TECHRON®

TECHNICAL MANUAL

Includes Service Information

77M01
DIGITAL PANEL
METER

Techron Division of Crown International, Inc., 1718 W. Mishawaka Road, Elkhart, IN 46517-4095

K80302-1
12/88

TECHRON
LIMITED ONE-YEAR WARRANTY

SUMMARY OF WARRANTY

CROWN INTERNATIONAL, INC., 1718 W. Mishawaka Road, Elkhart, Indiana 46517 (Warrantor) warrants to the ORIGINAL COMMERCIAL PURCHASER ONLY of each NEW TECHRON product, for a period of one (1) year from the date of purchase by the original purchaser (warranty period) that the product is free of defects in materials or workmanship and will meet or exceed all advertised specifications for such a product. This warranty does not extend to any subsequent purchaser or user, and automatically terminates upon your sale or other disposition of our product.

ITEMS EXCLUDED FROM WARRANTY

We are not responsible for product failure caused by misuse, accident or neglect. This warranty does not extend to any product on which the serial number has been defaced, altered or removed. It does not cover damage to loads or any other products or accessories resulting from Techron product failure. It does not cover defects or damage caused by your use of unauthorized modifications, accessories, parts, or service.

WHAT WE WILL DO

We will remedy any defect in materials or workmanship by repair, replacement, or refunds. If a refund is elected, then you must make the defective or malfunctioning component available to us free and clear of all liens or other encumbrances. The refund will be equal to the actual purchase price, not including interest, insurance, closing costs, and other finance charges less a reasonable depreciation on the product from the date of original purchase. Warranty work can only be performed at our authorized service centers or at our factory. Expenses in remedying the defect will be borne by Crown, including one way surface freight shipping costs within the United States. (Purchaser must bear the expense of shipping the product between any foreign country and the port of entry in the United States and all taxes, duties, and other custom's fee for such foreign shipments.)

HOW TO OBTAIN WARRANTY SERVICE

You must notify us of your need for warranty service not later than ninety (90) days after expiration of the warranty period. We will give you an authorization to return it to us for service. All components must be shipped in a factory pack or equivalent which, if needed, may be obtained from us for a nominal charge. Corrective actions will be taken within a reasonable time of the date of receipt of the defective product by us. If the repairs made by us are not satisfactory, notify us immediately.

DISCLAIMER OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

YOU ARE NOT ENTITLED TO RECOVER FROM US ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES RESULTING FROM ANY DEFECT IN OUR PRODUCT. THIS INCLUDES ANY DAMAGE TO ANOTHER PRODUCT OR PRODUCTS RESULTING FROM SUCH A DEFECT.

WARRANTY ALTERATIONS

NO PERSON HAS THE AUTHORITY TO ENLARGE, AMEND, OR MODIFY THIS WARRANTY. THE WARRANTY IS NOT EXTENDED BY THE LENGTH OF TIME WHICH YOU ARE DEPRIVED OF THE USE OF THE PRODUCT. REPAIRS AND REPLACEMENT PARTS PROVIDED UNDER THE TERMS OF THIS WARRANTY SHALL CARRY ONLY THE UNEXPIRED PORTION OF THIS WARRANTY.

DESIGN CHANGES

We reserve the right to change the design of any product from time to time without notice and with no obligation to make corresponding changes in products previously manufactured.

LEGAL REMEDIES OF PURCHASER

There is no warranty which extends beyond the terms hereof. This written warranty is given in lieu of any oral or implied warranties not contained herein. WE DISCLAIM ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. No action to enforce this Warranty shall be commenced later than ninety (90) days after expiration of the warranty period.

TECHRON division of Crown International, Inc.
1718 W. Mishawaka Road, Elkhart, IN 46517-4095

4/88

LIST OF EFFECTIVE PAGES

Revision 0 **December 88**

Page Number	Revision Number
Title Page	0
Warranty Page	0
a	0
i	0
1-1 to 1-2	0
2-1 to 2-2	0
3-1 to 3-5	0
4-1 to 4-7	0

TABLE OF CONTENTS

ILLUSTRATIONS

TABLES

SCHEMATICS

SECTION 1. INTRODUCTION

The TECHRON 77M01 Panel Meter adds a valuable 3 1/2 digit display to the 7700 series industrial power amplifier. Front panel controls offer flexibility in choosing between the display of true R.M.S. or peak output current or output voltage readings, eliminating external monitoring instruments. The large LCD display is easy to read at a distance.

By including a 77M01 digital meter the precision display capability is added to the 7700 power amplifier.

1.1. Specifications for 77M01

Mode: Output current or output voltage.
Range: 0 to 199.9, and 0 to 1.999
Controls: RMS/PEAK-Slide switch. Range-200/20 Slide switch. VOLTS/AMPS-Slide switch.
Display: 1" high, 3 1/2 digit LCD.
CONVERSION: True R.M.S. and Peak.

1.2. Operation

V-I Switch

The V - I Switch selects between amplifier output voltage and output current. Set the V/I Switch up for voltage (V) and down for current.

200- 20 Switch

Selects the full scale display range. Set the switch up for 200 volts or current full scale and down for 20 volts or amps.

Peak - RMS Switch

Displays the highest peak or RMS value reached.

Display

The 3 1/2 digit 77M01 display shows the output voltage or output current of the amplifier it is mounted on. For amplifiers in systems, the display may be a fraction or multiple of the total output voltage or current.

1.3. Service Policies

Due to the sophisticated circuitry of Model 77M01, have only qualified and fully trained technicians perform service work, or return to the factory.

When returning Model 77M01, enclose a brief letter explaining as completely as possible the problem or problems. For any service performed outside the TECHRON factory, be sure to read, understand and follow instructions in this manual.

Return authorization is not required before sending a 77M01 to the factory for service.

* TECHRON is a division of CROWN INTERNATIONAL, INC.

1.4. Installing 77M01 in the Field

To Install:

1. Remove the amplifier front panel.
2. Remove the display plate (see Illustration 4-1, Item 2).
3. Carefully remove the amplifier main board.
4. Locate the three black nylon screw (Item 8) and nylon standoffs (Item 7).
5. Fasten the nylon standoffs to the main board with the nylon screws.
6. Locate the 77M01 Display Interconnect Cable (Item 6) and plug it into J150 on the main board.
7. Place the 77M01 display board insulator (Item 9) over the nylon standoffs.
8. Place the 77M01 display board over the insulator and the nylon standoffs.
9. Secure the display board with the following hardware:
   a. Upper left with #6 Hex Nut (Item 4) and #6 star washer (Item 5)
   b. Upper right with #6 hex standoff (Item 11) and #6 lock washer.

CAUTION

In the next step, use a screwdriver narrower than the slotted standoff. A wide screwdriver will crack the meter display and damage it beyond repair.

   c. Lower middle - with slotted standoff (Item 12) and #6 lock washer.
10. Tighten all hardware.
11. Plug the interconnect cable into J150 on the meter display board.
12. Replace the mainboard on the amplifier and reconnect all cables.
13. Install the 75M01 display plate. Secure it at the four points shown in Illustration 1-1 with #6 machine screws (Illustration 4-1, Item 1).
14. Replace the amplifier front panel.

To Remove:

1. Remove the amplifier front panel
2. Remove the display plate by removing four #6 screws from the locations shown in Illustration 1-1.
3. Unplug the 77M01 Display Interconnect Cable (Item 6) from the main board.
4. Remove the following display board hardware:
   a. Upper left with #6 Hex Nut (Item 4) and #6 star washer (Item 5)
   b. Upper right with #6 hex standoff (Item 11) and #6 lock washer.

CAUTION

In the next step, use a screwdriver narrower than the slotted standoff. A wide screwdriver will crack the meter display and damage it beyond repair.

   c. Lower middle - with slotted standoff (Item 12) and #6 lock washer.
5. The display board may now be removed from the nylon standoffs for service.

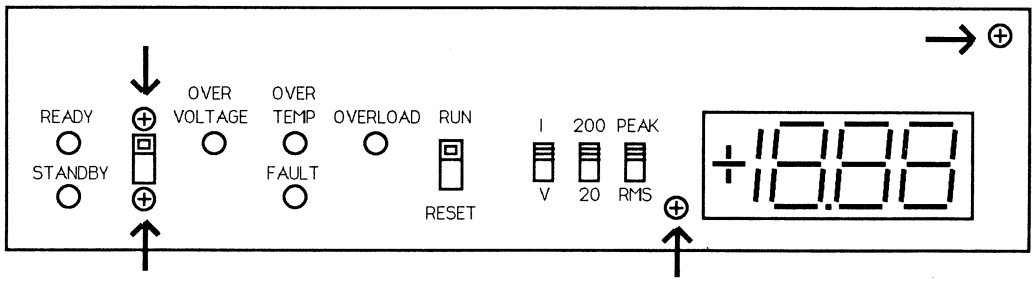


Illustration 4-1 77M01 Mounting Screws

SECTION 2. THEORY OF OPERATION

Refer to schematic J0212-1 Rev. C and the block diagram for the discussion of 77M01 operation.

The 77M01 contains five functional areas:

- Attenuation
- RMS conversion
- Catch-and-Hold
- Display
- Power Supply

2.1. Attenuation

R1 and R2 form an input attenuator to scale the host amplifiers output voltage by a factor of 16.6. This attenuation is not needed in the current mode as the current monitor's output voltage is scaled to a value compatible with the input of the R.M.S. converter, U1. Range attenuation is performed by R3 and R4.

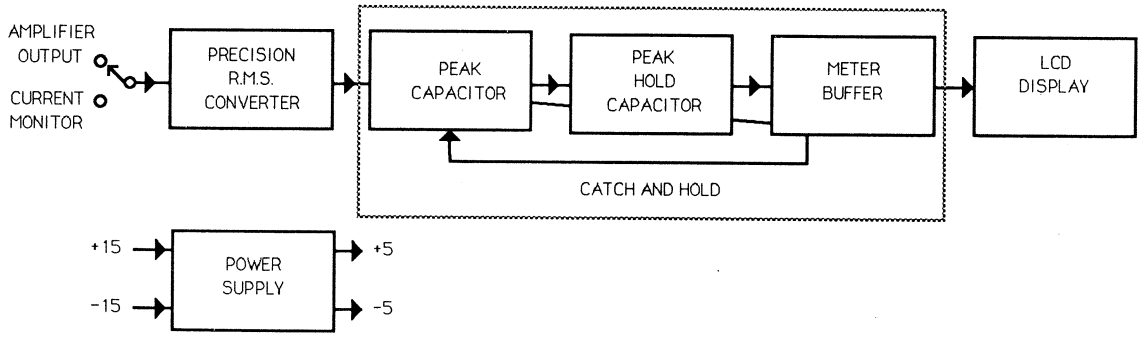
2.2. Conversion

U1 is a precision R.M.S. convertor with a built in reference voltage. The response and conversion characteristics are set by capacitors C2 and C3, In the R.M.S. mode, C3 is the only capacitance in the circuit. When S3 is set to the Peak mode, C2 is placed in series with C3, making the effective capacitance slightly less than the value of C2. Because C2 is considerably smaller than C3, the response of U1 becomes very fast with an output voltage that is representative of the peak value of the input voltage. R5 trims the input offset via R6 while R10 and R9 trim the output offset voltage.

2.3. Catch-and-Hold

The catch-and-hold function begins at U2. U2A compares the input signal with the meter output through R13. Should the output signal be greater than the input signal, D1 conducts. If the opposite is true, Q1 conducts. Q1 charges C5 which is buffered by voltage follower U2B. U2B drives R13 and the input of the LCD display driver. The result is that C5 stores the largest peak value of the input signal.

The catch-and-hold discharge timing circuit consists of Q2, U3A and C4. Hold time is set by R19 and C4. When Q1 charges C5, its collector current triggers Q2 to fully charge C4. During the intervals when D1 is conducting, C4 discharges through R19. When the charge on C4



3.1. Preparation for Testing

Perform these procedures following service to Model 77M01 Digital Panel Meter.

1. Turn off power to the amplifier by setting the main circuit breaker on the back panel down.
2. Remove the front panel of the amplifier and the control panel plate (Illustration 4-1, Item 2).
3. Disconnect loads from the amplifier output terminal and remove connections from the amplifier interlock.

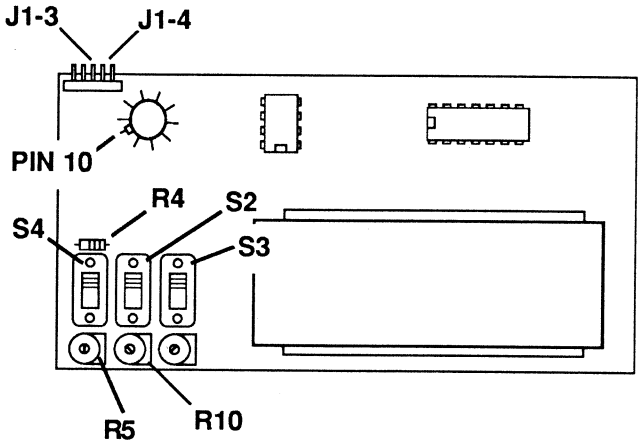
Note: Always test the digital panel meter without loads. Loads connected to the output of the amplifier may distort waveforms and limit the accuracy of calibration.

4. Short the inverting and non-inverting inputs of the amplifier to the input common.
5. Set the controls and switches on the amplifier main board to the following positions:

S501	Down	(standby)
S100	UP	(master)
B5	Left	(constant voltage mode)

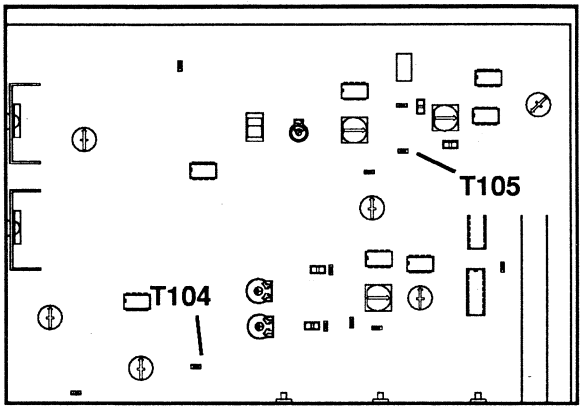
3.2. Meter Zero

1. Plug the amplifier into the 3 phase AC line and turn on the rear panel circuit breaker.
2. Set S501 Up (to the Ready position).
3. Connect the negative lead of the digital voltmeter (DVM) to J1 pin 3 and the positive lead to J1 pin 4. If there is more than +.003 volts DC present, perform offset adjustments to the amplifier.
4. Set the Meter switches as follows:
   S4 Volts (Down)
   S2 200 (UP)
   S3 Peak (Up)
5. Connect the negative lead of the DVM to the right side of R4 and the positive lead to pin 10 of U1.
6. Set the DVM to read DC volts on the 200 mV range.
7. Adjust R5 on the Digital Panel Meter to get the most negative (or least positive) reading on the DVM.
8. Adjust R10 to zero out any offset voltage remaining on the DVM.

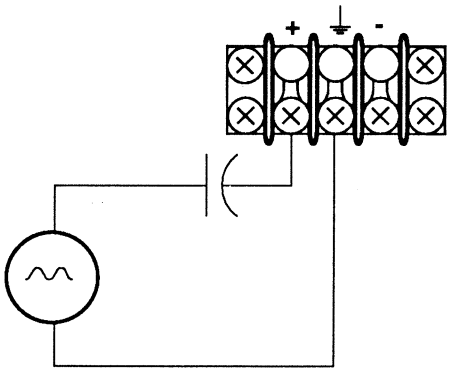


3.3. Calibration

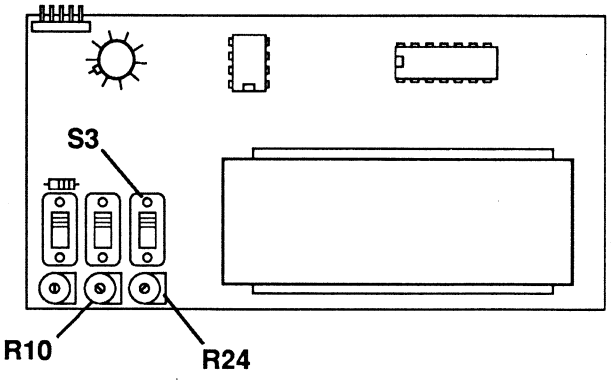
Note: This procedure calibrates the Digital Panel Meter to a known value. The accuracy of this adjustment is proportional to the accuracy of the digital voltmeter measuring the output of the amplifier.



1. Connect the negative lead to the main board ground (T105) and the positive lead to T104 (amplifier output). Set the meter to measure AC volts on the 200 volt range.



2. Connect a 22µF non-polar capacitor in series with the generator output and then to the amplifier input. Set the generator to 100 Hz sine wave. Adjust the level so that the DVM reads 80 VAC RMS (+ 5 volts).



3. Set S3 down (RMS).
4. Adjust R24 until the Digital Panel Meter reads the same as the DVM, (+ 0.1) volts.
5. Set the output voltage of the amplifier to 8.0 VAC (+0.5 VAC) by attenuating the input signal by 20 dB.
6. Adjust R10 until the Digital Panel Meter reads the same as the DVM (+ 0.1) volts.
7. Repeat steps 2 through 6 until the 77M01 agrees with the DVM.

Continued on next page

Continued

8. Set the output voltage of the amplifier to 25.3 VAC (+ 1.6 VAC) (10 dB down from 80 VAC).
9. The Digital Panel Meter must read the same voltage as the DVM (+0.1 VAC).
10. Turn the amplifier off at the back panel circuit breaker.

3.4. Final Procedure

1. Restore the amplifier to its original configuration.
2. Use standard latex paint to seal all adjustment points. This will protect adjustments against vibration or accidental movement.
3. Replace all covers.

SECTION 4. EXPLODED VIEWS AND PARTS LIST

4.1 General Parts Information

This section contains illustrations, parts list, and schematics for the 77M01 meter module. Use this information with the service, repair and adjustment procedures in Section 3.

Mechanical and structural type parts are illustrated and indexed on an exploded view drawing. Electrical and electronic parts are listed and indexed in both the exploded view drawing and the schematic parts lists.

The quantity of each part used in each location is shown for the exploded view parts listing.

4.2 Standard and Special Parts

Many electrical an electronic parts used in the 77M01 are standard items stocked by and available from electronic supply houses. However, some electronic parts that appear to be standard, are actually special. A part ordered from TECHRON will assure a workable replacement. Structural items are available only from TECHRON.

4.3 Ordering Parts

TECHRON, a division of Crown International, supplies parts through the Crown International Parts Department. Replacement parts are obtained from the address below.

When ordering parts, be sure to give the model and serial number and include the part description and Crown Part Number (CPN) from the parts list. Price quotes are available upon request.

4.4 Shipment

Shipment will be made by UPS or best method unless a preferred method is specified.

Shipments are made F.O.B. Elkhart Indiana only. Established accounts will have large orders shipped freight prepaid and billed. All other shipped freight collect.

4.5 Terms

Normal terms are C.O.D., Master Card or Visa unless the order is prepaid. If prepaying please add an amount for the freight charge. $1.60 is average for an order under one pound.

Net 30 day terms apply only to established accounts. Parts prices are subject to change without notice. New parts returned for credit are subject to a 10% restocking charge.

You must receive authorization from the Crown Parts Department before returning parts for credit.

Crown International Parts Department
1718 W. Mishawaka Road
Elkhart, Indiana 46517
(219) 294-8210
TWX 810 294-2160
FAX (219) 294-8329

4.6 Exploded View Parts List

ITEM #	PART #	QTY.	DESCRIPTION
1	C 1954-4	2	6-32 X .25 RDHD PH MSCR
2	F11017J4	1	PLATE, 77M01
3	Q42631-4	1	MOD, 77M01 (A) DISPLAY
4	C 1889-2	1	6 X32 HEX NUT
5	C 1823-1	3	#6 INT.STAR WASHER BLACK
6	H42740-3	1	CABLE, 7700 DISPLAY INTERCONN
	B 5616-6	1.85"	10 COND 24 AWG GRY RIB CBL
	C 6827-7	2	5POS .1"CENTERS #22GA MTA CONN
7	C 6961-4	3	.5 NYLON STANDOFF CBS-TFM-801
8	C 2620-0	3	6-32 X .38 BLACK NYLON MSCR
9	D 6408A3	1	INSULATOR, 7780 DISPLAY BD
10	C 6866-5	1	M5735-H4 3.5 DIGIT LCD 3/4"
11	D 6350-9	1	.413 HEX STANDOFF 6/32
12	D 6379-8	1	7/32 X .413 SLOTTED STANDOFF

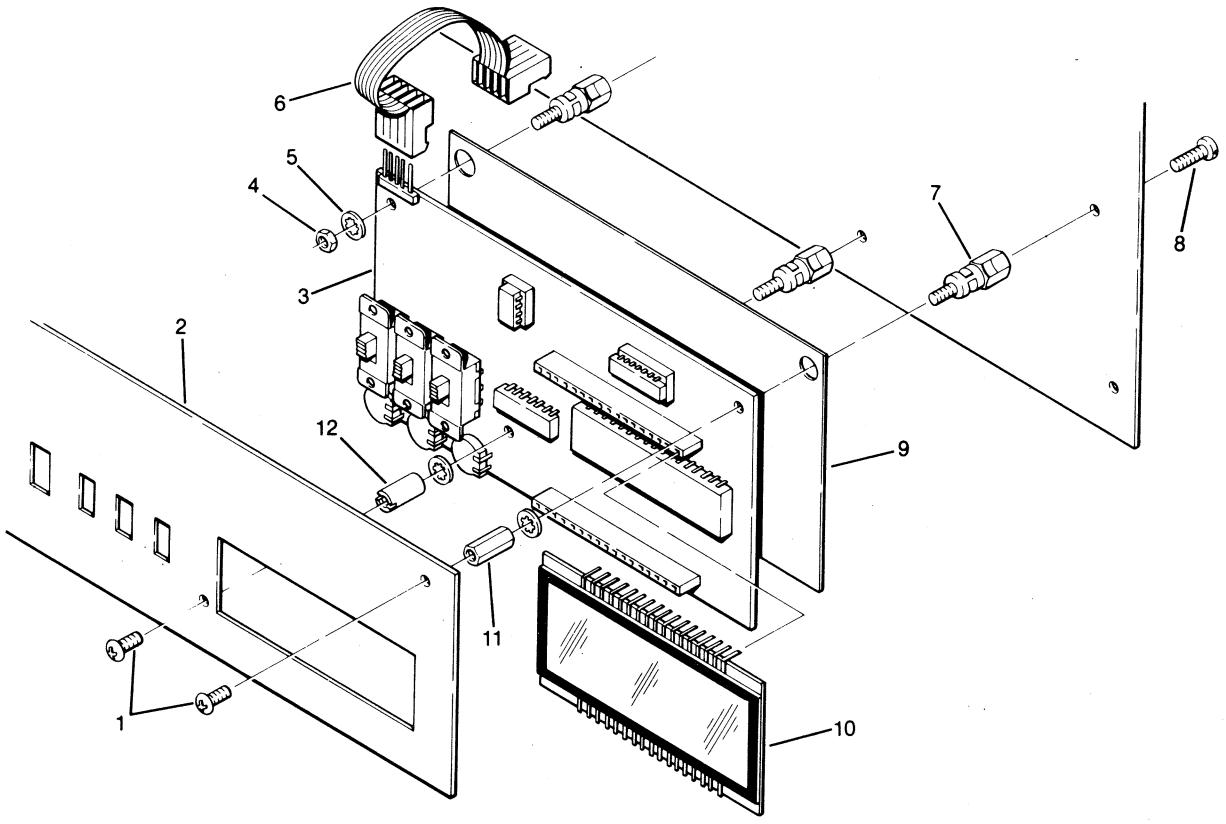


Illustration 4-1 77M01 Exploded View

4.7 Schematic Parts List

LOCATION #	PART #	DESCRIPTION
C1	C 5230-5	0.02MF 50V DISC
C2	C 3411-3	200PF DIPPED SILVER MICA
C3	C 3728-0	10MF 50V VERT
C4	C 7430-9	0.22MF 63V 5% MET POLY BOX
C5	C 7603-1	.47MF 63V 10% MET POLY BOX
C6	C 3410-5	100PF DIPPED SILVER MICA
C7	C 6130-6	0.1MF 50V MONO
C8	C 1751-4	0.01MF500V DISC
C9	C 4404-7	0.047MF250V 5%CARB
C10	C 4404-7	0.047MF250V 5%CARB
C11	C 6130-6	0.1MF 50V MONO
C12	C 6130-6	0.1MF 50V MONO
C13	C 6130-6	0.1MF 50V MONO
C14	C 6130-6	0.1MF 50V MONO
C15	C 6130-6	0.1MF 50V MONO
C17	C 6130-6	0.1MF 50V MONO
C18	C 6130-6	0.1MF 50V MONO
C19	C 6130-6	0.1MF 50V MONO
C20	C 5825-2	470PF MICA - SMALL
D1	C 3181-2	DIODE, 1N4148
D2	C 3181-2	DIODE, 1N4148
D3	C 3181-2	DIODE, 1N4148
D4	C 5082-0	DIODE, 1N4733A 5V ZENER
D5	C 5082-0	DIODE, 1N4733A 5V ZENER
J1	C 6851-7	5POS.1CENTER RT ANGLE MTA HDR
M1	C 6866-5	M5735-H4 3.5 DIGIT LCD 3/4"
Q1	D 2961-7	SEL 2N3859A, SPS8010 NPN
Q2	C 3625-8	2N4125 PNP
R1	C 6482-1	24.9KOHM 1W.5% MF
R2	C 6932-5	1.5 KOHM .25W 1% MF
R3	C 4496-3	9.09KOHM .25W 1% MF
R4	C 4850-1	1.0 KOHM .25W 1 MF
R5	C 5062-2	100KOHM LINEAR TRIMPOT
R6	C 4206-6	100.MOHM .25W 5 COMP
R7	C 5217-2	24. KOHM .25W 5 CF
R8	C 6517-4	24.0 OHM .25W 5% CF
R9	C 5270-1	30. KOHM .25W 5 CF
R10	C 5062-2	100KOHM LINEAR TRIMPOT

LOCATION #	PART #	DESCRIPTION
R12	C 4859-2	10. KOHM .25W 1 MF
R13	C 4859-2	10. KOHM .25W 1 MF
R14	C 4479-9	22.0 OHM .25W 5 CF
R15	C 5170-3	2.2 MOHM .25W 5 CF
R16	C 3939-3	4.7 KOHM .25W 5% CF
R17	C 3302-4	22. KOHM .25W 5% CF
R19	C 3221-6	10. MOHM .25W 5% CF
R20	C 2876-8	1.5 KOHM .25W 5% CF
R21	C 2876-8	1.5 KOHM .25W 5% CF
R22	C 2631-7	10. KOHM .25W 5% CF
R23	C 3198-6	1.0 MOHM .25W 5 CF
R24	C 6346-8	2KOHM HORZ TRIMPOT
R25	C 2627-5	1.0 KOHM .25W 5% CF
R26	C 2883-4	100.KOHM .25W 5% CF25
R27	C 6170-2	560.KOHM .25W 5% CF
R28	C 2883-4	100.KOHM .25W 5% CF25
R29	C 2883-4	100.KOHM .25W 5% CF25
R32	C 2883-4	100.KOHM .25W 5% CF25
R33	C 3198-6	1.0 MOHM .25W 5 CF
S2	C 5080-4	DPDT PC-MNT SLIDE SWITCH
S3	C 5080-4	DPDT PC-MNT SLIDE SWITCH
S4	C 5080-4	DPDT PC-MNT SLIDE SWITCH
U1	C 6867-3	AD536AJH RMS/DC CONVERTER
U2	C 6377-3	LF412A ACN LODRIFT OP AMP
U3	C 4345-2	LM339N VOLTCOMPARATR
U4	C 6868-1	ICL7116CPL 3.5 DIGIT A/D DISHL
U5	C 4833-7	MC14070EXCLV.OR GATE
	C 3450-1	IC SOCKET, 14PIN DIP
	C 3451-9	IC SOCKET, 8PIN DIP 2-640463-3
	C 6883-0	20PIN DIP SOCKET #ICC-120-S-T

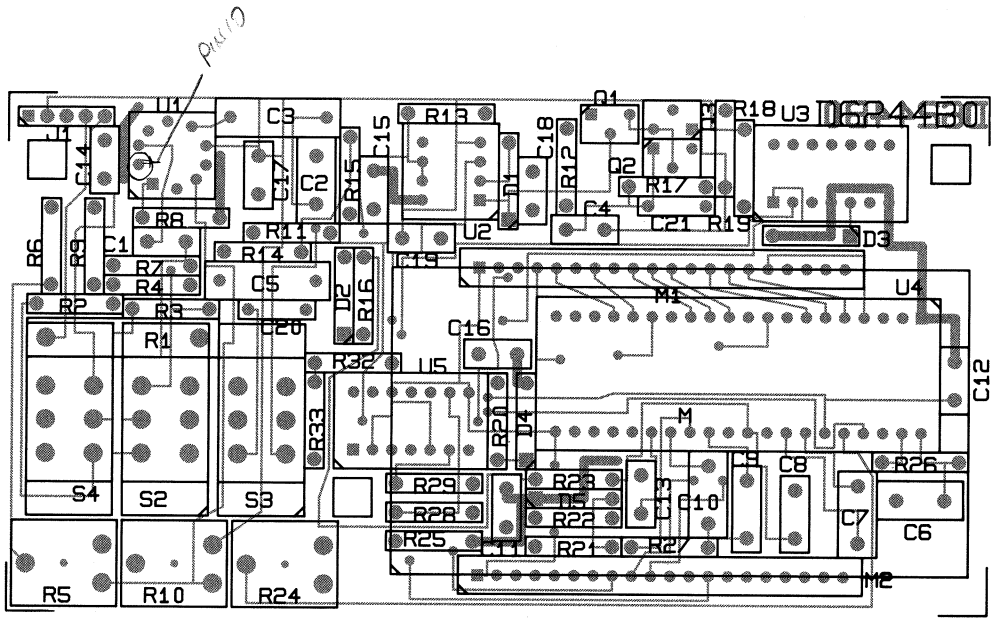


Illustration 4-2 77M01 Circuit Board

TEST POINT TO NULL
R5 (rough setting)
R10 (fine setting)

ZONE	REV	DESCRIPTION	DATE	BY	APPR
	A	ADD C20,C21 R 15 WAS 10 M.R17 WAS 100K ADD S3-B	4-16-87	LCD	JF/JR
	B	VALUE CHANGES	8-1-88	JM	JF
	C	VALUE CHANGES, U1 TERMINAL INFO.	8-30-88	JM	
	D				
	E				

LAST USED	OBSOLETED
R33	R11,R18,R28-R31
C20	C16
U5	
Q2	
M1	
D5	
S4	

3 1/2 DIGIT
LCD DISPLAY
TRUE RMS
AND PEAK

NOTE:
UNLESS OTHERWISE SPECIFIED
1) ALL RESISTORS ARE IN OHMS, 1/4 WATT, 5%
2) ALL CAPACITORS IN MICROFARADS

7700 SERIES DISPLAY

DRAWN	PAMM	12/3/84	APPROVED BY:			DO NOT SCALE PRINT
CK'D	R.J.	12/3/84	ME			SUPERSEDES J0212-1 REV B
SCALE	NONE		EE	R.JONES	12/3/84	E.C.N.
PROJ	D106		PE			C.P.N. J0212-1 REV C
NEXT ASSEMBLY						

REL FOR TOOLING	BY	DATE
REL FOR PROD	BY	DATE