T801-10 Frequency Reference Module

M801-10

Provisional Issue

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Scope of Manual

This Manual contains general, technical and servicing information on the T801-10 Frequency Reference Module.

Technical Information

Any enquiries regarding this manual or the equipment it describes should be addressed in the first instance to your nearest approved Tait Dealer or Service Centre. Further technical assistance may be obtained from the Quasi-Sync Group, Tait Electronics Ltd, Christchurch, New Zealand.

Updating Equipment And Manuals

In the interests of improving performance, reliability or servicing, Tait Electronics Ltd reserve the right to update their equipment and/or manuals without prior notice.

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Ordering Tait Service Manuals

Service Manuals should be ordered from your nearest Tait Branch or approved Dealer. When ordering, quote the Tait Internal Part Number (IPN) and, where applicable, the version.

Date Of Issue

IPN: M801-10 T801-10 Service Manual

Published May 1994

List Of Effective Pages

The total number of pages in this Manual is 26, as listed below.

Note: Any portion of text that has been changed is indicated by a vertical line in the outer margin of the page.

Page	Issue Date	
1	20/04/94	
2	20/04/94	
3	20/04/94	
4	20/04/94	
5	20/04/94	
6	20/04/94	
1.1	20/04/94	
1.2	20/04/94	
2.1	20/04/94	
2.2	20/04/94	
3.1	20/04/94	
3.2	blank	
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4.2	blank	
5.1	20/04/94	
5.2	20/04/94	
6.1	20/04/94	
6.2	20/04/94	
7.1	20/04/94	
7.2	20/04/94	
7.3	20/04/94	
7.4	blank	
7.5	20/04/94	
7.6	20/04/94	
7.7	20/04/94	
7.8	20/04/94	(fold-out)

Contents

7 PCB Information

List Of Illustrations

1 General Information

1.1 Introduction

The T801-10 OCXO Module is intended for use with the T800 series base station equipment. Its function is to provide a high stability frequency source to which the synthesiser within the T800 base station equipment can be locked. This will provide T800 transmitters with the frequency stability required for simulcast transmission.

The master standard within the T801-10 is a high quality ovenised crystal oscillator (OCXO). Three outputs are provided on the rear panel, which allows up to three T800 transmitters to be referenced to the source oscillator.

1.2 Specifications

1.2.1 General

Input Supply Voltage	.. +10.8 to +16V DC
Operating Temperature Range	.. -10°C to +55°C
Input Supply Current:	
General Operation	.. <0.4A
Warm-Up	.. <1.0A

Note: The current is at maximum at switch on, but settles to approximately 0.25A at 13.8V and room temperature.

SSB Phase Noise:	
@ 100Hz	.. -135dBc/Hz
@ 1kHz	.. -145dBc/Hz
Spurious Emissions	.. <-70dBc
Harmonics	.. <-25dBc
Transmitter LF Noise (unaffected)	.. <-55dB rms, 300Hz - 3kHz, de-emphasised
Tuning Range	.. band dependent; refer to Section 2.2
Output Level (50Ω)	.. +3dBm ±1.5dB
Dimensions:	
Height	.. 43mm
Width	.. 483mm
Length	.. 400mm
Weight	.. 3kg
Mounting	.. 483mm (19")rack, 1U high

1.2.2 OCXO Frequency Standard

Calibration (@ 25°C)	.. by external control voltage
Supply Voltage Stability	.. $<5x10^{-10}$
Temperature Stability	.. $<5x10^{-9}$
Warm-Up Time	.. <30 minutes
Output Amplitude	.. 0dBm ±2dBm
Frequency	.. 12.8MHz

2 Operating Instructions

2.1 General Operation

Connect a 4A 12V DC power source to the rear panel power terminals.

Connect the A, B, C outputs to the equipment they are driving (outputs can be left disconnected if they are not used).

Turn on the power switch on the front panel; check that the "On" LED illuminates.

If the "On" LED fails to illuminate, check the 3A fuse in the rear panel fuse holder.

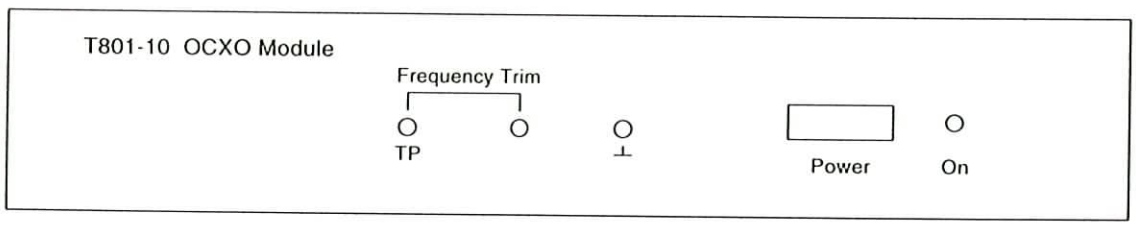


Figure 2.1 T801-10 Front Panel

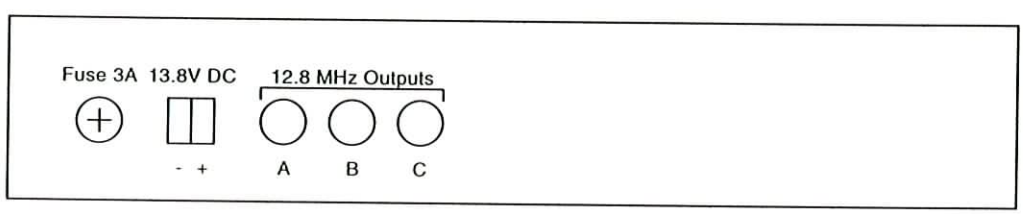


Figure 2.2 T801-10 Rear Panel

2.2 Tuning & Adjustment

It may be necessary from time to time to realign the OCXO because of natural ageing. The frequency of adjustment will depend on the magnitude of the frequency offset employed. Zero frequency offset will require the most frequent adjustment.

The adjustment is made by the potentiometer in the front panel labelled "Frequency Trim". The control voltage for the OCXO can be measured at the TP on the front panel. For a normal trim range this will be in the range of 3-5V. The front panel frequency trimpot has been designed to give a typical adjustment of ±10Hz for the band of operation.

Note: A maximum pulling range of ≥±0.5ppm is possible, which corresponds to an offset of:

≥±25Hz @ 66MHz
≥±60Hz @ 150MHz
≥±170Hz @ 440MHz.

Should you require a different adjustable frequency range from that nominally supplied, please contact your nearest approved Tait dealer.

To give some idea of the likely period of recalibration, the ageing characteristics of the DFO 51-S3SW OCXO are as follows:

daily ageing	$<5x10^{-10}$/day
1st year ageing	$<5x10^{-8}$/year
short term stability	$<5x10^{-11}$

A frequency counter may be used, provided that adequately long gate times are possible and that its reference clock is guaranteed to be invariant between individual transmitters. Locking to a broadcast high stability frequency standard is ideal for this purpose.

3 Circuit Description

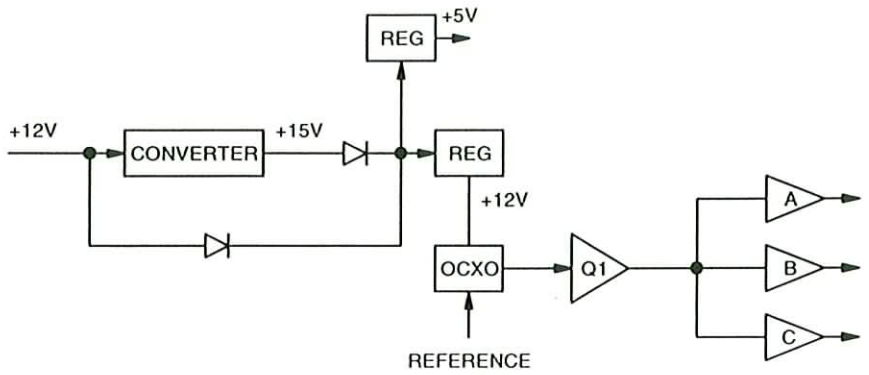


Figure 3.1 T801-10 Block Diagram

Figure 3.1 shows the T801-10 circuitry. The 12V input is fed to the DC-DC convertor which has an output voltage of 15V for supplying the 12V and 5V regulators. The 12V regulator supplies the OCXO and the reference potentiometer on the front panel, while the 5V regulator provides a supply for the output buffers.

Should the DC-DC convertor go short circuit, the supply to the 12V and 5V regulators is taken from the input supply.

The signal from the OCXO output is fed through buffers Q1 and IC5 where it is split evenly and directed to outputs A, B, and C on the rear panel.

4 Installation

4.1 Mounting & Connection

The T801-10 is designed to mount in a 483mm (19") rack frame. It requires a depth of approximately 400mm to allow for clearance for the rear connector and cable entry, and a clearance in height of approximately 43mm to allow for adequate air flow around the unit.

All coaxial connectors are BNC female, while the DC input is via a connector block mounted in the rear panel.

Note: In order that the OCXO can keep within its operating limits at high ambient temperature, it is important that an adequate convective air flow can be maintained over the T801. Installations with closely packed equipment or unventilated cabinets should be avoided.

4.2 Power Supply

Because frequency stability is critical in simulcast applications, it may be desirable, for the sake of system reliability, to use a battery based power supply. This is because the OCXO requires a warm up time of 30 minutes.

Note: When power is removed from the T801, the transmitters which are referenced to it will cease to transmit.

5 Introduction To Servicing

5.1 General

If further information is required about T801-10 OCXO Module or this Manual, it may be obtained from Tait Electronics Ltd or accredited agents. When requesting this information, please quote the equipment serial number or works order number. In the case of the Service Manual quote the Tait Internal Part Number (IPN) and Issue (e.g. M801-10 Issue A0), and for circuit diagrams quote the 'Title', 'IPN' and 'Issue'.

Caution: CMOS Devices

This equipment contains CMOS Devices which are susceptible to damage from static charges. Care when handling these devices is essential. For correct handling procedures refer to the manufacturers' data books, e.g. Philips data books covering CMOS devices, or Motorola CMOS data books, Section 5 'Handling', etc.

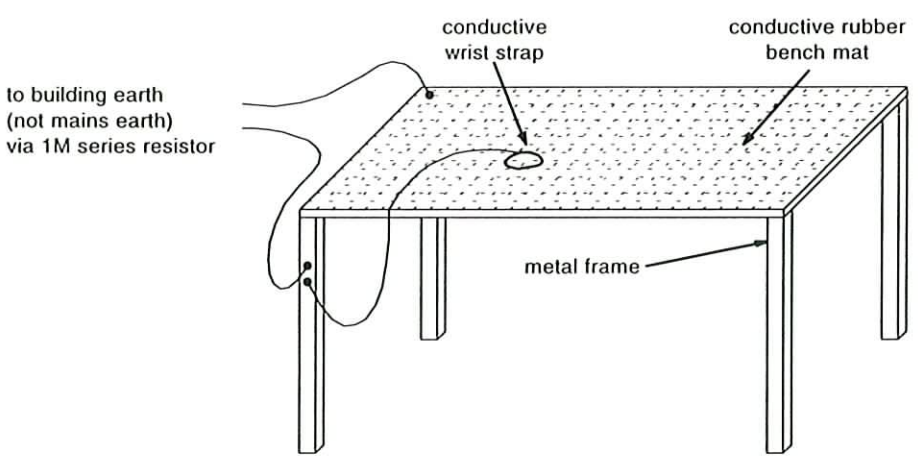


Figure 5.1 Typical Anti-static Bench Set-up

An anti-static bench kit (refer to Figure 5.1) is available from Tait Electronics Ltd under the usual consumable goods ordering system. The kit is held in stock under IPN 937-00000-34 and contains:

1 conductive rubber bench mat
1 earth lead to connect the mat to ground (c/w 1M series resistor)
1 wrist strap
information leaflet.

Technical Instructions (TI's)

From time to time TI's are issued by Tait Electronics Engineering Division. These TI's may be used to update equipment or information, or to meet specific operational requirements.

5.2 Mechanical

5.2.1 Pozidriv Recess Head Screws

Pozidriv recess head screws are the preferred standard on all Tait manufactured equipment. The very real advantages of this type of screw will not be realised unless the correct screwdrivers are used by servicing personnel.

5.3 Component Replacement

5.3.1 Leaded Components

Whenever components are removed from or fitted to the PCB, care must be taken to avoid damage to the track. The two satisfactory methods of removing components from PTH PCB's are detailed below.

Note: The first method requires the use of a desoldering station, e.g. Philips SBC 314 or Pace MBT-100E.

5.3.1.1 Desoldering Iron Method

Place the tip over the lead and, as the solder starts to melt, move the tip in a circular motion.

Start the suction and continue the movement until 3 or 4 circles have been completed.

Remove the tip while continuing suction to ensure that all solder is removed from the joint, then stop the suction.

Before pulling the lead out, ensure it is not stuck to the plating.

If the lead is still not free, resolder the joint and try again.

Note: The desoldering iron does not usually have enough heat to desolder leads from the ground plane. Additional heat may be applied by holding a soldering iron on the tip of the desoldering iron (this may require some additional help).

5.3.1.2 Component Cutting Method

Cut the leads on the component side of the PCB.

Heat the solder joint ***sufficiently*** to allow ***easy*** removal of the lead by drawing it out from the component side: do ***not*** use undue force.

Fill the hole with solder and then clear with solderwick.

6 Fault Finding

6.1 Visual Checks

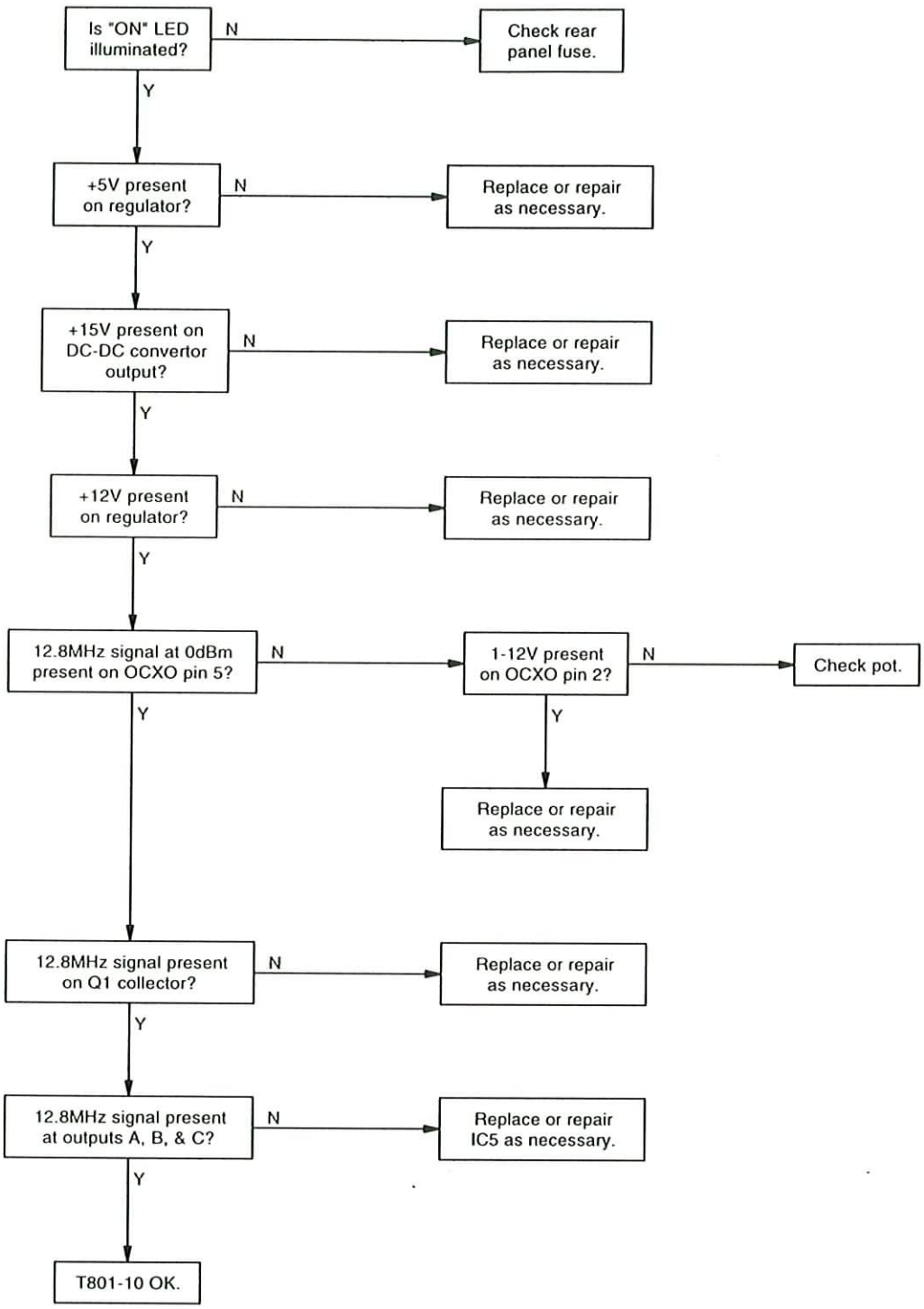
Remove the top cover from the T801-10 and inspect the PCB's for damaged or broken components.

Check for defective solder joints. If repair or replacement is considered necessary, refer to Section 5.3.

6.2 General Faults

If the "On" LED is not illuminated when the power is switched on, check the 3A fuse in the rear panel fuse holder.

6.3 Fault Finding Chart



7 PCB Information

7.1 Introduction

Parts Lists

The 10 digit numbers (000-00000-00) in this Parts List are "internal part numbers" (IPN's). Your spare parts orders can be handled more efficiently if you quote: equipment type, circuit reference and IPN, along with a brief description of the part.

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc) and those without (miscellaneous and mechanical).

Those with a circuit reference are grouped by component type in numerical order. Each component entry comprises three columns: the circuit reference, IPN and description.

The miscellaneous and mechanical section lists the variant and common parts in IPN order.

Using CAD Circuit Diagrams

Reading a CAD circuit diagram is similar to reading a road map, in that both have an alphanumeric border. The circuit diagrams in this manual use letters to represent the horizontal axis, and numbers for the vertical axis. These circuit diagram "grid references" are useful in following a circuit that is spread over two or more sheets.

When a line representing part of the circuitry is discontinued, a reference will be given at the end of the line to indicate where the rest of the circuitry is located. The first digit refers to the sheet number (printed on the bottom right hand corner of the CAD diagram) and the last two characters refer to the location on that sheet of the continuation of the circuit (e.g. 1-D4).

If more than one line is represented (indicated by a double thickness line), a dot with a reference label will follow the route each individual line represents.

7.2 T801-10 PCB

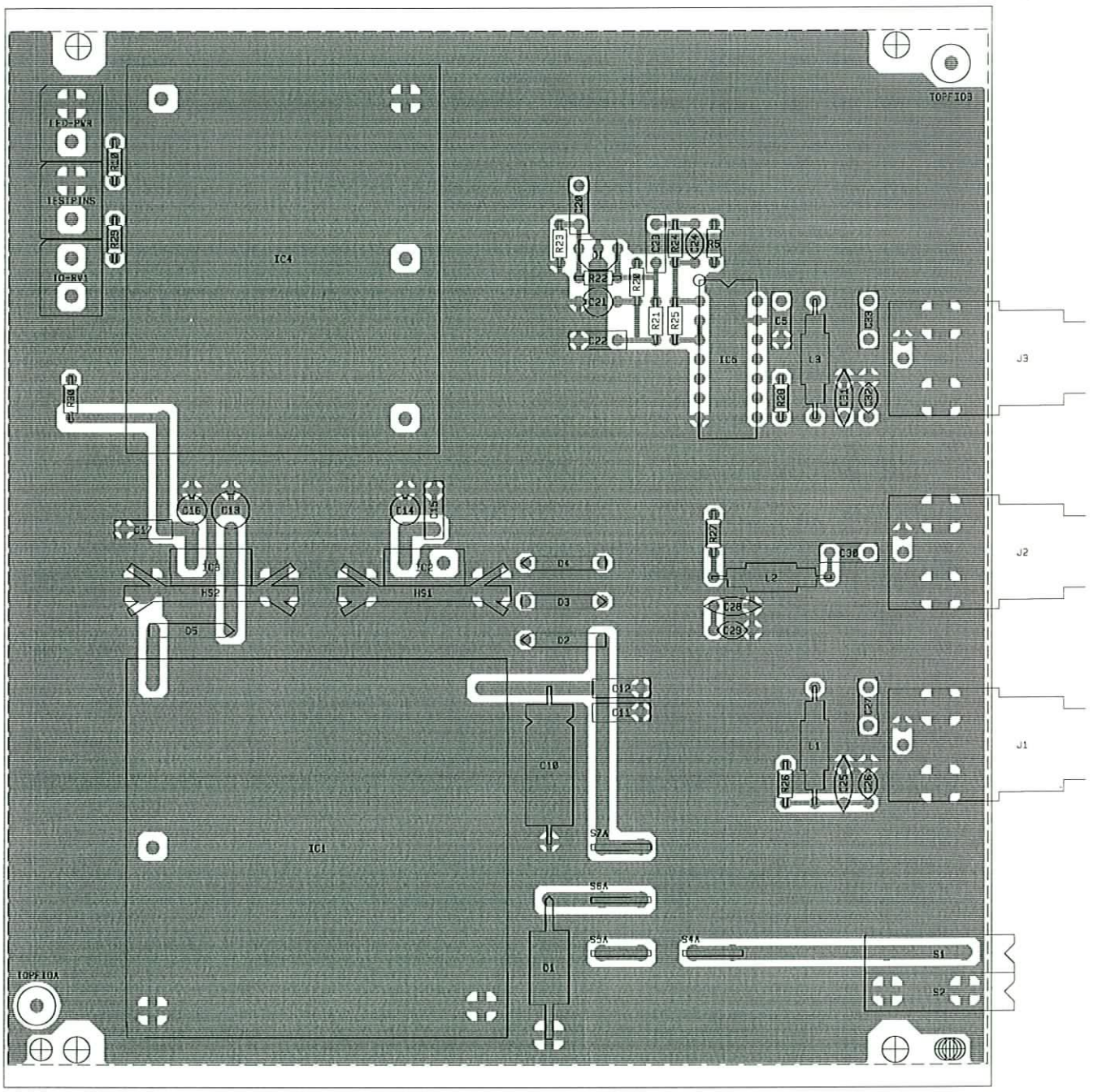
T801-10 Parts List (IPN 227-25001-00)

Ref	IPN	Description
C5	022-56100-10	CAP MYLAR AI 100N 5% 63V POTTED
C10	021-09100-01	CAP ELECT AXIAL 100M 25V 8X16MM
C11	022-54100-10	CAP MYLAR AI 1N 5% 63V POTTED
C12	022-56100-10	CAP MYLAR AI 100N 5% 63V POTTED
C13	020-58100-03	CAP ELECT AI RDL 10M 50V 5X11MM
C14	020-58100-04	CAP ELECT AI RDL 10M 16V 4X7MM
C15	022-55100-10	CAP MYLAR AI 10N 5% 63V POTTED
C16	020-58100-04	CAP ELECT AI RDL 10M 16V 4X7MM
C17	022-55100-10	CAP MYLAR AI 10N 5% 63V POTTED
C20	022-55100-10	CAP MYLAR AI 10N 5% 63V POTTED
C21	020-58100-04	CAP ELECT AI RDL 10M 16V 4X7MM
C22	022-55100-10	CAP MYLAR AI 10N 5% 63V POTTED
C23	022-55100-10	CAP MYLAR AI 10N 5% 63V POTTED
C24	011-52100-01	CAP CER AI 10P 5% NPO 50/63V
C25	011-52820-01	CAP CER AI 82P 5% N150 50/63V
C26	011-51560-01	CAP CER AI 5P6 5% NPO 50/63V
C27	022-55100-10	CAP MYLAR AI 10N 5% 63V POTTED
C28	011-52820-01	CAP CER AI 82P 5% N150 50/63V
C29	011-51560-01	CAP CER AI 5P6 5% NPO 50/63V
C30	022-55100-10	CAP MYLAR AI 10N 5% 63V POTTED
C31	011-52820-01	CAP CER AI 82P 5% N150 50/63V
C32	011-51560-01	CAP CER AI 5P6 5% NPO 50/63V
C33	022-55100-10	CAP MYLAR AI 10N 5% 63V POTTED
D1	001-00012-77	(S) DIODE 1N6277A ZENER 18V 1500W @ 1.0MS 1.5KE18A
D2	001-00011-70	(S) DIODE 1N4001 1A/50V
D3	001-00011-70	(S) DIODE 1N4001 1A/50V
D4	001-00011-70	(S) DIODE 1N4001 1A/50V
D5	001-00011-70	(S) DIODE 1N4001 1A/50V
FUSE	265-00010-05	FUSE 3A CARTRIDGE 6*32MM BS4265
IC1	705-00012-15	IC SH1215S 15V-15V DC-DC CONVERTOR 1000mA
IC2	002-00078-05	(S) IC MC7805ACT 5V REG(LINEAR)1AMP TO-220
IC3	702-00078-12	IC MC7812ACT 12V REG LINEAR TO-220
IC4	539-00010-51	IC DFO-51-S3SW OCXO 12.8MHZ
IC5	002-74000-04	(S) IC 74HCU04 UNBUFF HEX INVERTER
LEDPWR	240-04030-09	TERMINAL BLOCK PCB MTG 2WAY 5MM PITCH.
L1	056-00021-01	IND FXD 1.5UH AXIAL
L2	056-00021-01	IND FXD 1.5UH AXIAL
L3	056-00021-01	IND FXD 1.5UH AXIAL
POWER	008-00015-02	(S) LED RED COMPL WITH SATIN CHROME BEZEL-RECESSED
Q1	000-50020-11	(S) XSTR AI BF494 NPN TO-92 RF S/SIG
RV1	044-04200-03	RES PRESET MULTITURN 2K 10T PNL MTG
R5	030-52220-20	RES FILM AI 22E 5% 0.4W 4X1.6MM
R10	030-54470-20	RES FILM AI 4K7 5% 0.4W 4X1.6MM
R20	030-52220-20	RES FILM AI 22E 5% 0.4W 4X1.6MM
R21	030-53470-20	RES FILM AI 470E 5% 0.4W 4X1.6MM
R22	030-54270-20	RES FILM AI 2K7 5% 0.4W 4X1.6MM
R23	030-54100-20	RES FILM AI 1K 5% 0.4W 4X1.6MM
R24	030-55100-20	RES FILM AI 10K 5% 0.4W 4X1.6MM
R25	030-55470-20	RES FILM AI 47K 5% 0.4W 4X1.6MM
R26	030-53330-20	RES FILM AI 330E 5% 0.4W 4X1.6MM
R27	030-53330-20	RES FILM AI 330E 5% 0.4W 4X1.6MM
R28	030-53330-20	RES FILM AI 330E 5% 0.4W 4X1.6MM
R29	030-55100-20	RES FILM AI 10K 5% 0.4W 4X1.6MM
R30	030-53560-20	RES FILM AI 560E 5% 0.4W 4X1.6MM
SW1	230-00010-24	SWITCH ROCKER SPST 250V 16A PNL MTG ILLUM
S1	240-04030-07	TERML BLK PCB MTG 1WAY FRT 2.5H/SA10
S2	240-04030-07	TERML BLK PCB MTG 1WAY FRT 2.5H/SA10
TSTPNS	240-04030-09	TERMINAL BLOCK PCB MTG 2WAY 5MM PITCH.
TO-RV1	240-04030-09	TERMINAL BLOCK PCB MTG 2WAY 5MM PITCH.

Mechanical & Miscellaneous Parts (IPN 227-25001-00)

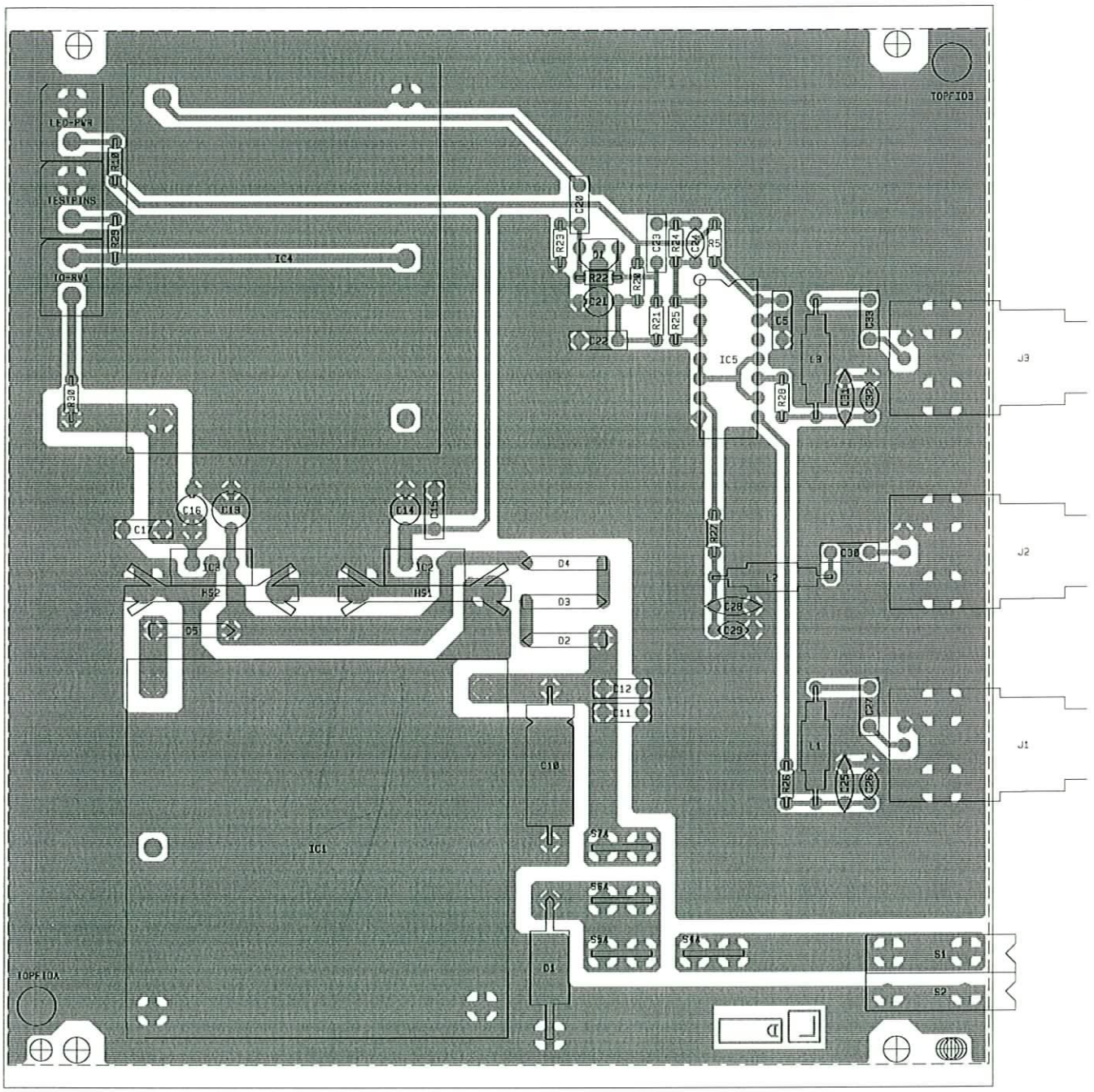
IPN	Description
201-00030-01	WIRE #1 T/C WIRE 7/0.2MM PVC BROWN
201-00030-03	WIRE #1 T/C WIRE 7/0.2MM PVC ORANGE
201-00030-04	WIRE #1 T/C WIRE 7/0.2MM PVC YELLOW
201-00030-07	WIRE #1 T/C WIRE 7/0.2MM PVC VIOLET
201-00030-09	WIRE #1 T/C WIRE 7/0.2MM PVC WHITE
201-00050-02	CABLE AUTO 148 RED 23/0.2MM PVC
227-25001-00	PCB T801-10
240-02100-20	SKT RGHT ANGLE BNC PCB MTG 50 OHM J1, J2, J3
240-04020-63	TERML INSULATED TEST PIN OXLEY 156
240-06010-27	BLANKING PLATE 2.5MM GREEN
308-13091-00	HSINK PCB MTG TO-220
340-00010-18	FUSEHLDR PNL MTG UL&CSA APPROVED 20 AMP FH052S
340-00011-50	COVER INSULATING FUSEHLDR PNL MTG
345-00040-10	SCREW M3*6MM PAN POZI ST BZ
345-00040-12	SCREW M3X10MM CSK POZI ST BZ
345-00050-16	SCREW M4*10MM BUTTON SKT HD BLACK ZINC PHOS
352-00010-29	NUT M4 NYLOC HEX
353-00010-13	WASHER M3 SHAKEPROOF INT BZ
356-00020-06	RECEPTL 6.3MM QUICK CONNECT FLARED INSULATED
356-00020-20	TAB 6.3MM PCB MTG QUICK CONNECT S4A, S5A, S6A, S7A
365-00011-38	LABEL STATIC WARNING YELLOW A4A315
369-00010-24	BASE CABLE TIE MTG SELF ADHESIVE
369-00010-27	TIE CABLE NYLON 140*2.6MM
400-00020-07	SLEEVING 2MM SIL RUBBER
410-01088-00	CRTN T800 SLIMLINE 520X440X150MM
410-01089-00	PKG T801 A3M2806 POLYST FOAM (COMPLETE 6 PIECES)
795-25001-00	IU RACK BIN CHASSIS
795-25002-00	IU RACK BIN FRONT PANEL T801-10
795-25003-00	IU RACK BIN REAR PANEL T801-10
795-25702-00	19 INCH RACK BIN TOP COVER

227-25001-00 P1



TAIT ELECTRONICS	IPN: 227-25001-00	ISS: P1	ID: 2.TA	DATE: 16 Mar 1994
T801-10 PCB LAYOUT - TOP SIDE.				

227-25001-00 P1



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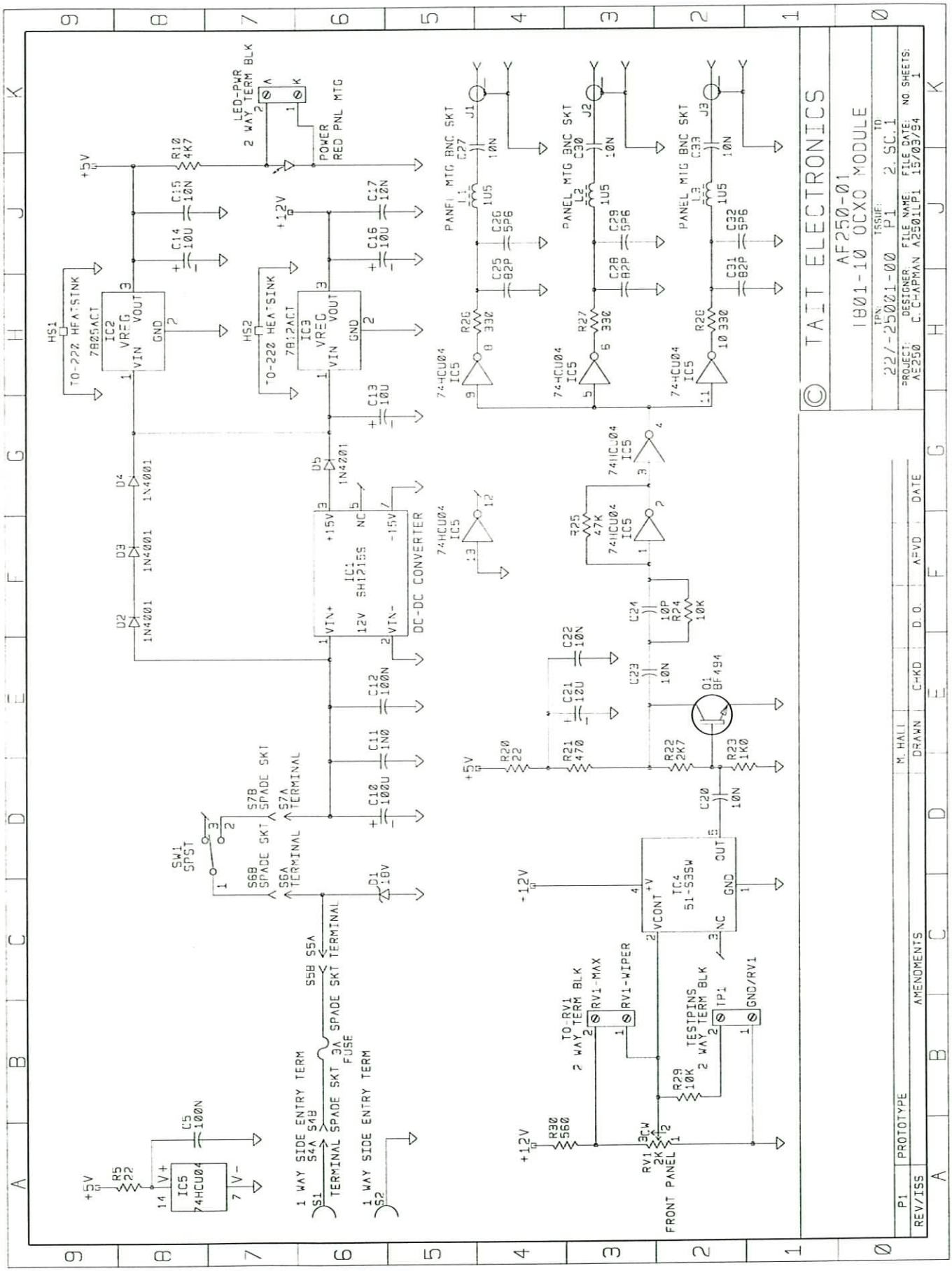
T801-10 PCB LAYOUT - TOP DEVICES/BOTTOM COPPER.				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AF250-01
1801-10 OCXO MODULE
TPN: 22/-25021-00
ISSUE: P1
TD: 2.SC.1
PROJECT: AE250
DESIGNER: C.C=APMAN
FILE NAME: A2501LP1
FILE DATE: 15/03/94
NO SHEETS: 1
REV/ISS
P1
PROTOTYPE
AMENDMENTS
DRAWN
M. HALL
C=KD
D.O.
A=VD
DATE
IC1 SH1215S DC-DC CONVERTER
IC2 7805ACT VREG
IC3 7812ACT VREG
IC4 51-535W
IC5 74HCU04
Q1 BF494
D1 10V
D2 1N4001
D3 1N4001
D4 1N4001
D5 1N4201
SW1 SPST
S1 1 WAY SIDE ENTRY TERM
S2 1 WAY SIDE ENTRY TERM
S5A S5B SPADE SKT TERMINAL
S6A S6B SPADE SKT TERMINAL
S7A S7B SPADE SKT TERMINAL
3A SPADE SKT FUSE
TERMINAL
TESTPINS 2 WAY TERM BLK
TO RV1 2 WAY TERM BLK
RV1-MAX
RV1-WIPER
GND/RV1
TP1
FRONT PANEL
LED-PWR 2 WAY TERM BLK
POWER RED PNL MTG
PANEL MTG BNC SKT
HS1 TO-220 HEATSINK
HS2 TO-220 HEATSINK