

FASTBUS FB8000 SYSTEM OPERATIONS MANUAL

MODEL FB8127-R4 FASTBUS CRATE
MODEL FB8152 FASTBUS COOLING UNIT
MODEL FB8199 FASTBUS POWER SUPPLY

DRAFT COPY

2-20-97

Bi Ra Systems

2404 Comanche NE
Albuquerque, NM • 87107

(505) 881-8887
Fax (505) 888-0651

GENERAL DESCRIPTIONS

FASTBUS CRATE MODEL FB8127-R4	1
MODEL FB8199 FASTBUS POWER SUPPLY	2
MODEL FB8152 FASTBUS COOLING SYSTEM.....	3
FASTBUS ANCILLARY LOGIC CARDS	4
SEGMENT CONNECTOR CONTACT ASSIGNMENTS	5

INSTALLATION

1.0.....	6
1.1.....	6
1.2.....	6
1.3.....	6
1.4.....	6
2.0 SYSTEM CONFIGURATION	6
3.0 POWER ATTACHMENTS.....	6
3.1.....	6
3.2.....	6
FIGURE 1 FB8000 SYSTEM FIRST ARRANGEMENT	7
FIGURE 2 FB8000 SYSTEM SECOND ARRANGEMENT.....	8
3.3.....	9
3.4.....	9
1.0 PREPARATION	9
2.0 POWER ON	9
2.1 SEGMENT TESTS	9
3.0 INPUT POWER SECTION	9
4.0 METERSWITCH	10
5.0 LCD DIGITAL VOLTMETERS	10
6.0 +/- 15V REGULATOR CIRCUITS	10
1.0 TROUBLESHOOTING HINT.....	10
WARRANTY	11

FASTBUS CRATE

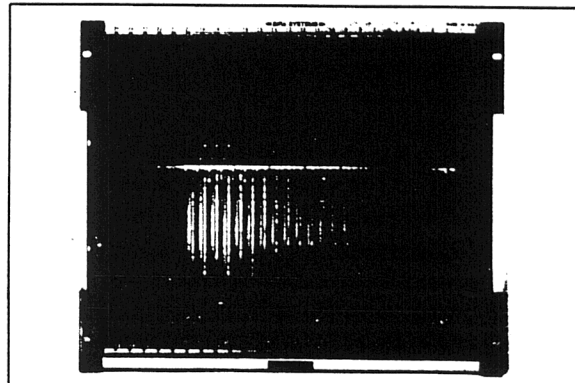
MODEL FB 8127- R3

FEATURES:

- Redesigned busbar makes power attachment easy
- Strain relief clamps for power cables
- Safety shield covers for power terminals
- 8 Layer Segment Board
- Sense Lead Card included
- New Segment and Auxiliary connectors
- All guide rails are electroless nickel-plated

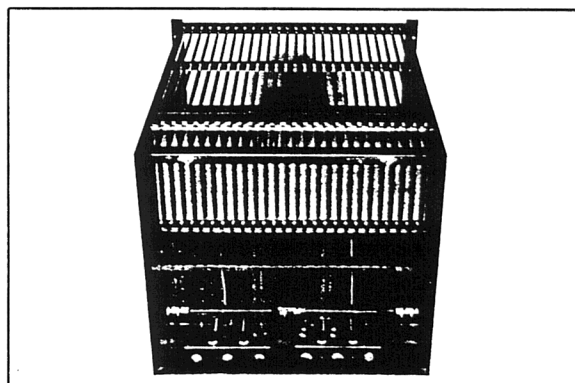
General Description

The BiRa Model FB 8127 - R3 meets all requirements of FASTBUS specifications and IEEE Standard 960 for Type (A) air-cooled crates. This fully redesigned crate is a standard rack-mountable package with 26 slots. The backplane of the crate consists of two parts; the Segment and the Auxiliary Backplane. The FASTBUS "Segment" is the digital data bus which provides the control and flow of data in the system. The FASTBUS "Auxiliary" is a separate PCB (optional) which is not employed for the transfer of data, instead it is used to implement optional features such as analog outputs to trigger logic, rear-panel inputs or custom I/O. The 26 station Segment Assembly is an eight (8) layer printed circuit board with ground and power planes embedded. The **NEW** Segment and Auxiliary connectors provide accurate placement of either flat or long half-slotted module connectors and pins are field replaceable.



Crate Description

The Model FB 8127 "A" FASTBUS Crate meets all requirements of the FASTBUS Specification (DOE/ER-0189) of the U.S. NIM Committee. The Crate is a 26 station, air cooled crate with a multilayer segment PCB capable of providing full power to modules. Electroless nickel-plated guide rails insure smooth alignment and minimizes air obstruction for cooling of the modules and provides excellent ground return (especially for analog designed modules). All support and mounting bars have been strengthened and self-locate through side panels.



Halt / Run Description

The Halt/Run Bar actuates a switch mounted in the front mounting bar of the bottom rack. Pressing the center front of the bar allows the bar to release (halt position) and drop down, allowing the insertion or removal of a FASTBUS module. The bar will not lock into place (run position) unless modules are fully inserted into crate. The new design allows user to release bar (halt position) on bench top.

Powered Busbar Description

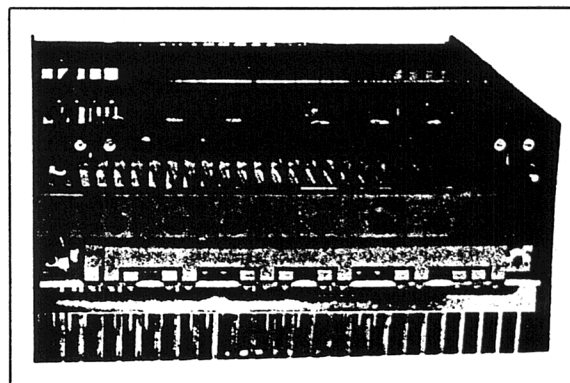
The redesigned busbar and digital return allows the user to attach and disconnect power cables easily. Power connections for the +5V, -5.2V, and -2V are made to tin plated copper bus bars attached to the bottom of the Segment PCB. Digital Return is mounted directly above the power connections on the Segment PCB to a tin plated copper bus bar. New strain relief clamps secure the heavy power and digital return cables. New safety shield covers protect these connections and indicate proper placement of cables. The analog voltages (+/-15V) and returns (split between stations 0-12 & 13-26) are soldered to the Segment PCB and brought to two connectors at the bottom rear of the Crate.

Crate Specifications

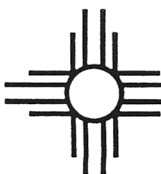
Dimensions: 19" rackmount, 15.75" height, 22.425" depth.
Weight: 39 lb. (17.7 kg)

Options:

- 1) Models FBA-771 & FBA-779 are RS485 output Auxiliary cards
- 2) Ancillary Logic Set (Model FB8183) contains Model FB 8177 ATC, Model FB8178 GAC cards



2404 Comanche N.E.
Albuquerque, NM 87107



Bi Ra Systems



Phone (505) 881-8887
Fax (505) 888-0651

MODEL FB8189 FASTBUS POWER SUPPLY

FEATURES:

- Dual LCD Digital Voltmeters for Outputs
- All outputs Monitored
- +/- 15V DC & 24A Shared to 600 Watts
- 200-260V 47-63Hz Input
- Panel Meters for Input AC

This unit is a rack mounted Power Supply Assembly intended for use with a FASTBUS crate. The FB8189 provides the +/- 15VDC, mains switches and metering, and the wired frame for mounting the switching regulators which supply the +5V, -5.2V, and -2V DC digital power to the crate. All outputs are monitored by dual (voltage & current) LCD digital voltmeters switch selected from the front panel. Input voltage and current are also metered at the front panel. The FB8189 also provides the switched mains voltage for a blower and external switching regulator power supplies. Any combination of three standard 5"x 8"x11-14" packages can be added by inserting them into the slots provided at the rear of the unit. Current options available are 120 or 200A for -2V and 200 or 300A for the -5.2 and +5. For units with switching regulators providing 200A or less each, inputs of 100-130 or 200-260V AC 47-63Hz are available. For crates requiring any switching regulator with an output above 200A units are available only with 200-260VAC 47-63Hz input. All switching regulators have self-contained fans which circulate air inside the chassis. All units have an ambient air temperature operating range of 0-50 degrees C.

Switching Regulator Power Supplies plug into pre-wired slots at rear of Power Supply Chassis. The -5.2 and +5V regulators are interchangeable. The +15V DC regulators, mains switching, and metering circuitry are pre-wired with plugs, switching current shunts, and all wiring including power leads to the crate.

ORDERING INFORMATION

Model FB8189-0 Power supply +/-15V, No switching Regulators

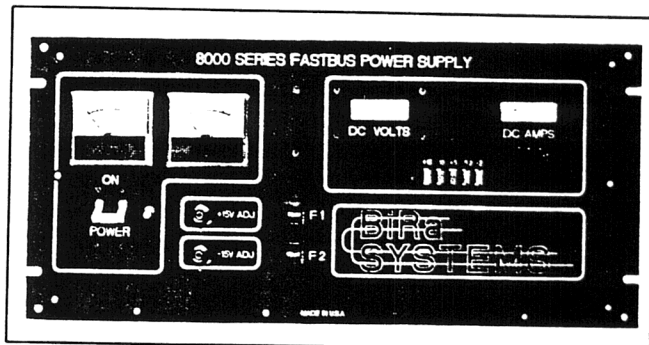
Model FB8189-1 Power supply +/-15V, -2V@120A, -5V@200A, +5V@200A

Model FB8189-2 Power supply +/-15V, -2V@120A, -5V@200A, +5V@300A

Model FB8189-3 Power supply +/-15V, -2V@200A, -5V@300A, +5V@200A

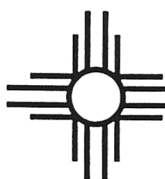
Model FB8189-4 Power supply +/-15V, -2V@200A, -5V@300A, +5V@300A

NOTE 1: +/- 15V Outputs Current Shared to 120% of output shown.

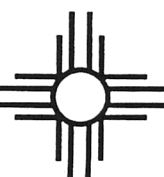


Specifications	Model 8189	300 AMP SW. REG.	100-200 AMP SW. REG.
Input	208-240V 47-63Hz	182-262VAC 47-63Hz	182-240VAC 47-63Hz
Output (See note 1)	+/- 15V @ 24 Amps	+5V or -5.2V	+5V, -5.2V or -2V
Regulation	(line & load) +/- 0.2%	TOTAL ERROR BAND: +/-2% or +100mV (whichever is greater) including the following: #Input Power variation over specified range. #Static Load variation 0-100% of full. #Dynamic Load stop (10 µsec rise) of 20% or 50A. #Ripple and Noise. #Temperature Stability over 0-50 deg. C. #Drift for an 8-hour period.	
Noise & Ripple	Less than 10 mV p.p.		
Ambient Temperature	0-50 deg C.		
Temperature Coeff.	0.02%/C		
Transient Recovery	50 µsec typical		
Fusing	Mains and all Reg. Input		
Remote Sensing	All Outputs		
Overload Protection	Foldback Current Limiting All Outputs		
Overvoltage Protection	125% max - All Outputs		
Overtemp. Protection	Automatic Shutdown		
Metering	Dual Liquid Crystal DVM : All Outputs by Switch Select		
Options		Status Bit	
Power Loss Holdup	16 msec	20 msec	30 msec
Efficiency	40%	72%	72%
Voltage Adj.	+/- 2.0% min.	+/-10% min.	+/-10% min.
Shipping Weights	49 lbs.	24 lbs.	26 lbs.
Size	8.75" X 26" X 19" Rack	5" X 8" X 11"	5" X 8" X 11"

2404 Comanche N.E.
Albuquerque, NM 87107



Bi Ra Systems



Phone (505) 881-8887
Fax (505) 888-0651

FASTBUS COOLING

MODEL FB8151

9-FAN SMART MODULAR AIR COOLING SYSTEM FOR FASTBUS

FEATURES

- Modular design for easy maintenance, serviceability, and interchangeability
- Aluminum honeycomb for shielding effectiveness and columniation of air flow
- Air Filter tray can be removed during blower operation
- Built-in cable tray with cable retainers
- Durable construction offers increased reliability
- Cools even a partially empty crate

OPTIONAL SMART FEATURES

- Logic circuitry for reliable system integration
- sensor controlled cooling
- Self monitoring system assures reliable cooling

APPLICATIONS

All FastBus cooling needs, especially those where highly reliable and intelligent cooling is required.

GENERAL DESCRIPTION

The Bi Ra Model FB8151 is a 19" rack mounted cooling unit designed for FastBus data acquisition systems. The modular design (Blower and filter module) makes maintenance and servicing easy. The 9-fan blower module (rated at 1008 CFM combined) can be interchanged and replaced without disconnecting the system, allowing for short down time in the event of a fan failure. The air filter module removes independently from inside the blower module to allow user to clean or replace air filter while system is operating. Aluminum hex-cell honeycomb material is incorporated into the blower chassis to columnate air flow and shield fans. Bottom panel can support and direct cables to the rear of the unit.

GENERAL DESCRIPTION of OPTIONAL SMART FEATURES

The Bi Ra Model FB8151 smart blower has logic circuitry for intelligent control and can detect and report various system conditions. The following options are available:

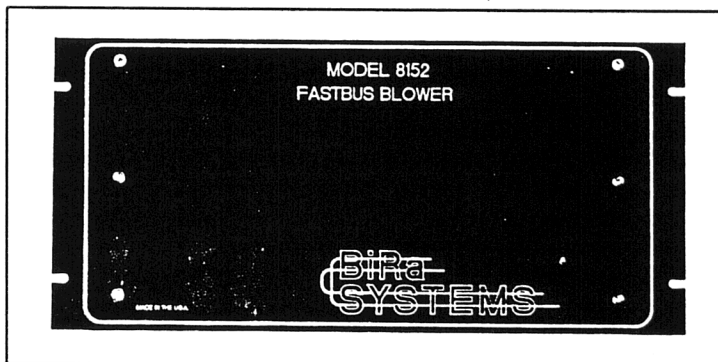
- 1) FAN FAILURE- Alarm circuit visually indicates fan failure by LED display on front panel. Alarm outputs can drive signal to FastBus power supply (Bi Ra Model 8189) to shut down entire FastBus system.
- 2) FAN SPEED CONTROL- Thermal sensors mounted on FastBus Crate (Bi Ra Model FB8127-R3) control automatic increase/decrease of fan speed. Thermal sensors are mounted in air stream of FastBus Crate.

MECHANICAL SPECIFICATIONS

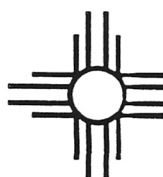
Dimensions: 19" rack mounted, 5U (8.75") height, 22.5" depth

MODEL FB8152

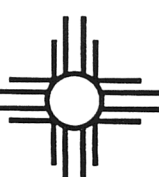
The Bi Ra Model FB8152 is a 19" rack mounted cooling unit is intended to be used with any crate requiring a high volume of air over a large area. Due to its unique design in utilizing two hex-cell honeycombs to straighten and columnate the air provided by the two large fans (rated at 680CFM combined), the FB8152 can cool even a partially empty crate.



2404 Comanche N.E.
Albuquerque, NM 87107



Bi Ra Systems



Phone (505) 881-8887
Fax (505) 888-0651

FASTBUS ANCILLARY LOGIC CARDS

GENERAL DESCRIPTION

FASTBUS is a standardized modular data-bus system for data acquisition, data processing, and control. A FASTBUS system consists of multiple bus segments which can operate independently, but link together for passing data and other information. FASTBUS modules are housed in crates. One key feature of FASTBUS is that it allows multiple masters to reside and/or access modules in a single crate. To accommodate this and other features of the specification as well as to provide terminators for ECL implemented bus, two logic boards are required and are housed at the rear of the crate, one board at each end. These are the Arbitration Timing Control (ATC) and the Geographical Address Control (GAC) modules. Together these modules are referred to as the Crate Segment Ancillary Logic. The Crate Segment Ancillary Logic, consisting of the Model 8177 (ATC) and the Model 8178 (GAC) modules, conforms to all mandatory and recommended features as specified in the December 1983 Department of Energy FASTBUS Specification (DOE/ER-0189, IEEE 960).

MODEL 8177 ATC

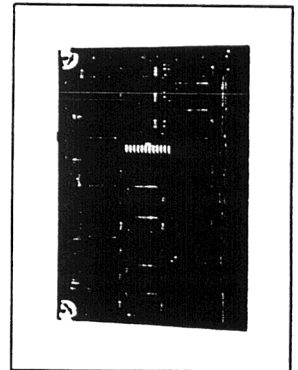
ARBITRATION TIMING CONTROL MODULE

ARBITRATION TIMING CONTROL LOGIC: This circuitry detects request for bus mastership from potential masters. When one or more requests are present and the previous master has released its control of the bus, this logic initiates an arbitration cycle, granting bus mastership to the highest priority requestor at the completion of the cycle. When potential bus masters are working in an "assumed access" mode, this logic also inhibits these masters from asserting new bus request until all devices currently requesting the bus have been granted bus mastership.

RUN/HAULT CONTROL LOGIC: Each FASTBUS crate has a bar across its lower front panel. All modules in a crate must be properly inserted before this bar can be put into its locked position. In this position, the bar forces a Run/Halt switch into its "Run" position. The Run/Halt Control Logic senses the position of this switch enabling bus activity (i.e. bus mastership requests) when the switch is in the "Run" position and disabling this activity when the switch is in the "Halt" position (i.e., bar in its unlocked position).

SYSTEM HANDSHAKE LOGIC: During FASTBUS Broadcast operations addressed modules do not return any address or data acknowledge handshake signals to the Broadcast master. Since Broadcast messages can be sent to several devices in several crates simultaneously, the Broadcast master must be provided with handshake signals which insure that even the most remotely distant addressed module has time to respond. The system Handshake Logic provides these signals.

BUS TERMINATIONS: An 82 ohm resistor to 2.0V is included for each bus line requiring an ECL termination.



MODEL 8178 GAC

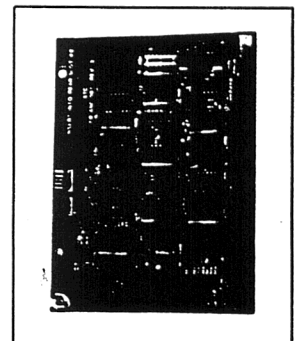
GEOGRAPHICAL ADDRESS CONTROL MODULE

GEOGRAPHICAL ADDRESS CONTROL LOGIC: There are three addressing modes in FASTBUS. One mode, called Geographical Addressing and used for system/device initialization and typically for addressing simple and front-end modules, is dependent upon the physical position of a module in a crate. To reduce circuitry in geographically addressed monitors, The Geographical Address Control Logic monitors the bus for geographic addresses. If one such address is detected, this logic asserts a signal indicating to slaves that the current address on the bus is geographical. A slave detecting this signal must then only decode a few bits rather than the full 32 bits to determine if it is being geographically addressed.

GEOGRAPHICAL ADDRESS VOLTAGE GENERATOR: This logic provides logic 1 and logic 0 levels at specified pins such that, via backplane bussing, the signals on the five Geographical Address pins at each slot in a crate are the binary number of the physical position of the slot in the crate. For example, slot 25 would have the logic states 11001 on these five pins, slot 14 01110, etc.

CSR 1 SWITCH REGISTER: Addressing CSR 1 on the GAC module will return on the upper data lines the states of a twelve-position switch. This switch enables the system software to uniquely identify a bus segment for diagnostic purposes.

BUS TERMINATORS: Same as the ATC module.



2404 Comanche N.E.
Albuquerque, NM 87107



Phone (505) 881-8887
Fax (505) 888-0651

Segment Connector Contact Assignments

In order of contact number as viewed from front of module or crate.

No.	Mnemonic	Function	No.	Mnemonic	Function
B01	0 V	Power Return	A01	0V	Power Return
B02	+28V	+28 V bus	A02	AL00	Arbitration Level 0
B03	+28V	+28 V bus	A03	AL01	Arbitration Level 1
B04	+15V	+15 V bus	A04	AL02	Arbitration Level 2
B05	-15V	-15 V bus	A05	0 V	Power Return
B06	0 VA	CLEAN EARTH	A06	AL03	Arbitration Level 3
B07	-5.2 V	-5.2 V bus	A07	AL04	Arbitration Level 4
B08	-5.2 V	-5.2 V bus	A08	AL05	Arbitration Level 5
B09	-5.2 V	-5.2 V bus	A09	AR	Arbitration Request
B10	AG	Arbitration Grant	A10	0 V	Power Return
B11	AI	Arbitration Inhibit	A11	GK	Grant Acknowledge
B12	SSO	Slave Status 0	A12	DK	Data Acknowledge
B13	-2 V	-2 V bus	A13	AK	Address Acknowledge
B14	+5.0 V	+5.0 V bus	A14	WT	Wait
B15	+5.0 V	+5.0 V bus	A15	0 V	Power Return
B16	SS1	Slave Status 1	A16	AS	Address Sync
B17	SS2	Slave Status 2	A17	DS	Data Sync
B18	RD	Read	A18	MS0	Mode Select 0
B19	MS2	Mode Select 2	A19	MS1	Mode Select 1
B20	LX	LAN Connection	A20	0 V	Power Return
B21	EG	Enable Geog. Address	A21	AD00	Address/Data, LSB
B22	+5.0 V	+5.0 V bus	A22	AD01	Address/Data
B23	SR	Service Request	A23	AD02	Address/Data
B24	RB	Reset Bus	A24	AD03	Address/Data
B25	BH	Bus Halted	A25	0 V	Power Return
B26	B26R	Reserved	A26	AD04	Address/Data
B27	GA00	Geog. Address 0	A27	AD05	Address/Data
B28	GA01	Geog. Address 1	A28	AD06	Address/Data
B29	GA02	Geog. Address 2	A29	AD07	Address/Data
B30	GA03	Geog. Address 3	A30	0 V	Power Return
B31	GA04	Geog. Address 4	A31	AD08	Address/Data
B32	-2 V	-2 V bus	A32	AD09	Address/Data
B33	DLA	Daisy Chain out Left	A33	AD10	Address/Data
B34	DRA	Daisy Chain in Right	A34	AD11	Address/Data
B35	DLB	Daisy Chain in Left	A35	0 V	Power Return
B36	DRB	Daisy Chain out Right	A36	AD12	Address/Data
B37	DAR	Daisy Chain A Return	A37	AD13	Address/Data
B38	DBR	Daisy Chain B Return	A38	AD14	Address/Data
B39	B39R	Reserved	A39	AD15	Address/Data
B40	FP0	Free Pin (not bussed)	A40	0 V	Power Return
B41	FP1	Free Pin (not bussed)	A41	TP	T pin
B42	-5.2 V	-5.2 V bus	A42	A42R	Reserved
B43	FP2	Free Pin (not bussed)	A43	PE	Parity Enable
B44	FP3	Free Pin (not bussed)	A44	PA	Parity
B45	B45R	Reserved	A45	0 V	Power Return
B46	TRO	Terminated Restricted	A46	AD16	Address/Data
B47	TR1	Terminated Restricted	A47	AD17	Address/Data
B48	TR2	Terminated Restricted	A48	AD18	Address/Data
B49	TR3	Terminated Restricted	A49	AD19	Address/Data
B50	TR4	Terminated Restricted	A50	0 V	Power Return
B51	TR5	Terminated Restricted	A51	AD20	Address/Data
B52	+5.0 V	+5.0 V bus	A52	AD21	Address/Data
B53	TR6	Terminated Restricted	A53	AD22	Address/Data
B54	TR7	Terminated Restricted	A54	AD23	Address/Data
B55	UR0	Unterm. Restricted	A55	0 V	Power Return
B56	UR1	Unterm. Restricted	A56	AD24	Address/Data
B57	TX	Transmit Serial	A57	AD25	Address/Data
B58	RX	Recieve Serial	A58	AD26	Address/Data
B59	-5.2 V	-5.2 V bus	A59	AD27	Address/Data
B60	-5.2 V	-5.2 V bus	A60	0 V	Power Return
B61	-5.2 V	-5.2 V bus	A61	AD28	Address/Data
B62	-2 V	-2 V bus	A62	AD29	Address/Data
B63	+5.0 V	+5.0 V bus	A63	AD30	Address/Data
B64	+5.0 V	+5.0 V bus	A64	AD31	Address/Data,MSB
B65	0 V	Power Return	A65	0 V	Power Return

INSTALLATION

1.0

The following items are required to install a fully powered and cooled Fastbus Crate.

1.1

Power Requirements: Single Phase, 208/240 VAC 50/60HZ 50 Amp Service (6 feet of lead wire is provided for connection to service).

1.2

A standard 19" Rack with 35" (20U) of vertical space x 26" deep.

1.3

Each unit is packaged and shipped in individual boxes. All mounting hardware is preassembled on each unit. Carefully unpackage units and check for any damage thru shipment. Switching Regulator Power supplies Modules are mounted and shipped in Power Supply Chassis. Remove all Power Supply Regulator Modules from chassis before mounting chassis to rack.

1.4

To remove Switching Regulator Power Supply Modules, first remove all power leads and plugs, loosen screws holding retaining latches, push latches up and pull all three modules from chassis.

2.0 SYSTEM CONFIGURATION:

The FB8000 system can be configured in two recommended mounting arrangements, both illustrated on following page.

1)The first arrangement (Figure 1) consists of mounting the Model 8127 (FastBus Crate) in the highest position with the Model FB 8152 directly below the crate with the honey comb facing up. The Model FB 8199 (FastBus Power Supply) is mounted 1.75" (1U) below the cooling unit, use as many of the mounting holes possible. Although the Chassis is designed to support the weight of the power supply mounted at the rear, it is advisable to provide extra support at the rear as protection against accidental stress.

2)The second arrangement (Figure 2) consists of installing the Model FB 8152 (Cooling Unit) into the cabinet in the highest position with the Model 8127 (FastBus Crate) directly below. The Cooling Unit mounts with the honey-comb material facing down. The Model FB 8199 (FastBus Power Supply) is mounted 1.75 (1U) below the crate, use as many of the mounting holes possible. Although the Chassis is designed to support the weight of the power supplies mounted at the rear, it is advisable to provide extra support at the rear as protection against accidental stress.

3.0 POWER ATTACHMENTS:

3.1

Once System is configured and installed in rack, first attach return cables to power supply. Before attaching power cables to crate check bus bars and power planes for shorts. After power and return cables are connected to appropriate terminal marked, attach safety cable strain relief covers

3.2

Attach the +15V & the Analog Return (red , blue, & black wires) from the power Distribution Board to the barrier block at the rear underside of the Crate. Secure the bottom guide rack assembly in place.

Figure 1

REAR VIEW OF FASTBUS SYSTEM ARRANGEMENT

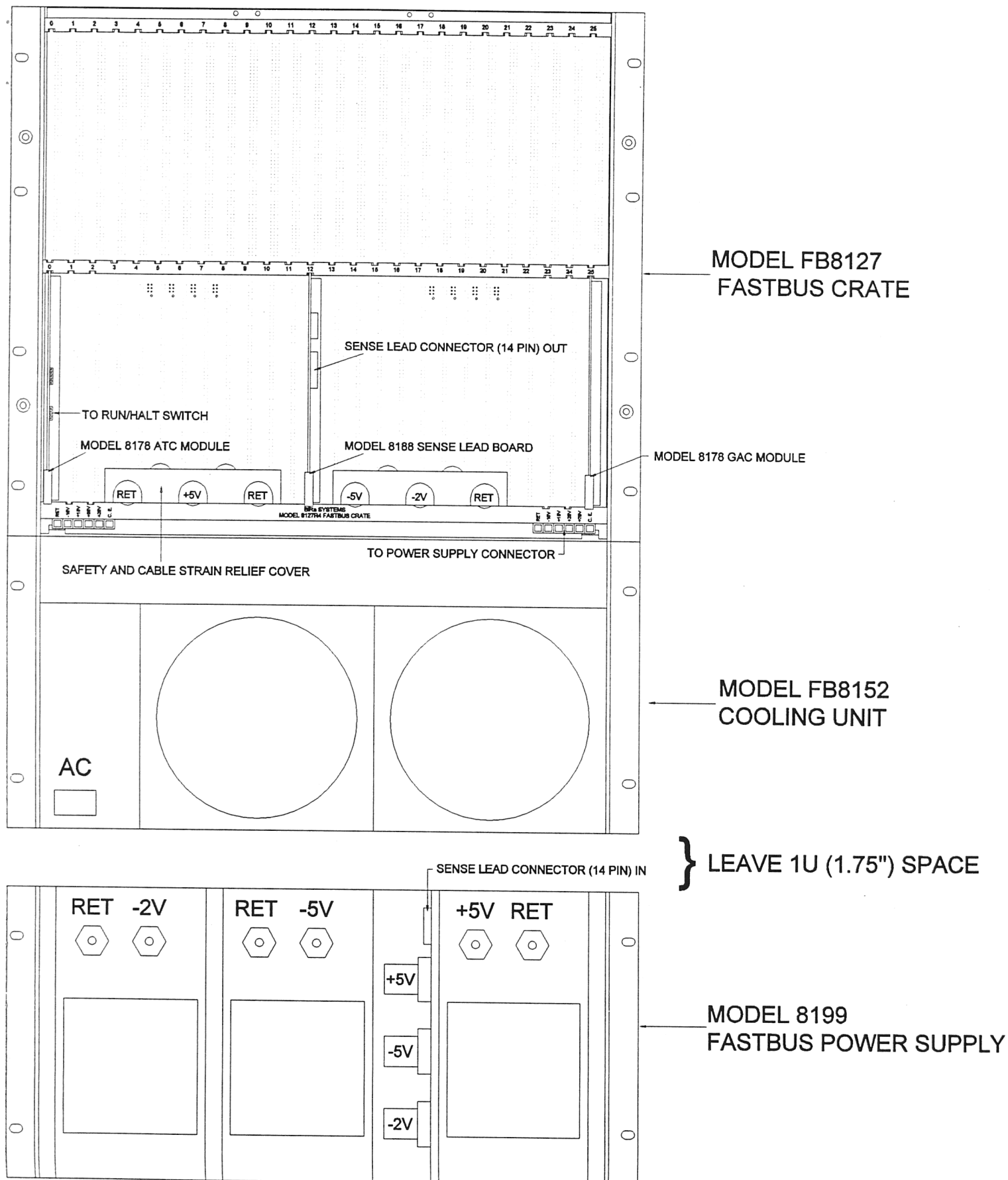
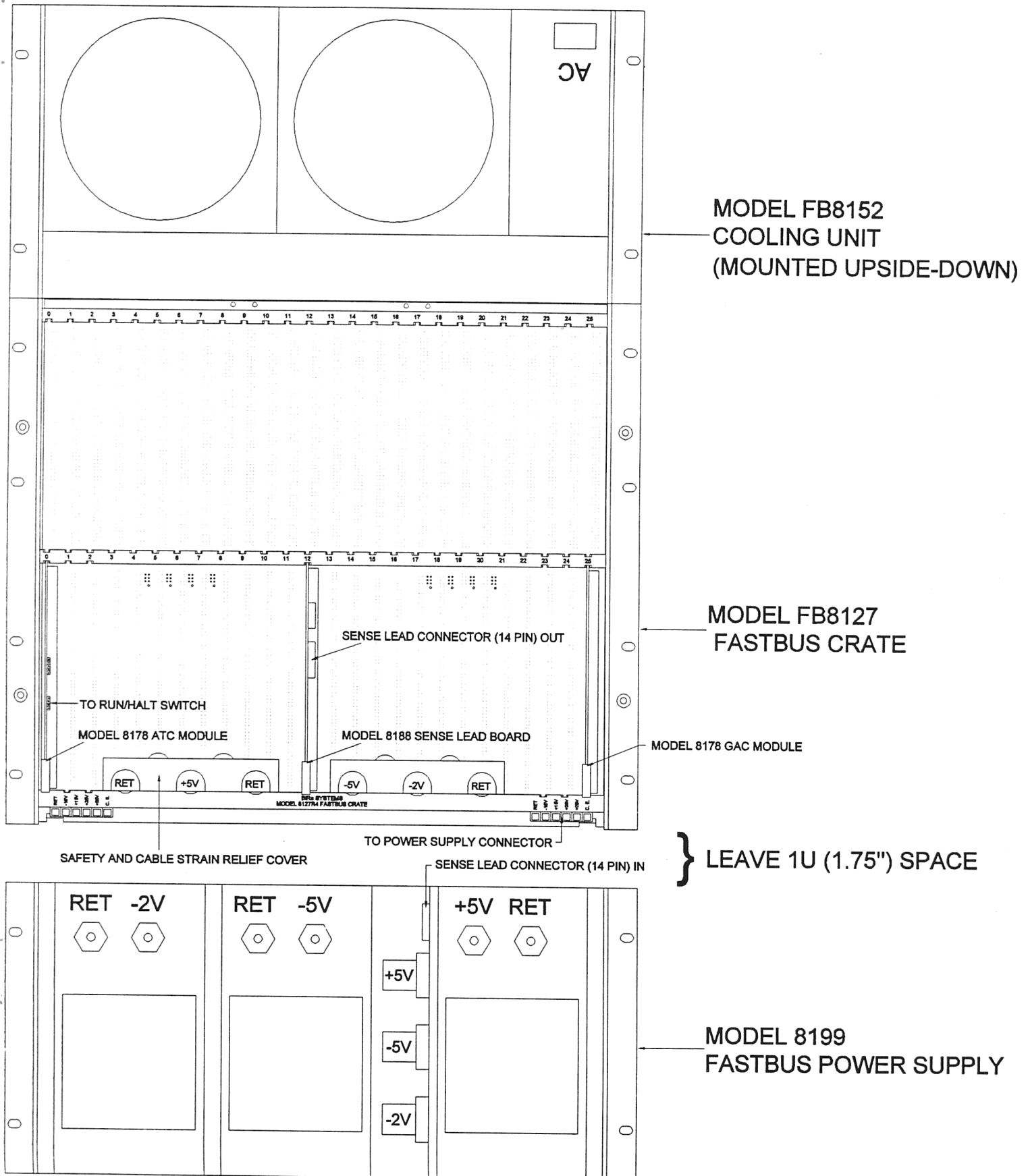


Figure 2

REAR VIEW OF FASTBUS SYSTEM ARRANGEMENT



3.3

Plug the 14 pin connector from the Power Distribution Board into the Sense Lead Board or the Status Bit Board.

3.4

Plug in the power cord provided to the Blower Module. Attach the 50 Amp service to the heavy power cord leads provided.

ACCEPTANCE TESTING

1.0 PREPARATION:

All FastBus Systems are tested fully assembled, then disassembled for crating and shipment to the user. However, damage may occur during shipment and subsequent reassembly, all components of the system should be tested individually before attaching power to the Segment PCB (the most expensive part of a FastBus System).

Power planes & Bus bars (+5V, -5.2V, +15V, -15V, -2V, & return) should be checked for shorts. Power supplies should be checked for proper operation with external loads. Check alignment of the Segment & Auxiliary backplanes to both of the front and rear guide rail systems. Test all rear backplane boards and all modules outside the crate whenever possible.

2.0 POWER ON :

After all units are tested and installed, the first test should be with crate completely unloaded but fully powered. All cables and wires should now be gently stressed to be sure that there are no potential shorts between wiring and cabling between the elements of the system. All current meter readings should be within +/-1 digit of zero reading.

2.1 SEGMENT TESTS:

Testing of the Segment should be performed by loading the crate with modules designed to properly load the Segment power planes to the appropriate levels and making measurements at the rear backplane area. Voltage drops across the Segment power planes should be made in pins which are not carrying current to the modules.

The +15V and -15V power planes are separated in the center of the Segment. Leads from the power supplies are split at the power supply cradle with the sense leads attached at slot 12 and thereby sensing only the right side (Slot 0 thru 12) of the Segment. The return lines for the +15V (analog return) are also separated into two sections with each pin of a section fanned down the Segment and jointed at the bottom. Testing of the +15V should take this arrangement into consideration.

When testing for drops across the Digital power planes, load the crate using the -5.2V and -2V supplies as currents between the +5V and either of the negative supplies tend to cancel and not flow thru the Digital power planes.

3.0 INPUT POWER SECTION:

Power is applied to the system through pins TB1-8, TB1-9, TB1-10, and TB1-11 on the Power Distribution Board located at the rear of the power supply cradle. From the Power Distribution Board power is applied through the front panel power line metering circuits to the 30A main breaker. From the metering circuits power is applied to the +15V regulators and digital metering circuits through 8A circuit breakers. Power is applied to the switching regulators through pins TB1-4 & TB1-5 on the Power Distribution Board. A 115 line is provided at TB1-6 & TB1-7 of the Power Distribution Board for fans or other control applications not to exceed 2 amps. This 115 VAC power may be derived from the 15V regulator transformer T-1 or split from the 208-240 VAC input line.

Selection is made with a jumper wire on the Power Distribution Board directly located behind pin TB1-6. With the jumper from TB1-6 to TB2-6 the 115 VAC is derived from the transformer.

4.0 METERSWITCH:

The meterswitch consists of a printed circuit board, a five button switch assembly and the components needed to power the LCD meters and equalize the assembly and the current sense voltages for proper reading on the meter. The resistor-zener diode strings, R1 & D1 and R2 & D2 provide the isolated 9V power required by the LCD voltmeters.

The LCD monitoring the voltages operates with a full scale reading of 19.99 with an input of 1.999 volts (the decimal is fixed at the position shown) with typical readings of 15.00, 5.00, 5.20, and 2.00 for the respective outputs. The LCD monitoring the output currents provides a full scale reading of 1999 with an input of .333 volts (no decimal point is set).

For voltage monitoring, the sense leads are applied to the DVM1 output thru a 9 to 1 resistor divider network (R3 & R4) resulting in a 15.00 reading for 15 volt inputs, etc.

For current monitoring of the digital voltages, the LCD meter will see .166 millivolts developed across the current shunts mounted in the cradle for each amp delivered to the crate (300 amps = 50 millivolts). For current monitoring of the 15 volt outputs, the voltages developed across the main chassis (20 millivolts per amp) heatsink current sense resistors R2 & R3 are applied to the DVM2 output thru the 121 to 1 resistor-divider networks of R5 & R7 and R6 & R8 resulting in .166 millivolts per amp.

5.0 LCD DIGITAL VOLTMETERS:

Each LCD Digital Voltmeter consists of a half-inch (.5") high 3 1/2 digit LCD display, a printed circuit board, a 7106 analog to digital converter and components needed to provide the user with voltage readings accurate to a hundredth of a volt and current readings accurate to an amp.

The decimal point is factory set to display hundredths of volts on the voltage monitor and uses Q1 as a driver. The LCD monitoring current has no decimal and reads in full amps.

The isolated 9V power input is used to establish a floating reference thru R1 & R4. Variable resistor R4 is the reference set point and can be adjusted by the user to effect the most accurate reading against a particular monitor point. The reference is set at the factory to give the most accurate readings against the digital voltage outputs. If it is necessary to adjust the readings of the meter, measure the output voltage at the sense leads or current across a shunt using at least a 4 1/2 digit DVM and adjust R4 for an exact reading by first going to the next higher reading, then the next lower reading and leave adjustment between these two points.

The LCD display is the reflective type and requires light entering from the front to provide a contrast to the black characters. If the equipment is to be used in a darkened area, it may be necessary to use a flashlight to read the meter. The analog to digital converter has been factory optimized for either 50 or 60Hz operation and may be subject to jitter if operated at other line frequencies or in a noisy environment. Before making any adjustments to the jittery meter, be certain the jitter is caused by noise or the wrong line frequency and not by a bad 7106. Generally, a jitter up one digit and down one digit is caused by noise and one which goes up and down two or more digits is caused by a bad A/D converter (7106).

6.0 +/- 15V REGULATOR CIRCUITS:

The +/- 15V regulator circuits are identical and interchangeable. Each contains foldback, current limiting, and crowbar protection circuitry.

TROUBLESHOOTING & MAINTENANCE

1.0 TROUBLESHOOTING HINTS:

Low Output: If output is in the range of 1-2 volts, the crowbar is probably activated and turning the supply off and then on after a minute should clear it.

Low Regulation: Bad regulator or faulty sense lead connection.

Crowbar Misfiring: Principal cause is faulty output lines, either bad connections or burned connector pins.

TABLE OF CONTENTS

Warranty Guide	Page I, II
DESCRIPTION	1
AIR COOLED STANDARD FEATURES & SPECIFICATIONS	2
INSTALLATION	3

ACCEPTANCE TESTING

1.0	PREPARATION	4
2.0	POWER ON	4
2.1	SEGMENT TEST	4
3.0	MAIN CHASSIS	4
3.1	INPUT POWER SECTION	4
3.2	METERSWITCH	5
3.3	LCD DIGITAL VOLTMETERS	5
4.0	+/-15V REGULATOR MODULES	6
4.1	+/-15V REGULATOR CIRCUITS	6
5.0	TROUBLESHOOTING HINTS	6
	DRAWING & PARTS LIST SECTION	7

WARRANTY GUIDE

WARRANTY

Equipment manufactured by BI RA SYSTEMS for use in the United States is warranted against defects in design, workmanship, and materials for a period of one (1) year from date of shipment. BI RA SYSTEMS will repair or replace, at its option, any such equipment found to be defective on a return to factory basis. Repair charges will be applicable after the warranty period has expired. Transportation charges for shipping the equipment to BI RA SYSTEMS shall be paid by the customer, while transportation charges for the return of the repaired equipment will be paid by BI RA SYSTEMS. Priority shipping methods are available at the customer's expense. SOFTWARE products by BI RA SYSTEMS are furnished under the terms and conditions of a separate Software Product License Agreement are warranted for a period of ninety (90) days from date of shipment to conform to the Software Product Description (SPD) applicable at the time of purchase. This warranty is contingent upon the proper use of the software as detailed in the Software Product License Agreement and is limited to the remedy of any non-conformance of the software to the SPD. PRODUCTS PURCHASED BY BI RA SYSTEMS FOR RESALE WILL CARRY THE ORIGINAL EQUIPMENT MANUFACTURER'S WARRANTY, IF ANY.

These warranties shall not apply to equipment or software that has been modified or serviced by other than a BI RA SYSTEMS or an authorized distributor service engineer.

All warranties are contingent upon proper use of the product or system. These warranties will not apply (i) if adjustment, repair or parts replacement is required because of accident, unusual physical, electrical, or electro-magnetic stress, neglect, misuse, failure of electric power, air conditioning, humidity control, transportation, failure of rotating media not furnished by BI RA SYSTEMS, operation with media not meeting or not maintained in accordance with BI RA SYSTEMS specification or causes other than ordinary use; or (ii) if the product or system has been modified by the purchaser; or (iii) where BI RA SYSTEMS' serial numbers or warranty date decals have been removed or altered. In addition to the foregoing, any applicable on-site warranty will not apply (i) if prerequisite equipment (as specified by BI RA SYSTEMS price list, equipment specifications, or contracts) is missing, or (ii) if the product or system has been installed by purchaser, or (iii) if the product or system has been dismantled or reinstalled by purchaser without the supervision of or prior written approval of BI RA SYSTEMS. Equipment may contain used parts which are equivalent to new in performance when used in the equipment. BI RA SYSTEMS MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER WARRANTY EITHER EXPRESS OR IMPLIED, EXCEPT AS IS EXPRESSLY SET FORTH HEREIN.

Outside the United States, the equipment warranty is limited to the repair or replacement of the equipment and excludes shipping, insurance, taxes, forwarders' fees, customs, or any other charges.

THE WARRANTY PERIOD MAY VARY IN COUNTRIES OUTSIDE THE UNITED STATES. CONTACT BI RA SYSTEMS OR YOUR LOCAL AUTHORIZED DISTRIBUTOR FOR SPECIFIC WARRANTY DETAILS.

WARRANTY GUIDE

LIMITATIONS OF LIABILITY

The purchaser's exclusive remedy or any claim of any kind for any loss or damage connected with, or resulting from the design, manufacture, sale, delivery, resale, or repair or use of any products furnished by BI RA SYSTEMS including but not limited to any claim of negligence or other breach, shall be the repair or replacement, F.O.B. factory, of the product or part thereof giving rise to such claim. BI RA SYSTEMS' liability for such repair or replacement shall in no event exceed the contract price allocable to the products or part which gives rise to the claim. BI RA SYSTEMS SHALL IN NO EVENT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

RETURN OF PRODUCTS

BI RA SYSTEMS must be notified before any product is returned for any reason. The Customer Service Department must issue a Return Material Authorization (RMA) number before any product can be accepted for credit, exchange, or repair. In order to provide an RMA number, Customer Service will need the complete model number, serial number, original purchase order number, and details regarding the reason for return and the service required.

All returns for CREDIT or EXCHANGE are subject to BI RA SYSTEMS' approval and will incur a minimum restocking charge of ten (10) percent, as well as any incoming transportation charges or other fees incurred by BI RA SYSTEMS.

All returns for WARRANTY REPAIR must include a description of the problem and the name of a technical contact in case the problem must be discussed. If the product is out of warranty, the customer must contact BI RA SYSTEMS for an estimate of the repair charges and include a purchase order number for the estimated repair charges.

Transportation charges for shipping the products to BI RA SYSTEMS shall be paid by the customer. Transportation charges for the return of the products that have been exchanged shall be paid by the customer, while transportation charges for the return of repaired equipment will be paid by BI RA SYSTEMS. The return shipment will be by UPS services, air freight, or truck. Premium methods of shipment are available at the customer's expense and will be used only when requested. If BI RA SYSTEMS selects the carrier, BI RA SYSTEMS will not thereby assume any responsibility or liability in connection with the shipment nor shall the carrier be in any way construed to be the agent of BI RA SYSTEMS.

After obtaining a Return Material Authorization (RMA) number, customers should return the product to:

BI RA SYSTEMS, INC. Telephone: (505) 881-8887
2404 COMANCHE N.E.
ALBUQUERQUE, NM 87107

SERVICES

Contact BI RA SYSTEMS for details regarding the following services: complete module design and development for both CAMAC and FASTBUS products (this includes the design, complete drafting package from schematic to artwork done on a CADNETIX CAE/CAD System, proto type development and testing, and production level products), System Integration, Installation, On-Site Warranty Repair, Module Exchange Program, Service Contracts, Applications Software Support, and Training.

DESCRIPTION: AIR COOLED POWERED FASTBUS SYSTEM

The standard system consists of an EC-3 Fastbus Crate, a Model 8189 Power Supply Assembly, and a Model 8152 Cooling Module. The EC-3 Air Crate is a 26 station air cooled assembly designed to accept standard (7 June 82 Specification) fastbus modules and rear backplane P.C. cards.

The 26 station Segment Assembly is an eight (8) layer printed circuit board with ground and power embedded. Pins are field replaceable and do not damage plated thru holes even after multiple insertions. Ferry slips provide for accurate placement of half-moon module connectors. Tin plated copper bus bars are used for +5V, -5.2V, -2V, and digital return. Flexible braided cables are soldered at the bus bars and swaged to large terminals at the power supply ends. Mounting bars are used as digital return bus bars and also provide a positive stop for backplane P.C. boards. Screw on barrier contacts are provided for the +15 VDC (2), -15 VDC (2), 28 VDC (4), and Analog Return (2). Design of the rear backplane areas provides for the use of ejectors, ejector/injectors, and locking ejectors. Analog voltages (+15V) are separated into two buses, each supplying half of the segment. Analog returns are separated into two sections and fanned down the full length of the segment to the connector.

The optional Auxiliary backplane P.C. Board (if supplied) contains the same replaceable pins used on the Segment (except 195 pins at each slot location). Mounting bars for the Auxiliary backplane provide positive stops and lead-in alignment for rear auxiliary backplane printed circuit boards. Vertical ferry slips are provided at the top of the board. The Auxiliary Backplane Assembly can be added to the standard crate without field modification.

The Halt/Run Bar actuates a switch mounted on the front mounting bar of the bottom rack. Pressing the center front of the bar allows the bar to release (halt position) and drop down, allowing the insertion or removal of a fastbus module. The bar will not lock into place (run position) unless modules are fully inserted into the crate.

Modular guide racks utilizing very thin (.2" wide) nickel plated rails are used to provide the maximum opening possible (greater than 65%) for the cooling air. The modular system also provides for easy replacement of damaged parts. The method used locks all rails firmly in place with stainless steel rods and maintains mechanical tolerances without the need for jigs or fixtures.

The 8189 Power Supply Assembly provides mounting slots and interconnect cableing for the -2V, +5V, and -5.2V switching regulator power supplies. The chassis contains the +15V, -15V, dual (simultaneous voltage and current) metering circuits for all DC voltages and currents, and mains switching for the entire system. The Power Supply Chassis provides the basic unit for powering a FASTBUS Crate. Any switching regulator (to 300 amps) contained in a standard 5x8 package may be used. All Power Supplies are interchangeable in the field without modification.

The Model 8152 Cooling module is intended for use with any crate requiring a high volume of air over a large area. Due to its unique design in utilizing two hex-cell honeycombs to straighten and columnate the air provided by the two large fans, the 8152 can cool even a partially empty crate.

AIR COOLED STANDARD FEATURES AND SPECIFICATIONSGeneral Specifications

- :: Size : Crate : 15.75" (3U) High x 22.30" Deep x 19" Rack Mount.
- Cooling Module : 8.75" (5U) High x 26" Deep x 19" Rack Mount.
- Power Supply : 8.74" (5U) High x 24.5" Deep x 19" Rack Mount.
- Spacer : 1.75" (1U) Open Space Between Crate and P.S. Module.
- :: Module Size Accepted : 14.41" x 15.878" Deep (7 June 82).
- :: Rear Backplane PCB : 6.923" High x 5.000" Deep.
- :: Input Voltage : 240 VAC 50/60 HZ Nominal.
- :: Halt/Run Switch Bar
- :: 26 Station Air Cooled
- :: Eight Layer Segment With Embedded Power Planes.
- :: Bus Bars For Digital Power Input To Segment.
- :: Analog Power Planes Fanned and Separate Into Two Sections.
- :: Replaceable Pins In Both Segment And Auxiliary Boards.
- :: Auxiliary Segment Board Has 3 Rows Of 65 Pins Per Slot.

SPECIFICATIONS: POWER SUPPLY MODULES FOR FASTBUS CRATES

Specifications	Model 8189	300AMP SW. REG.	100-200AMP SW. REG.
Input	105-240V 47-63HZ	182-262VAC 47-63HZ	93-138 or 184-250 VAC 47-63HZ
Outputs (See Note 1)	$\pm 15V$ @ 24 Amps	+5V or -5.2V	+5V, -5.2V or -2V
Regulation (24 hr)	(line & load) $\pm 0.2\%$	TOTAL ERROR BAND: $\pm 2\%$ or $\pm 100mV$ (whichever is greater) Including the following: <ul style="list-style-type: none"> # Input Power variation over specified range. # Static Load variation 0-100% of full load. # Dynamic load step (10us rise) of 25% or 50 Amps. # Ripple and Noise # Temperature Stability over 0-50 C. # Drift for an 8 hour period. 	
Noise & Ripple	Less than 10mV p.p.		
Ambient Temperature	0-50 degrees C		
Temperature Coeff.	.02%/C		
Transient Recovery	50 microsecond typical		
Fusing	Mains & All Reg. Inputs		
Remote Sensing	-----	All Outputs	-----
Overload Protection	-----	Foldback Current Limiting All Outputs	-----
Overvoltage Protection	-----	125% max - All Outputs	-----
Overtemp Protection	-----	Automatic Shutdown	-----
Metering	-----	Dual Liquid Crystal DVM : All Outputs by Switch Select	-----
Options	-----	Status Bit	-----
Power Loss Holdup	16msec	20msec	30msec
Efficiency	40%	72%	72%
Voltage Adjustment	$\pm 2.0\%$ min	$\pm 10\%$ min	$\pm 10\%$ min
Shipping Weights	49 lbs.	24 lbs. ea.	26 lbs. ea.
Size	8.75"x26"x19" Rack	5"x8"x11"	5"x8"x11"

NOTE 1: $\pm 15V$ Outputs Current Shared to 120% of output shown.

INSTALLATION

1.0 The following items are required to install a fully powered and cooled Fastbus Crate.

1.1 Power Requirements: Single Phase, 208/240 VAC 50/60HZ 50 Amp Service (6 feet of lead wire is provided for connection to service).

1.2 A standard 19" Rack with 35" (20U) of vertical space x 26" deep.

2.0 Unpack Blower and Crate (mount ears provided onto Crate) and install into cabinet with Blower in the highest position with Crate mounted directly below Blower. Blower mounts with honey-comb material facing down. Crate mounts with Halt/Run Bar at the bottom.

3.0 The Power Supply Module and any Switching Regulator Power Supply Modules are mounted and shipped in a single box. Remove entire assembly from shipping box carefully and remove all power supply modules from the Chassis. Do not attempt to mount Chassis into rack with Digital Power Supplies installed.

3.1 To remove Switching Regulator Power Supply Modules, first remove all power leads and plugs, loosen screws holding retaining latches, push latches up and pull all three modules from Chassis.

4.0 Mount Power Supply Chassis 1.75" (1U) below the crate using as many of the mounting holes provided as possible. Although the Chassis is designed to support the weight of the power supplies mounted at the rear, it is advisable to provide extra support at the rear as protection against accidental stress.

5.0 First attach Crate power leads (back bus bar is +5V, center bar is -2V, and front bar is -5.2V) to the current shunts (mounted +5V at the top, -5.2V at center, and -2V shunt at the bottom of Power Distribution Board) and then install the Switching Regulator Power Supply modules in appropriate slots as marked.

5.1 Attach the AC power (from Power Distribution Board) to Switching Regulators barrier strips and replace the covers over barrier strips. Attach power leads from rear terminals of current shunts to the appropriate studs on the Switching Regulators (positive output studs on +5V and COMM studs on the -5.2V & -2V). Attach the three digital power return leads from the single bus bar on the crate to the appropriate studs on the three Switching Regulators (COMM on the +5V and positive studs on the -5.2V & -2V). Attach the +15V & the Analog Return (red, blue, & black wires) from the Power Dist. Board to the barrier block at the rear underside of the Crate. Secure the bottom guide rack assembly in place.

5.2 Plug the 14 pin connector from the Power Distribution Board into the Sense Lead Board or the Status Bit Board.

6.0 Plug in the power cord provided to the Blower Module. Attach the 50 Amp service to the heavy power cord leads provided.

1: ACCEPTANCE TESTING 1:

1.0 PREPARATION:

All Fastbus Systems are tested fully assembled, then disassembled for crating and shipment to the user. However, as there is ample opportunity for damage during disassembly, shipment and subsequent reassembly, all components of the system should be tested individually before attaching power to the Segment (the most expensive part of a Fastbus System).

Power planes & Bus bars (+5, -5.2, +15, -15, 28, Analog return, Digital return) should be checked for shorts. Power supplies should be checked for proper operation with external loads. Check alignment of the Segment & Auxiliary backplanes to both the front and rear guide rail systems. Test all rear backplane boards and all modules outside the crate whenever possible.

2.0 POWER ON:

After all units are tested and installed, the first test should be with crate completely unloaded but fully powered. All cables and wires should now be gently stressed to be sure that there are no potential shorts between wiring and cabling between the elements of the system. All current meter readings should be within +/-1 digit of zero reading.

2.1 SEGMENT TESTS:

Testing of the Segment should be performed by loading the crate with modules designed to properly load the Segment power planes to the appropriate levels and making measurements at the rear backplane area. Voltage drops across the Segment power planes should be made in pins which are not carrying current to the modules.

The +15V and -15V power planes are separated in the center of the Segment. Leads from the power supplies are split at the power supply cradle with the sense leads attached at slot 12 and thereby sensing only the right side (Slot 0 thru 12) of the Segment. The return lines for the +15V (analog return) are also separated into two sections with each pin of a section fanned down the Segment and jointed at the bottom. Testing of the +15V should take this arrangement into consideration.

When testing for drops across the Digital power planes, load the crate using the -5.2V and -2V supplies as currents between the +5V and either of the negative supplies tend to cancel and not flow thru the Digital power planes.

3.0 MAIN CHASSIS:

3.1 Input Power Section: Power is applied to the system through pins TB1-8, TB1-9, TB1-10, and TB1-11 on the Power Distribution Board located at the rear of the power supply cradle.

From the Power Distribution Board power is applied through the front panel power line metering circuits to the 30A main breaker.

From the metering circuits power is applied to the +15V regulators and digital metering circuits through 8A circuit breakers. And power is applied to the switching regulators through pins TB1-4 & TB1-5 on the Power Distribution Board.

A 115 VAC line is provided at TB1-6 & TB1-7 of the Power Distribution Board for fans or other control applications not to exceed 2 amps. This 115 VAC power may be derived from the 15V regulator transformer T-1 or split from the 208-240 VAC input line.

Selection is made with a jumper wire on the Power Distribution Board directly located behind pin TB1-6. With the jumper from TB1-6 to TB1-8, the 115 VAC is split off the 208-240 VAC input. With the jumper from TB1-6 to TB2-6 the 115 VAC is derived from the transformer.

3.2 METERSWITCH:

The meterswitch consists of a printed circuit board, a five button switch assembly and the components needed to power the LCD meters and equalize the current sense voltages for proper reading on the meter. The resistor-zener diode strings, R1 & D1 and R2 & D2 provide the isolated 9V power required by the LCD voltmeters.

The LCD monitoring the voltages operates with a full scale reading of 19.99 with an input of 1.999 volts (the decimal is fixed at the position shown) with typical readings of 15.00, 5.00, 5.20, and 2.00 for the respective outputs. The LCD monitoring the output currents provides a full scale reading of 1999 with an input of .333 volts (no decimal point is set).

For voltage monitoring, the sense leads are applied to the DVM1 output thru a 9 to 1 resistor divider network (R3 & R4) resulting in a 15.00 reading for 15 volt inputs, etc.

For current monitoring of the digital voltages, the LCD meter will see .166 millivolts developed across the current shunts mounted in the cradle for each amp delivered to the crate (300 amps = 50 millivolts). For current monitoring of the 15 volt outputs, the voltages developed across the main chassis (20 millivolts per amp) heatsink current sense resistors R2 & R3 are applied to the DVM2 output thru the 121 to 1 resistor-divider networks of R5 & R7 and R6 & R8 resulting in .166 millivolts per amp.

3.3 LCD DIGITAL VOLTMETERS:

Each LCD Digital Voltmeter consists of a half-inch (.5") high 3 1/2 digit LCD display, a printed circuit board, a 7106 analog to digital converter and components needed to provide the user with voltage readings accurate to a hundredth of a volt and current readings accurate to an amp.

The decimal point is factory set to display hundredths of volts on the voltage monitor and uses Q1 as a driver. The LCD monitoring current has no decimal and reads in full amps.

The isolated 9V power input is used to establish a floating reference thru R1 & R4. Variable resistor R4 is the reference set point and can be adjusted by the user to effect the most accurate reading against a particular monitor point. The reference is set at the factory to give the most accurate readings against the digital voltage outputs. If it is necessary to adjust the readings of the

meter, measure the output voltage at the sense leads or current across a shunt using at least a 4 1/2 digit DVM and adjust R4 for an exact reading by first going to the next higher reading, then the next lower reading and leave adjustment between these two points.

The LCD display is the reflective type and requires light entering from the front to provide a contrast to the black characters. If the equipment is to be used in a darkened area, it may be necessary to use a flashlight to read the meter. The analog to digital converter has been factory optimized for either 50 or 60HZ operation and may be subject to jitter if operated at other line frequencies or in a noisy environment. Before making any adjustments to the jittery meter, be certain the jitter is caused by noise or the wrong line frequency and not by a bad 7106. Generally, a jitter up one digit and down one digit is caused by noise and one which goes up and down two or more digits is caused by a bad A/D converter (7106).

4.0 +15V REGULATOR MODULES:

4.1 +15V Regulator Circuits: The +15V regulator circuits are identical and interchangeable. Each contains foldback, current limiting, and crowbar protection circuitry.

5.0 TROUBLESHOOTING HINTS:

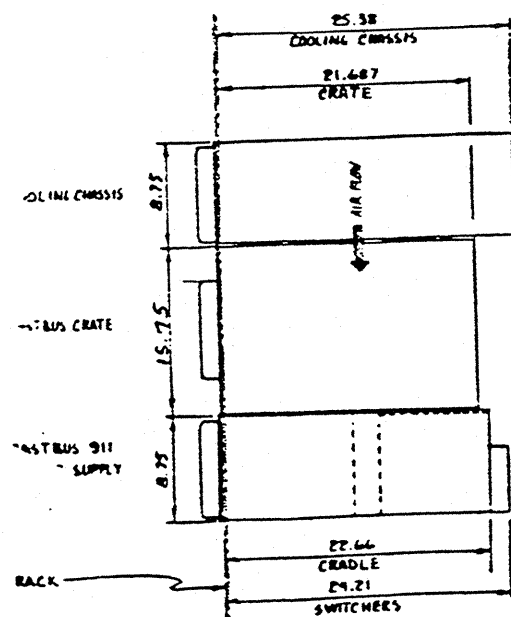
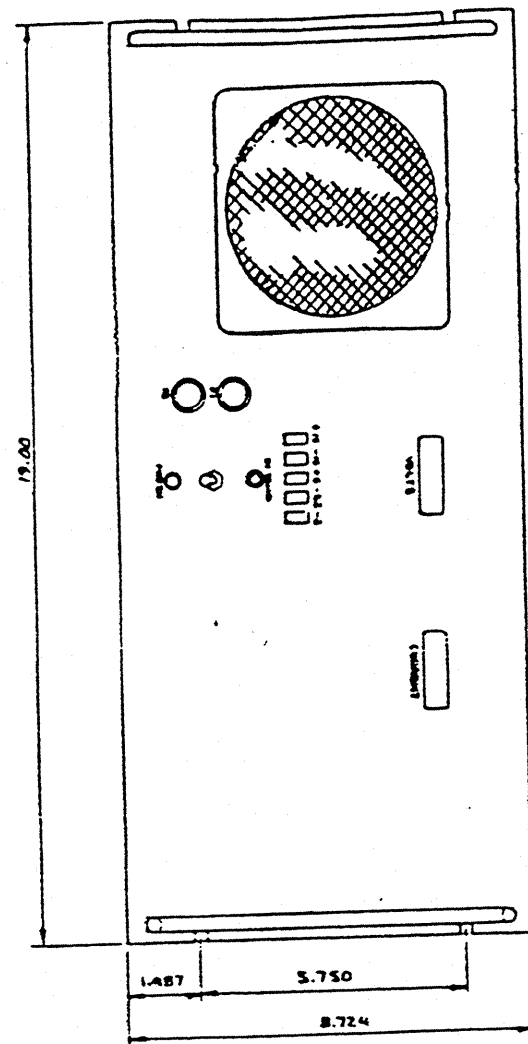
Low Output: If output is in the range of 1-2 volts, the crowbar is probably activated and turning the supply off and then on after a minute should clear it.

Low Regulation: Bad regulator or faulty sense lead connection.

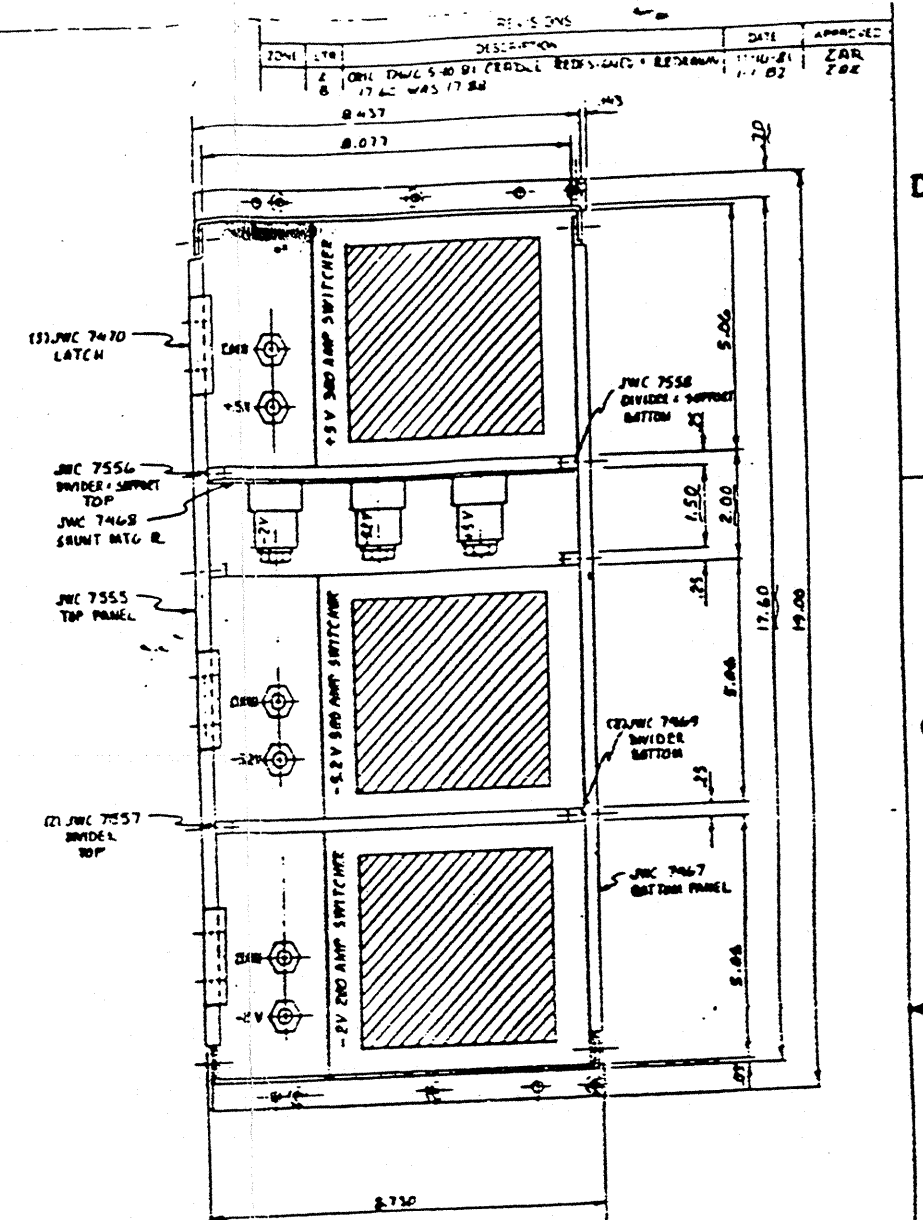
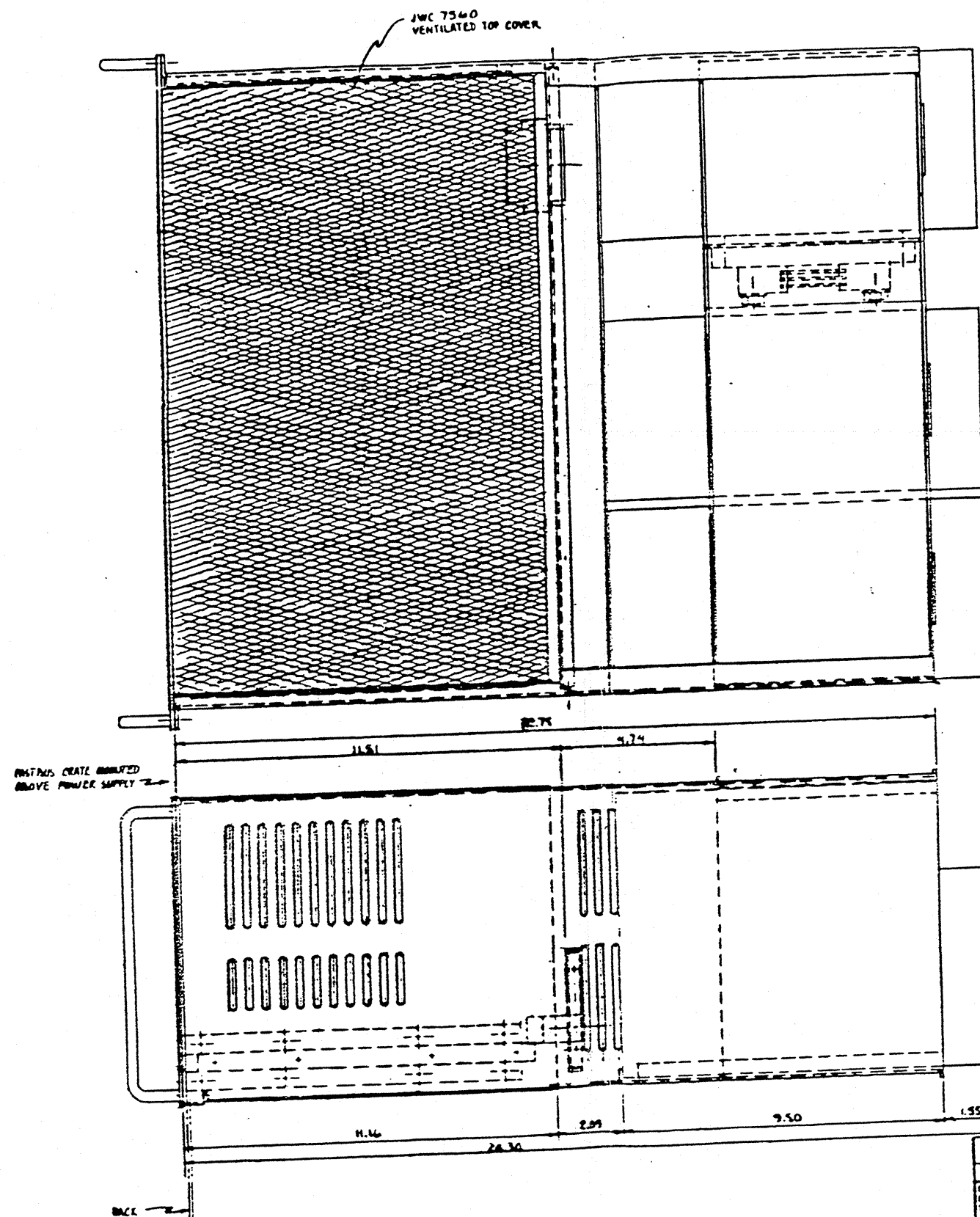
Crowbar Misfiring: Principal cause is faulty output lines, either bad connections or burned connector pins.

DRAWING & PARTS LIST SECTION

<u>PAGE</u>	<u>DWG</u>	<u>DESCRIPTION</u>
8	7348	PICTORIAL - 8189 POWER SUPPLY & CRADLE ASSEMBLY
9	8081	PICTORIAL - END VIEW / BACKPLANE AREA
10	8081	PICTORIAL - FRONT VIEW/SIDE VIEW OF EC-3 CRATE
11	8081	PICTORIAL - BOTTOM VIEW OF EC-3 CRATE
12	7807	SCHEMATIC - POWER DISTRIBUTION BOARD
13	7795	ASSY DWG - POWER DISTRIBUTION BOARD
14	7317	SCHEMATIC - POWER SUPPLY FRONT PANEL
15	7824	SCHEMATIC - 15V REGULATOR MODULE
16	5013	SCHEMATIC - SENSE LEAD BOARD
17	7779	ASSY DWG - SENSE LEAD BOARD
18	7096	SCHEMATIC - METERSWITCH & DISPLAYS

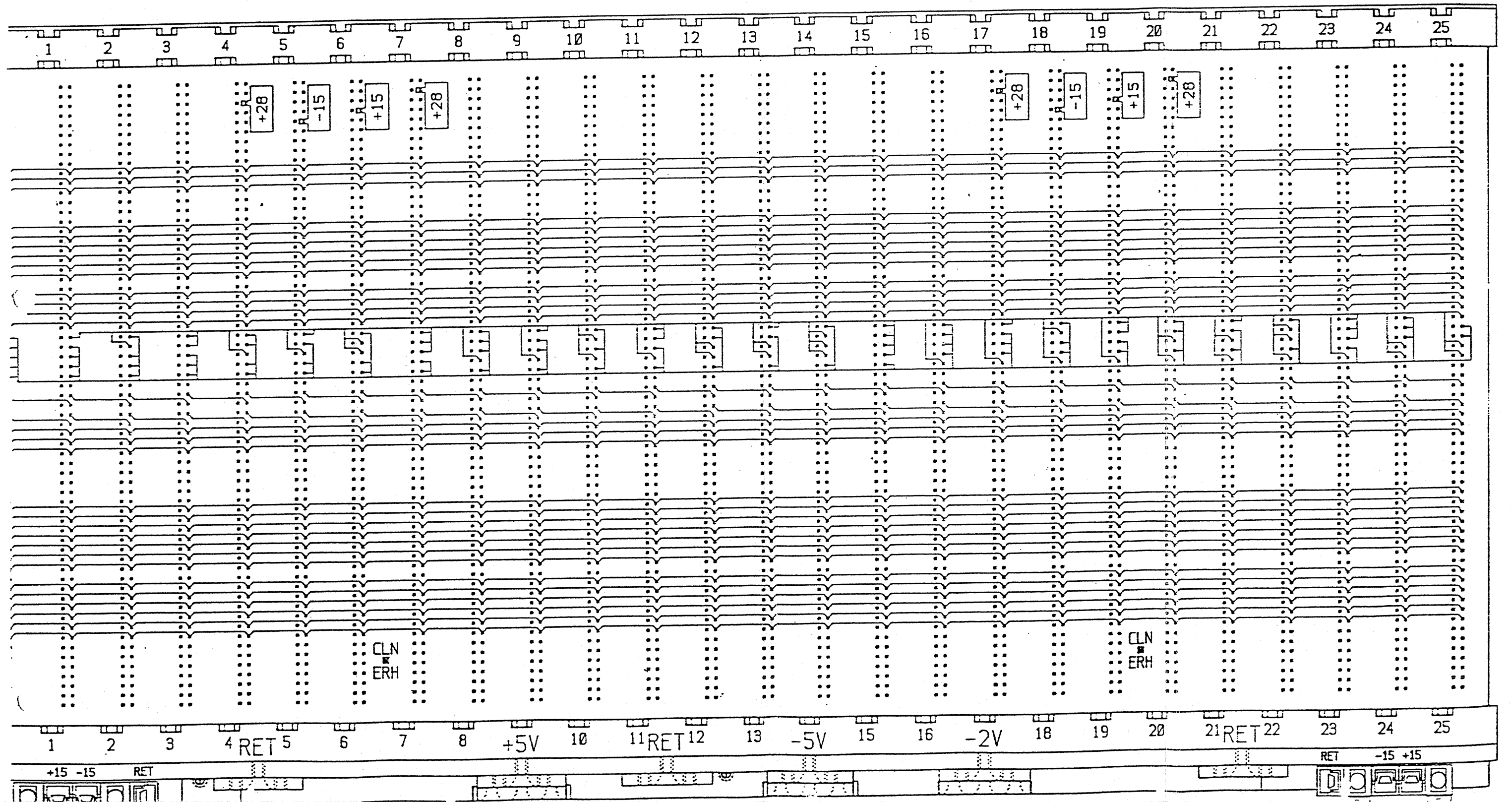


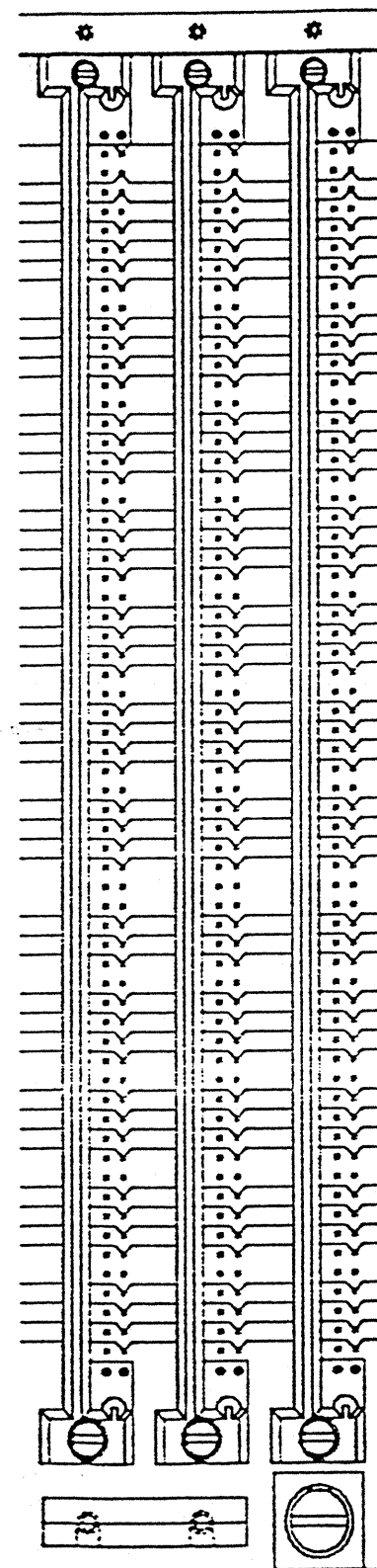
FASTBUS SYSTEM MOUNTING ARRANGEMENT



QTY		CODE	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION
REQ	IDENT			
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES				
X		XX	XXX	XXX
MATERIAL		CHECKED		
FINISH		DATE		
BEST ASSY		USED ON		
NO. NOT SCALE DRAWING		SCALE		

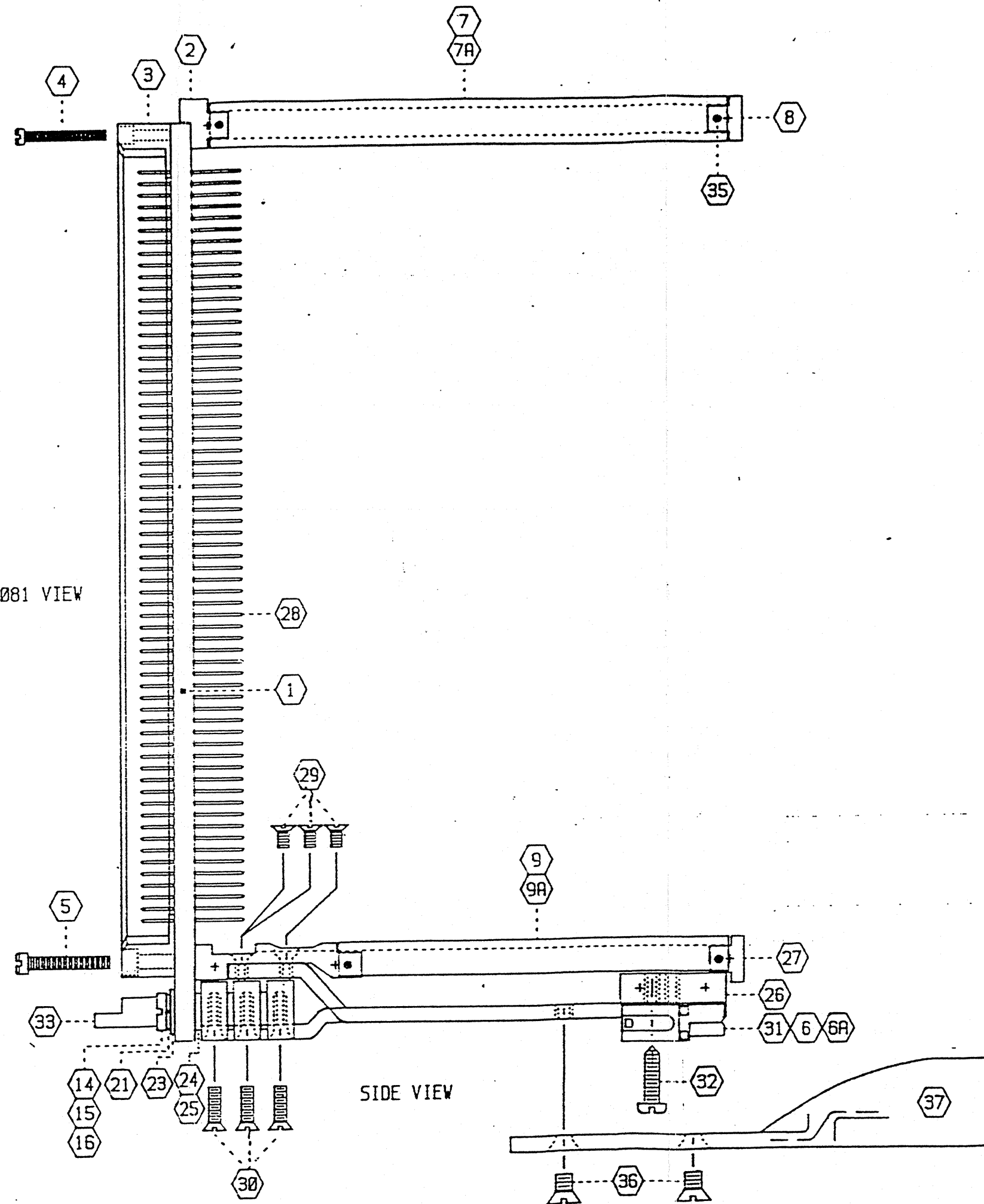
PARTS LIST		BIRA SYSTEMS, INC.	
QTY	DESCRIPTION	DATE	APPROVALS
1	FASTBUS 911 POWER SUPPLY SIZE LAYOUT	11-10-81	
DRAWN BY: J. R. MURPHY		CHECKED: J. R. MURPHY	
SIZE: D		CODE IDENT NO: 7348	
SHEET: 1		TOTAL: 1	



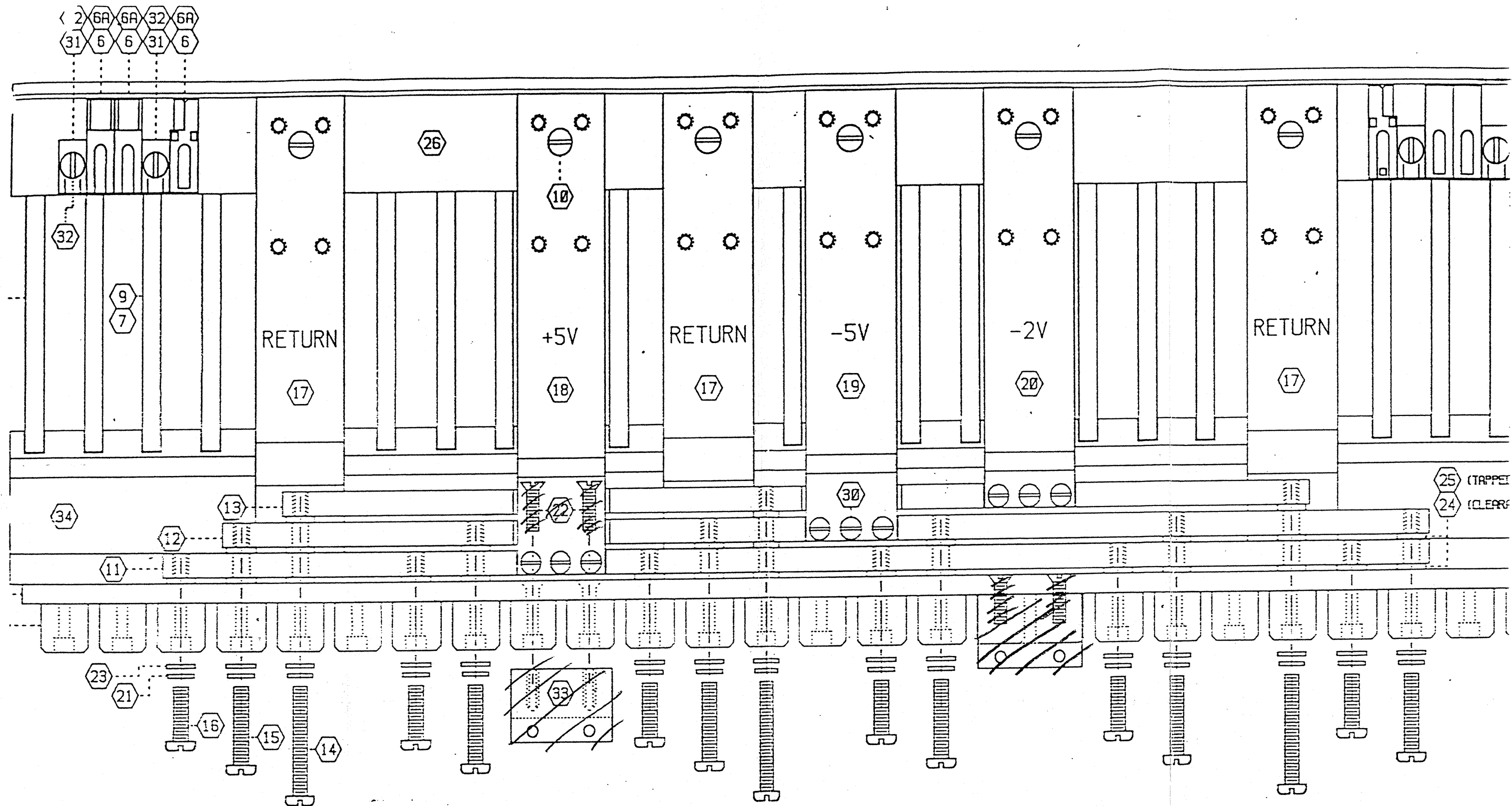


FRONT VIEW STA. 7-9

SV 8081 VIEW



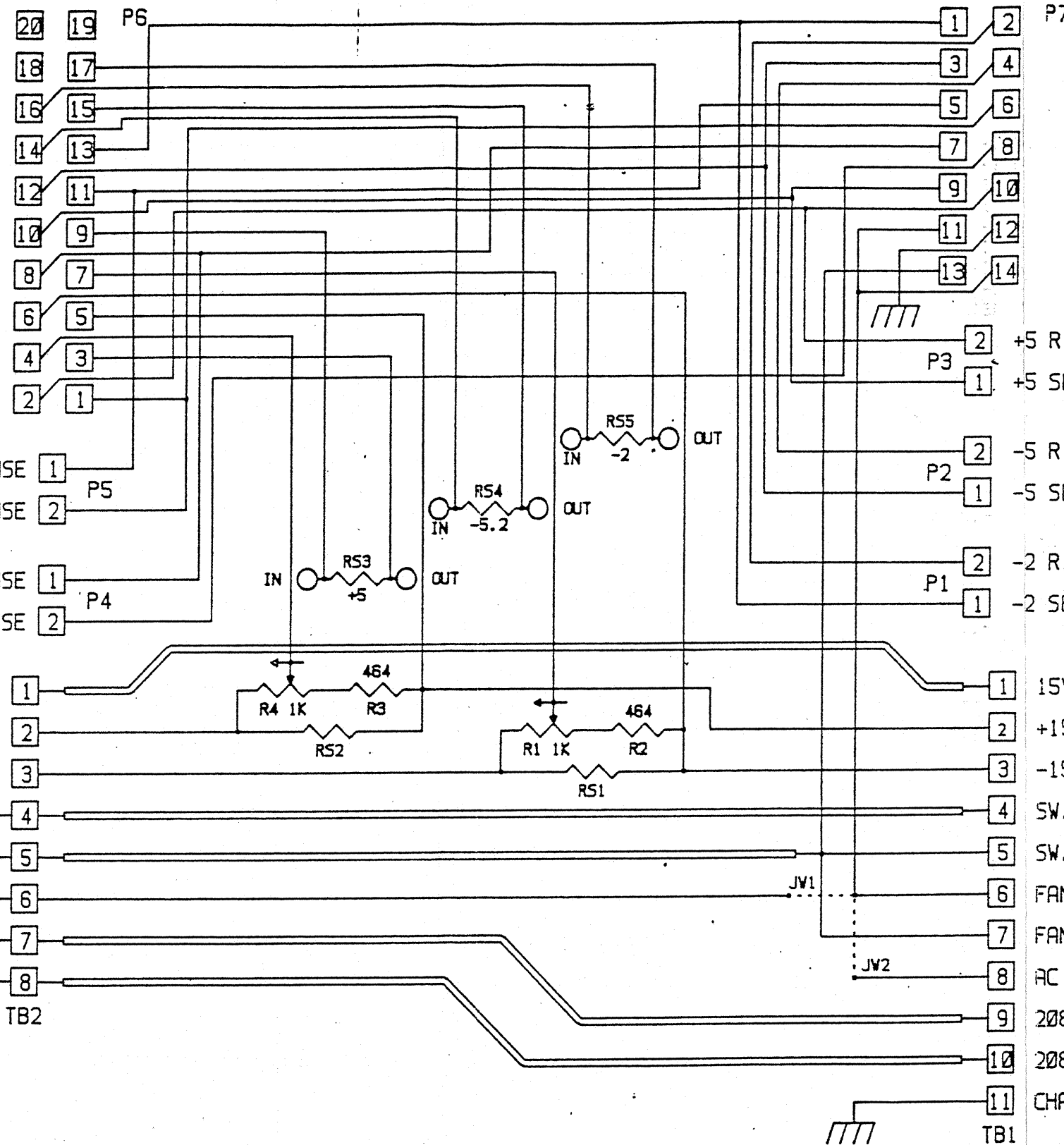
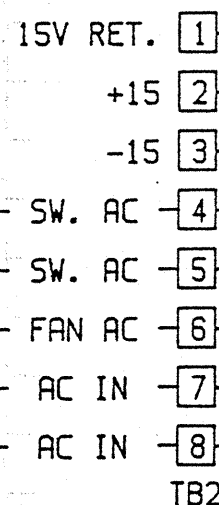
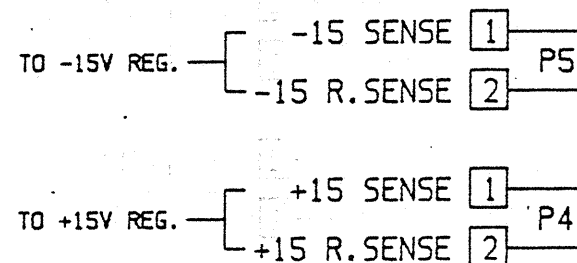
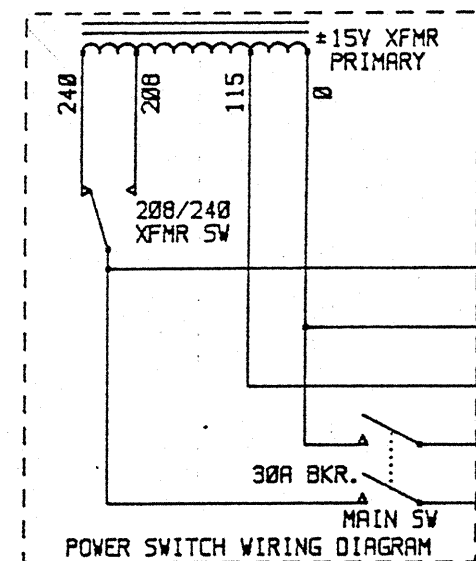
SIDE VIEW



BV 8081 VIEW

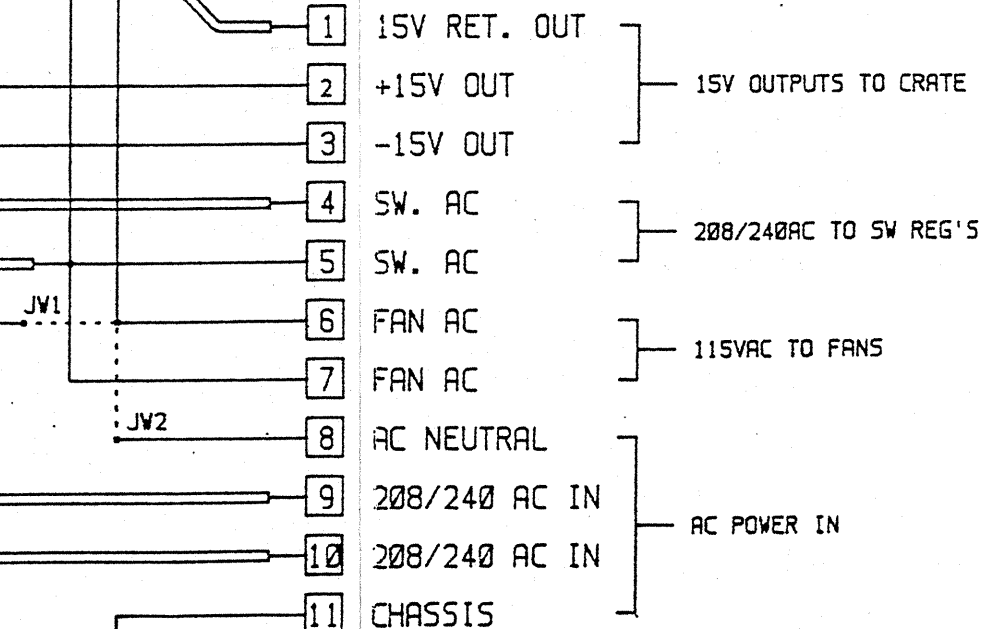
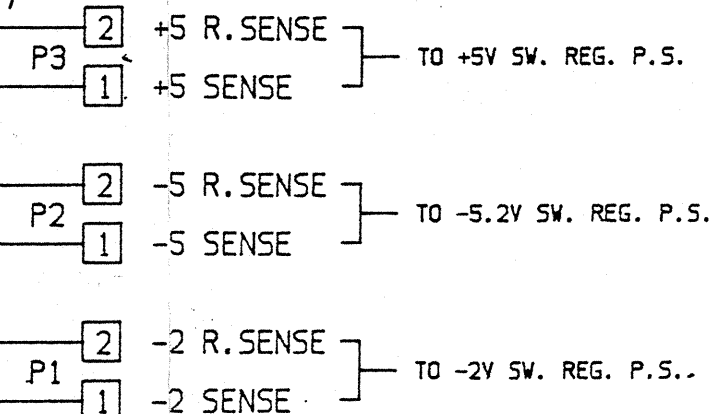
	20	19	
	18	17	-2 I+
-2 I-	16	15	-5 I+
-5 I-	14	13	-2 SENSE
-5 SENSE	12	11	-15 SENSE
+5 SENSE	10	9	+5 I+
+15 SENSE	8	7	-15 I-
-15 I+	6	5	+15 I-
+15 I+	4	3	+5 I-
D. RET.	2	1	A. RET.

TO METERING BOARD

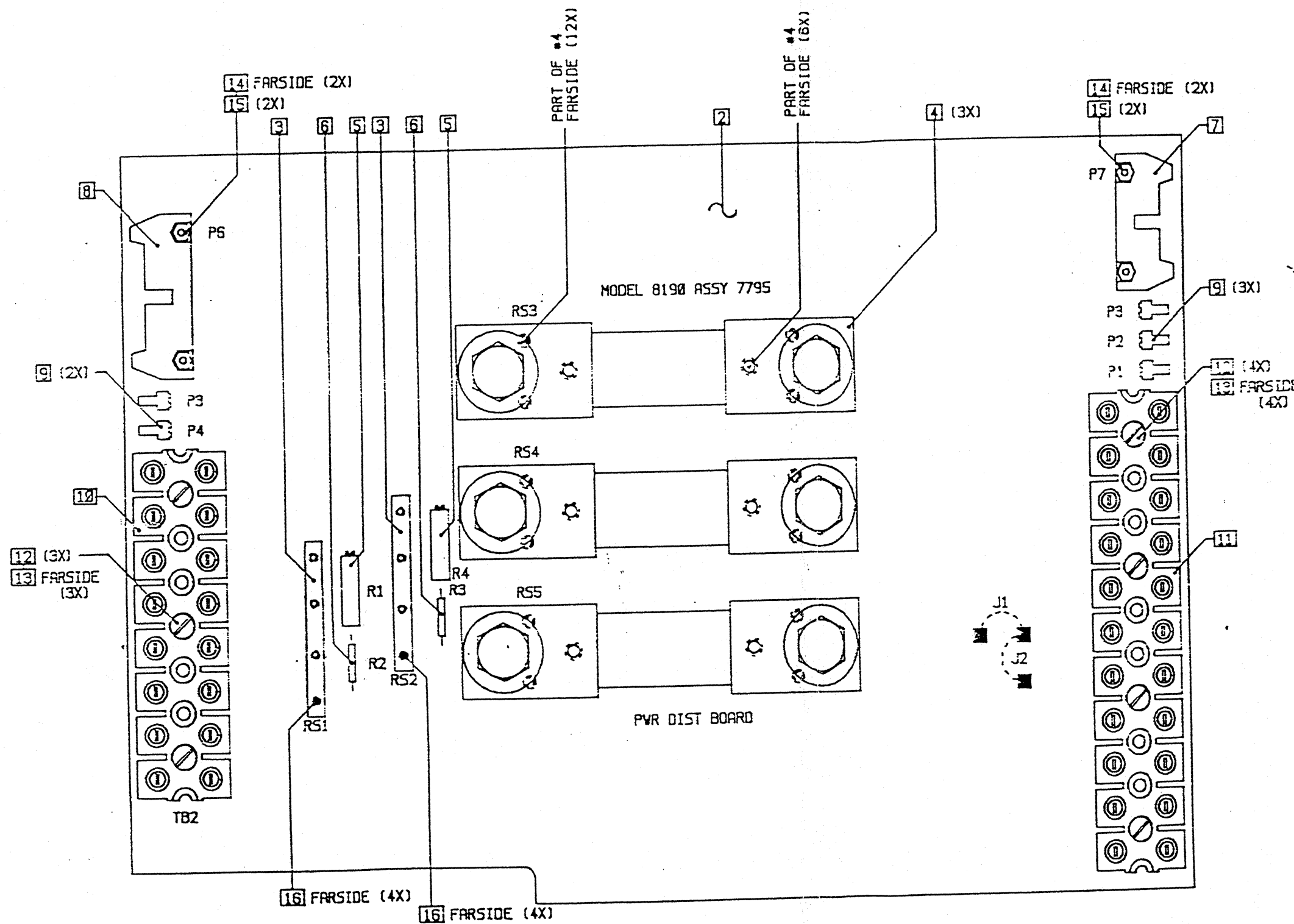


-2 SENSE	1	2	-2 RET.SENSE
-5 SENSE	3	4	-5 RET.SENSE
-15 SENSE	5	6	-15 RET.SENSE
+15 SENSE	7	8	+15 RET.SENSE
+5 SENSE	9	10	+5 RET.SENSE
AC NEUT	11	12	CHASSIS
120 VAC	13	14	120 VAC

TO CRATE SENSE PCB



SCHEMATIC - CRADLE
POWER DISTRIBUTION BOARD

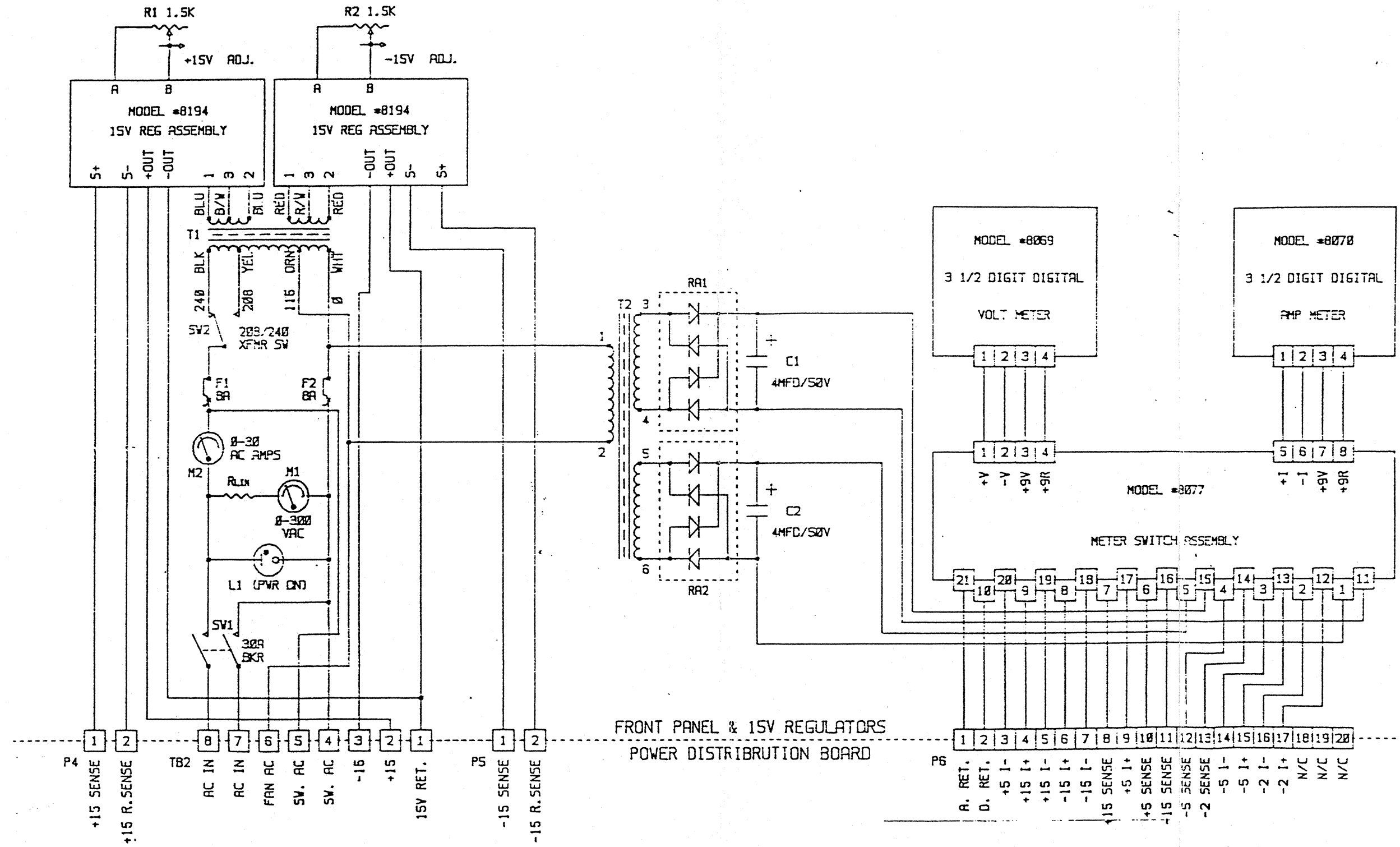


ITEM	QTY	PART#	DESIGNATION
2	1	7794	PVR DIST PCB
3	2	7797	SMALL SHUNT RS1,RS2
4	3	1446	LARGE SHUNT RS3-RS5
5	2	1116	1K VAR. R1,R4
6	2	1383	464 OHM R2,R3
7	1	1787	14X HEADER P7
8	1	1741	28X HEADER P6
9	5	1742	2X PLUG P1-P5
10	1	1745	8X BLOCK TB2
11	1	1746	11X BLOCK TB1
12	7	1747	6-32 X 7/16 PAN.H.M.S.
13	7	1852	6-32 HEX KEP NUT
14	4	1737	2-56 X 3/8 B.H.M.S.
15	4	1568	2-56 HEX NUT
16	8	1848	2-56 X 1/4 R.H.M.S. BRASS
17	6	1287	12 GA WIRE J1 OR J2

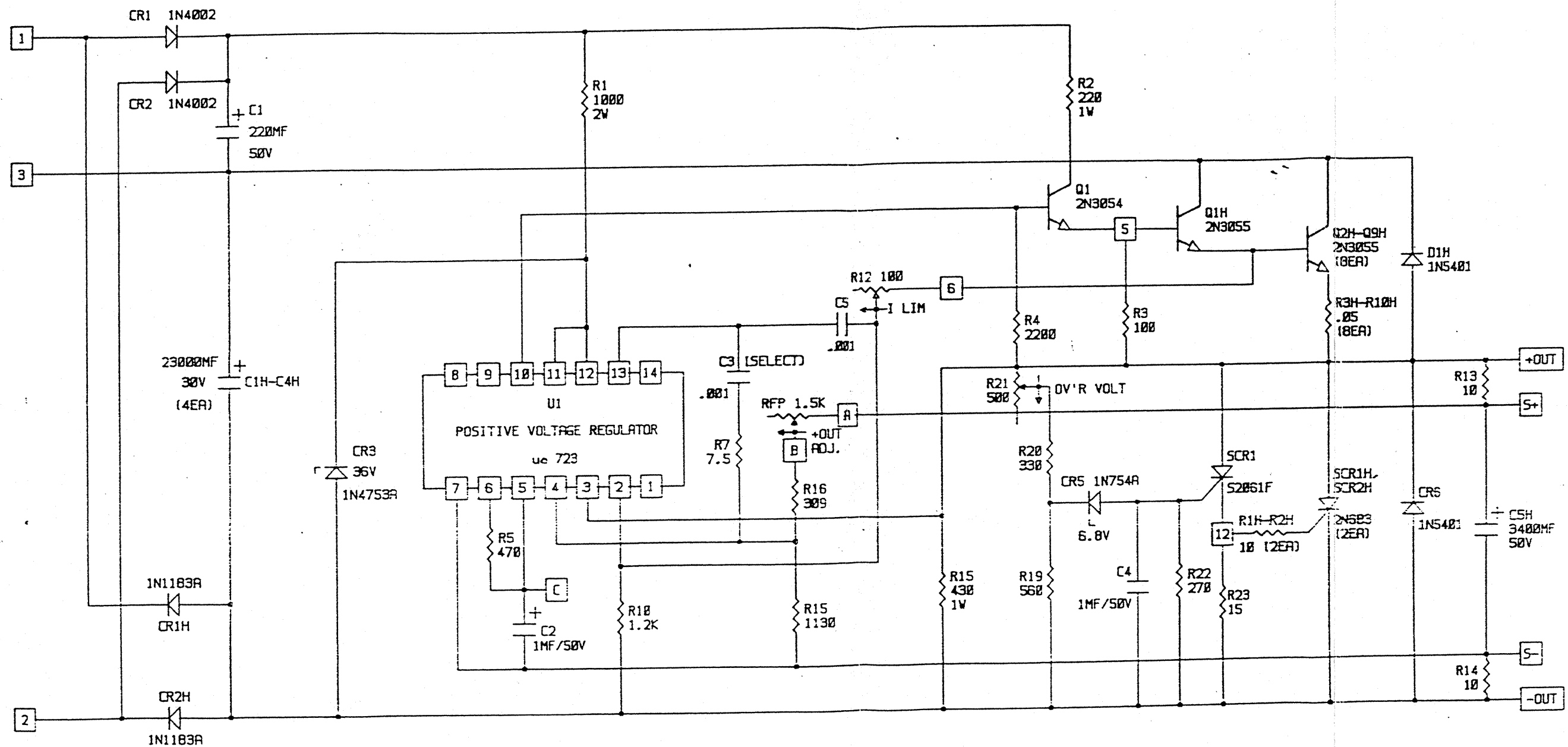
DATE DRAWN 12/08/83
COPY DATE 12/14/83

ASSY DWG - #8190
FOR PVR DIST PC BOARD

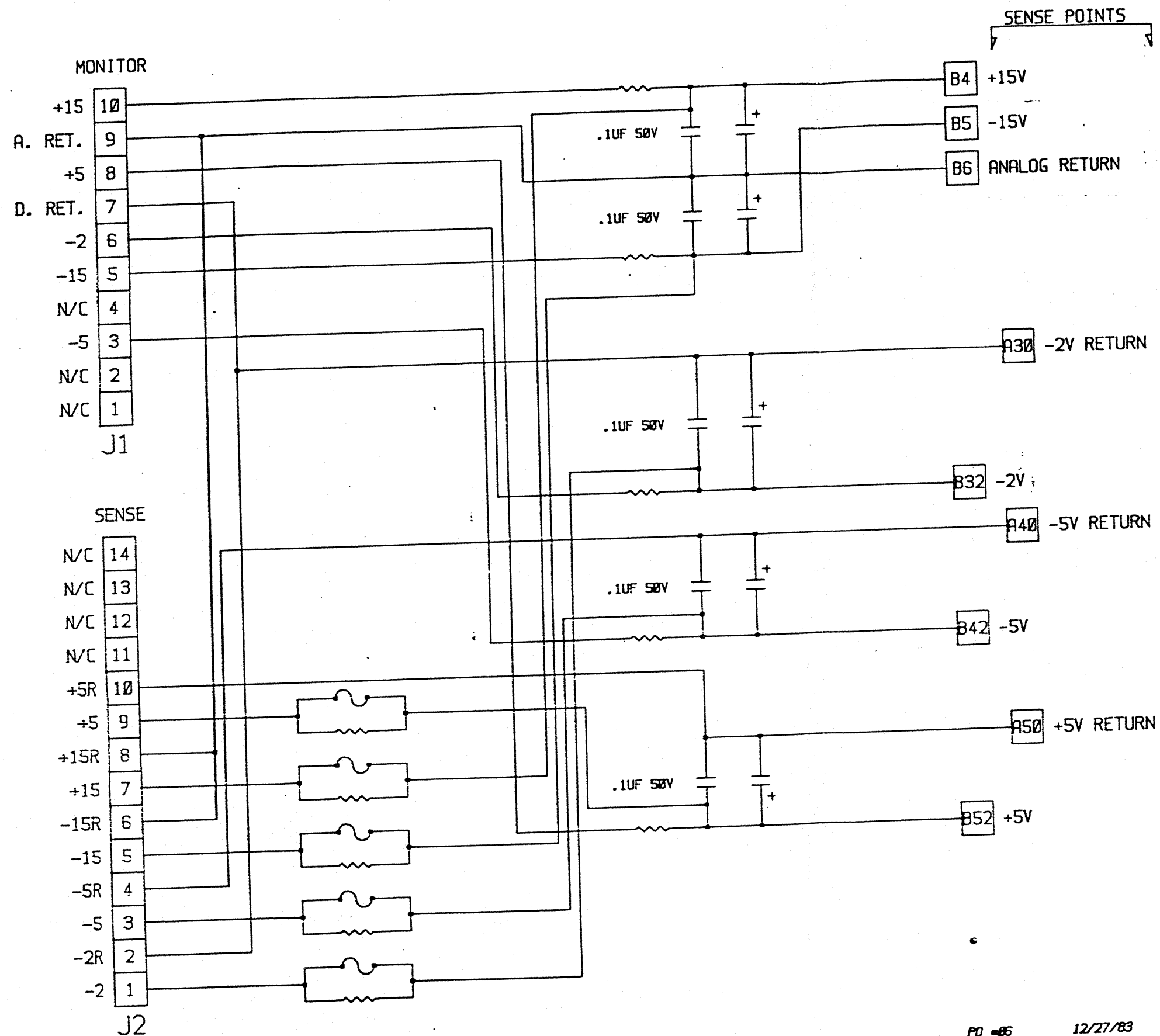
PL 7795 AD



SCHEMATIC - CRADLE
FRONT SECTION WIRING



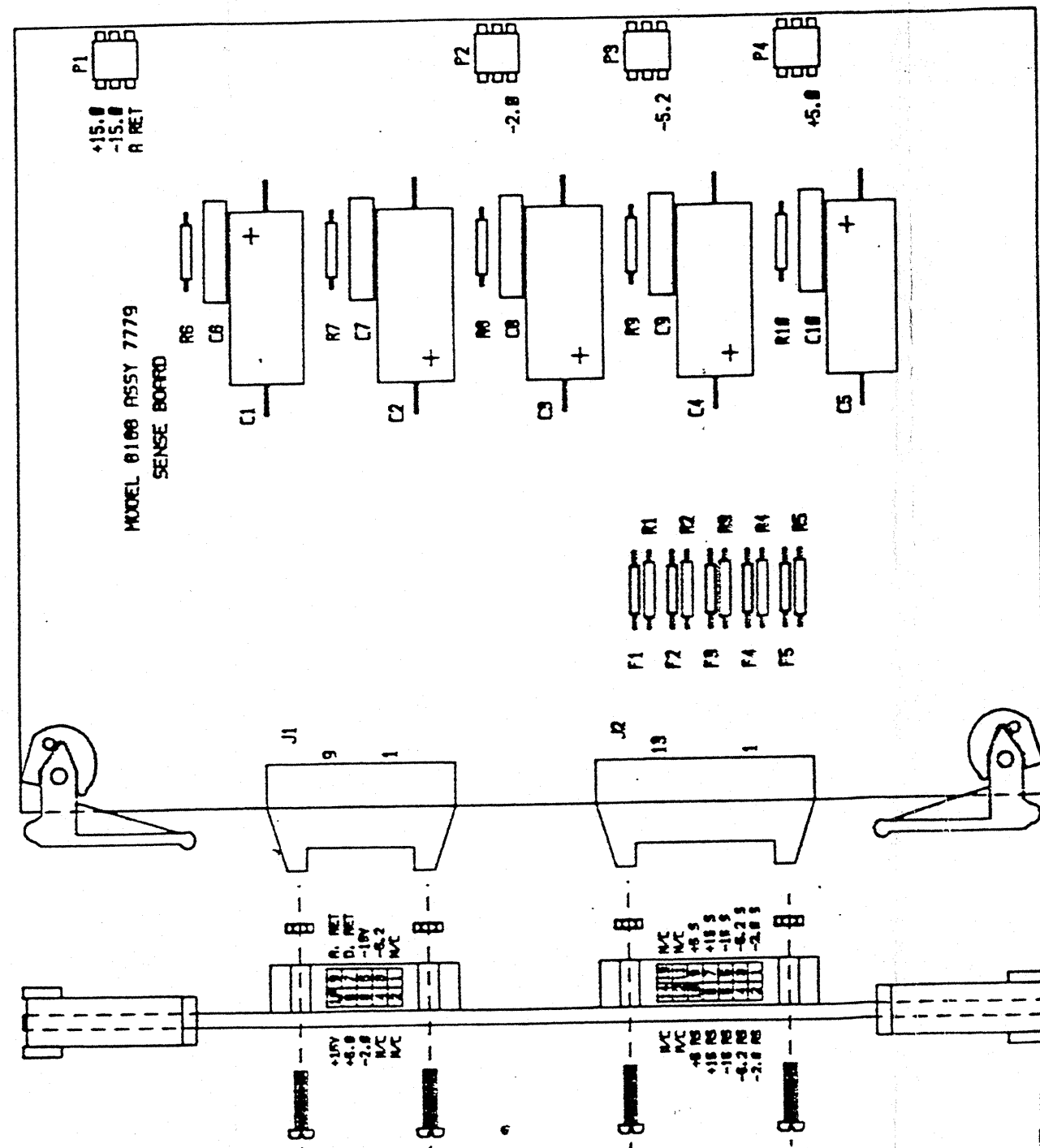
SCHEMATIC - PWR SUPPLY •
15V REGULATOR MODULE



- NOTES: (UNLESS OTHERWISE SPECIFIED)
1. ALL RESISTORS ARE 1K OHM.
 2. ALL FUSES ARE 1/4 AMP.
 3. ALL CAPACITORS ARE 470UF/50V.

SCHEMATIC -
SENSE LEAD BOARD

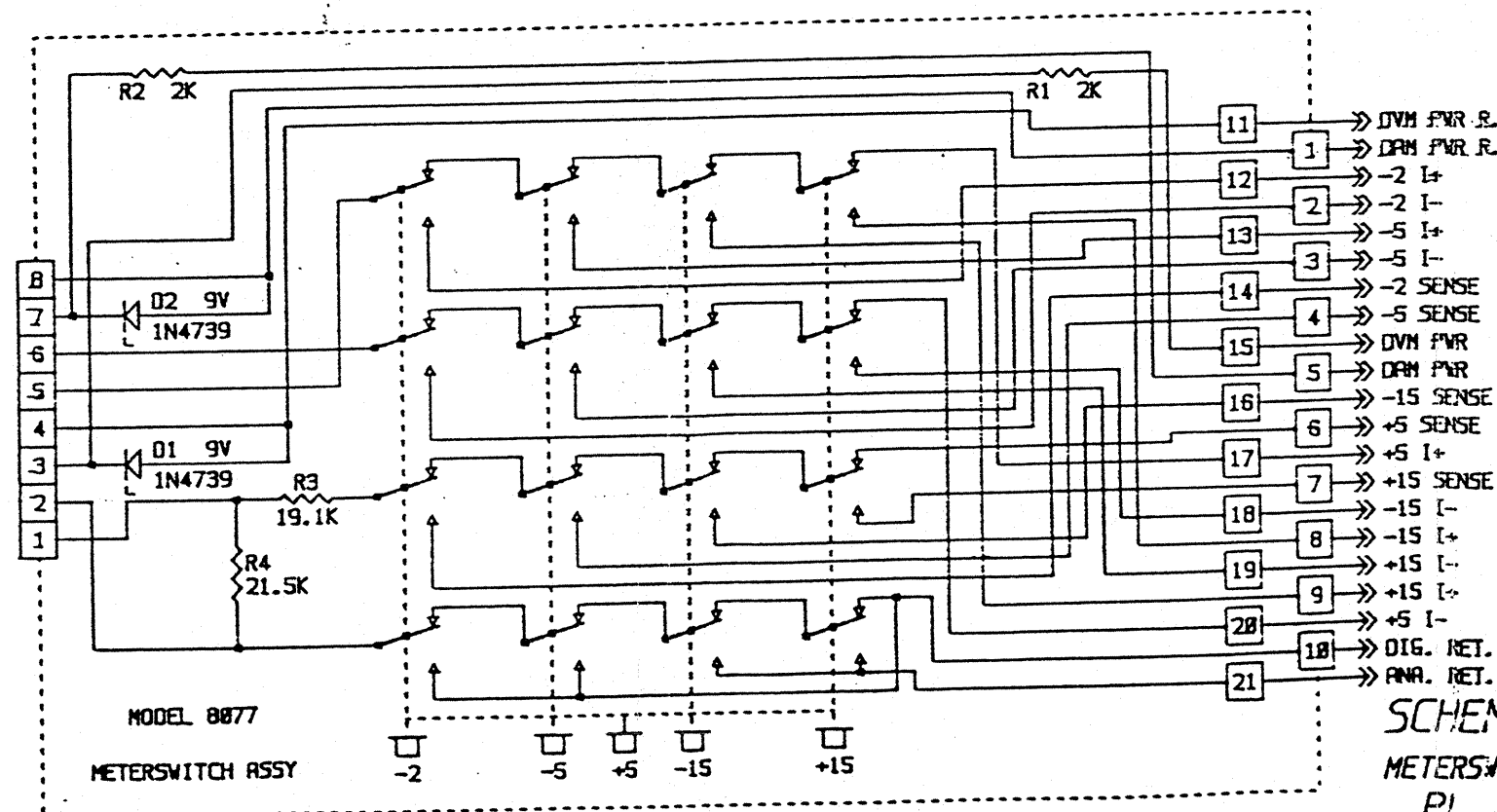
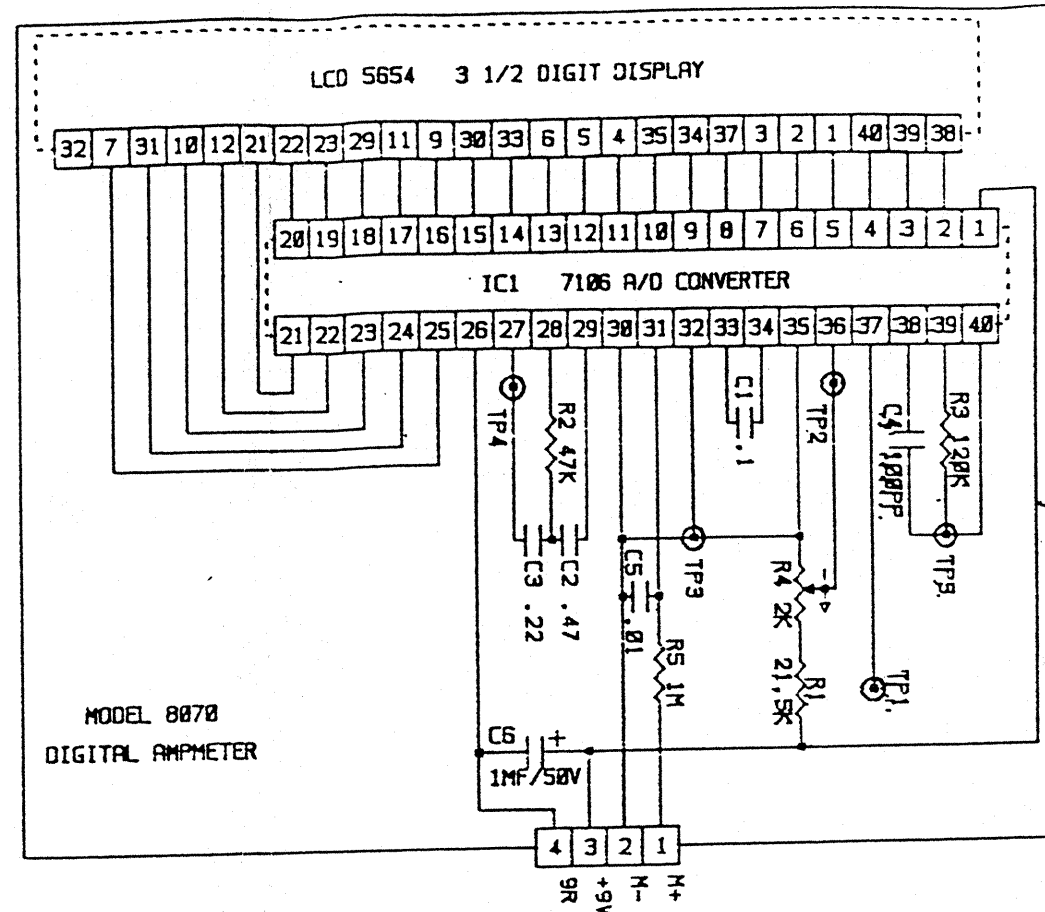
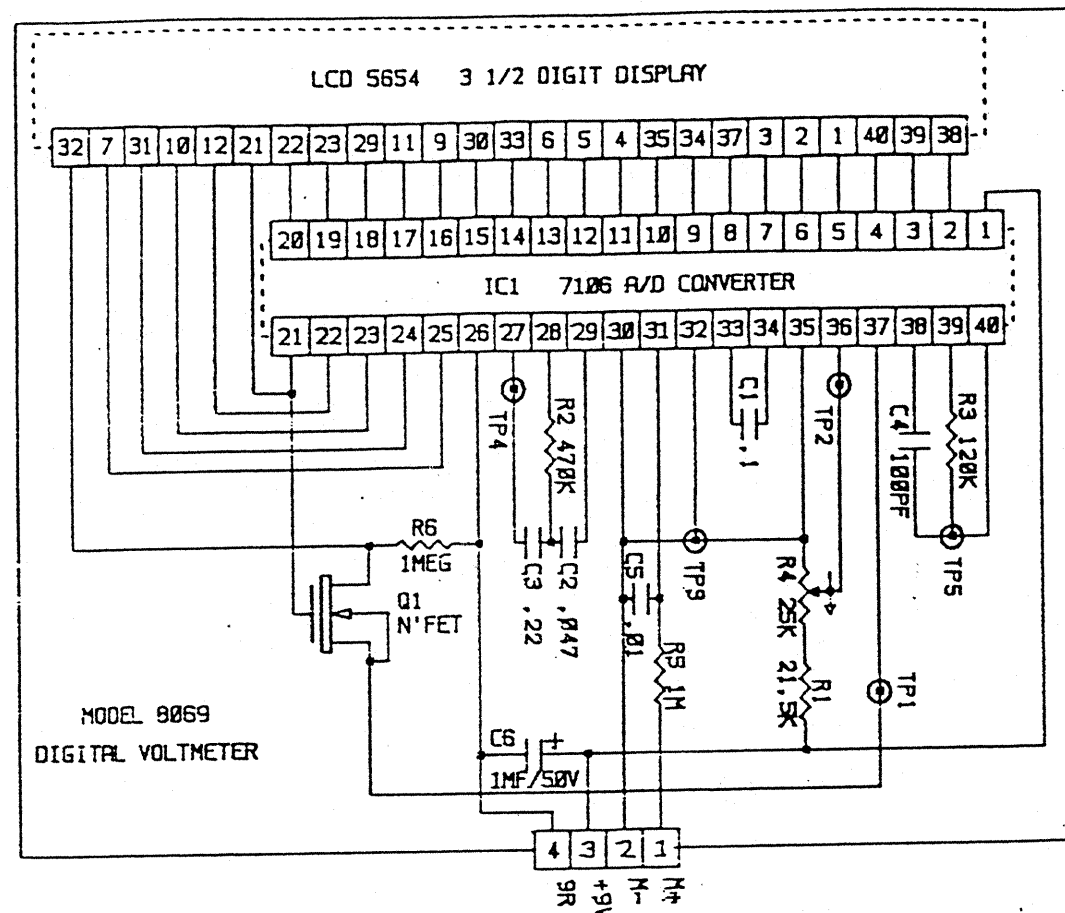
PL 5013 SD



ITEM	QTY	PART#	DESIGNATION
2	1	7788	SENSE PCB
3	5	1148	.1 MFD 18V C6-C10
4	5	1463	500 MFD 50V C1-C5
5	5	1378	1K OHM 1/4 W R6-R10
6	4	1728	3 POS CONN P1-P4
7	1	1787	14X HEADER J2
8	1	1786	18X HEADER J1
9	2	7743	CARD EJECTOR
10	4	1568	2-56 HEX NUT
11	4	1737	2-56 X 3/8 B.H.M.S.
12	8	1353	10K 1/4W R1-R5
13	8	1738	1A PICO FUSE F1-F5

ASSEMBLY #8188
SENSE BOARD

PL 7779 AD



SCHEMATIC - POWER SUPPLY
METERSWITCH & DISPLAYS
PL 7096 SD