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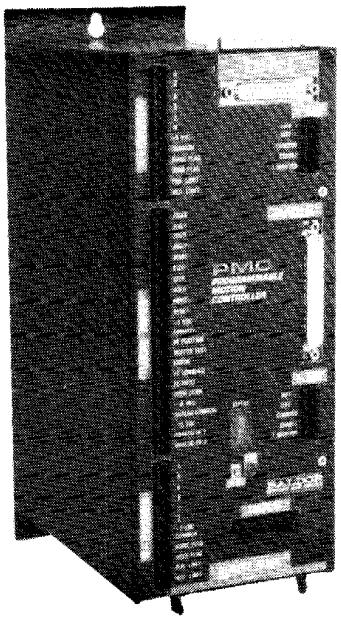
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BALDOR®
MOTORS AND DRIVES

PROGRAMMABLE MOTION CONTROL
PMC SERIES



Operations Manual

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11/93

TM-423-A

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OPERATIONS MANUAL, PROGRAMMABLE MOTION CONTROLLER

(PMC-2) & (PMC-2 BOX)

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DOCUMENT/
PMC2AX.1

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SECTION 1. GENERAL INFORMATION

1.1 Introduction:

The Baldor Programmable Motion Controller (PMC) supports both traditional moves and advanced parabolic moves. A flexible interface panel allows easy connection to drive assemblies, motor encoders, handwheels, status indicator, opto-isolated I/O and display devices. It communicates with the host computer through either RS-232 or Parallel lines. For multiple axes applications, the daisy chain links up to 16 PMCs together.

Another model of PMC is also available. The PMC-2 Box version is offered without a motion control card, so customers can install a Baldor Smart Motion Control Card (SMCC) in the field. Refer to Appendix B for information on field installation.

1.2 Model Information

Model number PMC-2

Supports a one or two axis system with encoder feedback. The PMC-2 includes a Smart Motion Control Card (SMCC).

Model number PMC-2 Box

Same as a PMC-2 in physical construction, but does not include a Smart Motion Control Card.

1.3 Packing list

A PMC-2 factory package includes the following items:

PMC-2 unit
Power cord
RS-232 cable
Terminal Connector Package
PMC Operations & Integration manual
SMCC Operations manual
Baldor Monitor software diskette

A PMC-Box only version includes the following items:

PMC-2 Box Unit
Power Cord
RS 232 Cable
Terminal Connector Pkg
PMC Operations & Integration Manual

1.4 Physical Dimensions and Weight

Face Plate: 4.5 X 10.5 inches (11.4 X 26.7 cm).

Base: 4.5 X 7.5 X 12 inches (11.4 X 19.1 X 30.4 cm), refer to Figure 1.

Net Weight: PMC: approximately 7.1 Lbs (3.23 Kg).
PMC-2 Box: approximately 6.1 lbs (2.77kg)

1.5 Power specification

AC Power input: 90 VAC to 260 VAC.

Built-in 30KHz switching power Supply:

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Input frequency: 47 to 63 Hz.
Drives all internal circuits and provides the following additional outputs:
+5 VDC 1 A; +15 VDC 1.15 A; -15 VDC 285mA.

1.6 Connector and screw terminal list

The PMC can interface with a wide range of external devices. For quick reference, all the connectors and screw terminals are briefly summarized as follows:

Two RS-232 DB-25 connectors

- Serial communication and daisy chain.

Encoder screw terminals

- Motor encoder feedback, home flag inputs, user flag inputs, limit flag inputs.

Amplifier screw terminals

- Motor amplifier/drive interface.

Local panel screw terminals

- Motion command inputs (Jog, Start, Stop, Reset .. etc), status indicator outputs (Following error, In-position, .. etc), analog inputs (Jog and feedrate control).

Display 14 pin ribbon cable connector

- Display (LCD, LED) interface.

Remote panel 50 pin ribbon cable connector

- Handwheel inputs, Opto-isolated input/outputs, analog inputs (Jog and feedrate control), status indicator outputs, home flag inputs, user flag inputs.

Parallel DB-37 pin connector

- Thumbwheel inputs, parallel communication interface, status indicator outputs (In-position, buffer full.. etc), reset input.

The connector layouts can be found in Figure 2. A typical PMC wiring diagram can be found in Figure 3. The PMC connector pinout description and interface circuit diagram are given in Appendix A.

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SECTION 2. INSTALLATION AND WIRING

This Section covers important installation procedures. Step by step compliance is strongly recommended.

A. Unpack and verify default settings

Unpack your PMC. Verify that all the components and manuals are present. If there is any damage and/or missing parts, notify the factory - DO NOT ATTEMPT TO REPAIR.

The PMC has a set of factory configured jumpers. In most applications these settings are appropriate.

In order to do a very simple PMC power-on test described in 2.C, it is recommended that you stay with default settings and do not connect the encoder and amplifier. Because the PMC power-on test only checks the communication line and PMC itself, you also need to connect an RS-232 communication cable. This is described in step 2.B.

For your reference, some of the default settings are listed in the following table. You may customize some of the setting to your needs later.

CONDITIONS	DEFAULT SETTING
Card address	default A0
Baud rate	default 9600
Encoder signal	use differential signal (see 2.E)
Feedback selection	incremental encoder.
Amplifier Enable	active low (see 2.F)
Limit detection	disabled (see 2.D)

Complete PMC default jumper settings are defined in Figures 4. If you need a particular setup, follow the directions given in the SMCC operations manual, Appendix E.

B. Connect RS-232 communication cable

The communication line on the PMC side is configured as a Null Modem. Use the supplied cable or any ordinary RS-232 cable. Connect it to the host computer's serial port and PMC's RS-232 connector. The PMC has two RS-232 connectors. Either one can be used.

The PMC uses a very common communication protocol: 1-Stop bit, 8-data bit, no parity, Half Duplex and 9600 Baud. Your computer communication software program must be able to support such protocol. The SMCC on board DIP switch can select a different baud rate, refer to the following table. The "0" indicates to press DIP switch at its number side.

SW6	SW7	SW8	Communication Mode
0	0	0	Serial 9600 Baud (Default)
1	0	0	Serial 4800 Baud
0	1	0	Serial 2400 Baud
1	1	0	Serial 1200 Baud
0	0	1	Parallel Communication

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1	0	1	Serial 300 Baud
0	1	1	Serial 38400 Baud
1	1	1	Serial 19200 Baud

The easiest way to communicate with PMC is to use the Baldor supplied "Monitor" program, a software package that is dedicated to SMCC operations under DOS and IBM PC/AT or compatible computers.

C. PMC Power On Verification

In this step, you will do the PMC power-on test and communication line test. Do not connect any amplifier or encoder line.

Turn on the PMC and press the reset switch on the Face Plate. The green LED should be on; The status display should read '.0' or '0.', otherwise, check the power cord and PMC power supply connector.

Load your communication program and select 1-Stop bit, 8-data bit, no parity, Half Duplex and 9600 Baud. If you use Baldor Monitor program, press function key F9 to configure.

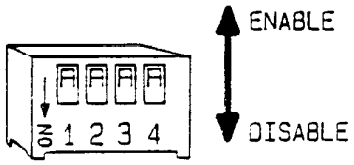
Press the return key, PMC will prompt you with a Line-Feed; Press a question mark ('?') and Return, You will read a 16-digit string, this means the PMC is communicating with the host. The exact meaning of this string is irrelevant at this moment. Turn off PMC and Host computer. Proceed with the wiring procedures given in the succeeding steps.

If communication cannot be established, refer to the diagnostic procedure given in the SMCC operations manual, chapter 3. If a communication problem persists, notify the factory - DO NOT ATTEMPT TO REPAIR.

D Set up limit flags

The PMC-2 has four limit flags, labeled on PCB as X+, X-, Y+, Y- respectively. Where the X+ denotes the limit flag at the positive travel limit of the X axis.

If your application requires the limit detection, lift the corresponding back-plane DIP switch upwards. A normally closed optical coupler, mechanical switch or equivalent means must be connected to the limit flag inputs (refer to Appendix A, encoder connector). When the system hits one of the limit flags, the SMCC halts the motion.



LIMIT SWITCHES

All unused limit flag inputs must be grounded (press DIP switch downwards). i.e. If X Positive limit is not used, the limit flag labeled as X+ must be grounded. If you leave a limit flag open without installing a limit switch, the PMC will not move.

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E Connect the motor encoder and Limit flag

The encoder interface accepts differential type signals (default) but can be configured to accept single-ended signals. For better noise immunity, it is recommended that you use the default differential signal. Cut an 8-conductor, #20-24 AWG, separately twisted and shielded cable to the proper length (Contact Baldor for this type of cable). If the encoder lines are traveling a great distance (> 100 feet), try to use a large wire gauge (20-22 AWG). Strip leads and connect to the appropriate screw terminals. Tie the shield at the PMC side and leave the other side floating. If necessary, connect the limit flag wires to the screw terminals. They share with the encoder connector. Plug the screw terminals into the PMC's X and Y-axis encoder connectors respectively.

If your encoder is single ended (No A/, B/ Z/ outputs), re-jumper the SMCC E42, E50, refer to DWG 2.

F Connect the amplifier and motor lines

Connect the X and Y-axis motor amplifier screw terminal to the corresponding PMC's Face Plate connectors. Figure 3 illustrates a typical connection for Baldor's TSD drive. The connection for current limiting I monitor (CUR0) is optional. To work with a PMC, the Baldor servo drives, including the TSD drive, must be set in the current mode.

The Baldor TSD uses an active low signal to enable the amplifier. Place jumper on E14 pin 1-2; The Baldor UM drive works the opposite way. Place jumper on E14 pin 2-3. Check your drive manual for proper enable polarity.

G Connect optional connectors

Some of the PMC connectors are optional. Refer to Appendix A for details.

H Daisy chain operation.

Multiple PMCs may be connected together by the Daisy Chain. Each PMC occupies an address (range from A0,.. A9, Aa,.. to Af). You need to adjust the jumpers according to following conditions:

Address	Jumper setting (default set to A0 card)
A0	Install jumper on E2, remove jumper from E3.
A1 - Af	Remove jumper from E2, install jumper on E3.

You also need to select the SMCC On-Board DIP switch 1,2,3 4 to the desired address. Refer to the following table. (An "0" indicates to press DIP switch at its number side.

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SW1	SW2	SW3	SW4	Card Address
0	0	0	0	A0 (Default)
1	0	0	0	A1
0	1	0	0	A2
1	1	0	0	A3
0	0	1	0	A4
1	0	1	0	A5
0	1	1	0	A6
1	1	1	0	A7
0	0	0	1	A8
1	0	0	1	A9
0	1	0	1	Aa
1	1	0	1	Ab
0	0	1	1	Ac
1	0	1	1	Ad
0	1	1	1	Ae
1	1	1	1	Af

Install a DB25 cable between the two PMC's RS-232 connectors. Since the Daisy Chain uses only part of the 25 signal lines, the DB25 is not a mandatory cable type. A minimum wire connection can be found in Appendix A, RS-232 Host Communication Connector.

For programming and host communication, you still need to connect an RS-232 cable from the Host computer to either of the PMC's RS-232 connectors.

Pressing the Reset switch on any one of the PMC's will reset every PMC in the Daisy Chain.

Section 3. Start Up and Tuning

This section contains important motor setup guidelines. To eliminate possible hazards, It is suggested that you read this entire section before you begin the actual setup operations.

The Main Power switch must be in a location without access difficulty.

3.1 Set up SMCC parameter

Turn on the PMC and Host computer.

DO NOT APPLY AMPLIFIER/DRIVE POWER !

The core unit inside a PMC is an SMCC. Usually, a servo system requires some predefined operation parameters to operate, such as acceleration time, maximum reference speed.. etc. For SMCC, we call them the i-parameters. The SMCC Operations manual, from chapter 3.2.2 to 3.3.11 covers the i-parameters set up procedure according to functional group, where Appendix A introduces the i parameter in number sequence.

The SMCC i-parameters were preset at the factory (See table 1). Most of these default values may be appropriate for your system. Only those application dependent parameters need to be adjusted. To expedite your set up time, you may refer to the

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following guidelines:

(1) Use the default value for i05 (487, Servo time), i07 (65498, servo constant) and i14 (40, Move Calculation time).

(2) The deviation between desired position and actual position, in SMCC terms, is referred as the Following Error. The SMCC uses two gates to monitor the Following Error. The warning gate issues a warning signal; the fatal gate usually traps the system. To reduce frequent hang up, set the Following Error Fault band i00 to a large value (15000) or 0 (disable fault checking). The SMCC will check warning band i10 first, then check i00. Therefore, the Following Error warning band i10 usually is set to a value smaller than i00 (usually, 50% of the fatal band). You may adjust the bands to an empirically smaller value when you feel comfortable with the motor tuning quality.

(3) The Home feedrate i04, PWM limits i32[i52] i33[i53], Proportional gain constant i20[i40] and Jog feedrate i31[i51] must be a non-zero value. It makes no sense to initiate a Jog command with zero speed.

(4) Do not exceed the system physical capability. Maintain the acceleration time i08 in the range of seconds (1024 = 1 seconds). Motor will oscillate if i08 is set too small.

(5) Set MDI mode i02 off (0). Line Feed Handshake i03 on (1). PLC i62 off (0).

(6) Set the Position Rollover range i37[i57] 0 (Maximum position range)

(7) Set the Position encoder control bits i39[i59] to 3 or 7.

The SMCC requires you to enter the motor type (i13). More precisely, it expects that you specify whether the commutation is done at motor/drive side or within the SMCC. The DC brush motor commutates by itself so set i13 to 0.

i13 0 When DC brush motors are used (See note below).
i15 0 For dual axis operation, valid only when i13 is set to 0.
i15 1 For X-axis only, valid only when i13 is set to 0.

Note: The Baldor drives such as TSD, UM, THM, BTS 15, BTS 10, and BTS 20, where the commutation sequencing is done at the motor or brushless drives that commutate without SMCC, for these cases, set i13 to 0.

Enter a "p" (display current position) command, the host computer will display two columns of numbers (a single axis configuration only shows one number). The left number is the position of the X-axis; The right number is the position of the Y-axis. Both numbers are in units of motor encoder counts.

Turn the motor shaft by hand (drive power still in off

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position). While slowly rotating motor shaft in the CW direction (assume that you are viewing the motor from the front), check the position by entering the "p" command repeatedly. If the position is decreasing, the connection of encoder A and B channels are reversed. If the position does not change while you rotate the shaft, verify the motor and encoder connections. If the problem persists, consult the diagnostic procedures given in the SMCC Operations manual, Chapter 3.3.6.

3.2 Basic Move and Tuning

The following steps may be exercised ONE AXIS AT A TIME. Be prepared to use the "k" command if the motor rotates at an uncontrollable speed at any time.

The Commands given without braces are for the X-axis; the Y-axis commands are denoted in braces [ ]. When starting the X-axis test, Unplug the Y-axis interface connection.

Be familiar with the SMCC commands such as Jog {j, J}. Kill {k}, Quit {q}, Torque input {O} .. etc.

Turn on the motor drive.

A. Enter a "O20" ["OY20"] command to confirm that the shaft will rotate in the clockwise direction. Enter a "O-20" ["OY-20"] command to confirm that the shaft will rotate in the counterclockwise direction.

   If a load is connected to the shaft, it may be necessary to use a higher value such as "O50" ["OY50"] (which means 50/255 of the maximum peak current will be delivered to the motor). Enter a "k" command to disable the signal input to the amplifier.

B. Enter an upper case character "O" ["OY"] and a digit "0". This open loop command verifies that the shaft is drifting. Adjust the drive balance pot to null the offset. For the Baldor TSD, this pot is labeled "BALANCE".

C. Enter a "q" command and verify that the shaft is locked. Adjust the servo parameters (i20[i40], i21[i41]) to obtain desired stiffness. Adjust amplifier gain and Peak current (The Baldor TSD is labeled "SIGNAL", "I PEAK" respectively). The motor current must not exceed the rated value during the duty cycle time. This is to prevent the motor from over heating.

D. Re-adjust servo parameters i20[i40], i21[i41]. You may use the Monitor program's on-line data capture utility to plot servo data (See Monitor manual, ALT F2 function). This utility expedites your tuning time.

E. Go back to Step A and repeat the same procedure for the Y-axis.

   Connect the load to the motor shaft. Make all direction jogs. Observe the response and adjust the acceleration and

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deceleration time (i08).

The system is ready to operate. See next section.

3.3 Simple operations

This section covers some basic operation commands. Follow the example step by step. For more comprehensive examples, you may refer to the SMCC Operations manual, chapter 3, 4, 5.

Try the following commands

```
A0          ;You must address the SMCC at least once after
            ;power-on or reset.
            ;If there is more than one SMCC in your system,
            ;each card must be individually addressed to pass
            ;information to/from the host.
p           ;This is a position request.
f           ;This is a Following error request.
J           ;Observe that the X axis begins to move in positive
            ;direction.
p           ;Use "p" or "f" to monitor the motion progress.
            ;This demonstrates that you may request from and
            ;send data on the fly.
j           ;Jog the X axis in the negative direction
i06         ;SMCC will send the current value of i06, the Max
            ;reference speed.
i0620000    ;20000 is the new reference speed. Enter a bigger
            ;number will increase speed. Enter a smaller value
            ;will decrease the speed.
j           ;Issue another "j" command to stop the jog motion.
            ;Repeating previous jog command will stop Jog motion.
            ;Of course, "q" command also stop the motion.
JJY         ;To jog both X and Y together, Note that both X and
            ;Y axes will move and that "X" does not have to be
            ;typed in but "Y" must be used.
j           ;Note that the X axis reverses direction.
jY          ;Note that the Y axis reverses direction.
jjY         ;Note that the X and Y axes both stop.
            ;You could also use "Q" or "q" to stop motion.
=           ;This is the "Return to Prejog" Command and the SMCC
            ;will begin moving until it reaches the "0" position
            ;where it started.
v           ;While the SMCC is returning to Prejog position,
            ;check the velocity of the motor.
i021        ;The SMCC enters the Manual Data Input (MDI) mode
i020        ;The SMCC exits the MDI mode.
```


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APPENDIX A: DESCRIPTIONS OF EXTERNAL CONNECTORS

Conventions:

The PIN name followed by a "/" indicates an active low signal.

The command enclosed by a pair of braces [ ] are for the Y axis.

1. RS-232 HOST COMMUNICATION CONNECTOR

Refer to DWG 1.

The PMC provides two 25-pin RS-232 connectors of different genders. You may select either one to establish serial communication.

The PMC communication line is configured as a "Null-Modem", an ordinary RS-232 cable works fine. If you decide to build your own cable, the minimum connection requires pin 1 through pin 7 and pin 20 be connected (marked as "RS-232" below).

If your host computer has a swapped TxD/ RxD/ pair or a swapped RTS/ CTS/ pair, re-plug the jumpers for E7 and E8 (refer to DWG 1).

To Hook up the daisy chain, requires those pins marked as "Daisy-Chain" be connected. You may use a DB25 ribbon cable directly, because all other signals are optional.

In the daisy chain operation, the card with an address other than A0 requires to re-position the jumpers, refer to section 2.H. Baud rate selection, refer to section 2.B

Remove the jumper from E26 will disconnect 5 Volt supply to pin 14. If you hook up a Baldor Motion Commander (an intelligent panel control device), make sure E26 jumper is installed.

PIN	NAME	FUNCTION (RS-232 Host communication connector-DWG 1.)
1	CHAS	RS-232, Chassis ground, Not tied to Common.
2	TXD/	RS-232, Transmit Data.
3	RXD/	RS-232, Receive Data.
4	RETS	RS-232, Request To Send (RTS).
5	CLTS	RS-232, Clear To Send (CTS).
6	DASR	RS-232, Data Set Ready (DSR).
7	GND	RS-232, Ground.
8	BUFU/	Output, Program Buffer Full.
9	EROR/	Output, Error (Fault or Communication Error).
10	RESET/	Daisy-Chain, Input, SMCC Reset.
11	GND	Ground.
12	GND	Ground.
13	GND	Ground.
14	+5 VDC	Output, +5 VDC SUPPLY. For PMC-2, this output can be deactivated by jumper E26.
15	not used.	
16	not used.	
17	not used.	
18	not used.	
19	not used.	

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20	DATR	RS-232, Data Terminal Ready (DTR).
21	not used.	
22	IPOS	Output, In-Position Indicator. Positive Logic.
23	BTXD	Daisy-Chain, TTL level, Buffered TXD.
24	BRTS	Daisy-Chain, TTL level, Buffered RTS.
25	SYNC/	Daisy-Chain, Multiple-card Synchronization Clock.

2. X-AXIS ENCODER CONNECTOR

Flag interface - refer to DWG 4.
Encoder interface - refer to DWG 2.

The X-axis and Y-axis encoder connector were designed for the incremental type encoder. The encoder signal can be either a differential type (default setting, all models) or a single ended type. Use E42 (X axis) and E50 (Y-axis) to select. For jumper setting refer to DWG 2.

PIN	NAME	FUNCTION (X-axis encoder connector)
1	A	Input, Encoder A channel Positive.
2	A/	Input, Encoder A channel Negative.
3	B	Input, Encoder B channel Positive.
4	B/	Input, Encoder B channel Negative.
5	Z	Input, Encoder Z channel Positive.
6	Z/	Input, Encoder Z channel Negative.
7	+5 VDC	Output, +5 VDC Power Supply
8	Common	Ground
9	Home flag	Input, the X-axis Home/flag.
10	User flag	Input, the X-axis User/flag.
11	POS. Limit	Input, the X-axis positive travel limit. Refer to the note below).
12	NEG. Limit	Input, the X-axis negative travel limit. Refer to the note below).

Note: The limit flag signal (Pin 11 and 12) works in positive logic. In other words, a TTL high pulse means the travel limit has been reached; a TTL low signal enables the desired moves. When the system hits a limit flag, it halts at that position. If your application does not require the travel limit flags, press down the corresponding backplane switches (labeled as X+, X-, Y+, Y-) to the backplane side.

3. Y-AXIS ENCODER CONNECTOR

Same pin outs as the X Axis. Refer to the previous section of X-axis encoder connector.

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PIN	NAME	FUNCTION (Y-axis encoder connector)
1	A	Input, Encoder A channel Positive.
2	A/	Input, Encoder A channel Negative.
3	B	Input, Encoder B channel Positive.
4	B/	Input, Encoder B channel negative.
5	Z	Input, Encoder Z channel Positive.
6	Z/	Input, Encoder Z channel Negative.
7	+5 VDC	Output, +5 VDC Power Supply
8	Common	Ground
9	Home flag	Input, the Y-axis Home/flag.
10	User flag	Input, the Y-axis User/flag.
11	POS. Limit	Input, the Y-axis positive travel limit.
12	NEG. Limit	Input, the Y-axis negative travel limit.

4. LOCAL PANEL CONNECTOR

Refer to DWG 3.

The equivalent software commands are enclosed by a pair of braces { }.

The status outputs such as the Following Error Fault output and Warning output may be used to drive a yellow and a red LED respectively, the color differentiates error severity.

The Reset input (pin 10) provides a hardware mechanism to reset the SMCC. The momentary switch on the face plate serves the same purpose.

PIN	NAME	FUNCTION (Local Panel connector)
1	JOG /X-	Input, Jog X-axis in negative direction. {j}.
2	JOG /Y-	Input, Jog Y-axis in negative direction. {jY}.
3	JOG /X+	Input, Jog X-axis in positive direction. {J}.
4	JOG /Y+	Input, Jog Y-axis in positive direction. {JY}.
5	START	Input, Start the motion program. {R}.
6	STOP	Input, Stop the motion program. {q}.
7	STEP	Input, Execute the motion program one step (block) at a time. {S}.
8	HOLD	Input, Hold program run temporarily. {H}.
9	HOME	Input, Go to HOME position. {h}.
10	RESET	Input, Low to reset SMCC, refer to DWG 6.
11	+5 VDC	Input, +5 VDC power supply.
12	Common	Ground.
13	In Position	Output, In-position indicator.
14	Buffer Full	Output, Program Buffer Full, refer to DWG 10.
15	ERROR	Output, Error (amplifier fault) indicator.
16	FE WARNING	Output, Following error warning indicator.
17	FE FAULT	Output, Following error fault indicator.
18	OVER CURR	Output, Current Overload indicator.
19	+15 VDC	Output, +15 VDC power supply.
20	Analog Common	Analog ground, refer to DWG 6.
21	-15 VDC	Output, -15 VDC power supply.
22	ANALOG IN 2	Input, analog input channel 2, refer to DWG 6 . This input is internally connected to ANA2 (pin 28, Remote panel connector).
23	ANALOG IN 3	Input, analog input channel 3, refer to

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Drawing 6. This input is internally connected to ANA3 (pin 29, Remote panel connector).

5. DISPLAY CONNECTOR

Refer to DWG 7.

The display connector may be used to drive various types of displays. The SMCC i18 parameter determines the display type and data format that the SMCC will write to.

PIN	NAME	FUNCTION (display connector)
1	PL5V	+5 VDC Power Supply.
2	GND	Ground.
3	RSTR	Output, Read Strobe.
4	CONT	Output, Contrast Adjust. 0 to 5 VDC (dual axis). In single axis model, R12 adjust output level, E2 selects R12 voltage reference.
5	EX	Output, X Display Select.
6	RDWR	Output, Read/Write. E27 (dual axis), E1 (single axis) selects function.
7	DAB1	DISPLAY DATA Output 1, TTL.
8	DAB0	DISPLAY DATA Output 0, TTL.
9	DAB3	DISPLAY DATA Output 3, TTL.
10	DAB2	DISPLAY DATA Output 2, TTL.
11	DAB5	DISPLAY DATA Output 5, TTL.
12	DAB4	DISPLAY DATA Output 4, TTL.
13	DAB7	DISPLAY DATA Output 7, TTL.
14	DAB6	DISPLAY DATA Output 6, TTL.

6. REMOTE PANEL CONNECTOR

Handwheel encoder interface, refer to DWG 5.
Opto-Isolated I/O, refer to DWG 11.
Analog Inputs, refer to DWG 6.
Flag inputs (XUFL/, YUFL/), refer to DWG 4.
Opto-Isolated indicators (FEOP/, FERT, IPOP/, IPRT), refer to DWG 9.

Opto-Isolated I/O: There are 7 inputs and 5 outputs.

+VCC (12 to 24 VDC) Inputs: 60 ma Max Load
Outputs: 250 ma Max Load

The logic of MAI5I/ - MAI7I/ works the opposite way from MAI1I/ - MAI4I/.

Analog inputs may be used to control the time base of both axes (When i14=1), or to control the speed of jog moves (i14=2).
The home flags initiate the SMCC homing cycle.
The user flags establishes a trigger signal to work with the "GO Until" and "Wait Until" moves.
The Opto-isolated status indicators (In-position and the Following error) may be used to signal the designated operation status.

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For PMC-2, there are two dedicated handwheel inputs, X and Y, available from remote panel. The handwheel interface accepts either the differential or the single-ended (default setting) encoder signal (E46, E46. DWG 5). It also accepts motor encoder or external injected signal. These kind of operations require proper i-parameter setup.

Note: Place jumpers on E47 and E48 will tie the X and Y handwheel signal together. For independently operated X and Y axis handwheel operation, you must not install these jumpers. (default condition).

PIN	NAME	FUNCTION (Remote panel connector)
1	HWYD/	Input, Y Handwheel Disable.
2	HWXD/	Input, X Handwheel Disable.
3	ENBX	Input, X handwheel encoder channel B.
4	ENAX	Input, X Handwheel encoder channel A.
5	ENBY	Input, Y Handwheel encoder channel B.
6	ENAY	Input, Y Handwheel encoder channel A.
7	ENBX/	Input, X Handwheel encoder channel B. Negative logic
8	ENAX/	Input, X Handwheel encoder channel A, Negative logic
9	ENBY/	Input, Y Handwheel encoder channel B. Negative logic
10	ENAY/	Input, Y Handwheel encoder channel A, Negative logic
11	MAO1IR	Machine output 1, Opto Return, transistor emitter. *
12	MAO1I/	Machine output 1, Opto output, transistor collector.
13	MAO2IR	Machine output 2, Opto Return, transistor emitter. *
14	MAO2I/	Machine output 2, Opto output, transistor collector.
15	MAO3IR	Machine output 3, Opto Return, transistor emitter. *
16	MAO3I/	Machine output 3, Opto output, transistor collector.
17	MAO4IR	Machine output 4, Opto Return, transistor emitter. *
18	MAO4I/	Machine output 4, Opto output, transistor collector.
19	MAO5IR	Machine output 5, Opto Return, transistor emitter. *
20	MAO5I/	Machine output 5, Opto output, transistor collector.
21	MAI7IS	Machine input 7, Opto input.
22	MAI7I/	Machine input 7, Opto Return.
23	MAI6IS	Machine input 6, Opto input.
24	MAI6I/	Machine input 6, Opto Return.
25	MAI5IS	Machine input 5, Opto input.
26	MAI5I/	Machine input 5, Opto Return.
27	MAI4IS	Machine input 4, Opto input.
28	MAI4I/	Machine input 4, Opto Return.
29	MAI3IS	Machine input 3, Opto input.
30	MAI3I/	Machine input 3, Opto Return.
31	MAI2IS	Machine input 2, Opto Input.
32	MAI2I/	Machine input 2, Opto Return.
33	MAI1IS	Machine input 1, Opto input.
34	MAI1I/	Machine input 1, Opto Return.
35	XUFL/	Input, X-axis User Flag.
36	XHFL/	Input, X-axis Home Flag.
37	YUFL/	Input, Y-axis User Flag.
38	YHFL/	Input, Y-axis Home Flag.
39	FEOP/	Opto-isolated output, the Following error indicator, transistor Collector.
40	IPOP/	Opto-isolated output, the In-position indicator, transistor Collector.
41	FERT	Opto-isolated output, the Following Error indicator, transistor Emitter.
42	IPRT	Opto-isolated output, the In-position indicator, transistor Emitter.

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43	ANA3	Input, Analog Input Channel #3, internally connected to pin 23, Local panel connector.
44	AGND	Analog ground.
45	ANA2	Input, Analog Input Channel #2, internally connected to pin 22, Local panel connector.
46	SPARE	Not used.
47	GND	Ground.
48	+15 VDC	Output, +15 VDC power supply. (Use only if
49	+ 5 VDC	Output, +5 VDC power supply. isolation is
50	-15 VDC	Output, -15 VDC power supply. not required.)

* Note A: For proper isolation to optically coupled relay boards, tie the common emitter to external power supply common.

7. X-AMP CONNECTOR

Refer to DWG 8.
These signals implement the interface for the X-axis amplifier.

PIN	NAME	FUNCTION (X-amplifier connector)
1	DIFF+	Output, X-axis Command Signal (PHA1) (Positive).
2	DIFF-	Output, X-axis Command Signal (PHA1/) (Negative).
3	COMMON	Ground.
4	ENABLE	Output, Amplifier Enable,(AENA) internally connected to the Y-AMP connector pin 5. See note below.
5	I MONITOR	Input, a current Input for Overload (I*T) fault processing.(CURO) The usage is optional.

Note: The Amplifier Enable polarity can be selected by E14, default to shunt pin 1-2, Low to enable. The default setting fits Baldor TSD's convention; In the case of Baldor UM drive, place jumper at E14 pin 2-3, this generates an active high Enable signal. Check your Amplifier manual for proper polarity.

8. Y-AMP CONNECTOR

Refer to the section of X-AMP connector

PIN	NAME	FUNCTION (Y-amplifier connector)
1	DIFF+	Output, Y-axis Command Signal (PHA3) (Positive).
2	DIFF-	Output, Y-axis Command Signal (PHA3/) (Negative).
3	COMMON	Ground.
4	ENABLE	Output, Amplifier Enable, (AENA) internally connected to the X-AMP connector pin 4. See note given in X-AMP connector.
5	I MONITOR	Input, a current Input for Overload (I*T) fault processing. (CURI)

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9. PARALLEL CONNECTOR

Refer to DWG 10.

The Parallel connector may be used to establish the parallel communication or read thumbwheel setting, the usage is mutual exclusive.

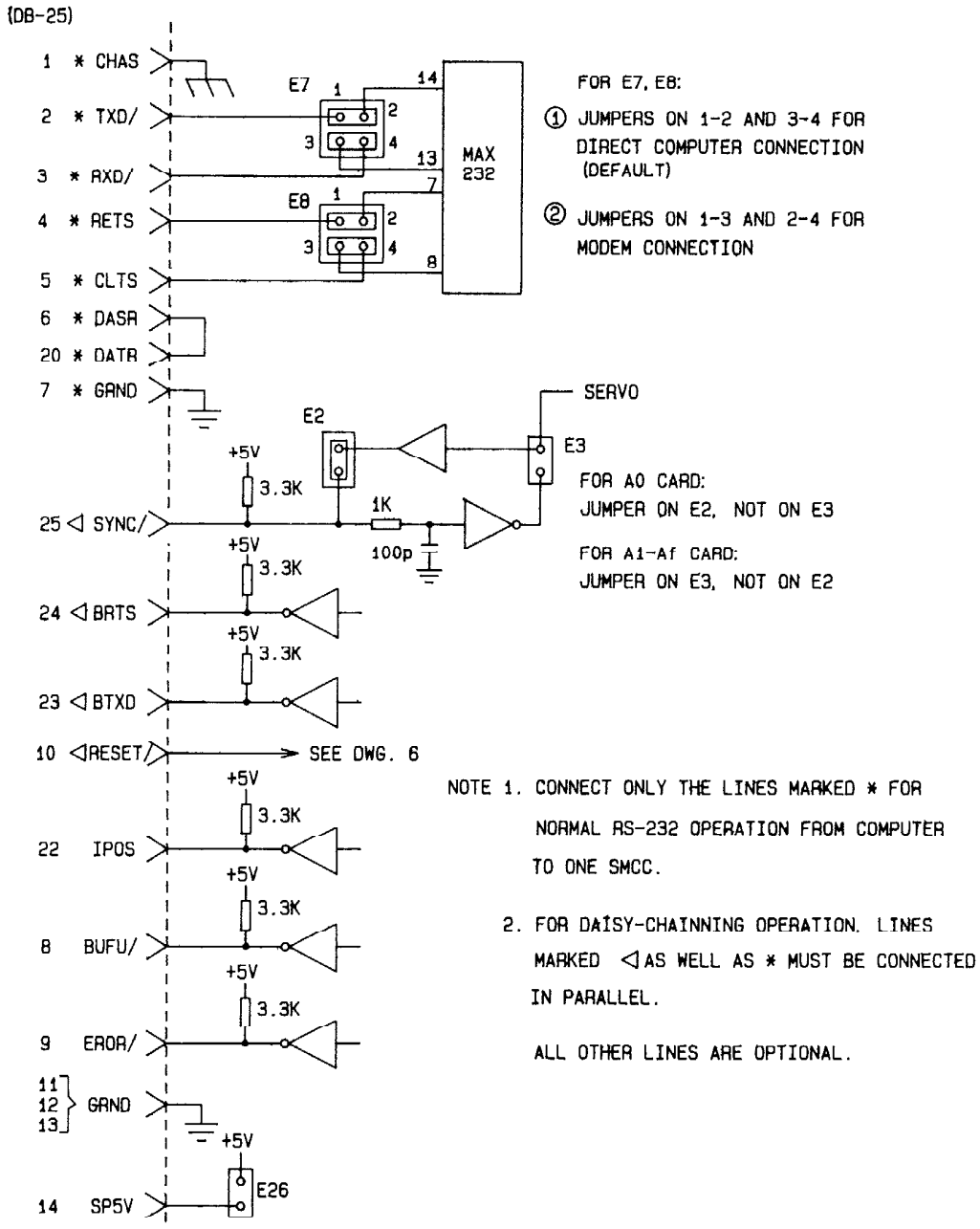
When interface with multiple thumbwheels, the SEL0 - SEL7 output lines may be used as multiplexer to select desired thumbwheels, refer to the SMCC Operations manual, chapter 7, example 7.4. To read thumbwheel inputs, the STRB/ line must be grounded.

PIN	NAME	FUNCTION (Parallel Connector)
1	STRB/	Input, Strobe Signal.
2	DAT0	Bidirectional, Parallel DATA 0.
3	DAT1	Bidirectional, Parallel DATA 1.
4	DAT2	Bidirectional, Parallel DATA 2.
5	DAT3	Bidirectional, Parallel DATA 3.
6	DAT4	Bidirectional, Parallel DATA 4.
7	DAT5	Bidirectional, Parallel DATA 5.
8	DAT6	Bidirectional, Parallel DATA 6.
9	DAT7	Bidirectional, Parallel DATA 7.
10	ACKN/	Output, Acknowledge Signal.
11	BUFU	Output, Program Buffer Full indicator.
12	IPOS/	Output, In-Position indicator.
13	+5 VDC	+5 VDC SUPPLY. (Jumper E26 configures).
14	GND	Ground.
15	BUFU/	Output, Program Buffer Full indicator.
16	GND	Ground.
17	CHAS	Chassis ground, Not tied to ground.
18	IPOS	Output, In-Position.
19	SPARE	
20	GND	Ground.
21	SEL0	Output, SEL0. Scanner for reading thumbwheel switches
22	SEL1	Output, SEL1. Scanner for reading thumbwheel switches
23	SEL2	Output, SEL2. Scanner for reading thumbwheel switches
24	SEL3	Output, SEL3. Scanner for reading thumbwheel switches
25	SEL4	Output, SEL4. Scanner for reading thumbwheel switches
26	SEL5	Output, SEL5. Scanner for reading thumbwheel switches
27	SEL6	Output, SEL6. Scanner for reading thumbwheel switches
28	SEL7	Output, SEL7. Scanner for reading thumbwheel switches
29	GND	Ground.
30	GND	Ground.
31	GND	Ground.
32	RESET/	Input, Reset SMCC, Low to activate, refer to DWG.6.
33	EROR/	Output, ERROR (Fault or Communication Error).
34	GND	Ground.
35	ORDY/	Output, active low signals the Output Ready status.
36	HSB/	Input, Read Strobe. Active Low.
37	SYNC/	Output(A0)/Input(others addresses), the Synchronization Clock, refer to DWG.1.

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CONNECTOR DIAGRAMS

RS-232 HOST COMMUNICATION CONNECTOR



NOTE 1. CONNECT ONLY THE LINES MARKED * FOR NORMAL RS-232 OPERATION FROM COMPUTER TO ONE SMCC.

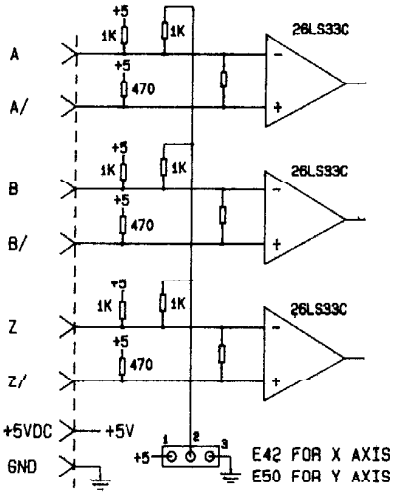
2. FOR DAISY-CHAINNING OPERATION. LINES MARKED ◁ AS WELL AS * MUST BE CONNECTED IN PARALLEL.

ALL OTHER LINES ARE OPTIONAL.

DWG. 1. Serial Communication Interface

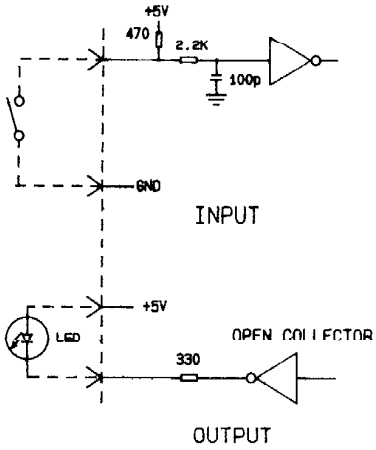
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X OR Y ENCODER CONNECTOR



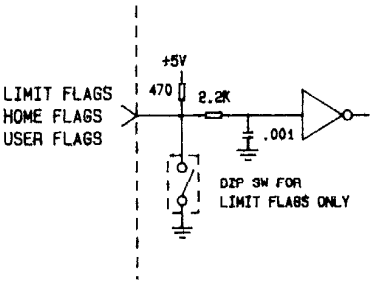
DWG. 2. Encoder Interface

LOCAL PANEL CONNECTOR



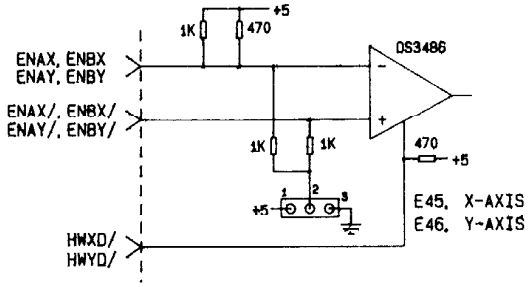
DWG. 3. Local Panel Interface

X OR Y ENCODER CONNECTOR



DWG. 4. Limit, User and Home flags

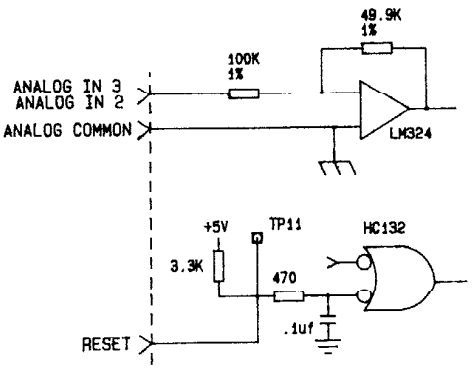
REMOTE PANEL CONNECTOR



DWG. 5. Handwheel Encoder Interface

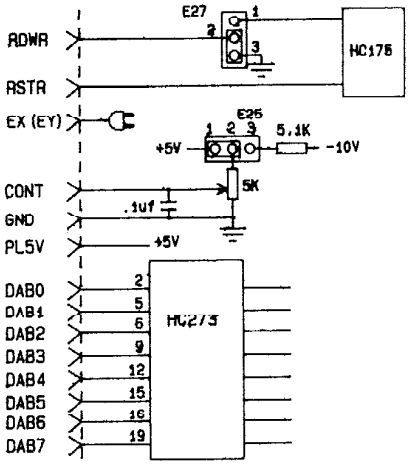
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LOCAL PANEL CONNECTOR

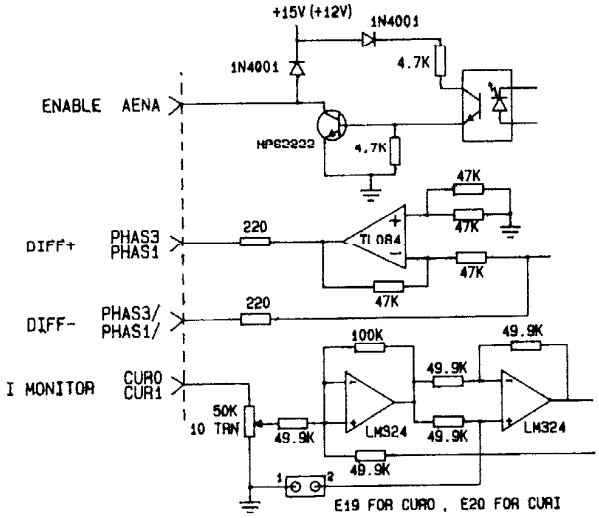


DWG. 6. Analog Command and Reset Circuit

DISPLAY INPUT CONNECTOR
(14 PIN RIBBON)

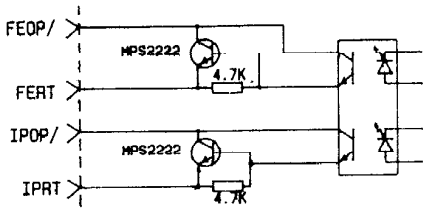


DWG. 7. LCD Display Interface



DWG. 8. Amplifier Interface

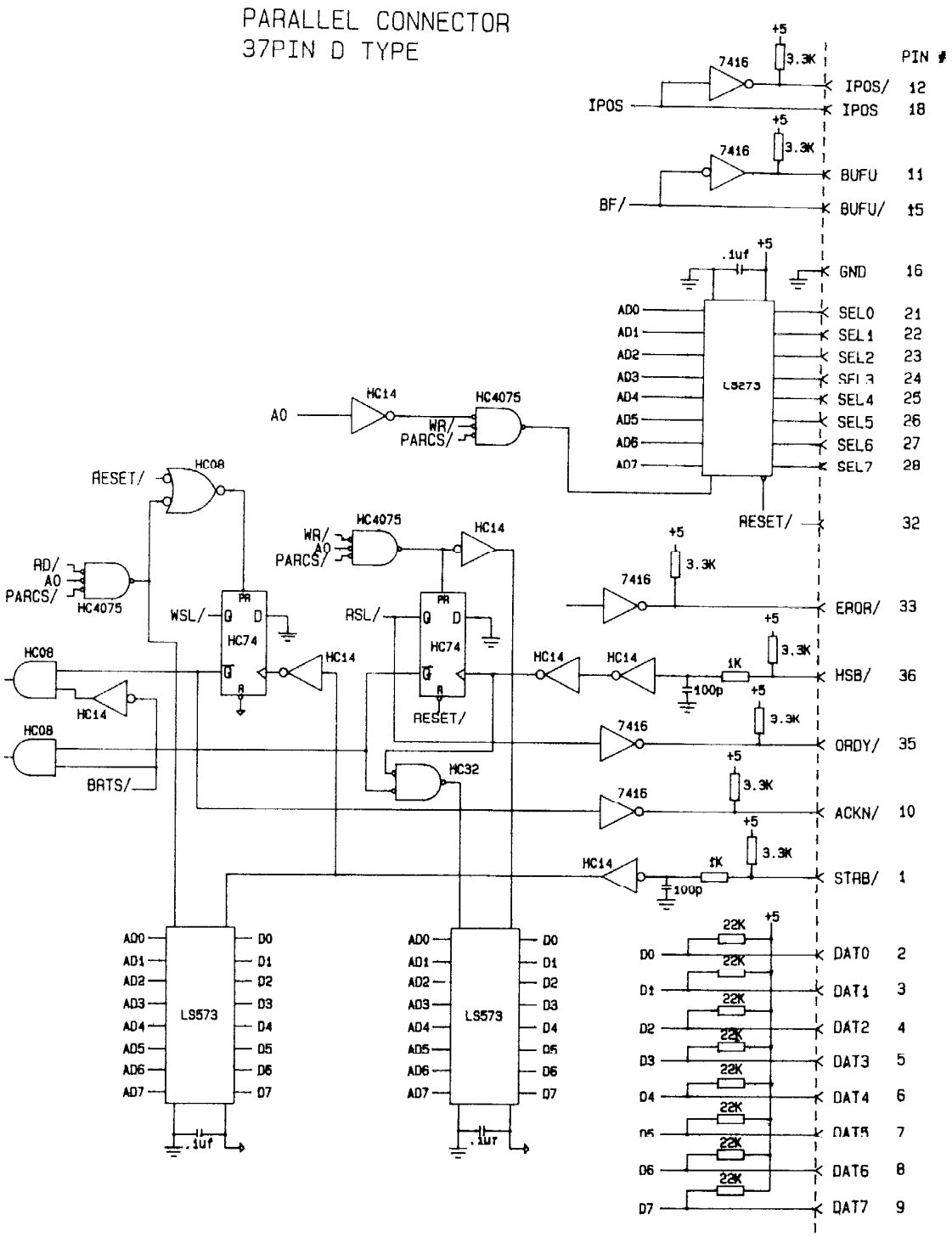
X OR Y AMP CONNECTOR



DWG. 9. Opto-Isolated Error Output

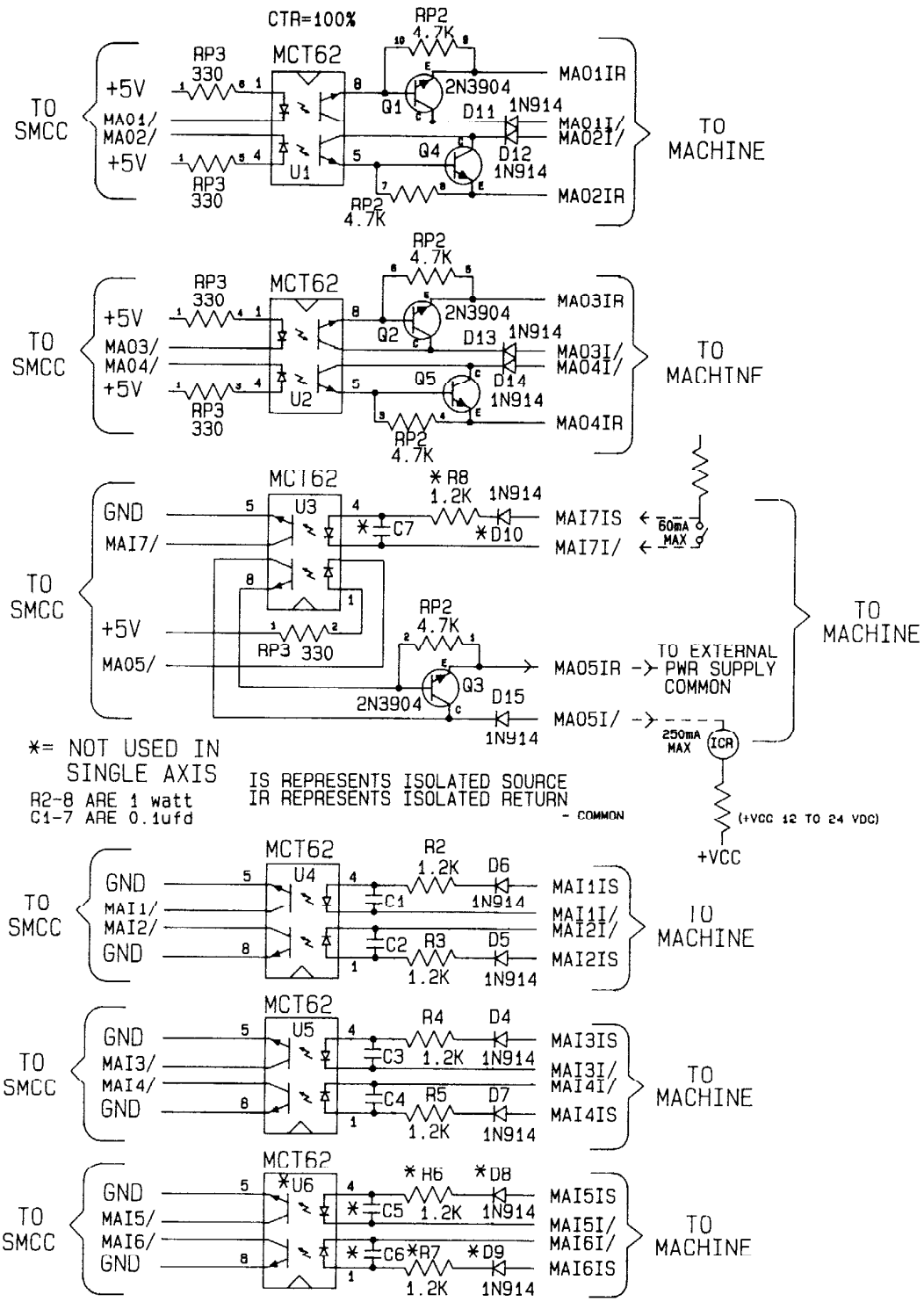
REMOTE PANEL CONNECTOR

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DWG. 10. Parallel Interface

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DWG. 11 Opto-Isolated Machine I/O

REMOTE PANEL CONNECTOR

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APPENDIX B: MODEL PMC-2 BOX

FIELD INSTALLATION INSTRUCTIONS

These instructions cover the procedures on how to field install a Baldor Smart Motion Control Card catalog #SMCC with options 1,2,3 or 4.

Note: SMCC option 3 must be installed in order to use the PMC analog input feature.

A) To gain access into the PMC enclosure, remove the (2) Phillips Head screws from the top and bottom of the enclosure (located near the connector). The front panel will come loose, but will have a cable connecting it to the logic power supply fastened to the right inside wall.

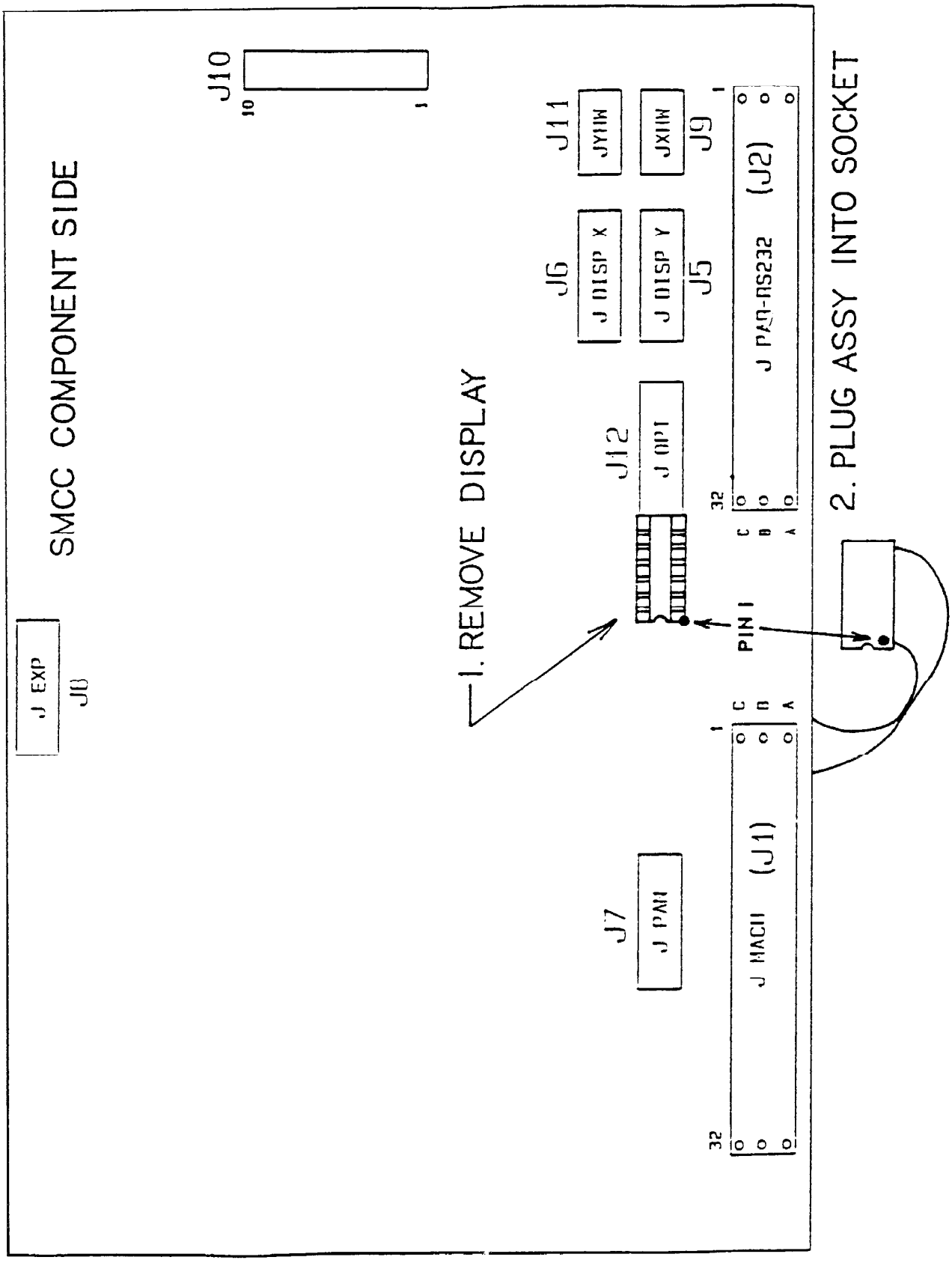
B) To mount your SMCC, remove the diagnostic LED from the SMCC socket. Plug the ribbon cable from the front panel into the SMCC display socket (Ref Data Sheet YC06500A-00). Plug the SMCC into the (2) 96 pin sockets on the front panel.

C) Slide the SMCC front panel assembly into the top and bottom rails of the PMC enclosure, and refasten with the (4) Phillips screws.

This completes the installation. Refer to the manual for further hook-up procedures.

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APPENDIX B: YC06500A-00 INSTALLATION DRAWING



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APPENDIX C: MISCELLANEOUS DRAWINGS

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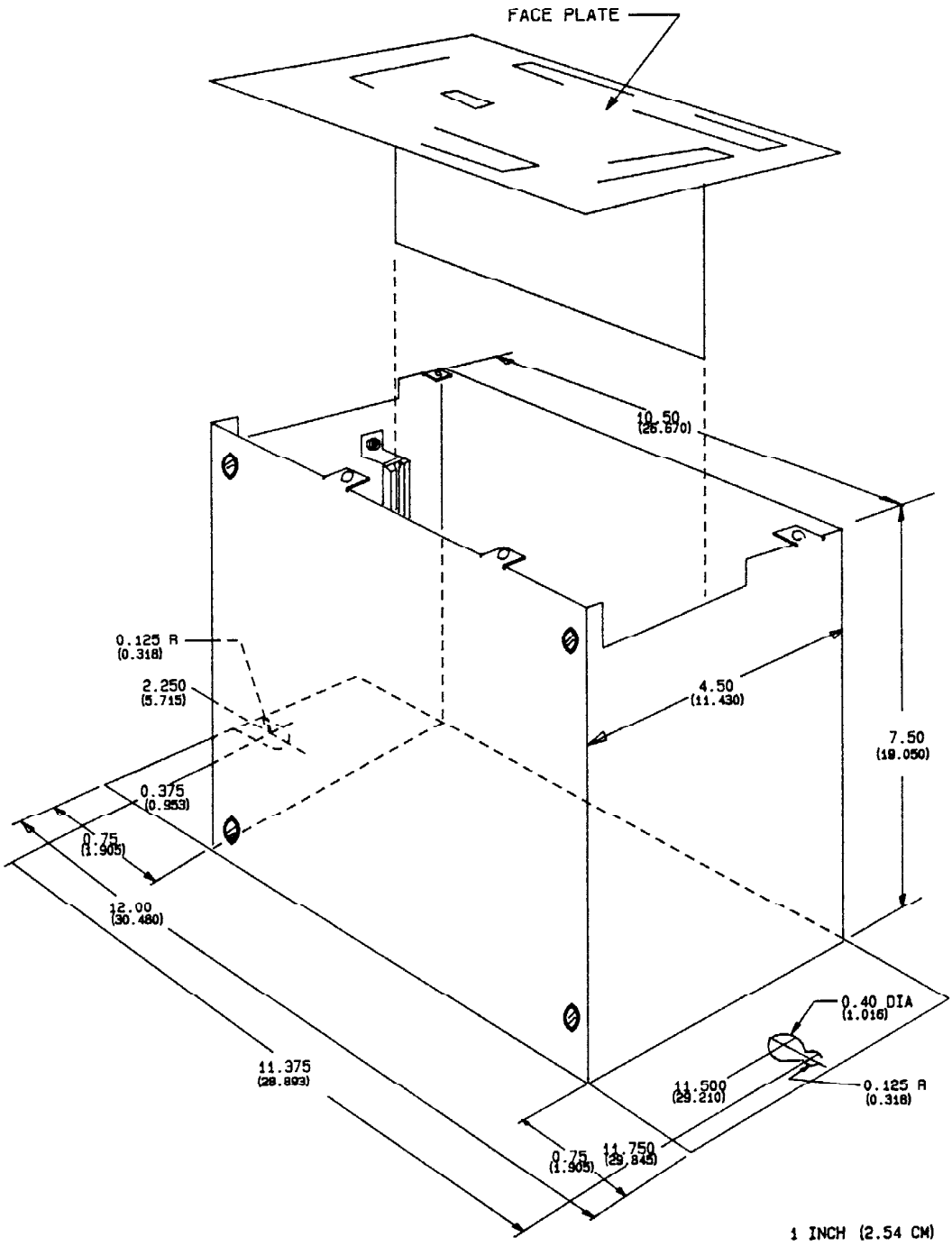


FIGURE 1. PMC CHASSIS DIMENSIONS

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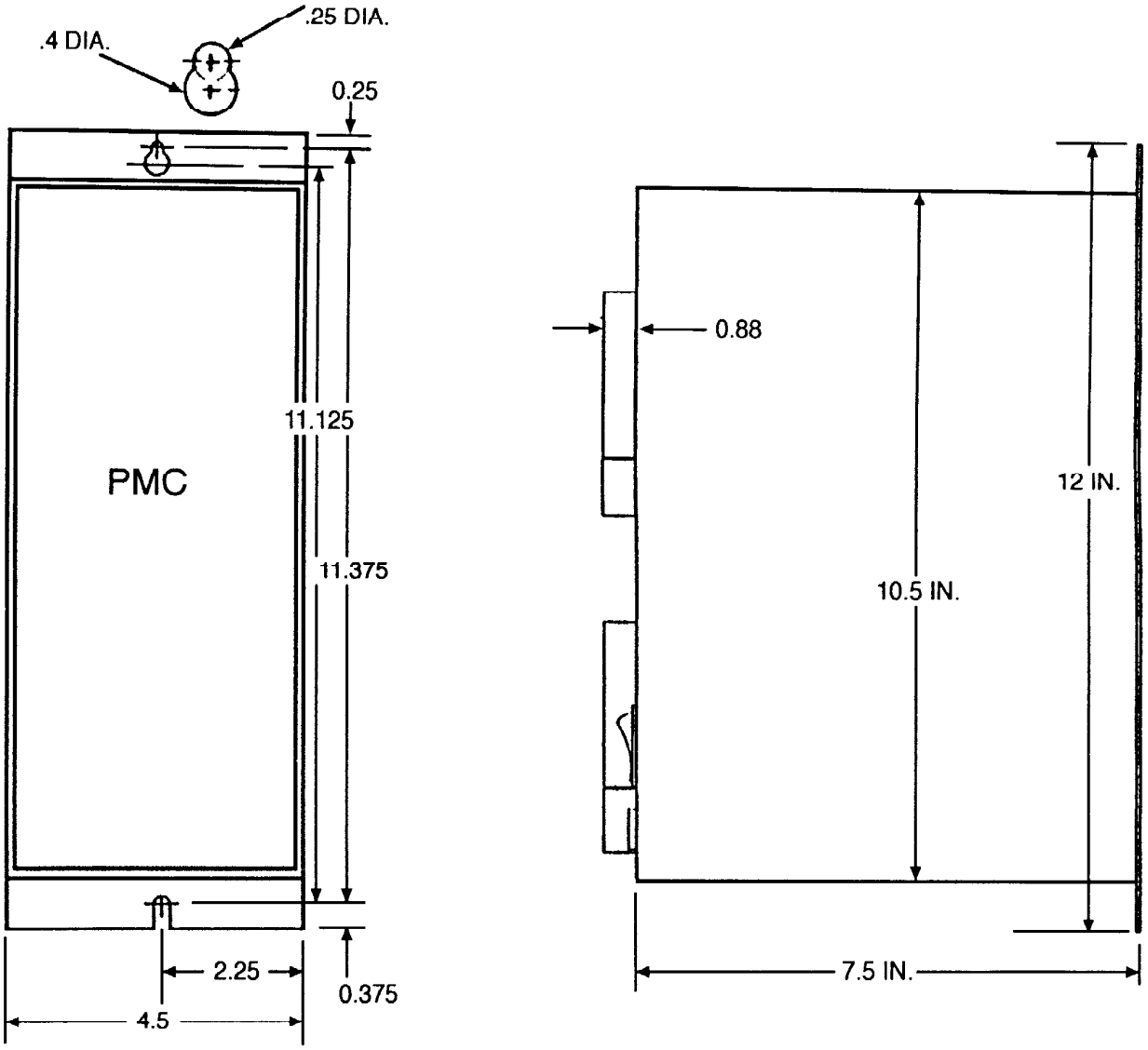


Figure 1.1

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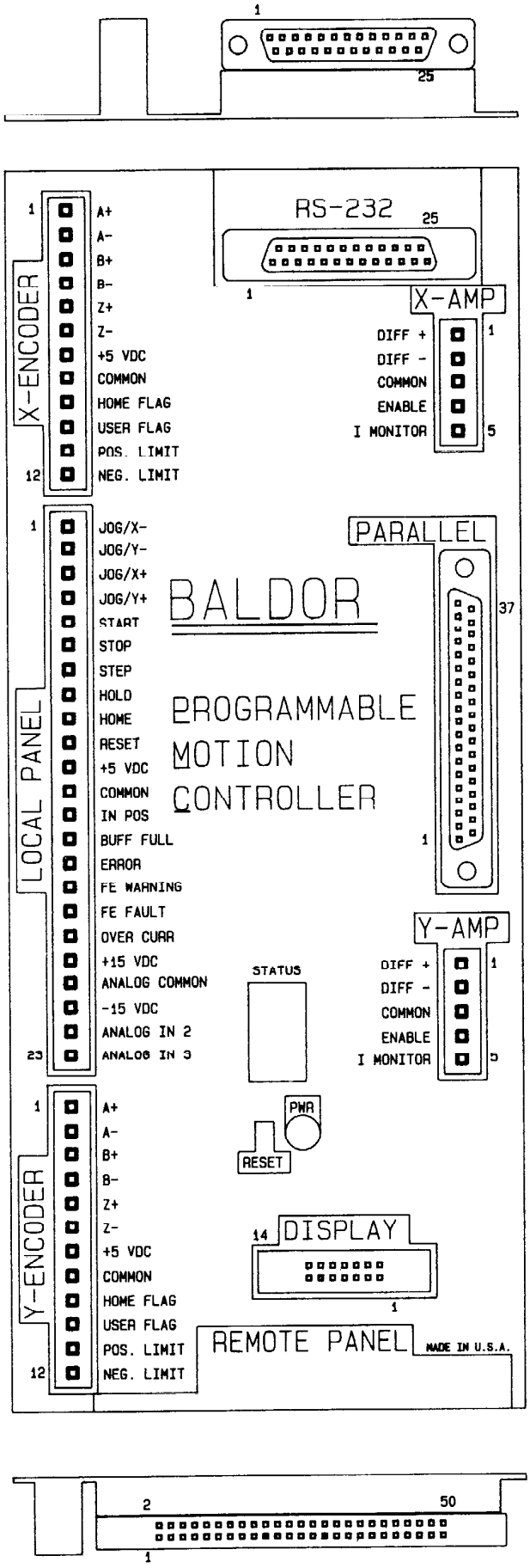
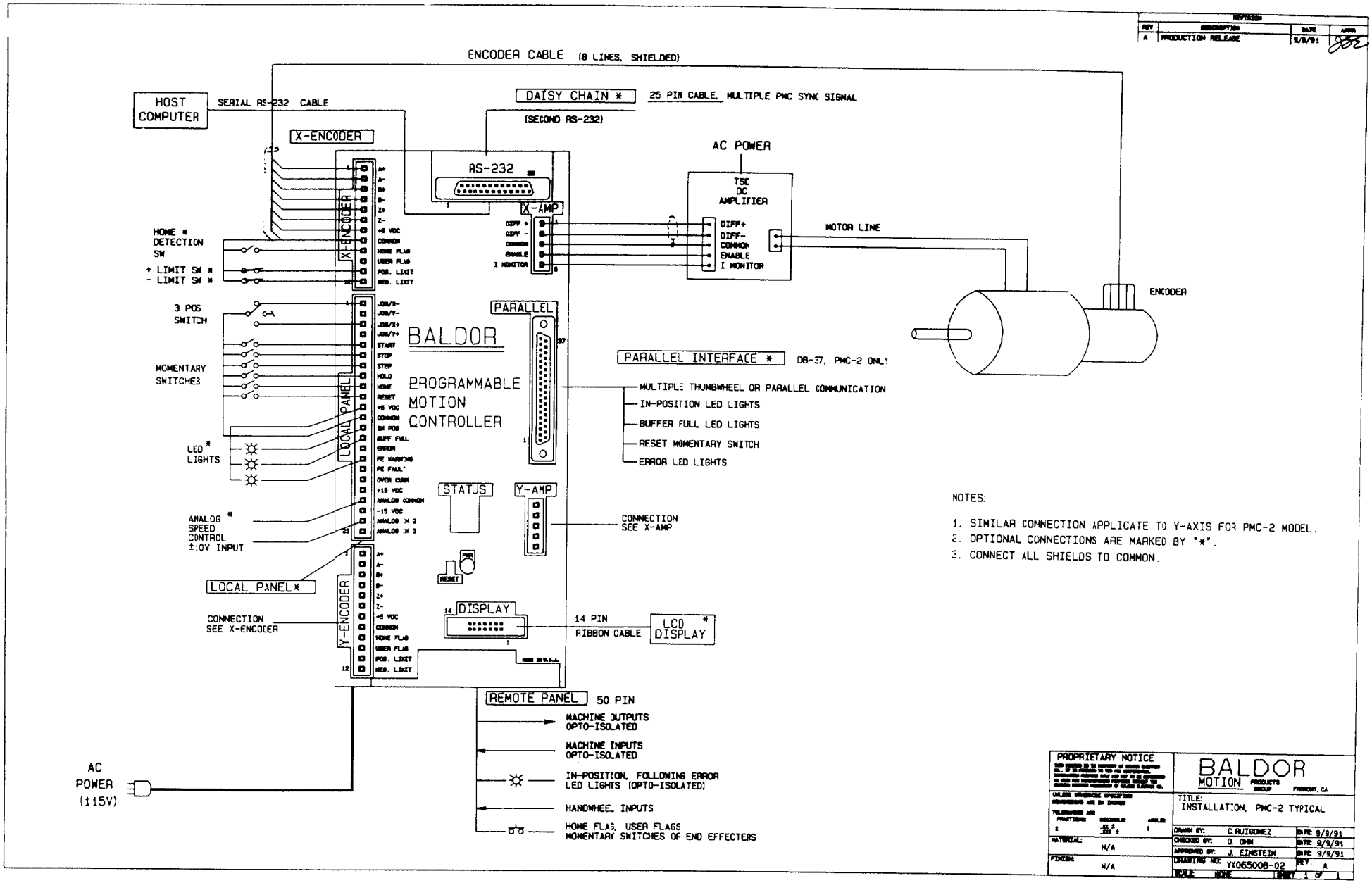
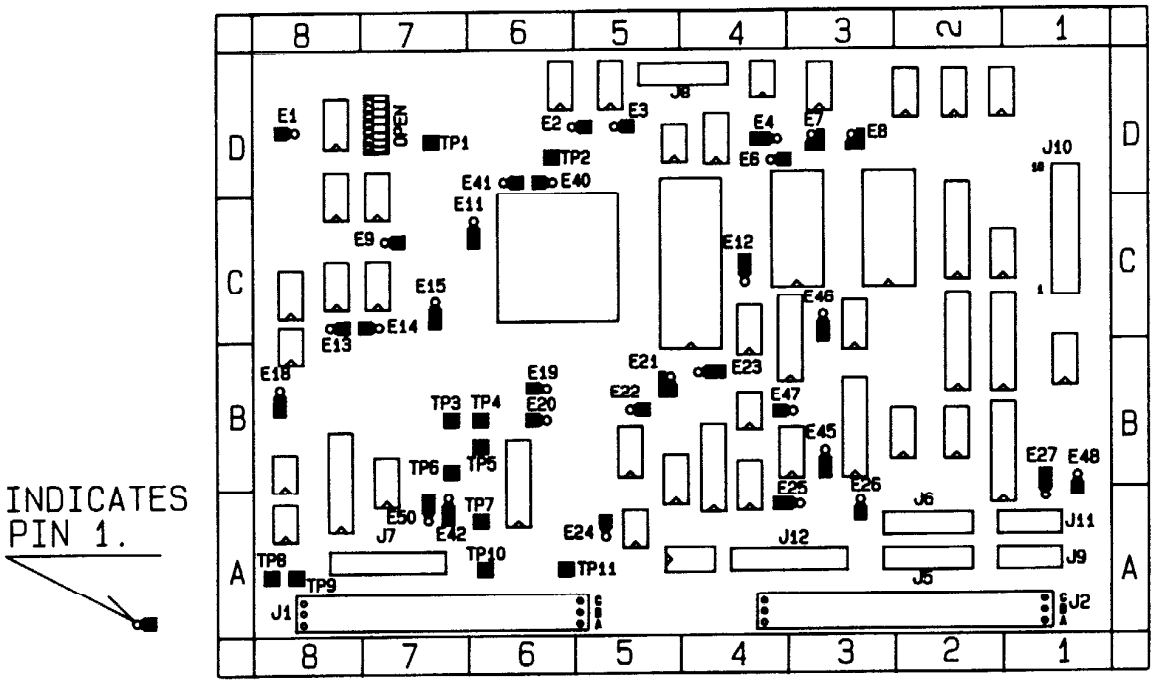


Figure 2 Dual Axis PMC Connectors

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E	LOC.	CONFIG.	REMARKS
E1	D8	2 1	+/-5V. (+/-10V)
E2	D6	[1 2]	SERVO AO
E3	D5	1 2	SYNC AO
E4	D4	3 2 [1]	NO RESOLVER
E6	D4	1 2	
E7	D3	[1 2] / [3 4]	RS-232
E8	D3	[1 2] / [3 4]	RS-232
E9	C7	1 2	+/-5V. (+/-10V)
E11	C7	[1] / [2]	EXTERNAL +15V
E12	C4	[3] / [2] / 1	8 KHZ
E13	C8	[1 2] 3	
*E14	C7	3 [2 1]	AENA (AENA/)
E15	C7	[1] / [2]	EXTERNAL +15V
E18	B8	[1] / [2] / 3	
E19	B6	1 2	
E20	B6	1 2	
E21	B5	4 1 / [5 2] / 6 3	

E	LOC.	CONFIG.	REMARKS
E22	B5	1 2	
E23	B4	1 [2 3]	
E24	A5	[1] / [2]	
E25	A4	3 [2 1]	
E26	A3	[1] / [2]	SP5V
E27	B1	[3] / [2] / 1	
E40	D6	[1 2]	
E41	D6	[1 2]	
E42	A7	[1] / [2] / 3	DIFFERENTIAL X-ENCODER
E45	B3	1 / [2] / [3]	
E46	C3	1 / [2] / [3]	
E47	B4	1 2	
E48	B1	[1] / [2]	
E50	A7	[3] / [2] / [1]	DIFFERENTIAL Y-ENCODER

*E14: FOR TSD CONNECTION, JUMPER E14 POSITION 1-2, NORMALLY CLOSED ENABLE OR INTERLOCK LINE.
*E14: FOR SUM CONNECTION, JUMPER E14 POSITION 2-3, NORMALLY OPEN ENABLE OR INTERLOCK LINE.

SMCC E-POINTS, LOCATIONS AND DEFAULT CONFIGURATION

FIGURE 4

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