



**BALDOR<sup>®</sup>**  
**MOTORS AND DRIVES**



**Expansion Boards  
for Series M Controls**

(Catalog Numbers  
EXB101Mxx  
EXB102Mxx  
EXB103Mxx)

**Operating Manual**

# Table of Contents

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<b>Section 1</b>	
<b>General Information</b> .....	1-1
Introduction .....	1-1
Limited Warranty .....	1-2
Safety Notice .....	1-3
Precautions .....	1-3
<b>Section 2</b>	
<b>Expansion Board Description</b> .....	2-1
Introduction .....	2-1
High Resolution Analog .....	2-2
Pulse Follower .....	2-5
<b>Section 3</b>	
<b>Installation</b> .....	3-1
Board Installation .....	3-1
<b>Section 4</b>	
<b>Hardware Setup</b> .....	4-1
Termination .....	4-1
EXB101 Serial RS232/485 only .....	4-2
EXB102 Serial & Pulse Follower .....	4-3
EXB102 Serial & High Res. Analog .....	4-4
Serial Cable Connection .....	4-6
Control Terminal Strip Connections .....	4-10
High Resolution Analog .....	4-11
Pulse Follower Connections .....	4-12
<b>Section 5</b>	
<b>Software Setup</b> .....	5-1
Configure Control Software for Serial Operating Mode ....	5-1
Host Computer Setup .....	5-3
Setup Windows 3.1 Terminal Emulation .....	5-3
Serial Mode Control Setup .....	5-5
Pulse Follower .....	5-7

---

## Section 6

<b>Serial Command Language</b>	6-1
ACK_ON	6-1
ACK_OFF	6-1
Ax(Address)	6-1
AA(Address All)	6-1
AUn (Auto-Tune)	6-1
C (Clear)	6-2
CALC	6-2
D (Disable)	6-2
DL (Download)	6-2
E (Enable)	6-2
ECHO_ON	6-2
ECHO_OFF	6-2
F (Fault)	6-2
GO (Process Target Register Command)	6-2
H (Home)	6-3
HF (Help Fault)	6-3
HL (Help Log)	6-3
HP or HPxxxx or HPxxxx nnnn (Help Parameters)	6-3
ID (Power Base ID)	6-4
IO (IO Status)	6-4
Jx (Jog)	6-4
L (Log)	6-4
M or Mxxxx (Absolute Move)	6-5
m or mxxxx (Incremental Move)	6-5
Ox (Report)	6-5
P or Pxxxx or Pxxxx nnnn	6-6
S (STOP)	6-6
SCxxxx (Security Code)	6-6
ST (STATUS)	6-7
STATUS (FULL STATUS)	6-7

Continued on next page

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T or Tnnnn (Torque command) .....	6-7
TAR xxxx (Target Register) .....	6-7
TP (Test Points) .....	6-8
TPF (Test Point File) .....	6-8
TPT (Test Point Trigger) .....	6-8
UL (Upload) .....	6-8
V or Vnnnn (Velocity Command) .....	6-9
VX or VXnnn (Velocity Command/256) .....	6-9
v or vxxxx (Positioning Speed) .....	6-9
W (Position to Zero) .....	6-9
Z (Set Current Position to Zero) .....	6-9
<b>Section 7</b>	
<b>Communication Using a Modem</b> .....	7-1
Series M Controls Remote Modem Setup .....	7-1
Set Modem Switches .....	7-1

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# Section 1

## General Information

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### **Introduction**

The Baldor controls represent the latest technology in microprocessor based motor controls. In addition to the user programmable parameters available in every control, many different expansion boards are available from Baldor to further customize the control to most any application.

Three expansion boards are available for the Series M controls.

**Table 1-1 Expansion Boards**

<b>Board Name</b>	<b>Catalog No.</b>
Serial Communications	EXB101Mxx
Serial + Pulse Follower	EXB102Mxx
Serial + High Resolution Analog	EXB103Mxx

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## **Limited Warranty**

For a period of two (2) years from the date of original purchase, BALDOR will repair or replace without charge controls and accessories which our examination proves to be defective in material or workmanship. This warranty is valid if the unit has not been tampered with by unauthorized persons, misused, abused, or improperly installed and has been used in accordance with the instructions and/or ratings supplied. This warranty is in lieu of any other warranty or guarantee expressed or implied. BALDOR shall not be held responsible for any expense (including installation and removal), inconvenience, or consequential damage, including injury to any person or property caused by items of our manufacture or sale. (Some states do not allow exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply.) In any event, BALDOR's total liability, under all circumstances, shall not exceed the full purchase price of the control. Claims for purchase price refunds, repairs, or replacements must be referred to BALDOR with all pertinent data as to the defect, the date purchased, the task performed by the control, and the problem encountered. No liability is assumed for expendable items such as fuses.

Goods may be returned only with written notification including a BALDOR Return Authorization Number and any return shipments must be prepaid.


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## **Safety Notice**

This equipment contains voltages that may be as great as 1000 volts! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

This equipment may be connected to other machines that have rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

## PRECAUTIONS

 **WARNING:** Do not touch any circuit board, power device or electrical connection before you first ensure that power has been disconnected and there is no high voltage present from this equipment or other equipment to which it is connected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

 **WARNING:** Be sure that you are completely familiar with the safe operation of this equipment. This equipment may be connected to other machines that have rotating parts or parts that are controlled by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

- 
- ⚠ WARNING:** Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury.
- ⚠ WARNING:** Do not remove cover for at least five (5) minutes after AC power is disconnected to allow capacitors to discharge. Dangerous voltages are present inside the equipment. Electrical shock can cause serious or fatal injury.
- ⚠ WARNING:** Improper operation of control may cause violent motion of the motor shaft and driven equipment. Be certain that unexpected motor shaft movement will not cause injury to personnel or damage to equipment. Peak torque of several times the rated motor torque can occur during control failure.
- ⚠ WARNING:** Motor circuit may have high voltage present whenever AC power is applied, even when motor is not rotating. Electrical shock can cause serious or fatal injury.
- ⚠ Caution:** Use a circuit capable of delivering not more than the RMS symmetrical amperes listed here at 600VAC maximum.

<u>Horsepower</u>	<u>RMS Symmetrical Amperes</u>
1-50	5,000
51-200	10,000
201-400	18,000
401-600	30,000
601-900	42,000

## Section 2

# Expansion Board Description

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### Introduction

Any computer that provides an RS-232 or RS-485 serial interface may be used to setup and operate the control using one of the available expansion boards. A proprietary Serial Command Language is built into the control for this purpose. A computer or terminal capable of serial communications using the standard ASCII character set is required to use the Serial Command Language.

A typical system consists of an MS-DOS™ compatible computer with communications software. The Serial Command Language can control any operation of the control including running the motor, changing parameters, and viewing output conditions. Some control features are unique to the Serial Operating Mode, such as positioning and file transfer commands.

### **EXB101Mxx – Serial Communications**

Allows RS232 half and full duplex communication at 9600 baud.

Standard DB9 pin connector is provided.

Allows RS485 communication with standard Phoenix terminal connections.

### **EXB102Mxx – Serial Communications and Pulse Follower**

Allows RS232 half and full duplex communication at 9600 baud.

Standard DB9 pin connector is provided.

Allows RS485 communication with standard Phoenix terminal connections.

Provides selectable master quadrature pulse reference or pulse and direction output reference for follower applications. Standard Phoenix terminal connections.

### **EXB103Mxx – Serial Communications and High Resolution Analog**

Allows RS232 half and full duplex communication at 9600 baud.

Standard DB9 pin connector is provided.

Allows RS485 communication with standard Phoenix terminal connections.

Allows one analog input with 16 bit resolution. Standard Phoenix terminal connections.

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## **High Resolution Analog**

Features:

One (1) Analog Input

Two (2) Analog Outputs\*

16 Bit\*\* Digital Resolution Maximum

\*Note: These outputs are high resolution. The standard outputs from the control board J1A are disabled.

\*\* Note: Resolution is a minimum of 12 bits during the initial 110 second warm up period. After 110 seconds, the full 16 bit maximum resolution applies.

The Analog I/O expansion board provides one high resolution analog input to the motor control board and two high resolution outputs from the motor control board. Both outputs are configured by jumper selection for 0–10VDC,  $\pm 10$ VDC or 4–20 mA.

Each analog output may be configured to a different voltage or current range, independent of the other output.

**Table 2-1 Characteristics**

High Resolution Input	Number of Inputs	One
	Input Signal Levels	0–5VDC, $\pm 5$ VDC, 0–10VDC, $\pm 10$ VDC, or 4–20mA
	Maximum Digital Resolution	14 to 16 bits – Depending on Input Signal Type
High Resolution Outputs	Number of Outputs	Two
	Output Signal Levels	0–10VDC, $\pm 10$ VDC, or 4–20mA
	Maximum Digital Resolution	15 to 16 bits – Depending on Output Signal Type

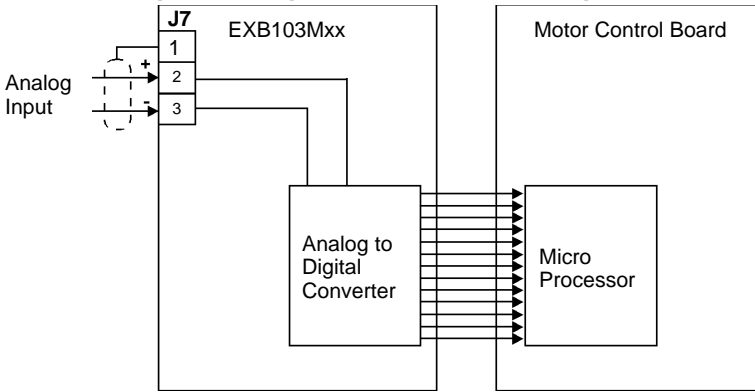
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**Table 2-2 Signal Resolution**

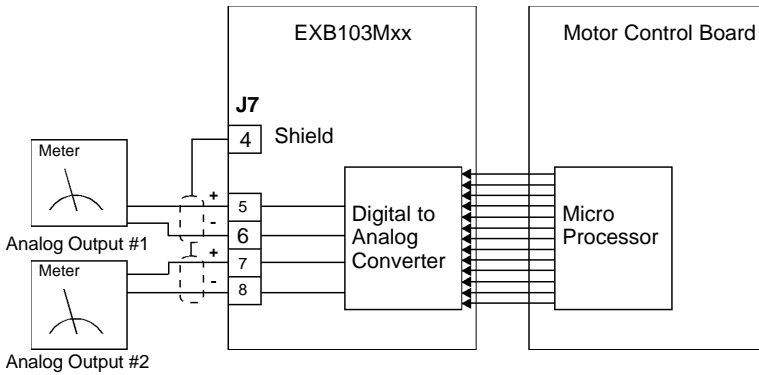
Input Signal	Signal Type	Digital Resolution	Analog Resolution
<b>High Resolution Input</b>			
±10VDC	Voltage	16 Bits (65636 Parts)	305 μVDC (0.000305 VDC)
0-10VDC	Voltage	15 Bits (32768 Parts)	305 μVDC (0.000305 VDC)
±5VDC	Voltage	15 Bits (32768 Parts)	305 μVDC (0.000305 VDC)
0-5VDC	Voltage	14 Bits (16384 Parts)	305 μVDC (0.000305 VDC)
4-20mA	Current	15 Bits (32768 Parts)	0.488 μA (0.000000488 AMP)
<b>High Resolution Output</b>			
±10VDC	Voltage	16 Bits (65636 Parts)	305 μVDC (0.000305 VDC)
0-10VDC	Voltage	15 Bits (32768 Parts)	305 μVDC (0.000305 VDC)
4-20mA	Current	15 Bits (32768 Parts)	0.488 μA (0.000000488 AMP)

Note: Resolution is a minimum of 12 bits during the initial 110 second warm up period. After 110 seconds, the full 16 bit maximum resolution applies.

**Figure 2-1 High Resolution Input Configuration**



**Figure 2-2 High Resolution Output Configuration**



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## **Pulse Follower**

Features:

- Master/Follower Operation
- Velocity Ratioing
- Position Following

Velocity ratioing is speed matching of two or more drives. Master follower ratios are set using integers within the range of 65535:1 to 1:65535. Fractional ratios can be set using integers, e.g. a 2.5:1 ratio is set at 5:2.

Position following or electronic gearing is pulse to pulse following of two or more drives. Master follower ratios are set using integers within the range of 65535:1 to 1:20. Fractional ratios can be set using integers, e.g. a 2.5:1 ratio is set at 5:2. Position following is only possible when the motor mounted feedback devices are resolvers.

**Note: If the master is to run faster than the follower, ratios of master to follower may be as high as 65535:1.**

**Table 2-1 Characteristics**

Input Voltage Level	5 - 15 VDC
Retransmit Voltage Level	5 VDC
Input Signal Types (Independent of Output)	Quadrature or Speed/Direction
Output Signal Types (Independent of Input)	Quadrature or Speed/Direction
Input/Output Ratio (adjusted within the control)	Adjustable ratio from 65535:1 to 1:20
Operating Modes	Master or Follower
Connection method	Parallel or Cascade

## **Configurations**

The board can be installed to configure a control as either a master or follower drive in a process. The configurations differ by control type and configuration.

---

## **Definitions**

### Parallel Configuration

In a parallel configuration all follower controls receive the master pulse train. All Followers are ratioed to the master pulse train. The master pulse train can originate from the first motor control in the process or from an encoder located ahead of the first control.

### Cascade Configuration

In a Cascade configuration all follower controls receive the pulse train from the control directly ahead of it in the process. If the master is a control that does not have a buffered encoder output at its control terminal strip, a pulse follower expansion board must be installed in the master and all follower controls. Otherwise, only the followers require expansion boards.

### Master

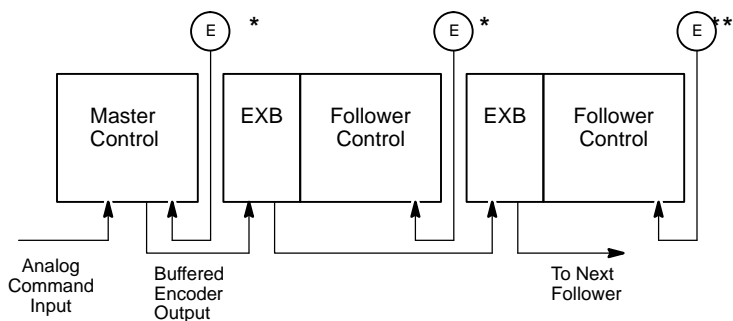
The master is the first pulse generator in the process. This can be the first control in the process or from an encoder located ahead of the first control.

### Follower

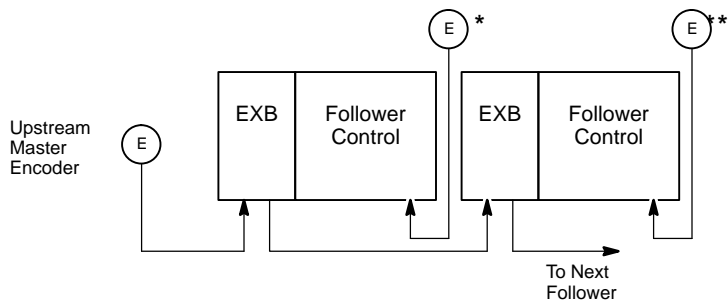
A follower is a control in the process that is ratioed to the master pulse train. In a parallel configuration all followers are ratioed to a single master. In a Cascade configuration followers are ratioed to the pulse train of the control directly ahead of it in the process.

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**Figure 2-3 Parallel Master and Follower**



**Figure 2-4 Parallel Following Upstream Encoder**



\*Note: Encoder feedback.

\*\*Note: Uses Resolver feedback.



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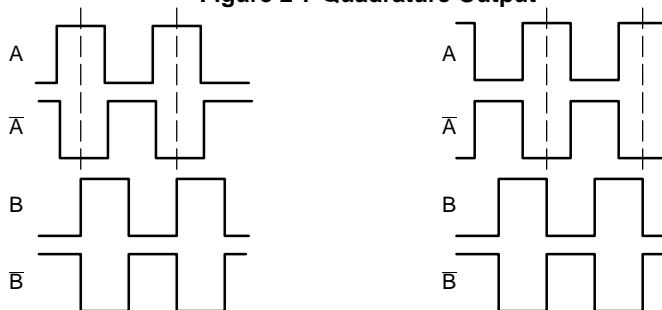
## Operating Modes

Two operating modes are selectable; Quadrature and Pulse-Direction. The master pulse train can be a 5 - 15 VDC signal level and will be retransmitted by the board as a 5 VDC signal level.

### Quadrature

The factory setting uses a two channel quadrature pulse train (identical to a standard encoder pulse train). The waveform of the quadrature outputs is shown in Figure 2-7. The channels are identified as A,  $\bar{A}$ , B and  $\bar{B}$ . Where A and B channels are in quadrature and  $\bar{A}$  is a complement of A, and  $\bar{B}$  is a complement of B.

Figure 2-7 Quadrature Output



Quadrature: A Leading B

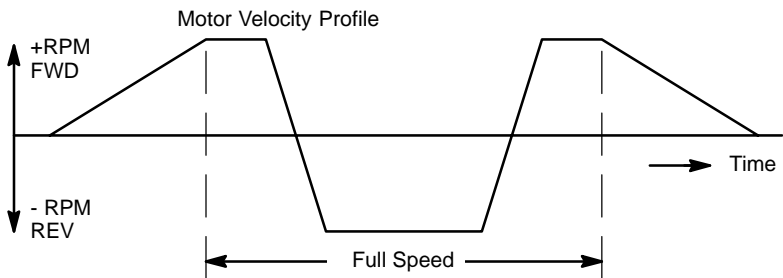
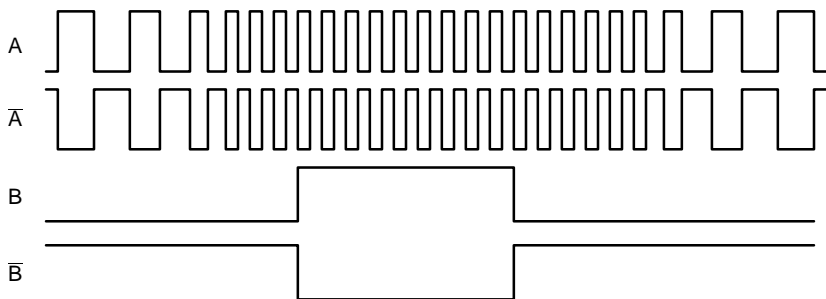
Quadrature: B Leading A

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### Speed/Direction

In Speed/Direction mode, the frequency of the A channel controls motor speed and the state of the B Channel controls rotational direction. The waveform is shown in Figure 2-8.

**Figure 2-8 Speed/Direction Output**



## Section 3

# Installation

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### **Board Installation**

The control must be ordered with the expansion board installed. However, if you need to replace the board, this procedure will assist you.

Remove the expansion board from the shipping container. Remove all packing material from the board. Conductive foam may be present on the connectors to prevent static build up during shipping. This can prevent proper circuit operation.

Procedure:

1. Be sure drive operation is terminated and secured.
2. Remove all power sources from the control.
3. Wait at least 5 minutes for internal capacitors to discharge.
4. Remove the control cover.
5. Release the standoffs and pull the expansion board away from the control board. Do not twist or pull unevenly or the pins will be bent.
6. Refer to Section 4 of this manual and configure the jumpers as desired.
7. Place the new expansion board over the control board and ensure the two rows of connector pins (ST1 and ST2) of the control board are properly aligned with the connectors (ST1 and ST2) on the expansion board. Press down firmly and evenly to engage the connector pins and lock the expansion board into the standoffs.
8. Install the control cover
9. Restore all power sources to the control.
10. Restore drive operation.



## Section 4

# Hardware Setup

---

### **Termination** (RS485 only)

First, a few brief words about termination resistance.

#### **What does termination or a termination resistor do?**

Termination resistance is used to match the impedance of the load to the impedance of the transmission line (cable) being used. Unmatched impedance causes the transmitted signal to not be fully absorbed by the load. This causes a portion of the signal to be reflected back into the transmission line (noise). If the *Source* impedance, *Transmission Line* impedance, and *Load* impedance are all equal, these reflections (noise) are eliminated.

Termination does increase load current and sometimes changes the bias requirements and increases the complexity of the system.

#### **What is a termination resistor?**

A resistor is added in parallel with the receiver input to match the impedance of the cable being used. Typically, the resistor value that is used is 100 ohm or 120 ohm. Resistors with 90 ohms or less should never be used.

#### **Where are these resistors placed?**

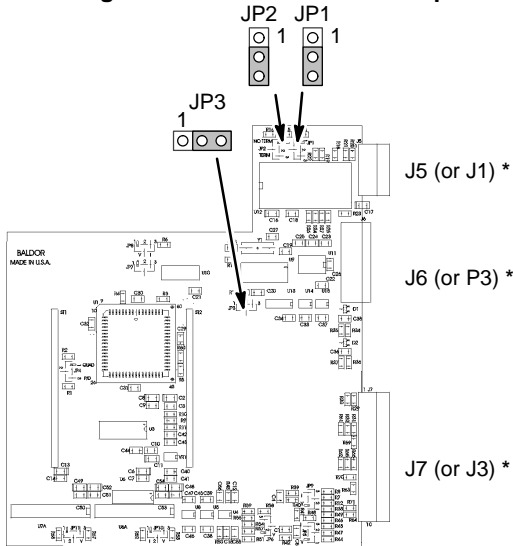
Terminators or Termination resistors are placed in parallel with the receiver at both ends of a transmission line. This means that you should **never** have more than two terminators in the system (unless repeaters are being used).

#### **How many resistors should my system have?**

Terminators or Termination resistors are placed in parallel with the receiver at both ends of a transmission line. This means that you should **never** have more than two terminators in the system (unless repeaters are being used).

**EXB101 Serial RS232/485 only** (See Figure 4-1 and Table 4-1).

**Figure 4-1 Connector and Jumper Locations**



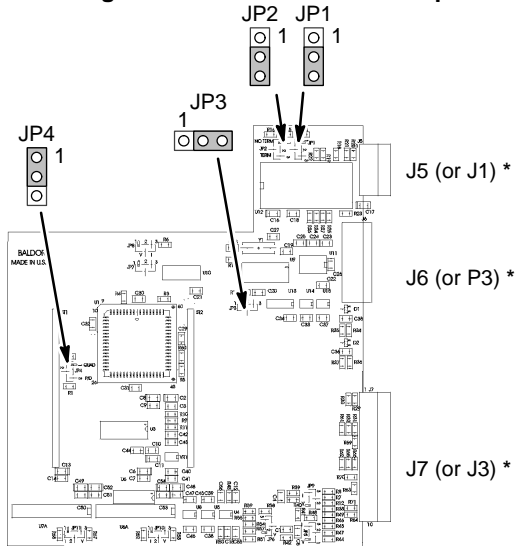
\* Connectors for boards with Rev A artwork were labeled J1, P3, J3).

**Table 4-1 Jumper Position Description**

JP #	Description	Position Definition		Factory Setting
		Pins 1 – 2	Pins 2 - 3	
1	Termination resistor (RS485 input TXB)	OFF	ON	Pins 2 - 3
2	Termination resistor (RS485 input TXA)	OFF	ON	Pins 2 - 3
3	Serial Communications	OFF	ON	Pins 2 - 3

**EXB102 Serial & Pulse Follower** (See Figure 4-2 and Table 4-2).

**Figure 4-2 Connector and Jumper Locations**



\* Connectors for boards with Rev A artwork were labeled J1, P3, J3).

**Table 4-2 Jumper Position Description**

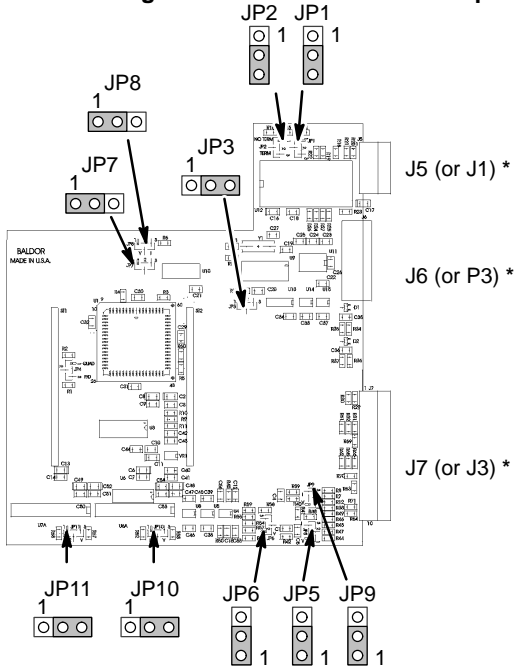
JP #	Description	Position Definition		Factory Setting
		Pins 1 – 2	Pins 2 - 3	
1	Termination resistor (RS485 input TXB)	OFF	ON	Pins 2 - 3
2	Termination resistor (RS485 input TXA)	OFF	ON	Pins 2 - 3
3	Serial Communications	OFF	ON	Pins 2 - 3
4	Quadrature/Pulse Direction (EXB102 only)	Quadrature	Pulse Direction	Pins 1 - 2

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## EXB103 Serial & High Res. Analog

(See Figure 4-3 and Table 4-3).

**Figure 4-3 Connector and Jumper Locations**



\* Connectors for boards with Rev A artwork were labeled J1, P3, J3).

**Table 4-3 Jumper Position Description**

JP #	Description	Position Definition		Factory Setting
		Pins 1 – 2	Pins 2 - 3	
1	Termination resistor (RS485 input TXB)	OFF	ON	Pins 2 - 3
2	Termination resistor (RS485 input TXA)	OFF	ON	Pins 2 - 3
3	Serial Communications	OFF	ON	Pins 2 - 3
5	Hi Res. Analog Output#1 Mode Select (EXB103 only)	Voltage	Current (4-20mA)	Pins 1 - 2
6	Hi Res. Analog Output#2 Mode Select (EXB103 only)	Voltage	Current (4-20mA)	Pins 1 - 2
7	Hi Res. Analog Output#2 Current Mode Enable (EXB103 only)	OFF	ON	Pins 1 - 2
8	Hi Res. Analog Output#1 Current Mode Enable (EXB103 only)	OFF	ON	Pins 1 - 2
9	Hi Res. Analog Input Mode Selection (EXB103 only)	Voltage	Current (4-20mA)	Pins 1 - 2
10	Hi Res. Analog Output#1 Mode Select (EXB103 only)	Current (4-20mA)	Voltage	Pins 2 - 3
11	Hi Res. Analog Output#2 Mode Select (EXB103 only)	Current (4-20mA)	Voltage	Pins 2 - 3

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## Serial Cable Connection (Figures 4-3 and 4-4)

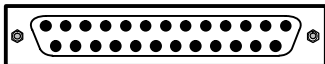
### RS232

A "Null Modem" cable connection is required. Connect the customer supplied null modem cable between the J6 (P3) DB9 connector on the expansion board (DCE) and the DB9 or DB25 RS-232 serial port of the computer or DTE equipment.

Proceed to Section 5 of this manual.

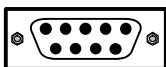
### Figure 4-4 9 & 25 Pin RS-232 Cable Connections

A null modem cable (also called a modem eliminator cable) must be used to connect the expansion board and the computer COM port. This will ensure that the transmit and receive lines are properly connected. Either a 9 pin or a 25 D connector can be used.



25 Pin Connector

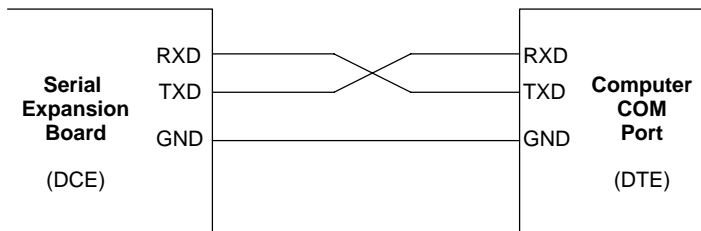
Pin	Signal
2	RXD
3	TXD
7	GND



9 Pin Connector


Pin	Signal
2	RXD
3	TXD
5	GND

### Null Modem Cable Connections



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**Figure 4-5 Phoenix Type Connections****J5 – 4 pin Phoenix Connector**

 Pin	Signal
1	GND (Shield)
2	TXB
3	TXA
4	Not Used

**J7 – 10 pin Phoenix Connector**

<b>Pulse Follower (EXB102)</b>	
Pin	Signal
1	Isolated Input A +
2	Isolated Input A –
3	Isolated Input B +
4	Isolated Input B –
5	DGND (Shield)
6	DGND (Shield)
7	Output A +
8	Output A –
9	Output B +
10	Output B –

**High Resolution Analog (EXB103)**

Pin	Signal
1	Not Used
2	Not Used
3	AGND
4	Analog Input +
5	Analog Input –
6	AGND
7	Analog OUT#1
8	AGND
9	Analog OUT#2
10	AGND

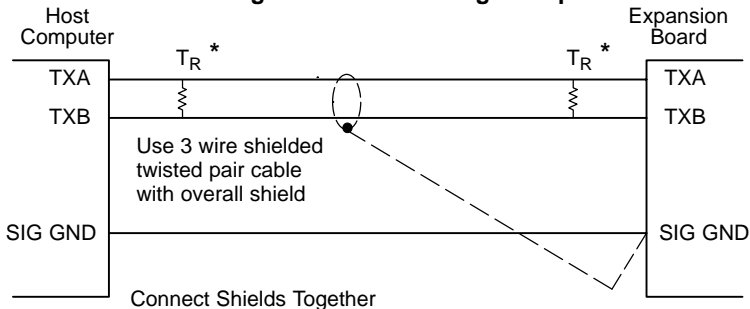
\* Connectors for boards with Rev A artwork were labeled J1, P3, J3).

## RS485

Connection diagrams for RS485 systems are provided in this section. Locate the diagram for your system configuration and make the proper connections at the J5 (J1) Phoenix connector. Set JP1 and JP2 for the termination resistor, if required.

Proceed to Section 5 of this manual.

**Figure 4-6 RS485 Single Drop**



- \* Contact PC and cable manufacturer to determine if terminating resistor is required for 2 wire RS485 connection.  
If so,  $120 \Omega$  is typical value for  $T_R$ .

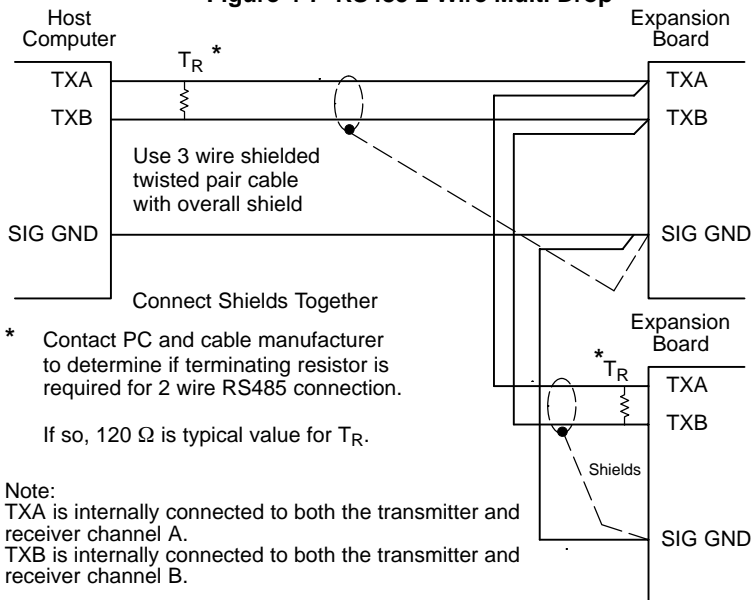
**Note:**

TXA is internally connected to both the transmitter and receiver channel A.  
TXB is internally connected to both the transmitter and receiver channel B.

**Table 4-4 Termination Jumper Settings**

Function	Jumper Number	Jumper Position
Termination	JMP 1	2-3
	JMP 2	2-3
No Termination	JMP 1	1-2
	JMP 2	1-2

**Figure 4-7 RS485 2 Wire Multi Drop**



**Table 4-5 Termination Jumper Settings**

Function	Jumper Number	Jumper Position
Termination	JMP 1	2-3
	JMP 2	2-3
No Termination	JMP 1	1-2
	JMP 2	1-2

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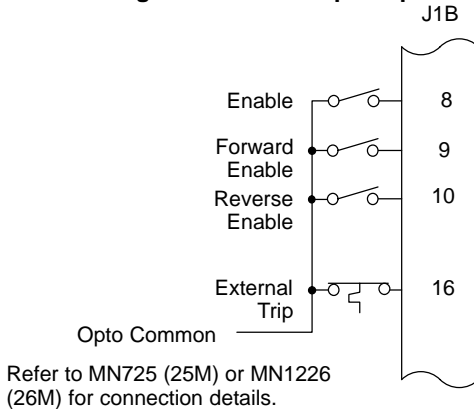
## Control Terminal Strip Connections

For Serial Mode operation, the Input/Output terminal strip J1B of the control is wired as shown in Figure 4-8. Connect the Enable, Forward Enable Switch, Reverse Enable Switch, External Trip and Opto Common connections as shown.

Note: All opto-isolated outputs and analog outputs remain active while operating in the Serial Mode.

When these connections are complete, refer to Section 5 of this manual and set the software for Serial Mode.

**Figure 4-8 Serial Opto Input Connections**



Note: Open both the Forward and Reverse switches to Stop.

---

## High Resolution Analog

This expansion board provides one high resolution analog input to the motor control board and two high resolution outputs from the motor control board. Each output is independent of the other and both may be configured by jumper selection.

The high resolution input A/D converter converts a source current or voltage into a digital signal for the motor control.

### Jumper Definitions

Table 4-6 defines the jumper position settings. Jumper locations on the board are shown in Figure 4-3.

**Table 4-6 Jumper Position Settings**

High Resolution Analog Input		
Function	Jumper Number	Jumper Position
Input Current	JMP 9	2-3
Input Voltage		1-2

High Resolution Analog Output #1		
Function	Jumper Number	Jumper Position
Output Current	JMP 5	2-3
	JMP 8	2-3
	JMP 10	1-2
Output Voltage	JMP 5	1-2
	JMP 8	1-2
	JMP 10	2-3

High Resolution Analog Output #2		
Function	Jumper Number	Jumper Position
Output Current	JMP 6	2-3
	JMP 7	2-3
	JMP 11	1-2
Output Voltage	JMP 6	1-2
	JMP 7	1-2
	JMP 11	2-3

---

## Pulse Follower Connections

### General Wiring Considerations

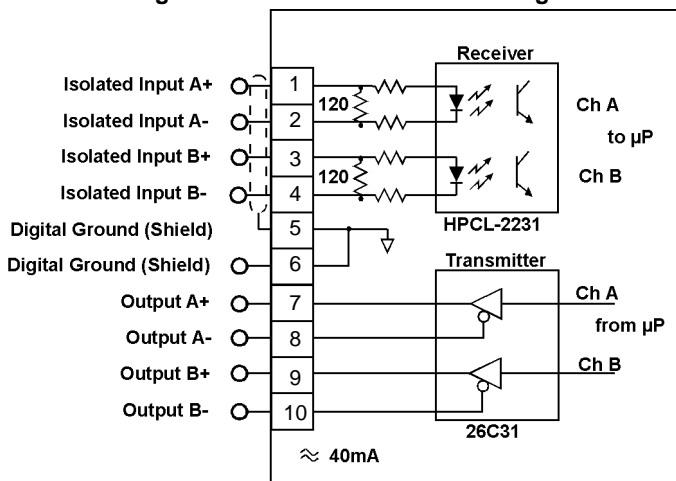
All connections are made between the master encoder or the master control terminal strip and the J7 (J3) terminal strip of the expansion board. Use two #22 AWG (.324mm<sup>2</sup>) (minimum) twisted pair wires with an overall insulated shield. Limit the distance between master and follower control(s) to 150 feet (45m) maximum. Connect the shields only to digital ground which is terminal 5 or 6 of the board.

The quadrature inputs of the board are optically isolated. These inputs are terminals 1, 2, 3 and 4. The quadrature output and digital grounds of the board (terminals 7, 8, 9, 10 and 6) are referenced to the control board digital ground.

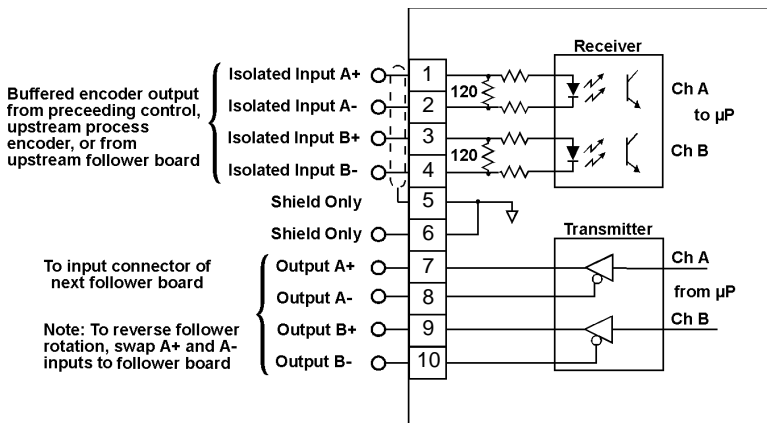
Various types of encoders may be used, such as dual channel line driver output encoders, dual channel open collector output encoders, single channel line driver output encoders, single channel open collector output encoders. Single channel encoders may be used with pulse and direction only (not quadrature). Wiring diagrams of these types encoder types are shown.

Use proper grounding techniques when connecting several controls or devices to the expansion board.

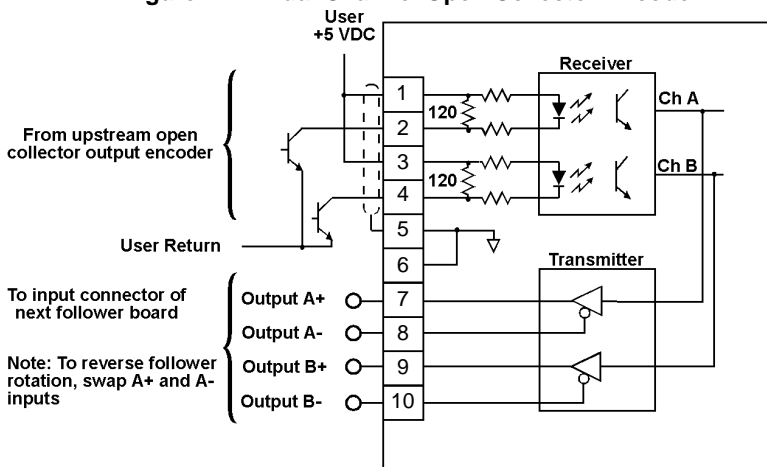
**Figure 4-9 General Connection Diagram**



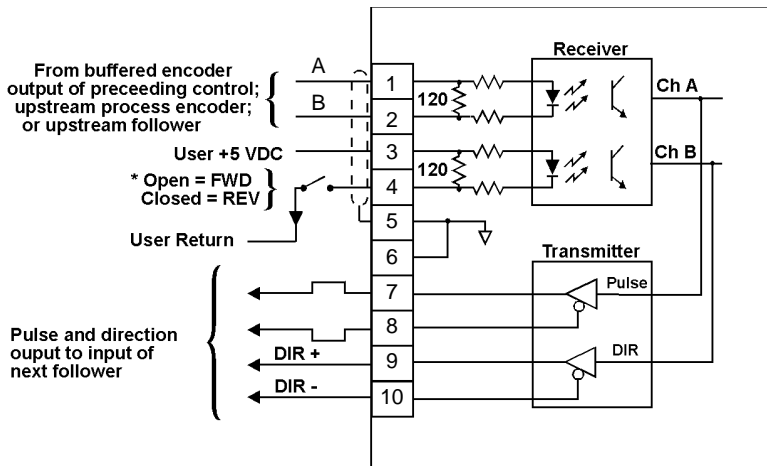
**Figure 4-10 Dual Channel Line Driver Encoder**



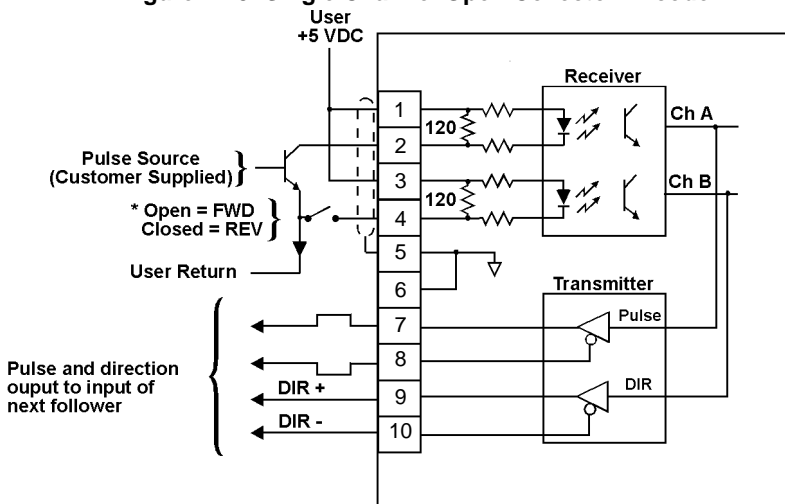
**Figure 4-11 Dual Channel Open Collector Encoder**



**Figure 4-12 Single Channel Line Driver Encoder**



**Figure 4-13 Single Channel Open Collector Encoder**



## Section 5

### Software Setup

---

#### **Configure Control Software for Serial Operating Mode**

Many commands in the Serial Command Language can be used regardless of the setting of the control's Operating Mode parameter (such as changing and viewing parameters). However, serial commands intended to control the motor shaft require the control be in the Serial Mode.

Action	Description	Display	Comments
Apply Power	Display illuminates	BALDOR MOTORS & DRIVES	Logo is displayed for 5 seconds.
	If no fault is found and control is programmed for local mode,OR,	STP MOTOR SPEED LOCAL 0RPM	Display mode.
	If no fault is found and control is programmed for remote mode	STP MOTOR SPEED REMOTE 0RPM	Display mode.
Press PROG key	Access programming mode.	PRESS ENTER FOR PRESET SPEEDS	First screen in programming mode
Press ▲ or ▼ key	Scroll to Level 1 Input block	PRESS ENTER FOR INPUT	Input Block.
Press Enter key	First selection choice	OPERATING MODE P: KEYPAD	Now in keypad mode.
Press Enter key	Flashing cursor indicates mode can be changed	OPERATING MODE ◄□ KEYPAD	
Press ▲ or ▼ key	Scroll to Serial mode	OPERATING MODE ◄□ SERIAL	Change to Serial mode.
Press Enter key	Saves mode change value	OPERATING MODE P: SERIAL	
Press ▲ key	Scroll to Command Select parameter	COMMAND SELECT P: +/-10VOLTS	Now in ±10 Volt input mode.
Press Enter key	Flashing cursor indicates mode can be changed	COMMAND SELECT ◄□ +/-10VOLTS	
Press ▲ or ▼ key	Scroll to Serial mode	COMMAND SELECT ◄□ SERIAL	Change to Serial.
Press Enter key	Saves change to serial command select	COMMAND SELECT P: SERIAL	
Press DISP key	Returns to Display mode	STP MOTOR SPEED LOCAL 0RPM	
Press LOCAL key	Changes to REMOTE (Serial) Operation	STP MOTOR SPEED SERIAL 0RPM	Control is ready for Serial operation.

The control is now configured for Serial mode and the Host software can be setup

---

## Host Computer Setup

Be sure that the following items are complete:

1. The Serial expansion board is installed.
2. The Serial expansion board is configured for RS232 or RS485 communication.
3. The communications cable is connected between the Serial expansion board and the PC or terminal (Host Computer).
4. The Control terminal strip (J1 or J4) is wired for Serial mode.
5. A Host Computer is setup and operating with a communications software program. (If not, the Windows 3.1 Terminal Emulation program may be used. Microsoft Windows 3.1 or higher must be installed.)

If you have a communications software package installed on the Host, skip this procedure. This procedure is only for those who do not have a communications program installed or may not know how to install one.

### Setup Windows 3.1 Terminal Emulation

1. Power up the Host and start Windows software.
2. In the "Windows Accessories Group" select "Terminal" ICON shown in Figure 5-1.

Figure 5-1 Terminal ICON



3. Select "Communications" from the Settings pull down menu within Terminal program.
4. Set the communications settings as shown in Figure 5-2 or as appropriate for the Communications expansion board settings.  
Settings shown are:
  - 9600 Baud rate
  - 8 Data Bits
  - 1 Stop Bit
  - No Parity
  - Xon/Xoff Flow Control
  - COM1 port of Host

Figure 5-2 Communications Settings

**Communications**

**Baud Rate**

110     300     600     1200  
 2400     4800     9600     14.4K  
 19.2K     38.4K     57.6K     115.2K

**Data Bits**

    6     7     8

**Stop Bits**

1     1.5     2

**Parity**

None  
 Odd  
 Even  
 Mark  
 Space

**Flow Control**

Xon/Xoff  
 Hardware  
 None

**Connector**

None ↑  
COM1  
COM2 ↓

Parity Check     Carrier Detect

OK  
Cancel

- 
5. Select "Binary Transfers" from the Settings pull down menu within Terminal program.
  6. Set the Binary Transfer protocol to XModem/CRC.
  7. Close menu and save the settings.
  8. Terminal Communications settings are now complete.

## Serial Mode Control Setup

1. Power up the control.
2. Type "ID" at the host keyboard. A list of Power Base ID settings, and other information should appear on your CRT display. A sample display is shown in Figure 5-3.

Note: You must use upper case characters. The control will not recognize lower case commands.

**Figure 5-3 Sample Power Base ID Display**

```
ID
Power Base ID =      0000 - 0000 - 1011
                    STD CT   STD VT   QT CT   QT VT   PRESENT
CONT CUR.  =      5.0      5.0      5.0      5.0      5.0 A RMS
PEAK CUR.  =     10.0     10.0     10.0     10.0     10.0 A RMS
RATED PWM  =      2.5      2.5      8.0      8.0      8.5 kHz
Current Scaling =  1.41 A/V
DC Bus Voltage =   339 V
Controller Temp =  33.3 C
```

Use the Serial Command Language described in Section 6 of this manual to communicate with the Control. As an example:

```
P1001 700      changes the value of parameter 1001 (Preset Speed
                #1 refer to control manual parameters) from its
                present value to 700 RPM.

V30           Changes the velocity to 30 RPM.
E             Enables the drive, motor rotates.
S             Stops and disables the drive.
```

---

If you type P (by itself) and press enter, a listing of all parameter values is displayed as follows:

(This list is an example only and may not be accurate)

```
P
P1001 =0      P1002 =0      P1003 =0      P1004 =0      P1005 =0
P1006 =0      P1007 =0      P1008 =0      P1009 =0      P1010 =0
P1011 =0      P1012 =0      P1013 =0      P1014 =0      P1015 =0
P1101 =3.0    P1102 =3.0    P1103 =0      P1104 =3.0    P1105 =3.0
P1106 =0      P1201 =200    P1202 =3.0    P1203 =3.0    P1204 =0
P1301 =-1     P1302 =-1     P1303 =-1     P1304 =-1     P1305 =-1
P1306 =1      P1307 =0      P1401 =6      P1402 =11     P1403 =0
P1404 =0.0    P1405 =0.00   P1406 =0      P1501 =0      P1502 =-1
P1503 =2      P1504 =6      P1505 =200    P1506 =100    P1507 =1750
P1508 =0      P1509 =8      P1510 =100    P1511 =100    P1512 =0.0
P1513 =6      P1601 =1750   P1602 =4      P1603 =1      P1604 =80
P1605 =150    P1606 =10     P1607 =1.00   P1608 =0      P1609 =31
P1610 =1.50   P1611 =1.290  P1612 =1.813  P2001 =0      P2002 =1750
P2003 =10.0   P2004 =8.5    P2005 =0.004  P2101 =5      P2102 =0
P2103 =10794  P2201 =0      P2202 =0      P2203 =0      P2204 =0
P2205 =0      P2301 =0      P2302 =0      P2303 =0      P2304 =0
P2305 =100    P2306 =1024   P2401 =0      P2402 =0      P2403 =23957
P2501 =230    P2502 =3.2    P2503 =1750   P2504 =60.0   P2505 =1.78
P2506 =1024  P2507 =0      P2508 =0      P2601 =9      P2602 =0
P2603 =10     P2604 =0.0    P2605 =10.0   P2606 =10     P2607 =0
P2608 =0.00   P2609 =0      P2610 =-1     P2611 =-1     P2612 =1024
P2701 =0      P2702 =0      P2703 =0
```

---

## **Pulse Follower**

Before attempting to operate drives in a Master/Follower or Pulse Direction configuration, the control must first successfully operate its' motor without the Pulse Follower board installed. After successful operation of the motor and control, the Pulse Follower board may be installed and the Master-Follower operation can be programmed.

Programming the control for Master-Follower operation is accomplished using the keypad or serial communication with the Series M control. For these examples, only the keypad method is shown. General programming steps are defined in the appropriate control manual.

## **Master Quadrature Pulse Reference Mode**

This mode is not available or necessary for these controls. These controls feature a buffered encoder pulse train output that can be used as a Master input to a Pulse Follower expansion board installed in a Follower drive.

---

## Quadrature Pulse Follower Mode

Be sure a Pulse Follower expansion board is installed in the Follower control and the input terminals of the expansion board are wired to the quadrature output of a Master control or encoder located ahead of the Follower control in the process. Check that the main control board terminal strip of the Follower drive is wired for the controls' operating mode.

Use the keypad to set these Level 1 parameters:

<u>Block</u>	<u>Parameter</u>	<u>Setting</u>
INPUT	OPERATING MODE	Set as desired.
INPUT	COMMAND SELECT	EXB PULSE FOL Master Profile
ACCEL/DECEL RATE	ACCEL 1	Set to follow Master Profile
ACCEL/DECEL RATE	DECEL 1	Set to follow Master Profile
ACCEL/DECEL RATE	S-CURVE 1	Set to follow Master Profile

### **Velocity Following:**

Vector Control	Position Gain	Set to zero
----------------	---------------	-------------

### **Position Following:**

Vector Control	Position Gain	Increase from 0 until unwanted reversals occur, then reduce setting
----------------	---------------	--

Use the keypad to set these Level 2 parameters:

<u>Block</u>	<u>Parameter</u>	<u>Setting</u>
PROCESS CONTROL	MASTER ENCODER	Encoder counts of Master pulse train

Continued on next page

---

## **Quadrature Pulse Follower Mode** Continued

### ***For all operating modes except Serial:***

<b><u>Block</u></b>	<b><u>Parameter</u></b>	<b><u>Setting</u></b>
PROCESS CONTROL	FOLLOW I:O RATIO	Desired integer ratio between Master and Follower encoder counts

### ***For Serial Operating Mode Only:***

<b><u>Block</u></b>	<b><u>Parameter</u></b>	<b><u>Setting</u></b>
PROCESS CONTROL	FOLLOW I:O RATIO	Master of encoder counts ratio
PROCESS CONTROL	FOLLOW I:O OUT	Follower of encoder counts ratio

The Follower drive is now ready to follow the velocity or the position (with position gain added) of the Master. Be sure to “Enable” both the Master and Follower controls to allow Master/Follower operation.

### **Clear the Position Register - Follower Mode**

The position register of the follower control can be cleared by opening the “Enable” input (disable the follower control). This is true for all operating modes that use the controls’ terminal inputs. Also, in the process mode the position register can be cleared by commanding a Jog at the control terminal strip. Finally, the position register is cleared anytime the follower control is in the “Keypad” mode (no longer following).

---

## Master Speed and Direction Pulse Reference Mode

This mode is not available or necessary for these controls. These controls feature a buffered encoder pulse train output that can be used as a Master input to a Pulse Follower expansion board installed in a Follower drive.

## Speed and Direction Pulse Follower Mode

Be sure a Pulse Follower expansion board is installed in the Follower control and the input terminals of the expansion board are wired to the encoder pulse train output of a Master control or encoder located ahead of the Follower control in the process. Check that the main control board terminal strip of the Follower drive is wired for the controls' operating mode.

Use the keypad to set these Level 1 parameters:

<b><u>Block</u></b>	<b><u>Parameter</u></b>	<b><u>Setting</u></b>
INPUT	OPERATING MODE	Set as desired
INPUT	COMMAND SELECT	EXB PULSE FOL
ACCEL/DECEL RATE	ACCEL 1	Set to 0 to follow Master Profile
ACCEL/DECEL RATE	DECEL 1	Set to 0 to follow Master Profile
ACCEL/DECEL RATE	S-CURVE 1	Set to 0 to follow Master Profile

### **Velocity Following:**

Vector Control	Position Gain	Set to zero
----------------	---------------	-------------

### **Position Following:**

Vector Control	Position Gain	Increase from 0 until unwanted reversals occur, then reduce setting
----------------	---------------	---

Use the keypad to set these Level 2 parameters:

<b><u>Block</u></b>	<b><u>Parameter</u></b>	<b><u>Setting</u></b>
PROCESS CONTROL	MASTER ENCODER	Encoder counts of Master pulse train

Continued on next page

---

## **Speed and Direction Pulse Follower Mode**

***For all operating modes except Serial:***

<b><u>Block</u></b>	<b><u>Parameter</u></b>	<b><u>Setting</u></b>
PROCESS CONTROL	FOLLOW I:O RATIO	Desired integer ratio between Master and Follower encoder counts

***For Serial Operating Mode Only:***

<b><u>Block</u></b>	<b><u>Parameter</u></b>	<b><u>Setting</u></b>
PROCESS CONTROL	FOLLOW I:O RATIO	Master of encoder counts ratio
PROCESS CONTROL	FOLLOW I:O OUT	Follower of encoder counts ratio

The Follower drive is now ready to follow the velocity or the position (with position gain added) of the Master. Be sure to “Enable” both the Master and Follower controls to allow Master/Follower operation.

### **Clear the Position Register - Follower Mode**

The position register of the follower control can be cleared by opening the “Enable” input (disable the follower control). This is true for all operating modes that use the controls’ terminal inputs. Also, in the process mode the position register can be cleared by commanding a Jog at the control terminal strip. Finally, the position register is cleared anytime the follower control is in the “Keypad” mode (no longer following).



## Section 6

# Serial Command Language

---

All commands are entered as ASCII characters followed by Enter key (hex 0D). The Enter “End of Line” character prompts the control to process the command. The Backspace character (hex 08 or Control-H) deletes the character to the left of the cursor. Control-X (hex18) deletes the line the cursor is on.

Some commands in the Serial Command Language require the control to be in the Serial Operating Mode. These commands are considered “Protected Commands”. All commands are case sensitive (UPPERCASE and lowercase).

### **ACK\_ON**

This command reports the total character string received.

Note: **This command is not available for Vector or Servo controls.**

### **ACK\_OFF**

This command turns off the “ACK\_ON” command.

Note: **This command is not available for Vector or Servo controls.**

### **Ax(Address) Multi-Drop Command**

The address command is used in multi-drop systems to select the control identified by **x**, for communication. Where **x** = control address from 0 - 31. Commands will be received and processed by the control with **x** address until another address is given, or a global **AA** (Address All) command is given. The control address is set by the DIP switches located on the serial expansion board.

When the control receives an address command it echoes back its control address to acknowledge that it is now on line. The Control address 0 will receive and processing commands unless another address is given.

### **AA(Address All) Multi-Drop Command**

This command is used in multi-drop systems to direct a command(s) to ALL controls regardless of their individual control ID. The Address All remains active until another address is given.

### **AUn (Auto-Tune) Protected Command**

The Auto-Tune command starts the motor tuning procedure. The control must be externally enabled (pin 8 of the terminal strip, see Figure 4-8). Refer to the parameter list in the Control Installation and Operating Manual for the auto-tuning numbers (**AU1-AU6**) that correspond to the test. The test will either pass or fail. If the test fails, refer to the control manual. (25M use AU1 - AU6. 26M use Au1 - AU4.)

Note: The **CALC** command **MUST** be given before running the auto-tuning tests.

---

## **C (Clear)**

This command clears an existing fault. The control will resume operation if an **E** (Enable) command is given and no faults are present.

## **CALC**

Calculates specific parameters based on motor rating values. This command must be given before the auto-tune tests are run. Motor rating information must be programmed into control using the operator keypad or "**P**" serial command before **CALC** command is run.

## **D (Disable) *Protected command***

Disables control output.

Note: The current status of the control can be retrieved by using the **ST** (STATUS) command.

## **DL (Download)**

Begins the download procedure. All parameters for the current parameter table of the control are downloaded to a host file using the standard XMODEM protocol. Control-X can be used to cancel the procedure. If the XMODEM procedure is not started within 60 seconds, the **DL** command aborts.

## **E (Enable) *Protected command***

Enables control output. External enables at the control terminal strip must be closed and the control must be in the Serial Operating Mode.

For safety reasons the control will not enable unless a valid **Vnnnn**, **Tnnnn** or **Mxxxxx** command was previously issued.

Note: The current status of the control can be retrieved by using the **ST** (STATUS) command.

## **ECHO\_ON**

Turns on the echo character function.  
(Preset to do so when not in multi-drop).

## **ECHO\_OFF**

Turns off the echo character function.  
(Preset to do so when in multi-drop).

## **F (Fault)**

This command returns the current fault code. Returns 0 if no fault condition exists. See **HF** command.

## **GO (Process Target Register Command)**

The command stored in target register will be processed.  
See **TAR** command.

---

## H (Home) Protected Command

Commands the control to go to the predefined home position at predefined homing speed. This command is not the same as the **W** (position to zero) command and not intended to be used with positioning commands. (Command is not available for 24M).

## HF (Help Fault)

This command returns the current fault code and gives a text definition of the fault. Consult the troubleshooting section of your control manual for recommended corrective action. Fault codes are defined as follows:

Fault Code	Description	Fault Code	Description	Fault Code	Description
0	No Faults	10	Logic Supply Fault	20	User Fault Text
1	Line Regen Fault	11	Overcurrent Fault	21	Lost User Data
2	Encoder Loss	12	DC Bus High	22	µP Reset Fault
3	Invalid Base ID	13	Following Error	23	Memory Fault
4	Low Init. Bus Volts	14	Torque Proving Fault	24	Overload 1-Minute
5	Regen R Power Fault	15	DC Bus Low	25	Inverter Base ID
6	Current Sense Fault	16	Overload 3-Seconds	26	New Base ID
7	Power Base Fault	17	Overspeed Fault	27	No EXB Installed
8	Ground Fault	18	External Trip	28	Power Module Fault
9	Resolver Loss	19	Int Over-Temp Fault		

## HL (Help Log)

Reports last 15 faults with time stamps. Most recent fault shown first. Gives text description of faults.

## HP or HPxxxx or HPxxxx nnnn (Help Parameters)

The **HP** command can be used in three ways:

1. **HP** gives a full list of all the parameters with a text description of the parameter and the current parameter setting.
2. **HPxxxx** gives a text description and current setting of a single parameter, where **xxxx** is the parameter number.
3. When the **HPxxxx** command is followed by a space and **nnnn**, parameter **xxxx** is changed to value of **nnnn**.  
Where **xxxx** is a value from 0 - 9999, and **nnnn** is a value from 0 - 9999 this is the same as **Pxxxx nnnn**.

Example: HP1201

P1201 JOG SPEED = 400 RPM

Min value = 0, Max value = 1750, Factory value = 200

---

## ID (Power Base ID)

This command returns a listing of power base settings with control bus volts, current scaling and control temperature.

Example:

```
ID
Power Base ID = 1000 - 0000 - 0101
                STD CT   STD VT   QT CT   QT VT   PRESENT
CONT CUR       = 15.2    9.6     15.2    15.2    15.2 A RMS
PEAK CUR       = 30.4    17.5    19.2    17.5    30.4 A RMS
RATED PWM      = 2.5     2.5     8.0     8.0     2.5KHz
CURRENT SCALING = 6.08 A/V
DC BUS VOLTAGE = 325V
CONTROLLER TEMP = 24.6 C
```

## IO (IO Status)

This command returns current state of all terminal strip connections (J1 for Vector, Servo and DC controls and J4 for Inverters). The J1 or J4 status is as follows:

Pins 2, 4, and 5 give the status of the analog inputs. A value of 0 = -10 V, 512 = 0V and 1024 = 10 V.

Pins 6 and 7 are the analog outputs. They are scaled 0 - 256, where 256 = the maximum value of 5 V.

## Jx (Jog) *Protected command*

Jogs the motor at the rate set by the Level 1, Jog Settings Block. A **J** command given with an x value of + or - (**J+** or **J-**) determines the direction of the jog. A **J** command given with an x value of **S** (**JS**) will stop the jog command at the decel rate specified in the Level 1, Jog Settings Block.

## L (Log)

Sends a report of the last 31 faults with time stamps, the most recent fault first. The fault numbers displayed correspond to the fault codes found in the Troubleshooting section of the Control Installation and Operating Manual.

See also **HL** command.

---

### **M or Mxxxx (Absolute Move) Protected command**

The **M** command by itself (without **xxxx**) returns the last position command. (Command is not available for 24M).

The **M** command followed by **xxxx**, causes the control to enter the position mode and move to the absolute position of **xxxx** encoder counts relative to the **Z** (zero) position. Speed is the rate defined with the **V** (positioning speed) command. Where **xxxx** is an absolute position (signed) in encoder counts X4. Positions negative to zero position must be preceded with a minus sign, (**-xxxx**). Maximum value of **xxxx** is  $2^{31}-1$  encoder counts.

### **m or mxxxxx (Incremental Move) Protected command**

The **m** command can be used in two ways:  
(Command is not available for 24M).

1. The **m** command by itself (without **xxxxx**) returns the last position command.
2. The **m** command with **xxxxx** causes the control to enter the position mode and move **xxxxx** encoder counts relative to the current position. The speed is defined with the **V**(positioning speed) command. Where **xxxxx** is a (signed number) position relative to the current position in encoder counts X4. Positions negative to zero position must be preceded with a minus sign, (**xxxxx**). Maximum value of **xxxxx** is  $2^{31}-1$  encoder counts.

### **Ox (Report)**

The **O** command by itself (without **x**) returns the present values of RPM, Hz, Vrms and Arms. Values for **x** are used to return a specific operating value according to the following table:

1 = RPM	5 = % Rated Load
2 = HZ	6 = Analog Input (+/ 4096)
3 = Motor Vrms	7* = Opto-Outputs (0 – 15)
4 = Motor Arms	8 = Absolute Position from Zero
	9 = User Scaled Display

\*Opto-output (7) report represents a 4 bit word as a decimal number. See Table 6-7.

---

**Table 6-7 Opto-Output 7**

Decimal Number	4 Bit Word $2^0, 2^1, 2^2, 2^3$	Output Status
0	0000	No outputs are on.
1	1000	Output #1 is on.
2	0100	Output #2 is on.
3	1100	Output #1 and 2 are on.
4	0010	Output #3 is on.
5	1010	Output #1 and 3 are on.
6	0110	Output #2 and 3 are on.
7	1110	Output #1, 2 and 3 are on.
8	0001	Output #4 is on.
9	1001	Output #1 and 4 are on.
10	0101	Output #2 and 4 are on.
11	1101	Output #1, 2 and 4 are on.
12	0011	Output #3 and 4 are on.
13	1011	Output #1, 3 and 4 are on.
14	0111	Output #2, 3 and 4 are on.
15	1111	All outputs are on.

**P or Pxxxx or Pxxxx nnnn** *Protected command*

The **P** command can be used in three ways:

1. The **P** command by itself (without **xxxx**) returns a list of all the parameter values.
2. When the command is **Pxxxx** the current value of parameter **xxxx** is returned. (Refer to the control manual Parameter List for the "Serial Mode Parameter Number" **xxxx**).
3. When the **Pxxxx** command is followed by a space and **nnnn**, parameter **xxxx** is changed to the value of **nnnn**. Where **xxxx** is the "Serial Mode Parameter Number", and **nnnn** is a value from 0 – 9999.

**S (STOP)** *Protected command*

Issues an ALL STOP to the control.

Level 1, Keypad Setup Block, Keypad Stop Mode parameter determines if the motor coasts to a stop or decels to a stop.

**SCxxxx (Security Code)**

Locks and unlocks serial commands, where **xxxx** is the Security Code.

---

## ST (STATUS)

This returns the present control status in the form of:

0 = Disabled ,1 = Enabled, 2 = Fault

## STATUS (FULL STATUS)

This returns a listing of serial mode variables and their status.

Example:

### STATUS

Drive Disabled	(drive status)
Serial Security Code Disabled	(security status)
Echo On	(echo status)
S1X-X.XX	(software version)

## T or Tnnnn (Torque command) *Protected command*

The **T** command can be used in two ways.

1. When the **T** command is alone it enters torque control and returns the last torque command given.
2. When followed by a numeric value it enters the torque mode and commands the value, where nnnn is a numeric value. **nnnn** =  $\pm 2048$  is equal to the control current limit.  
**nnnn** =  $\pm 1024$  is equal to half of the control current limit.

Note: Negative torques are indicated by a **-nnnn** (positive values may be entered by **+nnnn** but this is optional). **T+** or **T-** will (depending on the present torque direction) cause the control to reverse direction using the last commanded torque value.

## TAR xxxx (Target Register)

Store a command to the Target Register for execution at a later time (**GO** command) where **xxxx** is any serial command in its normal format.

This **TAR** command uses a target register (temporary data storage location) to store the command **xxxx** given after the space. This **xxxx** command is stored and processed when a **GO** command is given. This is useful when synchronizing multiple controls on a common mark. For example, on a 3 axis system, each control could be given a "target" position and all 3 could be started at the same time with a global **GO** command.

---

## TP (Test Points)

View the list of captured test point data in the buffer. The test point buffer consists of two channels. When the control is enabled the buffer continuously captures data. When the control becomes disabled or a fault occurs, the data capture stops and the buffer retains the last 32 points of data per channel.

Each channel can be set to buffer internal variables by setting P3001 (channel 1) and P3002 (channel 2) as follows:

0 = Velocity	8 = Field Weaken	16 = Speed Command
1 = Elec Angle	9 = Following ERR	17 = Overload Accum
2 = ABS Command	10 = Quad Control	18 = Phase 2 Current
3 = PWM Voltage	11 = Direct Control	19 = Phase 3 Current
4 = Direct Current	12 = AC Voltage	20 = Position
5 = CMD Direct CUR	13 = Bus Voltage	21 = Serial Command
6 = Quad Current	14 = Vector Angle	22 = Delta Count
7 = CMD Quad CUR	15 = Power	

## TPF (Test Point File)

This command starts a download of all the test points to a host computer file. Follow the same procedure as the **DL** command.

## TPT (Test Point Trigger)

The test point buffer is normally filled when the control is enabled and the buffer stops filling when the control is disabled or a fault occurs. If the **TPT** command is given, the test point buffer is filled for 255 points after the next "Enter" is received (example: **TPT**, Enter, **Vnnnn**, Enter). The test points can then be viewed by using the **TP** command.

## UL (Upload)

This command begins the Upload procedure using XMODEM protocol. It uploads a parameter file from the computer to the control. Control-X can be used to cancel the procedure. If the XMODEM procedure is not started within 60 seconds the command aborts.

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## **V or Vnnnn (Velocity Command) *Protected command***

The **V** command can be used in two ways:

1. The **V** command by itself returns the last velocity command.
2. The **V** command is followed by a numeric value **nnnn**, it enters the velocity mode and commands that value equal to RPM (for the vector, servo and DC controls) or Hz (for Inverters).

Note: Negative velocities are denoted by **-nnnn** (positive values may be entered by **+nnnn** but this is optional). **V+** or **V-** (depending on the current direction) will cause the control to reverse direction using the last commanded velocity value.

## **VX or VXnnn (Velocity Command/256) *Protected command***

The **VX** is similar to the **V** command except that it is used to command fractional RPM or less than 1 RPM.

Example:

VX128 = 0.5 RPM; VX256 = 1RPM; VX384 = 1.5 RPM.

## **v or vxxxx (Positioning Speed)**

**vxxxx** changes the maximum speed used in positioning commands. Where **xxxx** is a velocity value.

Note: Value is preset to 0 at control power up.

## **W (Position to Zero)**

This command positions the control to the absolute ZERO position as defined with the **Z** command. The command moves at the defined positioning "speed" as set by a **v** command. This is **NOT** the same as the **H** (Home) command.

## **Z (Set Current Position to Zero)**

This command sets the current position to zero. It is to be used only with positioning commands.



## Section 7

# Communication Using a Modem

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### Series M Controls Remote Modem Setup

**⚠ WARNING:** Use extreme care when in the Remote mode. You can gain complete control of the Series M control and motor operation from any phone line available. You can initiate an operation that could be hazardous to personnel or equipment from a remote location. Baldor assumes no liability for use, installation or application of the information contained in this document.

You must have a PC compatible computer to configure the modem. You will temporarily connect the modem to the computer, configure the modem then install the modem at the Series M control.

**Modem Type:** US Robotics Sportster 28,800 (External).

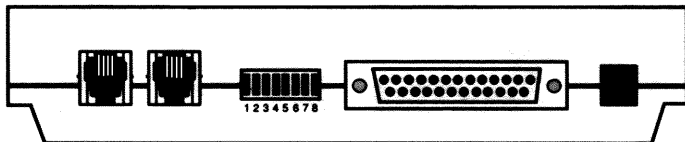
**Modem Setup:** Stand alone operation setup (3 wire interface).

A three wire interface consists of Receive data, Transmit data, and ground. Hardware flow control is not supported. Use the following steps to setup the modem for software flow control.

#### **Set Modem Switches (*Switches are located on rear panel.*)**

1. Rotate modem so rear panel faces you Figure 7-1. (Table 7-1 defines the function of each switch.)
2. Set switches 1 - 8 as follows:  
1 & 2 = Down                      4 = Down                      8 = Down  
3 = Up                                      5, 6 & 7 = Up

**Figure 7-1 Modem Rear Panel**




- 
3. Temporarily set Switch 7 Down to prevent loading defaults at power up.
  4. Connect the modem to your computer and AC power as instructed in the modem manual. You must have communications software loaded on your computer to perform this procedure.
  5. Start your communications software and download the following commands to the modem (make a software flow control template and disable flow control):  
 AT&F2&W<ENTER>  
 AT&H0<ENTER>  
 AT&K0<ENTER>  
 AT&W0<ENTER>
  6. Turn modem power OFF then back ON to load the changes.
  7. Set Switch 7 UP to its normal position. The modem is now ready to use.

Note: You only need to do this procedure during the initial installation and if the modem is replaced with a different modem for some reason.

**Table 7-1 Modem Switch Settings**

DIP Switch	Position	Description (Applies to US Robotics Sportster 28,800 Only)
1	Down	Data Terminal Ready; Down – override DTR
2	Down	Result Codes; Down – Numeric Codes
3	Up	Result Codes; Up – Suppress Codes
4	Down	Off-line Commands; Down – No echo commands
5	Up	Auto Answer; Up – On first ring (or more if set in RAM)
6	Up	Carrier Detect; Up – Normal
7	Up	Load Defaults; Up – Load NV RAM defaults
8	Down	Smart/Dumb Mode; Down – Smart Mode

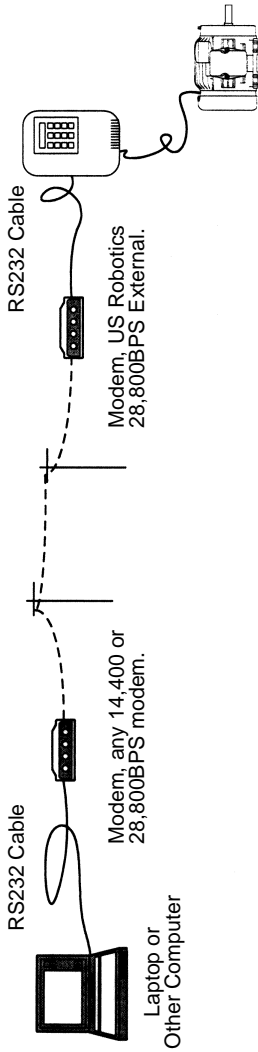
- 
8. Turn OFF modem power.
  9. Disconnect the modem from your computer.
  10. Connect the modem to the RS232 port of the Series M control.
  11. Connect the phone line to the modem Phone Jack.
  12. Apply power to the modem. The modem is now ready to auto answer.

 **WARNING:** Use extreme care when in the Remote mode. You can gain complete control of the Series M control and motor operation from any phone line available. You can initiate an operation that could be hazardous to personnel or equipment from a remote location.

**Baldor assumes no liability for use, installation or application of the information contained in this document.**

You may communicate with the drive from any where in the world. Use the instructions located in this manual to set parameter values and operate the control. You should always call someone at the site to inform them to keep personnel away from the drive during your remote testing.

Auto answer modems from other manufacturers may be used as long as they are configured in a similar manner as outlined in these instructions.



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Printed in USA  
3/03 C&J500