

PL Series

Power Supplies
Service Manual



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General

Applicability of this Manual

This Service Manual is for the revised PL models introduced from mid-1991, with the exception of the PL-P 3Amp programmable models which are covered by a separate manual. The revised PLs differ substantially in their circuit configurations from their predecessors whilst functionally remaining very similar; the new models can, however, be very easily distinguished from the earlier series because they have a push-button current damping switch instead of a panel-mounted rocker switch. The earlier PLs are covered by separate manuals for the manual and programmable versions.

Introduction

The PL series of power supplies are fully variable series regulated units incorporating separate digital meters for voltage and current. Separate voltage and current control circuits enable them to operate in constant voltage or constant current mode from 0 to 32 Volts at 0 to 1.1 Amps, 2.1 Amps or 3.1 Amps (0 to 15 Volts at 4 Amps - PL154); triple versions have additional 5 Volt logic supply outputs.

In addition to the AC input switch, there is a DC output switch. When this switch is 'off', the +ve output is disconnected and the current meter reads the value of the current control setting. The current meter decimal points are used to indicate the mode as follows:

- Decimal points off - output switch 'on', constant voltage operation, meter reading output current.
- Decimal points on - output switch 'off', meter reading current limit setting
- Decimal points flashing - output switch 'on' constant current operation, meter reading output current.

A damping switch is incorporated on the current meter. This provides a long time constant which averages out rapidly fluctuating load currents.

The input to the voltage control circuit and voltage meter are brought out to the front panel terminals labelled 'sense'. These are normally connected to the output terminals by shorting bars, but can be connected to the output at the load via separate leads in order to eliminate inaccuracies caused by lead resistances.

Quad Mode Dual (QMD) versions incorporate push button switches enabling Isolated, Parallel, Series, or Series Tracking operations to be selected. Quad Mode Triple (QMT) units are the same as the QMD supplies but have an additional higher current 5V output intended for powering logic circuits. The current rating and sophistication of the logic output varies according to the model from 5 Volt fixed at 1.5 Amp maximum to 4-6 Volt variable with a 0.1 - 7 Amp variable current limit.

General and Safety

This manual has been prepared to aid the experienced engineer in the maintenance and repair of PL Series power supplies. It should be used in conjunction with the owner's instruction manual.

Recalibration or repair should only be attempted by skilled personnel in conjunction with high quality test equipment. If the user is in any doubt as to his competence to carry out the work, the supply should be returned to the manufacturer or their agent overseas for the work to be carried out.

When the power supply is connected to the AC line, terminals may be live, and the opening of covers or removal of parts (except those to which access can be gained by hand) is likely to expose live parts.

The supply shall be disconnected from all voltages sources before it is opened for any adjustment, replacement, maintenance or repair. Capacitors inside the supply may still be charged even if the supply has been disconnected from all voltage sources. Any adjustment, maintenance or repair of the opened supply under voltage shall be avoided as far as possible and, if inevitable, shall only be carried out by a skilled person who is aware of the hazard involved.

Dismantling the Equipment

The cover is removed by removing the two screws through the handle, and the remaining screws on each side and on the top.

The front panel may be disconnected from the chassis by removing the two front feet and the self-tapping screws directly between them. This allows the front panel to be laid forward giving improved access to the rear of the PCB. All preset adjustments are accessible through the PCB.

Should it be necessary to gain access to the front of the PCB, press in the retaining barb on each corner fixing pillar and lift off the pcb, having first removed the 3 control knobs.

Specification

Main Output(s)

Output Range:	0-32 Volts nominal (0-15.5V PL154) 0-1.1A nominal (PL310); 0-2.1A nominal (PL320); 0-3.1A nominal (PL330); 0-4A (PL154)
Output Voltage Setting:	By coarse and fine controls; resolution better than 5mV across the range.
Output Current Setting:	By single logarithmic control.
Output Mode:	The power supply operates in constant current or constant voltage modes with automatic cross-over. Decimal points flash to indicate constant current mode.
Configuration Selection: (QMD and QMT only)	Isolated, True parallel, Series, or Series Tracking via front panel switches.
Output Switch:	Isolates the output and permits voltage and current limits to be set up before connecting the load.
Output Terminals:	4mm terminals on 19mm (.75") spacing.
Output Impedance:	
Constant Voltage:	Typically <5mOhm at 1kHz
Constant Current:	Typically 50kOhm with voltage limit at maximum
Output Protection:	Up to maximum output voltage +20 Volts forward; diode clamped for reverse voltages and up to 3A reverse current.
Load Regulation:	<0.01% of maximum output for 90% load change
Line Regulation:	<0.01% of maximum output for 10% line voltage change
Remote Sense:	Eliminates up to 0.5V drop per lead
Ripple and Noise:	Typically <1mV rms
Transient Response:	<20usec to within 50mV of setting for 90% load change
Temperature Coefficient:	Typically <100ppm/_o_C
Meter Type:	Dual 3.75 digit (4095 count) with 12.5mm (0.5") LEDS. Reading rate 4 per second.
Meter Resolution:	
Voltage:	10mV over the entire range
Current:	1mA over the entire range
Meter Accuracy:	
Voltage:	0.1% of reading
Current:	0.3% of reading
Current Meter Damping:	Nominally 20ms, switchable to 2 sec for averaging of rapidly varying loads.

Logic Output (PL330 QMT)

Output Voltage Range:	4 to 6 Volts
Output Current:	0.1 to 7 Amps.
Output Switch:	Electronic
Output Terminals:	4mm terminals on 19mm (.75") spacing.
Over-Voltage Protection:	Above 7 Volts
Output Protection:	Clamped by the over-voltage protection circuit for forward voltages over 7 Volts and up to 1 Amp forward current. Diode clamped for reverse voltages and up to 3 Amps reverse current.
Load Regulation:	<0.01% of maximum output for 90% load change
Line Regulation:	<0.01% of maximum output for 10% line voltage change
Remote Sense:	Eliminates up to 0.5V drop per lead
Ripple and Noise:	Typically <1mV rms
Transient Response:	<20usec to within 50mV of setting for 90% load change
Temperature Coefficient:	Typically <100ppm/°C
Meter Type:	3.75 digit (4095 count) with 12.5mm (0.5") LEDs. Reading rate 4 per second.
Meter Resolution:	
Voltage:	10mV
Current:	10mA
Meter Accuracy:	0.5% of reading + 1 digit

Logic Output (PL320 QMT)

Output Voltage Range:	4 to 6 Volts
Output Current:	0.1 to 4 Amps.
Output Switch:	Electronic
Output Terminals:	4mm terminals on 19mm (.75") spacing.
Over-Voltage Protection:	Above 7 Volts
Output Protection:	Clamped by the over-voltage protection circuit for forward voltages over 7 Volts and up to 1 Amp forward current. Diode clamped for reverse voltages and up to 3 Amps reverse current.
Load Regulation:	<0.01% of maximum output for 90% load change
Line Regulation:	<0.01% of maximum output for 10% line voltage change
Remote Sense:	Eliminates up to 0.5V drop per lead
Ripple and Noise:	Typically <1mV rms
Transient Response:	<20usec to within 50mV of setting for 90% load change
Temperature Coefficient:	Typically <100ppm/°C
Voltage Setting Accuracy:	Better than $\pm 0.1V$

Logic Output (PL310QMT)

Output Voltage:	Fixed 5V ± 0.1V
Output Current:	0 to 1.5 Amps
Output Terminal:	4mm terminals on 19mm (0.75") spacing
Output Protection:	Output will withstand up to 16V forward voltage. Diode clamped for reverse voltages and up to 3 Amps reverse current.
Load Regulation:	<0.3% for 50% load change
Load Regulation:	<0.1% for 10% line change

GENERAL

Power Requirements:

Input Voltage:	Internally set for 110, 120, 220 or 240VAC 50/60Hz
Input Voltage Range:	± 10% of voltage setting

Power Consumption:

	Single	Dual	Triple
30V/1A	75VA	150VA	150VA
15V/4A or 30V/2A	150VA	300VA	375VA
30V/3A	250VA	500VA	600VA

Environmental Operating Range: 5°C to 40°C, 20% to 80% RH

Environmental Storage Range: -20°C to +60°C

Weight:

	Single	Dual	Triple
30V/1A	4.0kg	8.0kg	8.5kg
15V/4A or 30V/2A	5.0kg	9.5kg	11.5kg
30V/3A	6.0kg	12.0kg	15.5kg

Size:

155 mm wide x 170mm high x 265/300mm deep (single)
350mm wide x 170mm high x 265/300mm deep (dual)
425mm wide x 170mm high x 265/300 mm deep (triple)

Electrical Safety:

Designed and manufactured to comply with IEC 348

EMC:

Designed and manufactured to comply with EN50081-1/EN50082-1.

Mains Operating Voltage

Check that the operating voltage of the instrument shown on the rear panel is suitable for the local supply. Should it be necessary to change the operating voltage range proceed as follows:

1. Ensure that the instrument is disconnected from the AC supply.
2. Remove the screws holding the case upper and handle.
3. Lift off the case upper.
4. The transformer primary taps are clearly marked:

A	0-110-120	B	0-110-120
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Rewire as follows:

240V operation:	Neutral (blue) wire to A0 Link (red) wire from A120 to B0 Live (brown) wire to B120
220V operation:	Neutral (blue) wire to A0 Link (red) wire from A110 to B0 Live (brown) wire to B110
120V operation:	Neutral (blue) wire to A0 Link (black) wire from A0 to B0 Link (red) wire from A120 to B120 Live (brown) wire to B120
110V operation:	Neutral (blue) wire to A0 Link (black) wire from A0 to B0 Link (red) wire from A110 to B110 Live (brown) wire to B110

Note: Units factory set to 220 or 240V will have no black link wire - this must be provided when converting to 110/120V operation. When converting a 110/120V unit to 220/240V the black link wire should be discarded.

5. Reassemble in the reverse order.
6. Change the fuse type if necessary.

Important Note: IEC 348 Safety Regulations state that the AC line voltage to which the apparatus is set must be clearly marked on the outside. If the line voltage setting is changed, it is imperative that the voltage marked on the label close to the power lead entry point is also changed.

Fuse

The AC fuse is located on the back panel. The correct fuse type is 20mm x 5mm 250V HBC time-lag with the following rating:

Model	220/240V	110/120V
PL310/PL320/PL154 (single)	1AT	2AT
PL330 (single)	1.6AT	3.15AT
PL310QMD/PL320QMD/PL310QMT/PL320QMT	2AT	4AT
PL330QMD	3.15AT	6.3AT
PL330QMT	4AT	8AT

Make sure that only fuses with the required rated current and of the specified type are used for replacement. The use of makeshift fuses and the short-circuiting of fuse holders is prohibited.

Mains Lead

When a three core mains lead with bare ends is provided this should be connected as follows:

BROWN	-	MAINS LIVE
BLUE	-	MAINS NEUTRAL
GREEN/YELLOW	-	EARTH

When fitting a fused plug a 5amp fuse should be fitted inside the plug. As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug proceed as follows:

The wire which is coloured green-and-yellow must be connected to the terminal in the plug which is marked by the letter E or by the safety earth symbol or coloured green or green-and-yellow.

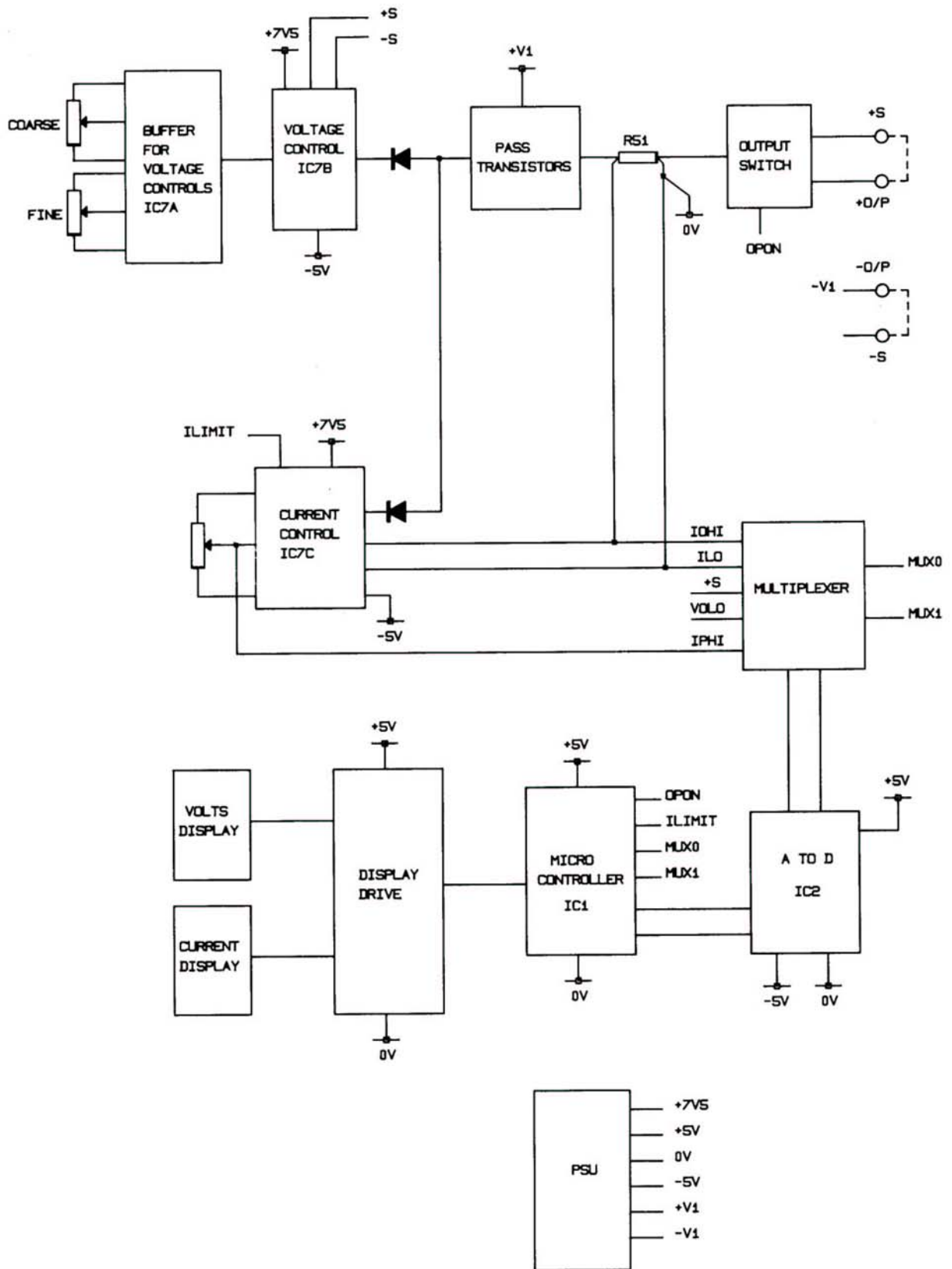
The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.

The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.

If the unit is to be connected to the main supply by fixed wiring, rather than via an AC line plug, then the protective earth (ground) wire in the 3 core mains lead shall be connected to a protective conductor before any other connection is made.

WARNING! THIS APPARATUS MUST BE EARTHED

Any interruption of the protective conductor inside or outside the apparatus or disconnection of the protective earth terminal is likely to make the apparatus dangerous. Intentional interruption is prohibited.



Block diagram - Main Outputs

Functional Description – Main Outputs

The relationship between the major circuit elements is shown in the block diagram opposite.

The transformer incorporates two secondary windings, one which produces the main supply powering the output, and another which produces an auxiliary supply powering the control and metering circuits.

The series regulator is placed in the positive output of the main supply, but because of the way in which the control and metering circuits operate, it is convenient to label the output of the series regulator as 0 volts, and to regard the negative side of the main supply as being the controlled output voltage (-V out).

The auxiliary supply provides stabilised symmetrical voltage outputs V+ and V- with the common point connected to the +ve output.

The series regulator is controlled by the 'voltage control circuit' until the output current flowing reaches the current limit setting, upon which the 'current control circuit' takes over. The voltage control buffer amplifies and provides low output impedance from the voltage controls.

The input to the voltage control circuit is from the control buffer, or from the master output on the slave side of PLQMD/PLQMT units.

The 12 bit A to D measures output voltage and either preset current or output current selected by the multiplexer.

The micro-controller reads the output of the A to D and drives the appropriate display.

Circuit Description – Main Outputs

Refer to the appropriate schematic at the back of this manual.

Power Supply - Mains

This consists of a full wave bridge rectifier feeding the reservoir capacitor C31. The full load secondary winding voltage is 36V rms giving approximately 55 volts off load and 40V on full load (30V and 24V on PL154).

Power Supply - Auxiliary

This consists of twin full wave rectified supplies from a 21V centre tapped winding. IC8 generates +5V for the micro-Controller, display and A to D. Q7 and D10 generate +7.5V for the analogue section. D11 generates -5V for the analogue section and A to D. 0V of this supply is connected to the positive output at R51.

Voltage Control

IC7A buffers the voltage control pots and VR3 sets maximum output voltage of the unit. D6 is the reference which is nominally 2.45V.

IC7B is a differential amplifier with a voltage gain of 13.3. For 30V output this means the voltage at PJ2-8 will be 2.25V and for 15V output 1.125V. VR9 trims differential gain and effects voltage regulation. This can be set more accurately by generating a few hundred millivolts between positive output and positive sense, see calibration section.

Current Control

IC7C is the error amplifier and compares the voltage on the wiper of VR5 with the voltage generated across the current sense resistor R51. When this limit is reached IC7C takes control changing the supply output from constant voltage to constant current. Current limit is indicated to the micro-controller by ILIMIT going high. The sense resistor is 100 milli-Ohm, therefore with the current limit set to 2A the voltage on the wiper of VR5 will be typically 188mV when VR7 is set central. VR8 adjusts the output current to be the same as the preset current at low levels. VR4 trims maximum output current.

Series Regulator

Q1 and Q2 form a triple Darlington. On 2 Amp and 4 Amp versions Q2 is in parallel with Q3, Q4 and Q5. On 3 Amp versions Q2 is in parallel with Q3, Q4, Q5, Q8 and Q9. Q1 is a Darlington and is on a heatsink on the driver pcb.

A to D

IC2 is a 12 bit dual slope converter. Its reference is derived from D6 by R27 and R28 and is typically 180mV. XL1 is either a 4MHz crystal or ceramic resonator. The buffered oscillator output is also used by the microcontroller IC1. Analogue multiplexer IC3 selects measurement of output voltage, preset current or output current. R65 and C38 provide the current meter damping facility.

Microcontroller

The measurement system and display is controlled by a microcontroller IC1.

The two 4-digit LED displays are driven by IC1 via the segment latches IC4 and IC9 and the digit latch IC5. Digit current is provided by IC6 and individual segment current is limited to 50mA by the resistors R10 and R17. The digit on-time rate is 2ms and is controlled by IC1 which also provides the inter digit blanking to prevent ghosting segments.

The measurement of output values of voltage and current is performed by the 12 bit analog to digital converter IC2. The measurement rate is controlled by the 4.0MHz ceramic resonator XL1 connected between pins 22 and 23 and the buffered version of this 4MHz signal at pin 25 is used as the clock to the microcontroller IC1. The ADC, IC2, is a dual slope converter and provides a little over 8 readings per second when clocked at 4MHz. The ADC is run in continuous mode and

the status signal on pin 2 is read by the microcontroller every 6ms. When a reading is ready the microcontroller reads the 12 bit binary value and then converts it to 7 segment BCD and stores it ready to be sent to the display. After each reading the microcontroller switches the input multiplexer IC3 to the next required input. In this way it is possible to read and display any of the following:

Output Volts (equal to Preset Volts when the output switch is off)
Output Current
Preset Current

The multiplexer is controlled by IC1. The decision on what to measure and display at any time is taken by the microcontroller and in order to do this correctly a number of status signals and switches are monitored on a regular basis. These are:

ILIMIT true if in current limit
OPON the output on/off switch signal

These signals may be read by the microcontroller as required.

Service Notes

On Issue 3 and earlier main pcbs the current damping was provided by a digital filter in the microcontroller program and R65 and C38 were not fitted. Also if jitter is experienced on the meters near full scale, this can be overcome by increasing C1 to 330n. If the integrator capacitor C4 has high dielectric absorption this will cause non zeroing of the current meter; this can be overcome by simply replacing it even with the same type as the yield is very good. On later pcbs more space has been provided to allow the larger pitch polypropylene type to be used.

Poor regulation can be caused by incorrect adjustment of the differential gain or the output is oscillating.

Quad Mode Dual Switchbank Assembly

The Quad Mode Dual units have a bank of four switches which allow four modes of operation to be obtained.

- Isolated: SW1 (Release) depressed. All interconnections between the two units is removed.
- Parallel: SW2 depressed. The Slave unit pass transistors are driven from Q1 on the Master PCB, and their output is combined with that of the Master unit, thus doubling its current capability. VR5 on the Master unit is disconnected from R47 and connected to a network generating twice the control voltage. The slave unit becomes inoperative.
- Series: SW2 depressed. The Slave unit positive terminal is connected to the Master unit negative terminal.
- Tracking: SW4 depressed. As for Series, but additionally R36 on the +ve input to the Slave unit voltage control op-amp IC7B is disconnected from IC7A and is instead connected to a potential divider connected between Master unit +ve output and Slave unit -ve output. This maintains the voltageage at the Slave +ve output (and hence the Master -ve output) equal to $\frac{1}{2}$ of the total output voltage, thus producing tracking supplies of $\pm 30V$ controlled from VR1 and VR2 on the Master unit. VR1 and VR2 on the Slave unit become inoperative.

PL330QMD Master

The main pcb on the master side on these instruments has some extra circuitry which allows current measurement above 4 amps and is only active when parallel mode is selected, QMPAR going low. IC10 halves the reference input to the A to D and selects VOL02 to give the correct output voltage readings. The current readings only read half and the microcontroller multiplies the answer by 2 before driving the display. This results in a resolution of 2mA and not 10mA which would be the case if a divide by 10 was used. See calibration section for correct adjustment of VR10 and VR11.

Calibration – Main Outputs

Equipment Required

A 5.5 digit multimeter with better than 0.05% accuracy on voltage and better than 0.1% accuracy on current or use a precision current shunt.

A small switch, 18K resistor and a diode.

Preparation

Preset adjustments are accessible from both sides of the main pcb, their idents are also marked on both sides of the pcb.

Take great care not to touch the mains connections on the transformers during adjustment. Use an insulated trim tool. Allow five minutes warm-up before proceeding.

Calibration

To avoid errors when making voltage measurements the DVM must be connected directly to the sense terminals.

Voltage - Differential Gain

Remove the link between + O/P and + sense only and fit a diode, cathode to + sense and anode to + O/P. Connect the small switch across the diode. Connect the 18K resistor between - O/P and + sense. Connect the DVM set to 20V range to the sense terminals.

Close the switch

Set the DC output switch on

Set the output voltage to approximately 14V

Note the reading

Open the switch and adjust VR9 for the same reading +/- 0.5mV

Close and open the switch and check the reading

Voltage - Output and meter

Remove the switch and 18K resistor and refit the link between +O/P and + sense.

Set coarse and fine controls to maximum and adjust VR3 to 32.1V or 15.6 on PL154 on the external DVM.

Adjust VR6 so the internal meter reads the same as the DVM.

Current

Set output switch to OFF

Set the current limit control for a reading of 10mA

Set output switch to ON ON and short the output terminals

Adjust VR8 for a reading of 10mA

Remove the short and connect an ammeter between the output terminals.

Set current limit to approximately:

900mA - PL310

1800mA - PL320

2700mA - PL330

3600mA - PL154

and adjust VR7 so that the internal and external ammeters read the same.

Set current limit to maximum, output off and adjust VR4 for:

1100mA - PL310

2100mA - PL320

3100mA - PL330

4050mA - PL154

Quad Mode Calibration

The above calibration must be carried out first.

i) **PL310QMD/QMT and PL320QMD/QMT**

Select parallel mode, output switches OFF

Master current limit to maximum

Adjust VR2 on switchbank pcb for

2100mA - PL310QMD/QMT

4050mA - PL320QMD

on the master ammeter

Select tracking mode, output switches ON

Set master output voltage to approximately 30V

Adjust VR1 on switchbank pcb so that the above voltmeter reads the same as the master voltmeter.

ii) **PL330QMD/QMT**

Select parallel mode, output switches OFF

Set master current limit to approximately 5A

Master output switch ON

Connect ammeter between the master output terminals

Adjust VR10 on the master main pcb for the same reading on the internal and external ammeters.

Remove external ammeter and connect the DVM to the master sense terminals.

Set master coarse voltage control to maximum.

Adjust VR11 on the master main pcb for the same reading on the internal and external voltmeters.

Note: In parallel mode, VR10 affects both the voltmeter and ammeter calibration; VR11 affects only the voltmeter.

Output switches OFF

Master current limit to maximum

Adjust VR2 on the switchbank pcb for 6100mA on the master ammeter

Select tracking mode, output switches ON

Set master output voltage to approximately 30V

Adjust VR1 on switchbank pcb so that the slave voltmeter reads the same as the master voltmeter.

Quad Mode Triples

Functional Description - 5V/7A Module (PL330 QMT)

The relationship between the major circuit elements is shown in the block diagram.

The transformer incorporates two secondary windings, one which produces the main supply powering the output, and another which produces an auxiliary supply powering the control and metering circuits.

The series regulator is placed in the positive output of the main supply, but because of the way in which the control and metering circuits operate, it is convenient to label the output of the series regulator as 0 volts, and to regard the negative side of the main supply as being the controlled output voltage (-V out).

The auxiliary supply provides stabilised symmetrical voltage outputs V+ and V- with the common point connected to the +ve output.

The series regulator is controlled by the 'voltage control circuit' until the output current flowing reaches the current limit setting, upon which the 'current control circuit' takes over. The voltage control buffer amplifies and provides low output impedance from the voltage controls.

The 12 bit A to D measures output voltage with the output switch off and output current with the output switch on selected by the multiplexer.

The micro-controller reads the output of the A to D and drives the display.

Circuit Description - 5V/7A (Issue 2 PCBs and later)

Power Supply - Mains

This consists of a full wave bridge rectifier feeding the reservoir capacitor C30. The full load secondary winding voltage is 11V rms giving approximately 15 volts off load and 12V on full load.

Power Supply - Auxiliary

This consists of twin full wave rectified supplies from a 21V centre tapped winding.

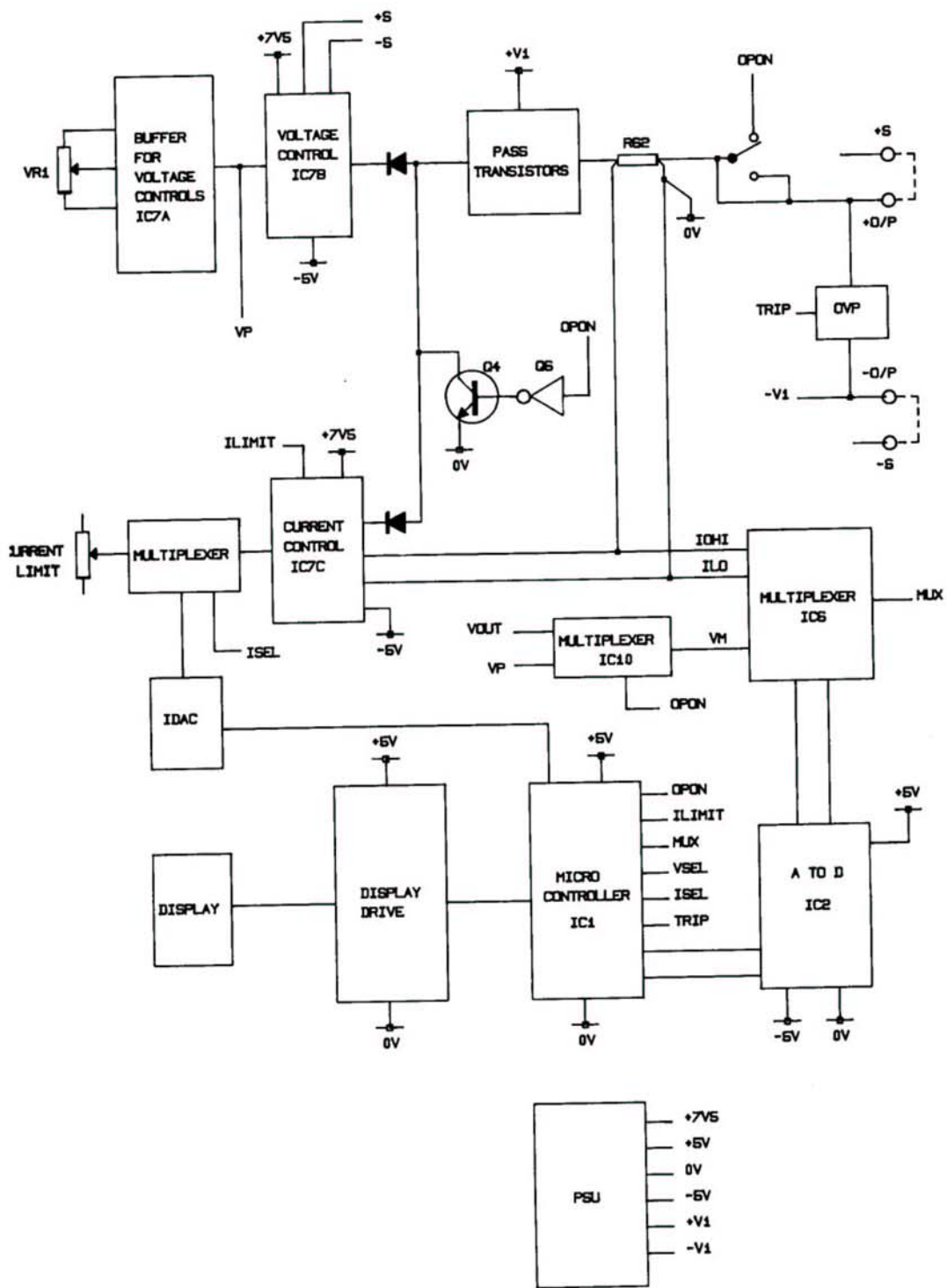
IC8 generates +5V for the micro-Controller, display and A to D. Q7 and D10 generate +7.5V for the analogue section.

D11 generates -5V for the analogue section and A to D.

0V of this supply is connected to the positive output at R62.

Voltage Control

IC7A buffers the voltage control pot and VR7 sets maximum output voltage of the unit. D9 is the reference which is nominally 2.45V.



Block Diagram – 5V/7A Output (Issue 2 pcb onwards)

IC7B is a differential amplifier with a voltage gain of 13.3. For 6V output this means the voltage at IC7A will be 450mV. VR4 trims differential gain and effects voltage regulation. This can be set more accurately by generating a few hundred millivolts between positive output and positive sense, see calibration section.

Current Control

IC9A is the error amplifier and compares the voltage on the wiper of VR3 with the voltage generated across the current sense resistor R62. When this limit is reached IC3A takes control. Current limit is indicated to the micro-controller by ILIMIT going high. The sense resistor is 50 milli-Ohm, therefore with the current limit set to 7A the voltage on the wiper of VR3 will be typically 330mV when VR5 is set central.

To limit power dissipation in the series regulator the power supply has foldback current limiting. When the power supply enters current limit the microcontroller also monitors the output voltage, and if this falls below 3.5V IC6B is switched from VR2 to a simple 3 bit DAC so that the microcontroller can take control of the current limit and reduce it as the output voltage falls.

Series Regulator

Q5, Q2 and Q3 form a triple Darlington. When the output current reaches 3 Amps, Q8 starts conducting.

Over Voltage Protection

When the voltage on the output terminals exceeds 7V, SCR1 is fired crowbaring the output. Current flowing through D6 is detected by IC9B which drives the trip line high informing the microcontroller of the trip condition. The microcontroller then turns the series regulator off via Q4.

A to D

IC2 is a 12 bit dual slope converter. Its reference is derived from D9 by R29 and R30 and is typically 180mV. XL1 is either a 4MHz crystal or ceramic resonator. The buffered oscillator output is also used by the microcontroller IC1. Analogue multiplexer IC3 selects measurement of preset voltage or output current.

Microcontroller

The measurement system and display is controlled by a microcontroller IC1.

The 4-digit LED display is driven by IC1 via the segment latch IC4 and the digit latch IC5. Digit current is provided by IC3 and individual segment current is limited to 25mA by the resistors R10 and R17. The digit multiplex rate is 2ms and is controlled by IC1 which also provides the inter digit blanking to prevent ghosting segments.

The measurement of output values of voltage and current is performed by the 12 bit analog to digital converter IC2. The measurement rate is controlled by the 4.0MHz ceramic resonator XL1 connected between pins 22 and 23 and the buffered version of this 4MHz signal at pin 25 is used as the clock to the microcontroller IC1. The ADC, IC2, is a dual slope converter and provides a little over 8 readings per second when clocked at 4MHz. The ADC is run in continuous mode and the status signal on pin 2 is read by the microcontroller every 6ms. When a reading is ready the microcontroller reads the 12 bit binary value and then converts it to 7 segment BCD and stores it ready to be sent to the display.

The output is electronically switched. The output from the unit bypasses the output switch (links) and the OPON signal drives Q4 via inverter Q5. When OPON is low, Q4 is on and removes the drive to the pass transistors. OPON also drives the multiplexer IC10 which switches to Vp when OPON is low.

Calibration - 5V/7A Module

Equipment Required

A 5.5 digit multimeter with better than 0.1% accuracy on voltage and better than 0.2% accuracy on current or use a precision current shunt.

A small switch, 560 Ohm resistor and a diode.

Preparation

Preset adjustments are located on both the main and driver pcbs. Presets are accessible from both sides of the main pcb.

Take great care not to touch the mains connections on the transformers during adjustment. Use an insulated trim tool. Allow five minutes warm-up before proceeding.

Calibration

To avoid errors when making voltage measurements the DVM must be connected directly to the sense terminals.

Voltage - Differential Gain

Remove the link between + O/P and + sense only and fit a diode, cathode to + sense and anode to + O/P. Connect the small switch across the diode. Connect the 560 Ohm resistor between -O/P and + sense. Connect the DVM set to 20V range to the sense terminals.

Close the switch.

Set the DC output switch ON.

Set the output voltage to approximately 5V.

Note the reading

Open the switch and adjust VR4 on the main pcb for the same reading +/- 0.5mV.

Close and open the switch and check the reading.

Voltage - Output and Meter

Remove the switch and resistor and refit the link between + O/P and + sense.

Set the voltage control to maximum and adjust VR7 for 6.0V to 6.05V on the external voltmeter.

Note the reading and set the output switch to OFF, adjust VR8 on the main pcb for the same reading on the internal meter.

Current

Set output switch to ON.

Set current limit control to maximum.

Set VR3 on the driver pcb fully clockwise.

Connect the DMM set to 20A range in series with an adjustable load to the O/P terminals.

Adjust the load for 5 to 6 Amp output current.

Adjust VR5 on the driver pcb so that the external and internal meters read the same.

Adjust the load and/or output voltage to give 7.1 Amps output current.

Fine adjust VR3 until the decimal points just start to flash. Check 7 Amps output can be achieved without the decimal points flashing.

Functional Description - 5V/4A Module (PL320QMT)

This is very similar to the linear section of the 5V 7A module. Refer to this section for the description.

Circuit Description - 5V/4A

Power Supply - Mains

This consists of a full wave bridge rectifier feeding the reservoir capacitor C1. The full load secondary voltage is 11V rms giving approximately 15Volts off load and 12V on full load.

Power Supply - Auxiliary

This consists of twin full wave rectified supplies from a 21V centre tapped winding.

D10 and Q5 generate +7V5 and D9 the -5V.

0V of this supply is connected to the positive output at R32.

Voltage Control

IC1A buffers the voltage control pot and VR5 sets maximum output voltage of the unit. D8 is the reference which is nominally 2.45V.

IC1B is a differential amplifier with a voltage gain of 13.3. For 6V output this means the voltage at IC1A will be 450mV. VR4 trims differential gain and effects voltage regulation. This can be set more accurately by generating a few hundred millivolts between positive output and positive sense, see calibration section.

Current Control

IC1D is the error amplifier and compares the voltage on the wiper of VR3 with the voltage generated across the current sense resistor R32. When this limit is reached IC1D takes control. This turns on Q1 which lights the current limit LED.

To limit power dissipation in the series regulator the power supply has foldback current limiting. When the output falls below 3.5V IC1C reduces the output current by reducing the voltage on VR3.

Over Voltage Protection

When the voltage on the output terminals exceeds 7V, SCR1 is fired crowbaring the output. When the output switch is turned off, Q4 is turned on, which turns the series regulator off, which allows SCR1 to turn off.

Calibration - 5V/4A

Equipment Required

A 5.5 digit multimeter.

A small switch, 560 Ohm resistor and a diode.

VOLTAGE - Differential Gain

Remove the link between + O/P and + sense only and fit a diode, cathode to + sense and anode to + O/P. Connect the small switch across the diode. Connect the 560 Ohm resistor between - O/P and + sense. Connect the DVM, set to 20V range, to the sense terminals.

Close the switch.

Set the DC output switch on.

Set the output voltage to approximately 5V.

Note the reading.

Open the small switch and adjust VR4 for the same reading $\pm 0.5\text{mV}$.

Close and open the small switch and check the reading.

VOLTAGE - Output

Remove the switch and resistor and refit the link between \pm O/P and + sense.

Set the voltage control to maximum and adjust VR5 for 6.0V to 6.05V output.

CURRENT

Set current limit to maximum.

Connect a load of 4.1A and adjust VR2 until the current limit LED just comes on; check the LED is off at 4A.

Circuit Description - 5V/1.5A (PL310QMT)

An extra winding on the master output transformer provides approximately 8V rms off load. D1 to D4 form a bridge rectifier and C1 and C2 the reservoir capacitor.

IC1 is a fixed 5V three terminal low drop out regulator, D5 and D6 provide protection.

No calibration is required, see Technical Specification section for performance figure.

Parts List

PCB ASSY - MAIN - PL310/310QMD/310QMT (44115-0440)
PCB ASSY - MAIN - PL320/320QMD/320QMT (44115-0400)
PCB ASSY - MAIN - PL330/330QMD/330QMT (44115-0600) - COMMON PARTS
PCB ASSY - MAIN - PL154 (44115-0700)
PCB ASSY - MASTER - PL330QMD/330QMT (44115-0590)

Part Number	Description	Position
10300-0313	PAD P/E S/AD 12 X 15MM	FOR R51
22225-0220	SWITCH PUSH/PUSH SPPH11060A	DAMPING
22573-0063	HEADER 16 WAY STR SIL (8.4MM)	FOR DISPLAYS
22573-0205	HEADER 5 WAY STRAIGHT .156P	PJ3
22573-0210	HEADER 10 WAY STRAIGHT .156P	PJ1
23185-0220	RES 22RJ W25 CF RD25S B/R	R5
23185-0270	RES 27RJ W25 CF RD25S B/R	R10-17 INC
23185-1470	RES 470RJ W25 CF RD25S B/R	R42
23185-2100	RES 1K0J W25 CF RD25S B/R	R43
23185-2180	RES 1K8J W25 CF RD25S B/R	R18
23185-2470	RES 4K7J W25 CF RD25S B/R	R1,34,40,41,64,69
23185-3100	RES 10KJ W25 CF RD25S B/R	R25,33,45,46
23185-3330	RES 33KJ W25 CF RD25S B/R	R9,66,67
23185-3470	RES 47KJ W25 CF RD25S B/R	R2,3,75
23185-4100	RES 100KJ W25 CF RD25S B/R	R6,24,62,65,70
23185-4220	RES 220KJ W25 CF RD25S B/R	R7,8,39
23185-6100	RES 10MJ W25 CF RD25S B/R	R26,44
23202-1330	RES 330RF W25 MF 50PPM	R52
23202-2105	RES 1K05F W25 MF 50PPM	R48
23202-2845	RES 8K45F W25 MF 50PPM	R54
23202-3143	RES 14K3F W25 MF 50PPM	R37
23202-3150	RES 15K0F W25 MF 50PPM	R32,36
23202-3180	RES 18K0F W25 MF 50PPM	R28
23202-3560	RES 56K0F W25 MF 50PPM	R31
23202-4200	RES 200KF W25 MF 50PPM	R35,38
23202-5100	RES 1M00F W25 MF 50PPM	R55
23284-0060	RES 2K2J 2W5 WW	R60,61
23347-0140	POT 10K LIN VO12L-PV25F-B10K	VR1,2
23347-0150	POT 10K LOG VO12L-PV25F-15A10K	VR5
23377-2470	RES PS/H 4K7 CF 10MM	VR3
23377-4100	RES PS/H 100K CF 10MM	VR8
23379-1100	RES PS/H 100R Cermet 10mm	VR7

PCB ASSY - MAIN - PL310/310QMD/310QMT - 44115-0440)
PCB ASSY - MAIN - PL320/320QMD/320QMT - 44115-0400)
PCB ASSY - MAIN - PL330/330QMD/330QMT - 44115-0600) - COMMON PARTS
PCB ASSY - MAIN - PL154 - 44115-0700)
PCB ASSY - MASTER - PL330QMD/330QMT - 44115-0590) continued/...

Part Number	Description	Position
23379-2100	RES PS/H 1K0 Cermet 10mm	VR6
23427-0329	CAP 47PG 63V CER N150 P5	C15,17
23427-0334	CAP 470PK 100V MED K P5	C36
23557-0611	CAP 47U 10V ELEC RE2 P2	C7
23557-0612	CAP 1U0 50V ELEC RE2 P2	C18,39
23557-0647	CAP 10U 35V ELEC RE2 P2	C25,26,38
23557-0665	CAP 2U2 50V ELEC RE2 P2	C16
23557-0668	CAP 220U 10V ELEC RE2 P2.5	C37
23620-0246	CAP 100NK 63V P/E P5	C2,6,9,12,27,28,29
23620-0249	CAP 330NK 63V P/E P5	C1,5,10,11
23620-0256	CAP 1U0K 63V P/E P5	C3
23620-9007	CAP 10NK 100V P/E P5	C13,14
23685-0007	CAP 100NK 160V P/P P10	C4
25021-0901	DIO 1N4148 B/R	D1-4,7,25
25061-9503	DISPLAY - 4 DIGIT LED	DISP1,2
25341-0214	TRAN PNP ZTX214L/BC559	Q6
25380-0229	TRAN NPN BC549	Q8
27106-0506	IC LM324N	IC7
27153-0030	IC ICL7109B	IC2
27161-0120	IC V/REF W/DIO ZN404 2.45V	D6
27164-0506	IC ULN-2803A	IC6
27226-0520	IC 4052B	IC3
27231-2730	IC 74HC273	IC5
27234-5730	IC 74AC573	IC4,9
27250-2000	IC MCU8 PIC16C55XT-P	IC1
28502-0010	RESONATOR CER 4MHZ	XL1
35555-2100	PCB - MAIN - PL	

- a. PCB ASSY - MAIN - PL310/310QMD/310QMT)
b. PCB ASSY - MAIN - PL320/320QMD/320QMT)
c. PCB ASSY - MAIN - PL330/330QMD/330QMT) - UNIQUE PARTS
d. PCB ASSY - MAIN - PL154)
e. PCB ASSY - MASTER - PL330QMD/330QMT)

Part Number	Description	Position
23185-0000	RES ZERO OHM	LK1,3,4,5 a,b,c,d
23185-1100	RES 100RJ W25CF RD25S B/R	R53 a,b,d
23185-1150	RES 150RJ W25CF RD25S B/R	R53 c,e
23185-4470	RES 470KJ W25CF RD25S B/R	R29 a,b,c,e
23185-5180	RES1M8J W25CF RD25S B/R	R29 d
23202-3100	RES 10K0F W25 MF 50PPM	R30 a,b,c
23202-3300	RES 30K0F W25 MF 50PPM	R4 a,b,c,d
23202-3820	RES 8K20F W25 MF 50PPM	R30 d
23202-3220	RES 22K0F W25 MF 50PPM	R47 a
23202-3105	RES 10K5F W25 MF 50PPM	R47 b
23202-2680	RES 6K08F W25 MF 50PPM	R47 c,e
23202-2536	RES 5K36F W25 MF 50PPM	R47 d
23202-2715	RES 7K15F W25 MF 50PPM	R55 e
23202-3100	RES 10K0F W25 MF 50PPM	R30 e
23202-3154	RES 15K4F W25 MF 50PPM	R27 e
23202-3470	RES 47F0F W25 MF 50PPM	R4 e
23202-4205	RES 205KF W25 MF 50PPM	R71 e
23202-4226	RES 226KF W25 MF 50PPM	R27 a,b,c,d
23206-2220	RES2K2F W60 MF 50PPM MRS25	R49 a,b,d,e
23207-2100	RES 1K00F 1W MF 250PPM	R49 c
23286-0010	RES 0R1J 10W WW ALUMINIUM	R51 a,b,c,d
23286-0030	RES 0R1J 15W WW ALUMINIUM	R51 e
23377-1470	RES PS/H 470R CF 10MM	VR4 d
23377-2100	RES PS/H1K0 CF 10MM	VR4,9 b,c,e
23377-2100	RES PS/H1K0 CF 10MM	VR9 d
23377-2220	RES PS/H2K2 CF 10MM	VR4,9 a
23379-2220	RES PS/H2K2 CERMET 10MM	VR11 e
23379-2470	RES PS/H4K7 CERMET 10MM	VR10 e
23557-0610	CAP 100U 50V ELEC RE2 P3.5	C20 c
23557-0666	CAP 47U 63V ELEC RE2 P3.5	C20 a,b,d,e

PCB ASSY - DRIVER - PL310/310QMD/310QMT (44115-0450))
PCB ASSY - DRIVER - PL320/320QMD/320QMT (44115-0410)) - COMMON PARTS
PCB ASSY - DRIVER - PL330/330QMD/330QMT (44115-0610))
PCB ASSY - DRIVER - PL154 (44115-0710))

Part Number	Description	Position
20037-0301	WASHER M3 SHK/PROOF I/T ZPST	FOR IC8 & Q1
20210-0101	NUT M3 ZPST	FOR IC8 & Q1
20234-0011	SCREW M3 X 10 PNHDPZ NPST	FOR IC8 & Q1
20611-0003	BUSH POLYESTER TO220 J22-5006	FOR IC8 & Q1
20613-0006	WASHER (SIL-PAD) TO220	FOR IC8 & Q1
20670-0180	HEATSINK PCB MTG 63MM HIGH	FOR IC8 & Q1
22573-0210	HEADER 10 WAY STRAIGHT .156P	
23179-3100	RES 10KJ W5 CF	R57
23185-0000	RES ZERO OHM	LK2
23185-0470	RES 47RJ W25 CF RD25S B/R	R19
23185-1100	RES 100RJ W25 CF RD25S B/R	R50
23185-1470	RES 470RJ W25 CF RD25S B/R	R59
23185-2100	RES 1K0J W25 CF RD25S B/R	R58
23557-0647	CAP 10U 35V ELEC RE2 P2	C23,24
23557-0664	CAP 1000U 35V ELEC RE2 P5	C21
23557-0667	CAP 220U 25V ELEC RE2 P3.5	C22
25115-0907	DIO 1N4002 B/R	D8,12,13,14,15
25130-0231	DIO ZEN 8V2 W4	D10
25130-0903	DIO ZEN 5V1 W4	D11
25382-0610	TRAN NPN DARLINGTON TIP120	Q1
25383-0505	TRAN NPN BC338	Q7
27160-0009	IC V/REG 7805 TO220	IC8

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- a) PCB ASSY - DRIVER - PL310/310QMD/310QMT (UNIQUE PARTS)
 - b) PCB ASSY - DRIVER - PL320/320QMD/320QMT " "
 - c) PCB ASSY - DRIVER - PL330/330QMD/330QMT " "
 - d) PCB ASSY - DRIVER - PL154 " "

Part Number	Description	Position	
22573-0205	HEADER 5 WAY STRAIGHT .156P	PJ6	a,b
22573-0206	HEADER 6 WAY STRAIGHT .156P	PJ7	a,b,d
23185-0000	RES ZERO OHM	R20	a
23185-0000	RES ZERO OHM	LK1	d
23185-0470	RES 47RJ W25 CF RD25S B/R	R56	a,b
23206-0010	RES 1R0F W60 MF 100PPM	R20-23,73,74	c
23215-9302	RES 0R47K W5 MF	R20,21,22,23	d
23215-9303	RES 1R 1/2W. 10% MF	R20,21,22,23	b
23557-0654	CAP 1000U 63V ELEC RE2 P7.5	C31,32	a,b,c
23557-0654	CAP 1000U 63V ELEC RE2 P7.5	C33,34	b
23557-0654	CAP 1000U 63V ELEC RE2 P7.5	C30,33,34,40	c
23557-0669	CAP 2200U 35V ELEC RE2 P7.5	C31,32,33,34	d
23685-0008	CAP 100NK 160V P/P MKP10	C30	a,b
25115-9001	DIO 1N4003	D18,20,22,24	a
25117-0020	DIO 1N5401	D16	a,b,c
25117-0020	DIO 1N5401	D2,17,19,21	b
35515-1220	PCB - DRIVER - PL		a,b,d
35515-1310	PCB - DRIVER - PL		c

PCB ASSY - 5V/7A MAIN - PL330QMT (44115-0650)

Part Number	Description	Position
22573-0063	HEADER 16 WAY STR SIL (8.4MM)	FOR DISPLAY
23185-0220	RES 22RJ W25 CF RD25S B/R	R64
23185-0560	RES 56RJ W25 CF RD25S B/R	R10,11,12,13,14,15,16,17
23185-1100	RES 100RJ W25 CF RD25S B/R	R48
23185-2100	RES 1K0J W25 CF RD25S B/R	R28
23185-2470	RES 4K7J W25 CF RD25S B/R	R27,34,42
23185-3100	RES 10KJ W25 CF RD25S B/R	R22,26,66
23185-3330	RES 33KJ W25 CF RD25S B/R	R5,6,7
23185-3470	RES 47KJ W25 CF RD25S B/R	R1,2,3
23185-4100	RES 100KJ W25 CF RD25S B/R	R65
23185-4150	RES 150KJ W25 CF RD25S B/R	R49
23185-4220	RES 220KJ W25 CF RD25S B/R	R8,9
23187-4300	RES 300KJ W25 CF RD25S B/R	R50
23187-4620	RES 620KJ W25 CF RD25S B/R	R51
23202-2100	RES 1K00F W25 MF 50PPM	R32
23202-2174	RES 1K74F W25 MF 50PPM	R33
23202-2845	RES 8K45F W25 MF 50PPM	R54
23202-3110	RES 11K0F W25 MF 50PPM	R31
23202-3143	RES 14K3F W25 MF 50PPM	R37
23202-3150	RES 15K0F W25 MF 50PPM	R36
23202-3180	RES 18K0F W25 MF 50PPM	R30
23202-3300	RES 30K0F W25 MF 50PPM	R4
23202-3866	RES 86K6F W25 MF 50PPM	R61
23202-4200	RES 200KF W25 MF 50PPM	R35,38
23202-4226	RES 226KF W25 MF 50PPM	R29
23202-5100	RES 1M00F W25 MF 50PPM	R55
23347-0140	POT 10K LIN VO12L-PV25F-B10K	VR1,2
23377-2100	RES PS/H 1K0 CF 10MM	VR4
23379-2100	RES PS/H 1K0 Cermet 10mm skel	VR6
23379-2220	RES PS/H 2K2 Cermet 10mm skel	VR7
23427-9247	CAP 330PG 100V CER N150 P2.5T	C15
23557-0611	CAP 47U 10V ELEC RE2 P2	C7,8
23557-0612	CAP 1U0 50V ELEC RE2 P2	C11
23557-0647	CAP 10U 35V ELEC RE2 P2	C25,26
23557-0668	CAP 220U 10V ELEC RE2 P2.5	C37
23620-0246	CAP 100NK 63V P/E P5	C2,6,27,28,29,38
23620-0249	CAP 330NK 63V P/E P5	C1,5,9,10

PCB ASSY - 5V/7A MAIN - PL330QMT (44115-0650) continued/...

Part Number	Description	Position
23620-0256	CAP 1U0K 63V P/E P5	C3
23620-9007	CAP 10NK 100V P/E P5	C13,14
23685-0007	CAP 100NK 160V P/P MKP4 P10	C4
25021-0901	DIO 1N4148 B/R	D1,2,3,5
25061-9503	DISPLAY - 4 DIGIT LED	DISP1
25380-0229	TRAN NPN BC549	Q1,4
27106-0513	IC LM358N	IC7
27153-0030	IC ICL7109B	IC2
27161-0120	IC V/REF W/DIO ZN404 2.45V	D9
27164-0507	IC ULN-2003A	IC3
27230-0530	IC 74HC4053	IC6
27231-2730	IC 74HC273	IC5
27234-5730	IC 74AC573	IC4
27250-2000	IC MCU8 PIC16C55XT-P	IC1
28502-0010	RESONATOR CER 4MHZ	XL1
35555-2160	PCB - MAIN - PL 5V/7A	
43171-1310	CONN ASSY DRIVER - PL 5V/7A	PJ1

PCB ASSY - 5V/7A DRIVER - PL330QMT (44115-0660)

Part Number	Description	Position
10300-0313	PAD P/E S/AD 12 X 15MM	FOR R62
20030-0263	WASHER M3 ZPST	FOR IC8/Q2
20038-9501	WASHER M3 Spring	FOR IC8/Q2
20210-0101	NUT M3 ZPST	FOR IC8/Q2
20234-0011	SCREW M3 X 10 PNHDPZ NPST	FOR IC8/Q2
20611-0003	BUSH POLYESTER TO220 J22-5006	FOR IC8
20613-0006	WASHER (SIL-PAD) TO220	FOR IC8
20670-0200	HEATSINK PCB MTG 50MM HIGH	HS1
22300-0211	FUSEHOLDER PCB MOUNTING	FOR FS1
22315-0240	FUSE 6.3A 20MM FB GLASS	FS1
22573-0203	HEADER 3 WAY STRAIGHT .156P	PJ4
22573-0205	HEADER 5 WAY STRAIGHT .156P	PJ6
22573-0207	HEADER 7 WAY STRAIGHT .156P	PJ3
22575-0065	HEADER 20 WAY (2X10) STR SKELTN	PJ5
23185-0000	RES ZERO OHM	LK1-9
23185-0470	RES 47RJ W25 CF RD25S B/R	R19
23185-1220	RES 220RJ W25 CF RD25S B/R	R21,23,47,63

PCB ASSY - 5V/7A DRIVER - PL330QMT (44115-0660) continued/...

Part No.	Description	Position
23185-1330	RES 330RJ W25 CF RD25S B/R	R52
23185-1470	RES 470RJ W25 CF RD25S B/R	R59
23185-2100	RES 1K0J W25 CF RD25S B/R	R18,58
23185-2150	RES 1K5J W25 CF RD25S B/R	R56
23185-2180	RES 1K8J W25 CF RD25S B/R	R20
23185-2220	RES 2K2J W25 CF RD25S B/R	R24
23185-2470	RES 4K7J W25 CF RD25S B/R	R39,40,41
23185-3100	RES 10KJ W25 CF RD25S B/R	R45,70
23185-3470	RES 47KJ W25 CF RD25S B/R	R43,44,46,69
23187-2620	RES 6K2J W25 CF RD25S B/R	R53
23202-2510	RES 5K10F W25 MF	R68
23202-3430	RES 43K0F W25 MF	R67
23274-0045	RES 100RJ 2W5 WW	R57,60
23286-0020	RES 0R05J 10W WW ALUM HSD	R62
23377-2100	RES PS/H 1KO CF 10MM	VR8
23377-2220	RES PS/H 2K2 CF 10MM	VR3
23379-1100	RES PS/H 100R Cermet 10mm skel	VR5
23428-0470	CAP 47PG 100V CER N150 P2.5T	C17
23557-0612	CAP 1UO 50V ELEC RE2 P2	C19
23557-0647	CAP 10U 35V ELEC RE2 P2	C16,23,24
23557-0664	CAP 1000U 35V ELEC RE2 P5	C21
23557-0667	CAP 220U 25V ELEC RE2 P3.5	C20,22
23557-0677	CAP 4700U 25V ELEC RAD P7.5	C30,31,32,33,34
23620-0246	CAP 100NK 63V P/E P5	C18,36
23620-9007	CAP 10NK 100V P/E P5	C12
25021-0901	DIO 1N4148 B/R	D4
25115-0907	DIO 1N4002 B/R	D12,13,14,15
25117-0020	DIO 1N5401	D6
25130-0231	DIO ZEN 8V2 W4	D10
25130-0903	DIO ZEN 5V1 W4	D11
25130-0913	DIO ZEN 6V8 W4	D7
25341-0214	TRAN PNP ZTX214L/BC559	Q5,6
25383-0505	TRAN NPN BC338	Q3,7
25386-9300	TRAN TIP31A	Q2
25801-9501	Thyristor TAG 666-100	SCR1

PCB ASSY - 5V/7A DRIVER - PL330QMT (44115-0660) continued/...

Part No.	Description	Position
27106-0513	IC LM358N	IC9
27160-0009	IC V/REG 7805 TO220	IC8
27230-0530	IC 74HC4053	IC10
35515-1350	PCB - DRIVER - PL 5V/7A	

PCB ASSY - 5V - PL310QMT (44115-0670)

Part Number	Description	Position
20030-0263	WASHER M3 ZPST	FOR IC1
20038-9501	WASHER M3 Spring	FOR IC1
20210-0101	NUT M3 ZPST	FOR IC1
20234-0012	SCREW M3 X 8 PNHDPZ ZPST	FOR IC1
20670-0200	HEATSINK PCB MTG 50MM HIGH	FOR IC1
22573-0202	HEADER 2 WAY STRAIGHT .156P	
23185-2100	RES 1K0J W25 CF RD25S B/R	R1
23424-0463	CAP 10NZ 1KV CER P5	C4
23557-0658	CAP 100U 25V ELEC RE2 P2.5	C3
23557-9122	CAP 4700U 16V ELEC RE2 P7.5	C1,2
25115-0907	DIO 1N4002 B/R	D5
25117-0020	DIO 1N5401	D1,2,3,4,6
27160-0450	IC V/REG L4940V5 T0220	IC1
35515-1360	PCB - 5V - PL310QMT	

PCB ASSY - 5V - PL320QMT (44115-0680)

PartNumber	Description	Position
20030-0263	WASHER M3 ZPST FOR SK1	
20038-9501	WASHER M3 Spring FOR SK1	
20210-0101	NUT M3 ZPST FOR SK1	
20234-0011	SCREW M3 X 10 PNHDPZ NPST FOR SK1	
20611-0003	BUSH POLYESTER TO220 FOR SK1	
20613-0006	WASHER (SIL-PAD) TO220 FOR SK1	
20670-0130	HEATSINK PCB MTG 25MM HIGH SK1	
22300-0211	FUSEHOLDER PCB MOUNTING FOR FS1	
22316-0201	FUSE 5A FB LBC 20MM GLASS FS1	
22454-0041	RECEPT RED FVDDF1.25-250 (2)	
22573-0203	HEADER 3 WAY STRAIGHT .156P PJ1,2	
22573-0205	HEADER 5 WAY STRAIGHT .156P PJ3	
23185-0000	RES ZERO OHM LINKS (9)	

PCB ASSY - 5V - PL320QMT (44115-0680) continued/...

Part No.	Description	Position
23185-0470	RES 47RJ W25 CF RD25S B/R R19	
23185-1100	RES 100RJ W25 CF RD25S B/R R15	
23185-1220	RES 220RJ W25 CF RD25S B/R R9,17,20,37	
23185-1470	RES 470RJ W25 CF RD25S B/R R5	
23185-2100	RES 1K0J W25 CF RD25S B/R R2,4,6,18	
23185-2150	RES 1K5J W25 CF RD25S B/R R33	
23185-2180	RES 1K8J W25 CF RD25S B/R R1	
23185-2220	RES 2K2J W25 CF RD25S B/R R27	
23185-2470	RES 4K7J W25 CF RD25S B/R R7,8,25,26	
23185-3100	RES 10KJ W25 CF RD25S B/R 13,16,28-30,38	
23185-4150	RES 150KJ W25 CF RD25S B/R R34	
23202-2100	RES 1K00F W25 MF 50PPM R10	
23202-3150	RES 15K0F W25 MF 50PPM R21	
23202-2174	RES 1K74F W25 MF 50PPM	R12
23202-3110	RES 11K0F W25 MF 50PPM	R3
23202-3143	RES 14K3F W25 MF 50PPM	R22
23202-3453	RES 45K3F W25 MF 50PPM	R14
23202-4200	RES 200KF W25 MF 50PPM	R23,24,36
23202-4360	RES 360KF W25 MF 50PPM	R35
23274-0045	RES 100RJ 2W5 WW	R11,31
23320-0003	RES R10 - FERRYALLOY	R32
23347-0140	POT 10K LIN VO12L-PV25F-B10K	VR1,3
23377-2100	RES PS/H 1K0 CF 10MM	VR4
23377-3100	RES PS/H 10K CF 10MM	VR2
23379-2220	RES PS/H 2K2 Cermet 10mm skel	VR5
23427-9247	CAP 330PG 100V CER N750 P2.5T	C11
23428-0470	CAP 47PG 100V CER N150 P2.5T	C12
23557-0612	CAP 1U0 50V ELEC RE2 P2	C8
23557-0647	CAP 10U 35V ELEC RE2 P2	C6,7
23557-0664	CAP 1000U 35V ELEC RE2 P5	C4
23557-0667	CAP 220U 25V ELEC RE2 P3.5	C5,9
23557-0677	CAP 4700U 25V ELEC RAD P7.5	C1,2,3
23620-9007	CAP 10NK 100V P/E P5	C23,14
25021-0901	DIO 1N4148 B/R	D1,2,3,5,6,7
25061-0200	LED - T1 ROUND (3mm) - RED	LED1
25115-0907	DIO 1N4002 B/R	D11,12,13,14

PCB ASSY - 5V - PL320QMT (44115-0680) continued/...

Part No.	Description	Position
25130-0231	DIO ZEN 8V2 W4	D10
25130-0903	DIO ZEN 5V1 W4	D9
25130-0913	DIO ZEN 6V8 W4	D4
25341-0214	TRAN PNP ZTX214L/BC559	Q1,4
25380-0229	TRAN NPN BC549	Q7
25383-0505	TRAN NPN BC338	Q3,5
25386-9300	TRAN TIP31A	Q2
25801-9501	Thyristor TAG 666-100	SCR1
27106-0506	IC LM324N 14 PIN	IC1
27161-0120	IC V/REF W/DIO ZN404 2.45V	D8
35515-1370	PCB - 5V - PL320QMT	

PCB ASSY SWITCHBANK 10MM PL310QMD/QMT (44115-0640))**PCB ASSY SWITCHBANK 10MM PL320QMD/QMT (44115-0630)) - COMMON PARTS****PCB ASSY SWITCHBANK 10MM PL330QMD/QMT (44115-0620))**

Part Number	Description	Position
20010-0205	POP RIVET TAP/D/33BS	
20040-9501	NUT No.4 Angle	
22225-0750	SWITCHBANK	
22573-0204	HEADER 4 WAY STRAIGHT .156P	PJ8
22575-0204	SKT 4W .156 20AWG (Yellow)IDT	
22575-0205	SKT 5W .156 20AWG (Yellow)IDT	
22575-0207	SKT 7W .156 20AWG (Yellow)IDT	
23185-0000	RES ZERO OHM	LK1
23202-4180	RES 180KF W25 MF 50PPM	R3
23379-3100	RES PS/H 10K Cermet 10mm skel	VR1
23620-0246	CAP 100NK 63V P/E P5	C1
35515-1340	PCB - SWITCHBANK - PL (10mm)	
37113-0170	BUTTON, SWITCHBANKS, MID-GREY	

- a) PCB ASSY SW/B 10MM PL310QMD/QMT (UNIQUE PARTS)
 b) PCB ASSY SW/B 10MM PL320QMD/QMT " "
 c) PCB ASSY SW/B 10MM PL330QMD/QMT " "

Part Number	Description	Position_	
23202-2316	RES 3K16F W25 MF 50PPM	R4	c
23202-2536	RES 5K36F W25 MF 50PPM	R4	b
23202-3105	RES 10K5F W25 MF 50PPM	R4	a
23206-0010	RES 1R0F W60 MF 100PPM MRS25	R1A,1B,2A,2B	a
23206-0010	RES 1R0F W60 MF 100PPM MRS25	R1A-1D,2A-2D	b
23206-0010	RES 1R0F W60 MF 100PPM MRS25	R1A-1F,2A-2F	c
23377-1470	RES PS/H 470R CF 10MM	VR2	b,c
23377-2100	RES PS/H 1K0 CF 10MM	VR2	a

- HEATSINK ASSY - PL310/310QMD/310QMT (46115-0450))
 HEATSINK ASSY - PL320/154/320QMD/320QMT (46115-0440))
 HEATSINK ASSY - PL330/330QMD/330QMT (46115-0470)) - COMMON PARTS
 HEATSINK ASSY - 5V/7A (46115-0510))
 HEATSINK ASSY - PL 5V/4A (46115-0500))

Part Number	Description	Position
10232-0306	SLEEVE H50 X 20MML BROWN	
20030-0240	WASHER 4BA ZPST	
20038-9503	WASHER M3.5 SPRING	
20100-9201	NUT 4BA Full - Steel	
20134-9007	SCREW 4BA x 1/2" Pozi Pan	
20611-0007	TRANSISTOR MOUNT - T03	
20613-0014	WASHER (SIL-PAD) TO3	
22451-0200	SOLDER TAG 4BA	
25386-9201	TRAN 2N3055	

- a) HEATSINK ASSY - PL310/310QMD/310QMT (UNIQUE PARTS)
 b) HEATSINK ASSY - PL320/154/320QMD/320QMT " "
 c) HEATSINK ASSY - PL330/330QMD/330QMT " "
 d) HEATSINK ASSY - 5V/7A " "
 e) HEATSINK ASSY - PL 5V/4A " "

Part Number	Description	
20670-0250	HEATSINK 11DN01250C2SX	d,e
20670-9001	HEATSINK KP314	a,b,c
22575-0203	SKT 3W .156 20AWG (Yellow)IDT	e
22575-0205	SKT 5W .156 20AWG (Yellow)IDT	d
22575-0206	SKT 6W .156 20AWG (Yellow)IDT	a,b
22575-0208	SKT 8W .156 20AWG (Yellow)IDT	c
23274-0060	RES 0R22K 4W WW KH206-044	d

FRONT PANEL ASSY - PL310/320/330/154	(46115-0600))
FRONT PANEL ASSY - PL310QMD/320QMD/330QMD	(46115-0490))
FRONT PANEL ASSY - PL310QMT	(46115-0670)) - COMMON PARTS
FRONT PANEL ASSY - PL320QMT	(46115-0780))
FRONT PANEL ASSY - PL330QMT	(46115-0680))

Part Number	Description	Position
20030-0240	WASHER 4BA ZPST	TERMINALS
20037-0247	WASHER 4BA SHK/PROOF I/T ZPST	TERMINAL GREEN
20038-9503	WASHER M3.5 SPRING	TERMINALS
20062-9301	SCREW No.4x3/8" Pozi. Pan	SW PCB
20062-9308	SCREW No.6x3/8" Pozi Pan	PCB FIXING
20134-9005	SCREW 4BA x 1/4" Pozi Pan	TERMINALS
20213-0010	CAPTIVE NUT SNU-1219-17-00	
20661-0257	SPACER Hex 4BA x 1/2" NPBR	TERMINALS
20661-0604	SPACER, PCB Support 1/2" Nyl	MAIN PCB MTG
22219-0060	SWITCH PADDLE DPST SOLDER LUGS	MAINS ON/OFF
22219-0080	SWITCH PADDLE DPDT PCB MTG	DC ON/OFF
22571-0670	TERMINAL INSULATED RED TP2	
22571-0680	TERMINAL INSULATED BLACK TP2	
22571-0690	TERMINAL INSULATED GREEN TP2	
22571-0691	WASHER ALUMINIUM FOR TP2E TERM	
22575-0205	SKT 5W .156 20AWG (Yellow)IDT	
25117-0020	DIO 1N5401	TERMINAL PCB
35331-0080	SHORTING BAR - PLATED	
35515-1210	PCB - Terminals - PLs	

a) FRONT PANEL ASSY - PL310/320/330/154	(UNIQUE PARTS)
b) FRONT PANEL ASSY - PL310QMD/320QMD/330QMD	" "
c) FRONT PANEL ASSY - PL310QMT	" "
d) FRONT PANEL ASSY - PL320QMT	" "
e) FRONT PANEL ASSY - PL330QMT	" "

Part Number	Description	Position
20030-0263	WASHER M3	PCB 5V c
20038-9501	WASHER M3 SPRING	PCB 5V c
20210-0101	NUT M3	PCB 5V c
20234-0042	SCREW M3 X 30	PCB 5V c
20661-0246	SPACER ROUND 9/64"ID11/16"L	PCB 5V c
22451-0200	SOLDER TAG 4BA	TERMINAL PCB a,b,c
22573-0205	HEADER 5 WAY STRAIGHT .156P	PJ2A c
22575-0204	SKT 4W .156 20AWG (Yellow)IDT b	

a) FRONT PANEL ASSY - PL310/320/330/154	(UNIQUE PARTS)	
b) FRONT PANEL ASSY - PL310QMD/320QMD/330QMD	" "	
c) FRONT PANEL ASSY - PL310QMT	" "	
d) FRONT PANEL ASSY - PL320QMT	" "	
e) FRONT PANEL ASSY - PL330QMT	" "	continued/...

Part No.	Description	Position	
22575-0207	SKT 7W .156 20AWG (Yellow)IDT d,e		
23424-0454	CAP 10NZ 1KV CER P10	TERMINAL PCB	a,b,c
23620-0246	CAP 100NK 63V 0P/E P5 d,e		
33331-5000	FRONT PANEL - PL Single a		
33331-5040	OVERLAY FRONT PANEL - PL a		
33331-5050	OVERLAY FRONT PANEL - PL310 a		
	OR		
33331-5060	OVERLAY FRONT PANEL - PL154 a		
	OR		
33331-5070	OVERLAY FRONT PANEL - PL330 a		
33331-5100	FRONT PANEL - PLQMD b,c		
33331-5110	OVERLAY FRONT PANEL - PLQMD b		
33331-5120	OVERLAY FRONT PANEL - PL310QMD b		
	OR		
33331-5130	OVERLAY FRONT PANEL - PL330QMD b		
33331-5300	FRONT PANEL - PLQMT d,e		
33331-5310	OVERLAY FRONT PANEL - PL330QMT e		
33331-5410	OVERLAY FRONT PANEL - PL310QMT c		
33331-5420	OVERLAY FRONT PANEL - PL320QMT d		
35515-1320	PCB TERMINAL UNIVERSAL d,e		

CHASSIS ASSY - PL310 (46115-0550)
CHASSIS ASSY - PL320 (46115-0580)
CHASSIS ASSY - PL330 (46115-0610)
CHASSIS ASSY - PL154 (46115-0630)
CHASSIS ASSY - PL310QMD (46115-0730)
CHASSIS ASSY - PL320QMD (46115-0740)
CHASSIS ASSY - PL330QMD (46115-0460)
CHASSIS ASSY - PL310QMT (46115-0660)
CHASSIS ASSY - PL330QMD (46115-0790)
CHASSIS ASSY - PL330QMD (46115-0770)

Part Number	Description	Position
10232-0304	SLEEVE H30 X 20MML BLACK	FUSEHOLDER, MAINS SWITCH, TRANSFORMER
10232-0305	SLEEVE H20 X 20MML BLACK	TRANSFORMER
20030-0240	WASHER 4BA ZPST	HEATSINK
20037-0304	WASHER M4 SHK/PROOF I/T ZPST CHASSIS/HEATSINK POST	
20037-0401	SOLDER TAG SHAKEPROOF - 4BA	
20038-9502	WASHER M4 SPRING COVER, EARTH, BR1,2,3	
20040-9401	NUT No.6 FLAT	FEET
20062-9303	SCREW NO 6 X 0.5" PNHDPZ ST/AB	TRANSFORMER/CHASSIS
20062-9308	SCREW No.6x3/8" POZI PAN	DRIVER/SPACERS
20210-0102	NUT M4 ZPST EARTH, HEATSINKS, BR1,2,3	
20213-0010	CAPTIVE NUT SNU-1219-17-00	CHASSIS, TRANSFORMER
20234-0014	SCREW M4 X 20 PNHDPZ ZPST	BR1,2,3
20234-0023	SCREW M4 X 8 PNHDPZ ZPST COVER, EARTH, HEATSINK	
20234-0029	SCREW M4 X 12 PNHDPZ ZPST	HEATSINK
20611-9305	TRAN MOUNTING BUSH SK18-4-1	HEATSINK
20661-0242	SPACER HEX M4 x 25 NPBR	HEATSINK
20661-0259	SPACER RND 3/8"ODx.175"ID NYL	HEATSINK
20661-0605	SPACER, PCB SUPPORT 7/8" NYL	DRIVER PCB MOUNTING
20661-9302	SPACER HEX STUD M4 x 25 ZPST	HEATSINK
22300-9301	FUSEHOLDER PANEL MOUNTING	
22443-0003	GROMMET - PV93	
22451-0041	RECEPTACLE RED	BR1,2,3
22448-0220	BUSH STRAIN RELIEF SR-5N-4	
22573-0204	HEADER 4 WAY STRAIGHT	PJ4 DRIVER

CHASSIS ASSY - PL310 (46115-0550)
CHASSIS ASSY - PL320 (46115-0580)
CHASSIS ASSY - PL330 (46115-0610)
CHASSIS ASSY - PL154 (46115-0630)
CHASSIS ASSY - PL310QMD (46115-0730)
CHASSIS ASSY - PL320QMD (46115-0740)
CHASSIS ASSY - PL330QMD (46115-0460)
CHASSIS ASSY - PL310QMT (46115-0660)
CHASSIS ASSY - PL330QMD (46115-0790)
CHASSIS ASSY - PL330QMD (46115-0770) continued/...

Part No.	Description	Position
22573-0205	HEADER 5 WAY STRAIGHT OR	PJ2A MAIN
22573-0207	HEADER 7 WAY STRAIGHT	PJ2A MAIN
22575-0203	SKT 3W .156 20AWG (Yellow)IDT	TRANSFORMER
22575-0205	SKT 5W .156 20AWG (Yellow)IDT	TRANSFORMER
22575-0210	SKT 10W .156 20AWG (Yellow)IDT	
25211-0300	RECTIFIER BRIDGE 25 AMP 200V	BR1,2,3
31512-0450	COVER HEATSINK - PL310/320/154	
31512-0400	COVER HEATSINK - PL330	
31512-0360	COVER HEATSINK - PL310QMD/310QMT/320QMT	
31512-0430	COVER HEATSINK - PL330QMD	
31512-0510	COVER HEATSINK - PL330QMD/330QMT/320QMT	
33536-3550	CHASSIS - PL SINGLE	
33536-3560	CHASSIS - PLQMD/310QMT	
33536-3580	CHASSIS - PL320QMT/330QMT	
37541-9010	LABEL - TRANSFORMER SHROUD - PL	
22115-0190	TRANSFORMER PL 5V/7A	
22115-0210	TRANSFORMER PL330/330QMD/330QMT	
22115-0230	TRANSFORMER PL310QMT	
22115-0250	TRANSFORMER PL320QMT	
43751-9010	TRANSFORMER PL310/310QMD/310QMT	
43751-9090	TRANSFORMER PL320/320QMD/320QMT	
43751-9100	TRANSFORMER PL154	

PL310 - CASE PARTS (51000-0101)
PL320 - CASE PARTS (51000-0201)
PL330 - CASE PARTS (51000-0301)
PL154 - CASE PARTS (51000-0401)
PL310QMD - CASE PARTS (51000-0501)
PL320QMD - CASE PARTS (51000-0601)
PL330QMD - CASE PARTS (51000-0701)
PL310QMT - CASE PARTS (51000-0801)
PL320QMT - CASE PARTS (51000-1301)
PL330QMT - CASE PARTS (51000-0901)

Part Number	Description	Position
20037-0247	WASHER 4BA SHK/PROOF I/T ZPST	LOWER CASE SCREWS
20062-9303	SCREW NO 6 X 0.5" PNHDPZ ST/AB	COVER/FRONT PANEL
20062-9305	SCREW No.6x3/4" Pozi. Pan	FEET
20062-9501	SCREW No.6x3/4"Raised Poz.	HANDLE
20630-9001	Black Handle	
20630-9003	Handle Clips	
20653-0204	CABLE TIE	
20657-0070	KNOB 21MM DA217 180 GREY 99	
20657-0072	CAP BLK LINE C211 GREY 99	
20662-9101	Instrument Foot	
33536-3510	COVER - PL310QMD/310QMT/320QMD	
33536-3500	COVER - PL330QMD	
33536-3620	COVER - PL310/320/154	
33536-3630	COVER - PL330	
33536-3660	COVER - PL330QMT/320QMT	
37113-0180	BUTTON, MID GREY ABS	
37522-0160	LABEL SER NO - THURLBY-THANDAR	

(i) INSTRUCTION BOOK

Part Number	Description
48511-0170	INSTRUCTION BOOK - PL SERIES

(ii) MAINS CABLES

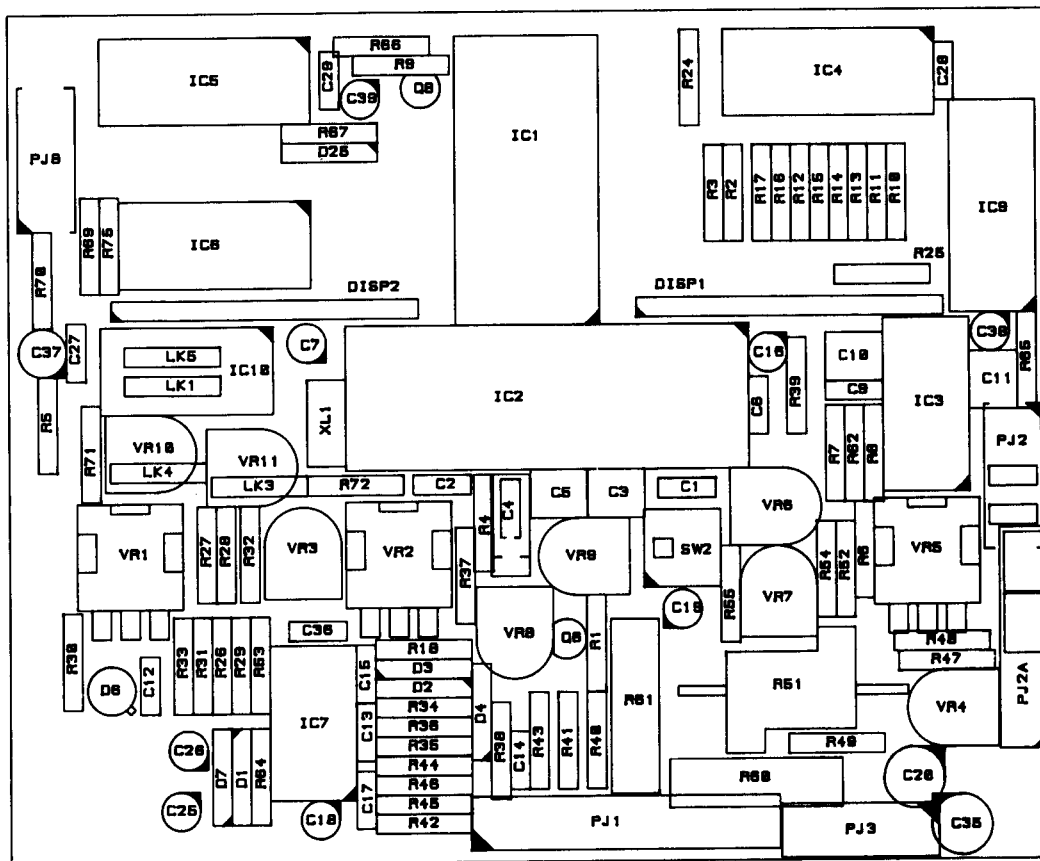
Part Number	Description	Type
10175-0110	MAINS LD 3 CORE 24/0.2MM	240V
22491-0200	MAINS LD BARE ENDS/EURO PLUG	220V
22491-0210	MAINS LD BARE ENDS/USA PLUG	110/120V

(iii) FUSES

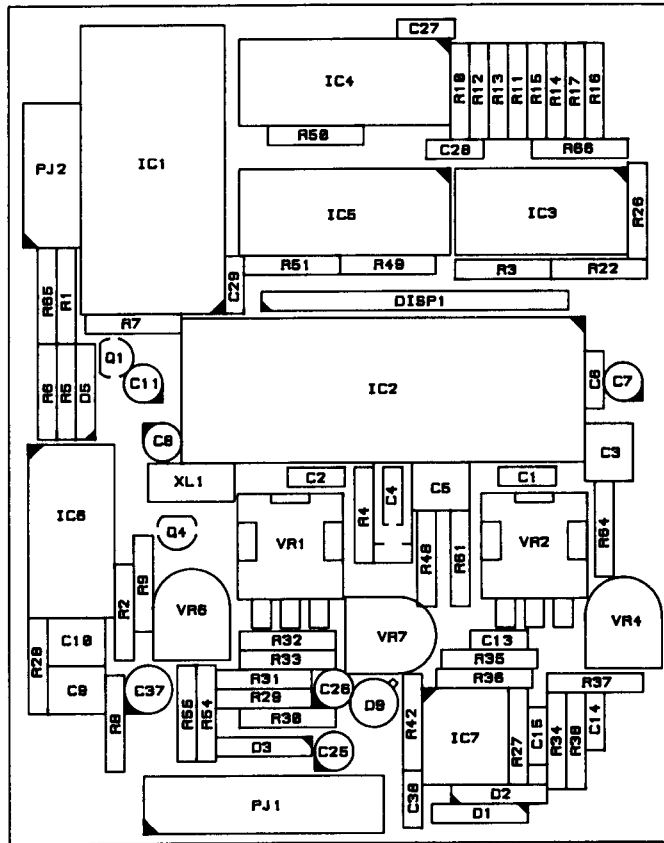
MODEL	240/220V	110/120V
PL310/320/154 (Single)	22315-9501	22315-9502
PL330 (Single)	22315-0230	22315-0241
PL310QMD/QMT PL320QMD/QMT	22315-9502	22315-9503
PL330QMD	22315-0241	22315-0244
PL330QMT	22315-9503	22315-0245

(iv) POWER WARNING LABELS

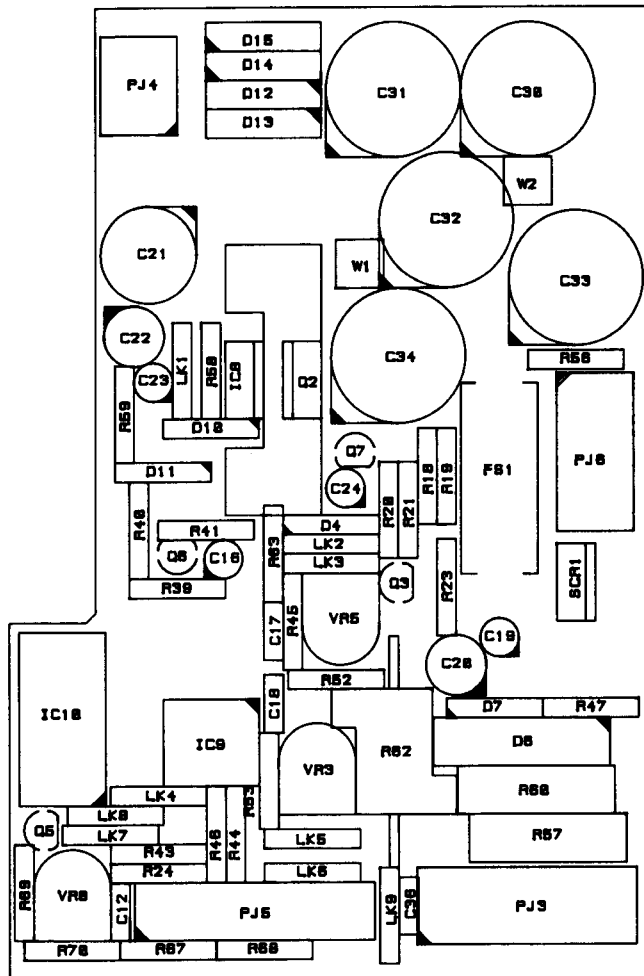
MODEL	240/220V	110/120V
PL310/320/154 (Single)	37559-0100/0110	37559-0130/0120
PL330 (Single)	37559-0380/0390	37559-0410/0400
PL310QMD/QMT PL320QMD	37559-0140/0150	37559-0170/0160
PL320QMT	37559-0420/0430	37559-0450/0440
PL330QMD	37559-0300/0310	37559-0330/0320
PL330QMT	37559-0340/0350	37559-0370/0360



Component Layout - PL Main Board

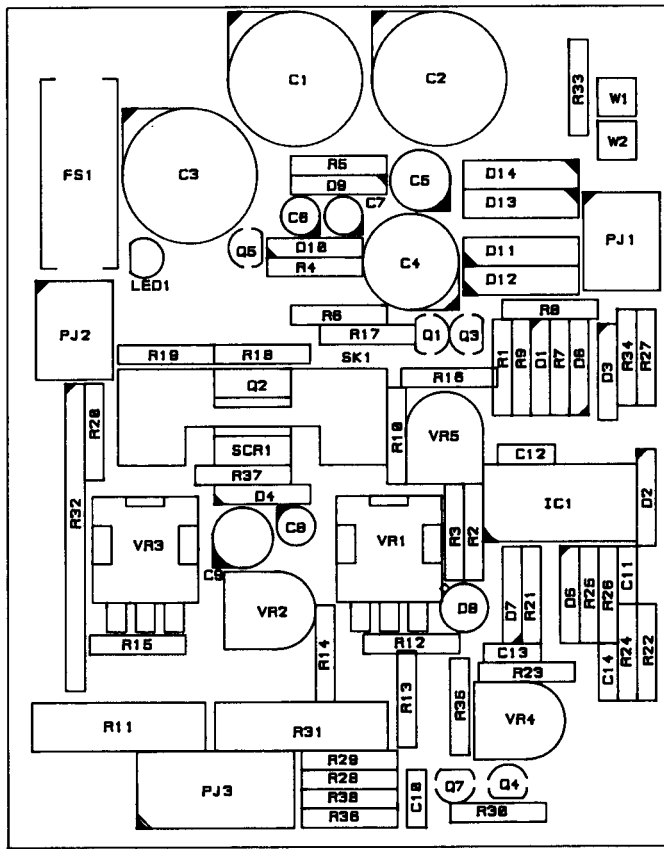


Main

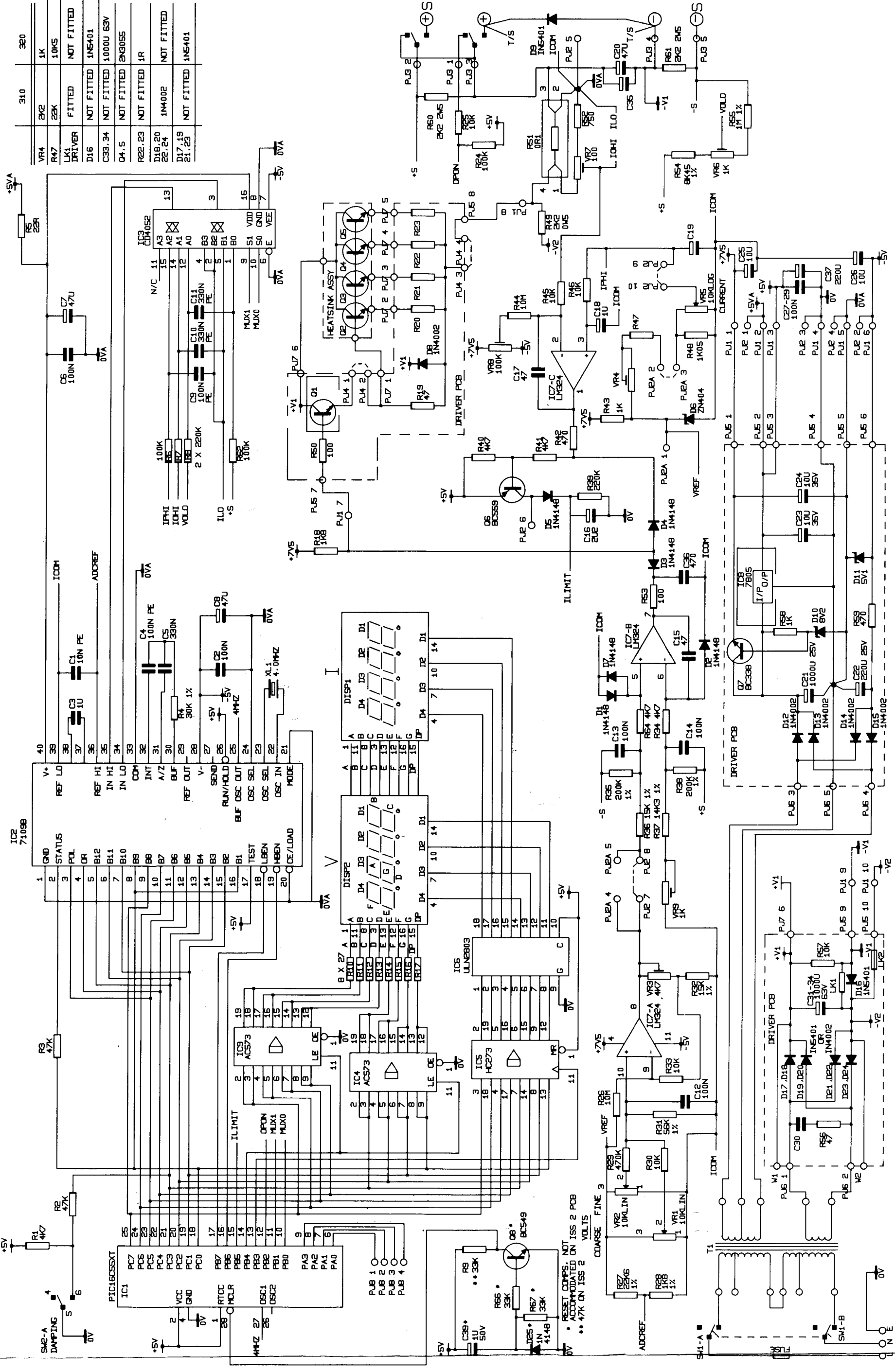


Driver

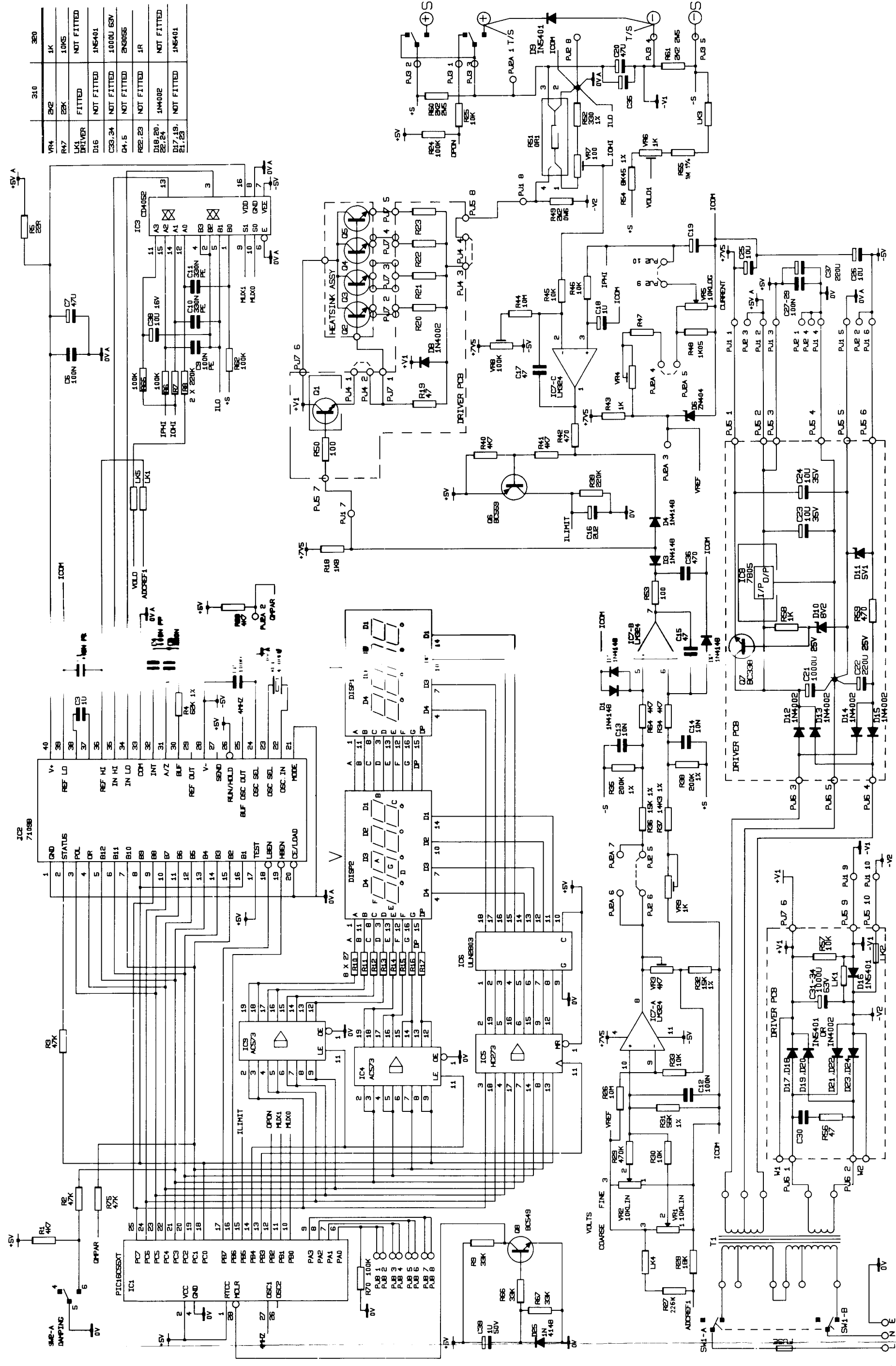
Component Layout - PL330QMT 5V/7A Section



Component Layout - PL320QMT 5V/4A Section



VR4	2K2	310	320
R47	22K		
LK1	DRIVER	FITTED	10K5
D16	NOT FITTED	NOT FITTED	1N5401
C33,34	NOT FITTED	NOT FITTED	1000U 63V
OK4,5	NOT FITTED	NOT FITTED	2N3055
RE2,23	NOT FITTED	NOT FITTED	1R
D18,20	NOT FITTED	NOT FITTED	1N4002
D17,19	NOT FITTED	NOT FITTED	1N5401

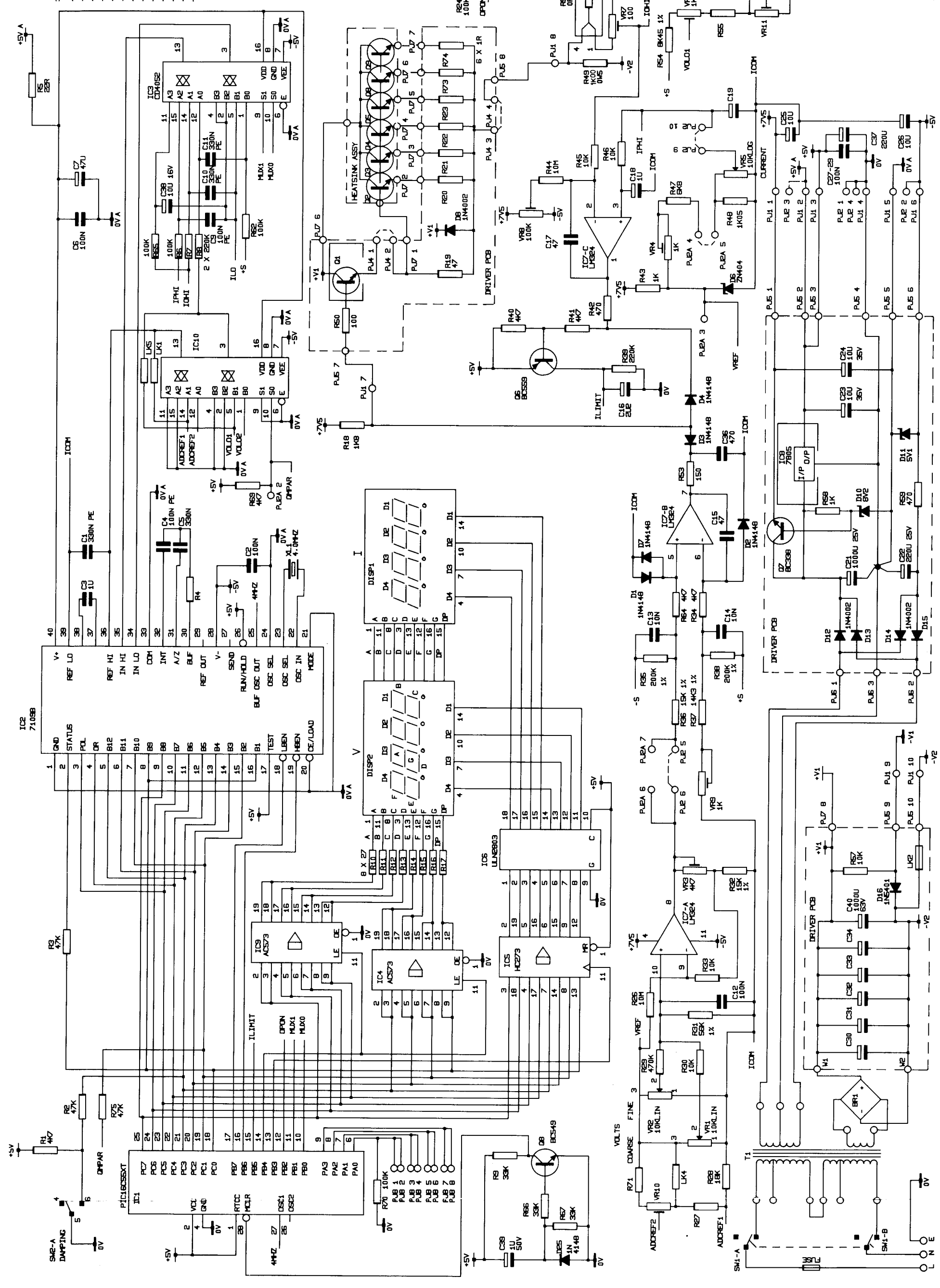


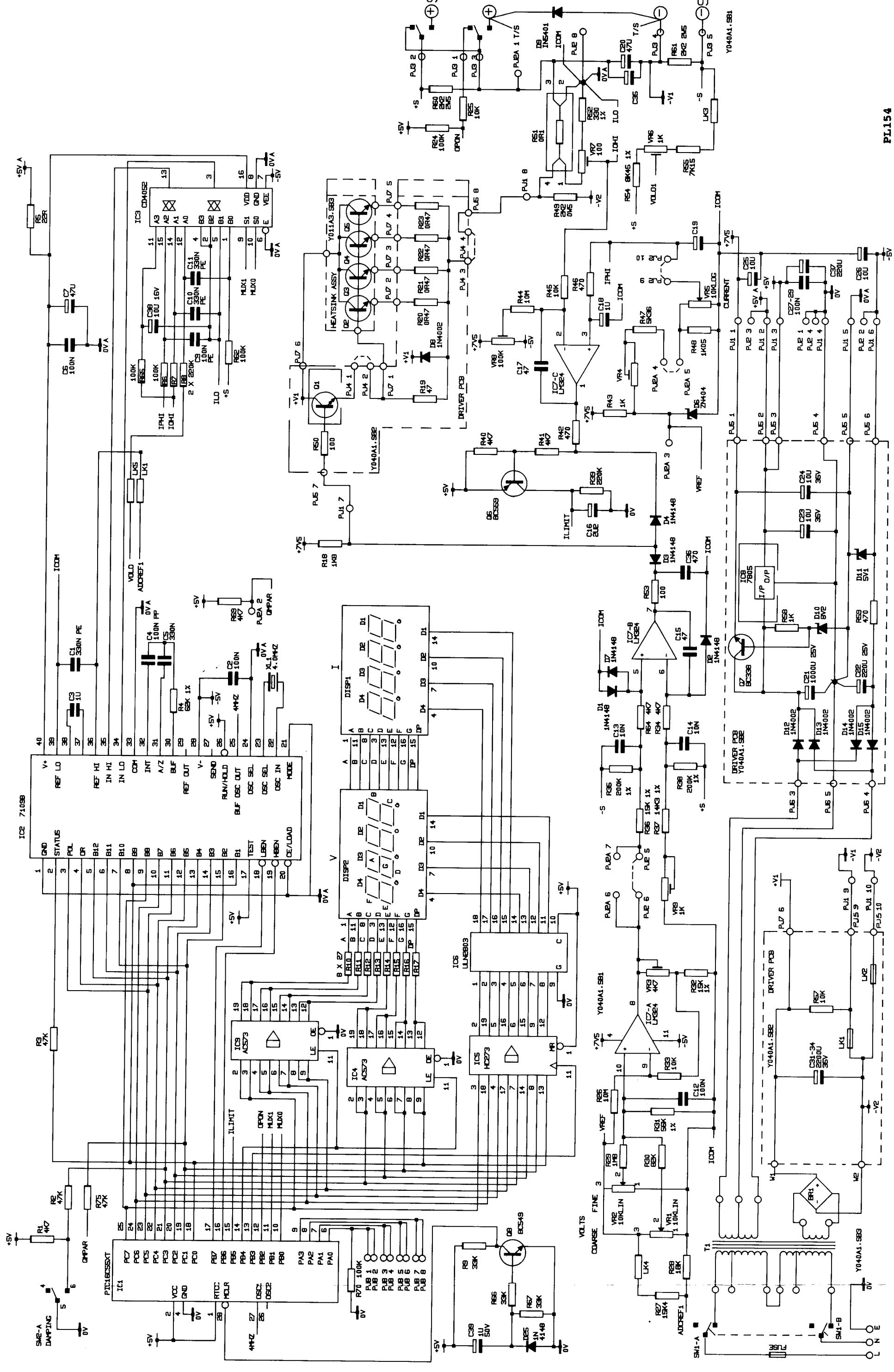
VR4	2K2	310	1K	320
RM7	22K		10MS	
LK1	DRIVER		FITTED	NOT FITTED
D16	NOT FITTED		1N6401	
C33,34	NOT FITTED		1000U 63V	
DA,5	NOT FITTED		2N9055	
RE2,23	NOT FITTED		1R	
D18,20,22,24	NOT FITTED		1N4002	
D17,19,21,23	NOT FITTED		1N6401	

PL310/PL320 (Main pcb Issue 4 and onwards)

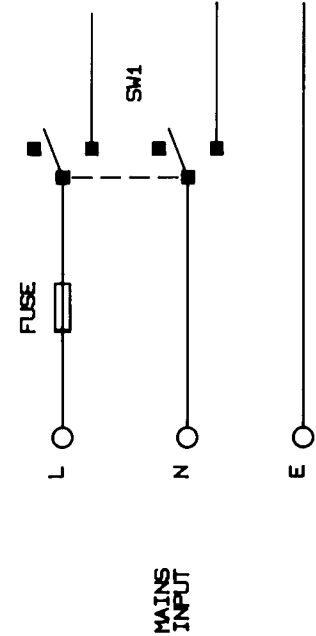
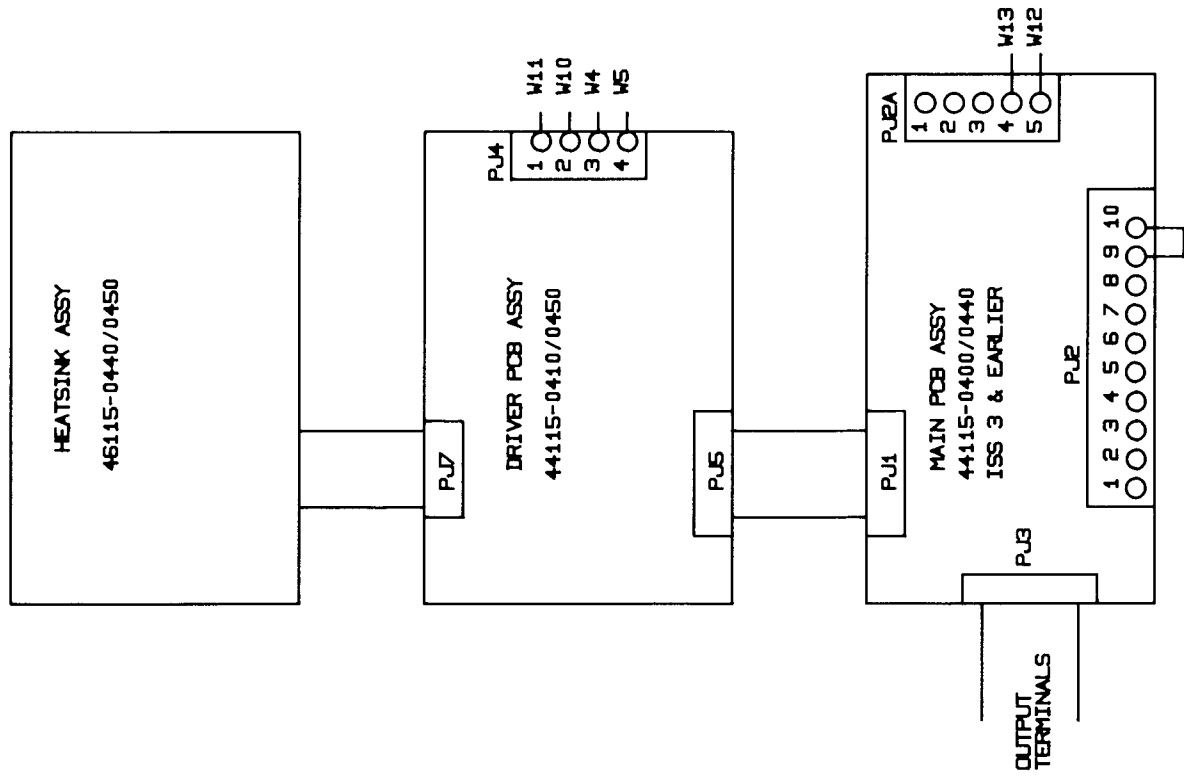
COMP MASTER	MAIN
44115-0590	44115-0600
LK1	NOT FITTED
LK3	NOT FITTED
LK4	NOT FITTED
LK5	NOT FITTED
IC10	CD4052
R4	47K
R27	15K4
R25	7K15
R71	205K
R72	1M
VR10	4K7
VR11	2K2
RS1	0R1 15M
OR1	10W

NOTE: RS1 IS FITTED SOLDER SIDE ON DPM MASTER

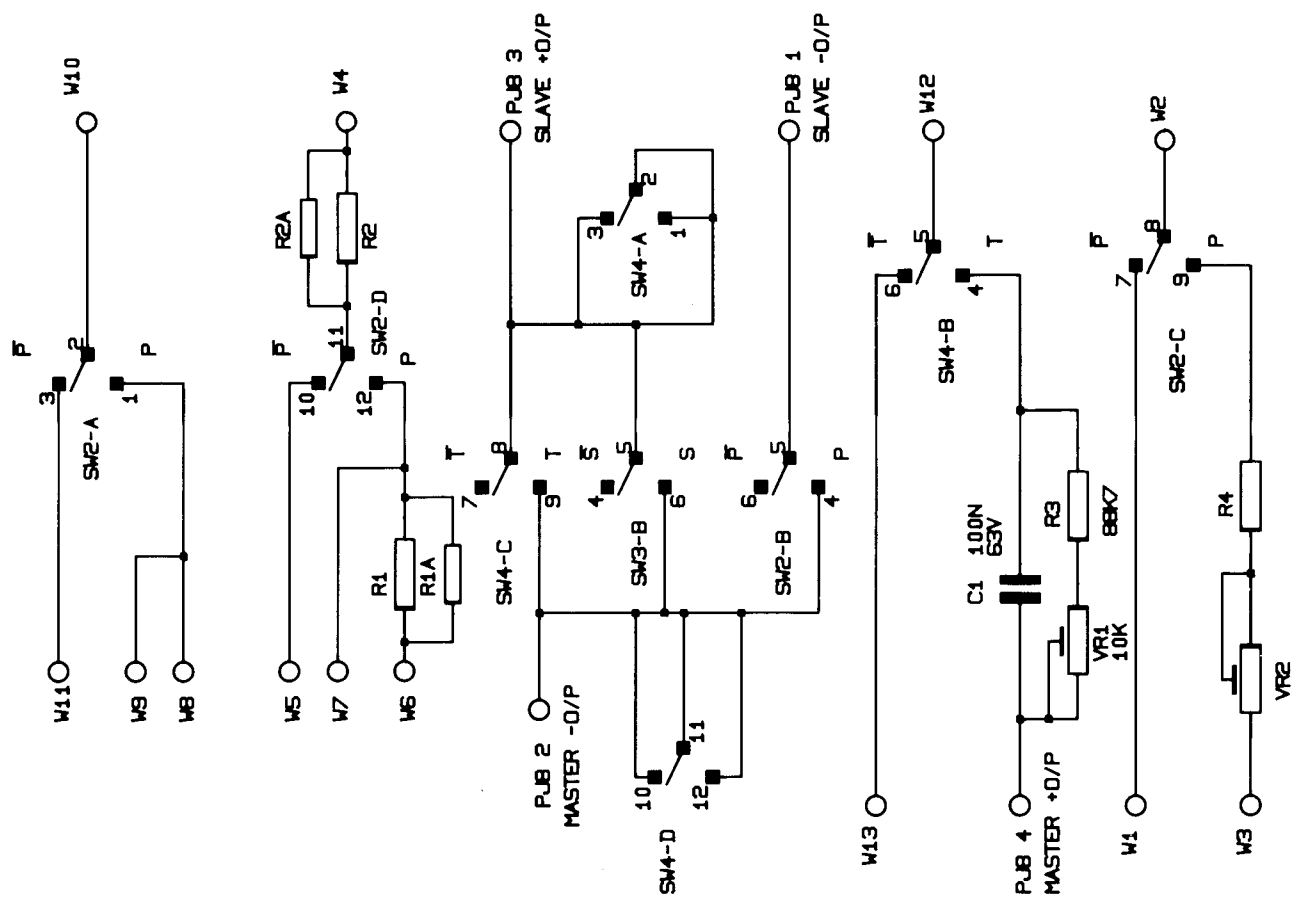




SLAVE



MASTER



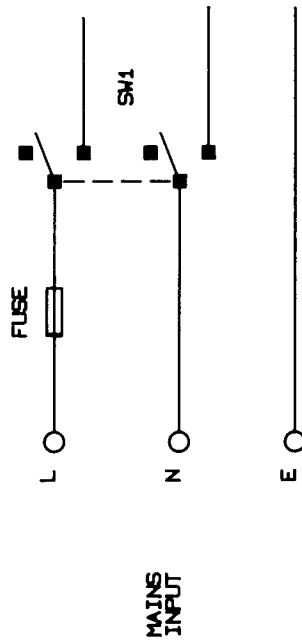
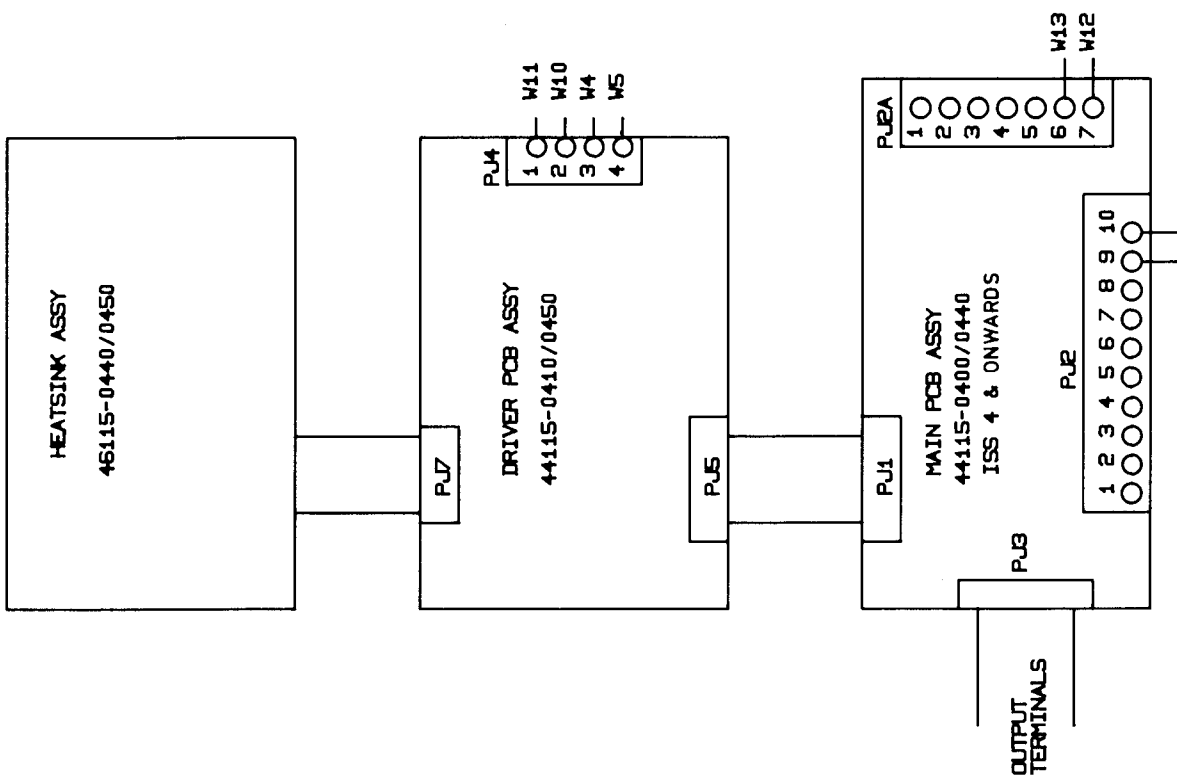
36515-1200 ISSUE 1

	PL310	PL320
R1	NOT FITTED	0R27 2M5
R1A	0R47 0.5W	NOT FITTED
R2	NOT FITTED	0R27 2M5
R2A	0R47 0.5W	NOT FITTED
R4	10K5	5K36
VR2	1K0	470

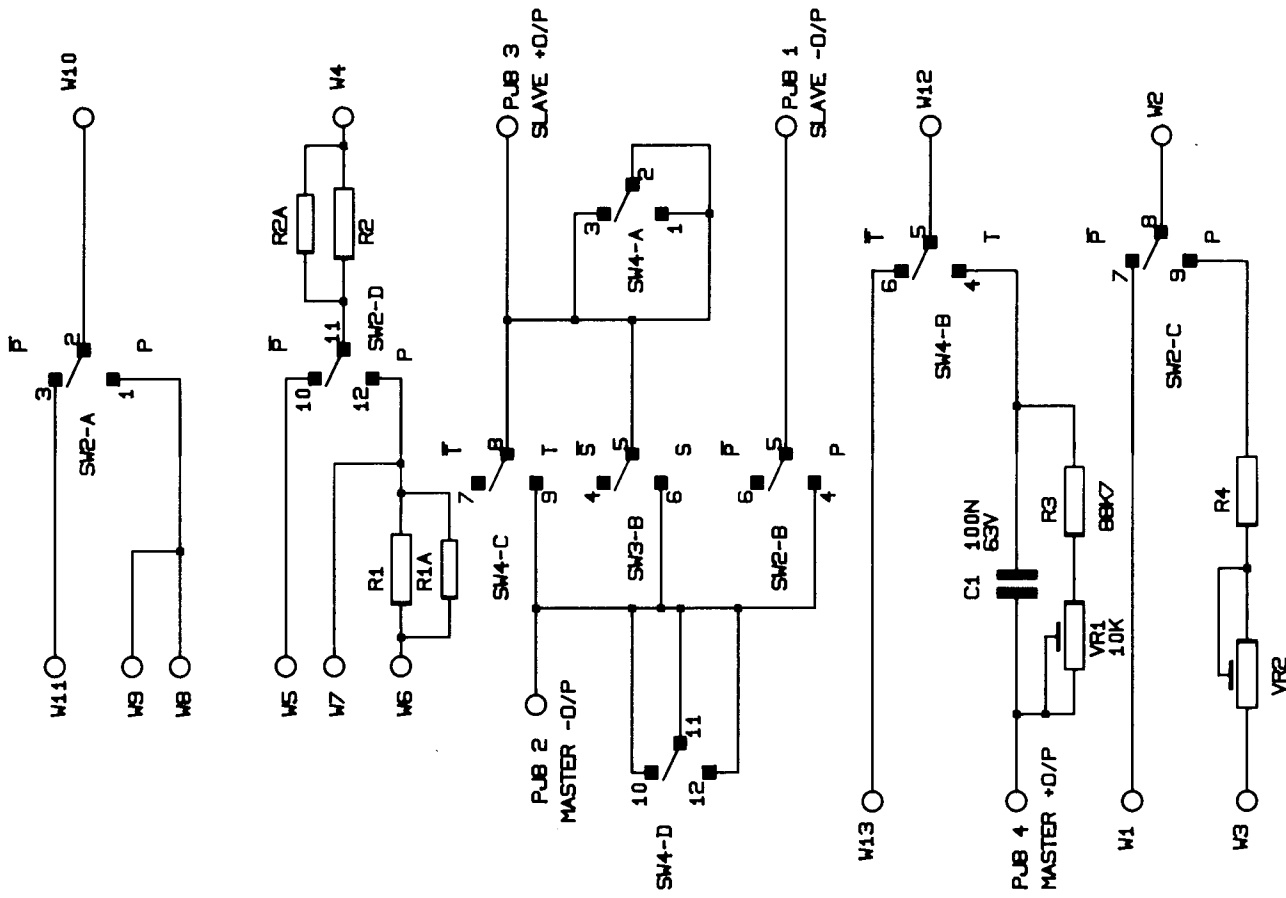
Note: See appropriate PL310/320 schematic for main, driver and heatsink assemblies.

PL310QMD/PL320QMD
(Main pcb Issue 3 and earlier) with 15mm switchbank

SLAVE



MASTER



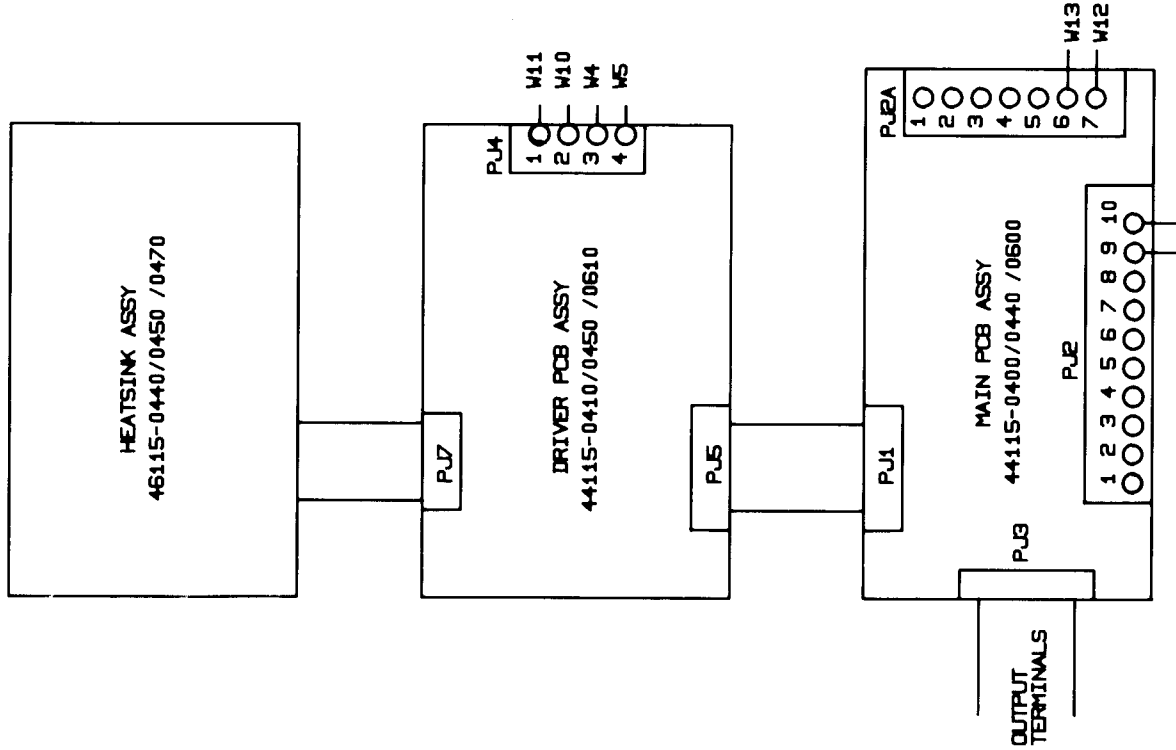
35515-1200 ISS 1

	PL310	PL320
R1	NOT FITTED	0R27 2M5
R1A	0R47 0.5W	NOT FITTED
R2	NOT FITTED	0R27 2M5
R2A	0R47 0.5W	NOT FITTED
R4	10K5	5K36
VR2	1K0	470

Note: See appropriate PL310/320 schematic for main, driver and heatsink assemblies.

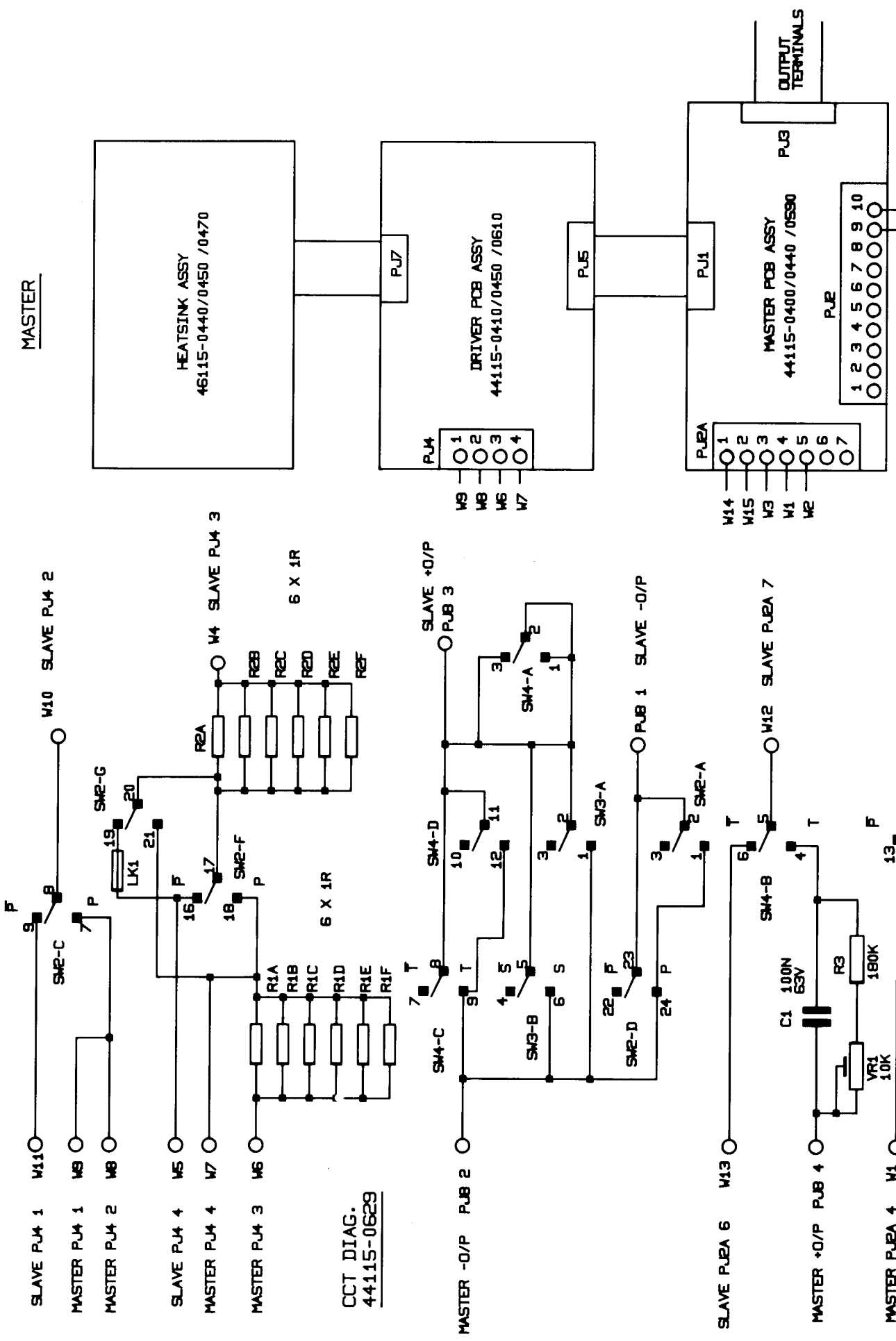
PL310QMD/PL320QMD
(Main pcb Issue 4 and onwards) with 15mm switchbank

SLAVE



COMPONENT	PL310	PL320	PL330
R1A, R1B	1R	1R	1R
R1C, R1D	NOT FITTED	1R	1R
R1E, R1F	NOT FITTED	NOT FITTED	1R
R2A, R2B	1R	1R	1R
R2C, R2D	NOT FITTED	1R	1R
R2E, R2F	NOT FITTED	NOT FITTED	1R
R4	10K5	5K36	3K16
VR2	1K0	470	470

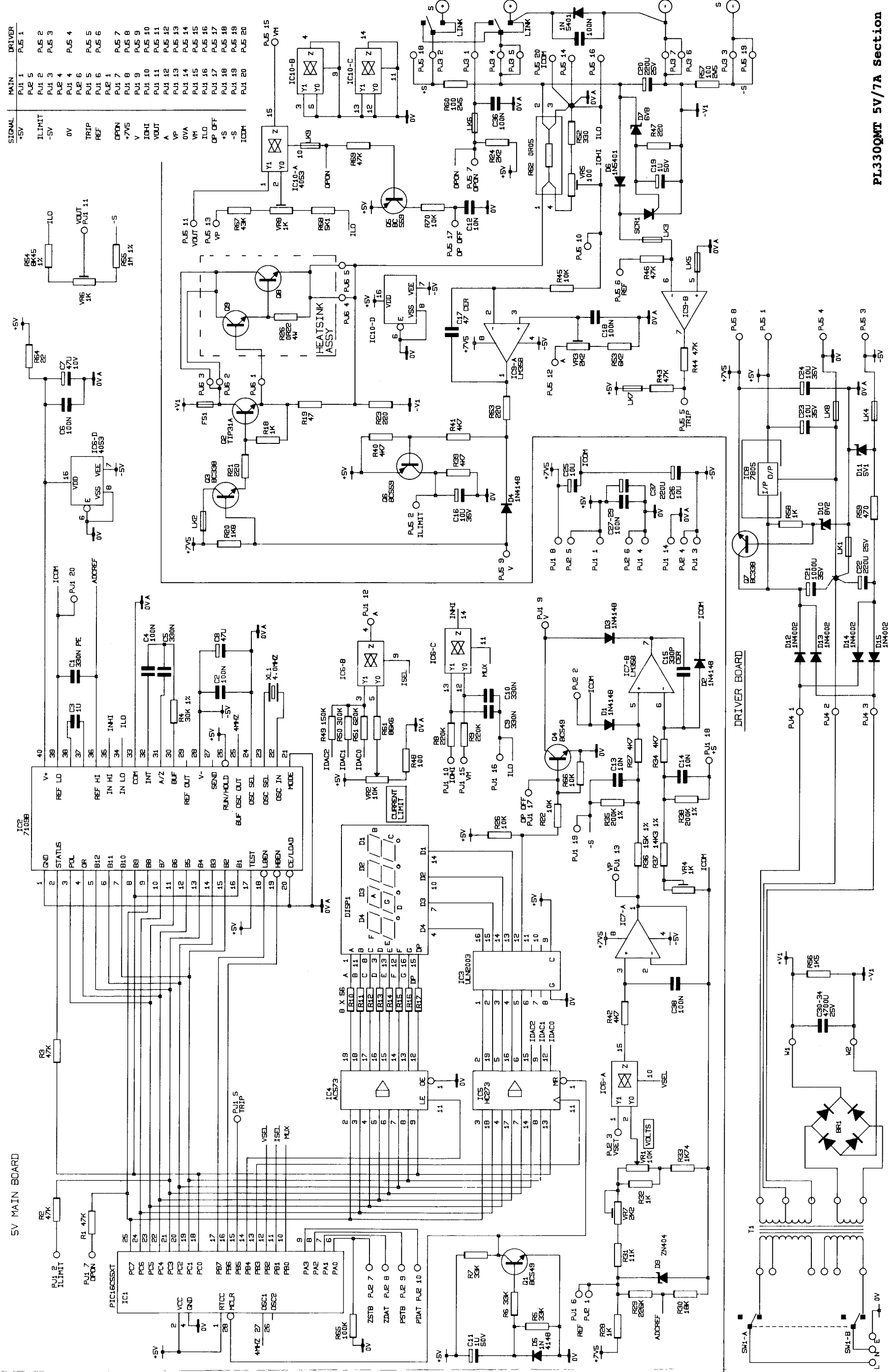
MASTER



CCT DIAG.
44115-0629

Note: See appropriate PL310/320/330 schematic for main, driver and heatsink assemblies.

PL310QMD/PL320QMD/PL330QMD
(main pcb Issue 4 and onwards) with 10mm switchbank



PL330QMT 5V/7A Section

SIGNAL	MAIN	DRIVER
+5V	PJ1 1	PJ5 1
ILIMIT	PJ1 2	PJ5 2
0V	PJ1 3	PJ5 3
TRIP	PJ1 4	PJ5 4
REF	PJ1 5	PJ5 5
OPON	PJ1 6	PJ5 6
+7V5	PJ1 7	PJ5 7
V	PJ1 8	PJ5 8
IDHI	PJ1 9	PJ5 9
VOULT	PJ1 10	PJ5 10
A	PJ1 11	PJ5 11
VP	PJ1 12	PJ5 12
OVA	PJ1 13	PJ5 13
VM	PJ1 14	PJ5 14
ILO	PJ1 15	PJ5 15
OP OFF	PJ1 16	PJ5 16
+S	PJ1 17	PJ5 17
-S	PJ1 18	PJ5 18
IDCM	PJ1 19	PJ5 19
	PJ1 20	PJ5 20