

77L01 Installation

Section 1—Introduction

1.1 Purpose

The 77L01 adds gain control and output monitor jacks to a Techron amplifier.

When installed in a Techron amplifier, the three jacks of the 77L01 provide front-panel monitor points of output voltage and current. This gives easy access to information about amplifier output. The voltage monitor is scaled at 1 volt for each 20 volts at the output terminals. The current monitor is scaled at 1 volt for each 20 amps drawn by the load.

Gain (level control) is adjusted by turning a front-mounted potentiometer with a medium flat-blade screwdriver. Turning the potentiometer full counterclockwise sets the amplifier to zero gain. Turning it full clockwise sets the amplifier to maximum gain.

The kit can be mounted in any Techron 7700 family amplifier (except for the TEC 7780RLY and TEC7790RLY).

1.2 Kit Contents

The 77L01 consists of the following items.

- The 77L01 circuit board (see Illustration 1).
- Four phenolic spacers and eight 6-32 x .375 screws (not shown) for mounting the circuit board to the front of the amplifier's main board.

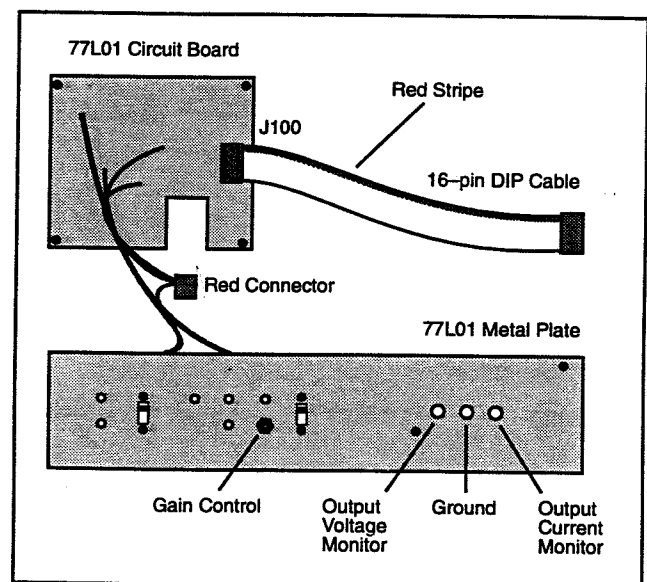


Illustration 1

- A front metal plate that replaces the existing plate on the amplifier.
- The necessary cables and connectors linking the plate and the two circuit boards.

1.3 Tools Required

- Grounding wrist strap
- Medium phillips screwdriver
- Cutting pliers
- Medium flat-blade screwdriver (for gain control)

Section 2—Procedure

1. Switch off power to the amplifier.
2. Since touching an inner conductor of one of the cables or jacks could cause electrostatic damage to a circuit board, properly ground yourself with a wrist strap.
3. Remove the front panel of the amplifier by loosening the four screws.
4. Unplug connectors from J300, J400, and J500. See Illustration 2.

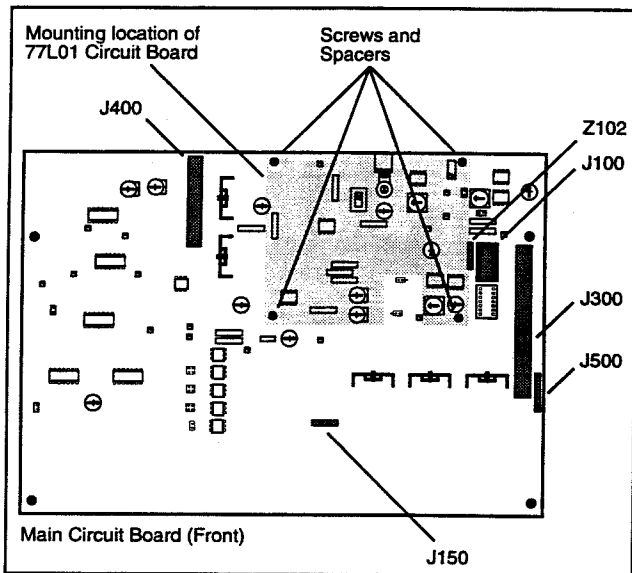


Illustration 2

5. Remove the four phillips-head screws (with washers) from the outer edges of the main circuit board. Remove the board and place on a static-free surface.
6. Remove the six screws that mount the metal plate to the main board. (Refer to Illustration 3 for locations.) Note that the screws for the reset switch have nuts and washers behind the panel. Remove the ground wire if so equipped.
7. Locate Z102 (zero-ohm resistor) next to J100. Clip the leads and remove Z102 from the board.

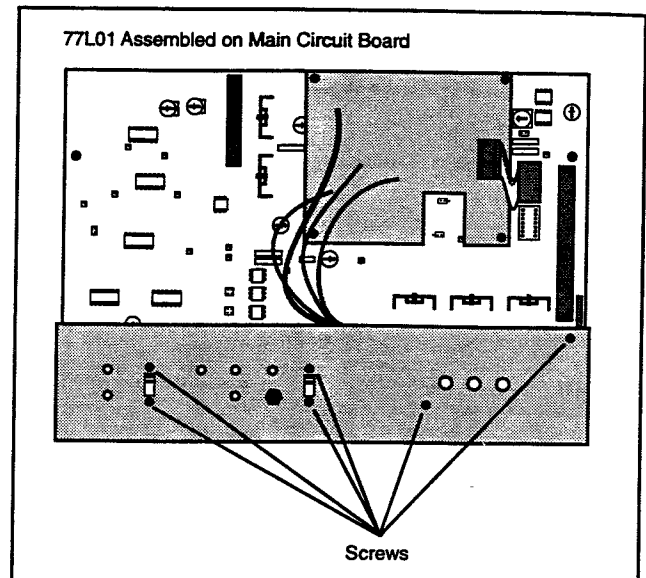
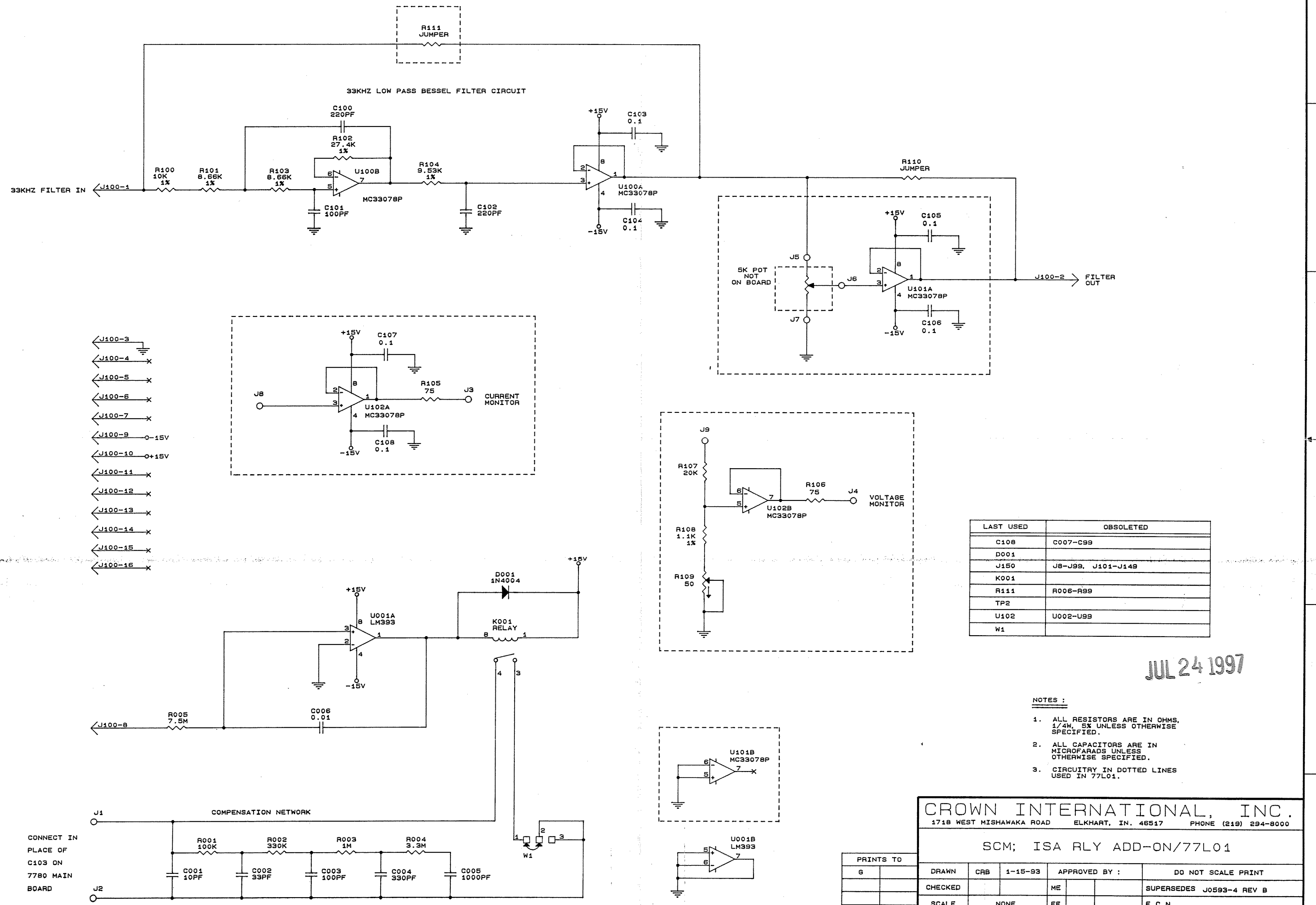


Illustration 3

8. Plug the red connector into J150 so that the three wires in the connector are in the three right-hand pins of J150. Be sure the connector seats fully.
9. Using four of the eight screws provided, attach the four phenolic spacers underneath the corners of the 77L01 circuit board. Using the remaining four screws mount the 77L01 circuit board to the top right of the upper surface of the main circuit board. Refer to Illustrations 2 and 3.
10. Fit the 16-pin DIP cable provided between J100 on the main board and J100 on the 77L01 board. Orient the cable so that the red striped wire is to the top of each connector. Be sure the connector seats fully.
11. Mount the 77L01 metal plate on the main circuit board using the hardware removed in Step 6.
12. Reinstall the main circuit board on the amplifier. Be sure that connectors J400, J100, J300, J500 seat fully.
13. Reinstall the front panel of the amplifier.

E.C.N.	ZONE	REV	DESCRIPTION	DATE	BY	APPROVALS
-	-	(A)	ADDED ADDITIONAL CIRCUITRY.	05-12-95	TAP	CK ME EE PE RM
T95-0239	-	(B)	DELETED W2 AND W3. ADDED R111, R112, NOTE 3 AND DASHED LINES. CHANGED TITLE.	07-10-95	TAP	RM
T95-0359	C4	(C)	R108 WAS: 976 IS: 1.1K	11-29-95	CRB	RM



LAST USED	OBSOLETE
C108	C007-C99
D001	
J150	J8-J99, J101-J149
K001	
R111	R006-R99
TP2	
U102	U002-U99
W1	

JUL 24 1997

- NOTES :**
- ALL RESISTORS ARE IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
 - ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
 - CIRCUITRY IN DOTTED LINES USED IN 77L01.

CROWN INTERNATIONAL, INC.
 1718 WEST MISHAWAKA ROAD ELKHART, IN. 46517 PHONE (219) 294-8000

SCM; ISA RLY ADD-ON/77L01

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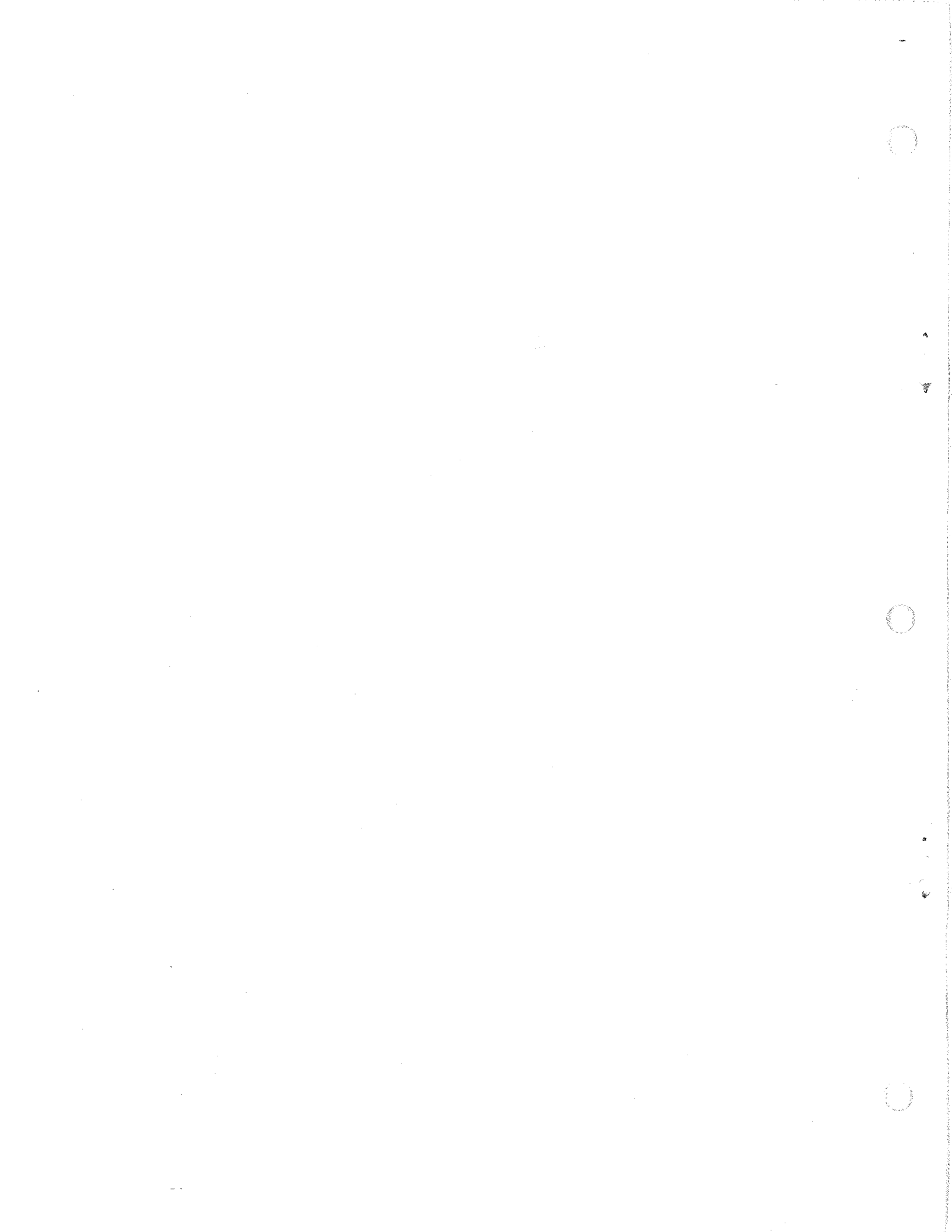
TECHRON[®]

TECHNICAL MANUAL

Includes Service Information

77M01 DIGITAL PANEL METER

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



**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.

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WHAT WE WILL DO

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HOW TO OBTAIN WARRANTY SERVICE

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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.

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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.

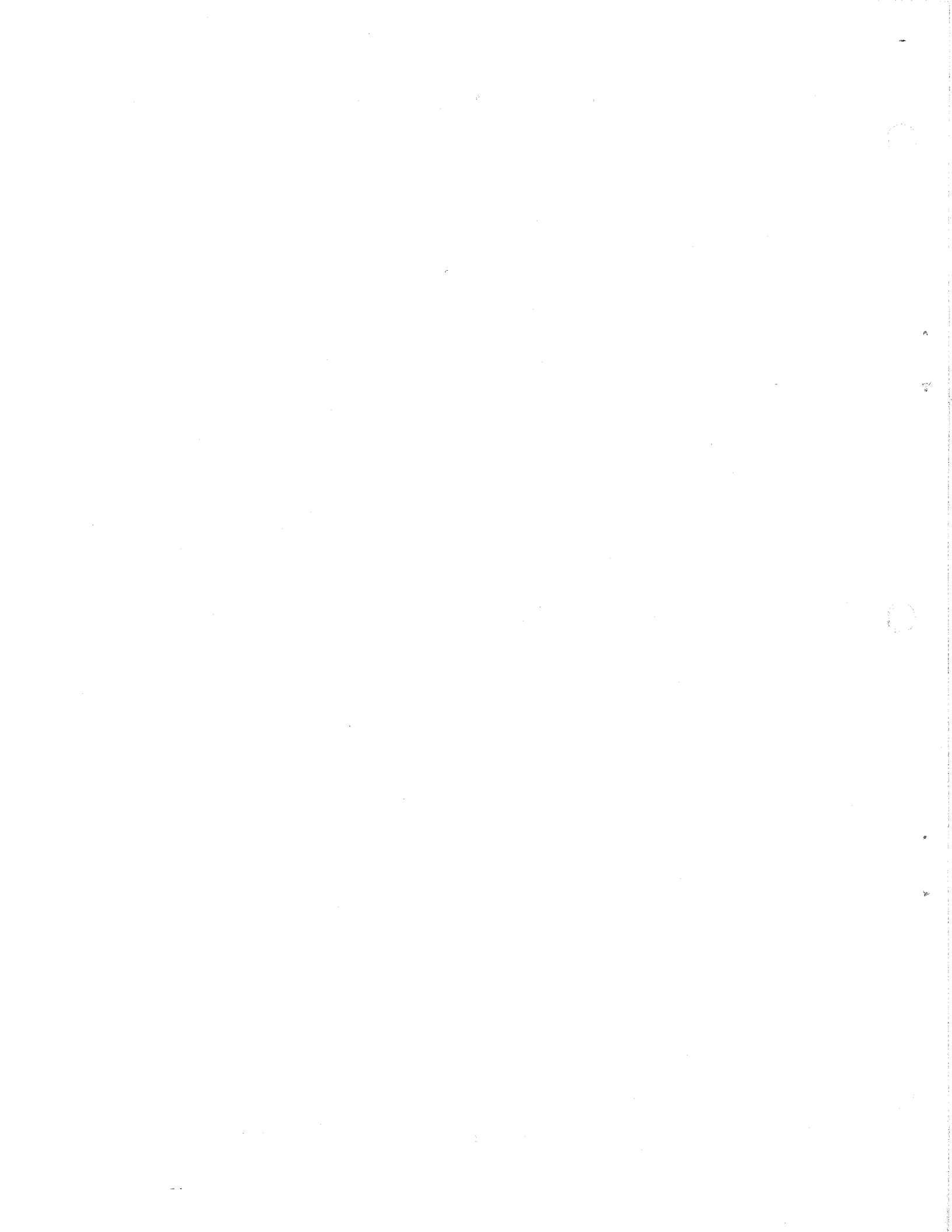
DESIGN CHANGES

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.

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1718 W. Mishawaka Road, Elkhart, IN 46517-4095



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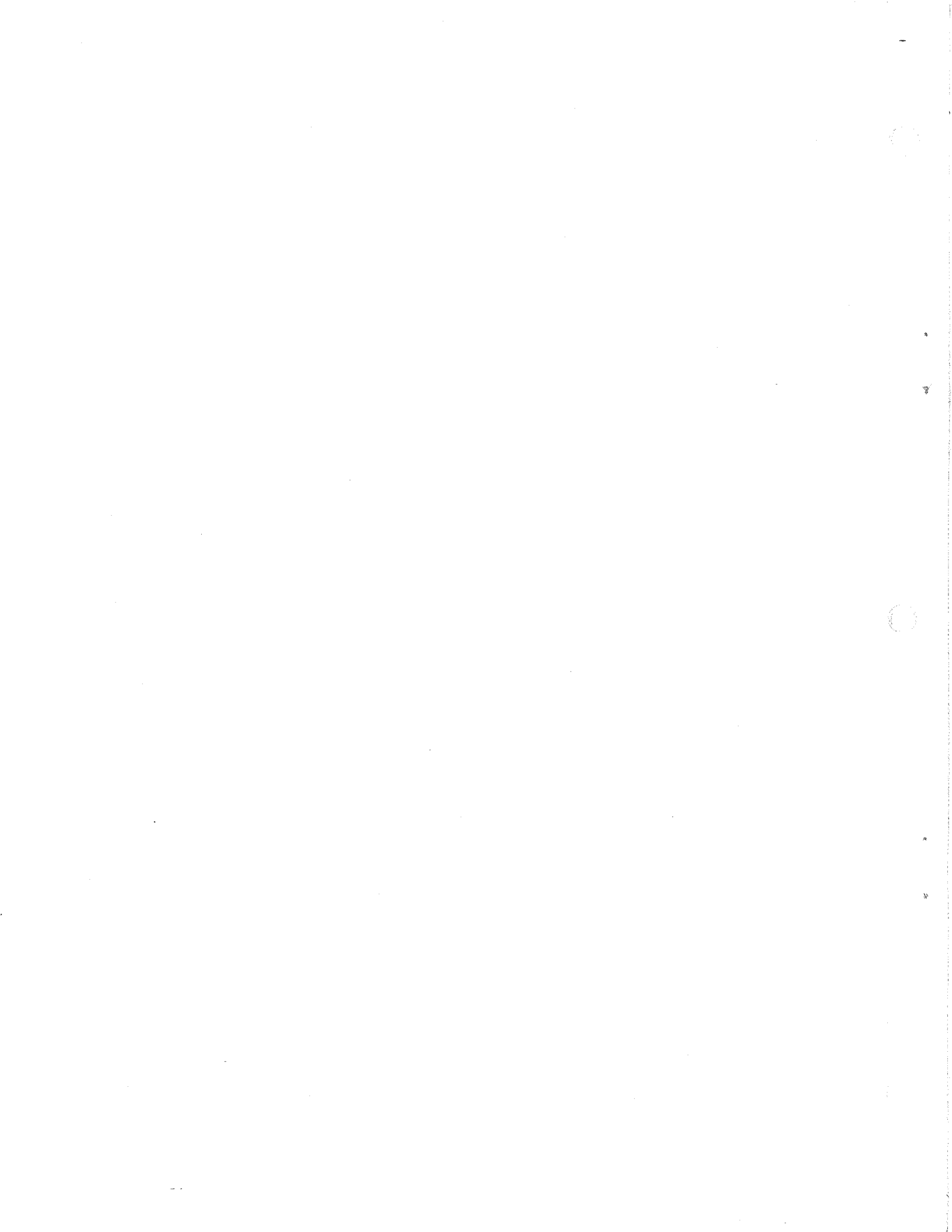


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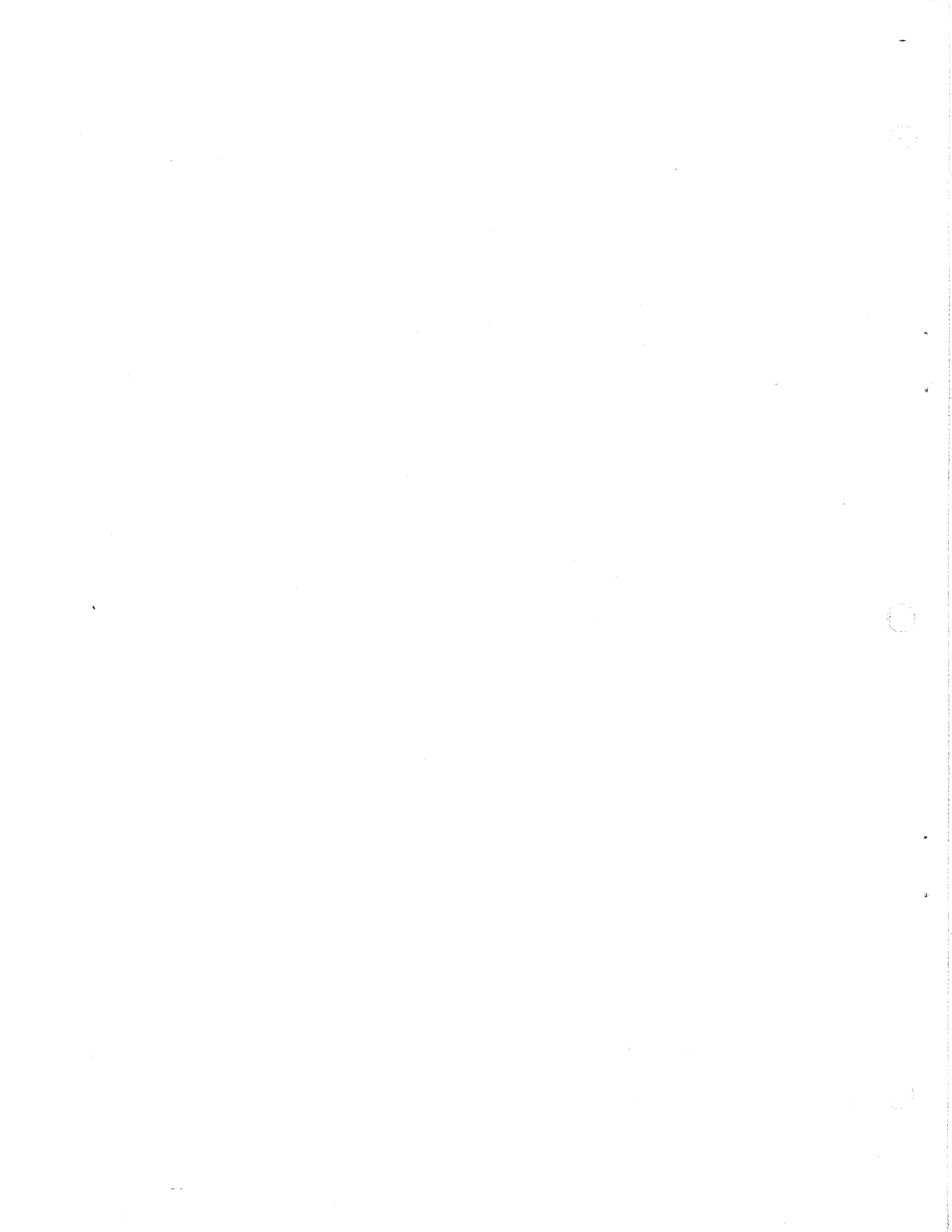
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SECTION 1. INTRODUCTION

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.

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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.
 - 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.

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.

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.
 - 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.

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.

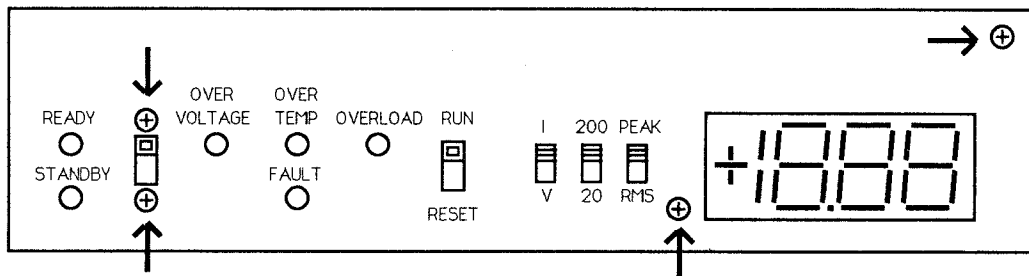


Illustration 4-1 77M01 Mounting Screws

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

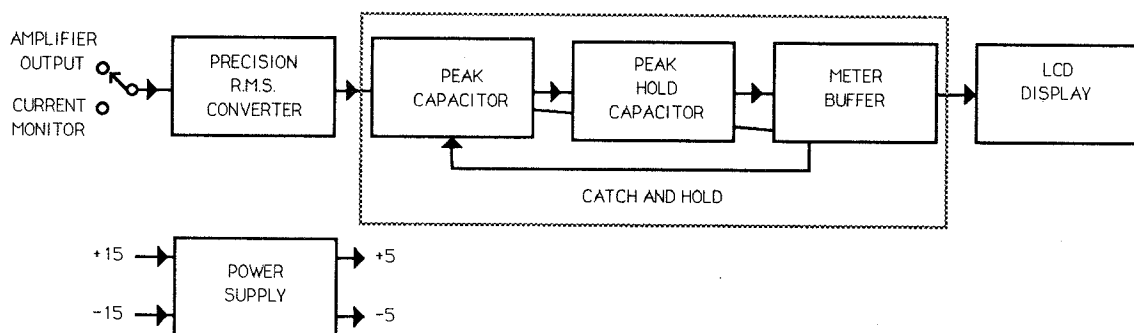
U1 is a precision R.M.S. convertor with a built in reference voltage. The response and conversion characteristics are set by capacitors C2 and C3,

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:

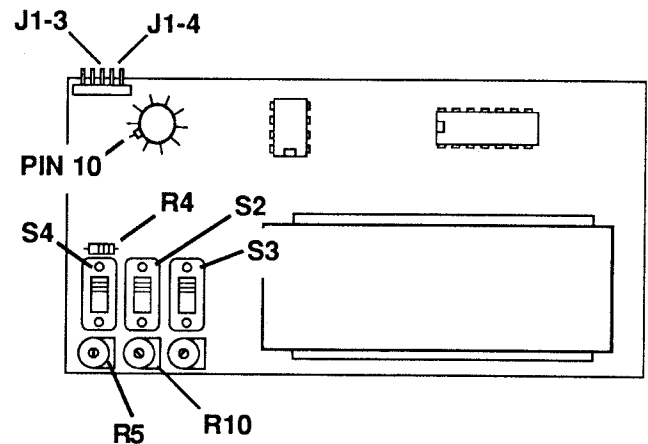
S501	Down	(standby)
S100	UP	(master)
B5	Left	(constant voltage mode)

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:

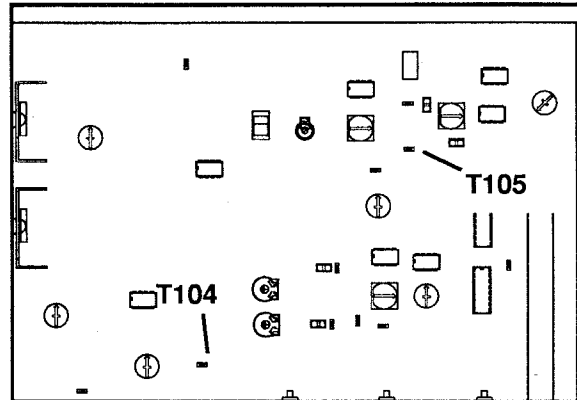
S4	Volts	(Down)
S2	200	(UP)
S3	Peak	(Up)
5. Connect the negative lead of the DVM to the right side of R4 and the positive lead to pin 10 of U1.
6. Set the DVM to read DC volts on the 200 mV range.
7. Adjust R5 on the Digital Panel Meter to get the most negative (or least positive) reading on the DVM.
8. Adjust R10 to zero out any offset voltage remaining on the DVM.

3.3. Calibration

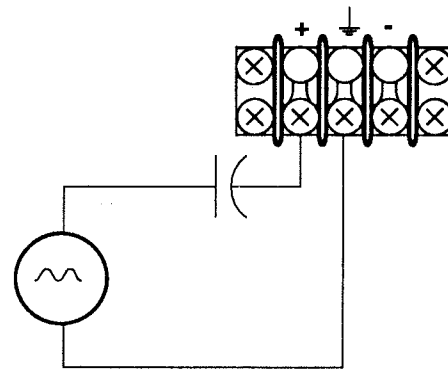


Note: This procedure calibrates the Digital Panel Meter to a known value. The accuracy of this adjustment is proportional to the accuracy of the digital voltmeter measuring the output of the amplifier.

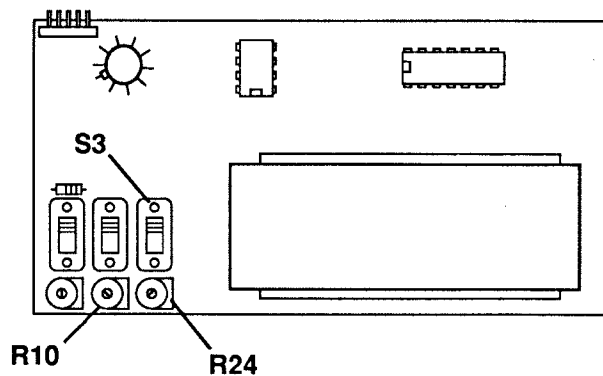
1. Connect the negative lead to the main board ground (T105) and the positive lead to T104 (amplifier output). Set the meter to measure AC volts on the 200 volt range.



2. Connect a 22 μ F 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.



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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 and 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

<u>ITEM #</u>	<u>PART #</u>	<u>QTY.</u>	<u>DESCRIPTION</u>
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

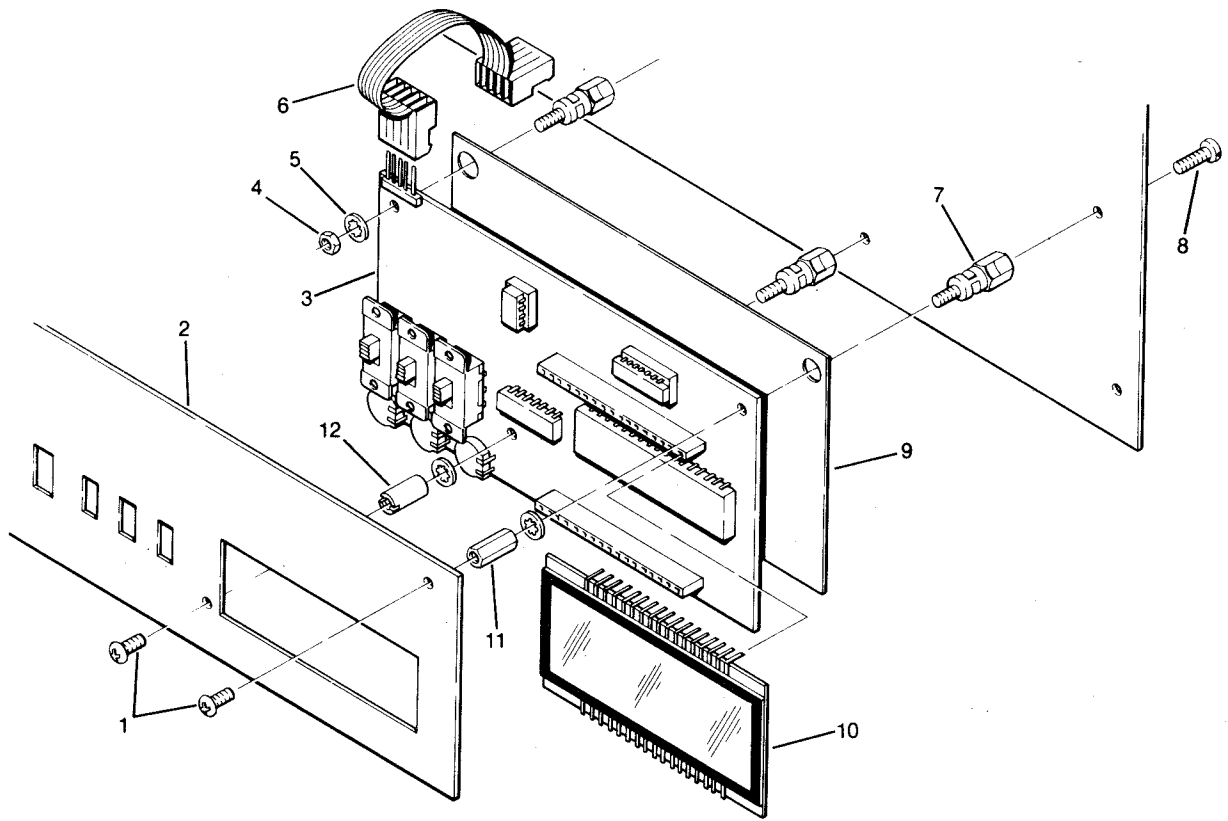


Illustration 4-1 77M01 Exploded View

4.7 Schematic Parts List

<u>LOCATION #</u>	<u>PART #</u>	<u>DESCRIPTION</u>
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

<u>LOCATION #</u>	<u>PART #</u>	<u>DESCRIPTION</u>
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

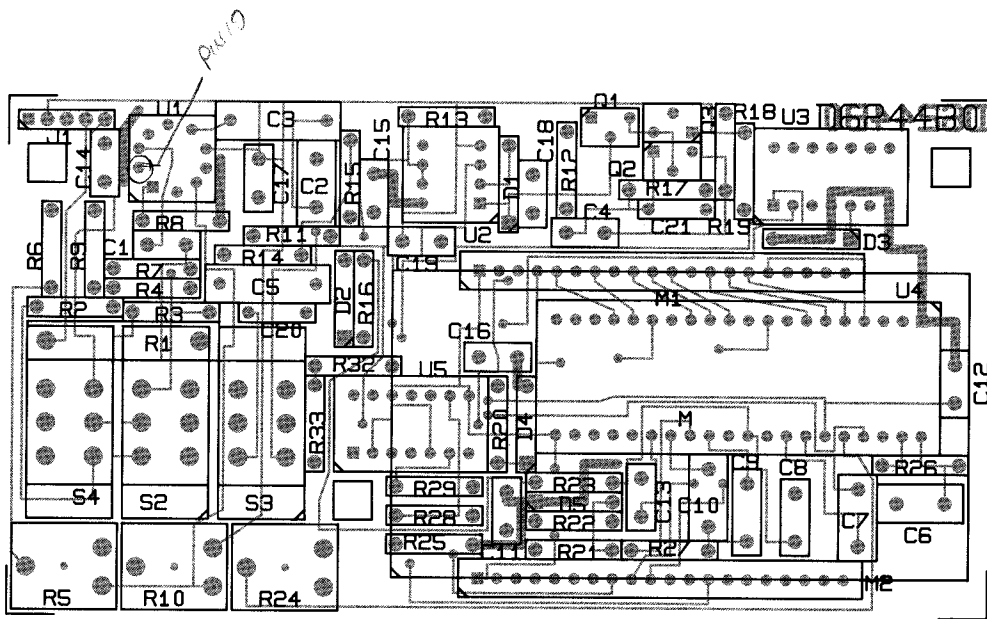
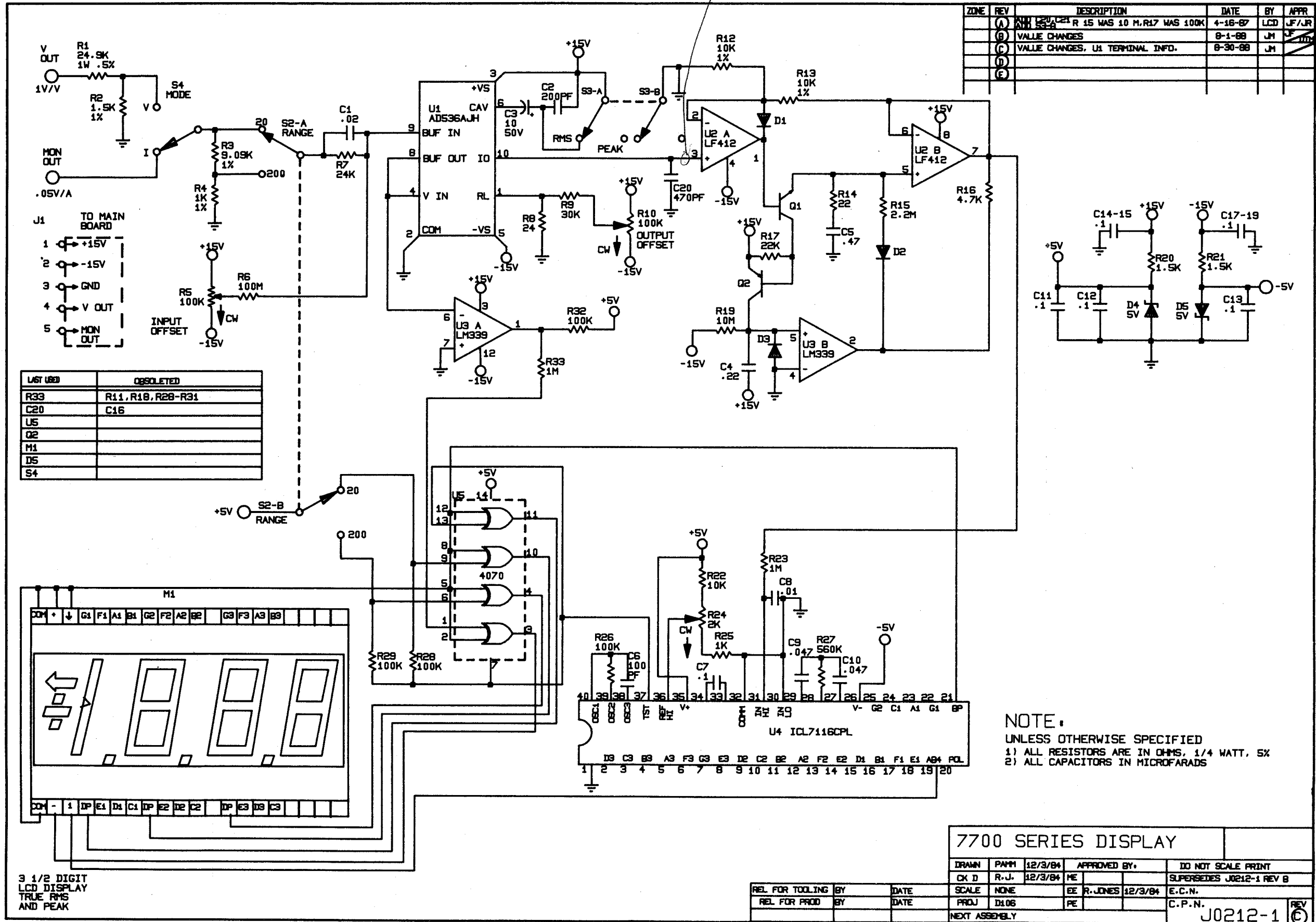


Illustration 4-2 77M01 Circuit Board

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



TECHRON®

TECHNICAL MANUAL

Includes Service Information

8420 FILTER INPUT MODULE

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

**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.

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1718 W. Mishawaka Road, Elkhart, IN 46517-4095

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1. GENERAL INFORMATION

1.1. Introduction

The *TECHRON** Filter Input Module option adds a valuable and versatile way of band limiting the input signal to the 7700 series amplifiers. It is easily installed behind the front panel onto the main board with the removal of one jumper, and plugs directly into the main board. Filter options are selected with the on-board DIP switch, and directions are provided for changing the filter frequencies.

1.2. Specifications

The active filter network (3 pole Butterworth) provides the following switch-selectable functions:

- Flat
- High Pass filter (30Hz)
- Band Pass filter (30Hz-15KHz)
- Low Pass filter (15KHz)
- Mute

The example filter cutoff frequencies shown in parenthesis above are determined by the values of:


R520 (18K)	C510 (.0015uf)
R521 (6.8K)	C511 (.0039uf)
R522 (120K)	C512 (220PF)

To determine the correct component values for any other cut-off frequency desired, refer to the instructions and formulas in the notes on the schematic.

* *TECHRON* is a division of CROWN INTERNATIONAL, INC.

2. INSTALLATION AND OPERATION

2.1. Field Installation

 WARNING
<p>Shock Hazard! Do not perform installation without a thorough understanding of the host amplifier. High voltages are present within the host amplifier that will cause injury or death, even when it is turned off. Review the appropriate amplifier manual before proceeding.</p>

With the product in hand, refer to Illustration 2-1 and the host amplifier manual to perform the following steps:

1. remove the front panel
2. remove the four mounting screws holding the main board
3. remove Z102 from the main board
4. install the Filter Input Module mounting hardware onto the main board
5. mount the Filter Input Module
6. remount the main board
7. plug the Filter Input Module ribbon cable into the main board at J100
8. reinstall the front panel.

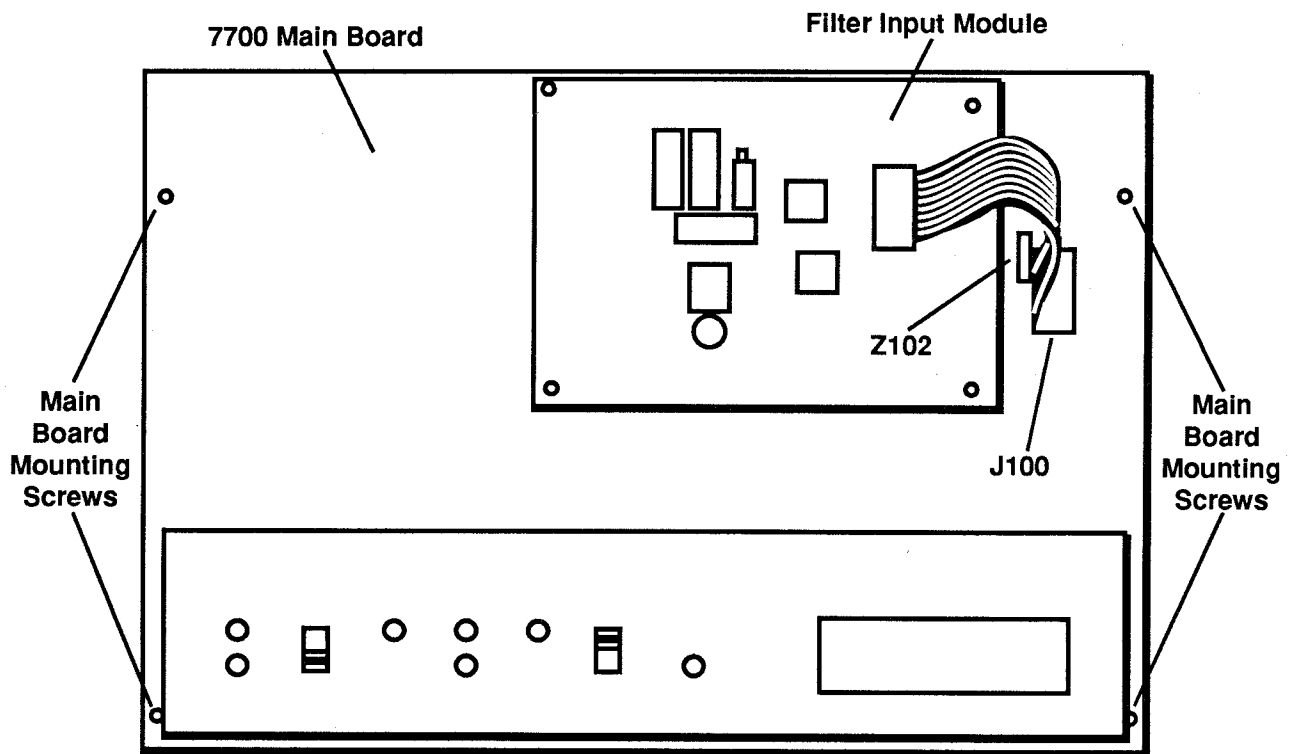


Illustration 2-1 Filter Input Module Installed

2.2. Operation

To change the function of the Filter Input Module, remove the front panel and change the appropriate DIP switch position (S100) according to the information conveniently printed on the circuit board, or from the schematic in this manual.

3. THEORY OF OPERATION

The Filter Input Module is designed with three-pole Butterworth, active filters for band limiting the input signal. To accomplish this, the signal is directed from the host amplifier through J100 pin 1 into the inverting input of one-half of a 4558 operational amplifier. The signal receives unity gain from this stage. Driving power for the three-pole Butterworth filters is provided by the other half of the 4558 operational amplifier. The gain of this stage is controlled by R516.

Another 4558 operational amplifier is used in the construction of the two Butterworth filter sections. The various configurations of the filters are selected by the DIP switch S100. Finally the signal is directed back to the host amplifier through J100 pin 2.

4. TESTING AND ADJUSTMENT

4.1. Introduction

The procedures outlined in this section must be performed following service or any change to the Filter Input Module.

4.2. Recommended Test Equipment

In addition to the standard hand tools and electronic test equipment, the specialized equipment listed in Table 4-1 is recommended to perform the tests in this section. Using the equipment listed will help insure that the Filter Input Module can be tested and adjusted to factory specifications. Any compromises in equipment could result in a compromise in performance or calibration.

Note: Avoid ground loops in test equipment caused by connecting input ground to output ground.

4.3. Preparation for Testing

WARNING

Shock Hazard! These tests and adjustments are performed with the unit powered by 208 volt AC Mains and with protective panels removed. The test steps must be followed precisely, and the technician must use extreme caution to avoid accidental touching of dangerous terminals or components. Powerful and potentially lethal electric shocks can occur as a result of accidental contact with capacitors, heat sinks and other interior components.

<p>1. Audio Signal Generator Sine/Square Output- 3 Volts rms into 3. ohm load, 1%THD</p>	<p>Wavetek 193 Khrohn-Hite 1000, 1200</p>
<p>2. Digital Voltmeter AC/DC Volts - (1mV-100V) AC/DC Amps - (10mA-10A) Ohms - (.1ohm-10Mohms)</p>	<p>Fluke 8060 series</p>

Table 4-1
Recommended Test Equipment

4.4. Pretest

1. Set switch S501 to the **DOWN** position to disable the amplifier.
2. Remove the front panel (see Illustration 4-6) from the 7700 series amplifier where the Filter Input Module has been installed.
3. Set switch S100 on the filter board for bandpass by placing the outside switches **ON** (closed) and the inside switches **OFF** (open).

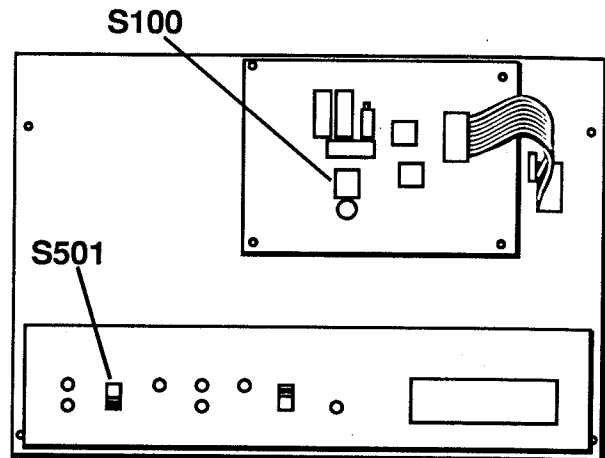


Illustration 4-1
Enable and Programming Switches

4. Connect a signal generator to the input of the amplifier.

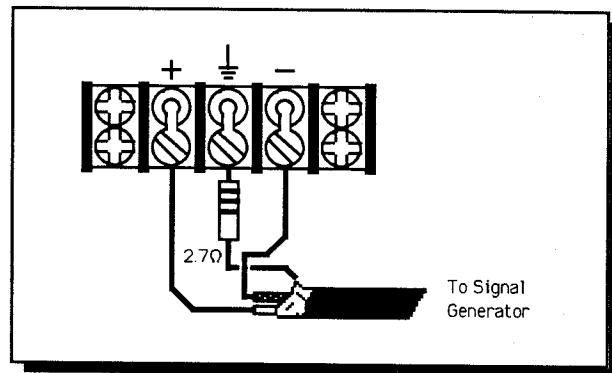


Illustration 4-2
Input Connections

5. Connect a Fluke 8060a meter to the output of the amplifier.

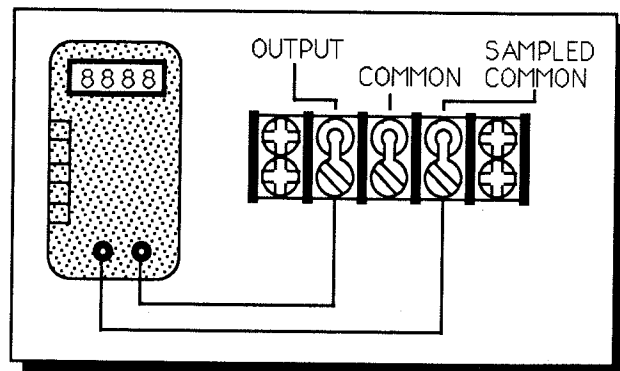


Illustration 4-3
Output Connections

4.5. Gain Setting

1. Set switch S501 to the **UP** position to enable the amplifier.
2. Connect a 500Hz, 0.5Vrms input signal to the amplifier.
3. Connect a voltmeter at the output.
4. Adjust R516 on the Filter Input Module for 62.5Vrms at the amplifier output.

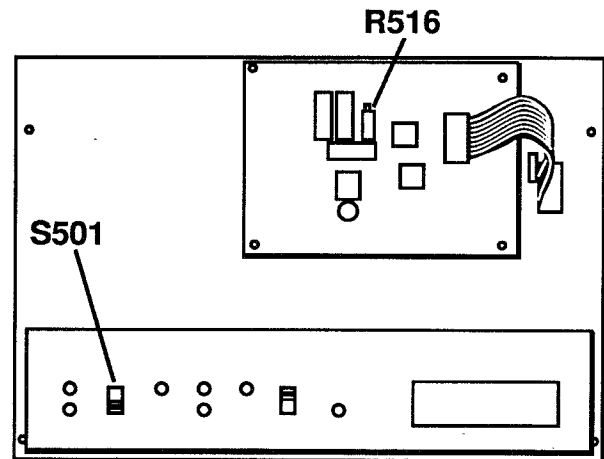


Illustration 4-4
Enable and Output Controls

4.6. Frequency Response

1. With the input frequency still set at 500Hz, consecutively press the dB , REL, and Hz buttons on the Fluke meter. Sweep the input frequency down to 30Hz, and press the Hz button on the meter. The dB reading on the meter should be -3dB (± 1dB).
2. Sweep the frequency up to 15kHz. Once again the meter should read -3dB (± 1dB).

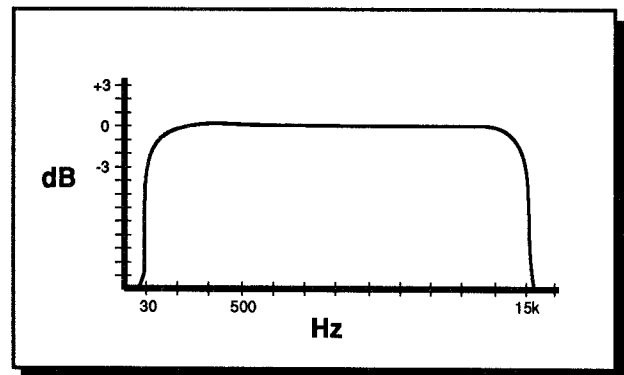


Illustration 4-5
Frequency Response

4.7. Final Procedure

1. Repeat section 4.5. if the cutoff frequencies are different from those used above. Substitute the desired low cutoff frequency with 30Hz and the desired high cutoff frequency with 15kHz.
2. Set switch S501 to the **DOWN** position to disable the amplifier.
3. Reinstall the front panel to the amplifier.
4. Set switch S501 to the **UP** position, to enable the amplifier.

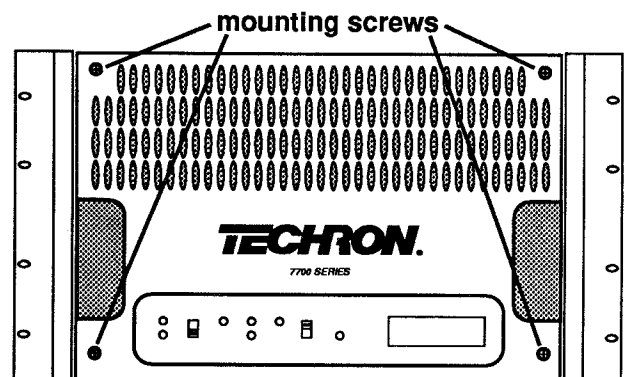


Illustration 4-6
Front Panel Installation

SECTION 5. PARTS LISTS AND SCHEMATICS

5.1. General Parts Information

This section contains parts list and schematics for the Techron 8420 Filter Input Module. Use this information with the service, repair, testing and adjustment procedures in Section 4.

Mechanical and structural 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.

5.2. Standard and Special Parts

Some electrical and electronic parts used in Techron products are standard items available from electronic supply houses, however, many parts are specially selected. To insure proper operation, all replacement parts should be ordered from TECHRON. Structural items are available only from TECHRON.

5.3. Ordering Parts

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

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

5.4. 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 orders are shipped freight collect.

5.5. Terms

Normal terms are C.O.D., Master Card or Visa, unless the order is prepaid. If prepaying, please add \$1.60 per pound for the freight charge.

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

5.6. Exploded View Parts

<u>ITEM #</u>	<u>PART #</u>	<u>QTY.</u>	<u>DESCRIPTION</u>
1	C 6078-7	8	6-32 X .375 RDHD PH B SCREW
2	D 4137-2	4	NYL THUMBSCRW WASHER
3	C 6998-6	4	"6/32X3/4" PHENOLIC SPACER"
4	REF.	1	MAIN BOARD (host amplifier)
5	Q42579-5	1	8420 FILTER INPUT MODULE

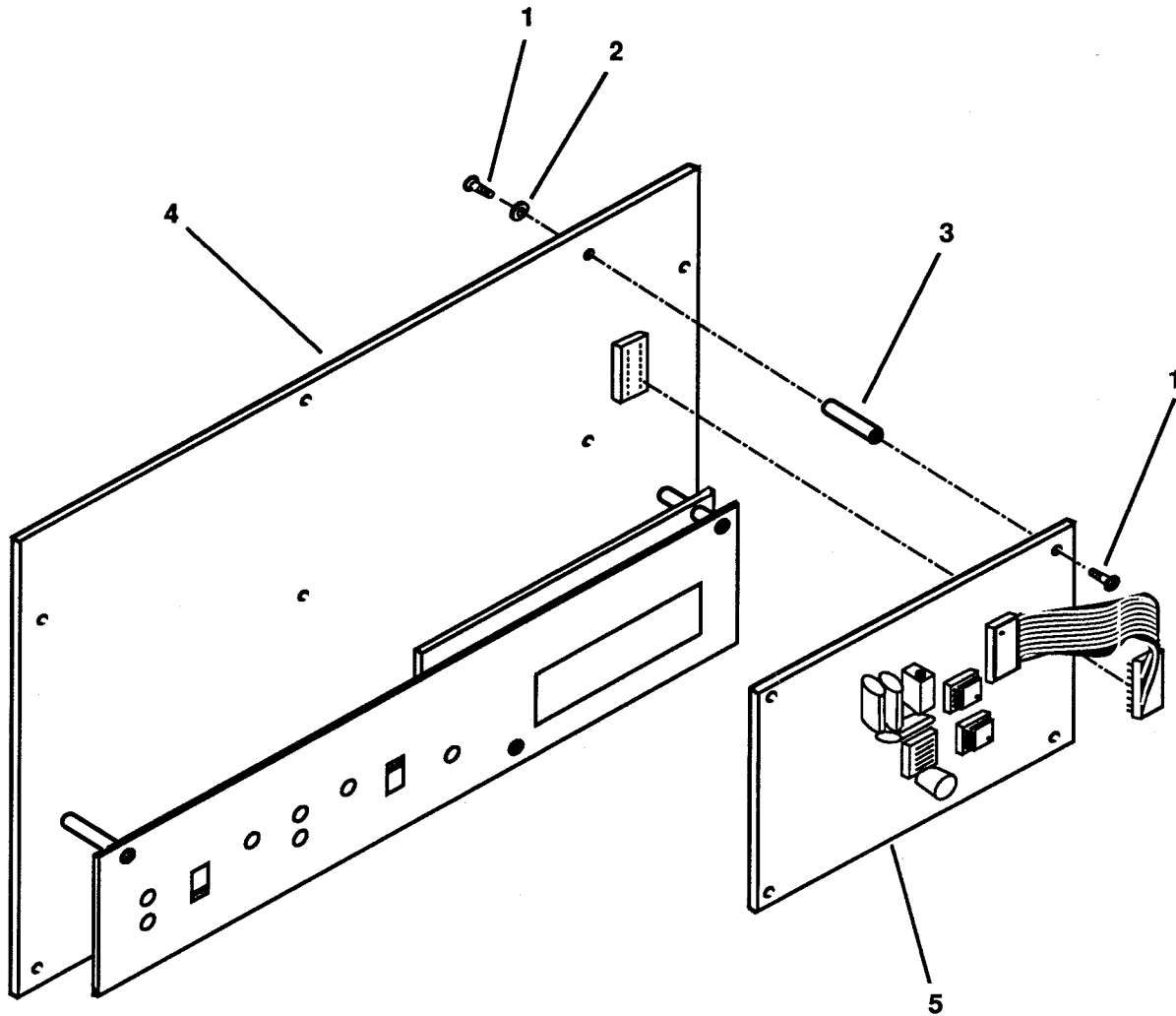


Illustration 5-1 Exploded View

5.7. Filter Input Module Parts

LOCATION#	PART#	DESCRIPTION
C501	C 6130-6	0.1MF 50V MONO
C502	C 6130-6	0.1MF 50V MONO
C503	C 3218-2	0.22MF100V 10%FILM
C504	C 3218-2	0.22MF100V 10%FILM
C505	C 3218-2	0.22MF100V 10%FILM
C510	SELECTED	
C511	SELECTED	
C512	SELECTED	
C513	C 5311-3	22MF 50V NP 20%
C514	C 6130-6	0.1MF 50V MONO
C515	C 6130-6	0.1MF 50V MONO
D500	C 4660-4	390.KOHM .25W 5 CF
D501	C 3181-2	"DIODE, 1N4148"
	C 3181-2	"DIODE, 1N4148"
J100	D 4798-1	5IN 16PIN DIP CABLE
R222	C 2631-7	10. KOHM .25W 5% CF
R223	C 2631-7	10. KOHM .25W 5% CF
R224	C 2631-7	10. KOHM .25W 5% CF
R515	C 5166-1	6.8 KOHM .25W 5 CF
R516	C 6219-7	100K 10-TURN CERMET TRIMPOT
R519	C 2631-7	10. KOHM .25W 5% CF
R520	SELECTED	
R521	SELECTED	
R522	SELECTED	
R523	C 2631-7	10. KOHM .25W 5% CF
	C 5046-5	20. KOHM .25W 5 CF
R524	C 2631-7	10. KOHM .25W 5% CF
S100	C 7109-9	SPST 5 POS DIP SWITCH
U510	C 3919-5	RC4558 DUAL NB IC
U511	C 3919-5	RC4558 DUAL NB IC
Z1	C 5868-2	0 OHM .25W JMPR TYP 10 MILOHM
Z2	C 5868-2	0 OHM .25W JMPR TYP 10 MILOHM
Z3	C 5868-2	0 OHM .25W JMPR TYP 10 MILOHM
Z4	C 5868-2	0 OHM .25W JMPR TYP 10 MILOHM
	C 3161-4	0.01MF100V 10%FILM
	C 6408-6	680PF 15V MICA CAP
	C 3996-3	.0047MF200V 5%FILM
	C 2881-8	51. KOHM .25W 5 CF25
	C 3451-9	"IC SOCKET, 8PIN DIP 2-640463-3"
	J 0202-2	"SCHEM, 7700 FILTER BD."
	P10109-0	"BD, 7780 FILTER"

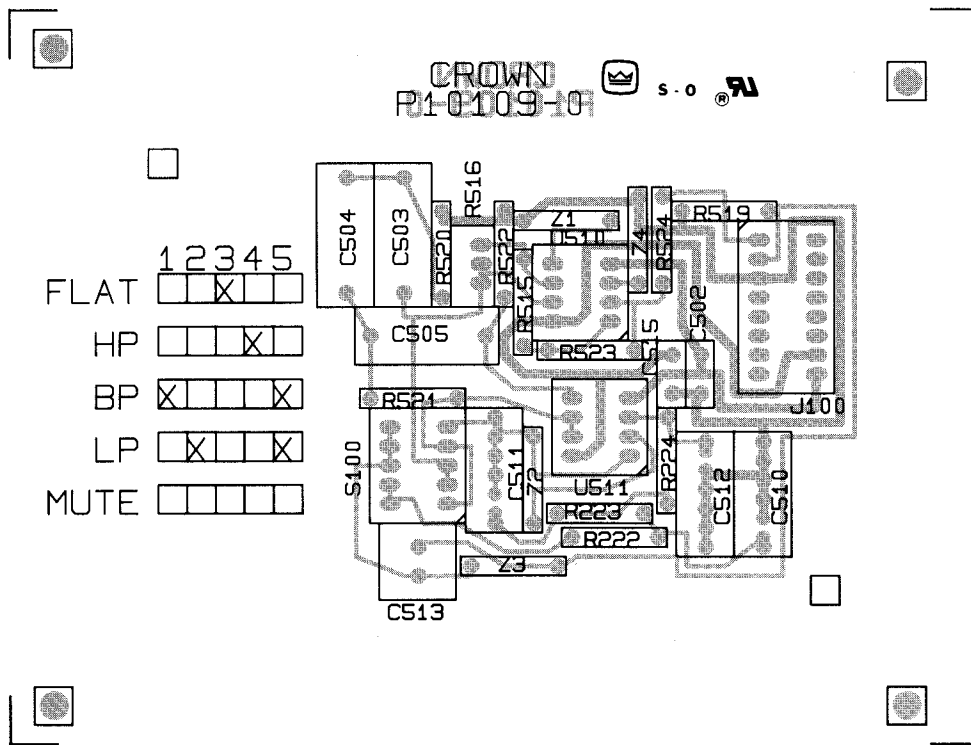
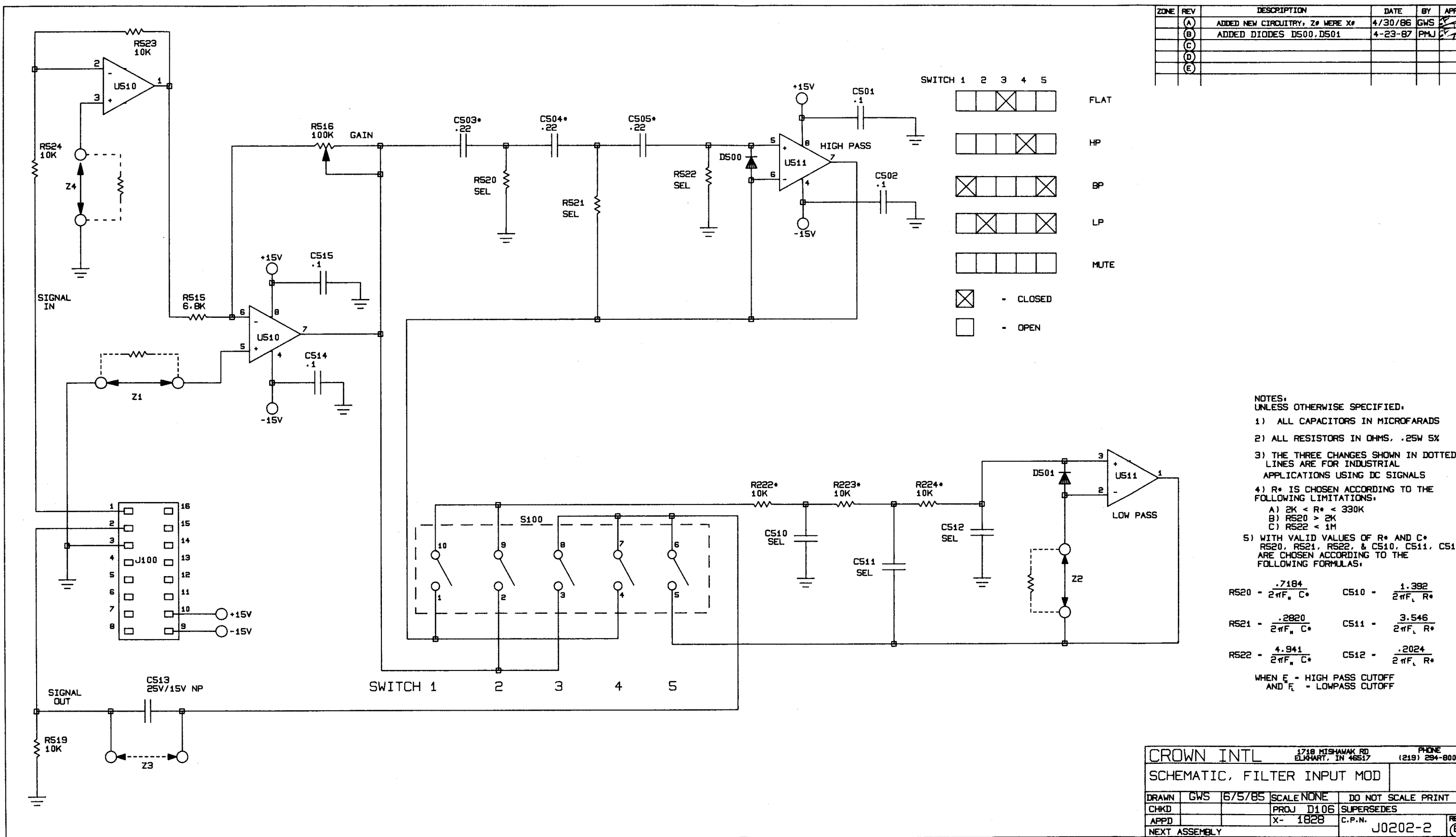


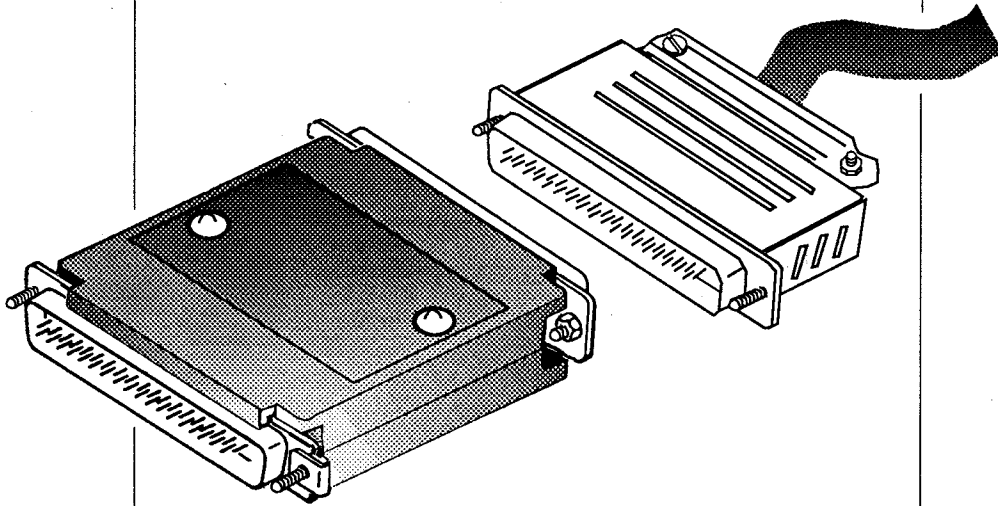
Illustration 5-2
Circuit Board Filter Input Module



Schematic Filter Input Module



Using OPTOC-1



TECHRON[®]

a Division of Crown[®] International Incorporated

1718 W. Mishawaka Road, Elkhart, Indiana 46517

(219) 294-8300

K80429-2

Understanding OPTOC-1

The term, "OPTOC", refers to an optical interlock and coupling device used with the Techron 7700 family of amplifiers configured in series. OPTOC-1 optically couples the interlock signals between the 7700 amplifiers with a shared load. OPTOC-1 is used to isolate the interlock systems of all amplifiers above ground potential.

OPTOC-1 consists of a small, printed circuit board and 2, 37-pin connectors that route the input and output signals.

Use OPTOC-1 whenever the **COMMON** or **SAMPLED COMMON** output from a 7700 amplifier connects to the output of another 7700 series amplifier. When using OPTOC-1, note that all amplifiers shut down when one is not functioning.

OPTOC-1 isolates the following signals to the originating amplifier:

- INTERLOCK COMMON
- +15V
- INTERLOCK
- AMP READY

OPTOC-1 passes the following signals without isolation:

- AMP OUT
- SAMPLED COMMON
- +1
- 1

WARNING

Damage **WILL** occur to the Techron 7700 family of amplifiers if OPTOC-1 is not installed when it is needed. Using OPTOC-1 when it is not needed does not impair correct operation of the amplifier.

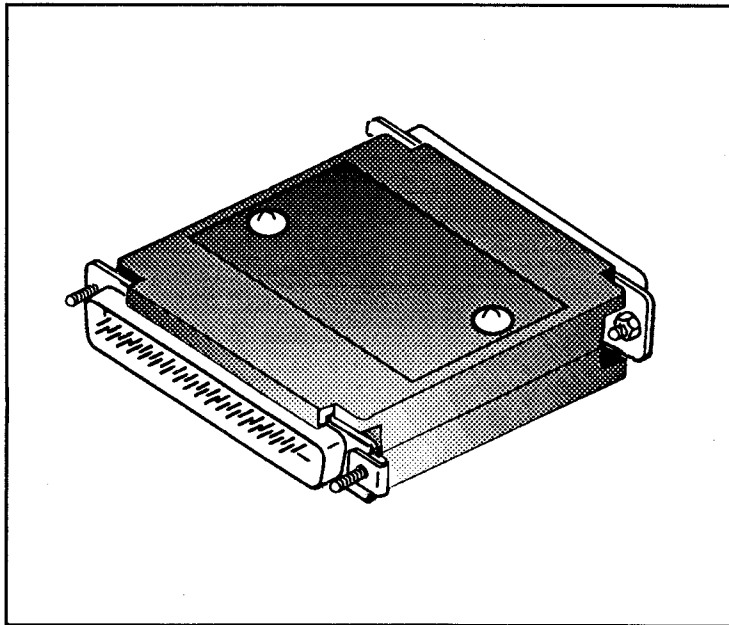


Figure 1 OPTOC-1 Optical Isolator, Interlock, and Coupling Device

Installing OPTOC-1

1. Attach the male connector of OPTOC-1 to the back of the slave amplifier.
2. Attach a cable to the female connector to daisy chain to the other OPTOC-1s and the master amplifier.
3. On the back of the amplifier (see Figure 2), remove the 2.7Ω 2w resistor connected between Sampled Common and Chassis Ground. Do so for all amplifiers except the master amplifier. (This resistor functions as a "fuse" for circulating ground currents that may be present due to incorrect wiring.)
4. Verify that the master amplifier is switched to "master" and the other amplifiers are in the "slave" mode. The 16-pin DIP connector, J300, should be properly configured for whatever current summing your system needs.

disables an amplifier in the event of a long duration overload. Locate this jumper on the lower left side of the main board (see Figure 3). If this circuit is not enabled, serious damage to the amplifiers may occur from the possible thermal overload of a slave amplifier.

- If you use a cable between OPTOC-1 and the slave amplifier instead of a direct, physical connection, it may be good practice to connect all pins of the 37-pin connector. In this manner you ensure compatibility should engineering changes occur in future versions of OPTOC-1.

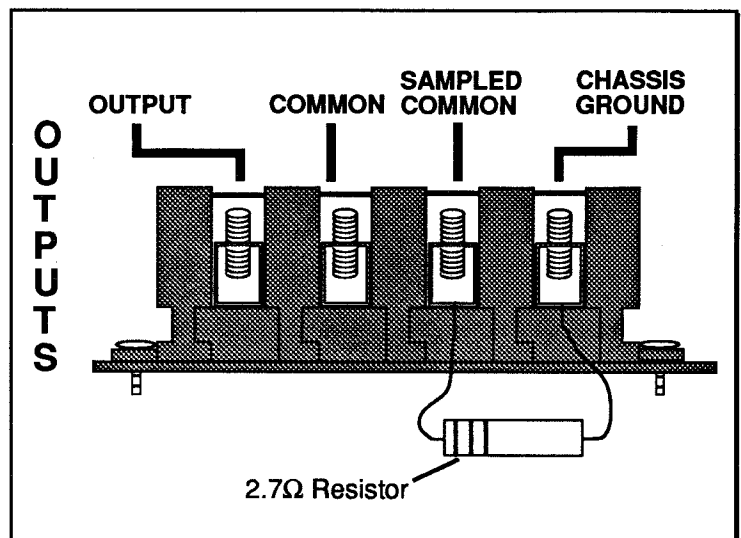


Figure 2 Removing the 2.7Ω Resistor

Other Installation Notes

- You should review the illustrations and text in the section, *Using OPTOC-1*, for more details about wiring considerations.
- If you have three or more amplifiers in a series stack, you must enable jumper Z505 (model 7780 revision C and above) on the main board of each amplifier in the stack. (Model and revision number information is located on the Techron label on the back of the amplifier.) This jumper

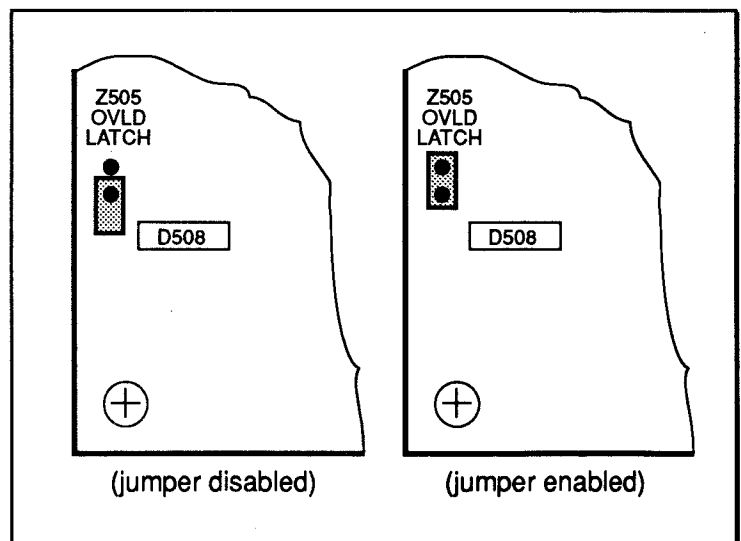


Figure 3 Enabling Jumper Z505

Using OPTOC-1

Limitations

- When configuring the Techron 7700 family of amplifiers in series, the maximum number of amplifiers, relative to ground, is five. This series stacking limit is a result of the maximum voltage potential standoff limit within each amplifier. If you need more than five amplifiers in series, contact Techron Application Engineering to discuss your application.
- The common mode range of the +1 and -1 inputs is one output level. In other words, when you connect more than two levels of series-configured, 7700 amplifiers, you must use an amplifier's output with lower potential (nearer the master) to reference the input signal of the next level amplifier. See Figure 4.
- Every amplifier exhibits a measurable amount of rise time, or signal response time delay, as well as phase delay. When configured in a series stack, phase delay is cumulative. However, Techron 7700 amplifiers configured in a push-pull series do not exhibit as much phase delay as stacked series configurations.

Application Examples

A. Figures 4 and 5 show an acceptable number of levels of amplifiers. While Figure 4 shows all amplifiers in a true stacked series configuration, Figure 5 uses one less OPTOC-1, showing amplifiers 1-3 in stacked series and amplifiers 4 and 5 in stacked series. Amplifiers 4 and 5 are in push-pull series mode with the master.

B. Figure 4 shows that, when stacked in series, an amplifier needs to be referenced to the output of the amplifier immediately preceding it. Amplifiers 2, 3, and 4 are referencing slaves because they provide a reference for the amplifier immediately after (above) them.

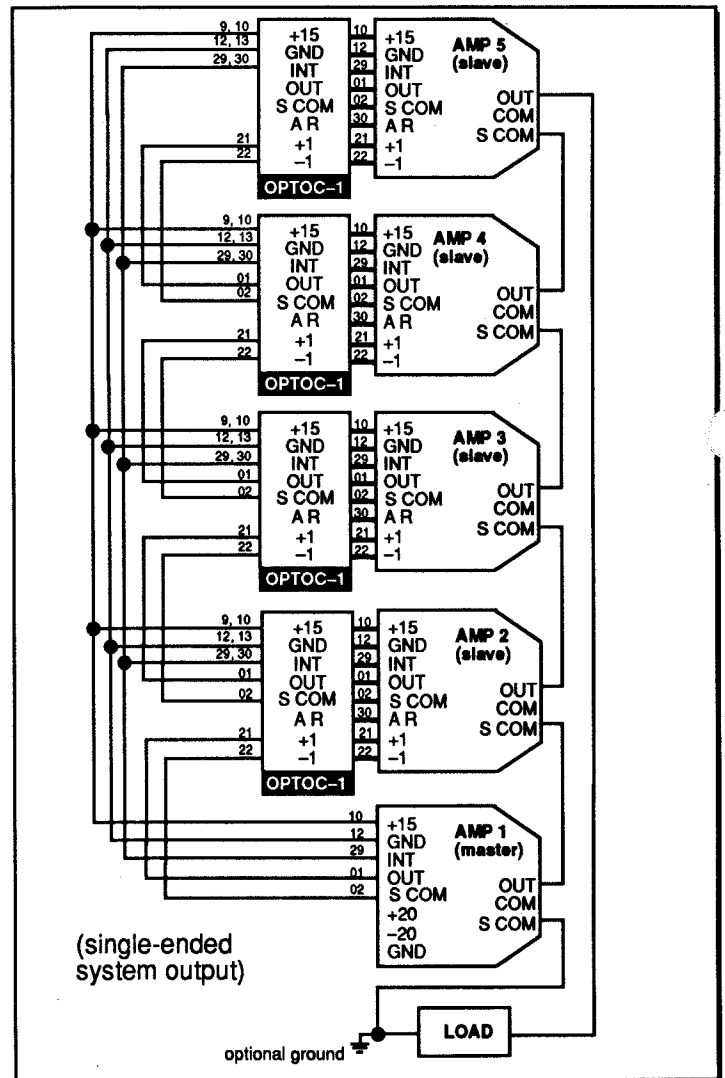


Figure 4 Series Stack Using OPTOC-1

Amplifier 4 in Figure 5 is referenced to amplifier 1, because it is in a push-pull series configuration with the master amplifier (amplifier 1). Amplifier 5 is referenced to amplifier 4. Amplifiers 4 and 5 are out of phase with the master amplifier. The configuration shown in Figure 5 is generally more desirable than the Figure 4 configuration because of cost (one less OPTOC-1) and better phase response (through more direct signal coupling).

C. With multiple amplifier systems, overall system phase response will be improved if the signal path is kept as short as possible. Figures 6a and 6b are simplified representations of Figure 4 and Figure 5 respectively. Figure 6c shows the optimum signal path for a 2X4 (2 parallel, 4 series amplifiers) system configuration.

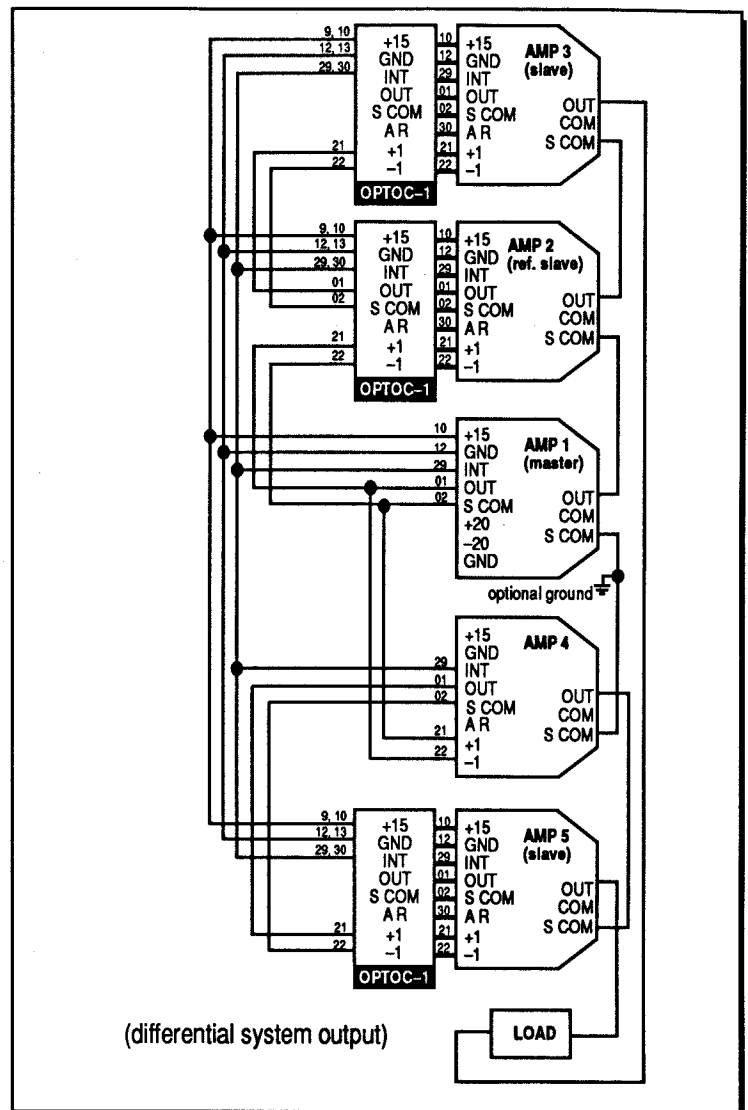


Figure 5 Alternate Series Stack Using OPTOC-1

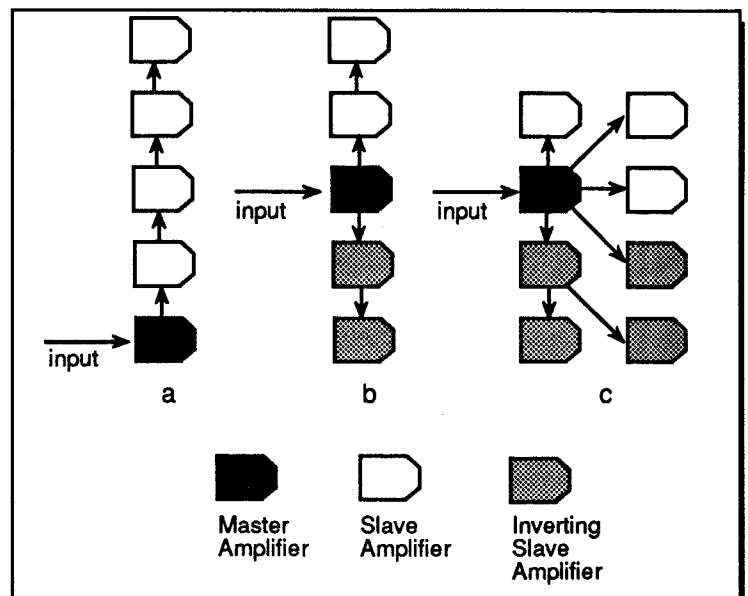


Figure 6 Signal Path Summary

Schematic

Figure 7 represents a schematic of OPTOC-1 circuitry. You may find this drawing helpful as you configure your system. Parts information associated with this schematic follows this section under the heading, *Servicing OPTOC-1*.

The interconnect shown on the right side of the schematic connects to a slave amplifier (or reference slave). The interconnect on the left side is to daisy chain to other OPTOC-1s and the master amplifier.

You may be confused by the multiple pin numbers for the +15, Interlock, and Interlock Common signals on the left side of the schematic. You saw these same pin numbers earlier in the application examples. The dual pin numbers for each of the three signals were created in OPTOC-1 so that you would not have to solder two wires together before placing the single, joined wire into one pin connector.

Under normal circumstances, pins 9, 13, and 30 on the J3 connector perform other functions for the

7700 family of amplifiers. Used with OPTOC-1, however, these pin numbers join pins 10, 11, and 29 respectively so that you can run one wire in and another wire out. The "official" pin numbers for the +15, Interlock and Interlock Common signals are 10, 29, and 12 respectively.

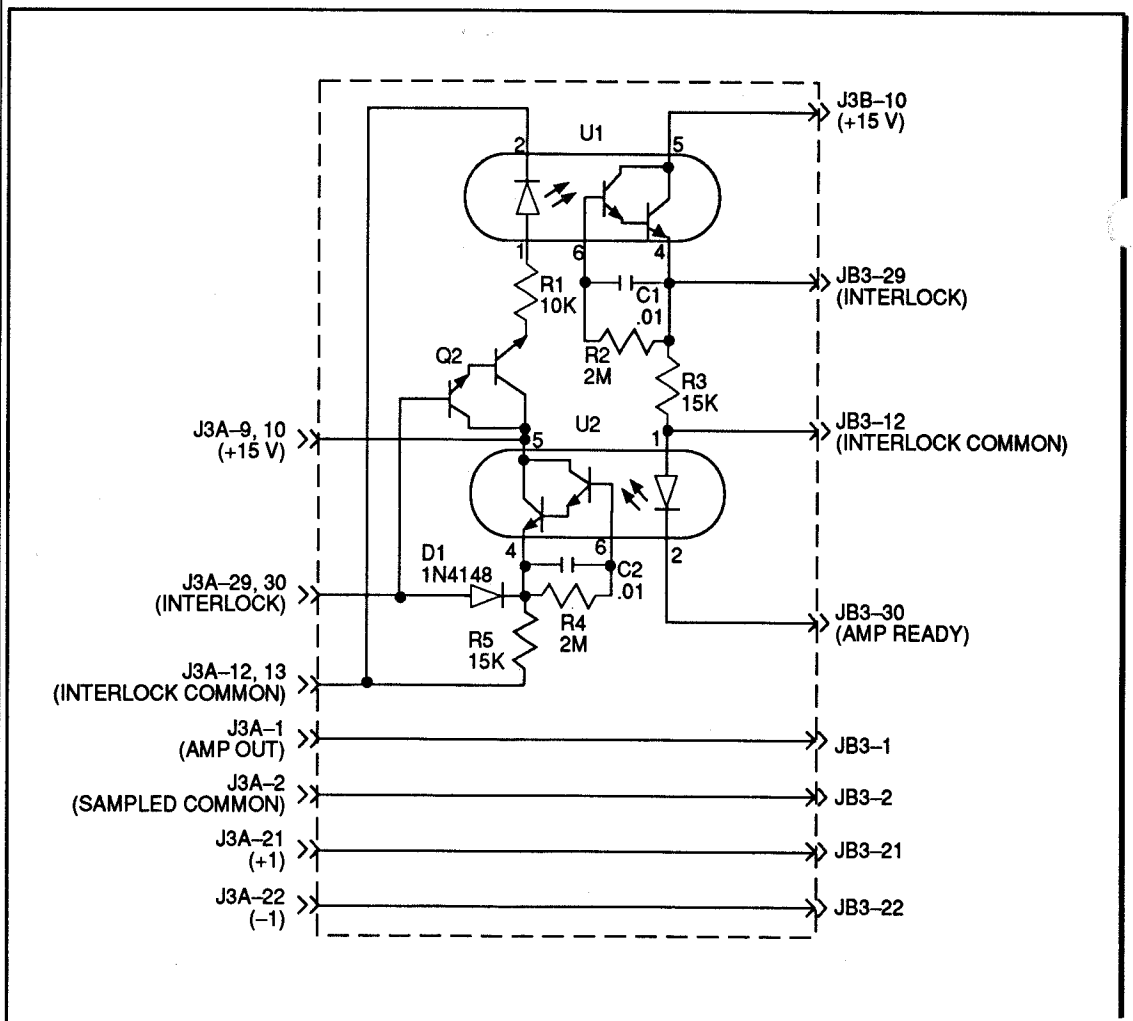


Figure 7 OPTOC-1 Schematic

Servicing OPTOC-1

Ordering Parts

Techron, a division of Crown International, supplies parts through the Crown International Parts Department. Obtain replacement parts using 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.

We ship by UPS or best method unless you specify a preferred method. Shipments are made F.O.B. Elkhart, Indiana only. We ship large orders to established accounts with freight prepaid and billed. All others orders are shipped freight collect.

Unless your order is prepaid, normal terms are C.O.D., MasterCard, or Visa®. 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.

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1718 W. Mishawaka Road
Elkhart, Indiana 46517
(219) 294-8210
FAX (219) 294-8329

Parts List—Circuit Board

The following parts list describes components on the OPTOC-1 circuit board. Use the schematic on the previous page to identify the parts. Main components of OPTOC-1 are illustrated on the next page.

I.D.	PART#	DESCRIPTION
C1	C-6806-1	.01 u 100V AXIAL
C2	C-6806-1	.01 u 100V AXIAL
D1	C-3181-2	IN4148
J3A	C-6969-7	DC37P D-SUB
J3B	C-7717-9	DCE37S D-SUB
Q2	C-7685-8	MPSA13 DARLINGTON TRANSITOR
R1	C 2631-7	10k Ω 1/4W 5%
R2	C-3199-4	2m Ω 1/4W 5%
R3	C-2632-5	15k Ω 1/4W 5%
R4	C-3199-4	2m Ω 1/4W 5%
R5	C-2632-5	15k Ω 1/4W 5%
U1	C-7684-1	H11G3 OPTO DARLINGTON
U2	C-7684-1	H11G3 OPTO DARLINGTON

**Parts List and
Exploded View**

ITEM#	PART#	QTY.	DESCRIPTION
1	D-7065-2	2	COVER,OPTO INTERLOCK
2	C-7721-1	2	SCREW 6-20 X 7/16 7YP.25
3	D-7064-5	1	BOARD
4	C 7074-5	2	SCRLOK W/.312 THD LG #205818-2
4	C 7231-1	2	#4 SCREW RETAINER
5	C 6969-7	1	CONNECTOR DC37P
6	C 7717-9	1	37 PIN D-SUB SOCKET SOLDER CUP
7	C 7717-9	1	DCE37S D-SUB
8	C 6968-9	1	CONNECTOR COVER
9	C 7231-1	2	MALE SCREW RETAINERS
N/A	D 7075-1	1	LABEL, TECHRON SERIAL/MODEL

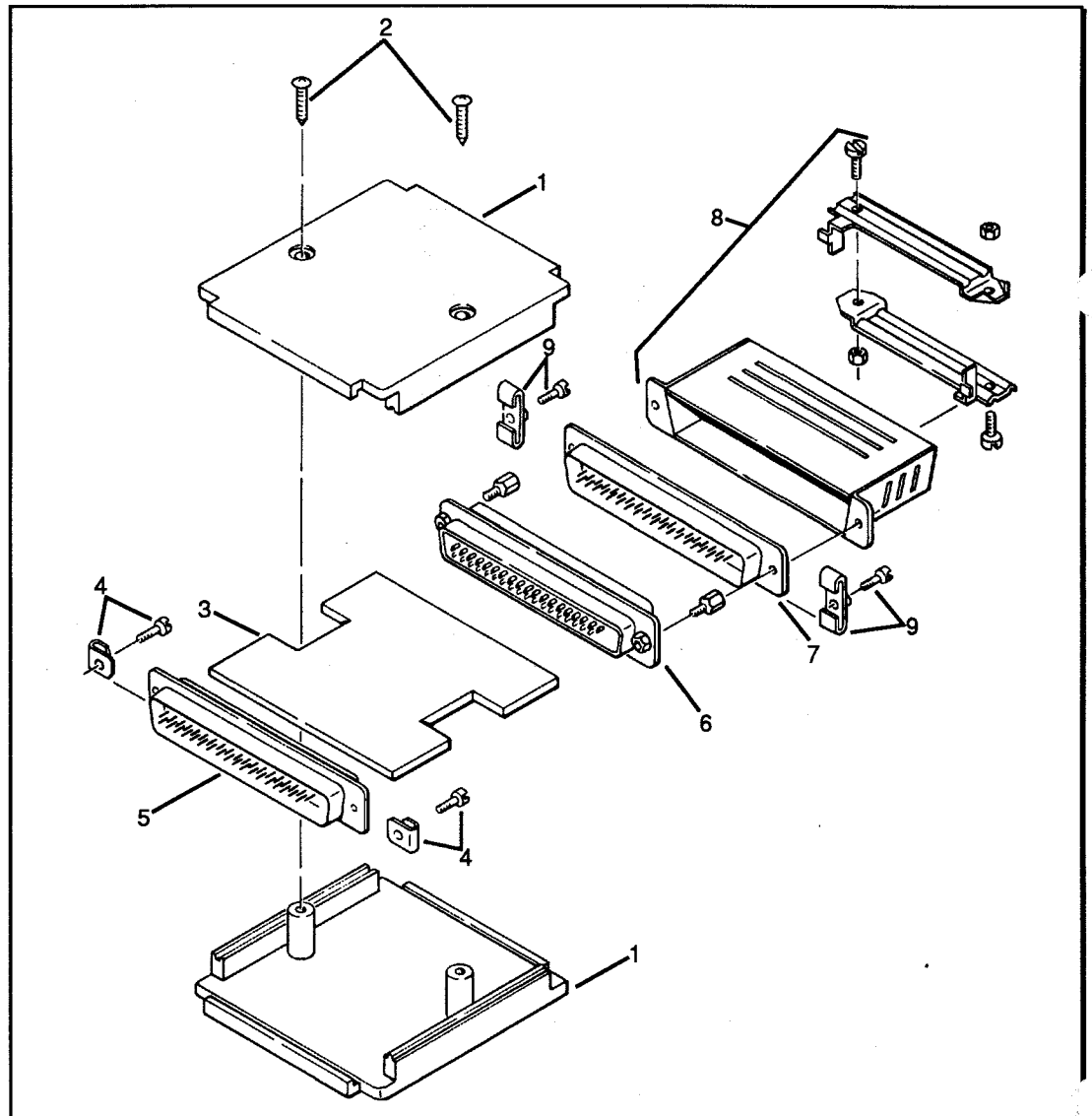


Figure 8 OPTOC-1 Exploded View