UNSCREW CONNECTOR P8G AND REMOVE THE 2 SCREW RET.'S UNC FROM CONNECTOR P8G.
INSTALL PLUG RECEPTACLE ADAPTOR BETWEEN CONNECTOR J8G AND CONNECTOR P8G. MOUNT THEM WITH 2 UNC 4-40 • 1" SCREWS TO IR CALIBRATION INTERFACE PCB ASS'Y.
10) SHEET 3 : IF REQUIRED PLACE O2 SHIELDING BOX OVER OXYGEN SENSOR BLOCK AND MARK 4 HOLES ON THE CHASSIS GASB. WELD ASS'Y. DRILL 4 HOLES 2.9mm IN TO THE CHASSIS GASB. WELD ASS'Y. MOUNT O2 SHIELDING BOX WITH 4 SELF TAPPING SCREWS (OR 4 BARB NUTS M4) AND 1 SEM SCREW INT. S/P W. M3•6 TO OXYGEN SENSOR BLOCK IF POSSIBLE.
11) SHEET 3 : REMOVE 3 SCREWS FROM IR ANALYZER PCB. PLACE SHIELDING PLATE LOWER AND SHIELDING PLATE UPPER, WITH BETWEEN THEM CABLE W4G, WITH 3 SPACERS, 3 SCREWS 6-32 • 5/8" AND 5 BARB NUTS M4 TO THE IR ANALYZER PCB AS SHOWN.
12) SHEET 5 : CUT EXISTING HOSE 270mm FROM AIR INTAKE PORT. MOUNT FILTER PARTICULATE BETWEEN THE HOSES WITH THE ARROW IN THE DIRECTION OF THE SOLENOID AS SHOWN.
13) SHEET 5 : REPLACE SECONDARY FILTER ELEMENT.
14) SHEET 1-5: TIGHTEN CABLES WITH TY-RAPS AT POSITIONS AS NECESSARY.
15) SHEET 5 : MOUNT OIML-INDENTIFICATION PLATE AS SHOWN USING 2 BRIV. RIVETS. STAMP YEAR OF MANUFACTURE ON OIML PLATE USING SECOND DIGIT OF THE SERIAL NUMBER:
IF 7 STAMP 87 IF 0 STAMP 90
IF 8 STAMP 88 IF 1 STAMP 91
IF 9 STAMP 89 ETC.
16) SHEET 2 : IF REQUIRED REPLACE SCREWS M4•12 AND WASHERS PLAIN BY 6 SEM SCREWS INT. S/P W. M4•12.
17) SHEET 2 : CALIBRATION:
ADJUST VR1 SO THAT DC VOLTAGE ON TEST POINT 1 IS 6.000 +(MAINS VAC-220)•0.028+(Va-12)•0.5 VOLT DC.
Va=12 VOLT DC OF SYSTEM.

Item	Qty	Dwg./Part no	Description		Remarks
Scale			Date	Used in	MCS-2000
Designed by				Material	
Drawn by	Heleena v/d Nieuwendijk		09.08.92		
Checked by	Peter Tel		10.9.92		
Approved				Finish	

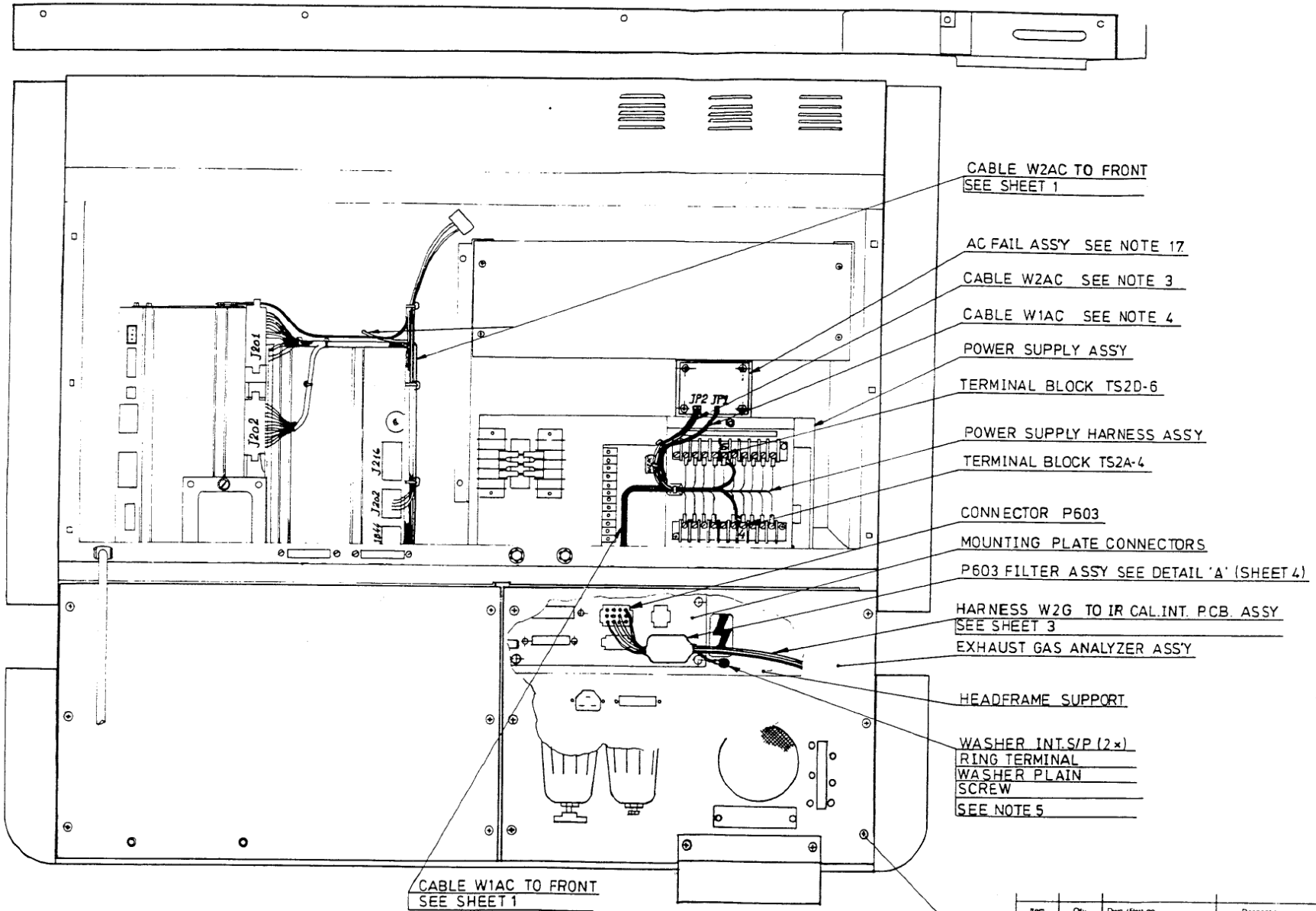
Unless otherwise specified: Dimensions are in mm. Tolerances on: Angles ± 0.5, Holes ± 0.1, Rest ± 0.5

Remove all sharp corners and remove burrs

Description	Dwg no
INSTALLATION DRAWING, OIML-KIT	0692E9308-75

Sun	A2	Sheet 1 of 5	Code	Issue A
		Project no E9214		

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Item	Qty	Dwg / Part no	Description	Remarks
Scale			Date	Used in MCS-2000
Designed by				Material
Drawn by Heleena v/d Nieuwendijk			03.07.92	
Checked by Peter Tel			10.9.92	
Approved Bernard Gac			10.9.92	Finish

Unless otherwise specified: Dimensions are in mm; Tolerances mm: Angles ± 0.5, Fillets ± 0.1, Rest ± 0.5

Remove all sharp corners and remove burrs

Description: INSTALLATION DRAWING, OIML-KIT

Dwg no: 0692E9308-75

Sun

A2

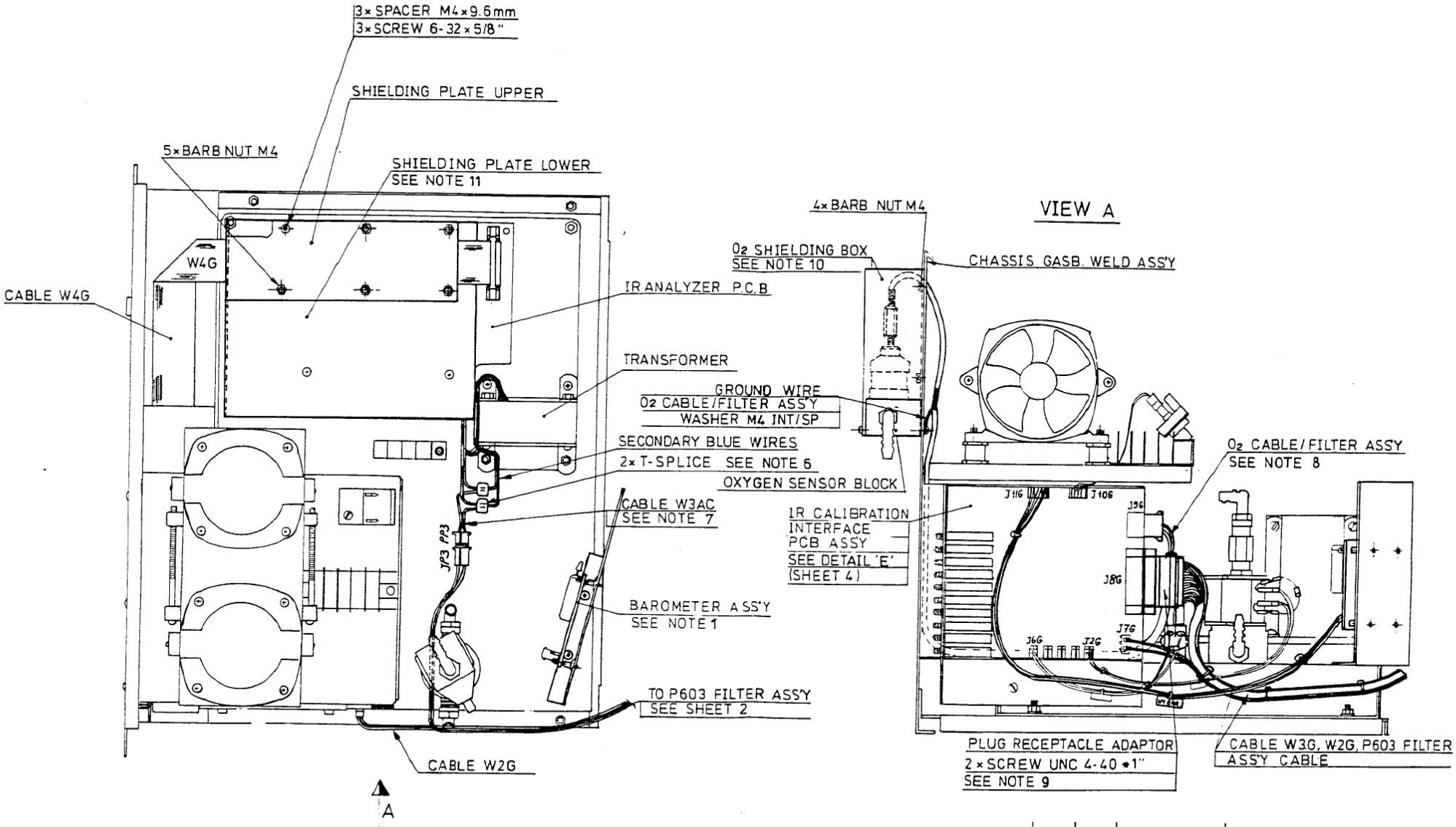
Sheet 2 of 5

Code

Project no E9214

Issue A

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Item	Qty	Dwg / Part no	Description		Remarks
Scale			Date	Used in MCS-2000	
Designed by				Material	
Drawn by Heleena v/d Nieuwendijk			04.07.92		
Checked by Peter Tel			10.9.92		
Approved Remco Tijs			10.9.92	Finish	

Unless otherwise specified: Dimensions are in mm. Tolerances on: Angles ± 0.5, Holes ± 0.1, Rest ± 0.5

Remove all sharp corners and remove burrs

Description: INSTALLATION DRAWING, OIML-KIT

Dwg no: 0692E9308-75

Sun

A2

Sheet 3 of 5

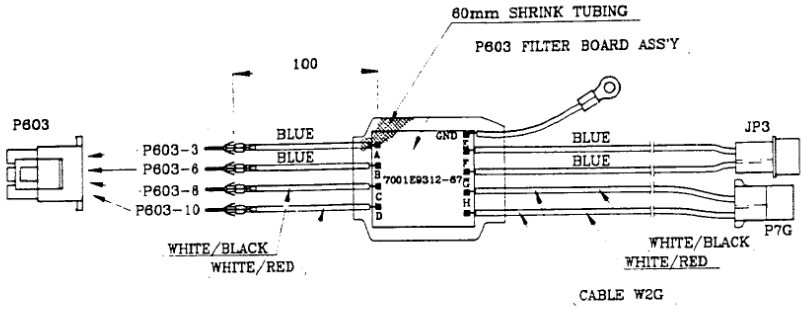
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Project no E9214

Issue A

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DETAIL 'A'



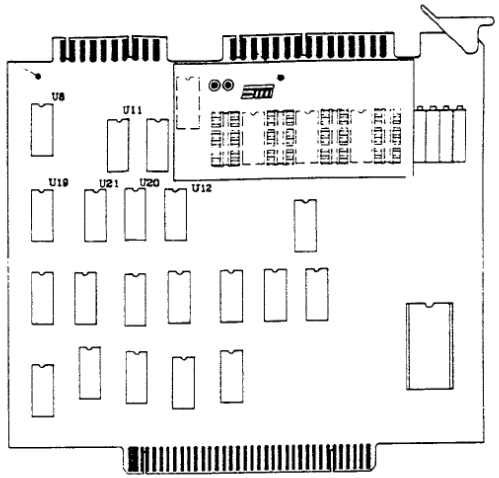
CABLE W2G

CUT CABLE W2G 100mm FROM CONNECTOR P603.
STRIP THESE WIRES 5mm.
SOLDER WIRES (WHITE/BLACK) ONTO P603 FILTER BOARD ASS'Y AT LOCATION C AND G.
SOLDER WIRES (WHITE/RED) ONTO P603 FILTER BOARD ASS'Y AT LOCATION D AND H.
CONNECT BLUE WIRE COMING FROM LOCATION A INTO POS'N 3 OF CONNECTOR P603.
CONNECT BLUE WIRE COMING FROM LOCATION B INTO POS'N 6 OF CONNECTOR P603.
FIT 60mm SHRINK TUBING OVER P603 FILTER BOARD ASS'Y AND SHRINK.

DETAIL 'B'

PIGGY BACK FILTER BOARD

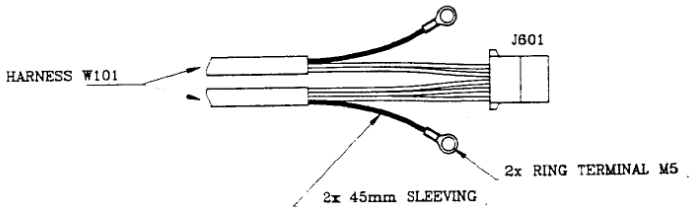
PCB MUX A/D
SEE NOTE A



NOTES:

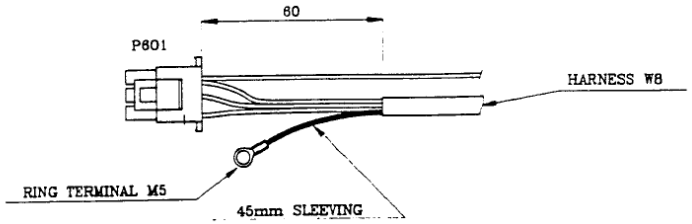
A) REMOVE U1 TILL U4 (DG508ACJ) FROM P.C.B MUX A/D AND REPLACE THEM ON PIGGY BACK FILTER BOARD ASS'Y (U101-U104). PLACE PIGGY BACK FILTER BOARD ASS'Y IN IC SOCKET U1 TILL U4 OF P.C.B MUX A/D.

DETAIL 'C'



STRIP OUTER COVERS CORE CABLES 50mm
CUT BACK GREEN CONDUCTOR.
FIT SLEEVING 2x 45mm OVER DRAIN WIRE.
PLACE AND CRIMP 2x RING TERMINAL M5 ONTO DRAIN WIRE.

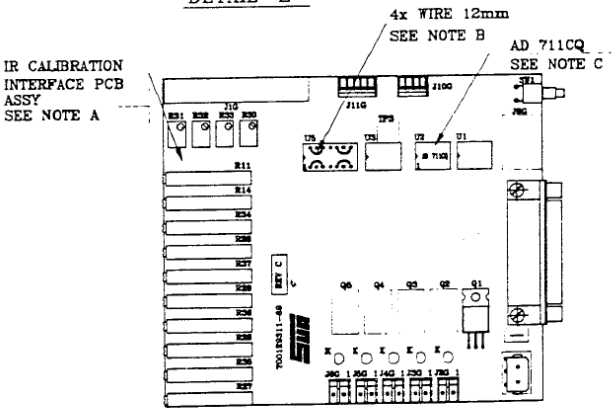
DETAIL 'D'



STRIP OUTER COVER CORE CABLE 60mm FROM CONNECTOR P601.
CUT BACK GREEN CONDUCTOR.
CUT BACK DRAIN WIRE AT P601-2 SIDE AND REMOVE SLEEVING.
FIT SLEEVING 45mm OVER DRAIN WIRE.
PLACE AND CRIMP RING TERMINAL ONTO DRAIN WIRE.

DETAIL 'E'

IR CALIBRATION INTERFACE PCB ASSY
SEE NOTE A



LABEL
SEE NOTE D

DETAIL 'E' NOTES:

A) UPDATING IS REQUIRED IF THE REVISION LEVEL OF P/N 7001E9311-69 IS "B" OR LOWER.

B) REMOVE U5 (LM324).
SOLDER FOUR WIRES 12mm BETWEEN:
U5 -1 AND U5 -3
U5 -5 AND U5 -7
U5 -8 AND U5 -10
U5 -12 AND U5 -14

C) REMOVE U2 (LM308A) AND INSTALL IC AD 711CQ

D) WRITE ON LABEL REV. C AND PLACE THE LABEL.

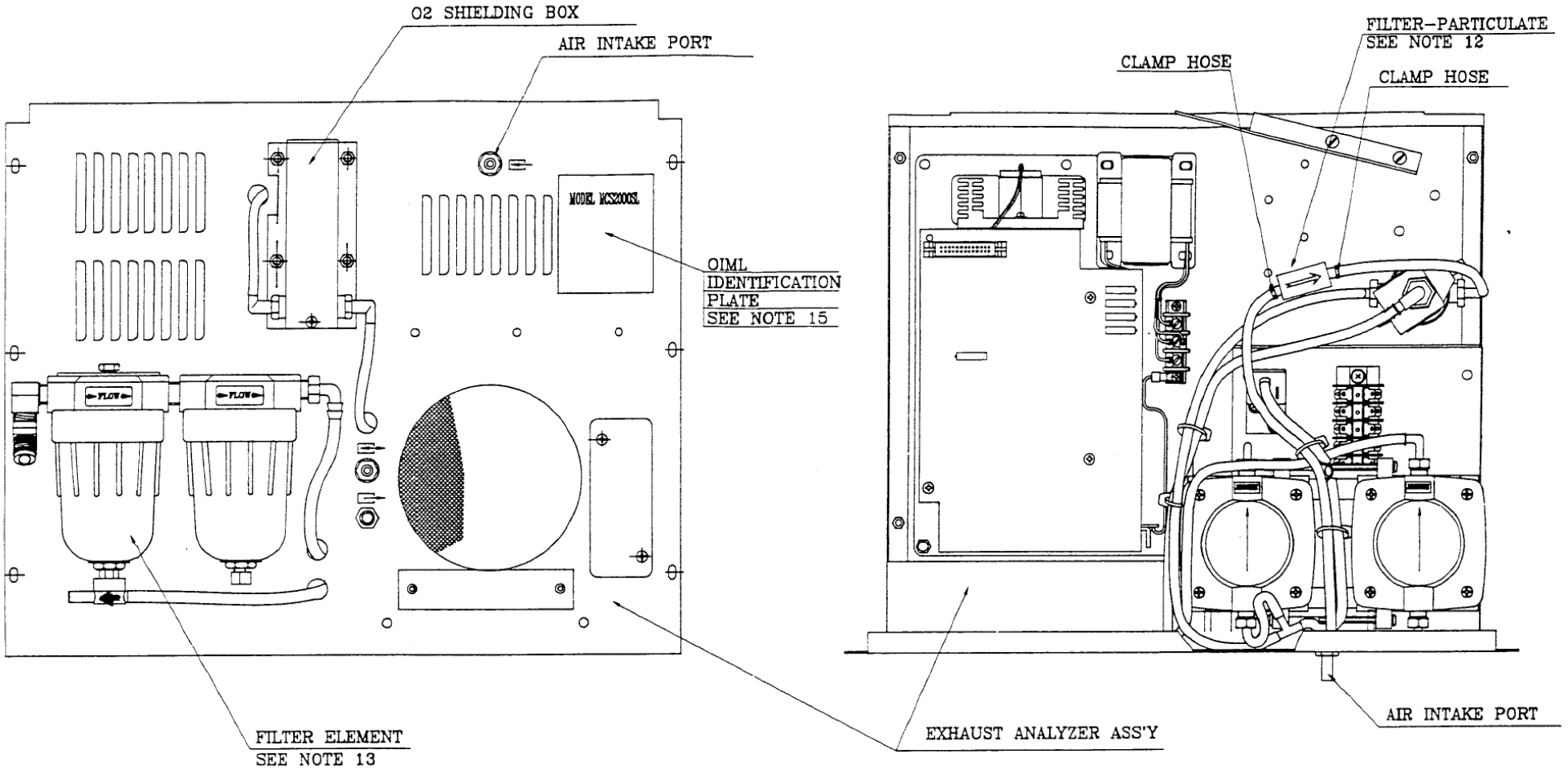
Item	Qty	Dwg./Part no.	Description		Remarks
Scale	N.T.S.		Date	Used in	MCS2000SL
Designed by	J.EGTBERTS		07-92	Material	
Drawn by	H.v/d NIEUWENDIJK		05-08-92		
Checked by	Peter Tel		10.9.92		
Approved	Bernard Lee		10.9.92	Finish	

Unless otherwise specified: Dimensions are in mm; Tolerances on: Angles ± 0° Holes ± 0.1 Rest ± .5
Remove all sharp corners and remove burrs

Description: INSTALLATION DRAWING , OIML-KIT
Dwg. no.: 0692E9308-75

SUN ELECTRIC EUROPE B.V. | A1 | Sheet 4 of 5 | Project no. E9214 | Rev. A

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Item	Qty.	Dwg./Part no	Description		Remarks
Scale N.T.S.			Date	Used in MCS2000SL	
Designed by J.EGTBERTS			07-92	Material	
Drawn by H.v/d NIEUWENDIJK			10-08-92		
Checked by Peter Tel			10.9.92		
Approved Bernard Gee			10.9.92	Finish	

Unless otherwise specified: Dimensions are in mm.; Tolerances are: Angles ± 0,5° Holes ± 0,1 Rest ± 0,5

Remove all sharp corners and remove burns

Description: INSTALLATION DRAWING OIML-KIT

Dwg. no. 0692E9308-75

SUN ELECTRIC EUROPE BV
Auteursrecht voorbehouden volgens de wet

A2

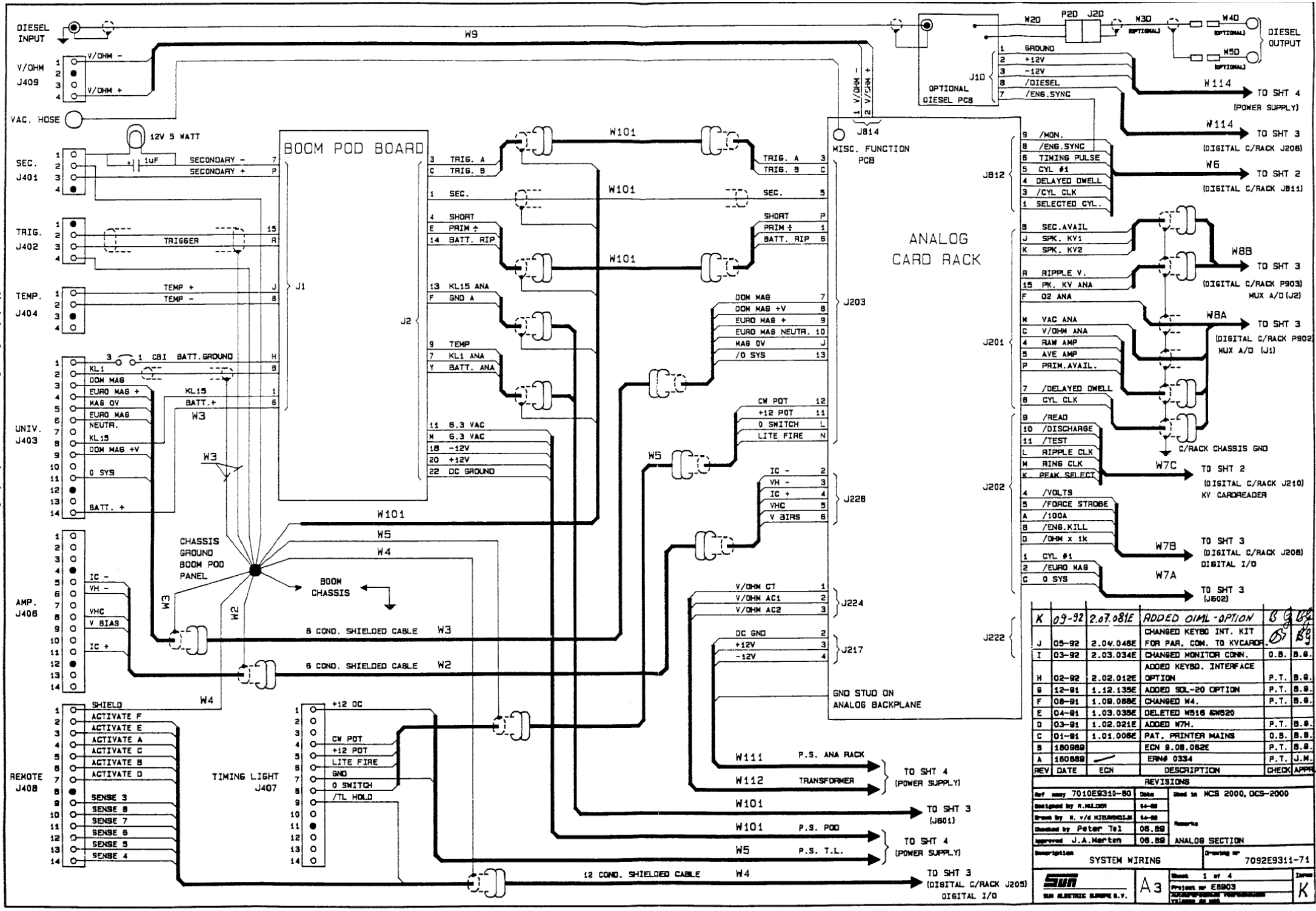
Sheet 5 of 5

Code

Project no. E9214

Issue A

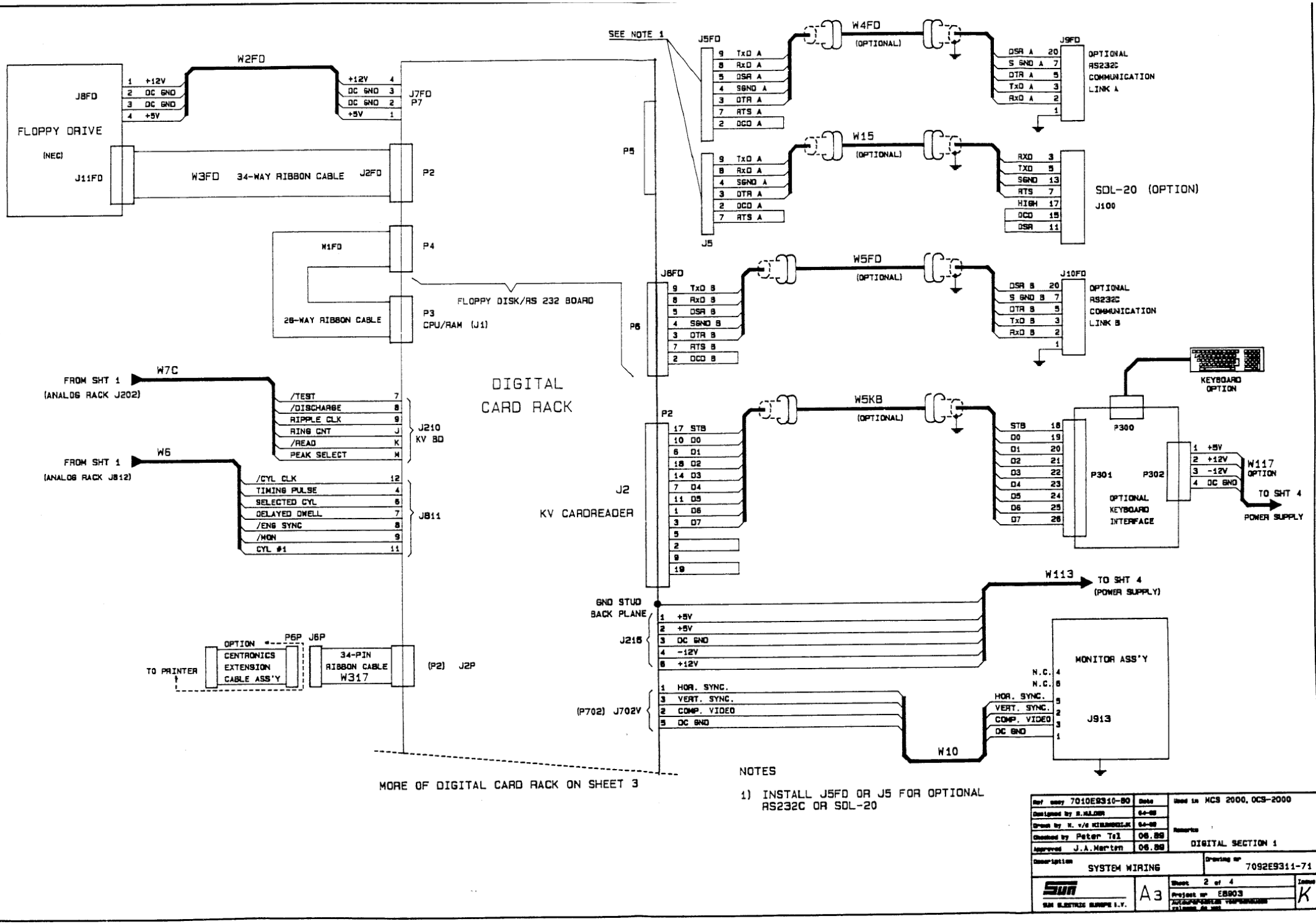
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REV	DATE	ECN	DESCRIPTION	CHECK	APPR
			REVISIONS		
K	09-92	2.07.081E	ADDED OIML-OPTION	B.G.	B.G.
J	05-92	2.04.046E	CHANGED KEYBD INT. KIT FOR PAR. COM. TO KVCARDR.	O.S.	B.G.
I	03-92	2.03.034E	CHANGED MONITOR CONN.	O.S.	B.G.
H	02-92	2.02.012E	ADDED KEYBD. INTERFACE OPTION	P.T.	B.G.
G	12-91	1.12.135E	ADDED SDL-20 OPTION	P.T.	B.G.
F	08-91	1.09.088E	CHANGED W4.	P.T.	B.G.
E	04-91	1.03.035E	DELETED W516 SW520		
D	03-91	1.02.021E	ADDED W7H.	P.T.	B.G.
C	01-91	1.01.006E	PAT. PRINTER MAINS	O.S.	B.G.
B	180989		ECN 8.08.062E	P.T.	B.G.
A	160889		ERN# 0334	P.T.	J.M.

Ref assy 7010E9310-80	Date	Used in MCS 2000, DCS-2000	
Designed by R.MULDER	04-88		
Drawn by H. v/d KIEVADELK	04-88		
Checked by Peter Tel	06.89	Remarks	
Approved J.A.Marten	06.89	ANALOG SECTION	
Description SYSTEM WIRING		Drawing nr 7092E9311-71	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 4	Issue K
		Project nr E8903	

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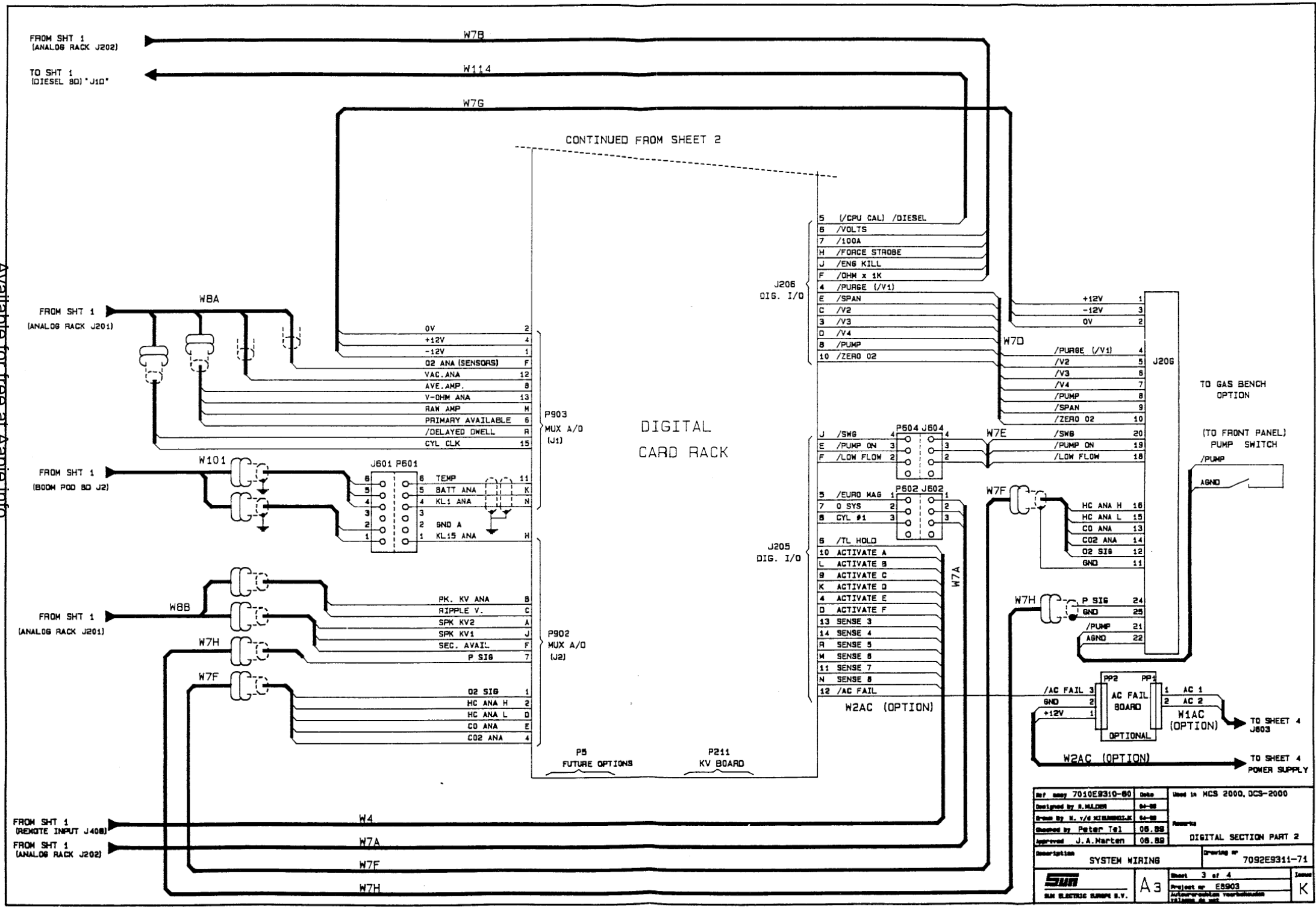


NOTES

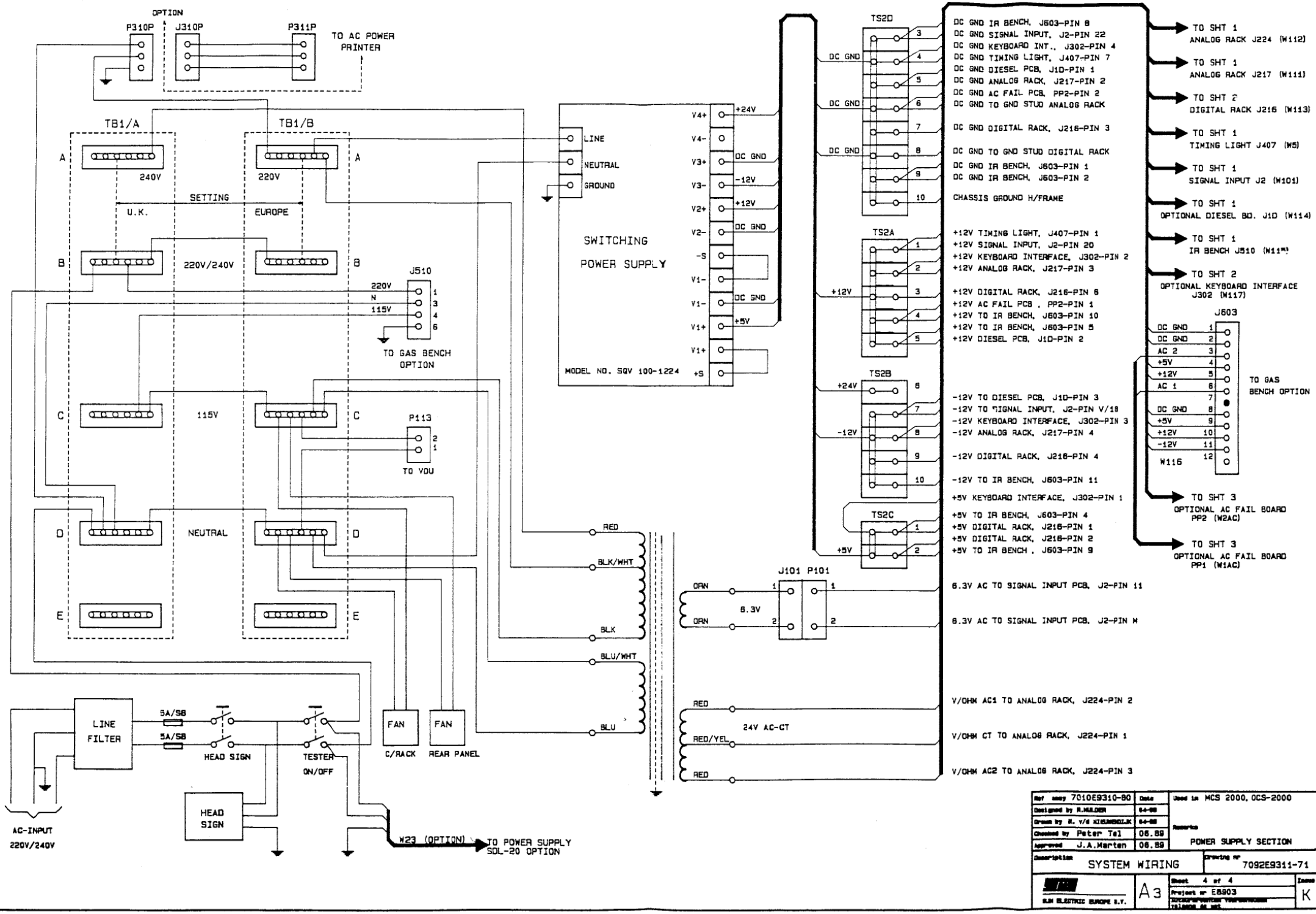
1) INSTALL J5FD OR J5 FOR OPTIONAL RS232C OR SDL-20

Ref assy 7010E9310-80	Date	Used in MCS 2000, OCS-2000	
Designed by S.HULDER	04-88		
Drawn by H. v/d KIBBENBELT	04-88	Remarks	
Checked by Peter Tel	06.88	DIGITAL SECTION 1	
Approved J.A.Marten	06.88		
Description SYSTEM WIRING		Drawing nr 7092E9311-71	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 2 of 4	Issue K
		Project nr E8903	

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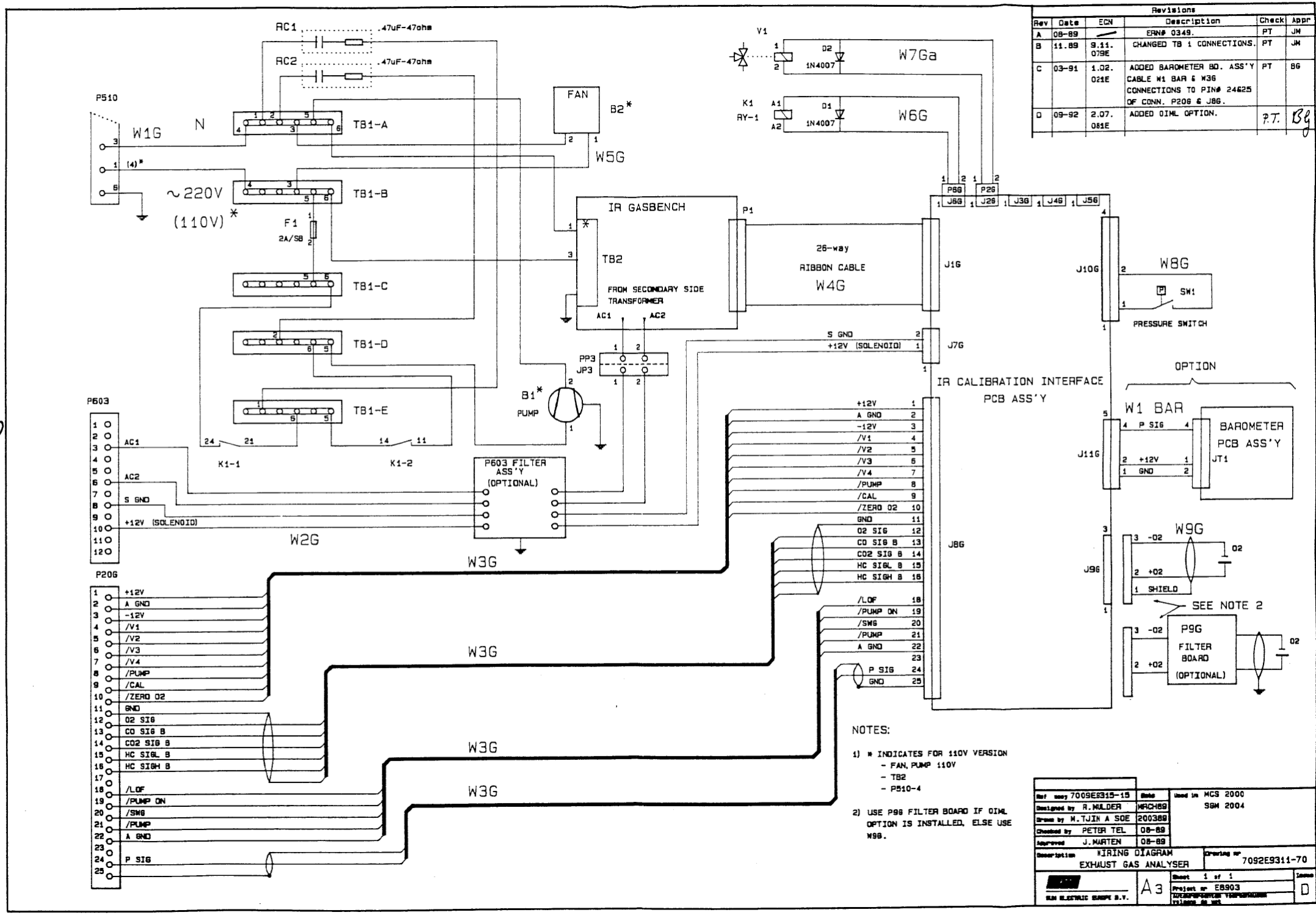


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Ref assy 7010E9310-80	Date	Used in MCS 2000, OCS-2000	
Designed by R.MULDER	04-88		
Drawn by H. v/d KIEUNDOLK	04-88		
Checked by Peter Tel	06.89	Remarks	POWER SUPPLY SECTION
Approved J.A.Marten	06.89		
Description SYSTEM WIRING		Drawing nr 7092E9311-71	
ELM ELECTRIC EUROPE B.V.	A3	Sheet 4 of 4	Issue K
		Project nr E8903	

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Revisions					
Rev	Date	ECN	Description	Check	Appr
A	08-89		ERN# 0349.	PT	JM
B	11.89	9.11. 079E	CHANGED TB 1 CONNECTIONS.	PT	JM
C	03-91	1.02. 021E	ADDED BAROMETER BD. ASS'Y CABLE W1 BAR & W3G CONNECTIONS TO PIN# 24&25 OF CONN. P2G & J8G.	PT	BG
D	09-92	2.07. 081E	ADDED OIML OPTION.	P.T.	BG

Ref spec	7009E9315-15	Date	Used in MCS 2000 SGM 2004
Designed by	R.MULDER	MARCH89	
Drawn by	M.TJIN A SOE	200389	
Checked by	PETER TEL	08-89	
Approved	J.MARTEN	08-89	
Description	WIRING DIAGRAM EXHAUST GAS ANALYSER	Drawing nr	7092E9311-70
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 1	Issue D
		Project nr E8903	

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Revisions					
Rev	Date	ECN	Description	Check	Appr
A	08-89		ERN# 0349	PT	JM
B	11-89	9.11. 079E	N4 CONNECTIONS C-B: DEFAULT INSTALLED	PT	JM
C	09-92	2.07. 081E	CHANGED U2: WAS LM308A (SHT2) .DELETED R17, R20, R23, R25, U5 (SHEET 3)	P.T.	BG

J1G CONNECTOR	
PIN NO.	SIGNAL
1	CO GAIN I
2	CO GAIN O
3	HC GAIN O
4	HC GAIN I
5	CO2 ZERO
6	CO ZERO
7	HC ZERO
8	COM GND
9	/CAL
10	SIG GND
11	HC SIG
12	CO SIG
13	CO2 SIG
14	CO2 GAIN I
15	CO2 GAIN O
16	HC ELSP I
17	HC ELSP O
18	CO ELSP I
19	CO ELSP O
20	CO2 ELSP I
21	CO2 ELSP O
22	N.C.
23	N.C. (+15V BENCH)
24	SIG GND
25	SIG GND
26	N.C. (-15V BENCH)

J2G CONNECTOR	
PIN NO.	SIGNAL
1	+Vs
2	/V1S

J3G CONNECTOR	
PIN NO.	SIGNAL
1	+Vs
2	/V2S

J4G CONNECTOR	
PIN NO.	SIGNAL
1	+Vs
2	/V3S

J5G CONNECTOR	
PIN NO.	SIGNAL
1	+Vs
2	/V4S

J6G CONNECTOR	
PIN NO.	SIGNAL
1	+Vs
2	/PUMPS

J7G CONNECTOR	
PIN NO.	SIGNAL
1	+Vs (+12V SOLENOID)
2	S GND

J8G CONNECTOR	
PIN NO.	SIGNAL
1	+12V
2	A GND
3	-12V
4	/V1
5	/V2
6	/V3
7	/V4
8	/PUMP
9	/CAL
10	/ZERO O2
11	A GND
12	O2 SIG
13	CO SIG B
14	CO2 SIG B
15	HC SIGL B
16	HC SIGH B
17	A GND
18	/LOF
19	/PUMP ON
20	/SW8
21	/PUMP
22	A GND
23	N.C.
24	P SIG
25	A GND

J9G CONNECTOR	
PIN NO.	SIGNAL
1	SHIELD
2	+O2
3	-O2

J10G CONNECTOR	
PIN NO.	SIGNAL
1	/LOF
2	A GND
3	/PUMP ON
4	A GND

J11G CONNECTOR	
PIN NO.	SIGNAL
1	A GND
2	+12V
3	-12V
4	P SIG
5	A GND

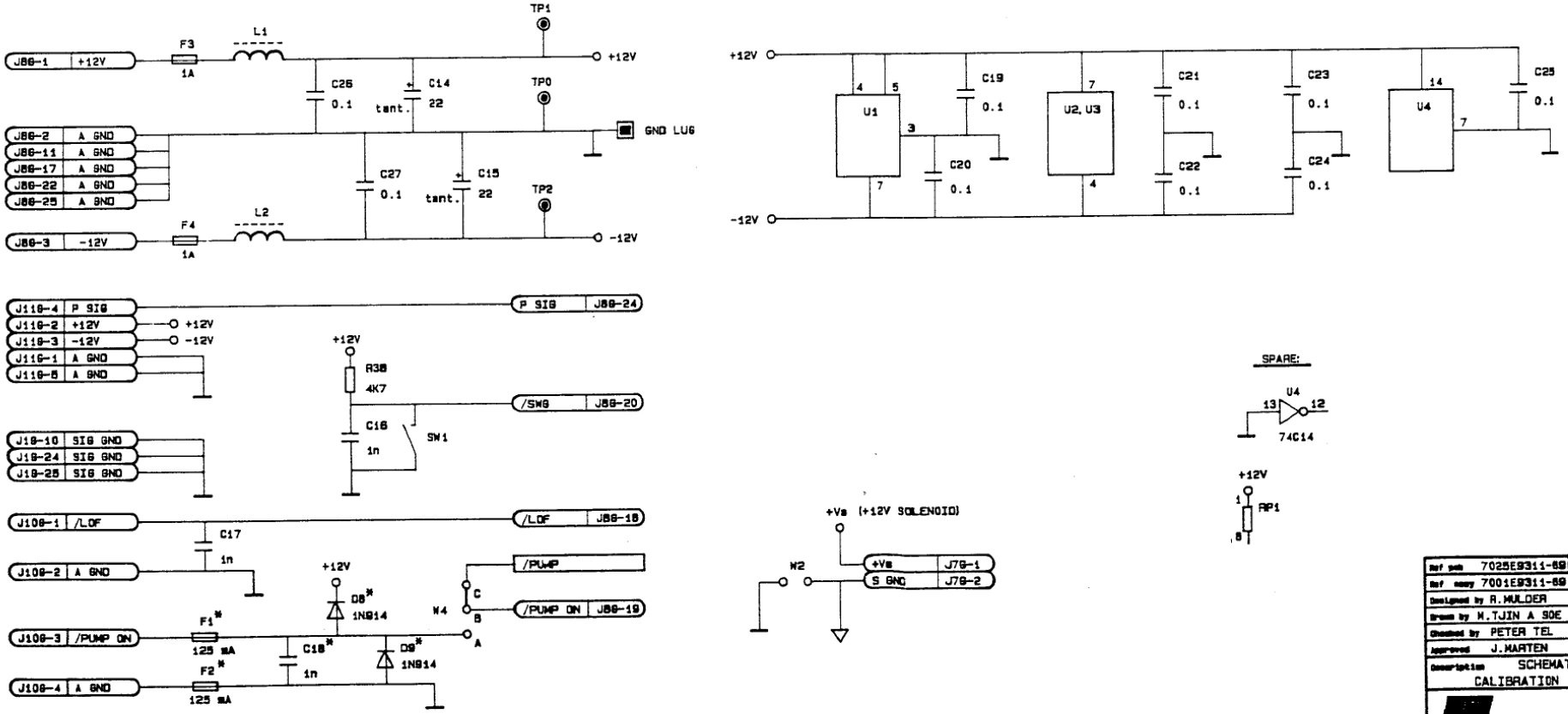
NOTES:

1/ UNLESS OTHERWISE SPECIFIED:
- A/ ALL RESISTORS ARE IN OHMS, 1/4W, 5%
- B/ ALL CAPACITORS ARE IN MICRO-FARADS
- C/ ALL DIODES ARE 1N914 OR 1N4148
- D/ ALL IC'S ARE 74LS-SERIES TYPE
- E/ ALL POLARIZED CAPACITORS ARE 16V

2/ LAST USED NO'S: R38, C27, D9, Q5, U5, RP5, LED5, SW1, W4, L2, J11G, TP7 & F4.

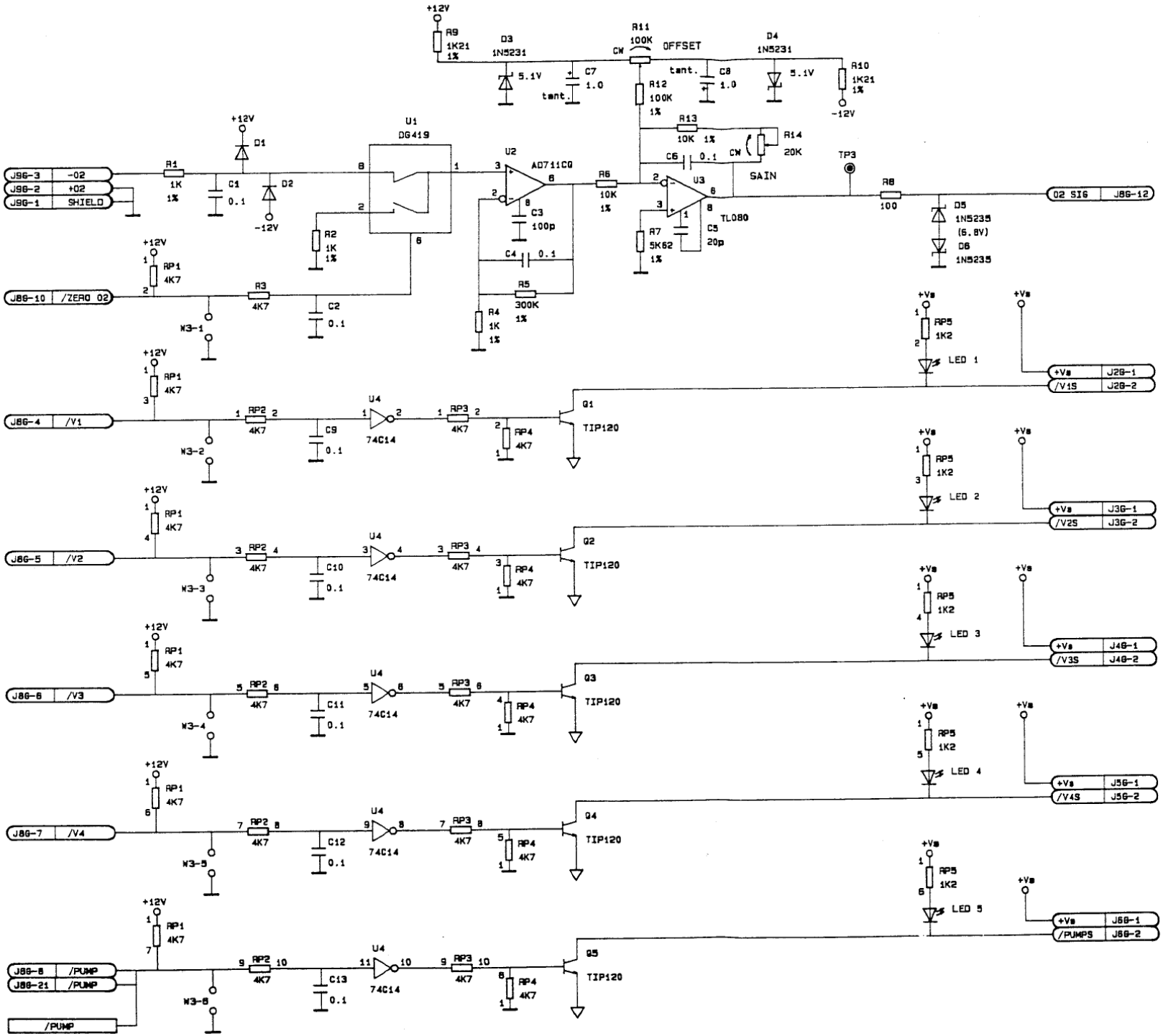
3/ NOT USED NO'S: R17, R20, R23, R25, U5.

3/ * INDICATES NOT INSTALLED COMPONENTS.



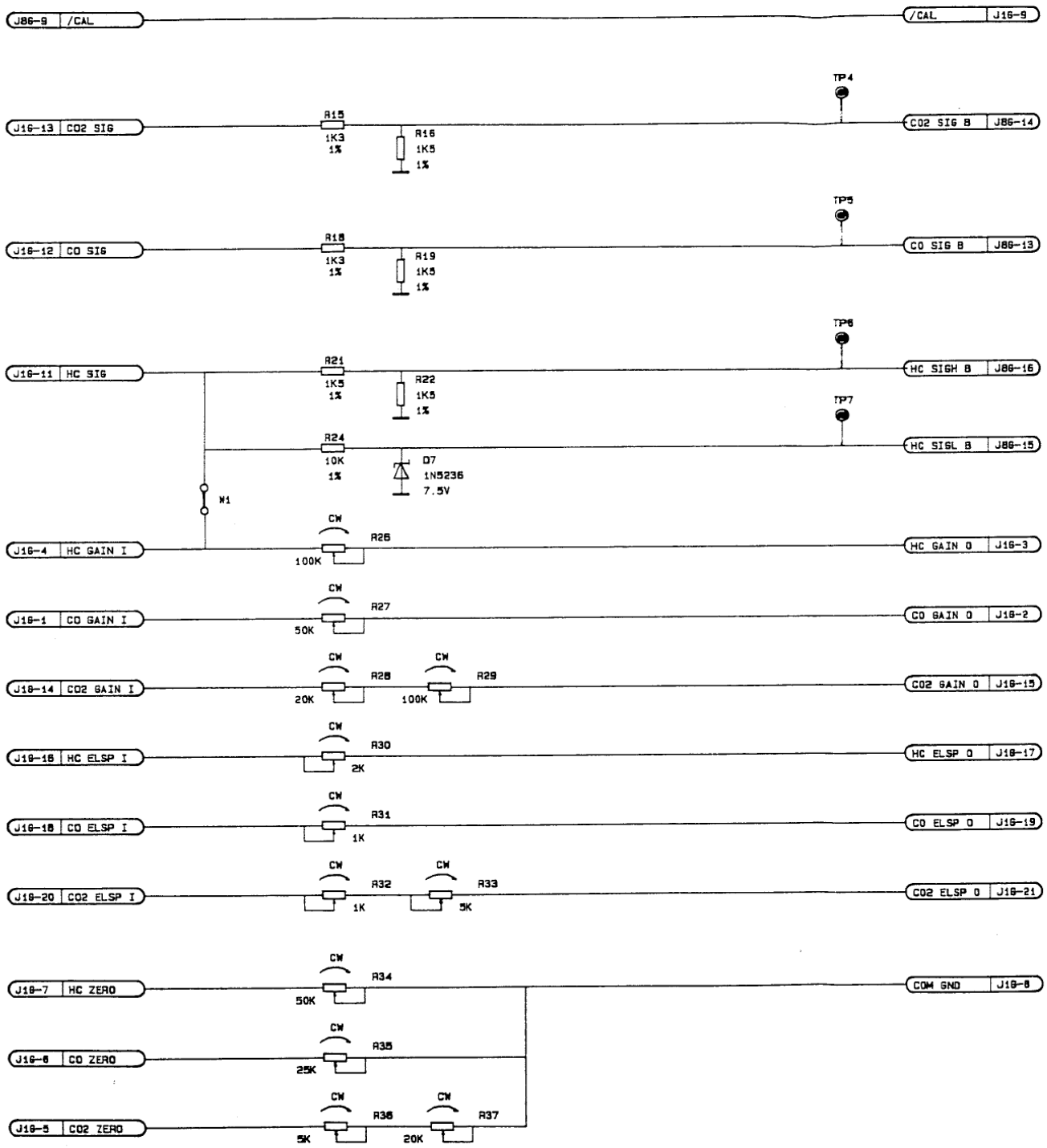
Ref pcb	7025E9311-89		Used in MCS 2000 SGH 2004
Ref assy	7001E9311-89	Date	
Designed by	R.MULDER	MARCH89	
Drawn by	M.TJIN A SOE	150389	
Checked by	PETER TEL	08-89	
Approved	J.MARTEN	08-89	
Description	SCHEMATIC CALIBRATION INTERFACE		Drawing nr 7092E9311-69
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 3 Project nr EB903	Issue C

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Ref PCB	7025E9311-69		
Ref assy	7001E9311-69	Date	Used in MCS 2000 SGM 2004
Designed by	R.MULDER	MARCH89	
Drawn by	M.TJIN A SOE	130389	
Checked by	PETER TEL	08-89	
Approved	J.MARTEN	08-89	
Description	SCHEMATIC CALIBRATION INTERFACE		Drawing nr 7092E9311-69
SUN ELECTRIC EUROPE B.V.	A3	Sheet 2 of 3	Issue C
		Project nr E8903	

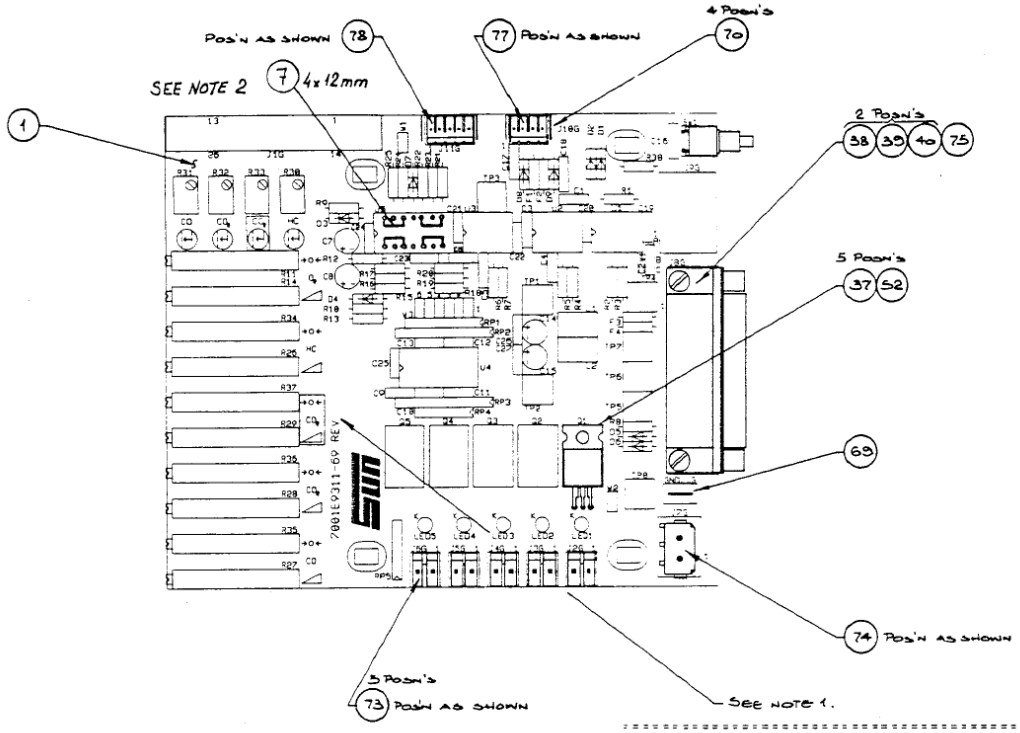
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Ref pcb 7025E9311-69			
Ref assy 7001E9311-69	Date	Used in MCS 2000	
Designed by R.MULDER	MARCH89	SGM 2004	
Drawn by M.TJIN A SOE	150389		
Checked by PETER TEL	08-89		
Approved J.MARTEN	08-89		
Description SCHEMATIC CALIBRATION INTERFACE		Drawing nr 7092E9311-69	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 3 of 3	Issue C
		Project nr E8903	

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NOTES: 1. PRODUCTION TO STAMP CURRENT REVISION LEVEL.

2. SOLDER A WIRE (ITEM 7) BETWEEN:
   U5-1 AND U5-3
   U5-5 AND U5-7
   U5-8 AND U5-10
   U5-12 AND U5-14

LINE NR	DIRECT ASSEM PART NR	QUAN.	COMPONENTS & SUB ASSEMBLIES	B/M PAGE NR ITEM NR.
41	0860-0123-00	1	CAPACITOR 20PF	C5
42	0860-0065-00	1	CAPACITOR 100PF	C3
43	0860-0088-00	2	CAPACITOR 1NF	C16-17
44	7096E1080-13	18	CAPACITOR 100NF CER	C1,2,4,6
45				9-13,19-25,
46				26,27
47				
48	7096E1055-19	2	CAPACITOR 1UF/16V TANT	C7,8
49	7096E1055-21	2	CAPACITOR 22UF/16V TANT	C14,15
50				
51				
52	0776-0249-00	5	TRANSISTOR TIP120	Q1-5
53				
54	0771-0272-00	2	DIODE 1N914B	D1,2,
55	0803-5231-00	2	DIODE ZENER 1N5231 5.1V	D3,4
56	0803-5235-00	2	DIODE ZENER 1N5235 6.8V	D5,6
57	0803-5236-00	1	DIODE ZENER 1N5236 7.5V	D7
58				
59	0771-0341-00	5	LED RED 3mm. HLMP-1300	LED1-5
60				
61	7096E4055-65	2	CHOKE SIEMENS	L1,2
62				
63				
64	0739-0106-07	2	PICOFUSE 1A	F3,4
65				
66	003-0689-562	1	SWITCH	SW1
67				
68	0676-0302-00	8	TERMINAL POST	TPO-7
69	0676-0125-00	1	TERMINAL TAB	GNDLUG
70	0676-0123-01	4	TERMINAL DISCONNECT	
71				
72	4162-2110-00	1	CONNECTOR RIBBON 26P	J1G
73	4162-1684-02	5	CONNECTOR MTA .156 2P	J2G-6G
74	4162-0371-00	1	CONNECTOR M-N-L 2P	J7G
75	7096E3056-81	1	CONNECTOR D ANGLE FEM 25P	J8G
76	7096E3065-58	1	CONNECTOR M-N-L ANGLE 3P	J9G
77	4162-0444-03	1	CONNECTOR MTA .1 4P	J10G
78	4162-0444-04	1	CONNECTOR MTA .1 5P	J11G
79				
80	7096E3055-91	11•6/36	JUMPER STRIP DOUBLE	W3
81	7092E9311-69	REF.	SCHEMATIC	
82				
83	0692E9306-13	REF.	FUNCT. DESCR.	

REVISIONS

SYM	DATE	ECN	DESCRIPTION	CHECK	APPR.
A	08-89	—	ERN# 0349	P.T.	gm.
B	10-90	0.10. 085E	ITEM 73 WAS 4162-1664-02 ITEM 77 WAS 4168-1662-04 ITEM 78 WAS 4162-1662-05		BG
C	09-92	2.07. 081E	CHANGED ITEM 4: WAS 0773-0159 CHANGED ITEM 7: WAS 0773-0217 AND ITEM 22: QTY WAS 4 DELETED ITEM 10: WAS 1670-7502 R17,R24...25 ADDED NOTE 2.	P.T.	BG

LINE NR	DIRECT ASSEM PART NR	QUAN.	COMPONENTS & SUB ASSEMBLIES	B/M PAGE NR ITEM NR.
1	7092E9311-69	1	PCB	
2				
3	7096E2070-22	1	I.C. DG419	U1
4	7096E2070-32	1	I.C. AD711CQ	U2
5	0773-0600-00	1	I.C. TL080	U3
6	0773-6014-00	1	I.C. 74C14	U4
7	0664-0090-00	10.048M	WIRE GREEN, 26 AWG	U5
8				
9	0680-2018-00	1	RESISTOR 100 1/4W 5%	R8
10				
11	1670-1003-00	3	RESISTOR 1K 1/4W 1%	R1, 2, 4
14	0685-0340-00	2	RESISTOR, VAR 1K	R31, 32
15	1670-1213-00	2	RESISTOR 1K21 1/4W 1%	R9, 10
16	1670-1303-00	2	RESISTOR 1K3 1/4W 1%	R15, 18
17	1670-1503-00	4	RESISTOR 1K5 1/4W 1%	R16, 19, 21, 22
18	0685-0342-00	1	RESISTOR, VAR 2K	R30
19	0680-2067-00	2	RESISTOR 4K7 1/4W 5%	R3, 38
20	0685-0341-00	1	RESISTOR, VAR 5K	R33
21	1670-5623-00	1	RESISTOR 5K62 1/4W 1%	R7
22	1670-1004-00	3	RESISTOR 10K 1/4W 1%	R6, 13, 24,
23	7096E0075-14	3	RESISTOR, VAR 20K	R14, 28, 37
24	7096E0075-15	1	RESISTOR, VAR 25K	R35
25	7096E0075-16	2	RESISTOR, VAR 50K	R27, 34
26	1670-1005-00	1	RESISTOR 100K 1/4W 1%	R12
27	7096E0075-17	3	RESISTOR, VAR 100K	R11, 26, 29
28	1670-3015-00	1	RESISTOR 300K 1/4W 1%	R5
29	7096E0075-12	1	RESISTOR, VAR 5K	R36
30				
31				
32	7096E0085-18	1	RES. PACK 5•1K2 6P. SIL	RP5
33	0779-0118-00	1	RES. PACK 7•4K7 8P. SIL	RP1
34	7096E0085-19	2	RES. PACK 5•4K7 10P. SIL	RP2, 3
35	0779-0128-00	1	RES. PACK 5•4K7 6P. SIL	RP4
36				
37	0608-0143-00	5	RIVET PLASTIC	Q1-5
38	404-0310-533	2	SCREW M3•8	J8G
39	409-0300-103	2	NUT M3	J8G
40	400-0300-303	2	WASHER M3 SPRING SINGLE CL.	J8G

Scale 1 : 1	Date	Used in SGM 2004	
Designed by		Material	
Drawn by Tjim A Soe M.	25.06.89		
Checked by Peter Tel	10.08.89		
Approved J.A. Marten	11-09-89	Finish	

Unless otherwise specified. Dimensions are in mm Tolerances on Angles ± 0.5 Holes ± 0.1 Rest ± 0.5

Remove all sharp corners and remove burrs

Description PRINTED CIRCUIT BOARD ASS'Y CALIBRATION INTERFACE

Dwg no 7001E9311-69

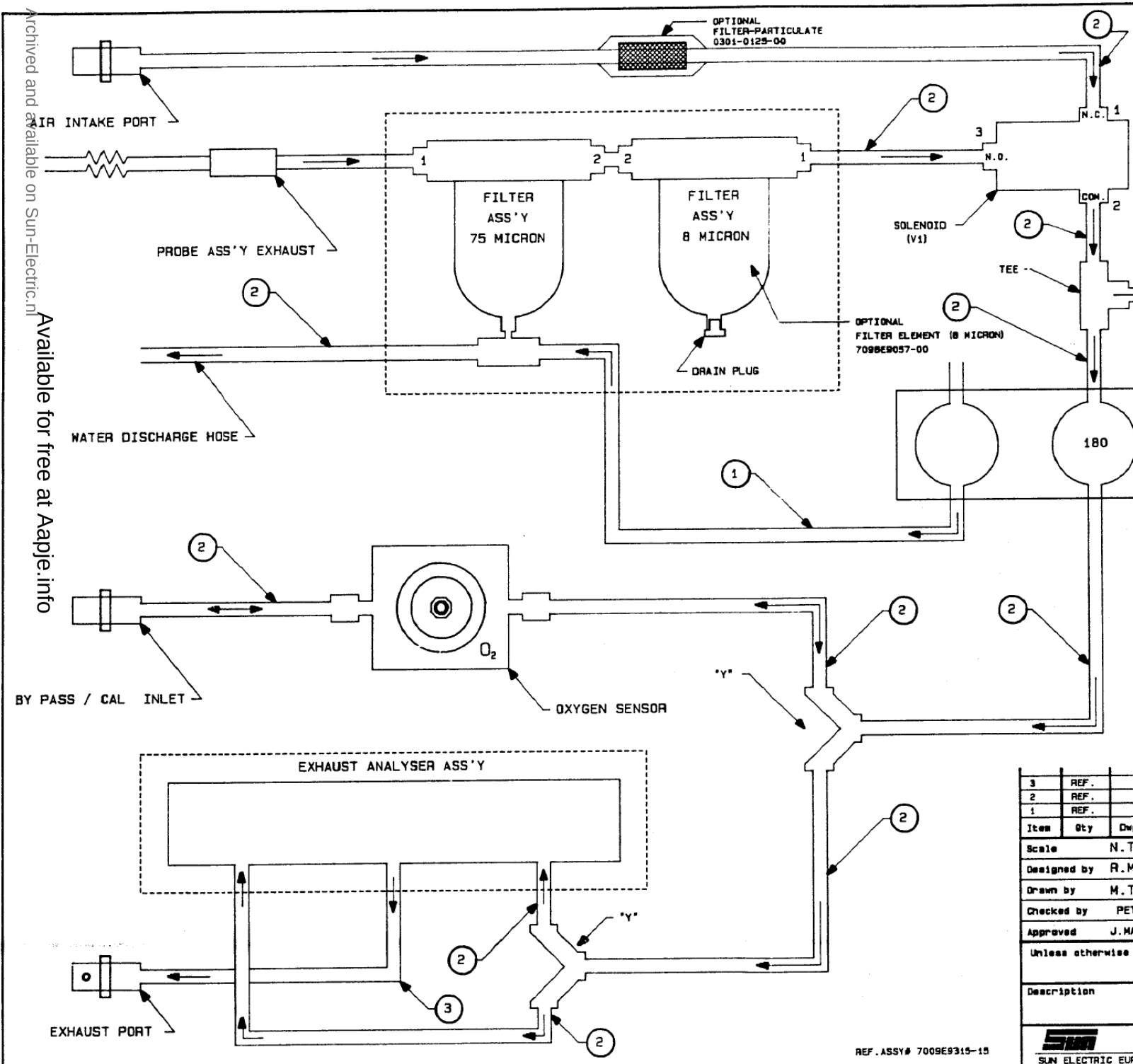
Sun — Sun Microsystems, Inc. Auteursrecht voorbehouden volgens de wet

A2

Sheet 1 of 1 | Code | Project no E8503

Issue C

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Revisions					
Rev	Date	ECN	Description	Check	Appr.
A	08-89		ERN# 0349	PT	JM
B	09-92	2.07. 081E	ADDED OPTIONS: FILTER PARTICULATE AND FILTER ELEMENT (8 MICRON)	P.T.	BG

MODE TABLE		
	V1	PUMP
ZERO	N.C.	ON
CAL GAS	X	OFF
SAMPLE	N.O.	ON
LEAK	N.O.	ON --> OFF

N.C. = SOLENOID ENERGIZED

N.O. = SOLENOID DEENERGIZED

Item	Qty	Dwg./Part no	Description	Remarks
3	REF.		HOSE 5/16" PLASTIC	
2	REF.		HOSE 1/4" PLASTIC	
1	REF.		HOSE 3/16" PLASTIC	

Scale	N.T.S.	Date	Used in MCS 2000, SGM 2004
Designed by	R.MULDER	MARCH'89	Material SEE DRAWING
Drawn by	M.TJIN A SOE	220389	
Checked by	PETER TEL	08-89	
Approved	J.MARTEN	08-89	Finish

Unless otherwise specif.: Dim. are in mm; Tol. on: Angles ± 0.5 ° Holes ± 0.1 Rest ± 0.5

Remove all sharp corners and remove burrs

Description: PNEUMATIC DIAGRAM
EXHAUST GAS ANALYSER

Dwg. no. 7092E9311-75

SUN ELECTRIC EUROPE B.V.
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A3

Sheet 1 of 1

Code

Project no. E8903

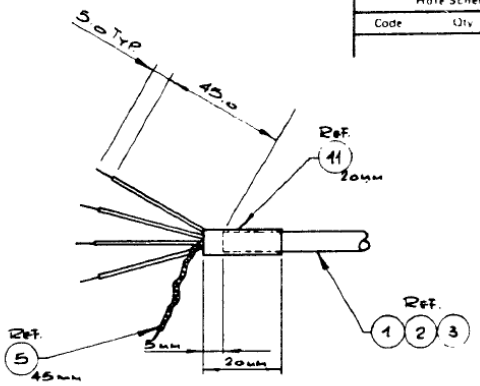
Issue B

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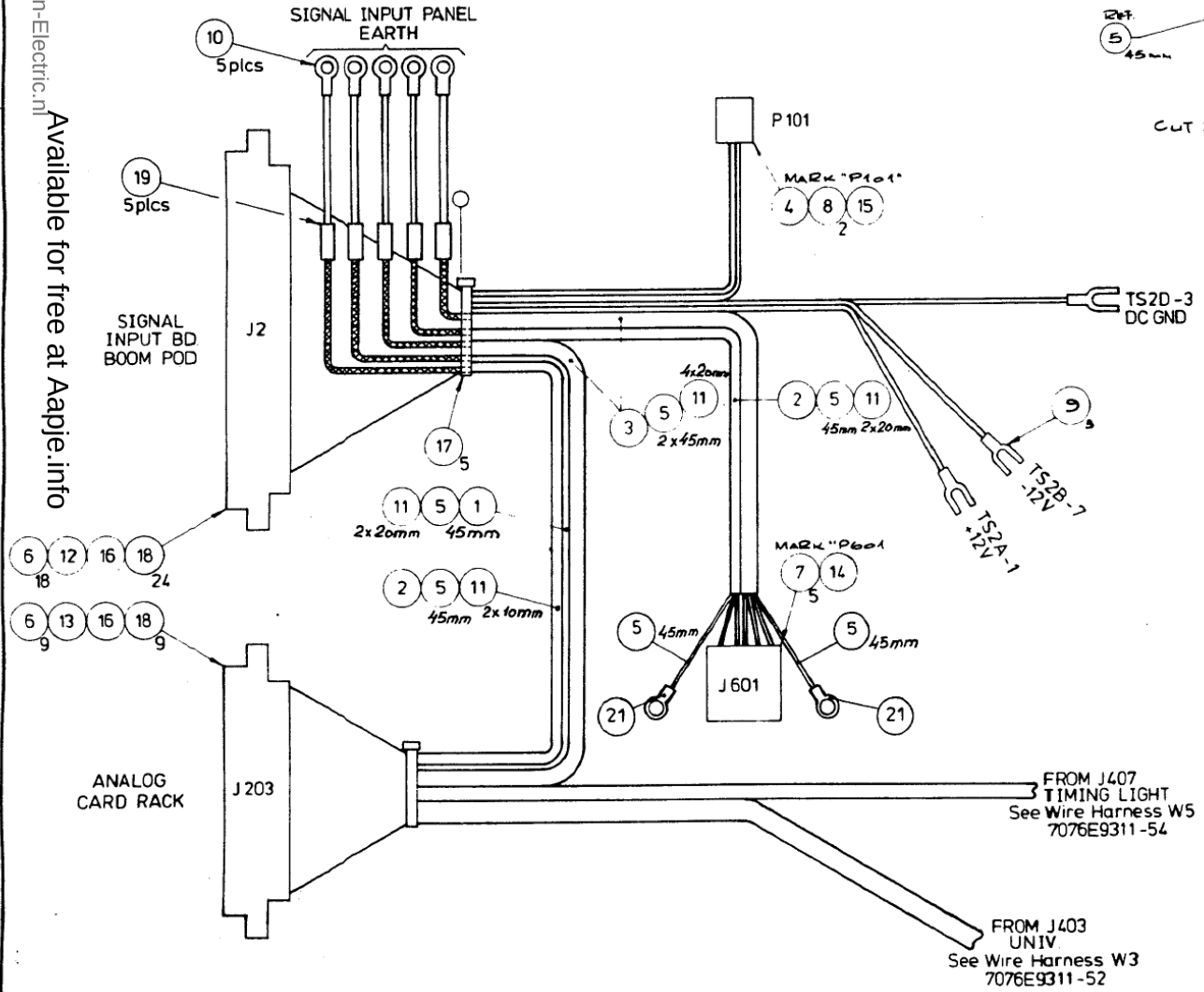
NOTES : 1 Strip outer covers (ables (item 1,2 & 3) 50mm at J2 & J203 & J601 end.
2. Sleeve screens to ensure no connection is possible between them.

3. Suit & fit 20mm shrink tubing (item 11) 45mm from both ends of each core-cable. See detail.
4. Use key connector (item 20) in following pos'n. :

CONNECTOR	POSITION
J2	15 : 16
J203	5 : 6, 10 : 11 & 12 : 13



Screened Cable's
Prepare Detail, both ends.
Cut back screening's J203 end only
as per wire table.



Hole Schedule			Revisions					
Code	Qty	Dia	sym	Date	ECN	Description	Check	Appr.
			1	14.09.87		DRAWN PRELIM. ISS		
			A	24.11.87	—	ERN # 0158 PART # ITEM 5 WAS 3.0660.844 QTY. ITEM 11 WAS 3mm & PART # WAS 3.0660.841. TO CORRECT DWG. ONLY CHANGED NOTE 2 AND CHANGED NOTE 3: PC. OF SHRINK TUBING WAS 3mm. QTY. ITEM 4 WAS 15.50m.	P.T.	BJC
			B	09-12	2.07.0816	CHANGED ITEM 5: QTY WAS 235mm. ADDED ITEM 21. SHT. 2 REDRAWN	P.T.	BJC

LINE NR	DIRECT ASSEM PART NR	QUAN.	COMPONENTS & SUB ASSEMBLIES	B/M PAGE NR ITEM NR.
1	003-0637-612	2.30M	CABLE, 1 CORE SCREENED	
2	0662-0179-00	4.58M	CABLE, 2 CORE SCREENED	
3	0662-0162-00	4.58M	CABLE, 4 CORE SCREENED	
4	0663-0329-09	13.44M	WIRE WHITE 18 AWG	
5	003-0669-522	0.315M	SLEEVING	
6	003-3931-657	22	LEAF CONT AuNi (583361-3)	
7	003-3931-729	5	M & L UNIV. SKT CONT. AuNi	
8	003-3931-735	2	M & L PLUG CONT.	
9	003-0606-585	3	SPADE TERM TAKBRO (FV2-Y53A)	
10	003-3931-824	5	RING TERMINAL M5 (160102-2)	
11	003-0669-550	0.20M	SHRINK TUBING, RED 4.76mm	
12	003-3931-740	1	LEAF EDGE CONN. 22-WAY	
13	003-3931-739	1	LEAF EDGE CONN. 15-WAY	
14	003-3931-715	1	SKT. HSG. 6-WAY (1-480705-0)	
15	4162-0300-00	1	PLUG HSG. 2-WAY (1-480319-0)	
16	003-0673-563	2	LABEL INDENT	
17	5878-0015-00	5	TY-RAP	
18	003-3931-745	41	DUMMY LEAF (AMP 66084-1)	
19	003-0606-550	5	BUTT CONN. DIAMOND GRIP	
20	003-3931-659	4	KEY CONNECTOR (RICE)	
21	003-3931-823	2	RING TERMINAL M4 (160101-2)	
22				
23				
24				
25				
26				
27				
28				
29				
30				

Item	Qty	Dwg. Part no.	Description	Remarks
Scale N.T.S			Date	Remarks USED ON MCS 1000
Drawn by Tjin A Soe M			14.09.87	
Checked by P. Tal			08.04.88	
Approved Bonnie Gu			8.4.88	Finish

Unless otherwise specified Dimensions are in mm Tolerances on Angles ± 0.5° Fillets Rad = 0.5

Description: WIRE HARNESS W101-SIGNAL INPUT
Dwg. no. 7076E9312-69

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WIRE NO.	SIZE AWG	COLOUR	LENGTH mm	STRIP mm	TERMINAL	FROM	STRIP mm	TERMINAL	TO
1	0662-0162-00 CABLE 4 CORE SCREENED	BLK / RED / WHT / SCREEN	2300		003-3931-657	J2 -4		003-3931-657	J203 -P
					003-3931-657	J2 -E		003-3931-657	J203 -1
					003-3931-657	J2 -14		003-3931-657	J203 -6
					003-0606-550	WIRE NO. 11		-	CUT BACK
2	0662-0179-00 CABLE 2 CORE SCREENED	RED / BLK / SCREEN	2300		003-3931-657	J2 -3		003-3931-657	J203 -3
					003-3931-657	J2 -C		003-3931-657	J203 -C
					003-0606-550	WIRE NO. 12		-	CUT BACK
3	CABLE 1 CORE SCREENED	CORE / SCREEN	2300		003-3931-657	J2 -1		003-3931-657	J203 -5
					003-0606-550	WIRE NO. 13		-	CUT BACK
4	0662-0179-00 CABLE 2 CORE SCREENED	RED / BLK / SCREEN	2280		003-3931-657	J2 -13		003-3931-729	J601 -1
					003-3931-657	J2 -F		003-3931-729	J601 -2
					003-0606-550	WIRE NO. 14		003-3931-823	EARTH
5	0662-0162-00 CABLE 4 CORE SCREENED	RED / BLK / WHT / SCREEN	2280		003-3931-657	J2 -9		003-3931-729	J601 -6
					003-3931-657	J2 -7		003-3931-729	J601 -4
					003-3931-657	J2 -Y		003-3931-729	J601 -5
					003-0606-550	WIRE NO. 15		003-3931-823	EARTH
6	18	ORN	2270	5	003-3931-657	J2 -11	5	003-3931-735	P101 -1
7	18	ORN	2270	5	003-3931-657	J2 -M	5	003-3931-735	P101 -2
8	18	WHT/VIO	2700	5	003-3931-657	J2 -18	5	003-0606-585	TS2B -7
9	18	WHT/RED	2760	5	003-3931-657	J2 -20	5	003-0606-585	TS2A -1
10	18	WHT/BLK	2740	5	003-3931-657	J2 -22	5	003-0606-585	TS2D -3
11	18	WHT/BLK	140	5	003-0606-550	SCREEN (1)	5	003-3931-824	EARTH
12	18	WHT/BLK	140	5	003-0606-550	SCREEN (2)	5	003-3931-824	EARTH
13	18	WHT/BLK	140	5	003-0606-550	SCREEN (3)	5	003-3931-824	EARTH
14	18	WHT/BLK	140	5	003-0606-550	SCREEN (4)	5	003-3931-824	EARTH
15	18	WHT/BLK	140	5	003-0606-550	SCREEN (5)	5	003-3931-824	EARTH

Item	Qty.	Dwg./Part no	Description		Remarks
Scale	N.T.S.		Date	Used in	MCS2000
Designed by	J.EGTBERTS		07-92	Material	
Drawn by	H.v/d NIEUWENDIJK		11-08-92		
Checked by	Peter Tel		10.9.92		
Approved	Bernard Goe		10.9.92	Finish	

Unless otherwise specified: Dimensions are in mm.; Tolerances on: Angles ± 0,5° Holes ± 0,1 Rest ± 0,5

Remove all sharp corners and remove burrs

Description: WIRE HARNESS W101 ~ SIGNAL INPUT

Dwg. no. 7076E9312-69

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A3

Sheet 2 of 2

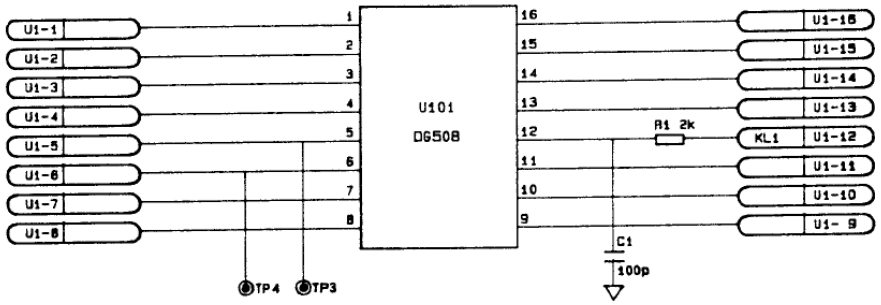
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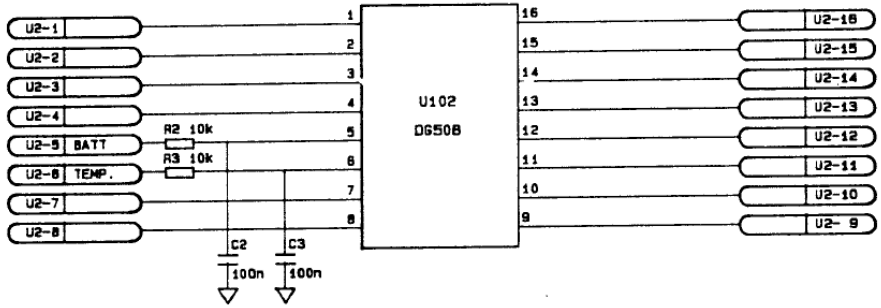
Project no. E 8713

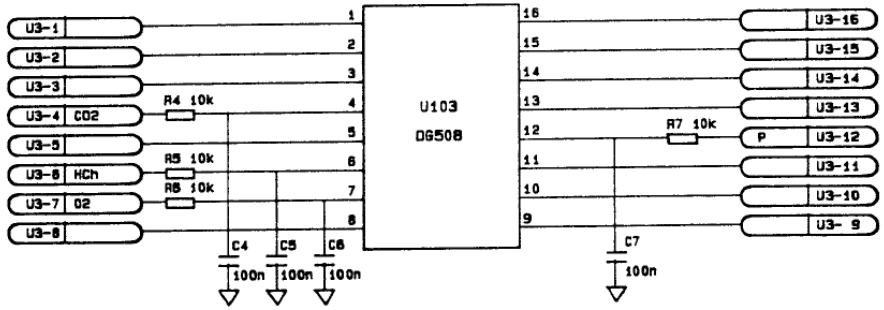
Issue B

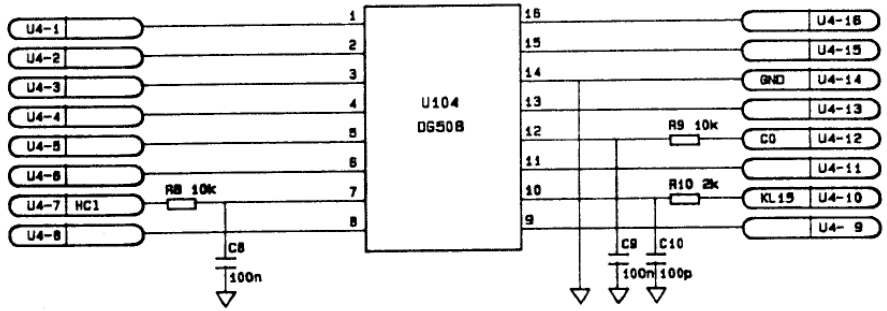
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Revisions					
Rev	Date	ECN	Description	Check	Appr
A	09-92		ERN# 0822. REL.FOR PROD.	P.T.	BG









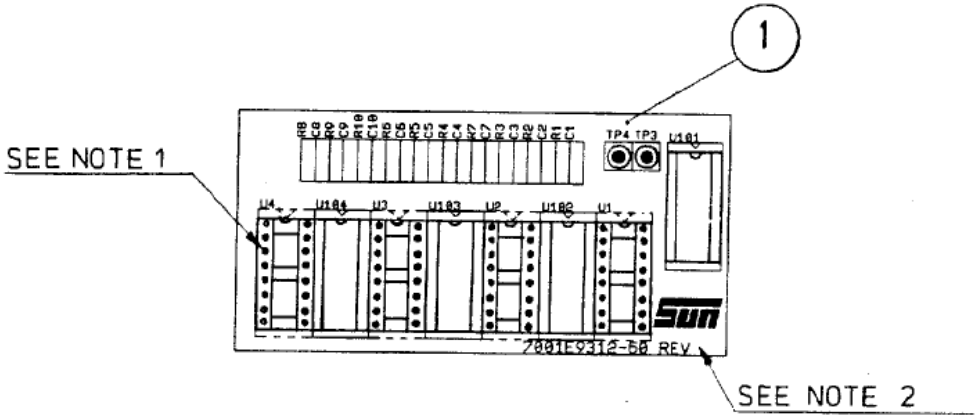
NOTES:
1/ UNLESS OTHERWISE SPECIFIED:
A/ ALL RESISTORS ARE IN OHMS, 1/4W, 1%
B/ ALL CAPACITORS ARE IN MICRO-FARADS
C/ ALL DIODES ARE 1N914 OR 1N4148
D/ ALL IC'S ARE 74LS-SERIES TYPE
E/ ALL POLARIZED CAPACITORS ARE 16V
2/ LAST USED NO'S: R10, C10, TP4, U104

3/ NOT USED NO'S: TP1, TP2, U5...U100

Ref pcb 7025E9312-80			
Ref assy 7001E9312-80	Date	Used in MCS-2000/DCS-2000	
Designed by S.K.	02-92	Remarks	
Drawn by R V/D HOEF	02-92		
Checked by Peter Tel	19.4.92		
Approved			
Description SCHEMATIC PIGGY BACK FILTER BOARD		Drawing nr 7092E9312-60	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 1	Issue A
		Project nr E9143	

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Revisions					
Rev	Date	ECN	Description	Check	Appr.
A	09-92		ERN#0822. REL. FOR PROD.	P.T.	BG



NOTES:
1) ALL COMPONENTS ARE PLACED ON COMPONENT SIDE OF PCB
2) ADD CURRENT REV. LEVEL

Item	Qty	Dwg./Part no	Description	Remarks
8	4	7096E3056-02	IC SOCKET 16-WAY	U101 - U104
7	4	7096E3062-64	ADAPTOR PLUG SAMTEC 16-WAY	U1 - U4
6	2	0536-0302-00	TESTPOINT	TP3, TP4
5	2	0860-0179-13	CAPACITOR 100pF	C1, C10
4	8	0860-0180-08	CAPACITOR 100nF	C2-C9
3	2	1670-2002-00	RESISTOR 2k	R1, R10
2	8	1670-1004-00	RESISTOR 10k	R2-R9
1	1	7025E9312-60	PIGGY BACK FILTER P.C.B.	

Scale 1:1 | Date | Used in MCS 2000 / OCS-2000
Designed by | | Material
Drawn by Heleena v/d Nieuwendijk | 29.07.92
Checked by Peter Tel | 10.9.92
Approved Bernard Lee | 10.9.92 | Finish

Unless otherwise specified: Dimensions are in mm. Tolerances on: Angles ± 0.5, Holes ± 0.1, Rest ± 0.5
Remove all sharp corners and remove burrs

Description: PRINTED CIRCUIT BOARD ASSEMBLY
PIGGY BACK FILTER

Dwg no 7001E9312 - 60

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A3 | Sheet 1 of 1 | Code | Project no E 9143 | Issue A

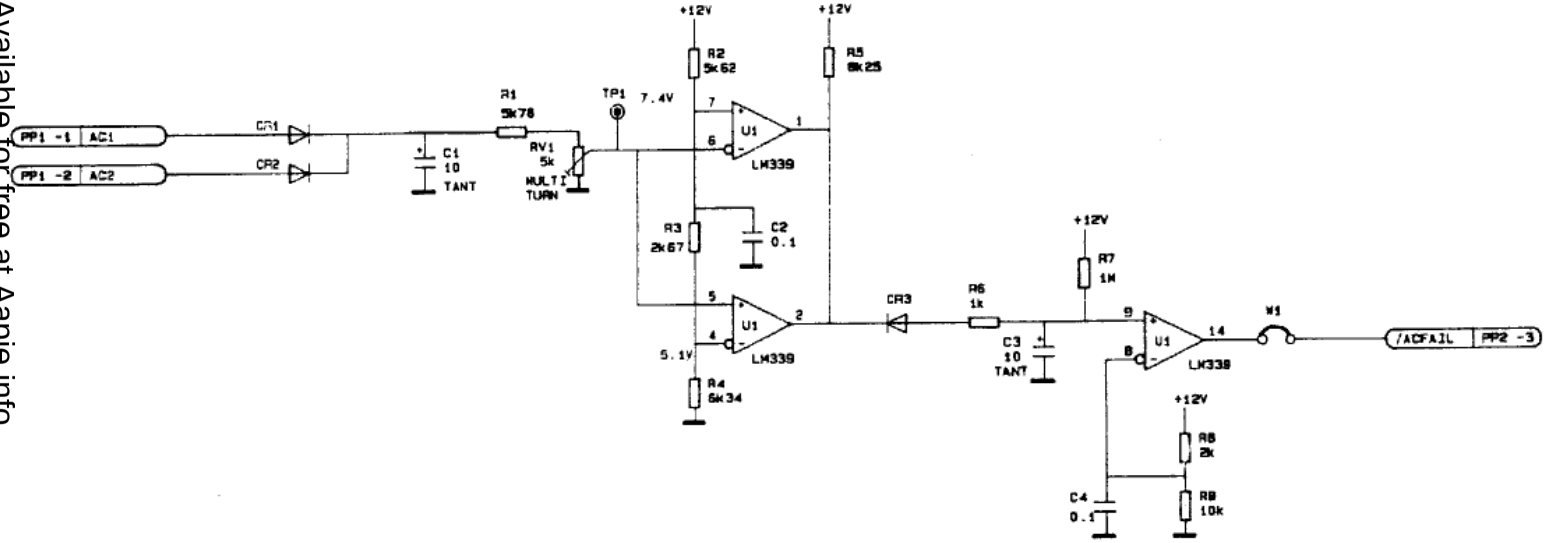
REF. # SCHEM.: 7092E9312-60

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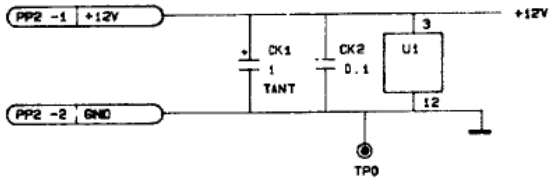
Revisions					
Rev	Date	ECN	Description	Check	Appr
A	07-90		ERN# 0445.	P.T.	RG

PP1 CONNECTOR	
PIN NO	SIGNAL
1	AC1
2	AC2

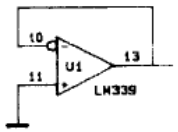
PP2 CONNECTOR	
PIN NO	SIGNAL
1	+12V
2	GND
3	/ACFAIL



POWER DISTRIBUTION



SPARES:



NOTES:

1/ UNLESS OTHERWISE SPECIFIED:
- A/ ALL RESISTORS ARE IN OHMS, 1/4W, 1%
- B/ ALL CAPACITORS ARE IN MICRO-FARADS
- C/ ALL DIODES ARE 1N914
- D/ ALL POLARIZED CAPACITORS ARE 35V

2/ LAST USED NO'S: RV1, R9, C4, CK2, CR3, U1, TP1, W1,

3/ NOT USED NO'S:

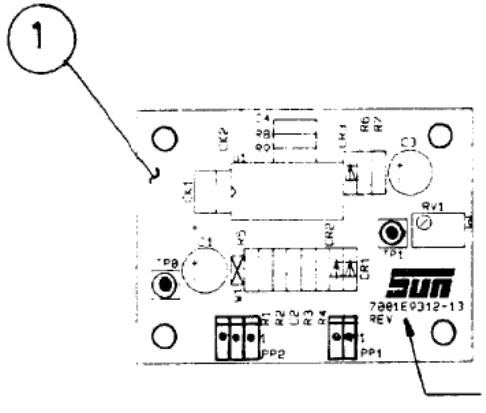
4/ JUMPER SETTING:
- W1 : INSTALLED

REF.PCB 7025E9312-13

Ref copy 7001E9312-13	Date	Used in MGA-1200	
Designed by P.HULDER	00-00		
Drawn by H.v/d KIEUWENHUIJK	00-00		
Checked by Peter Tol	4.9.90		
Approved R. Geer	5.90		
Description SCHEMATIC ACFAIL BOARD		Drawing nr 7092E9312-13	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 1 / Project nr E9015	Issue A

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Revisions					
Rev	Date	ECN	Description	Check	Appr
A	07.90	—	ERN # 0445.	P.T.	
B	10-90	ECN# 010.074E P/N LINE 20 WAS 4162-0444-02 P/N LINE 21 WAS 4162-0444-03		P.T.	



LINE NR	DIRECT ASSEM PART NR	QUAN.	COMPONENTS & SUB ASSEMBLIES	B/M PAGE NR ITEM NR.
1	7025E9312-13	1	PCB.	
2	0773-0189	1	I.C. LM339	U1
3	1670-5763	1	RESISTOR 5K76 1% 1/4 W	R1
4	1670-5623	1	" 5K62 " " "	R2
5	1670-2673	1	" 2K67 " " "	R3
6	1670-6343	1	" 6K34 " " "	R4
7	1670-8253	1	" 8K25 " " "	R5
8	1670-1003	1	" 1K " " "	R6
9	1670-1006	1	" 1M " " "	R7
10	1670-2003	1	" 2K " " "	R8
11	1670-1004	1	" 10K " " "	R9
12	0685-0448-09	1	RESISTOR VAR 5K MULTI TURN	RV1
13	0003-0679-665	2	CAPACITOR TANT 10 UF/35V	C1, 3
14	0679-0412	1	" " 1UF/35V	CK1
15	0860-0180-08	3	" CER 0.1UF	C2, 4, CK2
16	7096E3055-05	1+2/36	JUMPERSTRIP SINGLE	W1
17	7096E3055-12	1	JUMPER	W1
18	0771-0272	3	DIODE 1N914	CR1, 2, 3
19	0536-0302	2	TEST PINS	TP0, 1
20	4162-0444-01	1	CONNECTOR MTA 0.1" 2PINS	PP1
21	4162-0444-02	1	" " " 3PINS	PP2
22				

NOTES:
1) WRITE CURRENT REVISION LEVEL

REF. SCHEM.# 7092E9312-13
P.C.B.# 7025E9312-13

Item	Qty	Dwg. Part no.	Description	Remarks
Scale			Date	Sheet MGA-1200
Designed by				Material
Drawn by	Heleena v/d Nieuwendijk		25.07.90	
Checked by	Peter Tel		14.8.90	
Approved			15.8.90	Finish

Unless otherwise specified Dimensions are in mm Tolerances on Angles Notes

Remove all sharp corners and remove burrs

Description: PRINTED CIRCUIT BOARD ASSEMBLY
AC FAIL BOARD

Dwg. 7001E9312-13

Sun

Authorised modifications only

A3

Sheet 1 of 1

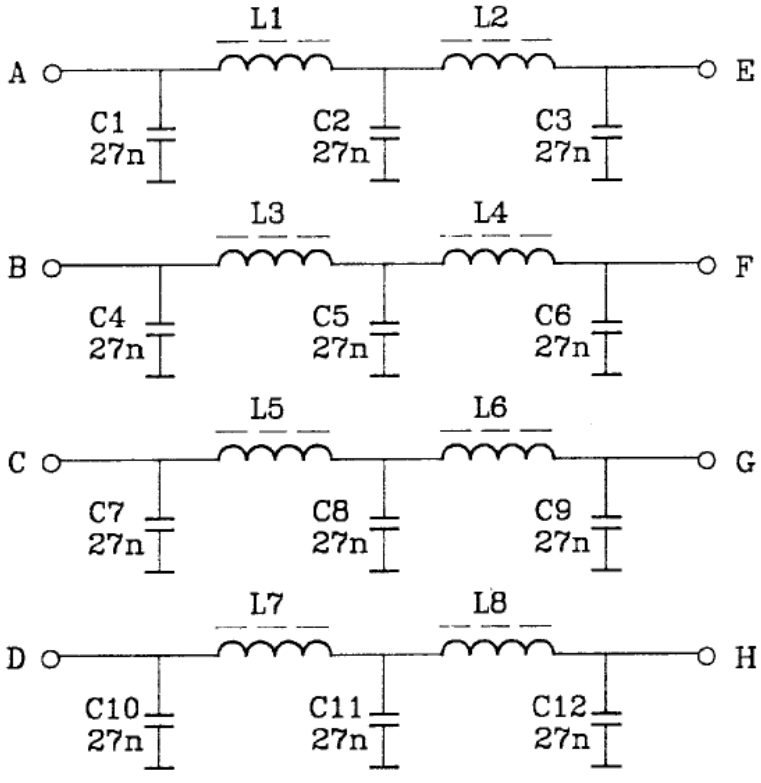
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Project no. E9015

B

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Revisions					
Rev	Date	ECN	Description	ck	Appr.
A	09-92		ERN# 0822.REL. FOR PROD.	P.T.	BG



NOTES:

1) UNLESS OTHERWISE SPECIFIED
   - A) ALL RESISTORS ARE IN OHMS,1/4W,1%
   - B) ALL CAPACITORS ARE IN MICRO-FARADS
   - C) ALL DIODES ARE 1N914 OR 1N4148
   - D) ALL IC'S ARE 74HCT-SERIES TYPE
   - E) ALL POLARIZED CAPACITORS ARE 16V
2) LAST USED NO'S: L8 ,C12
3) NOT USED NO'S:

REF. PCB 7025E9312-67
REF. ASSY 7001E9312-67

Item	Qty.	Dwg./Part no	Description	Remarks

Scale	N.T.S	Date	Used in MCS2000SL
Designed by	J.EGTBERTS	07-92	Material
Drawn by	H.v/d NIEUWENDIJK	29-07-92	
Checked by	Peter Tel	10.9.92	
Approved	Bernard Gee	10.9.92	Finish

Unless otherwise specified: Dimensions are in mm.; Tolerances on: Angles ± 0,5° Holes ± 0,1 Rest ± 0,5

Remove all sharp corners and remove burrs

Description: SCHEMATIC, P603 FILTER BOARD

Dwg. no. 7092E9312-67

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A3

Sheet 1 of 1

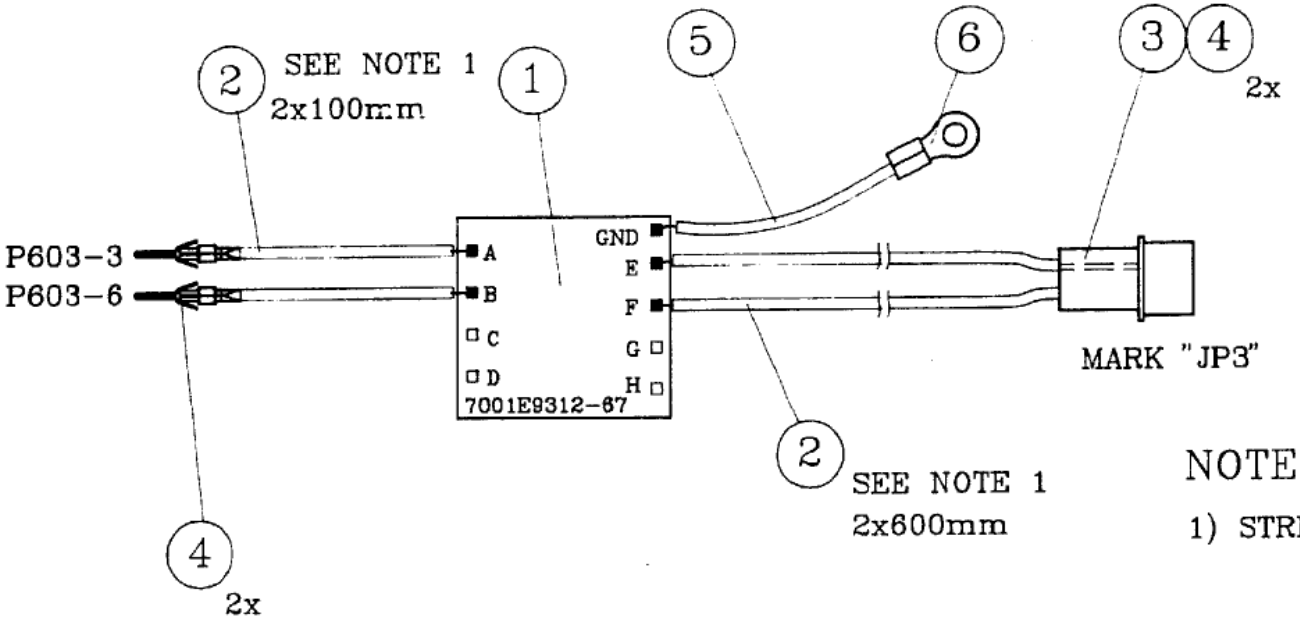
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Project no. E9143

Issue A

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Revisions					
Rev	Date	ECN	Description	Check	Appr.
A	09-92		ERN# 0822.REL. FOR PROD.	P.T	BG



NOTES :

1) STRIP WIRES 5mm ON BOTH SIDES

Item	Qty.	Dwg./Part no	Description	Remarks
6	1	003-3931-823	RING TERMINAL M4	
5	0.07m	0663-0329-14	WIRE 18 AWG WHT/BLK	
4	4	4162-0570-00	CONTACT PIN 18-24 AWG	
3	1	4162-0300-00	M&L PIN HSG. 2-WAY	
2	1.40m	0663-0328-06	WIRE 22 AWG BLUE	
1	1	7001E9312-67	P603 FILTER BOARD ASS'Y	

Scale	N.T.S.	Date	Used in MCS2000SL
Designed by	J.EGTBERTS	07-92	Material
Drawn by	H.v/d NIEUWENDIJK	30-07-92	
Checked by	Peter Tel	10.9.92	
Approved	Bernard Gee	10.9.92	Finish

Unless otherwise specified: Dimensions are in mm.; Tolerances on: Angles ± 0,5° Holes ± 0,1 Rest ± 0,5

Remove all sharp corners and remove burrs

Description: P603 FILTER ASS'Y

Dwg. no. 7009E9317-35

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A3

Sheet 1 of 1

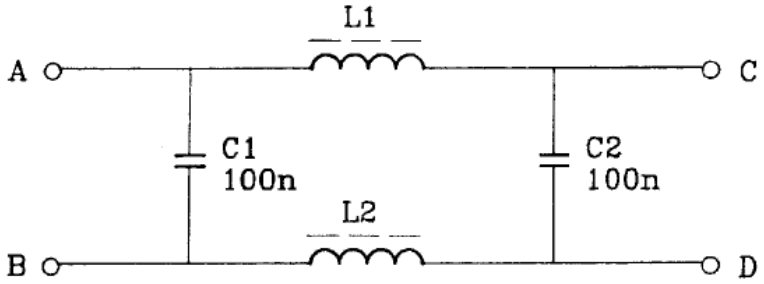
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Project no. E9214

Issue A

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Revisions					
Rev	Date	ECN	Description	Check	Appr.
A	09-92		ERN# 0822.REL. FOR PROD.	P.T.	BG



NOTES:

1) UNLESS OTHERWISE SPECIFIED
   - A) ALL RESISTORS ARE IN OHMS,1/4W,1%
   - B) ALL CAPACITORS ARE IN MICRO-FARADS
   - C) ALL DIODES ARE 1N914 OR 1N4148
   - D) ALL IC'S ARE 74HCT-SERIES TYPE
   - E) ALL POLARIZED CAPACITORS ARE 16V
2) LAST USED NO'S: L2 ,C2
3) NOT USED NO'S:

REF. PCB 7025E9312-68
REF. ASSY 7001E9312-68

Item	Qty.	Dwg./Part no	Description	Remarks
Scale	N.T.S	Date	Used in	MCS2000SL
Designed by	J.EGTBERTS	07-92	Material	
Drawn by	H.v/d NIEUWENDIJK	29-07-92		
Checked by	Peter Tol	10.9.92		
Approved	Bernard Gee	10.9.92	Finish	

Unless otherwise specified: Dimensions are in mm.; Tolerances on: Angles ± 0,5° Holes ± 0,1 Rest ± 0,5

Remove all sharp corners and remove burrs

Description	Dwg. no.
SCHEMATIC, P9G FILTER BOARD	7092E9312-68

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A3

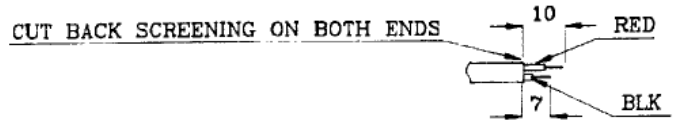
Sheet 1 of 1
Code
Project no. E9143

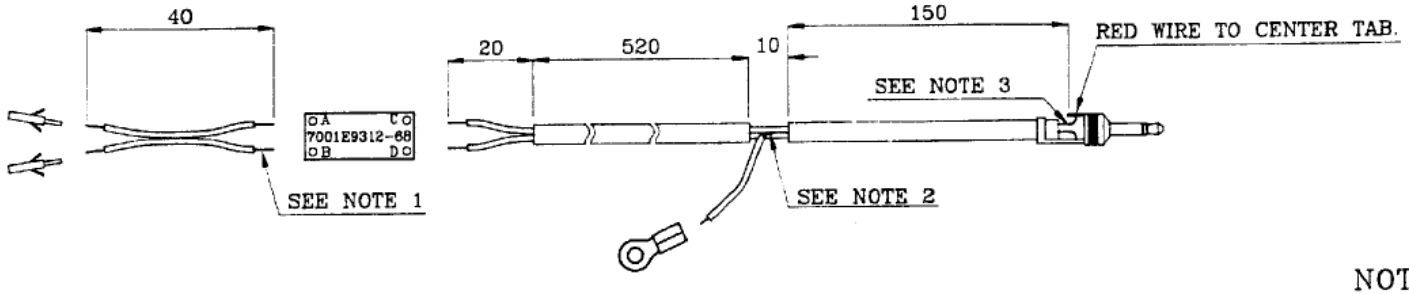
Issue A

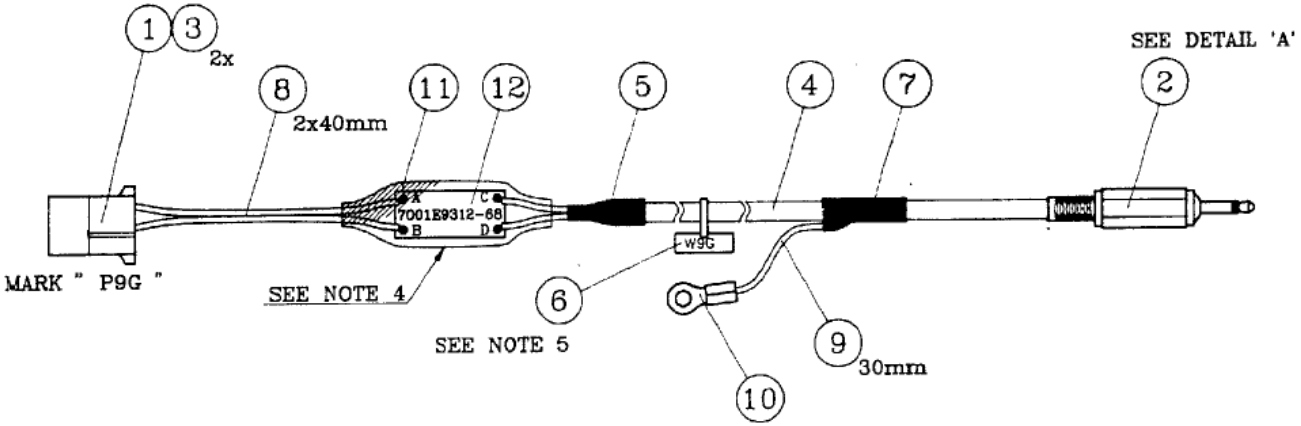
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REVISIONS					
Rev	Date	ECN	Description	Check	Appr.
A	09-92		ERN# 0822.REL FOR .	PT	BG

DETAIL 'A'

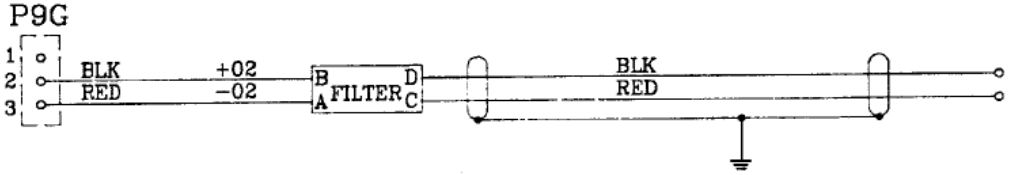






NOTES :

1) STRIP ALL WIRES 5mm
2) REMOVE 10mm OF INSULATING FROM CABLE (ITEM 4). SOLDER WIRE (ITEM 9) ONTO DRAIN WIRE OF CABLE (ITEM 4). PLACE SHRINK TUBING (ITEM 7) AND SHRINK.
3) FIT HOUSING BEFORE SOLDERING TERMINAL
4) PLACE SHRINK TUBING (ITEM 11) OVER P9G FILTER BOARD (ITEM 12) AND SHRINK.
5) WRITE ON LABEL TY " W9G "



Item	Qty.	Dwg./Part no	Description	Remarks
12	1	7001E9312-68	P9G FILTER BOARD	
11	0.06m	7096E4056-72	SHRINK TUBING 12.7mm CLEAR	
10	1	003-3931-823	RING TERMINAL M4	
9	0.03m	0663-0329-09	WIRE WHITE 18 AWG	
8	0.08m	0663-0328-09	WIRE WHITE 22 AWG	
7	0.02m	7096E4056-57	SHRINK TUBING, 9.5mm	
6	1	7096E9055-73	LABEL TY	
5	0.02m	7096E4056-56	SHRINK TUBING 6.4mm	
4	0.70m	0669-0179-00	CABLE RF, 2 CORE 22 AWG	
3	2	4162-0564-00	CONTACT SOCKET	
2	1	3931-0037-00	PLUG PHONE	
1	1	4162-0329-00	M&L PLUG 3-WAY	

Scale	N.T.S	Date	Used in MCS2000SL
Designed by	J.EGTBERTS	07-92	Material
Drawn by	H.v/d NIEUWENDIJK	30-07-92	
Checked by	Peter Tel	10.9.92	
Approved	Bernard Gee	10.9.92	Finish

Unless otherwise specified: Dimensions are in mm.; Tolerances on: Angles ± 0,5° Holes ± 0,1 Rest ± 0,5

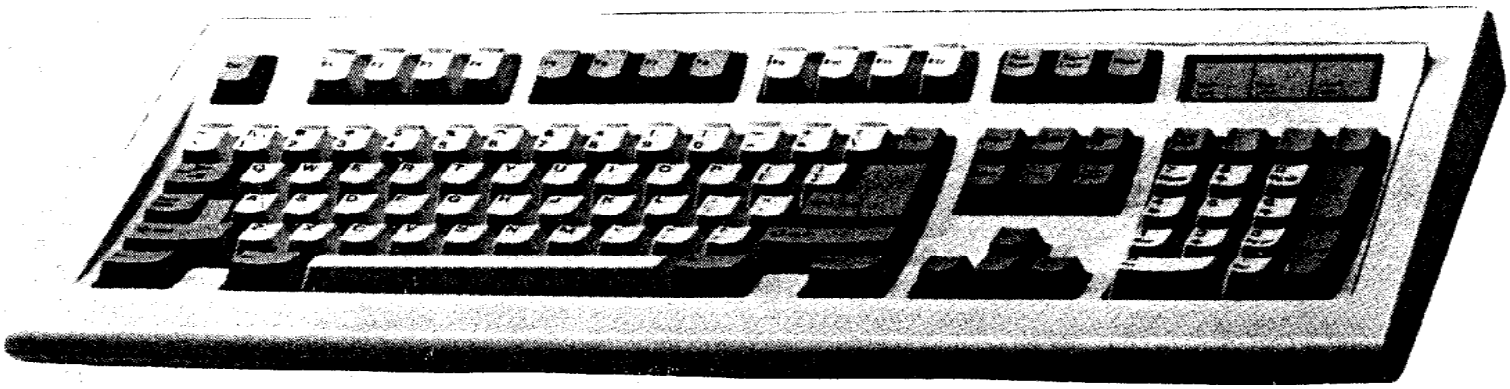
Remove all sharp corners and remove burns

Description	02 CABLE / FILTER ASS'Y
Dwg. no.	7009E9317-34

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A2

Sheet 1 of 1 | Code | Project no. E9214 | Issue A



KEYBOARD FOR THE MCS2000SL MODULAR COMPUTER SYSTEM

OPERATOR'S MANUAL

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SUN ELECTRIC EUROPE

Supplement to the operator's manual (06E9308-73 Rev : B) of

The Modular Computer System

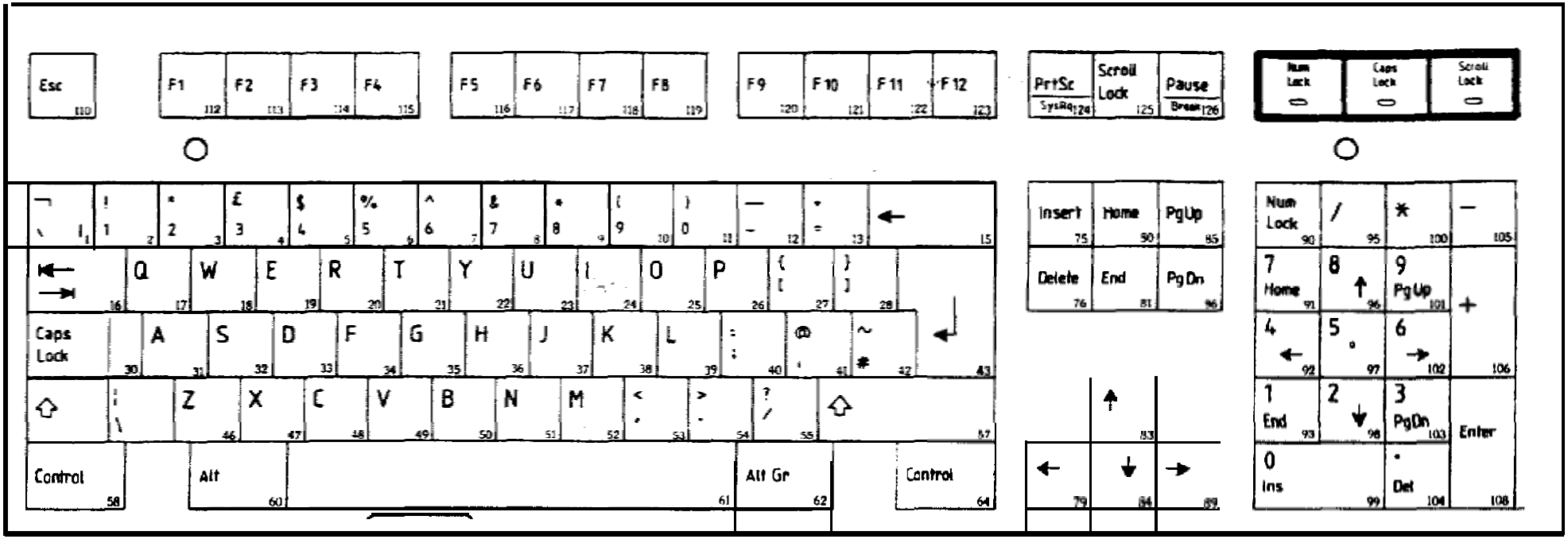
MCS2000SL

October-1992

software version : V5.13

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The illustration above represents the keyboard. On each key, there is a number in the bottom right corner.

On key 15 there is an arrow pointing left, this is the backspace key.
On key 43 there is the carriage return sign, this key can be used as an enter key.
Key 57 is a shift key.

Introduction

This is a supplement to the operator's manual of the MCS2OOOSL, it describes how to use the keyboard option;

MCS Keyboard key definitions

Which key you have to press, to do a certain function on the MCS depends on the page or mode in which you are working. There are also keys which work in every mode (Overall). Furthermore the MCS has these pages:

- Menu pages
- Key definitions page
- Help page
- Vehicle code number entry page
- Vehicle entry without limits page
- Customer message entry page
- Instruction pages
- Test pages
- Multimeter 1 and 2 page(s)
- Multimeter 3 page
- Vehicle summary page
- Limits page
- Diagnostics page
- Job entry page

The scope option for the MCS has these modes / pages:

Key definitions page
Ignition scope running mode
Ignition scope storage mode
- Ignition scope freeze mode

Ignition scope memory mode
Lab scope running mode
- Lab scope storage mode

Lab scope freeze mode
Lab scope memory mode
Alternator running mode
Alternator freeze mode

A list of functions will be given for each page or mode. The order of the pages or modes will be the same as in the two lists above.
To enter numbers you can use the number keys above the letter keys.
You can also enter numbers by setting the num lock on, and use the number keys at the right of the keyboard (numerical keys).
The arrow keys are at the left of the numerical keys.

Note : Remember that you first have to hold down the shift key when you want to use the functions P, S, M, ?, >, #.

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Overall

Function	Key to press
Make a printout of what is presently on the screen.	Prt Sc
Go to SDL	S
Go back to MCS from SDL	M
Engine kill	Pause

Menu pages

Function	Key to press
Step to next menu item	Arrow down or >
Step to previous menu item	Arrow up
Enter the chosen menu item	Enter or #
Leave this menu	Esc or P
Step to second column	Arrow right or *
Step to previous column	Arrow left
Go to next menu page (if applicable)	1
Go to key definitions page	0
Get help	2 or ?

After a vehicle is defined, you can also use these functions

Function	Key to press
Go directly to multimeter 1	F1
Go directly to ignition scope	F2
Go to last used test page (if vehicle is defined)	F10

Key definitions page

Function	Key to press
Leave this page.	1

Help pages

Function	Key to press
Toggle through pages	2
Go back	1
Abort	Esc or P

Vehicle code number entry page

Function	Key to press
Enter numbers	0 to 9
Enter	Enter or #
Abort, go to menu	Esc or P

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Vehicle entry without limits page

Function	Key to press
Go to next entry field	*
Go to previous entry field	Arrow left
Go to next line and at last line exit and save	Enter or #
Abort, go to menu	Esc or P

To enter top dead center offset

Function	Key to press
Enter numbers	0 to 9
Toggle - sign	+

Customer message entry page

Function	Key to press
Clear line	Delete
Clear previous character	Backspace
Enter character	0 to 9 and letters
Go to next position	Space or arrow right
Go to previous position	Arrow left
Go to next line	Arrow down
Go to next line and at last line exit and save	Enter or #
Abort, go to menu	Esc or P

Instruction pages

Function	Key to press
Go to next page (if applicable)	1
Continue	Enter or #
Abort, go to menu	Esc or P

Test pages

Function	Key to press
Save data	*
Repeat test	Arrow up or +
Go to next test page (if applicable)	1
Get help	2 or ?
Go to vehicle summary page	3
Go to limits page	4
Go to diagnostics page	5
Go to multimeter 1	F1
Go to ignition scope	F2
Abort test, go to menu	Esc or P

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Multimeter 1 and 2 page(s)

Function	Key to press
Go to next multimeter	Enter or #
Go to key definitions page	0
Go to next test page (if applicable)	1
Get help	2 or ?
Go to summary page	3
Go to limits page	4
Go to diagnostic page	5
Go to multimeter 1	F1
Go to ignition scope	F2
Go to last used test page (if vehicle is defined)	F10
Abort test, go to menu	Esc or P

Multimeter 3 page

Function	Key to press
Go to multimeter 1	Enter or #
Auto ohm range	Arrow up or +
Fixed ohm range	*
Toggle volt / ohm	F1, arrow down or >
Go to last used test page (if vehicle is defined)	F10
Go to key definitions page	0
Get help	2 or ?
Go to summary page	3
Go to limits page	4
Go to diagnostics page	5
Abort test, go to menu	Esc or P

Vehicle summary page

Function	Key to press
Toggle through pages	3
Go back to test	1
Abort, go to menu	Esc or P

Limits page

Function	Key to press
Toggle through pages	4
Go back to test	1
Abort, go to menu	Esc or P

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Diagnostics page

Function	Key to press
Toggle through pages	5
Go back to test	1
Abort, go to menu	Esc or P

Job entry page

Function	Key to press
Enter numbers	0 to 9
Go to next entry field	*
Go to previous entry field	Arrow left
Go to next line and at last line exit and save	Enter or #

SCOPE OPTION FUNCTIONS

Key definitions page

Function	Key to press
Leave this page	Esc or P
Go to multimeter 1	F1
Go to ignition scope	F2
Go to last used workshop test (if vehicle is defined)	F10

Ignition scope running mode

Function	Key to press
Go to key definitions page	0
Step down through X scales	1
Step up through X scales	2
Toggle primary / secondary ignition pattern	3
Step down through Y scale	4
Step up through Y scales	5
Store patterns	6
Step down through cylinder exchange rates	7
Step up through cylinder exchange rates	8
Toggle gasses in / out	9
Go to next cylinder	>
Go to previous cylinder	Arrow down or +
Freeze pattern	*
Go to multimeter 1	F1
Go to labscope	F2
Select primary ignition pattern	F3
Select secondary ignition pattern	F4
Toggle through Y scales	F5
Toggle through X scales	F6

Continued on next page

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Parade display	F7
100%; 1 cylinder continuous	F8
100%; swapping cylinders	F9
Go to last used workshop test (if vehicle is defined)	F10
Abort, go to menu	Esc or P

Ignition scope storage mode

Function	Key to press
Stop storage and go to memory mode	* on keypad

Ignition scope freeze mode

Function	Key to press
Go to key definition page	0
Activate cursor 1	1
Activate cursor 2	2
Toggle grid in out	3
Move selected cursor left	4 or arrow left
Move selected cursor right	5 or arrow right
Remove cursors	7
Toggle cursor values in / out	8
Go to running mode	Enter or #
Abort, go to menu	Esc or P

Ignition scope memory mode

Function	Key to press
Display previous pattern	Arrow up or +
Display next pattern	Arrow down or >
Go to key definition page	0
Activate cursor 1	1
Activate cursor 2	2
Toggle grid in out	3
Move selected cursor left	4 or arrow left
Move selected cursor right	5 or arrow right
Remove cursors	7
Toggle cursor values in / out	8
Toggle gasses in / out	9
Go to running mode	Enter or #
Abort, go to menu	Esc or P

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Lab scope running mode

Function	Key to press
Go to key definitions page	0
Step down through X scales	1
Step up through X scales	2
Toggle grid in / out	3
Step down through Y scale	4
Step up through Y scales	5
Store patterns	6
Toggle through trigger modes	7
Toggle gasses in / out	9
Toggle trigger level up	Arrow right or >
Toggle trigger level down	Arrow left or +
Freeze pattern	*
Go to alternator scope	F2 press two times
Toggle through Y scales	F5
Toggle through X scales	F6
Go to last used test page (if vehicle is defined)	F10
Abort, go to menu	Esc or P

Lab scope storage mode

Function	Key to press
Stop storage and go to memory mode	* on keypad

Lab scope freeze mode

Function	Key to press
Go to key definition page	0
Activate cursor 1	1
Activate cursor 2	2
Toggle grid in out	3
Move selected cursor left	4 or arrow left
Move selected cursor right	5 or arrow right
Remove cursors	7
Toggle cursor values in / out	8
Go to running mode	Enter or #
Abort, go to menu	Esc or P

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Lab scope memory mode

Function	Key to press
Display previous pattern	Arrow up or +
Display next pattern	Arrow down or >
Go to key definition page	0
Activate cursor 1	1
Activate cursor 2	2
Toggle grid in / out	3
Move selected cursor left	4 or arrow left
Move selected cursor right	5 or arrow right
Remove cursors	7
Toggle cursor values in / out	8
Toggle gasses in / out	9
Go to running mode	Enter or ##
Abort, go to menu	Esc or P

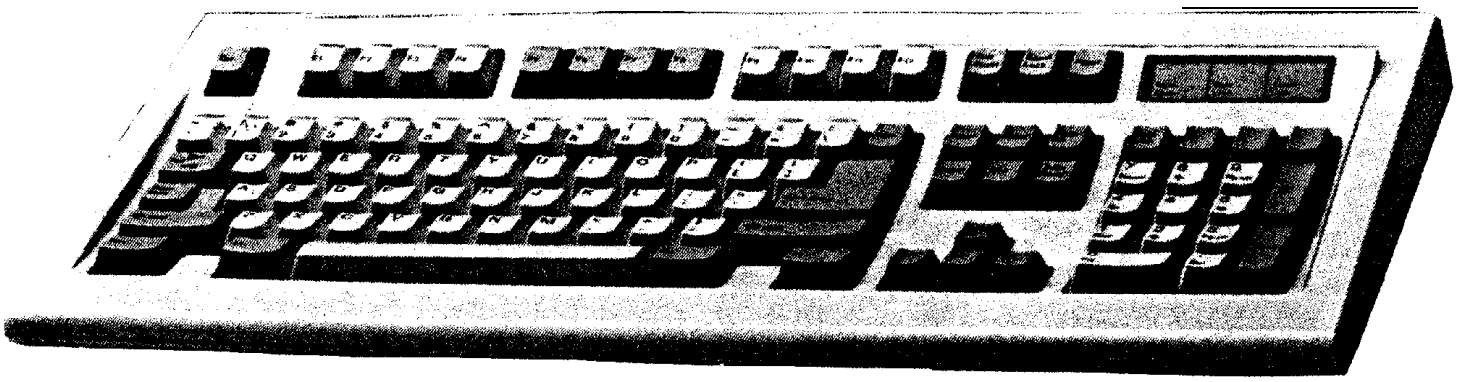
Alternator running mode

Function	Key to press
Go to key definitions page	0
Freeze pattern	*
Go to ignition scope	F2
Go to last used test page (if vehicle is defined)	F10
Abort, go to menu	Esc or P

Alternator freeze mode

Function	Key to press
Go to key definitions page.	0
Go to running mode	Enter or #
Abort or go to menu	Esc or P

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KEYBOARD FOR THE OCS2OOOSL / TECH 80 OPEL COMPUTER SYSTEM

OPERATOR'S MANUAL

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SUN ELECTRIC EUROPE

Supplement to the operator's manual (06E9306-35 Rev : A) of

The Opel Computer System

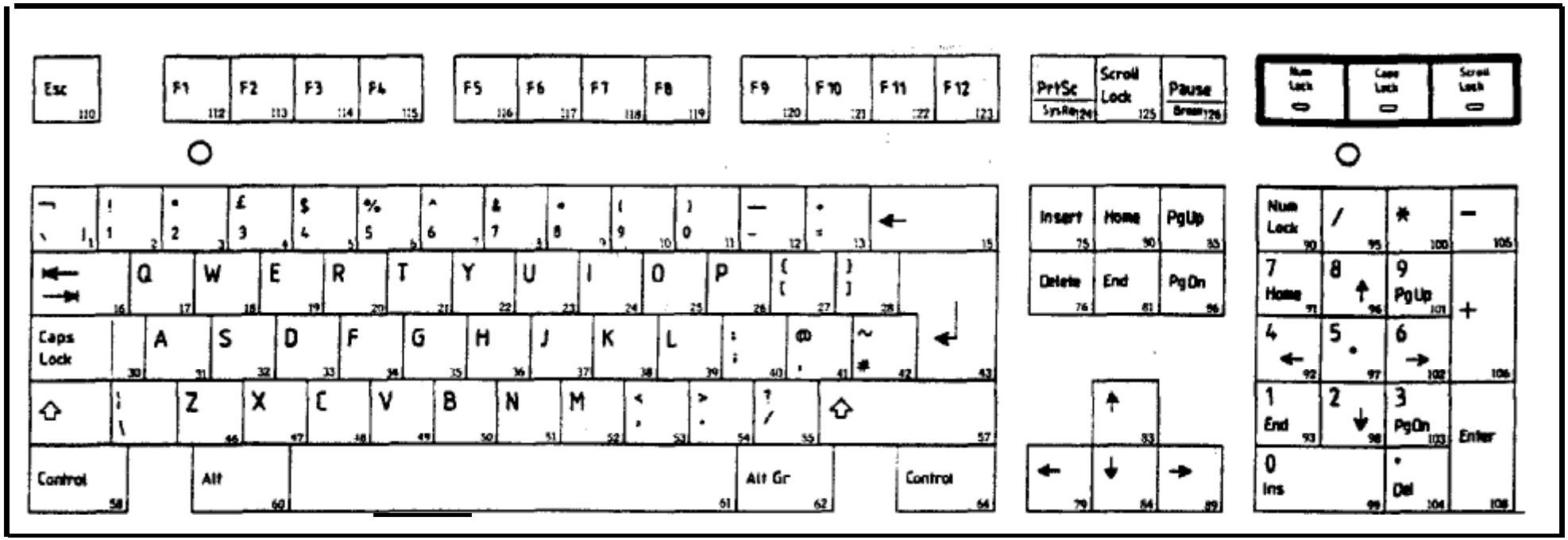
OCS2OOOSL / TECH 80

October-1992

software version : V5.13

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The illustration above represents the keyboard. On each key, there is a number in the bottom right corner.

On key 15 there is an arrow pointing left, this is the backspace key.
On key 43 there is the carriage return sign, this keycan be used as an enter key.
Key 57 is a shift key.

Introduction

This is a supplement to the operator's manual of the OCS2OOOSL, it describes how to use the keyboard option;

OCS Keyboard, key definitions

Which key you have to press, to do a certain function on the OCS / TECH 80 depends on the page or mode in which you are working. There are also keys which work in every mode (Overall). Furthermore the OCS / TECH 80 has these pages:

- Menu pages
- Key definitions page
- Help page
- Vehicle code number entry page
- Vehicle entry without limits page
- Customer message entry page
- Instruction pages
- Test pages
- Multimeter 1 and 2 page(s)
- Multimeter 3 page
- Vehicle summary page
  Limits page
- Diagnostics page
- Job entry page

The scope option for the OCS / TECH 80 has these modes / pages:

- Key definitions page
- Ignition scope running mode
- Ignition scope storage mode
- Ignition scope freeze mode
- Ignition scope memory mode
- Lab scope running mode
- Lab scope storage mode
- Lab scope freeze mode
- Lab scope memory mode
- Alternator running mode
- Alternator freeze mode

A list of functions will be given for each page or mode. The order of the pages or modes will be the same as in the two lists above.
To enter numbers you can use the number keys above the letter keys. You can also enter numbers by setting the num lock on, and use the number keys at the right of the keyboard (numerical keys).
The arrow keys are at the left of the numerical keys.

Note : Remember that you first have to hold down the shift key when you want to use the functions P, S, M, ?, >, #.

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Overall

Function	Key to press
Make a printout of what is presently on the screen,	Prt SC
Go to SDL	S
Go back to OCS from SDL	M
Engine kill	Pause

Menu pages

Function	Key to press
Step to next menu item	Arrow down or >
Step to previous menu item	Arrow up
Enter the chosen menu item	Enter or #
Leave this menu	Esc or P
Step to second column	Arrow right or *
Step to previous column	Arrow left
Go to next menu page (if applicable)	1
Go to key definitions page	0
Get help	2 or ?

After a vehicle is defined, you can also use these functions

Function	Key to press
Go directly to multimeter 1	F1
Go directly to ignition scope	F2
Go to last used test page (if vehicle is defined)	F10

Key definitions page

Function	Key to press
Leave this page.	1

Help pages

Function	Key to press
Toggle through pages	2
Go back	1
Abort	Esc or P

Vehicle code number entry page

Function	Key to press
Enter numbers	0 to 9
Enter	Enter or #
Abort, go to menu	Esc or P

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Vehicle entry without limits page

Function	Key to press
Go to next entry field	*
Go to previous entry field	Arrow left
Go to next line and at last line exit an-d save	Enter or #
Abort, go to menu	Esc or P

To “enter top dead center offset

Function	Key to press
Enter numbers	0 to 9
Toggle - sign	+

Customer message entry page

Function	Key to press
Clear line	Delete
Clear previous character	Backspace
Enter character	0 to 9 and letters
Go to next position	Space or arrow right
Go to previous position	Arrow left
Go to next line	Arrow down
Go to next line and at last line exit and save	Enter or #
Abort, go to menu	Esc or P

Instruction pages

Function	Key to press
Go to next page (if applicable)	1
Continue	Enter or #
Abort, go to menu	Esc or P

Test pages

Function	Key to press
Save data	*
Repeat test	Arrow up or +
Go to next test page (if applicable)	1
Get help	2 or ?
Go to vehicle summary page	3
Go to limits page	4
Go to diagnostics page	5
Go to multimeter 1	F1
Go to ignition scope	F2
Abort test, go to menu	Esc or P

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Multimeter 1 and 2 page(s)

Function	Key to press
Go to next multimeter	Enter or #
Go to key definitions page	0
Go to next test page (if applicable)	1
Get help	2 or ?
Go to summary page	3
Go to limits page	4
Go to diagnostic page	5
Go to multimeter 1	F1
Go to ignition scope	F2
Go to last used test page (if vehicle is defined)	F10
Abort test, go to menu	Esc or P

Multimeter 3 page

Function	Key to press
Go to multimeter 1	Enter or #
Auto ohm range	Arrow up or +
Fixed ohm range	*
Toggle volt / ohm	F1, arrow down or >
Go to last used test page (if vehicle is defined)	F10
Go to key definitions page	0
Get help	2 or ?
Go to summary page	3
Go to limits page	4
Go to diagnostics page	5
Abort test, go to menu	Esc or P

Vehicle summary page

Function	Key to press
Toggle through pages	3
Go back to test	1
Abort, go to menu	Esc or P

Limits page

Function	Key to press
Toggle through pages	4
Go back to test	1
Abort, go to menu	Esc or P

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Diagnostics page

Function	Key to press
Toggle through pages	5
Go back to test	1
Abort, go to menu	Esc or P

Job entry page

Function	Key to press
Enter numbers	0 to 9
Go to next entry field	*
Go to previous entry field	Arrow left
Go to next line and at last line exit and save	Enter or #

SCOPE OPTION FUNCTIONS

Key definitions page

Function	Key to press
Leave this page	Esc or P
Go to multimeter 1	F1
Go to ignition scope	F2
Go to last used workshop test (if vehicle is defined)	F10

Ignition scope running mode

Function	Key to press
Go to key definitions page	0
Step down through X scales	1
Step up through X scales	2
Toggle primary / secondary ignition pattern	3
Step down through Y scale	4
Step up through Y scales	5
Store patterns	6
Step down through cylinder exchange rates	7
Step up through cylinder exchange rates	8
Toggle gasses in / out	9
Go to next cylinder	>
Go to previous cylinder	Arrow down or +
Freeze pattern	*
Go to multimeter 1	F1
Go to labscope	F2
Select primary ignition pattern	F3
Select secondary ignition pattern	F4
Toggle through Y scales	F5
Toggle through X scales	F6

Continued on next page

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Parade display	F7
100%; 1 cylinder continuous	F8
100%; swapping cylinders	F9
Go to last used workshop test (if vehicle is defined)	F10
Abort, go to menu	Esc or P

Ignition scope storage mode

Function	Key to press
Stop storage and go to memory mode	* on keypad

Ignition scope freeze mode

Function	Key to press
Go to key definition page	0
Activate cursor 1	1
Activate cursor 2	2
Toggle grid in out	3
Move selected cursor left	4 or arrow left
Move selected cursor right	5 or arrow right
Remove cursors	7
Toggle cursor values in / out	8
Go to running mode	Enter or #
Abort, go to menu	Esc or P

Ignition scope memory mode

Function	Key to press
Display previous pattern	Arrow up or +
Display next pattern	Arrow down or >
Go to key definition page	0
Activate cursor 1	1
Activate cursor 2	2
Toggle grid in out	3
Move selected cursor left	4 or arrow left
Move selected cursor right	5 or arrow right
Remove cursors	7
Toggle cursor values in / out	8
Toggle gasses in / out	9
Go to running mode	Enter or #
Abort, go to menu	Esc or P

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Lab scope running mode

Function	Key to press
Go to key definitions page	0
Step down through X scales	1
Step up through X scales	2
Toggle grid in / out	3
Step down through Y scale	4
Step up through Y scales	5
Store patterns	6
Toggle through trigger modes	7
Toggle gasses in / out	9
Toggle trigger level up	Arrow right or >
Toggle trigger level down	Arrow left or +
Freeze pattern	*
Go to alternator scope	F2 press two times
Toggle through Y scales	F5
Toggle through X scales	F6
Go to last used test page (if vehicle is defined)	F10
Abort, go to menu	Esc or P

Lab scope storage mode

Function	Key to press
Stop storage and go to memory mode	* on keypad

Lab scope freeze mode

Function	Key to press
Go to key definition page	0
Activate cursor 1	1
Activate cursor 2	2
Toggle grid in out	3
Move selected cursor left	4 or arrow left
Move selected cursor right	5 or arrow right
Remove cursors	7
Toggle cursor values in / out	8
Go to running mode	Enter or #
Abort, go to menu	Esc or P

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Lab scope memory mode

Function	Key to press
Display previous pattern	Arrow up or +
Display next pattern	Arrow down or >
Go to key definition page	0
Activate cursor 1	1
Activate cursor 2	2
Toggle grid in / out	3
Move selected cursor left	4 or arrow left
Move selected cursor right	5 or arrow right
Remove cursors	7
Toggle cursor values in / out	8
Toggle gasses in / out	9
Go to running mode	Enter or #
Abort, go to menu	Esc or P

Alternator running mode

Function	Key to press
Go to key definitions page	0
Freeze pattern	*
Go to ignition scope	F22
Go to last used test page (if vehicle is defined)	F10
Abort, go to menu	Esc or P

Alternator freeze mode

Function	Key to press
Go to key definitions page	0
Go to running mode	Enter or #
Abort or go to menu	Esc or P

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FIELD INSTALLATION INSTRUCTIONS:

THE KEYBOARD KIT (UK)

PART NO: 7009E9317-42

AND

THE KEYBOARD KIT (D)

PART NO: 7009E9316-56

AND

THE KEYBOARD SUPPORT KIT

PART NO: 7009E9317-56

FOR THE MCS-2000 SL AND OCS-2000 SL TESTERS

AUGUST-1993

PART NO: 0692E9307-72 **REV: E, AUGUST-93**

REF FILE: MCS-KBDE.DOC
REF : ERN 0731, **ERN 0789, ERN 0926**
ECN 2.02.012E, ECN 2.04.046E, ECN 2.07.071E, ECN 2.12.164E, ECN 3.01.010E, ECN 3.02.021E, ECN 3.03.029E, ECN 3.04.038E, ECN 3.04.043E, ECN 3.08.104E

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FIELD INSTALLATION INSTRUCTIONS

FOR THE KEYBOARD KIT(S)

MCS-2000 SL / OCS-2000 SL

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SCHEMATIC KV CARD READER BOARD	DWG NO: 7092E9005, REV: B
KV CARD READER BOARD ASSEMBLY	DWG NO: 7001E9011, REV: B
SYSTEM WIRING DIAGRAM, MCS-2000	DWG NO: 7092E9311-71, REV: O

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REVISION: A, MARCH-1992
REVISION: B, JULY-1992
REVISION: C, FEBRUARY-1993
REVISION: D, APRIL-1993
REVISION: E, AUGUST-1993

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INTRODUCTION

Every effort has been taken in the preparation of this booklet to ensure the successful field installation of the Keyboard kit(s) for the MCS/OCS testers while minimising the time and manpower required.

This booklet is designed to enable the installation to be carried out using only the tools and equipment specified.

Make sure the latest software is installed (V5.13 or higher), refer to the latest service bulletins for details,

THE KEYBOARD KITS

The Keyboard kit (UK), P/N: 7009E9317-42, is the standard keyboard and the Keyboard kit (D), P/N: 7009E9316-56, is for German speaking countries.

The Keyboard Support Kit (P/N: 7009E9317-56) contains all items except the keyboard. A specific Keyboard can be obtained from "I.E.S." Sun Electric Europe, Amsterdam.

Also, check if the current software supports this specific keyboard.

The Keyboards are similar to the STL-OTL Keyboards and can be used for the following:

1: All Test functions.

2: Special Functions programme selection, for example, go to Multimeter, go to Scope, go to SDL, etc.

3: Special functions in "Scope".

When the Keyboard is installed the Tester Configuration must be changed using the Service Disk (V5.10 or higher).

GENERAL NOTES

The following procedure must be carried out in the sequence as specified in the table of contents. Do not touch any part of the tester unless instructed to do so. These rules should be adhered to during the installation procedure:

1: ALWAYS SWITCH OFF THE MAINS SUPPLY WHEN WORKING INSIDE THE CABINET.

2: WHEN UP-GRADING THE SOFTWARE LEVEL BE CAREFUL TO AVOID HANDLING THE INDIVIDUAL EPROMS MORE THAN ABSOLUTELY NECESSARY.

3: WHILE HANDLING THE EPROMS TRANSFER THEM AS QUICKLY AS POSSIBLE FROM THE PACKAGING TO THEIR CORRECT LOCATION ON THE PCB.

DO NOT TOUCH THE EPROM PINS AND PCB CONTACTS

4: WHEN ROUTING WIRES AND CABLES, ALWAYS KEEP THEM AWAY FROM NOISY COMPONENTS SUCH AS TRANSFORMERS ETC.

5: REMEMBER THAT THERE SHOULD BE NO SCREWS OR WASHERS ETC. LEFTOVER WHEN THE INSTALLATION PROCEDURE IS COMPLETED.

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KITS CONTENTS

The Keyboard kits come complete with all of the parts necessary to correctly install the kit(s) in the field:

THE KEYBOARD KIT (UK}, PART NO: 7009E9317-42

ITEM	PART NO:	QTY	DESCRIPTIONN
1	7001E9312-5 1	1	KEYBOARD INT. II PCB ASSY. REV: B
2	7076E9321-83	1	WIRE HARNESS, W117
3	7076E9322-76	1	WIRE HARNESS, W117B
4	7076E9321-84	1	WIRE HARNESS, W5 KB, (REV: B)
5	7009E9317-36	1	ASCII KEYBOARD ASS'Y (UK)
6	4600E931 0-07	1	STICKER, FUNCTION KEYS
7	0536-0514-00	4	INSULATION SUPPORT
8	5878-0015-00	5	TY-RAP
9	7096E9058-7 1	1	GROMMET, BLIND, 19mm, MODIFIED
10	0424-0804-01	2	BARBED TAPE, LOOP, 0.4M
11	0424-0804-02	2	BARBED TAPE, PROPERTY HOOK, 0.4M
12	0692E9307-72	1	INSTALLATION INSTRUCTIONS, REV: E
13	0692E9307-73	REF	INSTALLATION DRAWING, REV: G

THE KEYBOARD KIT (D), PART NO: 7009E9316-56

ITEM	PART NO:	QTY	DESCRIPTIONN
1	7001E9312-51	1	KEYBOARD INT. II PCB ASSY. REV: B
2	7076E9321-83	1	WIRE HARNESS, W117
3	7076E9322-76	1	WIRE HARNESS, W117B
4	7076E9321-84	1	WIRE HARNESS, W5 KB, (REV: B)
5	7009E93 16-98	1	ASCII KEYBOARD ASS'Y (D)
6	4600E931 0-07	1	STICKER, FUNCTION KEYS
7	0536-0514-00	4	INSULATION SUPPORT
8	5878-0015-00	5	TY-RAP
9	7096E9058-71	1	GROMMET, BLIND, 19mm, MODIFIED
10	0424-0804-01	2	BARBED TAPE, LOOP, 0.4M
11	0424-0804-02	2	BARBED TAPE, PROPERTY HOOK, 0.4M
12	0692E9307-72	1	INSTALLATION INSTRUCTIONS, REV: E
13	0692E9307-73	REF	INSTALLATION DRAWING, REV: G

THE KEYBOARD SUPPORT KIT, PART NO: 7009E9317-56

This Kit contains all of the above items except the keyboard. A specific Keyboard can be obtained from "I.E.S." Sun Electric Europe, Amsterdam. Also, check if the current software supports this specific keyboard.

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INSTALLATION NOTES:

1: The Keyboard kit(s) are active in the MCS/OCS software version V5.13 or higher. When the Keyboard is installed, the tester configuration must be changed using the MCS Service Disk V5.10 or higher.

2: When installing the Keyboard kits into an old (circa 1987) Non-Prewired MCS-2000 tester, which has not had an up-grade kit, (P/N: 7009E9315-15) installed.
The 20 way ribbon cable wire harness "W-51 6" must be disconnected from the KV-Processor board "J-2".
Refer to the Installation Instructions for the MCS-2000 Up-Grade Kit (P/N: 0692E9306-36, Jan-90) for further details.

TOOLS, EQUIPMENT AND DOCUMENTATION REQUIRED

The following Tools, Equipment, Software and Reference Documentation are required to correctly install the Keyboard kit(s) in the field:

1: An Electric Drill, with a 4.50 mm Drill Bit

2: A 19.0 mm or 20.0 mm Round Hole Punch

3: A Soldering Iron and some Solder

4: A Cross-Head Screwdriver

5: A Flathead Screwdriver

6: A Snipe Nose Pliers

7: A Side Cutter

a: MCS-2000 System Disk (V5.13 or higher)

9: MCS-2000 Service Disk (V5.10 or higher)

10: Installation drawing (REF), DWG NO: 0692E9307-73, REV: G

11: MCS-2000 SL Service Manual, for reference

12: MCS-2000 Service Disk Manual (V5.10 or higher)

PRE-INSTALLATION CHECKOUT PROCEDURE

Before beginning the installation of the Keyboard kit(s) into the MCS/OCS, it is important to verify the correct operation of the unit:

A: SWITCH ON THE UNIT AND ALLOW IT TO WARM-UP IN THE USUAL MANNER.

B: AFTER THE WARM-UP PROCEED THROUGH THE SELF TEST AND CALIBRATION.

C: ANY FAULTS SHOULD BE NOTED AND CORRECTED BEFORE STARTING THE INSTALLATION PROCEDURE. REFER TO THE SERVICE MANUAL FOR TROUBLESHOOTING INFORMATION ETC.

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INSTALLATION PROCEDURE

STEP: 1 **After performing the initial checkout and any necessary repairs are carried out, switch OFF the unit and disconnect it from the Mains Power Source.**

STEP: 2 **Check the Mains Cable and Plug** for any damage and repair or replace as necessary.

STEP: 3 **Check the condition of all External Leads, Tubing and Pick-ups connected to the unit for damage and repair or replace as necessary.**

STEP: 4 **Remove the Plastic Front Panel from the MCS/OCS-2000 and the Metal Plate from in front of the Rack assembly. Remove the Rear Panel.**

STEP: 5 **With reference to the Installation Drawing, (0692E9307-73):**

Using the Electric Drill with the 4.50 mm Drill Bit, carefully drill four **(4) holes in the STL Headframe Panel, refer to Detail "A" for hole positions and spacing.**

Using the Electric Drill with the 4.50 mm Drill Bit, carefully drill a guide hole in the Front Panel assembly near the Mains "ON/OFF" switch, refer to Detail "B" for hole position. Using the Hole Punch enlarge the diameter of the guide hole to 19.0 mm or 20.0 mm (Max).

Note: **TAKE CARE NOT TO DAMAGE ANY OF THE CABLING. REMEMBER TO REMOVE ANY SWARF AND TO DE-BURR THE HOLES.**

STEP: 6 **Insert the four (4) Insulation Supports (P/N: 0536-0514-00)** into the four **4.50** mm holes, **Mount the Keyboard Interface board (P/N: 7001E9312-51) onto the Insulation Supports.**

STEP: 7 **With reference to Detail "C" on the Installation Drawing:**

Solder the Wire Harness "W-117B" (P/N: 7076E9322-76) to the "KV Card Reader board", across Capacitor C22:

1: **"White / Black" wire to C22, on the "J2" side, (GND)**

2: **"White / Green" wire to C22, on the "R9" side, (+ 5V)**

Connect the wire harness "W-117" (P/N: 7076E9321-83) to connector marked P-302 on the Keyboard Interface board. Connect the other end of "W-117" to the "W-117B" harness on the KV Card Reader board.

STEP: 8 **Connect the wire harness "W5-KB" (P/N: 7076E9321-84) to the Keyboard Interface board connector marked P-301. Connect the floating wire to a solid Chassis Ground connection.**

Route the cable up to the front of the Digital Rack and connect the other end of the cable to the "KV Card Reader board" (Slot 2) connector marked J-2.

STEP: 9 **Secure the two cable harnesses in place using the five (5) Ty-Raps (P/N: 5878-0015-00).**

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STEP: 10 Check if the Jumper settings on the Keyboard Interface board are correct:

W1: DEFAULT IN COPPER
W2: DEFAULT INSTALLED, (PARALLEL OUTPUT)
W 3 : DEFAULT INSTALLED, (DISABLE /ACK, POSITION 2-3)
W 4 : DEFAULT NOT INSTALLED

STEP: 11 Place the Grommet (P/N: 7096E9058-71) on the Keyboard Cable and insert the Keyboard Cable through the 19.0 mm hole in the Front Panel.

Carefully push the Keyboard Cable through the hole and push the Grommet into the hole making sure not to pinch or damage the cable.

Connect the Keyboard Cable to the Keyboard Interface board to connector marked J-300.

STEP: 12 Remove the protective backing from the two (2) lengths of the Barbed Tape “Loop”, (P/N: 0424-0804-01) and attach the two lengths of tape to the bottom of the Keyboard.

Then, place the two (2) lengths of the Barbed tape “Property Hook” (P/N: 0424-0804-02) on top of the two (2) lengths of the Barbed tape “Loop”, which are already attached to the Keyboard.

Remove the protective backing from the two (2) lengths of the Barbed tape “Property Hook” and position the Keyboard onto the MCS/OCS tray as shown in the Installation drawing.

Gently press on the Keyboard to secure it in place.

Stick the Function Keys Sticker (P/N: 4600E9310-07) onto the Keyboard.

STEP: 13 Check that all connections are correct and properly secured and re-install the Front and Rear Panels of the MCS/OCS.

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SET-UP AND CHECKOUT PROCEDURE

1: Check all Electrical connections are correct and properly secured. Plug the tester into the nearest Mains Outlet.

2: Insert the Service Disk which contains the Keyboard Software, (V5.10 or higher). Switch on the Power to the unit.

The tester should perform the Memory Test Routine, Program Loading Sequence, after the tester Configuration and Calibration pages have been displayed, the “Main Menu” page will be displayed:

PROGRAM SELECTION
- TESTER CONFIGURATION ENTRY
- TESTER CALIBRATION
- GAS BENCH SPECIAL FUNCTIONS
- SPECIAL FUNCTIONS
- LANGUAGE SELECTION
- VEHICLE QUICK TESTS
- FACTORY TESTS

3: Select the “Tester Configuration Entry” page from the main menu. The “Tester Configuration Entry” (Page 1) should be displayed:

TESTER CONFIGURATION ENTRY	
- DIESEL OPTION	NOT DEFINED
- DIAGNOSTICS	NOT DEFINED
- TECH-15	NOT DEFINED
- DIGITAL SCOPE	DEFINED
- BAROMETER	DEFINED
- KEYBOARD	DEFINED
- DATE AND TIME	DEFINED
- SDL-20	NOT DEFINED
- OIML	NOT DEFINED

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4: **Step through** all lines by setting "Defined/Dot Defined" as required, by pressing the **#** key. Set the "Keyboard" to **Defined.**

When the # key is pressed on the last line, the "Tester Configuration Entry" (Page 2) will be displayed:

TESTER CONFIGURATION ENTRY	
EXT. CRT DRIVER	NOT DEFINED
DATE/TIME DISPLAYED	NOT DEFINED
BIT 14	NOT DEFINED
BIT 15	NOT DEFINED

Note. The definitions "Bit 14 & Bit 15" are intended for future use an should be left as "Not Defined".

Pressing the # key on the last line, the caption "Writing to Memory" will be displayed.

5: Next the "Tester Options Entry" pages (2 Pages) will be displayed, if other options have been installed at this time, adjust these pages as required.

6: When complete, (leave the Service Disk in the Disk Drive) and Re-Boot the tester.

7: When the "Main Menu" page is be displayed, select "Factory Tests" from the main menu:

FACTORY TESTS

- **"DIGITAL RACK TEST"**
- ANALOG RACK TEST

Note: Before the Factory Test Menu appears the "Simulator Configuration" entry will be entered.

8: Select the "Digital Rack Test" and select the "I/O Board" tests:

I/O BOARD TESTS

- OLD KEYPAD TEST
- **"KEYBOARD TEST"**
- NEW KEYPAD TEST
- I/O LINE ENABLE

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9: Select the “Keyboard Test” and the following screen will be displayed:

KEYBOARD TEST	
KEY TYPE:	ASCII
KEY RECOGNISED:	A
HEX VALUE:	00000061

10: Press each Key on the Keyboard to ensure it is operating correctly.

When a Key on the Keyboard is pressed the display is updated. Some Keyboard Functions have the same function as a Keypad Key.

If the detected Key is of the Keypad type, then the display is the equivalent Keypad Key; the Hex value will be cleared.

11: When completed Power Down the tester and insert the MCS System Disk (V5.13 or higher), select “Vehicle Testing” and perform an engine test to ensure the system is operating correctly.

THIS COMPLETES THE KEYBOARD INSTALLATION

FOR THE MCS-2000 / OCS-2000 TESTERS

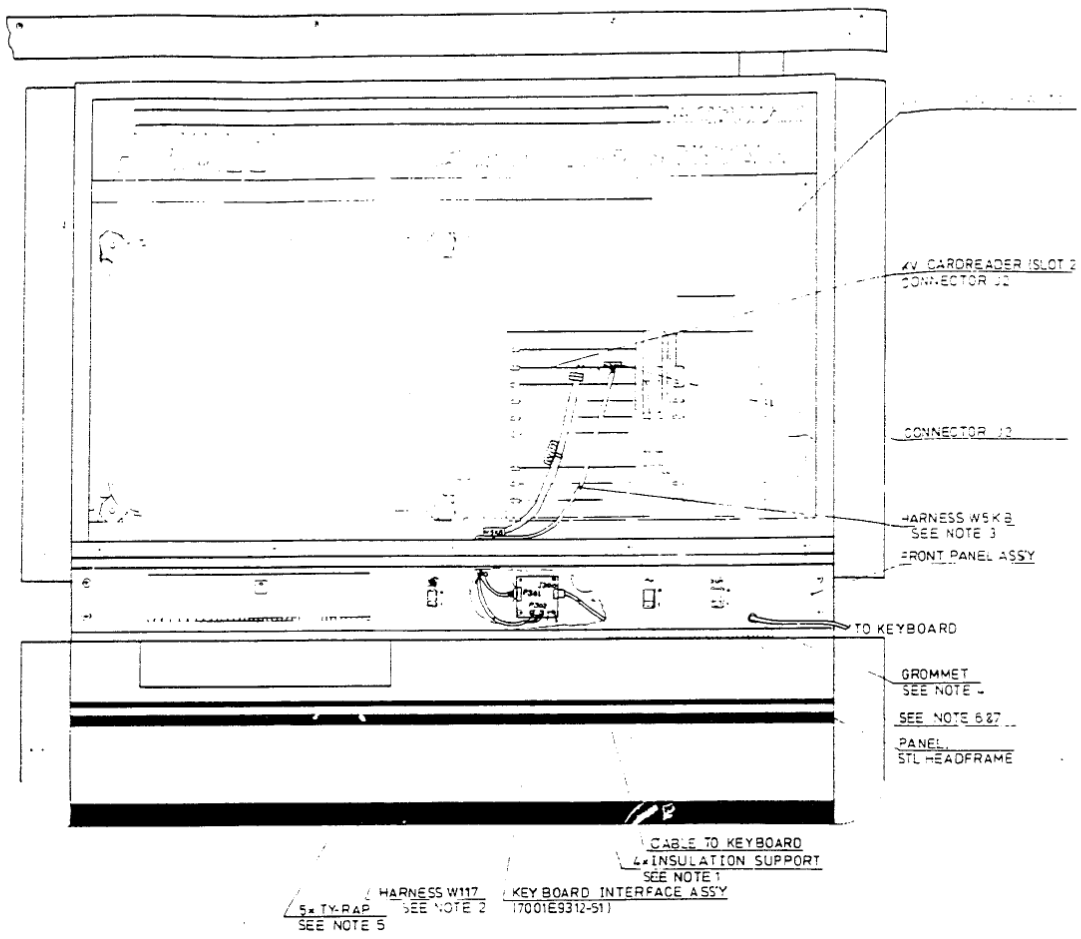
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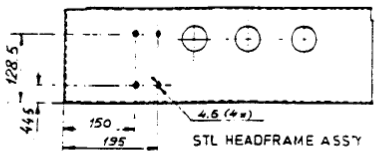
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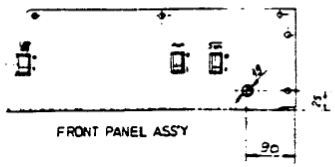
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D	12-92	212. 164E	CHANGED NOTE 2 INT OF WIRES		
E	01-93	301. 010E	ADDED ITEM 3	P.T	
F	03-93	3.03. 029E	CHANGED: "DETAIL B" @ 13 1/16 & 16	P.T	
G	04-93	3.04. 043E	ADDED NOTE 7		



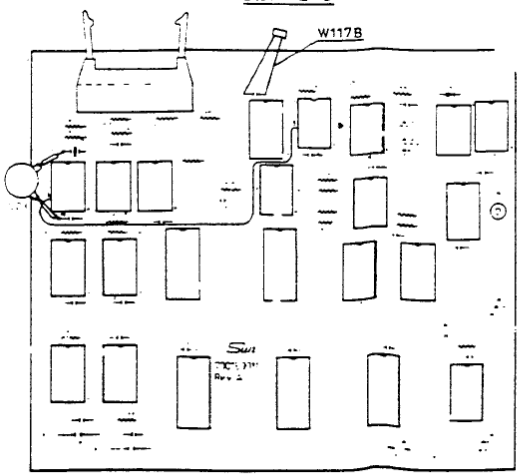
DETAIL "A"



DETAIL "B"



DETAIL "C"



NOTES:
1) DRILL FOUR HOLES IN STL HEADFRAME PANEL (SEE DETAIL "A"). PLACE FOUR INSULATION SUPPORTS INTO THE HOLES. PLACE KEYBOARD INTERFACE ASS'Y ON TO THE INSULATION SUPPORT.

2) SEE DETAIL "C". SOLDER HARNESS W117B TO KV READER BOARD. WHT/BLK CONDUCTOR TO C22 ON THE SIDE OF J2, AND WHT/GRN CONDUCTOR TO C22 ON THE SIDE OF R9. CONNECT P117 TO J117 AND J302 TO KEYBOARD INTERFACE ASS'Y CONN. P302.

3) CONNECT HARNESS W5KB TO KV CONNECTOR J2 AND TO KEYBOARD INTERFACE ASS'Y CONNECTOR P301. CONNECT GROUND WIRE TO WELDSTUD ON THE FRONT PANEL.

4) DRILL A HOLE IN THE FRONT PANEL ASS'Y (SEE DETAIL "B"). PLACE A GROMMET ON THE KEYBO. CABLE. FIT KEYBOARD CABLE THROUGH THE HOLE IN THE FRONT PANEL ASS'Y AND PUSH THE GROMMET IN TO THE HOLE. CONNECT KEYBOARD CONNECTOR TO KEYBOARD INTERFACE ASS'Y CONNECTOR J300.

5) TIGHTEN HARNESS W117 WITH 5 TYRAPS.

6) ATTACH THE BARBED TAPE (PROPERTY HOOK) TO THE TRAY OF THE MCS & THE BARBED TAPE (LOOP) TO THE KEYBOARD.

7) ALIGN FUNCTION KEYSSTICKER WITH FUNCTION KEYS

Item	Qty	Dwg./Part no.	Description	Remarks
3	1	7009E9317-56	KEYBOARD SUPPORT KIT	
2	1	7009E9316-56	KEYBOARD KIT (D)	
1	1	7009E9317-42	KEYBOARD KIT (UK)	

Scale: — Date: — Used on: MCS 2000/OCS 2000
Designed by: — Material:
Drawn by: R vd HOEF 14-10-92
Checked by: 22.10.92
Approved: 22.10.92

INSTALLATION DRAWING KEYBOARD KIT

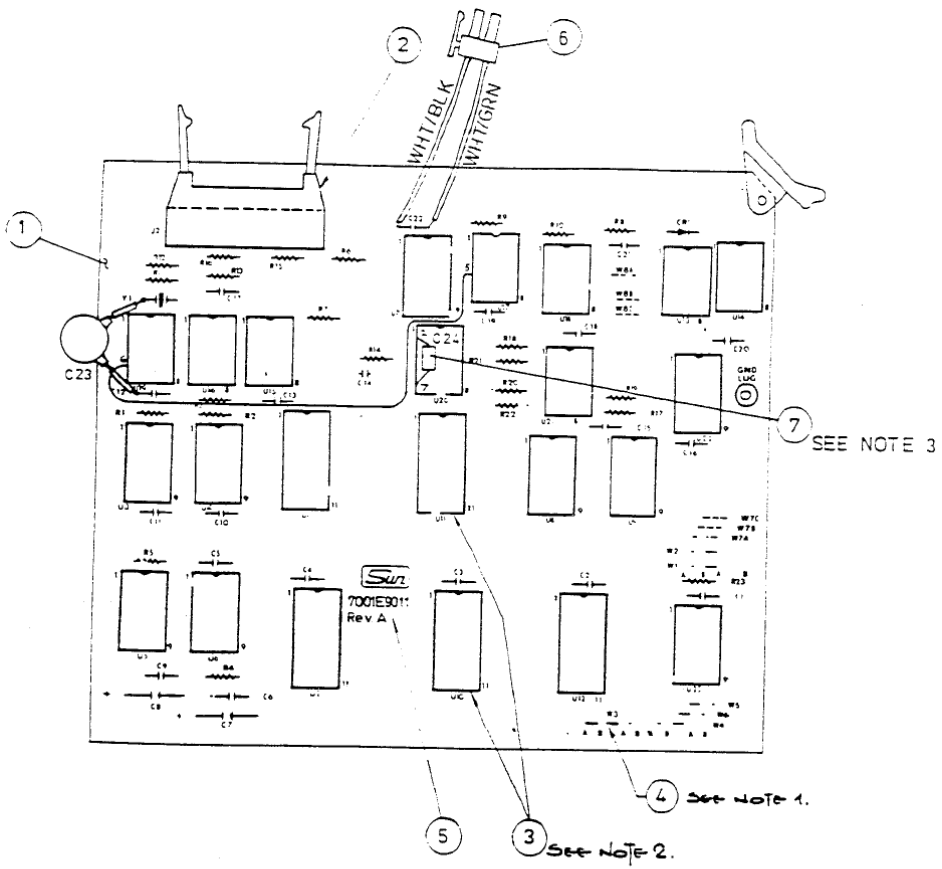
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Sun | A1 | Sheet 1 of 1 | Code E9202 | Rev G

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Hole Schedule		
Code	Qty	Dia

Revisions					
Sym	Date	ECN	Description	Check	Appr
A	07.10.87	—	ERN # 0109	P.T	BG
B	01-93	301 010E	ADDED ITEM 6 & 7. AND NOTE 3. P/N. ITEM 5 WAS 003-0673-563	P.T	BG



NOTES:

1. REMOVE JUMPER WIRE W3 FROM POS'N B-B & INSTALL RESISTOR ZERO OHM (ITEM 5) IN POS'N A-A.
2. WHEN NOT PRESENT INSTALL IC's, 74LS240 (ITEM 3) IN POSITIONS U10 & U11.
3. INSTALL CAPACITOR 1nF/100V BETWEEN PIN 2 AND PIN 7 OF U20.

Item	Qty.	Dwg./Part no.	Description	Remarks
7	1	0860-0179-25	CAPACITOR 1nF/100V axi	C24
6	1	7076E9322-76	WIRE HARNESS W117B	
5	1	0694-0484-00	LABEL, SELF ADHESIVE	
4	1	0668-0901-00	ZERO OHM RESISTOR	
3	2	0773-7240-00	IC. 74LS240	U10, U11
2	1	003-3931-926	SHROUDED 20 WAY PIN HEADER	J2
1	1	7001-0371-00	PCB ASS'Y KV CARDREADER	

Scale 1:1 | Date | Remarks: USED IN Sun 2014, Sun 4000 Mca 2000, ACS2000

Drawn by H.v/d NIEUWENDIJK 14.10.87

Checked by Peter Tal 11.05.88

Approved Bernard Gan 17.5.88 | Finish

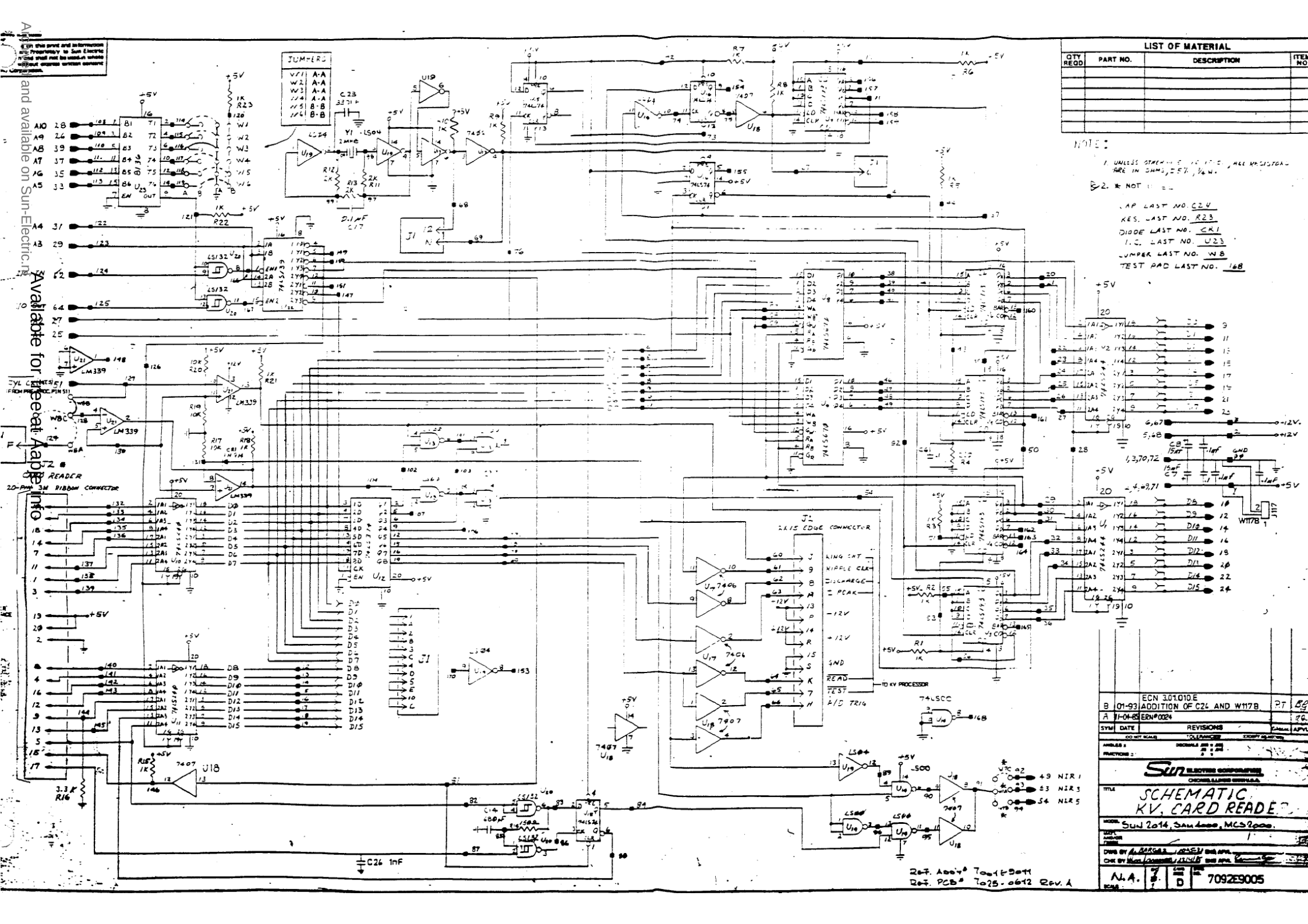
Unless otherwise specified: Dimensions are in mm., Tolerances on: Angles ± 0.5° Holes ± 0.1 Rest ± 0.5

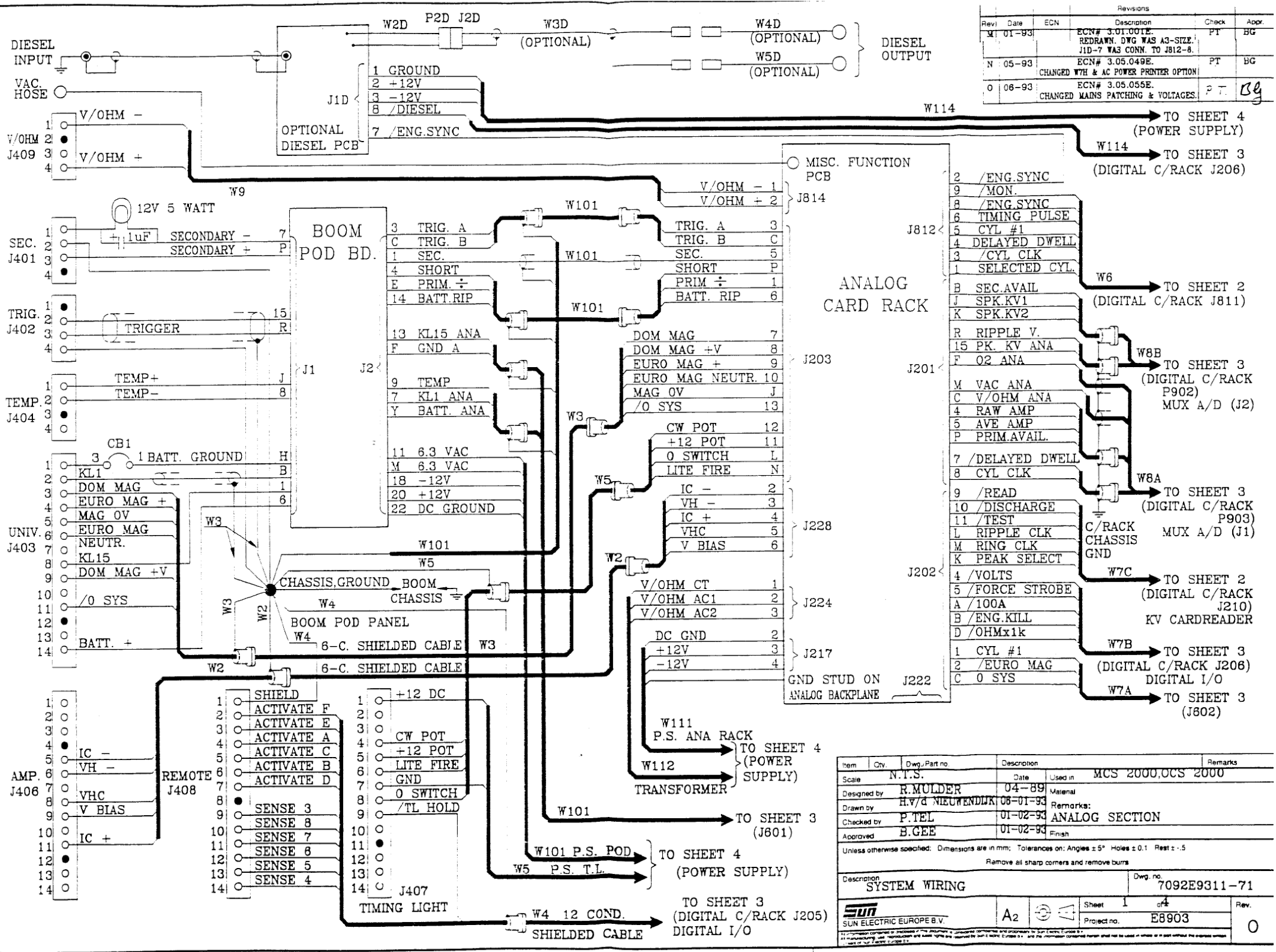
Description: PRINTED CIRCUIT BOARD ASSY CARD READER / KV CCA | Dwg no. 7001E9011

Sun MICROSYSTEMS EUROPE B.V. | A2 | Sheet 1 of 1 | Code | Project no. | Issue B

REF. SCHEMATIC DWG. 7092E9005
REF. PCB 7025-0612

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Revisions					
Rev	Date	ECN	Description	Check	Appr.
M	01-93		ECN# 3.01.001E. REDRAWN. DWG WAS A3-SIZE. J1D-7 WAS CONN. TO J812-8.	PT	BG
N	05-93		ECN# 3.05.049E. CHANGED W7H & AC POWER PRINTER OPTION	PT	BG
O	06-93		ECN# 3.05.055E. CHANGED MAINS PATCHING & VOLTAGES.	PT	BG

Item	Qty.	Dwg./Part no.	Description		Remarks
Scale		N.T.S.	Date	Used in	MCS 2000,OCS 2000
Designed by		R.MULDER	04-89	Material	
Drawn by		H.v/d NIEUWENDIJK	08-01-93	Remarks:	
Checked by		P.TEL	01-02-93		ANALOG SECTION
Approved		B.GEE	01-02-93	Finish	

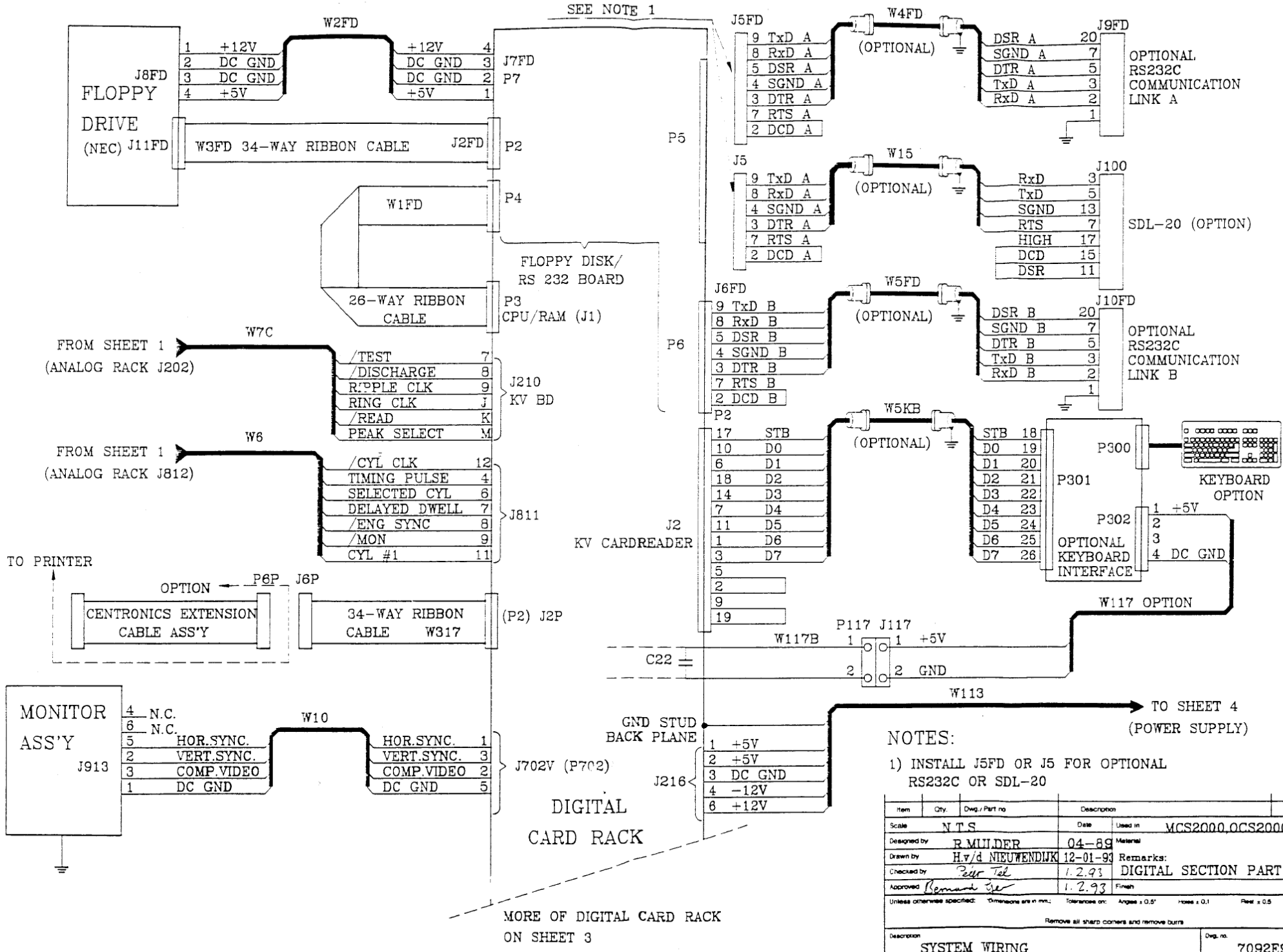
Unless otherwise specified: Dimensions are in mm; Tolerances on: Angles ± 5° Holes ± 0.1 Rest ± .5
Remove all sharp corners and remove burrs

Description	Dwg. no.
SYSTEM WIRING	7092E9311-71

SUN ELECTRIC EUROPE B.V. | A2 | Sheet 1 of 4 | Project no. E8903 | Rev. 0

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NOTES:

1) INSTALL J5FD OR J5 FOR OPTIONAL RS232C OR SDL-20

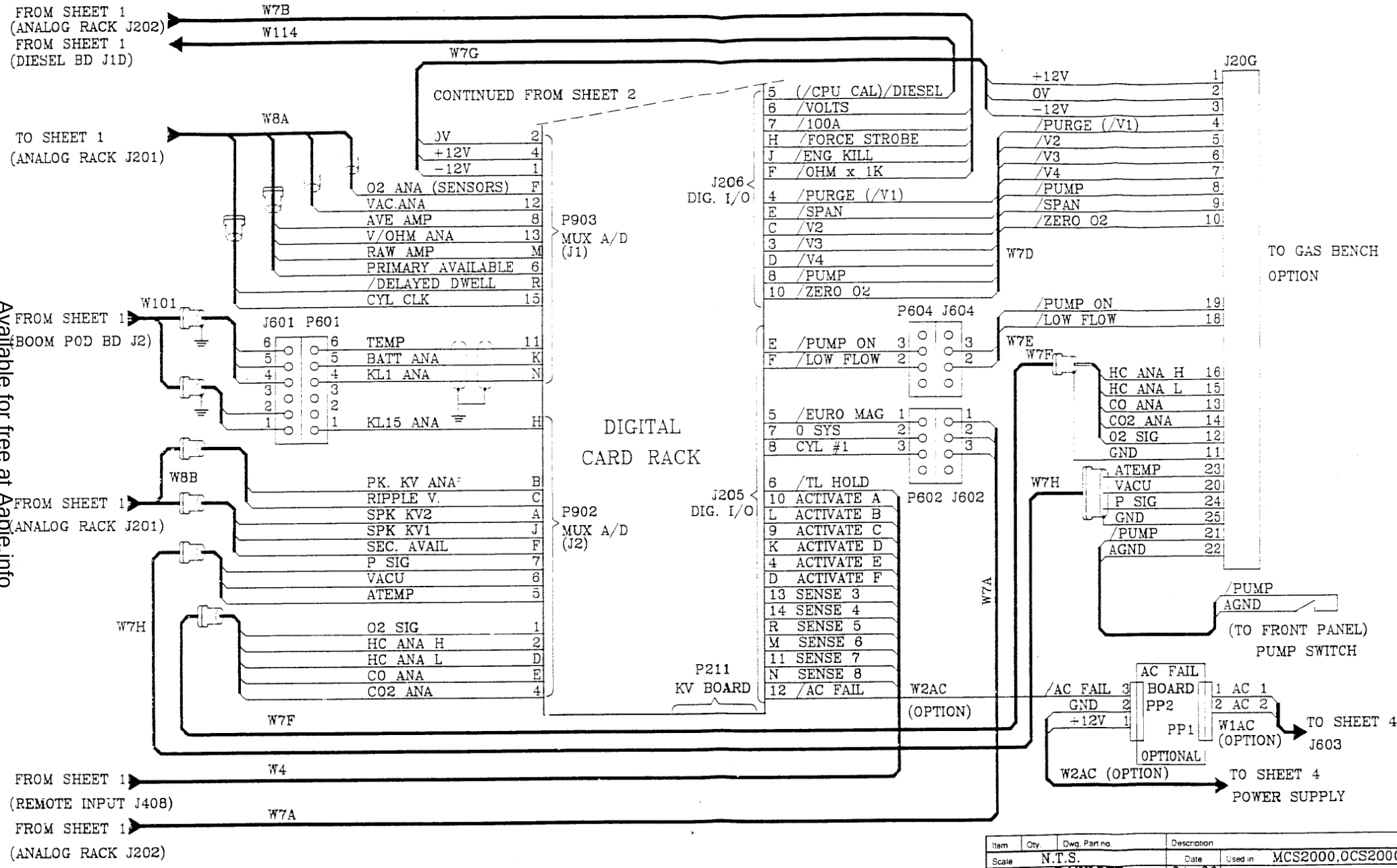
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Scale	N.T.S.		Date	Used in	MCS2000,OCS2000
Designed by	R.MULDER		04-89	Material	
Drawn by	H.v/d NIEUWENDIJK		12-01-93	Remarks:	
Checked by	Peter Tol		1.2.93		DIGITAL SECTION PART 1
Approved	Bernard Ver		1.2.93	Finish	

Unless otherwise specified: Dimensions are in mm.; Tolerances on: Angles ± 0.5° Holes ± 0.1 Rest ± 0.5

Remove all sharp corners and remove burrs

Description	SYSTEM WIRING	Dwg. no.	7092E9311-71
SUN ELECTRIC EUROPE B.V.	A2	Sheet 2 of 4	Issue 0
Auteursrecht voorbehouden volgens de wet		Code	
		Project no.	E8903

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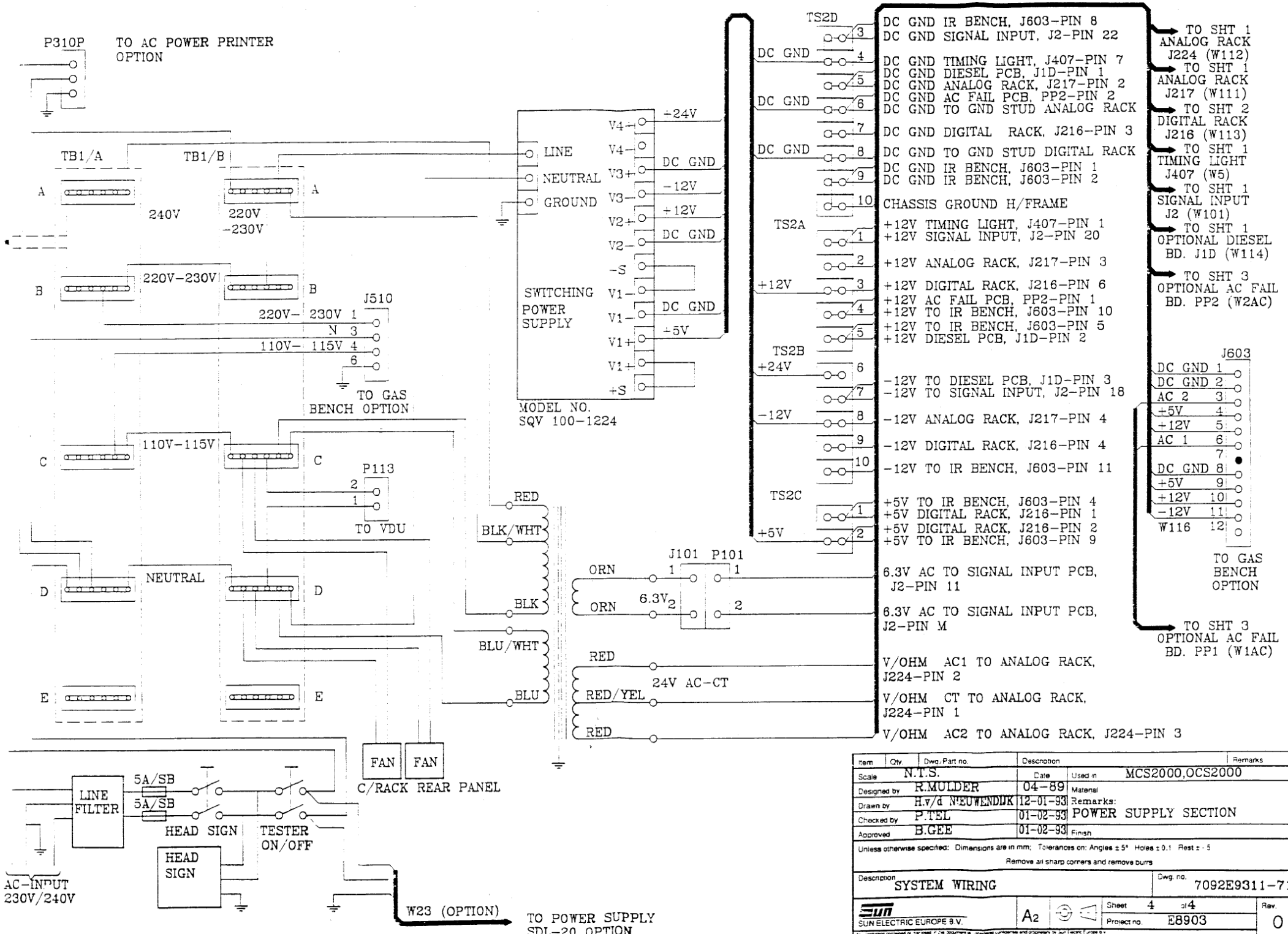
Item	Qty.	Dwg. Part no.	Description		Remarks
Scale	N.T.S.		Date	Used in MCS2000,OCS2000	
Designed by	R.MULDER		04-89	Material	
Drawn by	H.v/d VLEUWENDIJK		12-01-93	Remarks:	
Checked by	P.TEL		01-02-93	DIGITAL SECTION PART 2	
Approved	B.GEE		01-02-93	Finish	

Unless otherwise specified: Dimensions are in mm: Tolerances on: Angles ± 5° Holes ± 0.1 Rest ± .5
Remove all sharp corners and remove burrs

Description: SYSTEM WIRING — Dwg. no. 7092E9311-71

SUN ELECTRIC EUROPE B.V. — A2 — Sheet 3 of 4 — Project no. E8903 — Rev. 0

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Item	Qty	Dwg./Part no.	Description		Remarks
Scale	N.T.S.		Date	Used in	MCS2000,OCS2000
Designed by	R.MULDER		04-89	Material	
Drawn by	H.v/d NEUWENDIJK		12-01-93	Remarks:	
Checked by	P.TEL		01-02-93		POWER SUPPLY SECTION
Approved	B.GEE		01-02-93	Finish	

Unless otherwise specified: Dimensions are in mm; Tolerances on: Angles ± 5° Holes ± 0.1 Rest ± .5
Remove all sharp corners and remove burrs

Description: SYSTEM WIRING — Dwg. no. 7092E9311-71

SUN ELECTRIC EUROPE B.V. — A2 — Sheet 4 of 4 — Project no. E8903 — Rev. 0

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6.11 SDL-20

S U N E L E C T R I C E U R O P E

FIELD INSTALLATION INSTRUCTIONS

THE SDL-20-(L)

FOR THE MCS-2000-SL

AND

FOR THE MCS-2000-SL-L

OCTOBER-1992

PART NO: 0692E9307-98

REV:A

REF FILE: MCS-SDL.DOC

REF: ERN 0779
ERN 0874
ECN 2.06.069E

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FIELD INSTALLATION INSTRUCTIONS

FOR THE SDL-20-(L)

MCS-2000-SL & MCS-2000-SL-L

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* * * C O N F I D E N T I A L * * *

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REVISION: A, OCTOBER-1992

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INTRODUCTION

Every effort as been taken in the preparation of this installation booklet to ensure the successful installation of the SDL-20-(L) option into the MCS-2000-SL and the MCS-2000-SL-L testers while minimising the time and manpower required.

These instructions are designed to enable the installation to be carried out using only the equipment specified in the equipment required section.

The following procedure must be carried out in the sequence as specified in the table of contents, no sections may be skipped. Do not touch any part of the tester unless instructed to do so.

Make sure the latest software is installed (V5.00 or higher), refer to the latest service bulletins for details.

THE SDL-20-(L)

The SDL-20-(L) is a microprocessor based unit specifically designed to test, diagnose and troubleshoot on-board electronic systems with communication capability used on current vehicles and those systems expected to be introduced in the future. It is an Optional unit to expand the capabilities of the MCS-2000-SL and the MCS-2000-SL-L testers and uses the New Remote Control (P/N: 7009E9316-54) of the MCS-2000-SL and the MCS-2000-SL-L to ensure maximum ease of operation.

NOTES:

THESE RULES SHOULD BE ADHERED TO DURING THE INSTALLATION PROCEDURE:

1: ALWAYS SWITCH OFF THE MAINS SUPPLY WHEN WORKING INSIDE THE CABINET.

2: BE CAREFUL TO AVOID HANDLING THE INDIVIDUAL PROMS MORE THAN ABSOLUTELY NECESSARY.

3: WHILE HANDLING THE PROMS TRANSFER THEM AS QUICKLY AS POSSIBLE FROM THE ANTI-STATIC TUBE TO THEIR CORRECT LOCATION ON THE PCB.

DO NOT TOUGH THE PROM PINS AND THE PCB CONTACTS

4: WHEN ROUTING WIRES AND CABLES, ALWAYS KEEP THEM AWAY FROM NOISY COMPONENTS SUCH AS MAINS TRANSFORMERS ETC.

5: REMEMBER THAT THERE SHOULD BE NO SCREWS AND WASHERS ETC. LEFTOVER WHEN THE INSTALLATION PROCEDURE HAS BEEN COMPLETED.

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KIT CONTENTS

The SDL-20-(L) comes complete with all parts necessary to install the unit into the MCS-2000-SL and/or the MCS-2000-SL-L testers:

ITEM	PART NO:	QTY	DESCRIPTION
1	7010E9310-97	1	SDL-20-(L) FINAL ASSEMBLY
2	7009E9316-92	1	DISK DRIVE FRONT PANEL ASSEMBLY
3	7009E9314-50	1	FLOPPY DRIVE SUB ASSEMBLY
4	7009E9317-03	1	HARDWARE KIT, WHICH CONTAINS THE FOLLOWING ITEMS:
A	7012E9315-76	1	COVER PLATE
B	7012E9315-77	1	BRACKET COVER PLATE
C	7096E9056-75	1	GASKET
D	7096E9056-74	2	GASKET FOAM
E	400-0500-503	1	WASHER PLAIN, M5
F	408-0500-143	5	BARB NUT, M5
G	400-0500-203	4	WASHER INT/SP, M5
H	7096E3056-31	1	FASTON TAB, 6.3 mm
I	408-0600-143	4	BARB NUT, M6
J	400-0600-503	4	WASHER PLAIN, M6
5	7005E9313-89	1	REAR PANEL SDL-20, MCS-2000-SL
6	7005E9315-23	1	REAR PANEL SDL-20-L, MCS-2000-SL-L
7	6004E9310-41	1	EXTENSION CABLE, W9
8	7076E9315-01	1	GROUND WIRE, W36, FOR MCS-2000-SL
9	7076E9315-09	1	GROUND WIRE, W43, FOR MCS-2000-SL
10	7076E9315-02	1	GROUND WIRE, W36, FOR MCS-2000-SL-L
11	7076E9315-04	1	GROUND WIRE, W43, FOR MCS-2000-SL-L
12	7076E9316-01	1	GROUND WIRE, W42, USED IN BOTH
13	0703EO5O*-01	1	EPROM, D-5 (ECRT-BOARD SLOT 9) * = 2 OR HIGHER, DEPENDING ON LATEST RELEASED VERSION
14	0692E9307-98	1	INSTALLATION INSTRUCTIONS
15	0692E9308-45	REF	INSTALLATION DRAWING
16	0692E9308-11	1	OPERATOR'S MANUAL
17	0692E9308-12	REF	SOFTWARE CONFIG. LIST, SDL-20
18	0692E9308-54	REF	TEST PROCEDURE, SDL-20-(L)

NOTES: The SDL-20-(L) is active in the MCS-2000 software version V5.00 or higher.

When the SDL-20-(L) is installed the "TESTER CONFIGURATION" must be changed using the "MCS-2000 SERVICE DISK", (V5.00 or higher). The MCS-2000 "SYSTEM" and "SERVICE" disks are not parts of the SDL-20-(L) kit.

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TOOLS, EQUIPMENT AND DOCUMENTATION REQUIRED

The following tools, equipment and reference documentation are required to correctly install the SDL-20-(L) kit in the field:

1: A CROSSHEAD SCREWDRIVER

2: A CALIBRATION SCREWDRIVER

3: A SNIPE NOSE PLIERS

4: A SIDE CUTTER

5:	INSTALLATION DWG. SDL-20-(L) OPTION	P/N: 0692E9308-45
6:	TEST PROCEDURE SDL-20-(L)	P/N: 0692E9308-54
7:	APPLICATION DISK, EG: SDL-FORD-MON.GB	P/N: 0553E0672-41

8: MCS-2000 SERVICE MANUAL, FOR REFERENCE

9: MCS-2000 SYSTEM DISK (V5.00 OR HIGHER)

10: MCS-2000 SERVICE DISK (V5.00 OR HIGHER)

11:	MCS-2000 SERVICE DISK MANUAL	P/N: 0692E9308-17

TOOLS AND EQUIPMENT REQUIRED FOR THE TEST PROCEDURE

If problems arise during the check out procedure it will be necessary to perform the SDL-20-(L) Test Procedure. The following tools and equipment are required to perform the SDL-20-(L) Test Procedure:

1:	SDL-SLVTST.GB PROGRAM	P/N: 0553E0641-01
2:	SDL/STL E2PROM CONFIG. PROGRAM	P/N: 0553E0311-41
3:	CPB LED BOARD	P/N: 7001E9311-46
4:	POWER SUPPLY LED BOARD	P/N: 7001E9311-47
5:	TEST BOX	P/N: IPTE E8810-01
6:	KEYBOARD	P/N: 7009E9314-13
7:	KEYBOARD INTERFACE	P/N: 7001E9311-02
8:	EXTENDER	P/N: 7001E9311-10
9:	DVM	FLUKE 77 OR EQUIVALENT
10:	SCOPE	NATIONAL VP5521A OR EQUIVALENT
11:	FREQUENCY COUNTER	RACAL-DANA 1991
12:	FUNCTION GENERATOR	THANDAR TG 102
13:	POWER SUPPLY 0 - 1OV DC	DELTA E 015-2 OR EQUIVALENT

14: POWER SPLIT CABLE, REFER TO SDL-20-(L) TEST PROCEDURE FOR DETAILS.

15: DATA SPLIT CABLE, REFER TO SDL-20-(L) TEST PROCEDURE FOR DETAILS.

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NOTE:

THE NEW REMOTE CONTROL KIT (P/N: 7009E9316-55) FOR THE MCS-2000-SL MUST BE INSTALLED BEFORE THE SDL-20-(L) CAN BE INSTALLED.

REFER TO THE INSTALLATION INSTRUCTIONS FOR THE NEW REMOTE CONTROL KIT (P/N: 0692E9307-70, REV: A, RELEASED JAN-92) FOR FURTHER DETAILS.

PRE-INSTALLATION CHECKOUT PROCEDURE

Before beginning the installation of the SDL-20-(L) Option into the MCS-2000-SL or MCS-2000-SL-L, it is important to verify the correct operation of the unit:

A: SWITCH ON THE UNIT AND ALLOW IT TO WARM-UP IN THE USUAL MANNER.

B: AFTER THE WARM-UP PROCEED THROUGH THE SELF TEST AND CALIBRATION.

c: ANY FAULTS SHOULD BE NOTED AND CORRECTED BEFORE STARTING THE INSTALLATION PROCEDURE. REFER TO THE SERVICE MANUAL FOR TROUBLESHOOTING INFORMATION ETC.

INSTALLATION PROCEDURE: MCS-2000-SL

STEP: 1 AFTER PERFORMING THE INITIAL CHECKOUT AND ANY NECESSARY REPAIRS ARE CARRIED OUT, SWITCH OFF THE UNIT AND DISCONNECT IT FROM THE MAINS POWER SOURCE.

STEP: 2 CHECK THE MAINS CABLE AND PLUG FOR ANY DAMAGE AND REPAIR OR REPLACE AS NECESSARY.

STEP: 3 CHECK THE CONDITION OF ALL LEADS AND PICK-UPS CONNECTED TO THE BOOM FOR ANY DAMAGE AND REPAIR OR REPLACE AS NECESSARY.

STEP: 4 REMOVE THE PLASTIC FRONT PANEL, THE TOP REAR PANEL AND THE BLANK LOWER LEFT REAR PANEL FROM THE MCS-2000-SL. REMOVE THE METAL PLATE WHICH COVERS THE CARD RACKS.

STEP: 5 REMOVE THE SCREWS SECURING THE MCS-2000-SL CONTROL PANEL AND PLACE THE PANEL WITH ITS FRONT FACING DOWNWARDS ON THE CABINET.

STEP: 6 REMOVE THE DISK DRIVE FRONT PANEL AND DISCONNECT THE EARTH WIRE WHICH IS CONNECTED TO IT.

NOTE: CAREFULLY, RETAIN ALL SCREWS, NUTS AND WASHERS FOR RE-USE.

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STEP: 7 WITH REFERENCE TO THE SDL-20-(L) INSTALLATION DRAWING, DWG NO: **0692E9308-45, SHEET 1** OF 2:

A: DISCONNECT AND SLIDE OUT THE "ECRT" BOARD (DIGITAL RACK, SLOT 9). CHECK IF THE EPROM IS INSTALLED IN LOCATION D-5, REPLACE IT WITH THE UP-DATED EPROM SUPPLIED WITH THE KIT. RECONNECT AND RE-INSTALL THE "ECRT" BOARD INTO SLOT 9.

B: DISCONNECT AND SLIDE OUT THE "ECPU-68K" BOARD (DIGITAL RACK, SLOT 6). CHECK IF A JUMPER IS INSTALLED IN LOCATION "W-1", IF NOT INSTALL A JUMPER IN LOCATION "W-1". (JUMPER IS NOT SUPPLIED WITH THE KIT). RECONNECT AND RE-INSTALL THE "ECPU-68K BOARD INTO SLOT 6.

STEP: 8 CAREFULLY INSTALL THE "FLOPPY DRIVE SUB-ASSEMBLY" (P/N: 7009E9314-50) IN TO THE SPACE PROVIDED USING THE FOUR (4) M6 PLAIN WASHERS AND M6 BARB NUTS ON THE SHOCK MOUNTS.

CONNECT THE FLOATING GROUND WIRE TO A NEARBY GROUND WELD STUD USING ONE (1) MS BARB NUT AND AN M5 PLAIN WASHER.

PLACE THE "DISK DRIVE FRONT PANEL ASSY" (P/N: 7009E9316-92) ON TO THE MCS-2000-SL CONTROL PANEL NEAR THE DISK DRIVES, DO NOT INSTALL AT THIS STAGE.

STEP: 9 FROM THE REAR OF THE MCS-2000-SL, SLIDE THE SDL-20-(L) MAIN ASSEMBLY INTO THE SPACE PROVIDED. LOCATE AND ROUTE THE FOLLOWING CABLES THROUGH THE MCS-2000-SL CABINET:

1:	w-10,	DC POWER WIRES,	TO MCS POWER SUPPLY TABS
2:	w-15,	INTERNAL RS-232,	TO THE DIGITAL RACK
3:	W-16,	DISK DRIVE DATA,	TO THE DISK DRIVE ASSEMBLY
4:	W-18,	DISK DRIVE POWER,	TO THE DISK DRIVE ASSEMBLY
5:	W-38,	MAINS NEUTRAL,	TO MCS MAINS POWER SWITCH
6:	w-39,	MAINS LIVE,	TO MCS MAINS POWER SWITCH
7:	w-40,	LCD DATA/POWER,	TO DISK DRIVE ASSEMBLY

MCS-2000-SL POWER SUPPLY WIRING

STEP: 10 CONNECT THE DC POWER CABLE "W-10" TO THE MCS-2000-SL POWER SUPPLY TABS AS SHOWN BELOW:

SIGNAL	WIRE COLOUR	POWER TABS
GND	WHITE/BLACK	TOP 9
GND	WHITE/BLACK	TOP 9
+5 v	WHITE/GREEN	TOP 1
+5 v	WHITE/GREEN	TOP 2
+12 v	WHITE/RED	LOWER 4
-12 v	WHITE/VIOLET	LOWER 10

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MCS-2000-SL DIGITAL RACK WIRING

STEP: 11 CONNECT THE INTERNAL RS-232 CABLE "W-15" TO "PB-5" ON THE "FLOPPY DISK/RS-232 INTERFACE BOARD", DIGITAL RACK SLOT 8.

SDL-20-(L) FLOPPY DISK DRIVE WIRING

STEP: 12 CONNECT THE FLOPPY DISK DATA CABLE "W-16" TO "PDO-D" ON THE FLOPPY DISK DRIVE, MAKING SURE IT IS CORRECTLY ALIGNED.

STEP: 13 CONNECT THE FLOPPY DISK POWER CABLE "W-18" TO "PDO-P" ON THE FLOPPY DISK DRIVE, MAKING SURE IT IS CORRECTLY ALIGNED.

DISK DRIVE FRONT PANEL WIRING

STEP: 14 CONNECT THE LCD DATA/POWER CABLE "W-40" TO "P65A" ON THE LCD MODULE, WHICH IS MOUNTED ON THE DISK DRIVE FRONT PANEL ASSEMBLY, MAKING SURE IT IS CORRECTLY ALIGNED.

CHECK THAT ALL CABLES ARE CORRECT AND INSTALL THE DISK DRIVE FRONT PANEL ASSEMBLY, REUSE BLINDING GROMMETS.

MCS-2000-SL CONTROL PANEL WIRING

STEP: 15 DISCONNECT THE TWO (2) UPPER WIRES FROM THE MCS-2000-SL MAINS SWITCH AND RECONNECT THEM WITH "W-38" AND "W-39" FROM THE SDL-20-(L):

1:	"W-38", (NEUTRAL)	BLACK/BLUE,	WITH THE BLUE WIRE
2:	"W-39", (LIVE)	BLACK/BROWN,	WITH THE BROWN WIRE

GROUNDING

STEP: 16 CONNECT THE GROUND WIRE "W-43" (P/N: 7076E9315-09) TO A GROUND WELD STUD ON THE MCS-2000-SL CONTROL PANEL. ROUTE THE WIRE TO THE SDL-20-(L) MAIN BASE PLATE AND CONNECT IT TO A GROUND WELD STUD, USING TWO (2) M5 BARB NUTS AND INT./SP WASHERS.

STEP: 17 INSTALL A 6.3 **mm** FASTON TAB (P/N: 7096E3056-31) ON TO THE TOP WELD STUD OF THE SDL-20 REAR PANEL (P/N: 7005E9313-89).

MOUNT THE SDL-20 REAR PANEL ONTO THE SDL-20-(L) MAIN BASE PLATE USING THREE (3) M5 SCREWS, NOT SUPPLIED WITH THE KIT.

STEP: 18 CONNECT THE GROUND WIRE "W-36" (P/N: 7076E9315-01) TO THE LOWER GROUND WELD STUD ON THE SDL-20 REAR PANEL.

CONNECT THE OTHER END OF "W-36" TO A GROUND WELD STUD ON THE SDL-20-(L) MAIN ASSEMBLY AS SHOWN IN THE INSTALLATION **DRAWING SHEET 1,** DETAIL "D".

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STEP: 19 CONNECT THE GROUND WIRE "W-42" (P/N: 7076E9316-01) TO A WELD STUD ON THE CENTRE DIVIDING BRACKET USING ONE (1) M5 BARB NUT AND ONE (1) INT./SP WASHER.

CONNECT THE OTHER END OF THE GROUND WIRE "W-42" TO THE FASTON ALREADY INSTALLED ON THE SDL-20 REAR PANEL.

STEP: 20 INSTALL THE SQUARE COVER PLATE (P/N: 7012E9315-76) AND GASKET (P/N: 7096E9056-75) OVER THE RIGHT HAND HOLE IN THE MCS-ZOOO-SL INTERNAL FRONT PANEL, SECURE IN PLACE USING THE COVER PLATE BRACKET (P/N: 7012E9315-77).

NOTE: THE REASON FOR DOING THIS IS TO HELP IN PREVENTING DUST, DIRT AND OTHER FOREIGN MATTER FROM ENTERING THE MCS-ZOOO-SL TESTER.

STEP: 21 CHECK THAT ALL WIRING IS CORRECT, SLIDE THE SDL-20-(L) MAIN ASSEMBLY COMPLETELY INTO THE MCS-2OOO-SL AND SECURE IN PLACE RE-USING THE SIX (6) SCREWS.

STEP: 22 RE-INSTALL THE METAL PLATE WHICH COVERS THE CARD RACKS AND THE TOP REAR PANEL.

STEP: 23 RE-INSTALL THE FRONT CONTROL PANEL AND THE PLASTIC FRONT PANEL.

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INSTALLATION PROCEDURE: MCS-2000-SL-L

STEP: 1 AFTER PERFORMING THE INITIAL CHECKOUT AND ANY NECESSARY REPAIRS ARE CARRIED OUT, SWITCH OFF THE UNIT AND DISCONNECT IT FROM THE MAINS POWER SOURCE.

STEP: 2 CHECK THE MAINS CABLE AND PLUG FOR ANY DAMAGE AND REPAIR OR REPLACE AS NECESSARY.

STEP: 3 CHECK THE CONDITION OF ALL LEADS AND PICK-UPS CONNECTED TO THE BOOM FOR ANY DAMAGE AND REPAIR OR REPLACE AS NECESSARY.

STEP: 4 REMOVE THE PLASTIC FRONT PANEL, THE TOP REAR PANEL AND THE BLANK LOWER LEFT REAR PANEL FROM THE MCS-2000-SL-L. REMOVE THE METAL PLATE WHICH COVERS THE CARD RACKS.

STEP: 5 REMOVE THE SCREWS SECURING THE MCS-2000-SL-L CONTROL PANEL AND PLACE THE PANEL WITH ITS FRONT FACING DOWNWARDS ON THE CABINET.

STEP: 6 REMOVE THE DISK DRIVE FRONT PANEL AND DISCONNECT THE EARTH WIRE WHICH IS CONNECTED TO IT.

NOTE: CAREFULLY, RETAIN ALL SCREWS, NUTS AND WASHERS FOR RE-USE.

STEP: 7 WITH REFERENCE TO THE SDL-20-(L) INSTALLATION DRAWING, DWG NO: 0692E9308-45, **SHEET 1 OF 2** AND **SHEET 2 OF 2**:

A: DISCONNECT AND SLIDE OUT THE "ECRT" BOARD (DIGITAL RACK, SLOT 9). CHECK IF THE EPROM IS INSTALLED IN LOCATION D-5, REPLACE IT WITH THE UP-DATED EPROM SUPPLIED WITH THE KIT. RECONNECT AND RE-INSTALL THE "ECRT" BOARD INTO SLOT 9.

B: DISCONNECT AND SLIDE OUT THE "ECPU-68K" BOARD (DIGITAL RACK, SLOT 6). CHECK IF A JUMPER IS INSTALLED IN LOCATION "W-1", IF NOT INSTALL A JUMPER IN LOCATION "W-1". (JUMPER IS NOT SUPPLIED WITH THE KIT). RECONNECT AND RE-INSTALL THE "ECPU-68K BOARD INTO SLOT 6.

STEP: 8 CAREFULLY INSTALL THE "FLOPPY DRIVE SUB-ASSEMBLY= (P/N: 7009E9314-50) IN TO THE SPACE PROVIDED USING THE FOUR (4) M6 PLAIN WASHERS AND M6 BARB NUTS ON THE SHOCK MOUNTS.

CONNECT THE FLOATING GROUND WIRE TO A NEARBY GROUND WELD STUD USING ONE (1) M5 BARB NUT AND AN M5 PLAIN WASHER.

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PLACE THE "DISK DRIVE FRONT PANEL ASSY" (P/N: 7009E9316-92) ON TO THE MCS-2000-SL-L CONTROL PANEL NEAR THE DISK DRIVES, DO NOT INSTALL AT THIS STAGE.

STEP: 9 FROM THE REAR OF THE MCS-2000-SL-L, SLIDE THE SDL-20-(L) MAIN ASSEMBLY INTO THE SPACE PROVIDED. LOCATE AND ROUTE THE FOLLOWING CABLES THROUGH THE MCS-2000-SL-L CABINET:

1:	w-10,	DC POWER WIRES,	TO MCS POWER SUPPLY TABS
2:	w-15,	INTERNAL RS-232,	TO THE DIGITAL RACK
3:	W-16,	DISK DRIVE DATA,	TO THE DISK DRIVE ASSEMBLY
4:	W-18,	DISK DRIVE POWER,	TO THE DISK DRIVE ASSEMBLY
5:	W-38,	MAINS NEUTRAL,	TO MCS MAINS POWER SWITCH
6:	w-39,	MAINS LIVE,	TO MCS MAINS POWER SWITCH
7:	w-40,	LCD DATA/POWER,	TO DISK DRIVE ASSEMBLY

MCS-2000-SL-L POWER SUPPLY WIRING

STEP: 10 CONNECT THE DC POWER CABLE "W-10" TO THE MCS-2000-SL-L POWER SUPPLY TABS AS SHOWN BELOW:

SIGNAL	WIRE COLOUR	POWER TABS
GND	WHITE/BLACK	TOP 9
GND	WHITE/BLACK	TOP 9
+5 v	WHITE/GREEN	TOP 1
+5 v	WHITE/GREEN	TOP 2
+12 v	WHITE/RED	LOWER 4
-12 v	WHITE/VIOLET	LOWER 10

MCS-2000-SL-L DIGITAL RACK WIRING

STEP: 11 CONNECT THE INTERNAL RS-232 CABLE "W-15" TO "PB-5" ON THE "FLOPPY DISK/RS-232 INTERFACE BOARD", DIGITAL RACK SLOT 8.

SDL-20-(L) FLOPPY DISK DRIVE WIRING

STEP: 12 CONNECT THE FLOPPY DISK DATA CABLE "W-16" TO "PDO-D" ON THE FLOPPY DISK DRIVE, MAKING SURE IT IS CORRECTLY ALIGNED.

STEP: 13 CONNECT THE FLOPPY DISK POWER CABLE "W-18" TO "PDO-P" ON THE FLOPPY DISK DRIVE, MAKING SURE IT IS CORRECTLY ALIGNED.

DISK DRIVE FRONT PANEL WIRING

STEP: 14 CONNECT THE LCD DATA/POWER CABLE "W-40" TO "P65A" ON THE LCD MODULE, WHICH IS MOUNTED ON THE DISK DRIVE FRONT PANEL ASSEMBLY, MAKING SURE IT IS CORRECTLY ALIGNED.

CHECK THAT ALL CABLES ARE CORRECT AND INSTALL THE DISK DRIVE FRONT PANEL ASSEMBLY, REUSE BLINDING GROMMETS.

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STEP: 15 DISCONNECT THE TWO (2) UPPER WIRES FROM THE MCS-2000-SL-L MAINS SWITCH AND RECONNECT THEM WITH "W-38" AND "W-39" FROM THE SDL-20-(L):

1:	"W-38", (NEUTRAL)	BLACK/BLUE,	WITH THE BLUE WIRE
2:	"W-39", (LIVE)	BLACK/BROWN,	WITH THE BROWN WIRE

GROUNDING

STEP: 16 WITH REFERENCE TO THE SDL-20-(L) INSTALLATION DRAWING, DWG NO: **0692E9308-45, SHEET 2 OF 2**:

CONNECT THE GROUND WIRE "W-43" (P/N: 7076E9315-04) TO A GROUND WELD STUD ON THE MCS-2000-SL-L CONTROL PANEL. ROUTE THE WIRE TO THE SDL-20-(L) MAIN BASE PLATE AND CONNECT IT TO A GROUND WELD STUD, USING TWO (2) M5 BARB NUTS AND INT./SP WASHERS.

STEP: 17 INSTALL A 6.3 **mm** FASTON TAB (P/N: 7096E3056-31) ON TO THE TOP WELD STUD OF THE SDL-20-(L) REAR PANEL, (P/N: 7005E9315-23).

MOUNT THE SDL-20-(L) REAR PANEL ONTO THE SDL-20-(L) MAIN BASE PLATE USING THREE (3) M5 SCREWS, NOT SUPPLIED WITH THE KIT.

STEP: 18 CONNECT THE GROUND WIRE "W-36" (P/N: 7076E9315-02) TO THE LOWER GROUND WELD STUD ON THE SDL-20- (L) REAR PANEL.

CONNECT THE OTHER END OF "W-36" TO A GROUND WELD STUD ON THE SDL-20-(L) MAIN ASSEMBLY AS SHOWN IN THE INSTALLATION **DRAWING SHEET 2**.

STEP: 19 CONNECT THE GROUND WIRE "W-42" (P/N: 7076E9316-01) TO A WELD STUD ON THE CENTRE DIVIDING BRACKET USING ONE (1) M5 BARB NUT AND ONE (1) INT./SP WASHER.

CONNECT THE OTHER END OF THE GROUND WIRE "W-42" TO THE FASTON ALREADY INSTALLED ON THE SDL-20-(L) REAR PANEL.

STEP: 20 INSTALL THE SQUARE COVER PLATE (P/N: 7012E9315-76) AND GASKET (P/N: 7096E9056-75) OVER THE RIGHT HAND HOLE IN THE MCS-2000-SL-L INTERNAL FRONT PANEL, SECURE IN PLACE USING THE COVER PLATE BRACKET (P/N: 7012E9315-77).

NOTE: THE REASON FOR DOING THIS IS TO HELP IN PREVENTING DUST, DIRT AND OTHER FOREIGN MATTER ENTERING THE MCS-2000-SL-L TESTER.

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STEP: 21 CHECK THAT ALL WIRING IS CORRECT, SLIDE THE SDL-20-(L) MAIN ASSEMBLY COMPLETELY INTO THE MCS-2000-SL-L AND SECURE IN PLACE RE-USING THE FOUR (4) SCREWS.

STEP: 22 RE-INSTALL THE METAL PLATE WHICH COVERS THE CARD RACKS AND THE TOP REAR PANEL.

STEP: 23 RE-INSTALL THE FRONT CONTROL PANEL AND THE PLASTIC FRONT PANEL.

****

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1: CHECK ALL CONNECTIONS ARE CORRECT AND PROPERLY SECURED.

2: PLUG THE TESTER INTO THE NEAREST MAINS OUTLET. INSERT THE SERVICE DISK WHICH CONTAINS THE SDL-20 SOFTWARE, MCS-2000 SERVICE DISK (V5.0 OR HIGHER).

3: SWITCH ON THE POWER TO THE UNIT. THE MCS AND THE SDL ARE BOTH POWERED UP.

THE TESTER SHOULD PERFORM THE MEMORY TEST ROUTINE, PROGRAMME LOADING SEQUENCE, AFTER THE TESTER CONFIGURATION AND CALIBRATION PAGES HAVE BEEN DISPLAYED, THE "MAIN MENU" WILL BE DISPLAYED:

PROGRAMME SELECTION
- TESTER CONFIGURATION ENTRY
- TESTER CALIBRATION
- GAS BENCH SPECIAL FUNCTIONS
- SPECIAL FUNCTIONS
- LANGUAGE SELECTION
- VEHICLE QUICK TESTS
- FACTORY TESTS

4: SELECT THE "TESTER CONFIGURATION ENTRY" PAGE FROM THE MAIN MENU. THE "TESTER CONFIGURATION ENTRY" (PAGE 1) SHOULD BE DISPLAYED:

TESTER CONFIGURATION ENTRY	
- DIESEL OPTION	NOT DEFINED
- DIAGNOSTICS	DEFINED
- TECH-15	NOT DEFINED
- DIGITAL SCOPE	DEFINED
- BAROMETER	NOT DEFINED
- KEYBOARD	NOT DEFINED
- DATE AND TIME	DEFINED
- SDL-20	"DEFINED"
- OIML	NOT DEFINED

5: STEP THROUGH ALL LINES BY SETTING "DEFINED/NOT DEFINED" AS REQUIRED, BY PRESSING THE # KEY.

SET THE "SDL-20" OPTION TO "DEFINED".

WHEN THE # KEY IS PRESSED ON THE LAST LINE, THE "TESTER CONFIGURATION ENTRY" (PAGE 2) WILL BE DISPLAYED:

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TESTER CONFIGURATION ENTRY	
- EXT. CRT DRIVER	NOT DEFINED
- BIT 13	NOT DEFINED
- BIT 14	NOT DEFINED
- BIT 15	NOT DEFINED

THE DEFINITIONS "BIT 13, BIT 14 & BIT 15" ARE INTENDED FOR FUTURE USE AND SHOULD BE LEFT AS "NOT DEFINED".

6: NEXT THE "TESTER OPTIONS ENTRY" PAGES (2 PAGES) WILL BE DISPLAYED:

OPTIONS ENTRY, PAGE 1:

TESTER OPTIONS ENTRY	
- KEYPAD TYPE	"MEA"
- PRINTER TYPE	OKI-182E
- GAS BENCH TYPE	SGM-2004
- GASES AVAILABLE	HC/C02/CO
- GAS APPROVAL	PTB
- COUNTRY CODE	GERMANY

NOTE: MAKE SURE THE "KEYPAD TYPE" IS SET TO "MEA" KEYPAD.

OPTIONS ENTRY, PAGE 2:

TESTER OPTIONS ENTRY	
- ADDRESS 403223	000
- ADDRESS 403225	000
- ADDRESS 403227	000
- ADDRESS 403229	000
- ADDRESS 40322A	255
- ADDRESS 40322C	000
- ADDRESS 40322E	000
- ADDRESS 403231	000

THIS PAGE IS RESERVED FOR FUTURE USE. EACH ENTRY CAN BE DEFINED AS A DECIMAL VALUE FROM 0 TO 255.

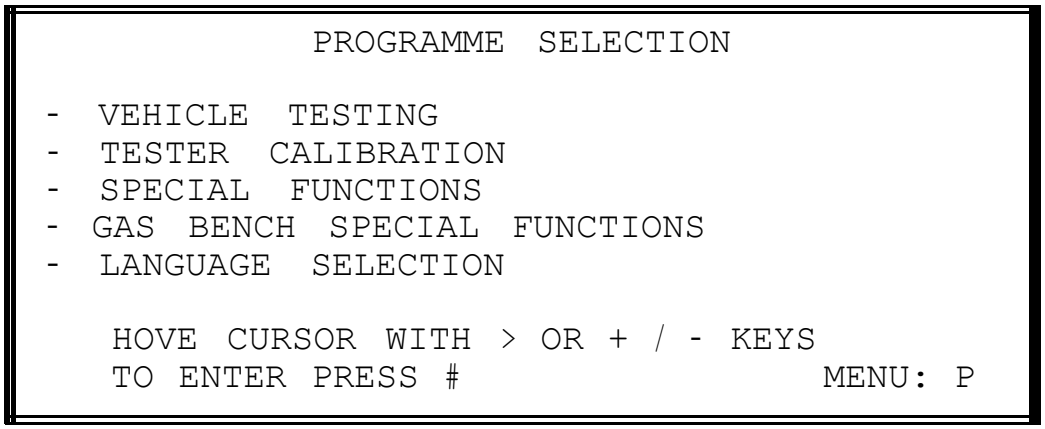
7: WHEN COMPLETED, RETURN TO THE MAIN MENU, SWITCH OFF THE POWER.

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8: REMOVE THE SERVICE DISK AND INSERT THE SYSTEM DISK (V5.00 OR HIGHER). SWITCH ON THE POWER TO THE UNIT.

THE TESTER SHOULD PERFORM THE SELF TEST ROUTINE, PROGRAMME LOADING SEQUENCE, WARM-UP PERIOD (APPROX. 15 MIN) AND THE CALIBRATION SEQUENCE.

AFTER THE TESTER CALIBRATION SEQUENCE HAS BEEN COMPLETED, THE "PROGRAM SELECTION" PAGE WILL BE DISPLAYED:



9: SELECT "VEHICLE TESTING" AND PERFORM AN ENGINE TEST TO ENSURE THE MCS SYSTEM IS OPERATING CORRECTLY.

10: WHEN COMPLETED, POWER DOWN THE TESTER WITH THE SYSTEM DISK STILL INSERTED IN THE DISK DRIVE.

****

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SDL-20-(L): CHECK OUT PROCEDURE

1: INSERT AN APPLICATION DISK INTO THE DISK DRIVE OF THE SDL-20-(L) (FOR EXAMPLE: SDL-FORD-MON.GB, P/N: 0553E0672-41). ALSO, MAKE SURE THAT THE MCS SYSTEM DISK IS INSERTED IN THE MCS DISK DRIVE.

2: SWITCH ON THE POWER TO THE UNIT.

3: AFTER THE TESTER CALIBRATION SEQUENCE HAS BEEN COMPLETED, THE "PROGRAM SELECTION" PAGE WILL BE DISPLAYED:

```
            PROGRAMME SELECTION

- VEHICLE TESTING
- TESTER CALIBRATION
- SPECIAL FUNCTIONS
- GAS BENCH SPECIAL FUNCTIONS
- LANGUAGE SELECTION

   MOVE CURSOR WITH > OR + / - KEYS
   TO ENTER PRESS #              MENU: P
```

7: PRESS THE  "GO TO SDL/STL" KEY ON THE REMOTE CONTROL.

THE LED ON THE SDL-20-(L) DISK DRIVE SHOULD LIGHT AND THE FOLLOWING SHOULD BE DISPLAYED ON THE MONITOR:

```
          VEHICLE IDENTIFICATION
                  MODEL

          FIESTA
          ESCORT
          SIERRA/SAPPHIRE
          SCORPIO/GRANADA

      NEW IDENTIFICATION: PUSH P, +-
    SELECTION: . AND +-, THEN PUSH E
```

NOTE: "E" =  KEY, TO RETURN TO MCS PROGRAM MENU PRESS THE # KEY.

SHOULD PROBLEMS OCCUR, IT WILL BE NECESSARY TO PERFORM THE PROCEDURES AS DESCRIBED IN THE "TEST PROCEDURE SDL-20-(L)", P/N: 0692E9308-54.

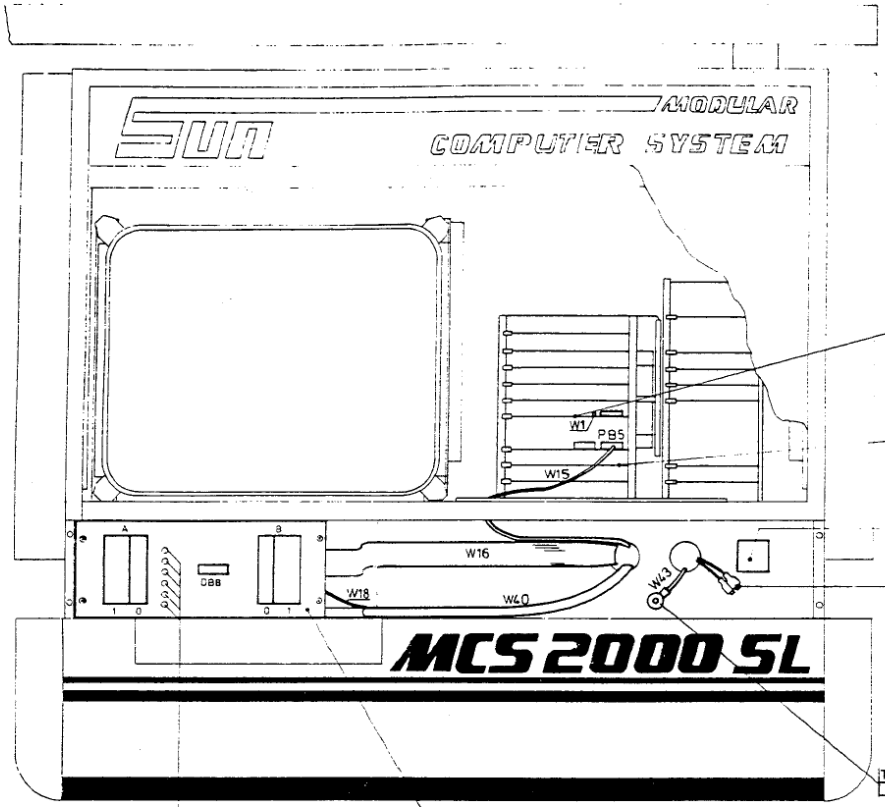
A COMPLETE SERVICE MANUAL FOR THE SDL-20-(L) WILL BE ISSUED AT A LATER DATE.

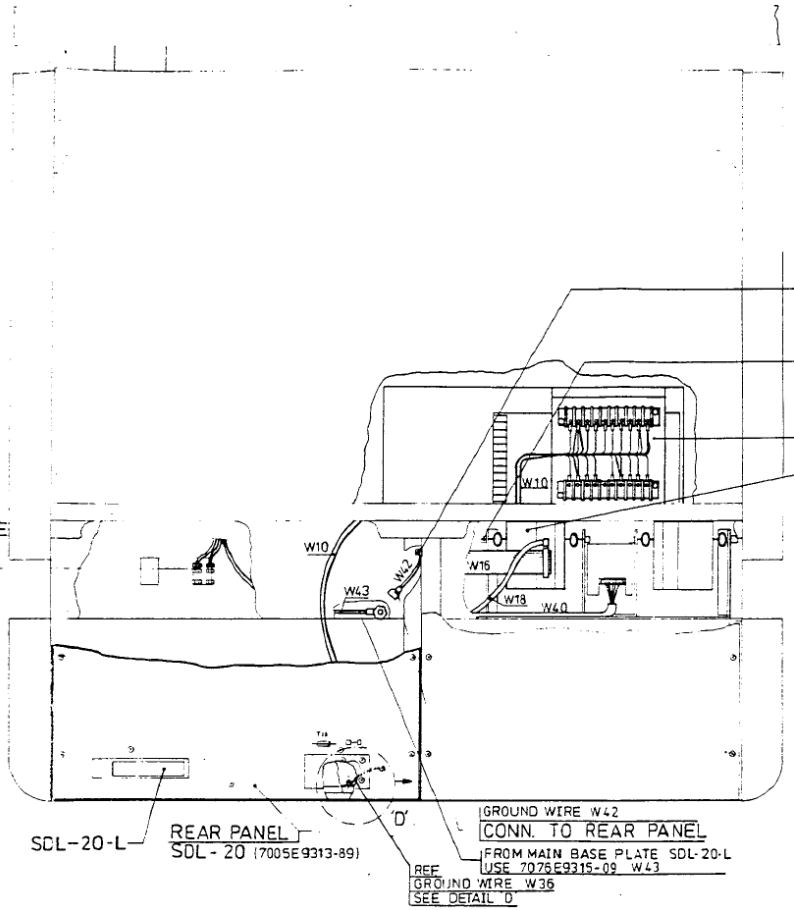
THIS COMPLETES THE SDL-20-(L) CHECK-OUT PROCEDURE
AND
THE SDL-20-(L) INSTALLATION PROCEDURE

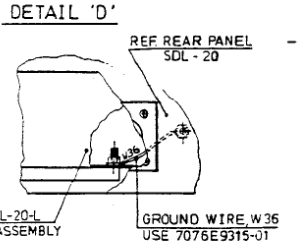
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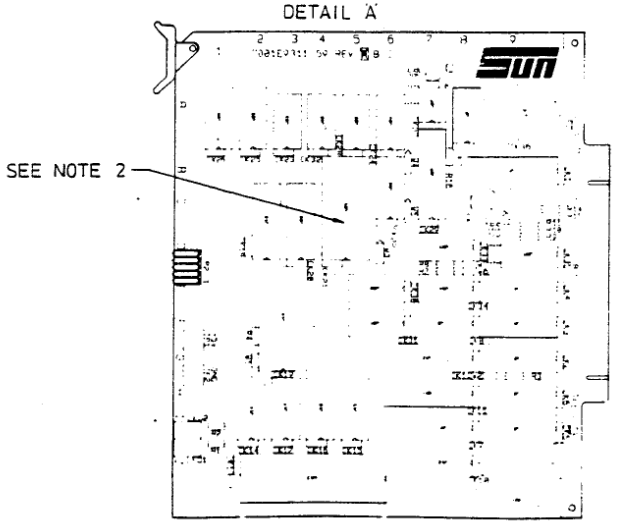
Archived and available on Sun Electric.nl
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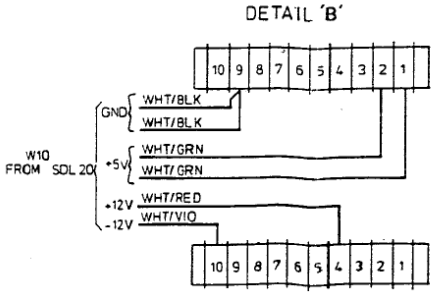
Rev	Date	ECN	Description	Check	Appr
A	05-92		ERN 0779 REL. FOR PRD		
B	07-92	2.06.069E	CHANGED DRAWING TO IMPROVE VISABILITY GROUND CONNECTIONS		











NOTES:

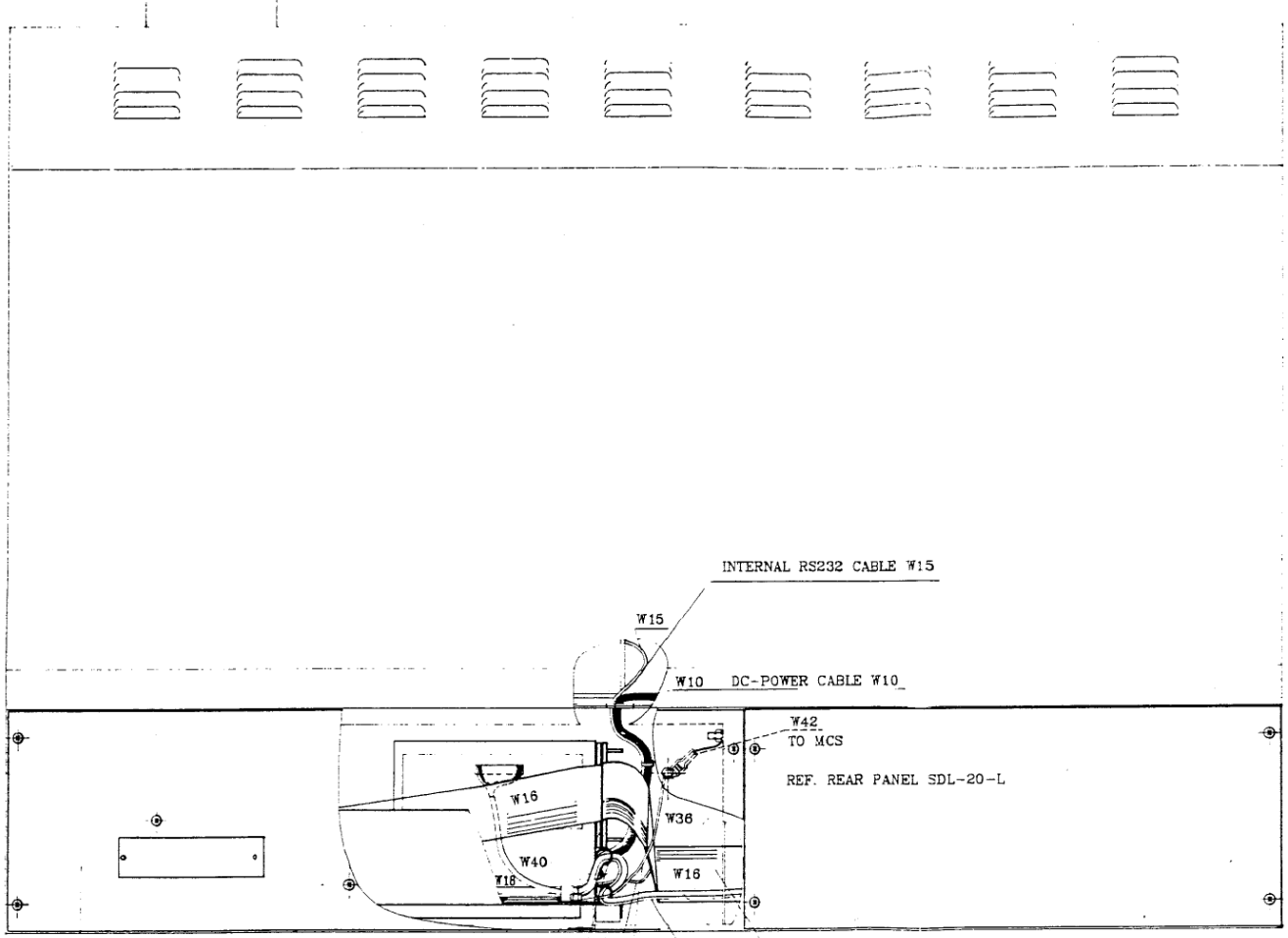
1) DISCONNECT UPPER TWO WIRES AND RECONNECT THEM TOGETHER WITH W38 & W39 OF SDL-20-L
   RECONNECT AS FOLLOWING: BLUE/BLACK WITH BLUE (W38)
   BROWN/BLACK WITH BROWN (W39)
2) IF EPROM P/N: 0703E0501-01 IS INSTALLED THEN REPLACE EPROM WITH UPDATE.
3) PLACE JUMPER ON LOCATION W1 ON ECPU-68K-BOARD IN SLOT 6 IF JUMPER IS NOT INSTALLED. MCS 2000SL

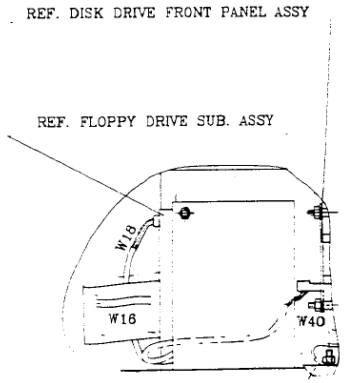
1	1	SDL-20-L	SDL-20-L
Item	Qty	Dwg / Part no	Description
Scale	N.T.S	Date	Used in MCS-2000 SL
Designed by			Materials
Drawn by	R v.d. HOEF	02-12-91	
Checked by	O. D'Souza	9-05-92	
Approved	Ronald Lee	27-5-92	

INSTALLATION DRAWING SDL-20-L — Dwg no 0692E9308-45

Sun — A1 — Sheet 1 of 2 — Code — Project no E9201 — Issue B

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REF. F. CABLE CLAMP BASE
REF. 2x F. CABLE CLAMP COVER
(SEE NOTE)

REAR PANEL SDL-20-L
(7005E9315-23)

FLOPPY DATA CABLE W16

LCD DATA CABLE W40

FLOPPY POWER CABLE W18

GROUND WIRE W36 (USE 7076E9315-02)

GROUND WIRE W43 (USE 7076E9315-04)
FROM BASE PLATE ,SDL-20-L

REF. PLASTIC CLIP NX5 (SEE NOTE)

REF.W36

REF. MAIN BASE PLATE,SDL-20-L

REF.W43
TO GROUND
ON FRONT PANEL

NOTE : FOR INSTALLATION IN MCS-2000SL-L
- REROUTE WIRES,W10;W15;W16;W18; W40 AS SHOWN
- MOUNT CABLE CLAMP AND PLASTIC CLIPS AS SHOWN.

Item	Qty.	Dwg./Part no	Description		Remarks
Scale	N.T.S.		Date	Used in	MCS2000SL-L
Designed by				Material	
Drawn by	H.v/d NIEUWENDIJK		21-05-92		
Checked by	O.BRUINSMA		27-05-92		
Approved	B.GEE		27-05-92	Finish	

Unless otherwise specified: Dimensions are in mm. Tolerances on: Angles ± 0.5° Holes ± 0.1 Rest ± 0.5

Remove all sharp corners and remove burrs

INSTALLATION DRAWING SDL-20-L

Dwg no. 0892E9308-43

Sun Electric Europe B.V.

A1

Sheet 2 of 2

Code

Project no. E9201

Issue B

S U N E L E C T R I C E U R O P E

FIELD INSTALLATION INSTRUCTIONS

THE REMOTE CONTROL KITS

FOR THE MCS-2000 SL, PART NO: 7009E9316-55

AND

FOR THE OCS-2000 SL, PART NO: 7009E9316-63

JANUARY-1992

PART NO: 0692E9307-70 REV: A

REF FILE: MCS-REM.DOC REF: ERN 0607

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FIELD INSTALLATION INSTRUCTIONS

FOR THE REMOTE CONTROL KIT(S)

MCS-2000 SL / OCS-2000 SL

TABLE OF CONTENTS

INTRODUCTION	**PAGE 1**
KIT(S) CONTENTS (PART NUMBERS)	**PAGE 2**
TOOLS AND EQUIPMENT REQUIRED	**PAGE 3**
PRE-INSTALLATION PROCEDURE	**PAGE 3**
TESTER CONFIGURATION PROCEDURE	**PAGE 3**
HARDWARE INSTALLATION PROCEDURE	**PAGE 6**
REMOTE CONTROL WIRING TABLES	**PAGE 8**
CHECK OUT PROCEDURE	**PAGE 9**

DRAWINGS

INSTALLATION DRAWING	DWG NO: 0692E9307-71 (1 SHEET)
SYSTEM WIRING DIAGRAM MCS/OCS-2000 REV: F	DWG NO: 7092E9311-71 (3 SHEETS)

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INTRODUCTION

EVERY EFFORT HAS BEEN TAKEN IN THE PREPARATION OF THIS INSTALLATION BOOKLET TO ENSURE THE SUCCESSFUL FIELD INSTALLATION OF THE REMOTE CONTROL KIT(S) FOR THE MCS-2000 AND THE OCS-2000 TESTERS WHILE MINIMISING THE TIME AND MANPOWER REQUIRED.

THIS BOOKLET IS DESIGNED TO ENABLE THE INSTALLATION TO BE CARRIED OUT USING ONLY THE TOOLS AND EQUIPMENT SPECIFIED IN THE EQUIPMENT SPECIFIED SECTION.

MAKE SURE THE LATEST SOFTWARE IS INSTALLED (V5.00 OR HIGHER), REFER TO THE LATEST SERVICE BULLETINS FOR DETAILS.

THE NEW REMOTE CONTROL

THE NEW REMOTE CONTROL(S) FOR THE MCS/OCS TESTERS ARE SIMILAR TO THE MEA-1500 REMOTE CONTROL. THE NEW REMOTE CONTROL CAN BE USED IN:

1: ALL TEST FUNCTIONS

2: SPECIAL FUNCTIONS PROGRAMME SELECTION, FOR EXAMPLE, GO TO MULTIMETER, GO TO SCOPE, GO TO SDL, ETC,

3: SPECIAL FUNCTIONS IN "SCOPE".

*** * * I M P O R T A N T * * ***

T H E T E S T E R M U S T B E C O N F I G U R E D F O R T H E " N E W R E M O T E C O N T R O L - BEFORE T H E H A R D W A R E MODIFICATION A R E PERFORMED,

*** * * * * * * * * * ***

GENERAL NOTES

THE FOLLOWING PROCEDURE MUST BE CARRIED OUT IN THE SEQUENCE AS SPECIFIED IN THE TABLE OF CONTENTS.

DO NOT TOUCH ANY PART OF THE TESTER UNLESS INSTRUCTED TO DO SO. THESE RULES SHOULD BE ADHERED TO DURING THE INSTALLATION PROCEDURE:

1: ALWAYS SWITCH OFF THE MAINS SUPPLY WHEN WORKING INSIDE THE CABINET,

2: WHEN UP-GRADING THE SOFTWARE LEVEL BE CAREFUL TO AVOID HANDLING THE INDIVIDUAL EPROMS MORE THAN ABSOLUTELY NECESSARY.

3: WHILE HANDLING THE EPROMS TRANSFER THEM AS QUICKLY AS POSSIBLE FROM THE ANTI-STATIC TUBE TO THEIR CORRECT LOCATION ON THE PRINTED CIRCUIT BOARD.

DO NOT TOUCH THE EPROM PINS AND PCB CONTACTS

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4: WHEN ROUTING WIRES AND CABLES, ALWAYS KEEP THEM AWAY FROM NOISY'. COMPONENTS SUCH AS TRANSFORMERS ETC.

5: REMEMBER THAT THERE SHOULD BE NO SCREWS OR WASHERS ETC. LEFTOVER WHEN THE INSTALLATION PROCEDURE IS COMPLETED.

****

KIT CONTENTS

THE REMOTE CONTROL KITS PART NO: 7009E9316-55 FOR THE MCS-2000 AND PART NO: 7009E9316-63 FOR THE OCS-2000, COME COMPLETE WITH ALL OF THE PARTS NECESSARY TO CORRECTLY INSTALL THE KIT(S) IN THE FIELD.

THE REMOTE CONTROL KIT (PART NO: 7009E9316-55, MCS-2000)

ITEM	PART NO:	QTY	DESCRIPTION
1	7076E9321-82	1	CABLE W4 REMOTE CONTROL
2	5878-0015	7	TY-RAP
3	7009E9316-54	1	REMOTE CONTROL ASS'Y II
4	0692E9307-70	1	INSTALLATION INSTRUCTIONS
5	0692E9307-71	REF	INSTALLATION DRAWING

THE REMOTE CONTROL KIT (PART NO: 7009E9316-63, OCS-2000)

ITEM	PART NO:	QTY	DESCRIPTION
1	7076E9321-82	1	CABLE W4 REMOTE CONTROL
2	5878-0015	7	TY-RAP
3	7009E9316-62	1	REMOTE CONTROL ASS'Y III
4	0692E9307-70	1	INSTALLATION INSTRUCTIONS
5	0692E9307-71	REF	INSTALLATION DRAWING

NOTES: THE NEW REMOTE CONTROL KIT(S) ARE ACTIVE IN THE MCS SOFTWARE VERSION V5.00 OR HIGHER.

WHEN THE NEW REMOTE CONTROL(S) ARE INSTALLED THE TESTER CONFIGURATION MUST BE CHANGED USING THE MCS SERVICE DISK (V5.00 OR HIGHER).

THE MCS-2000 SYSTEM AND SERVICE DISKS ARE NOT PARTS OF THE REMOTE CONTROL KITS.

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TOOLS, EQUIPMENT AND DOCUMENTATION REQUIRED

THE FOLLOWING TOOLS, EQUIPMENT AND REFERENCE DOCUMENTATION ARE REQUIRED TO CORRECTLY INSTALL THE REMOTE CONTROL KIT(S) IN THE FIELD:

1 A CROSS-HEAD SCREWDRIVER

2: A FLATHEAD SCREWDRIVER

3: A SNIPE NOSE PLIERS

4: A SIDE CUTTER

5: INSTALLATION DRAWING (REF) DWG NO: 0692E9307-71

6: MCS-2000 SERVICE MANUAL, FOR REFERENCE

7: MCS-2000 SYSTEM DISK (V5.00 OR HIGHER)

8: MCS-2000 SERVICE DISK (V5.00 OR HIGHER)

9: MCS-2000 SERVICE DISK (V5.OO OR HIGHER) MANUAL, P/N: 0692E9308-17

PRE-INSTALLATION CHECKOUT PROCEDURE

BEFORE BEGINNING THE INSTALLATION OF THE REMOTE CONTROL KIT(S) INTO THE MCS-2000 OR OCS-2000, IT IS IMPORTANT TO VERIFY THE CORRECT OPERATION OF THE UNIT:

A: SWITCH ON THE UNIT AND ALLOW IT TO WARM-UP IN THE USUAL MANNER.

B: AFTER THE WARM-UP PROCEED THROUGH THE SELF TEST AND CALIBRATION.

C: ANY FAULTS SHOULD BE NOTED AND CORRECTED BEFORE STARTING THE INSTALLATION PROCEDURE. REFER TO THE SERVICE MANUAL FOR TROUBLESHOOTING INFORMATION ETC.

* * * **IMPORTANT** * * *

THE TESTER MUST BE CONFIGURED FOR THE "NEW REMOTE CONTROL" BEFORE THE HARDWARE MODIFICATIONS ARE PERFORMED.

* * * * * * * * * * *

CONFIGURATION PROCEDURE

1: POWER DOWN THE TESTER AND INSERT THE SERVICE DISK WHICH CONTAINS THE NEW REMOTE CONTROL SOFTWARE, (V5.0 OR HIGHER). POWER UP THE TESTER,

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THE TESTER SHOULD PERFORM THE MEMORY TEST ROUTINE, PROGRAMME LOADING SEQUENCE, AFTER THE TESTER CONFIGURATION AND CALIBRATION PAGES HAVE BEEN DISPLAYED, THE "MAIN MENU" WILL BE DISPLAYED:

PROGRAMME SELECTION
- TESTER CONFIGURATION ENTRY
- TESTER CALIBRATION
- GAS BENCH SPECIAL FUNCTIONS
- SPECIAL FUNCTIONS
- LANGUAGE SELECTION
- VEHICLE QUICK TESTS
- FACTORY TESTS

2: SELECT THE "TESTER CONFIGURATION ENTRY" PAGE FROM THE MAIN MENU. THE "TESTER CONFIGURATION ENTRY" (PAGE 1) SHOULD BE DISPLAYED:

TESTER CONFIGURATION ENTRY	
- DIESEL OPTION	NOT DEFINED
- DIAGNOSTICS	NOT DEFINED
- TECH-15	NOT DEFINED
- DIGITAL SCOPE	DEFINED
- BAROMETER	NOT DEFINED
- KEYBOARD	NOT DEFINED
- DATE AND TIME	DEFINED
- SDL-20	NOT DEFINED
- OIML	NOT DEFINED

3: STEP THROUGH ALL LINES BY SETTING "DEFINED/NOT DEFINED" AS REQUIRED, BY PRESSING THE # KEY.

WHEN THE # KEY IS PRESSED ON THE LAST LINE, THE "TESTER CONFIGURATION ENTRY" (PAGE 2) WILL BE DISPLAYED:

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TESTER CONFIGURATION ENTRY	
- EXT. CRT DRIVER	NOT DEFINED
- BIT 13	NOT DEFINED
- BIT 14	NOT DEFINED
- BIT 15	NOT DEFINED

THE DEFINITIONS "BIT 13, BIT 14 & BIT 15" ARE INTENDED FOR FUTURE USE AND SHOULD BE LEFT AS "NOT DEFINED".

4: NEXT THE "TESTER OPTIONS ENTRY" PAGES (2 PAGES) WILL BE DISPLAYED:

OPTIONS ENTRY, PAGE 1:

TESTER OPTIONS ENTRY	
- KEYPAD TYPE	"MEA"
PRINTER TYPE	OKI-182E
GAS BENCH TYPE	SGM-2004
- GASES AVAILABLE	HC/C02/CO
- GAS APPROVAL	PTB
- COUNTRY CODE	GERMANY

5: SET "KEYPAD TYPE" TO "MEA" KEYPAD.

OPTIONS ENTRY, PAGE 2:

THIS PAGE IS RESERVED FOR FUTURE USE. EACH ENTRY CAN BE DEFINED AS A DECIMAL VALUE FROM 0 TO 255.

TESTER OPTIONS ENTRY	
- ADDRESS 403223	000
- ADDRESS 403225	000
- ADDRESS 403227	000
- ADDRESS 403229	000
- ADDRESS 40322A	255
- ADDRESS 40322C	000
- ADDRESS 40322E	000
- ADDRESS 403231	000

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PRESSING THE # KEY ON THE LAST LINE, THE CAPTION "WRITING TO MEMORY" WILL BE DISPLAYED.

6: WHEN COMPLETED, RE-BOOT THE TESTER.

****

HARDWARE INSTALLATION PROCEDURE

STEP: 1 AFTER PERFORMING THE INITIAL CHECKOUT, CONFIGURATION PROCEDURE AND ANY NECESSARY REPAIRS ARE CARRIED OUT, SWITCH OFF THE UNIT AND DISCONNECT IT FROM THE MAINS POWER SOURCE.

STEP: 2 CHECK THE MAINS CABLE AND PLUG FOR ANY DAMAGE AND REPAIR OR REPLACE AS NECESSARY.

STEP: 3 CHECK THE CONDITION OF ALL EXTERNAL LEADS, TUBING AND PICK-UPS CONNECTED TO THE UNIT FOR DAMAGE AND REPAIR OR REPLACE AS NECESSARY.

STEP: 4 REMOVE THE PLASTIC FRONT PANEL FROM THE MCS/OCS-2000.

STEP: 5 REMOVE THE TOP METAL COVER FROM THE BOOM ASSEMBLY OF THE MCS/OCS-2000.

STEP: 6 DISCONNECT THE EXISTING REMOTE CONTROL FROM J-408 ON THE BOOM ASSEMBLY.

STEP: 7 WITH REFERENCE TO THE INSTALLATION DRAWING 0692E9307-71 AND TO THE OLD AND NEW REMOTE CONTROL WIRING TABLES (**PAGE 8**):

ROUTE THE W4-REM CABLE (P/N: 7076E9321-82, WITH THE RING TERMINAL TO THE INPUT END) THROUGH THE BOOM ASSEMBLY TO THE DIGITAL RACK.

INSERT THE RED WIRE OF W4-REM INTO THE REMOTE CONTROL CONNECTOR J-408, PIN 3 AND INSERT THE BLACK WIRE OF W4-REM INTO THE REMOTE CONTROL CONNECTOR J-408, PIN 9.

CONNECT THE RING TERMINAL TO A SOLID CHASSIS EARTH.

STEP: 8 DISCONNECT THE CONNECTOR J-205 FROM THE DIGITAL I/O BOARD IN THE DIGITAL RACK (SLOT 1).

REMOVE THE DUMMY LEAF CONTACTS FROM PIN D, PIN 4 AND PIN 13 OF THE CONNECTOR J-205.

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MOVE THE WHITE/BLACK LEAF CONTACT FROM PIN 15 TO PIN D ON THE CONNECTOR J-205.

INSERT THE RED WIRE FROM THE W4-REM CABLE INTO PIN 4 OF CONNECTOR J-205 AND INSERT THE BLACK WIRE FROM THE W4-REM CABLE INTO PIN 13 ON THE CONNECTOR J-205,

RECONNECT THE CONNECTOR J-205 TO THE DIGITAL I/O BOARD.

STEP: 9 CHECK ALL CONNECTIONS ARE CORRECT AND SECURE THE W4-REM CABLE IN PLACE USING THE 7 TY-RAPS.

STEP: 10 REINSTALL THE BOOM TOP COVER PLATE AND THE MCS/OCS-2000 PLASTIC FRONT PANEL.

STEP: 11 CONNECT THE NEW REMOTE CONTROL (REMOTE CONTROL II FOR THE MCS-2000 AND REMOTE CONTROL III FOR THE OCS-2000) TO THE CONNECTOR J-408 ON THE BOOM ASSEMBLY.

****

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MCS/OCS-2000 REMOTE CONTROL WIRING TABLES

1: OLD REMOTE CONTROL WIRING TABLE

BOOM J-408	W4 WIRE COLOUR	DIGITAL I/O J-205	COMMENTS:
-	-	D	REMOVE DUMMY LEAF CONTACT
-	-	4	REMOVE DUMMY LEAF CONTACT
-		13	REMOVE DUMMY LEAF CONTACT
1	SCREEN		TO SOLID CHASSIS GROUND
2	WHITE/BLACK	15	
3	N.C.		
4	BLACK	10	
5	BROWN	9	
6	RED	L	
7	ORANGE	K	
8	N.C.		
9	N.C.		
10	YELLOW	N	
11	GREEN	11	
12	BLUE	M	
13	VIOLET	R	
14	WHITE	14	

2: NEW REMOTE CONTROL WIRING TABLE

BOOM J-408	W4 + W4-REM WIRE COLOUR	DIGITAL I/O J-205	COMMENTS:
-	SCREEN		W4-REM TO SOLID CHASSIS GND
1	SCREEN		TO SOLID CHASSIS GROUND
2	WHITE/BLACK	D	MOVED FROM J-205, PIN 15
3	RED	4	W4-REM ADDED, J-205, PIN 4
4	BLACK	10	
5	BROWN	9	
6	RED	L	
7	ORANGE	K	
8	N.C.		
9	BLACK	13	W4-REM ADDED, J-205, PIN 13
10	YELLOW	N	
11	GREEN	11	
12	BLUE	M	
13	VIOLET	R	
14	WHITE	14	

CONNECTOR J-205 PIN LOCATIONS (NEW REMOTE CONTROL)

1	2	3	"4"	5	6	7	8	"9"	"10"	"11"	12	"13"	"14"	15
A	B	C	"D"	E	F	H	J	"K"	"L"	"M"	"N"	P	"R"	S

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CHECKOUT PROCEDURE

1: CHECK ALL CONNECTIONS ARE CORRECT AND PROPERLY SECURED.

2: PLUG THE TESTER INTO THE NEAREST MAINS OUTLET. INSERT THE SERVICE DISK WHICH CONTAINS THE KEYPAD SOFTWARE, MCS-2000 SERVICE DISK (V5.0 OR HIGHER), SWITCH ON THE POWER TO THE UNIT.

THE TESTER SHOULD PERFORM THE MEMORY TEST ROUTINE, PROGRAMME LOADING SEQUENCE, AFTER THE TESTER CONFIGURATION AND CALIBRATION PAGES HAVE BEEN DISPLAYED, THE "MAIN MENU" WILL BE DISPLAYED:

PROGRAMME SELECTION

- TESTER CONFIGURATION ENTRY
- TESTER CALIBRATION
- GAS BENCH SPECIAL FUNCTIONS
- SPECIAL FUNCTIONS
- LANGUAGE SELECTION
- VEHICLE QUICK TESTS
- FACTORY TESTS

3: SELECT THE "FACTORY TESTS". BEFORE THE FACTORY TEST MENU APPEARS THE "SIMULATOR CONFIGURATION" ENTRY MUST BE ENTERED:

SIMULATOR CONFIGURATION

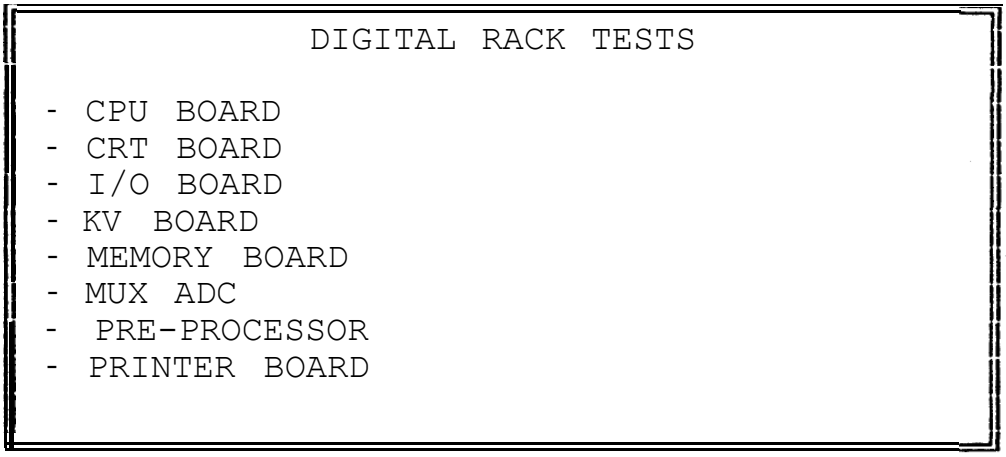
ENGINE TYPE:	LPG
NUMBER OF CYLINDERS:	4
FIRING ORDER:	1- 3- 4- 2
CYLINDER STROKE:	4
MAG PROBE:	YES
TDC OFFSET:	-20.0

FACTORY TESTS

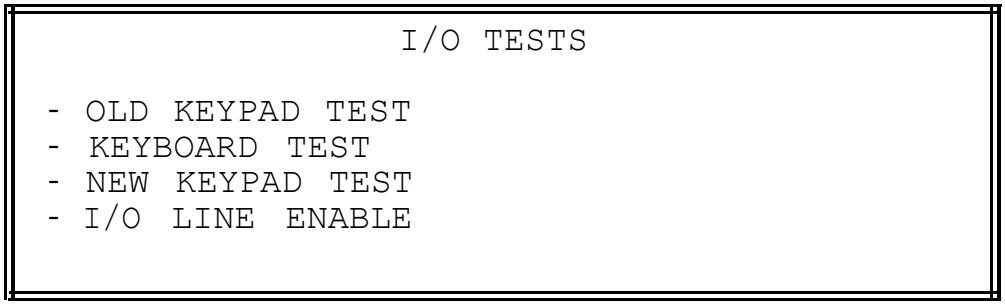
- DIGITAL RACK TEST
- ANALOG RACK TEST

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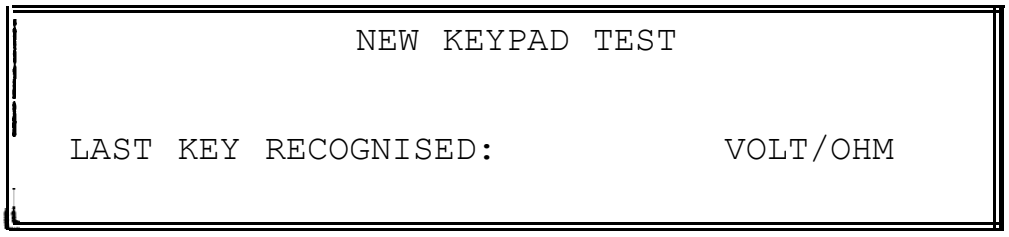
4: SELECT THE "DIGITAL RACK TESTS":



5: SELECT THE "I/O BOARD" TESTS:



6: SELECT "NEW KEYPAD TEST":



WHEN A KEY IS PRESSED ON THE KEYPAD, A LINE OF TEXT THAT CORRESPONDS TO THE FUNCTION OF THAT KEY IS DISPLAYED.

7: WHEN COMPLETED, RETURN TO THE MAIN MENU, SWITCH OFF THE POWER,

REMOVE THE SERVICE DISK AND INSERT THE SYSTEM DISK (V5.00 OR HIGHER). SWITCH ON THE POWER TO THE UNIT.

THE TESTER SHOULD PERFORM THE SELF TEST ROUTINE, PROGRAMME LOADING SEQUENCE, WARM-UP PERIOD (APPROX. 15 MIN) AND THE CALIBRATION SEQUENCE.

AFTER THE TESTER CALIBRATION SEQUENCE HAS BEEN COMPLETED, THE "PROGRAM SELECTION" PAGE WILL BE DISPLAYED:

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PROGRAMME SELECTION

- VEHICLE TESTING
- TESTER CALIBRATION
- SPECIAL FUNCTIONS
- GAS BENCH SPECIAL FUNCTIONS
- LANGUAGE SELECTION

MOVE CURSOR WITH > OR + / - KEYS
TO ENTER PRESS # MENU: P

8: SELECT "VEHICLE TESTING" AND PERFORM AN ENGINE TEST TO ENSURE THE SYSTEM IS OPERATING CORRECTLY.

9: PERFORM AN ENGINE TEST TO ENSURE THAT THE REMOTE CONTROL IS FULLY OPERATIONAL,

THIS COMPLETES THE REMOTE CONTROL INSTALLATION

****

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FIELD INSTALLATION INSTRUCTIONS

FOR

THE DSS-1 FIELD INSTALLATION KIT

FOR

THE MCS/OCS-2000SL

P/N :0692E9309-74
REV.:A, APRIL-1995
FILE:MCSDSS.DOC
REF :ERN NO. 1037, 1071
ECN NO. 3.07.091E, 3.10.127E

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FIELD INSTALLATION INSTRUCTIONS
FOR
THE DSS-1 FIELD INSTALLATION KIT
FOR
THE MCS/OCS-2000SL

TABLE OF CONTENTS

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CONFIGURATION AND CHECK OUT	PAGE 8

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INTRODUCTION

DIB, DOMP, DSS-1, DSPP, MDIB, UDK and RS232 are all optional kits or parts of kits for diesel measurement on a MCS/OCS.
These abbreviations may confuse you but they will be made clear.

Every effort has been taken in the preparation of this installation booklet to explain the coherence between the pieces of hardware and to ensure a successful field installation.

PRODUCT DESCRIPTION

This installation booklet describes the field installation of the "DSS-1 Field Installation Kit".

This kits contains all the necessary hardware to interface a DSS-1 (Diesel Smoke Sensor) to a SUN MCS/OCS-2000SL, equipped with a UDK (Universal Diesel Kit).

Note that the DSS-1 and the UDK are not included in this kit.

NOTES

Always switch off the mains supply when working inside the unit.

Make sure the correct hardware is installed in the tester before starting the installation. Refer to the service manual, service bulletins and option list.

Make sure the correct software is available before starting the installation.

Use anti-static procedures while performing the installation. Utilise the "Static Field Service Kit", p/n: 0552-0032-09.

Be careful to avoid handling the individual EPROM's more than absolutely necessary. Do not touch the PCB contacts or EPROM pins.

The installation procedure must be carried out in the sequence as described.

When routing wires and cables, always keep them away from noisy components such as transformers etc.

Do not forget to refit the ground connections to the front and back plate or the gas-bench drawer when finished.

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KIT CONTENTS (PART NUMBERS)

7009E9318-32 * DSS-1 FIELD INSTALLATION KIT

- 7009E9318-01 * DSS-1 SUPPORT KIT
  - 7009E9318-00 * DSS-1 INTERFACE BOX (DIB)
    - 7001E9312-82 * PCB ASSY DSPP
    - 7001E9313-06 * PCB ASSY MDIB
    - 0739-0094-00 * FUSE T 4.00 A
  - 7009E9318-02 * ACCESSORY KIT
  - 6004E9312-16 * DSS-1 COMMUNICATION CABLE 9 M
  - 6004E9312-18 * EXTERNAL DATA CABLE MCS-DIB
- 7009E9318-12 * DIESEL OUTPUT MULTIPL. BOARD KIT (DOMB)
  - 7001E9313-20 * PCB ASSY DOMP
  - 7076E9323-08 * DOMP CONNECTION CABLE
  - 7076E9323-09 * MODIFICATION WIRE W114
  - 5878-0015-00 * TY-RAP
- 7009E9315-11 * RS232 INTERNAL OPTION KIT
  - 7076E9311-83 * WIRE HARNESS W4FD
  - 7030E9301-36 * LABEL A RS232-C
  - 4162-0602-00 * SCREW LOCK SET UNC
  - 7096E3055-12 * JUMPER, Wl PCB ASSY CPU
- 0680-2022-00 * RESISTOR, 150 OHM
- 7096E4056-53 * SHRINK TUBING, 55 mm

NOTE; 6004E9312-17 * OPTIONAL DSS-1 COMM. CABLE 20 M

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DRAWINGS

INSTALLATION DRAWINGS:

0692E9309-73	DSS-1 SUPPORT KIT	1 SHEET
0692E9309-78	DOMB OPTION KIT	1 SHEET
0692E9306-09	RS232 INTERNAL OPTION KIT	1 SHEET

ASSEMBLY AND SYSTEM WIRING:

7009E9318-00	ASSEMBLY DSS-1 INTERFACE BOX	1 SHEET
7092E9311-71	SYSTEM WIRING MCS/OCS	4 SHEETS

BOARDS:

709239312-82	DSPP PCB SCHEMATIC	3 SHEETS
7001E9312-82	DSPP PCB ASSEMBLY	1 SHEET
7092E9313-06	MDIB PCB SCHEMATIC	1 SHEET
7001E9313-06	MDIB PCB ASSEMBLY	1 SHEET
7092E9313-20	DOMB PCB SCHEMATIC	1 SHEET
7001E9313-20	DOMB PCB ASSEMBLY	1 SHEET
7092E9310-11	FLOPPY/RS-INT PCB SCHEMATIC	2 SHEETS
7001E9310-05	FLOPPY/RS-INT PCB ASSEMBLY	1 SHEET

CABLES:

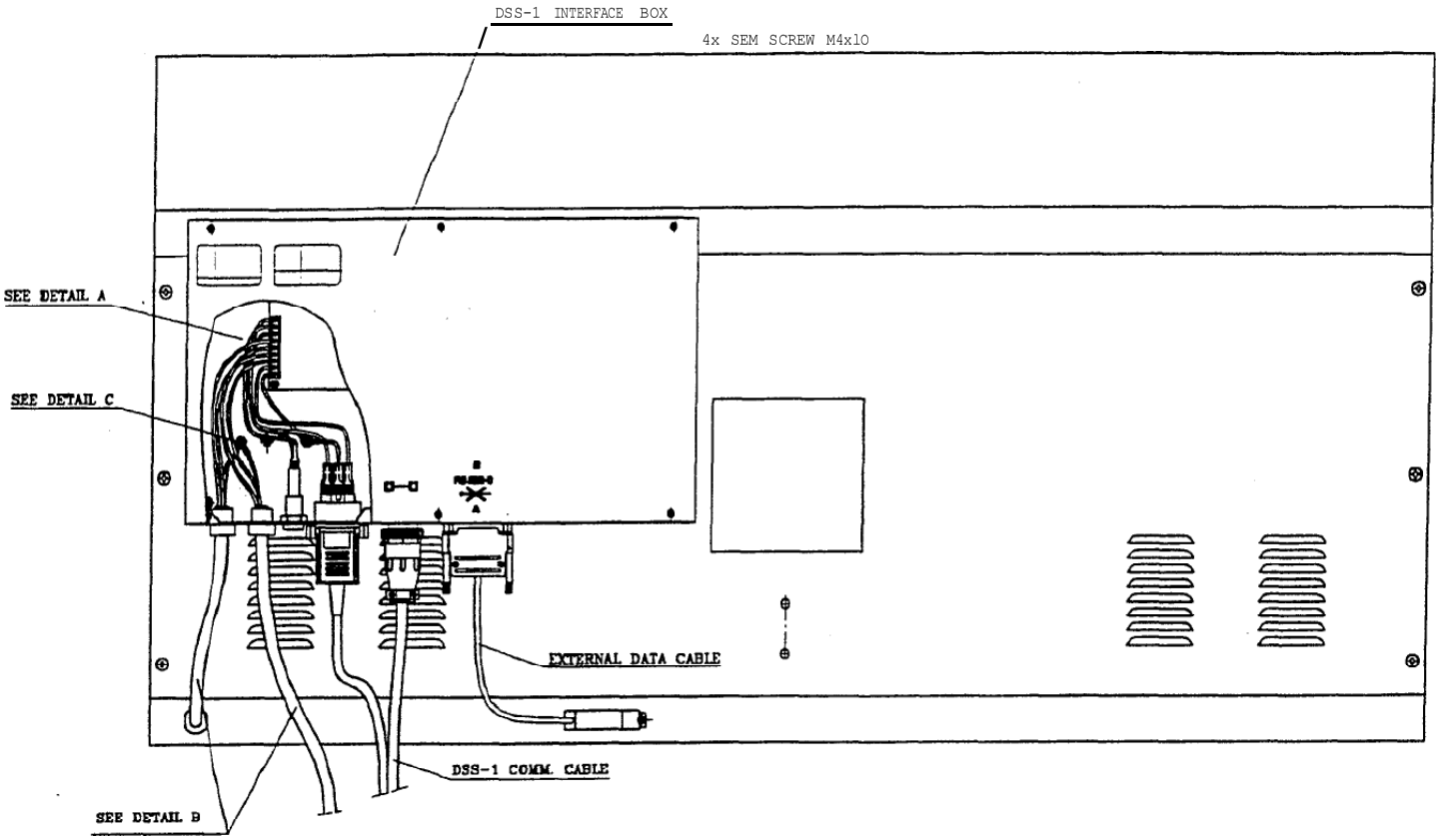
6004E9312-16	DSS-1 COMMUNICATION CABLE	1 SHEET
6004E9312-18	DSS-1 EXTERNAL DATA CABLE	1 SHEET
7076E9323-08	DOMP CONNECTION CABLE	1 SHEET
7076E9311-83	RS232 WIRE HARNESS MCS/OCS	1 SHEET

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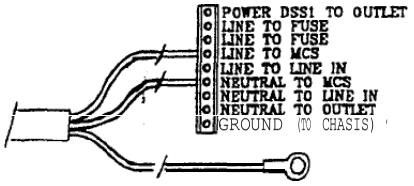
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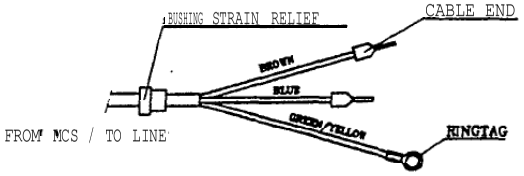
Rev	Date	Description	Check	Appr
A	09'93	ERN# 1037 R.F.P.	P.T.	



DETAIL A

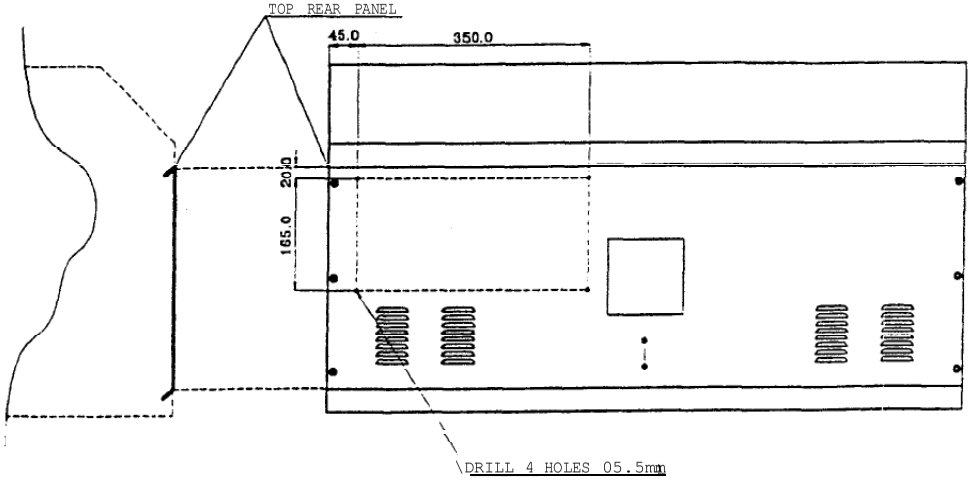


DETAIL B

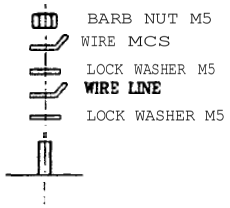


COLOR	LENGTH	STRIP
BROWN	130mm	5mm
BLUE	120mm	5mm
GREEN/YELLOW	140mm	5mm

STRIP OUTER COVER 140mm



DETAIL C



NOTES:

1) DRILL HOLE'S AS SHOWN.

2) CUT MAINS CORD OF MCSA ND STRIP As SHOWN 800mm (FROM BACK OF MCS). INSTALL WIRES AS SHOWN IN DETAIL A.

3) THIS INSTALATION DWG. ASSUMES THAT THE RS-232 KIT (P/N 7009E9315-11) REV C OR HIGHER HAS BEER INSTALLED.

1	1	7009E9318-01	SUPPORT KIT	

Drawn by	R. V/D HOEF	09-93	
Checked by	Peter Tel	11.10.93	
Approved	K. Gee	19.93	

INSTALLATION DRAWING

0592E9309-73

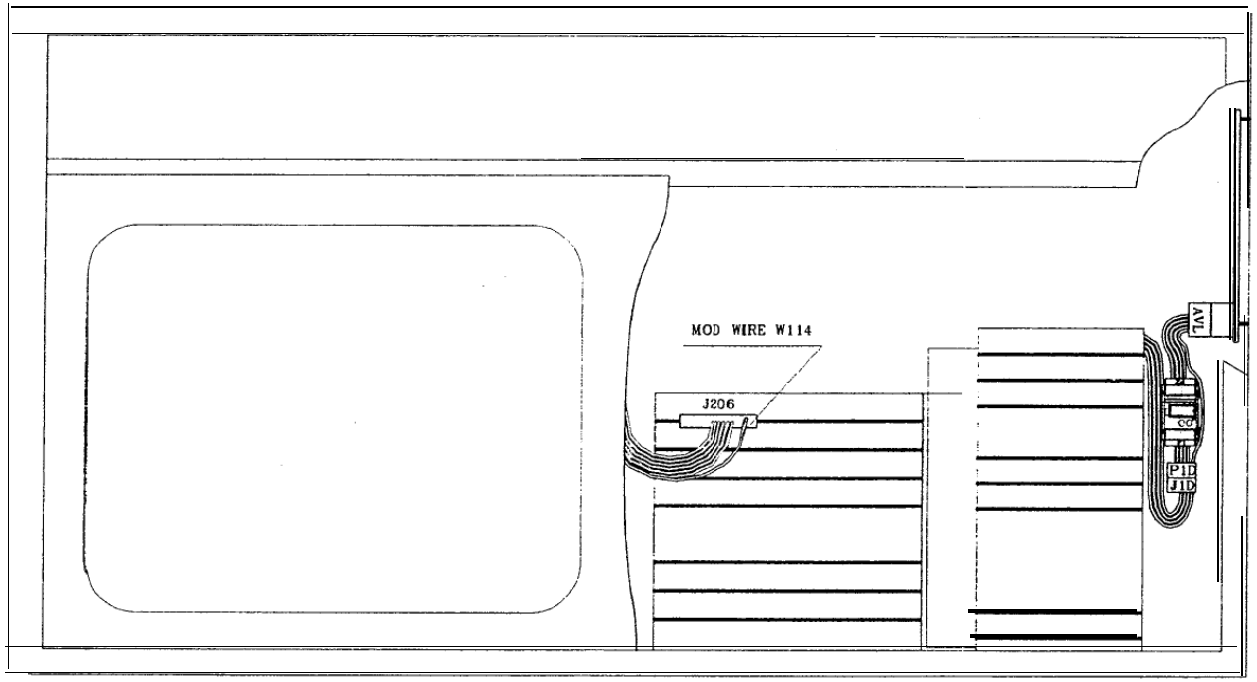
A1

Sheet 1 of 1

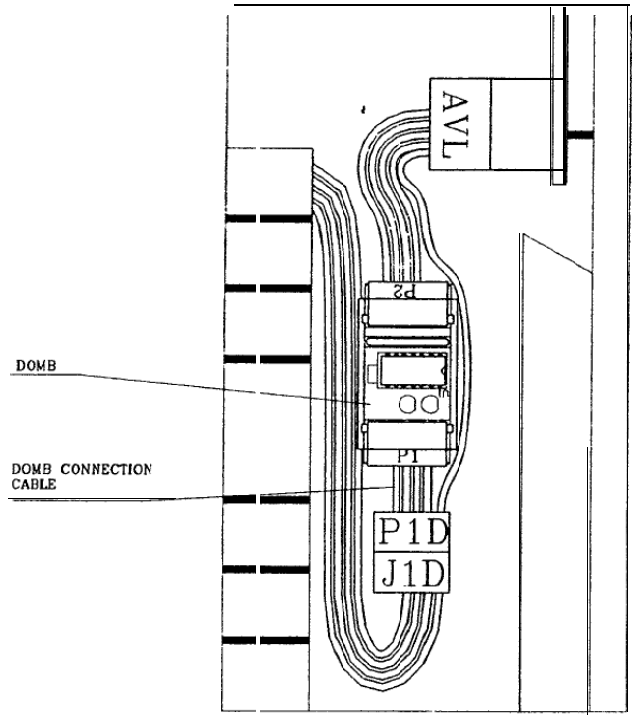
Rev A

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3.2

Rev	Date	Description	Check	Appr
A	10'93	ERN# 1071 R.F.P.	O.B.	B.G.
B	11'93	ECN# 3.10.127E. CORRECTED P1D/J1D WERE PD1/JD1	PT	BG



DETAIL A



NOTES:

1) REMOVE J1D FROM AVL BOARD.
2) LOCATE CABLE 7076E9323-08 BETWEEN J1D AND AVL DIESELBOARD.
3) CONNECT J1 OF CABLE 7076E9323-08 TO P1 OF DOMB AND J2 OF CABLE TO P2 OF DOMB.
4) REMOVE DUMMY CONTACT OF J206-K AND CONNECT LOOSE MODIFICATION WIRE 114 TO J206-K AND J1D-6.
5) DRESS MODIFICATION WIRE W114 TO LOOM 114 USING TYRAPS.

Item	Qty	Dwg/Part no	Description	Remarks
1	1	7009E9318-12	DOMB OPTION KIT	

Scale	N.T.S.	Date	Used on MCS/OCS-2000 SL
Designed by	LEO VIS	10-93	Material
Drawn by	R. V/D HOEF	10-93	
Checked by	OTTE BRUINSMA	10-93	
Approved	BERNARD GEE	10-93	Finish

Unless otherwise specified dimensions are in mm. Tolerances on: Angles ±0° Holes ±0.1 Mill 0.5
Remove all sharp corners and remove burrs

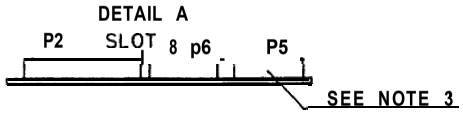
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Dwg no: 0692E9309-78

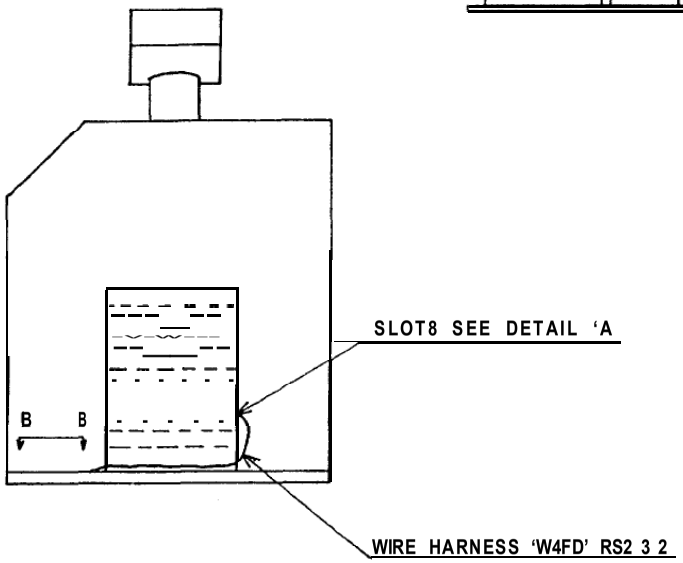
SUN ELECTRIC EUROPE B.V. | A1 | Sheet 1 of 1 | Project no | Rev B

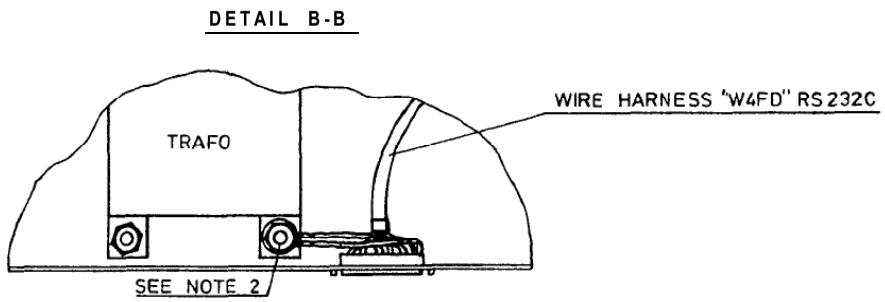
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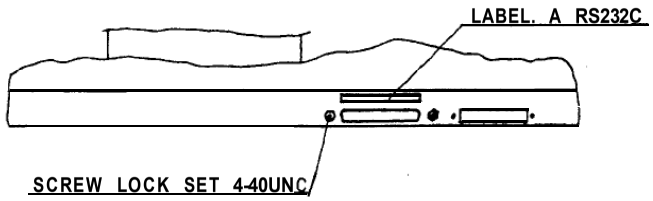
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-3.3-

Revisions					
Rev	Date	ECN	Description	Check	Appr.
B	09-92	2.08.086E	REVISED & REDRAWN	P.T.	BG.
C	07-93	3.07.091E	CHANGED NOTE 3	P.T.	BG









NOTES :

1) MAKE SURE INSERTED CPU BOARD IS P/N 7001E9004 REV. B OR 'HIGHER" & SWITCH JUMPER W12 TO THE ON POSITION. INSTALL JUMPER W1 AT ECPU BOARD P/N 7001E9311-44.
2) CONNECT CABLE SCREEN WIRE RINGTAG & RINGTAG FROM PIN 1 OF J9FD TO TRANSFORMER MOUNTING STUD
3) PLACE RS232C CABLE IN P5 OF SLOT 8. MAKE SURE FLOPPY DISK /RS 232 INTERFACE BOARD IS P/N 7001E9310-05 REV. C OR HIGHER WHEN MCS / DSS-1 INTERFACE IS USED.

Item	Qty.	Dwg./Part no	Description	Remarks
1	1	7009E9315-11	RS232 INTERNAL OPTION KIT	

Scale		Date	Used in MCS 2000
Designed by			Material
Drawn by	R.v.d.HOEF	30-09-92	
Checked by	Peter Tel	30.9.92	
Approved		1.10.92	Finish

Unless otherwise specified: Dimensions are in mm.; Tolerances on: Angles ± 0,5° Holes ± 0,1 Rest ± 0,5

Remove all sharp corners and remove burrs

Description: INSTALLATION DRAWING
Dwg. no: 0692E9306 -09

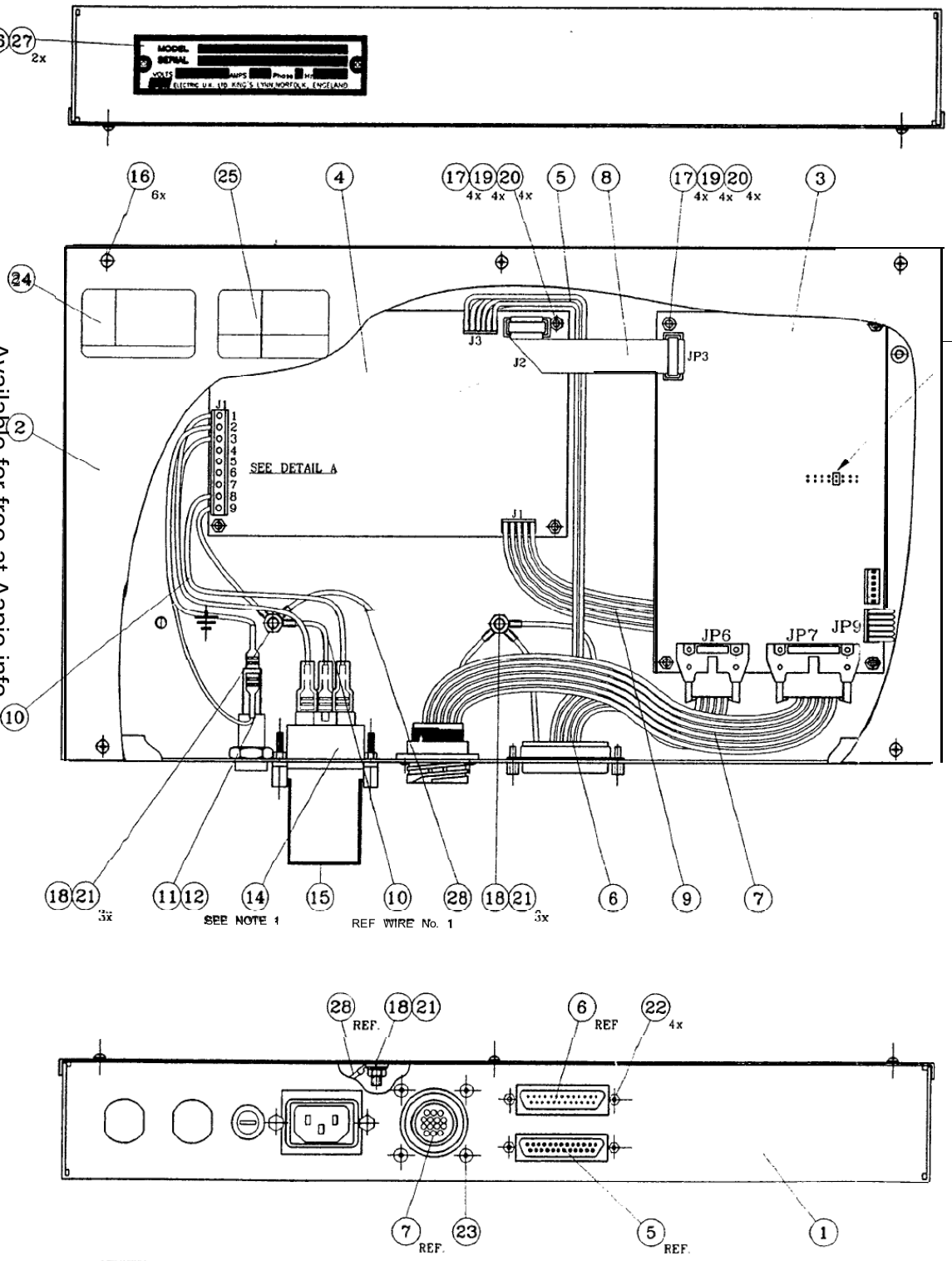
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A2

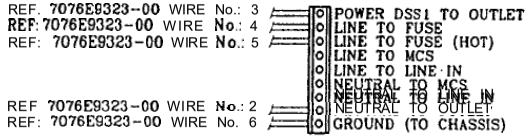
Sheet 1 of 1
Code
Project no.
Issue C

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-3.44-

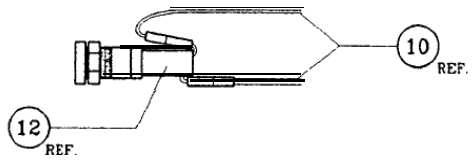
Rev	Date	Description	Check	Appr
A	09'93	ERN# 1037 R FP	PT	B.C
B	11'93	ECN 3.11.137E ADDED GROUNDWIRE TO COVER ITEM 28 CHD QTY ITEM 18 & 21.	P.T.	B.C



DETAIL A



DETAIL B



NOTES

1) BEND TERMINAL AS SHOWN IN DETAIL B

2) INSTALL JUMPER IN POSITION W17-E

Item	Qty	Dwg/Part no	Description	Remarks
29	1	7096E3055-12	JUMPER	
28	1	7076E9315-20	GND WIRE RING/RING	
27	2	003-0608-511	BRIV RIVET	
26	1	1243E9301-70	SERIAL NUMBER PLATE	
25	1	4600E9310-29	STICKER RWTüV D-13.99.016	
24	1	4600E9310-28	STICKER RWTüV A-13.99.021	
23	4	7096E6055-08	RIV SCREW M4	
22	4	4162-0602-00	SCREW LOCK SET	
21	7	400-0500-203	WASHER LOCK M5	
20	8	401-0310-607	SPACER M3x10	
19	8	400-0300-503	WASHER PLAIN M3	
18	3	408-0500-143	BARB NUT M5	
17	8	408-0300-143	BARB NUT M3	
16	6	407-0310-560	SEM SCREW M3	
15	1	7096E9059-07	CONNECTOR RETAINER CLAMP	
14	1	7096E3062-39	MAINS OUTLET	
13				
12	1	7096E4055-14	FUSE HOLDER	
11	1	0739-0094-00	FUSE T4.00 A 6.3x32mm	
10	1	7076E9323-00	MAINS WIRE SET	
9	1	7076E9322-99	POWER CABLE DSPP-PDIB	
8	1	7076E9322-98	RS 232 INT DSPP-PDIB	
7	1	7076E9322-97	SMOKE HEAD INTERNAL	
6	1	7076E9322-96	RS232 INT MCS-SGK2009	
5	1	7076E9322-95	RS232 INT MCS-DIB	
4	1	7001E9313-06	PCB ASSY MDIB (MCS/DSS1 INT. BD)	
3	1	7001E9312-82	PCB ASSY DSPP (DIESEL PRE PROC.)	
2	1	7005E9315-97	COVER TOP	
1	1	7020E9314-75	CASE, DSS1 CONTROL BOX WELD ASSY	

Scale 1 : 1 | Date | Used on

Designed by

Drawn by R. V/D HOEF 08-93 | Material

Checked by PETER TEL 10-93

Approved BERNARD GEE 10-93

Unless otherwise specified : Dimensions are in mm. Tolerances on : Angles ±5° Holes ±0.1 Rest ±0.5

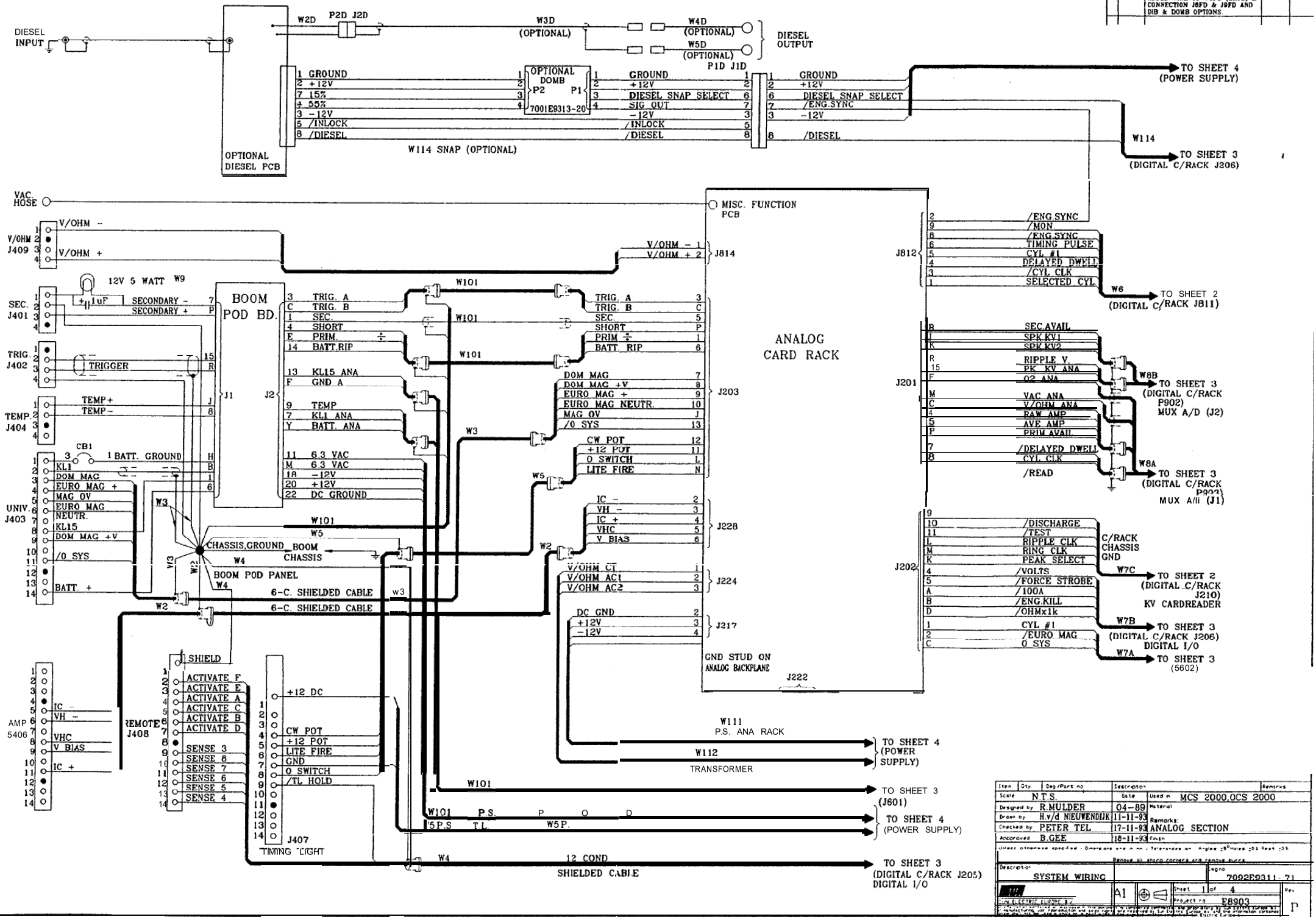
Remove all sharp edges and remove burrs

Description: SUB ASSY DSS-1 INTERFACE BOX | Figure: 7009E9318-00

SUN ELECTRIC EUROPE B.V. | A1 | Sheet 1 of 1 | Project no | Rev B

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Rev.	Date	Description	Check	Appr
P	11'93	ECN# 3.10.127E SHT 1 REDPAWN WAS A2 ADDED WIRE TO W4FD (SHT2) & CONNECTION J8FD & J9FD AND D1B & D0MB OPTIONS	PT	BG



Item	Qty	Dwg/Part no	Description	Remarks
Scale	N.T.S.		Date	Used in MCS 2000,0CS 2000
Designed by	R.MULDER		04-89	Material
Drawn by	H.v/d NIEUWENDIJK		11-11-93	Remarks:
Checked by	PETER TEL		17-11-93	ANALOG SECTION
Approved	B.GEE		18-11-93	Finish

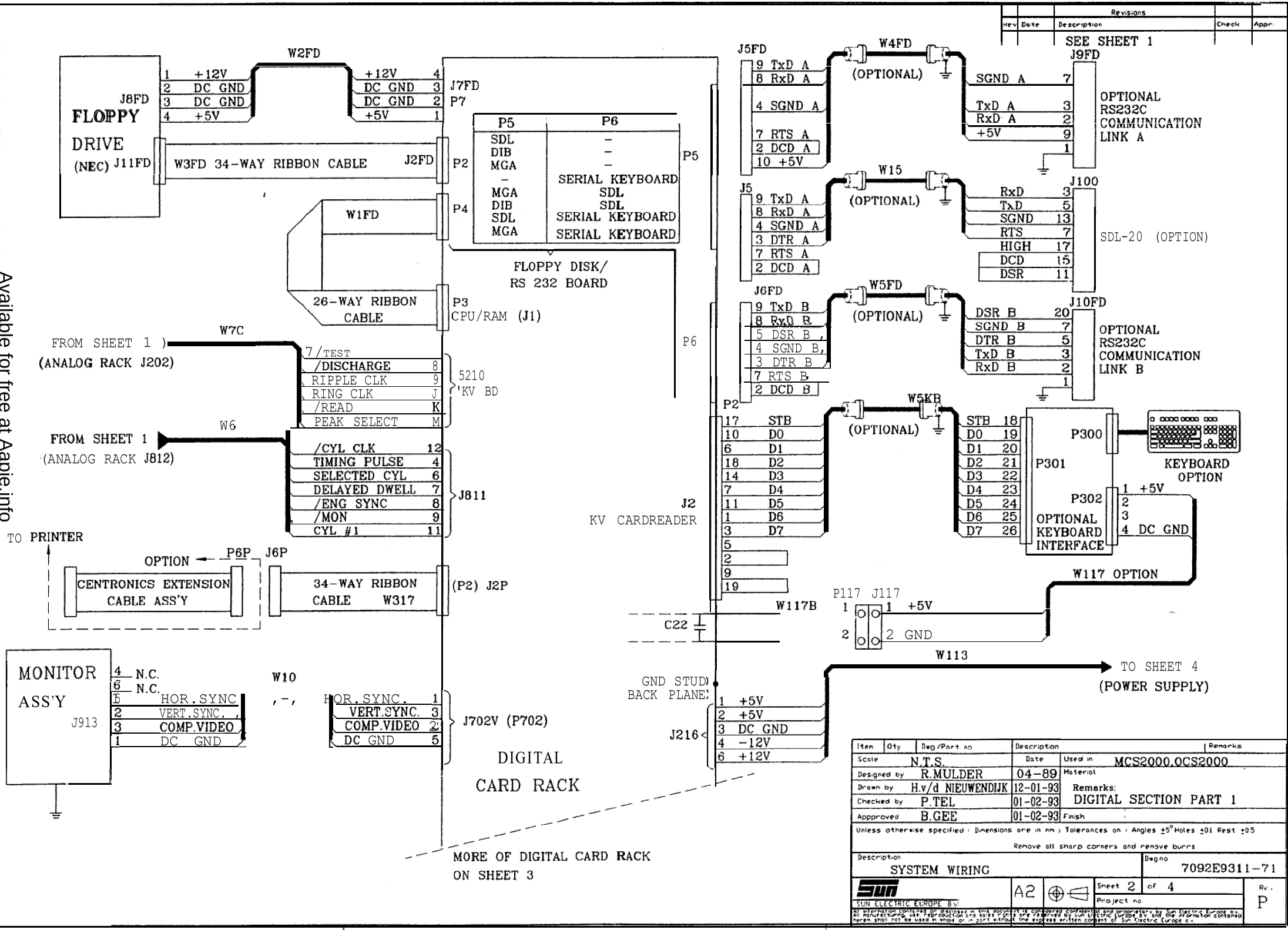
Unless otherwise specified - Dimensions are in m.m. Tolerances on Angles ±0° Holes ±0.1 Rest ±0.5
Remove all sharp corners and remove burrs

Description: SYSTEM WIRING
Dwgno: 7092E9311-71

A1 | Sheet 1 of 4 | Project no E8903 | Rev. P

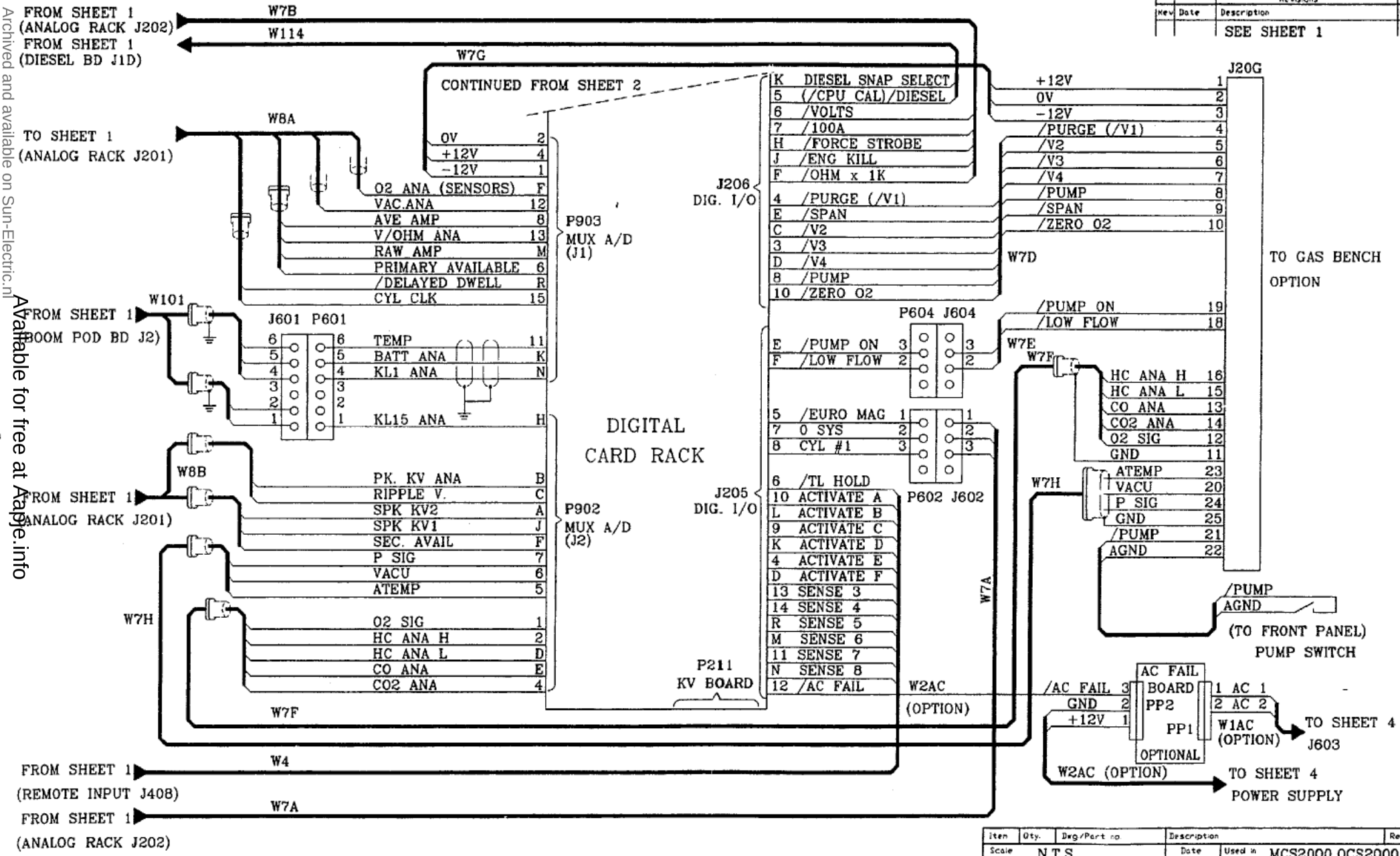
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Revisions				
Rev	Date	Description	Check	Appr.
		SEE SHEET 1		



Item	Qty.	Dwg/Part no.	Description	Remarks
Scale	N.T.S.	Date	Used in	MCS2000.0CS2000
Designed by	R.MULDER	04-89	Material	
Drawn by	H.v/d NIEUWENDIJK	12-01-93	Remarks:	
Checked by	P.TEL	01-02-93	DIGITAL SECTION PART 2	
Approved	B.GEE	01-02-93	Finish	

Unless otherwise specified : Dimensions are in mm / Tolerances on : Angles ±5° Holes ±01 Rest ±05

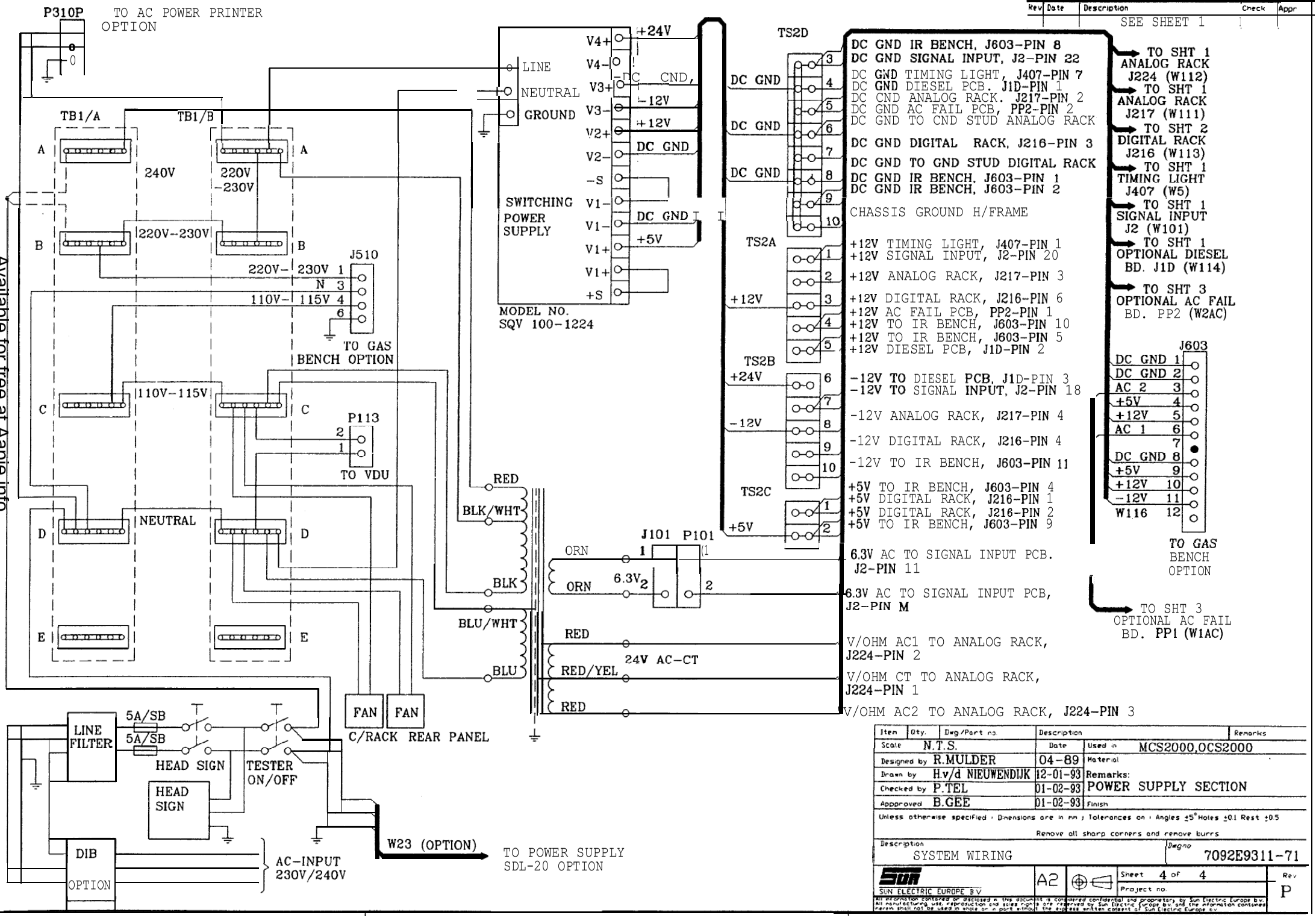
Remove all sharp corners and remove burrs

Description	Dwg no
SYSTEM WIRING	7092E9311-71

SUN ELECTRIC EUROPE B.V. | A2 | Sheet 3 of 4 | Project no | Rev P

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Rev	Date	Description	Check	Appr
Revisions				

Item	Qty.	Dwg/Part no.	Description	Remarks
Scale	N.T.S.	Date	Used in	MCS2000,OCS2000
Designed by	R.MULDER	04-89	Material	
Drawn by	H.v/d NIEUWENDIJK	12-01-93	Remarks:	
Checked by	P.TEL	01-02-93		POWER SUPPLY SECTION
Approved	B.GEE	01-02-93	Finish	

Unless otherwise specified : Dimensions are in mm ; Tolerances on : Angles ±5° Holes ±0.1 Rest ±0.5

Remove all sharp corners and remove burrs

Description: SYSTEM WIRING

Dwg no: 7092E9311-71

SUN ELECTRIC EUROPE B.V. | A2 | Sheet 4 of 4 | Project no. | Rev P

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Revisions					
Rev	Date	ECN	Description	Check	Appr
A	07-93		ERN# 0944.REL.FOR PROD.	DB	BB
B	07-93	3.07.093E	CHANGED C21, WAS 0.1.	DS	BB

PP0 POWER

PIN NO.	SIGNAL
1	GND
2	+5V
3	/INIT

PP1 CANCOMA

PIN NO.	SIGNAL
1	CB0
2	CB2

PP2 CANCOMB

PIN NO.	SIGNAL
1	CB1
2	CB3

PP3 DEBUG CON.

PIN NO.	SIGNAL
1	TXD
2	RXD
3	/REQ
4	/INCON
5	NC
6	NC
7	/COM
8	+5V
9	GND
10	RST

PP4 CAN I/O BUS FOR REF. ONLY

PIN NO.	SIGNAL
1	CLKOUT
2	w.7
3	P0.6
4	P0.5
5	P0.4
6	P0.3
7	P0.3
2	P0.1
2	P0.0
10	P1.0
11	P1.1
12	P1.3
13	pt.3
14	P1.4
15	P1.3
16	P1.6

PP5 EXPANSION CONNECTOR FOR REF. ONLY

PIN NO.	SIGNAL	PIN NO.	SIGNAL
1	AD0	21	RESET
2	AD1	22	/RESET
3	AD2	23	/CS128
4	AD3	24	/CS32
5	AD4	25	/CS16
6	AD5	26	/CSEXP1
7	AD6	27	/CSEXP2
8	AD7	28	/INTURT0
9	A0	29	T0
10	A1	30	T1
11	A2	31	/INT0
12	A3	32	/INT1
13	A4	33	INT2
14	A5	34	/INT0C
15	A6	35	/RD
16	A7	36	/WR
17	A8	37	ALE
18	A9	38	T2EX
19	A10	39	+5V
20	A11	40	GND

PP6 RS232 CHANNEL 0

PIN NO.	SIGNAL
1	GND
2	DCD-0
3	DTR-0
4	GND
5	DSR-0
6	CTS-0
7	RTS-0
8	RxD-0
9	TxD-0
10	+HIGH-0

PP7 RS232 CHANNEL 1

PIN NO.	SIGNAL
1	GND
2	NC
3	DTR-1
4	GND
5	THERM+
6	CTS-1
7	NC
8	RxD-1
9	TxD-1
10	+THRM
11	/SRST
12	+5V
13	+12VF
14	-12VF
15	GND
16	GND

PP8 POWER-IN

PIN NO.	SIGNAL
1	GND
2	+5V
3	/INIT
4	GND
5	+12V
6	-12V

PP9 POWER-OUT

PIN NO.	SIGNAL
1	GND
2	+5V
3	/INIT
4	GND
5	+12V
6	-12V

NOTES:
1/ UNLESS OTHERWISE SPECIFIED:
- A/ ALL RESISTORS ARE IN OHMS, 1/4W, 1%
- B/ ML CAPACITORS ARE IN MICRO-FARADS
- C/ ML DIODES ARE 1N914 OR 1N4148
- D/ ALL IC'S ARE 74HCT-SERIES TYPE
- E/ ALL POLARIZED CAPACITORS ARE 16V

2/ LAST USED NO'S: R30, U21, RP9, F4, CR3, SW1, Q3, X2, C25, TP2, FA1, CK24, W17, LED2, PP9

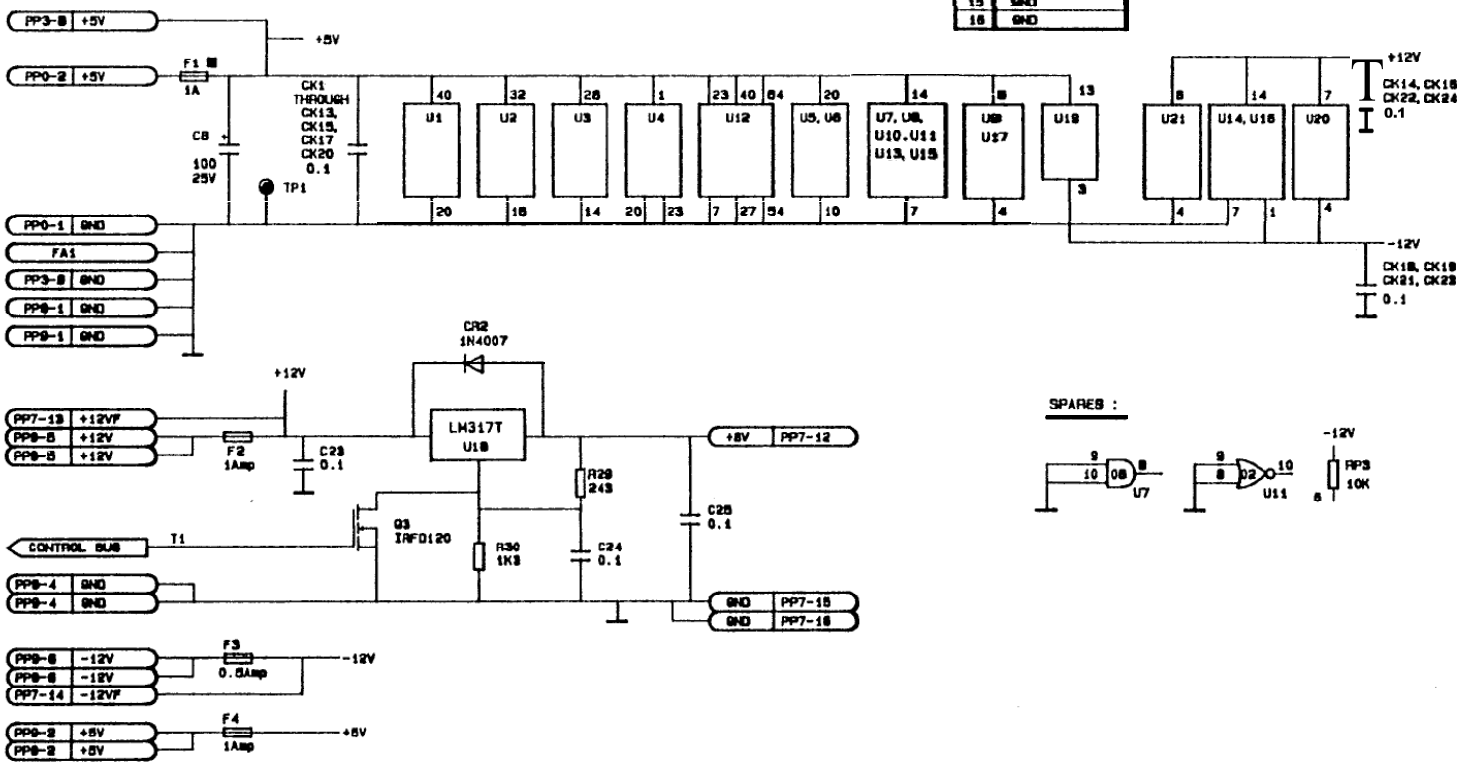
3/ NOT USED NO'S: R5

4/ JUMPERSETTING:
- W1: DEFAULT IN COPPER
- W2: DEFAULT INSTALLED
- W3: 1-2 INSTALLED FOR 8K RAM
  2-3 INSTALLED FOR 32K RAM
- WC: INSTALLED IF CAN IS NM INSTALLED
- W5: DEFAULT 2-3 FOR USE WITH 27C256
  1-2 FOR USE WITH 27C512
- W6: DEFAULT IN COPPER
- W7: DEFAULT IN COPPER
- W8: 2-3 DEFAULT IN COPPER (8K OR 32K RAM)
  1-2 IF 2K RAM IS USED
- W9: OPTION JUMPER (DEFAULT INSTALLED)
- W10: OPTION JUMPER
- W11: DEFAULT IN COPPER
- W12: A - DEFAULT IN COPPER
  B - ENABLES INT2 ON /ACK
- W13: DEFAULT IN COPPER (OUT IF 16C552 IS USED)
- W14: DEFAULT IN COPPER (OUT IF 16C552 IS USED)
- W15: DEFAULT IN COPPER (OUT IF 16C552 IS USED)
- W16: DEFAULT IN COPPER (OUT IF 16C552 IS USED)
- W17: OPTION JUMPERS
  - A:
  - B:
  - C
  - D:
  - E:
  - F:
  - G:
  - H:

  } FUTURE USE

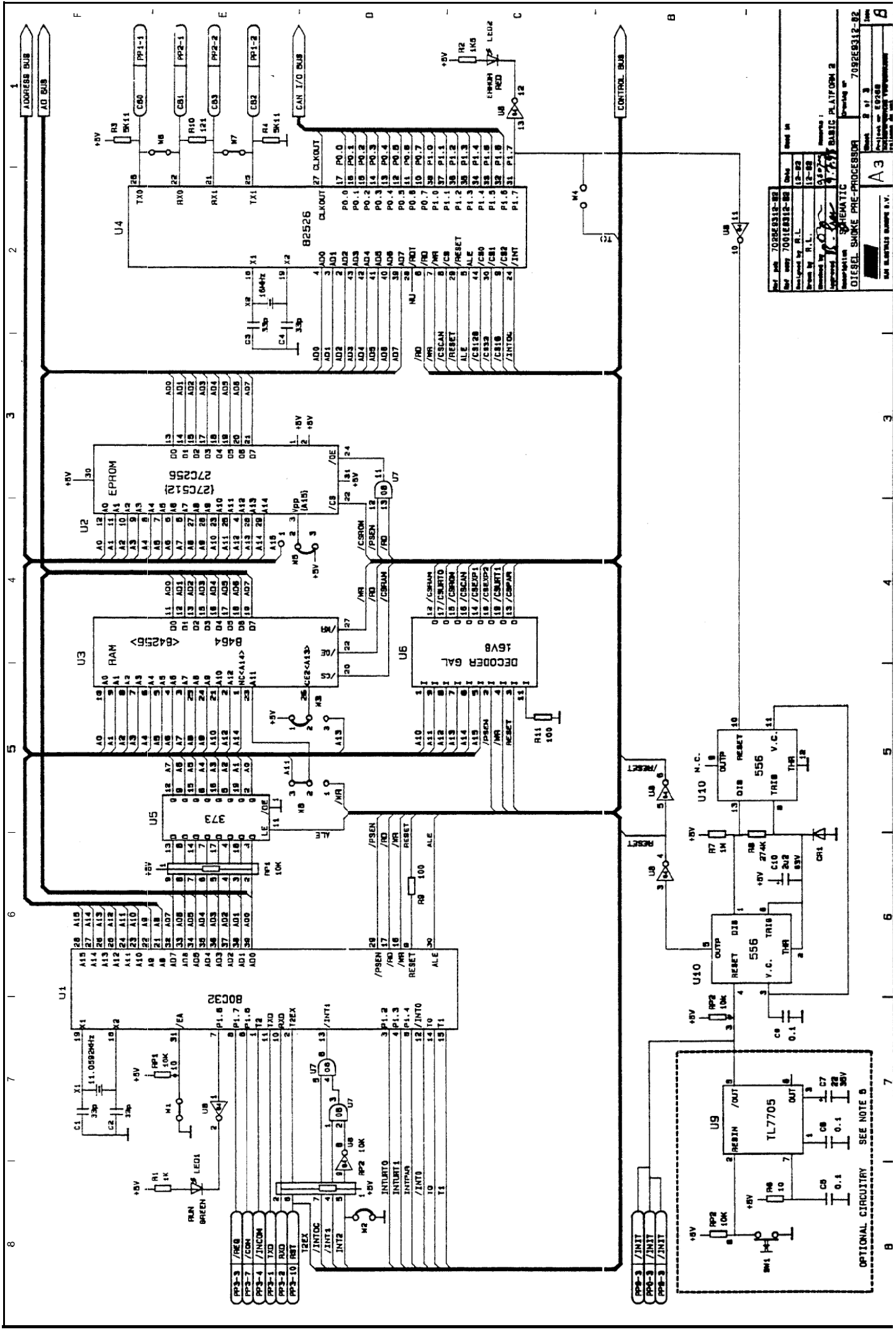
5/ COMPONENTS MARKED WITH ■ ARE NOT INSTALLED

POWER DISTRIBUTION :



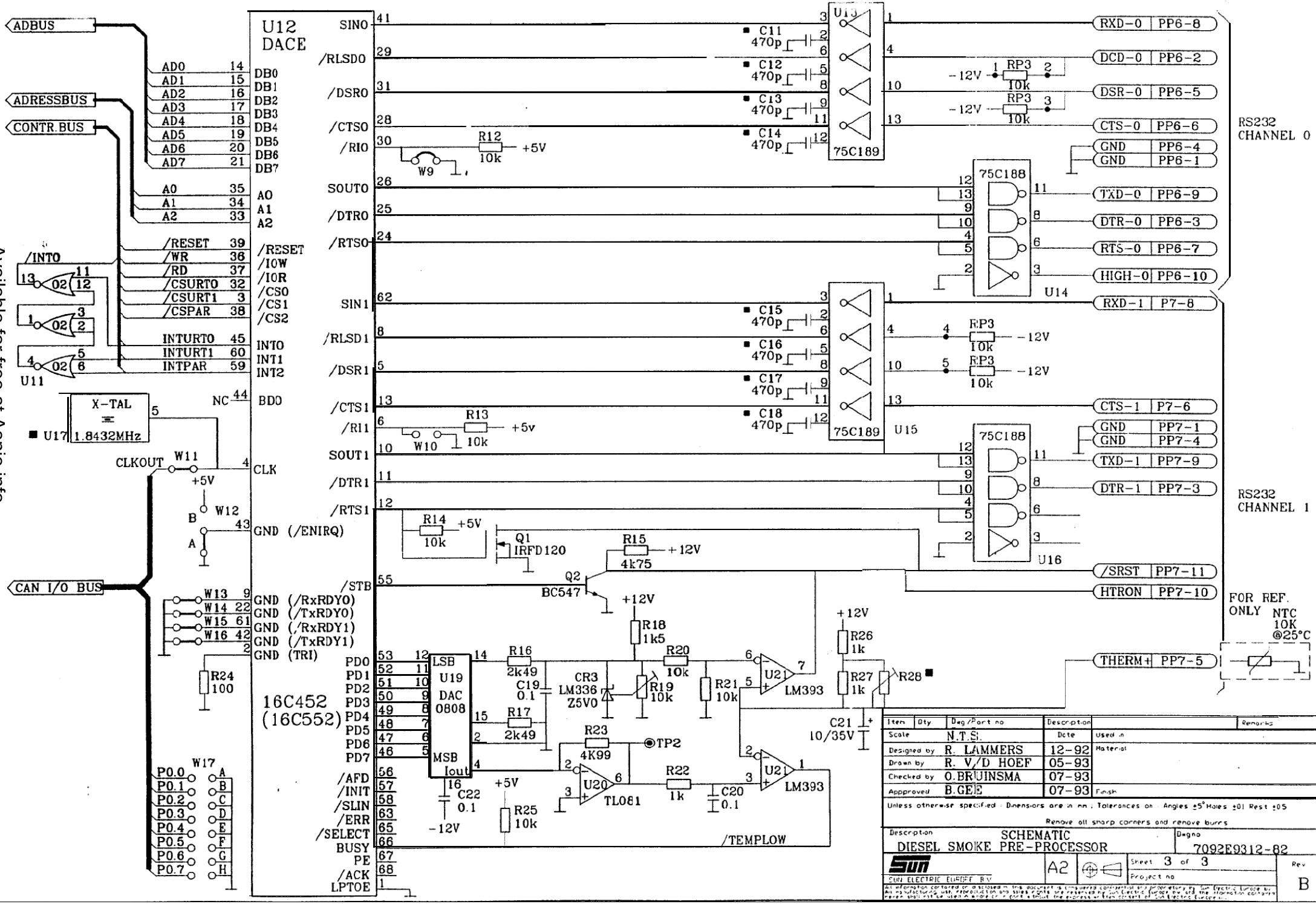
SPARES :

Ref pcb	7025E9312-B2		
Ref assy	7001E9312-B2	Date	Used in DSPP_PCB
Designed by	R.L.	DEC'92	
Drawn by	R.L.	DEC'92	Remarks :
Checked by	O.BRUINSMA	07-93	CONNECTOR LISTING &
Approved	B.DEE	07-W	POWER DISTRIBUTION
Description	SCHEMATIC		Drawing nr
	DIESEL SMOKE PRE-PROCESSOR		7092E9312-B2
[redacted]		A3	Sheet 1 of 3
DAF ELECTRIC EUROPE B.V.			Project nr E9259
			Issue B



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Item	Qty	Dwg/Part no	Description	Remarks
Scale	N.T.S.		Date	Used in
Designed by	R. LAMMERS		12-92	Material
Drawn by	R. V/D HOEF		05-93	
Checked by	O.BRUINSMA		07-93	
Approved	B.GEE		07-93	Finish

Unless otherwise specified : Dimensions are in mm ; Tolerances on : Angles ±5° Holes ±0.1 Rest ±0.5

Remove all sharp corners and remove burrs

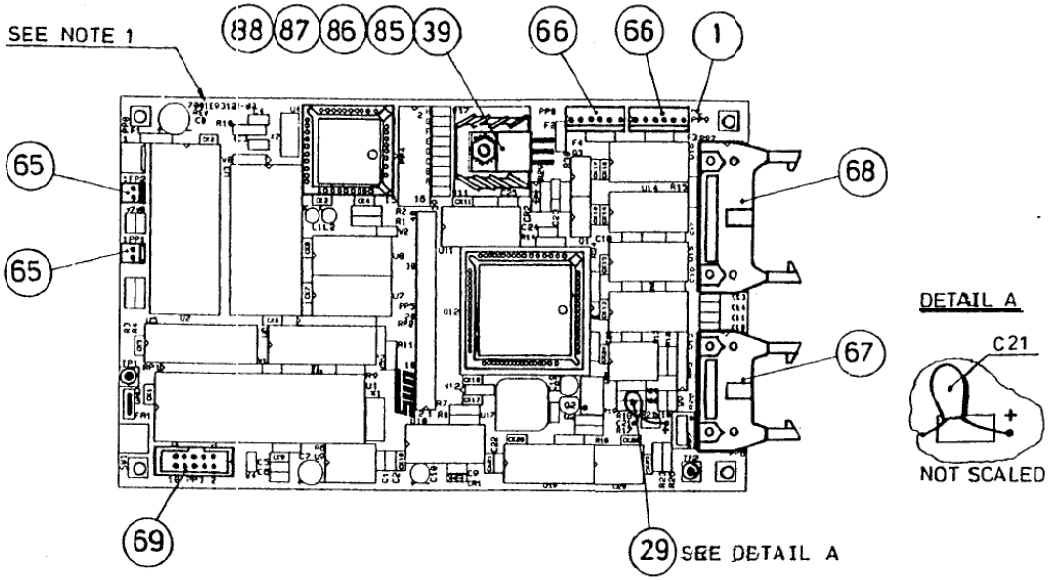
Description	Dwgno
DIESEL SMOKE PRE-PROCESSOR SCHEMATIC	7092E9312-82

SUN ELECTRIC EUROPE B.V. | A2 | Sheet 3 of 3 | Project no | Rev B

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Revisions					
Rev.	Date	ECN	Description	Check	Appr
A	07-93		ERN#0944. RELFORPROD.		
B	07-93	3.07.0895	CHANGED C21		



DETAIL A

NOT SCALED

NOTES:
1) ADD CURRENT REV. LEVEL

LINE NR	DIRECT ASSEM PART NR.	QUANT	COMPONENTS & SUB ASSEMBLIES	ITEM NR.
1	7025E9312-82	1	PCB DIESEL SMOKE PRE-PROCESSOR REV A	
2				
3	1670-1002-00	3	RESISTOR 100E 0.25W 1%	R9,R11,R24
4	1670-2432-00	1	RESISTOR 243E 0.25W 1%	R29
5	1670-1003-00	4	RESISTOR 1K 0.25W 1%	R1,R22,R26,R27
6	1670-1303-00	1	RESISTOR 1K3 0.25W 1%	R30
7	1670-1503-00	2	RESISTOR 1K5 0.25W 1%	R2,R18
8	1670-2493-00	2	RESISTOR 2K49 0.25W 1%	R16,R17
9	1670-4753-00	1	RESISTOR 4K75 0.25W 1%	R15
10	1670-4993-00	1	RESISTOR 4K99 0.25W 1%	R23
11	1670-5113-00	2	RESISTOR 5K11 0.25W 1%	R3,R4
12	1670-1004-00	6	RESISTOR 10K 0.25W 1%	R12-R14,R20,R21, R25
13				
14	1670-2745-00	1	RESISTOR 274K 0.25W 1%	R8
15	1670-1006-00	1	RESISTOR 1M 0.25W 1%	R7
16				
17	0685-0433-10	1	RESISTOR VARIA 10K	R19
18				
19	7096E0085-14	1	RESISTOR NETWORK 5*10K	RP3
20	0779-0186-01	1	RESISTOR NETWORK 7*10K	RP2
21	0779-0119-00	1	RESISTOR NETWORK 9*10K	RP1
22				
23	0860-0179-07	4	CAPACITOR 33pF-100V	C1-C4
24	0860-0180-08	29	CAPACITOR 100nF-50V	C9,C19,C20,C22 & C25,CK1-CK8,CK10 & CK16,CK18-CK24 CK18
25				
26				
27	7096E1055-37	1	CAPACITOR 2µ2/63V	C10
28	003-0679-693	1	CAPACITOR 100µF/25V	C8
29	7096E1055-50	1	CAPACITOR 10µF/35V	C21
30	7096E4057-44	1	X-TAL 11.0592 MHz	X1
31	7096E4057-45	1	X-TAL 16.000 MHz	X2
32	7096E2055-39	1	LED GREEN TLUG 164	LED 1
33	7096E2055-38	1	LED RED TLUR 164	LED 2
34	0771-0272-00	1	DIODE 1N914B	CR1
35	0771-0315-00	1	DIODE 1N4007	CR2
36	7096E2055-87	1	VOLTAGE DIODE LM336Z5V0	CR3
37	0776-0311-01	1	TRANSISTOR BC547 A	Q2
38	7096E2055-44	2	IRFD 120	Q1,Q3
39	0773-0252-00	1	VOLTAGE REGULATOR LM317T	U18
40				

LINE NR	DIRECT ASSEM PART NR.	QUANT	COMPONENTS & SUB ASSEMBLIES	ITEM NR.
41	0773-0035-00	1	IC 74HCT02	U11
42	7096E2080-46	1	IC 74HCT04	U8
43	7096E2080-57	1	IC 74HCT08	U7
44	0773-0034-00	1	IC 74HCT373	U5
45	7096E2080-84	2	IC LINE DRIVER 75C188	U14,U16
46	7096E2080-85	2	IC LINE RECIVER 75C189	U13,U15
47	7096E2080-80	1	IC TLC 556	U10
48	0773-0014-01	1	IC TL081	U20
49	7096E2080-91	1	IC DAC 0808	U19
50	0773-0557-00		IC LM 393	U21
51	7096E2080-61	1	IC 82526	U4
52	7096E2080-86	1	IC 16C452	U12
53	7096E2080-76	1	IC 80C32	U1
54	7096E2080-73	1	IC SRAM MB8464A-10LL	U3
55	0733E052*-64	1	IC PROGRAMMED GAL DECODER	U6
56	0703E101*-01	1	IC PROGRAMMED EPROM	U2
57				
58	7096E3056-01	4	IC SOCKET 14 WAY DIL3	U13-U16
59	7096E3056-04	1	IC SOCKET 20 WAY DIL3	U6
60	7096E3056-07	1	IC SOCKET 28 WAY DIL4	U3
61	7096E3061-13	1	IC SOCKET 32 WAY DIL4	U2
62	7096E3061-00	1	IC SOCKET 44 WAY PLCC	U4
63	7096E3061-29	1	IC SOCKET 68 WAY PLCC	U12
64				
65	7096E3056-93	2	CONN. RCO 2 WAY	PP1,PP2
66	4162-0444-05	2	CONN. MTA.100 6 WAY	PP8,PP9
67	7096E3057-91	1	CONN. IDC R/A LONG EJECT 10 WAY	PP6
68	7096E3057-92	1	CONN. IDC R/A LONG EJECT 16 WAY	PP7
69	7096E3057-40	1	CONN. IDC STR L/PROF 10 WAY	PP3
70	7096E3055-05	1	JUMPERSTRIP 2 WAY SIL	W2
71	7096E3055-05	2	JUMPERSTRIP 3 WAY SIL	W3,W5
72	7096E3055-91	1	JUMPERSTRIP 2 WAY DIL	(W9,W10)
73	7096E3055-91	1	JUMPERSTRIP 8 WAY DIL	W17
74	7096E3055-12	6	JUMPER	W2,W3,W5,W9
75				
76	0536-0302-00	2	TESTPOINT	TP1,TP2
77	7096E3056-17	1	FASTON '250' TAB,PCB MOUNT	FA1
78				
79				
80				

LINE NR	DIRECT ASSEM PART NR.	QUANT	COMPONENTS & SUB ASSEMBLIES	ITEM NR.
81				
82	0739-0106-05	1	PICO FUSE 0.5A	F3
83	0739-0106-07	2	PICO FUSE 1.0A	F2,F4
84				
85	7096E9057-48	1	HEATSINK TV-5	U18
86	407-0310-483	1	SEM SCREW M3*10 PPH/SPW STL	U18
87	408-0300-143	1	BARB NUT M3	U18
88	0626-0541-00	A/R	HEATSINK COMPOUND	U18
89				
90	7092E9312-82	REF	SCHEMATIC DIESEL PRE-PROCESSOR BOARD	
91				
92				
93				
94				
95				
96				
97				
98				

Item	Qty	Dwg / Part no	Description	Remarks
Scale 1:1 (N.T.S)			Date	Used in DGA-1800
Designed by				Material
Drawn by H. v/d Nieuwendijk			02.07.93	
Checked by O. Pronk			9.7.93	
Approved			9.7.93	Finish

Unless otherwise specified: Dimensions are in mm. Tolerances on: Angles ±0.5, Holes ±0.1, Rest ±0.5

Remove all sharp corners and remove burrs

Description: PRINTED CIRCUIT BOARD ASSEMBLY DIESEL SMOKE PRE-PROCESSOR

Dwg no: 7001E9312-82

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A2

Sheet 1 of 1

Issue: B

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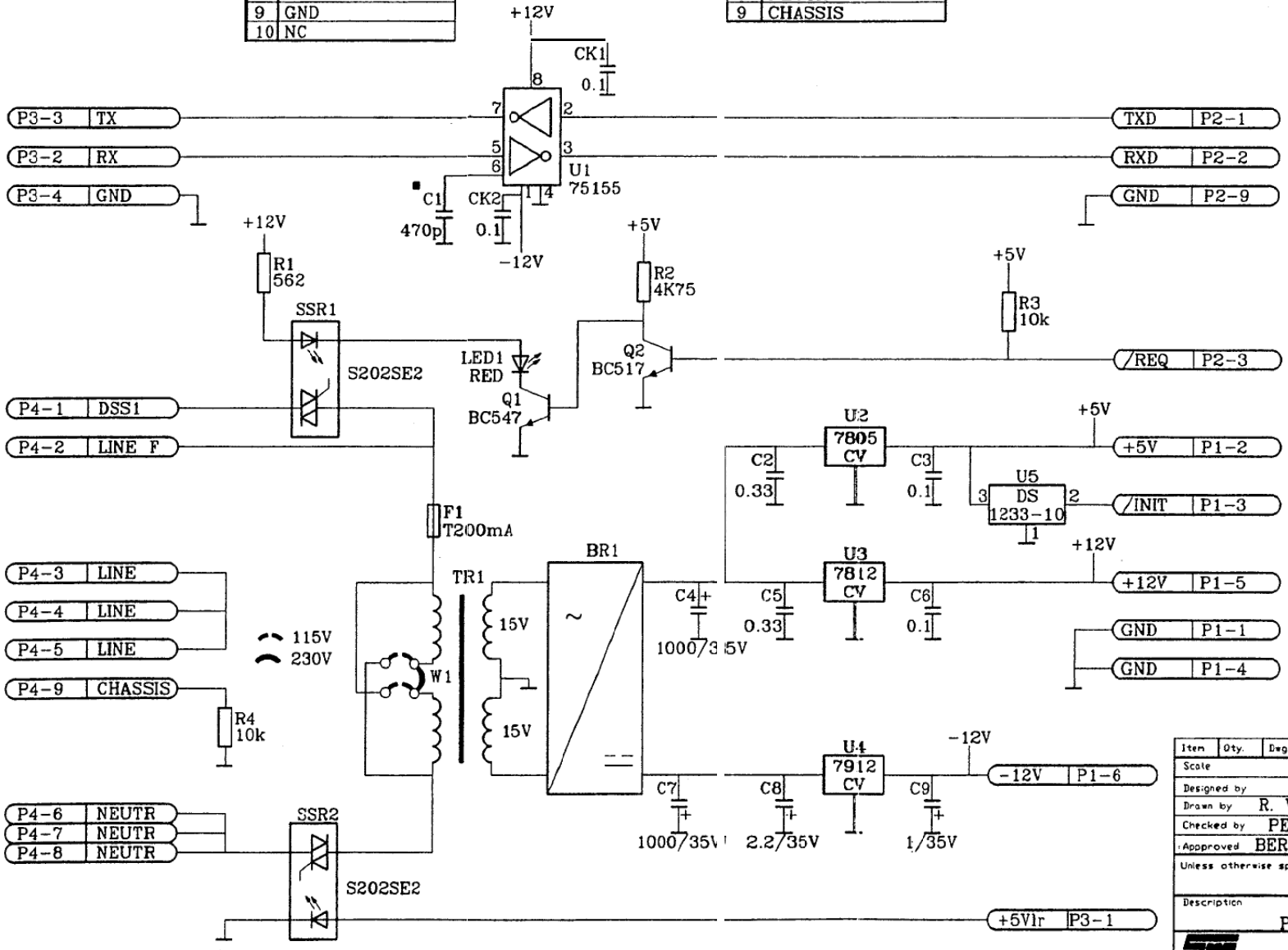
Rev	Date	Description	Check	Appr.
A	09'93	ERN# 1037 R.F.P.	P.T.	B.G.
B	11'93	ECN 3.11.137E CHD TYPE OF Q2	P.T.	B.G.

P1 POWER	
PIN NO	SIGNAL
1	GND
2	+5V
3	/INIT
4	GND
5	+12V
6	-12V

P2	
PIN NO	SIGNAL
1	TXD
2	RXD
3	/REQ
4	NC
5	NC
6	NC
7	NC
8	NC
9	GND
10	NC

P3	
PIN NO	SIGNAL
1	+5Vlr
2	RX
3	TX
4	GND
5	NC

P4	
PIN NO	SIGNAL
1	DSS1
2	LINE F
3	LINE
4	LINE
5	LINE
6	NEUTR
7	NEUTR
8	NEUTR
9	CHASSIS



NOTES:

1) UNLESS OTHERWISE SPECIFIED
   - A) ALL RESISTORS ARE IN OHMS,1/4W,1%
   - B) ALL CAPACITORS ARE IN MICRO-FARADS
   - C) ALL DIODES ARE 1N914 OR 1N4148
   - D) ALL IC'S ARE 74HCT-SERIES TYPE
   - E) ALL POLARIZED CAPACITORS ARE 16V
2) LAST USED NO'S: R4, CK2, C9, LED1, Q2, BR1, SSR2, U5, W1, TR1, F1, P4.
3) NOT USED NO'S:
4) COMPONENTS MARKED WITH ■ ARE NOT INSTALLED
5) W1 DEFAULT IN 230V POS.

Item	Qty.	Dwg./Part no.	Description		Remarks
Scale	N.T.S.		Date	Used in	DIB
Designed by				Material	
Drawn by	R. V/D HOEF		06-93		
Checked by	PETER TEL		10-93		
Approved	BERNARD GEE		10-93	Finish	

Unless otherwise specified : Dimensions are in mm / Tolerances on : Angles ±5° Holes ±01 Rest ±0.5

Remove all sharp corners and remove burrs

Description: SCHEMATIC
POWER DSS1 INTERFACE BOARD

Dwg no: 7092E9313-06

SUN ELECTRIC EUROPE B.V.

A2

Sheet 1 of 1

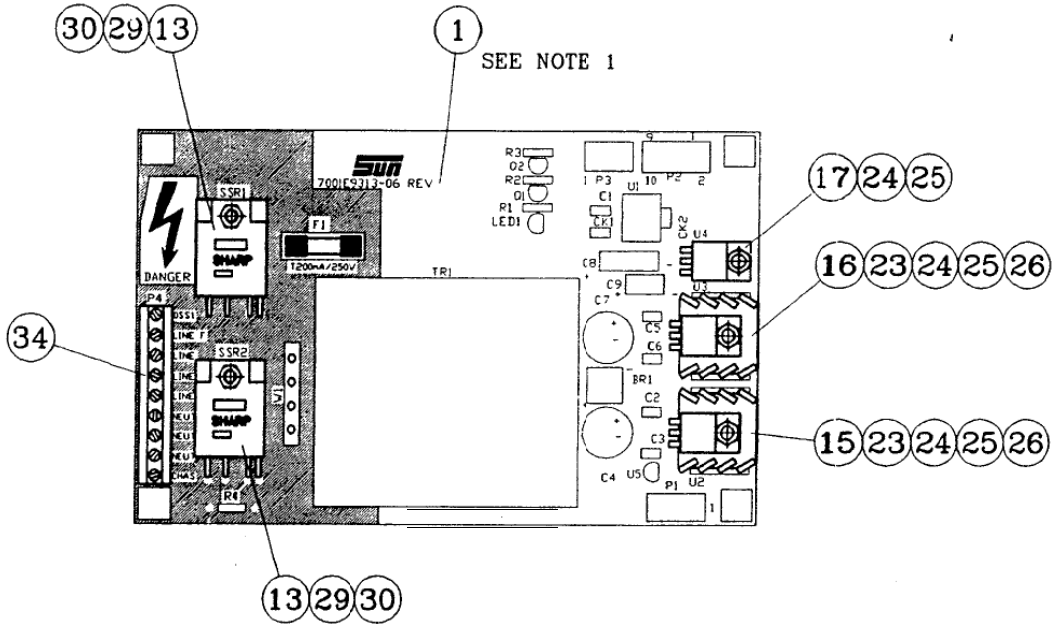
Project no.

Rev B

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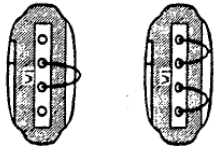
Rev	Date	Description	Check	Appr.
A	09'93	ERN# 1037 R.F.P.	P.T.	B.G.
B	11'93	ECN 3.11.137E ADDED ITEM 35 & CHD P/N ITEM 8, 20 AND CHD QTY ITEM 11.	P.T.	B.G.



NOTES
1) ADD CURRENT REVISION LEVEL

W1 JUMPER SETTINGS

230V 115V



Item	Qty.	Dwg/Part no.	Description	Remarks
35	1	7096E2055-92	DARLINGTON BC517	Q2
34	3	7096E3056-71	CONN. SCREW STRIP	P4
33	1	7096E3057-40	CONN. IDC STR L/PROF 10 WAY	P2
32	1	4162-0444-05	CONN. MTA .100 6 WAY	P1
31	1	4162-0444-04	CONN. MTA .100 5 WAY	P3
30	2	409-0300-109	NUT M3 NYLON	SSR1, SSR2
29	2	404-0312-539	MA SCREW M3x12 NYLON	SSR1, SSR2
28	4	0610-0071-00	SELFTAPPING SCREW 6x3/8	TR1
27	1	7096E4057-86	TRANSFORMER 2x15V	TR1
26	A/R	0626-0541-00	HEATSINK COMPOUND	U2,U3
25	3	408-0300-143	BARB NUT M3	U2,U3,U4
24	3	407-0312-563	SEM SCREW M3x12 PPH/SPW STL	U2,U3,U4
23	2	7096E9057-46	HEATSINK TV5	U2,U3
22	1	7096E3056-00	IC SOCKET 8 WAY	U1
21	15mm	0663-0333-09	JUMPER WIRE	W1
20	1	7096E4057-87	FUSE 200mA 5x20mm	F1
19	2	7096E4055-84	FUSE HOLDER PCB	F1
18	1	7096E2080-90	DS 1233-10	U5
17	1	7096E2070-15	-12V REGULATOR L7912CV	U4
16	1	7096E2070-11	+12V REGULATOR L78S12CV	U3
15	1	7096E2070-09	+ 5V REGULATOR L78S05CV	U2
14	1	7096E2080-92	LINE DRV. & RECIEVER IC75155	U1
13	2	7096E2055-89	SOLID STATE RELAY S202SE2	SSR1,SSR2
12	1	7096E2055-06	BRIDGE RECTIFIER	BR1
11	1	003-0776-569	TRANSISTOR BC 547B NPN	Q1
10	1	0771-0344-00	LED RED	LED1
9	2	7096E1055-53	CAPACITOR 1000µF 35V RAD	C4,C7
8	1	0679-0352-00	CAPACITOR 2µ2 35V AX	C8
7	1	0679-0412-00	CAPACITOR 1µF 35V AX	C9
6	2	7096E1080-33	CAPACITOR 330nF AX	C2,C5
5	4	0860-0180-08	CAPACITOR 100nF AX	CK1,CK2,C3,C6
4	2	1670-1004-00	RESISTOR 10K 0.25W 1%	R3, R4
3	1	1670-4753-00	RESISTOR 4K75 0.25W 1%	R2
2	1	1670-5622-00	RESISTOR 562E 0.25W 1%	R1
1	1	7025E9313-06	PCB MCS/OCS-DSS1 INTERFACE BD.	

Scale	1 : 1	Date	Used in DIB
Designed by			Material
Drawn by	R. V/D HOEF	09-93	
Checked by	PETER TEL	10-93	
Appproved	BERNARD GEE	10-93	Finish

Unless otherwise specified : Dimensions are in mm ; Tolerances on Angles ±5° Holes ±01 Rest ±05
Remove all sharp corners and remove burrs

Description	PCB ASSEMBLY POWER DSS-1 INTERFACE	Dwg no 7001E9313-06

SUN ELECTRIC EUROPE BV	A2	Sheet 1 of 1 Project no	Rev B

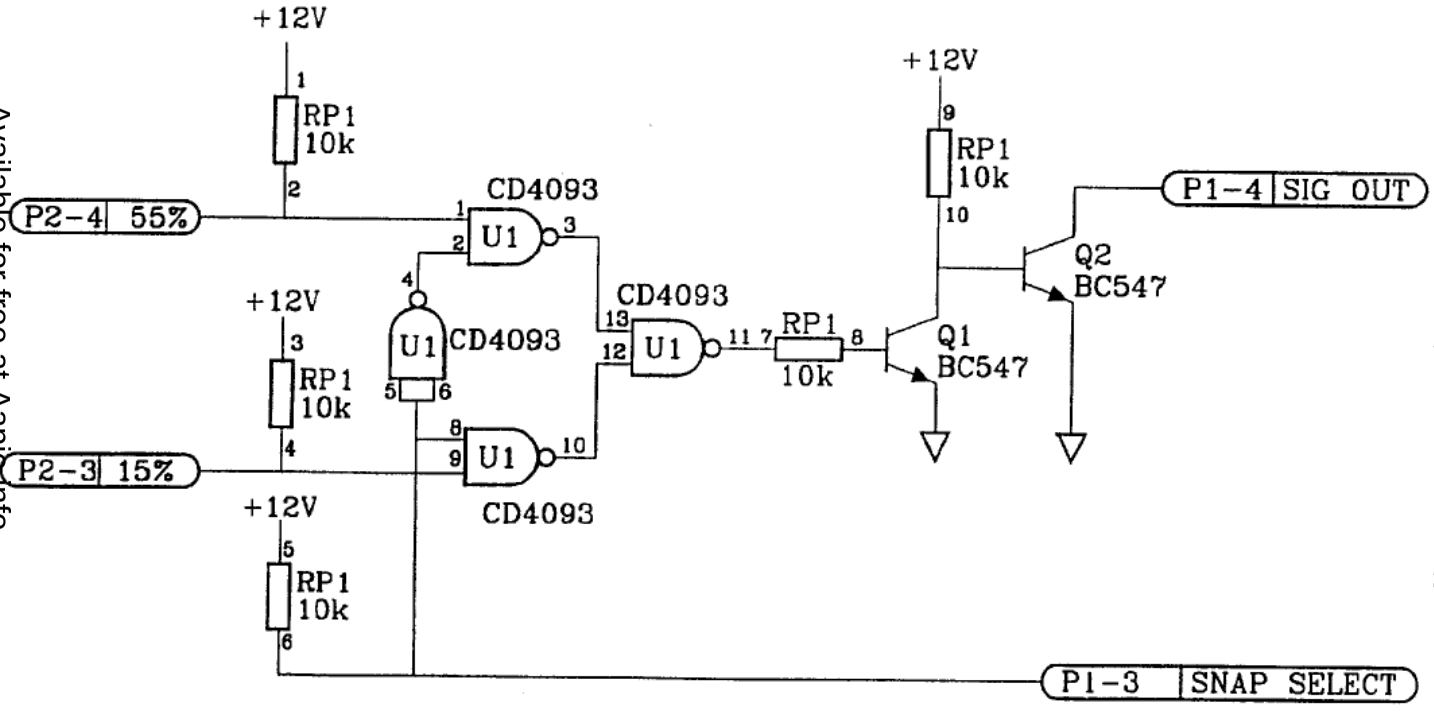
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P1 MCS	
PIN NO	SIGNAL
1	GND
2	+12V
3	SNAP SELECT
4	SIG OUT

P2 AVL	
PIN NO	SIGNAL
1	GND
2	+12V
3	15%
4	55%

Revisions				
Rev	Date	Description	Check	Appr.
A	10'93	ERN# 1071 R.F.P.		



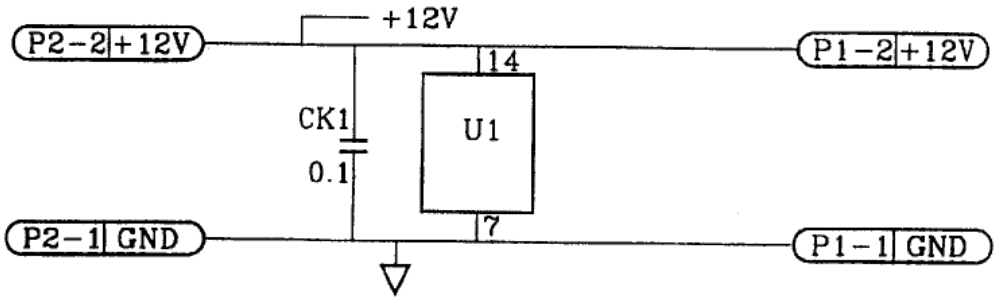
NOTES:

1) UNLESS OTHERWISE SPECIFIED
   ALL CAPACITORS ARE IN MICRO-FARADS

2) LAST USED NO'S: U1, Q2, RP1, P2, CK1.

3) NOT USED NO'S:

REF ASS'Y: 7001E9313-20
REF PCB: 7025E9313-20



Item	Qty.	Dwg./Part no.	Description		Remarks
Scale	N.T.S.		Date	Used in	DIB, SUNDRY
Designed by	LEO VIS		09-93	Material	
Drawn by	R. V/D HOEF		09-93		
Checked by					
Appproved				Finish	

Unless otherwise specified : Dimensions are in mm ; Tolerances on : Angles ±5° Holes ±0.1 Rest ±0.5
Remove all sharp corners and renove burrs

Description: SCHEMATIC
DIESEL OUTPUT MULTIPLEXER BD

Dwg.no: 7092E9313-20

SUN ELECTRIC EUROPE B.V.

A3

Sheet 1 of 1

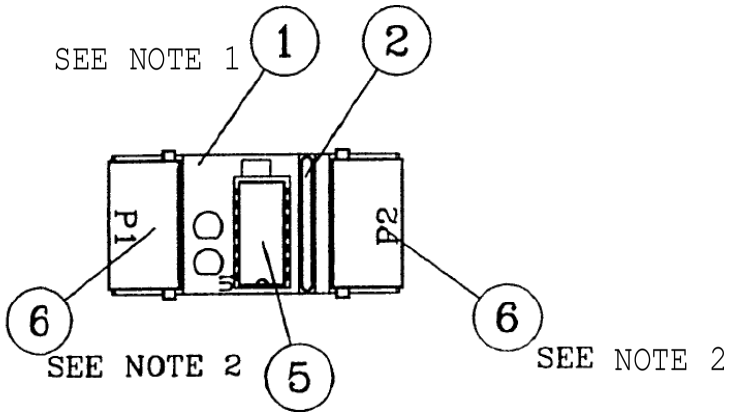
Project no.

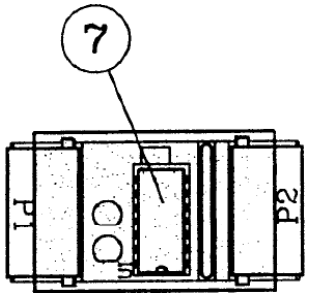
Rev. A

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Revisions				
Rev	Date	Description	Check	Appr.
A	10'93	ERN# 1071 R.F.P.		





NOTES

1) ADD CURRRENT REVISION LEVEL
2) WRITE ON CONNECTOR NUMBER AS SHOWN.

Item	Qty.	Dwg./Part no.	Description	Remarks
7	50mm	7096E4056-74	HEATSCHRINK TUBING CLEAR 1"	
6	2	7096E3056-78	CONN. M&L 4 WAY R/A	P1, P2
5	1	0733-4093-00	IC CD4093	U1
4	2	0776-0311-01	TRANSISTOR BC547	Q1, Q2
3	1	0860-0180-08	CAPACITOR 100nF	CK1
2	1	0779-0148-00	RESISTOR NETWORK, SIL, 10 PIN 5x10k	RP1
1	1	7025E9313-20	PCB D.O.M.B.	

Scale	1 : 1	Date	Used in MCS-2000SL
Designed by	G. KOK	10-93	Material
Drawn by	R. V/D HOEF	10-93	
Checked by			
Appproved	B. Lee	25.10.93	Finish

Unless otherwise specified : Dimensions are in mm ; Tolerances on : Angles ±5° Holes ±0.1 Rest ±0.5

Renove all sharp corners and renove burrs

Description	Dwg.no
DIESEL OUTPUT MULTIPLEXER BOARD	7001E9313-20

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A3 Sheet 1 of 1 Project no. Rev. A

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-3.J.17-

JUMPER TABLE			
	SUN2014	SAM4000	MCS2000
W1	A-B	A-B	A-B
W2	A-B	A-B	A-B
W3	A-B	A-B	A-B
W4	A-C	A-C	A-C
W5	A-C	A-C	A-C
W6	A-B	A-B	A-B

W16	W15	DRIVES PRESENT	MODEL
IN	IN	0	SUN 2014, SAM4000, MCS2000
IN	OUT	0,1	
OUT	IN	0,1,2	
OUT	OUT	0,1,2,3	

Item	Qty	Dwg./Part no.	Description	Mat'l Spec.	Remarks
A	21.8.87		ECN 8806		JUMPER
B	16.11.87		7.11 0366		ADD TABLE ADD MODEL MCS2000
C	07-93		3.07 0916		SEE SHEET 2

Check	Appr.
KM	06
P.T.	86
P.T.	86

NOTES:
1 ALL ODD PIN NO'S OF P2 ARE CONNECTED TO GROUND
2 INSTALLATION OF JUMPERS:

W14	W13	W12	W11	BAUDRATE ESTIMPS)
IN	IN	IN	OUT	50
IN	IN	OUT	IN	75
IN	IN	OUT	OUT	109.92
IN	OUT	IN	IN	134.58
IN	OUT	IN	OUT	150
IN	OUT	OUT	IN	300
IN	OUT	OUT	OUT	600
OUT	IN	IN	IN	1200
OUT	IN	IN	OUT	1800
OUT	IN	OUT	IN	2400
OUT	IN	OUT	OUT	3600
OUT	OUT	IN	IN	4800
OUT	OUT	IN	OUT	7200
OUT	OUT	OUT	IN	9600
OUT	OUT	OUT	OUT	19200

W17: SPARE FUNCTION

3 UNLESS OTHERWISE SPECIFIED:
A ALL IC'S ARE 74LS-TYPES.
B ALL RESISTORS ARE OHMS, 1/4W/5%.
C ALL CAPACITORS ARE IN MICROFARADS.
4 LAST NO'S USED: R22, RP1, W17, X3, U15 G48, TP8.
5 NO'S NOT USED: R3, C-2, R2, R6, R7, R9, R13, R14, R5, W7, W8, TP 1-4

REF ASSY# 7001E9310-05
PCB# 7025E9310-04

UNUSED GATES:

Item	Qty	Dwg./Part no.	Description	Mat'l Spec.	Remarks
			USED ON SUN 2014, SAM 4000, MCS 2000		

Scale		
Drawn by J.P. Verkeyisser	Date 10-12-86	
Checked by R. MULDER	22-07-87	
Approved	15.9.87	

FLOPPY DISK - RS 232 INTERFACE

Dwg. no. 7092E9310-11

Sun Electronics Europe Amsterdam

A1

Sheet 1 of 2

C

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- 3.18 -

	Date	ECN		Check	Appr
A	21.9.87		ECN 0076	JM	BG
B	18.11.87	7.11. 0566	ADD MCS 2000 IN JUMPER TABLE ADD MODEL NAME	P.T.	BG
C	07.93	3.07 0918	ADDED R22 BETWEEN PS 10 AND U23 14	P.T	BG

R/W to sheet 1

P4

5 POLE CONNECTOR PU-BD J11

P3.17 D0 · P3.16 D1 · P3.15 D2 · P3.2 D3 · P3.3 D4 · P3.4 D5 · P3.5 D6 · P3.6 D7 · P3.8 E · P3.7 VMA · P3.10 RES · P3.11 R/W · P3.23 A1 · P3.22 A2 · P3.21 A3 · P3.20 A4 · P3.24 A5 · P3.19 S800 · P3.18 IRQ · P3.1 +12V_L · P3.13 +5V_L · P3.25 GND_L · P3.14 -12V_L · P3.9 INT7 · P3.12 IACK7

U16 20 · U19 14 · U18 20

JUMPER TABLE

	SUN 2014	SAM 4000	MCS 2000
W9	A-C, B-D	A-C, B-D	A-C, B-D
W10	A-C, B-D	A-C, B-D	A-C, B-D

U16: 6551 ACIA — X2 18.432 MHz — TP7 RxC — IRQ — CS1

U17: 6551 ACIA — X3 18.432 MHz — TP8 RxC — IRQ — CS1

RTS, DTR, TxD, RxD, DCD, DSR, CTS

U21 1488 · U22 1488 · U23 1489 · U24 1489

C19 100p · C20 100p · C21 100p · C22 330p · C23 330p · C24 330p · C25 330p

C26 100p · C27 100p · C28 100p · C29 330p · C30 330p · C31 330p · C32 330p

W9 · W10

R19 10K · R20 10K · +12V_L

R22 150 · -5V_L · +5V_LR

ESTM RS232C

P5.1 NC · P5.7 RTS · P5.3 DTR · P5.8 RXD · P5.9 TXD · P5.2 DCD · P5.5 DSR · P5.6 CTS · P5.4 GND

AUX RS232C

P6.7 RTS · P6.3 DTR · P6.8 RXD · P6.9 TXD · P6.2 DCD · P6.5 DSR · P6.6 CTS · P6.4 GND · P6.1 INT · P6.10 N.C

C35 47µ/16V · C45 to 46 0.1µ/100V · C34 47µ/16V · C37 to 44 0.1µ 100V · C36 47µ/16V · C47 to 48 0.1µ/100V · TP6 GND LUG

+12V_L · +5V_L · GND_L · -12V_L

YE NOTE

NOTE
THE CIRCUITRY ON THIS SCHEMATIC IS POWERED BY P1
+5V_L MEANS +5V LOCAL

R21 1K · U25 74 · R17 1K · R18 47 · C33 100µ/10V

RES · IACK7 · U20 08

U25 7% · U20 08 · U19 14 · U18 20 · U21 U22 1488 · U23 U24 1489 · U16 U17 6551

UNUSED GATES.

TO R21

Item	Qty	Dwg Part no	Description	Mat'l Spec	Remarks
Scale		Date			USED ON SUN 2014, SAM 4000, MCS 2000
Drawn by J.P. Varkevisser		10-12-86			
Checked by R. MULDER		25-05-87			
Approved Bernard Spee		25.05.87	Finish		

FLOPPY DISK - RS 232 INTERFACE

7092E9310-11

Sun ELECTRIC EUROPE AMSTERDAM

A1

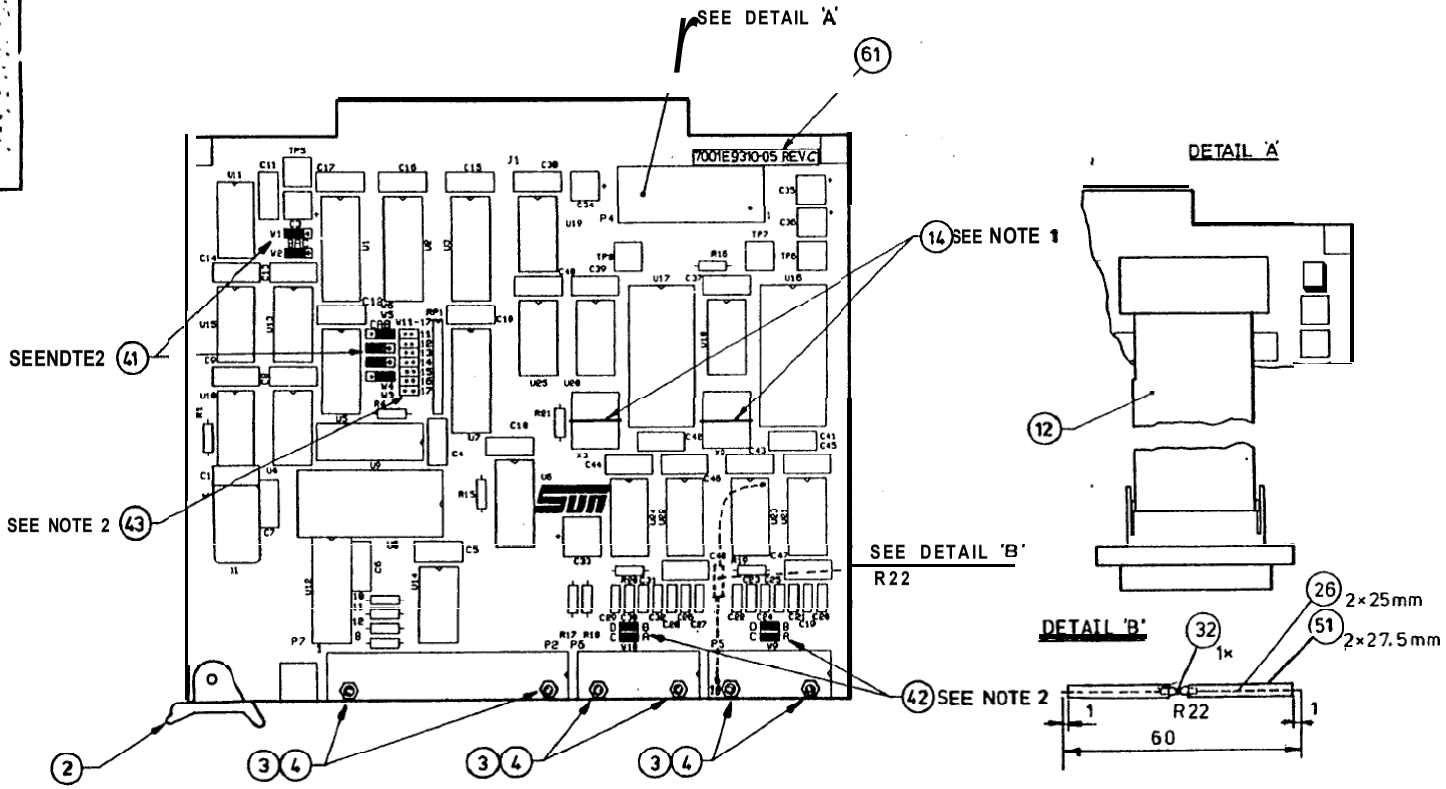
Sheet 2 of 2

REF. ASSY# 7001E9310-05
PCB# 7025E9310-04

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- 3.19 -

Hole Schedule		
Code	Qty	Dia

Revisions					
Sym	Date	ECN	Description	Check	Appr
A	21.5.87		ERN # 0078	R.M.	BG
B	16.11.87	7.11.056E	ADD MCS 2000 IN JUMPER TABLE AND ITEM 61.	G.T.	BG
C	07.93	3.07.0976	SHT. 1 REDRAWN ADDED R22	P.T.	BG



NOTES: 1. SECURE COMPONENTS X2 AND X3 WITH WIRE ITEM 14 AS SHOWN.

2. POSITION JUMPERS ITEM 44 AS SHOWN ON TABLES BELOW

CIRCUIT REF	JUMPER POSITION
W1	A.B
W2	A.B
W3	A.B
W4	A.C
W5	A.C
W6	A.B
W9	A.C/B.D
W10	A.C/B.D

JUMPER SITION	MCS 2000 SUN 2014 SAM 4000	
W11	FIT	
w12	FIT	
W13	FIT	
W14	NOT FITTED	
W15	FIT	
W16	FIT	
W17	NOT FITTED	

3. FIT IC SOCKETS ITEM 18 TO POSITIONS U21,22,23 & 24, AND IC SOCKETS ITEM 19 TO POSITIONS U6,16 & 17.

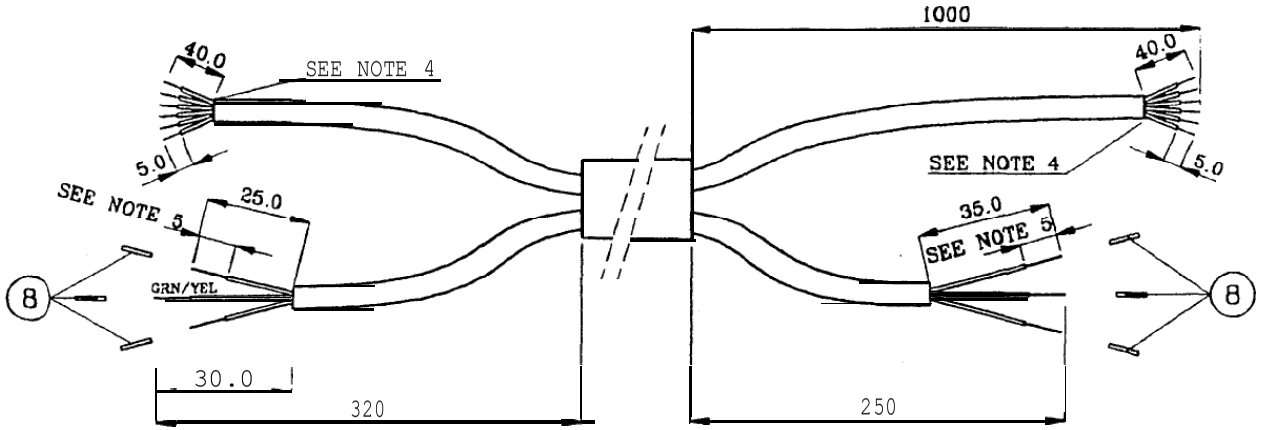
REF SCHEM # 7092E9310.11
PCB # 7025E9310.04

Item	Qty	Dwg Part no	Description	Matl Spec	Remarks

Scale N.T.S.	Date 13/5/87	Remarks USED ON SUN 2014 / SAM 4000 / MCS 2000
Drawn by M M Silva	25.5.87	
Checked by P. TILLOTSON	25.5.87	Finish
Approved		
Unless otherwise specified Dimensions are in mm	Tolerances	Next Dwg
Description PCB ASSY FLOPPY DISK / RS 232 INTERFACE		Dwg no 7001E9310.05
Sun	A2	Sheet 2 of 2 Code Project no
		Issue C

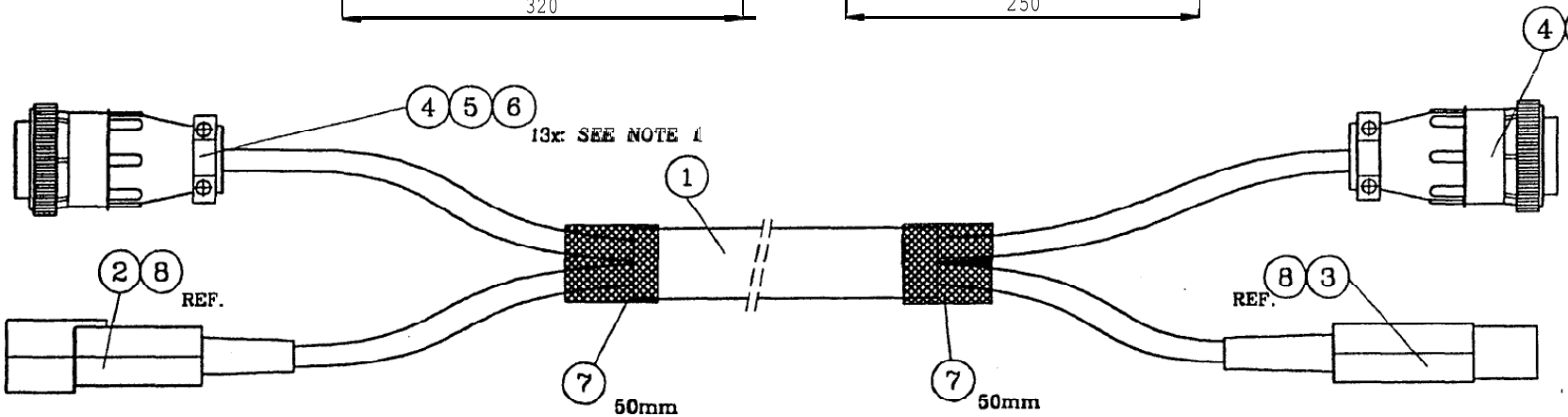
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-3.20-

Revisions			
Revi	Date	Description	Check / Appr.
A	09'93	ERN#1037 REL. FOR PROD.	P.T. / BG

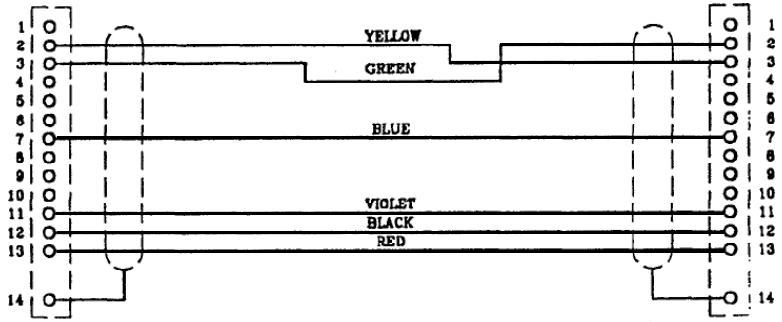


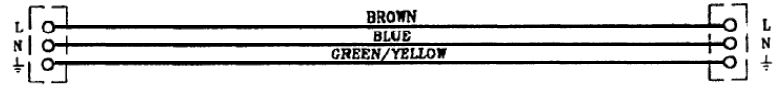
NOTES

1) PLACE DUMMY CONTACTS IN POS'N 4. 5, 6. **8.** 9, 10.
2) PRESS **'V'** IN MIDDLE OF SHRINK TURING ON MARKED SIDE ONLY.
3) **HOTSTAMP** PARTNUMBER ON CABLE WITH CURRENT REVISION LEVEL
4) CUT BACK **WHITE.** BROWN **&** ORANGE WIRES.
5) STRIP WIRES AS SPECIFIED IN VENDOR SHEET.



SEE NOTE 2





Item	Qty. -16	Qty. -17	Dwg./Part no.	Description	Remarks
8	6	6	7096E4057-92	CABLE ENDS	
7	0.1m	0.1m	7096E4056-63	SHRINK TUBING 19-6mm	
6	26	26	4162-0926-00	CPC PIN 24-20 AWG 0.04-0.08² INS AU RL	
5	2	2	4162-0806-00	CPC CABLE PLUG 14 P/HSG F/H	
4	2	2	4162-0902-00	CPC CABLE CLAMP SIZE 17	
3	1	1	7096E3061-19	REWIREABLE SOCKET STRAIGHT	
2	1	1	7096E3061-18	REWIREABLE PLUG STRAIGHT	
1	9m	20m	7096E3075-24	CABLE, MOLDED FOR SMOKE HEAD	

Scale		Date	Used in: DGA-1800, MCS-2000
Designed by			Material
Drawn by	R V/D HOEF	07-93	
Checked by	Peter Tel	11.10.93	
Approved	B. Gee	11.10.93	Finish

Unless otherwise specified : Dimensions are in mm ; Tolerances on : Angles ±5° Holes ±0.1 Rest ±0.5

Remove all sharp corners and remove burrs

Description	Dwg.no
DSS-1 COMMUNICATION CABLE	6004E9312-16/-17

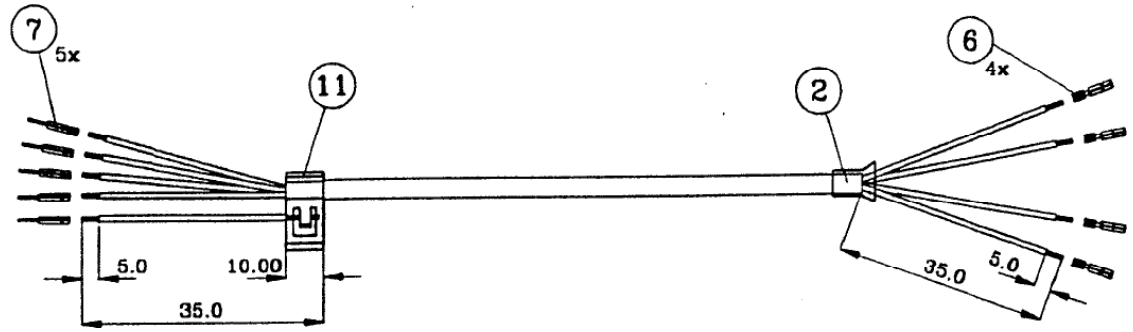
SUN ELECTRIC EUROPE B.V. | A2 | Sheet 1 of 1 | Project no. | Rev. A

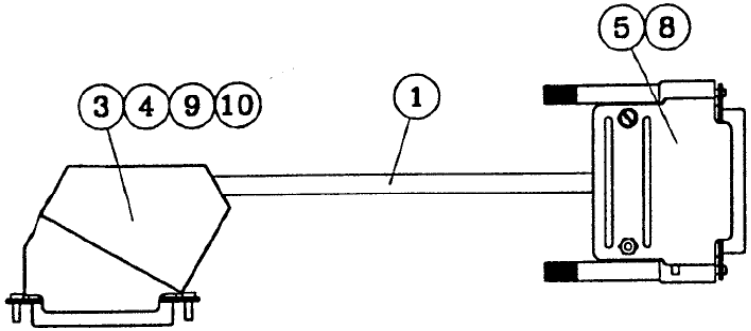
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Revisions			
Revi	Date	Description	Check / Appr
A	09'93	ERN# 1037 R.F.P.	P.T. / BG





NOTES:

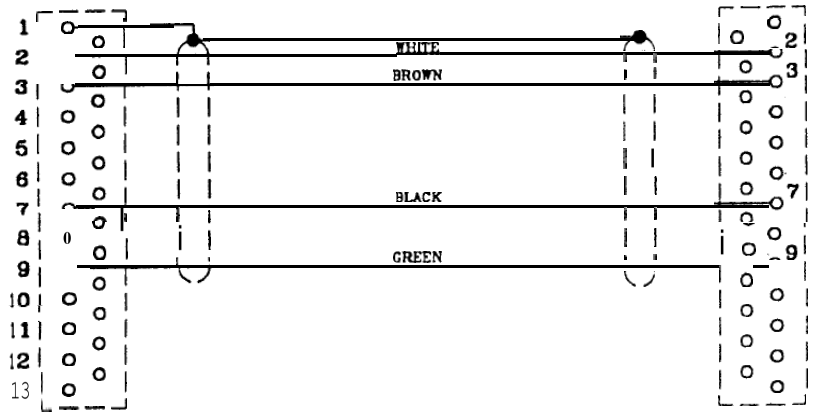
1) CUT & PREPARE CABLE AS SHOWN.
CUT BACK RED CONDUCTOR BOTH ENDS.

2) CUT BACK SCREENING TO **10mm.**
STRIP ONE END OF **WHITE** WIRE (ITEM 3) **10mm.**
INSERT **10mm** STRIPPED END OF WHITE WIRE (ITEM 3) INTO GROUND-LEAD TRAP, AND SHIELDED CABLE **INTO** LARGE OPENING OF CRIMP **CONNECTOR** ITEM 1) AS SHOWN.
SECURELY **CRIMP** CONNECTOR AROUND THE SHIELD.

3) **SUIT & FIT SHRINK TUBING ITEM 2 (15mm)**
AT ONE END ONLY OVER CORE CABLE, TO ENSURE
NO CONNECTION IS POSSIBLE BETWEEN WIRES.

4) HOT STAMP **PARTNUMBER** AND CURRENT REVISION LEVEL ON ITEM 1.

5) **ATTACH** CONNECTORS REFERING TO **WIRING** SCHEMATIC FOR PIN POSITIONS.



Item	Qty.	Dwg/Part no.	Description	Remarks
11	1	7096E3056-66	CONN. CRIMP FOR SHIELDED CABLE RSK 30	
10	1	4162-0618-00	SCREW LOCK SET	
9	1	7096E4056-72	SUB D SIZE (25P) CABLE CLAMP R/A	
8	1	7096E3061-61	SUB D SIZE (25P) CABLE CLAMP STR	
7	5	7096E3055-90	SUB D PIN 24-20AWG 1.52 INS AU RL	
6	4	7096E3055-89	SUB D SKT 24-20AWG 1.52 INS AU RL	
5	1	4162-0415-02	SUB D 25 POS SKT HSG	
4	1	4162-0413-03	SUB D 25 POS PIN HSG	
3	35mm	0663-0328-09	WIRE WHITE 22 AWG	
2	15mm	7096E4056-57	SHRINK TUBING 3/8" BLK	
1	25cm	7096E3075-07	CABLE SCREENED 5 CORE 22 AWG	

Scale		Date	Used in DIB
Designed by	LEO VIS	08-93	Material
Drawn by	R. V/D HOEF	08-93	
Checked by	Peter Tel	11.10.'93	
Approved	B. Gee	11.10.93	Finish

Unless otherwise specified : Dimensions are in mm ; Tolerances on : Angles ±5° Holes ±0.1 Rest ±0.5
Remove all sharp corners and remove burrs

Description	Dwgno
EXTERNAL DATA CABLE	6004E9312-18

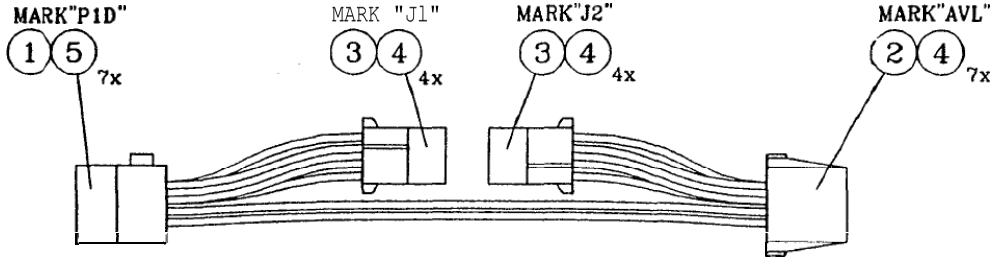
SUN ELECTRIC EUROPE B.V. | A2 | Sheet 1 of 1 | Project no | Rev. A

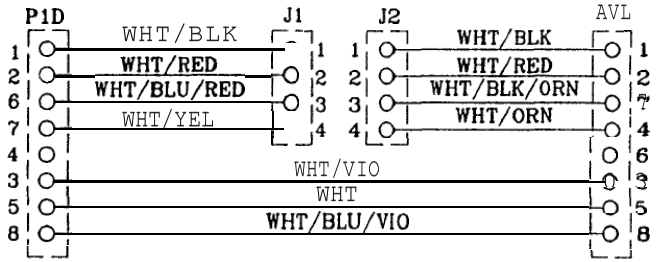
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WIRE No.	SIZE AWG	COLOUR	LENGTH mm	STRIP mm	TERMINAL	FROM	STRIP mm	TERMINAL	TO
1	18	WHT/BLK	70	5	4162-0554-00	P1D-1	5	4162-0555-00	J1-1
2	18	WHT/RED	70	5	4162-0554-00	P1D-2	5	4162-0555-00	J1-2
3	20	WHT/BLU/RED	70	5	4162-0554-00	P1D-6	5	4162-0555-00	J1-3
4	20	WHT/YEL	70	5	4162-0554-00	P1D-7	5	4162-0555-00	J1-4
5	18	WHT/BLK	70	5	4162-0555-00	J2-1	5	4162-0555-00	AVL-1
6	18	WHT/RED	70	5	4162-0555-00	J2-2	5	4162-0555-00	AVL-2
7	20	WHT/BLK/ORN	70	5	4162-0555-00	J2-3	5	4162-0555-00	AVL-7
8	20	WHT/ORN	70	5	4162-0555-00	J2-4	5	4162-0555-00	AVL-4
9	18	WHT/VIO	200	5	4162-0554-00	P1D-3	5	4162-0555-00	AVL-3
10	20	WHT	200	5	4162-0554-00	P1D-5	5	4162-0555-00	AVL-5
11	20	WHT/BLU/VIO	200	5	4162-0554-00	P1D-8	5	4162-0555-00	AVL-8

Revisions				
Rev.	Date	Description	Check	Appr.
A	10'93	ERN# 1071 R.F.P.	O.B.	B.G.
B	11'93	ECN# 3.10.127E. CORRECTED P1D/AVL WERE PD1/JD1.	PT	BG





Item	Qty	Dwg/Part no	Description	Remarks
7	0.68m	1637-2099-00	WIRE 20 AWG WHITE	
6	0.48m	1637-1899-00	WIRE 18 AWG WHITE	
5	7	4162-0554-00	CRIMP CONTACT PIN 61116-1	
4	15	4162-0555-00	CRIMP CONTACT SOCKET 61314-1	
3	2	4162-0299-00	CONN. M&L 4WAY PLG SKT HSG 480424	
2	1	4162-0295-00	CONN. M&L 8WAY PLG SKT HSG 480283	
1	1	4162-0372-00	CONN. M&L 8WAY SKT PIN HSG 480345	

Scale	N.T.S.	Date	Used in MCS/OCS-2000SL, SUNDRY
Designed by	LEO VIS	09-93	Material
Drawn by	R. V/D HOEF	09-93	
Checked by	OTTE BRUINSMA	10-93	
Appproved	BERNARD GEE	10-93	Finish

Unless otherwise specified : Dimensions are in mm ; Tolerances on : Angles ±5° Holes ±01 Rest ±0.5

Remove all sharp corners and remove burrs

Description	Dwg no
CONNECTION CABLE D.O.M.B.	7076E9323-08

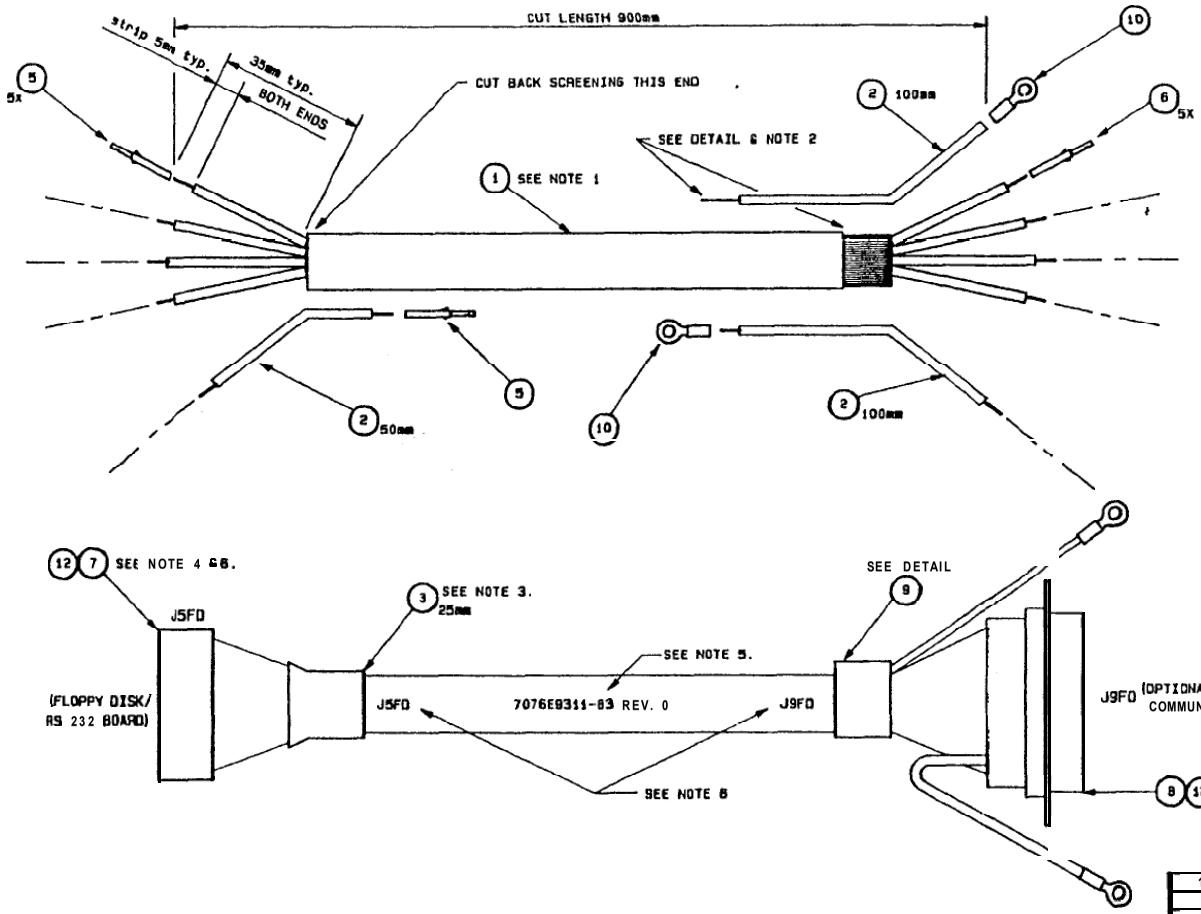
SUN ELECTRIC EUROPE B.V. | A2 | Sheet 1 of 1 | Project no | Rev. B

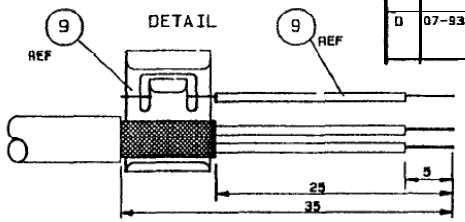
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Revisions					
Rev	Date	ECN	Description	Check	App
A	290289		ERN# 0311	PT	BG
B	OS-91	1.05. 059E	PART.NO ITEM 5 WAS 7096E3055-88 & ITEM 7 WAS 7096E3055-87	PT	CA
C	09-92	2.08. 088E	P/N ITEM 2 WAS 2636-2299: P/N ITEM 3 WAS 3-0569-542: P/N ITEM 9 WAS 7096E3056-57. P/N ITEM 10 WAS 7096E3055-36 DELETED : ITEM 11. WAS 7096E9055-73, & ITEM 12. WAS 0694-0484. CHANGED NOTE 5 & NOTE 6.	PT	86
D	07-93	3.07. 091E	DELETED CONN. J5FD-5/J9FD-20 J5FD-3/J9FD-5 P. T. ADDED CONN. J5FD-10/J9FD-9		BG





NOTES:

1/ CUT & PREPARE CABLE AND WIRES AS SHOW.

2/ CUT BACK SCREENING TO 10 mm CUT BACH REO WIRE BOTH ENDS. STRIP ONE ENO OF WHITE WIRE (ITEM 2) 10 mm. INSERT 10mm STRIPPED ENO OF WHITE WIRE (ITEM 2) IN70 GROUND-LEAD TRAP. AND SHIELDED CABLE INTO LARGE OPENING OF CRIMP CONNECTOR (ITEM 9) AS SHOWN. SECURELY CRIMP CONNECTOR AROUND THE SHIELD.

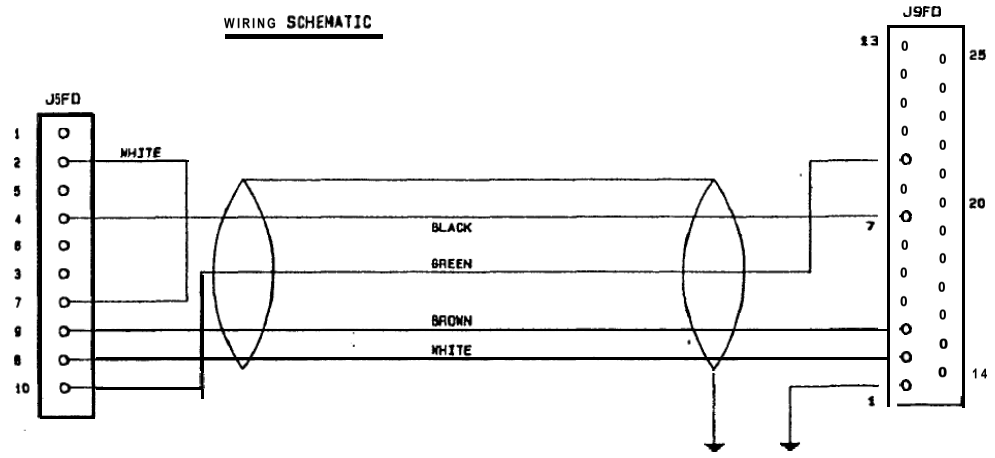
3/ SUIT & FIT SHRINK TUBING ITEM 3 (25mm) AT ONE ENO ONLY OVER CORE CABLE, TO ENSURE NO CONNECTION IS POSSIBLE BETWEEN HIRES.

4/ ATTACH CONNECTOR9 REFERING TO WIRING SCHEMATIC FOR PIN POSITIONS.

5/ HOT STAMP PARTNUMBER AND CURRENT REVISION LEVEL ON ITEM 1.

6/ HOT STAMP 'J5FD' & 'J9FD' ON ITEM 1.

WIRING SCHEMATIC



Item	Qty	Dwg./Part no	Description	Remarks
10	2	003-3931-823	RING TERM. M4	
9	1	7096E3056-66	CONN.CRIMP FOR SHIELDED CABLE ASK 301	
8	1	4162-0459-00	CONN.SKT 'D'CRMP 25w(AMP164533-4)	
7	1	7096E3061-67	HSG. CRIMP SNAP-IN , 10-WAY	
6	5	7096E3055-89	CONTACT SKT 24-20 AWG	ON REEL
5	6	7096E3055-99	CRIMP SNAP-IN CONTACT SK7	
4				
3	25mm	7096E4056-57	SHRINK TUBING 3/8"BLK	
2	250mm	0663-0333-09	WIRE WHITE 20 AWG UL1061	
1	0.9m	7096E3075-07	CABLE SCREENED 5-CORE 22 AWG.	

Scale	N.T.S.	Date	Used In SUN 2014, MCS 2000
Designed by	R. MULDER	17-03-89	Material
Drawn by	M.TJINASOE	08-04-87	
Checked by	PETER TEL	14-03-89	
Approved	B. GEE	14-03-89	Finish

Unless otherwise specified: Dimensions are in mm; Tolerances on: Angles ± 0.5° Holes ± 0,1 Rest ± 0,5

Remove all sharp corners and remove burrs

Description: WIRE HARNESS "W4FD" RS232

Dwg. no. 7076E9311-83

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A3

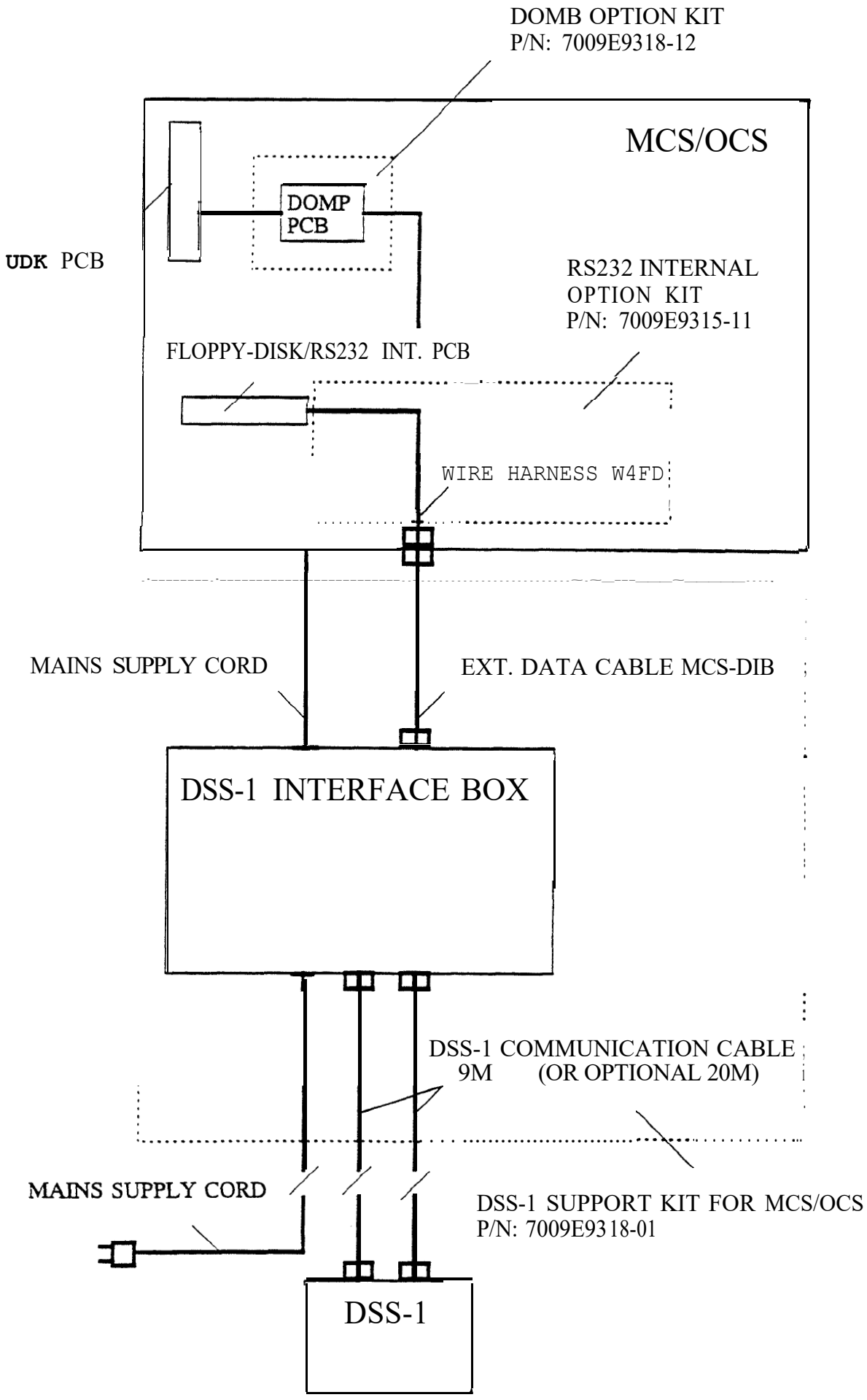
Sheet 1 of 1

Code

Project no. E8701/E8703

Issue D

DSS-I FIELD INSTALLATION KIT FOR MCS/OCS



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MINIMUM HARDWARE REQUIREMENTS BEFORE INSTALLATION

The MCS/OCS must be equipped with the following parts and options:

New CPU- pcb	P/n:	7001E9311-44	
New RAM- pcb	P/n:	7001E9311-48	With memory expansion to 768 KB, refer to Service Bulletin 477.
RS232/FD pcb	p/n:	7001E9310-05	Rev. C or higher
ASU-II option	p/n:	SGM2004	Gasbench Option
		7009E9317-79	Update Gasbench for ASU-II Kit
		7009E9312-96	Universal Diesel Kit
		7009E9316-56	Keyboard (D) Kit
		OR	
		7009E9317-42	Keyboard (UK) Kit
		7009E9316-57	Real Time Clock Kit
Printer option		7096E4056-95	Printer
		0528-0994-00	Printer Paper
		7009E9313-44	Printer Cover Kit
		7009E9314-70	Printer Mounting Kit
		7009E9317-83	Printer Connection Kit

Also the Diesel Smoke Sensor must be present, p/n: DSS-1

SOFTWARE AND DOCUMENTATION REQUIREMENTS FOR CONFIGURATION AND CHECK OUT

MCS/OCS Service disk 1	V 5.50	SERVICE.GB	P/n: 0553E1075-51
MCS/OCS Service disk 2	V 5.50	SERV_OPT.GB	P/n: 0553E5005-51
Service Disk Manual	for V 5.50 service disks p/n: 0692E9308-17		
MCS/OCS System disk	V 5.20 or higher		

PRE-INSTALLATION CHECKOUT PROCEDURE

Before beginning the installation verify the correct operation of the unit:

Switch on the unit and allow it to warm-up in the usual manner.

After the warm-up, proceed through the self test and calibration.
Check all the main functions of the unit by using the IS-lOOB,

Note the configuration of the unit. Any faults should be noted and corrected before starting the installation procedure.
Refer to the service manual for trouble shooting information etc.

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INSTALLATION PROCEDURE

Before beginning the installation of the DSS-1 Field Installation Kit, it is important to verify that all parts are present and accounted for according to the Kit Contents.

Step 1 After performing the initial check out and any necessary repairs are carried out, switch OFF the unit and disconnect it from mains power source.

Step 2 Check the mains power supply cord for damage and repair or replace as necessary.

Step 3 Remove the rear panel of the MCS/OCS unit, taking care not to damage the cabling of the fan.

Step 4 Remove from the front of the unit, the plastic front panel and the metal cover plate.

Step 5 With reference to installation drawing 0692E9306-09, install the "RS232 Internal Option Kit"

A Remove and discard from the back of the unit the left RS232 cover plate.

B Mount wiring harness "W4FD" from P5 of the Floppy Disk Interface board, slot 8 of the digital rack, to the back of the unit and mount the RS232 connector.

Note: The RS232/Floppy Disk Interface board, p/n: 7001E9310-05, must be REV. C or higher.

C Connect the cable screen ringtag and ringtag of "W4FD" to the transformer mounting stud.

D Install jumper Wl on the (E)CPU board, p/n: 7001E9311-44, slot 6 of the digital rack.

E Place label "RS232-C" near the connector on the back.

Step 6 With reference to the installation drawing p/n: 0692E9309-78, install the "DOMB Option Kit":

A Remove JlD from the (AVL) Diesel board.

B Locate cable p/n: 7076E9323-08 between JlD and the (AVL) Diesel board.

C Connect Jl of cable p/n: 7076E9323-08 to Pl of the "DOMB" and J2 of this cable to P2 of the "DOMB".

D Remove the dummy contact of J206-K (I/O board, slot 1 of the Digital Rack) and connect (loose modification) wire W114 to J206-K and to JlD-6. Dress this wire to loom 114 by using Ty-raps.

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Step 7 With reference to the installation drawing p/n: **0692E9309-73**, install the "DSS-1 Support Kit":

A Drill 4 holes 5,5 mm in the rear panel of the unit, as shown on the **installation drawing**.

B Using 4 screws M4x10 mount the DSS-1 Interface Box (DIB) to the rear panel.

C Refit the rear panel with DIB to the unit.

D Cut the Mains Power Supply cord 600 mm from the unit.

E Remove the 6 screws of the DIB cover plate and connect the Mains Power cord from the MCS/OCS unit to the DIB as shown on the installation drawing.

Note: See details A, B and C. Do not forget to mount the bushing strain relief and the green/yellow wire.

F Refit the DIB cover plate and mount the External Data cable MCS-DIB (RS232), p/n: 6004E9312-18 and the DSS-1 Communication cable, p/n: 6004E9312-16.

Step 8 Refit to the front of the unit the metal cover plate and the plastic front panel.

Step 9 Connect the DSS-1 Communication cable to the DSS-1 and the new Mains Power Cord (from the DIB) to the mains power source.

End of installation procedure.

****

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CONFIGURATION AND CHECK OUT

Refer to the Service Disk Manual for service disks V 5.50, p/n: 0692E9308-17, Rev. B from February 1995, to find the information how to configure the unit and test this option.

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S U N E L E C T R I C E U R O P E

I N S T A L L A T I O N I N S T R U C T I O N S

FIELD KIT ENHANCED, SIGNAL INPUT BOARD

FOR MCS-2000, OCS-2000, MEA-1500 AND MEA-I200

(PART NO: 7009E9318-38)

PART NO : 0692E9310-10
REV : A, MARCH-1994
REF NO : INPUT.DOC
ERN NO : E9317

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INSTALLATION INSTRUCTIONS

THE FIELD KIT ENHANCED SIGNAL INPUT BOARD

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KIT CONTENTS / PART NUMBERS	PAGE 2
TOOLS AND EQUIPMENT REQUIRED	PAGE 2
INSTALLATION PROCEDURE FOR MCS/OCS-2000	PAGE 3
INSTALLATION PROCEDURE FOR MEA-1500/1200	PAGE 4

REFERENCE DRAWINGS:

SIGNAL INPUT BOARD MCS/OCS-2000	7092E9016-00
SIGNAL INPUT BOARD MEA-1500/1200	7092E9311-19
TRIGGER INPUT ADAPTER BOARD	7092E9313-18
MODIFIED SIGNAL INPUT BOARD MCS/OCS-2000	7092E9313-21
MODIFIED SIGNAL INPUT BOARD MEA-1500/1200	7092E9313-22
CABLE "PT1, PT2, PT3"	7076E9323-10/11/12

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INTRODUCTION

GREAT CARE HAS BEEN TAKEN IN THE PREPARATION OF THIS INSTALLATION BOOKLET TO ENSURE A SUCCESSFUL INSTALLATION OF THE FIELD KIT ENHANCED SIGNAL INPUT BOARD FOR THE MCS-2000, MCS-2000SL, MCS-2000SL-L, OCS-2000, MEA-1500SL AND MEA-1200.

THIS BOOKLET IS DESIGNED TO ENABLE THE INSTALLATION TO BE CARRIED OUT USING ONLY THE EQUIPMENT SPECIFIED IN THE EQUIPMENT REQUIRED SECTION.

MAKE SURE THAT THE TESTER IS FULLY OPERATIONAL AND PERFORM ALL NECESSARY REPAIRS BEFORE STARTING THIS INSTALLATION.

THE FOLLOWING PROCEDURE MUST BE CARRIED OUT IN THE SEQUENCE AS SPECIFIED IN THE TABLE OF CONTENTS, NO SECTIONS MAY BE SKIPPED.
DO NOT TOUCH ANY PART OF THE TESTER UNLESS INSTRUCTED TO DO SO.

PRODUCT DESCRIPTION

THIS FIELD KIT WILL MODIFY THE TWO INPUT BOARDS PN: 7001E9005-00 AND PN: 7001E9313-20 USED IN THE PREVIOUS MENTIONED TESTERS.
IT WILL CHANGE THE PROCESSING OF THE SIGNAL COMING FROM THE RED TRIGGER PICK-UP. THE TRIGGER SIGNAL IS NOW TOTALLY DEPENDING ON THE CURRENT THROUGH THE CYLINDER #1 WIRE (INDUCTIVE TRIGGER).
THIS INDUCTIVE TRIGGER WILL WORK MORE RELIABLE ON MODERN IGNITION SYSTEMS LIKE WASTED SPARK.

RULES

* ALWAYS SWITCH OFF THE MAINS SUPPLY WHEN WORKING INSIDE THE UNIT.
* WHEN ROUTING WIRES AND CABLES, ALWAYS TRY TO KEEP THEM AWAY FROM NOISY COMPONENTS SUCH AS MAINS TRANSFORMERS ETC.
* USE ANTI-STATIC PROCEDURES WHILE PERFORMING THE INSTALLATION. UTILISE THE "STATIC FIELD SERVICE KIT" PART NUMBER: 0552-0032-09.
* DO NOT FORGET TO REFIT THE GROUND CONNECTIONS WHEN FINISHED.

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KIT CONTENTS:

THE FIELD KIT ENHANCED SIGNAL INPUT BOARD, PART NUMBER 7009E9318-38, COMES WITH ALL THE PARTS NECESSARY TO MODIFY THE SIGNAL INPUT BOARDS: 7001E9005-00 AND 7001E9311-20.

PART NUMBER	QUA	DESCRIPTION
7001E9313-18	1	TRIGGER INPUT ADAPTER BOARD
7076E9323-10	1	CONN. CABLE PT1 (TRIGGER INPUT)
7076E9323-11	1	CONN. CABLE PT2 (TRIGGER OUTPUT)
7076E9323-12	1	CONN. CABLE PT3 (POWER SUPPLY)
401-0406-609	4	SPACER M4X6
407-0414-480	4	SEM SCREW SP/W M4X14 BLACK
407-0306-480	4	SEM SCREW SP/W M3X6 BLACK
402-0316-137	2	TAPPED SPACER M3X16 TAPPED
402-0316-167	2	TAPPED SPACER M3X16 TAPPED WITH STUD
0694-0484-00	1	LABEL INDENT. 7001E9313-21
0694-0484-00	1	LABEL INDENT. 7001E9313-22
0694-0484-00	1	LABEL INDENT. BLANK
0692E9310-10	1	INSTALLATION INSTRUCTIONS

TOOLS AND EQUIPMENT

A STANDARD TOOLS KIT IS REQUIRED TO PERFORM THE INSTALLATION OF THIS FIELD KIT:

- SET STANDARD SCREWDRIVERS
- SET CROSSHEAD SCREWDRIVERS
- SIDE CUTTER
- SNIPE NOSE PLIERS
- SOLDER IRON
- SOLDER

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INSTALLATION PROCEDURE FOR MCS/OCS-2000

STEP 1 REMOVE THE SIGNAL INPUT BOARD, P/N: 7001E9005-00, FROM THE BOOM OF THE MCS/OCS AND PLACE IT ON A CLEAN WORK-BENCH. NOTE THE WAY THE EDGE CONNECTORS J1 AND J2 ARE FITTED.

STEP 2 REMOVE AND DISCARD THE FOLLOWING ITEMS (REFER TO SCHEMATICS 7092E9016-00):
C1, C2, C3, C4, C5, RV1, L1 AND R52.

STEP 3 WITH REFERENCE TO THE "MODIFIED SIGNAL INPUT BOARD" DRAWING, P/N: 7001E9313-21, SOLDER THE CABLES PT1, PT2 AND PT3 ONTO THE SIGNAL INPUT BOARD. NOTE THE COLOR OF THE WIRES.

STEP 4 MOUNT THE TWO TAPPED SPACERS M3X16 ONTO THE INPUT BOARD. MOUNT THE TRIGGER INPUT ADAPTER BOARD ONTO THE SPACERS, REFER TO DETAIL E, SOLDER-SIDE UPWARD.

STEP 5 CONNECT THE CABLES PT1, PT2 AND PT3 TO THE TRIGGER INPUT ADAPTER BOARD AND PLACE LABEL MARKED "7001E9313-21" ON THE MODIFIED SIGNAL INPUT BOARD.

NOTE THE NEW SIGNAL INPUT BOARD, P/N: 7001E9313-21, INCLUDES THE TRIGGER INPUT ADAPTER BOARD.

STEP 6 REPLACE THE 4 GREY SPACERS M4X9.6 BY SPACERS M4X6 AND REFIT THE MODIFIED SIGNAL INPUT BOARD INTO THE BOOM OF THE MCS/OCS. TEST THE NEW TRIGGER CIRCUIT BY CONNECTING THE RED TRIGGER PICK-UP TO A IS-100B OR A CAR SYSTEM.

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INSTALLATION PROCEDURE FOR MEA-1500/1200

STEP 1 REMOVE THE SIGNAL INPUT BOARD, P/N: 7001E9311-20, FROM THE BACK PLATE OF THE MEA AND PLACE IT ON A CLEAN WORK-BENCH. NOTE THE FITTING OF CONNECTORS J400, J401, J402 AND J410.

STEP 2 REMOVE AND DISCARD THE FOLLOWING ITEMS (REFER TO SCHEMATICS 7092E9311-19):
T1, T2, L12, L13, C17, C18, C19, C20, C21, C46, VR2 AND R9.

STEP 3 WITH REFERENCE TO THE "MODIFIED SIGNAL INPUT BOARD DRAWING, P/N: 7001E9313-22, SOLDER THE CABLES PT1, PT2, PT3 ONTO THE SIGNAL INPUT BOARD. NOTE THE COLOR OF THE WIRES.

STEP 4 MOUNT THE TWO TAPPED SPACERS M3X16 WITH STUD ONTO THE INPUT BOARD. MOUNT THE TRIGGER INPUT ADAPTER BOARD ONTO THE SPACERS, COMPONENT SIDE UPWARD (REFER TO THE DRAWING).

STEP 5 CONNECT THE CABLES PT1, PT2 AND PT3 TO THE TRIGGER INPUT ADAPTER BOARD. PLACE BLANK MARKED "7001E9313-22" ON THE MODIFIED SIGNAL INPUT BOARD AND THE BLANK LABEL ON THE TRIGGER INPUT ADAPTER BOARD.

NOTE THE NEW SIGNAL INPUT BOARD, P/N: 7001E9313-22, INCLUDES THE TRIGGER INPUT ADAPTER BOARD.

STEP 6 REFIT THE MODIFIED SIGNAL INPUT BOARD AND ALL CABLES. TEST THE NEW TRIGGER CIRCUIT BY CONNECTING THE RED TRIGGER PICK-UP TO A IS-100B OR A CAR SYSTEM.

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Hole Schedule			
Code	Qty	Dia	

Revisions					
Sym	Date	ECN	Description	Check	Appr
A	11.04.85		ERN# 0024		GS
B	06-89	9.06.0356	ADDED CR3 TO PREVENT LEAKAGE-CURRENT FROM KL15 TO KL1	G.K.	BG

J1

RED TRIGGER INPUT
14 R
15 S
TP3
TP4
C1 10n
R52 10k 1W
C2
RV1
L1
C3 47n
C5 47n
C4 10n
TP5 3
TP6 C
TRIGGER (TO TRIG PRIMARY) PIN 6 PIN 7
J2

TO BE REMOVED

SECONDARY INPUT
P
7
13
H
TP7
C6 680p
R1 68 2W
C7 33n±2%
N1
TP8 1
SECONDARY (TO TRIG PRIMARY PIN 5 / TO KV PROCESSOR PIN 2)

TO AUTOMOTIVE GROUND

KL 1 (COIL MINUS)
B
C
TP9
RV3
R12 220k 1% 0.5W
TP11
R13 100k
TP10
R14 50k
+12V
CR10
CR11
-12V
R15 100k
TP12
R16 100k
TP13
C12 100p
TP14
U2
R17 1k
TP16 7
TP15
CR26
CR27
KL 1 ANALOG (TO MUX A/D J1 PIN 1)

R18 220k 1% 0.5W
TP17
R19 11k 1%
+12V
CR18
CR19
-12V
R20 100k
TP18
R21 100k
TP19
C13 100p
TP20
U2
R51 47
TP21 E
C28 10n
PRIMARY ÷ (TO MISC FUNC PIN 14)

CR3 1N5624
R22 25W
TP22
CR1 65038
TP31
R24 100
C27 100n
Q1 2N4037
R23 68
TP23
CR12
CR13
CR14
CR15
TP24
TP25
TP26
TP29
R25 2k7
C15 10n
TP27
R27 220
TP32
R26 1k
TP33
U3
R28 100k
TP34
R29 100
C17 100n
C16 100
TP28 4
SHORT (FROM MISC FUNC PIN 11)
CR2
TP30 11
TP35 M
6.3 Vac
(FROM POWER SUPPLY)

TP36
KL 15
2
1
RV4
R30 220k 1% 0.5W
TP38
R31 100K
TP37
R32 50k
+12V
CR16
CR17
-12V
R33 100k
TP39
R34 100k
TP40
C18 100p
TP41
U2
R35 1k
TP43 13
TP42
CR22
CR23
KL 15 ANALOG (TO MUX A/D J2 PIN 14)
J1
J2

FOR NOTES SEE SHEET 2

REF TO ASSY NO 7001E9005
PCB NO 7025E9015

Item	Qty	Dwg Part no	Description	Matl Spec	Rv. etc

Scale
Drawn by K.E Soeleman — Date 09-11-84
Checked by Ron Lammers — 12-11-84
Approved Bernard Jek. — 15.11.85
Remarks: Used on Sun 2014, SAM 40 MCS 2000.
Finish
Unless otherwise specified: Dimensions are in mm. Tolerances on Angles: ±0.5° Holes: ±0.1 Bend: ±0.5

SIGNAL INPUT

Drawing No 7092E9016

Sun ELECTRIC EUROPE AMSTERDAM

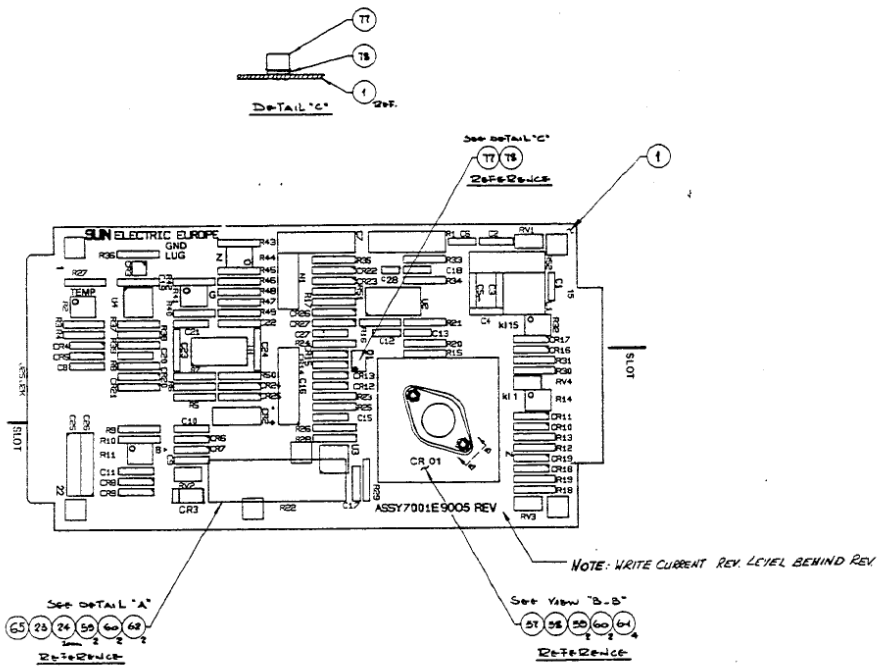
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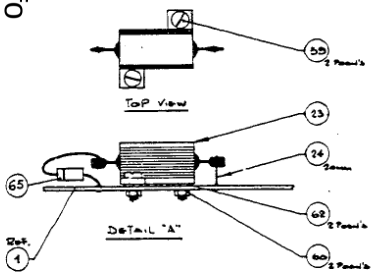
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Code
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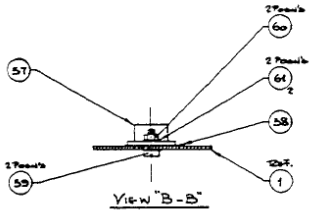
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Hole Schedule		
Code	Qty	Dia

Sym	Date	ECN	Description	Check	Appr
A	07.10.87	—	ERN°0108	P.T.	BG
B	06-89	9.06. 035E	ADDED ITEM 65	G.K.	BB.
C	12-89	3.11. 081E	ADDED "NOTE: WRITE CURRENT REV. LEVEL BEHIND REV."	P.T.	BG
D	01-94	3.12. 172E	ITEM 24 QUANT CHANGED FROM 2×20mm TO 20mm. ITEM 65 PIN WAS 0774-080+ 000.	P.T.	BG







LINE NR	DIRECT ASSEM PART NR.	QUANT	COMPONENTS & SUB ASSEMBLIES	ITEM NR.
1	7025E9015-00	1	PCB ASSY SIGNAL INPUT	
2				
3				
4	0680-2011-00	1	RES 47R 5% 1/4W	R51
5	0680-2016-00	1	RES 68R 5% 1/4W	R23
6	0680-2018-00	2	RES 100R 5% 1/4W	R24,R29
7	0680-2027-00	1	RES 220R 5% 1/4W	R27
8	0680-2045-00	4	RES 1K 5% 1/4W	R8,R17,R26,R35
9	0680-2061-00	1	RES 2K7 5% 1/4W	R25
10	0680-2076-00	1	RES 15K 5% 1/4W	R10
11	0680-2101-00	1	RES 82K 5% 1/4W	R9
12	0680-2106-00	12	RES 100K 5% 1/4W	R5-R7,R13,R15,
13			R16,R20,R21	R28,R31,R33,R34
14				
15	1670-2493-00	1	RES 2K49 1% 1/4W	R3
16	1670-3483-00	1	RES 3K48 1% 1/4W	R4
17	1670-1104-00	1	RES 11KO 1% 1/4W	R19
18				
19				
20	003-0670-616	3	RES 220K 1% 1/2W	R12,R18,R30
21	0680-0750-00	1	RES 68R 10% 2W	R1
22	003-0680-761	1	RES 10K 5% 1W	R52
23	003-0684-538	1	RES 1R 5% 25W	R22
24	003-0637-611	20mm	WIRE TINNED COPPER 22AWG	USED ON R22
25				
26				
27	003-0685-568	1	RES VAR 5K	R11
28	0685-0411-00	1	RES VAR 20K	R2
29	0685-0406-00	2	RES VAR 50K	R14,R12
30				
31	0668-0901-00	5	RES ZERO OHM	R39,R40,R47-R49
32				
33				
34				
35	003-0679-714	2	CAP ELEC 4,7µF, 25V	C25,C26
36	0679-0255-00	1	CAP ELEC 100µF, 25V	C16
37				
38				
39	003-0679-739	1	CAP POLY 33nF, 63V, 1%	C7
40	003-0679-738	2	CAP CER 47nF,100V,10%	C3,C5

LINE NR	DIRECT ASSEM PART NR.	QUANT	COMPONENTS & SUB ASSEMBLIES	ITEM NR.
41	003-0679-563	6	CAP MET POLY .10µF, 100V	C9,C9,C17,C23
42				C24,C27
43	003-0679-627	1	CAP MET POLY .22µF, 50V	C11
44	003-0679-716	1	CAP CER 47pF	C10
45	003-0679-709	3	CAP CER DISK 100pF	C12,C13,C18
46	003-0679-619	1	CAP CER DISK 680pF, 100V	C6
47	0679-0404-00	3	CAP CER DISK 10nF, 250V	C4,C15,C28
48	003-0679-626	1	CAP MET POLY .01µF, 250V	C1
49				
50				
51	003-0776-617	2	I.C. TL 084 CN	U1,U2
52	0773-0129-00	1	I.C. OPTO-COUPLER	U3
53				
54	0859-0067-00	1	NEON BULB	N1
55				
56				
57	0771-0260-00	1	THYRISTOR 65038	CR1
58	0776-0909-00	1	MICA WASHER	USED ON CR1
59	404-0308-523	4	SCREW M3 × 8	USED ON CR1,R22
60	409-0300-103	4	NUT M3	USED ON CR1,R22
61	400-0300-203	4	WASHER M3 INT S/P	USED ON CR1,R22
62	400-0300-509	2	WASHER M3 NYLON	USED ON R22
63	7096E2055-93	1	BRIDGE RECT 1B01	CR2
64				
65	0771-0246-00	1	DIODE 1N5624	CR3
66	0771-0272-00	16	DIODE 1N914B	CR4-CR19
67	0803-5235-00	6	DIODE ZENER 6.8V 1/2W	CR20-23,CR26-27
68				
69				
70	0778-0389-00	1	TOROID TRANSFORMER	L1
71				
72				
73	0749-0208-00	4	VDR 2754	RV1-RV4
74				
75				
76				
77	0776-0198-00	1	TRANS 2N4037	Q1
78	003-0776-531	1	PAD	USED ON Q1
79				
80	7092E9016-00	REV	SCHEMATIC	

Item	Qty	Dwg Part no.	Description	Ref. designation

Scale 1:1
Drawn by Jim A Soo M. — Date 6.06.88
Checked by Peter Tal — 11.05.88
Approved Bernard Gan — 17.5.88
Finish

Remarks: Used on Sumi 2044, Sumi 4000, MCA 2000.

Unless otherwise specified: Dimensions are in mm. Tolerances: Angles ±0°30' Fractions ±1/64 Decimals .x ±0.1 .xx ±0.05 .xxx ±0.025

Description: PRINTED CIRCUIT BOARD ASS'Y SIGNAL INPUT

7001E9006-00

Sun

A1

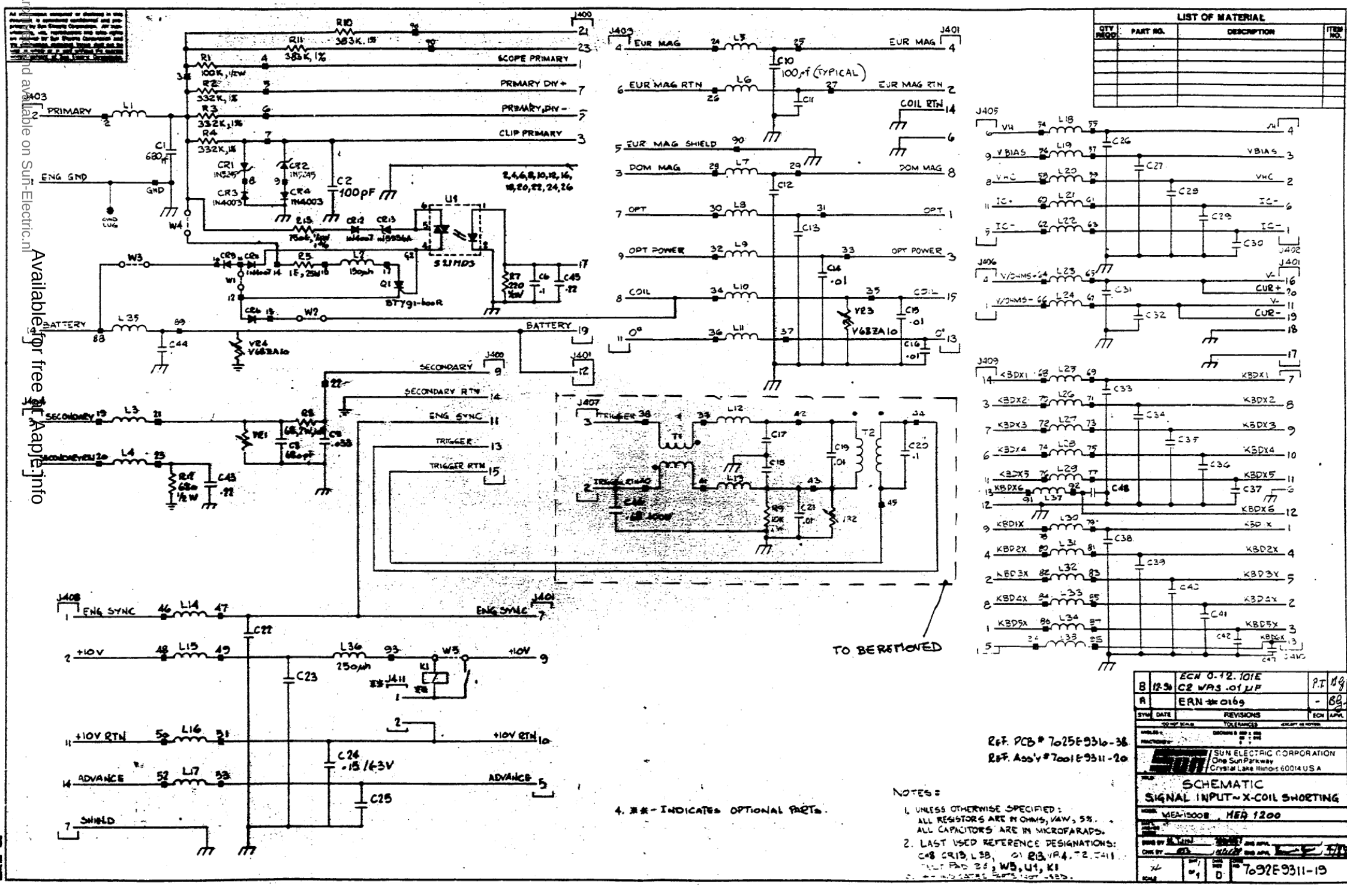
Sheet 1 of 1

Code

Project no 6-8713

Issue D

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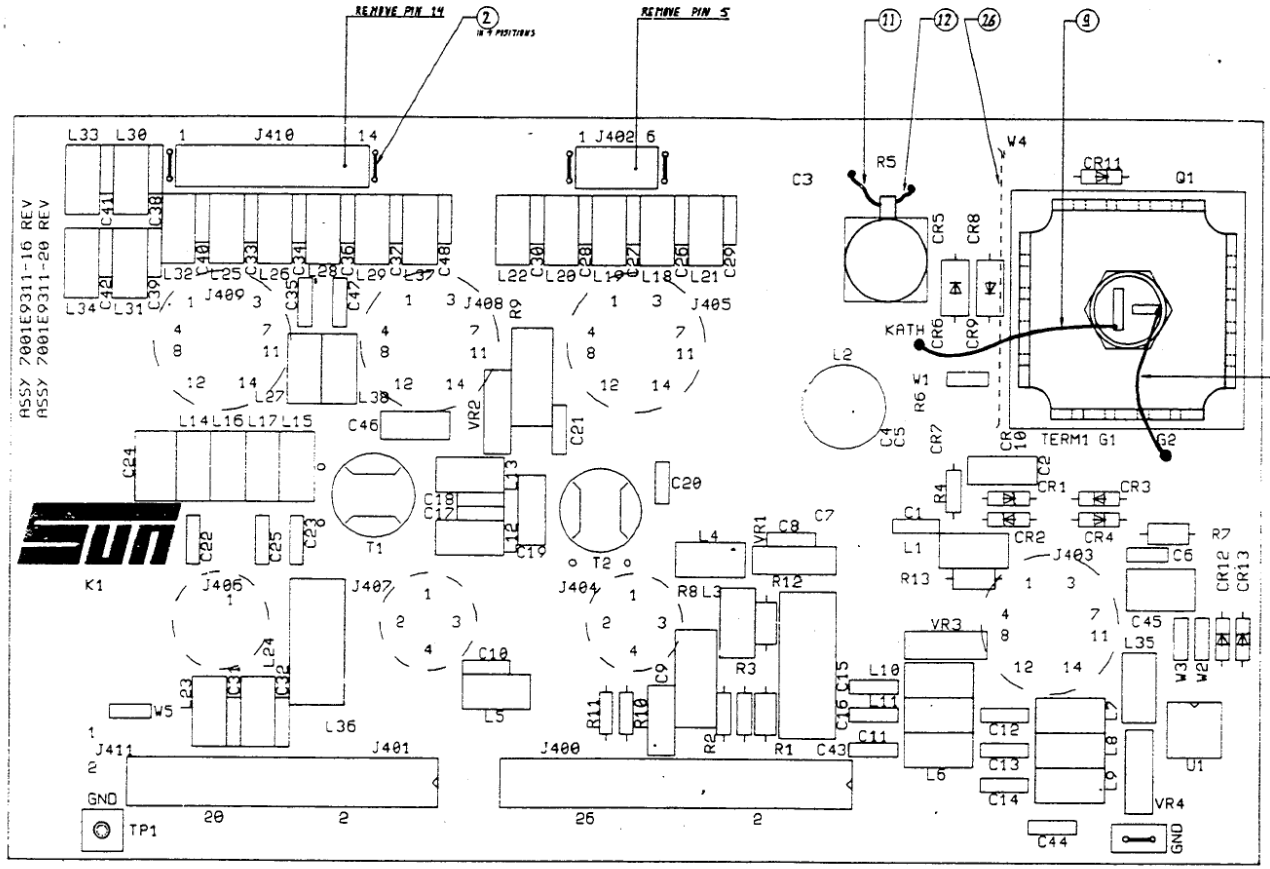
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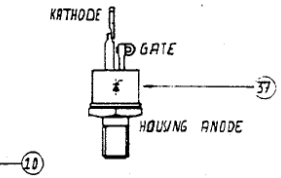
A	15.1.88		ECN # 0163	GS	
B	11.2.88		ECN 8.02.010 E ADDED MISSING INFO SH 2 CHANGE TEXT SH. 1	GS	B
C	11/4/88		SEE ENT 1	GS	B
D	04-08-88	5.04.0208	QTY ITEM 7 WAS 8. ADD. KEY PLUG (ITEM 7) IN J408-12, CALL'D BOARD "D", WAS "B".	P.T.	B
E	10-10	6.10.085E	ITEM 30 WAS 4162-1662-04 ITEM 33 WAS 4162-1662-14	GS	B
F	12-90	8.12.101E	CAPACITOR C2 WAS 0.01µF, 500V, DISC. QTY ITEM 59 WAS 5 QTY ITEM 65 WAS 33	P.T.	B

CONTACT SOCKET POSITIONS	
CONN.	POSITIONS
J403	1.2.3.4.5.6.7.8.9.11.14
J404	1.3
J405	5.6.8.9.11
J406	1.4
J407	2.3
J408	1.2.7.11.14
J409	1.2.3.4.5.6.7.8.9.11.12.13.14

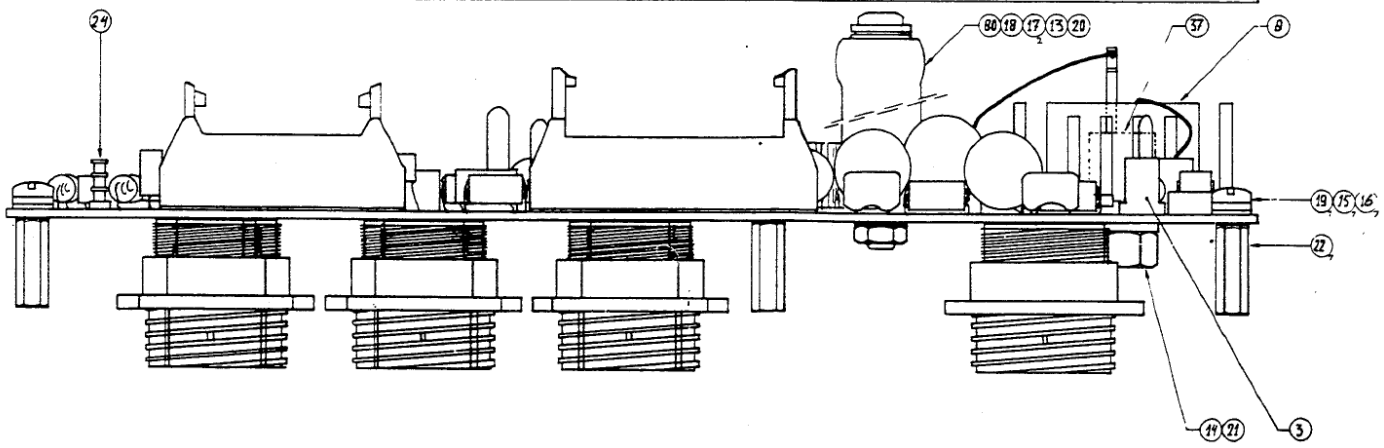
KEY PLUG LOCATIONS	
CONN.	LOCATIONS
J403	12
J404	4
J405	1.14
J406	2
J407	1
J408	8, 9
J409	10

JUMPER TABLE	
W1	IN
W2	IN
W3	IN
W4	IN
W5	IN





NOTE: 1. COVER PART No 7001E9311_16 WITH MASKING TAPE OR WATERPROOF FELTIP MARKER
2. ADD CURRENT REV LEVEL
3. APPLY ITEM 23 TO T1, T2 AND L2 TO PREVENT MOVEMENT



Scale 2:1 — Date — Mem 4300, MEM 1200

Drawn by PDJ 13.1.88

Checked by C.P. Thomson

Approved by [illegible]

ASSY DWG SIGNAL INPUT X COIL SHORTING 7001E9311.20

Sun

A1

Sheet 2 of 2

Drawing 63205

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Revisions				
Rev	Date	Description	Check	Appr.
A	01'94	ERN 1065 R.F.P.	P.T.	B.G.

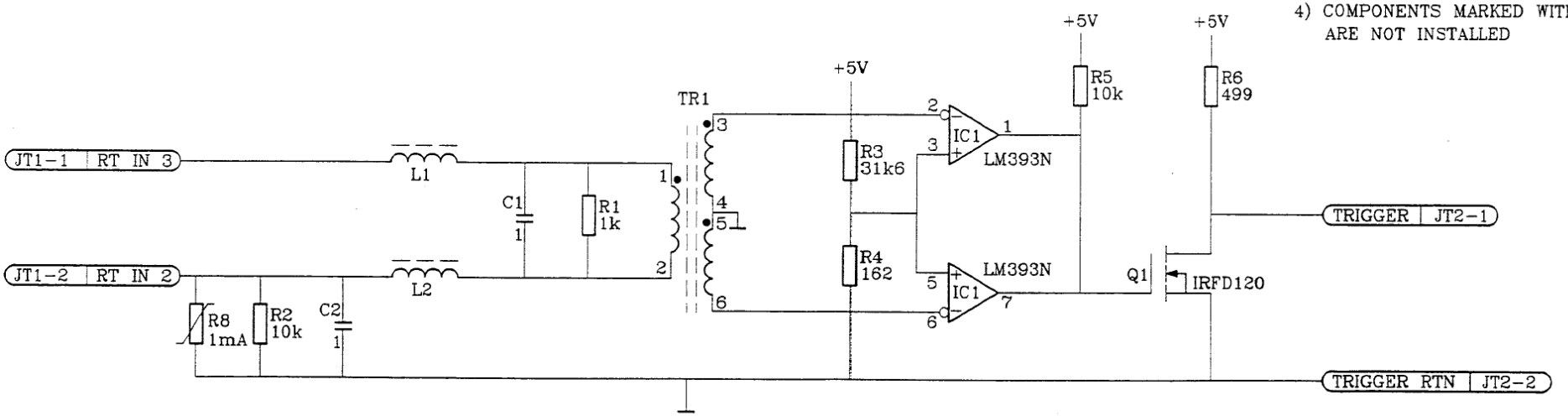
JT1- CONNECTOR	
PIN NO	SIGNAL
1	RT IN 3
2	RT IN 2

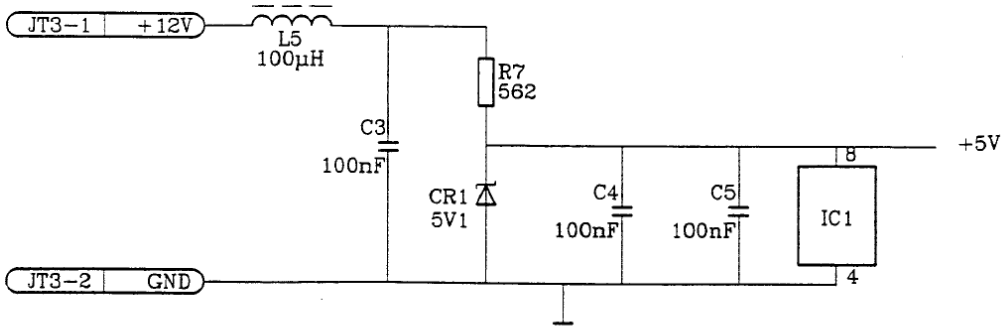
JT2-CONNECTOR	
PIN NO	SIGNAL
1	TRIGGER
2	TRIGGER RTN

JT3-CONNECTOR	
PIN NO	SIGNAL
1	+12V
2	GND

NOTES:

1) UNLESS OTHERWISE SPECIFIED
   - A) ALL RESISTORS ARE IN OHMS,1/4W,1%
   - B) ALL CAPACITORS ARE IN MICRO-FARADS
   - C) ALL DIODES ARE 1N914 OR 1N4148
   - D) ALL IC'S ARE 74HC-SERIES TYPE
   - E) ALL POLARIZED CAPACITORS ARE 16V
2) LAST USED NO'S: CK2, CR1, R8, IC1, C5, JT3, Q1, TR1, L5
3) NOT USED NO'S: L3, L4
4) COMPONENTS MARKED WITH ■ ARE NOT INSTALLED





Item	Qty.	Dwg./Part no.	Description	Remarks
Scale	N.T.S.	Date	Used in	MEA/MCS/OCS
Designed by	KEES STAM	11-93	Material	
Drawn by	R. V/D HOEF	11-93		
Checked by	PETER TEL	01-94		
Appproved	BERNARD GEE	01-94	Finish	

Unless otherwise specified : Dimensions are in mm ; Tolerances on : Angles ±5° Holes ±0.1 Rest ±0.5

Remove all sharp corners and remove burrs

Description: SCHEMATIC TRIGGER INPUT ADAPTER BOARD

Dwg.no: 7092E9313-18

SUN ELECTRIC EUROPE B.V.

A2

Sheet 1 of 1

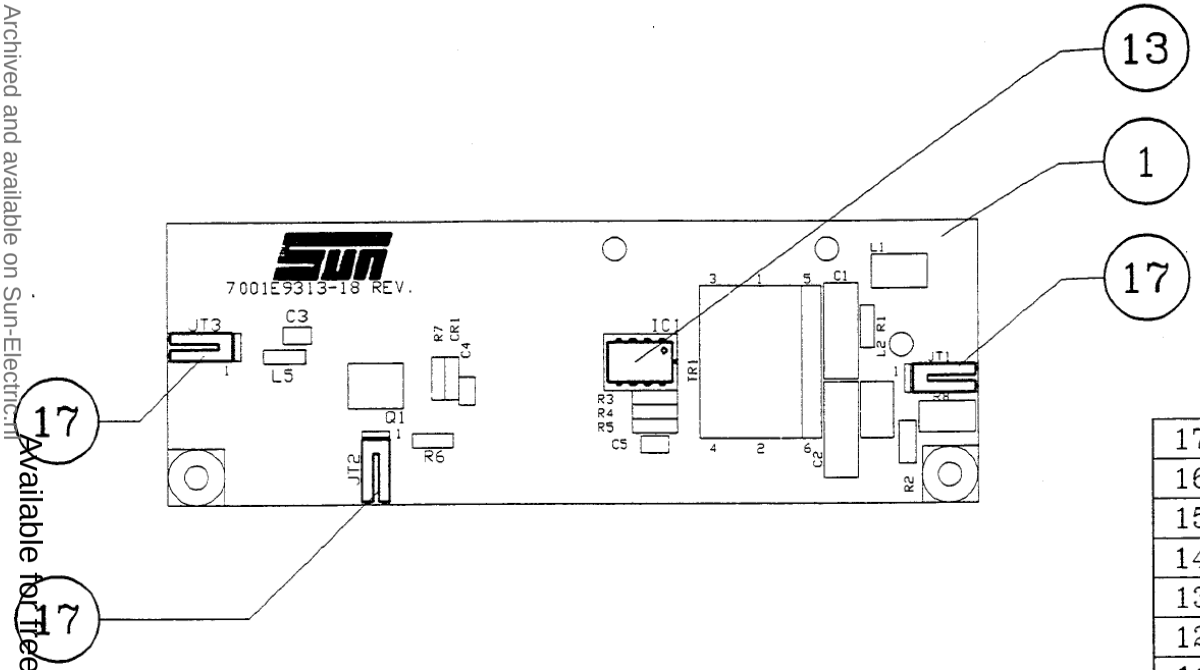
Project no.

Rev. A

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Revisions				
Rev	Date	Description	Check	Appr.
A	01'94	ERN 1065 R.F.P.	P.T.	B.G.



Item	Qty.	Dwg./Part no.	Description	Remarks
17	3	4162-1678-01	MTA 100 2-WAY W/L /R.A.	JT1,JT2,JT3
16	1	7096E4057-95	CHOKE 100µH	L5
15	2	7096E4055-65	CHOKE B82114-R-A4 SIEMENS	L1,L2
14	1	7096E4057-90	PULSE TRANSFORMER	TR1
13	1	7096E2070-38	IC LM393N	IC1
12	1	7096E2055-44	HEX FET IFRD 120	Q1
11	1	0603-4733-00	ZENERDIODE 5V1 1N4733A	CR1
10	2	7096E1080-16	CAP. 1µF 100V mkt rad	C1,C2
9	3	0860-0180-08	CAP. 100nF 50V cer axi	C3,C4,C5
8	1	0749-0208-00	VDR 473/583	R8
7	1	1670-3164-00	RESISTOR 31K6 1/4W 1%	R3
6	2	1670-1004-00	RESISTOR 10K 1/4W 1%	R2,R5
5	1	1670-1003-00	RESISTOR 1K 1/4W 1%	R1
4	1	1670-5622-00	RESISTOR 562E 1/4W 1%	R7
3	1	1670-4992-00	RESISTOR 499E 1/4W 1%	R6
2	1	1670-1622-00	RESISTOR 162E 1/4W 1%	R4
1	1	7025E9313-18	PCB TRIGGER INPUT ADAPTER	

NOTES:
1) ADD CURRENT REVISION LEVEL.

REF. PCB 7025E9313-18
REF. SCHEMA 7092E9313-18

Scale	N.T.S.	Date	Used in MEA/MCS/OCS
Designed by	KEES STAM	11-93	Material
Drawn by	R. V/D HOEF	12-93	
Checked by	PETER TEL	01-94	
Appproved	BERNARD GEE	01-94	Finish

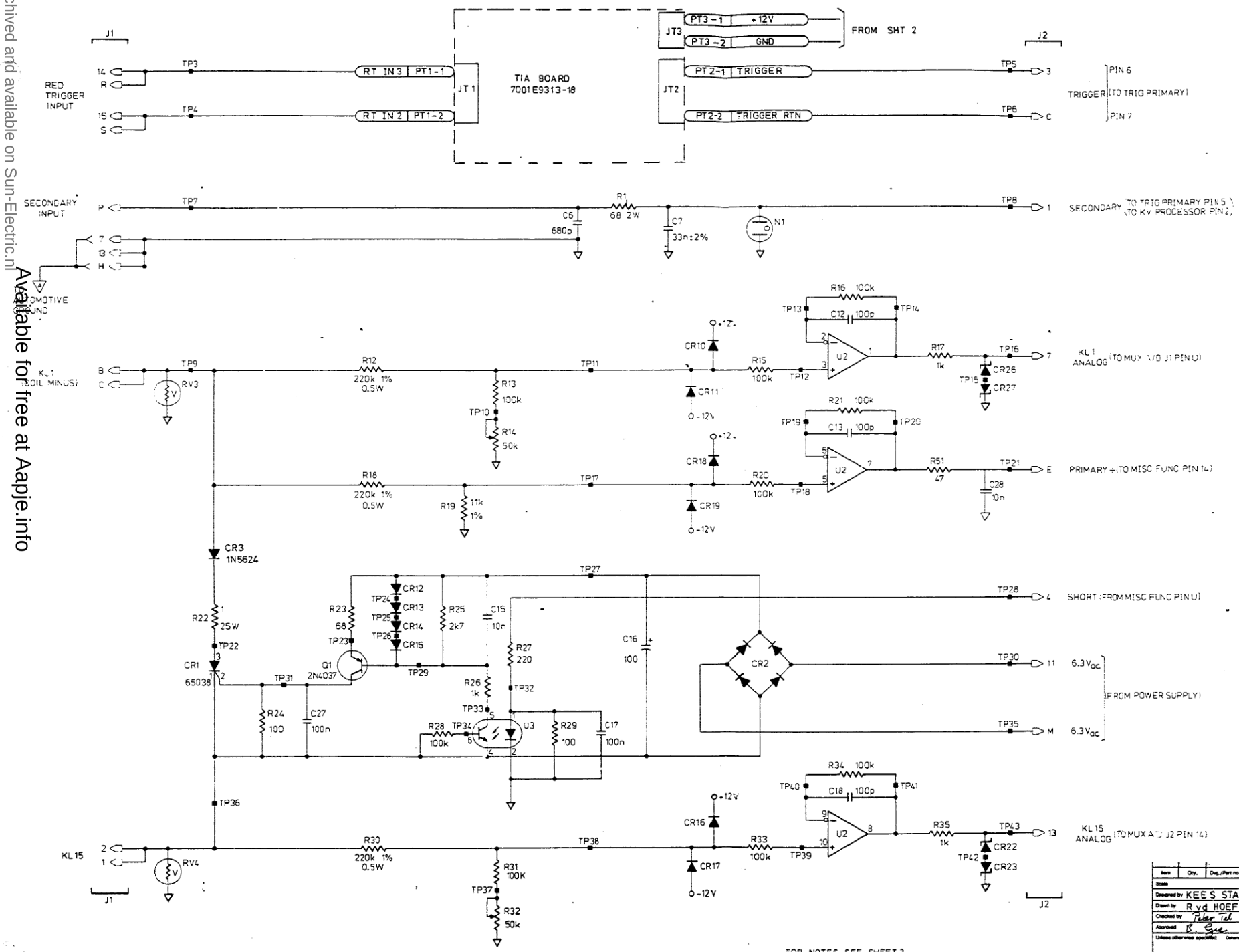
Unless otherwise specified : Dimensions are in mm ; Tolerances on : Angles ±5° Holes ±0.1 Rest ±0.5
Remove all sharp corners and remove burrs

Description: TRIGGER INPUT ADAPTER	Dwg.no: 7001E9313-18	
SUN ELECTRIC EUROPE B.V.	A3	Sheet 1 of 1 / Project no.
		Rev. A

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Sym	Date	Init	Description	Check	Appr
A	01-'94		ERN 1065 RF.P.	P.T.	



REF PCB : 7025E9015

Item	Qty.	Dwg./Part no	Description		Remarks
Scale			Date	Used in MCS/OCS - 2000	
Designed by KEES STAM			10-93	Material	
Drawn by Ryd HOEF			12-93		
Checked by Peter Tel			18.1.'94		
Approved B. Gee			20.1.94	Finish	

Unless otherwise specified: Dimensions are in mm; Tolerances are: Angles ± 0,5°; Holes ± 0,; Rest ± 0,5

Remove all sharp corners and remove burrs

Description: SCHEMATIC MODIFIED SIGNAL INPUT BOARD

Dwg. no. 7092E9313-2

SUN ELECTRIC EUROPE B.V.

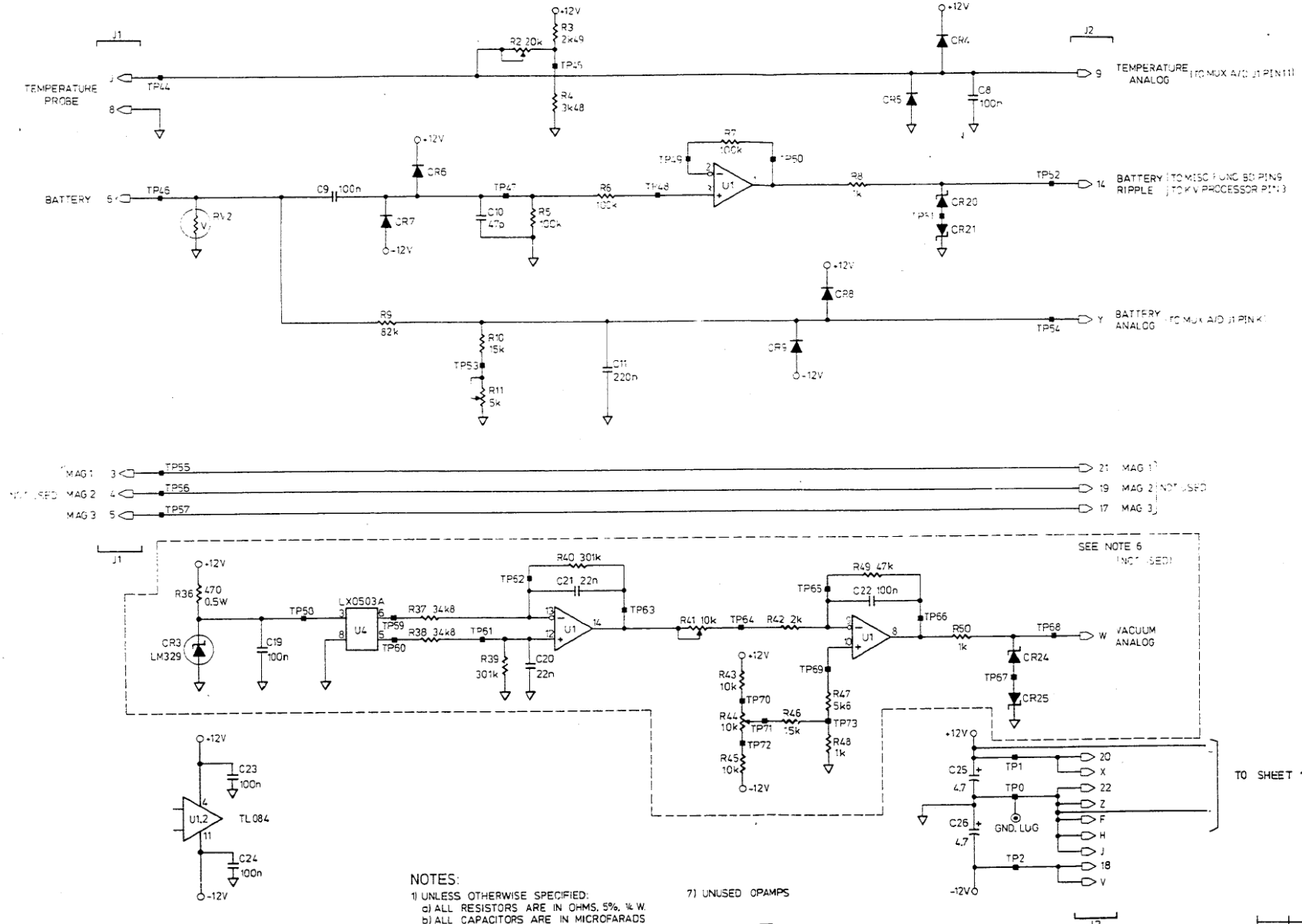
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Sheet 1 of 2

Code

Project no.

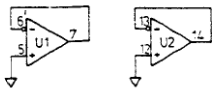
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NOTES:

1) UNLESS OTHERWISE SPECIFIED:
   a) ALL RESISTORS ARE IN OHMS, 5%, ¼ W.
   b) ALL CAPACITORS ARE IN MICROFARADS
   c) ALL DIODES ARE 1N914B
   d) ALL ZENERS ARE 6.8V, 250mW.
2) ALL POTMETERS ARE TEN TURN OR MORE
3) J1 IS A 30 PIN EDGE CONNECTOR
   J2 IS A 40 PIN EDGE CONNECTOR
4) NOT USED NRS. C14
5) LAST USED NRS. C28, CR27, L1, N1, R52, RV4, TP73, U4, Q1
6) PARTS NOT INSERTED WHEN VACUUM CIRCUITRY ON MISC. BOARD IS BEING USED. REPLACE R39, R40, R47, R48 AND R49 WITH JUMPERS.
7) PARTS NOT INSERTED C2

7) UNUSED OPAMPS



Item	Qty.	Dwg./Part no	Description		Remarks
Scale			Date	Used in MCS/OCS - 2000	
Designed by KEES STAM			12-93	Material	
Drawn by R.v.d. HOEF			12-93		
Checked by Peter Tel			18.1.'94		
Approved B. Gaz			20.1.94	Finish	

Unless otherwise specified: Dimensions are in mm. Tolerances are: Angles ± 0.5° Holes ± 0.1 Rest ± 0.3

Remove all sharp corners and remove burrs.

Description	Dwg no
SCHEMATIC MODIFIED SIGNAL INPUT BOARD	7092E9313-21

SUN ELECTRIC EUROPE BV
Automotive Wiederholen Wijers en wet

A

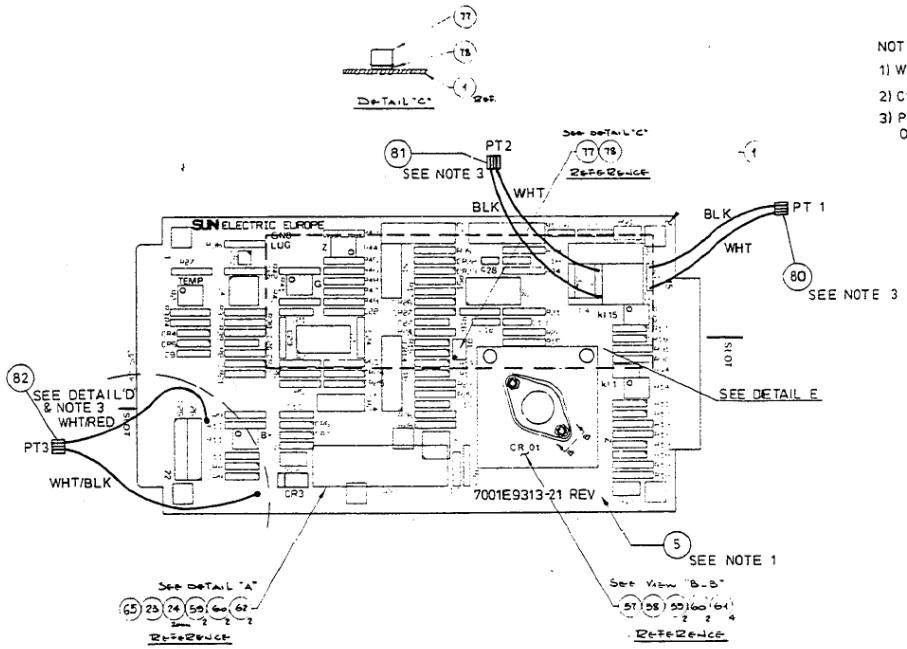
Sheet 2 of 2
Code
Project no.

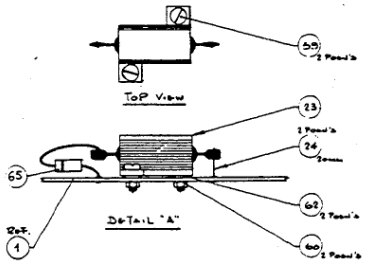
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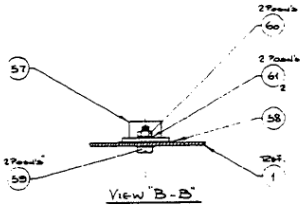
Rev	Date	ECN	Description	Check	Appr
A	12-93		ERN 1065 RPE	P.T.	

NOTES:

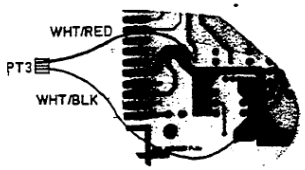
1) WRITE CURRENT P/N & REV. ON ITEM 2.
2) COVER P/N OF ITEM 74 WITH ITEM 3.
3) PLACE CONN. ON APPROPRIATE PLACE ON ITEM 74



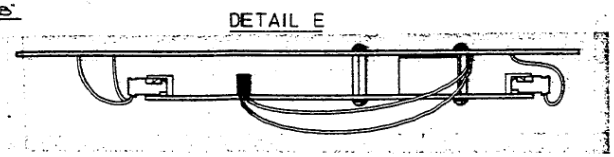


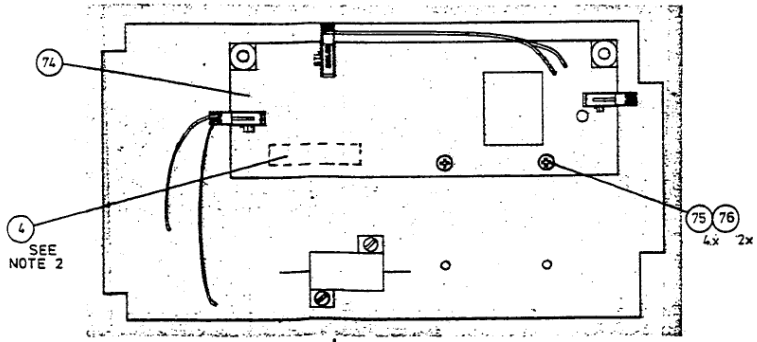


DETAIL 'D'



DETAIL E





ITEM NR	DIRECT ASSEM PART NR.	QUANT	COMPONENTS & SUB ASSEMBLIES	ITEM NR.
1	7025E9015	1	PCB SIGNAL INPUT	
2	0643-0484-00	1	LABEL IDENT. (7001E9313-21)	
3	0643-0484-00	1	LABEL IDENT.	
4	0680-2011-00	1	RESISTOR 47E 5% 1/4W	R51
5	0680-2016-00	1	RESISTOR 68E 5% 1/4W	R23
6	0680-2018-00	2	RESISTOR 100E 5% 1/4W	R24,29
7	0680-2027-00	1	RESISTOR 220E 5% 1/4W	R27
8	0680-2045-00	4	RESISTOR 1K 5% 1/4W	R8,17,26,33
9	0680-2061-00	1	RESISTOR 2K7 5% 1/4W	R25
10	0680-2076-00	1	RESISTOR 15K 5% 1/4W	R10
11	0680-2101-00	1	RESISTOR 82K 5% 1/4W	R9
12	0680-2106-00	12	RESISTOR 100K 5% 1/4W	R5-7,13,15,16,20 R21,28,31,33,34
13				
14				
15	1670-2493-00	1	RESISTOR 2K49 1% 1/4W	R3
16	1670-3483-00	1	RESISTOR 3K48 1% 1/4W	R4
17	1670-1104-00	1	RESISTOR 11K 1% 1/4W	R19
18				
19				
20	701-0670-616	3	RESISTOR 220K 1% 1/2W	R12,18,30
21	0680-0753-00	1	RESISTOR 68E 10% 2W	R1
22				
23	003-0684-538	1	RESISTOR 1E 5% 25W	R22
24	003-0637-611	20 mm	WIRE TINNER COPPER 22 AWG	R22
25				
26				
27	003-0685-568	1	RESISTOR VARIABLE 5K	R11
28	0685-0411-00	1	RESISTOR VARIABLE 25K	R2
29	0685-0406-00	2	RESISTOR VARIABLE 50K	R14,R32
30				
31	0668-5901-00	5	RESISTOR ZERO OHM	R39,40,47-49
32				
33				
34				
35	003-0679-714	2	CAPACITOR elec. 4.7µF 25V	C25,26
36	0679-0255-00	1	CAPACITOR elec. 100µF 25V	C16
37				
38				
39	003-0679-739	1	CAPACITOR poly. 33nF 63V ±1%	C7
40				
41				
42	703-0679-563	6	CAPACITOR met.poly 0.1µF 100V	C8,9,17,27,23,24
43	003-0679-627	1	CAPACITOR met.poly 0.22µF 50V	C11
44	003-0679-716	1	CAPACITOR cer. 47pF	C10
45	003-0679-709	3	CAPACITOR cer.disc 100pF	C12,13,18
46	003-0679-619	1	CAPACITOR cer.disc 680pF 100V	C6
47	0679-0404-00	2	CAPACITOR cer.disc 10nF 250V	C15,28
48				
49				
50				
51	003-0776-617	2	IC TL084CN	U1,2
52	0773-0129-00	1	IC OPTO-COUPLER	U3
53				
54	0859-0067-00	1	NEON BULB	N1
55				
56				
57	0771-0269-00	1	THYRISTOR (65038)	CR1
58	0776-0909-00	1	MICA WASHER	CR1
59	404-0308-523	4	SCREW M3x8 POS.PAN HEAD	CR1,R22
60	409-0300-103	4	NUT M3 FULL	CR1,R22
61	400-0300-203	4	WASHER M3 INT. S/P	CR1
62	400-0300-509	2	WASHER M3 NYLON	R22
63	7096E2055-93	1	RECTIFIER BRIDGE	CR2
64				
65	0771-0246-00	1	DIODE 1N5624	CR3
66	0771-0272-00	16	DIODE 1N914B	CR4-19
67	0803-5235-00	6	DIODE ZENER 6.8V 1/2W	CR20-23,26,27
68				
69				
70				
71				
72				
73	0769-0200-00	3	VOLT INDICATOR ASSEMBLY 2760	SEE-4
74	7001E9313-10	1	TRIGGER INPUT MONITOR BOARD	
75	407-0306-480	4	SEM SCREW 6G/S M3x6 BLACK	
76	402-0316-137	3	TAPPED SPACER (TAPPED THROUGH)	
77	0776-0198-00	1	TRANSISTOR 2N4037	Q1
78	003-0776-531	1	PAD	Q1
79				
80	7076E9323-10	1	CONN. CABLE PT1 (TRIGGER INPUT)	
81	7076E9323-11	1	CONN. CABLE PT2 (TRIGGER OUTPUT)	
82	7076E9323-12	1	CONN. CABLE PT3 (POWER)	
83				
84				
85	7092E9313-21	REF	SCHEMATIC MODIFIED SIGNAL INPUT BOARD	

REF. PCB 7025E9015

Item	Qty.	Dwg./Part no	Description		Rev.-artic.
Scale	NTS		Date	Used in MCS/OCS	
Designed by	KEES STAM		10-93	Material	
Drawn by	R.v.d. HOEF		12-93		
Checked by	Peter Tel		18.1.'94		
Approved	Rene Ger		26.1.94	Finish	

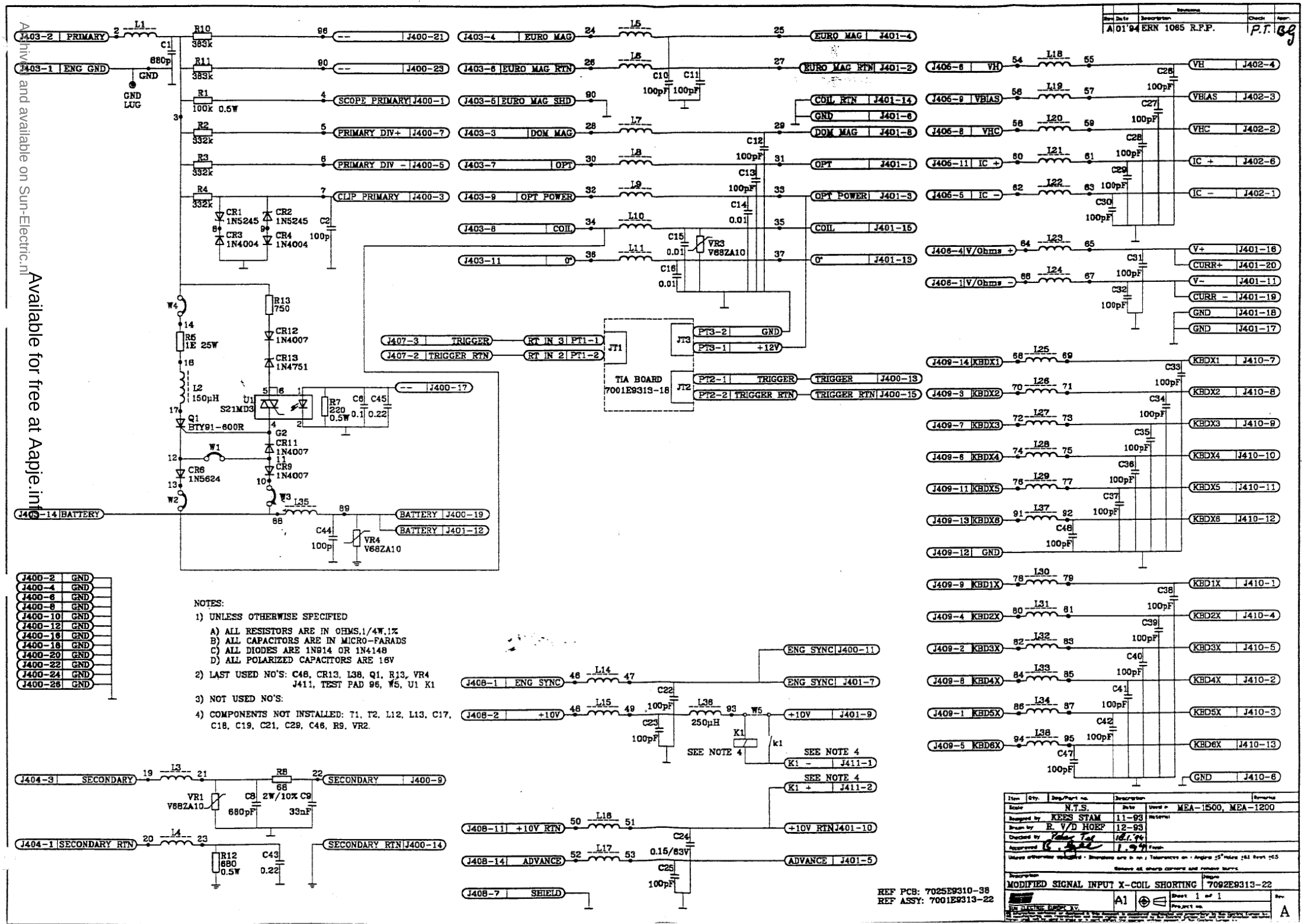
Unless otherwise specified: Dimensions are in mm; Tolerances are: Angles ± 0.5° Holes ± 0.1 Rest ± 0.5

Remove all sharp edges and remove burrs

Description	Dwg. no
MODIFIED SIGNAL INPUT BOARD WITH IMPROVED TRIGGER CIRCUIT	7001E9313-2

SUN ELECTRIC EUROPE — A1 — Sheet 1 of 1 — Code — Project no.

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NOTES:

1) UNLESS OTHERWISE SPECIFIED
   A) ALL RESISTORS ARE IN OHMS,1/4W,1%
   B) ALL CAPACITORS ARE IN MICRO-FARADS
   C) ALL DIODES ARE 1N914 OR 1N4148
   D) ALL POLARIZED CAPACITORS ARE 16V
2) LAST USED NO'S: C48, CR13, L38, Q1, R13, VR4
   J411, TEST PAD 96, W5, U1 K1
3) NOT USED NO'S:
4) COMPONENTS NOT INSTALLED: T1, T2, L12, L13, C17, C18, C19, C21, C29, C46, R9, VR2.

REF PCB: 7025E9310-38
REF ASSY: 7001E9313-22

Rev	Date	Description	Check	Appr.
A	01'94	ECN 1085 R.F.P.	P.T.	BG

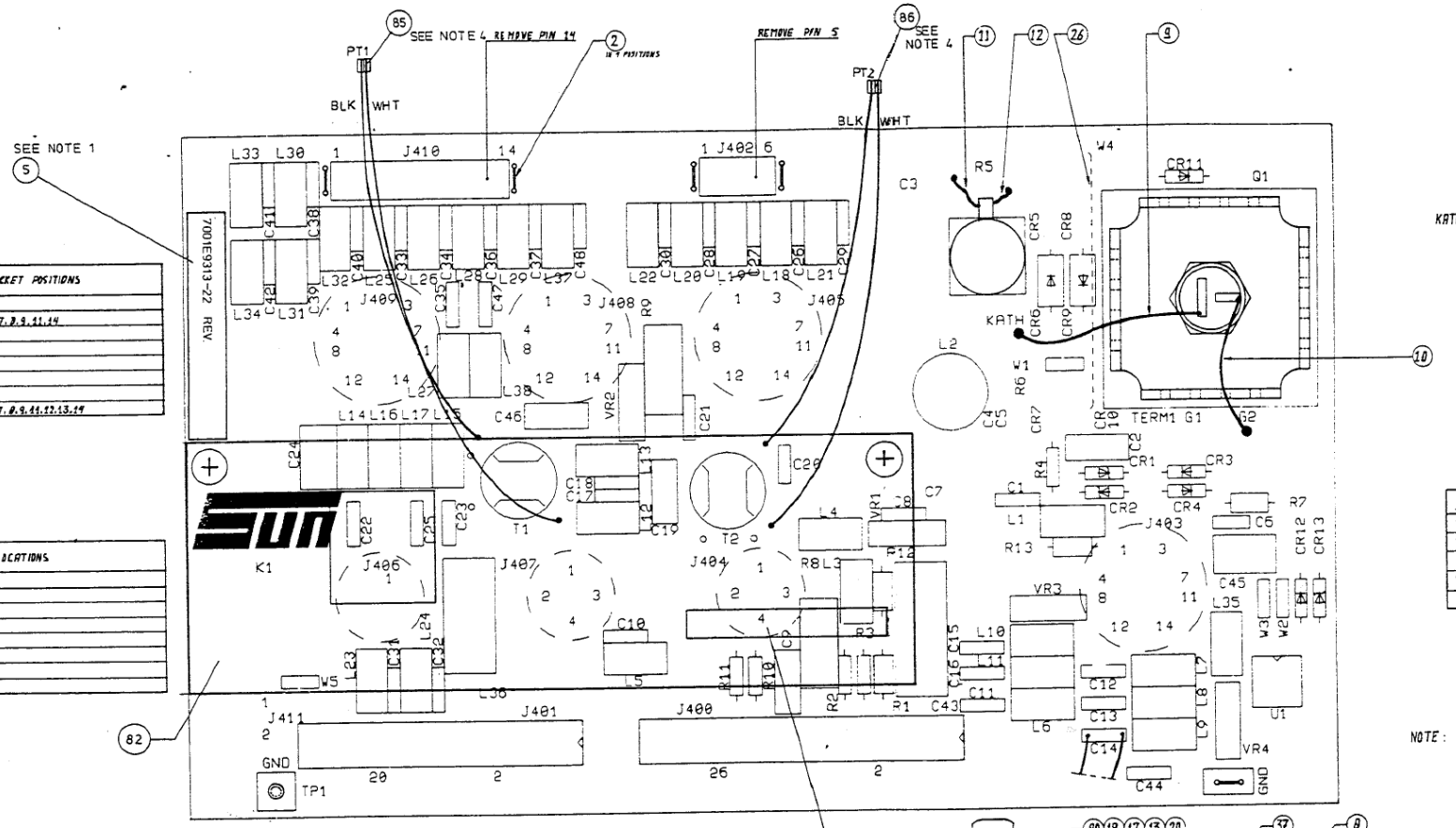
Scale	N.T.S.	Date	MEA-1500, MEA-1200
Designed by	KEES STAM	11-93	
Drawn by	R. V/D HOEF	12-93	
Checked by		1.1.94	
Approved		1.94	

MODIFIED SIGNAL INPUT X-COIL SHORTING — 7092E9313-22

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A	01-94		ERN 1065 R.F.P	P.T.



CONTACT SOCKET POSITIONS	
CONN.	POSITIONS
J403	1.2.3.4.5.6.7.8.9.11.14
J404	1.3
J405	5.6.8.9.11
J406	1.4
J407	1.3
J408	1.2.7.11.14
J409	1.2.3.4.5.6.7.8.9.11.12.13.14

KEY PLUG LOCATIONS	
CONN.	LOCATIONS
J403	12
J404	4
J405	1.14
J406	2
J407	1
J408	8, 5
J409	10

JUMPER TABLE	
W1	IN
W2	IN
W3	IN
W4	IN
W5	IN

NOTE:
1. COVER PART No 7001E9311-16 & -20 WITH ITEM 5 & WRITE CURRENT P/N. & REV. ON LABEL.
2. APPLY ITEM 23 TO L2 TO PREVENT MOVEMENT
3. COVER P/N OF ITEM 82 WITH ITEM 6.
4. PLACE CONN. ON APPROPRIATE PLACE ON ITEM 82.

Item	Qty.	Dwg./Part no	Description	Remarks
Scale	2:1		Date	Used in MEA-1200/-1500
Designed by	KEES STAM		10-93	Materials
Drawn by	R.v.d. HOEF		12-93	
Checked by	Peter Tel		18.1.'94	
Approved	K. Lyer		20.1.94	Finish

Unless otherwise specified: Dimensions are in mm; Tolerances on: Angles ± 0.5° Holes ± 0.1 Rest ± 0.5

Remove all sharp corners and remove burrs

Description: MODIFIED SIGNAL INPUT BOARD X COIL SHORTING WITH IMPROVED TRIGGER CIRCUIT

Dwg. no. 7001E9313-22

SUN ELECTRIC EUROPE B.V.

A1

Sheet 1 of 2

Code

Project no.

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Revisions				
Rev	Date	Description	Check	Appr.
A	01'94	ERN 1065 R.F.P.	P.T.	B.G.

ITEM	QTY.	PARTNUMBER	DESCRIPTION	REMARK
1	1	7025E9310-38	PRINTED CIRCUIT BOARD	
2	4	0676-0123-01	TERMINAL DISCONNECT	
3	1	7096E3056-17	FASTON TAB	
4	40	4162-0638-00	CONTACT SOCKETS	
5	1	0694-0484-00	LABEL IDENT. 7001E9313-22	
6	1	0694-0484-00	LABEL IDENT.	
8,	9	4162-0916-00	KEY PLUG	
8	1	0776-0930-00	HEAT SINK	
9	70mm	0663-0328-02	WIRE 22 AWG RED	
10	70mm	0663-0328-10	WIRE 22 AWG BLACK	
11	70mm	0663-0328-06	WIRE 22 AWG BLUE	
12	20mm	003-0637-611	WIRE 22 AWG SOLID BARE	
13	1	400-0500-603	WASHER, M5	
14	1	0604-0014-00	WASHER, SPLIT LOCK, 1/4	
15	7	400-0300-503	WASHER, PLAIN, M3	
16	7	400-0300-253	WASHER, SPRING, M3	
17	2	400-0500-700	WASHER, SRBP, M5	
18	1	404-0565-533	SCREW, MACH, M5-65	
19	7	404-0306-533	SCREW, M3x6mm LONG	
20	1	409-0500-103	NUT, M5	
21	1	0409-0070-00	NUT, HEX 1/4-28	
22	7	402-0316-137	STUD, M3x16	
23	A/R	0626-0528-00	RTV	
24	1	0536-0302-00	TERMINAL POST	
25	60mm	0663-0329-01	WIRE ELECT 18 AWG BRN	
26	2	402-0316-167	TAPPED SPACER(ONE END	
27			TAPPED OTHER END STUD)	
28	1	4162-2110-00	CONN. RIBBON 26 PIN	J400
29	1	4162-1693-00	CONN. RIBBON 20 PIN	J401
30	1	4162-0444-05	CONN. MTA 6 PIN	J402
31	4	4162-0832-00	CONN. BODY 14 POS.	J403,405,408,409
32	3	4162-0831-00	CONN. BODY 4 POS.	J404,406,407
33	1	4162-0444-13	CONN. MTA 14 PIN	J410
34				
35				
36				
37	1	7096E2055-19	THYRISTOR BTY 91-600R	Q1
38				
39	1	0749-0208-00	VARISTOR 423/579V 1mA	VR1
40				
41	2	0749-0209-00	VARISTOR 68Z10A	VR3,4
42				
43				
44				
45	1	7096E2055-20	OPTOCOUPLER, S21MD3, 6 P Dil	U1
46				

ITEM	QTY.	PARTNUMBER	DESCRIPTION	REMARK
47	2	0803-5245-00	DIODE, ZENER 1N5245 16V	CR1,2
48	2	0771-0233-00	DIODE 1N4004 400V	CR3,4
49	2	0771-0246-00	DIODE 1N5624	CR6, CR9
50	1	0803-4751-00	DIODE, ZENER 1N4751 30V	CR13
51	2	0771-0315-00	DIODE 1N4007	CR11, CR12
52	34	7096E4055-65	RF. CHOKE, SIEMENS	L1,3-11,14-35,
53				L37,38
54	1	0778-0381-00	COIL, RF 150µH	L2
55	1	0851-0018-00	COIL, RF, 250µH	L36
56				
57				
58	2	0860-0079-00	CAPACITOR 680pF 500V Disc.	C1,8
59	3	0860-0097-00	CAPACITOR .01uF 500V Disc.	C14-16
60				
61				
62	1	7096E1080-01	CAPACITOR .1uF 50V Cer.	C6
63	2	0679-0532-00	CAPACITOR .22uF 630V Mylar	C7,43
64	1	0679-0472-00	CAPACITOR .033uF 250V Poly	C9
65	28	0860-0056-00	CAPACITOR 100pF 500V Nug.	C2,10-13
66				22,23,25-42,
67				44,47,48
68				
69	1	0860-0170-00	CAPACITOR .15uF 100V Poly	C24
70	1	003-0679-647	CAPACITOR .22uF 100V MKH	C45
71				
72	1	0380-1106-00	RESISTOR 100k 1/2W 5%	R1
73	3	1670-3325-00	RESISTOR 332k 1/4W 1%	R2,3,4
74	1	0680-1027-00	RESISTOR 220E 1/2W 5%	R7
75	1	0680-0191-00	RESISTOR 68E 2W 10%	R8
76				
77	2	1670-3835-00	RESISTOR 383k 1/4W 1%	R10,11
78	1	0680-1146-00	RESISTOR 680E 1/2W 5%	R12
79	1	0684-0585-00	RESISTOR 1E 20W 5%	R5
80	1	1670-7502-00	RESISTOR 750E 1/4W 10%	R13
81	REF	7092E9313-22	SCHEM. MOD. SIGN.INP. X COIL SHORTING	
82	1	7001E9313-18	TRIGGER INPUT ADAPTER BOARD	
83				
84	1	7076E9323-10	CONN. CABLE PT1 (TR. INPUT)	
85	1	7076E9323-11	CONN. CABLE PT2 (TR. OUTPUT)	
86	1	7076E9323-12	CONN. CABLE PT3 (POWER)	

Item Qty.	Dwg./Part no.	Description		Remarks
Scale	N.T.S.	Date	Used in	MEA-1200, 1500
Designed by	KEES STAM	12-93	Material	
Drawn by	R. V/D HOEF	12-93		
Checked by	PETER TEL	01-94		
Approved	BERNARD GEE	01-94	Finish	

Unless otherwise specified : Dimensions are in mm ; Tolerances on : Angles ±5° Holes ±0.1 Rest ±0.5

Remove all sharp corners and remove burrs

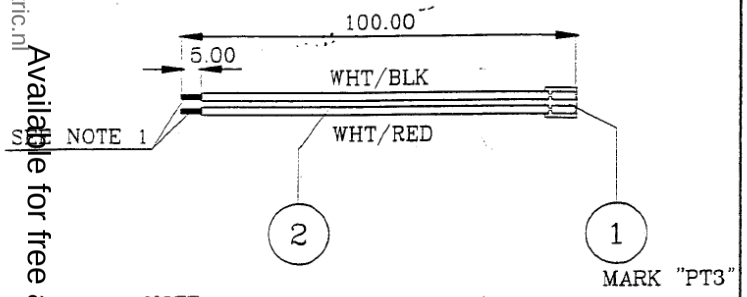
Description	Dwg.no
MODIFIED SIGNAL INPUT X COIL SHORTING	7001E9313-22

SUN ELECTRIC EUROPE B.V. | A2 | Sheet 2 of 2 | Project no. | Rev. A

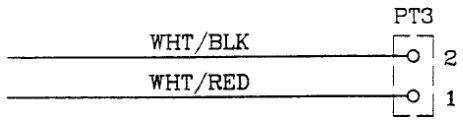
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Revisions			
Revi	Date	Description	Check	Appr.
A	01'94	ERN 1065 R.F.P.	P.T.	BG



NOTE:
1) TWIST STRANDS TOGETHER AND TIN.



Item	Qty.	Dwg./Part no.	Description	Remarks
2	0.2m	0663-0328-09	WIRE 22 AWG WHITE	
1	1	4162-0394-02	MTA100 2POS T/PL CL END W/L	

Scale	N.T.S.	Date	Used in MEA/MCS/OCS
Designed by	KEES STAM	10-93	Material
Drawn by	R. V/D HOEF	12-93	
Checked by	Peter Tel	18.1.'94	
Approved	B. Gee	20.1.94	Finish

Unless otherwise specified : Dimensions are in mm ; Tolerances on : Angles ±5° Holes ±0.1 Rest ±0.5

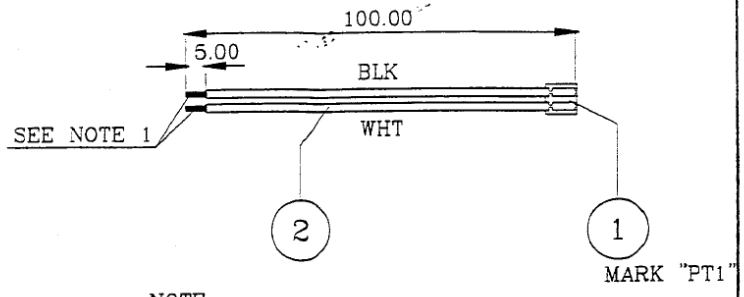
Remove all sharp corners and remove burrs

Description	Dwg.no	Rev.
CABLE, CONNECTOR PT3 (POWER)	7076E9323-12	A

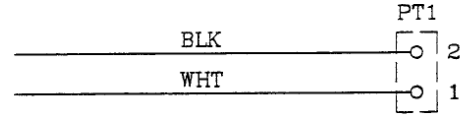
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Revisions			
Revi	Date	Description	Check	Appr.
A	01'94	ERN 1065 R.F.P.	P.T.	BG



NOTE:
1) TWIST STRANDS TOGETHER AND TIN.



Item	Qty.	Dwg./Part no.	Description	Remarks
2	0.2m	0663-0328-09	WIRE 22 AWG WHITE	
1	1	4162-0394-02	MTA100 2POS T/PL CL END W/L	

Scale	N.T.S.	Date	Used in MCS/OCS-2000 & MEA
Designed by	KEES STAM	10-93	Material
Drawn by	R. V/D HOEF	12-93	
Checked by	Peter Tel	18.1.'94	
Approved	B. Gee	20.1.94	Finish

Unless otherwise specified : Dimensions are in mm ; Tolerances on : Angles ±5° Holes ±0.1 Rest ±0.5

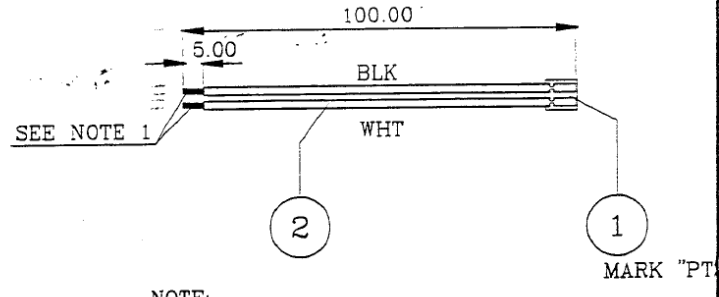
Remove all sharp corners and remove burrs

Description	Dwg.no	Rev.
CABLE, CONNECTOR PT1 (TRIGGER INPUT)	7076E9323-10	A

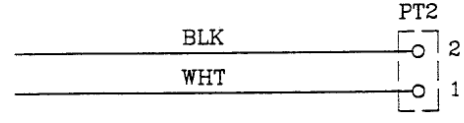
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Revisions			
Revi	Date	Description	Check	Appr.
A	01'94	ERN 1065 R.F.P.	P.T.	BG



NOTE:
1) TWIST STRANDS TOGETHER AND TIN.



Item	Qty.	Dwg./Part no.	Description	Remarks
2	0.2m	0663-0328-09	WIRE 22 AWG WHITE	
1	1	4162-0394-02	MTA100 2POS T/PL CL END W/L	

Scale	N.T.S.	Date	Used in MEA/MCS/OCS
Designed by	KEES STAM	10-93	Material
Drawn by	R. V/D HOEF	12-93	
Checked by	Peter Tel	18.1.'94	
Approved	B. Gee	20.1.94	Finish

Unless otherwise specified : Dimensions are in mm ; Tolerances on : Angles ±5° Holes ±0.1 Rest ±0.5

Remove all sharp corners and remove burrs

Description	Dwg.no	Rev.
CABLE, CONNECTOR PT2 (TRIGGER OUTPUT)	7076E9323-11	A

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