



# *To Beam or not to Beam*



OUTPUT DATA : 4200A / 4V  
 DF ORDER No. : ENG 3309 / Oxford Instruments  
 SERIAL No. : 9209042

~~92010049~~  
~~9210049~~      9210049

*Christian Pilegaard*  
 45 46 79 0058  
 45 7220 24 03 Service  
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Signature		

**MANUAL  
 MAGNET POWER SUPPLY 854  
 SYSTEM 8000**

72202400

**IMPORTANT!**

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## INTRODUCTION AND SPECIFICATIONS.

### 1.1. GENERAL INTRODUCTION.

The System 8000 Precision Magnet Power Supplies are DC constant current output Power Supplies designed for applications requiring very high stability and low noise combined with reliability and ease of operation.

The System 8000 is aimed at precision spectroscopy and ion beam transport applications. It is the result of an intensive development effort at Danfysik based on twenty years of experience in delivering precision DC Power Supplies to industrial and research laboratory users around the world.

The System 8000 is available as a range of power, control and interface modules which can be configured to meet specific application requirements with guaranteed performance.

- \* Current stability options of 0.1, 1 or 10 ppm classes.
- \* Power outputs from 5 kW to 1 MW.
- \* Output current (maximum) from 120 A to 10,000 A.
- \* Precision current transducer ULTRASTAB (DCCT = DC Current Transformer) to achieve new performance levels for stability and linearity over very wide current ranges.
- \* Optically isolated digital control to eliminate ground loops and conducted noise. The control and interface electronics modules are isolated from the power modules by an electrostatic and thermal shielding wall.

1.2. SPECIFICATIONS.

STABILITY CLASS ..... 0.3 ppm.

DC OUTPUT RATINGS:

Power range..... 16.8 kW.  
Current range..... 4200 A.  
Voltage..... 4 V.

PERFORMANCE:

All drift and regulation data are given for max. current output.

Warm up time. (cold start) 30 min.  
Warm up time. (with control power ON) 5 min.

Drift:  
Short term 3 min. (fwhm) +/- 3 ppm.  
Short term 30 min. +/- 3 ppm.  
Long term 8 hours. +/- 10 ppm.

Line regulation:  
+/- 10 % slow. T > 1 min. 0.5 ppm.  
+- 1 % fast. T > 3 ms. 0.5 ppm.

Load regulation:  
+ 10 % resistance change. T > 1 min. 0.5 ppm.

PARD: (Periodic And Random Deviation).  
(Resistive load.)  
Output voltage f > 1 Hz. 5 mV + 0.01%  
of V out.

Temperature coefficient:  
(Per degree centigrade variation).  
Ambient. 0.2 ppm.  
Cooling water. 0.05 ppm.

Ramp.time 0 - full scale:  
(Load dependent). 10 - 200 sec.  
MPS with preregulator. 60 - 200 sec.

DC output isolation resistance: > 1 M ohm.  
(Without earth leakage detector and cooling water).

Number of output channels: ..... 1.

Output polarity: ..... UNIPOLAR.

Current setting resolution: . . 16 Bit 15 ppm.

Current readback resolution: . . 16 Bit 15 ppm.

TEMPERATURE RATINGS.

OPERATING. Centigrades.  
Ambient temperature. 15 to 35  
Cooling water temperature. 15 to 35

STORAGE temperature -20 to 50

MAIN COOLING SYSTEM.

COOLING WATER PRESSURE: bar. psi.  
Minimum differential pressure. 6 87  
Maximum absolute (Static pressure). 12 174  
Test pressure. 15 290

COOLING WATER FLOW:  
(3 bar diff.press). 50 ltr./min.

Cooling water fitting. 3/4 inch BSP.

AC SUPPLY POWER.

CONTROL VOLTAGE:  
Single phase, 48 - 62 Hz . . 115/240 Volts +/- 10 %.

MAINS VOLTAGE:  
Three phase, 48 - 62 Hz . 415/480 Volts +/- 10 %.  
3 or 4 wire system.

MAINS CURRENT:  
Per phase ..... 86/75 Amps +/- 10 %.

OVERALL DIMENSIONS AND WEIGHT.

CABINET:	MM.	Inches.
Height .....	1765	69.5
Width .....	610	24.0

Depth .....	800	31.5
-------------	-----	------

OPERATOR CONTROL PANEL:  
 (19 Inches wide)

Height .....	88	3.5
Depth .....	75	3.0

WEIGHT: (approx.)	Kg.	Lbs.
Netto weight .....	380	836
Shipping weight .....	430	946

INPUT/OUTPUT INTERFACES.

OPERATOR CONTROL PANEL M.

Current setting by knob control with a digital Bit generator

Three resolution ranges are selectable:

- 1 : 10. Coarse.
  - 1 : 1000. Medium.
  - 1 : 100.000. Fine.
- Per rev. of full scale.

Two line LCD display for showing:

On upper line:  
 Preset current-SET(%)/Actual current-ADC(%).

On lower line: (by means of a push button).  
 Actual output current (Bar graph).  
 Actual output current (%).  
 Magnet field reading "\*" ( T ).  
 Output voltage (%).  
 Internal voltage + 15 V.  
 Internal voltage - 15 V.  
 Internal voltage + 5 V.  
 Delta temperature (DAC) Degree K.  
 Transistor passbank voltage ( V ).

And  
 Interlock Status text string, controlled by 4 push buttons with LEDs.

"\*" This feature is only used where optional Hall probe is mounted.

LEDs` for indicating of:

Control Power	ON.
Main Power	ON/OFF.
Interlock Status.	(4 LED's)
Local/Remote control mode.	
Polarity.	(+) (-)
Ready.	
Current setting resolution.	(C) (M) (F)

COMPUTER INTERFACE.

RS 232C and RS 422.  
 Or:  
 IEEE 488 (GPIB).  
 Or:  
 Custom specified.

### 1.3. WARRANTY.

DANFYSIK A/S warrants the equipment delivered from the company to be free from any defects in materials and workmanship for a period of:

Max. 3 years from the date of shipment.  
Whichever is shortest.

From the above there are the following exceptions:

a.. Parts not manufactured by DANFYSIK A/S are covered by the warranty from the original manufacturer of the parts.

Within these warranty periods, DANFYSIK A/S will repair or replace any defective parts free of charge either on the customers site or at our factory at our choice.

DANFYSIK A/S will pay or reimburse the lowest freight rate two way charges on any items returned to DANFYSIK A/S or our designated agent/representative provided prior written authorization for such return has been given by DANFYSIK A/S

This warranty shall not apply to any equipment which our inspection shows to our satisfaction, to have become defective or unworkable due to mishandling, improper maintenance, incorrect use, radiation damage or any other circumstance, not generally acceptable for equipment of a similar type.

DANFYSIK A/S reserves the right on standard products to make changes in design without incurring any obligation to modify previously manufactured units.

The foregoing is the full extent of this warranty and no other warranty is expressed or implied. In no event shall Danfysik be liable for special damage arising from the delivery, late delivery or use of the equipment.

If any fault develops, the following steps should be taken.

Notify DANFYSIK A/S, giving full details of the problems, and include Model-Type and Serial number.

On receipt of these information, DANFYSIK A/S will give you either service information or instructions for shipping.

All shipments of DANFYSIK equipment should be made according to our instructions and shipped in the original or a similar container.

For smaller parts a carton will be sufficient, if the parts are wrapped in plastic or paper and surrounded with at least 10 centimeters of shock-absorbing material.



## 2. UNPACKING AND INSTALLATION.

### 2.1. RECEIVING THE GOODS.

The Shipping container and the Power Supply should be thoroughly inspected for signs of obvious physical damage immediately upon receipt.

All materials in the container should be checked against the enclosed packing list.

DANFYSIK A/S will not be responsible for shortages against the packing list unless notified immediately.

### 2.2. INSTRUCTIONS FOR UNPACKING.

The Power Supply is shipped on a wooden pallet enclosed in either reinforced cardboard or wood crate. Remove the packing straps and nails if wood crated, the top lid should be removed first.

If the equipment is damaged in any way, a claim should be filed with the shipping agent, and a full report of the damage should be forwarded to DANFYSIK A/S or our local agent/representative immediately.

Upon receipt of this report, you will be issued instructions for the repair, replacement or return shipment.

Please include the Model no, Type no, Serial no, and Order no for the Power Supply on any communication with DANFYSIK A/S or our representative.

### 2.3. INSTALLATION REQUIREMENTS.

During installation of the Power Supply, local rules and regulations for electric power and water supplies should be respected and the following conditions and installations should be available.

- \* A normal, dust free room with a humidity not above 80 % and a room temperature within 15 to 35 centigrade.
- \* Three-phase Mains voltage, switched and fused.
- \* Single-phase Control Power, switched and fused. The Control Power may also be supplied from one of the Phase-terminals and Neutral for the Main Power supply, if a 4 - wire system is used
- \* Ground connection according to the local authority regulation and the requirements for the equipment.
- \* Cooling water supply at a temperature within 15 to 35 centigrade.  
Differential pressure: Min. 3 bar.  
Max. inlet pressure: 12 bar.

Please see specification sheet chapter 1.2 in this manual for actual figures for this Power Supply.

## 2.4. INSTALLATION.

Before and during installation of the Power Supply, the following points should be checked/carried out.

### **Before power up:**

- \* Check that the AC main input voltage and frequency matches to the specified and labeled requirements (208, 380 or 415 Volt). (se chapter 2.4.1 for right tapping)
- \* Check that all screw connections to the primary and from the secondary of the transformer are tightened. Check that connections from the secondary of the transformer to the output terminals are tightened. (I.e. cable and bussbars carrying heavy current).
- \* When water cooling is ON, check for leaks. (I.e. tighten if necessary).
- \* Check that circuit boards are pushed into final position.
- \* Check that all plug terminated cables are pushed into final position.
- \* If the magnet is provided with a water-flowswitch connect the contacts to terminal 1 and 2. If not, short-circuit the terminals.
- \* If the magnet is provided with a thermal breaker connect the contacts to terminal 3 and 4. If not, short-circuit the terminals.
- \* An external emergency switch can be connected to terminal 5 and 6. The emergency switch is in series with the control power (AC) to the main circuit breaker coil. By an open circuit the main circuit breaker is switched off. The emergency switch shall have two sets of normal closed contacts. Connect one to terminal 5 and 6 and the other one to connector P8 pin 9 and 10 on the Interlock board. By connecting to the Interlock board an interlock is set when the emergency switch is open circuit. If no external emergency switch is used short-circuit the terminals.
- \* Terminal 7 and 8 is a closed contact on Main Power OFF.
- \* Check that the two active filters are either both connected to the load or disabled. If connected it is important that the mid point "M" is connected too.

**With AC mains ON: (Not main power ON)**

- \* Check that local control panel works properly.
- \* Check that all interlock can be reset.
- \* Check that the temperature read out on control panel (DAC divation temperature) approaches zero.

**With main power ON:**

- \* Check the voltage across the transistor bank.  
It should be around 7 Volt when the magnet is at operating temperature.
- \* Check that the ready LED is illuminated when the system is in operating temperature.
- \* After some ours in operation check for transistor failures.

**2.4.1 TAPPING OF THE MAIN TRANSFORMER**

The transformer has tappings for 415 and 480 V mains input. 415V, 50Hz for UK voltage and 480V. 60Hz for US voltage.

Ensure that the voltage tapping is correct acording to the input voltage.

The phase imbalance relay mus be changed to a 60Hz type when connected to the 480V, 60Hz.

### 3. OPERATING INSTRUCTIONS.

This chapter outlines the procedure and precautions for the operation in local and in remote control mode. It identifies and describes the controls and indicators on the Operator Control Panel (M). Also the programming of the remote lines are described. Instructions for initial remote line set up is given in chapter 3.6.

#### 3.1. SWITCHING ON.

For the first time it is recommended to start the Power Supply up in LOCAL CONTROL mode.

After the Power Supply has been connected to the mains (line) voltage in accordance with chapter 1.2, 2.3 and 2.4 it can be switched ON.

Immediately after the Power Supply is switched ON the Operator Control Panel displays "INITIALIZE" while the local line is checked. All LEDs' on the CONTROL BOARD lights up for approximately 3 sec.

After approximately 5 sec. the panel is ready for use.

The remote line is ready for use after approximately 3 sec.

Take care that the time between switching - OFF and switching - ON the CONTROL POWER is at least 5 sec. to ensure a correct cold start (initialization of the Power Supply).

- Select LOCAL CONTROL mode (LED is OFF) (10).
- If any Interlocks are set, push the "OFF" button (3).  
Remove the faults if the Interlocks (4)+(5)+(6)+(7) are not reset
- Preset the output current in either COARSE (16), MEDIUM (17), or FINE (18) mode by the Current setting control knob (19).
- Switch the Main power "ON" (2).
- The READY LED (15) turns on, when the output current is equal to the preset value within +/-200 ppm.
- Switch the main power "OFF" (3).

### 3.2. OPERATING WITH THE OPERATOR CONTROL PANEL.

The OPERATOR CONTROL PANEL (M) is an interface module to the SYSTEM 8000 Magnet Power Supply.

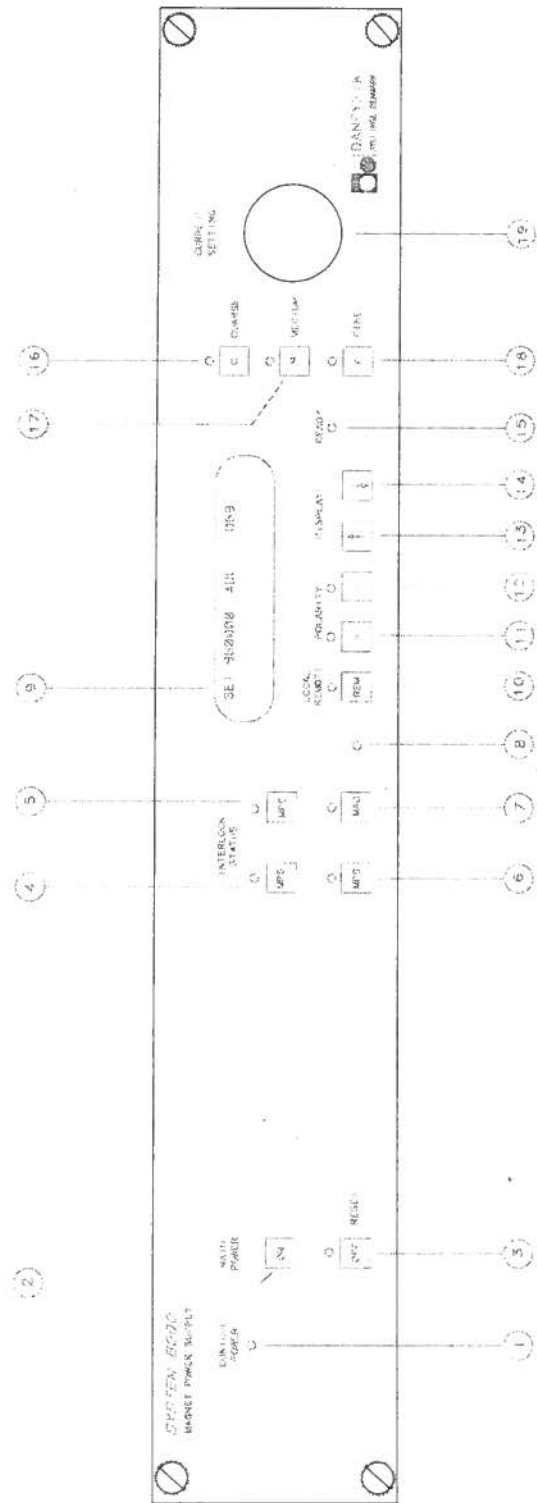
The Control Panel can be connected and disconnected from the Power Supply without affecting the power supply operation.

Communication between the Power Supply and the Operator Control Panel is by a serial link, and may be physically located at the Power Supply or up to 400 meters away from it.

Control from the Operator Control Panel requires that LOCAL control mode is asserted, otherwise only status and parameters can be read.

#### 3.2.1. FRONT PANEL CONTROLS.

1. Control Power "ON" LED.
2. Main power "ON" push button.
3. Main power "OFF" and interlock "RESET" push button.  
The LED indicates an interlock.
4. Toggle push button for interlock group I (MPS) read-out.  
The LED indicates a failure(s).
5. Toggle push button for interlock group II (MPS) read out. The LED indicates a failure(s).
6. Toggle push button for interlock group III (MPS) read out. The LED indicates a failure(s).
7. Toggle push button for interlock group IV (MAGNET) read out. The LED indicates a failure(s).
8. Display contrast adjustment screw.
9. 2 - line Display for the read-out of:
  - Set value
  - Actual value
  - Bar-graph for an analog indication of the output current or a message line for the interlock groups and system parameters.
10. "REMOTE / LOCAL" toggle push button.  
The LED indicates REMOTE control.
11. "POLARITY +" output not reversed push button and LED.
12. "POLARITY" - output reversed push button and LED.
13. Display UP.
14. Display DOWN.  
The push buttons 13 and 14 enables the readout of internal auxiliary voltages and other system parameters.
15. READY LED indicates when the actual output current is equal to the preset value within +/-200 ppm.
16. Push button and LED indication for COARSE setting of the output current by the control knob.
17. Push button and LED indication for MEDIUM setting of the output current by the control knob.
18. Push button and LED indication for FINE setting of the output current by the control knob.
19. Current setting control knob.



### 3.2.2. THE DISPLAY.

The upper line to the left will always display the output current setting with six digits. After a cold start it displays "SET 000000". When full output current is set, it displays "SET 999999", which is to be read as 99.9999 % of full scale.

The upper line to the right will always display the actual output current with three digits. E.g. "ADC 055" means that the current is 55 % of full scale. This reading is made by the internal 8 Input 8 Bit scanning ADC.

If a more accurate read out is required, the MPS can be provided with a 16 Bit ADC, as an optional device. Then the current is displayed by five digits. E.g. "ADC 34634" means that the current is 34.634 % of full scale.

The lower line will normally indicate the actual output current by means of a bar-graph. The output current is 100 % when the bar-graph is full.

A second function of the lower line is to display various status information from the MPS. By toggling the "DISPLAY" buttons, the following status information will be displayed one by one, forwards or backwards.

OUTPUT CURRENT : XXX % Shows the Output Current in percentages of the nominal output with a resolution of 1% and a range from 0 to 125%.  
Option is a direct reading in APMS.

MAGNET FIELD : XXX T Shows the Magnet Field in Tesla with a resolution of 0.01 Tesla and a range from 0 to 2.5 Tesla.  
Optional Hall-probe required.

OUTPUT VOLTAGE : XXX % Shows the Output Voltage in percentages of the nominal output with a resolution of 1% and a range from 0 to 125%.  
Option is a direct reading in VOLTS.

INTERNAL +15 V : +XX.X V Shows the +15 V Supply on the CONTROL-BOARD with a resolution of 0.1 V.  
If the voltage deviates more than +/-1.5V an "E" for Error will appear on the display.

INTERNAL -15 V : -XX.X V Shows the -15 V Supply on the CONTROLBOARD with a resolution of 0.1 V.  
If the voltage deviates more than +/-1.5V an "E" for Error will appear on the display.

INTERNAL +5 V : +X.XX V Shows the +5 V Supply on the CONTROL-BOARD With a resolution of 0.05 V.  
If the voltage deviates more than +0.5V or -0.25V an "E" for Error will appear on the display.

<u>D TEMPERATURE</u> : +/-XX.X	Shows how many Centigrade the temperature of the DAC enclosure has deviated from its set value. The resolution is 0.1 centigrade in the range from -7.5 to +7.5 centigrade.
<u>PASSBANK DROP</u> : +XXX.V	Shows the Voltage drop across the transistor series regulator in volts with a resolution of 1V in the range from 0 to 125V.

A third function of the lower line on the display is to show all the interlock conditions. If a fault appears, one of the four LEDS under "Interlock Status" will be illuminated. By pushing the respectively push button, the fault condition will be displayed. If more than one fault appears at a time, then they will be displayed one by one for each push on the UP-or DOWN buttons. When no more faults are indicated, the display will return to the Bar-graph.

The interlock status are as follows:

Push Button No.4 GROUP I - MPS.

1. push: "PHASE FAILURE".
2. push: "WATERFLOW FAILURE".
3. push: "PANIC BUTTON/DOOR SWITCH".
4. push: "EARTH LEAKAGE FAILURE".
5. push: Return to Bar-graph.

Push Button No.5 GROUP II - MPS.

1. push: "REGULATION MODULE FAILURE".
2. push: "NORMAL RUN DOWN".
3. push: "ONE TRANSISTOR FAULT".
4. push: "MAX. CURRENT SET".
5. push: Return to Bar-graph.

Push Button No.6 GROUP III - MPS.

1. push: "DC OVERLOAD".
2. push: "DC OVERCURRENT".
3. push: "THERMAL BREAKER/FUSES".
4. push: "OVERTEMPERATURE".
5. push: Return to Bar-graph.

Push Button No.7 GROUP IV - MAGNET.

1. push: "FAST RUN DOWN".
2. push: "FAST RUN DOWN".
3. push: Return to Bar-graph.

A fourth function of the Bar-graph is to indicate texted error messages e.g.

- ILLEGAL COMMAND
- CHANGE IN PROGRESS

Further information is given in chapter 3.3.3 (ERRC and ERRT).



### 3.2.3. MAIN POWER ON / OFF AND RESET.

The Main Power "OFF" push button has two functions:

- Turning the Main Power OFF.
- RESET Interlocks.

The LED by the OFF push button is ON when the Power Supply is interlocked either by an interlock or by the regulation transformer.

The regulation transformer interlocks the Power Supply, when the main power is OFF, but the regulation transformer is not at the zero output position.

The Main Power is switched ON by the Main Power "ON" push button.

### 3.2.4. CURRENT SETTING.

Press the "COARSE" button (LED will turn ON) and turn the current setting knob clock-wise. The current setting will be increased by 10 % for each turn. The first two digits on the display will change.

Press the "MEDIUM" button (LED will turn ON). By turning the current setting knob the current setting will be altered by 0.1 % for each turn. Digit 3 and 4 on the display will change.

Press the "FINE" button (LED will turn ON). By turning the current setting knob the current setting will be altered by 10 ppm. for each turn. The last two digits on the display will change.

To lock the current setting knob adjustment, press the "FINE" button again. The same procedure applies for "COARSE" and "MEDIUM" settings.

When the output current is within a limit of 200 ppm of the set value the "READY" LED will turn ON.

### 3.2.5. POLARITY REVERSAL.

If a polarity reversal switch is installed, one of the "Polarity" LEDs is ON to indicate the polarity of the output current (+ is NOT reversed).

If a polarity reversal is required, press the not-actual polarity button. If the main power is ON, the following sequence is initiated.

- The DAC is set to zero.
- When the current is zero, the Main Power is switched OFF.
- The switch motor is activated to reverse the polarity.
- When the switch is in correct position, the DAC will be set back to the original value and the Main Power will be switched ON again.
- The output current will increase until it reaches X % again.

If the Main Power is OFF the above sequence is initiated but the Main Power is not switched ON.

### 3.2.6. LOCAL / REMOTE CONTROL.

When the Power Supply is in LOCAL CONTROL, the LED above the "REM" push button is not illuminated. If LOCAL CONTROL has been required by the Control Panel, the Power Supply **is locked** in Local Control mode, and Remote

Control can not be requested by the remote line.

If LOCAL CONTROL has been initiated the Remote Line, the Power Supply **is not locked** in Local Control.

The control mode is changed by pushing the "REM" push button.

In REMOTE CONTROL mode all commands are ignored, and "ILLEGAL COMMAND" is displayed. All status information are still displayed.

OPERATING BY RS 232C OR RS 422 I/O.

The CONTROL-BOARD uses standard serial interfaces RS 232C and RS 422 which are compatible with many computers and terminals.

Two data communication links are available:

- A REMOTE LINE, with either RS 232C or RS 422 communication.

The link is optically isolated.

SETTING UP THE FPS.

The set up of the FPS is done by four (4) switches.

- SW 1 : Sets the address of the MPS in a multiplex mode.
- SW 2 : Sets the communication with the Operator Control Panel (LOCAL LINE).  
The control mode when POWER-UP and the ADDRESS mode.
- SW 3 : Sets the reset configuration and read back units.
- SW 4 : Sets the configuration of the serial communication links (REMOTE LINES).

The power supply have from Danfysik following default setting:

Remote line : RS-422  
19200 Baud, 8 bit, no parity.  
Interlock reset by "F" command.  
NO ADR mode  
Remote control  
NASW mode } When power-up

SW 1 ADDRESS.

1	2	3	4	5	6	7	8
							1 . . . . . 255
						1	. . . . . 254
						1	. . . . . 253
						1	. . . . . 251
					1	. . . . . 247	
				1	. . . . . 239		
		1	. . . . . 223				
	1	. . . . . 191					
1	. . . . . 127						

1 = Switch ON

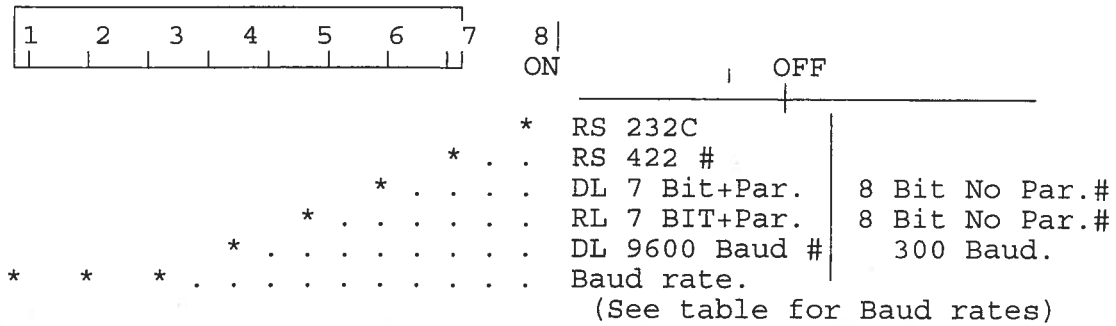
SW 2 INITIAL CONTROL MODE AND CONTROL PANEL FORMAT.

1	2	3	4	5	6	7	8
					*	*	
							* BAUD RATE. CONTR.PANEL.
							(See table for Baud rates)
							ON.   OFF.
							----- -----
					*	. . . . .	8 Bit No Par.# 7 Bit + Par.
					*	. . . . .	Not used. Not used.
					*	. . . . .	NASW MODE. # ASW MODE.(1)
					*	. . . . .	REMOTE. # LOCAL. (1)
					*	. . . . .	ADR MODE. # NO ADR MODE.#
							(1) when Power-UP.
							# switch setting when shipped

SW 3 RESET AND UNITS.

1	2	3
		1 . . . . .
		The units AD 0 and AD 2
		are AMPS and VOLTS.
		Special PROM required.
		1 . . . . .
		Interlocks are reset by the
		OFF command (F). #
		1 . . . . .
		Interlocks are reset by the
		RESET command (RS).
		# switch setting when shipped

SW 4 SERIAL COMMUNICATION CONFIGURATION (REMOTE LINES).



(See table for Baud rates)

DL = Data Log Line  
 RL = Remote Line

# switch setting when shipped

BAUD RATES.

SW 2.	6	7	8
SW 4.	1	2	3

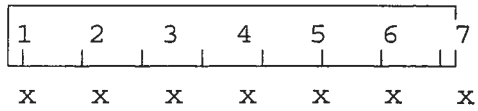
19200	OFF #	OFF #	OFF #
9600	ON	OFF	OFF
4800	OFF	ON	OFF
2400	ON	ON	OFF
1200	OFF	OFF	ON
600	ON	OFF	ON
300	OFF	ON	ON
150	ON	ON	ON

# switch setting when shipped

EXAMPLES.

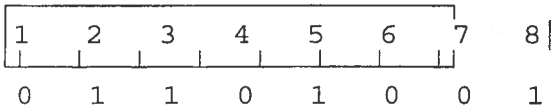
With IEEE 488 / GPIB INTERFACE.

SW 1.



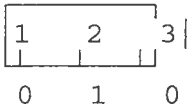
0 = Switch OFF  
 1 = Switch ON  
 X = Do not care.

SW 2.



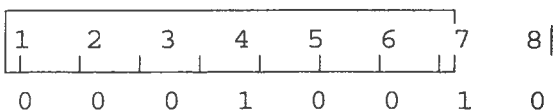
REMOTE control when power-up.  
 No Answer mode.  
 8 Bit No parity,  
 1200 Baud, Local Line.

SW 3.



OFF resets interlocks  
 UNITS of AD 0 and AD 2 are %.

SW 4.



RS 422 Remote Line at  
 8 Bit No parity,  
 19200 Baud.

RS 232C Datalog Line at  
 8 Bit No parity,  
 9600 Baud.

EXAMPLES. cont.

With RS 422 Multidrop.

SW 1.

1	2	3	4	5	6	7	8
1	0	0	0	0	0	0	0
0	0	1	0	1	0	0	1
0	0	1	0	1	0	0	0
0	0	0	0	0	0	0	0

MPS. ADDRESS.

#
127
214
215
255

SW 2.

1	2	3	4	5	6	7	8
1	1	1	0	1	0	0	1

ADDRESS MODE.  
 REMOTE Control when  
 power-up.  
 No answer mode.  
 8 Bit No parity,  
 1200 Baud, Local Line.

SW 3.

1	2	3
1	0	1

RESET resets interlocks.  
 Units of AD 0 and AD 2  
 are AMPS and VOLTS.  
 Special PROM required.

SW 4.

1	2	3	4	5	6	7	8
1	0	0	0	0	0	1	0

RS 422 Remote Line at  
 8 Bit No parity,  
 9600 Baud.

RS 232 Datalog Line at  
 8 Bit No parity,  
 300 Baud.

3.3.2. DATA COMMUNICATION.

Connection for the host is located on the CONTROL- BOARD behind the front door of the Power Supply. The host connection cable can get access to the board through the front-hole in the bottom of the power supply. The pin numbers on the connector depends on which type of communication is used.

- RS 232C : A D-SUB Female 25 - pin connector.
- RS 422 : A D-SUB Female 9 - pin connector.

The direction used in the tables below are:

- Rx : Signals received by the MPS from its host.
- Tx : Signals transmitted by the MPS to its host.

<u>RS 232C</u>	<u>DB 25 S.</u>	<u>RS 422</u>	<u>DB 25 S.</u>
Pin No.	Signal.	Pin No.	Signal
2	Tx.	7	RETURN.
3	Rx.	9	Tx high.
7	RETURN.	10	Tx low.
		11	Rx high.
		12	Rx low.

NOTE! The selection between RS232 and RS422 is determined by SW 4 pos. 7 and 8 on the CONTROL-BOARD.

The Datalog Line is normally only present at connector P4 at the CONTROL-BOARD with the following assignments:

<u>DATA LOG</u>	<u>RS 232C.</u>
Pin No.	Signal.
16	Tx.
17	Rx.
18	RETURN.

The communication is done by transmitting characters in ASCII code terminated by CARRIAGE RETURN. The termination characters from the Power Supply is LINE FEED and CARRIAGE RETURN.

An ERROR message includes a "?BELL". (Bell = ASCII 7.)  
NOTE! None of serial lines has control signals.



3.3.3. PROGRAMMING.

In the following all commands will be listed in alphabetic order.

COMMANDS. summary

AD X	Read value from an ADC channel.		
ADR	Read the address of the MPS.	PO	Polarity status.
ADR XXX	Write an address to a MPS.	PO +	Change to Normal polarity.
ASW	Enters answer mode.	PO -	Change to Reverse polarity.
		PRINT	Reads internal user information about the MPS.
BAUD XXXXX	Set the Baud rate.	R3	Read slew DAC 1 absolute
CMD	Read current control mode.	RA	Read the set value.
CMDSTATE	Read current control state.	REM	Change to remote control.
CONT	Continue sequence operation	RLOCK	Remote line only
CSS	Clear sequence stack	RRSP	Reset read sequence pointer
		RS	Reset interlocks.
ERRC	Coded error message.	RSA	Read sequence and auto increment
ERRT	Text string error message.	RSP	Read sequence position
		R(x)	Read slew DAC 1 or 2
F	Main Power OFF.	S1	Read the internal status.
FAST	Fast sequence timing	S2	Read the internal status.
HALT	Halt sequence operation	SLOW	Slow sequence timing
IEEE	Used to set IEEE iteface communication if present.	SPEED	Read sequence timing
		STOP	Stop sequence executing
LALL	Listen ALL.	TD	Test DAC function
LOC	Change to Local Control.	TS	Trig sequence
LOCK	Lock the MPS in Local Control.	TYPE	AD type in use
		UNLOCK	Unlock the MPS.
UNLOCK	Unlock the MPS in Local Control.	VER	Reads the software verition
MULT	Reads the multiplying factor for DAC scaling	W(X)	Write slew DAC 1 or 2
MULT XX	Writes a Multiplying factor for DAC scaling	W3	Write slew DAC 1 absolute
		WA XXXXXX	Write a set value (Set output current).
N	Main Power ON.		
NASW	No answer mode.	WSA	Write Sequence and auto increment
NERR	No error message.	WSP	Write Sequence position

X is a number from 0 to 9

## CSS

### Clear Sequence Stack

---

<b>Command:</b>	CSS 'sp 'stack 'cr' stack: ASCII digit 0 to 3
<b>Example:</b>	CSS 2 Syntax: CSS'sp'2'cr'
<b>Answer:</b>	No answer, except errors
<b>Errors:</b>	<b>STACK FRAME ERROR,</b> means missing space and stack number after command or stack number outside specified. <b>STACK IS RUNNING,</b> means attempt to clear a running stack. <b>SYNTAX ERROR,</b> means a missing space between the command and parameter or wrong syntax. <b>DATA ERROR,</b> means parameters outside specified or by use of a non-digit character as parameter, which, in case, can produce a double-error, as it will translate a non-digit character as a zero.

The command **CSS** resets write-sequence pointer to its first position. First set of parameters is marked as empty.

No other command, except **WSA**, affects the autoincrement-writepointer.

Related commands: **WSA**  
Internal execution time: **XXXX**  $\mu$ sec.

## WSA

### Write Sequence and Autoincrement

Command:            WSA ' sp' stack, start, stop, time 'cr'

                      stack:  ASCII digit 0 to 3  
                      start:  ASCII digits 000000 to 999999            in PPM  
                      stop:  ASCII digits 000000 to 999999            in PPM  
                      time:  ASCII digits 00001 to 65535            in time units \*)

Leading zero's can be omitted in all parameters

\*) See FAST and SLOW commands. If time is set to zero, position will be marked EMPTY!

**Example**            WSA 0,000,450050,00225  
                      Syntax:        WSA'sp'0,000000,450050,00225'cr'  
  (most readable syntax but slow)

**or**                WSA 0,0,450050,225  
                      Syntax:        WSA'sp'0,0,450050,225'cr'  
  (recommendable syntax medium speed)

**or**                WSA ,,450050,225  
                      Syntax:        WSA'sp',,45050,225'cr'  
  (fast syntax)

**Answer:**            No answer, except errors

**Errors:**            **STACK FRAME ERROR,**    stack pointed to, outside specified.

**STACK IS RUNNING,**        means attempt to write to a running stack.

**SYNTAX ERROR,**            means a missing space between the command and parameters  
  or wrong syntax.

**DATA ERROR,**            means that parameter format incorrect or a non-digit character  
  found in data field or parameters outside specified.

**STACK NO LONGER,**        means attempt to write to a position beyond stack.

The command **WSA** is used to load a complete sequence into sequence-stack without using absolute position. Each **WSA** command increment position-pointer till next position, until last position is reached.

Before using **WSA** command, use the command **CSS** to clear and reset pointer.

No other command, except **CSS**, affects the autoincrement-writepointer.

Related commands:        **CSS, WSP, RSA, RSP**  
Internal execution time:    **XXXX**  $\mu$ sec.

## RRSP

### Reset Read Sequence Pointer

<b>Command:</b>	RRSP'sp'stack'cr'
	stack: ASCII digit 0 to 3
<b>Example:</b>	RRSP 2
	Syntax: RRSP'sp'2'cr'
<b>Answer:</b>	No answer, except errors
<b>Errors:</b>	<b>STACK FRAME ERROR,</b> means missing space and stack number after command or stack number outside specified.
	<b>SYNTAX ERROR,</b> means a missing space between the command and parameter or wrong syntax.
	<b>DATA ERROR,</b> means parameters outside specified or by use of a non-digit character as parameter, which, in case, can produce a double-error, as it will translate a non-digit character as a zero.

The command **RRSP** resets read-sequence pointer, used by the **RSA** command, to its first position.

No other command, except **RSA**, affects the autoincrement-readpointer.

Related commands: **RSA**

Internal execution time: **XXXX**  $\mu$ sec.

# TS

## Trig Sequence

- Command:** TS'sp'stack'cr'  
stack: ASCII digit 0 to 3
- Example:** TS 0  
Syntax: TS'sp'0'cr'
- Answer:** No answer, except errors
- Errors:**
- STACK NO LONGER,** means that stack is marked empty in its first position, as after a CSS command or power-up/hard-reset, or a WSA/WSP command has placed a string with zero-time
  - STACK IS RUNNING,** means attempt to Trig a running stack.
  - SYNTAX ERROR,** means a missing space between the command and parameter or wrong syntax.
  - DATA ERROR,** means parameters outside specified or by use of a non-digit character as parameter, which, in case, can produce a double error, as it will translate a non-digit character as a zero.

The command TS is starting a given programmed sequence, from its first position.

Related commands: **HALT, STOP, CONT**

Internal execution time: **XXXX**  $\mu$ sec.

## RSA

### Read Sequence and Auto increment

**Command:** RSA'sp'stack'cr'  
stack: ASCII digit 0 to 3

**Example:** RSA 0  
Syntax: RSA'sp'0'cr'

**Answer:** If actual position contains data then:  
SP'sp'stack,posit,start,stop,time'lf'cr'

or If actual position does not contain data (time=zero) then:  
SP'sp'stack,posit,EMPTY'lf'cr'

or If actual position attempts to pass last position then:  
'bell'?sp'STACK NO LONGER'lf'cr'

stack: ASCII digit 0 to 3  
posit: ASCII digits 00 to 15  
start: ASCII digits 000000 to 999999 in PPM  
stop: ASCII digits 000000 to 999999 in PPM  
time: ASCII digits 00001 to 65535 in time units \*)

**Errors:** **STACK FRAME ERROR,** stack pointed to, outside specified.  
**SYNTAX ERROR,** means a missing space between the command and parameters or wrong syntax.  
**DATA ERROR,** means that parameter format incorrect or a non-digit character found in data field or parameters outside specified.

The command **RSA** is used to read a complete sequence from sequence-stack without using absolute position. Each **RSA** command increment position-pointer to next position, until last position has past.

Before using **RSA** command, use the command **CSS** to clear and reset pointer, if you want to start reading from the beginning.

No other command, except **RRSP**, affects the autoincrement-readpointer.

Related commands: **RRSP, RSP, WSA, WSP**

Internal execution time: **XXXX**  $\mu$ sec.

## RSP

### Read Sequence Position

**Command:** RSP'sp'stack,posit'cr'

stack: ASCII digit 0 to 3  
posit: ASCII digit 00 to 15

**Example:** RSP 0  
Syntax: RSP'sp'0'cr'

**Answer:** If pointed position contains data then:  
SP'sp'stack,posit,start,stop,time'lf'cr'

or If pointed position does not contain data (time=zero) then:  
SP'sp'stack,posit,EMPTY'lf'cr'

or If pointed position attempts to pass last position then:  
'bell'?sp'STACK NO LONGER'lf'cr'

stack: ASCII digit 0 to 3  
posit: ASCII digits 00 to 15  
start: ASCII digits 000000 to 999999 in PPM  
stop: ASCII digits 000000 to 999999 in PPM  
time: ASCII digits 00001 to 65535 in time units \*)

**Errors:** **STACK FRAME ERROR,** stack pointed to, outside specified.  
**SYNTAX ERROR,** means a missing space between the command and parameters  
or wrong syntax.  
**DATA ERROR,** means that parameter format incorrect or a non-digit character  
found in data field or parameters outside specified.

The command **RSP** is used to read a set of parameters from a given position in a given sequence-stack.

No pointers are affected.

Related commands: **RSA, WSA, WSP**

Internal execution time: **XXXX**  $\mu$ sec.

# HALT

## HALT sequence

**Command:** HALT'cr'

**Example:** HALT  
**Syntax:** HALT'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR,** means that there are no sequence running. I.e. that it already has been HALT'ed or no sequence has been triggered.  
**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **HALT** puts the sequence-run into a momentary stop. The sequence can from this be continued or stopped.

In **HALT** mode all timing and calculating is frozen, and the DAC output stays at its value, actual, when **HALT** was given.

In **HALT** mode the sequence can be terminated by using **STOP**, without restarting it with **CONT**.

**Related commands:** **STOP, CONT**

**Internal execution time:** **XXXX**  $\mu$ sec.



## CONT

### CONTinue sequence \_\_\_\_\_

**Command:** CONT'cr'

**Example:** CONT  
**Syntax:** CONT'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR,** means that there are no running sequence HALT'ed or no sequence has been triggered.

**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **CONT** releases the momentary stop, and continue executing sequence, from its frozen point.

**Related commands:** **STOP, HALT**

**Internal execution time:** **XXXX**  $\mu$ sec.

## STOP

### STOP sequence

**Command:**            **STOP'cr'**

**Example:**            **STOP**  
                         **Syntax:**        **STOP'cr'**

**Answer:**            No answer, except errors

**Errors:**            **SYNTAX ERROR,**            means that there are no running sequence to stop.  
                         **ILLEGAL REQUEST**        means that line-in-command is wrong.

The command **STOP** terminates further sequence executing, and it cannot be continued.

After a **STOP** command is given, the DAC output will freeze at its actual value.

If you are not sure that you really want to terminate the sequence, then use **HALT** in first place, and then **STOP**, if it is correct. Going this way, gives you the same response, and a little time to think.

**Related commands:**        **HALT, CONT**

**Internal execution time:**    **XXXX**  $\mu$ sec.

## MULT

### MULTiply factor (write)

**Command:** MULT'sp'stack,factor'cr'  
stack: ASCII digit 0 to 3  
factor: ASCII digit 000000 to 999999 in PPM

**Example:** MULT 1,750000  
Syntax: MULT'sp'1,750000'cr'

**Answer:** No answer, except errors

**Errors:** **STACK FRAME ERROR,** means stack number outside specified.  
**STACK IS RUNNING,** means attempt to set factor in a running stack.  
**SYNTAX ERROR,** means a missing space between the command and parameter or wrong syntax.  
**DATA ERROR,** means parameters outside specified or by use of a non-digit character as parameter.

The command **MULT** (write) is used as a scale factor, with which both start and stop parameter are multiplied. Time parameter is not affected.

This command is used as a general "volume control", which allow you to scale all DAC parameters in a given stack.

A **MULT**iply value at 000000 disables the function.

No other commands, except **MULT**, affects this parameter.

Related commands: **MULT** (read)

Affected commands: **WSA, WSP, RSA, RSP**

Internal execution time: **XXXX**  $\mu$ sec.

## MULT

### MULTiply factor (read)

**Command:**           MULT'sp'stack'cr'  
                  stack:  ASCII digit 0 to 3

**Example:**           MULT 1  
                  Syntax:       MULT'sp'1'cr'

**Answer:**            MULT'sp'stack,factor'lf'cr'  
                  stack:  ASCII digit 0 to 3  
                  factor: ASCII digit 000000 to 999999 in PPM

**Errors:**           **STACK FRAME ERROR,**   means missing space and stack number, after command or stack number outside specified.

**SYNTAX ERROR,**        means a missing space between the command and parameter or wrong syntax.

**DATA ERROR,**         means parameters outside specified or by use of a non-digit character as parameter.

The command **MULT** (read) returns actual scale-factor, with which both start and stop parameter are multiplied.

A **MULT**iply value at 000000 means a disabled function.

Command, **MULT** (read), does not affects its parameter.

Related commands:       **MULT** (Write)

Affected commands:   **WSA, WSP, RSA, RSP**

Internal execution time:   **XXXX**  $\mu$ sec.

# FAST

## FAST sequence timing

**Command:** FAST'sp'stack'cr'  
stack: ASCII digit 0 to 3

**Example:** FAST 0  
**Syntax:** FAST'sp'0'cr'

**Answer:** No answer, except errors

**Errors:**

<b>STACK FRAME ERROR,</b>	means missing space and stack number, after command or stack number outside specified.
<b>STACK IS RUNNING,</b>	means attempt to set timing to a running stack.
<b>SYNTAX ERROR,</b>	means a missing space between the command and parameter or wrong syntax.
<b>DATA ERROR,</b>	means parameters outside specified or by use of a non-digit character as parameter.

The command **FAST** sets the time unit \*) to 0.1 second and affects all time parameters in a given stack.

This command gives a time range, for each step, from 0.1 sec. to 6553.5 sec.

This command does not affect any parameters, only the speed-setting.

**Related commands:** SLOW, SPEED

**Affected commands:** WSA, WSP, RSA, RSP

**Internal execution time:** XXXX  $\mu$ sec.

## SLOW

### SLOW sequence timing

**Command:** SLOW'sp'stack'cr'  
stack: ASCII digit 0 to 3

**Example:** SLOW 0  
Syntax: SLOW'sp'0'cr'

**Answer:** No answer, except errors

**Errors:**

<b>STACK FRAME ERROR,</b>	means missing space and stack number, after command or stack number outside specified.
<b>STACK IS RUNNING,</b>	means attempt to set timing to a running stack.
<b>SYNTAX ERROR,</b>	means a missing space between the command and parameter or wrong syntax.
<b>DATA ERROR,</b>	means parameters outside specified or by use of a non-digit character as parameter.

The command **SLOW** sets the time unit \*) to 1 second and affects all time parameters in a given stack.

This command gives a time range, for each step, from 1 sec. to 65535 sec.

This command does not affect any parameters, only the speed-setting.

Related commands: **FAST, SPEED**

Affected commands: **WSA, WSP, RSA, RSP**

Internal execution time: **XXXX**  $\mu$ sec.

## SPEED

### **SPEED** (read sequence timing)

**Command:**                 SPEED'sp'stack'cr'  
                                  stack: ASCII digit 0 to 3

**Example:**                 SPEED 0  
                                  Syntax:         SPEED'sp'0'cr'

**Answer:**                 If stack is running in FAST mode then:  
                                  SPEED'sp'0,FAST'lf'cr'  
  
                              **or**         If stack is running in SLOW mode then:  
                                  SPEED'sp'0,SLOW'lf'cr'

**Errors:**                 **STACK FRAME ERROR,**         means stack number outside specified.  
  
                              **SYNTAX ERROR,**                 means a missing space between the command and parameter  
  or wrong syntax.  
  
                              **DATA ERROR,**                 means parameters outside specified or by use of a non-digit  
  character as parameter.

The command **SPEED** returns the actual speed-mode set to a given stack.

This command does not affect any parameters.

**Related commands:**         **FAST, SLOW**

**Internal execution time:**   **XXXX**  $\mu$ sec.

## WSP

### Write Sequence Position

**Command:** WSP'sp'stack,posit,start,stop,time'cr'  
stack: ASCII digit 0 to 3  
posit: ASCII digits 00 to 15  
start: ASCII digits 000000 to 999999 in PPM  
stop: ASCII digits 000000 to 999999 in PPM  
time: ASCII digits 00001 to 65535 in time units \*)

Leading zero's can be omitted in all parameters

\*) See FAST and SLOW commands. If time is set to zero, position will be marked EMPTY!

**Example:** WSP 0,09,000000,450050,00225  
Syntax: WSA'sp'0,09,000000,450050,00225'cr'  
(most readable syntax but slow)

or WSP 0,9,0,450050,225  
Syntax: WSP'sp'0,0,450050,225'cr'  
(recommendable syntax medium speed)

or WSP ,9,,450050,225  
Syntax: WSP'sp',,45050,225'cr'  
(very fast syntax but not recommended)

**Answer:** No answer, except errors

**Errors:** **STACK FRAME ERROR,** stack pointed to, outside specified.  
**STACK IS RUNNING,** means attempt to write to a running stack.  
**SYNTAX ERROR,** means a missing space between the command and parameters or wrong syntax.  
**DATA ERROR,** means that parameter format incorrect or a non-digit character found in data field or parameters outside specified.  
**STACK NO LONGER,** means attempt to write to a position beyond stack.

The command **WSP** is used to load a set of parameters into a given position of a given sequence-stack.

No pointers are affected.

Related commands: **WSA, RSA, RSP**  
Internal execution time: **XXXX**  $\mu$ sec.





## W3

### Write slewdac 1 (absolute)

**Command:** W3'sp'rampspeed'cr'  
rampspeed: digits 0000.00 to 1550.40 in mA/sec.  
Leading zero's, before decimal point, can be omitted in parameter.  
{Do not omit any decimals.}

**Example:** W3 0048.64  
Syntax: W3'sp'0048.64'cr'  
(most readable syntax but slower)  
or W3 48.64  
Syntax: W1'sp'48.64'cr'  
(recommendable syntax medium speed)

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR,** means a missing space between the command and parameters or wrong syntax.

**DATA ERROR,** means that parameter format incorrect or a non-digit character found in data field or parameters outside specified.  
Or decimals given by more or less than 2.

**ILLEGAL REQUEST** Indicates that you are in a wrong command mode. Change REMote or LOCal.

The command **W3** is used to write an absolute value between 0.00 and 1550.40 to option0 port address. Option0 port address is used as SLEW-DAC port.

The command is similar to **W1** command, except that this command converts the given absolute value to a value between 0 and 255 which is sent to option0 port address. This restricts the solution in a given value, which cannot be better than 0006.08 mA/sec. Any given value, outside this solution, is rounded off in the converted value. Any read-back from **W3**, will always be in a solution at 0006.08.

**Related commands:** **R3, (R1)**

**Internal execution time:** **XXXX**  $\mu$ sec.

**Remark:**

At the LOCAL-line the commands **W1** and **R1** are still used, even with read-out in absolute value. This read-out is calculated into the LOCAL-panel depending on the switch-setting. However, the commands **W3** and **R3** can be used at the LOCAL-line if wanted.

## R3

### Read slewdac 1 (absolute)

**Command:** R3'cr'

**Answer:** rampspeed'lf'cr'

rampspeed: digit 0000.00 to 1550.40 in mA/sec.

**Example:** Command: R3  
Syntax: R3'cr'  
Answer: 0048.64  
Syntax: 0048.64'lf'cr'

**Errors:** **SYNTAX ERROR,** means wrong syntax.  
**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **R3** is used to read an absolute value between 0.0 and 1550.40 from option0 port address. Option0 port address is used as SLEW-DAC port.

The command is similar to **R1** command, except that this command converts the value between 0 and 255 read from option0 port address into an absolute value between 0000.0 and 1550.40. Read-back from **W3**, will always be in a solution at 0006.08.

Related commands: **W3, (W1)**

Internal execution time: **XXXX**  $\mu$ sec.

## R(x)

### Read slewdac 1 or 2

**Command:** R1'cr'  
or R2'cr'

**Answer:** value'lf'cr'

value: digit 000 to 255

Leading zero's can be omitted in parameter

**Example:** Command: R1  
Syntax: R1'cr'  
Answer: 025  
Syntax: 025'lf'cr'

**Errors:** **SYNTAX ERROR,** means wrong syntax.

**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **R1** or **R2** is used to read a value between 0 and 255 from option0 or option1 port address. Option0 port address is normally used as SLEW-DAC port, and option1 port address is normally free.

Related commands: **W1, W2, (W3/R3)**

Internal execution time: **XXXX**  $\mu$ sec.

## WA

### Write DAC (in PPM) All versions 9xx except ver. 95x

<b>Command:</b>	WA'sp'dac'cr'
	dac:        digits 000000 to 999999    in PPM.
	!!!! Please remark that the decimal point is implied just before first digit as following example: .000000, due to this, all leading zero'es are significant but trailing zero'es can be omitted.
<b>Example:</b>	WA 004800
	Syntax:    WA'sp'004800'cr' (most readable syntax but slower)
or	WA 0048
	Syntax:    WA'sp'0048'cr' (recommendable syntax medium speed)
or	WA
	Syntax:    WA'sp"cr' (fast trick to clear the setting to 000000)
<b>Answer:</b>	'dac'        digits 000000 to 999999    in PPM.
<b>Errors:</b>	<b>SYNTAX ERROR,</b> means a missing space between the command and parameters or wrong syntax.
	<b>DATA ERROR,</b> means that parameter format incorrect or a non-digit character found in data field or parameters outside specified. In case of this error you should inspect the settings or correct your parameter, and then rewrite it.
	<b>ILLEGAL REQUEST</b> Indicates that you are in a wrong command mode. Change REMote or LOCAL.
	<b>CHANGE IN PROGRESS</b> Indicates that the controller are doing an internal sequence as polar change. While this is running, it is not allowed to make a new setup.

The command WA is used to write an PPM value between 0 and 999999 to the DCCT DAC.

Related commands:    **RA**

Internal execution time:    **XXXX**  $\mu$ sec.

{Remark: This commands parameter differs from all other, in the way the digits are represented.}

## WA

### Write DAC (in PPM) Only version 95x

<b>Command:</b>	WA'sp'dac'cr'
	dac:          digits 000000 to 999999    in PPM.
	Leading zero's can be omitted in parameter.
<b>Example:</b>	WA 004800
	Syntax:      WA'sp'004800'cr'    (most readable syntax but slower)
<b>or</b>	WA 4800
	Syntax:      WA'sp'4800'cr' (recommendable syntax medium speed)
<b>!!</b>	WA
	Syntax:      WA'sp"cr'          (Fast syntax that clears the setting to 000000)
<b>Answer:</b>	No answer, except errors
<b>Errors</b>	<b>SYNTAX ERROR,</b> means a missing space between the command and parameters or wrong syntax.
	<b>DATA ERROR,</b> means that parameter format incorrect or a non-digit character found in data field or parameters outside specified. In case of this error you should inspect the settings or correct your parameter, and then rewrite it.
	<b>ILLEGAL REQUEST</b> Indicates that you are in a wrong command mode. Change REMote or LOCal.
	<b>CHANGE IN PROGRESS</b> Indicates that the controller are doing an internal sequence as polar change. While this is running, it is not allowed to make a new setup.

The command **WA** is used to write a PPM value between 0 and 999999 to the DCCT DAC.

Related commands:      **RA**

Internal execution time:  **XXXX**  $\mu$ sec.

Remark: This command, in version 95x, differs from other versions of the program in the way that in this version it is allowed to omit the leading zero'es and not the trailing.

## **RA** **Read DAC**

---

**Command:** RA'cr'

**Answer:** dac'lf'cr'

dac: digit 000000 to 999999

**Example:** Command: RA  
Syntax: R1'cr'  
Answer: 004800  
Syntax: 004800'lf'cr'

**Errors:** **SYNTAX ERROR** means wrong syntax.  
**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **RA** is used to read a value between 0 and 999999 from the DCCT DAC.

To calculate the actual output current:  $I_o = I_n * (Y / 1000000)$ .

Where  $I_n$  is the nominal output current of the Power Supply, and  $Y$  is the value read by the command "RA".

Related commands: **WA**

Internal execution time: **XXXX**  $\mu$ sec.

## LOC

### LOCal (line) \_\_\_\_\_

**Command:** LOC'cr'

**Example:** LOC  
**Syntax:** LOC'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.

The command **LOC** is used to switch the line-in-command to the local line. The line-in-command can be locked to local-line by the command **LOCK** or released by the command **UNLOCK**. If the change to local is done by the local-line (control panel), the line-in-command will be **LOCKed** to local, and cannot be changed from remote line without releasing it with the command **UNLOCK**. A change to remote line made from the control panel automatically releases the lock feature.

**Related commands:** **REM, LOCK, UNLOCK**

**Affected commands:** **REM**

**Internal execution time:** **XXXX**  $\mu$ sec.



## REM

### REMOte (line)

---

**Command:** REM'cr'

**Example:** REM  
**Syntax:** REM'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.

**ILLEGAL REQUEST** means that line-in-command is locked to local-line.  
Unlock can be used to release this.

The command **REM** is used to switch the line-in-command to the remote line. The line-in-command can be locked to remote-line by the command **RLOCK**, if command is given from remote-line, and is automatically released by a **LOC** command, also given at the remote-line. Local-line cannot change command-line if locked.

**Related commands:** **LOC, LOCK, UNLOCK, RLOCK**

**Affected commands:** **LOC**

**Internal execution time:** **XXXX**  $\mu$ sec.

## ASW

AnSWer (remote line only)

**Command:** ASW'cr'

**Example:** ASW  
**Syntax:** ASW'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.

**ILLEGAL REQUEST** means that line-in-command is local-line.

The command **ASW** is used to switch the remote line into an auto-answer mode in which some setup commands generate an answer. The **ASW** mode is suppressed when the controller is in **LALL** mode. Commands which will generate an answer are listed in the following: **WA, PO+/-, W1, W2, W3**.

**Related commands:** **NASW**

**Internal execution time:** **XXXX**  $\mu$ sec.

## NASW

No AnSWer (remote line only)

**Command:** NASW'cr'

**Example:** NASW  
**Syntax:** NASW'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.

**ILLEGAL REQUEST** means that line-in-command is local-line.

The command **NASW** is used to cancel the auto-answer mode, in which some setup commands generate an answer.

**Related commands:** **ASW**

**Internal execution time:** **XXXX**  $\mu$ sec.

**LALL**  
**Listen ALL** (remote line only)

**Command:** LALL'cr'

**Example:** LALL  
Syntax: LALL'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.

The command **LALL** is used to put all the controllers connected into a pseudo-addressed mode. This means that all controllers will respond to any setup command, except the oN command. No answers will be available.

The only way to disable the **LALL** mode is by using the **ADR** command either as a setup of a new address or to read last addressed controller. Remark that in **ADR** read, the first access will not give any response, in which way you will have to repeat the command to get an answer.

**Related commands:** **ADR**

**Internal execution time:** **XXXX**  $\mu$ sec.

## **ERRC** **ERROR in Code (remote line only)**

**Command:** ERRC'cr'

**Example:** ERRC  
Syntax: ERRC'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.

**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **ERRC** is used internally, to put the controller into a mode, in which it will respond any error, with a message containing an error string followed by a single sign, showing which error is encountered. This mode is normally chosen, when the controller(s) is (are) connected to a host computer, which is able to decode the error message.

CODE NO.	ERROR TEXT.
1	Syntax.
2	Data contents.
3	Data length.
4	Illegal command.
5	Can not execute command.
6	Status qou, no change.
7	Change in progress.
8	No data present.
9	Local line, input buffer full.
10	Remote line, input buffer full.
11	NOT USED.
12	Can not execute command.
13	NOT USED.
14	Datalog line, input buffer full.
15	NOT USED.
16	Program module not implemented.

**Related commands:** **ERRT, NERR**

**Internal execution time:** **XXX**  $\mu$ sec.

## **ERRT**

### **ERRor in Text (remote line only)**

**Command:** ERRT'cr'

**Example:** ERRT  
Syntax: ERRT'cr'

**Answer:** No answer, except errors

**Errors:** **YNTAX ERROR** means wrong syntax.

**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **ERRT** is used internally, to put the controller into a mode, in which it will respond any error, with a message containing an error string followed by a text string, showing which error is encountered. This mode is normally chosen, when the controller(s) is (are) connected to a low level host computer or terminal equipment, which is not able to decode the error message.

**Related commands:** **ERRC, NERR**

**Internal execution time:** **XXXX**  $\mu$ sec.

## **NERR**

**No ERRor** \_\_\_\_\_ **(remote line only)**

**Command:** NERR'cr'

**Example:** NERR  
**Syntax:** NERR'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.

**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **NERR** is used internally, to put the controller into a mode, in which it will respond any error, with a message containing an error string only, without any indication of which error is encountered. This mode is normally chosen, if you only want to be kept informed about an error condition, and not interested in which type.

**Related commands:** **ERRC, ERRT**

**Internal execution time:** **XXXX**  $\mu$ sec.

## **CMD**

### **CoMmanD line**

---

**Command:** CMD'cr'

**Answer:** If line-in-command is remote line:  
REM  
Syntax: 'sp'REM'lf'cr'  
  
or If line-in-command is local line:  
LOC  
Syntax: 'sp'LOC'lf'cr'

**Example:** Command: CMD  
Syntax: CMD'cr'  
  
Answer: REM  
Syntax: 'sp'REM'lf'cr'

**Errors:** **SYNTAX ERROR** means wrong syntax.  
**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **CMD** is used to return answer about which line is line-in-command. The command is used by the control panel to decide the status of the line-in-command indicator. It can be used from remote line to decide if anyone had made change to this, from the control panel, if you receive an unexpected **ILLEGAL REQUEST**.

Related commands: **CMDSTATE**

Internal execution time: **XXXX**  $\mu$ sec.



## **CMDSTATE** **CoMmanD line STATE**

---

**Command:** CMDSTATE'cr'

**Answer:** If line-in-command is remote line:  
REMOTE  
Syntax: REMOTE'lf'cr'

**or** If line-in-command is local line and command is given from remote line: LOCAL  
Syntax: LOCAL'lf'cr'

**or** If line-in-command is local line and command is given from local line or LOCKed from remote line: LOCK  
Syntax: LOCK'lf'cr'

**Example:** Command: CMDSTATE  
Syntax: CMDSTATE'cr'  
Answer: REMOTE  
Syntax: REMOTE'lf'cr'

**Errors:** **SYNTAX ERROR** means wrong syntax.

**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **CMDSTATE** is an extended command similar to **CMD** and is also used to return answer about which line is line-in-command. The answer is more detailed than in **CMD** and is initially constructed to be used between the controller and the IEEE-488 interface unit, doing initializing.

Related commands: **CMD**

Internal execution time: **XXXX**  $\mu$ sec.

**LOCK**  
**LOCK** \_\_\_\_\_ **(remote line only)**

**Command:** LOCK'cr'

**Example:** LOCK  
**Syntax:** LOCK'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.

**ILLEGAL REQUEST** means that line-in-command is remote line.

The command **LOCK** is used internally, to put the controller into a mode, in which the line-in-command will be locked to local line. The **LOCK** feature is performed automatically when the line-in-command to local line change is made from control panel and released by return to remote line. From remote line you will have to perform this by separate commands. The **LOCK** feature is made to avoid remote access, when serviced and controlled by the control panel, and the **UNLOCK** feature by remote line is added for one reason only: to be able to shut down the entire system in an emergency situation. You should avoid to use the **LOCK** and **UNLOCK** feature, from the remote line except in an emergency situation.

**Related commands:** **UNLOCK, (REM, LOC, RLOCK)**

**Internal execution time:** **XXXX**  $\mu$ sec.

## UNLOCK

### UNLOCK (remote line only)

**Command:** UNLOCK'cr'

**Example:** UNLOCK  
Syntax: UNLOCK'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.

**ILLEGAL REQUEST** means that the line-in-command is either remote line or unlocked in local line.

The command **UNLOCK** is used internally, to release the **LOCK** feature when the line-in-command to local line change is made from control panel. The **LOCK** feature is made to avoid remote access, when serviced and controlled by the control panel, and the **UNLOCK** feature by remote line is added for one reason only: to be able to shut down the entire system in an emergency situation. You should avoid to use the **UNLOCK** feature from the remote line except in an emergency situation.

**Related commands:** **LOCK, (REM, LOC, RLOCK)**

**Internal execution time:** **XXXX**  $\mu$ sec.

## **RLOCK** **Remote LOCK** (remote line only)

**Command:** RLOCK'cr'

**Example:** RLOCK  
**Syntax:** RLOCK'cr'

**Answer:** No answer, except errors

<b>Errors:</b>	<b>SYNTAX ERROR</b>	means wrong syntax.
	<b>ILLEGAL REQUEST</b>	means that the line-in-command is either remote line or unlocked in local line.
	<b>COMMAND ALREADY ACTIVE</b>	means that the command has been given already and is still active.

The command **RLOCK** is used internally, to lock the remote line similar to the function existing, when line-in-command is switched to local by the local line.  
When the **RLOCK** command is given at the remote line, it will inhibit the control panel to switch the line-in-command to local.  
The **RLOCK** can only be switched off by giving a new line-in-command command from remote line (**REM** or **LOC**).

**Related commands:** (LOCK, REM, LOC, UNLOCK)

**Internal execution time:** XXXX  $\mu$ sec.

# S1

## Status 1

---

**Command:** S1'cr'

**Answer:** STATUS  
**Syntax:** STATUS'lf'cr' Where STATUS consists of 24 signs . or ! , each showing the status of a specific function, including all interlocks.

**Example:** Command: S1  
**Syntax:** S1'cr'  
**Answer:** .!!.....!  
**Syntax:** .!!.....!'lf'cr'

**Errors:** **SYNTAX ERROR** means wrong syntax.  
**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **S1** is used to return answer about the internal status. The returned status line consists of a mixture of interlocks, polarity and on/off status.

The status command can be used in several ways to decide polarity +,- or none, to indicate type of interlocks and ON/OFF status.

In some versions some spare bits can be assigned special functions.

The interpretation of the individual characters, when the exclamation mark is shown, are as follows:

CHARACTER NO. CONTENTS.

1	.....	MAIN POWER OFF.
2	.....	POLARITY NORMAL.
3	.....	POLARITY REVERSED.
4	.....	REGULATION TRANSFORMER $\diamond$ 0 * MAIN POWER OFF.
5	.....	!
6	.....	!
7	.....	! = % , . = AMPS and VOLTS.
8	.....	MAX CURRENT SET.
9	.....	ONE TRANSISTOR FAULT.
10	.....	SUM - INTERLOCK.
11	.....	DC OVERCURRENT (OCP).
12	.....	DC OVERLOAD.
13	.....	REGULATION MODULE FAILURE.
14	.....	NORMAL RUN DOWN.
15	.....	PHASE FAILURE.
16	.....	MPS WATERFLOW FAILURE.
17	.....	EARTH LEAKAGE FAILURE.
18	.....	THERMAL BREAKER / FUSES.
19	.....	MPS OVERTEMPERATURE.
20	.....	PANIC BUTTON / DOOR SWITCH.
21	.....	FAST RUN DOWN.
22	.....	FAST RUN DOWN.
23	.....	MPS NOT READY.
24	.....	.

Internal execution time:        XXXX  $\mu$ sec.

## S2

### Status 2

---

**Command:** S2'cr'

**Example:** S2  
**Syntax:** S2'cr'

**Answer:** If sequence is running then:  
Rstack,posit'lf'cr'

**or** If sequence is halt'ed then:  
Hstack,posit'lf'cr'

**or** If sequence is stopped or has not been started after reset, then:  
Sstack,posit'lf'cr'

stack: ASCII digit 0 to 3 or X \*)  
posit: ASCII digits 00 to 15

\*)After a reset or a power-up (before any sequence has been triggered) the stack is not yet been specified and will then return as X. The same answer is possible after a **STOP** command is executed.

**Errors:** **SYNTAX ERROR,** means wrong syntax.

The command **S2** is used to read back, information about the internal status of the sequence state machine.

It return's information about sequence status (running, halted or stopped), which stack actual running or halted and what position, into the returned stack, actual being executed.

If the sequence has been stopped or finished, the information about the stack, is normally lost and the returned stack will be expressed as a X. The position will allways be the actual (last) executed position.

The command **S2** can be executed at any time.

Internal execution time: **XXXX**  $\mu$ sec.

## **ADR** **AdDRess (read)**

---

**Command:**           ADR'cr'

**Answer:**            address

**Example:**    Command:    ADR  
                  Syntax:    ADR'cr'  
  
                  Answer:    address  
                  Syntax:    address'lf'cr'  
  
                  address:    ASCII digits 000 to 063 in decimal notation.

**Errors:**        **SYNTAX ERROR**            means wrong syntax.

The **ADR** command is an internal command, used to verify actually addressed unit. The command returns the address of the actually addressed unit.

Only one exception is made by using the **ADR** command, due to the **LALL** mode. When connected units are in **LALL** mode, the first **ADR** command given, following the **LALL** command, will disable this function. For the same reason, no answer will be generated, because the **LALL** mode has to be cancelled, before any answer can be generated. In this case, if you want to know the address of the addressed unit, you will have to repeat the **ADR** command.

In cases where no answer is generated, even if you have tried the command twice, you maybe have been addressing a non-existing unit-address, or the actual unit-address has been switched off. In that case just address another unit to verify the communication line and then re-address to the "dead" address for test.

Related commands:        **ADR** (write)

Affected commands:       **LALL**

Internal execution time:   **XXXX**  $\mu$ sec.



## **ADR** **AdDRess (write)**

---

**Command:**            ADR address'cr'  
                          address:            ASCII digits 00 to 63 in decimal notation.

**Example:**            ADR 23  
                          Syntax:            ADR 23'cr'

**Answer:**            No answer, except errors

**Errors:**            **SYNTAX ERROR**            means wrong syntax.  
                          **ILLEGAL REQUEST**        means that line-in-command is wrong.  
                          **DATA ERROR**            means that parameter format incorrect or a non-digit character found in data field or parameters outside specified. In case of this error you should inspect the settings or correct your parameter, and then rewrite it.

The **ADR** command is an internal command, used to select an actual unit. The previously addressed unit is automatically de-selected.

Only one exception is made by using the **ADR** command, due to the **LALL** mode. When connected units are in **LALL** mode, the first **ADR** command given, following the **LALL** command, will disable this function.

Related commands:        **ADR (read)**  
Affected commands:      **LALL**  
Internal execution time: **XXXX**  $\mu$ sec.

## PO

### POlarity (read)

**Command:** PO'cr'

**Answer:** polarity

**Example:** Command: PO  
Syntax: PO'cr'  
Answer: polarity  
Syntax: polarity'lf'cr'  
polarity: ASCII sign plus or minus. (+ or -)

**Errors:** **SYNTAX ERROR** means wrong syntax.  
**ILLEGAL REQUEST** means that line-in-command is wrong.

The **PO** command is an internal command, used to verify actual polarity of the unit. The command returns the polarity sign in ASCII.

If there is no polarity switch build-in, the returned polarity will be positive.

**Related commands:** **PO** (write)

**Internal execution time:** **XXXX**  $\mu$ sec.

## **PO**

### **POlarity (write)**

---

**Command:** PO sign'cr'  
sign: ASCII sign plus or minus. (+ or -)

**Example:** PO +  
Syntax: PO +'cr'

**Answer:** no answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.  
**ILLEGAL REQUEST** means that line-in-command is wrong or no polarity switch build-in.  
**DATA ERROR** means that the sign is neither plus nor minus.

The **PO** command is an internal command, used to change actual polarity of the unit. The command starts an internal state-machine doing the work to switch-off the supply, change polarity and then switch it on again. The previous setting of the DAC is restored before switch on.

If there is no polarity switch build-in, an illegal request error is returned.

**Related commands:** **PO (read)**

**Internal execution time:** **XXXX**  $\mu$ sec.

## **PRINT**

---

**Command:** PRINT'cr'

**Example:** PRINT  
**Syntax:** PRINT'cr'

**Answer:** Two lines each containing 15 characters plus terminator as:  
xxxxxxxxxxxxxxxx'cr'  
xxxxxxxxxxxxxxxx'cr'

**Errors:** **SYNTAX ERROR** means wrong syntax.  
**ILLEGAL REQUEST** means that line-in-command is wrong.

The **PRINT** command is an internal command, used to return internal information about the unit. The contents of these two lines depend on the manufacturer, who can program this field with serial and/or type number, or anything he wants.

The command was designed primarily as a service command, to get information about the unit.

The command can be used at the remote-line only.

Internal execution time: **XXXX**  $\mu$ sec.

# VER

## VERsion

**Command:** VER'cr'

**Example:** VER  
Syntax: VER'cr'

**Answer:** Three lines each containing 23 characters plus terminator as:  
XXXXXXXXXXXXXXXXXXXXXXXXX'cr'  
XXXXXXXXXXXXXXXXXXXXXXXXX'cr'  
XXXXXXXXXXXXXXXXXXXXXXXXX'cr'

**Errors:** **SYNTAX ERROR** means wrong syntax.  
**ILLEGAL REQUEST** means that line-in-command is wrong.

The **VER** command is an internal command, used to return internal information about the program. The contents of these three lines depend on the program manufacturer, who programs this field with copyright notes, the actual version number and release date.

The command was designed primarily as a service command, to get information about the internal program.

The command can be used at the remote-line only.

Internal execution time: **XXXX**  $\mu$ sec.

**AD**  
**AD X**

---

**Command:** AD'sp'ch'cr'  
 ch: ASCII digit 0 to 9

**Example:** MULT 0  
 Syntax: MULT'sp'0'cr'

**Answer:** ch'sp'val'lf'cr'  
 ch: ASCII digit 0 to 9  
 val: ch 0 to 5, 7 and 9, ASCII digit 000 to 999  
 ch 6 ASCII +/-00 to +/-99  
 ch 8 ASCII 00000 to 99999  
 mark! val can start with an E in case of over or under range

**Errors:** **ILLEGAL REQUEST** means that line-in-command is wrong.  
**SYNTAX ERROR,** means a missing space between the command and parameter or wrong syntax.

Where D is a number from 0 to 9, and S is a sign character ( either + or - ).  
 If the value returned contains an E, the returned value is the last value measured before the over/under range error condition, and not the actual present value. To get the actual value after an error-condition, just make another read. If an E still exists, the error-condition is still present.

AD channel 6 differs from the other by containing a sign, plus or minus, before the value.

<u>CHANNEL.</u>	<u>VALUE.</u>	<u>UNITS.</u>	<u>RESPONCE.</u>
(X)			
0	Output current	(I/In)*100	"DDD"
1	Tesla	T*100	"DDD"
2	Output Voltage	(V/Vn)*100	"DDD"
3	Internal +15V. sup.	V*10	"DDD"
4	Internal -15V. sup.	Num.(V*10)	"DDD"
5	Internal + 5V. sup.	V*10	"DDD"
6	Delta temperature	(DEg.°C*10)	"SDD"
7	Trans. Bank Vce	V	"DDD"
8	Optional Iout (16 Bit)	(I/In)*100000	"DDDDD"
9	Aux. Iout (Contr. Pan)	(I/In)*120	"DDD"

Where D is a number from 0 to 9, and S is a sign character ( either + or - ).

If switch No. 3 pos.3 is set and a special PROM is inserted on the CONTROLBOARD, the UNITS of AD 0 are in AMPS divided by ten and and AD 2 are in VOLTS multiplied with 100.

Internal execution time: XXXX µsec.

## **F** **of F**

---

**Command:** F'cr'

**Example:** F  
**Syntax:** F'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.

**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **F** is used to switch-off the main contact. It also clears all interlock's, if the interlock cases are removed.  
All setting are left unaffected.

**Related commands:** **N, RS**

**Internal execution time:** **XXXX**  $\mu$ sec.

**N**  
**oN**

---

**Command:** N'cr'

**Example:** N  
**Syntax:** N'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.  
**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **N** is used to switch-on the main contact. All settings are left unaffected.  
This command cannot be used in **LALL** mode.

**Related commands:** **F, RS**

**Internal execution time:** **XXXX**  $\mu$ sec.



## **RS** **ReSet**

---

**Command:** RS'cr'

**Example:** RS  
**Syntax:** RS'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.  
**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **RS** is used to clear all interlock's, if the interlock cases are removed. The **RS** command can be disabled by hard-ware, where the command is accepted, but no action will occur. All settings are left unaffected.

**Related commands:** F, N

**Internal execution time:** XXXX  $\mu$ sec.

## **TD** **Test DAC**

---

**Command:** TD'sp'set'cr'  
set: ASCII digit 0 to 8

**Example:** TD 4  
Syntax: TD'sp'4'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.  
**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **TD** is used to set-up a certain bit-pattern to the DAC output. The command can be used to adjust or verify the DAC. There are nine different patterns shown in the following.

TD 0: All bit's are reset to zero	Output:	000000
TD 1: Bit 19 is set on, remaining set to zero	Output:	500000
TD 2: Bit 18 is set on, remaining set to zero	Output:	250000
TD 3: Bit 17 is set on, remaining set to zero	Output:	125000
TD 4: Bit 16 is set on, remaining set to zero	Output:	062500
TD 5: Bit 19 to 16 are set to zero, bit 15 to 0 are set on	Output:	062499
TD 6: Bit 19 to 0 are set on	Output:	999999
TD 7: Bit 19 to 1 are set to zero, bit 0 is set on	Output:	000001
TD 8: Bit 19 to 16 are set to zero, bit 15 is set on, remaining set to zero	Output:	031250

Previous **WA** and **RA** setting are affected. Make a new **WA** command to correct this.

Internal execution time: **XXXX**  $\mu$ sec.

**IEEE**  
**IEEE**

---

**Command:** IEEE'cr'

**Example:** IEEE  
**Syntax:** IEEE'cr'

**Answer:** No answer, except errors

**Errors:** **SYNTAX ERROR** means wrong syntax.

**ILLEGAL REQUEST** means that line-in-command is wrong.

The command **IEEE** is used internally, between the PSU controller and an externally connected IEEE-interface. The command makes some certain changes into the way the remote-line is serviced, to cooperate with the interface.

**In normal use, NEVER use this command, only a power-down or reset of the PSU will remove this status.**

A lot of internal functions are affected by this command.

Internal execution time: **XXXX**  $\mu$ sec.

## TYPE TYPE

---

**Command:** TYPE'cr'

**Example:** TYPE  
Syntax: TYPE'cr'

**Answer:** T'sp'type'lf'cr'  
type: ASCII digit 0 or 8  
If 0, you will have no 16 bit ADC  
If 8, you will have the 16 bit ADC

**Errors:** **ILLEGAL REQUEST** means that line-in-command is wrong.  
**SYNTAX ERROR,** means a missing space between the command and parameter or wrong syntax.

The command **TYPE** returns a code, used by the control panel to determine the AD-channel used as read-out for the display. If a 0 is returned, it will use AD channel 0 to read-out a 3-digit current value. If an 8 is returned, it will use AD channel 8 to read-out a 5-digit current value. This command can only be used at the control-line.

Internal execution time: XXXX  $\mu$ sec.

#### 4. THEORY OF OPERATION.

##### 4.0 Introduction.

The power supply is designed to supply a magnet with direct current stabilized to 10 ppm (long term) of maximum output current.

The main AC input supply is connected to the main transformer through a contactor which turns on the power in two steps to minimize the inrush current. After the transformer the current is rectified in a 3 phase rectifier and filtered in a L-C low-pass filter.

The current is controlled by a transistor bank in series with the output. The transistor bank contains 512 power transistors in parallel.

Stabilization is achieved by comparing the voltage drop across a resistor connected across the output of the ultra high precision D.C. current transducer (DCCT) and associate electronic, with the output of an stabilized digital to analog converter. The resultant error signal is feed into a high DC gain amplifier system on the regulation board, the output which controls the output current through the transistor driver / transistor bank such that the output current is maintained with the specified limits.

Due to safety reasons it is possible to stop (interlock) the power supply. These interlocks can either be generated internally (phase-, transistor- ,temperature- ,over current- failures and others) or externally (magnet over temperature- or magnet cooling failure). These interlocks is latched on the interlock board.

The system is controlled by a cpu, located on the Controll board. Through this it's possible to control the power supply either by the local control panel located on the front door of the supply or through the RS-232c / RS-422 serial remote line. In both ways it's possible to switch the supply ON/OFF, reset interlocks, read status information (interlocks, internal voltages, output current/voltage etc.), and give a setvalue for the DAC on the regulation board to give a certain current.

## 4.2 CONTROL BOARD

Schematic: 82370 1/10 to 10/10  
Assy: 8 bit ADC 82412 A  
16 bit ADC 82369 A

The task of the CONTROL BOARD module is, as the name already indicates, to control the power supply. To do so it also acts as a motherboard (link) for other main modules. In short these functions are: Interlock process and evaluation, turning the power supply ON and OFF, communication with the FRONT PANEL module or a CAMAC module, monitoring of different analog signals and setting the output current value (DAC control). A micro processor takes care of the above mentioned functions.

The CONTROL BOARD can be divided in following functions:

- $\mu$ -Processor.
- Interlock control
- DAC control
- Communication.
- Analog measurements
- Motherboard .

### 4.2.1 $\mu$ -Processor:

All the digital signals are processed by the  $\mu$ -processor block. It consist of the integrated circuits U1 to U7, U13 to U16, U18 and U19 (mainly in the diagram pages 2 & 4). To expand the I/O capabilities of the  $\mu$ -processor the following I/O port expansion circuits are added U17 (page 4)U40 to U42 (page 5).

The above mentioned functions are controlled by a Zilog Z8 single chip  $\mu$ -Processor. The Z8 has a built in EPROM, serial interface and some I/O bits.

The CPU runs at 7.37 MHz, coming from an oscillator made with the crystal Y1 and U2A & U2B. A counter U3 divides this frequency further down suitable for ADC's and port control (serial and parallel).

U7 is a "watchdog" circuit, if for some reason it doesn't get its refresh "bone" every second, e.g. due to that the  $\mu$ P has stopped the program execution, it will reset the  $\mu$ P. and at the same time the LED D54 will flash once.

U5 acts as an address latch for the lower eight bits.

U15 and U16 are coupled as an address decoder for the I/O Chips.

U40 to U42 are port expansion chips.

#### 4.2.2 Interlock control:

The interlock input signals are processed by this block. See page 8 of the diagram.

The circuit is mainly built on the opto couplers U26 to U30. Their outputs are connected to the U40 and U41 expansion ports and also hard wired ( OR) to the ON/OFF FF (flip Flop) U56A.

All incoming interlock signals are opto isolated from the electronics. The interlock opto couplers are driven by a isolated 24 Volt supply, with a current of 24 mA which ensures a good contact in the interlock contact it self. The opto coupler outputs are gated together via the diodes D1 through D13 (sum-interlock) and the signal is then passed through a delay-line U31. The delay-line ensures that an interlock signal only is accepted, if it stays high for longer than app. 100 mSec.. This in order to eliminate false noise generated interlocks. The output of the delay-line will clock the flip-flop U56A, which with a "high Q" output will turn off opto coupler U32A that controls the main contactor. The sum interlock signal is also connected to the LED D54 .

If the  $\mu$ P. wants to turn OFF the power supply (as a response to a command from the local control panel or the remote line) it presets the flip-flop U32A to "OFF". For an ON command the  $\mu$ P first resets the flip-flop. The same signal is delayed in the delay line U31B and it is now possible to give an on signal to the Main contactor via U32A.

For safety reasons the main interlock chain is hard wired. The display of an interlock event however is controlled by the  $\mu$ P. It is shown on the board it self (D20-D44), on the local control panel and it can be requested via the remote line. Each interlock is individually connected to an input pin on U40 or U42. Every time an edge is detected a 100 Msec software timer is started, in order to correlate the hardware controlled "OFF" signal with the software controlled display of the interlock that caused the event.

#### 4.2.3 DAC control:

The DAC control block presets the bits to the Digital to Analog Converter controlling the output current level. (page 7)

This circuit is build upon U41 (normal operating mode and U63 to U65 (CAMAC operating mode).

The system can control the DAC setting with up to 20 bit resolution. All bits come from U41 (see page 5/10) and they are preset by the  $\mu$ -Processor.

If a CAMAC- or a custom made- board (parallel) is plugged in P3 (P3 pin A32 pulled low) and the system is in remote control, U63-U65 (see page 9/10) will be enabled and U41 will change to be an input port instead of an output port. In this way it is possible to read the parallel setting on the local control panel. If the system is set to local control mode (with a parallel board plugged in) U63-U65 will be disabled and U41 changed to output the set value from the local control panel.

U57 is used to enable or disable the control signals (ON, OFF, RESET, INVERT) from the parallel interface.

#### 4.2.4 Communication:

The communication between the control board and the outside world is done through serial links, except of course for the CAMAC interface (See paragraph above). There are three serial communication ports implemented for the communication.

- |             |   |
|-------------|---|
| A) Con. P14 | RS232 to the M-PANEL (Chip U1)  |
| B) Con. P13 | RS232 to the Data log line (Chip U17 and U23 to U25)                        |
| C) Con. P13 | RS422/RS232 to the Remote control.<br>(Chip U11 to U12, U17 and U20 to U22) |

All serial communication lines are isolated from the  $\mu$ P on the board, by means of opto couplers and separate isolated voltage supplies. The Remote- and data log- lines are controlled by a Z8030 U17, which takes care of the baudrate, parity check and data format for Z8 (see page 4/10). The local control line comes directly from the Z8 (see page 2/10).

For isolation purpose the H11L1 TTL logic output opto couplers are used and as TTL to RS422 converter a UA9637 circuit with three state outputs. The three state output option of the UA9637 is used when the system is driven in the multidrop mode. This makes it possible to connect up to 255 control boards in parallel, and only the power supply which is addressed is allowed to enable its output driver. The MC3487 is used as RS422 to TTL receive converter.

The RS232 data-log line is driven by a LT1081 (U25). The same IC is used to drive the remote line if it is used in RS232 mode instead of RS422 (by changing switch SW4 pos 7 and 8).

The data communication protocol is explained else where in the manual.

#### 4.2.5 Analog measurements:

Different internal voltages, temperatures and external output currents and load values are monitored by means of Analog to Digital converters.

The following analog signals are monitored:

- +15 Volt, -15 Volt and +5 Volt internal voltages.
- Output voltage of the supply. (option by some models)
- Output current of the supply.
- The voltage across the transistor bank. (Option for some models)
- The offset temperature in the regulation module.
- Input from a magnet field probe. (Optional)

This block is build upon ADC U8 (page 2/10) and ADC U52 to U54 (page 6/10) if the control board is a 16 bit version. The amplifiers used for the level conversion are U36 to U39 (page 3/10).

The measurements is made with the U8 circuit ADC0809, an 8 input 8 bit ADC. The ADC is connected directly to the  $\mu$ P, and with its software the data from the ADC will be available both on the local control panel and the serial remote lines. The reference voltage input to U8 is 2.55V and it comes from U55. This gives a max. input voltage to the ADC to be the 2.55V. In case of output readings in %, the software will scale a 2V input signal to be 100%, thereby leaving room for a max percentage reading of 125%.



The reference voltage for the ADC is adjusted on POT6.

The burden resistor on the regulation board receives one Ampere for 100% output current. The voltage of the burden resistor is measured by a high impedance input configuration made by amplifier U36 and U37, in order not to disturb the current regulation. These amplifiers are supplied with high precision Vishay resistors to give low drift, especially when the optional 16 bit ADC is used.

POT3 adjusts the voltage reading of the passbank voltage

The external magnet field signal can be connected to TP7 and TP6.

#### Adjusting possibilities:

POT3: Pot3 is adjusted to give a M-panel read out of 100V with a "PASS.BANK.V" input value of 10V. After installation in the MPS pot3 may need a fine adjustment to match the actual pass bank voltage.

POT6: Pot6 is adjusted to ensure a reference voltage to U8 of exactly 2.550V measured between pin 12 and 16 on U8.

R54 (fixed resistor on page 3) adjusts the magnet field reading.

#### 4.2.6 Motherboard:

The control board contains the control and monitoring circuits for the MPS. In addition it is used as motherboard for the following modules:

DCCT module, Regulation module, CAMAC module (Option) and the Isolation module for external monitoring of the output current (0 → 10V) (Option)

Page 7/10 of the circuit diagram shows the interconnection wiring.

as well as the supply voltages to the different boards. Some of the supply voltages are galvanically isolated from each other in order to prevent ground loops.

The voltage regulators are U58, U50 and U67 to U68.

4.2.7 LED indications on the board:

Most of the status signals indicated on the remote lines can also be read from light emitting diodes. Most of these LED's are software controlled and they are therefore only valid if the  $\mu$ P works.

The following is a list of these LED's with their description :

LED NO.	Description	Color	Diode NO.
LD0	: OCP.	Red	D20
LD1	: Overload.	Red	D21
LD2	: Phase-failure.	Red	D22
LD3	: MPS Waterflow.	Red	D23
LD4	: 1% Transistor failure.	Red	D24
LD5	: Normal run down.	Red	D25
LD6	: Thermal Fuses.	Red	D26
LD7	: MPS Over-Temp.	Red	D27
LD8	: Fast run down.	Red	D28
LD9	: Earth-leakage.	Red	D29
LD10	: Max current set	Red	D30 $\leftarrow$ red
LD12	: Fast run down.	Red	D32
LD13	: Pre.Reg.Fail	Red	D33
LD14	: General	Red	D34
LD11	: Main power is ON	Green	D31
LD15	: Pol. non-inv.	Green	D35
LD16	: Pol. inv.	Green	D36
LD17	: Vario trafo. at zero	Yellow	D37
LD18	: Ready	Green	D38
LD19	: Spare 1	Green	D39 $\leftarrow$ green
LD20	: Spare 2	Green	D40 $\leftarrow$ green
LD21	: Spare 3	Yellow	D41 $\leftarrow$ yellow
LD22	: Spare 4	Green	D42 $\leftarrow$ green
LD23	: Option Switch	Green	D43
LD24	: TP 4	Green	D44
LD25	: TP 5	Green	D45
LD29	: Sum Interlock	Red	D49 $\leftarrow$ red

Hardware controlled LED's:

LED NO.	Description	Color	Diode NO.
LD35	: Main power is ON	Green	D55
LD36	: Rev. Pol	Green	D56
LD37	: Norm. Pol.	Green	D57
LD38	: Variab. trafo at zero	Yellow	D58
LD34	: Sum Interlock	Red	D54 $\leftarrow$ red
LD32	: "Talk"-enable	Green	D52 $\leftarrow$ green
LD33	: CPU reset	Red	D53

4.2.8 Interface specification:

The Driver Interface board has following connection:

- P1 DCCT Electronics interface
- P2 Regulation module interface
- P3 Camac or custom made I/O interface (optional)
- P4 Isolation amplifier interface (optional)
- P5 Interlock input
- P6 Interlock input
- P7 Interlock input
- P8 Aux-relay and pol. switch output
- P9 Aux-relay and pol. switch input
- P10 Aux-power supply
- P11 Spare
- P12 LED status panel (optional)
- P13 RS 232 / RS 422 remote line interface
- P14 Local control panel interface
- P15 Aux power supply interface

**Connector P1:** (To/From DCCT Electronic module)

Pin no:	Name	I/O	Description & Specification
AC-1			Not used
AC-2	+7V	O	+7V Power supply.
AC-3			Not used
AC-4			Not used
AC-5	RTN_7V	O	±7V Power supply return.
AC-6	-7V	O	-7V Power supply.
AC-7			Not used
AC-8	DCCT.CURR	I	DCCT Output current. +1A source current when the DCCT head is 100% loaded and -1A sink current when -100%.
AC-9			Not used
AC-10	-23V	O	-23V Power supply.
AC-11			Not used
AC-12	0V	O	0V Power supply for ±23V & ±15V.
AC-13			Not used
AC-15 → AC18			Not used
AC-19	OUT.CURR.H	I	Output current high side. Voltage representation of the supply output current, as the voltage across the burden resistor relative to OUT.CURR.L. This line must not be loaded with a higher bias current than 1/10★ 1★(The accuracy of the MPS in ppm).
AC-20	OUT.CURR.L	I	Output current low side. See specification of AC-19.
AC-21 → AC29			Not used
AC-30	0V	I	0V Power supply for ±23V & ±15V.
AC-31			Not used
AC-32	DCCT.INTL	O	DCCT Interlock signal.

**Connector P2: (To/From the Regulation Module)**

Pin no:	Name	I/O	Description & Specification
A-1			Not used
C-1	TEMP.ANALOG	I	Analog representation of the DAC temperature. 1V equals 2,75°C. The load of this line can be seen as a 17,6KΩ resistor in series with a 1,33V battery.
AC-2	+7V	O	+7V Power supply.
AC-3	+23V	O	+23V Power supply.
AC-4	0V	O	0V Power supply for ±23V & ±15V.
AC-5	-23V	O	-23V Power supply.
AC-6	-7V	O	-7V Power supply.
AC-7	RTN_7V	O	±7V Power supply return.
AC-8	RTN_7V	O	±7V Power supply return.
AC-9	+7V	O	+7V Power supply.
A-10			Not used
C-10	DAC0	O	DAC0 signal TTL compatible output for the Digital to Analog converter. DAC0 is the least significant bit. Max load is one TTL input
A-11			Not used
C-11	DAC1	O	DAC1. See DAC0 for further specification.
A-12			Not used
C-12	DAC2	O	DAC2. See DAC0 for further specification.
A-13	OUTP.V	I	Voltage representation of the output voltage (Not applicable on all members of the system 8000). The voltage read out is calibrated in % of max output voltage. An output voltage of 9V is calibrated to represent 100%.
C-13	DAC3	O	DAC3. See DAC0 for further specification.
A-14	/READY	I	When this TTL signal is pulled low it indicates, that the output current of the power supply is within a certain accuracy of the set value (normally 200 to 1000 PPM depending on the power supply type).
C-14	DAC4	O	DAC4. See DAC0 for further specification.
A-15	TRANS.FAIL	I	One transistor failure input. If this signal is pulled low by the Regulation module, no interlock is generated. A 1.5KΩ resistor pulls this line up to +5V.
C-15	DAC5	O	DAC5. See DAC0 for further specification.
A-16	OVERLOAD	I	Overload error input. If this signal is pulled low by the Regulation module, no interlock is generated. A 1.5KΩ resistor pulls this line up to +5V.
C-16	DAC6	O	DAC6. See DAC0 for further specification.
A-17	REG.FAIL	I	Regulation module failure input. If this signal is pulled low by the Regulation module, no interlock is generated. A 1.5KΩ resistor pulls this line up to +5V.
C-17	DAC7	O	DAC7. See DAC0 for further specification.
A-18	PW.IS.ON	O	High when power is on (MPS in operation).
C-18	DAC8	O	DAC8. See DAC0 for further specification.
A-19	INTRESET	O	This TTL signal is used as reset for local interlock bits for MPS 853. It depends on the position of the dip switch SW3.
C-19	DAC9	O	DAC9. See DAC0 for further specification.
A-20			Not used
C-20	DAC10	O	DAC10. See DAC0 for further specification.
A-21			Not used
C-21	DAC11	O	DAC11. See DAC0 for further specification.
A-22			Not used
C-22	DAC12	O	DAC12. See DAC0 for further specification.
A-24	PASS.BNK.V	I	Passbank voltage input. The load of this line can be seen as a min. 17KΩ resistor to ground. A 10V input signal is calibrated to give an 100V output reading.
C-23	DAC13	O	DAC13. See DAC0 for further specification.
A-24	+5V	O	+5V Power supply.
C-24	DAC14	O	DAC14. See DAC0 for further specification.
A-25			Not used
C-25	DAC15	O	DAC15. See DAC0 for further specification.
A-26			Not used

C-26	DAC16	O	DAC16. See DAC0 for further specification.
A-27			Not used
C-27	DAC17	O	DAC17. See DAC0 for further specification.
A-28			Not used
C-28	DAC18	O	DAC18. See DAC0 for further specification.
A-29			Not used
C-29	DAC19	O	DAC19. See DAC0 for further specification.
AC-30	RTN_7V	I	±7V Power supply return. For DCCT current return signal. See AC-31.
AC-31	DCCT.CURR	O	DCCT current. ±1A when the DCCT head is 100% loaded.
A-32	OUT.CURR.H	I	Output current high side. Voltage representation of the supply output current, as the voltage across the burden resistor relative to OUT.CURR.L. This line must not be loaded with a higher bias current than 1/10 ★ 1★ (The accuracy of the MPS in ppm).
C-32	OUT.CURR.L	I	Output current low side. See specification of AC-19.

**Connector P3: (CAMAC Interface)**

<u>Pin no:</u>	<u>Name</u>	<u>I/O</u>	<u>Description &amp; Specification</u>
AC-1	+5V	O	+5V Power supply.
AC-2			Not used
AC-3	+23V	O	+23V Power supply.
AC-4	0V	O	0V Power supply for ±23V & ±15V.
AC-5	-23V	O	-23V Power supply.
A-6	RESET	I	Active high TTL pulse input to Reset Interlock status. The pulse width of this input must be between ½ to 1 second. <b>NOT implemented, for future use only.</b>
A-7	ON	I	Active high TTL pulse input to switch the main power ON. The pulse width of this input must be between ½ to 1 second.
A-8	OFF/RESET	I	Active high TTL pulse input to switch the main power OFF and RESET the interlock status. The pulse width of this input must be between ½ to 1 second.
A-9	INV	I	Active high TTL pulse input to start the polarity reversal switch. The pulse width if this input must be between ½ to 1 second.
A-10 to A-29	CBIT0 to CBIT19	I	Active high current setting TTL output. CBIT0 is the least significant bit.
AC-30	TEMP.ANALOG	I	Analog representation of the DAC temperature. 1V equals 2,75°C. The load of this line can be seen as a 17,6KΩ resistor in series with a 1,33V battery.
AC-31			Not used
AC-32	/CAMAC.ACT.	I	Enable the P3 CAMAC connector signals. Pulling this TTL signal low will enable the CAMAC parallel P# connector. (Normally hard wired in the connector of the CAMAC boards)
C-6	M.POWER-ON	O	This TTL signal is high when the Main power is ON and the vario Transformer is at zero.
C-7	/MAXRESET	O	This active low TTL signal is in parallel with the CPU reset, and can therefore be used to initialize the CAMAC interface board.
C-8			Not used
C-9	PW.IS-ON	O	This TTL signal is active low when the power is ON.
C-10	REV.POL	O	This TTL signal is high when the polarity switch is at its reversal position.
C-11	NOR.POL	O	This TTL signal is high when the polarity switch is at its normal position.
C-12	MAG.TEMP	O	Active high TTL interlock signal indicating a too high magnet temperature.
C-13	TR.FAULT	O	Active high TTL interlock signal indicating a faulty transistor.
C-14	∑.INTL.	O	Active high TTL sum interlock signal.

C-15	OVER-CUR.	O	Active high TTL interlock signal indicating a too high output current.
C-16	OVER-LOAD	O	Active high TTL interlock signal indicating an over loaded transistor bank. (Typically when exceeding SOAR curve).
C-17	REG.FAULT	O	Active high TTL interlock signal indicating a failure in the regulation module. (Typically if the internal voltages in the regulation board are too low or off course if the regulation board is not properly mounted.)
C-18	PRE.REG.ER	O	Active high TTL interlock signal indicating an error in the pre regulator.
C-19	PHASE.ERR	O	Active high TTL interlock signal indicating a phase error in the line input .
C-20	MPS.FLOW	O	Active high TTL interlock signal indicating missing water flow inside the MPS.
C-21	EARTH.LEAK	O	Active high TTL interlock signal indicating an earth leakage error.
C-22	THRM.FUSE	O	Active high TTL interlock signal indicating that the thermal fuse has tripped the MPS OFF.
C-23	MPS.TEMP	O	Active high TTL interlock signal indicating that a component inside the MPS is overheated.
C-24	GENERAL	O	Active high TTL interlock signal indicating that the general interlock input is active.
C-25	MAG.FLOW	O	Active high TTL interlock signal indicating missing water flow to the magnet (load).
C-26	MAG.TEMP	O	Active high TTL interlock signal indicating that the magnet is overheated.
C-27	/READY	O	Active high TTL signal indicating that the output current of the power supply is within a certain accuracy of the set value (normally 200 to 1000 PPM depending on the power supply type).
C-28			Not used
C-29	OUT.CURR.H	O	Output current high side. Voltage representation of the supply output current, as the voltage across the burden resistor relative to OUT.CURR.L. This line must not be loaded with a higher bias current than 1/10★ 1★(The accuracy of the MPS in ppm).
C-30	OUT.CURR.L	O	Output current low side. See specification of C-29
C-31	PASS.BNK.V	O	Passbank voltage output. A 10V signal ref pin A-C4 equals a 100V pass bank voltage .
C-32	OUTP.V	O	Voltage representation of the output voltage (Not applicable on all system 8000 members). The voltage read out is calibrated in % of max output voltage. An output voltage of 9V ref pin A-C4 is calibrated to represent 100% .

**Connector P4: (Current monitor Interface)**

<u>Pin no:</u>	<u>Name</u>	<u>I/O</u>	<u>Description &amp; Specification</u>
AC-1	+5V	O	+5V Power supply.
AC-2			Not used
A-3			Not used
C-3	+23V	O	+23V Power supply.
A-4			Not used
C-4	0V	O	0V Power supply for ±23V & ±15V.
AC-5	-23V	O	-23V Power supply.
AC-6	ISO+8V	O	Galvanically isolated unregulated +8V Power supply.
AC-7	ISOGND	O	Ground for ISO+8V.
A-12	0V	O	0V Power supply for ±23V & ±15V.
A-14	+23V	O	+23V Power supply.
A-15	REMRX	O	Receive line of the remote RS232 port.
A-16	REMTX	O	Transmit line of the remote RS232 port.

C-19	OUT.CURR.H	O	Output current high side. Voltage representation of the supply output current, as the voltage across the burden resistor relative to OUT.CURR.L. This line must not be loaded with a higher bias current than 1/10★ 1★(The accuracy of the MPS in ppm).
C-20	OUT.CURR.L	O	Output current low side. See specification of C-30
C-31	PASS.BNK.V	O	Passbank voltage output. A 10V signal equals an 100V pass bank voltage.
C-32	OUTP.V	O	Voltage representation of the output voltage (Not applicable on all system 8000 members). The voltage read out is calibrated in % of max output voltage An output voltage of 9V is calibrated to represent 100%.

Not described pins for P4 are unused.

**Connector P5: (Internal Interlock signals)**

<u>Pin no:</u>	<u>Name</u>	<u>I/O</u>	<u>Description &amp; Specification</u>
1	PHASE	I	Pin 1 & 2 must be connected when the phase relay indicates <b>no ERROR</b>
3	TH.FUSES	I	Pin 3 & 4 must be connected when the thermal fuse(s) indicates <b>no ERROR</b>
5	PHASE	I	Pin 5 & 6 must be connected when the MPS internal water flow detector indicates <b>no ERROR</b>
7	MPS.OVERT.	I	Pin 7 & 8 must be connected if <b>no part</b> inside the MPS is(are) overheated.
2&4&6&8	GND2	I	Ground for the signals above.

**Connector P6: (External Interlock signals)**

<u>Pin no:</u>	<u>Name</u>	<u>I/O</u>	<u>Description &amp; Specification</u>
1	MAGN.FLOW	I	Pin 1 & 2 must be connected when the magnet water flow detector indicates <b>no ERROR</b>
3	MAGN.TEMP	I	Pin 3 & 4 must be connected when the magnet temperature is <b>within</b> the specified level.
2&4	GND2	I	Ground for the signals above.

**Connector P7: (Internal Interlock signals)**

<u>Pin no:</u>	<u>Name</u>	<u>I/O</u>	<u>Description &amp; Specification</u>
1	EARTH.LEAK	I	Pin 1 & 2 must be connected when the Earth leak detector indicates <b>no ERROR</b>
3	PREREG	I	Pin 3 & 4 must be connected when the pre-regulator indicates <b>no ERROR</b>
5	SPARE	I	Pin 5 & 6 must be connected when the spare interlock input indicates <b>no ERROR</b>
7	GENERAL.	I	Pin 7 & 8 must be connected when the General interlock input indicates <b>no ERROR</b>
8 & 9	LUS		Pin 8 and 9 are connected together. By this it is possible to wire "OR" two general interlocks..
2&4&6&10	GND2	I	Ground for the signals above.

**Connector P8: (Drive signals)**

<u>Pin no:</u>	<u>Name</u>	<u>I/O</u>	<u>Description &amp; Specification</u>
1&3	+24VOLT	O	+24V line.
2	MAINPW.ON	O	Open collector output. This pin will be pulled low in one second when turning the main power ON.

4	INV	O	Open collector output. This pin will be pulled low in one second when the polarity has to be reversed. The maximum sink current of an open collector output is 100mA.
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**Connector P9: (Status signals)**

<u>Pin no:</u>	<u>Name</u>	<u>I/O</u>	<u>Description &amp; Specification</u>
1	MAIN.IS.ON	I	Pin 1 & 2 must be connected when the main contactor is ON
3	REV.POL	I	
5	NORM.POL	I	Pin 3 & 4 must be connected when the polarity switch is reversed.
7	VARIO.ZERO	I	Pin 5 & 6 must be connected when the polarity switch is in normal position
2&4&6&8	GND2	I	Pin 7 & 8 must be connected when the vario transformer is at zero.
			Ground for the signals above.

**Connector P10 (Power supply input)**

<u>Pin no:</u>	<u>Name</u>	<u>I/O</u>	<u>Description &amp; Specification</u>
1	+24V	I	+24V Unregulated voltage input. (Used by the M-panel).
2	RTN+24V	I	
3	+5V	I	+24V Return line.
4	RTN+5V	I	+5V Regulated voltage input
5	+7V	I	+5V return line.
6	RTN±7V	I	+7V Unregulated voltage input
7	-7V	I	±7V Return line.
8	+23V	I	-7V Unregulated voltage input
9	RTN+23V	I	
10	-23V	I	+23V Unregulated voltage input. This voltage is intended for the DCCT electronic module.
11	+23VDAC	I	±23V return line.
12	RTN+23VDAC	I	-23V Unregulated voltage input. This voltage is intended for the DCCT electronic module.
13	-23VDAC	I	
			+23VDAC Unregulated voltage input. This voltage is intended for the DAC module.
			±23VDAC return line.
			-23VDAC Unregulated voltage input. This voltage is intended for the DAC module.

**Connector P11 (Power supply output)**

<u>Pin no:</u>	<u>Name</u>	<u>I/O</u>	<u>Description &amp; Specification</u>
1	+24V	O	+24V Unregulated voltage output. This voltage is taken from P10 pin 1.
2	RTN+24V	O	
3			+24V Return line.
4			Not used
5	RTN±15V	O	Not used
6	+15V	O	±15V Return line.
7	RTN±15V	O	+15V Regulated voltage output. This voltage is taken from P10 pin 8. See specification on AUX Power supply for maximum load.
8	-15v	O	
			±15V Return line.
			-15V Regulated voltage output. This voltage is taken from P10 pin 10. See specification on AUX Power supply for maximum load.

**Connector P12: (Status output signals)**



Pin no:	Name	I/O	Description & Specification
1	CONT.PW.ON	O	Open collector output. This pin will be pulled low when the control power is ON.
2	MAIN.PW.ON	O	Open collector output. This pin will be pulled low when the main power is ON.
3	READY	O	Open collector output indicating that the output current of the power supply is within a certain accuracy of the set value (normally 200 to 1000 PPM depending on the power supply type).
4	SUMINTERL	O	Open collector output. This pin will be pulled low if any interlock is active.
5	GND	O	Ground line for the signals above.

The maximum sink current of an open collector output is 100mA.

**Connector P13: (Serial interface DB25)**

Pin no:	Name	I/O	Description & Specification
2	REMTX232	O	Transmit line of the remote RS232 port.
2	REMRX232	I	Receive line of the remote RS232 port.
1, 4 → 6, 8, 14, 15, 19, 20	ISOGND	O	Not connected
7, 18	ISOGND	O	Isolated ground for the serial interface.
21 → 25	ISOGND	O	Isolated ground for the serial interface.
9	REMTX422	O	Transmit line of the remote RS422 port.
10	REMTX422	O	Transmit line of the remote RS422 port.
11	REMRX422	I	Receive line of the remote RS422 port.
12	REMRX422	I	Receive line of the remote RS422 port.
13	ISO+8V	O	Isolated 8V Voltage supply.
16	LOGTX232	O	Transmit line of the LOG RS232 port. (used internally for debugging purpose)
17	LOGRX232	I	Receive line of the LOG RS232 port. (used internally for debugging purpose)

**Connector P14: (M-Panel Serial interface DB9)**

Pin no:	Name	I/O	Description & Specification
1	ISOGND	O	Isolated ground for the serial interface.
2	REMTX422	O	RS422 Transmit line to the M-Panel.
3	REMRX422	O	RS422 Transmit line to the M-Panel.
4	REMRX422	I	RS422 Receive line from the M-Panel.
5	REMRX422	I	RS422 Receive line from the M-Panel.
6, 7	+24V	O	+24V Voltage supply.
8, 9	GND2	O	Ground for the +24V Voltage supply.

**Connector P15 (Power supply input)**

1			Not used.
2	GND	O	General circuit ground.
3			Not used.
4	ISO+8V	I	Galvanically isolated +8V unregulated voltage input.
5	ISOGND	I	Return line for the ISO+8V

#### 4.4 Regulation Module

Magnet Power Supply 854 and 859, system 8000

Schematic: 82514

Assy. : 82513

The main task of the Regulation Module is to produce a regulated signal to the power output stage from the "ERROR" amplifier located in the DAC module. The power output stage can either be transistor banks or switch mode modules both connected via a driver interface board. It also acts as a link between the control board and the driver board (interlock/status signals) and a link to the DAC module (preset and actual value).  
principe

The Regulation board contains the following main functions:

- Interface for the DAC module
- Current loop Amplifier/compensation
- Temperature control amplifier
- Ready indication
- Over load protection and interlocks
- Internal voltage supplies.

Each type of power supply can in principle be connected to different loads. The Amplifier loop compensation must therefore match to the specified load. Please see the change notes in chapter 9 for the component values.

##### 4.4.1 Interface for the DAC module:

This block receives the digital preset value bits from the control board and passes them to the DAC module via the opto couplers IC4 to IC16.

The DAC module is connected to the Regulation board through P3.

See specification for P3 connector for further information.

##### 4.4.2 Current loop Amplifier/compensation:

This block amplifies the "ERROR" signal coming from the "ERROR" amplifier located in the DAC module, and it is built upon the dual operational amplifiers A1 and A2 and. The bode plot of this circuit is matched to the connected load specification and may therefore differ from one power supply to another. Se change notes for actual components value.

Jumper 2 is used to switch the loop between a resistive load and the actual inductive load. The resistive load is normally used for testing. If R18 is connected in parallel with R17 with the jumper 2, the power supply is in the resistive load mode.

#### 4.4.3 Temperature control amplifier:

The voltage reference and the DAC and the error amplifier in the dac module are temperature controlled to app. 0.2 C accuracy.

This is done by means of a peltier element. Since a peltier element can both heat and cool, it is possible to keep the temperature just over room temp (35 C).

The temperature inside the DAC module is sensed with an resistor temp sensor, which electrically is connected in a bridge circuit around R32 to R35. The high impedance Amplifier circuit A7 and  $\frac{1}{2}$ A5 amplifies the error signal for further amplification by the second half of A5. The output signal is also used by the control board for delta T readout, high and low temperature indication with the LED's D12 and D13 and can be tested on test point TP1. 1V at TP1 equals 2,75°C. The peltier element is driven by the power amplifier A4.

#### 4.4.4 Ready indication:

The task of the ready indication circuit is to tell when the output current level is within a certain accuracy.

This circuit is build upon A3 and  $\frac{1}{2}$ IC21.

The output voltage from the "ERROR" amplifier located in the DAC module, can be seen as proportional to the accuracy of the output current. If the gain in the ERROR amplifier is known, it is then possible for the window discriminator, A3, to test if the output current is within the wanted level. The window span (R23 to R26) is calculated for each power supply individually to meet the specification. Normally from 200 to 1000PPM.

#### 4.4.5 Over load protection and interlocks:

The task of the overload protection is to turn the power supply OFF if the output current rises above 110%. It is adjustable by means of R5.

This circuit is build upon A6, Q1, IC20 and  $\frac{1}{2}$ IC21.

When the power supply delivers 100% output current, the DCCT delivers exact 1A. This 1A current is fed through a 1 $\Omega$  resistor in the DAC module giving 1V. If this 1V rises above 1.1V the comparator A6 will open the Transistor/overload interlock chain by removing the working current to the opto coupler IC20.

The trip voltage to the A6 is adjustable with R5. This trip voltage is must be adjusted a little higher than the 1.1V to compensate for connector and wire resistances in the PCB's. The best way to adjust R5 is to measure the voltage at A6 pin 3 at 100% output current and then add 10% to this value to be measured at pin 2.

Added to this overload interlock the regulation module also produces a "REG MODULE FAIL" interlock if one of the internal voltages fails. Interlocks from the Driver board is just passed through to the control board.

4.4.6 Internal voltage supplies:

The Regulation module carries its own voltage regulation circuit to achieve the best stability and noise performance.

The different voltage supplies are regulated by IC1 to IC3 and IC17 and IC18.

4.4.7 Interface specification:

The Regulation module has following connection:

- P1 Control board
- P2 Driver module
- P3 DAC module

**Connector P1: (To/From the Control board)**

Pin no:	Name	I/O	Description & Specification
A-1			Not used
C-1	TEMP.ANALOG	O	Analog representation of the DAC temperature. 1V equals 2,75°C. Output impedance is 1.2KΩ.
AC-2	+7V	I	+7V Power supply.
AC-3	+23V	I	+23V Power supply.
AC-4	0V	I	0V Power supply for ±23V & ±15V.
AC-5	-23V	I	-23V Power supply.
AC-6	-7V	I	-7V Power supply.
AC-7	RTN_7V	I	±7V Power supply return.
AC-8	RTN_7V	I	±7V Power supply return.
AC-9	+7V	I	+7V Power supply.
A-10			Not used
C-10	DAC0	I	DAC0 signal TTL compatible input for the Digital to Analog converter (BIT 20). DAC0 is the least significant bit. Max load is one TTL input
A-11			Not used
C-11	DAC1	I	DAC1. See DAC0 for further specification.
A-12			Not used
C-12	DAC2	I	DAC2. See DAC0 for further specification.
A-13	OUTP.V	O	Voltage representation of the output voltage (Not applicable on all members of the system 8000). The voltage read out is calibrated in % of max output voltage. An output voltage of 9V is calibrated to represent 100%.
C-13	DAC3	I	DAC3. See DAC0 for further specification.
A-14	/READY	O	When this TTL signal is pulled low it indicates, that the output current of the power supply is within a certain accuracy of the set value (normally 200 to 1000 PPM depending on the power supply type).
C-14	DAC4	I	DAC4. See DAC0 for further specification.
A-15	TRANS.FAIL	O	One transistor failure output. This signal is normally pulled low, and will open in case of one transistor fault. (Comes from the Driver board)
C-15	DAC5	I	DAC5. See DAC0 for further specification.
A-16	OVERLOAD	O	Overload error output. This signal is normally pulled low, and will open in case of more than one transistor fault or (Comes from the Driver board) or if the output current rises above 110%.
C-16	DAC6	I	DAC6. See DAC0 for further specification.
A-17	REG.FAIL	O	Regulation module failure input. This signal is normally pulled low, and it will open if one of the internal voltage supplies fails.
C-17	DAC7	I	DAC7. See DAC0 for further specification.
A-18	PW.IS.ON	I	High when power is on (MPS in operation).
C-18	DAC8	I	DAC8. See DAC0 for further specification.

A-19			Not used
C-19	DAC9	I	DAC9. See DAC0 for further specification.
A-20			Not used
C-20	DAC10	I	DAC10. See DAC0 for further specification.
A-21			Not used
C-21	DAC11	I	DAC11. See DAC0 for further specification.
A-22			Not used
C-22	DAC12	I	DAC12. See DAC0 for further specification.
A-23	PASS.BNK.V	O	Passbank voltage output. A 10V signal is calibrated to give an 100V output reading.
C-23	DAC13	I	DAC13. See DAC0 for further specification.
A-24	+5V	I	+5V Power supply.
C-24	DAC14	I	DAC14. See DAC0 for further specification.
A-25			Not used
C-25	DAC15	I	DAC15. See DAC0 for further specification.
A-26			Not used
C-26	DAC16	I	DAC16. See DAC0 for further specification.
A-27			Not used
C-27	DAC17	I	DAC17. See DAC0 for further specification.
A-28			Not used
C-28	DAC18	I	DAC18. See DAC0 for further specification.
A-29			Not used
C-29	DAC19	I	DAC19 (BIT 1). See DAC0 for further specification. DAC19 is the most significant bit. Max load is one TTL input
AC-30	RTN_7V	I	±7V Power supply return. For DCCT current return signal. See AC-31.
AC-31	DCCT.CURR	I	DCCT current. ±1A when the DCCT head is 100% loaded.
A-32	OUT.CURR.H	O	Output current high side. Voltage representation of the supply output current, as the voltage across the burden resistor relative to OUT.CURR.L. This line must not be loaded with a higher bias current than 1/10★ 1★(The accuracy of the MPS in ppm).
C-32	OUT.CURR.L	O	Output current low side. See specification of AC-19.

**Connector P2: (To/From the Driver board)**

1	REG.OUT	O	Regulation output current signal (Between pin 1 & 2). This signal indicates how much the power output stage has to open. The current is 0mA for 0% output current and 5mA (+20%/-50%) for 100% output current. The maximum allowable voltage difference between pin 1 & 2 is 2V. Connecting pin 1 & 2 will result in a voltage representation of the regulation signal to pin 8. This voltage is 0V for 0% output current and 10V(+20%/-50%) for 100% output current.
2	REG.OUT.RTN	O	Return wire for pin 1.
3	-15V	O	-15V voltage supply.
4	+15V	O	+15V voltage supply.
5	TRANS.OVERL	I	Multi transistor failure input. This signal is normally pulled high (+15V), and will open if more than one transistor fails.
6			Not used.
7	TRANS.FAIL	I	One transistor failure input. This signal is normally pulled low by the driver module. If one transistor fails it will open.
8	0V	I	0v line for the ±15V.
9	VCE.BANK	I	Passbank voltage output. A 10V signal is calibrated to give a 100V output reading.
10	VOUT.BANK	I	Voltage representation of the output voltage (Not applicable on all members of the system 8000). The voltage read out is calibrated in % of max output voltage. An output voltage of 9V is calibrated to represent 100%.
11	VOUT.CLAMP	I	This signal is only connected to a test point TP3, but clamping this signal to a minus voltage in respect to - OUTPUT will also clamp the output voltage. Normally a - 10V signal at TP3 will represent a 100% output voltage (+20% -50%). Only applicable if jumper 2 in the driver module is inserted, and if so then the output is no longer 2KV isolated.
12	18VAC1	I	18V AC input voltage one.
13	18VACRTN	I	18V AC input voltage return.
14-24			Not used.
25	18VAC2	I	18V AC input voltage two.

**Connector P3: (To/From the DAC Module)**

1-18	IDAC2-IDAC20	I	Isolated TTL representation of IDAC2 to IDAC20. (IDAC0 is the least significant bit)
19-20	IDAC1-0	I	Isolated TTL representation of IDAC1 and IDAC0. (IDAC0 is the least significant bit)
21	GND	O	Ground for D±15V
22-25			Not used
26	RTMP.LOW	I	Temperature sensor line low side.
27	RTMP.HIGH	I	Temperature sensor line high side.
28	OUT.CURR.L	O	Output current low side. see pin 29.
29	OUT.CURR.H	O	Output current high side voltage representation relative to OUT.CURR.L.
30	D-15V	O	-15V voltage supply.
31	D.GND	O	Ground for D±15V
32	D+15V	O	+15V voltage supply.
33	DCCT.CURR	I	DCCT current. ±1A when the DCCT head is 100% loaded.
34	DCCT.RTN	I	DCCT current return signal.
35	S.GND	O	Signal ground.
36	ERR.SIG	O	"ERROR" signal from the sum amplifier.
37			Not used
38	S.GND	O	Signal ground.

#### 4.7 Aux Power Supply

Magnet Power Supply system 8000

Schematic: 81761

Assy. : 81760

The Aux Power Supply module delivers the supply voltages for the control board and the other modules connected to it.

Except for one 5V supply (used by the  $\mu$ P and peripherals) all other voltages are unregulated. Regulation is done locally due to noise reasons.

Be aware of the galvanic isolation between most of the voltages, please do not connect these voltages during measurements and servicing.

The voltage levels indicated in the connector specification are not the exact voltages, but indicates the voltage levels they are intended to be after regulation. Please see also the schematic for the right levels.

##### 4.7.1 Interface specification:

The Aux Power Supply module has following connection:

- P1 Transformer AC supply
- P2 DC supply
- P3 Extra DC supply

##### **Connector P1: (To/From the Transformer)**

<u>Pin no:</u>	<u>Name</u>	<u>I/O</u>	<u>Description &amp; Specification</u>
1	6.7V.AC	I	6.7V AC input line
2	6,7VRTN	I	6.7V AC input line return
3	16,6V.AC1	I	16.6V AC input line
4	16.6V.AC2	I	16.6V AC input line
5	16.6VRTN	I	16.6V AC input line return
6	19VRTNA	I	19V AC input line return
7	19V.AC1A	I	19V AC input line
8	19V.AC2A	I	19V AC input line
9	19VRTNB	I	19V AC input line return
10	19V.AC1B	I	19V AC input line
11	19V.AC2B	I	19V AC input line
12	5VRTN	I	5V AC input line return
13	5V.AC1	I	5V AC input line
14	5V.AC2	I	5V AC input line
15	5.3V.AC2	I	5.3V AC input line
16	5.3VRTN	I	5.3V AC input line return
17	18V.AC	I	19V AC input line
18	18VRTN	I	19V AC input line return



**Connector P2:** (To/From the Control board)

Pin no:	Name	I/O	Description & Specification
1	24V	O	24V DC output. (27V) The maximum load current for this voltage is 1A.
2	24VRTN	O	24V DC return
3	5V	O	5V DC regulated output. The maximum load current for this voltage is 2A.
4	5VRTN	O	5V DC return
5	+7V	O	+7V DC output. (8.5V) The maximum load current for this voltage is 4A.
6	7VRTN	O	±7V DC return
7	-7V	O	-7V DC output. (8.5V) The maximum load current for this voltage is 0.6A.
8	+23V	O	+23V DC output. (28.5V) The maximum load current for this voltage is 0.7A.
9	23VRTN	O	±23V DC return.
10	-23V	O	-23V DC output. (28.5V) The maximum load current for this voltage is 0.7A.
11	+23VDAC	O	+23VDAC DC output. (28.5V) The maximum load current for this voltage is 75mA.
12	23VRTNDAC	O	±23VDAC DC return
13	-23VDAC	O	-23VDAC DC output. (28.5V) The maximum load current for this voltage is 75mA.

**Connector P3:** (Extra DC supply)

Pin no:	Name	I/O	Description & Specification
1	24V	O	24V DC output.(27V) Same as P2 pin 1.
2	24VRTN	O	24V DC return. Same as P2 pin 2.
3	+15V	O	+15V DC output. (25V) The maximum load current for this voltage is 100mA.
4	-15V	O	-15V DC output. (25V) The maximum load current for this voltage is 100mA.
5	5V	O	5V DC output. (11V) The maximum load current for this voltage is 700mA.
6	15VRTNDAC	O	±15 & 5V DC return

#### 4.9 DAC Module

Magnet Power Supply 854 and 859, system 8000

Schematic:	82525 (16bit 0% > 100%)
	82527 (16bit 92% > 100%)
	82321 (18bit 0% > 100%)
Assy.:	82524 (16bit 0% > 100%)
	82526 (16bit 92% > 100%)
	82322 (18bit 0% > 100%)

The main task of the DAC Module is to compare the preset value with the actual current and give the resulting "ERROR" value to the regulation board. To do this the DAC module contains following functions:

- Voltage reference
- DAC (16 to 18 Bit)
- Summing amplifier
- Peltier element for the temperature control

##### 4.9.1 Voltage reference

The voltage reference block delivers the 7.2V high precision voltage for the digital to analog converter. For further improvements of stability and noise it is possible to connect up to four reference circuits in parallel

The reference circuit consists of IC1A to IC1D, IC2A, IC2B, IC6 and IC9.

The voltage reference is build upon LTZ1000, a precision zener circuit from Linear Technology together with the operational amplifiers IC2A and IC2B (if four LTZ1000 is mounted). IC9 with summing precision resistors takes the average of all reference voltages.

##### 4.9.2 DAC circuit

The DAC block converts the digital preset value to a current.

The circuit is build around IC5, IC6, IC7 and IC10

The DAC circuit delivers an output current proportional with the digital input value. IC10 (a multiplying DAC) and IC6 take care of the lower 16 bits. The two most significant bits are made separately using the analog switches of IC5 and the buffers of IC7 together with R9 and R13.

R12, R16 and R20 are adjusted to ensure ½ bit monotony.

In case of a 92% to 100% DAC module the most significant bit is always set and adjusted at Danfysik to give the 92%. The remaining 8% are then covered by the lower 16 bits giving a resolution of 15PPM.

#### 4.9.3 Error amplifier

The ERROR amplifier amplifies the ERROR signal from the summing point.

The ERROR amplifier consists of IC3

The output current is converted to one ampere in the DCCT and it is measured as a voltage across the high precision, very low drift  $1\Omega$  burden resistor. This voltage is buffered with IC4 and converted to a current using the resistors R8A to R8D. (These resistors are adjusted by Danfysik using a high precision reference source traceable to international standard laboratories. It is not recommended to "field" adjust the resistors)

This negative current is then compared with the positive DAC current in a sum point, and the difference is fed to the amplifier IC3 an LT1007. The amplification factor of IC3 and its frequency response can vary with the specification for each power supply. Please see Chapter 9 for possible change notes.

#### 4.9.4 Temperature control

The total DAC module is mounted inside a heavy aluminum faraday box where all incoming and outgoing signals are filtered with "PI" filters. The aluminum box is temperature controlled to approx. 0.2 deg.C stability with a peltier element (shown in the main schematic). The temperature controller is located in the regulation module. Please see this chapter for further information.

Since a peltier element can heat and cool the temperature can be kept just above normal room temperature (35 C).

## 6. TROUBLE SHOOTING

The syntax for trouble shooting hints:

### **SYMPTOM:**

- Check #1:
  - > A new check caused by check #1:
  - > The failure or a new check.
- Check #2:
  - > A new check caused by check #2:
  - > The failure or a new check.

### **NO RESPONSE ON CONTROL PANEL:**

- Check aux-power supply.
- Check cable connections to Control board and control panel.
  - > Failure on Control board or control panel.

### **WILL NOT GIVE MAIN POWER ON:**

- Check for interlocks.
- Check connections to main contactor:
  - > Failure on interlock board or Control board.

### **NONE OR BAD REGULATION:**

- Check the Vce voltage, must be within 7-12 volt:
  - > Check transformer tapping and mains voltage.
- Check the temperature readout for the regulation board:
  - > Delta temperature more than +/- 0.5°C offset, it should approach - 0.2°C:
  - > Failure on regulation board.
- Check ambient temperature:
  - > Temperature higher than 30°C:  
Ambient temperature must come down.

**HIGH FREQUENCY OSCILLATION (more than 10KHz):**

- Check all connections to driver board:
  - > If connections are correct then the driver board is defect.

**LOW FREQUENCY OSCILLATION (below 10KHz):**

- Check connections to DCCT by-pass filter (0.1-10Hz osc):
  - > Failure on regulation board.

**OVERCURRENT INTERLOCK:**

- Check green LED on DCCT electronic box:
  - > Check cable connections:
  - > Check aux-power supply:
  - > Failure on DCCT electronic box:

**PHASE FAIL INTERLOCK:**

- Check all phases.
- Check phase rotation:
  - > Swap two AC main cables.
  - > Defect phase relay.
- Check AC main power voltage.

**ONE TRANSISTOR FAILIURE INTERLOCK:**

- Check when main power is on for illuminated red LED(s) on the transistor bank boards:
  - > Change the transistor(s) and fuse(s).

### **DC OVER LOAD INTERLOCK:**

The "DC over load" can be generated if the output current exceeds a preadjusted value (given by R5), if one driver transistor is defect or if more than 4% of the slave transistors fails.

- Check when main power is on for illuminated red LEDs on the transistor emitter boards. Note the LED will only illuminate when main power is on, therefore look at the transistor bank boards when main power is turned on (the power supply will turn off immediately):
  - > Change the transistors and fuses.
- Check aux-power supply.
  - > Adjust Pot R5 on regulation board:
  - > Failure on regulation board.

### **OVER TEMPERATURE INTERLOCK:**

- Check water cooling.

### **THERMAL BREAKER INTERLOCK:**

- Check adjustment of main input thermal breaker:
  - > Failure in thermal breaker.

### **FAST RUN DOWN INTERLOCK:**

- Check connections to external interlock system.

8. DRAWINGS.

	<u>SCHEMATIC</u>	<u>ASSEMBLY</u>
	Dwg. No.	Dwg.No.
Main Schematic	82652	
Control Board Module	82370 A	82369 D
Regulation Module	82514 D	82513
DAC Module 16 Bit	82720	
Operator Control Panel	82039 D	82038 E
Aux. Power Supply	81761 C	81760 B
Resistor Board	82641	82640
Driver	82721	82433 C
Ramp Controller	82928 B	82927
Optional Port	82675	82674
Driver Booster Board	82612 A	
Ultrastab 861R:		
Main Circuit Diagram	88143	88099
PCB Circuit Diagram	88166	88101 A
Compensation Amplifier	88079 A	88078 A
Voltage Regulator	88082 A	88081 A

## 9. CHANGE NOTES.

### Driver module P-82433:

- R9, R10 and R26 are a short circuit.
- R28 is changed to 4K75.
- A 5K62 resistor (R26) is mounted from IC1 pin 8 to the -15V supply.
- A BZX83C 3V3 is mounted in series with the base of Q1.
- R46 is 75K and R48 is 10K.

### Regulation module P-82514C:

- A wire is mounted from P3.23 to A1 pin 7.
- A wire is mounted from P1.A18 to P3.25.
- A1 is removed.
- R25 and R26 are changed to 56 $\Omega$ .
- A2 is changed to LT1013.

### DAC 16 bit P-82725:

- R8B is a 3K05 0.1% Vishay resistor.
- A 75 $\Omega$  Vishay, 55 $\Omega$  Vishay and a 2K2 1% resistor are mounted in parallel with the burden resistor.

### Control board P-82369-4:

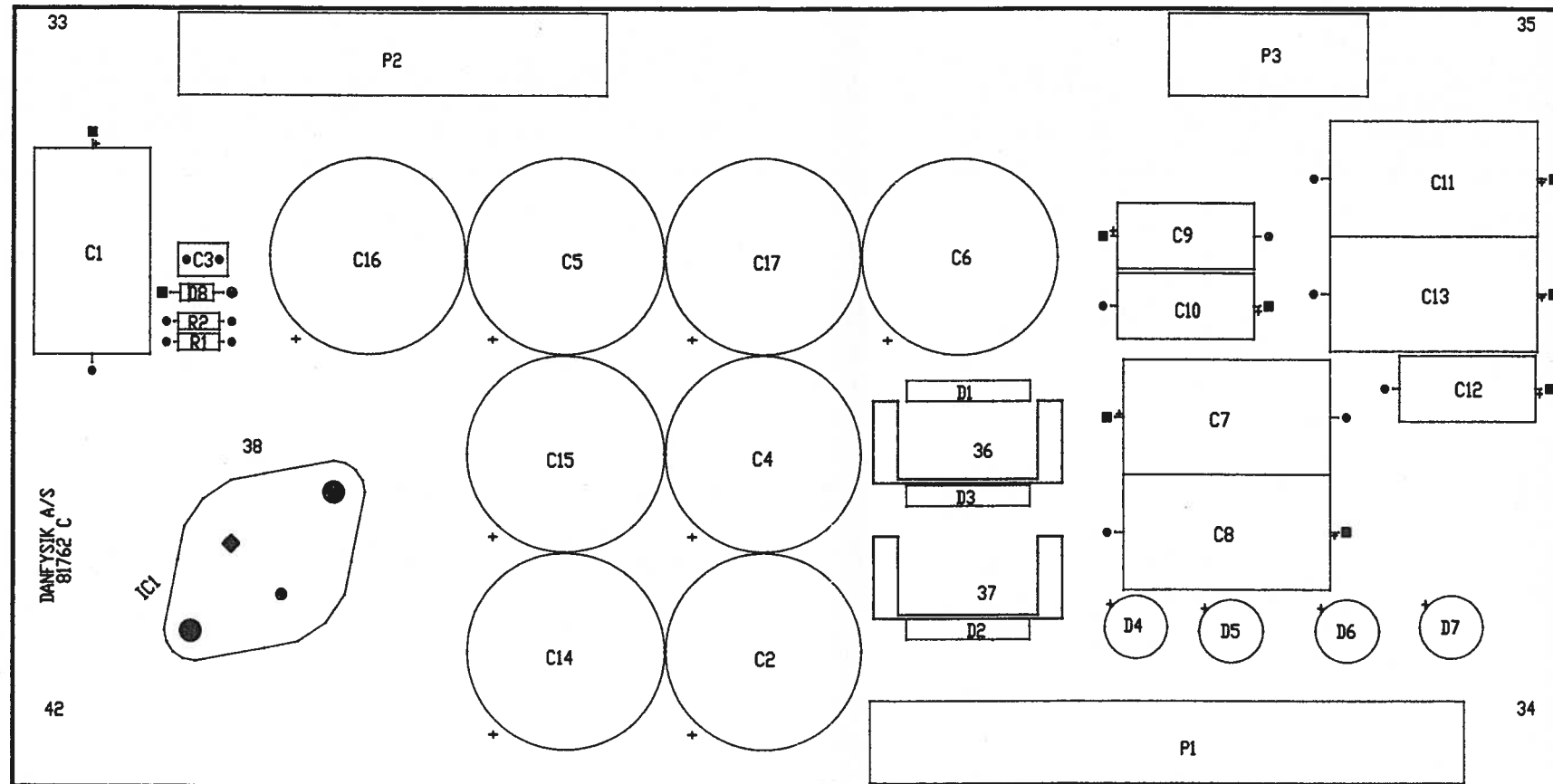
- D7 and D8 is not mounted.
- A wire is mounted between TP14 and U18 pin 27.
- Two 300K resistors in series are mounted across R43 & R44.



10. PARTS LISTS.

REF. NO:	PART/DWG. NO:	DESCRIPTION	MAN.	No. REQ
C1	47mF/40V	Electrolytic cap. (85°C)	Rifa	10
C2	10µF/63V	Capacitor type MKT		3
C3	45µF/350V	Electrolytic cap.	Philips	1
C4	47µF/385V	Electrolytic cap.	Philips	1
D1-D6	SW06CXC470LK7	Diode module 6 dioder 7 cooler	Westcode	2
D7-13	D 690s 2000	Diode Mounted on K 0,05F Heatsink	AEG AEG	7 7
D14	1N4007	Diode		1
F1-F3	200mA/F	Fuses		3
F4	3,164A/6A S	Fuses		1
F5	4A/F	Fuses		1
F6-F10	1A/F	Fuses		5
F11-F12	200mA/S	Fuses		2
F13-F16	1A/S	Fuses		4
L1	KO11938	Filter coil 10µH/2000A	KO	1
MOV1-3	S14K550	Varistor	Siemens	3
R1-R3	2R8/300W	Resistor GRF30/152A/2R8 Mounting for above	Danotherm	3 6
R4	39R/5W	Resistor	Philips	1
R5-11	7,42mΩ	Dump resistors	Danotherm	7
RL1	B177 80-110A	Thermal breaker	AEG	1
RL2	LS107.22 220VAC	Circuit breaker	AEG	1
RL3	LS17.22 220VAC	Circuit breaker	AEG	1
RC		RC network f. RL2 + RL3	AEG	2
RL4	RH1B-24VDC	Aux. relay	Izumi	1
	SH1B-05	Socket f. RL4	Izumi	1
		Spring f. RL4	Izumi	1

REF. NO:	PART/DWG. NO:	DESCRIPTION	MAN.	No. REQ
RL5	H471/156/480/60	Phase relay	UNIC	1
RL5	H471/156/415/60	Phase relay	UNIC	1
RL6	S-183 230V	Level control	Electromatic	1
RL7	PQC 96s/1 1mA	Meter relay	Danotherm	1
T1		Main transformer Prim: 3 * 480V Sec : 3 * 10,5V / 1714A N : 62KVA	AA	2
T2	KO11234	Aux. transformer	KO	1
T3		Auto transformer 0-220-115-240V 800VA	KO	1
T4	KO11336	Transformer f. driver	KO	1
T5		Auto transformer Prim: 3 X 415/480V		
AUX P.S 2	9V/4A	Power supply for transistor bank	Bentron	1
AUX P.S 3	5V/6A	Power supply for drivers	Bentron	1
AUX P.S 4	+ -15V/1A	Power supply for LEM DCCT	Bentron	1
		500A LEM DCCT		1
Plug	88089	Transducer head 10000A	DF	1
Cable	88141 1	DCCT program. plug 4375A	DF	1
Cable	81909E	DCCT elec. - DCCT head	DF	1
Cable	82183A	Aux. PS - control board	DF	1
Cable	82183A	Driver module - trafo T4	DF	1
Cable	81942	Reg. module driver	DF	1
Cable	82405A	Control board panel M	DF	1
		Jumper for trans. bank	DF	2x17
	P-82369-8	Control Board Module	DF	1
	P-82513-6	Regulation Module	DF	1
	P-82038-10	Operator Control Panel	DF	1
	P-81760-7	Aux. Power Supply Module	DF	1
	P-82640-1	Resistor Board Assembly	DF	1
	P-82433-5	Driver Module	DF	1
	P-82674	Ramp Controller Module	DF	1
	P-82727	Optional Port	DF	1
	P-88127-5	Ultrastab 861R Unit	DF	1
	P-88101-5	Transducer Elec. Assy	DF	1
	P-88078-1	Comp. Amplifier Assy	DF	1
	P-88081-1	Voltage Reg. Assy	DF	1
	P-82611-1	Driver Booster Board	DF	1



DANFYSIK A/S  
81762 C

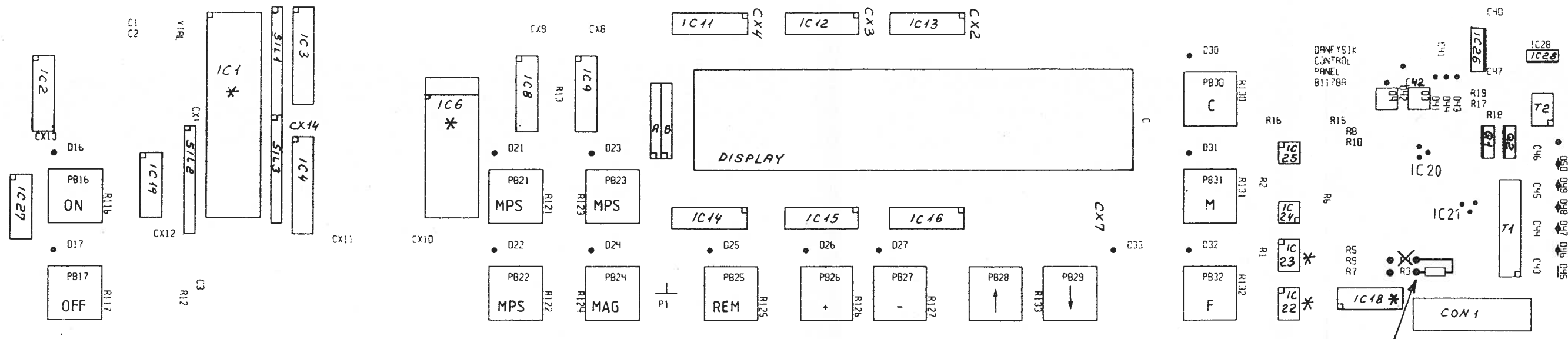
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**AUX. POWER SUPPLY  
ASSEMBLY DRAWING  
SYSTEM 8000**

DRAWN BY MK 05.11.99  
DESIGN APP. HKH 05.11.99  
PROD.APP. .  
PROJ.ENGR. HKM  
DWG.NO.:  
**81760B**

	CUSTOMER: .	ORDER NO. .	REVISION: B	SHEET 1 OF 1
	FILE: .		DATE: MK 05.11.99	SIZE: A3

2017 01  
 FIRST ANGLE  
 PROJECTION




\* MOUNTED ON SOCKET

NOTE A: C3, C43, C44, CON 1, C48 D45, D46, D47, D48, D49, D50, D51, D52, D53, D54  
 T1, T2, Q1, Q2, SIL4, XTAL, PSI, IC 20, IC 21, R135, R136, SW1  
 ARE MOUNTED ON THE SOLDER SIDE

NOTE B: D39 AND R20 ARE CONNECTED TO IC2 PIN 5, 16  
 NOTE C: R21 IS CONNECTED TO THE CHASSIS BY A SOLDER LUG AT CX9  
 NOTE D: IC1 PIN 30 IS CONNECTED TO +5V AT THE SOLDER SIDE  
 NOTE E: IC26 AND IC28 ARE MOUNTED ON THE HEATSINK  
 NOTE F: ISOLATED THE DISPLAY FROM THE FRONT PANEL BY GUMMED TAPE.  
 NOTE G: SOCKET DIL 16 IS USED FOR IC7

PL: P-82038, SCH: 82039 PCB: 81178.

NO.	ITEM	MATERIAL	QTY	ITEM NO	DWG NO
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REV A: 24.5.89 AC/B: 3.7.90 AC/C: 4/11-91 AC/D: 5.2.93 AC/E: 2.9.93 AC/					
MACHINING: /			SURF TREATMENT /		
TOLERANCE: /		<b>CONTROL PANEL M</b> <b>MODULE</b> <b>ASSEMBLY DRAWING</b> <b>SYSTEM 8000</b>		DRAWN BY LLH.19.9.88.	
SCALE: /				DESIGN APP J1288.09.19	
 <b>DANFYSIK</b> JYLLINGE-DENMARK		CUSTM		PROD. APP	
				PROJ ENGR.	
ORDER NO.		SUPERSEDING DWG <b>82038E</b>		SUPERSEDING	
				SUPERSEDING	

FIRST ANGLE PROJECT

J Dor

POWERSUPPLY SECTION FOR CPU-UNIT

POWER

16 BIT ADC SECTION

82370 - 6/10  
ADC 16  
IN (0..9)  
AD (0..7)  
D (0..4)  
CS (0..7)

CAMAC OG BUSINTERFACE

82370 - 7/10  
BUS IO  
INTL (0..42)  
P (0..42)  
DAC (0..19)  
CAM (0..13)  
P2A (0..32)  
P2C (0..32)  
P3A (0..32)

OPTO-SECTION FOR INTERLOCKS / COMMANDS

82370 - 8/10  
OPTO  
P3A (0..32)  
P (0..42)  
INTL (0..42)

CAMAC / EXTERNAL REMOTE CONTROL CONNECTION

82370 - 9/10  
CAMAC  
P3A (0..32)  
DAC (0..19)  
INTL (0..42)

CPU SECTION

82370 - 2/10  
CPU  
D (0..4)  
C (0..4)  
A (0..11)  
AD (0..7)  
IN (0..9)  
PU (0..5)

ANALOG SECTION

82370 - 3/10  
LINIAR  
P2A (0..32)  
P2C (0..32)  
IN (0..9)

DECOD. MEMORY AND SERIAL I/O

82370 - 4/10  
DEC/MEM/IO  
AD (0..7)  
A (0..11)  
C (0..4)  
D (0..4)  
PU (0..5)  
CS (0..7)


INTERLOCK SECTION / COMMAND SECTION

82370 - 5/10  
INTER-DCCT  
DAC (0..19)  
INTL (0..42)  
CAM (0..13)  
AD (0..7)  
A (0..11)  
C (0..4)  
D (0..4)  
CS (0..7)

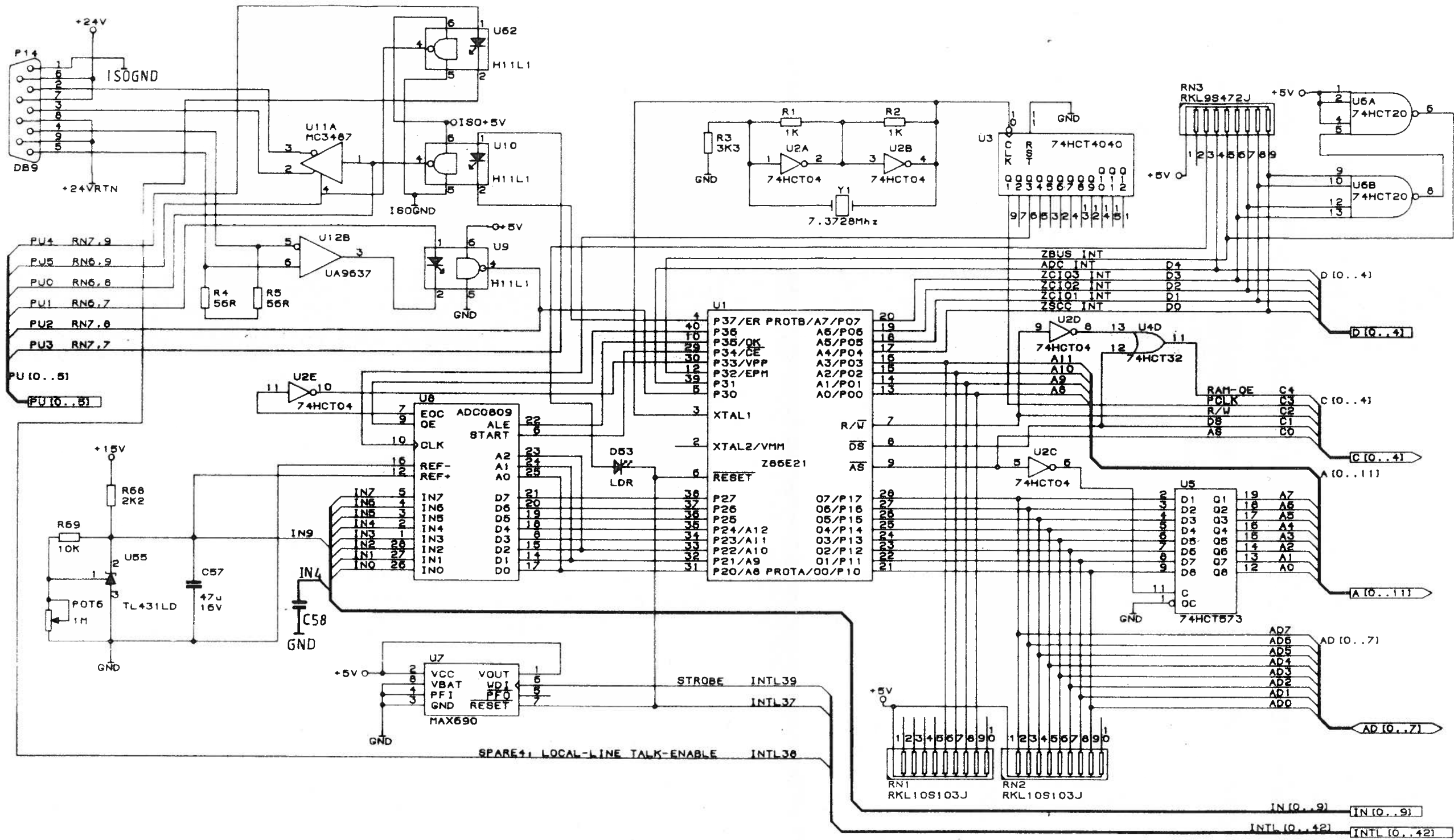
AFKOBLINGER OG OVERSKUD 82370 - 10/10

CAPS/SPARE

- D : INTERRUPT BUS
- C : INTERNAL CONTROL BUS
- IN : ANALOG SIGNAL BUS
- PU : PULL-UP BUS
- CS : CHIP SELECT BUS
- A : ADDRESS BUS
- AD : MULTIPLEXED ADDRESS/DATA BUS
- INTL : INTERNAL INTERLOCK BUS
- CAM : CAMAC STATUS OUTPUT (S) IN HARDWARE)
- DAC : DAC SETTING BUS
- P : EXTERNAL CONNECTING FOR INTERLOCK
- P2A : EXTERNAL CONNECTING TO P2 (A SIDE)
- P2C : EXTERNAL CONNECTING TO P2 (C SIDE)
- P3A : EXTERNAL CONNECTING TO P3 (A SIDE)
- P3C : EXTERNAL CONNECTING TO P3 (C SIDE)

REV A: 7.7.93 AC/		SURF TREATMENT /	
MACHINING /		DRAWN BY	
TOLERANCE /		DESIGN APP LK910701	
SCALE /		PROD APP	
		PROJ ENGR	
		SUPERSEDING DWG	
CUSTM		82370 - 1/10B	
ORDER NO		SUPERSEDED BY	

FIRST ANGLE PROJEC



REV A: 7.7.93 AC/

MACHINING /

SURF TREATMENT /

TOLERANCE /

SCALE: /

**CONTROL BOARD**  
**CPU SECTION**  
**CIRCUIT DIAGRAM**  
**SYSTEM 8000**

DRAWN BY  
 DESIGN APP *LK 910701*  
 PROD APP  
 PROJ ENGR

SUPERSEDING  
 DWG

**82370-2/10B**

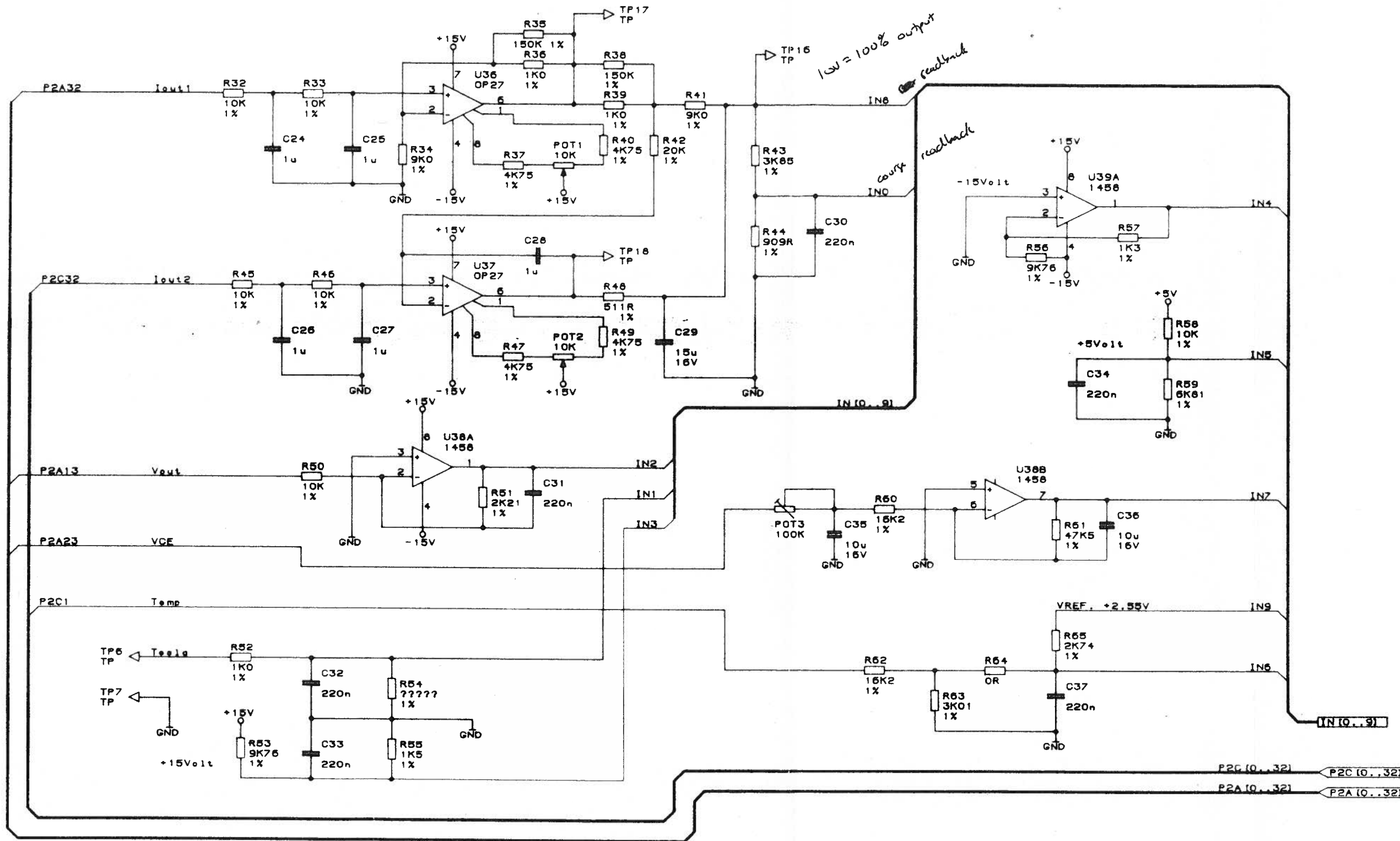
SUPERSEDED BY



CUSTM

ORDER NO

FIRST ANGLE PROJECT 1



REV A: 7.7.93 AC/

MACHINING: /

SURF TREATMENT /

TOLERANCE /

SCALE: /

**CONTROL BOARD**  
**ANALOG SECTION**  
**CIRCUIT DIAGRAW**  
**SYSTEM 8000**

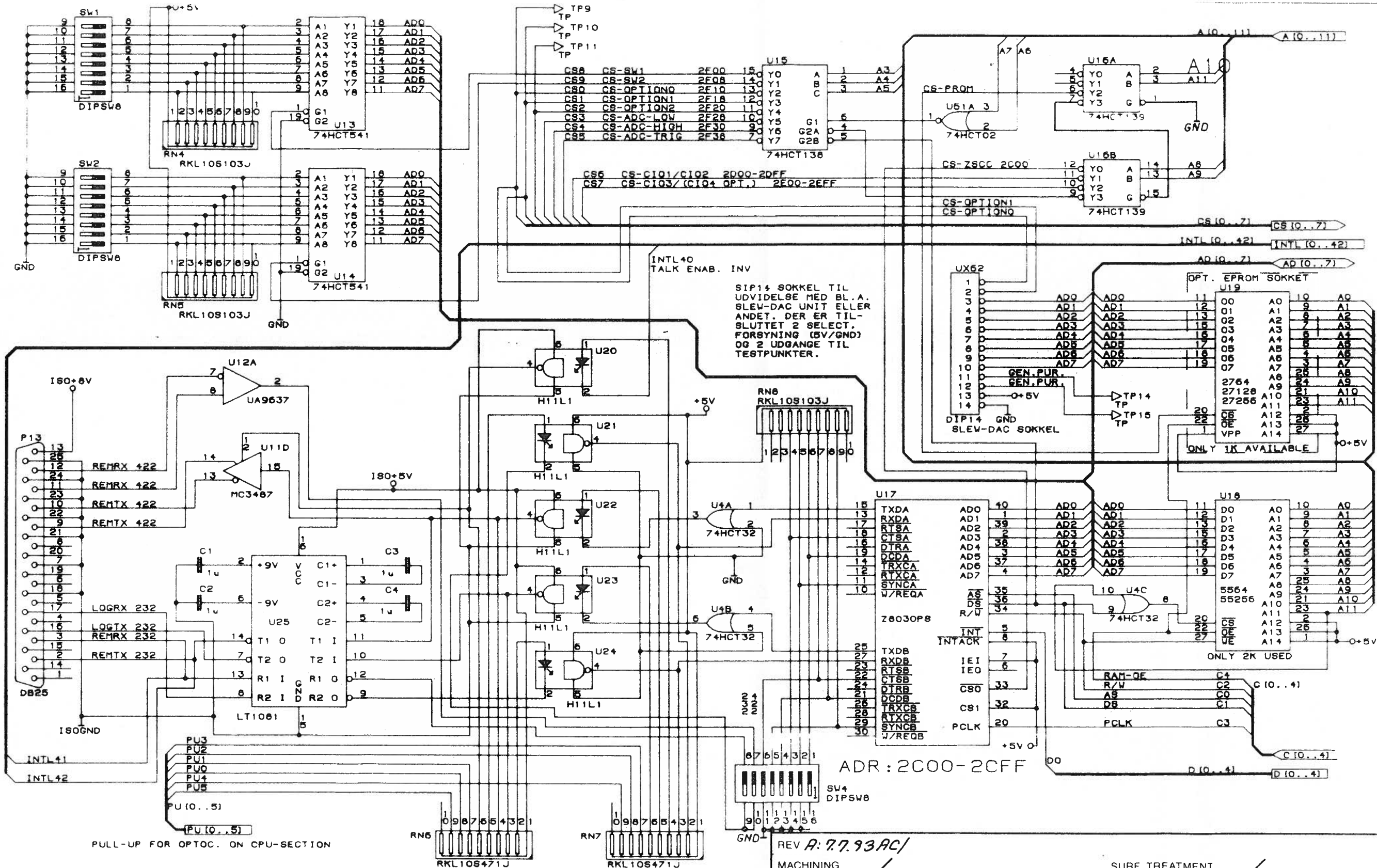
DRAWN BY  
 DESIGN APP Lu 9/0701  
 PROD. APP  
 PROJ. ENGR.  
 SUPERSEDING  
 DWG.  
**82370-3/10B**  
 SUPERSEDED BY



CUSTM

ORDER NO.

FIRST ANGLE PROJECT.



SIP14 SOKKEL TIL UDVIDELSE MED BL.A. SLEW-DAC UNIT ELLER ANDET. DER ER TILSLUTTET 2 SELECT. FORSYNING (5V/GND) OG 2 UDGANGE TIL TESTPUNKTER.

PULL-UP FOR OPTOC. ON CPU-SECTION

REV A: 7.7.93 AC/

MACHINING /

SURF TREATMENT /

TOLERANCE /

SCALE /

**CONTROL BOARD  
MEMORY AND SERIAL I/O  
CIRCUIT DIAGRAM**

**SYSTEM 8000**

CUSTOM

ORDER NO

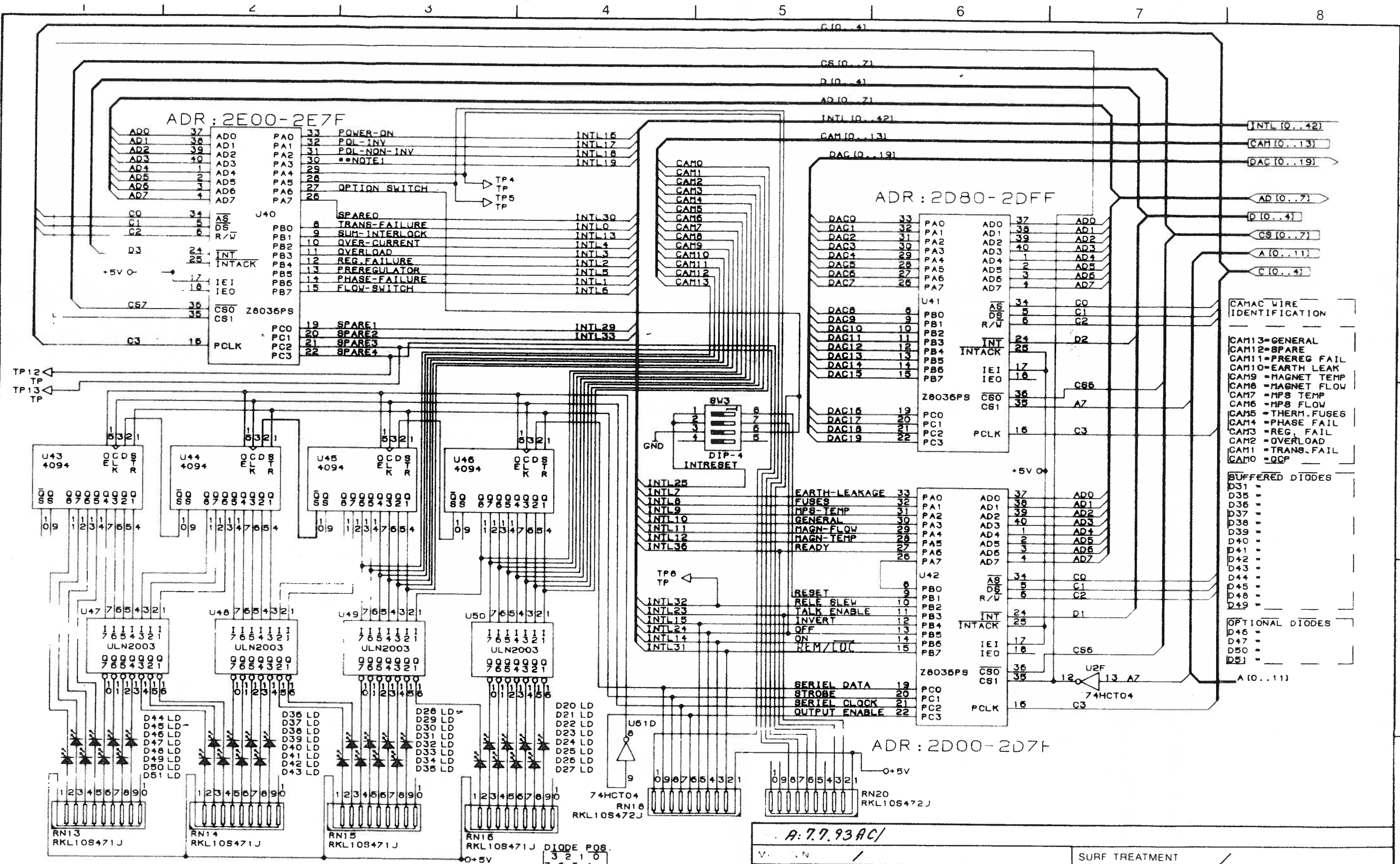
DRAWN BY  
DESIGN APP *Lk 910701*  
PROD APP  
PROJ ENGR

SUPERSEDING  
DWG  
**82370-4/10B**  
SUPERSEDED BY




FIRST ANGLE PROJ. 1



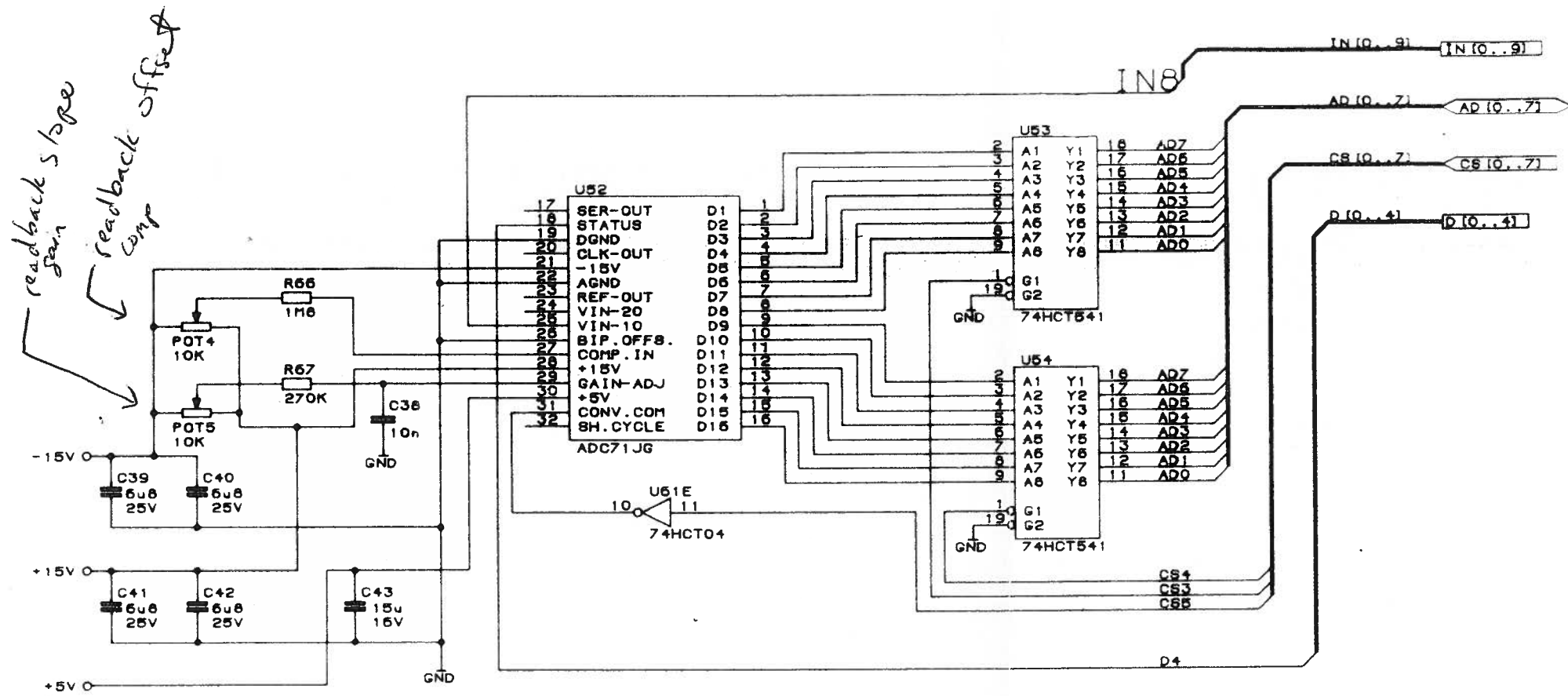


NOTE 1: MAIN POWER IS OFF AND VARIO IS NOT AT ZERO


32 LED'S AVAILABLE FOR PANEL-INDICATION  
 THIS INCLUDE INTERLOCK-STATUS INDICATION AND  
 INTERNAL MACHINE STATUS  
 DETAILED INFORMATION WILL BE AVAILABLE BASED ON  
 LED'S PHYSICAL POSITION-NUMBERS  
 INDICATE LED-COLOR WITH R-G-Y AFTER LD

A: 7.7.93 AC		SURF TREATMENT	
DATE	/	DRAWN BY	
SCALE	/	DESIGN APP 24910701	
 DANFYSIK JYLLINGE DENMARK		PROD APP	
		PROJ ENGR	
ORDER NO		SUPERSEDING	
		DWG	
		82370-5/10B	
		SUPERSEDED BY	

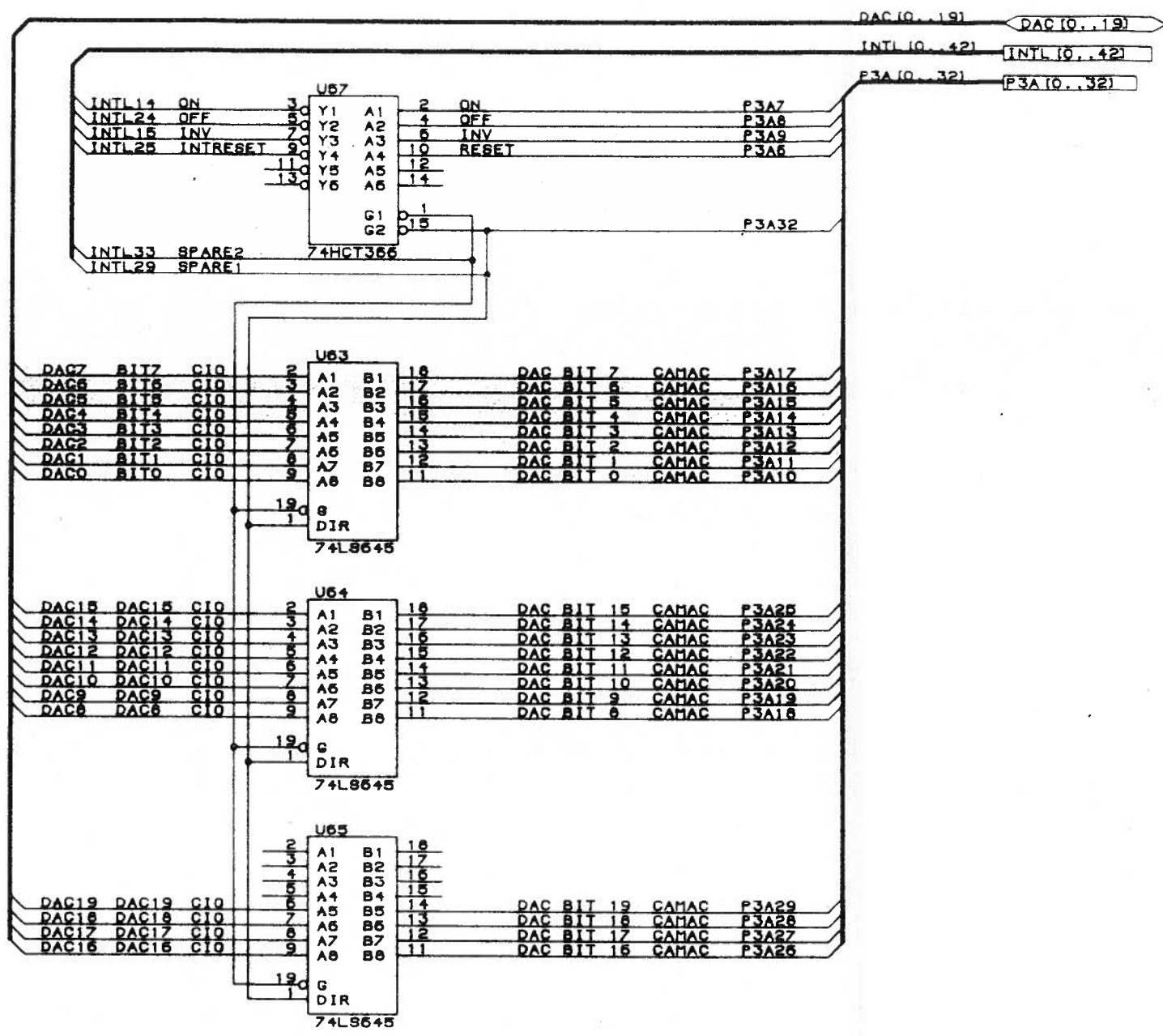
FIRST ANGLE PROJECT




*readback slope gain*  
*readback offset comp*

REV	SURF. TREATMENT /	
MACHINING /	<b>CONTROL BOARD</b> <b>16 BIT ADC SECTION</b> <b>CIRCUIT DIAGRAM</b> <b>SYSTEM 8000</b>	DRAWN BY
TOLERANCE /		DESIGN APP. <i>Lk9107ol</i>
SCALE /		PROD APP
 <b>DANFYSIK</b> JYLLINGE-DENMARK	CUSTOM.	PROJ ENGR.
	ORDER NO	SUPERSEDING DWG
		<b>82370-6/10B</b>
		SUPERSEDED BY

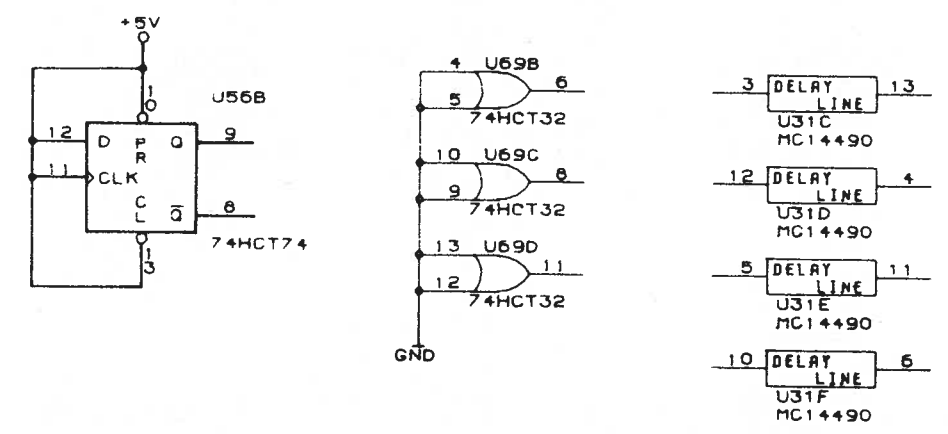
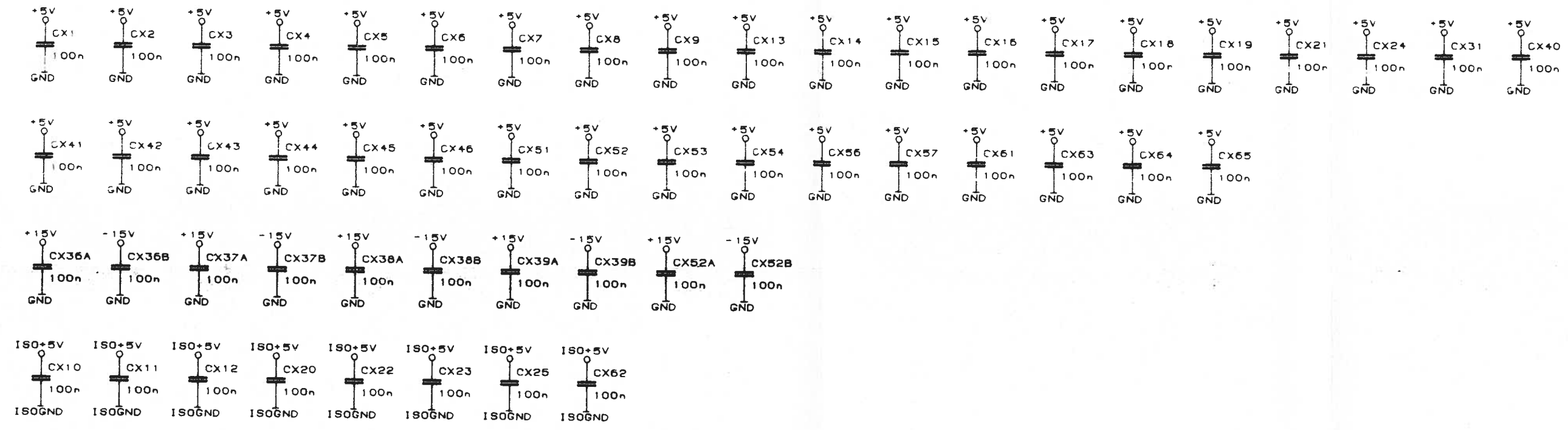
FIRST ANGLE PROJECT



A  
E  
C  
D  
E

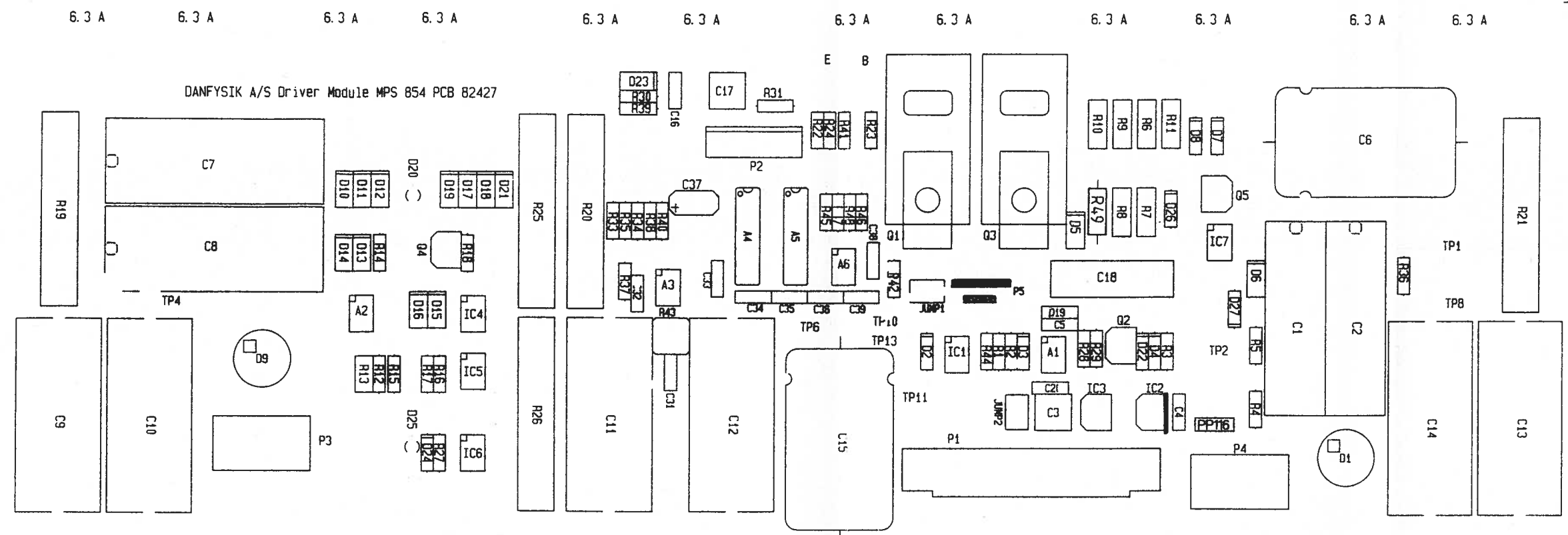
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MACHINING /			
TOLERANCE /	<b>CONTROL BOARD</b> <b>CAMAC INTERFACE</b> <b>CIRCUIT DIAGRAM</b> <b>SYSTEM 8000</b>		DRAWN BY
SCALE /			DESIGN APP <i>Lk9107ol</i>
		PROD. APP	PROJ. ENGR
		SUPERSEDING DWG <b>82370-9/10B</b> SUPERSEDED BY	
CUSTOM	ORDER NO		

FIRST ANGLE PROJECT




REV <i>A: 7.7.93 AC/</i>		SURF TREATMENT /	
MACHINING /			
TOLERANCE /	<b>CONTROL BOARD</b> <b>BYPASS-CAPS. / SPARE</b> <b>CIRCUIT DIAGRAM</b> <b>SYSTEM 8000</b>		
SCALE /			
	DRAWN BY		Lk 9/107ol DESIGN APP PROD APP PROJ ENGR
	CUSTM		
		ORDER NO	

FIRST ANGLE PROJECT

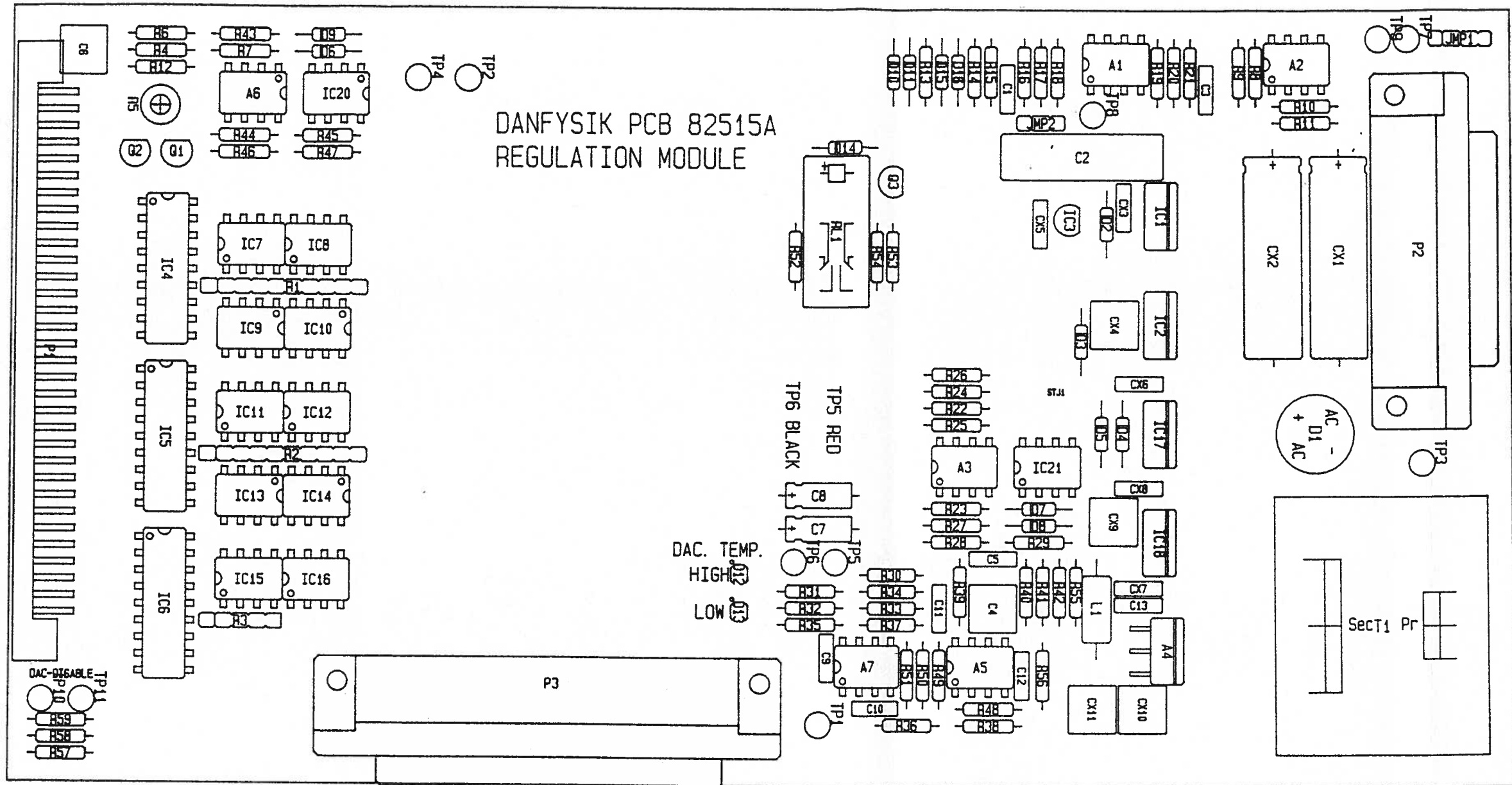


SCHEM. 82336, PCB 82427


NO.	ITEM	MATERIAL	QTY	ITEM NO.	DWG. NO.
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<p>REV: <i>A: 8.1.93/B: 31.8.93 AC/C: 15.2.94 AC/</i></p>					
<p>MACHINING: / SURF. TREATMENT: /</p>					
<p>TOLERANCE: /</p>					
<p>SCALE: /</p>					
 <p><b>DANFYSIK</b> JYLLING - DENMARK</p>			<p><b>DRIVER MODULE</b> <b>WITH ISOLATED READ OUT</b> <b>ASSEMBLY DRAWING</b></p>		
<p><b>MPS 854 / SYSTEM 8000</b></p>			<p>ORDER NO.</p>		
<p>CUSTOM.</p>			<p>82433C</p>		
<p>SUPERSEDED BY</p>					

DRAWN BY *AC 6.2.92*  
 DESIGN APP.  
 PROD. APP. *PHK 30-1.92*  
 PROJ. ENGR.  
 SUPERSEDING  
 DWG.  
**82433C**  
 SUPERSEDED BY

FIRST ANGLE PROJECTION  
 0A68



SCHEM. 82514

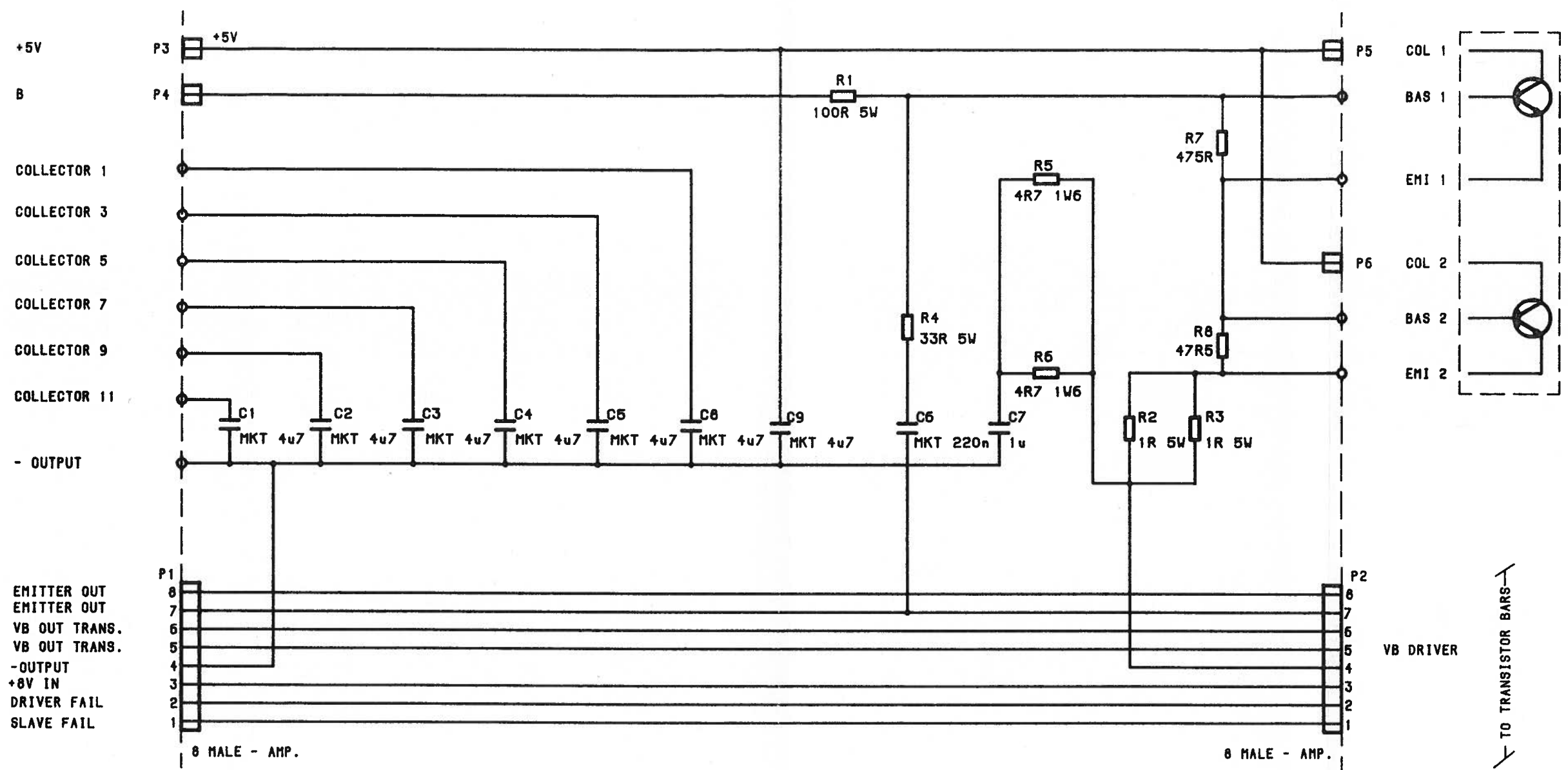
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REV:					
MACHINING: /			SURF. TREATMENT: /		
TOLERANCE: /					
SCALE: /					
		<p><b>REGULATION MODULE</b></p> <p><b>ASSY</b></p>		DRAWN BY <i>AC 17.8.92</i>	
				DESIGN APP. <i>PHC 17.8.92</i>	
<p>MPS 854 / SYSTEM 8000</p>		<p>CUSTOM. ORDER NO.</p>		PROD. APP.	
				PROJ. ENGR.	
<p>82513</p>		<p>82513</p>		SUPERSEDING DWG.	
				SUPERSEDED BY	

PROJECTION 1/10 18

PLACED ON EVERY SECOND BAR

FROM DRIVER MODULE

TO TRANSISTOR BARS



+5V  
 B  
 COLLECTOR 1  
 COLLECTOR 3  
 COLLECTOR 5  
 COLLECTOR 7  
 COLLECTOR 9  
 COLLECTOR 11  
 - OUTPUT


EMITTER OUT  
 EMITTER OUT  
 VB OUT TRANS.  
 VB OUT TRANS.  
 -OUTPUT  
 +8V IN  
 DRIVER FAIL  
 SLAVE FAIL

COL 1  
 BAS 1  
 EMI 1  
 COL 2  
 BAS 2  
 EMI 2

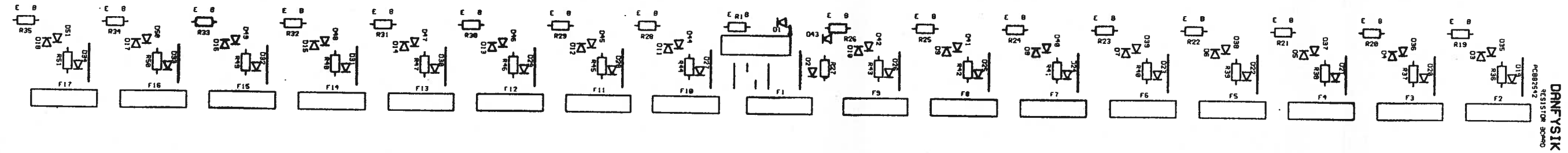
P1  
 8  
 7  
 6  
 5  
 4  
 3  
 2  
 1  
 8 MALE - AMP.

P2  
 8  
 7  
 6  
 5  
 4  
 3  
 2  
 1  
 8 MALE - AMP.

VB DRIVER




REV. A:22.12.92 AC/		
 DANFYSIK JYLLAND-DENMARK	DRIVER BOOSTER BOARD SCHEMATIC MPS 854, SYSTEM 8000	DRAWN BY AC 24.4.92 DESIGN APP. <i>AMH 11.1.93</i> PROD. APP. PROJ. ENGR. SUPERSEDING DWG. 82612A SUPERSEDED BY
	CUSTM.	ORDER NO.

0020



DANFYSIK  
RESISTOR BOARD  
PCB82642

**SCHEMATIC 82641, PCB 82642**

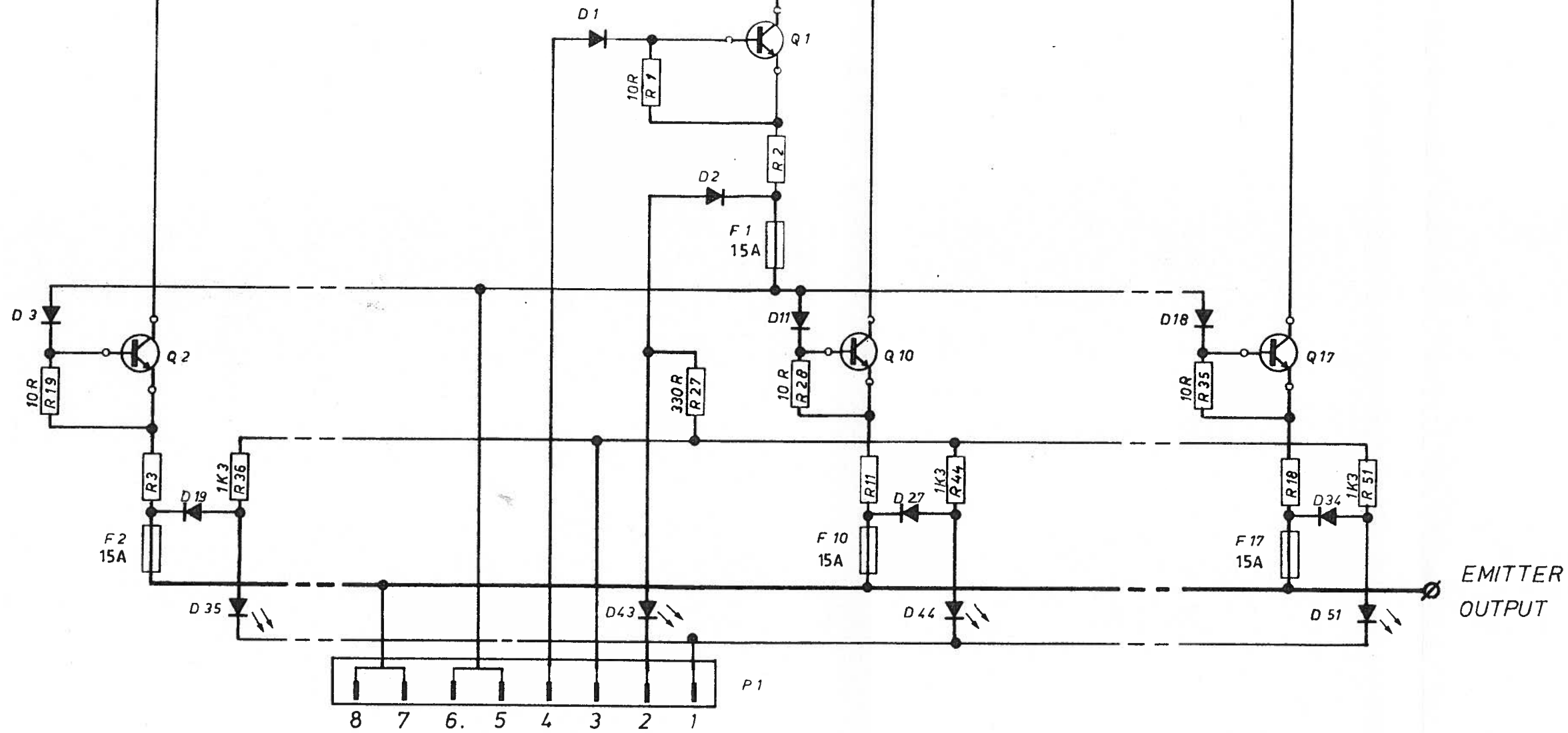
NO.	ITEM	MATERIAL	QTY	ITEM NO.	DWG. NO.
<p><b>IMPORTANT!</b> This document contains information which is the property of <i>Danfysik A/S Denmark</i>. It is submitted to you in confidence that it will not be disclosed or transmitted to others or used for manufacturing without Danfysik's authorization in writing.</p>					
REV:					
MACHINING: /			SURF. TREATMENT: /		
TOLERANCE: /		<p><b>HIGH CURRENT RESISTOR BOARD</b></p> <p><b>MODULE</b></p> <p><b>ASSY</b></p> <p><b>MPS 854 / SYSTEM 8000</b></p> <p>CUSTM. ORDER NO.</p>		DRAWN BY <i>RC 18.1.93</i>	
SCALE: /				DESIGN APP. <i>07 18.1.93</i>	
 <p><b>DANFYSIK</b> JYLINGE-DENMARK</p>		<p><b>82640</b></p>		PROD. APP.	
				PROJ. ENGR.	
 <p><b>DANFYSIK</b> JYLINGE-DENMARK</p>		<p><b>82640</b></p>		SUPERSEDING	
				DWG.	
 <p><b>DANFYSIK</b> JYLINGE-DENMARK</p>		<p><b>82640</b></p>		SUPERSEDED BY	

FIRST ANGLE PROJECT

0000



COLLECTOR  
INPUT




EMITTER  
OUTPUT

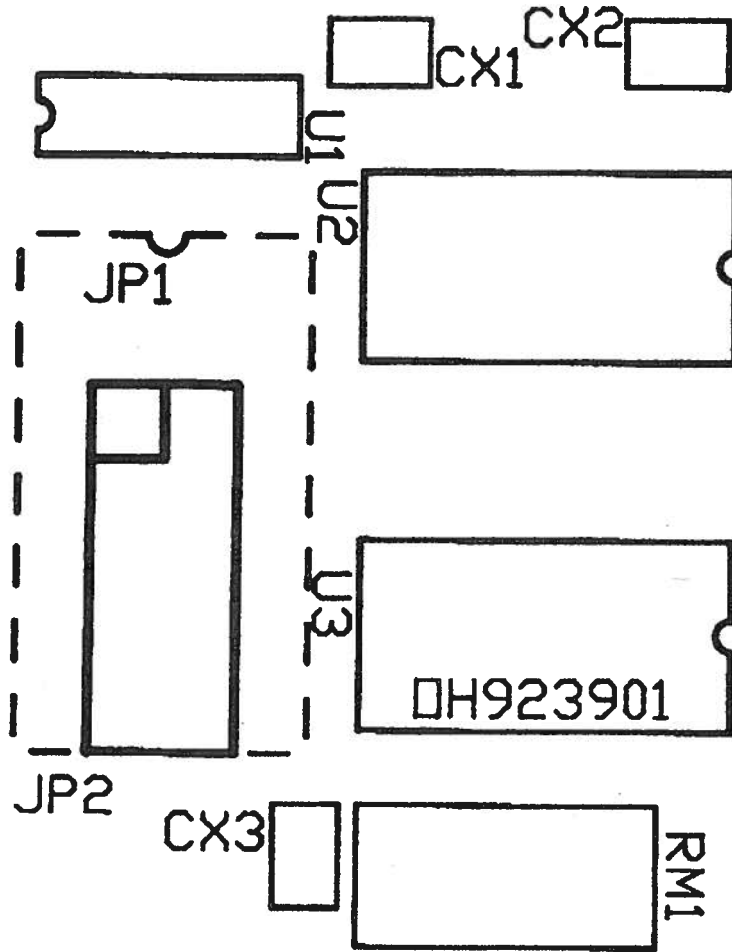
- P1
- 8 EMITTER OUT
  - 7 EMITTER OUT
  - 6 V<sub>b</sub> OUTPUT TRANSISTOR
  - 5 V<sub>b</sub> OUTPUT TRANSISTOR
  - 4 V<sub>b</sub> DRIVER
  - 3 +8V IN
  - 2 DRIVER FAILURE
  - 1 SLAVE FAILURE

D1 - D34 : IN 4007  
 D35 - D51 : LTZ MR15  
 Q1 - Q17 : 2N5685  
 R2 - R18 : SE PARTS LIST

**ASSY 82640, PCB 82642**

NO	ITEM	MATERIAL	QTY	ITEM NO	DWG NO.
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REV:					
MACHINING:			SURF. TREATMENT:		
TOLERANCE:			DRAWN BY: AC 18.1.93		
SCALE:			DESIGN APP: 03 18.1.93		
 <b>DANFYSIK</b> JYLLINGE-DENMARK			PROJ. ENGR.		
			HIGH CURRENT RESISTOR BOARD MODULE CIRCUIT DIAGRAM MPS 853 / SYSTEM 8000 CUSTM ORDER NO.		
			SUPERSEDING DWG		
			82641		
			SUPERSEDED BY		

FIRST  
ANGLE  
PROJEC



*SCHEMATIC 82675, PCB 82676*


NO.	ITEM	MATERIAL	QTY	ITEM NO.	DWG. NO.
REV					
MACHINING:	/	SURF. TREATMENT:		/	
TOLERANCE:	/	<b>OPTIONAL PORT CONTROL BOARD</b>  <b>ASSY</b>  <b>SYSTEM 8000</b> CUSTM. ORDER NO.			
SCALE:	/				
		DRAWN BY		AC 28.6.93	
		DESIGN APP.		MMH 29.6.93	
		PROD. APP.			
		PROJ. ENGR.			
		SUPERSEDING			
		DWG.		82674	
		SUPERSEDED BY			

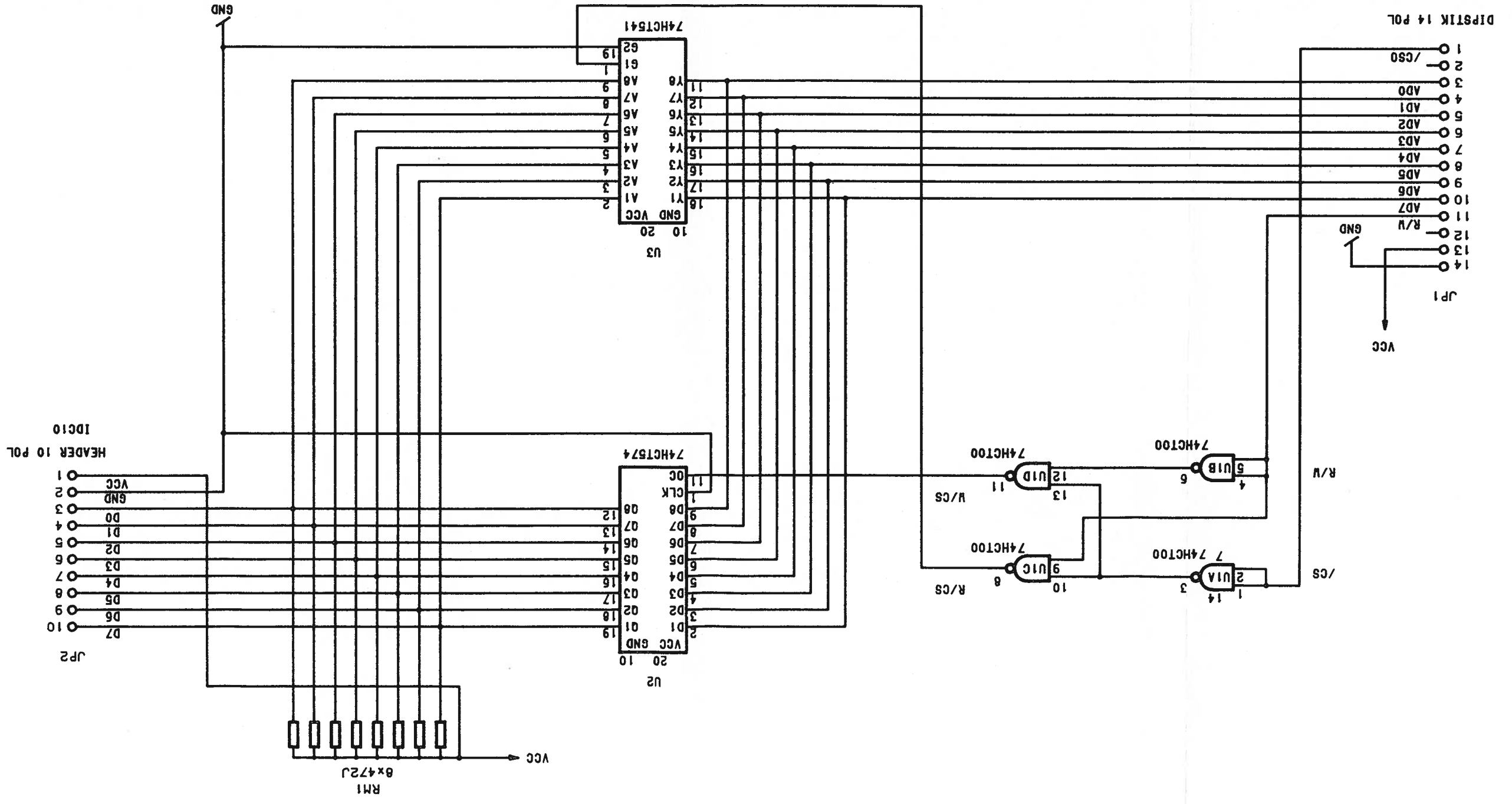
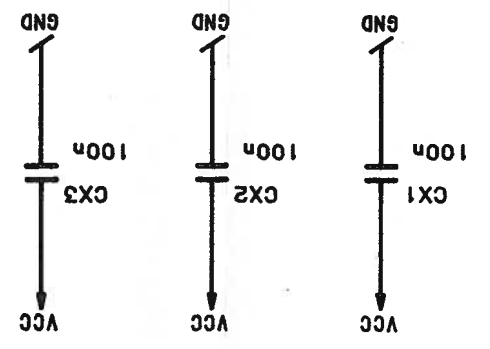


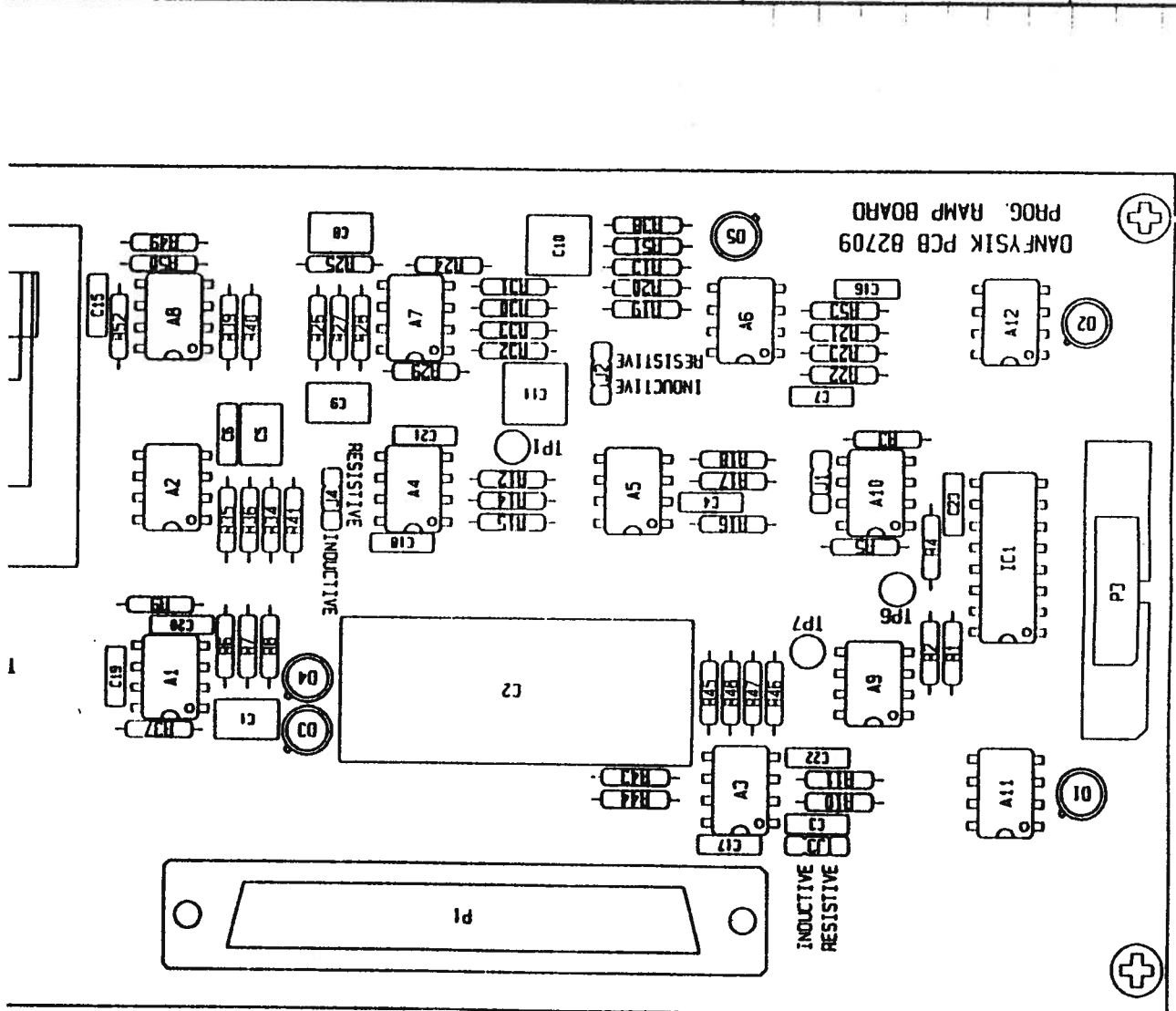
1637 Tulein & Koch 01-133630

40081

REV.

 <p style="text-align: center;">DANFYSIK ÅRLLINE-DEMARK</p>	<p style="font-size: 1.2em;">OPTIONAL BOARD</p> <p>CONTROL BOARD</p> <p>SCHEMATIC</p> <p>SYSTEM 8000</p>	<p>CUSTOM. ORDER NO.</p>
<p>DRAWN BY AC 28.6.93</p> <p>DESIGN APP. <i>MM 29.6.93</i></p> <p>PROD. APP.</p> <p>PROJ. ENGR.</p> <p>SUPERSEDING</p> <p>DWG. 82675</p> <p>SUPERSEDED BY</p>		





NO ITEM

QTY ITEM NO

MATERIAL

DWG. NO

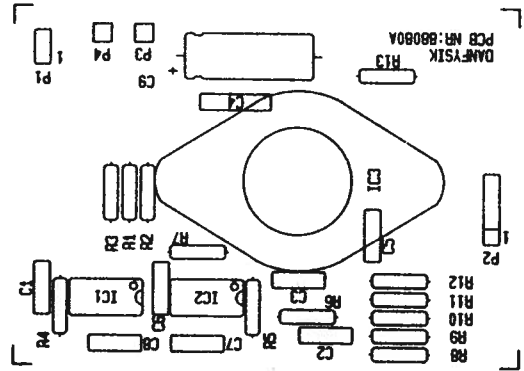
REV.

MACHINING

SURF TREATMENT /

TOLERANCE

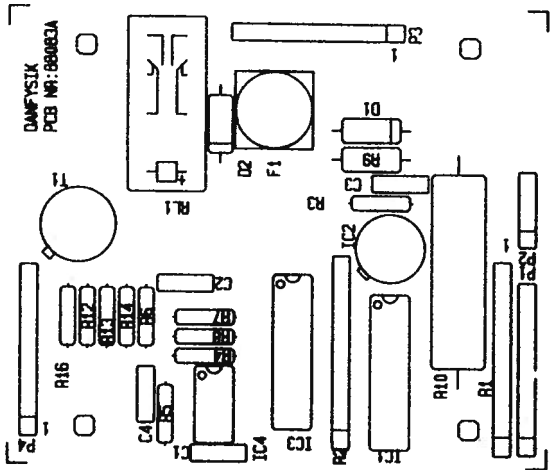
SILKSCREEN COMP      Dps 2926 910409



NO. ITEM	MATERIAL	QTY	ITEM NO.	DWG. NO.
REV A: 3.5.91 AC/				
MACHINING: /				
TOLERANCE: /				
SURF TREATMENT: /				
DRAWN BY AC 20.11.90				



SILKSCREEN COMP  
 Dps 2927 910410  
 DANFYSIK 10KA VOLTAGE REGULATOR



NO.   ITEM	MATERIAL	QTY	ITEM NO.	DWG. NO
REV. A: 3.5.91 AC /				
MACHINING: /				
TOLERANCE: /				
DRAWN BY: 02 III 11 02				

TRANSDUCER ELEC.

TP22

TP21

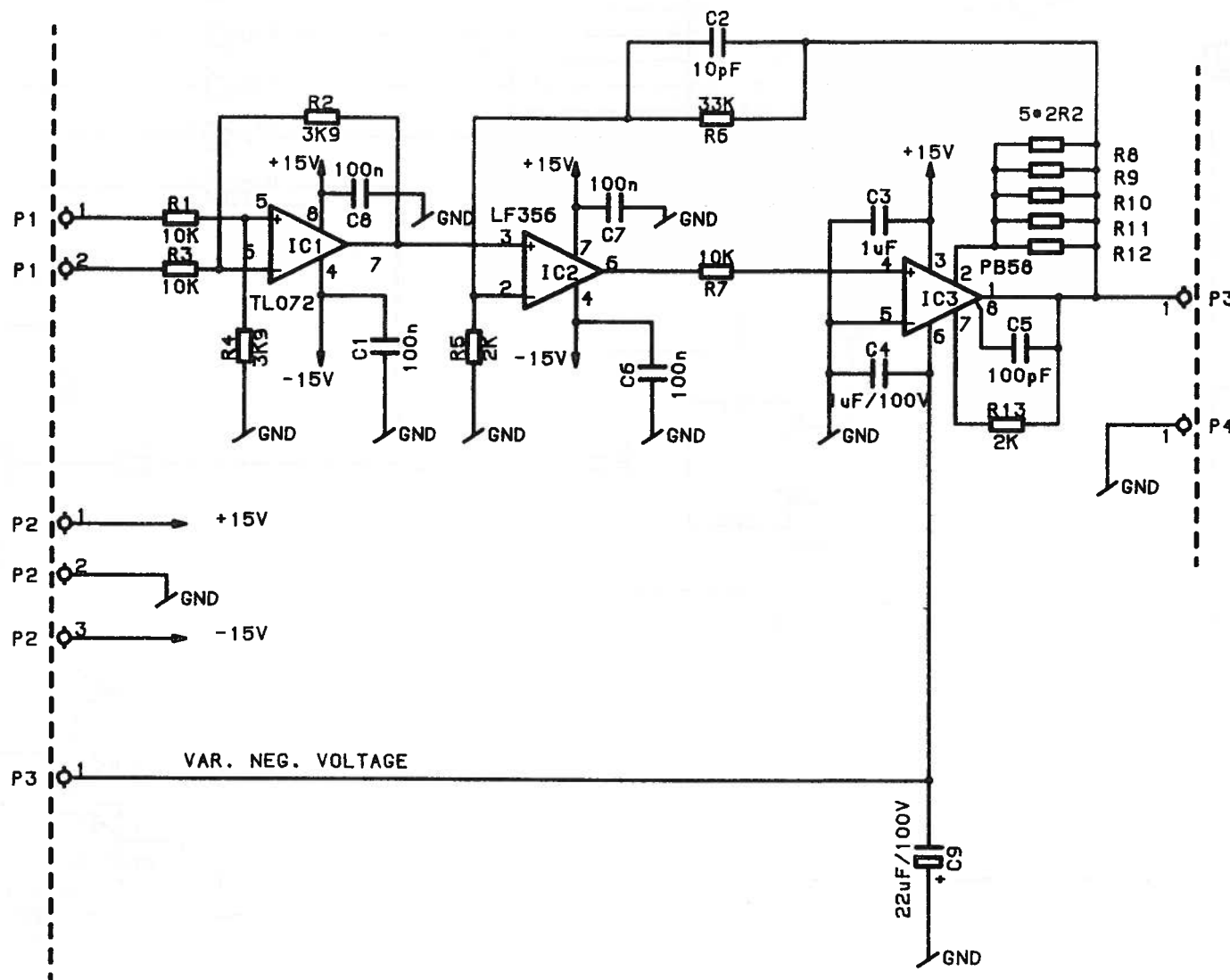
VOLTAGE REG.

P4.4

P4.5

P4.6

P4.8




TRANSDUCER ELECTRONIC

TP23

COMP. CURRENT

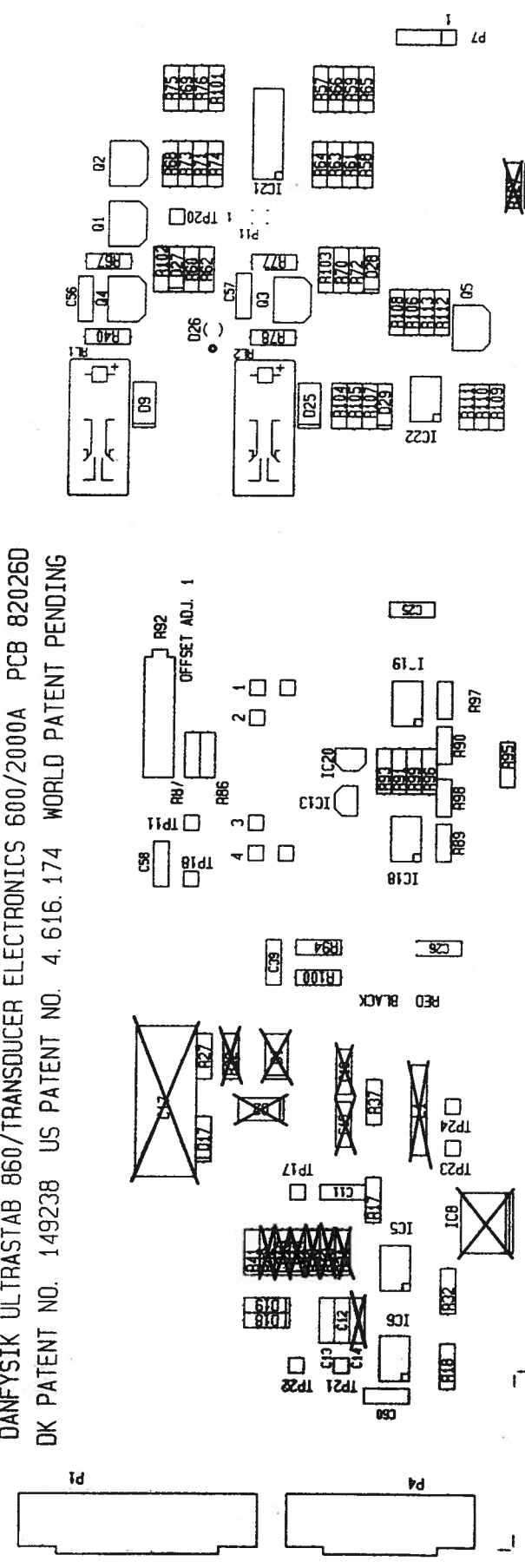
TP24

COMP. CURRENT RTN.

NO.	ITEM	MATERIAL	QTY	ITEM NO.	DWG. NO.
REV. A: PHC 31.7.91/					
MACHINING: /			SURF. TREATMENT: /		
TOLERANCE: /		<b>COMPENSATION AMPLIFIER</b>		DRAWN BY PHC 16.8.90	
SCALE: /				DESIGN APP.	
		<b>10kA TRANSDUCER</b>		PROD. APP.	
				PROJ. ENGR.	
		<b>SCHEMATIC</b>		SUPERSEDING	
				DWG.	
		<b>ULTRASTAB 861R</b>		<b>88079A</b>	
				SUPERSEDED BY	

3E51

DANFYSIK ULTRASTAB 860/TRANSDUCER ELECTRONICS 600/2000A PCB 820260  
DK PATENT NO. 149238 US PATENT NO. 4.616.174 WORLD PATENT PENDING

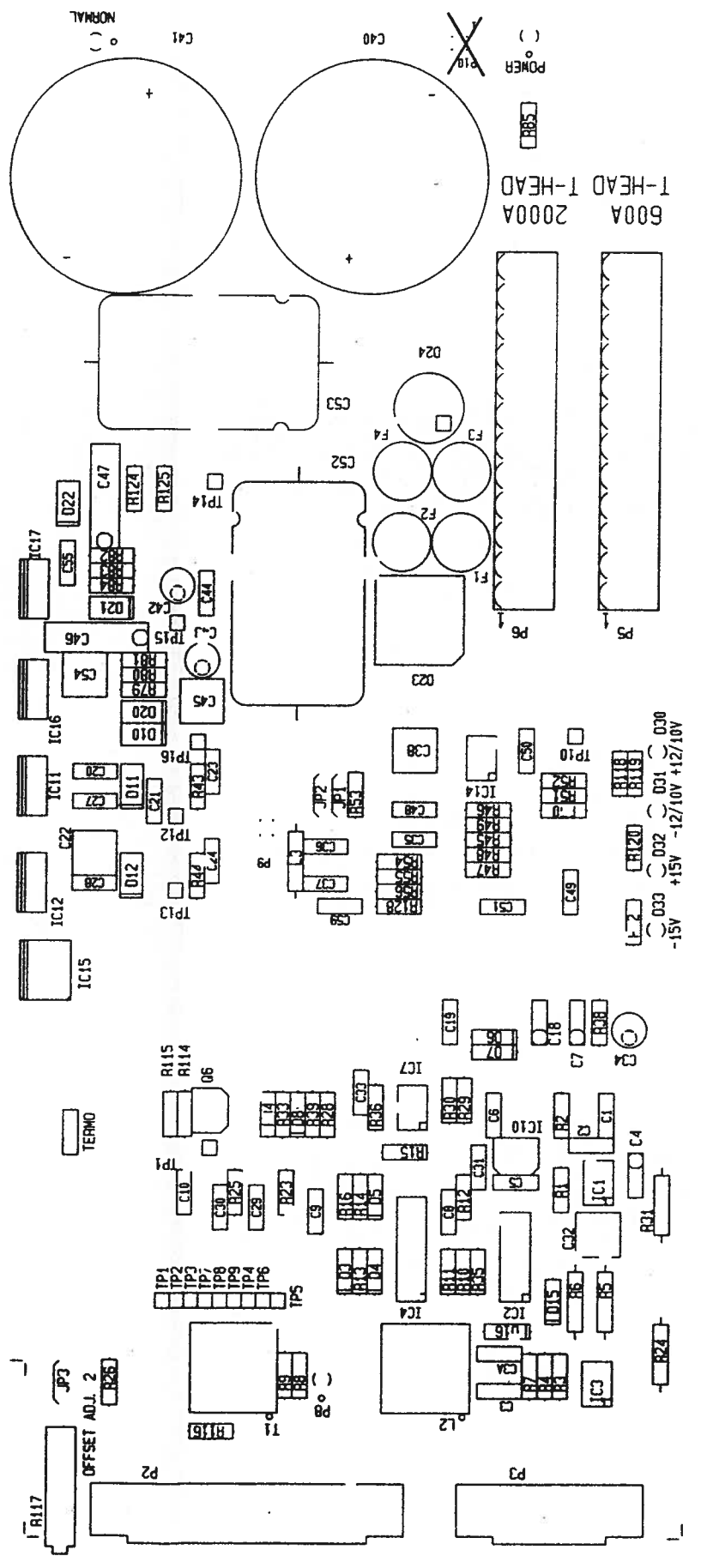
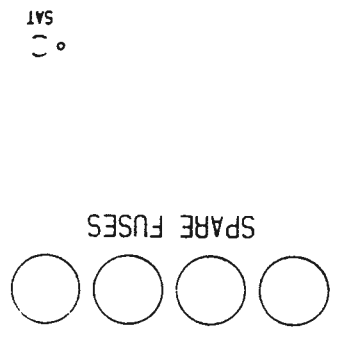


SILKSCREEN COMP Dps 2594 910409  
DANFYSIK ULTRASTAB 860 PCB 820260

H-S2

H-S3

H-S1



X NOT MOUNTED

NO.	ITEM	MATERIAL	QTY	ITEM NO	DWG NO
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REV **A: 19.4.91 AC/**

MACHINING

SURF TREATMENT

TOLERANCE

SCALE



**MAIN ELECTRONICS**

**10 kA**

**CT BOARD ASSEMBLY**

**ULTRASTAB 861 R**

CUSTOM ORDER NO

DRAWN BY **AC 5.3.91**

DESIGN APP

PROD APP **75 8.3.91**

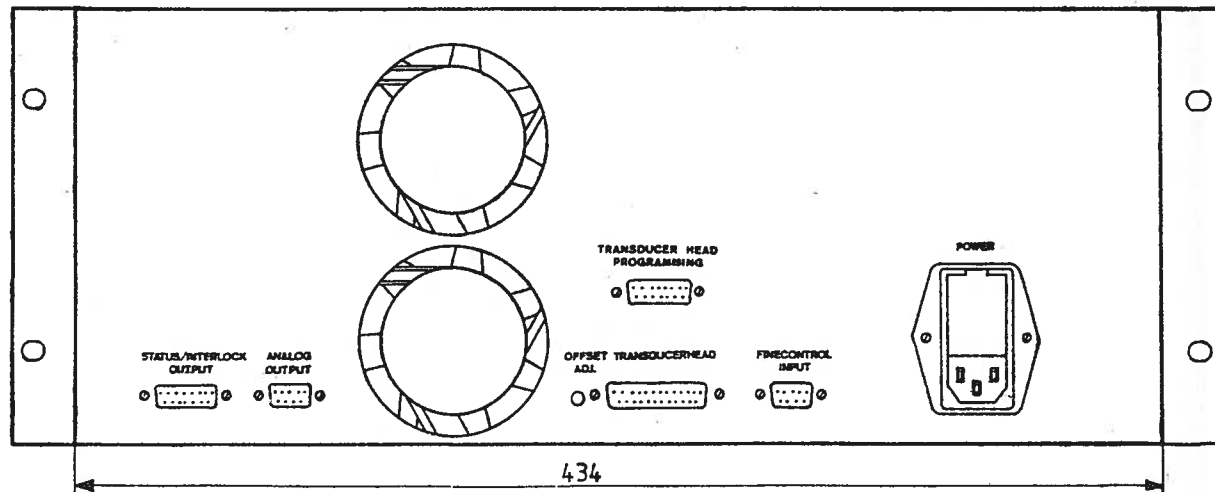
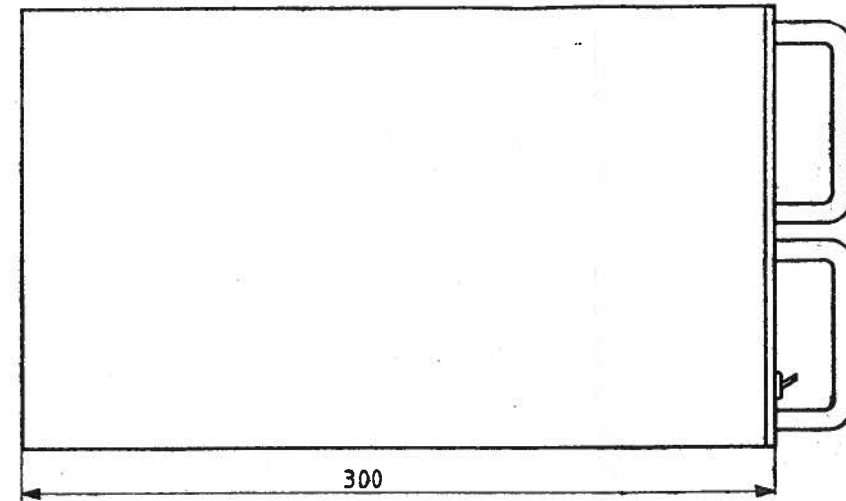
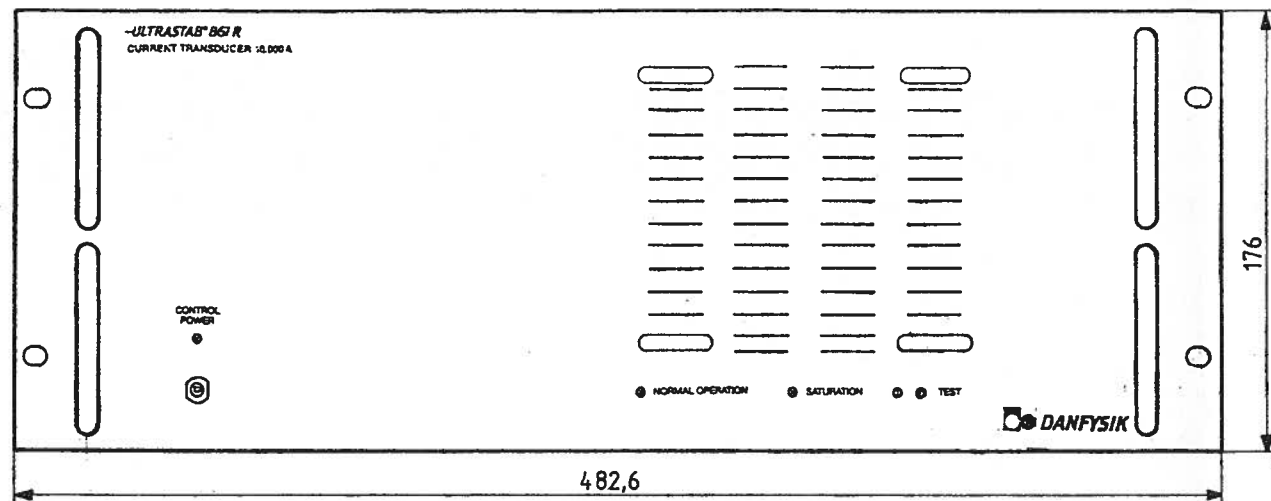
PROJ ENGR


SUPERSEDING

DWG **88101A**

SUPERSEDED BY





NO.	ITEM	MATERIAL	QTY	ITEM NO	DWG. NO
<p>IMPORTANT! This document contains information which is the property of Danfysik A/S Denmark. It is submitted to you in confidence that it will not be disclosed or transmitted to others or used for manufacturing without Danfysik's authorization in writing.</p>					
REV.					
MACHINING: /			SURF. TREATMENT: /		
TOLERANCE: /					
SCALE: 1:2					
 DANFYSIK JYLLAND-DENMARK		<b>ULTRASTAB ELECTRONICS</b> <b>CABINET ASSEMBLY</b> <b>10.000 Amp</b> <b>ULTRASTAB 861R</b>		DRAWN BY <i>mm 101090</i> DESIGN APP <i>75 AL</i> PROD APP PROJ ENGR SUPERSEDING DWG. <b>88099</b> SUPERSEDED BY:	
CUSTM		ORDER NO			

PART NO.: P-82038  
 DESC....: OPERATOR CONTROL PANEL TYPE M  
 MODULE  
 SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
1		DWG 82038	OPERATOR CONTROL PANEL M, ASSY	DF	1
2		DWG 82039	OPERATOR CONTROL PANEL M, SCH.	DF	1
3		PCB 81178	OPERATOR CONTROL PANEL, PCB	DF	1
4					-
5					-
6					-
7		P-81182	SHAFT ENCODER	DF	1
8					-
9					-
10					-
11	R1	274R	RESISTOR 1% 1/4W	PHILIPS	1
12	R2	1K	RESISTOR 1% 1/4W	PHILIPS	1
13	R3	100R	RESISTOR 1% 1/4W	PHILIPS	1
14	R4	NOT USED	OPEN CIRCUIT		1
15	R5	274R	RESISTOR 1% 1/4W	PHILIPS	1
16	R6	1K	RESISTOR 1% 1/4W	PHILIPS	1
17	R7	274R	RESISTOR 1% 1/4W	PHILIPS	1
18	R8	274R	RESISTOR 1% 1/4W	PHILIPS	1
19	R9	22K1	RESISTOR 1% 1/4W	PHILIPS	1
20	R10	22K1	RESISTOR 1% 1/4W	PHILIPS	1
21	R11	NOT USED	OPEN CIRCUIT		1
22	R12	332R	RESISTOR 1% 1/4W	PHILIPS	1
23	R13	4K75	RESISTOR 1% 1/4W	PHILIPS	1
24	R14	N/A	NOT APPLICABLE		-
25	R15	5K11	RESISTOR 1% 1/4W	PHILIPS	1
26	R16	274K	RESISTOR 1% 1/4W	PHILIPS	1
27	R17	150R	RESISTOR 1% 1/4W	PHILIPS	1
28	R18	150R	RESISTOR 1% 1/4W	PHILIPS	1
29	R19	4K75	RESISTOR 1% 1/4W	PHILIPS	1
30	R20	332R	RESISTOR 1% 1/4W	PHILIPS	1
31	R21	10K	RESISTOR 1% 1/4W	PHILIPS	1
32	R22	N/A	NOT APPLICABLE		-
33	R23	N/A	NOT APPLICABLE		-
34	R24	N/A	NOT APPLICABLE		-
35	R116	332R	RESISTOR 1% 1/4W	PHILIPS	1
36	R117	332R	RESISTOR 1% 1/4W	PHILIPS	1
37	R118	NOT USED	OPEN CIRCUIT		1
38	R119	NOT USED	OPEN CIRCUIT		1
39	R120	NOT USED	OPEN CIRCUIT		1
40	R121	332R	RESISTOR 1% 1/4W	PHILIPS	1
41	R122	332R	RESISTOR 1% 1/4W	PHILIPS	1
42	R123	332R	RESISTOR 1% 1/4W	PHILIPS	1
43	R124	332R	RESISTOR 1% 1/4W	PHILIPS	1
44	R125	332R	RESISTOR 1% 1/4W	PHILIPS	1
45	R126	332R	RESISTOR 1% 1/4W	PHILIPS	1
46	R127	332R	RESISTOR 1% 1/4W	PHILIPS	1
47	R128	N/A	NOT APPLICABLE		-
48	R129	N/A	NOT APPLICABLE		-
49	R130	332R	RESISTOR 1% 1/4W	PHILIPS	1
50	R131	332R	RESISTOR 1% 1/4W	PHILIPS	1

PART NO.: P-82038  
 DESC....: OPERATOR CONTROL PANEL TYPE M  
 MODULE  
 SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
51	R132	332R	RESISTOR 1% 1/4W	PHILIPS	1
52	R133	332R	RESISTOR 1% 1/4W	PHILIPS	1
53	R135	1K	RESISTOR 1% 1/4W	PHILIPS	1
54	R136	1K	RESISTOR 1% 1/4W	PHILIPS	1
55					-
56	RP1	9X4K7	RESISTOR ARRAY 9X4K7 5%, SIL	ROHM	1
57	RP2	9X10K	RESISTOR ARRAY 9X10K 5%, SIL	ROHM	1
58	RP3	9X10K	RESISTOR ARRAY 9X10K 5%, SIL	ROHM	1
59	RP4	9X2K2	RESISTOR ARRAY 9X2K2 5%, SIL	ROHM	1
60	RP5	N/A	NOT APPLICABLE		-
61	RP6	N/A	NOT APPLICABLE		-
62	RP7	9x4K7	RESISTOR ARRAY 9X4K7 5%, SIL	ROHM	1
63					-
64					-
65	P1	S-TRIM 10K-1	SINGLE TURN TRIMPOT 10K 1/4"	BOURNS	1
66					-
67					-
68					-
69					-
70	C1	CER 10p-63	CAP. CER 10p 5% 63V	SIEMENS	1
71	C2	CER 10p-63	CAP. CER 10p 5% 63V	SIEMENS	1
72	C3	EVL 22u-35	CAP. ELEC. 22uF 35V ø5mm	PHILIPS	1
73	C4	N/A	NOT APPLICABLE		-
74	C5	N/A	NOT APPLICABLE		-
75	C6-C39	N/A	NOT APPLICABLE		-
76	C40	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
77	C41	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
78	C42	MKT 22n-63	CAP. MKT 22n 10% 63V RM=5	SIEMENS	1
79	C43	CER 220n-50	CAP. CER 220n 20% 50V	AVX	1
80	C44	SAL 15u-16	CAP. SOLID A1 15u 16V 20% RM=5	PHILIPS	1
81	C45	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
82	C46	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
83	C47	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
84	C48	CER 100p-63	CAP. CER 100p 5% 63V	SIEMENS	1
85					-
86					-
87	CX1	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
88	CX2	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
89	CX3	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
90	CX4	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
91	CX5	N/A	NOT APPLICABLE		-
92	CX6	N/A	NOT APPLICABLE		-
93	CX7	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
94	CX8	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
95	CX9	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
96	CX10	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
97	CX11	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
98	CX12	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
99	CX13	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
100	CX14	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1

PART NO.: P-82038  
DESC....: OPERATOR CONTROL PANEL TYPE M  
MODULE  
SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
101					-
102					-
103					-
104	T1	P-81281	TRANSFORMER T1	DF	1
105	T2	P-81282	TRANSFORMER T2	DF	1
106					-
107					-
108					-
109	X1	X-TAL 7M3728	CRYSTAL 7.3728 MHZ	NEL	1
110					-
111					-
112					-
113	CON1	CON DE 09PW3	D-SUB CON MALE WW3 9 POLE	SOURIAU	1
114	CON2	NOT USED	OPEN CIRCUIT		1
115	CON3	NOT USED	OPEN CIRCUIT		1
116					-
117					-
118					-
119	PB1-15	N/A	NOT APPLICABLE		-
120	PB16	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
121	PB17	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
122	PB18	NOT USED	OPEN CIRCUIT		1
123	PB19	NOT USED	OPEN CIRCUIT		1
124	PB20	NOT USED	OPEN CIRCUIT		1
125	PB21	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
126	PB22	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
127	PB23	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
128	PB24	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
129	PB25	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
130	PB26	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
131	PB27	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
132	PB28	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
133	PB29	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
134	PB30	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
135	PB31	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
136	PB32	P SWITCH CON	COSMOS CONTACT MODULE	SECME	1
137					-
138					-
139		P SWITCH BUT	COSMOS BUTTON	SECME	14
140		P SWITCH COV	COSMOS COVER FOR BUTTON	SECME	14
141					-
142		P-81804	LABELS FOR PUSH BUTTONS	DF	1
143					-
144	SW1	DIL SWITCH 8	PCB SWITCH 8 CONTACTS, DIL	EECO	1
145	SW2	NOT USED	OPEN CIRCUIT		1
146					-
147					-
148					-
149	Q1	BUZ 20	MOSFET, N-CHANNEL 100V 12A	SIEMENS	1
150	Q2	BUZ 20	MOSFET, N-CHANNEL 100V 12A	SIEMENS	1

PART NO.: P-82038  
 DESC....: OPERATOR CONTROL PANEL TYPE M  
 MODULE  
 SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
151	Q3	BC 637	TRANSISTOR, NPN 60V 1A	SIEMENS	1
152	Q4	BC 637	TRANSISTOR, NPN 60V 1A	SIEMENS	1
153					-
154					-
155					-
156	D1-D15	N/A	NOT APPLICABLE		-
157	D16	LED ø2.9-G	LED ø2.9mm GREEN	AEG	1
158	D17	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
159	D18	NOT USED	OPEN CIRCUIT		1
160	D19	NOT USED	OPEN CIRCUIT		1
161	D20	NOT USED	OPEN CIRCUIT		1
162	D21	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
163	D22	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
164	D23	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
165	D24	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
166	D25	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
167	D26	LED ø2.9-G	LED ø2.9mm GREEN	AEG	1
168	D27	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
169	D28	N/A	NOT APPLICABLE		-
170	D29	N/A	NOT APPLICABLE		-
171	D30	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
172	D31	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
173	D32	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
174	D33	LED ø2.9-G	LED ø2.9mm GREEN	AEG	1
175	D34	N/A	NOT APPLICABLE		-
176	D35	N/A	NOT APPLICABLE		-
177	D36	N/A	NOT APPLICABLE		-
178	D37	N/A	NOT APPLICABLE		-
179	D38	N/A	NOT APPLICABLE		-
180	D39	LED ø2.9-G	LED ø2.9mm GREEN	AEG	1
181	D40	N/A	NOT APPLICABLE		-
182	D41	1N 4148	DIODE 75V 75mA	THOMSON	1
183	D42	1N 4148	DIODE 75V 75mA	THOMSON	1
184	D43	1N 4148	DIODE 75V 75mA	THOMSON	1
185	D44	1N 4148	DIODE 75V 75mA	THOMSON	1
186	D45	BYV 27-200	DIODE, 2A 200V, FAST RECOVERY	PHILIPS	1
187	D46	BYV 27-200	DIODE, 2A 200V, FAST RECOVERY	PHILIPS	1
188	D47	BYV 27-200	DIODE, 2A 200V, FAST RECOVERY	PHILIPS	1
189	D48	BYV 27-200	DIODE, 2A 200V, FAST RECOVERY	PHILIPS	1
190	D49	BYV 27-200	DIODE, 2A 200V, FAST RECOVERY	PHILIPS	1
191	D50	BYV 27-200	DIODE, 2A 200V, FAST RECOVERY	PHILIPS	1
192	D51-54	BZX 83 C 8V2	DIODE, ZENER 8,2V 500mW	THOMSON	4
193					-
194					-
195	IC1	PCPU LPM 914	EPROM CPU FOR CONTROL PANEL M	DF	1
196	IC2	SN 74LS138	3-TO-8 LINE DECODER	TEXAS	1
197	IC3	SN 74ALS573	OCTAL D-TYPE TRANSPARENT LATCH	TEXAS	1
198	IC4	SN 74LS645	OCTAL BUS TRANSCEIVER	TEXAS	1
199	IC5	NOT USED	OPEN CIRCUIT		1
200	IC6	HM6264ALP-10	8Kx8 CMOS SRAM 100nSEC.	TEXAS	1

PART NO.: P-82038  
DESC....: OPERATOR CONTROL PANEL TYPE M  
MODULE  
SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
201	IC7	NOT USED	OPEN CIRCUIT		1
202	IC8	SN 74LS138	3-TO-8 LINE DECODER	TEXAS	1
203	IC9	SN 74LS138	3-TO-8 LINE DECODER	TEXAS	1
204	IC10	N/A	NOT APPLICABLE		-
205	IC11	CD 4099B	8-BIT ADDRESSABLE LATCH	RCA	1
206	IC12	CD 4099B	8-BIT ADDRESSABLE LATCH	RCA	1
207	IC13	CD 4099B	8-BIT ADDRESSABLE LATCH	RCA	1
208	IC14	ULN 2004A	TRANSISTOR ARRAY, DAR. NPN CE	TEXAS	1
209	IC15	ULN 2004A	TRANSISTOR ARRAY, DAR. NPN CE	TEXAS	1
210	IC16	ULN 2004A	TRANSISTOR ARRAY, DAR. NPN CE	TEXAS	1
211	IC17	SN 74LS541	OCTAL BUFFER 3-STATE	TEXAS	1
212	IC18	HEF 40106B	HEX INVERTING SCHMITT TRIGGER	PHILIPS	1
213	IC19	SN 74LS32	QUAD 2-INPUT OR GATE	TEXAS	1
214	IC20	SFH 900-2	LIGHT REFLECTING SWITCH	SIEMENS	1
215	IC21	SFH 900-2	LIGHT REFLECTING SWITCH	SIEMENS	1
216	IC22	uA 9637AC	DUAL DIFFERENTIAL LINE REC.	TEXAS	1
217	IC23	uA 9638C	DUAL DIFFERENTIAL LINE DRIVER	TEXAS	1
218	IC24	H 11L1	SINGLE OPTOCOUPLER, DIL	ISOCOM	1
219	IC25	H 11L1	SINGLE OPTOCOUPLER, DIL	ISOCOM	1
220	IC26	uA 7815C	VOLTAGE REGULATOR, POS 15V 1A	TEXAS	1
221	IC27	SN 74LS04	HEX INVERTER	TEXAS	1
222	IC28	uA 7815C	VOLTAGE REGULATOR, POS 15V 1A	TEXAS	1
223					-
224					-
225					-
226	DISP	DISP LCM 523	DOT MATRIX LCD, 24x2 LINES	SANYO	1
227					-
228					-
229		SOCKET DIL 8	SOCKET FOR 8 LEAD DIL, SOLDER	SWISS	2
230		SOCKET DIL14	SOCKET FOR 14 LEAD DIL, SOLDER	SWISS	1
231		SOCKET DIL16	SOCKET FOR 16 LEAD DIL, SOLDER	SWISS	1
232		SOCKET DIL28	SOCKET FOR 28 LEAD DIL, SOLDER	SWISS	2
233		SOCKET DIL40	SOCKET FOR 40 LEAD DIL, SOLDER	SWISS	1
234					-
235					-
236					-
237		CON TR 14HSD	ROW CON HEADER SOLDER 14P DIL	SOURIAU	1
238					-
239		F-SCREW M3-1	D-SUB FEMALE SCREW LOCK M3x8.3	SOURIAU	2
240		PINOL M3x4	PINOL SCREW M3x4, DIN 916	HFC	1
241		PHJX Z M2x10	SCREW M2x10 Zn PLATED, DIN7985	HFC	4
242		PJXZ M2.5x6	SCREW M2.5x6 Zn PLATED DIN7985	HFC	4
243		PHJX Z M3x6	SCREW M3x6 Zn PLATED, DIN7985	HFC	4
244		PHJX Z M3x8	SCREW M3x8 Zn PLATED, DIN7985	HFC	12
245		MSM N M2	NUT M2 Ni PLATED, DIN 934	HFC	4
246		MSS Z M2.5	NUT M2.5 Zn PLATED, DIN 934	HFC	4
247		MSS Z M3	NUT M3 Zn PLATED, DIN 934	HFC	2
248					-
249		SBN ø3.2	WASHER ø3.2 NYLON, DIN 125A	HFC	22
250					-

-----  
 PART NO.: P-82038  
 DESC.....: OPERATOR CONTROL PANEL TYPE M  
 MODULE  
 SYSTEM 8000  
 -----

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
251		SSS Z $\phi$ 2.2	L-WASHER $\phi$ 2.2 EL Zn. DIN 6798A	HFC	4
252		SSS Z $\phi$ 2.7	L-WASHER $\phi$ 2.7 EL Zn, DIN 6798A	HFC	4
253		SSS Z $\phi$ 3.2	L-WASHER $\phi$ 3.2 EL Zn, DIN 6798A	HFC	8
254		DB M3x15 N i	DISTANCE BOLT M3x15 BRASS Ni i	ASSMANN	2
255		DB M3x30 N i	DISTANCE BOLT M3x30 BRASS Ni i	ASSMANN	2
256		P-87143	DIST.PIPE $\phi$ 7.3.6x3.5 POLYSTYR.	DF	4
257					-
258					-
259					-
260		RIVET 4023	SOLDER-LUG $\phi$ 3.2mm	F. R-P	1
261					-
262		WIRE .25-B	WIRE 0.25mm <sup>2</sup> BLACK	DATWYLE	0.1
263		WIRE .25-G	WIRE 0.25mm <sup>2</sup> GREEN	DATWYLE	0.1
264		WIRE .25-R	WIRE WRAP, TEFLON 0.25mm <sup>2</sup> RED	DATWYLE	0.1
265		HS TUBE $\phi$ 2-B	HEAT SHRINKABLE TUBE $\phi$ 2mm B	R. FLEX	0.06
266		HS TUBE $\phi$ 3-B	HEAT SHRINKABLE TUBE $\phi$ 3mm B	R. FLEX	0.04
267					-
268		P-81296	BUTTON FOR PANEL, $\phi$ 36x $\phi$ 6mm	DF	1
269		P-81300	HEATSINK, CONTROL PANEL	DF	1
270		P-81728	FRONT PANEL, CONTROL PANEL M	DF	1
271		P-81892	COVER FOR CONTROL PANEL	CUBIC	1
272		P-87004	MOUNTING RAIL FOR PANEL COVER	DF	2
273		S-LOCK B	SNAP LOCK, BLACK	ARROW	2
274		P-87058	INSULATOR FOR DISPLAY	DF	1
275		NEL D32-43	CONVERTER FOR DISPLAY LCM 523	SANYO	-

PART NO.: P-82369

DESC....: CONTROL BOARD, 16 BIT ADC

MPS 853/854/858/SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
1		DWG 82369	CONTROL BOARD, 16BIT ADC, ASSY	DF	1
2		DWG 82370	CONTROL BOARD 8+16BIT ADC, SCH	DF	1
3		PCB 82371	CONTROL BOARD, 16BIT ADC, PCB	DF	1
4					-
5					-
6					-
7					-
8					-
9	R1	1K	RESISTOR 1% 1/4W	PHILIPS	1
10	R2	1K	RESISTOR 1% 1/4W	PHILIPS	1
11	R3	3K32	RESISTOR 1% 1/4W	PHILIPS	1
12	R4	56R2	RESISTOR 1% 1/4W	PHILIPS	1
13	R5	56R2	RESISTOR 1% 1/4W	PHILIPS	1
14	R6	1K 2W	RESISTOR 5% 2W	PHILIPS	1
15	R7	1K 2W	RESISTOR 5% 2W	PHILIPS	1
16	R8	1K 2W	RESISTOR 5% 2W	PHILIPS	1
17	R9	1K 2W	RESISTOR 5% 2W	PHILIPS	1
18	R10	1K 2W	RESISTOR 5% 2W	PHILIPS	1
19	R11	1K 2W	RESISTOR 5% 2W	PHILIPS	1
20	R12	1K 2W	RESISTOR 5% 2W	PHILIPS	1
21	R13	1K 2W	RESISTOR 5% 2W	PHILIPS	1
22	R14	1K 2W	RESISTOR 5% 2W	PHILIPS	1
23	R15	1K 2W	RESISTOR 5% 2W	PHILIPS	1
24					-
25	R17	15K	RESISTOR 1% 1/4W	PHILIPS	1
26	R18	1K	RESISTOR 1% 1/4W	PHILIPS	1
27	R19	68R1	RESISTOR 1% 1/4W	PHILIPS	1
28	R20	274R	RESISTOR 1% 1/4W	PHILIPS	1
29	R21	1K	RESISTOR 1% 1/4W	PHILIPS	1
30	R22	22K1	RESISTOR 1% 1/4W	PHILIPS	1
31	R23	22K1	RESISTOR 1% 1/4W	PHILIPS	1
32	R24	10R	RESISTOR 1% 1/4W	PHILIPS	1
33	R25	150R	RESISTOR 1% 1/4W	PHILIPS	1
34	R26	10R	RESISTOR 1% 1/4W	PHILIPS	1
35	R27	150R	RESISTOR 1% 1/4W	PHILIPS	1
36	R28	1K 2W	RESISTOR 5% 2W	PHILIPS	1
37	R29	1K 2W	RESISTOR 5% 2W	PHILIPS	1
38	R30	1K 2W	RESISTOR 5% 2W	PHILIPS	1
39	R31	1K 2W	RESISTOR 5% 2W	PHILIPS	1
40	R32	10K	RESISTOR 1% 1/4W	PHILIPS	1
41	R33	10K	RESISTOR 1% 1/4W	PHILIPS	1
42	R34	9K*0.1%	PRECISION RESISTOR	VISHAY	1
43	R35	150K	RESISTOR 1% 1/4W	PHILIPS	1
44	R36	1K*0.1%	PRECISION RESISTOR	VISHAY	1
45	R37	4K75	RESISTOR 1% 1/4W	PHILIPS	1
46	R38	150K	RESISTOR 1% 1/4W	PHILIPS	1
47	R39	1K*0.1%	PRECISION RESISTOR	VISHAY	1
48	R40	4K75	RESISTOR 1% 1/4W	PHILIPS	1
49	R41	9K*0.1%	PRECISION RESISTOR	VISHAY	1
50	R42	20K	RESISTOR 1% 1/4W	PHILIPS	1



PART NO.: P-82369

DESC....: CONTROL BOARD, 16 BIT ADC

MPS 853/854/858/SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO.	REQ
51	R43	3K65	RESISTOR 1% 1/4W	PHILIPS		1
52	R44	909R	RESISTOR 1% 1/4W	PHILIPS		1
53	R45	10K	RESISTOR 1% 1/4W	PHILIPS		1
54	R46	10K	RESISTOR 1% 1/4W	PHILIPS		1
55	R47	4K75	RESISTOR 1% 1/4W	PHILIPS		1
56	R48	511R	RESISTOR 1% 1/4W	PHILIPS		1
57	R49	4K75	RESISTOR 1% 1/4W	PHILIPS		1
58	R50	10K	RESISTOR 1% 1/4W	PHILIPS		1
59	R51	2K21	RESISTOR 1% 1/4W	PHILIPS		1
60	R52	1K	RESISTOR 1% 1/4W	PHILIPS		1
61	R53	9K76	RESISTOR 1% 1/4W	PHILIPS		1
62	R54	S/C	SHORT CIRCUIT			1
63	R55	1K5	RESISTOR 1% 1/4W	PHILIPS		1
64	R56	9K76	RESISTOR 1% 1/4W	PHILIPS		1
65	R57	1K3	RESISTOR 1% 1/4W	PHILIPS		1
66	R58	10K	RESISTOR 1% 1/4W	PHILIPS		1
67	R59	6K81	RESISTOR 1% 1/4W	PHILIPS		1
68	R60	16K2	RESISTOR 1% 1/4W	PHILIPS		1
69	R61	47K5	RESISTOR 1% 1/4W	PHILIPS		1
70	R62	16K2	RESISTOR 1% 1/4W	PHILIPS		1
71	R63	3K01	RESISTOR 1% 1/4W	PHILIPS		1
72	R64	S/C	SHORT CIRCUIT			1
73	R65	2K74	RESISTOR 1% 1/4W	PHILIPS		1
74	R66	1M82	RESISTOR 1% 1/4W	PHILIPS		1
75	R67	274K	RESISTOR 1% 1/4W	PHILIPS		1
76	R68	2K21	RESISTOR 1% 1/4W	PHILIPS		1
77	R69	10K	RESISTOR 1% 1/4W	PHILIPS		1
78						-
79						-
80						-
81	RN1	9X10K	RESISTOR ARRAY 9X10K 5%, SIL	ROHM		1
82	RN2	9X10K	RESISTOR ARRAY 9X10K 5%, SIL	ROHM		1
83	RN3	9X4K7	RESISTOR ARRAY 9X4K7 5%, SIL	ROHM		1
84	RN4	9X10K	RESISTOR ARRAY 9X10K 5%, SIL	ROHM		1
85	RN5	9X10K	RESISTOR ARRAY 9X10K 5%, SIL	ROHM		1
86	RN6	9X470R	RESISTOR ARRAY 9X470R 5%, SIL	ROHM		1
87	RN7	9X470R	RESISTOR ARRAY 9X470R 5%, SIL	ROHM		1
88	RN8	9X10K	RESISTOR ARRAY 9X10K 5%, SIL	ROHM		1
89	RN9	9X1K5	RESISTOR ARRAY 9X1K5 5%, SIL	ROHM		1
90	RN10	9X1K5	RESISTOR ARRAY 9X1K5 5%, SIL	ROHM		1
91	RN11	9X470R	RESISTOR ARRAY 9X470R 5%, SIL	ROHM		1
92	RN12	9X1K5	RESISTOR ARRAY 9X1K5 5%, SIL	ROHM		1
93	RN13	9X470R	RESISTOR ARRAY 9X470R 5%, SIL	ROHM		1
94	RN14	9X470R	RESISTOR ARRAY 9X470R 5%, SIL	ROHM		1
95	RN15	9X470R	RESISTOR ARRAY 9X470R 5%, SIL	ROHM		1
96	RN16	9X470R	RESISTOR ARRAY 9X470R 5%, SIL	ROHM		1
97	RN17	9X1K5	RESISTOR ARRAY 9X1K5 5%, SIL	ROHM		1
98	RN18	9X4K7	RESISTOR ARRAY 9X4K7 5%, SIL	ROHM		1
99	RN19	9X1K5	RESISTOR ARRAY 9X1K5 5%, SIL	ROHM		1
100	RN20	9X4K7	RESISTOR ARRAY 9X4K7 5%, SIL	ROHM		1

PART NO.: P-82369

DESC....: CONTROL BOARD, 16 BIT ADC

MPS 853/854/858/SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
101					-
102					-
103	POT1	M-TRIM 10K-3	MULTITURN TRIMPOT 10K 10% 1/4"	BOURNS	1
104	POT2	M-TRIM 10K-3	MULTITURN TRIMPOT 10K 10% 1/4"	BOURNS	1
105	POT3	S-TRIM M1-1	SINGLE TURN TRIMPOT 100K 1/4"	BOURNS	1
106	POT4	M-TRIM 10K-3	MULTITURN TRIMPOT 10K 10% 1/4"	BOURNS	1
107	POT5	M-TRIM 10K-3	MULTITURN TRIMPOT 10K 10% 1/4"	BOURNS	1
108	POT6	S-TRIM 1M-1	SINGLE TURN TRIMPOT 1M 1/4"	BOURNS	1
109					-
110					-
111					-
112					-
113					-
114					-
115					-
116	C1	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
117	C2	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
118	C3	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
119	C4	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
120	C5	CER 22n-50	CAP. CER 22n 10% 50V	AVX	1
121	C6	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
122	C7	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
123	C8	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
124	C9	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
125	C10	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
126	C11	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
127	C12	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
128	C13	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
129	C14	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
130	C15	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
131	C16	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
132	C17	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
133	C18	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
134	C19	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
135	C20	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
136	C21	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
137	C22	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
138	C23	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1
139	C24	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
140	C25	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
141	C26	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
142	C27	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
143	C28	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
144	C29	SAL 15u-16	CAP. SOLID A1 15u 16V 20% RM=5	PHILIPS	1
145	C30	MKT 220n-63	CAP. MKT 220n 10% 63V RM=5	SIEMENS	1
146	C31	MKT 220n-63	CAP. MKT 220n 10% 63V RM=5	SIEMENS	1
147	C32	MKT 220n-63	CAP. MKT 220n 10% 63V RM=5	SIEMENS	1
148	C33	MKT 220n-63	CAP. MKT 220n 10% 63V RM=5	SIEMENS	1
149	C34	MKT 220n-63	CAP. MKT 220n 10% 63V RM=5	SIEMENS	1
150	C35	SAL 10u-16	CAP. SOLID A1 10u 16V 20% RM=5	PHILIPS	1

PART NO.: P-82369

DESC....: CONTROL BOARD, 16 BIT ADC

MPS 853/854/858/SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
151	C36	SAL 10u-16	CAP. SOLID A1 10u 16V 20% RM=5	PHILIPS	1
152	C37	MKT 220n-63	CAP. MKT 220n 10% 63V RM=5	SIEMENS	1
153	C38	CER 10n-50	CAP. CER 10n 10% 50V	AVX	1
154	C39	SAL 6u8-25	CAP. SOLID A1 6u8 25V 20% RM=5	PHILIPS	1
155	C40	SAL 6u8-25	CAP. SOLID A1 6u8 25V 20% RM=5	PHILIPS	1
156	C41	SAL 6u8-25	CAP. SOLID A1 6u8 25V 20% RM=5	PHILIPS	1
157	C42	SAL 6u8-25	CAP. SOLID A1 6u8 25V 20% RM=5	PHILIPS	1
158	C43	SAL 15u-16	CAP. SOLID A1 15u 16V 20% RM=5	PHILIPS	1
159	C44	MKT 330n-63	CAP. MKT 330n 10% 63V RM=5	SIEMENS	1
160	C45	MKT 330n-63	CAP. MKT 330n 10% 63V RM=5	SIEMENS	1
161	C46	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
162	C47	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
163	C48	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
164	C49	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
165	C50	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
166	C51	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
167	C52	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
168	C53	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
169	C54	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
170	C55	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
171	C56	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
172	C57	SAL 47u-6V3	CAP. SOLID A1 47u 6V3 20% RM=5	PHILIPS	1
173	C58	MKT 330n-63	CAP. MKT 330n 10% 63V RM=5	SIEMENS	1
174					-
175	CX1	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
176	CX2	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
177	CX3	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
178	CX4	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
179	CX5	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
180	CX6	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
181	CX7	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
182	CX8	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
183	CX9	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
184	CX10	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
185	CX11	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
186	CX12	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
187	CX13	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
188	CX14	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
189	CX15	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
190	ZX16	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
191	CX17	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
192	CX18	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
193	CX19	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
194	CX20	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
195	CX21	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
196	CX22	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
197	CX23	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
198	CX24	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
199	CX25	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
200	CX31	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1

PART NO.: P-82369

DESC....: CONTROL BOARD, 16 BIT ADC

MPS 853/854/858/SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
201	CX36A	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
202	CX36B	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
203	CX37A	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
204	CX37B	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
205	CX38A	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
206	CX38B	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
207	CX39A	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
208	CX39B	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
209	CX40	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
210	CX41	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
211	CX42	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
212	CX43	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
213	CX44	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
214	CX45	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
215	CX46	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
216	CX51	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
217	CX52	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
218	CX52A	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
219	CX52B	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
220	CX53	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
221	CX54	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
222	CX56	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
223	CX57	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
224	CX61	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
225	CX62	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
226	CX63	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
227	CX64	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
228	CX65	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1
229					-
230	P1	CON DI644UFA	DIN-REVPLUG FEMALE ANG 64C A-C	SOURIAU	1
231	P2	CON DI644UFA	DIN-REVPLUG FEMALE ANG 64C A-C	SOURIAU	1
232	P3	CON DI644UFA	DIN-REVPLUG FEMALE ANG 64C A-C	SOURIAU	1
233	P4	CON DI644UFA	DIN-REVPLUG FEMALE ANG 64C A-C	SOURIAU	1
234	P5	CON 231-08PS	SERIE 231 CON MALE STR 8 POLE	WAGO	1
235	P6	CON 231-04PS	SERIE 231 CON MALE STR 4 POLE	WAGO	1
236	P7	CON 231-10PS	SERIE 231 CON MALE STR 10 POLE	WAGO	1
237	P8	CON 231-04PS	SERIE 231 CON MALE STR 4 POLE	WAGO	1
238	P9	CON 231-08PS	SERIE 231 CON MALE STR 8 POLE	WAGO	1
239	P10	CON 231-13PA	SERIE 231 CON MALE ANG 13 POLE	WAGO	1
240	P11	CON 231-08PS	SERIE 231 CON MALE STR 8 POLE	WAGO	1
241	P12	CON 231-05PS	SERIE 231 CON MALE STR 5 POLE	WAGO	1
242	P13	CON DB 25SA	D-SUB CON FEMALE ANG 25 POLE	SOURIAU	1
243	P14	CON DE 09SA	D-SUB CON FEMALE ANG 9 POLE	SOURIAU	1
244	P15	CON 231-05PA	SERIE 231 CON MALE ANG 5 POLE	WAGO	1
245					-
246					-
247	D1	1N 4148	DIODE 75V 75mA	THOMSON	1
248	D2	1N 4148	DIODE 75V 75mA	THOMSON	1
249	D3	1N 4148	DIODE 75V 75mA	THOMSON	1
250	D4	1N 4148	DIODE 75V 75mA	THOMSON	1

PART NO.: P-82369

DESC....: CONTROL BOARD, 16 BIT ADC

MPS 853/854/858/SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
251	D5	1N 4148	DIODE 75V 75mA	THOMSON	1
252	D6	1N 4148	DIODE 75V 75mA	THOMSON	1
253	D7	1N 4148	DIODE 75V 75mA	THOMSON	1
254	D8	1N 4148	DIODE 75V 75mA	THOMSON	1
255	D9	1N 4148	DIODE 75V 75mA	THOMSON	1
256	D10	1N 4148	DIODE 75V 75mA	THOMSON	1
257	D11	1N 4148	DIODE 75V 75mA	THOMSON	1
258	D12	1N 4148	DIODE 75V 75mA	THOMSON	1
259	D13	1N 4148	DIODE 75V 75mA	THOMSON	1
260					-
261	D15	1N 4148	DIODE 75V 75mA	THOMSON	1
262	D16	1N 4148	DIODE 75V 75mA	THOMSON	1
263	D17	1N 4148	DIODE 75V 75mA	THOMSON	1
264	D18	1N 4007	DIODE 1000V 1A	THOMSON	1
265	D19	1N 4007	DIODE 1000V 1A	THOMSON	1
266	D20	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
267	D21	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
268	D22	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
269	D23	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
270	D24	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
271	D25	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
272	D26	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
273	D27	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
274	D28	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
275	D29	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
276	D30	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
277	D31	LED ø2.9-G	LED ø2.9mm GREEN	AEG	1
278	D32	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
279	D33	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
280	D34	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
281	D35	LED ø2.9-G	LED ø2.9mm GREEN	AEG	1
282	D36	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
283	D37	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
284	D38	LED ø2.9-G	LED ø2.9mm GREEN	AEG	1
285	D39	LED ø2.9-G	LED ø2.9mm GREEN	AEG	1
286	D40	LED ø2.9-G	LED ø2.9mm GREEN	AEG	1
287	D41	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
288	D42	LED ø2.9-G	LED ø2.9mm GREEN	AEG	1
289	D43	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
290	D44	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
291	D45	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
292	D46	NOT USED	OPEN CIRCUIT		1
293	D47	NOT USED	OPEN CIRCUIT		1
294					-
295	D49	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
296	D50	NOT USED	OPEN CIRCUIT		1
297	D51	NOT USED	OPEN CIRCUIT		1
298	D52	LED ø2.9-G	LED ø2.9mm GREEN	AEG	1
299	D53	LED ø2.9-R	LED ø2.9 mm RED	AEG	1
300	D54	LED ø2.9-R	LED ø2.9 mm RED	AEG	1

PART NO.: P-82369

DESC....: CONTROL BOARD, 16 BIT ADC

MPS 853/854/858/SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
301	D55	LED ø2.9-G	LED ø2.9mm GREEN	AEG	1
302	D56	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
303	D57	LED ø2.9-G	LED ø2.9mm GREEN	AEG	1
304	D58	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
305					-
306					-
307					-
308	Q1	2N 2907A	TRANSISTOR, PNP 60V 600mA	PHILIPS	1
309	Q2	2N 2907A	TRANSISTOR, PNP 60V 600mA	PHILIPS	1
310	Q3	2N 2907A	TRANSISTOR, PNP 60V 600mA	PHILIPS	1
311	Q4	2N 2907A	TRANSISTOR, PNP 60V 600mA	PHILIPS	1
312	Q5	2N 2907A	TRANSISTOR, PNP 60V 600mA	PHILIPS	1
313					-
314					-
315					-
316	Y1	X-TAL 7M3728	CRYSTAL 7.3728 MHZ	NEL	1
317					-
318					-
319	U1	SCC 933AC	CPU FOR CONTROL BOARD, 16 BIT	DF	1
320	U2	SN 74HCT04	HEX INVERTER	TEXAS	1
321	U3	74HCT4040	12 STAGE BINARY COUNTER	PHILIPS	1
322	U4	SN 74HCT32	QUAD 2 INPUT OR	TEXAS	1
323	U5	SN 74HCT573	OCTAL D-LATCH	TEXAS	1
324	U6	SN 74HCT20	DUAL 4 INPUT POSITIVE-NAND G.	TEXAS	1
325	U7	MAX 690	WATCHDOG-TIMER	MAXIM	1
326	U8	ADC 0809	8-BIT ADC	MICRO L	1
327	U9	H 11L1	SINGLE OPTOCOUPLER, DIL	ISOCOM	1
328	U10	H 11L1	SINGLE OPTOCOUPLER, DIL	ISOCOM	1
329	U11	MC 3487	QUAD RS-422 LINE DRIVER, 3-STA	MOT	1
330	U12	uA 9637AC	DUAL DIFFERENTIAL LINE REC.	TEXAS	1
331	U13	SN 74HCT541	OCTAL BUFFER	TEXAS	1
332	U14	SN 74HCT541	OCTAL BUFFER	TEXAS	1
333	U15	SN 74HCT138	3 TO 8 LINE DECODER	TEXAS	1
334	U16	SN 74HCT139	DUAL 2 LINE TO 4 LINE DECODER	TEXAS	1
335	U17	Z8030	Z-SCC	ZILOG	1
336	U18	HM6264ALP-10	8Kx8 CMOS SRAM 100nSEC.	TEXAS	1
337	U19	NOT USED	OPEN CIRCUIT		1
338	U20	H 11L1	SINGLE OPTOCOUPLER, DIL	ISOCOM	1
339	U21	H 11L1	SINGLE OPTOCOUPLER, DIL	ISOCOM	1
340	U22	H 11L1	SINGLE OPTOCOUPLER, DIL	ISOCOM	1
341	U23	H 11L1	SINGLE OPTOCOUPLER, DIL	ISOCOM	1
342	U24	H 11L1	SINGLE OPTOCOUPLER, DIL	ISOCOM	1
343	U25	LT 1081	5V RS232 DUAL DRIVER RECEIVER	LINTECH	1
344	U26	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
345	U27	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
346	U28	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
347	U29	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
348	U30	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
349	U31	MC 14490	HEX CONTACT BOUNCE ELIMINATOR	MOT MC	1
350	U32	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1

PART NO.: P-82369

DESC....: CONTROL BOARD, 16 BIT ADC

MPS 853/854/858/SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
351	U33	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
352	U34	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
353	U35	ULN 2003A	TRANSISTOR ARRAY, DAR. NPN CE	TEXAS	1
354	U36	OP-27G	OP-AMP, SINGLE DIL	PMI	1
355	U37	OP-27G	OP-AMP, SINGLE DIL	PMI	1
356	U38	LM 1458	OP-AMP, DUAL DIL	THOMSON	1
357	U39	LM 1458	OP-AMP, DUAL DIL	THOMSON	1
358	U40	Z8036	COUNTER/TIMER AND PARALLEL I/O	ZILOG	1
359	U41	Z8036	COUNTER/TIMER AND PARALLEL I/O	ZILOG	1
360	U42	Z8036	COUNTER/TIMER AND PARALLEL I/O	ZILOG	1
361	U43	HEF 4094B	8 STAGE SHIFT + STORE REGISTOR	PHILIPS	1
362	U44	HEF 4094B	8 STAGE SHIFT + STORE REGISTOR	PHILIPS	1
363	U45	HEF 4094B	8 STAGE SHIFT + STORE REGISTOR	PHILIPS	1
364	U46	HEF 4094B	8 STAGE SHIFT + STORE REGISTOR	PHILIPS	1
365	U47	ULN 2003A	TRANSISTOR ARRAY, DAR. NPN CE	TEXAS	1
366	U48	ULN 2003A	TRANSISTOR ARRAY, DAR. NPN CE	TEXAS	1
367	U49	ULN 2003A	TRANSISTOR ARRAY, DAR. NPN CE	TEXAS	1
368	U50	ULN 2003A	TRANSISTOR ARRAY, DAR. NPN CE	TEXAS	1
369	U51	SN 74HCT02	QUAD 2 INPUT NOR	TEXAS	1
370	U52	ADC 71J	16-BIT ADC	BB	1
371	U53	SN 74HCT541	OCTAL BUFFER	TEXAS	1
372	U54	SN 74HCT541	OCTAL BUFFER	TEXAS	1
373	U55	TL 431CLP	PROGRAMMABLE PREC. REFERENCE	MOT	1
374	U56	SN 74HCT74	DUAL D-TYPE FLIP FLOP	TEXAS	1
375	U57	SN 74HCT366	HEX BUFFER / LINE DRIVER, INV.	PHILIPS	1
376	U58	uA 7815C	VOLTAGE REGULATOR, POS 15V 1A	TEXAS	1
377	U59	uA 7915C	VOLTAGE REGULATOR, NEG 15V 1A	TEXAS	1
378					-
379	U61	SN 74HCT04	HEX INVERVER	TEXAS	1
380	UX62	NOT USED	OPEN CIRCUIT		1
381	U63	SN 74LS645	OCTAL BUS TRANSCEIVER	TEXAS	1
382	U64	SN 74LS645	OCTAL BUS TRANSCEIVER	TEXAS	1
383	U65	SN 74LS645	OCTAL BUS TRANSCEIVER	TEXAS	1
384	U66	uA 7805C	VOLTAGE REGULATOR, POS 5V 1A	TEXAS u	1
385	U67	uA 7815C	VOLTAGE REGULATOR, POS 15V 1A	TEXAS	1
386	U68	uA 7915C	VOLTAGE REGULATOR, NEG 15V 1A	TEXAS	1
387	U69	SN 74HCT32	QUAD 2 INPUT OR	TEXAS	1
388	U62	H 11L1	SINGLE OPTOCOUPLER, DIL	ISOCOM	1
389					-
390					-
391	TP1-18	RIVET ø1.0	RIVET ø1.0x8.5 FOR PCB		18
392	SW1	DIL SWITCH 8	PCB SWITCH 8 CONTACTS, DIL	EECO	1
393	SW2	DIL SWITCH 8	PCB SWITCH 8 CONTACTS, DIL	EECO	1
394	SW3	DIL SWITCH 4	PCB SWITCH 4 CONTACTS, DIL	EECO	1
395	SW4	DIL SWITCH 8	PCB SWITCH 8 CONTACTS, DIL	EECO	1
396		BB 3-360mm	BUS BAR, 3 LAYER 360mm	MEKTRON	1
397		SOCKET DIL 8	SOCKET FOR 8 LEAD DIL, SOLDER	SWISS	9
398		SOCKET DIL16	SOCKET FOR 16 LEAD DIL, SOLDER	SWISS	2
399		SOCKET DIL20	SOCKET FOR 20 LEAD DIL, SOLDER	SWISS	3
400		SOCKET DIL28	SOCKET FOR 28 LEAD DIL, SOLDER	SWISS	2

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PART NO.: P-82369

DESC....: CONTROL BOARD, 16 BIT ADC

MPS 853/854/858/SYSTEM 8000  
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POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
401		SOCKET DIL40	SOCKET FOR 40 LEAD DIL, SOLDER	SWISS	1
402		SOCKET DIL28	SOCKET FOR 28 LEAD DIL, SOLDER	SWISS	1
403		H-S KL-105-H	HEATSINK FOR CASE TO-220 H	SEIFERT	2
404		PHJX Z M3x8	SCREW M3x8 Zn PLATED, DIN7985	HFC	6
405		MSM N M3	NUT M3 Ni PLATED, DIN 934	HFC	6
406		SSS Z ø3.2	L-WASHER ø3.2 EL Zn, DIN 6798A	HFC	4
407		BUSHING 220	INSULATING BUSHING, TO-220	MEC	4
408		S-INS. 220	SILICONE INSULATOR, TO-220	ALUTRON	4
409		RIVET ø2.5	RIVET BRASS, DIN 7340	F. R-P	8
410		F-SCREW M3-1	D-SUB FEMALE SCREW LOCK M3x8.3	SOURIAU	4
411		WIRE .50-B	WIRE 0.50mm2 BLACK	DATWYLE	0.3
412		INS. T018	INSULATOR FOR T018 TRANSISTOR	ALUTRON	5



## P A R T S L I S T

PAGE : 1  
ISSUE : 5PART NO.: P-82433  
DESC.....: DRIVER MODULE  
MED ISOLERET UDLÆSNING  
MPS 854, SYSTEM 8000

STOCK.NO	ITEM NO.	PART/DWG NO.	DESCRIPTION	MANUFAC.	NO. REQ
83082433		DWG 82433	DRIVER MODULE, ASSY	DF	0,00
82082336		DWG 82336	DRIVER MODULE, SCHEMATIC	DF	0,00
84082427		PCB 82427	DRIVER MODULE, PCB	DF	1,00
83087111		DWG 87111	ASSEMBLY PROCEDURE	DF	0,00
11013750	R1	7K5	RESISTOR 1% 1/4W	PHILIPS	1,00
11013562	R2	5K62	RESISTOR 1% 1/4W	PHILIPS	1,00
11012475	R3	475R	RESISTOR 1% 1/4W	PHILIPS	1,00
11014681	R4	68K1	RESISTOR 1% 1/4W	PHILIPS	1,00
11014681	R5	68K1	RESISTOR 1% 1/4W	PHILIPS	1,00
11020322	R6	2K2 2W	RESISTOR 5% 2W	PHILIPS	1,00
11020322	R7	2K2 2W	RESISTOR 5% 2W	PHILIPS	1,00
11020322	R8	2K2 2W	RESISTOR 5% 2W	PHILIPS	1,00
11020322	R9	2K2 2W	RESISTOR 5% 2W	PHILIPS	1,00
11020322	R10	2K2 2W	RESISTOR 5% 2W	PHILIPS	1,00
11020110	R11	10R 2W	RESISTOR 5% 2W	PHILIPS	1,00
11013332	R12	3K32	RESISTOR 1% 1/4W	PHILIPS	1,00
11012825	R13	825R	RESISTOR 1% 1/4W	PHILIPS	1,00
11013100	R14	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
11013100	R15	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
11012681	R16	681R	RESISTOR 1% 1/4W	PHILIPS	1,00
11013100	R17	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
11013332	R18	3K32	RESISTOR 1% 1/4W	PHILIPS	1,00
11030133	R19	3R3 5W	RESISTOR 5% 5W	VITROHM	1,00
11030133	R20	3R3 5W	RESISTOR 5% 5W	VITROHM	1,00
11030133	R21	3R3 5W	RESISTOR 5% 5W	VITROHM	1,00
11012475	R22	475R	RESISTOR 1% 1/4W	PHILIPS	1,00
11015150	R23	150K	RESISTOR 1% 1/4W	PHILIPS	1,00
11015150	R24	150K	RESISTOR 1% 1/4W	PHILIPS	1,00
11030422	R25	2K2 5W	RESISTOR 5% 5W	VITROHM	1,00
11030422	R26	2K2 5W	RESISTOR 5% 5W	VITROHM	1,00
11012681	R27	681R	RESISTOR 1% 1/4W	PHILIPS	1,00
11013221	R28	2K21	RESISTOR 1% 1/4W	PHILIPS	1,00
11012100	R29	100R	RESISTOR 1% 1/4W	PHILIPS	1,00
11013100	R30	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
11010475	R31	4R75	RESISTOR 1% 1/4W	PHILIPS	1,00
11014200	R33	20K	RESISTOR 1% 1/4W	PHILIPS	1,00
11013392	R34	3K92	RESISTOR 1% 1/4W	PHILIPS	1,00
11013392	R35	3K92	RESISTOR 1% 1/4W	PHILIPS	1,00
11015100	R36	100K	RESISTOR 1% 1/4W	PHILIPS	1,00
11014200	R37	20K	RESISTOR 1% 1/4W	PHILIPS	1,00
11013392	R38	3K92	RESISTOR 1% 1/4W	PHILIPS	1,00
11015100	R39	100K	RESISTOR 1% 1/4W	PHILIPS	1,00
11013392	R40	3K92	RESISTOR 1% 1/4W	PHILIPS	1,00
11015100	R41	100K	RESISTOR 1% 1/4W	PHILIPS	1,00
11013475	R42	4K75	RESISTOR 1% 1/4W	PHILIPS	1,00
11111310	R43	S-TRIM 10K-1	SINGLE TURN TRIMPOT 10K 1/4"	BOURNS	1,00
11013750	R44	7K5	RESISTOR 1% 1/4W	PHILIPS	1,00
11013332	R45	3K32	RESISTOR 1% 1/4W	PHILIPS	1,00
11014100	R46	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
11014110	R47	11K	RESISTOR 1% 1/4W	PHILIPS	1,00
11014100	R48	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
11014100	R49	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
12096447	C1	EAL 470u-63	CAP. ELEC. 470uF 63V, $\phi$ 12.5x30	PHILIPS	1,00

## P A R T S L I S T

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PART NO.: P-82433  
 DESC....: DRIVER MODULE  
 MED ISOLERET UDLÆSNING  
 MPS 854, SYSTEM 8000

STOCK.NO	ITEM NO.	PART/DWG NO.	DESCRIPTION	MANUFAC.	NO. REQ
12096447	C2	EAL 470u-63	CAP. ELEC. 470uF 63V, $\phi$ 12.5x30	PHILIPS	1,00
12012510	C3	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1,00
12012410	C4	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
12072223	C5	CER 220p-63	CAP. CER 220p 5% 63V	SIEMENS	1,00
12099347	C6	EAL 47u-385	CAP. ELEC. 47u 385V, $\phi$ 18x40	PHILIPS	1,00
12092547	C7	EAL 4700u-16	CAP. ELEC. 4700uF 16V, L=30mm	PHILIPS	1,00
12092547	C8	EAL 4700u-16	CAP. ELEC. 4700uF 16V, L=30mm	PHILIPS	1,00
12014547	C9	MKT 4u7-250	CAP. MKT 4u7 10% 250V RM=27.5	PHILIPS	1,00
12014547	C10	MKT 4u7-250	CAP. MKT 4u7 10% 250V RM=27.5	PHILIPS	1,00
12014547	C11	MKT 4u7-250	CAP. MKT 4u7 10% 250V RM=27.5	PHILIPS	1,00
12014547	C12	MKT 4u7-250	CAP. MKT 4u7 10% 250V RM=27.5	PHILIPS	1,00
12014547	C13	MKT 4u7-250	CAP. MKT 4u7 10% 250V RM=27.5	PHILIPS	1,00
12014547	C14	MKT 4u7-250	CAP. MKT 4u7 10% 250V RM=27.5	PHILIPS	1,00
12099347	C15	EAL 47u-385	CAP. ELEC. 47u 385V, $\phi$ 18x40	PHILIPS	1,00
12012310	C16	MKT 10n-63	CAP. MKT 10n 10% 63V RM=5	SIEMENS	1,00
12012510	C17	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1,00
12015368	C18	MKT 680n-400	CAP. MKT 680nF 10% 400V RM=22,	PHILIPS	1,00
12012410	C19	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
12012410	C20	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
12012410	C31	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
12012410	C32	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
12012410	C33	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
12012410	C34	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
12012410	C35	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
12012410	C36	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
12082310	C37	SAL 10u-16	CAP. SOLID Al 10u 16V 20% RM=5	PHILIPS	1,00
12012410	C38	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
12012410	C39	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
22083504	D1	PB-154-M	DIODE BRIDGE 1.5A 400V	LIGHT O	1,00
22011148	D2	1N 4148	DIODE 75V 75mA	THOMSON	1,00
22011148	D3	1N 4148	DIODE 75V 75mA	THOMSON	1,00
22011148	D4	1N 4148	DIODE 75V 75mA	THOMSON	1,00
22011007	D5	1N 4007	DIODE 1000V 1A	THOMSON	1,00
22011007	D6	1N 4007	DIODE 1000V 1A	THOMSON	1,00
22045552	D7	BZX 85 C 30	DIODE, ZENER 30V 1.3W	THOMSON	1,00
22045552	D8	BZX 85 C 30	DIODE, ZENER 30V 1.3W	THOMSON	1,00
22083504	D9	PB-154-M	DIODE BRIDGE 1.5A 400V	LIGHT O	1,00
22011007	D10	1N 4007	DIODE 1000V 1A	THOMSON	1,00
22011007	D11	1N 4007	DIODE 1000V 1A	THOMSON	1,00
22011007	D12	1N 4007	DIODE 1000V 1A	THOMSON	1,00
22011007	D13	1N 4007	DIODE 1000V 1A	THOMSON	1,00
22011007	D14	1N 4007	DIODE 1000V 1A	THOMSON	1,00
22011148	D15	1N 4148	DIODE 75V 75mA	THOMSON	1,00
22011148	D16	1N 4148	DIODE 75V 75mA	THOMSON	1,00
22011007	D17	1N 4007	DIODE 1000V 1A	THOMSON	1,00
22011007	D18	1N 4007	DIODE 1000V 1A	THOMSON	1,00
22045034	D19	BZX 79 C 11	DIODE, ZENER 11V 500mW	THOMSON	1,00
22101103	D20	LED $\phi$ 2.9-G	LED $\phi$ 2.9mm GREEN	AEG	1,00
22011007	D21	1N 4007	DIODE 1000V 1A	THOMSON	1,00
22011148	D22	1N 4148	DIODE 75V 75mA	THOMSON	1,00
22011007	D23	1N 4007	DIODE 1000V 1A	THOMSON	1,00
22045040	D24	BZX 79 C 15	DIODE, ZENER 15V 500mW	PHILIPS	1,00
22101103	D25	LED $\phi$ 2.9-G	LED $\phi$ 2.9mm GREEN	AEG	1,00

## P A R T S L I S T

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ISSUE : 5

PART NO.: P-82433  
 DESC.....: DRIVER MODULE  
 MED ISOLERET UDLÆSNING  
 MPS 854, SYSTEM 8000

STOCK.NO	ITEM NO.	PART/DWG NO.	DESCRIPTION	MANUFAC.	NO. REQ
22045022	D26	BZX 79 C 6V2	DIODE, ZENER 6,2V 500mW	THOMSON	1,00
34022106	IC1	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1,00
31031415	IC2	uA 7815C	VOLTAGE REGULATOR, POS 15V 1A	TEXAS	1,00
31032015	IC3	MC 79L15AC	VOLTAGE REGULATOR, NEG 15V .1A	MOT	1,00
34022106	IC4	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1,00
34022106	IC5	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1,00
34022106	IC6	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1,00
34022106	IC7	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1,00
31017020	A1	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1,00
31017020	A2	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1,00
31017020	A3	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1,00
33051122	A4	ISO122P	ISOLATION AMPLIFIER	BB	1,00
33051122	A5	ISO122P	ISOLATION AMPLIFIER	BB	1,00
31017020	A6	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1,00
21014100	Q1	TIP 48	TRANSISTOR, NPN 300V 1A	TEXAS	1,00
21011307	Q2	BC 307B	TRANSISTOR, PNP 50V 100mA	SIEMENS	1,00
21013533	Q3	BDX 33C	TRANSISTOR, DAR. NPN 100V 10A	MOT	1,00
21011237	Q4	BC 237B	TRANSISTOR, NPN 45V 100mA	SIEMENS	1,00
21011237	Q5	BC 237B	TRANSISTOR, NPN 45V 100mA	SIEMENS	1,00
15020525	P1	CON DB 25PA	D-SUB CON MALE ANG 25 POLE	SOURIAU	1,00
15096108	P2	CON MTA 08HS	MTA CON HEADER SOLDER 08P SIL	AMP	1,00
15098104	P3	CON 231-04PA	SERIE 231 CON MALE ANG 4 POLE	WAGO	1,00
15098104	P4	CON 231-04PA	SERIE 231 CON MALE ANG 4 POLE	WAGO	1,00
15093104	P5	CON TRI 4HSS	ROW CON INS. HEADER SOL 4P SIL	SOURIAU	1,00
15092102	JUMP1	CON TR 02HSS	ROW CON HEADER SOLDER 02P SIL	SOURIAU	1,00
51020102		JACK $\phi$ 1.02	CONNECTOR JACK	CAMBION	2,00
15100308		SOCKET DIL 8	SOCKET FOR 8 LEAD DIL, SOLDER	SWISS	9,00
15100316		SOCKET DIL16	SOCKET FOR 16 LEAD DIL, SOLDER	SWISS	2,00
58002105		H-S KL-105-H	HEATSINK FOR CASE TO-220 H	FISHER	2,00
58200220		S-INS. 220	SILICONE INSULATOR, TO-220	ALUTRON	2,00
58300220		BUSHING 220	INSULATING BUSHING, $\phi$ 3,5/ $\phi$ 3,1	ALUTRON	2,00
52262208		PHJX Z M3x8	SCREW M3x8 Zn PLATED, DIN7985	HFC	4,00
53301220		MSS Z M3	NUT M3 Zn PLATED, DIN 934	HFC	4,00
54311220		SSS Z $\phi$ 3.2	L-WASHER $\phi$ 3.2 EL Zn, DIN 6798A	HFC	4,00
65010720		FW 3 75-O	FLEX WIRE 0.75 L=75mm, ORANGE	DF	0,12
65010725		FW 3 75-W	FLEX WIRE 0.75 L=75mm, WHITE	DF	0,60
51070300		HS TUBE $\phi$ 3-B	HEAT SHRINKABLE TUBE $\phi$ 3mm B	R. FLEX	0,10
51061952		T-WRAP 195x2	TIEWRAP 195x2.5mm, BLACK	HELLERM	2,00
51010100	TP10	RIVET $\phi$ 1.0	RIVET $\phi$ 1.0x8.5 FOR PCB	F. R-P	1,00
51010100	TP11	RIVET $\phi$ 1.0	RIVET $\phi$ 1.0x8.5 FOR PCB	F. R-P	1,00
51010100	TP13	RIVET $\phi$ 1.0	RIVET $\phi$ 1.0x8.5 FOR PCB	F. R-P	1,00

Notat til varer : P-82433

PART NO.: P-82513  
DESC....: REGULATION MODULE

MPS 854, SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
1		DWG 82513	REGULATION MODULE, ASSY	DF	1
2		DWG 82514	REGULATION MODULE, SCHEMATIC	DF	1
3		PCB 82515	REGULATION MODULE, PCB	DF	1
4					-
5					-
6					-
7					-
8					-
9					-
10	R1	9X680R	RESISTOR ARRAY 9X680R 5%, SIL	ROHM	1
11	R2	9X680R	RESISTOR ARRAY 9X680R 5%, SIL	ROHM	1
12	R3	4X680R	RESISTOR ARRAY 4X680R 5%, SIL	ROHM	1
13	R4	10K	RESISTOR 1% 1/4W	PHILIPS	1
14	R5	S-TRIM 1K-1	SINGLE TURN TRIMPOT 1K 1/4"	BOURNS	1
15	R6	475R	RESISTOR 1% 1/4W	PHILIPS	1
16	R7	1K5	RESISTOR 1% 1/4W	PHILIPS	1
17	R8	10K	RESISTOR 1% 1/4W	PHILIPS	1
18	R9	10K	RESISTOR 1% 1/4W	PHILIPS	1
19	R10	56R2	RESISTOR 1% 1/4W	PHILIPS	1
20	R11	2K21	RESISTOR 1% 1/4W	PHILIPS	1
21	R12	18K2	RESISTOR 1% 1/4W	PHILIPS	1
22	R13	1K	RESISTOR 1% 1/4W	PHILIPS	1
23	R14	33K2	RESISTOR 1% 1/4W	PHILIPS	1
24	R15	10K	RESISTOR 1% 1/4W	PHILIPS	1
25	R16	825K	RESISTOR 1% 1/4W	PHILIPS	1
26	R17	332K	RESISTOR 1% 1/4W	PHILIPS	1
27	R18	1K	RESISTOR 1% 1/4W	PHILIPS	1
28	R19	1K	RESISTOR 1% 1/4W	PHILIPS	1
29	R20	33K2	RESISTOR 1% 1/4W	PHILIPS	1
30	R21	2K21	RESISTOR 1% 1/4W	PHILIPS	1
31	R22	1K	RESISTOR 1% 1/4W	PHILIPS	1
32	R23	15K	RESISTOR 1% 1/4W	PHILIPS	1
33	R24	15K	RESISTOR 1% 1/4W	PHILIPS	1
34	R25	1K	RESISTOR 1% 1/4W	PHILIPS	1
35	R26	1K	RESISTOR 1% 1/4W	PHILIPS	1
36	R27	2K21	RESISTOR 1% 1/4W	PHILIPS	1
37	R28	2K21	RESISTOR 1% 1/4W	PHILIPS	1
38	R29	1K	RESISTOR 1% 1/4W	PHILIPS	1
39	R30	5K11	RESISTOR 1% 1/4W	PHILIPS	1
40	R31	5K11	RESISTOR 1% 1/4W	PHILIPS	1
41					-
42					-
43	R32	5K11	RESISTOR 1% 1/4W	PHILIPS	1
44	R33	6K19	RESISTOR 1% 1/4W	PHILIPS	1
45	R34	6K19	RESISTOR 1% 1/4W	PHILIPS	1
46	R35	6K19	RESISTOR 1% 1/4W	PHILIPS	1
47	R36	1K82	RESISTOR 1% 1/4W	PHILIPS	1
48	R37	1K82	RESISTOR 1% 1/4W	PHILIPS	1
49	R38	8M25	RESISTOR 1% 1/4W	PHILIPS	1
50	R39	47K5	RESISTOR 1% 1/4W	PHILIPS	1

PART NO.: P-82513  
DESC....: REGULATION MODULE

MPS 854, SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
51	R40	825R	RESISTOR 1% 1/4W	PHILIPS	1
52	R41	10K	RESISTOR 1% 1/4W	PHILIPS	1
53	R42	10R	RESISTOR 1% 1/4W	PHILIPS	1
54	R43	1K	RESISTOR 1% 1/4W	PHILIPS	1
55	R44	2K21	RESISTOR 1% 1/4W	PHILIPS	1
56	R45	4K75	RESISTOR 1% 1/4W	PHILIPS	1
57	R46	2K21	RESISTOR 1% 1/4W	PHILIPS	1
58	R47	4K75	RESISTOR 1% 1/4W	PHILIPS	1
59	R48	82K5	RESISTOR 1% 1/4W	PHILIPS	1
60	R49	82K5	RESISTOR 1% 1/4W	PHILIPS	1
61	R50	1K	RESISTOR 1% 1/4W	PHILIPS	1
62	R51	1K	RESISTOR 1% 1/4W	PHILIPS	1
63	R52	10K	RESISTOR 1% 1/4W	PHILIPS	1
64	R53	10K	RESISTOR 1% 1/4W	PHILIPS	1
65	R54	475K	RESISTOR 1% 1/4W	PHILIPS	1
66	R55	1R	RESISTOR 1% 1/4W	PHILIPS	1
67	R56	1K21	RESISTOR 1% 1/4W	PHILIPS	1
68	R57	NOT USED	OPEN CIRCUIT		1
69	R58	681R	RESISTOR 1% 1/4W	PHILIPS	1
70	R59	0R	RESISTOR 1/4W	PHILIPS	1
71	CX1	EAL 470u-40	CAP. ELEC. 470uF 40V	FRAKO	1
72	CX2	EAL 470u-40	CAP. ELEC. 470uF 40V	FRAKO	1
73	CX3	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
74	CX4	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
75	CX5	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
76	CX6	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
77	CX7	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
78	CX8	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
79	CX9	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
80	CX10	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
81	CX11	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
82	C1	MKT 15n-63	CAP. MKT 15n 10% 63V RM=5	SIEMENS	1
83	C2	MKT 2u2-63	CAP. MKT 2u2 10% 63V RM=22.5	PHILIPS	1
84	C3	MKT 1n5-63	CAP. MKT 1n5 10% 63V RM=5	THOMSON	1
85	C4	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
86	C5	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
87	C6	MKT 470n-63	CAP. MKT 470n 10% 63V RM=5	SIEMENS	1
88	C7	EAL 10u-25	CAP. ELEC. 10uF 25V, ø5	FRAKO	1
89	C8	EAL 10u-25	CAP. ELEC. 10uF 25V, ø5	FRAKO	1
90	C9	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
91	C10	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
92	C11	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
93	C12	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
94	C13	CER 220n-50	CAP. CER 220n 20% 50V	AVX	1
95	C14	MKT 220n-63	CAP. MKT 220n 10% 63V RM=5	SIEMENS	1
96	C15	MKT 220n-63	CAP. MKT 220n 10% 63V RM=5	SIEMENS	1
97	D1	W04M	DIODE BRIDGE 1.5A 400V	GI	1
98	D2	1N 4007	DIODE 1000V 1A	THOMSON	1
99	D3	1N 4007	DIODE 1000V 1A	THOMSON	1
100	D4	1N 4007	DIODE 1000V 1A	THOMSON	1

PART NO.: P-82513  
DESC....: REGULATION MODULE

MPS 854, SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
101	D5	1N 4007	DIODE 1000V 1A	THOMSON	1
102	D6	1N 4148	DIODE 75V 75mA	THOMSON	1
103	D7	1N 4148	DIODE 75V 75mA	THOMSON	1
104	D8	BZX 83 C 18	DIODE, ZENER 18V 500mW	THOMSON	1
105	D9	BZX 83 C 18	DIODE, ZENER 18V 500mW	THOMSON	1
106	D10	BZX 83 C 6V2	DIODE, ZENER 6,2V 500mW	THOMSON	1
107	D11	BZX 83 C 6V2	DIODE, ZENER 6,2V 500mW	THOMSON	1
108	D12	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
109	D13	LED ø2.9-Y	LED ø2.9mm YELLOW	AEG	1
110	D14	1N 4007	DIODE 1000V 1A	THOMSON	1
111					-
112	IC1	uA 7815C	VOLTAGE REGULATOR, POS 15V 1A	TEXAS	1
113	IC2	uA 7915C	VOLTAGE REGULATOR, NEG 15V 1A	TEXAS	1
114	IC3	uA 78L05A	VOLTAGE REGULATOR, POS 5V .1A	TEXAS	1
115	IC4	ULN 2803A	TRANSISTOR ARRAY, DAR. NPN CE	SGS	1
116	IC5	ULN 2803A	TRANSISTOR ARRAY, DAR. NPN CE	SGS	1
117	IC6	ULN 2803A	TRANSISTOR ARRAY, DAR. NPN CE	SGS	1
118	IC7	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
119	IC8	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
120	IC9	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
121	IC10	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
122	IC11	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
123	IC12	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
124	IC13	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
125	IC14	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
126	IC15	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
127	IC16	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
128	IC17	uA 7815C	VOLTAGE REGULATOR, POS 15V 1A	TEXAS	1
129	IC18	uA 7915C	VOLTAGE REGULATOR, NEG 15V 1A	TEXAS	1
130	IC20	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
131	IC21	IL-CT 6	DUAL OPTOCOUPLER, DIL	SIEMENS	1
132					-
133					-
134	A1	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1
135	A2	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1
136	A3	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1
137	A4	LM 675	20W POWER AMPLIFIER	NSC	1
138	A5	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1
139	A6	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1
140	A7	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1
141					-
142					-
143					-
144					-
145	JMP1	CON TR 04HSS	ROW CON HEADER SOLDER 04P SIL	SOURIAU	1
146	JMP2	CON TR 03HSS	ROW CON HEADER SOLDER 03P SIL	SOURIAU	1
147		O-SHUNT TR	OPEN SHUNT FOR TR CONNECTOR,Au	SOURIAU	2
148					-
149	L1	CHOKE 5uH-1	INDUKTOR 5uH 1.5Amp	OVERGRD	1
150					-

PART NO.: P-82513  
DESC....: REGULATION MODULE

MPS 854, SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
151	P1	CON DI644PMA	DIN-PLUG MALE ANG 64C A-C	SOURIAU	1
152	P2	CON DB 25SA	D-SUB CON FEMALE ANG 25 POLE	SOURIAU	1
153	P3	CON DC 37SF	D-SUB CON FEMALE FC 37 POLE	SOURIAU	1
154		F-SCREW M3-2	D-SUB FEMALE SCREW LOCK M3x13	SOURIAU	2
155		F-SCREW M3-2	D-SUB FEMALE SCREW LOCK M3x13	SOURIAU	2
156	TR1	TRAFO-11594	2x18V, 2x18V, 2VA	OVERGRD	1
157	Q1	BC 237B	TRANSISTOR, NPN 45V 100mA	SIEMENS	1
158	Q2	BC 237B	TRANSISTOR, NPN 45V 100mA	SIEMENS	1
159		P-87028	HEATSINK 1, TRANSDUCER ELEC.	DF	1
160		P-87102	HEATSINK, REG. MODULE	DF	1
161	TP1-9	RIVET ø1.0	RIVET ø1.0x8.5 FOR PCB		11
162	STJ1	RIVET ø1.0	RIVET ø1.0x8.5 FOR PCB		1
163		S-INS. 220	SILICONE INSULATOR, TO-220	ALUTRON	5
164		BUSHING 220	INSULATING BUSHING, TO-220	MEC	5
165		SOCKET DIL18	SOCKET FOR 18 LEAD DIL, SOLDER	SWISS	3
166		SOCKET DIL16	SOCKET FOR 16 LEAD DIL, SOLDER	SWISS	5
167		SOCKET DIL 8	SOCKET FOR 8 LEAD DIL, SOLDER	SWISS	8
168	Q3	BC 546B	TRANSISTOR, NPN 80V 100mA	SIEMENS	1
169	RL1	RE RD2N-24	RELAY 2XCO 24VDC 1.25A DIL	IZUMI	1
170					-
171		DP ø3.2x5 N	DISTANCE PIPE ø3.2x5 BRASS Ni	ASSMANN	2
172					-
173		PHJX Z M3x40	SCREW M3x40 Zn PLATED, DIN7985	HFC	2
174		PHJX Z M3x16	SCREW M3x16 Zn PLATED, DIN7985	HFC	5
175		PHJX Z M3x10	SCREW M3x10 Zn PLATED, DIN7985	HFC	2
176		MSM N M3	NUT M3 Ni PLATED, DIN 934	HFC	9
177		SSS Z ø3.2	L-WASHER ø3.2 EL Zn, DIN 6798A	HFC	9
178		SBN ø3.2	WASHER ø3.2 NYLON, DIN 125A	HFC	4
179		DP ø3.2x10	DISTANCE PIPE ø3.2x10 BRASS Ni	ASSMANN	4
180		PHJX Z M3x25	SCREW M3x25 Zn PLATED, DIN7985	HFC	4
181		DP ø3.2x5 N	DISTANCE PIPE ø3.2x5 BRASS Ni	ASSMANN	2

PART NO.: P-82611

DESC....: DRIVER BOOSTER BOARD

MPS 854, SYSTEM 8000

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
1		DWG 82612	DRIVER BOOSTER BOARD, SCHEM.	DF	1
2		DWG 82611	DRIVER BOOSTER BOARD, ASSY	DF	1
3		PCB 82613	DRIVER BOOSTER BOARD, PCB	DF	1
4					-
5					-
6					-
7					-
8	R1	100R 5W	RESISTOR 5% 5W	VITROHM	1
9	R2	1R 5W	RESISTOR 10% 5W	VITROHM	1
10	R3	1R 5W	RESISTOR 10% 5W	VITROHM	1
11	R4	82R 5W	RESISTOR 5% 5W	VITROHM	1
12	R5	4R7 1.6W	RESISTOR 5% 1.6W	PHILIPS	1
13	R6	4R7 1.6W	RESISTOR 5% 1.6W	PHILIPS	1
14	R7	475R	RESISTOR 1% 1/4W	PHILIPS	1
15	R8	47R5	RESISTOR 1% 1/4W	PHILIPS	1
16					-
17					-
18					-
19					-
20	C1	MKT 4u7-100	CAP. MKT 4u7 10% 100V RM=	PHILIPS	1
21	C2	MKT 4u7-100	CAP. MKT 4u7 10% 100V RM=	PHILIPS	1
22	C3	MKT 4u7-100	CAP. MKT 4u7 10% 100V RM=	PHILIPS	1
23	C4	MKT 4u7-100	CAP. MKT 4u7 10% 100V RM=	PHILIPS	1
24	C5	MKT 4u7-100	CAP. MKT 4u7 10% 100V RM=	PHILIPS	1
25	C6	MKT 220n-63	CAP. MKT 220n 10% 63V RM=5	SIEMENS	1
26	C7	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
27	C8	MKT 4u7-100	CAP. MKT 4u7 10% 100V RM=	PHILIPS	1
28	C9	MKT 4u7-100	CAP. MKT 4u7 10% 100V RM=	PHILIPS	1
29					-
30					-
31					-
32	P1	CON MTA 08HS	MTA CON HEADER SOLDER 08P DIL	AMP	1
33	P2	CON MTA 08HS	MTA CON HEADER SOLDER 08P DIL	AMP	1
34	P3	RIVET ø1.0	RIVET ø1.0x8.5 FOR PCB		1
35	P4	RIVET ø1.0	RIVET ø1.0x8.5 FOR PCB		1
36	P5	RIVET ø1.0	RIVET ø1.0x8.5 FOR PCB		1
37	P6	RIVET ø1.0	RIVET ø1.0x8.5 FOR PCB		1
38					-
39					-
40					-
41		FW 3 75-0	FLEX WIRE 0.75 L=75mm, ORANGE	DF	2
42		FW 3 75-W	FLEX WIRE 0.75 L=75mm, WHITE	DF	2
43		PEARL S ø4	STEATIT PEARL ø4xø1.3x3.5		16



## P A R T S L I S T

PAGE : 1

ISSUE : 1

PART NO.: P-82640

DESC.....: TRANS. BANK BOARD, Re=OR056, 17 TRANS  
 BOARD FOR AUTOSIKRING OG 1mm TRANS. BEN  
 MPS 853/854, SYSTEM 8000

STOCK.NO	ITEM NO.	PART/DWG NO.	DESCRIPTION	MANUFAC.	NO. REQ
83082640		DWG 82640	TRANSISTOR BANK BOARD, ASSY	D	0,00
82082641		DWG 82641	TRANSISTOR BANK BOARD, DIAGRAM	DF	0,00
84082642		PCB 82642	TRANSISTOR BANK BOARD, PCB	DF	1,00
71080435		DWG 80435	MOUNTING RAIL FOR TRANS-BANK.	DF	1,00
11011274	R1	27R4	RESISTOR 1% 1/4W	PHILIPS	1,00
11030105	R2-18	OR056 5W	RESISTOR 5% 5W	VITROHM	17,00
11011182	R19-26	18R2	RESISTOR 1% 1/4W	PHILIPS	8,00
11012332	R27	332R	RESISTOR 1% 1/4W	PHILIPS	1,00
11011182	R28-35	18R2	RESISTOR 1% 1/4W	PHILIPS	8,00
11013130	R36-51	1K3	RESISTOR 1% 1/4W	PHILIPS	16,00
22011007	D1-34	1N 4007	DIODE 1000V 1A	THOMSON	34,00
22103201	D35-51	LED A3-R	LED AXIAL 3mm RED	ROHM	17,00
15096108	P1	CON MTA 08HS	MTA CON HEADER SOLDER 08P SIL	AMP	1,00
52262406		PHJX Z M4x6	SCREW M4x6 Zn PLATED, DIN7985	HFC	8,00
54311240		SSS Z $\phi$ 4.3	L-WASHER $\phi$ 4.3 EL Zn, DIN 6798A	HFC	8,00
65010720		FW 3 75-O	FLEX WIRE 0.75 L=75mm, ORANGE	DF	0,00
65010725		FW 3 75-W	FLEX WIRE 0.75 L=75mm, WHITE	DF	0,00
19010130		JUMPER	JUMPER MONTERINGSTRÅD		2,00
66152070		# 3522	PCB TERMINAL FOR SPADE, SOLDER	DANCONT	34,00
51020102		JACK $\phi$ 1.02	CONNECTOR JACK	CAMBION	34,00
16104000		AUTO-FUSE 10	AUTO-FUSE 10A	RS: 141	17,00

Notat til varer : P-82640

17 autosikringer

## P A R T S L I S T

PAGE : 1  
ISSUE : 1PART NO.: P-82674  
DESC.....: OPTIONAL PORT, CONTROL BOARD

## SYSTEM 8000

STOCK.NO	ITEM NO.	PART/DWG NO.	DESCRIPTION	MANUFAC.	NO. REQ
83082674		DWG 82674	OPTIONAL PORT, ASSY	DF	1,00
82082675		DWG 82675	OPTIONAL PORT, SCHEMATIC	DF	1,00
84082676		PCB 82676	OPTIONAL PORT, PCB	DF	1,00
11071347	RM1	8X4K7 SMD	SIL SMD 4K7	ROHM	1,00
15100414	JP1	SOCKET SMD14	SOCKET FOR 14 LEAD SMD, SOLDER	ÅRL	1,00
15042810	JP2	CON SMD 10S	HEADER 10 POL FC STRAIGHT	ÅRL	1,00
30029000	U1	PC 74HCT00T	IC PC74HCT00T SMD SO-14	PHILIPS	1,00
30029574	U2	PC74HCT574T	IC PC74HCT574T SMD	PHILIPS	1,00
30029541	U3	PC74HCT541T	IC PC74HCT541T SMD	PHILIPS	1,00
12052510	CX1	CER 100n SMD	CAP.CER.100n 50V Z5U/1206	MURATA:	1,00
12052510	CX2	CER 100n SMD	CAP.CER.100n 50V Z5U/1206	MURATA:	1,00
12052510	CX3	CER 100n SMD	CAP.CER.100n 50V Z5U/1206	MURATA:	1,00

Notat til varer : P-82674

PART NO.: P-88078  
 DESC.....: COMPENSATION AMPLIFIER, 10kA  
 PCB ASSY  
 ULTRASTAB 861R

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
1		DWG 88078	COMPENSATION AMP. 10kA, ASSY	DF	1
2		DWG 88079	COMPENSATION AMP. 10kA, SCHEM.	DF	1
3		PCB 88080	COMPENSATION AMP. 10kA, PCB	DF	1
4		P-88105	HEATSINK FOR COMP. AMPLIFIER	DF	1
5					-
6					-
7					-
8					-
9					-
10	R1	10K	RESISTOR 1% 1/4W	PHILIPS	1
11	R2	3K92	RESISTOR 1% 1/4W	PHILIPS	1
12	R3	10K	RESISTOR 1% 1/4W	PHILIPS	1
13	R4	3K92	RESISTOR 1% 1/4W	PHILIPS	1
14	R5	2K	RESISTOR 1% 1/4W	PHILIPS	1
15	R6	33K2	RESISTOR 1% 1/4W	PHILIPS	1
16	R7	10K	RESISTOR 1% 1/4W	PHILIPS	1
17	R8	2R21	RESISTOR 1% 1/4W	PHILIPS	1
18	R9	2R21	RESISTOR 1% 1/4W	PHILIPS	1
19	R10	2R21	RESISTOR 1% 1/4W	PHILIPS	1
20	R11	2R21	RESISTOR 1% 1/4W	PHILIPS	1
21	R12	2R21	RESISTOR 1% 1/4W	PHILIPS	1
22	R13	2K	RESISTOR 1% 1/4W	PHILIPS	1
23					-
24					-
25					-
26					-
27					-
28	C1	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
29	C2	CER 10p-100	CAP. CER 10p 5% 100V	SIEMENS	1
30	C3	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
31	C4	EAL 1u0-100	CAP. ELEC. 1u 100V, ø5	FRAKO	1
32	C5	CER 100p-100	CAP. CER 100p 5% 100V	SIEMENS	1
33	C6	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
34	C7	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
35	C8	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
36	C9	EAL 22uF-100	CAP. ELEC. 22uF 100V, ø9	PHILIPS	1
37					-
38					-
39					-
40					-
41					-
42	IC1	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1
43	IC2	LF 356	OP-AMP, SINGLE JFET DIL	THOMSON	1
44	IC3	PB 58	POWER BOOST. AMP	APEX	1
45					-
46					-
47	P1	CON TR 02HSS	ROW CON HEADER SOLDER 02P SIL	CONNECT	1
48	P2	CON TR 03HSS	ROW CON HEADER SOLDER 03P SIL	CONNECT	1
49	P3	CON TR 04HSS	ROW CON HEADER SOLDER 04P SIL	CONNECT	1
50	P4-7	RIVET ø1.0	RIVET ø1.0x8.5 FOR PCB		4

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PART NO.: P-88078  
DESC....: COMPENSATION AMPLIFIER, 10KA  
PCB ASSY  
ULTRASTAB 861R  
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POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
51		PHJX Z M3x20	SCREW M3x20 Zn PLATED, DIN7985	HFC	2
52		MSM N M3	NUT M3 Ni PLATED, DIN 934	HFC	4
53		SBJ Z ø3.2	WASHER ø3.2 Zn PLATED, DIN 433	HFC	2

PART NO.: P-88081  
 DESC.....: VOLTAGE REGULATION, 10kA  
 PCB ASSY  
 ULTRASTAB 861R

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
1		DWG 88081	VOLTAGE REGUL. 10kA, ASSY	DF	1
2		DWG 88082	VOLTAGE REGUL. 10kA, SCHEM.	DF	1
3		PCB 88083	VOLTAGE REGUL. 10kA, PCB	DF	1
4		P-88106	HEATSINK FOR VOLTAGE REGUL.	DF	1
5					-
6					-
7					-
8					-
9					-
10	R1	9X10K	RESISTOR ARRAY 9X10K 5%, SIL	ROHM	1
11	R2	9X10K	RESISTOR ARRAY 9X10K 5%, SIL	ROHM	1
12	R3	10K	RESISTOR 1% 1/4W	PHILIPS	1
13	R4	5K11	RESISTOR 1% 1/4W	PHILIPS	1
14	R5	2K	RESISTOR 1% 1/4W	PHILIPS	1
15	R6	36K5	RESISTOR 1% 1/4W	PHILIPS	1
16	R7	10R	RESISTOR 1% 1/4W	PHILIPS	1
17	R8	100K	RESISTOR 1% 1/4W	PHILIPS	1
18	R9	10R 1.6W	RESISTOR 5% 1.6W	PHILIPS	1
19	R10	1R5 5W	RESISTOR 10% 5W	VITROHM	1
20	R11	100R	RESISTOR 1% 1/4W	PHILIPS	1
21	R12	20K	RESISTOR 1% 1/4W	PHILIPS	1
22	R13	10K	RESISTOR 1% 1/4W	PHILIPS	1
23					-
24					-
25					-
26					-
27					-
28	C2	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1
29	C3	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
30	C4	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
31	C5	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1
32					-
33					-
34					-
35					-
36					-
37	D1	1N 4007	DIODE 1000V 1A	THOMSON	1
38	D2	1N 4007	DIODE 1000V 1A	THOMSON	1
39					-
40	RL1	RE D2 2CM-24	MINI RELAY 2XCO 24VDC 2A	SIEMENS	1
41					-
42	1	ULN 2003A	TRANSISTOR ARRAY, DAR. NPN CE	TEXAS	1
43	IC1	ULN 2003A	TRANSISTOR ARRAY, DAR. NPN CE	TEXAS	1
44	IC2	REF-102	PRECISION 10V REFERENCE	BB REF	1
45	IC3	DAC 08E	8-BIT DAC	MOT	1
46	IC4	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1
47					-
48					-
49	P1	CON TR 09HSS	ROW CON HEADER SOLDER 09P SIL	CONNECT	1
50	P2-4	RIVET ø1.0	RIVET ø1.0x8.5 FOR PCB		3

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 PART NO.: P-88081  
 DESC....: VOLTAGE REGULATION, 10kA  
 PCB ASSY  
 ULTRASTAB 861R  
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POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
51	P5	CON TR 02HSS	ROW CON HEADER SOLDER 02P SIL	CONNECT	1
52	P6-8	RIVET $\phi 1.0$	RIVET $\phi 1.0 \times 8.5$ FOR PCB		3
53	P9	CON TR 02HSS	ROW CON HEADER SOLDER 02P SIL	CONNECT	1
54	P10	CON TR 02HSS	ROW CON HEADER SOLDER 02P SIL	CONNECT	1
55	P11	RIVET $\phi 1.0$	RIVET $\phi 1.0 \times 8.5$ FOR PCB		1
56	P12	CON TR 04HSS	ROW CON HEADER SOLDER 04P SIL	CONNECT	1
57	P13	CON TR 04HSS	ROW CON HEADER SOLDER 04P SIL	CONNECT	1
58	P14	NOT USED	OPEN CIRCUIT		1
59	P15	NOT USED	OPEN CIRCUIT		1
60					-
61					-
62	T1	2N 2907A	TRANSISTOR, PNP 60V 600mA	PHILIPS	1
63	T2	BDX 33C	TRANSISTOR, DAR. NPN 100V 10A	MOT	1
64	T3	2N 3773	TRANSISTOR, NPN 140V 16A	MOT	1
65					-
66					-
67					-
68		PHJX Z M3x8	SCREW M3x8 Zn PLATED, DIN7985	HFC	1
69		PHJX Z M3x16	SCREW M3x16 Zn PLATED, DIN7985	HFC	2
70		PHJX Z M3x20	SCREW M3x20 Zn PLATED, DIN7985	HFC	4
71		MSM N M3	NUT M3 Ni PLATED, DIN 934	HFC	2
72		SBJ Z $\phi 3.2$	WASHER $\phi 3.2$ Zn PLATED, DIN 433	HFC	2
73		SBN $\phi 3.2$	WASHER $\phi 3.2$ NYLON, DIN 125A	HFC	8
74		SBNL $\phi 3.2$	L-WASHER $\phi 3.2$ NYLON, DIN 125A	HFC	4
75		RIVET 4023	SOLDER-LUG $\phi 3.2$ mm	F. R-P	1
75		DP $\phi 3.6 \times 10$	DIST. PIPE $\phi 3.6 \times 10$ , POLYSTYROL	ASSMANN	4
76		HS TUBE $\phi 2$ -B	HEAT SHRINKABLE TUBE $\phi 2$ mm B	R. FLEX	0.05

## P A R T S L I S T

PAGE : 1  
ISSUE : 5PART NO.: P-88101  
DESC.....: TRANSDUCER ELEC. 600/2000A  
PCB ASSY  
ULTRASTAB 861R

POS.NO	ITEM NO.	PART/DWG NO.	DESCRIPTION	MANUFAC.	NO. REQ
1		DWG 88101	TRANSDUCER ELEC 600/2000A ASSY	DF	1,00
2		DWG 88100	TRANSDUCER ELEC 600/2000A SCH	DF	1,00
3		PCB 82026	TRANSDUCER ELEC. 600/2000A PCB	DF	1,00
4		P-88038	HEATSINK, OUTPUT AMPLIFIER	DF	1,00
5		P-81875	HEATSINK 3	DF	1,00
6		P-88033	HEATSINK, VOLTAGE REG.	DF	1,00
7		P-88034	HEATSINK, COMPENSATION AMP.	DF	1,00
8		P-88035	HEATSINK, TEMP. REGULATOR	DF	1,00
9		P-88036	HEATSINK, PELTIER ELEMENT	DF	1,00
16	R1	15K	RESISTOR 1% 1/4W	PHILIPS	1,00
17	R2	15K	RESISTOR 1% 1/4W	PHILIPS	1,00
18	R3	5K62	RESISTOR 1% 1/4W	PHILIPS	1,00
19	R4	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
20	R5	100R 2W	RESISTOR 5% 2W	PHILIPS	1,00
21	R6	100R 2W	RESISTOR 5% 2W	PHILIPS	1,00
22	R7	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
23	R8	475R	RESISTOR 1% 1/4W	PHILIPS	1,00
24	R9	475R	RESISTOR 1% 1/4W	PHILIPS	1,00
25	R10	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
26	R11	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
27	R12	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
28	R13	5K62	RESISTOR 1% 1/4W	PHILIPS	1,00
29	R14	5K62	RESISTOR 1% 1/4W	PHILIPS	1,00
30	R15	3K92	RESISTOR 1% 1/4W	PHILIPS	1,00
31	R16	3K92	RESISTOR 1% 1/4W	PHILIPS	1,00
32	R17	3K92	RESISTOR 1% 1/4W	PHILIPS	1,00
33	R18	100R	RESISTOR 1% 1/4W	PHILIPS	1,00
34	R19	NOT USED	OPEN CIRCUIT		1,00
35	R20	NOT USED	OPEN CIRCUIT		1,00
36	R21	NOT USED	OPEN CIRCUIT		1,00
37	R22	NOT USED	OPEN CIRCUIT		1,00
38	R23	475R	RESISTOR 1% 1/4W	PHILIPS	1,00
39	R24	82R 2W	RESISTOR 5% 2W	PHILIPS	1,00
40	R25	475R	RESISTOR 1% 1/4W	PHILIPS	1,00
41	R26	NOT USED	OPEN CIRCUIT		1,00
42	R27	2K74	RESISTOR 1% 1/4W	PHILIPS	1,00
43	R28	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
44	R29	5K62	RESISTOR 1% 1/4W	PHILIPS	1,00
45	R30	22K1	RESISTOR 1% 1/4W	PHILIPS	1,00
46	R31	82R 2W	RESISTOR 5% 2W	PHILIPS	1,00
47	R32	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
48	R33	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
49	R34	1K21	RESISTOR 1% 1/4W	PHILIPS	1,00
50	R35	221R	RESISTOR 1% 1/4W	PHILIPS	1,00
51	R36	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
52	R37	56R2	RESISTOR 1% 1/4W	PHILIPS	1,00
53	R38	33R2	RESISTOR 1% 1/4W	PHILIPS	1,00
54	R39	2K21	RESISTOR 1% 1/4W	PHILIPS	1,00

## P A R T S L I S T

PAGE : 2

ISSUE : 5

PART NO.: P-88101  
 DESC.....: TRANSDUCER ELEC. 600/2000A  
 PCB ASSY  
 ULTRASTAB 861R

POS.NO	ITEM NO.	PART/DWG NO.	DESCRIPTION	MANUFAC.	NO. REQ
55	R40	2K21	RESISTOR 1% 1/4W	PHILIPS	1,00
56	R41	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
57	R42	NOT USED	OPEN CIRCUIT		1,00
58	R43	33R2	RESISTOR 1% 1/4W	PHILIPS	1,00
59	R44	33R2	RESISTOR 1% 1/4W	PHILIPS	1,00
60	R45	2K21	RESISTOR 1% 1/4W	PHILIPS	1,00
61	R46	2K43	RESISTOR 1% 1/4W	PHILIPS	1,00
62	R47	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
63	R48	3K32	RESISTOR 1% 1/4W	PHILIPS	1,00
64	R49	30K1	RESISTOR 1% 1/4W	PHILIPS	1,00
65	R50	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
66	R51	100R	RESISTOR 1% 1/4W	PHILIPS	1,00
67	R52	8M25	RESISTOR 1% 1/4W	PHILIPS	1,00
68	R53	33K2	RESISTOR 1% 1/4W	PHILIPS	1,00
69	R54	825R	RESISTOR 1% 1/4W	PHILIPS	1,00
70	R55	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
71	R56	10R	RESISTOR 1% 1/4W	PHILIPS	1,00
72	R57	15K	RESISTOR 1% 1/4W	PHILIPS	1,00
73	R58	2K21	RESISTOR 1% 1/4W	PHILIPS	1,00
74	R59	1K1	RESISTOR 1% 1/4W	PHILIPS	1,00
75	R60	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
76	R61	221K	RESISTOR 1% 1/4W	PHILIPS	1,00
77	R62	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
78	R63	221K	RESISTOR 1% 1/4W	PHILIPS	1,00
79	R64	15K	RESISTOR 1% 1/4W	PHILIPS	1,00
80	R65	2K21	RESISTOR 1% 1/4W	PHILIPS	1,00
81	R66	1K1	RESISTOR 1% 1/4W	PHILIPS	1,00
82	R67	182R	RESISTOR 1% 1/4W	PHILIPS	1,00
83	R68	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
84	R69	100R	RESISTOR 1% 1/4W	PHILIPS	1,00
85	R70	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
86	R71	10M	RESISTOR 1% 1/4W	PHILIPS	1,00
87	R72	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
88	R73	NOT USED	OPEN CIRCUIT		1,00
89	R74	150K	RESISTOR 1% 1/4W	PHILIPS	1,00
90	R75	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
91	R76	100R	RESISTOR 1% 1/4W	PHILIPS	1,00
92	R77	221R	RESISTOR 1% 1/4W	PHILIPS	1,00
93	R78	2K21	RESISTOR 1% 1/4W	PHILIPS	1,00
94	R79	121R	RESISTOR 1% 1/4W	PHILIPS	1,00
95	R80	39R2	RESISTOR 1% 1/4W	PHILIPS	1,00
96	R81	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
97	R82	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
98	R83	39R2	RESISTOR 1% 1/4W	PHILIPS	1,00
99	R84	121R	RESISTOR 1% 1/4W	PHILIPS	1,00
100	R85	1K3	RESISTOR 1% 1/4W	PHILIPS	1,00
101	R86	TBD	TO BE DEFINED		1,00
102	R87	TBD	TO BE DEFINED		1,00
103	R88	0.5R*0.1% Z	RESISTOR ZERANIN 0.5R 0.1%	ISABELL	1,00
104	R89	1K*0.02%	PRECISION RESISTOR	VISHAY	1,00
105	R90	1K*0.02%	PRECISION RESISTOR	VISHAY	1,00



## P A R T S L I S T

PAGE : 3  
ISSUE : 5PART NO.: P-88101  
DESC.....: TRANSDUCER ELEC. 600/2000A  
PCB ASSY  
ULTRASTAB 861R

POS.NO	ITEM NO.	PART/DWG NO.	DESCRIPTION	MANUFAC.	NO. REQ
106	R91	4K75	RESISTOR 1% 1/4W	PHILIPS	1,00
107	R92	M-TRIM 500-2	MULTITURN TRIMPOT 500R 10%	VISHAY	1,00
108	R93	4K75	RESISTOR 1% 1/4W	PHILIPS	1,00
109	R94	475R	RESISTOR 1% 1/4W	PHILIPS	1,00
110	R95	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
111	R96	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
112	R97	10K018*0.02%	PRECISION RESISTOR	VISHAY	1,00
113	R98	10K018*0.02%	PRECISION RESISTOR	VISHAY	1,00
114	R99	9K09	RESISTOR 1% 1/4W	PHILIPS	1,00
115	R100	56R2	RESISTOR 1% 1/4W	PHILIPS	1,00
116	R101	150K	RESISTOR 1% 1/4W	PHILIPS	1,00
117	R102	20K	RESISTOR 1% 1/4W	PHILIPS	1,00
118	R103	20K	RESISTOR 1% 1/4W	PHILIPS	1,00
119	R104	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
120	R105	2M21	RESISTOR 1% 1/4W	PHILIPS	1,00
121	R106	15K	RESISTOR 1% 1/4W	PHILIPS	1,00
122	R107	2K21	RESISTOR 1% 1/4W	PHILIPS	1,00
123	R108	1K3	RESISTOR 1% 1/4W	PHILIPS	1,00
124	R109	1K3	RESISTOR 1% 1/4W	PHILIPS	1,00
125	R110	10K	RESISTOR 1% 1/4W	PHILIPS	1,00
126	R111	2M21	RESISTOR 1% 1/4W	PHILIPS	1,00
127	R112	2K21	RESISTOR 1% 1/4W	PHILIPS	1,00
128	R113	15K	RESISTOR 1% 1/4W	PHILIPS	1,00
129	R114	22K1	RESISTOR 1% 1/4W	PHILIPS	1,00
130	R115	22K1	RESISTOR 1% 1/4W	PHILIPS	1,00
131	R116	1M5	RESISTOR 1% 1/4W	PHILIPS	1,00
132	R117	M-TRIM 5K-1	MULTITURN TRIMPOT 5K 0.75W	BOURNS	1,00
133	R118	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
134	R119	1K	RESISTOR 1% 1/4W	PHILIPS	1,00
135	R120	1K5	RESISTOR 1% 1/4W	PHILIPS	1,00
136	R121	1K5	RESISTOR 1% 1/4W	PHILIPS	1,00
137	R122	NOT USED	OPEN CIRCUIT		1,00
138	R123	NOT USED	OPEN CIRCUIT		1,00
139	R124	4K75	RESISTOR 1% 1/4W	PHILIPS	1,00
140	R125	4K75	RESISTOR 1% 1/4W	PHILIPS	1,00
141	R126	NOT USED	OPEN CIRCUIT		1,00
142	R127	NOT USED	OPEN CIRCUIT		1,00
143	R128	1R	RESISTOR 1% 1/4W	PHILIPS	1,00
144	C1	CER 2n2-50	CAP. CER 2n2 10% 50V	AVX	1,00
145	C2	MKT 10n-63	CAP. MKT 10n 10% 63V RM=5	SIEMENS	1,00
146	C3	MKT 2u2-100	CAP. MKT 2u2 10% 100V RM=15	PHILIPS	1,00
147	C3A	MKT 2u2-100	CAP. MKT 2u2 10% 100V RM=15	PHILIPS	1,00
148	C4	SAL 10u-16	CAP. SOLID AL 10u 16V 20% RM=5	PHILIPS	1,00
149	C5	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
150	C6	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1,00
151	C7	SAL 10u-16	CAP. SOLID AL 10u 16V 20% RM=5	PHILIPS	1,00
152	C8	MKT 10n-63	CAP. MKT 10n 10% 63V RM=5	SIEMENS	1,00
153	C9	MKT 47n-63	CAP. MKT 47n 10% 63V RM=5	SIEMENS	1,00
154	C10	MKT 47n-63	CAP. MKT 47n 10% 63V RM=5	SIEMENS	1,00
155	C11	MKT 47n-63	CAP. MKT 47n 10% 63V RM=5	SIEMENS	1,00
156	C12	CER 100n-50	CAP. CER 100n 20% 50V	AVX	1,00

## P A R T S L I S T

PAGE : 4

ISSUE : 5

PART NO.: P-88101  
 DESC....: TRANSDUCER ELEC. 600/2000A  
 PCB ASSY  
 ULTRASTAB 861R

POS.NO	ITEM NO.	PART/DWG NO.	DESCRIPTION	MANUFAC.	NO. REQ
157	C13	CER 10n-50	CAP. CER 10n 10% 50V	AVX	1,00
158	C14	NOT USED	OPEN CIRCUIT		1,00
159	C15	NOT USED	OPEN CIRCUIT		1,00
160	C16	NOT USED	OPEN CIRCUIT		1,00
161	C17	NOT USED	OPEN CIRCUIT		1,00
162	C18	SAL 10u-16	CAP. SOLID Al 10u 16V 20% RM=5	PHILIPS	1,00
163	C19	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
164	C20	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
165	C21	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
166	C22	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1,00
167	C23	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
168	C24	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
169	C25	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
170	C26	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
171	C27	MKT 330n-63	CAP. MKT 330n 10% 63V RM=5	SIEMENS	1,00
172	C28	MKT 330n-63	CAP. MKT 330n 10% 63V RM=5	SIEMENS	1,00
173	C29	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
174	C30	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
175	C31	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
176	C32	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1,00
177	C33	CER 1u0-50	CAP. CER 1u0 20% 50V	AVX	1,00
178	C34	EVL 22u-35	CAP. ELEC. 22uF 35V $\phi$ 5mm	PHILIPS	1,00
179	C35	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
180	C36	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
181	C37	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
182	C38	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1,00
183	C39	CER 470p-63	CAP. CER 470p 5% 763	SIEMENS	1,00
184	C40	EVL 15mF-25	CAP. ELEC. 15000uF 25V, $\phi$ 40	RIFA	1,00
185	C41	EVL 15mF-25	CAP. ELEC. 15000uF 25V, $\phi$ 40	RIFA	1,00
186	C42	EVL 22u-35	CAP. ELEC. 22uF 35V $\phi$ 5mm	PHILIPS	1,00
187	C43	EVL 22u-35	CAP. ELEC. 22uF 35V $\phi$ 5mm	PHILIPS	1,00
188	C44	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
189	C45	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1,00
190	C46	EAL 10u-63	CAP. ELEC. 10uF 63V, $\phi$ 4,5x10	PHILIPS	1,00
191	C47	EAL 10u-63	CAP. ELEC. 10uF 63V, $\phi$ 4,5x10	PHILIPS	1,00
192	C48	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
193	C49	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
194	C50	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
195	C51	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
196	C52	EAL 4700u-40	CAP. ELEC. 4700uF 40V, $\phi$ 21x40	PHILIPS	1,00
197	C53	EAL 4700u-40	CAP. ELEC. 4700uF 40V, $\phi$ 21x40	PHILIPS	1,00
198	C54	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1,00
199	C55	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
200	C56	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
201	C57	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
202	C58	CER 3n3-50	CAP. CER 3n3 10% 50V	AVX	1,00
203	C59	MKT 100n-63	CAP. MKT 100n 10% 63V RM=5	SIEMENS	1,00
204	C60	CER 220n-50	CAP. CER 220n 20% 50V	AVX	1,00
206	RL1	RE RD2N-24	RELAY 2XCO 24VDC 1.25A DIL	IZUMI	1,00
207	RL2	RE RD2N-24	RELAY 2XCO 24VDC 1.25A DIL	IZUMI	1,00
208	RL3	NOT USED	OPEN CIRCUIT		1,00

## P A R T S L I S T

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ISSUE : 5

PART NO.: P-88101  
 DESC.....: TRANSDUCER ELEC. 600/2000A  
 PCB ASSY  
 ULTRASTAB 861R

POS.NO	ITEM NO.	PART/DWG NO.	DESCRIPTION	MANUFAC.	NO. REQ
210	P1	CON DA 15PA	D-SUB CON MALE ANG 15 POLE	SOURIAU	1,00
211	P2	CON DB 25PA	D-SUB CON MALE ANG 25 POLE	SOURIAU	1,00
212	P3	CON DE 09PA	D-SUB CON MALE ANG 9 POLE	SOURIAU	1,00
213	P4	CON DE 09SA	D-SUB CON FEMALE ANG 9 POLE	SOURIAU	1,00
214	P5	CON 231-12PS	SERIE 231 CON MALE STR 12 POLE	WAGO	1,00
215	P6	CON 231-12PS	SERIE 231 CON MALE STR 12 POLE	WAGO	1,00
216	P7	CON TRI 4HSS	ROW CON INS. HEADER SOL 4P SIL	SOURIAU	1,00
217	P8	CON TRI 2HSS	ROW CON INS. HEADER SOL 2P SIL	SOURIAU	1,00
218	P9	CON TRI 3HSS	ROW CON INS. HEADER SOL 3P SIL	SOURIAU	1,00
219	P10	NOT USED	OPEN CIRCUIT		1,00
220	P11	CON TR 03HSS	ROW CON HEADER SOLDER 03P SIL	SOURIAU	1,00
221	S7	CON TR 04SCS	ROW CON SOCKET CRIMP 4P SIL	SOURIAU	1,00
222		CON TRI 2HSS	ROW CON INS. HEADER SOL 2P SIL	SOURIAU	3,00
223		CON TR 02SCS	ROW CON SOCKET CRIMP 2P SIL	SOURIAU	3,00
224		CRIMP F TR	CRIMP CONNECTOR FEMALE, Au	SOURIAU	10,00
225		O-SHUNT TR	OPEN SHUNT FOR TR CONNECTOR, Au	SOURIAU	1,00
226	F1-4	FUSE 2.0A S5	FUSE 2.0A, SLOW, 125V, TR-5	WICKMAN	8,00
227		F-SOC TR-5	SOCKET FOR FUSE TR-5, PCB	WICKMAN	8,00
228	TP1-9	CON TR 09HSS	ROW CON HEADER SOLDER 09P SIL	SOURIAU	1,00
230	TP24	RIVET $\phi$ 1.0	RIVET $\phi$ 1.0x8.5 FOR PCB	F. R-P	15,00
236	Q1	2N 2222A	TRANSISTOR, NPN 40V 800mA	PHILIPS	1,00
237	Q2	2N 2222A	TRANSISTOR, NPN 40V 800mA	PHILIPS	1,00
238	Q3	2N 2907A	TRANSISTOR, PNP 60V 600mA	PHILIPS	1,00
239	Q4	2N 2907A	TRANSISTOR, PNP 60V 600mA	PHILIPS	1,00
240	Q5	2N 2222A	TRANSISTOR, NPN 40V 800mA	PHILIPS	1,00
241	Q6	BC 237B	TRANSISTOR, NPN 45V 100mA	SIEMENS	1,00
242	L1	NOT USED	OPEN CIRCUIT		1,00
243	L2	P-81802	DOUBLE CHOKE	DF	1,00
244	L3	CHOKE 5uH-1	INDUKTOR 5uH 1.5Amp	OVERGRD	1,00
245	T1	P-81801	TRANSFORMER	DF	1,00
250	D1	NOT USED	OPEN CIRCUIT		1,00
251	D2	NOT USED	OPEN CIRCUIT		1,00
252	D3	1N 4148	DIODE 75V 75mA	THOMSON	1,00
253	D4	1N 4148	DIODE 75V 75mA	THOMSON	1,00
254	D5	1N 4148	DIODE 75V 75mA	THOMSON	1,00
255	D6	1N 4148	DIODE 75V 75mA	THOMSON	1,00
256	D7	1N 4148	DIODE 75V 75mA	THOMSON	1,00
257	D8	BZX 79 C 18	DIODE, ZENER 18V 500mW	PHILIPS	1,00
258	D9	1N 4007	DIODE 1000V 1A	THOMSON	1,00
259	D10	1N 4007	DIODE 1000V 1A	THOMSON	1,00
260	D11	1N 4007	DIODE 1000V 1A	THOMSON	1,00
261	D12	1N 4007	DIODE 1000V 1A	THOMSON	1,00
262	D13	NOT USED	OPEN CIRCUIT		1,00
263	D14	NOT USED	OPEN CIRCUIT		1,00
264	D15	1N 4148	DIODE 75V 75mA	THOMSON	1,00
265	D16	1N 4148	DIODE 75V 75mA	THOMSON	1,00
266	D17	1N 4148	DIODE 75V 75mA	THOMSON	1,00
267	D18	1N 4148	DIODE 75V 75mA	THOMSON	1,00
268	D19	1N 4148	DIODE 75V 75mA	THOMSON	1,00
269	D20	1N 4007	DIODE 1000V 1A	THOMSON	1,00
270	D21	1N 4007	DIODE 1000V 1A	THOMSON	1,00

## P A R T S L I S T

PAGE : 6  
ISSUE : 5PART NO.: P-88101  
DESC.....: TRANSDUCER ELEC. 600/2000A  
PCB ASSY  
ULTRASTAB 861R

POS.NO	ITEM NO.	PART/DWG NO.	DESCRIPTION	MANUFAC.	NO. REQ
271	D22	1N 4007	DIODE 1000V 1A	THOMSON	1,00
272	D23	KBP C602	DIODE BRIDGE 6A 200V	FRONTI.	1,00
273	D24	W04M	DIODE BRIDGE 1.5A 400V	FRONTI.	1,00
274	D25	1N 4007	DIODE 1000V 1A	THOMSON	1,00
275	D26	LED $\phi$ 2.9-G	LED $\phi$ 2.9mm GREEN	AEG	1,00
276	D27	BZX 79 C 20	DIODE, ZENER 20V 500mW	THOMSON	1,00
277	D28	BZX 79 C 20	DIODE, ZENER 20V 500mW	THOMSON	1,00
278	D29	BZX 79 C 18	DIODE, ZENER 18V 500mW	PHILLIPS	1,00
279	D30	LED $\phi$ 2.9-G	LED $\phi$ 2.9mm GREEN	AEG	1,00
280	D31	LED $\phi$ 2.9-G	LED $\phi$ 2.9mm GREEN	AEG	1,00
281	D32	LED $\phi$ 2.9-G	LED $\phi$ 2.9mm GREEN	AEG	1,00
282	D33	LED $\phi$ 2.9-G	LED $\phi$ 2.9mm GREEN	AEG	1,00
283	D36	1N 4007	DIODE 1000V 1A	THOMSON	1,00
287	IC1	TLC 555CP	TIMER, SINGLE CMOS DIL	TEXAS	1,00
288	IC2	SN 74LS74A	DUAL D-TYPE FLIP-FLOP	TEXAS	1,00
289	IC3	SN 75453B	DUAL PERIPHERAL OR DRIVER	TEXAS	1,00
290	IC4	DG 390A	ANALOG SWITCH, DUAL DIL	SIL-X	1,00
291	IC5	OP-177GP	OP-AMP, SINGLE DIL	BB	1,00
292	IC6	OP-177GP	OP-AMP, SINGLE DIL	BB	1,00
293	IC7	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1,00
294	IC8	NOT USED	OPEN CIRCUIT		1,00
295	IC9	N/A	NOT APPLICABLE		0,00
296	IC10	$\mu$ A 78L05A	VOLTAGE REGULATOR, POS 5V .1A	TEXAS	1,00
297	IC11	$\mu$ A 7815C	VOLTAGE REGULATOR, POS 15V 1A	TEXAS	1,00
298	IC12	$\mu$ A 7915C	VOLTAGE REGULATOR, NEG 15V 1A	TEXAS	1,00
299	IC13	AD 590J	TEMPERATURE TRANSDUCER	ANALOG	1,00
300	IC14	TL 072C	OP-AMP, DUAL JFET DIL	TEXAS	1,00
301	IC15	LM 675	20W POWER AMPLIFIER	NSC	1,00
302	IC16	LM 333T	VOLTAGE REGULATOR, NEG VAR 3A	NSC	1,00
303	IC17	LM 350T	VOLTAGE REGULATOR, POS VAR 3A	NSC	1,00
304	IC18	OP-27G	OP-AMP, SINGLE DIL	PMI	1,00
305	IC19	OP-37G	OP-AMP, SINGLE DIL	PMI	1,00
306	IC20	TL 431CLP	PROGRAMMABLE PREC. REFERENCE	MOT	1,00
307	IC21	OP-400G	OP-AMP, QUAD DIL	PMI	1,00
308	IC22	MC 1458	OP-AMP, DUAL DIL	MOT. MC	1,00
309		BUSHING 220	INSULATING BUSHING, $\phi$ 3,5/ $\phi$ 3,1	ALUTRON	6,00
310		S-INS. 220	SILICONE INSULATOR, TO-220	ALUTRON	6,00
311		PELTIER 6-8	PELTIER ELEMENT 6.0A 8.60V	MELCOR	1,00
312		TS 2455R-60	THERMAL SWITCH 60grad C NC 10A	ELMWOOD	1,00
313		F-SCREW M3-1	D-SUB FEMALE SCREW LOCK M3x8.3	SOURIAU	8,00
314		WIRE .06-HFB	WIRE HIGHFLEX. 0.06mm <sup>2</sup> BLACK	DATWYLE	0,25
315		P-82004	S-INSULATOR, OUTPUT MODULE	DF	3,00
316	JP1	JUMPER	JUMPER		1,00
317	JP2	JUMPER	JUMPER		1,00
318	JP3	JUMPER	JUMPER		1,00
319		TYLLE $\phi$ 3 $\phi$ 5 $\phi$ 8	PVC TYLLE SORT $\phi$ 3 $\phi$ 5 $\phi$ 8 TIL T1.5		1,00

PART NO.: P-88127  
 DESC....: ULTRASTAB 861R  
 UNIT

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
1		DWG 88127	ULTRASTAB 861R, ASSY	DF	1
2		DWG 88168	ULTRASTAB ELECTRONICS, 10kA	DF	1
3		DWG 88195	ULTRASTAB 861R, MAIN SCHEMATIC	DF	1
4					1
5		DWG 87077	CUT OUT FOR D-SUB DIN	DF	1
6					-
7		P-88101	TRANSDUCER ELEC. 500/2000A	DF	1
8		P-87172	FRONT PLATE, ULTRASTAB 861R	DF	1
9		P-87171	CHASSIS, ULTRASTAB 861R	DF	1
10		P-87056	BOTTOM PLATE, ULTRASTAB 860R	DF	1
11		P-87057	TOP PLATE, ULTRASTAB 860R	DF	1
12		P-88040	HANDLE	DF	4
13		P-88171	TRANSFORMER	DF	1
14					-
15					-
16					-
17		CON DE 09PS	D-SUB CON MALE SOLD 9 POLE	SOURIAU	1
18		CON DE 09SS	D-SUB CON FEMALE SOLD 9 POLE	SOURIAU	1
19		CON DA 15SS	D-SUB CON FEMALE SOLD 15 POLE	SOURIAU	2
20		PLUG ø2-B	TEST PLUG ø2mm, BLACK	ELMA	1
21		PLUG ø2-R	TEST PLUG ø2mm, RED	ELMA	1
22		SOCKET ø2-B	TEST SOCKET ø2mm, BLACK	ELMA	1
23		SOCKET ø2-R	TEST SOCKET ø2mm, RED	ELMA	1
24		FUSE 2.0A S1	FUSE 2.0A, SLOW BLOW, 5x20mm	WERNER	3
25		LED ø2.9-G	LED ø2.9mm GREEN	AEG	2
26		LED ø2.9-R	LED ø2.9 mm RED	AEG	1
27		CON TR 02SCS	ROW CON SOCKET CRIMP 2P SIL	SOURIAU	2
28		CON TR 03SCS	ROW CON SOCKET CRIMP 3P SIL	SOURIAU	1
29		CON TR 04SCS	ROW CON SOCKET CRIMP 4P SIL	SOURIAU	2
30		CON TR 09SCS	ROW CON SOCKET CRIMP 9P SIL	SOURIAU	3
31		JACK ø1.02	CONNECTOR JACK	CAMBION	10
32		FAN 80x80-11	FAN 80x80x25 115V	SUNON	2
33		F-GUARD B-1	FINGER GUARD 3 1/8"	SUNON	2
34		T SWITCH 1x2	TOGGLE SWITCH, 1x2	OTHO	1
35		DRESS NUT ø9	DRESS NUT FOR SWITCH, 9.5mm	OHTO	1
36		FN 376-2	POWER LINE FILTER	SCHAFF	1
37		W CLAMP 19	WIRECLAMP 19x19mm	PANDUIT	14
38		T-WRAP 100x2	TIEWRAP 100x2.4mm, BLACK	GL	17
39		SNAP HOOD DE	D-SUB SNAP HOOD FOR SIZE DE	SOURIAU	2
40		SNAP HOOD DA	D-SUB SNAP HOOD FOR SIZE DA	SOURIAU	1
41		PHJX Z M3x6	SCREW M3x6 Zn PLATED, DIN7985	HFC	5
42		PHJX Z M3x8	SCREW M3x8 Zn PLATED, DIN7985	HFC	5
43		CHSH Z M5x10	SCREW M5x10 Zn PLATED, DIN 912	HFC	8
44		MSM N M3	NUT M3 Ni PLATED, DIN 934	HFC	10
45		MSS Z M5	NUT M5 Zn PLATED, DIN 934	HFC	8
46		SSS Z ø3.2	L-WASHER ø3.2 EL Zn, DIN 6798A	HFC	10
47		CHSH Z M4x10	SCREW M4x10 Zn PLATED, DIN912	HFC	8
48		PHJX Z M3x30	SCREW M3x30 Zn PLATED, DIN7985	HFC	2
49		PHJX Z M4x8	SCREW M4x8 Zn PLATED, DIN7985	HFC	8
50		UHJX Z M3x6	SCREW M3x6 Zn PLATED, DIN965	HFC	15

PART NO.: P-88127  
 DESC....: ULTRASTAB 861R  
 UNIT

POS. NO	ITEM NO	PART/DWG NO	DESCRIPTION	MANUFAC.	NO. REQ
51	SFS Z	ø3.1	T-WASHER ø3.1 EL Zn, DIN127B	HFC	24
52	UHJX Z	M3x8	SCREW M3x8 Zn PLATED, DIN 965	HFC	2
53	EBS 3m3-160		CAP. ELEC. 3300uF 160V, ø52	RIFA	2
54	KBP C602		DIODE BRIDGE 6A 200V	FRONTI.	2
55	PHJX Z	M5x10	SCREW M5x10 Zn PLATED, DIN7985	HFC	2
56	CRIMP F TR		CRIMP CONNECTOR FEMALE, Au	SOURIAU	40
57					-
58	WIRE .75-Y/G		WIRE 0.75mm2 YELLOW/GREEN	DATWYLE	0.1
59	WIRE .75-BR		WIRE 0.75mm2 BROWN	DATWYLE	2.6
60	WIRE .25-B		WIRE 0.25mm2 BLACK	DATWYLE	1.5
61	WIRE .25-R		WIRE WRAP, TEFLON 0.25mm2 RED	DATWYLE	1
62	WIRE .25-O		WIRE 0.25mm2 ORANGE	DATWYLE	0.5
63	WIRE .25-Y		WIRE 0.25mm2 YELLOW	DATWYLE	0.9
64	WIRE .25-G		WIRE 0.25mm2 GREEN	DATWYLE	0.9
65	WIRE .25-BL		WIRE WRAP, TEFLON 0.25mm2 BLUE	DATWYLE	0.5
66	WIRE .25-V		WIRE 0.25mm2 VIOLET	DATWYLE	0.5
67	WIRE .25-W		WIRE WRAP, TEFLON 0.25mm2 WHITE	DATWYLE	0.5
68	HS TUBE ø2-B		HEAT SHRINKABLE TUBE ø2mm B	R. FLEX	0.15
69	RIVET 4023		SOLDER-LUG ø3.2mm	F. R-P	1
70	P-88160		COMPENSATION AMPLIFIER, 10kA	DF	1
71	P-88163		VOLTAGE REGULATOR, 10kA	DF	1
72					-
73	P-88228		MOUNTING PLATE FOR CAPASITORS	DF	1
74	P-88226		MOUNTING CLAMP FOR HEATSINK	DF	4
75	P-87311		HEATSINK FOR ULTRASTAB 861R	ALUTRON	1
76	RE RH2B-110		RELAY 2XCO 110VAC 10A	IZUMI	1
77	RE-SOC SH2B		SOCKET FOR RELAY RH2B, DIN	IZUMI	1
78	TS 2455R-60		THERMAL SWITCH 60grad C NC 10A	ELMWOOD	1
79	SPRING SFA-2		HOLD-DOWN SPRING, RELAY RH1/2B	IZUMI	2
80	T-RELAY110V1		TIMER 0.5-10SEC., 110V	OMRON	1
81	T-RE-SOC1		SOCKET FOR TIMER, DIN RAIL	OMRON	1
82	SPRING Y92H		HOLD DOWN SPRING, TIMER H3Y	OMRON	2
83					-
84					-
85	P-88218		CONNECTION CABLE A	DF	1
86	P-88219		CONNECTION CABLE B	DF	1
87	P-88220		CONNECTION CABLE	DF	1
88	P-88221		CONNECTION CABLE A	DF	1
89	P-88222		CONNECTION CABLE B	DF	1
90	P-88223		CONNECTION CABLE C	DF	1

## P A R T S L I S T

PAGE : 1  
ISSUE : 7PART NO.: P-81760  
DESC.....: AUX POWER SUPPLY  
MODULE  
SYSTEM 8000

STOCK.NO	ITEM NO.	PART/DWG NO.	DESCRIPTION	MANUFAC.	NO. REQ
83081760		DWG 81760	AUX POWER SUPPLY, ASSY	DF	0,00
82081761		DWG 81761	AUX POWER SUPPLY, DIAGRAM	DF	0,00
84081762		PCB 81762	AUX POWER SUPPLY, PCB	DF	1,00
11012121	R1	121R	RESISTOR 1% 1/4W	PHILIPS	1,00
11012392	R2	392R	RESISTOR 1% 1/4W	PHILIPS	1,00
12094522	C1	EAL 2200u-40	CAP. ELEC. 2200uF 40V, $\phi$ 18.5x3	PHILIPS	1,00
12092622	C2	EAL 22m-16	CAP. ELEC. 22000uF 16V, RM=50	ECC	1,00
12012510	C3	MKT 1u0-63	CAP. MKT 1u0 10% 63V RM=5	SIEMENS	1,00
12092622	C4	EAL 22m-16	CAP. ELEC. 22000uF 16V, RM=50	ECC	1,00
12092622	C5	EAL 22m-16	CAP. ELEC. 22000uF 16V, RM=50	ECC	1,00
12092622	C6	EAL 22m-16	CAP. ELEC. 22000uF 16V, RM=50	ECC	1,00
12094522	C7	EAL 2200u-40	CAP. ELEC. 2200uF 40V, $\phi$ 18.5x3	PHILIPS	1,00
12094522	C8	EAL 2200u-40	CAP. ELEC. 2200uF 40V, $\phi$ 18.5x3	PHILIPS	1,00
12094422	C9	EAL 220u-40	CAP. ELEC. 220uF 40V, $\phi$ 10.5	ECC	1,00
12094422	C10	EAL 220u-40	CAP. ELEC. 220uF 40V, $\phi$ 10.5	ECC	1,00
12094522	C11	EAL 2200u-40	CAP. ELEC. 2200uF 40V, $\phi$ 18.5x3	PHILIPS	1,00
12094422	C12	EAL 220u-40	CAP. ELEC. 220uF 40V, $\phi$ 10.5	ECC	1,00
12094522	C13	EAL 2200u-40	CAP. ELEC. 2200uF 40V, $\phi$ 18.5x3	PHILIPS	1,00
22083504	D1	WO4M	DIODE BRIDGE 1.5A 400V	FRONTI.	1,00
22083602	D2	KBP C602	DIODE BRIDGE 6A 200V	FRONTI.	1,00
22083602	D3	KBP C602	DIODE BRIDGE 6A 200V	FRONTI.	1,00
22083504	D4	WO4M	DIODE BRIDGE 1.5A 400V	FRONTI.	1,00
22083504	D5	WO4M	DIODE BRIDGE 1.5A 400V	FRONTI.	1,00
22083504	D6	WO4M	DIODE BRIDGE 1.5A 400V	FRONTI.	1,00
22083504	D7	WO4M	DIODE BRIDGE 1.5A 400V	FRONTI.	1,00
22011007	D8	1N 4007	DIODE 1000V 1A	THOMSON	1,00
31033838	IC1	LM 338	VOLTAGE REGULATOR, POS VAR 5A	LIN.TEC	1,00
15098118	P1	CON 231-18PA	SERIE 231 CON MALE ANG 18 POLE	WAGO	1,00
15098113	P2	CON 231-13PA	SERIE 231 CON MALE ANG 13 POLE	WAGO	1,00
15098106	P3	CON 231-06PA	SERIE 231 CON MALE ANG 6 POLE	WAGO	1,00
58001201		H-S FK201	HEATSINK FOR CASE TO3 6.0K/W	FISCHER	1,00
58002105		H-S KL-105-H	HEATSINK FOR CASE TO-220 H	FISHER	1,00
52262212		PHJX Z M3x12	SCREW M3x12 Zn PLATED, DIN7985	HFC	4,00
53301220		MSS Z M3	NUT M3 Zn PLATED, DIN 934	HFC	4,00
54311220		SSS Z $\phi$ 3.2	L-WASHER $\phi$ 3.2 EL Zn, DIN 6798A	HFC	4,00
51061952		T-WRAP 195x2	TIEWRAP 195x2.5mm, BLACK	HELLERM	4,00
58200300		S-INS. TO3	SILICONE INSULATOR, TO-3	ALUTRON	1,00
58300300		BUSHING TO-3	INSULATING BUSHING $\phi$ 3.8/ $\phi$ 3.1	ALUTRON	2,00