RETIRED

Acromag®
LEADER IN SIGNAL CONDITIONING

Instructions: Series 930
Card Cage Enclosures and Alarm Modules

Table of Contents

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2-010.1
8500-044-D09390

INSTRUCTIONS: SERIES 930
Section 1: Model 937-CG Card Cage Enclosures

INTRODUCTION:

Section 1 of these instructions cover the Card Cage Enclosure models and accessories listed below. For information regarding the individual Series 930 Alarm Modules, refer to Section 2 of these instructions. Supplementary sheets are attached for units with special options or features.

Table 1: Card Cage Enclosure Models

A. Model Number Format: Card Cage Enclosure Model Number-Power
B. Typical Model Number: 937-CG-115

Card Cage Enclosure Model Number	-Power
937-CG	-115 -230

Table 2: Card Cage Enclosure Accessories

Model Number	Description
937-EXT	Module extender board used for calibration and troubleshooting. (Refer to Drawing No. 4500-177.)
45175	NEMA 4, water-tight enclosure.
45161	NEMA 12, oil-tight enclosure.

DESCRIPTION:

The Model 937-CG-115 Card Cage Enclosure is designed for use with the Model 931 Alarm Relay Modules, and the Model 937-CG-230 Card Cage Enclosure is designed for use with Model 932 Alarm Relay Modules. Refer to Section 2 of this instructions for relay model types and specifications. Up to 10 Alarm Relays can be used in one Series 937 Card Cage Enclosure. The card cage enclosures may be surface or rack mounted, field changeable.

All required terminations for AC power, signal input, and relay output are made directly to the card cage enclosure screw terminals. Internal wiring distributes the fused primary power to all ten alarm module slots. Sensor input wiring connections are made through the top of the enclosure; relay output and power connections are made through the bottom of the enclosure. These wiring connections provide both physical and mechanical barriers between input and output connections. In addition, individual alarm modules may be changed or removed without disturbing field wiring.

SPECIFICATIONS:

Function: Card Cage Enclosure to accommodate 10 Series 930 Alarm Modules, power option 115V AC or 230V AC, 19 inch rack or surface mounting.

Model/Series 937-CG-

Power:
-115 115V AC, ±10%, 50/60 Hz, 1.0A (for use with Model 931 Alarms)
-230 230V AC, ±10%, 50/60 Hz, 0.5A (for use with Model 932 Alarms)

System Capacity:
Model 937-CG-115: Up to 10 Model 931 Alarm Modules in any combination.
Model 937-CG-230: Up to 10 Model 932 Alarm Modules in any combination.

Power Input Protection: Fuse F1, as listed below. Enclosure cover must be removed for access, Fuse is 0.25 by 1.25 inch, 3 AG, fast acting.

937-CG-115: 1 amp.
937-CG-230: 0.5 amp.

Electrical Connections (Input, Output, and Power): Barrier type terminal strips using No. 6 screws and clamp plates. Wire range 12 to 26 AWG.

Mounting Configuration:
Surface Mounting: Standard.
Rack Mounting: End flanges can be reversed in the field for 19 inch rack mounting.

Module Extender Board: The Model 937-EXT Extender Board provides easy access for troubleshooting, periodic maintenance tests, or adjustments to the internal portion of the alarm module, while it is connected to the card cage enclosure AC power supply, input, and output terminations. Test-points are located on the top of the Model 937-EXT Extender Board to provide access to all 15 pins of the edge connector on the alarm module. A LED mounted on the Extender board indicates when AC power is being applied. This Extender Board may be used in either the Model 937-CG-115 or 937-CG-230 Card Cage Enclosures and accepts all alarm modules designed to mount in these enclosures.

The test-point socket on the extender board will accept a 0.080 inch (maximum) diameter probe tip. Each test-point is labeled with a letter which specifically corresponds to a letter on the edge-card connector. Refer to Drawing No. 4500-177 for pin letter assignment.

Dimensions: Refer to card cage enclosure mounting and dimensions diagram (Drawing No. 4500-133).

Construction:
Enclosure: Steel painted with a baked on epoxy paint (Polane), color, silver/gray; Cover: Aluminum painted with a baked on epoxy paint (Polane), color blue.

Shipping Weight: 15 pounds (6.8 kg) packaged.

OPTIONAL ENCLOSURES (Separate Model Numbers):

Refer to Drawing No. 4500-175, for outline dimensions of the enclosure options listed below.

Note: Unit is installed in enclosure at factory. Conduit mounting holes and fittings are customer supplied.

Model 45175: NEMA 4 Enclosure, water-tight. Enclosure material and finish: 0.075 and 0.060 inch thick steel with gray hammertone enamel finish inside and out. Shipping weight: 38 pounds (17.2 kg) packaged.

Model 45161: NEMA 12 Enclosure, oil-tight. Enclosure material and finish: 0.075 and 0.060 inch thick steel with gray hammertone enamel finish inside and out. Shipping weight: 34 pounds (15.4 kg) packaged.

INSTALLATION:

The Model 937-CG Card Cage Enclosure system is designed to be installed in any covenient location suitable for general purpose electronic equipment. Use an auxiliary enclosure to protect against unfavorable environments and locations. Maximum operating ambients should be within 32° to 122°F (0° to 50°C) for satisfactory performance of the complete system. It is recommended that the card cage enclosure be mounted and wired before the alarm modules are installed. If an alarm module requires calibration, refer to Section 2 of these instructions.

Mounting: To convert a standard surface mount 19 inch card cage enclosure to a 19 inch rack mount enclosure follow Steps 1 through 4 listed below. For mounting hole and clearance dimensions, refer to Drawing No. 4500-133.

1. Remove card cage enclosure cover.
2. Remove the two screws and nuts securing each end of the enclosure bracket.
3. Remount enclosure brackets so that end flanges face forward.
4. Reinsert the two screws and nuts to secure the enclosure brackets.

Electrical Connections: The wire size used to connect the alarm to the control system is not critical. All terminal strips can accommodate wire from 12 to 26 AWG. Input wiring should be either twisted pairs or shielded, output wires should be twisted pairs. Since common mode voltages can exist on signal wiring, adequate wire insulation should be used and proper wiring practices should be followed. It is recommended that power wiring be separated from signal wiring for safety as well as for low noise pick-up.

To bring the wiring to the terminal blocks, pierce the special grommets, pull wires through and attach to terminals.

For card cage enclosure and alarm module connection information refer to Drawing No. 4500-172.

1. Power: Connect the AC power to the barrier strip on the card cage per connection diagram, use suitable wire per applicable codes. Label on unit specifies the power required for the particular unit being installed. Connect the "Hot" input power lead to the terminal marked "L1" and the "common" lead to the terminal marked "W" (115V AC), or "L2" (230V AC). Incorrect wiring will defeat the fuse and cause a safety hazard.

   Note: Model 931 Alarms must be used with the Model 937-CG-115 Card Cage Enclosure. Model 932 Alarms must be use with the Model 937-CG-230 Card Cage Enclosure.

2. Grounding: Connect the terminal marked "G" (GND) to an earth ground. Note: The ground wire must be installed for safe use of the instrument.

3. Input and Output: All input and output terminations to the alarm modules are made using the ten terminal barrier strips located on the card cage enclosure.

   Input connections are made to the unit through the top of the enclosure. Output and power connections are made through the bottom of the card cage enclosure.

   For specific alarm module input and output connection information, refer to Section 2 of these instructions; also refer to the connection diagram.

4. Module Installation: After mounting and wiring of the card cage enclosure is complete, install alarm modules in the appropriate enclosure slots. Mark the label, located on the lower lip of the enclosure, with appropriate information to identify alarm module location in the enclosure.

   For alarm module calibration information refer to Section 2 of these instructions.

5. After all wiring is complete and modules are installed, replace cover on unit. Note, cover also functions as a card retainer.

Notes:

INSTRUCTIONS: SERIES 930
Section 2: Model 931 and 932 Alarm Relays

INTRODUCTION:

Section 2 of these instructions cover the alarm models listed below. For information regarding the Series 930 Card Cage Enclosures, refer to Section 1 of these instructions. Supplementary sheets are attached for units with special options or features.

Table 1:

A. Model Number Format:
Series/Power-Input and Relay Type-Output-Calibration
B. Typical Model Number: 931-MS-5

Series and Power	-Input	Output Relay Type	-Output	*-Cal.
931 932	-M -J -K -T -S -R -E -RB -P -C	S D	-5 -7 -8 -9	(Blank) -C

*Units may be ordered with or without factory calibration. If the unit is factory calibrated to customer specifications the model number suffix "-C" will indicate this. The calibration information will be specified on a separate calibration label on the unit.

DESCRIPTION:

Model 931 and 932 Alarm Relays accept millivolt, thermocouple, RTD, slidewire, and process current inputs and provide relay actuation at a preset signal level. Up to 10 Model 931 Alarms may be used, in any combination, in the 115V AC powered Model 937-CG-115 Card Cage Enclosure. Up to 10 Model 932 Alarms may be used, in any combination, in the 230V AC powered Model 937-CG-230 Card Cage Enclosure.

The input circuit of each channel is isolated from the power, contacts, and other alarm modules. It is designed to permit use of grounded sensors or signal inputs up to 100V DC from ground. Each alarm module also features an adjustable deadband control in addition to input filtering to minimize false trips. Trip-point adjustments are made using high-resolution 22-turn potentiometers. Deadband adjustments are independant of the trip-point adjustments and are made using high-resolution 15-turn potentiometers

Series 930 Thermocouple Alarms are equipped with TC reference junction compensation. These thermocouple alarms sense open thermocouples by driving the input upscale; downscale operation is achieved by cutting a jumper on the circuit board. Process current inputs are handled by placing a precision resistor across the card cage enclosure terminal strip, providing a 1 to 5V DC signal to a voltage alarm.

Single alarm modules feature DPDT (double-pole, double-throw) contacts, dual alarm modules feature two SPDT (single-pole, double-throw) contacts; both are rated at 5 amps, 115V AC or 28V DC resistive load. Optional hermetically sealed output relays are available on both the Model 931 and Model 932 Alarm Relays. These modules also feature field selectable high or low "failsafe" operation. Relay operation can be converted from normal acting (relay energized above trip-point--"failsafe low" limit alarming) to reverse acting (relay energized below trip-point--"failsafe high" limit alarming) by cutting a jumper on the circuit board.

SPECIFICATIONS:

Function: Series 930 Alarms accept millivolt, thermocouple, RTD, slidewire, and process current inputs and provides relay actuation at a preset signal level. These units include adjustable dead band adjust and 115V AC or 230V AC power option.

Model/Series: 931-, 932-

Input:

-M Millivolt, -10 mV to + 100 mV Range
-J Type J Thermocouple, Iron/Constantan, -210° to +1200°C Range
-K Type K Thermocouple, Chromel/Alumel, -270° to +1373°C Range
-T Type T Thermocouple, Copper/Constantan, -270° to +400°C Range
-S Type S Thermocouple, Plat. Rhod/Plat., -50° to +1760°C Range
-R Type R Thermocouple, Plat. Rhod/Plat., -50° to +1760°C Range
-E Type E Thermocouple, Chromel/Constantan, -270° to +1000°C
-RB RTD, 2- or 3- wire. minimum span: 5 ohms; maximum sensor current: 1 mA. Built to customer specifications of temperature and bulb type.
-P Slidewire, standard 3-wire, 100 to 5000 ohms. Excitation: 20 mV, nominal.
-C Voltage/Process Current. Standard voltage input is 1 to 5V. Process current inputs are handled by placing precision resistors across the input terminals on the card cage enclosure. Trip-point may be set as low as 10 mV. For inputs of:

1 to 5 mA, use 1000 ohms, ±0.1% (Acromag Part No. 712-1000).
4 to 20 mA, use 250 ohms, ±0.1% (Acromag Part No. 712-250).
10 to 50 mA, use 100 ohms, ±0.1% (Acromag Part No. 712-100).

Input Impedance: 500,000 ohms minimum for thermocuple models. One megohm minimum for all other models.

Output Relay Type:

S Single trip-point with one DPDT (double-pole, double-throw) relay.
D Dual trip-point with two SPDT (single-pole, double-throw) relays.

Output:

-5 SPDT relay, hermetically sealed contacts rated at 3 amps, 115V AC or 24V DC resistive load ("D" units only).

-7 DPDT relay, hermetically sealed contacts rated at 3 amps, 115V AC or 24V DC resistive load ("S" units only).

-8 SPDT relay, contacts rated at 5 amps, 115V AC or 28V DC resistive load ("D" units only).

-9 DPDT relay, contacts rated at 5 amps, 115V AC or 28V DC resistive load ("S" units only).

Trip Adjustments: One trip-set (single unit) or two trip-set (dual unit) potentiometer(s), 22-turn, metal film, screwdriver settable.

Series/Power:

931-: 115V AC powered enclosure

932-: 230V AC powered enclosure

Relay Operation: Alarms can be converted from "Normal" acting (relay energized above trip-point, "fail-safe" for low limit alarming) to "Reverse" acting (relay energized below trip-point, "fail-safe" for high limit alarming) by cutting a field changeable jumper on the printed circuit board. Note: Reverse acting units are designated by the model number prefix "R".

LED: The LED(s) on the circuit board indicate when the output relay(s) is energized.

Deadband: One (single unit) or two (dual unit) potentiometers, 15-turn, metal film, screwdriver settable. Adjustable from 1% to 10% of trip span for process current inputs. Adjustable from 100 microvolts to 2 mV (referred to input) for other inputs.

Isolation: The input circuit is isolated from the power supply circuit allowing the input to operate up to 100V DC above ground.

Compensation:

TC Automatic thermocouple reference junction compensation over ambient temperature range of 32° to 122°F (0° to 50°C). Trip-point shifts less than ±30 microvolts when changing module position in the card cage enclosure.

RTD Lead wire compensation for 3-wire RTD.

Thermocouple Break Protection: Upscale standard, downscale selected by cutting jumper on the circuit board.

CSA: CSA approval labels are available for Series 930 Alarms.

Referece Test Conditions: Model 931-JS-5: 77°F (25°C) ambient temperature.

Ambient Temperature Range: 32° to 122°F (0° to 50°C).

Ambient Temperature Effect: Trip-point varies less than ±10 microvolts per °C (referred to input) for ambient temperature range.

Accuracy: Accurate to within ±0.1% of span for constant conditions, 77°F (25°C).

Response Time: 500 ms, typical.

Noise Rejection:
Common Mode: 140 dB at 60 Hz, 100 ohm source unbalance.

Normal Mode: 40 dB at 60 Hz.

Warm-up Time: Five seconds to reach rated accuracy.

Construction: Epoxy glass printed circuit board with heavy duty gold plated edge connector.

Dimensions: Refer to Drawing No. 4500-553 for alarm module dimensions.

Shipping Weight: 1 pound (0.45 kg) packaged.

INSTALLATION:

Model 931 Alarm Relays must be used with the Model 937-CG-115 Card Cage Enclosure. The Model 932 Alarm Relays must be used with the Model 937-CG-230 Card Cage Enclosure. Refer to Section 1 of these instructions for card cage enclosure description, mounting, and specifications. Maximum operating ambients should not exceed 32° to 122°F (0° to 50°C) for satisfactory performance. If the unit has been factory calibrated, it is ready for installation. Connect as shown in connection diagram. If the unit has not been factory calibrated, refer to the following "CALIBRATION" section.

Electrical Connections: Refer to Section 1, Model 937-CG Card Cage Enclousres "Electrical Connections".

For connection information refer to Drawing No. 4500-172.

Module Installation: Insert the alarm module into the card cage enclosure and wire as shown in the connection diagram for the particular module type.

Note: Process current inputs are handled by placing precision resistors across the input terminals (plus (+) and minus (-) input) on the card cage enclosure. For inputs of:

1 to 5 mA, use 1000 ohms, ±0.1% (Acromag Part No. 712-1000).
4 to 20 mA, use 250 ohms, ±0.1% (Acromag Part No. 712-250).
10 to 50 mA, use 100 ohms, ±0.1% (Acromag Part No. 712-100).

CALIBRATION:

If the unit has been factory calibrated, refer to the following "Adjustment Procedure" to verify or change calibration. On factory calibrated units, a label describing calibration appears on the front of the unit. If the unit has not been factory calibrated, proceed as outlined in the following "Adjustment Procedure".

Note: For single alarms, refer to Drawing No. 4500-134, pages 1 and 2, for parts location diagram and detailed schematic.

For dual alarms, refer to Drawing No. 4500-135, pages 1 and 2, for parts location diagram and detailed schematic.

Adjustment Procedure:

1. Determine which trip mode is required for the application, "normal" or "reverse" acting. "Normal" refers to relay energized when input signal is above trip-point (low fail-safe limit alarming). "Reverse" refers to relay energized when input signal is below trip-point (high fail-safe limit alarming). Refer to Table 3 of alarm detailed schematic drawings and cut jumpers as required.

2. For thermocouple models, determine if up-scale or down-scale break indication is required. Units are normally supplied with up-scale break indication. If down-scale break indication is required, cut jumper J1. (Refer to parts location and detailed schematic drawings for location of jumper J1.)

3. Trip-point and deadband adjustments:

   A. Millivolt models:

      1. Apply a pure DC millivolt source at the input terminals ("+INPUT" and "-INPUT") of the value desired for a trip condition.

      2. Adjust the trip-point "SP" potentiometer until the relay operates. The associated LED will light when the relay coil is energized.

      3. Rock adjustment screw clockwise and counterclockwise to achieve as close a reading as possible to the actual trip-point.

      4. Vary input and verify that relay operates at desired trip-point. The difference between the signal voltage at which the relay operates (pull-in) and drops out is the amount of deadband.

      5. Adjust the deadband (DB) potentiometer and vary the input between pull-in and drop-out until desired deadband is obtained.

      6. The deadband adjustment has a minimal effect on the trip-point, however, for improved accuracy reset the trip-point control following Steps 1, 2, and 3 above.

   B. Thermocouple Models: Calibration of thermocouple models in the same as for millivolt models described above (Steps 3A, 1 through 6), except an Acromag Series 320 Reference is used to simulate a thermocouple input. Refer to Bulletin 10-003.0 for detailed information. Alternatively, an ice bath or other reference may be used.

   C. RTD and Slidewire (-P) Models

      1. RTD and slidewire models are factory calibrated and compensated for the RTD or slidewire to be used. It will be necessary to vary the resistance of the RTD or slidewire to adjust the trip.

      2. Adjustment of the trip-point and deadband is the same as described for millivolt models above (Steps 3A, 1 through 6), except verification of the input resistance to the desired value is required.

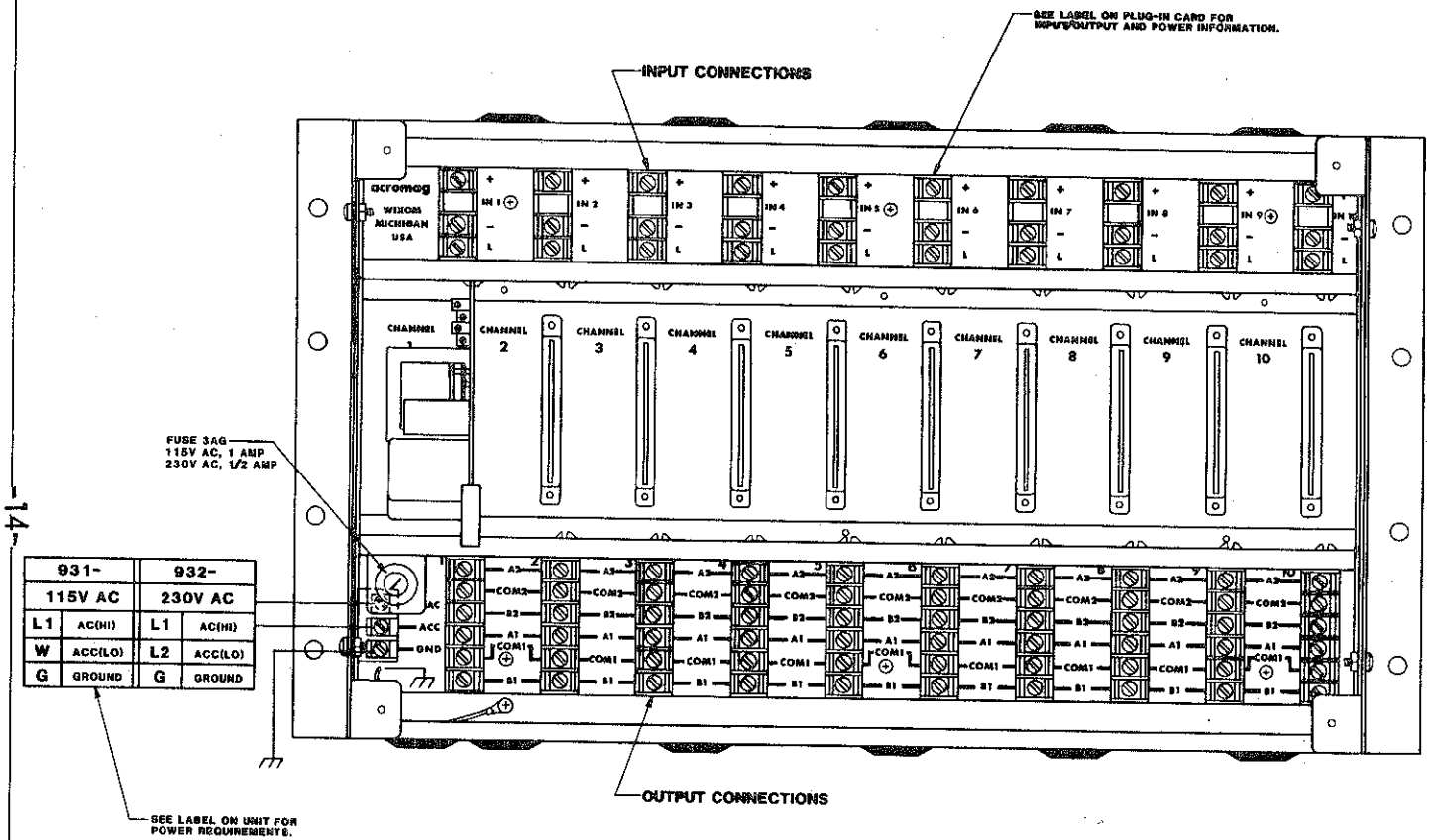
D. Voltage Input Models "C" Option: The procedure for adjusting the trip-point and deadband is the same as described for millivolt models above (Steps 3A, 1 through 6), except the input signal is a voltage between 0 and 5V DC. Refer to "Input" listed under "SPECIFICATIONS" in Section 2 of these instructions for the selection of the proper input resistor when applying process current inputs.

These instruments contain solid-state components and require no maintenance except for periodic cleaning and calibration verification. If a unit is not operating properly, it should be removed and given a full bench checkout. Past experience indicates that most problems are in the field wiring and associated circuits rather than in the unit itself. If the problem is traced to the unit itself, conventional electronic troubleshooting methods may be used. An Acromag Module Extender, Model 937-EXT, is available for troubleshooting purposes.

In the event of a suspected failure, check for presence of AC power. Exchanging the unit with a known good unit is a convenient method for identifying faulty units. Fault isolation at the component level requires proper test equipment and qualified technicians familiar with solid-state circuitry. If these facilities are not available, the unit should be returned to the factory for repair and recalibration.

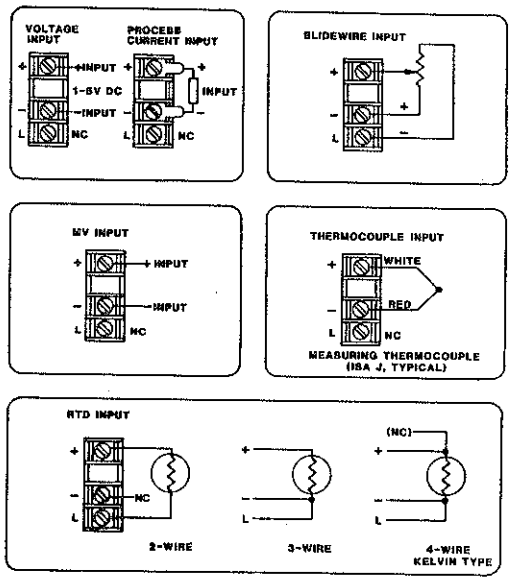
If replacement parts must be ordered, the following information should be included:

A. Instrument model number
B. Instrument serial number
C. Component designation and value (e.g., R20, 499 ohms, 1/8W, 1%)

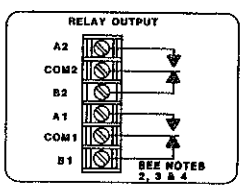


931-		932-	
115V AC		230V AC	
L1	AC(HI)	L1	AC(HI)
W	ACC(LO)	L2	ACC(LO)
G	GROUND	G	GROUND

INPUT CONNECTIONS



OUTPUT CONNECTIONS

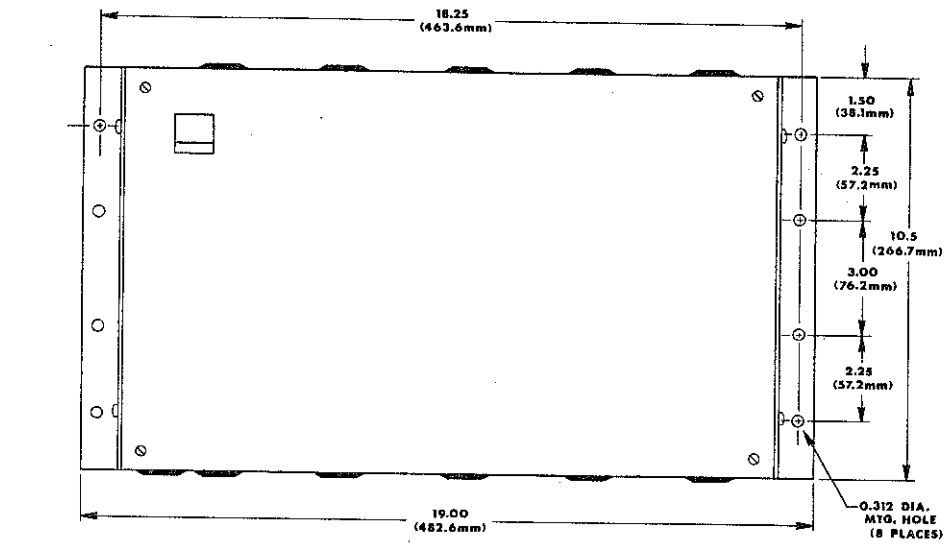


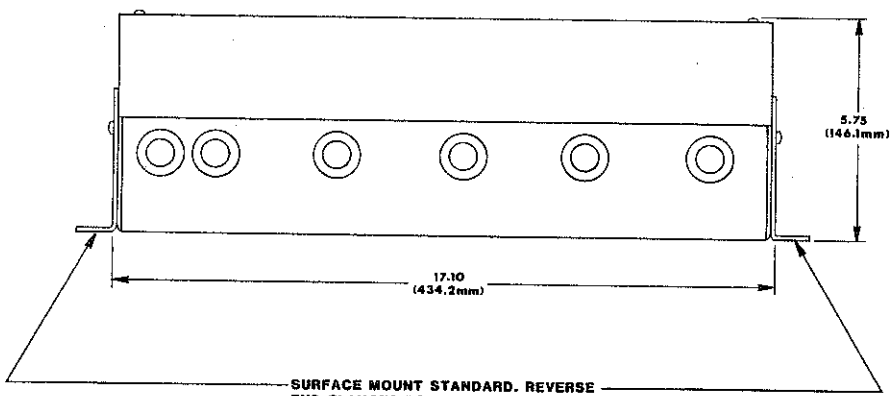
NOTES:

1. USE PRECISION RESISTORS FOR PROCESS CURRENT INPUTS.
   1 TO 5mA = 1000 OHMS
   4 TO 20mA = 250 OHMS
   10 TO 50mA = 100 OHMS
2. SINGLE RELAY MODELS (S) HAVE ONE SET OF DPDT CONTACTS. DUAL RELAY MODELS (D) HAVE TWO SETS OF SPDT CONTACTS.
3. RELAY CONTACTS ARE RATED AT 5 AMPS FOR 117V AC OR 28V DC RESISTIVE LOADS EXCEPT FOR HERMETICALLY SEALED RELAYS. THEY ARE RATED AT 3 AMPS.
4. CONTACTS SHOWN WITH OUTPUT RELAYS DE-ENERGIZED. STANDARD UNITS ARE DE-ENERGIZED BELOW TRIP-POINT. REVERSE ACTING UNITS ARE DE-ENERGIZED ABOVE TRIP-POINT.

TOLERANCES	ACROMAG, INC.-WIXOM, MICH.	
SERIES 930		
ELECTRICAL CONNECTIONS		
D	6-18-78	4500-172B

DATE	SYM	REVISION RECORD	CLP	DR	CK
11-83	A	5979	AE	TW	WG



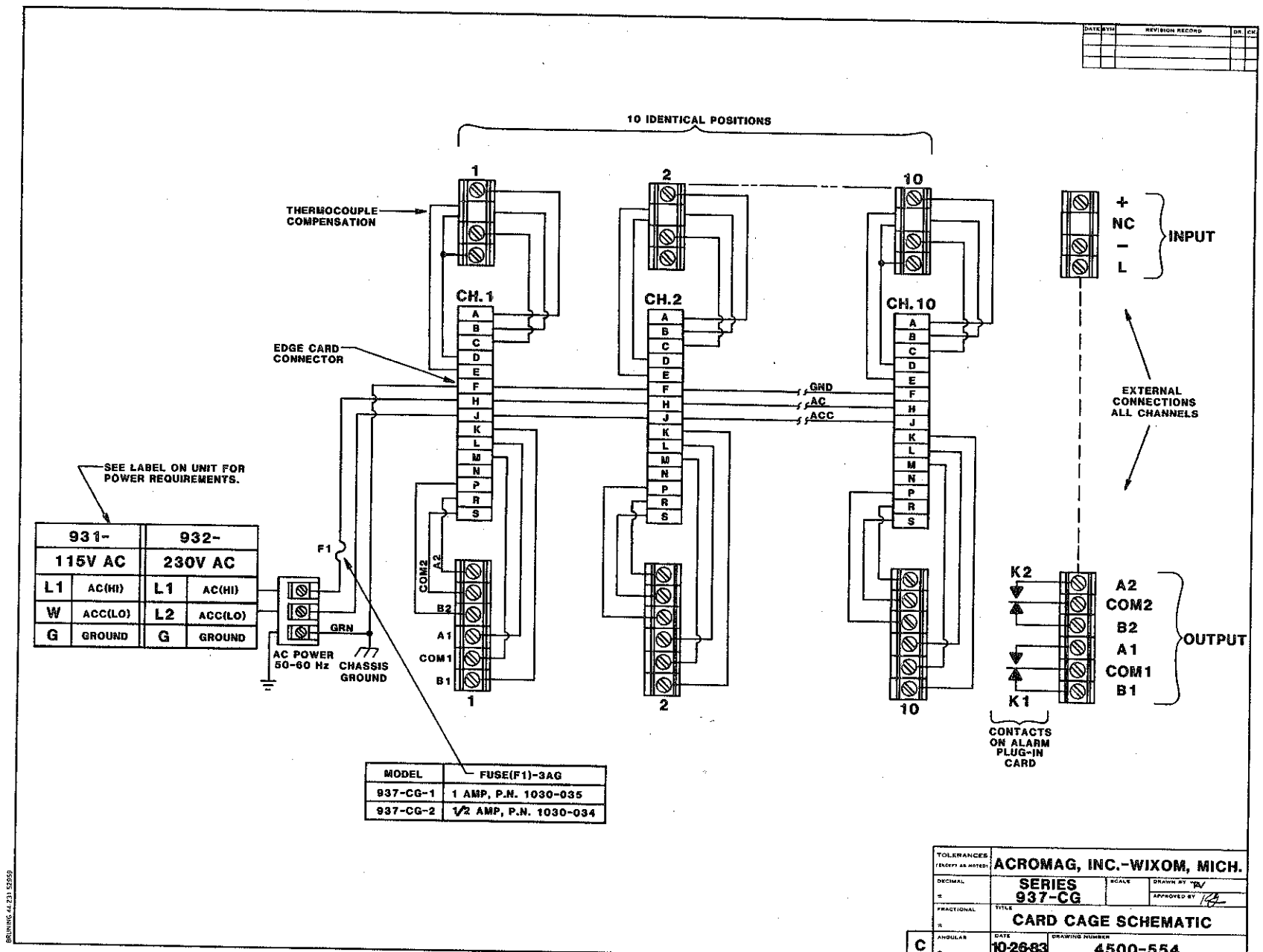


SURFACE MOUNT STANDARD. REVERSE END FLANGES FOR RACK MOUNTING.

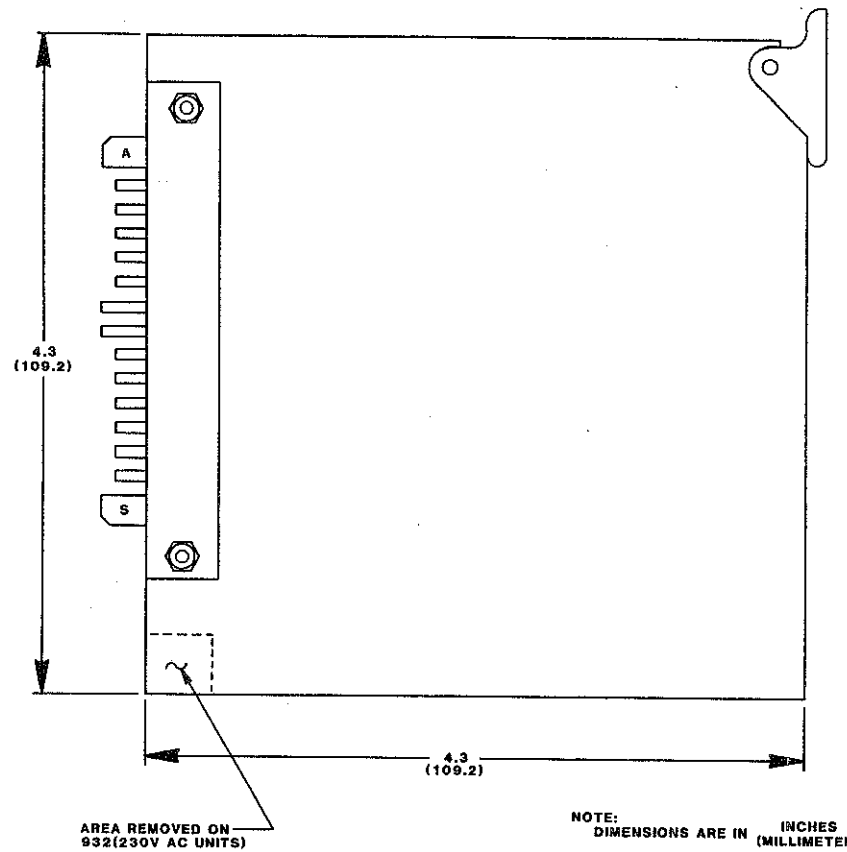
TOLERANCES (EXCEPT AS NOTED)	ACROMAG INC. -WIXOM, MICH.		
DECIMAL ±	SERIES 920/930	SCALE 1:2	DRAWN BY WH APPROVED BY KB
FRACTIONAL ±	TITLE CARD CAGE ENCLOSURE		
ANGULAR ±	DATE 7-5-77	DRAWING NUMBER 4500-133A	

C

BRUNING 40-21


10 IDENTICAL POSITIONS
THERMOCOUPLE COMPENSATION
EDGE CARD CONNECTOR
CH. 1
CH. 2
CH. 10
GND
AC
ACC
+
NC
–
L
INPUT
EXTERNAL CONNECTIONS ALL CHANNELS
SEE LABEL ON UNIT FOR POWER REQUIREMENTS.
931- 115V AC
L1 AC(HI)
W ACC(LO)
G GROUND
932- 230V AC
L1 AC(HI)
L2 ACC(LO)
G GROUND
F1
GRN
AC POWER 50-60 Hz
CHASSIS GROUND
COM2
A2
B2
A1
COM1
B1
K2
K1
A2
COM2
B2
A1
COM1
B1
OUTPUT
CONTACTS ON ALARM PLUG-IN CARD
MODEL
FUSE(F1)-3AG
937-CG-1
1 AMP, P.N. 1030-035
937-CG-2
1/2 AMP, P.N. 1030-034
ACROMAG, INC.-WIXOM, MICH.
SERIES 937-CG
CARD CAGE SCHEMATIC
10-26-83
4500-554
C

DATE	BY	REVISION RECORD	DR	CK

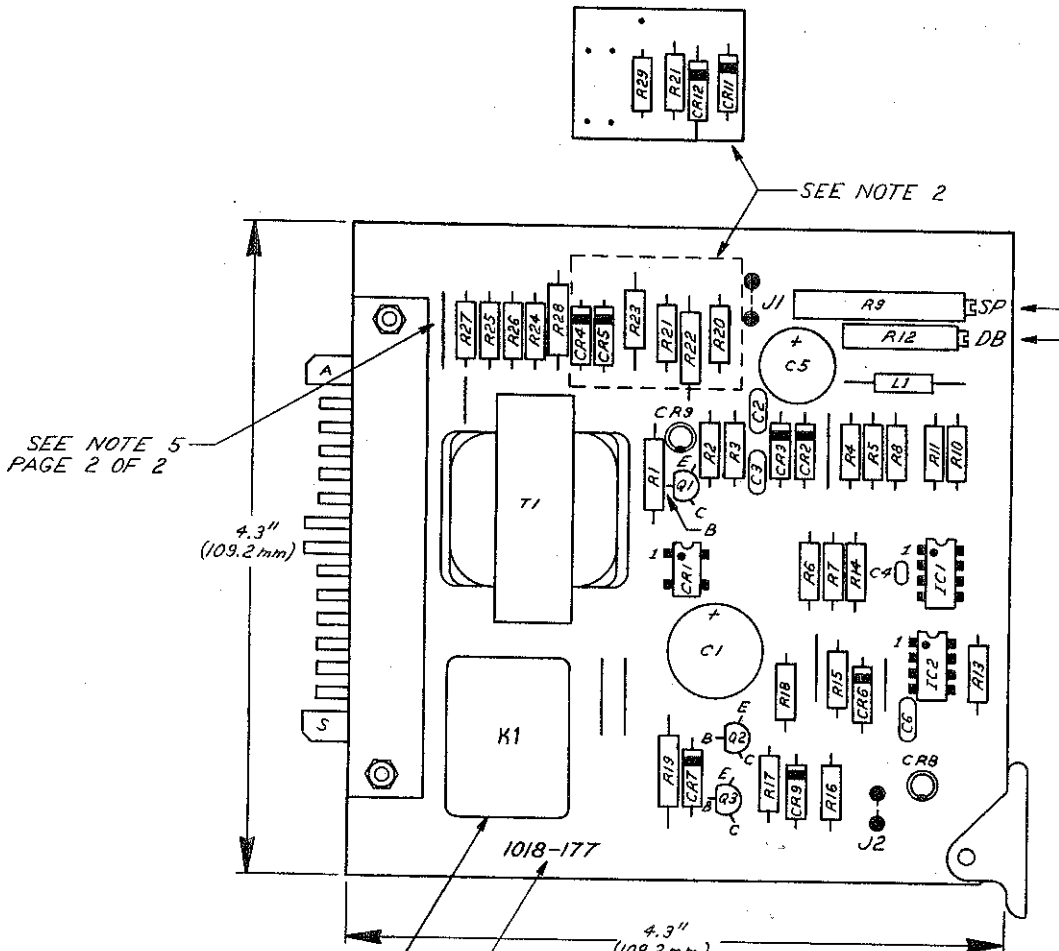


SERIES 930 • CARD MECHANICAL DIMENSIONS

TOLERANCES (EXCEPT AS NOTED)	ACROMAG, INC.-WIXOM, MICH.		
DECIMAL ±	SERIES 930	SCALE	DRAWN BY TAV / APPROVED BY
FRACTIONAL ±	TITLE CARD MECHANICAL DIMENSIONS		
ANGULAR ±	DATE 9-20-83	DRAWING NUMBER 4500-553	

C

DATE	SYM	REVISION RECORD	CHK	DR.	CK
5-76	A	2012		DWH	DM
10-76	B	3060		DWH	DWH
4-79	C	3229		DWH	DB
4-81	D	8731	KB	TW	DT
10-86	E	9181	MA	TW	MA

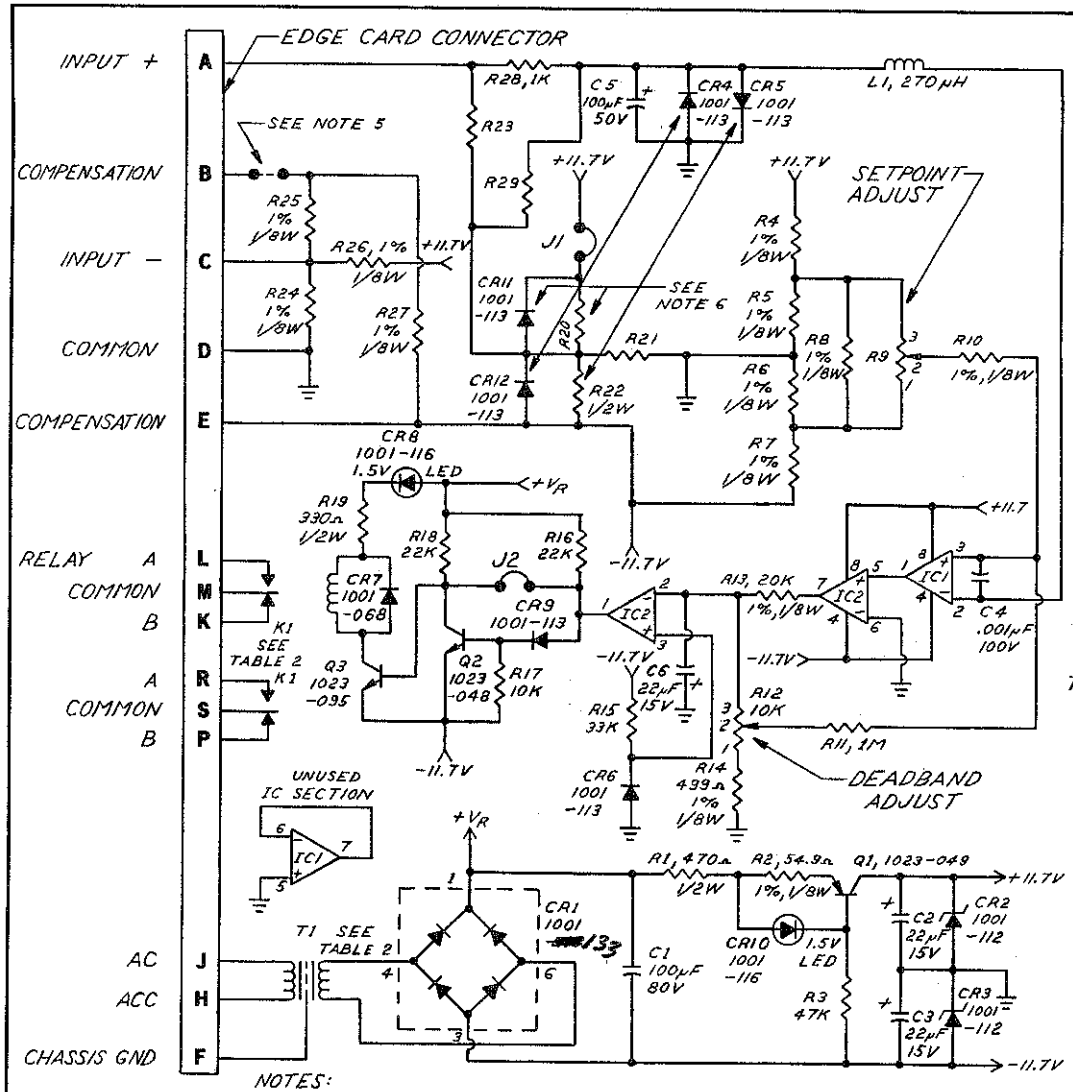


NOTES:
1. JUMPERS J1 & J2 ARE LOCATED ON THE FOIL SIDE OF THE PC BOARD.
2. DIODES CR4 & CR5 ARE OMITTED ON TYPE "C" UNITS. CR10 & CR11 REPLACE RESISTORS R20 & R22 ON TYPE "C" UNITS. IN ADDITION R23 IS DELETED & R29 IS USED.

PAGE 1 OF 2

TOLERANCES (EXCEPT AS NOTED)	ACROMAG INC. - WIXOM MICH.	
DECIMAL ±	931 & 932 SERIES	SCALE / DRAWN BY TWH / APPROVED BY RKM
FRACTIONAL ±	TITLE SINGLE ALARM RELAY	
ANGULAR ±	DATE 10-14-77	DRAWING NUMBER C 4500-134E

BRUNING 49-21



NOTES:

1. ALL RESISTORS 10%, 1/4 W UNLESS OTHERWISE SPECIFIED.
2. ALL SEVEN DIGIT NUMBERS ARE ACROMAG PART NUMBERS.
3. IC1 IS AN ACROMAG 1033-208 (DUAL OP-AMP).
4. IC2 IS AN ACROMAG 1033-209 (DUAL COMPARATOR).
5. THIS JUMPER INSTALLED ON J, K, T, S & E THERMOCOUPLE TYPES ONLY.
6. DIODES CR4 & CR5 ARE OMITTED ON TYPE "C" UNITS. DIODES CR11 & CR12 REPLACE RESISTORS R20 & R22 ON TYPE "C" UNITS. IN ADDITION, R23 IS DELETED & R29 IS USED.

DATE	SYM	REVISION RECORD	CLR	DR	EC
5-78	A	2012		MM	
10-78	B	3060		MM	
4-79	C	3229		MM	DB
4-81	D	8731	RD	TA	
10-81	E	9181	RD	TA	

TABLE 1

	INPUT TYPE								
	M	C	J	K	T	S	E	P	RB
R4	4.53K	4.99K	3.48K	3.65K	4.99K	8.06K	3.65K	SELECTED	
R5	604Ω	NOT USED	75Ω	49.9Ω	33.2Ω	49.9Ω	150Ω		
R6	20Ω	JUMPER	10Ω	10Ω	10Ω	10Ω	20Ω		
R7	4.53K	NOT USED	2.94K	3.48K	4.12K	6.49K	3.24K		
R8	100Ω		100Ω	100Ω	100Ω	100Ω	100Ω	100Ω	100Ω
R9	100Ω	10K	100Ω	100Ω	100Ω	100Ω	100Ω	100Ω	100Ω
R20	NOT USED	CR11	56K	56K	56K	56K	56K	NOT USED	JUMPER
R21			47K	47K	47K	47K	47K		
R22		CR12	68K	68K	68K	68K	68K		
R23			22M	22M	22M	22M	22M		23.7K
R24	JUMPER	JUMPER	31.6Ω	25.5Ω	25.5Ω	JUMPER	38.3Ω	20Ω	NOT USED
R25	NOT USED		1.21K	1.21K	1.21K	NOT USED	1.21K	NOT USED	SELEC-TED
R26			20.5K	20.5K	20.5K		20.5K	12.4K	NOT USED
R27			10.0K	10.0K	10.0K		10.0K	NOT USED	SELEC-TED
R10	499Ω	100K	499Ω	499Ω	499Ω	499Ω	499Ω	499Ω	499Ω
R29	NOT USED	JUMPER	NOT USED						

TABLE 2

PART	MODEL			
	931-XX-7	931-XX-9	932-XX-7	932-XX-9
K1	1022-015	1022-017	1022-015	1022-017
T1	1014-061	1014-061	1014-062	1014-062

TABLE 3

JUMPER OPTION	JUMPERS J1	J2
TC BREAK:		
UPSCALE	IN	—
DOWNSCALE	OUT	—
RELAY OPERATION:		
NORMAL (RELAY ENERGIZED SIGNAL ABOVE SETPOINT)	—	IN
REVERSE (RELAY ENERGIZED SIGNAL BELOW SETPOINT)	—	OUT

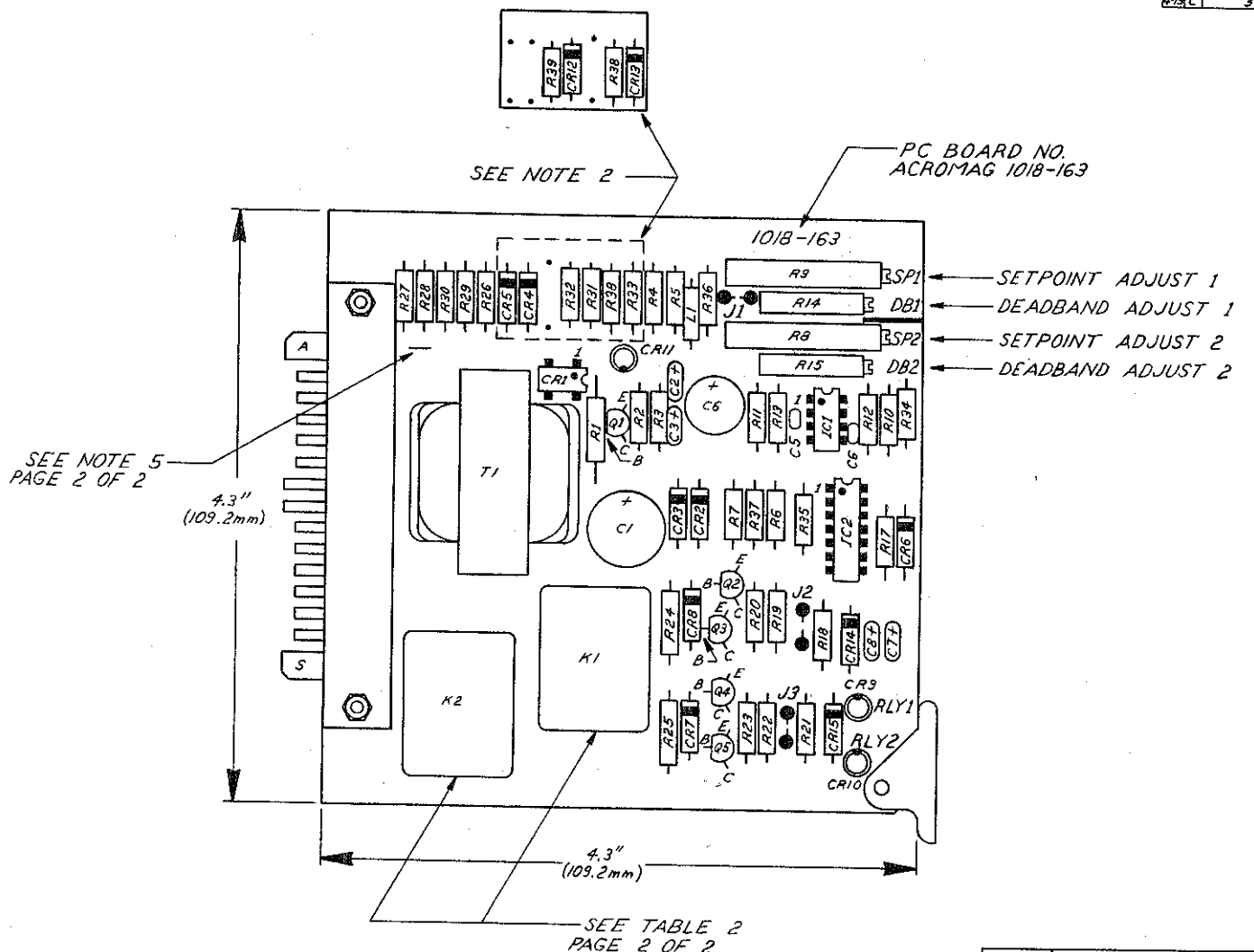
TOLERANCES (EXCEPT AS NOTED)	ACROMAG INC. - WIXOM, MICH.	
DECIMAL =	931 & 932 SERIES	SCALE / DRAWN BY / APPROVED BY
FRACTIONAL =	TITLE: SINGLE ALARM RELAY	
ANGULAR =	DATE: 10-14-77	DRAWING NUMBER: 4500-134E

PAGE 2 OF 2

C

BRUNING 40-21

DATE	SYM	REVISION RECORD	DR.	CK.
5-8	A	2013	MH	RM
10-16	B	3059	MH	CE
4-79	C	3230	MH	DB



NOTES
1. JUMPERS J1, J2, & J3 ARE LOCATED ON THE FOIL SIDE OF THE PC BOARD.
2. CR4 & CR5 DIODES ARE OMITTED ON TYPE "C" UNITS. DIODES CR12 & CR13 REPLACE RESISTORS R32 & R33 ON TYPE "C" UNITS. IN ADDITION, R31 IS DELETED & R39 IS USED.

TOLERANCES (EXCEPT AS NOTED)	ACROMAG INC. - WIXOM MICH.		
DECIMAL ±	931 & 932 SERIES	SCALE	DRAWN BY MH APPROVED BY RKM
FRACTIONAL ±	TITLE: DUAL ALARM RELAY		
ANGULAR ±	DATE: 10-14-77	DRAWING NUMBER: 4500-135C	C

BRUNING 40-21

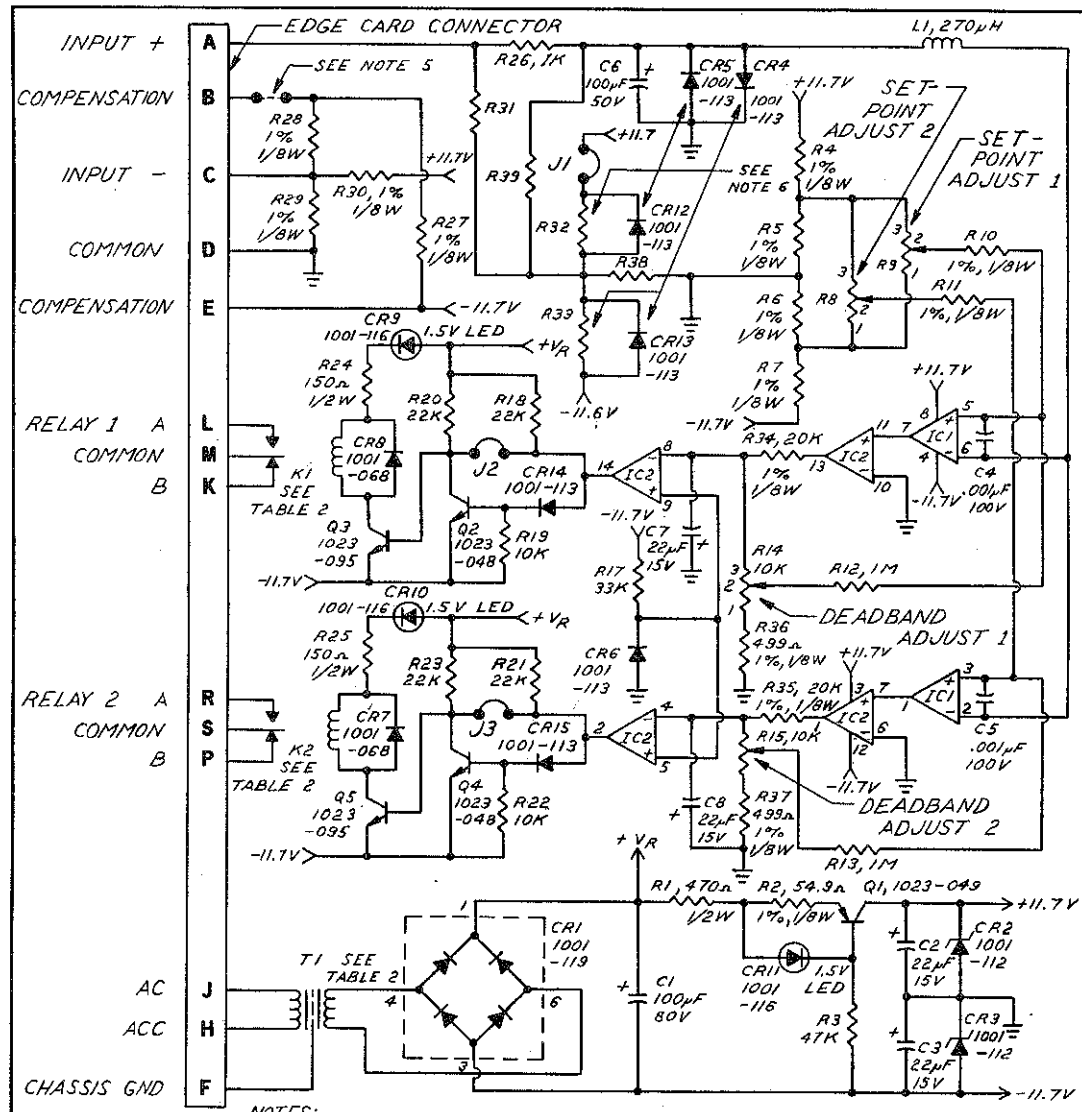


TABLE 1

	INPUT TYPE								
	M	C	J	K	T	S	E	P	RB
R4	4.53K	4.99K	3.48K	3.65K	4.99K	8.06K	3.65K	SELECTED	
R5	604Ω	NOT USED	75Ω	49.9Ω	33.2Ω	49.9Ω	150Ω		
R6	20Ω	JUMPER	10Ω	10Ω	10Ω	10Ω	20Ω		
R7	4.53K	NOT USED	2.94K	3.48K	4.12K	6.49K	3.24K		
R8	100Ω	10K	100Ω	100Ω	100Ω	100Ω	100Ω	100Ω	100Ω
R9	100Ω	10K	100Ω	100Ω	100Ω	100Ω	100Ω	100Ω	100Ω
R27	NOT USED		10K	10K	10K	NOT USED	10K	NOT USED	SELECTED
R28			1.21K	1.21K	1.21K		1.21K		
R29	JUMPER	JUMPER	31.6Ω	25.5Ω	25.5Ω	JUMPER	38.3Ω	20Ω	NOT USED
R30			20.5K	20.5K	20.5K	NOT USED	20.5K	12.4K	
R31			22M	22M	22M	22M	22M		23.7K
R32	NOT USED	CR12	56K	56K	56K	56K	56K		JUMPER
R33		CR13	68K	68K	68K	68K	68K	NOT USED	
R38			150K	150K	150K	150K	150K		
R10	499Ω	100K	499Ω	499Ω	499Ω	499Ω	499Ω	499Ω	499Ω
R11	499Ω	100K	499Ω	499Ω	499Ω	499Ω	499Ω	499Ω	499Ω
R39	NOT USED	JUMPER	NOT USED						

TABLE 2

PART	MODEL			
	931-XX-5	931-XX-8	932-XX-5	932-XX-8
K1	1022-015	1022-017	1022-015	1022-017
K2	1022-015	1022-017	1022-015	1022-017
T1	1014-061	1014-061	1014-062	1014-062

TABLE 3

JUMPER OPTIONS	JUMPERS J1	J2	J3
TC BREAK			
UPSCALE	IN	—	—
DOWNSCALE	OUT	—	—
RELAY OPERATION:			
NORMAL (RELAY ENERGIZED SIGNAL ABOVE SETPOINT)	—	IN	IN
REVERSE (RELAY ENERGIZED SIGNAL BELOW SETPOINT)	—	OUT	OUT

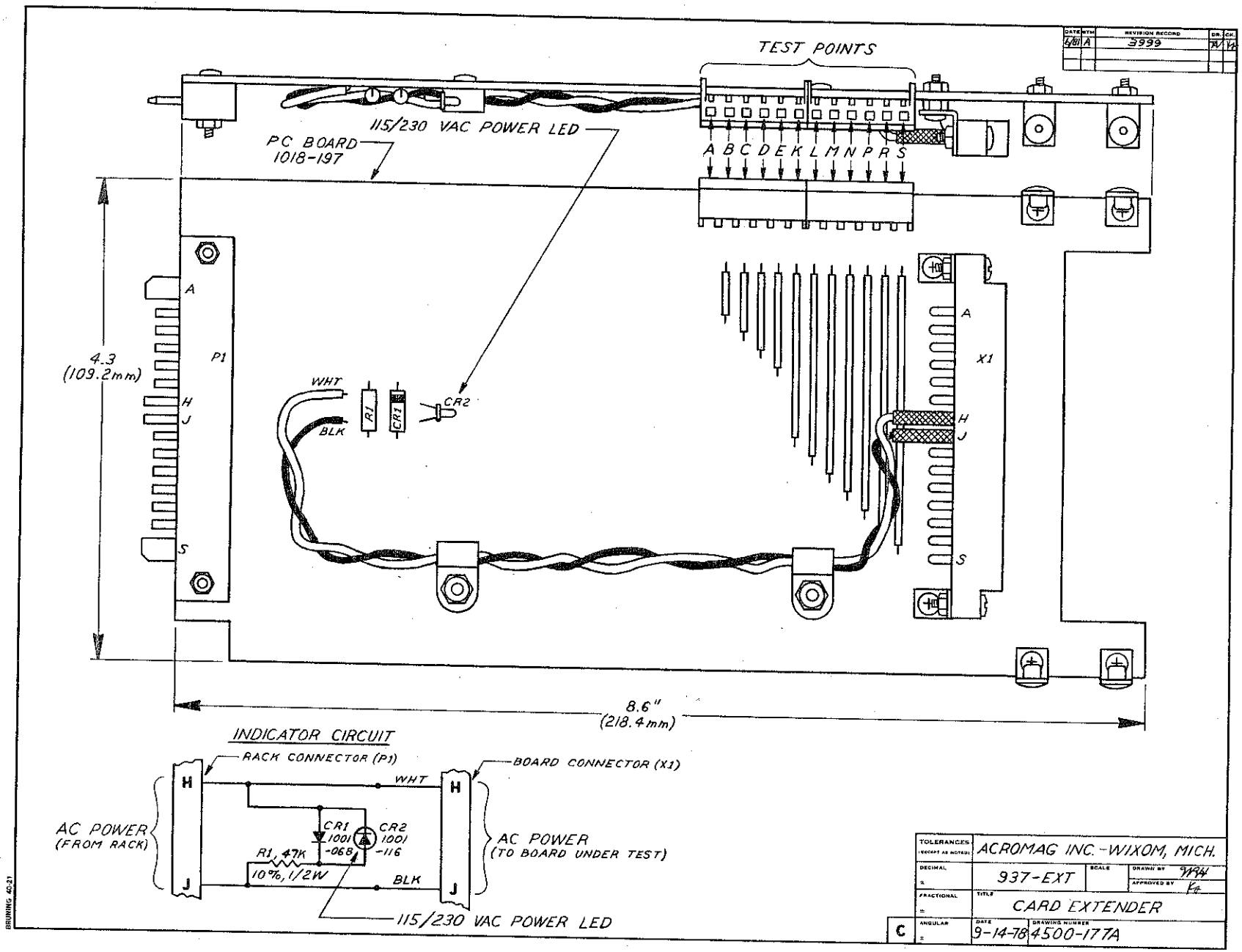
NOTES:
1. ALL RESISTORS 10%, 1/4 W UNLESS OTHERWISE SPECIFIED.
2. ALL SEVEN DIGIT NUMBERS ARE ACROMAG PART NUMBERS.
3. IC1 IS AN ACROMAG 1033-208 (DUAL OP-AMP).
4. IC2 IS AN ACROMAG 1033-152 (QUAD COMPARATOR).
5. THIS JUMPER INSTALLED ON J, K, T, S & E THERMOCOUPLE TYPES ONLY.
6. CR4 & CR5 DIODES ARE OMITTED ON TYPE "C" UNITS. CR12 & CR13 DIODES REPLACE RESISTORS R32 & R33 ON TYPE "C" UNITS.

PAGE 2 OF 2

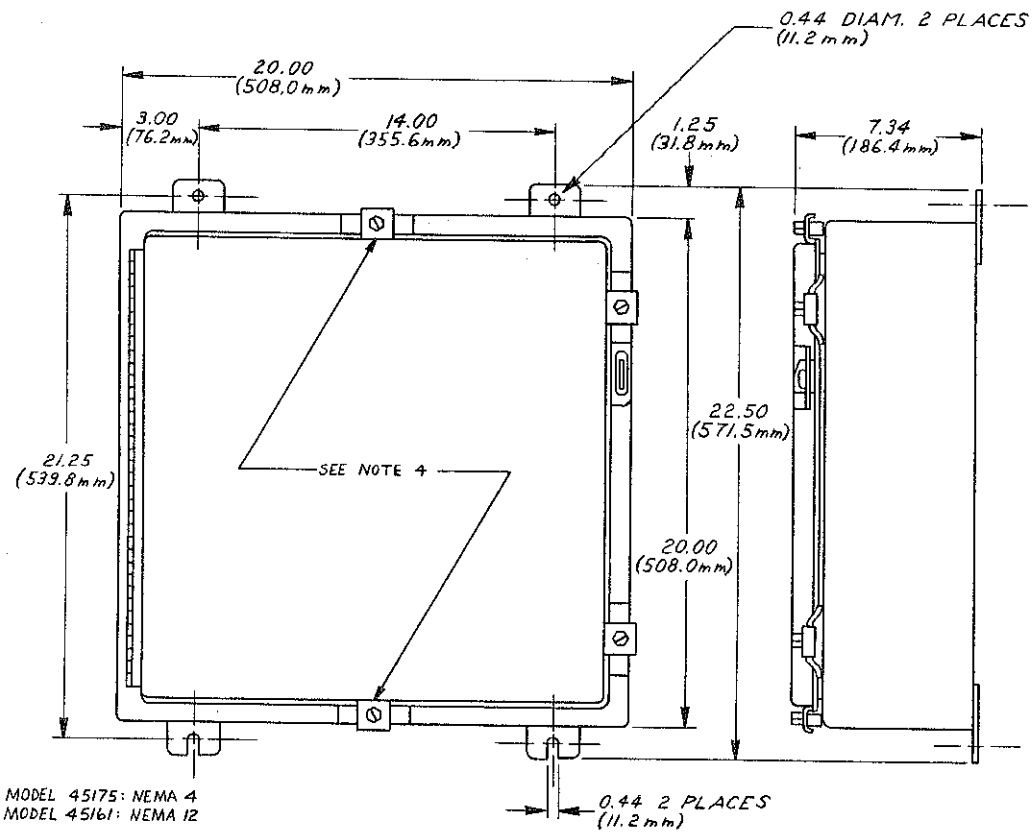
DATE	SYM	REVISION RECORD	DR.	CK.
5-78	A	2013	MM	DM
10-78	B	3059	MM	CMS
4-79	C	3230	MM	DB

TOLERANCES (EXCEPT AS NOTED)	ACROMAG INC. - WIXOM, MICH.
DECIMAL ±	931 & 932 SERIES
SCALE	DRAWN BY 9/79
APPROVED BY RKM
FRACTIONAL ±	TITLE DUAL ALARM RELAY
ANGULAR ±	DATE 10-14-77
DRAWING NUMBER 4500-135C
C

BRUNING 40-21


TEST POINTS
115/230 VAC POWER LED
PC BOARD
1018-197
A B C D E K L M N P R S
4.3
(109.2mm)
P1
A
H
J
S
WHT
BLK
R1
CR1
CR2
X1
8.6"
(218.4mm)
INDICATOR CIRCUIT
RACK CONNECTOR (P1)
BOARD CONNECTOR (X1)
WHT
AC POWER
(FROM RACK)
CR1
1001
-068
CR2
1001
-116
R1, 47K
10%, 1/2W
BLK
AC POWER
(TO BOARD UNDER TEST)
115/230 VAC POWER LED
BRUNING 40-21
REVISION RECORD
3999
ACROMAG INC. -WIXOM, MICH.
937-EXT
CARD EXTENDER
9-14-78
4500-177A
C

DATE	SYM	REVISION RECORD	ELP	CR.	CK.
4-78	A	3245			
1-83	B	5978			



NOTES:

1. MATERIAL 0.075" (1.9 mm) THICK STEEL.
2. FINISH: SURFACES ARE PHOSPHATISED WITH GRAY PRIME OUTSIDE AND WHITE ENAMEL INSIDE.
3. CONDUIT MOUNTING HOLES AND FITTINGS ARE CUSTOMER SUPPLIED.
4. THESE SPECIFIC CLAMPS ON NEMA 4 ENCLOSURES ONLY.
5. DIMENSIONS ARE IN INCHES (MILLIMETERS).

ACROMAG REF. NEMA 4 - 1036-019
NEMA 12 - 1036-026

TOLERANCES (EXCEPT AS NOTED)	ACROMAG, INC.-WIXOM, MICH.	
DECIMAL ±	SERIES 920/930	DRAWN BY
FRACTIONAL ±	TITLE NEMA 4/12 ENCLOSURE	APPROVED BY
ANGULAR ±	DATE 9-8-78	DRAWING NUMBER 4500-175B

C

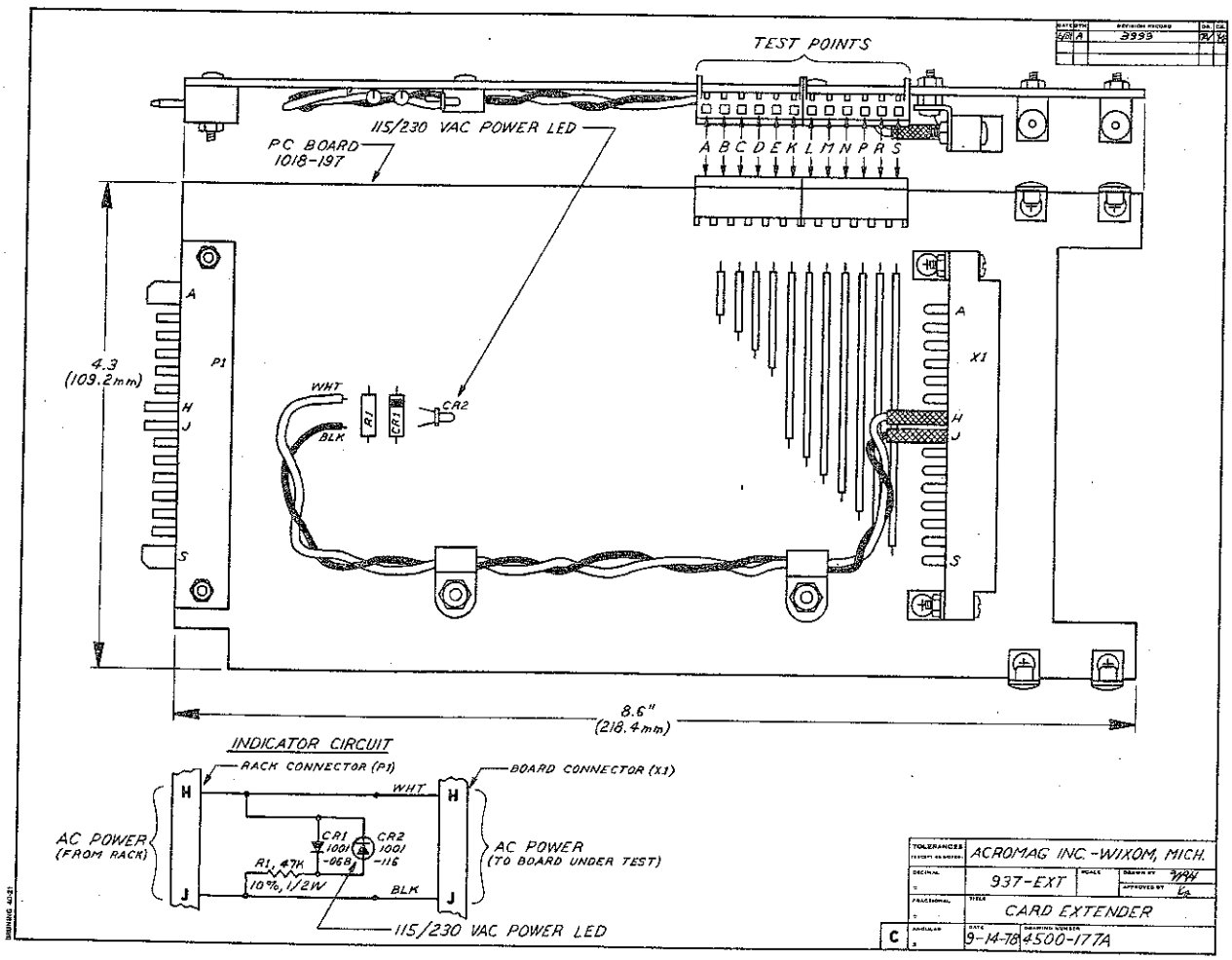
BRUNING 40-21

Extender Board - Model 937-EXT

General Information:

The Model 937-EXT Extender Board enables the service technician to test or adjust the internal portion of a card while it is connected to the card cage AC supply and the input and output terminations. Test points are located on the top of the 937-EXT Extender Board to provide access to all 15 pins of the edge connector on the plug-in module. An L.E.D. mounted on the Extender Board indicates when AC power is being applied. The Extender Board can be used in either the Acromag 937-CG-115 or 937-CG-230 card enclosure. It accepts all cards designed to mount in these enclosures.

The test point socket will accept a 0.080 in. (maximum) diameter probe tip. See Drawing No. 4500-177A (below) for test point location. Each test point is labeled with a letter which specifically corresponds to a letter on the edge-card connector. Refer to the schematic diagram of the plug-in module for the pin letter assignment (below).



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