GENERAL MONITORS

MODEL DC120

Smart Sensor Combustible Gas
Readout/Relay Module

INSTRUCTION MANUAL 11

Part No. MANDC
Revision 11-95

GENERAL MONITORS

26776 Simpatica Circle
Lake Forest, California 92630-8128
Telephone: (714) 581-4464
Fax: (714) 581-1151
Visit our Website at: **http://www.generalmonitors.com/**

06 February, 1995

To All Model DC120/DT220 Users:

The Model DC120 (revision 12/89) and the Model DT220 (revision 11/88) Instruction Manuals do not adequately reflect the current revision of these units. These manuals are in the process of being updated, and in order to continue servicing you on these products, please make note of the following changes:

- The Group B breather drain option is not available on the Models DC120 & DT220. The table below lists the pages where the Instruction Manual mentions a Group B breather drain option.

Model DC120	**Model DT220**
Introduction, Page 1 Specifications, Page 12	Introduction, Page 1 Specifications, Page 11
Configuration Code DC120-31X-X00-12X is not valid	Configuration Code DT220-31X-X00-12X is not valid

- To change the normally open (NO) and normally closed (NC) relay contacts refer to the table below for the correct Input/Output Board jumper selections:

	Alarm		Warn	
Jumper	NO	NC	NO	NC
W1			X	
W2				X
W3	X			
W4		X		

If you have any questions, please contact your General Monitors' Sales Representative or the factory direct. Thank you.

Respectfully,

Charles Simek
Technical Writer
General Monitors, Inc.

GENERAL MONITORS

CONTENTS

GENERAL MONITORS

MODEL DC120

COMBUSTIBLE GAS SMART SENSOR DUAL/SINGLE CHANNEL READOUT/RELAY MODULE

I. INTRODUCTION

A. NOTICE

All information contained in this instruction manual may be used only to install and operate the Model DC120 System provided by GENERAL MONITORS, INC. (GMI). The sale of the instrument does not license the user to reproduce GENERAL MONITORS' drawings or to utilize proprietary circuitry or information without prior written permission.

The Model DC120 System is easy to install and operate. However, this manual should be read in full, and the information contained herein understood, before attempting to install or operate the system.

B. GENERAL

The Model DC120 is a dual/single channel Readout/Relay Module to be used with the Model SC100 Smart Sensor. This system is designed to continuously monitor most combustible gases and vapors in the 0-100% Lower Explosive Limit (LEL) range. Normally only a periodic system calibration check is needed to assure dependable performance. There are relatively few combustible gases which should not be monitored by the system; however, as a precaution GMI should always be consulted to verify the feasibility of monitoring any gas or vapor other than those specified at the time of purchase.

The microprocessor based DC120 is housed in an explosion-proof/weatherproof enclosure and may be used in a hazardous location. Its electrical classification is Class I, Division 1, Groups C and D.

NOTE: Weatherproof and explosion proof enclosures are not included in the Factory Mutual performance approval of these systems.

The DC120 has digital displays (0-99% LEL) and visual status indicators for gas alarms (ALARM and WARN), calibration (CA) and malfunction (Er). Three relay alarm circuits are provided: (two for the gas alarm circuits, ALARM and WARN, and one for the malfunction alarm circuits).

C. OPTIONAL CONFIGURATIONS

The Model DC120 has been designed to provide a compact, field mounted module and as such, optional configurations are limited and must be provided by modifications to the circuit boards rather than field adjustable DIP switches.

C. OPTIONAL CONFIGURATIONS (cont'd)

The standard configuration for the Model DC120 is as follows:

Dual Channel unit with common relays.
SPST relays, unsealed.
Latching ALARM Relay - Non-latching WARN Relay.
ALARM & WARN Relays de-energized.
ALARM & WARN Relay contacts normally open.
Malfunction Relay is always supplied energized with normally closed contacts.

Options which may be specified when ordering are limited to the following:

Both ALARM & WARN Relays Non-latching.
Both ALARM & WARN Relays latching.
Either or both ALARM & WARN Relay contacts normally closed.
Single channel system.
A single channel system will have channel 1 as the active channel and channel 2 will be inoperative.

Check your original order for the Model DC120 you have to see if variations of the above options were ordered.

NOTE: Factory Mutual requires that any combustible gas controller alarm be of the latching type and not capable of being set above 60% LEL.
If the Model DC120 has been ordered with non latching relays it should be connected to an auxiliary system that accomplishes the latching function.

D. OPERATION

The Model DC120 requires 24 VDC power for operation. It receives the 4 to 20 MA output signal from the SC100. The digital display of the DC120 shows the gas concentration level up to 99% LEL. Higher concentration levels will cause the display to blink the 99 reading. Should a malfunction occur in an SC100 Smart Sensor, the DC120 will display an "Er" on the appropriate channel display. During calibration the DC120 will display a "CA" on the channel of the SC100 that is being calibrated.

If the latching relay option is selected, an explosion proof pushbutton switch (GMI P/N 30051-1) is installed in one of the two 3/4" NPT ports. (See item 11 on Figure 2). If a gas concentration exceeding the WARN or ALARM setpoint is detected, its value will be indicated by the DC120, and the appropriate LED will be illuminated. When latching alarms are used and the gas concentration has dropped below the preset ALARM level, the ALARM may be reset by actuating the pushbutton switch.

D. OPERATION (cont'd)

The WARN may also be reset in the same manner when the gas concentration falls below the WARN setpoint.

NOTE: If both channels are in the WARN or ALARM condition the LED's will continue to flash and cannot be reset until both channels fall below the setpoint levels.

GENERAL MONITORS

II INSTALLATION INSTRUCTIONS

A. LOCATION OF THE UNIT

The electrical connections to the Model DC120 must be made utilizing explosion proof conduit if the unit is to be used in a hazardous area. In most cases, the connection of the enclosure to the conduit should provide adequate mechanical strength. If greater strength is required the enclosure may be secured by the two mounting holes located on each side of the unit. (see fig. 1).

The Model DC120 must not be located in direct sunlight as this causes an unnecessary amount of heat to accumulate inside the unit, and it also makes the LED displays difficult to read. In most applications a shaded location can be found which will not require the addition of a shelf or other type of protection.

The mounting should be as free from shock and vibration as possible. Although the unit is RFI resistant, it should not be located near transmitters, generators or other sources of electro-magnetic radiation.

B. SYSTEM INTERCONNECTIONS

To gain access to the terminal block (TB1) of the DC120 it is necessary to to remove the cover of the explosion proof housing by turning it counter clockwise. After the cover has been removed, grasp the red display window by the two finger holes on either side and pull the entire display board out of the unit. This will expose the Input/Output Board located under the Display Board and terminal block TB-1 which is an 11 position block. (See Figure 4).

The TB1 field connections for the Model DC120 are:

TB1 -1. System Reset Input
TB1 -2. Warning Output Relay Contact
TB1 -3. Warning Common Relay Contact
TB1 -4. Malfunction Output Relay Contact
TB1 -5. Malfunction Common Relay Contact
TB1 -6. Alarm Common Relay Contact
TB1 -7. Alarm Output Relay Contact
TB1 -8. 4-20 mA Input Channel One
TB1 -9. 4-20 mA Input Channel Two
TB1 -10. System Common
TB1 -11. +24 VDC Input

The connections are compression type and are made by pressing down with a small screwdriver on the orange tab portion of TB1, inserting the wire and releasing the tab.

C. POWER CONNECTIONS

The DC120 and two SC100 smart sensors units will operate from a 22 to 30 VDC source and will require a current of less than 0.75 amperes. There is no power on-off switch, so power must remain disconnected until all other wiring connections are made. A power on-off switch is not included to prevent accidental system shutdown, since the system is designed for continuous use to maximize protection from combustible gases. See Figure (5) for the connection of the COM (TB1-10) and the + 24VDC (TB1-11) leads.

D. SIGNAL CONNECTIONS TO THE MODEL SC100

The 4-20 mA output signals from two Model SC100 Smart Sensors are interconnected with the Model DC120 Readout/Relay unit to provide 1) gas concentration indication remote to the Model SC100 and 2) alarm conditions by way of visual LED indicators and relay contact closures.

To interconnect the DC120 to the two SC100 units:

(Refer to Fig. 1 in the SC100 instruction manual for the SC100 connections).

1. Make sure that the common leads of all three units, terminal 6 identified as "COM (BLK)" on terminal block TB1 of the two SC100 units and terminal TB1-10 of the DC120, are properly tied together.

2. Connect the 4-20 mA output identified as current out (WHT) of the first SC100 to terminal TB1-8 of the Model DC120.

3. Connect the 4-20 mA output identified as current out (WHT) of the second SC100 to terminal TB1-9 of the Model DC120.

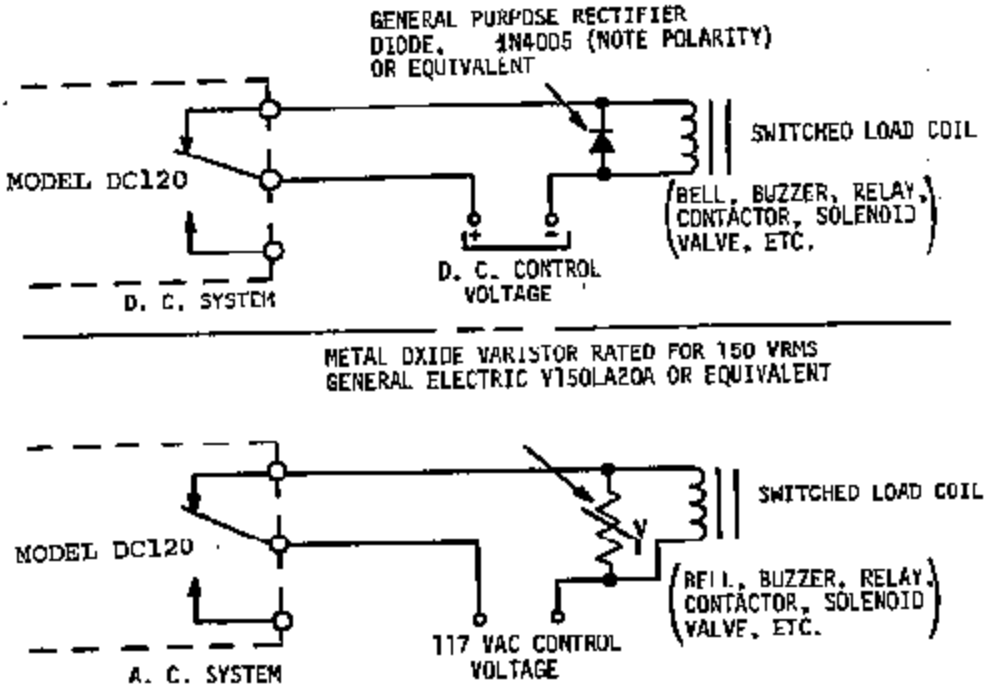
E. ALARM WIRING CONNECTIONS

Alarm wiring connections are made to terminals 2 through 7 of connector TB1 of the Model DC120. The ALARM, WARNing and Malfunction relay contacts (dry) are SPST and rated at 2 amperes at 24VDC or 1 ampere at 117VAC, resistive. The ALARM and WARN relays may have been ordered as latching (manual reset) or nonlatching (automatic reset), as normally closed contacts or normally open. Latching ALARM contacts and non-latching WARNing contacts are standard. The Malfunction relay is normally energized with the contacts held open when power is applied.

The relay connections are identified in paragraph II.B above. The contact identified as the output relay contact will be either normally open or normally closed depending on which option has been selected.

E. ALARM WIRING CONNECTIONS (cont'd)

CAUTION: Inductive loads (bells, buzzers, relays, contactors, solenoid valves etc.) connected to the relay contacts must be clamped as shown in one of the following diagrams. Unclamped inductive loads can generate voltage spikes in excess of 1000 volts. Spikes of this magnitude will cause false alarms and possible damage.



After completion of the interconnections, the display board assembly should be replaced in the housing. Notice that the two interconnecting plugs P1 and P2 (see figure 3) are keyed so that the assembly cannot be made incorrectly.

F. APPLYING POWER

Before applying power to the system for the first time, all wiring connections should be double-checked for correctness.

The system has a time delay feature. For approximately 45 seconds after the power is applied to the system the alarm relays remain deactivated. The purpose of this feature is to eliminate false alarms which might otherwise result while the sensor beads are stabilizing. The time delay is also initiated when the SC100 Smart Sensor returns to normal operation from the malfunction mode. During the time delay, the display on the DC120 will indicate a zero gas condition.

G. ALARM SET POINT ADJUSTMENTS

CAUTION: The following adjustments require that the explosion proof cover be removed from the DC120. It is important to insure that no combustible gas is present when these adjustments are being made.

NOTE: To minimize the physical dimensions of the Model DC120, an alarm relay disable switch has not been included. Before making alarm level adjustments or testing the system with a gas sample, all warning alarm devices should be temporarily de-activated to prevent false alarming.

1. Alarm Level Display

The values of the WARN and ALARM settings may be viewed at anytime. To do so, remove cover of the enclosure and, using a pencil point or small screwdriver, press the switch button labeled DISPLAY LEVELS. The WARN level will appear on the channel 1 display and the ALARM level will appear on the channel 2 display.

2. Alarm Level Setting

To make adjustments to the ALARM and WARN level settings the display window must be removed. Remove the four screws securing it to the display circuit board. To set the WARN level, hold the DISPLAY LEVELS switch (S1) down and adjust the WARN trimpot (R4) (see fig. 3) until the desired level is displayed on the channel 1 display. To set the ALARM level, hold the DISPLAY LEVEL switch (S1) down and adjust the ALARM trimpot (R2) (see fig. 3) until its desired level is displayed on the channel 2 display. When completed, secure the display window to the display circuit board with the four screws and replace the cover on the enclosure.

III. INDICATORS, DISPLAYS and RESET FUNCTION

A. % LEL DISPLAY

The digital display is scaled from 0 to 99% LEL for the gas/vapor for which the system will be calibrated. Should a malfunction occur in a given channel the display for that channel will indicate an "Er" reading and the MALfunction relay switch contacts will close. During the calibration of a SC100 Smart Sensor, the display reading will be "CA".

CAUTION: READINGS OF 99% LEL OR HIGHER (A BLINKING 99 INDICATION), INDICATE AN EXPLOSIVE GAS CONCENTRATION IS PRESENT AND IMMEDIATE ACTION IS REQUIRED.

B. ALARM INDICATORS

When the gas concentration exceeds the previously set WARN level the amber WARN LED will blink and the WARN relay switch contacts will activate. If the gas concentration continues increasing past the ALARM level setting the ALARM LED will blink and the ALARM relay switch contacts will activate.

C. RESET SWITCH

If latching relays are selected for the ALARM only or the ALARM and WARN conditions, a reset switch must be provided. General Monitors recommends that explosion proof switch P/N 30051-1 be used for this application. The GMI explosion proof switch will mount directly in one of the two 3/4" NPT ports in the Model DC120 enclosure, and will be installed prior to being shipped from the factory. If it is desired to use the opposite port, disconnect the two leads from the terminal block (TB1) and unscrew the switch from the port. When installing it in the opposite port it is only necessary to install it hand tight. The switch has four colored leads but only two are used in this application. The brown lead from the switch is connected to the DC120 common terminal (TB1-10) and the green lead is connected to the system reset in terminal (TB1-1) The orange and gray leads are not used.

IV. OPERATIONAL ADJUSTMENTS AND PROCEDURES

A. INITIAL START-UP

Each Model DC120 is completely checked at the factory for proper operation. However, a complete checkout is a necessity upon placing the system in operation to assure system integrity. This includes verifying the digital indicator zero, checking and/or adjusting alarm set points and performing a complete calibration procedure for each associated Model SC100.

B. MODEL SC100/DC120 CALIBRATION

During a normal calibration of a Smart Sensor, Model SC100, the output current is held at a constant 1.5 mA so that alarm circuits need not be disabled to prevent activation of the relay contacts during calibration. If a test is to be made of the DC120 by gassing the sensor, then the alarm indicating devices will have to be disabled.

C. ALARM SET POINT CHECK

To check the alarm set points, depress the DISPLAY LEVELS switch and observe the corresponding readings on the digital display.

NOTE: Up to 3% hysteresis is normal around alarm set points. This is required to prevent relay chatter. If the relays are latching, the RESET will have to be depressed to deactivate alarm circuits.

V. SYSTEM PROBLEMS AND TROUBLESHOOTING

A. MAINTENANCE

Once installed, the Model SC100/DC120 systems require little or no routine maintenance other than periodic calibration checks which GMI recommends be performed every 90 days. GMI also recommends that a calibration schedule be established and maintained and that a log book be kept showing calibration dates and dates of sensor replacement.

B. TROUBLESHOOTING TABLE

The information presented in the following table is designed to correct the more common problems which appear during system startup and operation. Should the various actions suggested in the table fail to restore normal operation, we recommend that the factory be consulted and, if necessary, that the module be returned to the factory for repair.

V. MODEL DC120 TROUBLE-SHOOTING GUIDE

INTRODUCTION:

This section is intended to be a guide in correcting problems which may arise in the field. This section is not all-inclusive, and General Monitors should be contacted for assistance if the corrective actions listed do not eliminate the problem. If equipment or qualified personnel required for various tests is not available it is recommended that the defective unit be returned to General Monitors for repair. A complete written description of the problem should be included and it is necessary to obtain a Return Material Authorization number prior to returning the equipment. Call the factory for an RMA number to include with your shipment.

Be sure to disconnect external alarm wiring before making any check which might send the unit into alarm, if an alarm condition will create problems.

NOTE: If the equipment is under warranty, any repairs performed by persons other than General Monitors' authorized personnel may void the warranty. Please read the warranty statement carefully.

1.	% LEL displays do not turn on after application of power.	1. No input power. 2. Input voltage may be greater than 32 VDC	1. Insure proper power supply to controller. 2. Be sure input voltage is in the range of 22 to 30 VDC.
2.	One or both channels indicate "Er".	1. Low input power. 2. An SC100 is in the malfunction mode.	1. Insure proper power supply to controller. 2. Check the SC100 units for proper operation
3.	WARN and/or ALARM LED's do not turn "ON" when % LEL readout exceeds alarm set point.	1. Alarm pots not properly adjusted.	1. Perform ALARM and WARN alarm set point adjustment.

GENERAL MONITORS

VI. SPECIFICATIONS FOR MODEL DC120

Dimensions:	4-1/2" dia. x 3-1/2" high with two 3/4 NPT ports.
Classification:	NEMA 7, NEMA 4 suitable for Class I, Division 1, Groups C. & D.
Weight:	3.0 lbs. (1.4 Kg).
Temperature Range:	-40°F to 140°F (-40°C to 60°C)
Storage Temperature:	-28°F to 130°F.
Humidity:	NEMA 4 Weatherproof enclosure.
Input Power:	22 to 30 VDC at 0.12 Amps maximum.
Signal Input: (each channel)	0 to 20 milliamperes (compatible with the SC100 Smart Sensor).
Display Range:	0 to 99% LEL with blinking digits for over-range.
Accuracy:	± 3% LEL or ± 10% of applied gas, whichever is greater.
Status Indicator:	Red LED for ALARM, Amber LED for WARNing, "Er" message on display for Malfunction, and "CA" on display for Calibration.
Display levels switch:	To set and/or indicate WARN Level on Channel 1 and ALARM level on Channel 2.
Relay Contacts:	SPST for Alarm, Warning and Malfunction. 2 amperes at 24 VDC, 1 ampere at 117 VAC resistive.
Maximum Wire Distance: (18 gauge wire)	+24 VDC supply to display unit 100 feet. Sensor to display unit 1000 feet.
Warranty:	Two years.

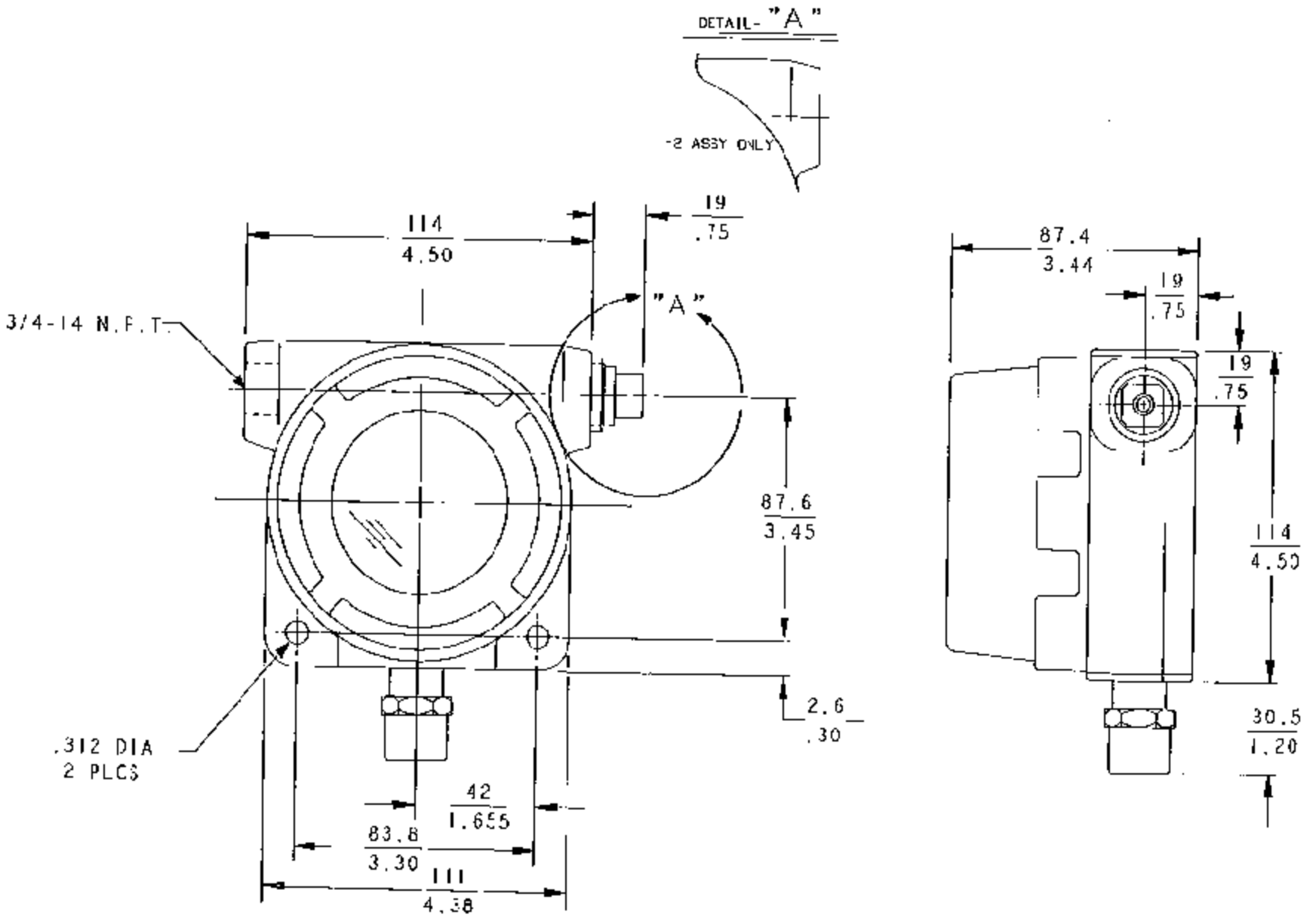
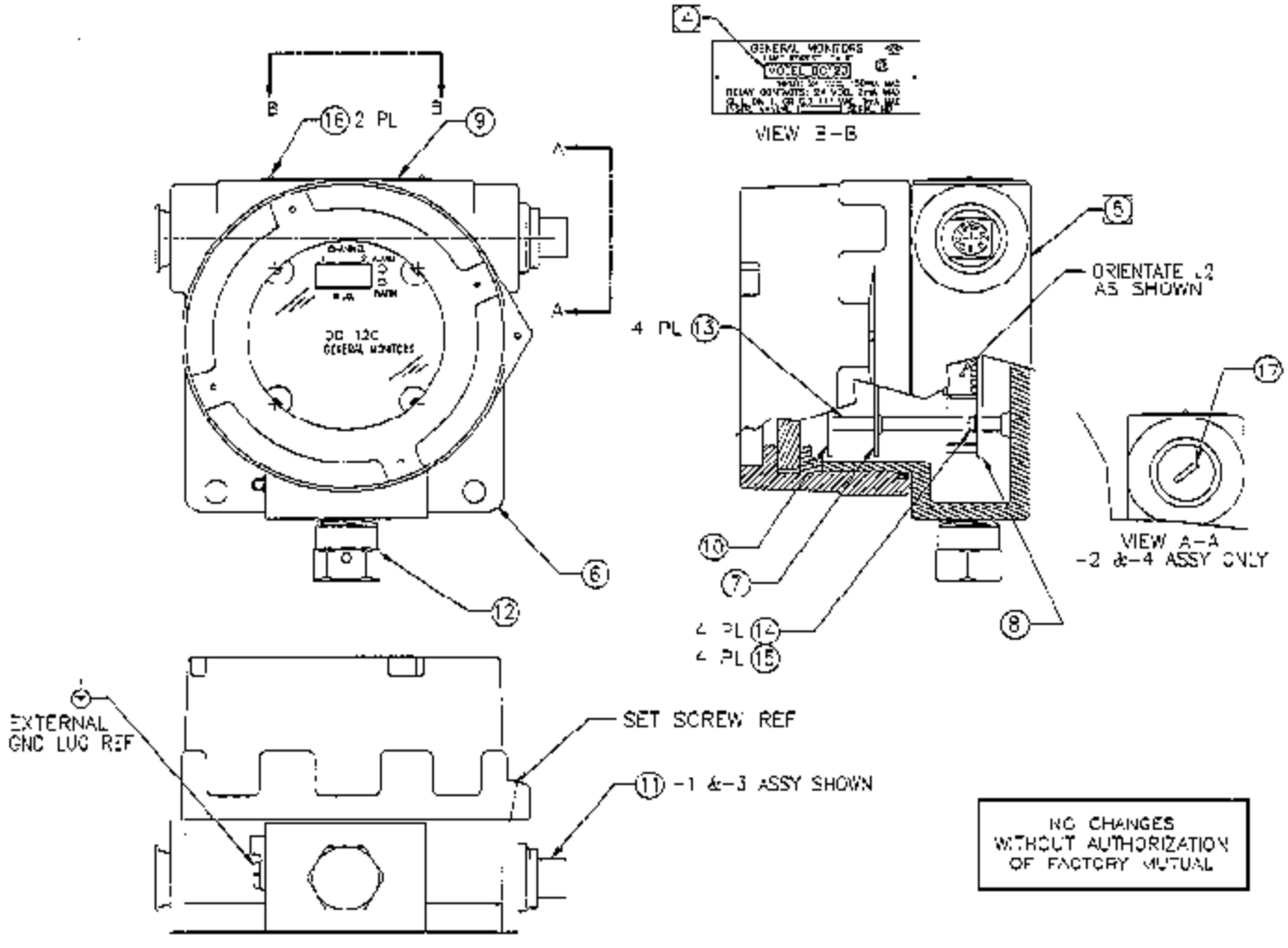


FIG 1

OUTLINE DIMENSIONS
MODEL DC120



5. STAMP CUSTOMER CONFIGURATION PER DWG 30048 USING BLACK METAL ETCH INK ON THE BACKSIDE OF HOUSING.
4. PRIOR TO MOUNTING, ENGRAVE "MODEL DC120" AND INSTR. MANUAL NO. AS SHOWN.
3. WIRE PER DRAWING NO. 30034.
2. LUBRICATE ALL THREADS USING AN ANTISEIZE COMPOUND. DO NOT USE ANY LUBRICANTS CONTAINING SILICONES.
1. DELETED.

FOR PARTS LIST SEE COMPUTER BOM 30030-

–	-4	READOUT WITHOUT SWITCH ASSY (FM APPROVED MARK)	6
			7
–	-3	READOUT WITH RESET SWITCH ASSY (FM APPROVED MARK)	8
			5
–	-2	READOUT WITHOUT SWITCH ASSY	4
			3
–	-1	READOUT WITH RESET SWITCH ASSY	2
			1

Figure 2, Sheet 1 Final Assembly, Model DC120 (30030 G)

30030	INFO		FINAL ASSY READOUT MODULE COMB	E	
30033	INFO		SCHEMATIC INPUT/OUTPUT BD	C	
30032	INFO		SCHEMATIC DISPLAY BOARD	D	
30031	INFO		OUTLINE DRAWING	D	
30034	INFO		FIELD CONNECTIONS	D	
30035-1	1		CCA DISPLAY BOARD DC120/DT220	F	7
30038-1	1		CCA INPUT/OUTPUT BD DC120/DT220	G	8
30041-1	1		ENCLOSURE EXPL PROOF MOD BLUE	D	6
30042-1	1		NAMEPLATE DC120	C	9
30050-1	1		DISPLAY WINDOW SILKSCREENED DC120	B	10
30051-1	1		SWITCH PUSHBUTTON ASSY	B	11
914-060	1	KDB-1	BREATHER/DRAIN EXPL PROOF		12
9043	4		SCR 6-32X3/8 PHIL FL HD BLK 100DGR		13
9117	4		WASH #6 INT-T STL CAD PLT		15
9047	4		SCR 6-32X7/16 PHIL PAN HD SST		14
928-770	2	0-3/16	STUD DRIVE LOCK-ROUND HD 3/16 LG.		16

(30030-1 E)

FIG 2 SHT 2

PARTS LIST
FINAL ASSEMBLY
MODEL DC120
WITH RESET SWITCH

1	30030	INFO		FINAL ASSY REARCUT MODULE COMB	
2	30033	INFO		SCHEMATIC INPUT/OUTPUT BD	
3	30032	INFO		SCHEMATIC DISPLAY BOARD	
4	30031	INFO		OUTLINE DRAWING	
5	30034	INFO		FIELD CONNECTIONS	
6	30035-1	1		CCA DISPLAY BOARD DC120/DT220	7
7	30038-1	1		CCA INPUT/OUTPUT BD DC120/DT220	8
8	30041-1	1		ENCLOSURE EXPL PROOF MOD BLUE	6
9	30042-1	1		NAMEPLATE DC120	9
10	30050-1	1		DISPLAY WINDOW SILKSCREENED DC120	10
11	914-065	1	OLP-2	PLUG 3/4 IN CLOSE UP	17
12	914-060	1	KDB-1	BREATHER/DRAIN EXPL PROOF	12
13	9043	4		SCR 6-32X3/8 PHIL FL HD BLK 1000GR	13
14	9117	4		WASH #6 INT-T STL CAD PLT	15
15	9047	4		SCR 6-32X7/16 PHIL PAN HD SST	14
16	928-770	2	0-3/16	STUD DRIVE LOCK-ROUND HD 3/16 LG.	16

(30030-2 E)

FIG 2 SHT 3

PARTS LIST
FINAL ASSEMBLY
MODEL DC120
WITHOUT RESET SWITCH

30030	INFO		FINAL ASSY READOUT MODULE COMB	E	
30033	INFO		SCHEMATIC INPUT/OUTPUT BD	C	
30032	INFO		SCHEMATIC DISPLAY BOARD	D	
30031	INFO		OUTLINE DRAWING	D	
30034	INFO		FIELD CONNECTIONS	D	
30035-2	1		CCA DIPLAY BOARD FM	A	7
30038-1	1		CCA INPUT/OUTPUT BD DC120/DT220	G	8
30041-1	1		ENCLOSURE EXPL PROOF MOD BLUE	D	6
30042-1	1		NAMEPLATE DC120	C	9
30050-1	1		DISPLAY WINDOW SILKSCREENED DC120	D	10
30051-1	1		SWITCH PUSHBUTTON ASSY	B	11
914-060	1	KDB-1	BREATHER/DRAIN EXPL PROOF		12
9043	4		SCR 6-32X3/8 PHIL FL HD BLK 100DGR		13
9117	4		WASH #6 INT-T STL CAD PLT		15
9047	4		SCR 6-32X7/16 PHIL PAN HD SST		14
928-770	2	0-3/16	STUD DRIVE LOCK-ROUND HD 3/16 LG.		16

(30030-3 A)

FIG 2 SHT 4

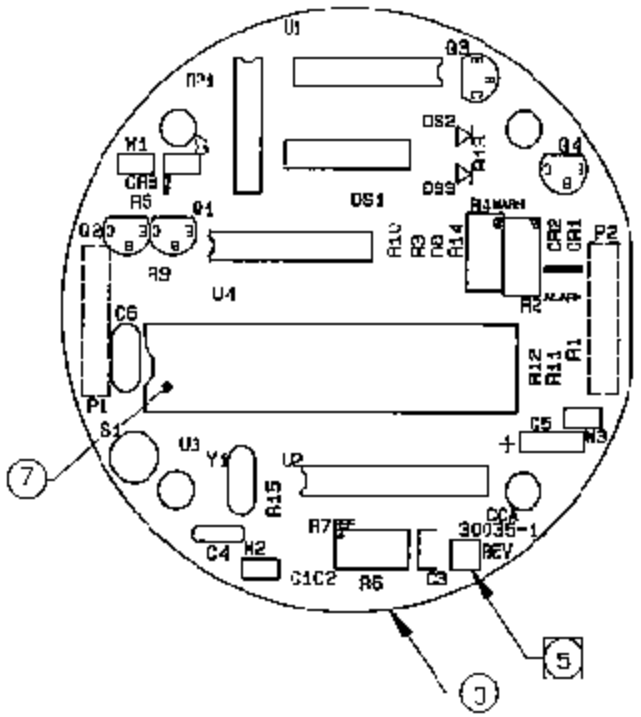
PARTS LIST
FINAL ASSEMBLY
MODEL DC120
WITH RESET SWITCH
FM APPROVED ALARMS

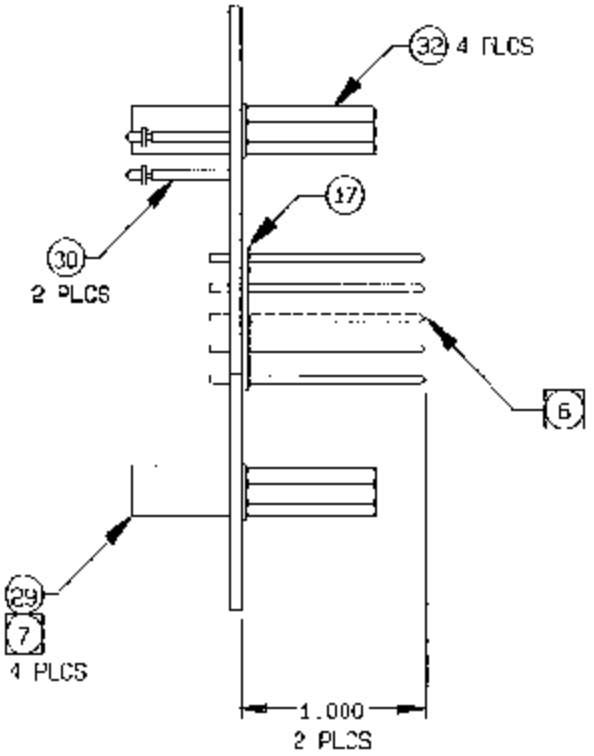
PART NUMBER	GMIL PART	QTY	MFG PART NUMBER	DESCRIPTION	ITEM	REFERENCE DESIGNATOR
30030		INFO		READOUT MODULE COMB		
30033		INFO		SCHEMATIC INPUT/OUTPUT BD		
30032		INFO		SCHEMATIC DISPLAY BOARD		
30031		INFO		OUTLINE DRAWING		
30034		INFO		FIELD CONNECTIONS		
30035-2		1		CCA DIPLAY BOARD FM	7	
30038-1		1		CCA INPUT/OUTPUT BD DC120/DT220	8	
30041-1		1		ENCLOSURE EXPL PROOF MOD BLUE	6	
30042-1		1		NAMEPLATE ONE/TWO CHANNEL READOUT	9	
30050-1		1		DISPLAY WINDOW SILKSCREENED DC120	10	
914-065		1	CUP-2	PLUG 3/4 IN CLOSE UP	17	
914-060		1	KDB-1	BREATHER/DRAIN EXPL PROOF	12	
9043		4		SCR 6-32X3/8 PHIL FL HD BLK 1000GR	13	
9117	27600	4		WASH #6 INT-T STL CAD PLT	15	
9047		4		SCR 6-32X7/16 PHIL PAN HD SST	14	
928-770		2	0-3/16	STUD DRIVE LOCK-ROUND HD 3/16 LG.	16	

30030-4A

FIG 2 SHT 5

PARTS LIST
FINAL ASSEMBLY
MODEL DC120
WITHOUT RESET SWITCH
FM APPROVED ALARMS





OPTION CONFIGURATION						
JUMPERS	FUNCTION					
	ALARM DELAY		RESET POLAR		DISPL. OPERATION	
	LATCH	NON-LATCH	LATCH	NON-LATCH	DUAL	SINGLE
W1	OUT	IN				
W2			OUT	IN		
W3					OUT	IN

NO CHANGES
WITHOUT AUTHORIZATION
OF FACTORY MUTUAL

FOR PARTS LIST SEE COMPUTER BOM 30035-

REF	-2	CCD DISPLAY BOARD (FM APPROVED ALARM)
REF	-1	CCD DISPLAY BOARD

(REF 30035 F)

FIG. 3

CCA DISPLAY BOARD

PART NUMBER	GMTI PART	QTY	MFG PART NUMBER	DESCRIPTION	ITEM	REFERENCE DESIGNATOR
30035		INFO		PCA DISPLAY BOARD		
30052		INFO		SCHEMATIC DISPLAY BOARD		
30036-1		1		PCB DISPLAY BD DC120/DI220	3	
931-428	521-019	1	HEF4051B	IC ANA MUX/DEMUX SGL 8 CHANNEL		U1
931-438		1	ADC0803LCD	IC 8 BIT MICROPRO A/D CONVERTER		U2
931 540		1	DS-8856	IC 8 OUTPUT DISPLAY DRIVER		U4
947-548		2	66WR2K	POT 2K 20 TURNS		R3,R4
947-529		1	66WR500	POT 500 OHM 20 TURNS		R7
953-423		1	8531-C-Q	SWITCH PB MICROMINIATURE PC MT		S1
921-750		2	09-80-1054	CONN HEADER 5 POS PC MT GLD PLT	17	P1,P2
947-900		1	899-3R220	RES NETWORK 220 OHM 16 PIN 7 RES		RP1
948-250		4	MPS445	TRANS NPSUMS 911 1W 40V NPN		Q1,Q2,Q3,Q4
923-001		1	MC-18,U 3.000MHZ TE	CRYSTAL 3.0000 MHZ TEMP -40 TO 70 C		Y1
948-343		1	5082-7415	LED DISPLAY 5 DIGIT 7 SEG DIP		DS1
948-344		1	ESPR3431	LED RED EXTRA SUPER BRIGHT		DS2
948-345		1	ESAA3431	LED AMBER EXTRA SUPER BRIGHT		DS3
947-010	20037	1		RES 330 OHM 1/4W 5% CARBON		R5
947 016		1		RES 1.8K 1/4W 5% CARBON		R8

PART NUMBER	GMTI P/N	QTY	MFG PART NUMBER	DESCRIPTION	ITEM	REFERENCE DESIGNATOR
947-015		1		RES 360 OHM 1/4W 5% CARBON		R6
947-079	19550	2		RES 22K 1/4W 5% CARBON		R9,R10
947-026		2		RES 1K 1/4W 5% CARBON		R13,R14
947-036	19901	1		RES 10K 1/4W 5% CARBON		R15
915-035		2	CM15A220J	CAP 22PF 100V CER		C1,C2
915-040		1	CM15A151J	CAP 150PF 100V CER		C3
915 120		1	173DX226U006AS	CAP 22UF 6V TANT		C5
915-026		1	CL50C105M	CAP 1UF 50V CER		C4
921-518		3	TK-101-1N	JUMPER TEST PCLHI .100 SPAC HS		W1,W2,W3
915-033		2	CW20C104K-244	CAP .1UF 50V CER		C6,C7
947 017		4		RES 2K 1/4W 5% CARBON		R1,2,11,12
948-080		3	1N4734A	DIODE 1N4734A 5.6V 1W 5%		CR1,CR2,CR3
928-541		4	7586-S 632-N	SHDF 6-32 X 1/4 RND KNRLX9/ALG BRE	29	
932-002		A/R	5700	COATING CONFORMAL		
928-423		2	038-500	SPACER PLASTIC LED .500 LG	31	
928-544		4	4591	STANDOFF 4-37(1/4)X K 7/8LC N/F MT	32	
10284-15		1		MICRO-COMPUTER PROM	7	U3

NO CHANGES WITHOUT AUTHORIZATION OF FACTORY MUTUAL

(30036-1H)

FIG 3 SHT 2

PARTS LIST
DISPLAY BOARD
MODEL DC120

PART NUMBER	CMIL PART	QTY	MFG PART NUMBER	DESCRIPTION	ITEM	REFERENCE DESIGNATOR
30035		REFD		PCB DISPLAY BOARD		
30032		REFD		SCHEMATIC DISPLAY BOARD		
30036-1		1		PCB DISPLAY BD DC120/31220	3	
931-425	921-015	1	MC14051B	IC CMOS MUX/DEMUX SGL 8 CHANNEL		U1
951-438		1	ADC0803LCN	IC 8 BIT MICROPRO A/D CONVERTER		U2
931-447		1	DS8854	IC 8 OUTPUT DISPLAY DRIVER		U4
947-548		2	66WR2K	POT 2K 20 TURNS		R2,R4,
947-529		1	66WR500	POT 500 OHM 20 TURNS		R7
951-471		1	7411-0-0	SWITCH PB MICROMINIATURE PC MT		S1
921-734		2	09-60-1051	CONN HEADER 5 POS PC MT GLD PLT	17	P1,P2
947 004		1	899-3R220	RES NETWORK 220 OHM 8 PIN 7 RES		RP1
948-231		4	MPS645	TRANS MPS645 S L 1W 43V NPN		Q1,Q2,Q3,Q4
923-004		1	HC-18/U 3.6000MHZ 20	CRYSTAL 3.6000 MHZ TEMP -40 TO 70 C		Y1
948-342		1	5082-7415	LED DISPLAY 5 DIGIT 7 SEG DIP 14		DS1
948-344		1	ESBR3451	LED RED EXTRA SUPER BRIGHT		DS2
948-345		1	ESAA3431	LED AMBER EXTRA SUPER BRIGHT		DS3
947-016	30003	1		RES 330 OHM 1/4W 5% CARBON		R5
947-011		1		RES 1.6K 1/4W 5% CARBON		R6

PART NUMBER	CMIL PART	QTY	MFG PART NUMBER	DESCRIPTION	ITEM	REFERENCE DESIGNATOR
947-359		2		RES 5.49K 1% RN55D MET FLM		R1,3
946-1??		3	1N4733A	DIODE 1N4733A 5.1V 1W 5%		CR1,CR2,CR3
928-541		4	7586-1-632-B-O	STDF 6-32 X 1/4RHM KNURL/1640 BRB	29	
952-002		AR	5200	COATING CONFORMAL		
928-423		2	909-500	SPACER PLASTIC LED .500 LG	30	
928-545		4	4391	STANDOFF 6-32X1/4X K 7/8LG M/F HT	32	
10284-15		1		MICRO-COMPUTER PROM	7	U3
947-016		1		RES 360 OHM 1/4W 5% CARBON		R5
947-039	10950	2		RES 22K 1/4W 5% CARBON		R9,R10
947-074		2		RES 1K 1/4W 5% CARBON		R13,R14
947 036	10950	1		RES 10K 1/4W 5% CARBON		R15
945-034		2	CN15A220K	CAP 22PF 100V CER		C1,C2
945-040		1	CN15A 151K	CAP 150PF 100V CER		C3
945-129		1	T330D226K035AS	CAP 22UF 35V TANT		C5
945-036		1	CY30C105M	CAP 1UF 50V CER		C6
921-518		3	TP-101-10	JUMPER TEST POINT .100 SPACING		W1,W2,W3
945-033		2	CW20C104K-2AL	CAP .1UF 50V CER		C4,7
947-027		2		RES 2K 1/4W 5% CARBON		R11,12

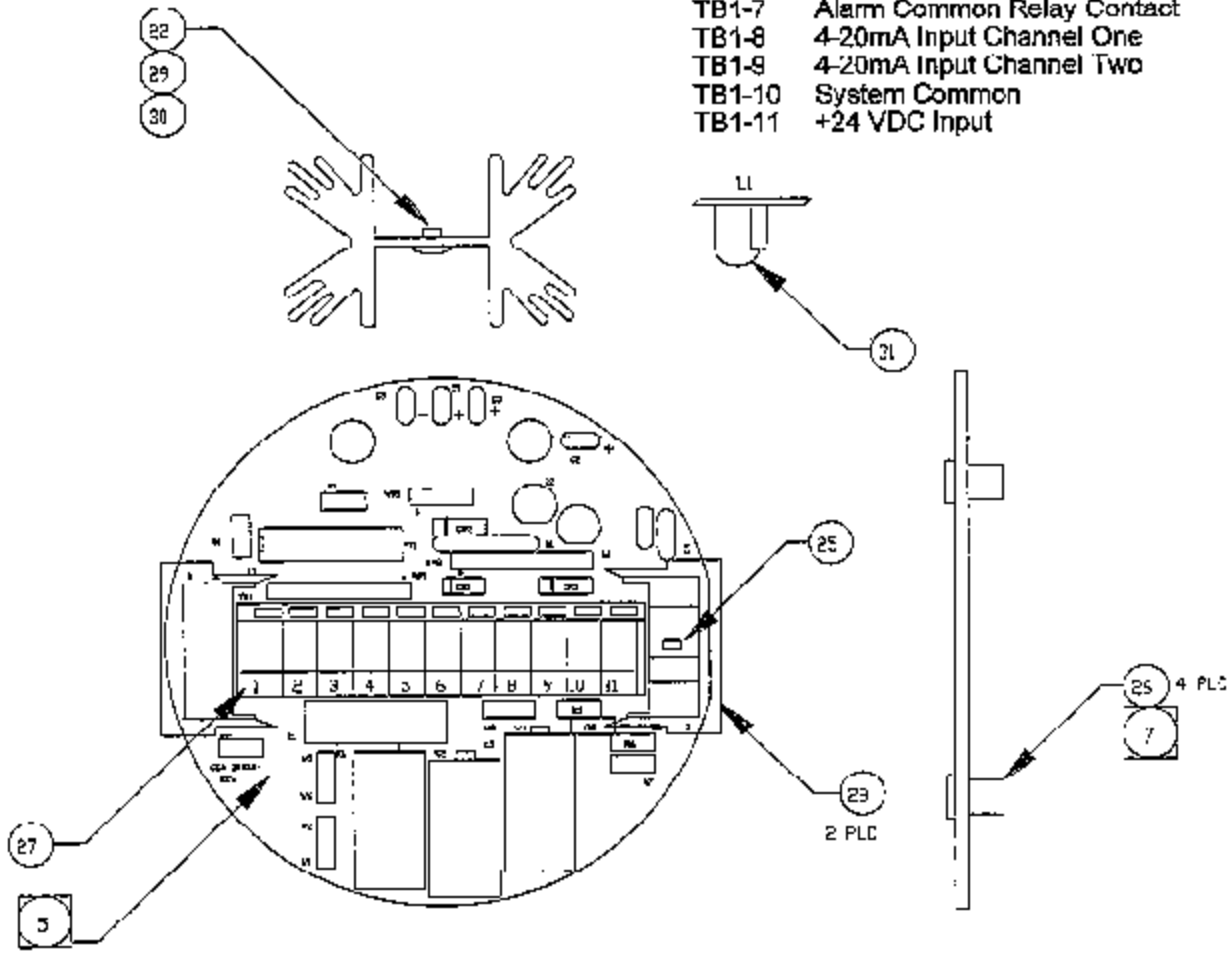
NO CHANGES WITHOUT AUTHORIZATION OF FACTORY MGMT.

(30036-2B)

FIG 3 SHT 3

PARTS LIST
DISPLAY BOARD
MODEL DC120

TB1-1	System Reset Input
TB1-2	Warning Output Relay Contact
TB1-3	Warning Common Relay Contact
TB1-4	Malfunction Output Relay Contact
TB1-5	Malfunction Common Relay Contact
TB1-6	Alarm Output Relay Contact
TB1-7	Alarm Common Relay Contact
TB1-8	4-20mA Input Channel One
TB1-9	4-20mA Input Channel Two
TB1-10	System Common
TB1-11	+24 VDC Input



OPTION CONFIGURATION						
JUMPERS	WARN		ALARM		MALF	
	NO	NC	NO	NC	NC	NC
W1	IN					
W2		IN				
W3			IN			
W4				IN		
W5					IN	
W6						IN

Figure 4, Sheet 1

CCA Input/Output Board,
Model DC120 (30038 K)

PART NUMBER	CHIL PART	QTY	MFG PART NUMBER	DESCRIPTION	ITEM	REFERENCE DESIGNATOR
30038		INFO		SCH INPUT/OUTPUT BOARD		
30033		INFO		SCHEMATIC INPUT/OUTPUT BD		
30039-1		1		PCB INPUT/OUTPUT BD DC120/DC220	1	
948-102		1	1N4002	DIODE 1N4002 100V 1A		CR1
947-413		1	4?2-100-5	RES 100 OHM 5% 10K W		R1
947-920		1	770-81-R3.3K	RES NTWK 3.3K 8PIN SIP 7 COM		RP1
948-206		2	2N3906	TRANS 2N3906 PNP		Q1,2
947-710		1	[illegible]185A	RES 40A 30V PTC DEVICE		PT1
947-044		1		RES 20K 1/4W 5% CARBON		R2
931-453		1	ULN2003A	IC DARLINGTON TRANS ARRAY HI VOLT		U1
921-312		10	1790349	TERM BLOCK SINGLE POS PC MT		TB1
921-313		1	1790306	TERM BLOCK SGL POS END PC MT	20	XTB1
921-749		2	09-69-[illegible]	CONN 4 POS TOP ENTRY PC MT		J1,2
947-342		4		RES 124 OHMS 1% RN55D		R5,6,7,8,
947-921		1	[illegible]-33-0	RES NTWK 33K 8PIN SIP ISOLD		RP2
915-110		2	[illegible]	CAP 4.7UF 50 VDC SOLID TANT		C1,2
948-127		2	1N5347B	DIODE 1N5347B 10V 5W 5% ZENER		CR2,3
931-612		1	LM2931	IC VOLT REG 5V LOW DROP		VR1

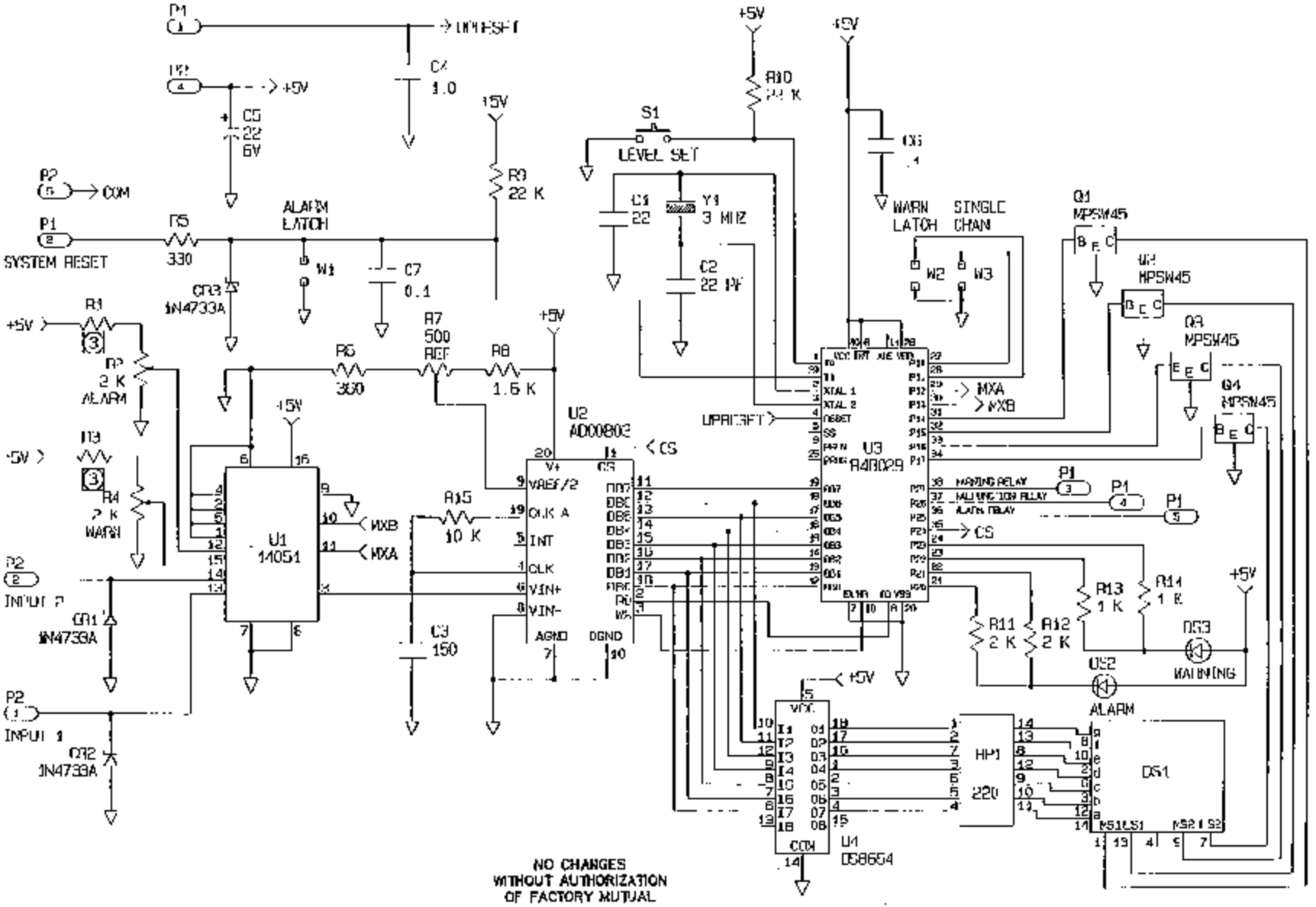
PART NUMBER	CHIL PART	QTY	MFG PART NUMBER	DESCRIPTION	ITEM	REFERENCE DESIGNATOR
10420-1		2		SYNPOWER RECEPTACLE	28	
10385-1		1		MARKER STRIP HORIZONTAL 1 11	27	
9016		1		SCR 4-40X1/4 PHIL PAN HD SST	30	
9350		1		NUT 4-40 SEL LOCK HEX	31	
922-102		AR	5783	COATING CONFORMAL		
921-056		1	7403-09FR-51	INSULATOR PAD .75 X .5 IN.	29	
11452-1		1		HEATSINK ASSY TO 220 .75 IN	22	HS1
915-139		2	[illegible]	CAP 22UF 10V TANT		C5,3
915-053		1	CW20C104K-2?4	CAP .1UF 50V CER		C4
945-041		3	[illegible]	RELAY POLARIZED SPDT 24V 2A DIP		K1,2,3
921-518		4	TP-101-10	JUMPER TEST POINT .100 SPACING		W1,2,3,4
947-140	1W20	1		RES 10K 1/4W 5% CARBON		R3
947 056		1		RES 470K 1/4W 5% CARBON		R4
948-008		1	[illegible]	CORE FERRITE		L1
946				WIRE BUSS 22AWG SOFT DRAWN		
921-736		1	15-04-0219	KEY POLARIZING CONNECTOR-NYLON	25	
928-420		4	1532-B-6-A-[illegible]	SPACER SWG 1/4RNDX3/16ID AL	26	

NO CHANGES WITHOUT AUTHORIZATION OF FACTORY MUTUAL

(30038-1J)

FIG. 4
SHT. 2

PARTS LIST
INPUT/OUTPUT BOARD
MODEL DC120

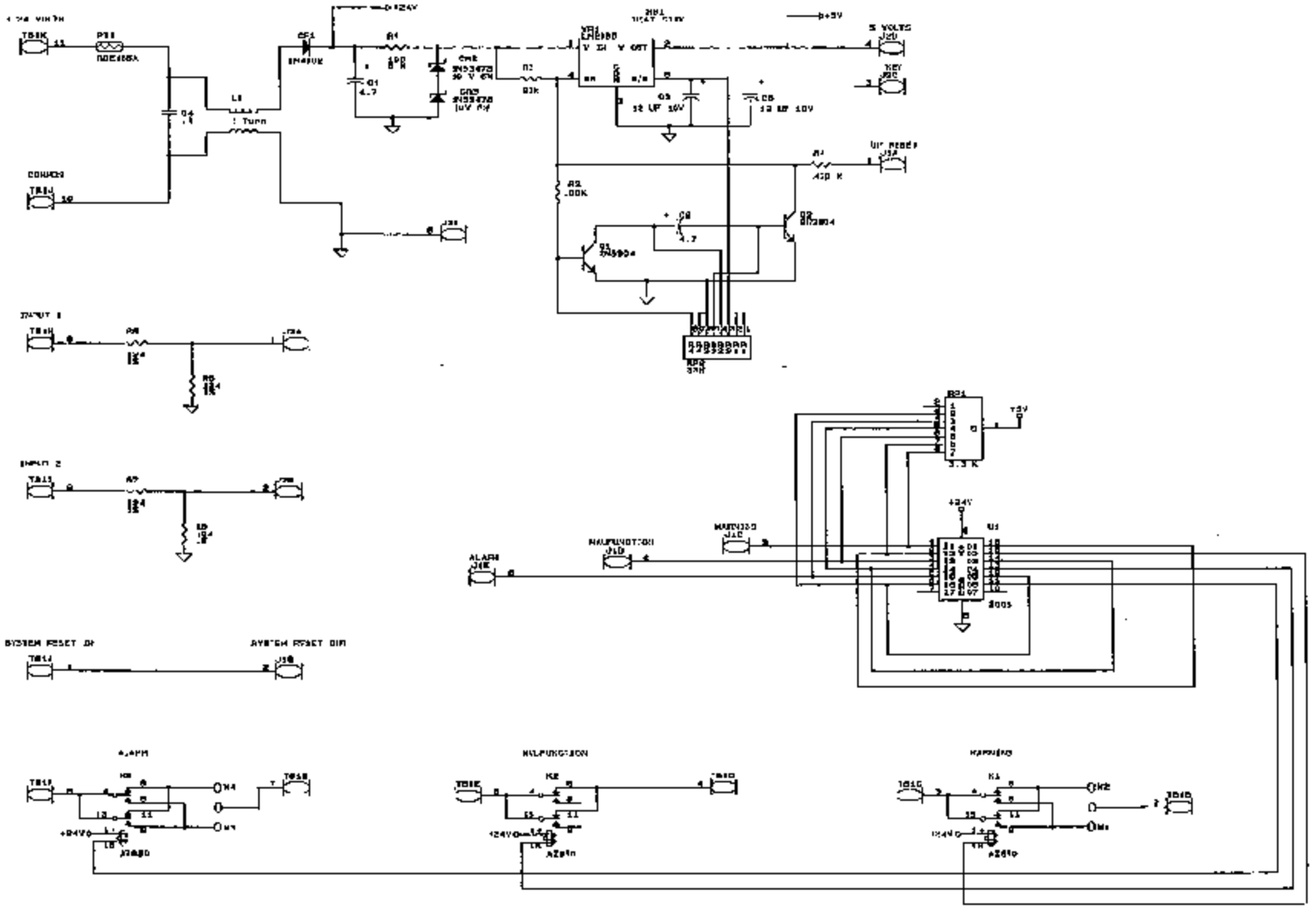


VERSION -1 : R1, R3 VALUES ARE 2K.
VERSION -2 : R1, R3 VALUES ARE 3.4K OHM REQUIRED

CAPACITOR VALUES ARE IN MICROFARADS, 10%, 50V.

RESISTOR VALUES ARE IN OHMS, 1/4W, +/- 5%.

FIG. 5 SCHEMATIC DIAGRAM DISPLAY BOARD MODEL DC120



ALL CAPACITOR VALUES ARE IN MICROFARADS, 10%, 50V.

ALL RESISTOR VALUES ARE IN OHMS, 5%, 1/4 WATT.

NO CHANGES
WITHOUT AUTHORIZATION
OF FACTORY MUTUAL

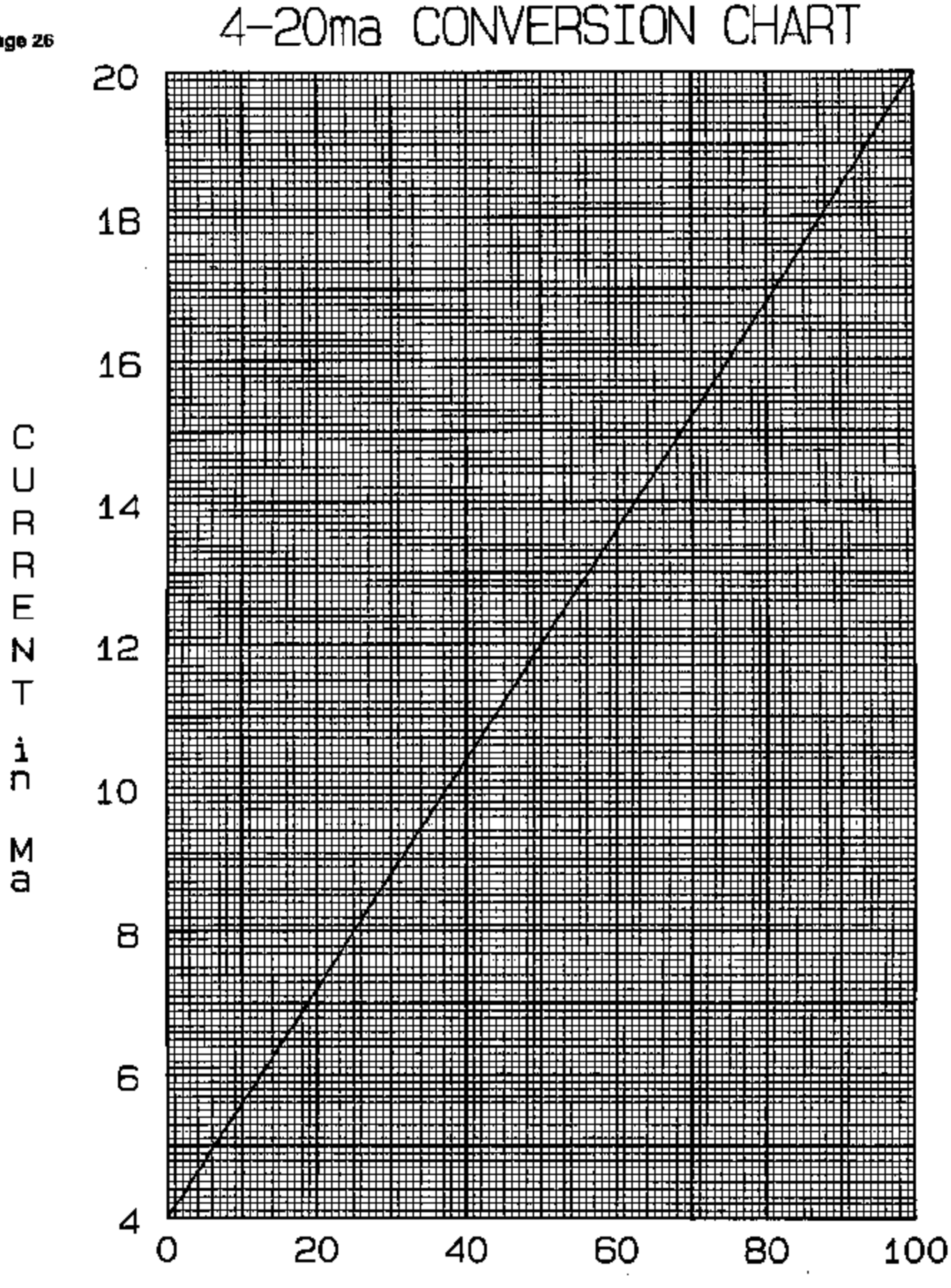

4-20ma CONVERSION CHART
20
18
16
14
12
10
8
6
4
CURRENT in Ma
0
20
40
60
80
100
%LEL

FIG. 7