All Time Electronics instruments are subject to continuous development and improvement and in consequence may incorporate minor detail changes from the information contained herein.

9812 PROGRAMMABLE SWITCH
TECHNICAL MANUAL

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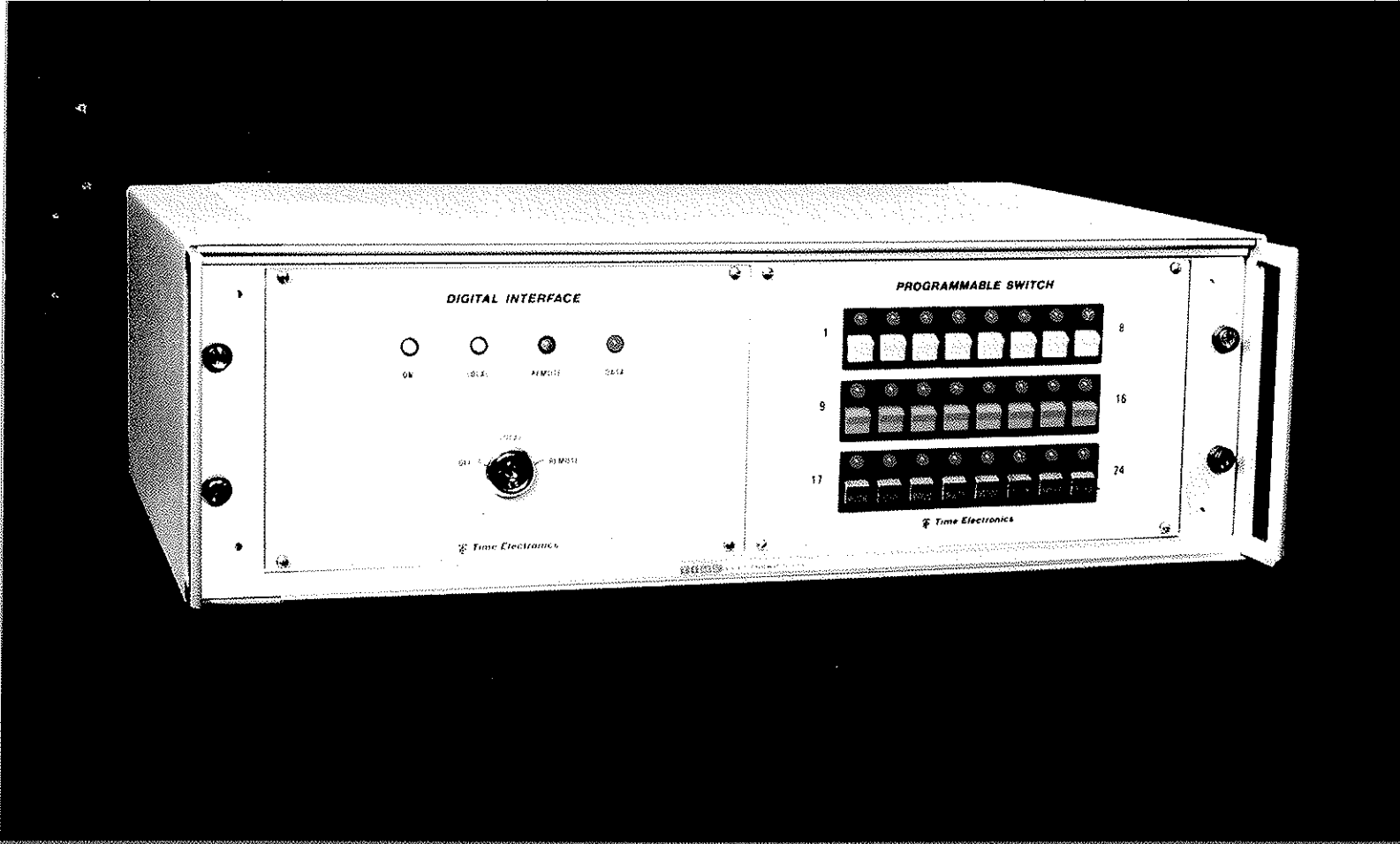


PROGRAMMABLE SWITCH 9812

- IEEE/GPIB/IEC/HPIB
- 6 program modes
- Remote or local operation
- Self test feature
- 24 switches + LED status
- 2 pole changeover

The 9812 is a microprocessor controlled switch with full local controls and LED status indicators. The local control mode is particularly useful at system design stage and for checking and troubleshooting.
Advanced programming capability with 6 program command modes simplifies the bus control program and enhances the switch performance. Additionally the 9812's self test mode enables malfunctions to be detected without external bus control. All 24 switches are operated sequentially by the 9812's internal self test program.
Construction is standard 19" Euroframe with plug-in modules which allow easy access and improved servicing and maintenance. It can be rack mounted or housed in a free standing case.

Time Electronics

SECTION 1: INSTALLATION

Time Electronics programmable units are housed in standard 19" Euro size frames, and can be mounted in either a 19" rack system, or in a free standing case.
To prolong the life of the equipment, it should be used in an atmosphere as free as possible from dust, damp, and corrosive vapours. It is desirable to keep the temperature constant, and to have adequate ventilation, or temperature coefficients will have to be taken into account. Thermal E.M.F.'s due to thermal gradients may cause errors if the unit is subjected to direct sunlight or draughts, so it is wise to protect against these with suitable shielding.

POWER SUPPLY

The standard supply to the equipment is 220/250 Volts 50/60 Hz. A.C. mains. 110 Volt 60 Hz. units can be supplied to order, or 240 Volt units can be converted as described below.

240V/110V CONVERSION

To convert a 240 Volt unit into a 110 Volt unit, it is necessary to rewire the mains input as described below.

1) Disconnect unit from mains.

2) Remove the power supply module from the frame by unscrewing the 4 locating screws and sliding the module out.

3) Disconnect the flying lead on the rear of the module.

4) Rewire the mains input to the transformer as required:

FOR 240V OPERATION, LINK 2 AND 3
FOR 110V OPERATION, LINK 1 AND 3 AND 2 AND 4

5) Reassemble, using steps 1 to 3 in reverse order.

CONNECTION TO MAINS SUPPLY

Connection to U.K. mains is normally made using a standard 13 amp plug, which should be fitted with a 5 amp fuse.

BROWN	-	LIVE
BLUE	-	NEUTRAL
GREEN/YELLOW	-	EARTH

IMPORTANT: This instrument should be earthed for safety. If any doubt exists on the supply connection, it is recommended that an Electrical Engineer fits the mains plug.

SECTION 2: FRONT PANEL CONTROLS

DIGITAL INTERFACE UNIT

1) 3 POSITION KEYSWITCH - A) OFF.
   B) LOCAL: Unit responds to front panel controls.
   C) REMOTE: Unit responds to IEEE commands.

2) ON INDICATOR - Illuminated when unit is on.

3) LOCAL INDICATOR - Illuminated when local mode selected.

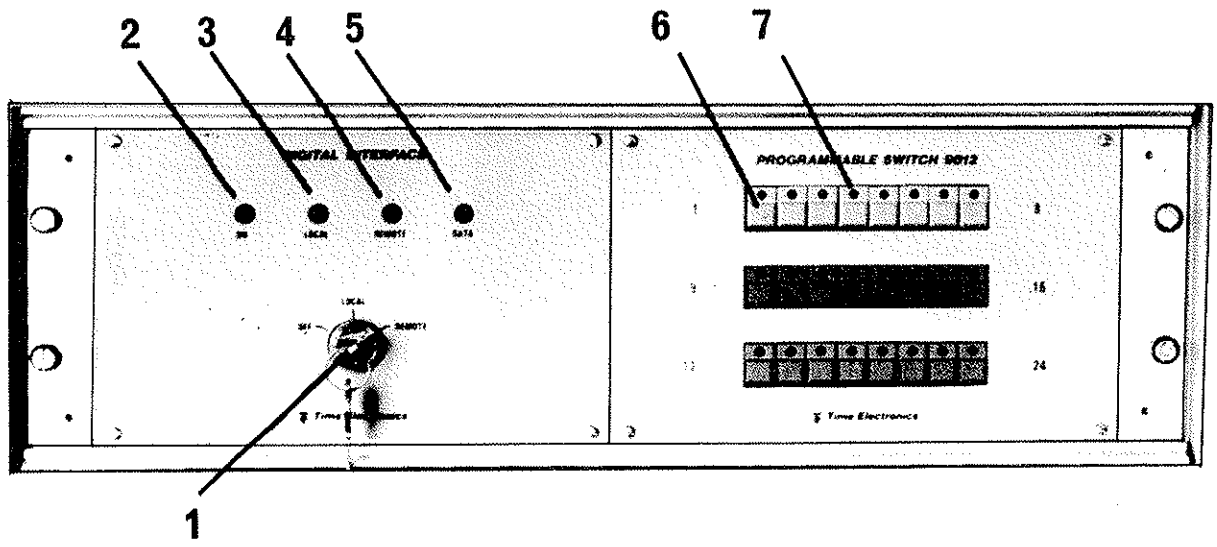
4) REMOTE INDICATOR - Illuminated when remote mode selected

5) DATA INDICATOR - Flashes once when a complete command has been received.

PROGRAMMABLE SWITCH

6) 24 SWITCHES - Allow manual operation of relays when in local mode.

7) 24 LED INDICATORS - Display currently operated relays in both local and remote modes.



SECTION 3: REAR PANEL CONTROLS/CONNECTIONS

1) MAINS INPUT.

2) MAINS FUSE.

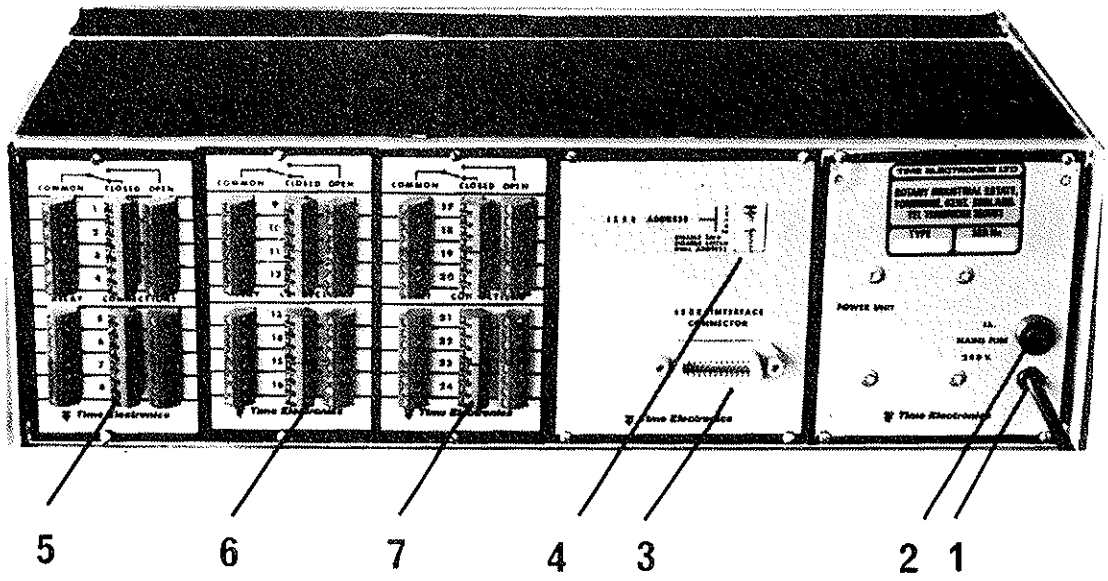
3) IEEE CONNECTOR.

4) 8 WAY SWITCH TO SELECT IEEE ADDRESS OF UNIT.

5) TERMINAL BLOCKS - SWITCHES 1 TO 8.

6) TERMINAL BLOCKS - SWITCHES 9 TO 16.

7) TERMINAL BLOCKS - SWITCHES 17 TO 24.



IEEE CONNECTOR

Both the dimensions and the actual pin locations of the connector are prescribed in the 488-1975 Standard. Recommended connectors include MICRORIBBON (Amphenol or Cinch Series 57) or CHAMP (AMP).

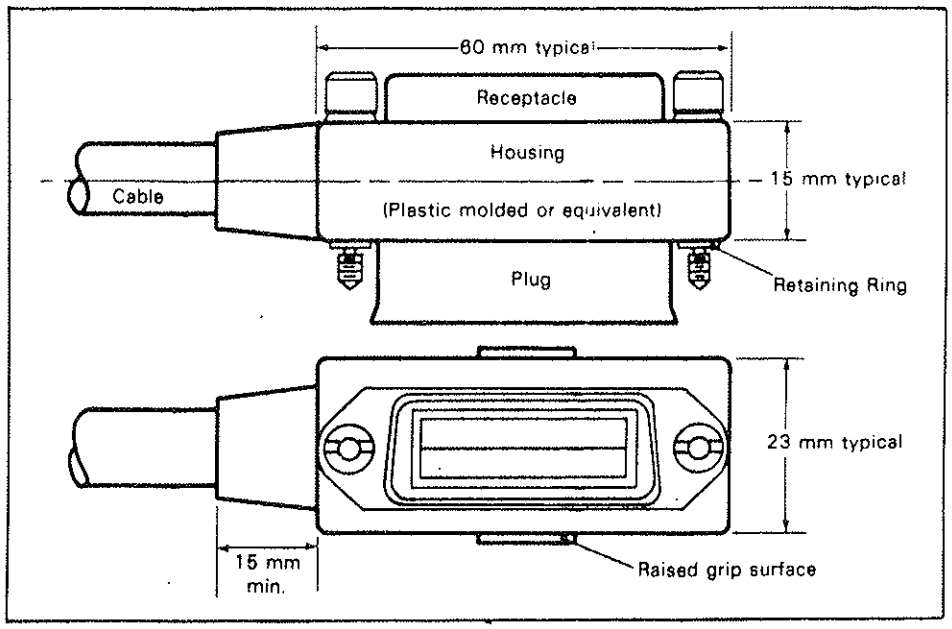
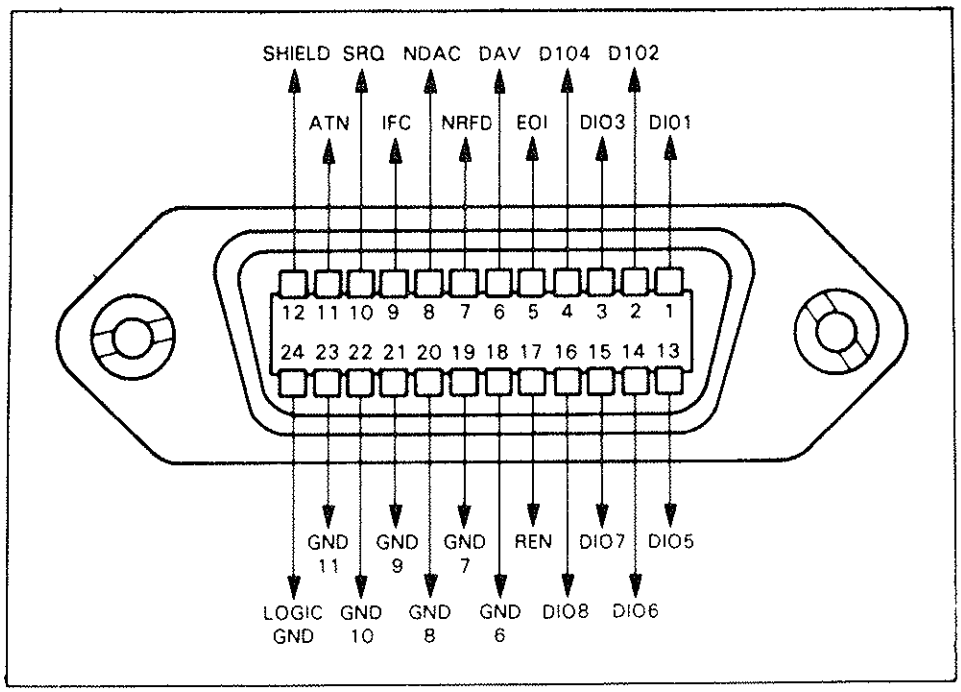


Figure 3-9. The GPIB cable connectors showing the receptacle/plug combination



The GPIB connector showing pin designations

CABLE ASSEMBLIES

Interconnecting cables used with interface systems have dual connectors. These can be stacked to accommodate a variety of physical layouts by allowing more than one cable to be attached to any device. Complete cable assemblies are available. We recommend these cables with connectors since they are preassembled.

Manufacture/supplier	Part No.	Length
BELDEN	9642	1m
"	9643	2m
"	9644	4m
"	9645	8m
TIME ELECTRONICS	9596	1m
" "	9597	2m

INTERCONNECTING THE 9800 SERIES WITH THE IEC BUS

To interface to the IEC bus it is necessary to use an adapter the IEC standard has 25 pins as opposed to the 24 used with the IEEE standard (A comparision listed below), other than this the IEEE 488 is described as being "in concert with its international counterpart, International Electrotechnical Commission (IEC) publication 625-1. Major portions of the (IEC) publication are identical word for word.

IEEE AND IEC CONNECTOR PIN ASSIGNMENTS

The bus connector pin designations — a comparison of IEEE Std 488-1978 and the IEC Standard 625-1

IEEE Standard		IEC Standard	
Pin	**Designation**	**Pin**	**Designation**
1	DIO1	1	DIO1
2	DIO2	2	DIO2
3	DIO3	3	DIO3
4	DIO4	4	DIO4
5	EOI	5	REN
6	DAV	6	EOI
7	NRFD	7	DAV
8	NDAC	8	NRFD
9	IFC	9	NDAC
10	SRQ	10	IFC
11	ATN	11	SRQ
12	SHIELD	12	ATN
13	DIO5	13	SHIELD
14	DIO6	14	DIO5
15	DIO7	15	DIO6
16	DIO8	16	DIO7
17	REN	17	DIO8
18	GND 6	18	GND 5
19	GND 7	19	GND 6
20	GND 8 (Ground pins for lines 6-11 inclusive)	20	GND 7
21	GND 9	21	GND 8 (Ground pins for lines 5-12 inclusive)
22	GND 10	22	GND 9
23	GND 11	23	GND 10
24	LOGIC GND	24	GND 11
		25	GND 12

SECTION 4: OPERATION

ADDRESS SELECTION

The 8 way switch on the rear panel selects the address and operating mode of the unit. Switches 1 to 5 select IEEE addresses in the range 0 to 31, in binary.

The following table relates switch positions to IEEE addresses:

A 1 in the table corresponds to the 'left' position of the switch. Switch 1 is the least significant binary digit, and switch 5 the most significant.

DECIMAL ADDRESS	SWITCH SETTINGS 5 4 3 2 1	DECIMAL ADDRESS	SWITCH SETTINGS 5 4 3 2 1
0	0 0 0 0 0	16	1 0 0 0 0
1	0 0 0 0 1	17	1 0 0 0 1
2	0 0 0 1 0	18	1 0 0 1 0
3	0 0 0 1 1	19	1 0 0 1 1
4	0 0 1 0 0	20	1 0 1 0 0
5	0 0 1 0 1	21	1 0 1 0 1
6	0 0 1 1 0	22	1 0 1 1 0
7	0 0 1 1 1	23	1 0 1 1 1
8	0 1 0 0 0	24	1 1 0 0 0
9	0 1 0 0 1	25	1 1 0 0 1
10	0 1 0 1 0	26	1 1 0 1 0
11	0 1 0 1 1	27	1 1 0 1 1
12	0 1 1 0 0	28	1 1 1 0 0
13	0 1 1 0 1	29	1 1 1 0 1
14	0 1 1 1 0	30	1 1 1 1 0
15	0 1 1 1 1	31	1 1 1 1 1

Switch 6,in the 'left' position , disables the unit's IEEE talk mode, and switch 7 disables the listen mode.

Switch 8 enables Dual Primary Addressing mode. In this mode, the unit will respond to two primary addresses differing only in the least significant bit of the address. For instance, if the address switches were set to 8, and dual primary addressing mode were enabled, the unit would respond to addresses 8 and 9. Similarly, if the switches were set to 31, the unit would also respond to address 30, etc.

NOTE: FOR MOST APPLICATIONS, SWITCHES 6,7 AND 8 SHOULD BE LEFT IN THE 'DOWN' POSITION.

The switches are only read when the unit is switched from LOCAL to REMOTE mode on the front panel keyswitch, so if the address needs to be changed during remote use, the switch must be turned from REMOTE to LOCAL and back again to cause the new address to be read.

RELAY CONNECTIONS

The rear panel of the switch unit has 3 panels, with connections for 8 double pole changeover switches on each panel.
This means that for each relay, there are six connections on the rear panel. There are two common terminals, two 'closed' terminals, and two 'open' terminals. When the relay is not active (i.e. front panel LED is not on), the common terminals are connected to their respective 'closed' terminals. The two common terminals for each relay are not connected together, so two separate loads can be switched by each relay.

RELAY OPERATION

The operating procedure is fairly self explanatory, but the main steps are outlined below.

1) Turn unit on by selecting required mode on keyswitch.

2) Check 'ON' indicator for supply.

3) Operate required relays from the front panel if in local mode, or via the IEEE bus if in remote mode.

PROGRAMMING

Before programming via the IEEE bus, the address switches on the rear panel must be set (see relevant section of manual).

SAMPLE PROGRAM IN A TYPICAL MICROCOMPUTER BASIC:

This program is useful when learning how to program the unit. Characters typed on the keyboard are printed on the screen, and transmitted over the IEEE bus to the unit. Any characters received back from the unit are printed out on the screen.

```
100    OPEN 1,7                    OPEN UNIT AS IEEE DEVICE
300    INPUT £1,A$                 CHECK FOR ANY CHARACTERS FROM UNIT
310    IF ST=2 THEN 700            GO TO 700 IF NO CHARACTERS RECEIVED
320    PRINT A$                    PRINT CHARACTER STRING
700    GET X$                      CHECK FOR CHARACTER FROM KEYBOARD
710    IF X$="" THEN 300           ROUND AGAIN IF NO KEY PRESSED
720    PRINT X$;                   ECHO CHARACTER ON SCREEN
730    PRINT £1,X$;                OUTPUT CHARACTER TO IEEE
740    GOTO 300                    ROUND AGAIN
```

COMMANDS

All commands to the unit must be followed by a terminator. This terminator may be carriage return (<CR>) or line feed (<LF>). There is also a mode where the IEEE Group Execute Trigger may be used.

There are two formats for sending programming instructions to the unit.

DECIMAL FORMAT

The unit is programmed by sending the switch numbers which are to be operated. In the simplest form, the numbers are sent separated by semicolons, and the new settings will overwrite the old settings.

```
450   PRINT £1,"1;2;3;24"          SETS SWITCHES 1,2,3,24 ON, ALL
                                   OTHERS OFF
```

Switches can also be operated without affecting the current settings, by adding "+" and "-" signs in front of the switch numbers. For example, if 1,2,3,24 are currently on:

```
460    PRINT £1,"-1;+22;+23"
```

This turns switch 1 off, and turns 22 and 23 on, leaving all the other switches unchanged. This means that after this command, switches 2,3,22,23,24 are on.

If the timing of the operations is critical, delays can be specified in the command, after which the switches will operate. The delay is specified in multiples of 100mS. If 1,2,3,24 are currently on:

```
470   PRINT £1,"-1;+23/10/20"
```

This line has the effect of turning switch 1 off, 1 second after the command is received, and switch 23 on, 2 seconds after the command is received. The figure after the first "/" is the delay for switches being turned off (the "off delay"), and the figure after the second "/" is the delay for switches being turned on (the "on delay"). The delays may be up to 25 seconds in length. If only an on delay is required, an off delay (which may be zero) must still be specified.

```
500   PRINT £1,"-1;-2/25"          TURN 1 & 2 OFF IN 2.5 SECONDS
510   PRINT £1,"-1;+7/0/2"         TURN 1 OFF NOW, AND 7 ON IN 0.2 SECONDS
```

HEXADECIMAL

By sending a string of 6 characters (one for each block of relays), any pattern of relays can be set.

CHARACTER:	1st	2nd	3rd	4th	5th	6th
RELAYS:	24 - 21	20 - 17	16 - 13	12 - 9	8 - 5	4 - 1

The characters 0 to 9 and A to F (i.e. Hexadecimal) are used to set any combination in a block of 4 relays. In the table , W X Y and Z are the relays making up a block of 4, with W as the highest, and Z as the lowest. For instance, in the highest block of relays, W would be relay 24, and Z would be relay 21.
In the table, a 1 means that the relay operates.

CHARACTER SENT	RELAYS OPERATED			
	W	X	Y	Z
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
A	1	0	1	0
B	1	0	1	1
C	1	1	0	0
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

From a typical microcomputer BASIC the following line could be used to operate relays 1,2 and 24

```
PRINT £1,"800003"
```

When six characters have been received without a terminator, the unit will disregard all subsequent characters except a terminator, and will only accept a new command after a terminator has been received.
If an illegal character (e.g. not a terminator or a hex digit) is received at any time, the illegal character is ignored.

PROGRAM TO OPERATE EACH SWITCH IN TURN

This program operates each switch from 1 to 24 in turn, with a short pause in between operations.

```
100    OPEN 1,7
150    PRINT £1,"I2"                    RESET TO DECIMAL INPUT MODE
200    FOR X=1 TO 24                    LOOP THROUGH SWITCHES
210    PRINT £1,STR$(X)                 OUTPUT THE SWITCH NUMBER TO OPERATE
220    FOR Y=1 TO 1000 : NEXT Y         SHORT WAIT
230    NEXT X
250    CLOSE 1 : END
```

DATA FORMAT COMMANDS

There are a number of commands for changing the format of data the unit receives and transmits. These are set out in the table below.

CHARACTERS SENT	EFFECT
I1	Change to hexadecimal input mode.
I2	Change to decimal input (default).
G1	Execute commands after G.E.T.,<CR> or <LF>.
G2	Execute commands after <CR> or <LF> only.
L	Enter local mode.
T	Transmit the front panel switch settings.
R	Return to remote mode.
O1	Terminate local mode front panel settings with <CR>.
O2	Terminate local mode front panel settings with <LF>.
O12	Terminate local mode front panel settings with <CR><LF>.
O21	Terminate local mode front panel settings with <LF><CR>.

EXAMPLES

```
500    PRINT £1,"I1"                    CHANGE TO HEXADECIMAL INPUT MODE
510    PRINT £1,"G1"                    ALLOW G.E.T. AS A TERMINATOR
```

GROUP EXECUTE TRIGGER

In this mode of operation the entered data is stored until a Group Execute Trigger (G.E.T.) command is received. In this way several instruments on the bus can be made to respond simultaneously. To select Group Execute Trigger mode send G1 to the unit. To return to immediate mode send data G2 to the instrument.

		Command
GET mode	:	G1
Immediate mode	:	G2

When in "GET" mode data can be entered in the normal manner, but will not be used until the unit receives a "GET".

TERMINATING CHARACTERS

To enable the unit to correctly transmit data to various IEEE controllers it is necessary for the user to select the correct terminating characters. Terminating characters are :

Carriage return,
Line feed,
or any combination of these.

The terminating character is selected by sending 1 or 2 or a combination to the unit. 1 selects carriage return, 2 selects line feed.

Example : " 012" will cause - carriage return, line feed to be appended to the end of the data string transmitted from the unit. After power on the unit is set to send line feed carriage return. This combination will be accepted by the PET as a terminator for an input statement. However, HP85s only require a line feed character for a terminator to the enter statement. This can be set by sending "02" to the unit.

LOCAL MODE

In this mode, the front panel keyswitch is left in the remote position, and the relays are operated from the front panel rocker switches. The mode is entered with the "L" command. The REMOTE and LOCAL indicators will light. The settings of the switches may then be read back from the unit using the "T" command. The settings are in the hexadecimal format, and the terminator for the transmission can be set using the "0" command.

To leave this mode, the "R" command is used.

PROGRAM FOR LOCAL MODE

```
100   OPEN 1,7
110   PRINT £1,"01"                        SET TERMINATOR TO <CR>
120   PRINT £1,"L"                         ENTER LOCAL MODE
130   INPUT £1,T$                          READ BACK FRONT PANEL SETTINGS
140   IF ST=2 THEN 130                     WAIT UNTIL SETTINGS RECEIVED
150   PRINT £1,"R"                         RETURN TO REMOTE MODE
160   PRINT "SWITCHES ARE SET TO: ";T$
170   CLOSE 1 : END
```

SELF-TEST MODE

If the rear panel address switches are all set on, the self-test routine is entered. In this mode, the unit operates each switch for about a second in turn.

DIFFERENT CONTROLLERS

The programs shown in this manual use CBM BASIC. Although similar to other 'basic' languages, some changes may be necessary.

Example : Print and Input become Output and Enter for the HP85 controller. If in doubt about the exact commands consult the programming handbook for the controller.

SOFTWARE UPDATES

From time to time new versions of programs become available incorporating new features and operating modes. These are often retro-fittable by the user taking the form of a 'PROM' exchange. If you wish to be informed of any such developments, please complete the form at the end of the Manual and return it to TIME ELECTRONICS LTD.

SECTION 6: 9800 SERIES - CONSTRUCTION

9800 series are constructed in a 19 inch euro card frame.

Cards and modules plug into the frame from the rear of the unit. The digital interface front panel connects to the power unit via a flying lead, while the local controls front panel connects to the 64 way flexible bus system which all modules and cards connect to, with a DIN 41612 type connector. (See diagram 1 for bus line assignment).

FRONT PANEL REMOVAL.

Front panels may be removed by unscrewing the four captivated screws in each corner. The front panel may then be lifted away from the frame, to enable the lead connections to be unplugged.

POWER UNIT REMOVAL.

The power unit is located in a module on the right hand side of the frame when viewed from the rear. To remove, unscrew the four captivated screws at the top and bottom of the unit, then simply slide back.
WARNING: Do not pull back with the mains lead.

It is usually necessary to remove either the top plates of the IEEE rear panel to enable this operation to be completed. When the unit clears the frame, it is necessary to unplug the multipin connector which connects to the digital interface front panel. Reassembly is in reverse order.

The multipin connector is polarized to prevent accidental reversal.

TOP/BOTTOM PLATE REMOVAL.

The top and bottom plates can be simply removed by releasing the black plastic clips at the rear of the unit. This is easily achieved with the use of a screwdriver. The front edge of the top and bottom plates locate in a groove in the frame extrusion. Simply lift clear of the unit. Replacement is the reverse order. It should be noted that the ventilation slots must be placed over the power unit end.

IEEE AND PROCESSOR BOARD REMOVAL.

The IEEE and processor board are located behind the IEEE rear panel. Remove rear panel by unscrewing the four captivated screws located top and bottom of the panel and lift clear. Disconnect the multipin plug from the IEEE connector to the IEEE board. The IEEE and processor board can now be unplugged from the 9800 frame. NOTE it is necessary to depress the card retaining clip. Replacement is the reverse order.

NOTE that the IEEE multipin connector may be reversed, and it is necessary to observe the location of the embossed arrowhead on the connector. Also care should be taken to ensure the correct alignment of the DIL address switch with the rear panel cut out.

FUSE REPLACEMENT

1) MAINS FUSE:

Location: The mains fuse is on the power units rear panel.
Value: 1amp, 20mm, quick blow.
Replacement: Disconnect the unit from the mains and unscrew the slot headed fuse cap with a coin.
Suppliers: TIME ELECTRONICS Order Code: 6110
R.S. COMPONENTS Order Code: 412-144

2) 5V SUPPLY FUSE:

Location: Mounted on left hand printed circuit board (top rear) inside the power unit.
Value: 2A, 20mm, quick blow.
Replacement: Disconnect unit from supply. Remove power unit from frame, (see power unit removal section 6).
Suppliers: TIME ELECTRONICS Order Code: 6111
R.S. COMPONENTS Order Code: 412-166

3) 12V SUPPLY FUSE:

Location: Mounted on left hand printed circuit board, (bottom left rear) inside power unit.
Value: 2A,20mm, quick blow.
Replacement: Disconnect unit from supply. Remove power unit from frame, (see power unit removal section 6).
Supplies: TIME ELECTRONICS Order Code: 6111
R.S. COMPONENTS Order Code: 412-166

SECTION 7: TECHNICAL DESCRIPTION

1. POWER UNITS

The Power Unit contains the mains transformer DC regulated supplies and the select logic for the local remote LED and switch. The standard mains transformer is a 50 Va type with a 9 volt, 11 volt, 18 volt, 18 volts windings. The primary winding is two times 110 volt ac taps.

The low voltage windings of the transformer are switched by the off/local/remote switch. The 9 volt AC connects to a 2A 20mm fuse mounted on the printed circuit board. A full wave bridge rectifier and smoothing capacitor give approximately 10 volts DC unregulated. A three terminal regulator mounted on a heatsink produces 5 volts at 1 amp regulated for the micro processor and IEEE boards.

The 11 volts winding is also fused by a 2a, 20mm fuse and full wave rectified to produce 14 volts, 1 amp unregulated.

The third DC supply is taken from the 12 volt supplies. This supply is normally at 5 volts unregulated, but can be pulled up to 12 volts on command.

THE MICRO PROCESSOR BOARD

The 9800 series uses the motorola MC6802 micro processor. The clock for the micro processor is a 3.2768 Mhz crystal, which is internally divided down by the 6802 for 812 khz clock. The clock, micro processor, prom, power on reset circuitry, address decoding, and 32 lines of parallel I/O are all included on the micro processor board.

The parallel I/O being generated by 2 MC6821 peripheral interface adaptors, (PIA). Pull up resistors are connected to all PIA IO lines. Provision has been made for the installation of two types of proms. An on board link enables either 16k proms (2516) or 32k proms (2532) to be fitted.

Power on reset pulses are generated by a low frequency oscillator, which is held in the reset condition by a reservoir capacitor which is charged via stall pulses generated by the micro processor. Should the micro processor fail to produce stall pulses at 10 millisecond intervals, the reservoir capacitor will discharge below the trip level and the power on reset oscillator will start. Reset pulses are then generated at approximately 1/2 second intervals until the processor restarts. Provision is also made on board for installation of 1 k bytes of additional ram. Should a fault be detected on this board, it is recommended a replacement board is installed.

Non maskable interrupt (NMI) pulses are generated every 5mS by dividing down the 812KHz with a CMOS BINARY COUNTER (MC14040).

IEEE INTERFACE BOARD

The interface board is constructed round the motorola MC 68488 general purpose interface adapter. The I/O lines from the 68488 are driven through MC 3448 GPIB drivers.

The address switch mounted directly on the board, and its condition is gated onto the 6800 bus via a 74 LS244 tristate buffer. The most likely cause of failure of this board is the malfunction of one of the MC3448 bus drivers, due to overload on the IEEE bus. Again, however should a fault be suspected on this card then a replacement should be obtained.

FAULT CHECK LIST

1) Unit completely dead, no front panel lights:

   a) No mains supply at socket.
   b) Mains fuse in plug blown.
   c) Mains fuse on rear panel blown.
   d) Internal fuses blown,(see fuse replacement).
   e) Digital interface panel not plugged into power unit.

2) Unit responded to manual controls, but not to IEEE controls - data light does not flash:

   a) Defective IEEE cable.
   b) 9800 incorrect addressed.
   c) Incorrect terminating characters.
   d) Processor board not fully plugged in.

3) Data light flashes, but unit fails to respond:

   a) Incorrect command.

SECTION 9: SPARE PARTS

ITEM	ORDER CODE
12V RELAY	6314
KEY SWITCH	6362
8 WAY D.I.L. SWITCH	6306
BLUE ROCKER SWITCH	6318
YELLOW ROCKER SWITCH	6325
ORANGE ROCKER SWITCH	6343
TERMINAL BLOCK	6441
IEEE CONNECTOR	6420
MAINS FUSE 20MM (1A)	6110
FUSE 20MM (2A)	6111
IEEE DRIVER (3448)	4555
IEEE INTERFACE (68488)	4556
CRYSTAL (3.2768 MHZ)	4559
MICROPROCESSOR (6802)	4583
PIA (6821)	4585
12 BIT TIMER (14040)	4590

SECTION 10: GUARANTEE AND SERVICE FACILITIES

The unit is guaranteed for a period of one year from its delivery to the purchaser.

We maintain comprehensive after sales facilities and the unit can, if necessary , be returned to us (or our authorised dealer) for servicing. The type and serial number should always be quoted, together with details of any fault, and the service required.

Equipment returned to us for servicing must be adequately packed, preferably in the special box supplied, and shipped with transportation charges prepaid. WE CAN ACCEPT NO RESPONSIBILITY FOR INSTRUMENTS ARRIVING DAMAGED. Should the cause of failure during the guarantee period be due to misuse or abuse of the unit, or if the guarantee period has expired, the repair will be put in hand without delay, and charged unless other instructions are received.

9800 SERIES BUS CONNECTIONS - DIAGRAM 1

COLUMN A		FUNCTION		COLUMN C		FUNCTION
	PIA 1				POWER SUPPLIES	
1	.....	PA0		1	.....	0 VOLTS
2	.....	PA1		2	.....	0 VOLTS
3	.....	PA2		3	.....	+5 VOLTS
4	.....	PA3		4	.....	+5 VOLTS
5	.....	PA4		5	.....	+10 VOLTS
6	.....	PA5		6	.....	OV ISOLATED(*1)
7	.....	PA6		7	.....	LOCAL
8	.....	PA7		8	.....	-18 VOLT (*1)
9	.....	PB0		9	.....	+18 VOLT (*1)
10	.....	PB1		10	.....	5/10V SUPPLY
11	.....	PB2		11	.....	
12	.....	PB3		12	.....	
13	.....	PB4		13	.....	VMA
14	.....	PB5		14	.....	A15
15	.....	PB6		15	.....	A14
16	.....	PB7	TTL	16	.....	A13
	PIA 2		LEVEL		CONTROL LINES	
17	.....	PA0	I/O	17	.....	RST (*5)
18	.....	PA1		18	.....	ENABLE
19	.....	PA2		19	.....	R/W
20	.....	PA3		20	.....	RS0(A0)6800 P BUS
21	.....	PA4		21	.....	RS1(A1)
22	.....	PA5		22	.....	RS2(A2)
23	.....	PA6		23	.....	IRQ
24	.....	PA7		24	.....	CS 6000
25	.....	PB0(*3)		25	.....	D0
26	.....	PB1(*4)		26	.....	D1
27	.....	PB2		27	.....	D2
28	.....	PB3		28	.....	D3
29	.....	PB4		29	.....	D4
30	.....	PB5		30	.....	D5
31	.....	PB6		31	.....	D6
32	.....	PB7		32	.....	D7

(*1) ISOLATED SUPPLY CONNECTIONS : Used when +/-18 Volt regulator board fitted to power unit.

(*2) ADDITIONAL UP BUS LINES : Connected in processor 'active' units.

(*3) PB0 - 12V SELECT : Logic '1' sets 5/12V supply to 12V and turns on data light.

(*4) PB1 - SELECT LOCAL : uP sets high to select local operation in uP 'dead' units. uP reads to determine position (local or remote) of key switch in uP active units.

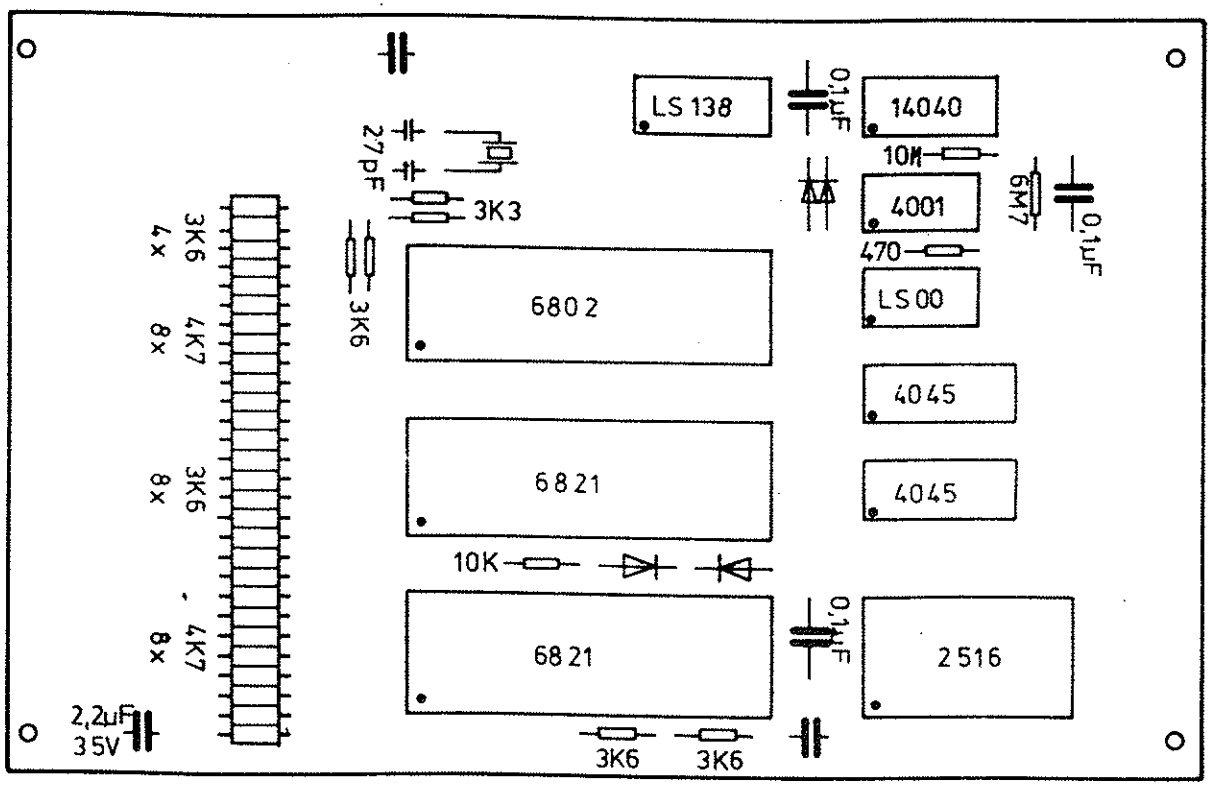
(*5) RESET (RST) : Grounded by key switch in uP 'dead' units driven by uP for POR in uP active units.

SUPPLIES :
5V, 1A regulated - 0V TO IEEE GND
10V, 1A unregulated - 0V to IEEE GND
+/-18V, regulated - Isolated from IEEE.

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

TIME ELECTRONICS LIMITED, BOTANY INDUSTRIAL ESTATE, TONBRIDGE, KENT.

DRG No L89		TITLE LAYOUT µP BOARD 9800 SERIES



NOTE DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED — REMOVE ALL BURRS AND SHARP EDGES

ISSUE	A								
MOD NO	—								
DATE	5-10-82								

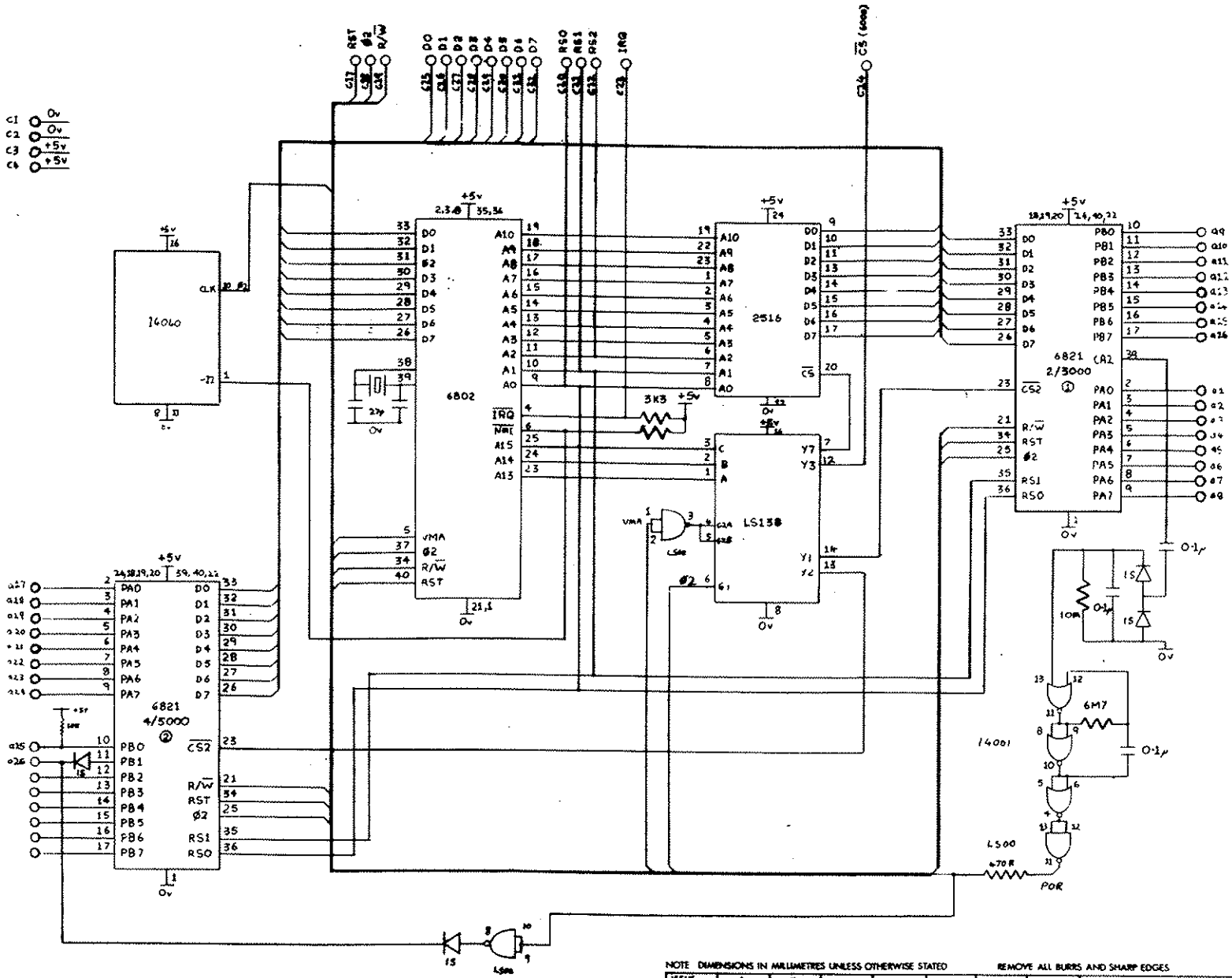
THE CONTENTS OF THIS DRG MUST NOT BE COPIED OR USED WITHOUT PRIOR WRITTEN CONSENT OF TIME ELECTRONICS LTD

3rd ANGLE PROJECTION

TOLERANCES .00 ± .1 .0 ± .4	MATERIAL	FINISH	SCALE
			USED ON
			SCHEDULE
DRAWN STK	TIME ELECTRONICS LIMITED		DRG.N° L89
APPRD JB			

DRWG. No. C151

TITLE PROCESSOR BOARD



NOTE DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED — REMOVE ALL BURRS AND SHARP EDGES

ISSUE	A	B					
MOD Nº		MR 215					
DATE	26/8/80	10/2/82					

THE CONTENTS OF THIS DRG MUST NOT BE COPIED OR USED WITHOUT PRIOR WRITTEN CONSENT OF TIME ELECTRONICS LTD

3rd ANGLE PROJECTION

TOLERANCES .00 ± .1 .0 ± .4	MATERIAL
DRAWN C. J. LORD	FINISH
APPRD	

SCALE

USED ON

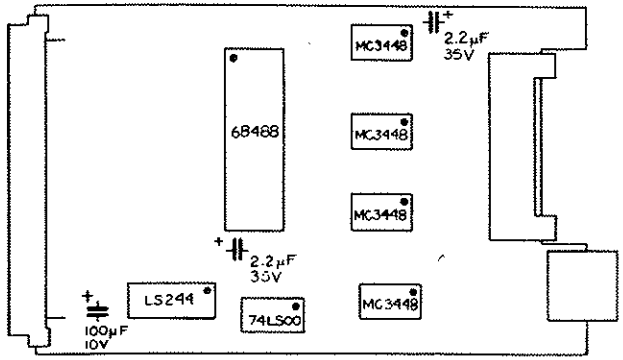
SCHEDULE

TIME ELECTRONICS LIMITED

DRG. Nº C151

A2

DRG No L94		TITLE IEEE CARD - COMP LAYOUT

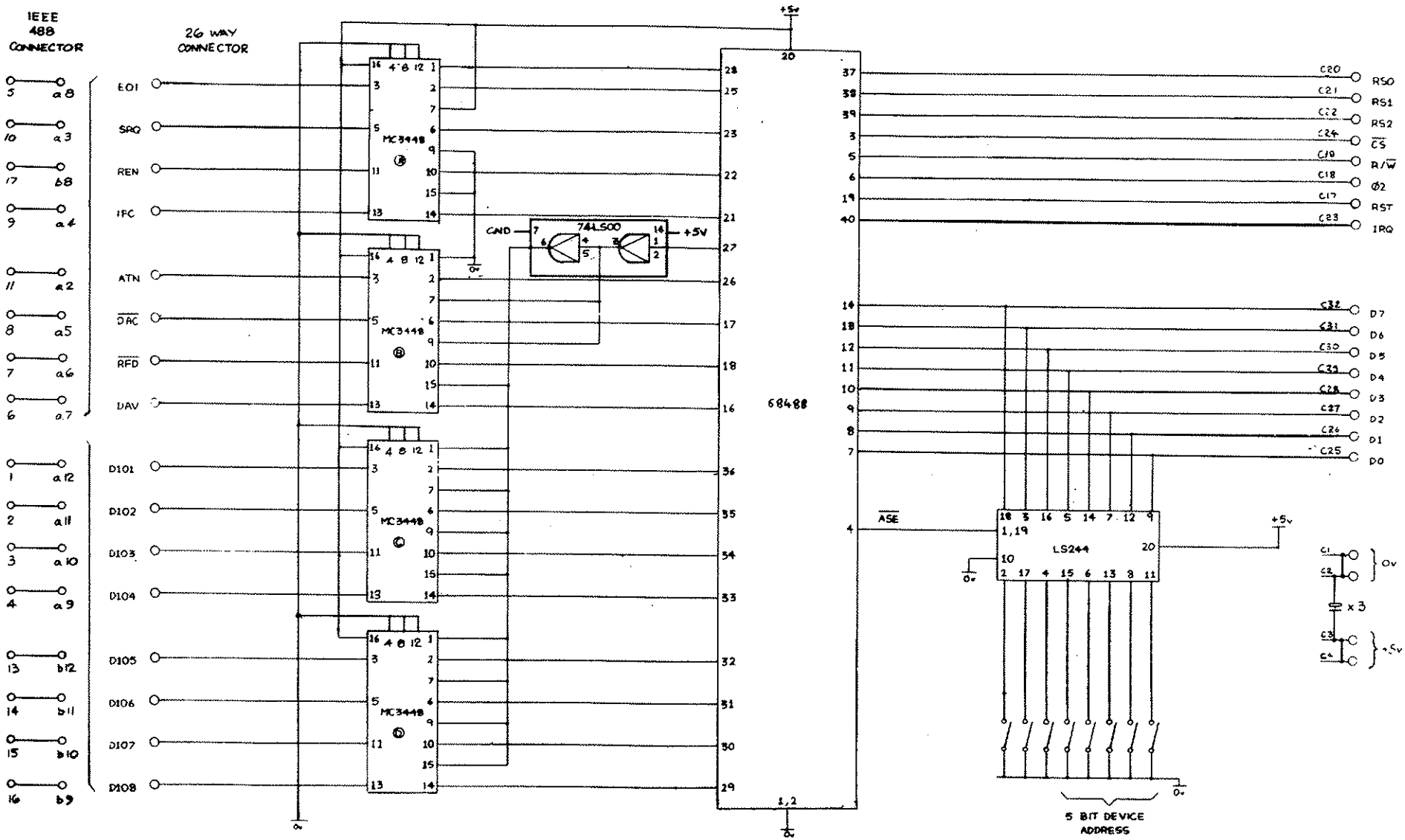


NOTE DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED REMOVE ALL BURRS AND SHARP EDGES

ISSUE	A							THE CONTENTS OF THIS DRG MUST NOT BE COPIED OR USED WITHOUT PRIOR WRITTEN CONSENT OF TIME ELECTRONICS LTD	3rd ANGLE PROJECTION
MOD No									SCALE 1:1
DATE	27-4-85								
TOLERANCES .00 ± .1 .0 ± .4		MATERIAL						FINISH	USED ON
									SCHEDULE
DRAWN	R.B.	TIME ELECTRONICS LIMITED							DRG.No L94
APPRD									

DRG. No. C152

TITLE IEEE INTERFACE BOARD



NOTE DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED REMOVE ALL BURRS AND SHARP EDGES

ISSUE	A								
MOD Nº									
DATE	25/8/80								

3rd ANGLE PROJECTION

TOLERANCES
00 ± 1
0 ± 4

MATERIAL

FINISH

SCALE

USED ON

SCHEDULE

DRAWN C. J. LORD

APPRD

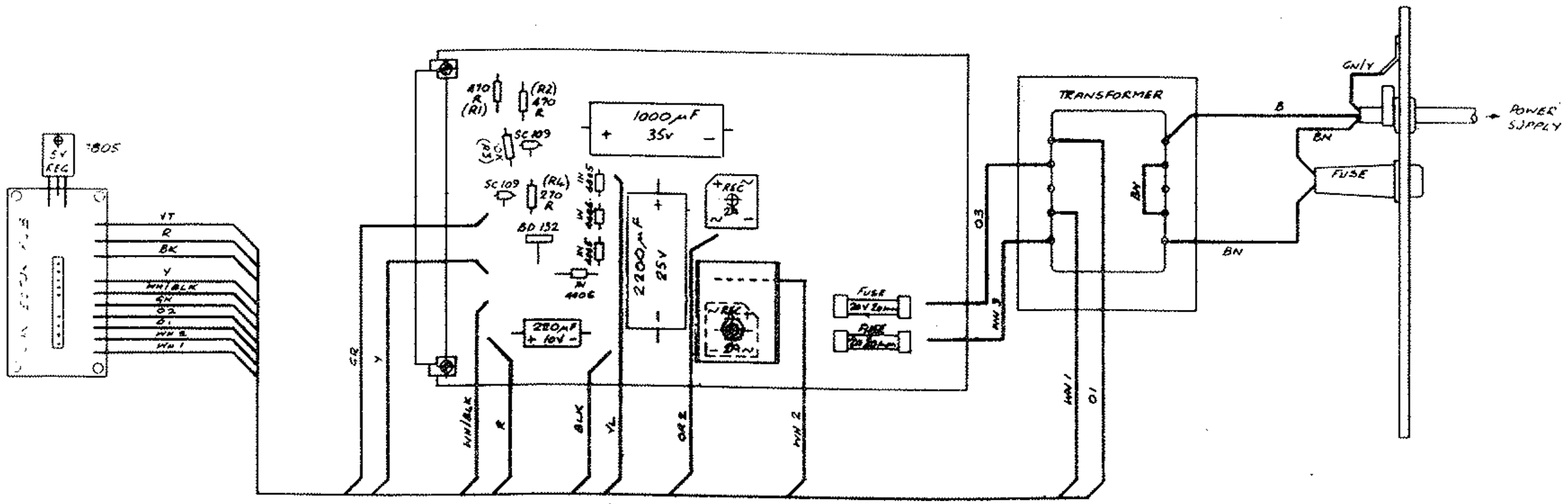
TIME ELECTRONICS LIMITED

DRG. Nº C152

A2

DRG NO. L 86

TITLE Power Supply Module - Layout/Wiring.



NOTE DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED   REMOVE ALL BURRS AND SHARP EDGES

THE CONTENTS OF THIS DRG MUST NOT BE COPIED OR USED WITHOUT PRIOR WRITTEN CONSENT OF TIME ELECTRONICS LTD.

3rd ANGLE PROJECTION

SCALE

USED ON

SCHEDULE

TOLERANCES

MATERIAL

FINISH

DRAWN E Jones

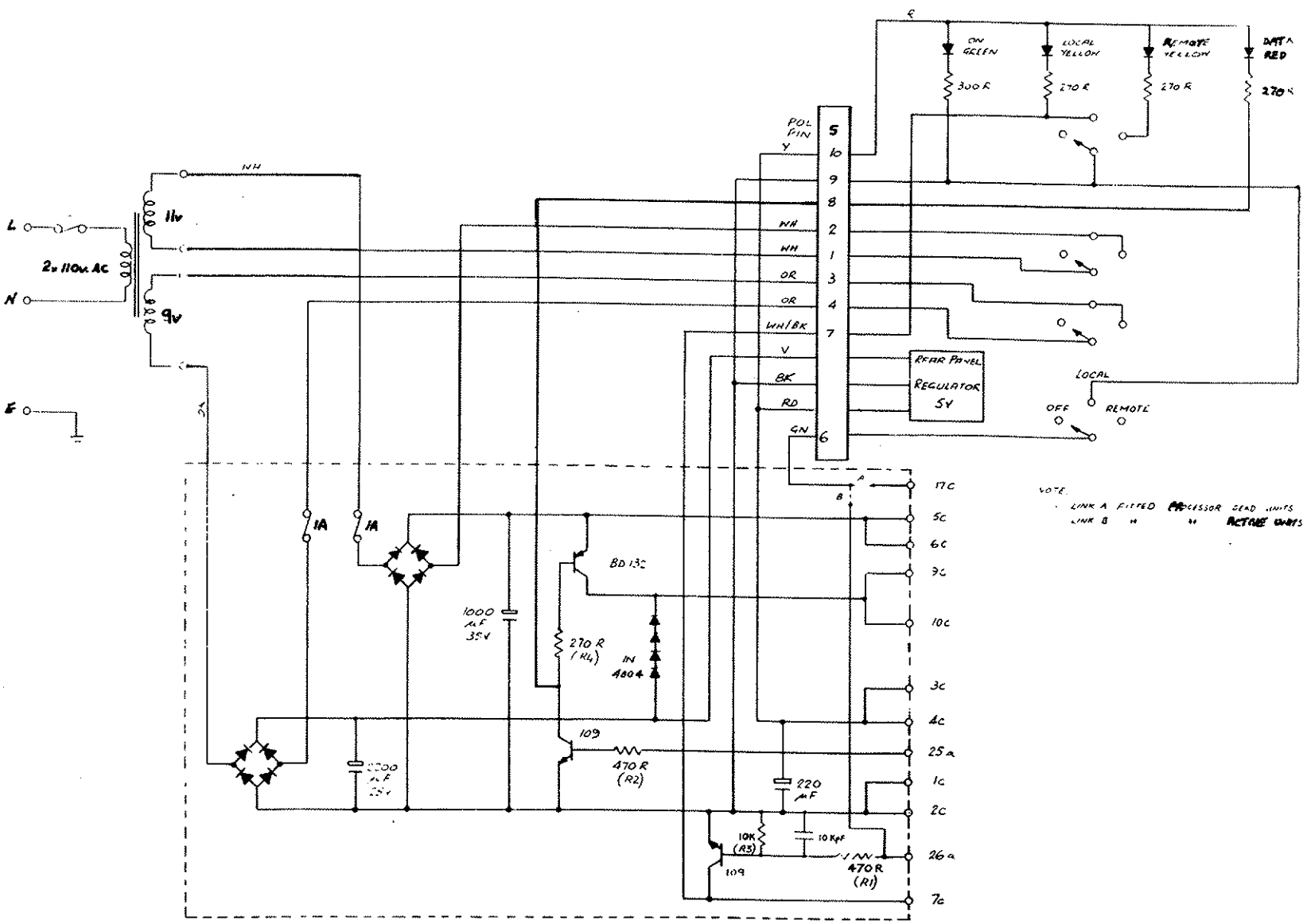
APPRD

TIME ELECTRONICS LIMITED

DRG.NO L86

DRG No C155

TITLE POWER SUPPLY MODULE – CIRCUIT DIAGRAM.



NOTE DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED REMOVE ALL BURRS AND SHARP EDGES

ISSUE	A	B	C	D	E		
MOD NO	—	MR 214	MP 221	MR 231	MR 232		
DATE	10-11-82	10-3-83	5.12.83	20/1/83	2/3/83		

TOLERANCES
00 ± 1
0 ± 4

DRAWN E.N JONES

APPRD

MATERIAL

FINISH

3rd ANGLE PROJECTION

SCALE

USED ON

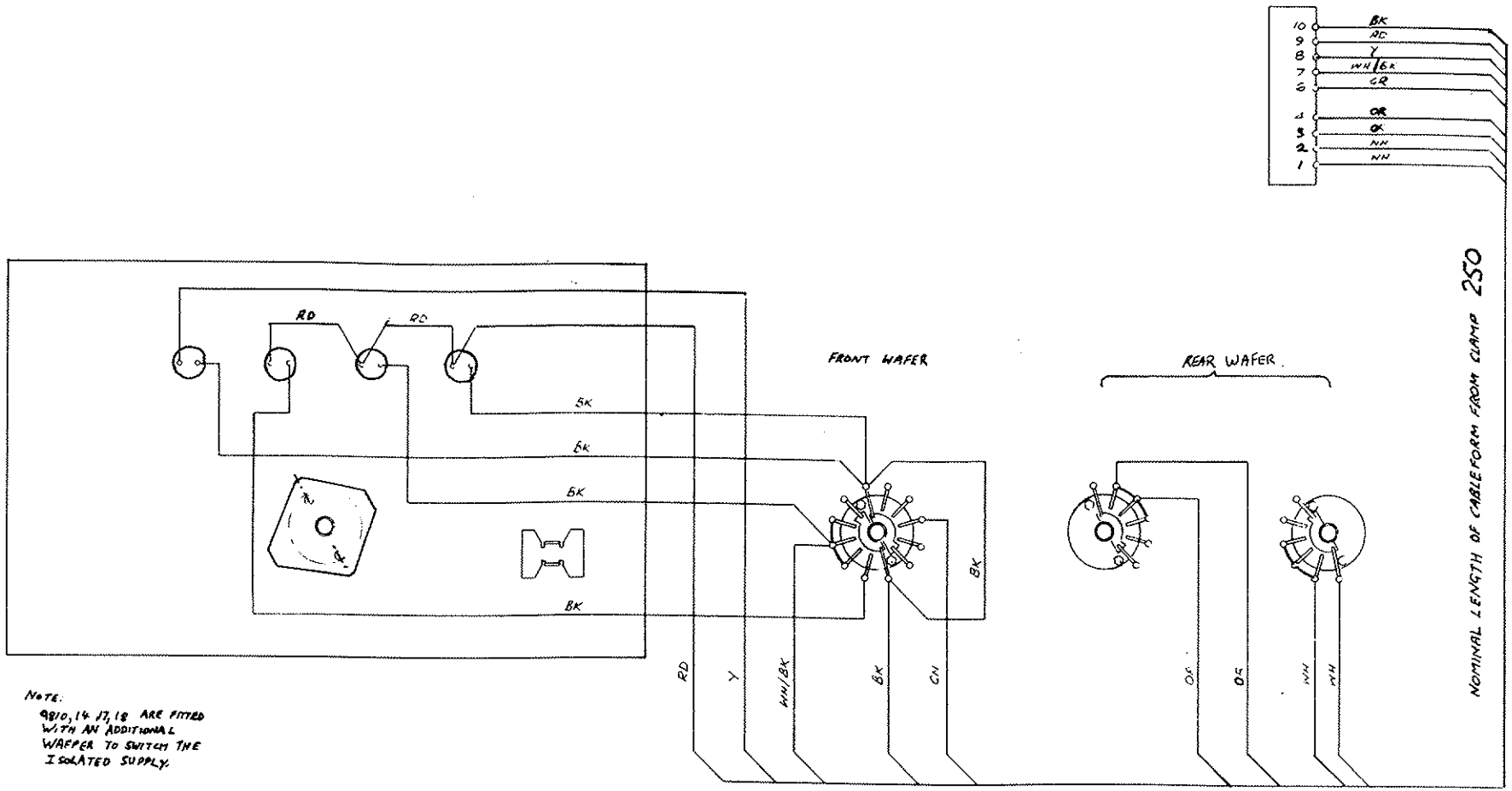
SCHEDULE

TIME ELECTRONICS LIMITED

DRG.Nº C155

DRG. No L 87

TITLE DIGITAL INTERFACE — FRONT PANEL LAYOUT AND WIRING



NOTE.
9810, 14 17, 18 ARE FITTED WITH AN ADDITIONAL WAFFER TO SWITCH THE ISOLATED SUPPLY.

NOTE DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED — REMOVE ALL BURRS AND SHARP EDGES

ISSUE	A								
MOD Nº	—								
DATE	22-2-80								

3rd ANGLE PROJECTION

SCALE

USED ON 1900 SERIES

SCHEDULE

TOLERANCES
.00 ± .1
.0 ± .4

MATERIAL

FINISH

DRAWN EH JONES

APPRD

TIME ELECTRONICS LIMITED

DRG.Nº L87