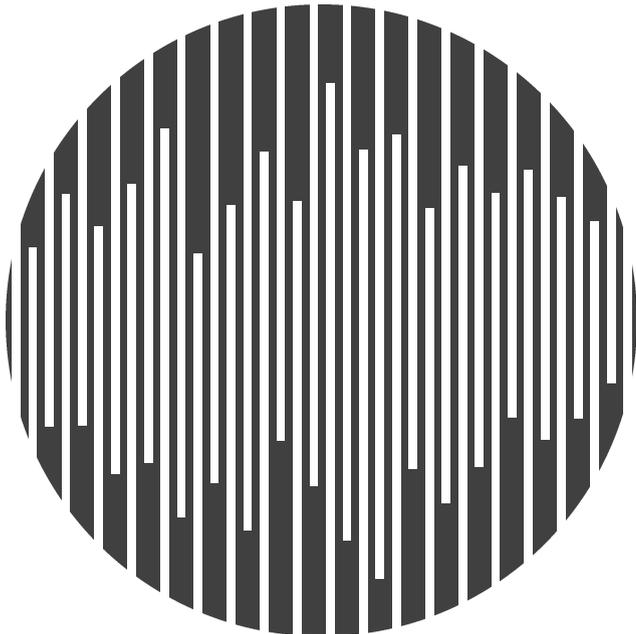


Modicon B885-XX Motion Modules User Guide

GI-B885-1XX Rev. A

**AEG SCHNEIDER
AUTOMATION**
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MODICON

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GI-B885-1XX Rev. A

February, 1996

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AUTOMATION**
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**AEG Schneider Automation, Inc.
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Preface

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Modbus	Modbus Plus	B885-100
Modicon	984	B885-101
B885-110	B885-111	Ourbus
Cyberline 1000A	Cyberline 1000D	MMDS
SASS	Modsoft	

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Related Publications

In addition to this manual, you will need:

Modicon Motion Development Software (MMDS) User Guide
(GMMMDS-002)

Single Axis Software System (SASS) Motion User Guide
(GM-MOTN-001)

Other related documents include:

Cyberline 1000A System Design and Installation Manual
(GI-CYBL-002)

Cyberline 1000D Drive User Guide
(GI-CYBL-004)

Modicon Modsoft Programmer Manual
(GM-MSFT-001)

Modicon 984 Programmable Controllers Systems Manual
(GM-0984-SYS)

Chapter 1

Introducing your B885-1XX Motion Modules

Overview of the B885-1XX Motion Modules TESTTTT

Communications Between 984 PLC and B885-1XX

1.1 Overview of the B885-1XX Motion Modules

The B885-10X motion modules (B885-100, and B885-101), controls one servo axis with a single resolver providing all feedback. The B885-11X motion modules (B885-110, and B885-111) are the same as the (B885-100, and B885-101) but with two added encoder inputs that are used as primary and/or secondary feedback. The B885-1XX may be installed in a single-width, 800-Series I/O housing slot, or operate as a standalone motion controller. The B885-1XX employs Modicon's DNP (Direct Numerical Processing) technology and provides high-performance control of all the functions of a single axis of motion. Advanced digital brushless motion provides optimal control by eliminating potentiometer adjustments and analog velocity loops.

 **Note:** The B885-110 and B885-111 come with a dual quadrature encoder card that provides two independent channels of single-ended or differential quadrature encoder feedback to the module.

 **Note:** The B885-101 and B885-111 use the NV FLASH Executive Memory rather than the cartridge.

Module Capability

Module Model	Module Functions	Memory Media
B885-100	Resolver	Cartridge
B885-101	Resolver	NV FLASH
B885-110	Resolver and Encoders	Cartridge
B885-111	Resolver and Encoders	NV FLASH

The B885-1XX is controlled by an Intel 80C196 microprocessor. The microprocessor has a multiplexed address/data bus, on-board eight channel A/D converter and three multi-function I/O ports. The microprocessor operates at 12 MHz. Refer to Figure 1 for the block diagram.

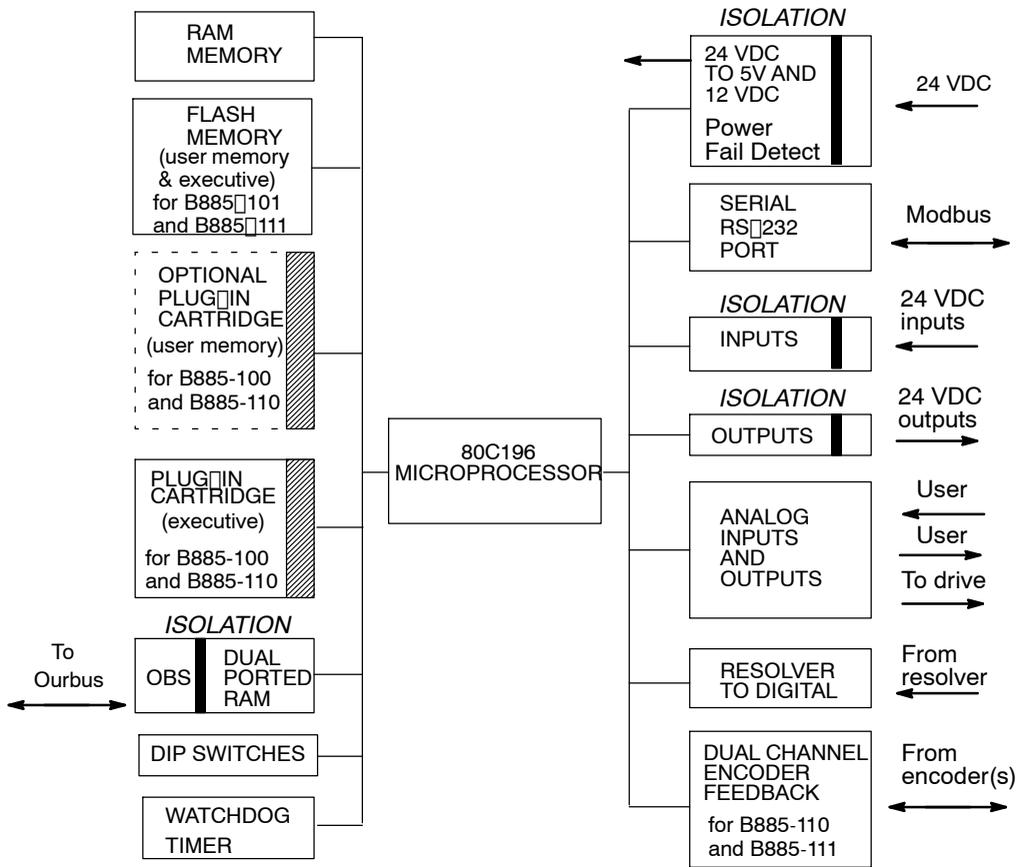


Figure 1 B885-1XX Motion Module Block Diagram

1.1 Hardware Interface

The B885-1XX is designed to interface directly to the Modicon Cyberline 1000 series of brushless servo drives and the CGC, CGD, CGP, CGX and CHB brushless motors. It also interfaces to dc motors using the Cyberline drives, and to other types of dc and brushless drives from Gettys and other manufacturers.

The B885-1XX contains inputs and outputs that interface to the drive and the machine, including drive enable, drive fault, and a variety of user-configurable signals.

All B885-1XX modules have a standard-resolver feedback interface. Discrete I/O and Analog I/O connectors are provided to interface with field devices. All connections (power and signal) are made through Phoenix connectors. Refer to Figure 2.

1.1.1 Encoder Interface (B885-110 and B885-111 only)

In addition to the standard resolver interface, the B885-110 and B885-111 modules comes with a dual quadrature encoder interface, providing two

independent channels of single-ended or differential quadrature encoder feedback. The dual channel card has a DB25 connector for connection to the encoders.

Connection to the encoders is through a cable and breakout box. The cable is available in 3 feet and 6 feet lengths, with male DB25 connectors on each end. The breakout box, a rail-mountable terminal block PCB assembly, accommodates discrete wiring from the encoder(s). It has a female DB25 connector for the cable attachment and the terminals are clearly marked with the appropriate encoder connections. Refer to Figure 2 for DB25 location.



Note: The primary feedback used by the DNP servo system is position information from either a resolver or an encoder mounted to the motor. Velocity information is derived from the position information, rather than being received from a velocity transducer. This leads to some inaccuracies when using the DNP servo as a velocity controller. Some speed irregularities will result, particularly at slower speeds. Please consult Modicon for applications information if you intend to use the DNP servo specifically for precise velocity control.

1.1.2 Control Interface

A control interface to the B885-1XX is possible through either two or three interfaces, depending on the executive firmware your B885-1XX contains (standard or enhanced).

1.. Using standard executive firmware:

- Communication through the backplane of the 800-Series I/O system using OURBUS
- Communication through an RS-232 serial port using MODBUS. The RS-232 interface allows the B885-1XX to operate in a standalone mode to provide you with convenient program development without setting up an entire 984 PLC system.

2.. Using enhanced executive firmware:

- Communication through the backplane of the 800-Series I/O system using OURBUS.
- Communication through an RS-232 serial port using MODBUS. The RS-232 interface allows the B885-1XX to operate in a standalone mode to provide you with convenient program development without setting up an entire 984 PLC system.
- The current executing program provides input to the active control register.

Regardless of which control interface is connected to the B885-1XX, the active control register is the result of a logical OR operation of all control interface control registers. When any control interface asserts a bit, that bit is activated.

1.1.3 Memory

The B885-1XX modules use two types of memory: Executive Memory and User Memory. Both allow future upgrades at customer sites. The B885-100 and B885-110 use removable memory cartridges, in contrast the B885-101 and B885-111 use NV FLASH memory.

- Executive Memory

It contains the executive of the Single Axis Software System (SASS). Executive cartridges are available in two versions: a standard executive or an enhanced executive. Only the enhanced executive version is available for the NV FLASH. The enhanced executive provides register manipulation, program control of the active control register, event flags and interrupts, sync-ratio and math, logical and program flow commands.

- User Memory

This is offered as an optional accessory on B885-100 and 110 and is standard on NV FLASH models, it is required if you want to utilize the program storage capability of the enhanced executive. When installed, in addition to providing the ability to store application programs that can be run by the B885-1XX, it allows you to store parameters in the B885-1XX and to exchange them from module to module. You may store items such as servo parameters, executive version, number of writes, and options used.

The B885-1X0 accepts two plug-in memory cartridges, accessible through an access panel on the side of the B885-1X0. One connector for the Executive Memory and one connector for the optional User Memory. Refer to Figure 2.

The executive and user memory in the B885-1X1 modules is a FLASH memory file, which is downloaded (and upgraded) through the MODBUS port. The FLASH memory file is pre-loaded into your B885-1X1 module from the factory.

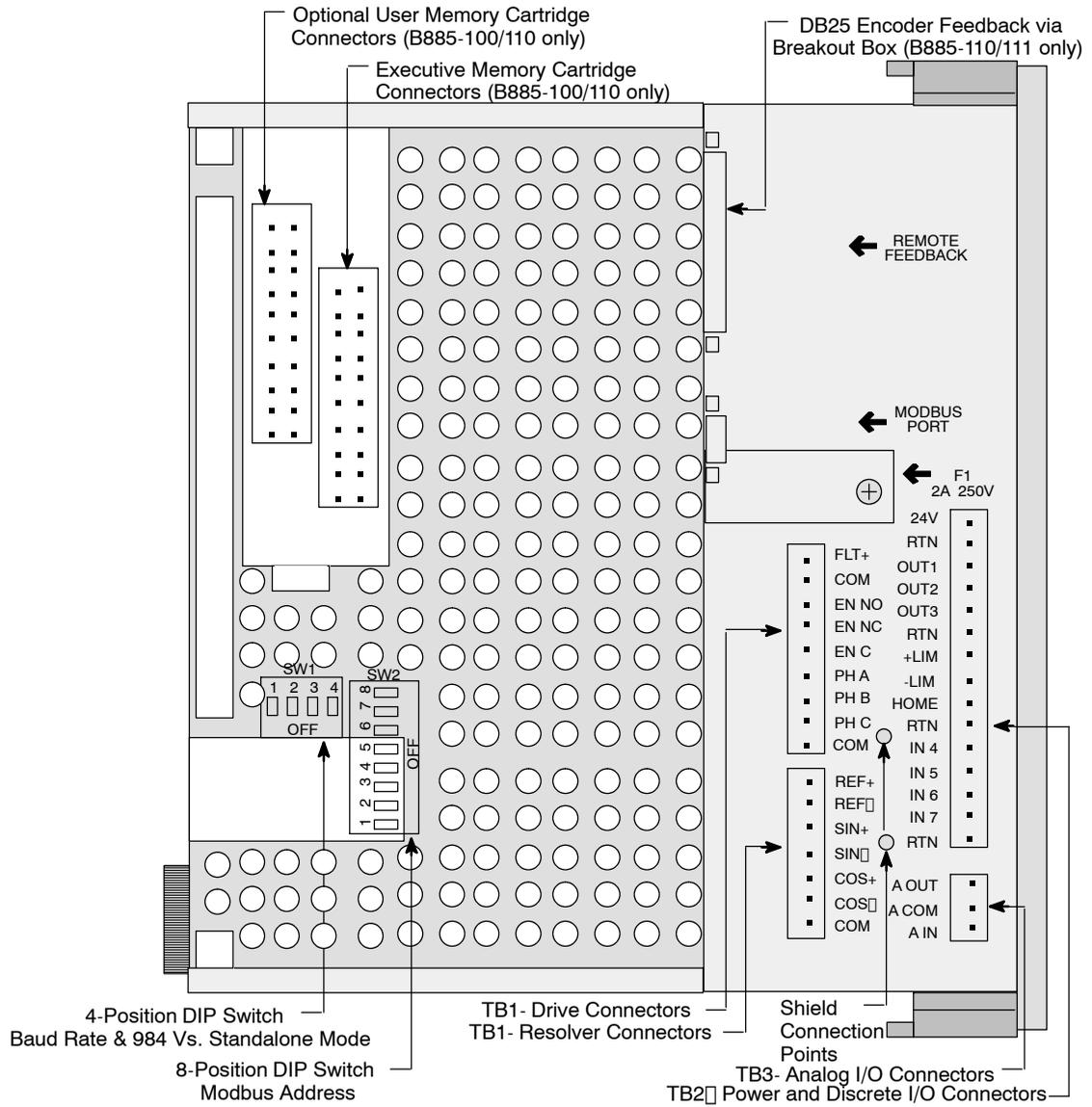


Figure 2 Side View of a B885-1XX

1.1.4 Status Indicators

Eighteen LEDs are visible on the front panel to indicate various functions and conditions. Figure 3 illustrates the indicator positions and conditions.

nomenclature and the following table provides a brief explanation of their function.



Note: The digital inputs and outputs may be used as either predefined inputs or as user-configurable inputs. Refer to the *Single-Axis Software System (SASS) Motion User Guide* (GM-MOTN-001), for details on configuring the I/O.

Status Indicators

Indicator	Description
IN 1 (+ LIMIT)	Indicates the motor has not reached the maximum limit for clockwise (CW) motion or the user-configured input 1 is active
IN 2 (- LIMIT)	Indicates the motor has not reached the maximum limit for counterclockwise (CCW) motion or the user-configured input 2 is active
IN 3 (HOME LM)	Indicates the motor is not at the Home switch or the user-configured input 3 is active
IN 4 (JOG +)	Indicates the Jog + switch or the user-configured input 4 is active
IN 5 (JOG -)	Indicates the Jog - switch or the user-configured input 5 is active
IN 6	Indicates the user-configured input 6 is active
IN 7	Indicates the user-configured input 7 is active
IN 8 (DRV FLT)	Indicates a fault condition exists in the drive controlled by the B885-1XX
DRV ENBL	Indicates the drive enable signal to the drive is active
OUT 1 (BRAKE OFF)	Indicates the user-configured output 1 is active (or brake is off)
OUT 2	Indicates the user-configured output 2 is active
OUT 3	Indicates the user-configured output 3 is active
ACTIVE	Indicates the OURBUS communication link to the 984 PLC is active
MODULE OK	When illuminated, indicates the B885-1XX is operational. When not illuminated, indicates that a failure of the B885-1XX has been detected
POWER OK	Indicates the internal power supply is operational
SER PORT	Indicates the MODBUS RS-232 serial port communication link is active. This indicator blinks when communicating
MOVING	Indicates the B885-1XX is still commanding new positions for the motor
IN POS	Indicates motion is within the in-position of the final target

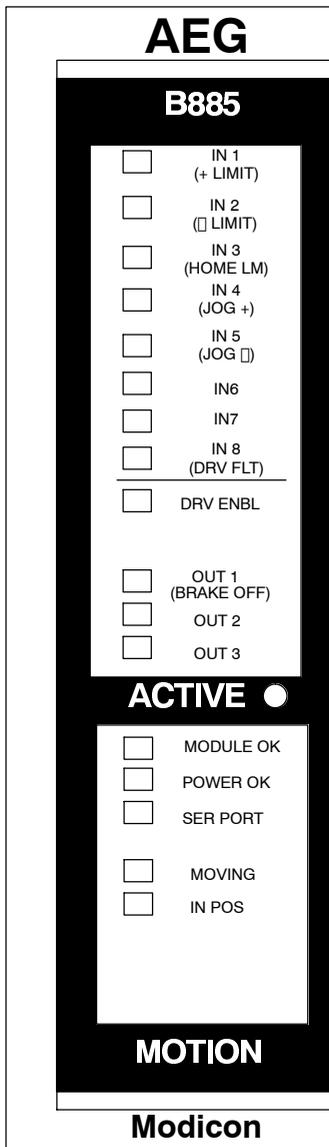


Figure 3 B885-111 Front Panel Indicators

1.1.5 Software Interface

The executive cartridges and the FLASH memory file contains the most up-to-date version of the Modicon *Single Axis Software System (SASS)*. SASS consists of hundreds of easy-to-understand instructions called *commands*. You select a combination of these commands and code them in one or more application programs that, when executed in the B885-1XX, run your factory machinery and carry out your automation tasks. To use

SASS, Modicon recommends you purchase the *Modicon Motion Development Software (MMDS)* (part number SW-MMDS-1DB), version 4.1 or higher. With MMDS, Modicon will send you these two manuals:

- *Modicon Motion Development Software (MMDS) User Guide*
(GM-MMDS-002)

- *Single-Axis Software System (SASS) Motion User Guide*
(GM-MOTN-001)

The Modicon Motion Development Software (MMDS) is a menu driven software used to develop your application programs offline, and allows access to SASS motion programming language commands. MMDS runs on a user-supplied IBM PC or compatible computer. Using a RS-232 serial cable between your IBM PC or compatible computer, and the B885-1XX you may set parameters, check module diagnostics, up load or down load programs, and exercise the motor during initial system setup. In addition, the B885-1XX may be connected to a 984 PLC for other programming purposes via the I/O bus of the backplane. This lets you write motion programs using your computer and download them to a 984 PLC using Modicon Modsoft Programmer Software, (MODSOFT), (part number S-MSXD-XA).



Note: MMDS and Modsoft are purchased separately - call your distributor or Modicon representative for details.

1.2 Communications Between 984 PLC and B885-1XX



See: Refer to the *Single Axis Software System (SASS) Motion User Guide* for register usage, control register, command register and status register information.

1.2.1 Data Types

The B885-1XX supports several data types for its variables. Data placed in these registers is in the Module 10K format, unless otherwise specified in the *Single-Axis Software System (SASS) Motion User Guide* (GM-MOTN-01).

1.2.2 Discrete I/O



See: Refer to the *Single Axis Software System (SASS) Motion User Guide* for additional information.

The B885-1XX contains seven discrete inputs and three discrete outputs. Five of the inputs can be used as either user-defined discrete inputs or as predefined inputs. The discrete outputs, as well as the inputs, are controlled by the I/O command set. The following tables show the register bit assignments.

Discrete Input Bit Definitions

Register Bit	Bit Definition
1	+Limit OK/discrete input 1
2	-Limit OK/discrete input 2
3	NOT HOME/discrete input 3
4	Jog +/discrete input 4
5	Jog -/discrete input 5
6	Discrete input 6
7	Discrete input 7
8	Drive fault
9 ... 16	Reserved

Discrete Output Bit Definitions

Register Bit	Bit Definition
--------------	----------------

1	Discrete output 1 (BRAKE OFF)
2	Discrete output 2
3	Discrete output 3
4 ... 16	Reserved

 **Note:** Any input or output configured in an unsupported mode by the Input/Output Mask command (e.g., discrete input 6 configured as predefined) will be disabled.

 **Note:** B885-1XX inputs 1 (+ LIMIT), 2 (- LIMIT) and 3 (NOT HOME LM) default to 1 (predefined) at power-up while inputs 4 (JOG +) and 5 (JOG -) default to 0 (discrete).

Chapter 2

System Installation

- Planning Your Installation
- Requirements for CE Compliance
- Wiring Do's and Don'ts
- Wiring
- B885-1XX Configuration

2.1 Planning Your Installation

With proper planning, installation, and wiring, you can avoid startup problems that require extensive rewiring. These guidelines help you plan the wiring of the B885-1XX and avoid problems.

- 1.. Have cables and wiring materials before you start. Before you start the wiring, first be sure you have the necessary materials with which to construct your cabling. Tag your wires as you connect them.



Note: Do not bundle power wiring to signal wiring, as this will increase signal noise.

- B885-1XX module
 - 24 Vdc power supply (to power B885-1XX, and all I/O functions)
 - B885-1XX/drive cables
 - Resolver and/or encoder cables
 - Encoder feedback breakout box (only if encoders are used)
 - B885-1XX/IBM PC RS-232 cable (for Modicon Motion Development Software (MMDS))
 - Cyberline equipment (drives, power supply, mounting plate, servo motors, isolation transformer, cables) see Cyberline manual for details)
- 2.. Use approved items. Make sure all items in the B885-1XX installation are supplied by Modicon or conform to our design requirements. This will reduce interference and ground loops.
 - 3.. Wire for accessibility. Plan your system for comfortable wiring and service. Install items so they can be removed with minimum disturbance to the rest of the system. Plan cable runs with generous service loops so you can disconnect the components without major disassembly.

- 4.. Wire to meet code and design requirements. All wiring must follow the National Electrical Code (NEC) or its national equivalent (such as CSA or Cenelec) as well as local codes. Within these requirements, wire the motion module system as specified in this manual.
- 5.. Protect Against Physical Damage. Provide adequate protection from dirt, spray and flying debris. Hazardous locations have special requirements.
- 6.. Allow adequate ventilation. If you are installing the system in a cabinet, ensure the B885-1XX gets adequate ventilation.
- 7.. Provide adequate, reliable grounding. You must connect all exposed non-current carrying metal to ground at one central point. We refer to this point as a star connection. Connect this ground to the factory or facility earth ground. Be sure to use a suitable conductor size that complies with accepted wiring methods (such as the NEC).
- 8.. Consider line resistance and voltage losses. You avoid major problems by wiring for minimum power loss and signal loss. Again, there are a number of codes and guidelines you can refer to, such as the NEC. Follow their guidelines in these areas:
 - Select the proper conductor size to carry the current.
 - Be aware of the limitations on the number of conductors in conduit and junction boxes.
 - Select wire with the proper temperature rating. Is the rating in conduit or free air? How should it be de-rated when bundled with other wires?

- 9.. Design to avoid noise pickup. Design your wiring to minimize electrical noise before it enters the B885-1XX system.**
- Use twisted shielded pair on the most sensitive lines. In the B885-1XX system, the most sensitive lines are the resolver connections and other signal wiring.
 - Connect shields at only one end of each cable. If you connect both ends of the shield, current may flow through the shield. This introduces a ground loop and generates electrical noise.
 - Provide a separate line for the common or return line. Never use the shield for the signal return line.
 - Route cables with space between power circuits and signal cables. Don't run power wiring in the same conduit with signal wiring.
 - With shielded cables, continue the shield to the point where you connect the lines to the B885-1XX. Don't cut the shield just past the point where it enters the enclosure.

2.1.1 Hardware and Tools Required

To install the B885-1XX, you'll need common tools.

2.1.2 B885-1XX Installation

The B885-1XX is installed in a standard Modicon 800-Series I/O rack. Keep in mind, as you install the B885-1XX, that any mounting scheme that blocks air circulation reduces the unit's ability to dissipate heat.

2.1.3 Cyberline Drive Installation

Install the Cyberline drives, their PLS4 power supply and other drive components. Refer to the *Cyberline 1000A System Design and Installation Manual* (GI-CYBL-002) for the installation details.

2.1.4 Power Supply Installation

You must have one external 24 Vdc power supply to power the B885-1XX.

2.2 Requirements for CE Compliance

This section covers the installation requirements necessary to maintain compliance with the European Directive for EMC 89/336/EEC for certain 984 PLC/800 Series I/O system components. The majority of 984 PLC/800 Series I/O components are approved per these requirements; however, examine your particular product/shipping carton for the CE mark to ensure approval.

The following requirements should be followed for installations complying with the CE marking:

- Equipment must be mounted in metal IP55 or NEMA12 enclosures. Doors must be closed during normal operation of equipment.
- All wiring for power supply and I/O lines must be in grounded steel conduits (EMT) or must use braided shielded cable. If shielded cable is used, the braid must have 80% or more shield coverage and the outside diameter of the braid (without jacket) must be in the range of 0.189 ... 0.237 in (4.8 ... 6.0 mm).
- All cable shields must be grounded using clips on the Grounding Bar (Modicon part number 043509693). Shield is not terminated at module field connector.
- Install braided earth ground as shown in Figure 4 from building earth ground to grounding clip (or clips as required) and to back-plane ground reference.
- All panels and doors of equipment rack must be electrically connected to the Grounding Bar.
- Use a 110/220Vac Line Filter (Schaffner part number FN670-30/6), with a Ferrite Bead (Steward part number 28 B0625-100). Install as shown in Figure 6 on power input to rack power supply.
- AC and DC power input lines to I/O modules must pass through Ferrite Bead (Steward part number 28 B0625-100).
- Remote I/O cables must have Ferrite Bead (Steward part number 28 B1020-100) placed over cable and attached to tie wraps or equivalent. In the case of dual cable installations, place one Ferrite Bead/cable when entering or exiting the control cabinet. In the case of redundant cable installations, the bead should be placed on the single cable exit of splitter, and single cable tap output to J8xx/P8xx products.

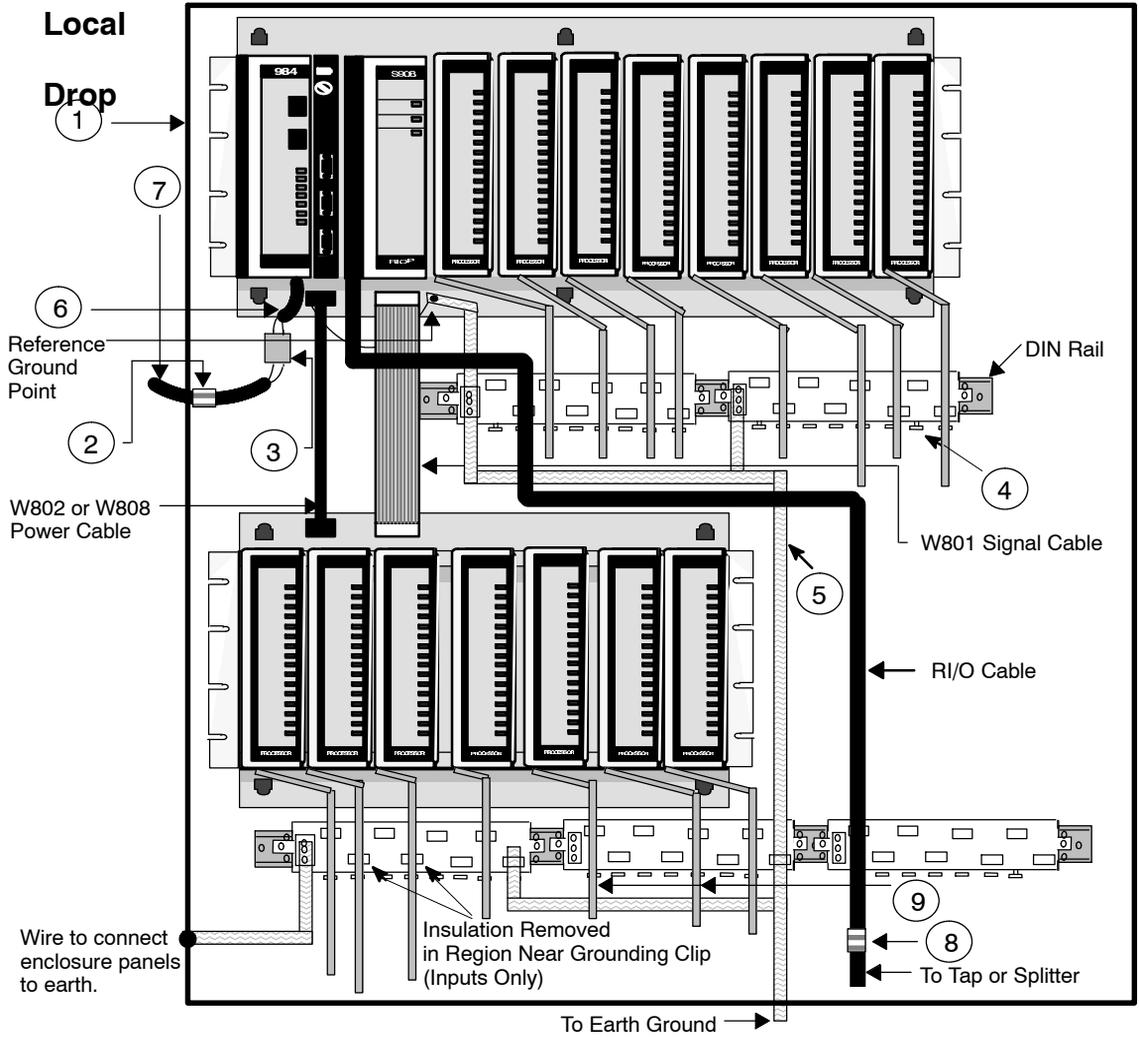


Figure 4 Typical CE Installation for a Local Drop

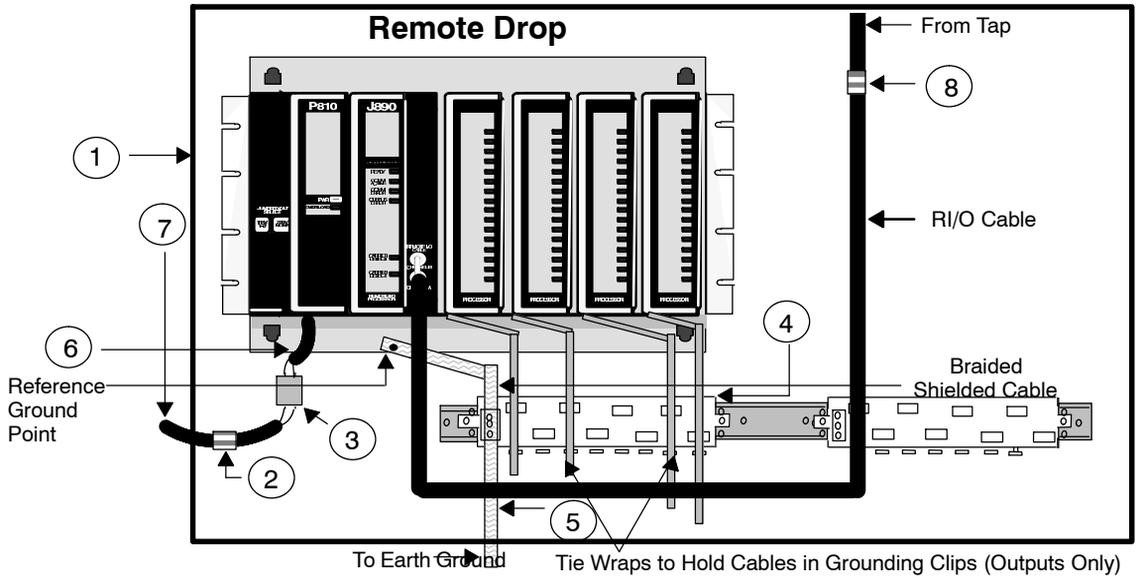


Figure 5 Typical CE Installation for a Remote Drop

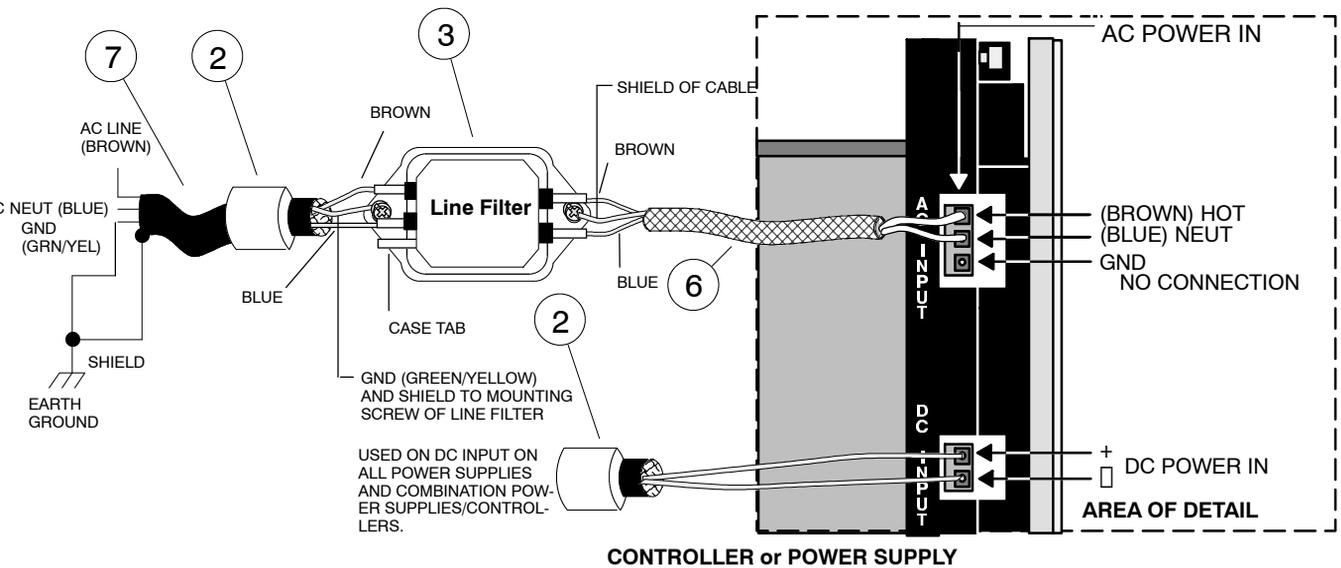


Figure 6 Detail Installation

Parts List for Figures 4 through 6

Callout	Vendor	Part Number	Description	Instructions
1			NEMA12 or IP55 Enclosures	Enclosure must be connected to earth.

2	Steward	28 B0624-100	Ferrite Bead	Install next to the filter and secure it with tie wraps at both ends.
	Fair Rite	2643665702		
3	Schaffner	FN670-3/06	Line Filter (Fast on terminals) Dimensions Length: 3.4 in (85 mm) Width: 2.2 in (55 mm) Height: 1.6 in (40 mm) Mounting Holes: 0.2 in (5.3 mm) dia.; 3 in (75 mm) centerline mounted Fast on Terminals: 0.25 in (6.4 mm)	Install next to the 984 CPU.
4	Modicon	043509693 or Equivalent	Grounding Bar	All cable shields must be grounded. Note: Not required if using steel conduit.
5			Flat Ground Braided Cable	
6	Oflex	35005 3 conductor 100cy Series	Shielded Cable	The maximum length is 30in (760mm); the shield is terminated at the EMI Line Filter, open at CPU end. The third conductor is not used.
7	Oflex	35005 3 conductor 100cy Series	Shielded Cable	Terminate the shield at panel ground; at EMI Filter.
8	Steward	28 B1020□100	Ferrite Bead	Install over the Remote I/O cable for dual cable and redundant cable applications and secure it with tape or tie wrap.
9			Shielded I/O cables # of conductors, and conductor gauge or wire to conduit per user requirements.	

2.3 Wiring Do s and Don ts



See: Refer to the *Single Axis Software System (SASS) Motion User Guide* for additional general information on grounding.

Key points to remember include:

2.3.1 Grounding

- Each component in the B885-1XX system has a chassis ground terminal for connection to earth ground.
- Use 14 AWG wire for connections to the terminal strip grounds on the B885-1XX and Cyberline 1000X drives.
- Use a suitable wire size (6 AWG or larger) for connecting the system to the building earth ground, as specified by NEC or other prevailing wiring code.
- Select a central grounding point or terminal strip in the cabinet for the ground lines connected to the motion module system components.
- To guard against accidental shock, and to provide a common reference to all equipment, the B885-1XX system components must be adequately earth grounded. Using a separate line for each item, connect all B885-1XX modules, power supplies, and motor housings to a common grounding bar or, if a cabinet is used, to the cabinet chassis ground stud. (This is referred to as a star grounding configuration.) Connect the grounding bar or the cabinet itself to the plant grounding system earth ground.



Warning! SHOCK HAZARD! Lethal voltages may exist at exposed connections. Disconnect the line power before wiring the B885-1XX system.

2.3.2 Discrete I/O

- The limit switch inputs have an optical isolation circuit that requires external power supply. Use a supply rated at 24 Vdc (nominal).
- + (CW) and - (CCW) limit switches are to be normally closed. The switches should be wired between the limit switch power supply and the breakout box terminals. The mechanics of your system should hold the switch closed until reaching the end of travel, then open the switch as the condition occurs.
- Home limit switches are to be normally closed. The mechanics of your system should hold the switch open until reaching the home position.
- Although the limit switch wiring is not as vulnerable to noise as the resolver wiring, use shielded wire and keep these lines as short as possible.
- Use 18-22 AWG twisted pair shielded cable, such as Belden 8451 or Alpha 2462. Connect the shield only at the B885-1XX end; don't connect the shield at the other end.
- Route signal wiring away from power wiring and motor wiring.

2.3.3 Resolver

- Do not run the resolver cable through a conduit or raceway containing power or motor wiring. Also, do not bundle the resolver wiring with power or motor wiring.
- Connect the shields only to the terminals on the B885-1XX. Don't connect the shields at the resolver end.
- CG-series motors include over-temperature sensors, wired through the resolver cables. You can wire these connections to digital inputs, to interrupt the program if a motor overheats.
- As an option, a CG-series motor can include an electric brake, wired through the resolver cable. You can wire this connection to a relay controlled by digital output 1. Through programming, you can use this output to control the brake.

2.3.4 MODBUS Serial Port

- When using the MODBUS port, try for a maximum cable length of 25 feet.
- Don't run the MODBUS port wiring through a conduit or raceway containing power or motor wiring. Also, don't bundle this wiring with power or motor wiring.

- Use shielded wire for the MODBUS port. Connect the shield only at the B885-1XX end; don't connect the shield at the other end.
- Obtain a DB-9 male connector to mate with the B885-1XX, and whatever connector mates with the IBM PC (probably DB-9 or DB-25).

2.4 Wiring

Five connectors are available and they consist of:

- TB2 Power and Discrete I/O Connector
- TB1 Drive Connector
- TB1 Resolver Connector
- TB3 Analog I/O Connector
- DB25 Connector - - Encoder Feedback via Breakout Box

Refer to Figure 7 for the location of these connectors.

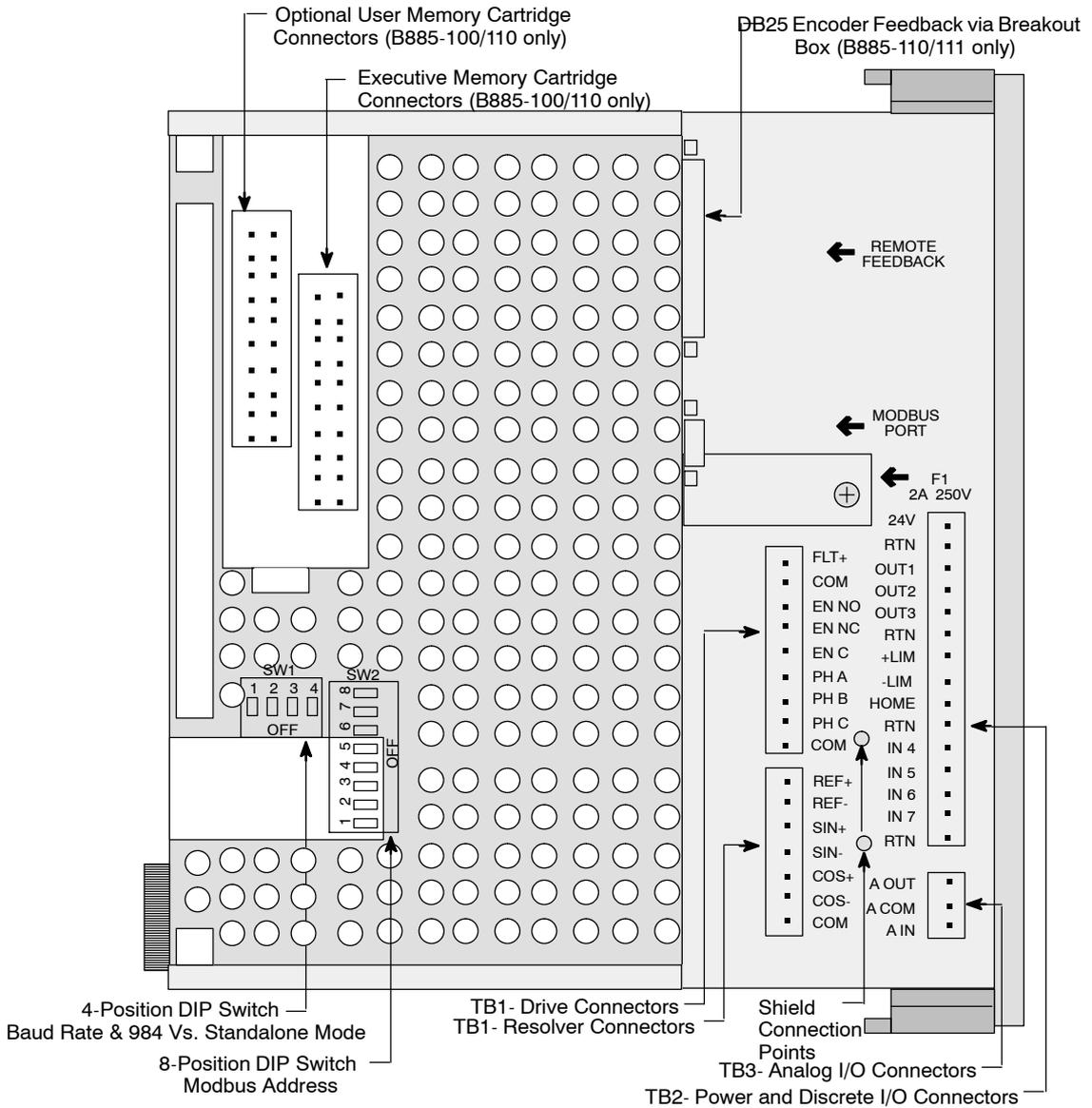


Figure 7 Side View of a B885-1XX

2.4.1 Power and Discrete I/O Wiring

In the B885-1XX system, power wiring consists of wiring ac power to an appropriate 24 Vdc power supply. The B885-1XX requires a minimum power input of 24 \pm 5 Vdc @ 8.2 W. The 24 Vdc power input is taken to an internal power supply, with 1000 Vac isolation, which generates the internal power supply levels.

The B885-1XX interfaces with field devices using up to 7 digital inputs and 3 digital outputs. Inputs send signals to the B885-1XX to let it know the status of a portion of the system, while the outputs are signals sent by the B885-1XX to provide specific control to certain equipment. The inputs and outputs can include switches, indicators and certain relay contacts. Five of the seven inputs default to assigned functions, such as (+ LIMIT or JOG -), or can be user-defined for your unique application.

The digital I/O on the B885-1XX is 24 Vdc true high. Both the inputs and outputs are optically isolated to 1000 Vac. The inputs are protected by a 1K Ω resistor in series with a 36 Vdc transient suppressor. Their nominal impedance is 3.7K Ω . The inputs activate for either 12 or 24 Vdc inputs. The outputs are true high and use power from an external power supply, nominally 24 Vdc. They are rated at 150 mA of continuous current. The outputs are transient-protected at 36 Vdc and are protected against short circuits.

TB2 Power and Discrete I/O Connector Assignments

Pin#	Signal	Function
1	24V	24 VDC power
2	RTN	Common
3	OUT1	User-configurable output (BRAKE OFF)
4	OUT2	User-configurable output
5	OUT3	User-configurable output
6	RTN	Signal return
7	+LIM	+ Limit or user-configurable input
8	-LIM	- Limit or user-configurable input
9	HOME	Home limit or user-configurable input
10	RTN	Signal return
11	+ IN 4	Jog + or user-configurable input
12	- IN 5	Jog - or user-configurable input
13	IN 6	User-configurable input
14	IN7	User-configurable input
15	RTN	Signal return

Step 1 Follow the supply manufacturer s directions for ac power wiring.

Step 2 Wire the 24 Vdc power supply output to the TB2 connector (pins 1 and 2) of the B885□1XX. Refer to Figure 8.

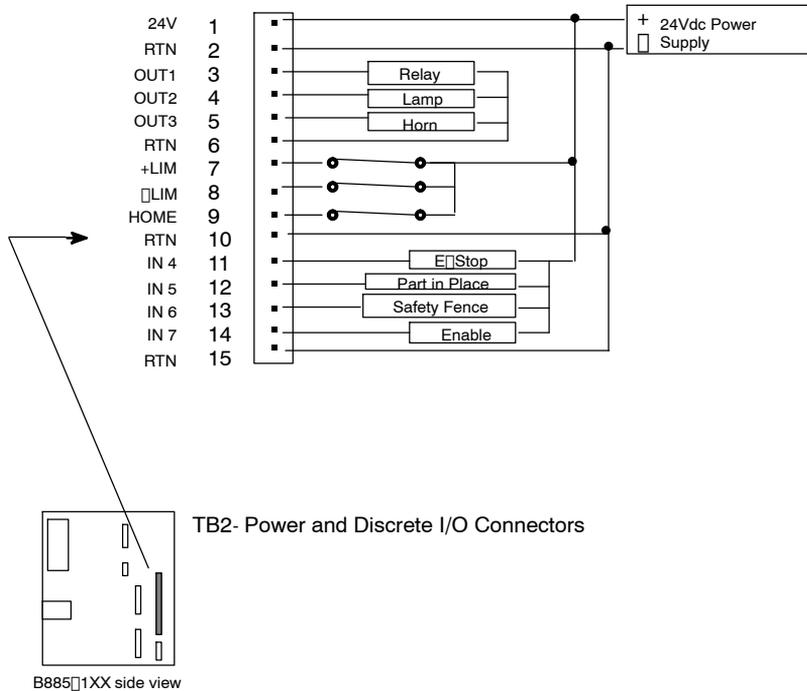


Figure 8 TB2 Typical Wiring

- Step 3** Wire power to the Cyberline drive, refer to the Cyberline manual. Be sure to route power wiring away from signal wiring and motor wiring.
- Step 4** Wire ac line power to the isolation power supplies (used with the limit switches). Follow the supply manufacturer's directions for wiring. These supplies usually require a single-phase 105 ... 120 Vac line @ 60 Hz.
- Note:** With the limit switch inputs, the B885-1XX can detect when the axis is at the + (CW) and - (CCW) limits, and the home position.
- Step 5** Wire the end-of-travel and home limit switches to B885-XX TB2 connector (pins 7,8,9 and 10).
- Step 6** Wire any user-configured digital I/O to the B885-1XX connector TB2 (pins 3,4,5,6,11,12,13,14, and 15) based upon your application.

2.4.2 Drive/Motor Wiring

The drive signal wiring consists of the drive enable, drive fault and phase current command signals between the B885-1XX and the drive. A form

C relay is provided to enable the drive. The relay contacts are rated at 125 Vac, 0.1 A resistive or 30 Vdc, 0.5 A resistive.

A drive fault signal is accepted from the drive. The true high signal must be held off at ground, sinking at least 100 microamps of current.

Three current commands are provided to control a 3-phase brushless ac motor. For dc drives, only two of the three phases are used. The current commands will be $\pm 10\text{ V @ } 5\text{ mA}$. A 12 bit D/A convert is to generate signals for two phases, which are then scaled using a current command signal output by another 12 bit D/A converter. The resulting signals are output as phase A and phase B, and their sum is output as phase C. Refer to Figure 9 and Figure 10.

TB1 Drive Connector Assignments

Pin#	Signal	Function
1	FLT+	Drive fault
2	COM	Drive fault common
3	EN NO	Drive enable (normally open contacts)
4	EN NC	Drive enable (normally closed contacts)
5	EN C	Drive enable return
6	PH A	Phase A current command
7	PH B	Phase B current command
8	PH C	Phase C current command
9	COM	Current command common
10		Not used (Key insert)

- Step 7** Wire the drive fault (FLT+) signal from the drive connector to B885□1XX TB1 connector (pin 1). Refer to Figure 9.
- Step 8** Wire the normally□open (EN N.O.) drive enable signal from the B885□1XX TB1 connector (pin 3) to the drive connector.
- Step 9** When using a Cyberline drive (with a ac motor only), wire the Phase A (PH A), Phase B (PH B) and Phase C (PH C) current command signals and current command common (COM) from the B885□1XX TB1 connector (pins 6,7,8, and 9) to the drive connector.
- Step 10** Jumper pin 2 to pin 5 on the B885□1XX TB1 connector.
- Step 11** Wire the cable shield to the B885□1XX shield connection points.

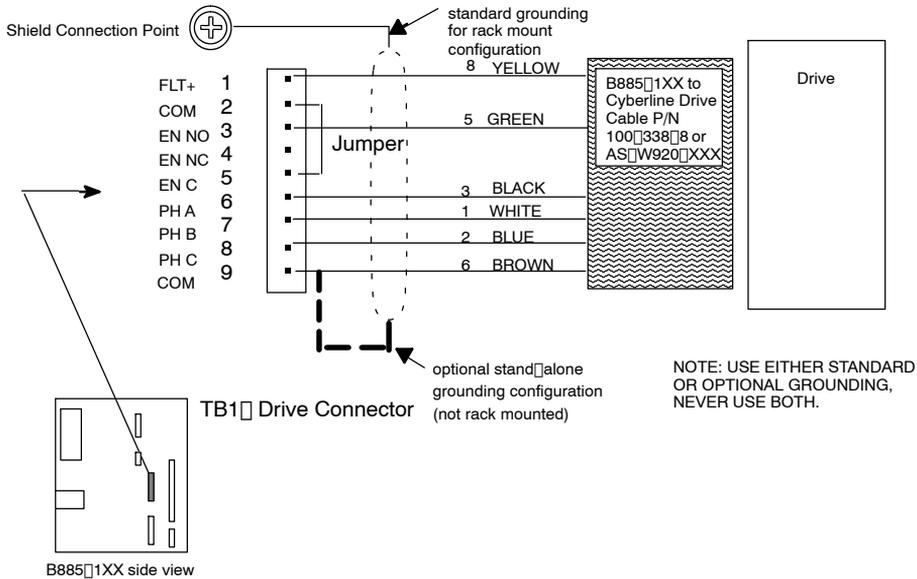


Figure 9 TB1 Drive Typical Wiring

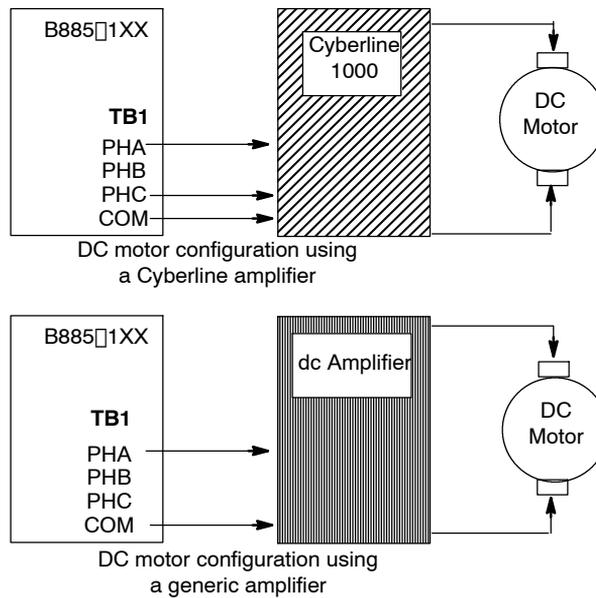


Figure 10 Typical DC Motor Wiring

2.4.3 Resolver Wiring

The B885-1XX may use a resolver to provide feedback for the position, velocity and commutation of the motor. A resolver is essentially a rotary

brushless transformer that provides absolute position information to the motion module. The B885-1XX calculates an absolute position from the continuous signal of the resolver.

The B885-1XX provides a reference output to drive transmit mode resolvers. The drive signal is a 3.75 KHz, self-compensating sine wave. The amplitude of the reference is adjusted by the B885-1XX (if necessary) at power-up to get returned signal strengths of approximately 2 Vrms at the sine and cosine inputs of the B885-1XX.

The received sine and cosine signals are interpreted to yield an absolute position with resolution that varies with velocity.

Interpreted Sine and Cosine Signals

Speed	Resolution
up to 375 RPM	16 Bits
375 ... 1500 RPM	14 Bits
1500 ... 6000 RPM	12 Bits



Note: The primary feedback used by the DNP servo system is position information from either a resolver or an encoder mounted to the motor. Velocity information is derived from the position information, rather than being received from a velocity transducer. This leads to some inaccuracies when using the DNP servo as a velocity controller. Some speed irregularities occur, particularly at slower speeds. Please consult Modicon for application information if you intend to use the DNP servo specifically for precise velocity control.

TB1 Resolver Connector Assignments

Pin#	Signal	Function
11	REF+	Resolver reference high
12	REF-	Resolver reference low
13	SIN+	Sine feedback high
14	SIN-	Sine feedback low
15	COS+	Cosine feedback high
16	COS-	Cosine feedback low
17	COM	Signal common

Step 12 Wire the reference outputs (REF+ and REF-) from the B885-1XX connector TB1 (pins 11 and 12) to the resolver connector. Refer to Figure 11.

Step 13 Wire the sine (SIN+ and SIN-) and cosine (COS+ and COS-) inputs from the resolver connector to the B885-1XX connector TB1 (pins 13,14 and 15,16.)

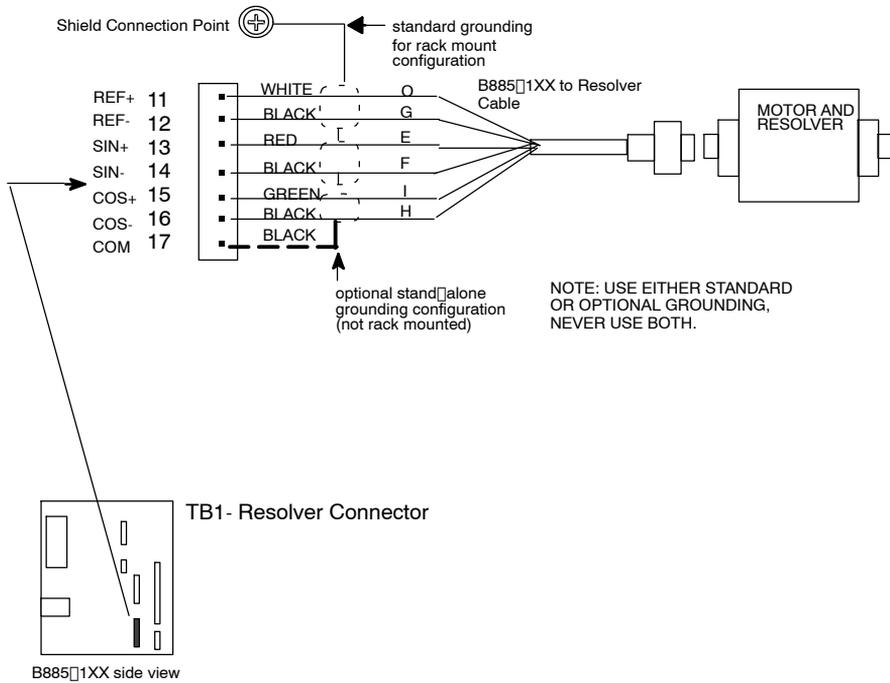


Figure 11 TB1 Resolver Typical Wiring

Resolver Connector Pins		
Wiring Label and Color		
Signal	All CG s	CHB Resolver Pin
Reference +	O / white	A
Reference -	G / black	B
Sine +	E / red	C
Sine -	F / black	D
Cosine +	I / green	F
Cosine -	H / black	E

2.4.4 Analog I/O Wiring

In addition to the analog three phase current commands output by the B885-1XX, there is an additional analog output and analog input that are completely user-configurable. A 12 bit D/A converter is used to generate a customer-specified analog output signal. Full scale output is ± 10 Vdc @ 5 mA. A ± 10 Vdc customer-specified analog input has a nominal impedance of 30K Ω . Resolution of the A/D converter for the analog input is 10 bits. These signals are wired to B885-1XX connector TB3 (pins 1,2, and 3). Refer to Figure 12.

TB3 Analog I/O Connector Assignments

Pin#	Signal	Function
1	A OUT	User Configurable
2	A COM	Return
3	A IN	User Configurable

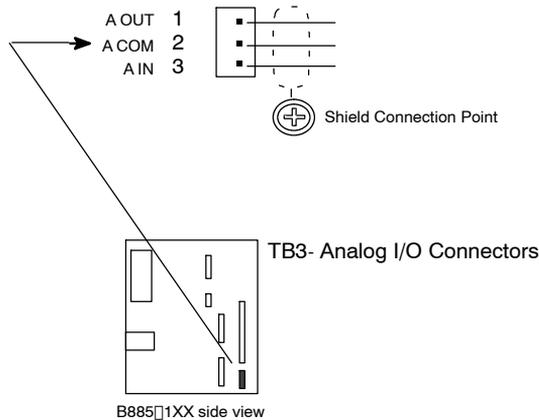


Figure 12 TB3 Analog I/O Typical Wiring

2.4.5 Encoder Wiring (B885-110/111 only)

A dual quadrature encoder card provides two independent channels of single-ended or differential quadrature encoder feedback to the B885-11X. The encoder feedback signal wiring consists of three single-ended or differential signals per encoder: the Channel A inputs, Channel B inputs, and marker signal. These discrete signals are wired from the encoders through a breakout box (part number AS-BR85-110), where they are gathered and routed onto a standard Modicon Encoder Cable (part number AS-W885-00X) and connected to the B885-11X via a DB25 connector.

The DB25 connector supplies either +5V or +12V to the encoders, or the encoders may be powered from an external power supply between 5V ... 24V. The internal supplies can provide 400 mA @ 5V \pm 10% and 200 mA @ 12V \pm 10%. Any combination of internally and externally supplied voltages to the encoders is allowed, as long as the total current drawn from the B885-11X does not exceed the limits stated above. Internal and external power supplies may not be paralleled.

- In the single-ended mode, the B885-11X detects signals from +3.3V ... +24V as high and signals from 2.0V ... -0.7V as low.



Note: Single-ended signals must be connected to the respective + inputs and the -- inputs should be left unconnected because they are terminated by internal pull-up resistors.

- In the differential mode, the B885-11X detects signals from +2.5V ...+24V as high and signals from 0.7V ... -0.7V as low. The B885-11X detects a loss of phase A or B signals (open or short) when supplied with differential signals. The loss of the marker signal, which is only used in homing, is not constantly monitored.



Note: Loss of the marker signal results in the inability to home the system.

The nominal input impedance to 5V devices is >500 ohms. The B885-11X accepts signals up to 200 kHz. Signals from 200 kHz ... 500 kHz are also accepted but some loss of noise immunity results. All signals on the DB25 connector are clamped to 36Vdc and -0.7V.

Connection to the encoders is through a cable and breakout box. The breakout box is a rail mountable terminal block PCB assembly and accommodates discrete wiring from the encoder(s). It has a female DB25 connector for the cable attachment and the terminals are clearly marked with the appropriate encoder connections. Refer to Figure 13.

DB25 Encoder Feedback Connector Assignments

Pin#	Signal	Function	Comments
1	+5V	+5 Vdc	5 Vdc power for external devices
2	+5V	+5 Vdc	5 Vdc power for external devices
3	A2+	Channel A +	Encoder 2 Channel A + input
4	A2-	Channel A -	Encoder 2 Channel A - input
5	Common	Shield	Use for encoder 2 signal shield
6	B2+	Channel B +	Encoder 2 Channel B + input
7	B2-	Channel B -	Encoder 2 Channel B - input
8	Common	Shield	Use for encoder 1 signal shield
9	M2+	Mark +	Encoder 2 mark + input
10	M2-	Mark -	Encoder 2 mark - input
11	COM	Common	Power common
12	COM	Common	Power common
13	A1+	Channel A +	Encoder 1 Channel A + input
14	A1-	Channel A -	Encoder 1 Channel A - input
15	COM	Common	Power common
16	B1+	Channel B +	Encoder 1 Channel B + input
17	B1-	Channel B -	Encoder 1 Channel B - input
18	Common	Common	Not used
19	M1+	Mark +	Encoder 1 mark + input
20	M1-	Mark -	Encoder 1 mark - input
21	Common	Common	Not used
22	+12V	+12 Vdc	12 Vdc power for external devices
23	+12V	+12 Vdc	12 Vdc power for external devices
24 and 25			Reserved

Step 14 Wire the Channel A inputs (A+ and A-) from the encoder to the breakout box P1 connector (pins 1 and 2).

Step 15 Wire the Channel B inputs (B+ and B-) from the encoder to the breakout box P1 connector (pins 3 and 4).

Step 16 Wire the marker signal inputs (M+ and M-) from the encoder to the breakout box P1 connector (pins 5 and 6).

Step 17 Wire cable SHIELD from the encoder to the breakout box P1 connector (pin 7).

Step 18 Wire POWER + and POWER COM from the encoder to the breakout box P1 connector (pins 8 and 9). Repeat Step 14 through Step 18 using connector P2 for encoder #2.



Note: If using the B885-11X internal power supply for the encoders, perform Step 19. If using an external power supply for the encoders, perform Step 20.

- Step 19** Jumper either (pin 1 or 2) on the breakout box P4 connector (dependent upon the voltage requirements of the encoders) to (pin 3).
- Step 20** Wire the external power supply output to the breakout box P4 connector (pin 3) and the supply common to (pin 4).
- Step 21** Connect Encoder Cable (part number AS-W885-00X) from breakout box connector P3 to the Encoder Feedback connector (DB25) on the B885-11X. Refer to Figure 13.

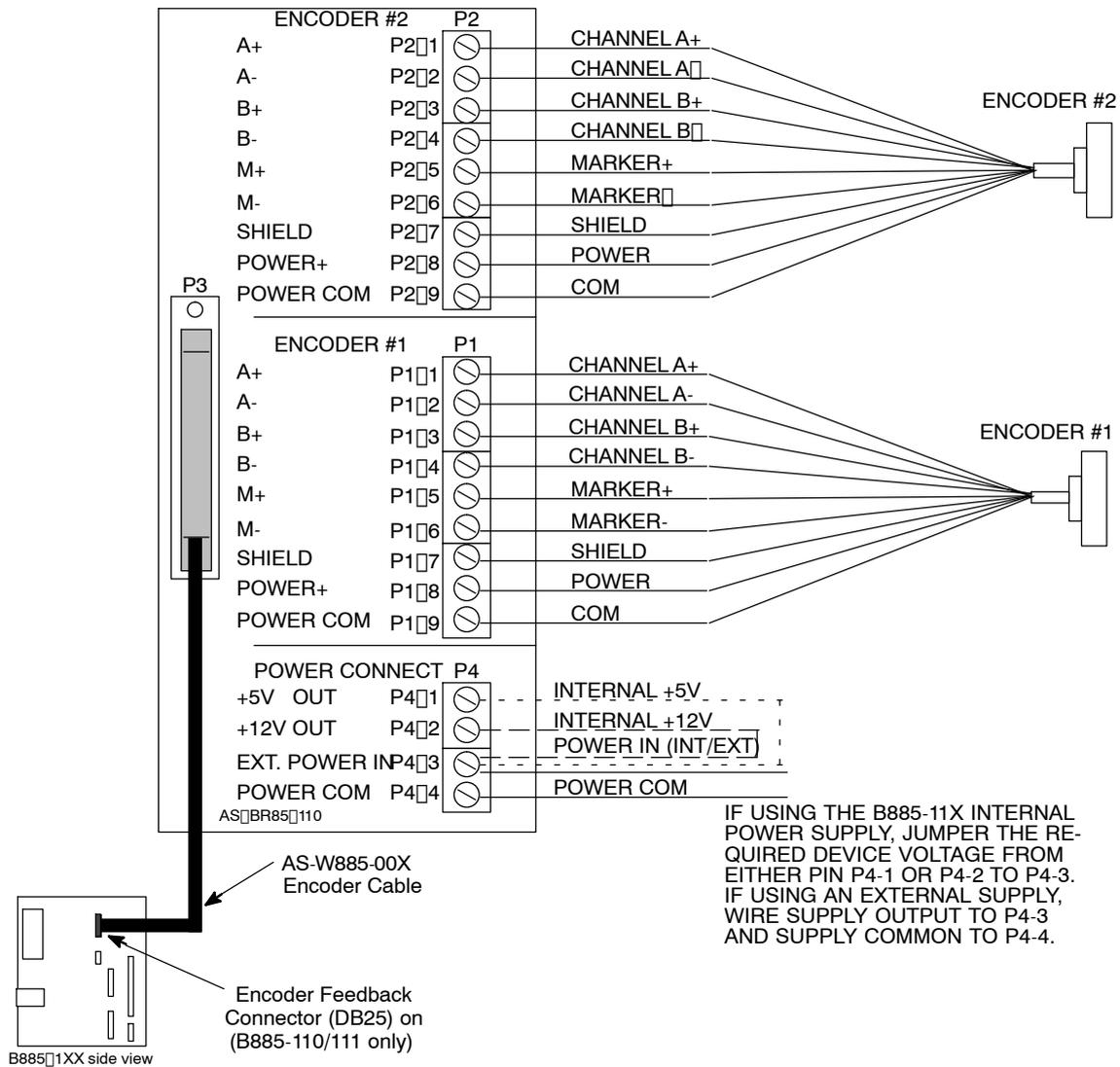


Figure 13 Typical Encoder Signal Wiring to Breakout Box

2.5 B885-1XX Configuration

2.5.1 DIP Switches

Two banks of DIP switches are located on the side of the B885-1XX. Refer to Figure 14. The 4-position DIP switch bank controls the baud rate of RS-232 serial port using (SW1 ... 3) and the B885-1XXs mode of operation (984 PLC Vs. Standalone) using (SW4). The 8-position DIP switch bank controls the MODBUS address of the RS-232 serial port.

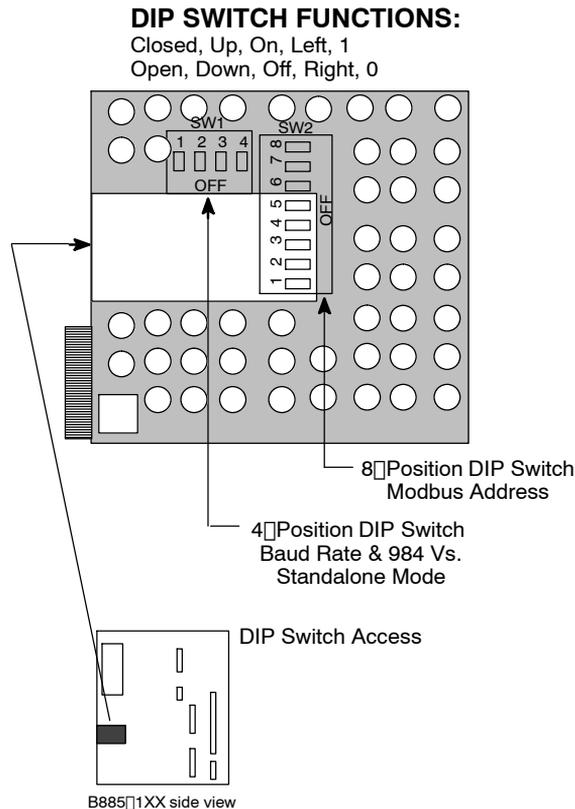


Figure 14 DIP Switch Access

The factory baud rate setting is 9600. The selectable baud rates are given below.

Baud Rate Selections

Baud Rate	SW1	SW2	SW3
300	Open	Open	Open

600	Closed	Open	Open
1200	Open	Closed	Open
2400	Closed	Closed	Open
4800	Open	Open	Closed
9600	Closed	Open	Closed

Switch 4 controls which device may perform writes to the B885-1XX. This switch is read at power-up and selects either the MMDS or the 984 PLC to control the operation of the B885-1XX. This local lockout is a safety feature that prevents a user with access to the MMDS from issuing commands to the B885-1XX while the 984 PLC is controlling the system. Set the DIP switch so that MMDS is controlling (SW4= Closed).

SW4 Selections

Operation Mode	SW4
Standalone	Closed
984 PLC	Open

When using FLASH based modules (B885-101 or B885-111) certain events occur during power-up: The DIP switches are read at power-up, and a local lockout command issued from the 984 PLC overwrites the DIP switches.

When using cartridge based modules (B885-100 or B885□110) certain events occur during power-up: The DIP switches are read at power□up, a local lockout command issued from the 984 PLC overwrites the DIP switches, and the user memory cartridge overwrites the DIP switches (except for a new user memory cartridge which does not overwrite the DIP switches). Refer to *Modicon Single Axis Software System (SASS) Motion User Guide* (GM-MOTON-001), for details.

 **Note:** The first time a memory transfer command is sent to a new user memory cartridge and no 984 PLC local lockout has been used, the switch setting read at power□up is saved in the user memory cartridge. This switch setting can only be changed by sending a local lockout command from the 984 PLC.

 **Note:** When a memory transfer command is given, the parameter values in RAM are saved, not the DIP switch settings. The serial port setup command overwrites the baud rate and MODBUS address switches.

SW 1 ... 8 of the 8□position DIP switch bank may be set to the binary bit pattern 00000000 ... 11111111 which is the equivalent of decimal 0 ... 255

respectively. To derive the address add 1 to the binary. The default is a binary 0 which is address 1 (SW1 ...8=Open). Refer to Figure 14.

These are the default characteristics that apply to the MODBUS RS-232 serial port.

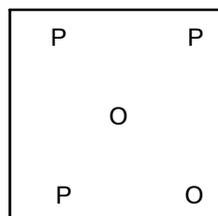
- 1 start bit
- 7 data bits
- 1 stop bit
- Even parity checking
- Default baud rate: 9600 baud

These characteristics can be changed through software. Refer to *Modicon Single Axis Software System (SASS) Motion User Guide* (GM-MOTN-001), for details.

Step 22 When using optional key pins (provided with housing shipment), install them above and below the housing slot selected for the B885-1XX.

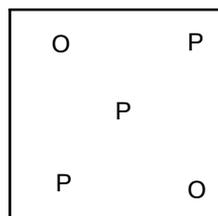
Figure 15 shows this optional mechanical keying system used to match the module type with a particular slot in the housing to ensure proper module replacement. The Key Pin location is the same for all four B885-1XX models.

LOOKING AT FRONT OF HOUSING - OVER MODULE SLOT



When facing housing, place the knurled end of the key pins into the holes indicated by the P. Use a 1/2 in plastic head mallet or equivalent to drive the pin into the housing approximately 1/4 in.

NOTE: The keying system is optional.



LOOKING AT FRONT OF HOUSING - UNDER MODULE SLOT

Figure 15 Key Pin Location

Step 23 Insert the B885-1XX into the standard backplane of the Modicon 800 Series I/O rack, giving the 984 PLC access to the B885-1XX through the OURBUS protocol. Refer to Appendix A, Section A.2, for a listing of housings.



Note: First time installation of a B885-1XX may be tight.

Step 24 Secure the B885-1XX to housing using captive slotted mounting screws at the top and bottom of the B885-1XX front panel.

2.5.2 Memory

The B885-1XX uses two types of memory: Executive Memory and User Memory. Both allow future upgrades at customer sites. The B885-100 and B885-110 use removable memory EEPROM cartridges, in contrast the B885-101 and B885-111 that use FLASH memory.

Step 25 For B885-100 or B885-110, that uses memory Cartridge(s), insert either the Standard Executive (part number AS-EM85-000) or Enhanced Executive (part number AS-EM85-302) into the connector. If using the optional User memory cartridge (part number AS-ME85-000) insert into the left connector. Refer to Figure 16.

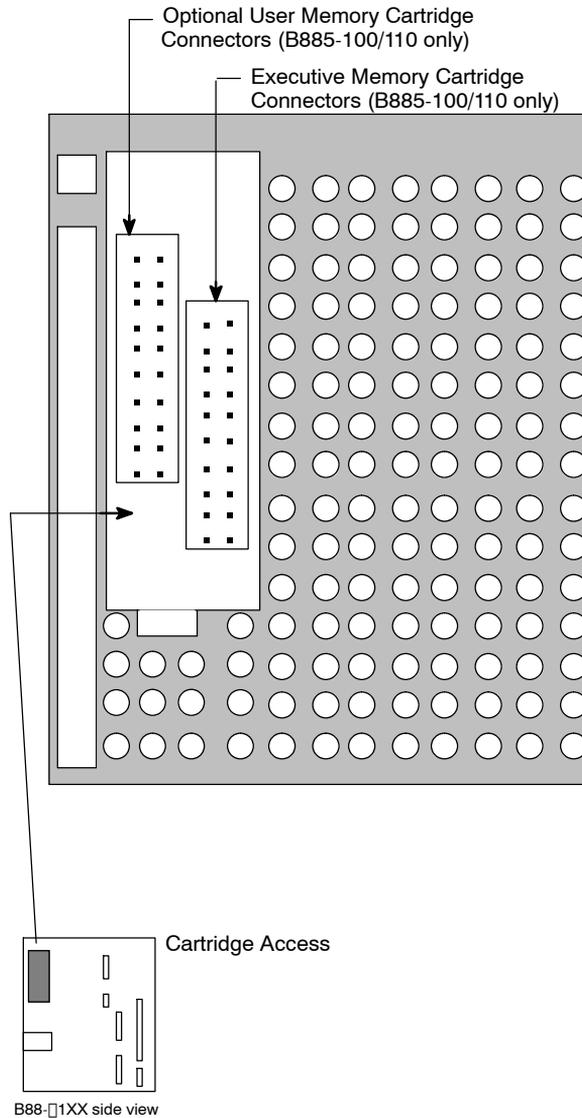


Figure 16 Cartridge Access

Step 26 For B885-101 or B885-111, that use FLASH, Step 25 is not required. However, for upgrading FLASH Memory in the field, refer to Appendix A, Section A.3, for details.

2.5.3 I/O Map

The I/O Map is used to direct the flow of data between the various I/O modules and the logic program. It is the tie between the references used in the logic program and the I/O module connection points.

The 800 Series I/O Map lets you match the 984 PLC I/O addresses with what will be installed or with what actually exists in the field. The I/O Map also tells the controller how to use an input signal in user logic, and, where to send an output signal. The format of register data (BCD - binary coded decimal or BIN binary) is specified on this screen. The screen objective is to load the card selections and reference number selections to complete the I/O configuration.

In the Configuration Overview, you must specify the number of I/O drops and I/O modules. These numbers are checked when entries to the I/O Map are made. The Modsoft Runtime files contain descriptions of the different kinds of modules. GCNFTCOP.SYS includes the description of B8 modules, with module number, number of inputs, outputs description and identifier.

Step 27 Using the I/O Map, select six registers (three 30XXX input registers and three 40XXX holding registers). Refer to your MODSOFT software. Also, refer to the *Modicon Modsoft Programmer User Manual* (GM-MSFT-001).

Chapter 3

Verification of Installation

- Inspection and Checkout

3.1 Inspection and Checkout

After installing and wiring the B885-1XX, you should perform a pre-power inspection, conduct an initial power-up check, and clear any faults.



Warning! SHOCK HAZARD! Lethal voltages may exist at various points throughout the B885-1XX system. To avoid severe personal injury or death, only trained electronics personnel should perform these procedures.

3.1.1 Pre-Power Inspection

Before you apply power to the B885-1XX perform Step 1 through Step 3.

- Step 1** Check all wiring. Compare your wiring to the diagrams in the System Installation chapter. Make sure the dc power is within the range specified for the B885-1XX.
- Step 2** Inspect the motors and loads. Are the motors securely mounted? Is it safe to run the motors? Remove keys from motor shafts to disconnect the motors from their mechanical loads.
- Step 3** Disconnect power from the I/O wiring (or disconnect the wiring from the I/O inputs) to prevent an accidental local lockout command issued from the 984 PLC which cannot be changed by the MMDS. The MMDS is not capable of changing this setting, even by reformatting the memory. The only way a B885-1XX with user memory set to 984 PLC control can be returned to standalone mode is if the 984 PLC releases the control. If a Set or Motion Command is issued while the MODBUS is locked out (984 PLC in command), the B885-1XX rejects the command and sets a fault bit true.



Warning! OPERATING MACHINERY! During the following tests, the machinery may run at any time. Warn people near the machine that you are going to start it and the motors may run unexpectedly.

3.1.2 Initial Power-Up Check

Apply power to the B885-1XX and check its initial response using Step 4 through Step 9.

- Step 4** Ensure that both DIP switch banks (SW1 and SW2) are set to select the baud rate, communications protocol and MODBUS address, as specified previously in Chapter Two, Section 2.5.1.
- Step 5** Ensure that the Modicon Motion Development Software (MMDS), (part number SW-MMDS-1DB) is installed and running on your development system computer (refer to the *Modicon Motion Development Software (MMDS) Manual*, (GM-MMDS-002).
- Step 6** Connect your development system computer to the B885-1XX MODBUS port via an RS-232 serial cable.
- Step 7** Apply power to the B885-1XX. The B885-1XX immediately enters a power-up self-test mode indicated by the flashing Module OK indicator. While self-test is being executed, the B885-1XX flashes the Power OK, Ser Port, Moving and In Pos indicators as different diagnostic tests are being performed.

If the self-test diagnostics are passed, you should see the following indications on the B885-1XX front panel:

- MODULE OK indicator is illuminated. Watchdog timer is operational and B885-1XX is functioning properly.
 - POWER OK indicator is illuminated. Internal power supply is operational.
 - IN POS indicator is illuminated.
- Step 8** Reconnect any motor wiring that may have been disconnected during the preparation for the initial power-up.
- Step 9** Reconnect any I/O wiring that may have been disconnected during the preparation for the initial power-up.

3.1.3 Clearing Faults

Faults may have been activated during the initial power-up. Perform Step 10 through Step 14 using the MMDS (part number SW-MMDS-1DB) to clear faults.

- Step 10** From the Main Menu, select the Motion Mode (function key F4). The Motion Mode Menu is displayed.
- Step 11** From the Motion Mode menu, select Immediate Mode (function key F4). The Immediate Mode Menu is displayed.
- Step 12** Press [F8] (Read Error) to get a display of the first fault log. Record this fault.
- Step 13** Press [F7] (Read Next Error). Repeat as necessary until there are no more errors, record each new fault.
- Step 14** Press [F5] (Reset) to clear all faults.



Note: If the B885-1XX continually faults, the error register may be read using the MMDS to determine the exact nature of the problem. Refer to the *Modicon Motion Development Software (MMDS) User Guide* (GM-MMDS-002) for details on this procedure.

Appendix A

Specifications

- B885-1XX Specifications
- Part Numbers
- Customer Service & Technical Assistance

A.1 B885-1XX Specifications

B885-1XX Specifications

Module Topology	Number of Discrete Inputs	7
	Number of Discrete Outputs	3
	Number of Analog Inputs	1
	Number of Analog Outputs	1
Power Supplies	I/O system Bus 5Vdc	25 mA
	Encoder power	5V \pm 10% @ 400 mA; 12V \pm 10% @ 200 mA;
	Main power input	19.2 ... 30Vdc @ 8.2 W (excluding power supplied to external encoders and with all I/O off)
Digital I/O	Optically isolated	to 1000Vdc
	Output drive capability	150 mA (using customer supplied 20 ... 28Vdc, true high)
	Input impedance	3.7K Ω (inputs on @ 10 Vdc minimum, off at 4 Vdc maximum, true high)
Analog I/O	Analog input	\pm 10Vdc
	Analog output	\pm 10Vdc, 5mA drive capability
	Accuracy (not including offsets)	\pm 100 mVdc (10 bit resolution) for inputs
		\pm 50 mVdc (12 bit resolution) for outputs
Drive Interface	Drive fault input	True high
	Drive enable relay form C contacts	120 Vac at 0.1 A resistive or 30 Vdc at 0.5 A resistive
	Three-phase current command signals	\pm 10 Vdc
	Drive capability	5 mA
	Summing	To 0, \pm 0.1 Vdc
	Velocity command	Software selectable
Communications	Modbus	1 RS-232 serial port interface
	Baud rates (for ASCII only)	300 to 19200, 9600 default, set by software or DIP switch.
	5Vdc supply	250 mA maximum
Resolver Feedback	Resolver reference drive	3.75 \pm 0.05 KHz; 3.9 \pm 2.1 VRMS; 120 mA drive capability
	Resolver sine/cosine inputs	3K Ω impedance
	Resolver resolution	16 bits to 375 RPM; 14 bits to 1500 RPM; 12 bits to 6000 RPM
	System accuracy	\pm 6 arc minutes with Modicon standard transmit style resolver (worst case \pm 10 arc minutes)

	System repeatability	±2 minutes of arc
Encoder Feed-back (B885-110 and B885-111 only)	Single-ended or differential signals	0 ... 24V nominal, 30V maximum
	Input impedance	>500 Ω
	Maximum encoder frequency	200 KHz square wave (55%-45% with less than 15 degrees quadrature error
	Encoder feedback loss	detected on phase A and B differential signals. Loss of marker signal cannot be detected; results in failure to home the system.
	Resolution	4 times encoder line count
	Power for encoder from PLC	3.3 Vdc minimum, 0.7 Vdc maximum
Motion	Absolute positioning range	32 bits of resolution, convertible to inches, millimeters, or any other user unit
	Speed range	0 ... 6000 RPM
	Response time to 984 control register	3 ms (maximum)
Dimensions (WxHxD)	2.0 x 10.5 x 8.0 in	50.8 x 266.7 x 203.2 mm
Weight	2.4 lbs	1.1 kg
Space Required	1 I/O slot	
Breakout Module (WxHxD)	3.0 x 5.31 x 4.5 in (Includes the DB25 connector and cable bend radius)	7.6 x 13.5 x 11.4 mm
Agency Approvals	Designed to meet	UL508 and CSA 22.2 No.142 standards
Environmental Temperature	Operating	0 ... 60 C (32 ... 140 F)
	Storage	-40 ... 80 C
Environmental Humidity	Operating	0 ... 95%, noncondensing
	Storage	0 ... 95%, noncondensing
Shock and Vibration	Designed to meet	QT-QUAL-00

A.2 Part Numbers

B885 End User Part Numbers

B885 Models	AS-B885-100	Motion Module with resolver feedback and memory cartridge
	AS-B885-101	Motion Module with resolver feedback and NV FLASH memory
	AS-B885-110	Motion Module with resolver, dual encoder feedback and memory cartridge
	AS-B885-111	Motion Module with resolver, dual encoder feedback and NV FLASH memory
Cartridges	AS-EM85-000	Standard Executive Memory, 64K words
	AS-EM85-302	Enhanced Executive Memory, 64K words
	AS-ME85-000	Optional User Memory, 8K words
Cables	AS-W885-003	Encoder to B885-11X cable, 3 feet
	AS-W885-006	Encoder to B885-11X cable, 6 feet
Breakout Box	AS-BR85-110	Encoder(s) to B885-11X via DB25 connector, for wiring breakout, rail mountable
Fuse	Bussman type GMA-2A	2A, 250V fast acting fuse
Software	SW-MMDS-1DB	MMDS Motion Development Software, a menu driven software used to develop your application programs offline, also used to access SASS motion programming language commands

Examples of Accessory Equipment End User Part Numbers

Cables	100-338-8	Cyberline Drive to B885-11X cable, 8 feet
	120-103-25	Cyberline Drive to motor cable, 25 feet
	120-063-25	Resolver to B885-11X cable, 25 feet
	AS-W955-0XX	Modbus to Null Modem (IBM PC/XT) cable, 12 or 25 feet
	AS-W952-012	Modbus to IBM AT cable, 12 feet
Housings	AS-H819-209	Primary 19 Housing
	AS-H827-209	Primary 27 Housing
	AS-H819103	Primary 19 Housing
	AS-H827-103	Primary 27 Housing
	AS-H819-100	Secondary 19 Housing
	AS-H827-100	Secondary 27 Housing
Software	SW-MSXD-9XA	Modsoft Programmer Software, allows you to program, debug, monitor, and maintain a 984 PLC system

A.3 Customer Service & Technical Assistance

AEG Schneider Automation telephone numbers are as follows:

- To call us from anywhere in North America except from within the state of Massachusetts: 1-(800)-468-5342
- To call us from within Massachusetts or from outside North America: 1-(508)-975-5001

Customer Service -- When calling the AEG Schneider Automation telephone number, ask for service from the list below.

When calling the 800 number, you will get a recording asking you to enter a one digit code for the type of service you want (listed below). However, this only works with a touch tone phone. If using a dial phone, hang on and the operator will intercept after a short pause.

The service categories -- and *extra digit* code responses for push-button phones -- are:

- 1 Hardware or software technical support
- 2 Order entry, buying hardware or software
- 3 Modfax
- 4 Training/course registration inquiries
- 5 General information other than above.

 **Note:** MODFAX: For available hardware data sheets, application notes, and software information. Recommended catalogue MC-FAX-DIR which is the master of all available catalogues (only twelve pages) lists all catalogues available on the MODFAX system.

 **Note:** BBS (AEG Schneider Automation's Customer Service Bulletin Board): For Modsoft updates, conversion utilities, hardware and software help, field service bulletins, Modbus and Modbus Plus help, software revision levels, FLASH EXEC updates for B885-101 or B885-111 modules, and more. Parameters are: up to 14.4k baud, no parity, 8 data, 1 stop. The BBS telephone number is 1-(508)-975-9779.

Appendix B

Troubleshooting

- Cable Fabrication
- MODBUS Cable Pinouts
- Pre-Troubleshooting
- Troubleshooting
- Electrical Noise Problems
- I/O Record Sheet

B.1 Cable Fabrication

If you plan to fabricate your own cables, follow these guidelines on wire size for the appropriate type of cable for your application. Standard resolver and drive cables for the B885-1XX are available from Modicon. Refer to Appendix A, Section A.2. These cables have the proper termination for use with Modicon's standard motors and Cyberline drives. The non-terminated ends of each multi-conductor cable are left as pig-tails for easy connection to the Phoenix connectors used on the B885-1XX.

Cable Wire Size Guideline

Gauge	Application
12 AWG maximum	Power wiring, power supply wiring
16 ... 22 AWG (shielded)	Digital or analog I/O, resolver and encoder cables

Figure 17 shows the internal structure of a typical cable used to connect the devices of the B885-1XX system. The figure illustrates a three-wire cable; when wiring motor or resolver signals, you will need 6 or 8 conductors and a shield.

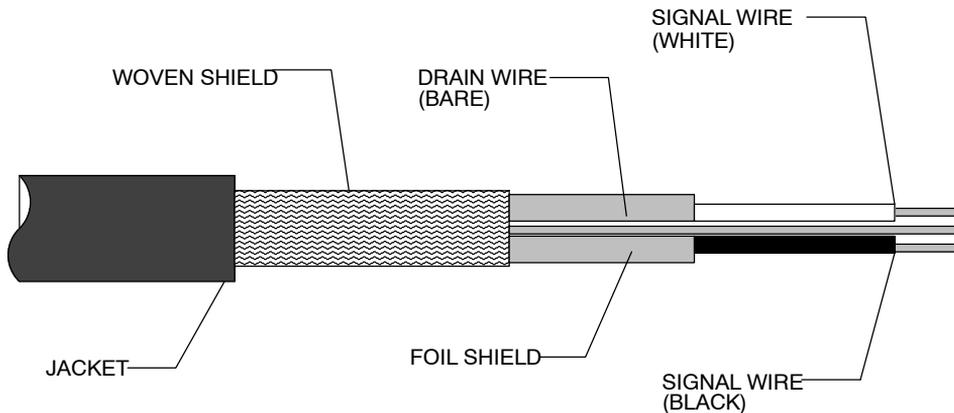


Figure 17 Cross Section of a Typical Signal Cable

Figure 18 illustrates the standard method to prepare a cable for wiring to a connector. Remove approximately three inches of the cables outer jacket and shields as shown.

Strip approximately 0.25 inches of the insulation from the end of each signal wire. This provides you with an adequate amount of wire to work with and enough bare wire to insert into the Phoenix connector.

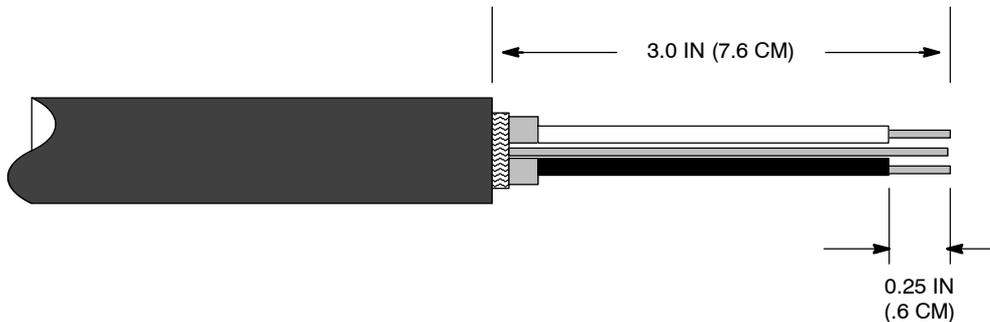


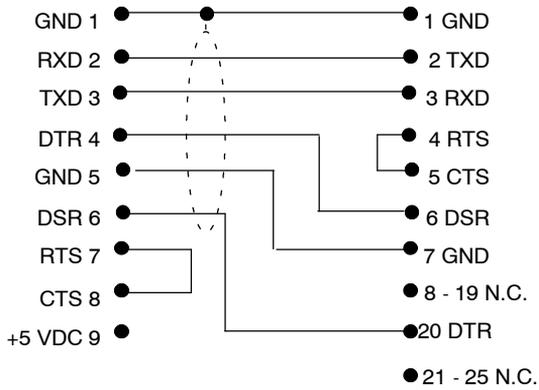
Figure 18 Preparing the B885-1XX End of the Cable

All wires of the motor and resolver cables have specific connections on the Phoenix connectors. Refer to the Chapter 2, Section 2.4 for the motor, resolver, and encoder wiring.

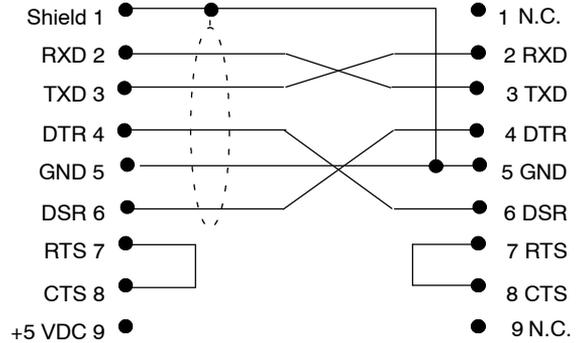
When all wires are inserted in the connector, you should check the terminal connections by performing a continuity check from the Phoenix connector to the drive connector. This ensures that there are no loose connections and that the wiring is correct from pin to pin on each connector.

B.2 MODBUS Cable Pinouts

Figure 19 gives MODBUS cable pinouts for use in troubleshooting or should you need to fabricate your own.



A. B885-1XX Modbus Connector
to Null Modem (IBM PC/XT)
(AS-W955-0XX)



B. B885-1XX Modbus Connector
to IBM AT (AS-W952-012)

Figure 19 MODBUS Cable Pinouts

B.3 Pre-Troubleshooting



Warning: Equipment could inadvertently run, causing injury or damage. When working on the B885-1XX system, warn others to stay clear of the equipment. The system could start without any notice. The outputs could activate without notice. If a motor can be damaged if an axis runs or an output gets activated, disconnect the motor or mechanically uncouple it from its load so you can test the system without danger.

Before you begin any troubleshooting, first consider the following:

- Observe the status indicators

The operational status of either interface (OURBUS, or MODBUS) is monitored with an LED, so you can determine whether or not communication is taking place. The OURBUS interface is monitored by the ACTIVE indicator, while the MODBUS interface is monitored by the SERIAL PORT indicator. The POWER OK and MODULE OK indicators should illuminate during power-up. The IN POS indicator should illuminate while the DRV FLT indicator should not illuminate when the drive and resolver wiring are intact and operational.

For additional information, refer to Chapter One, Section 1.1.4. Once B885-1XX communication is established, the operational state of the B885-1XX can be determined exactly by issuing the appropriate command.

- For a new B885-1XX

In a startup situation, your problem is either a wiring problem and/or a programming problem. Carefully compare your wiring to the diagrams in Chapter Two, Section 2.4. Check your handling of limit switches and control inputs and outputs in your program.

- For an existing B885-1XX

In most cases the problem relates to a recent change in the following areas: programming, hardware, motor/load, or wiring.

B.4 Troubleshooting

Ten symptom trees are provided to help you isolate the problem. Using the table below: find your problem, then refer to the symptom tree number and follow the arrows. Some of the symptom trees (4 ... 9) logic blocks refer you to specific test procedures (A,B,C,D,E,F, and G) that help in narrowing down the problem.

Troubleshooting Process

Problem	Symptom Tree Number	Test Procedures
Dead unit	1	None Applicable
No communication to the 984	2	
No communication with the MMDS	3	
Drive will not enable	4	A-Drive Fault, or B-Drive Enable
Motor does not turn (drive enables)	5	C-Torque Commands, or D-Resolver Signals
Drive enables and motor runs, but quickly faults	6	C-Torque Commands, or D-Resolver Signals, or E-Encoder Signals
Motor runaway, lockup, jerky motion or oscillation	7A and 7B	C-Torque Commands, or D-Resolver Signals, or E-Encoder Signals
Discrete I/O not working	8	F-Discrete Inputs and Outputs
Analog I/O not working	9	G-Analog Inputs and Outputs
Servo stability and dynamic problems	10	None Applicable

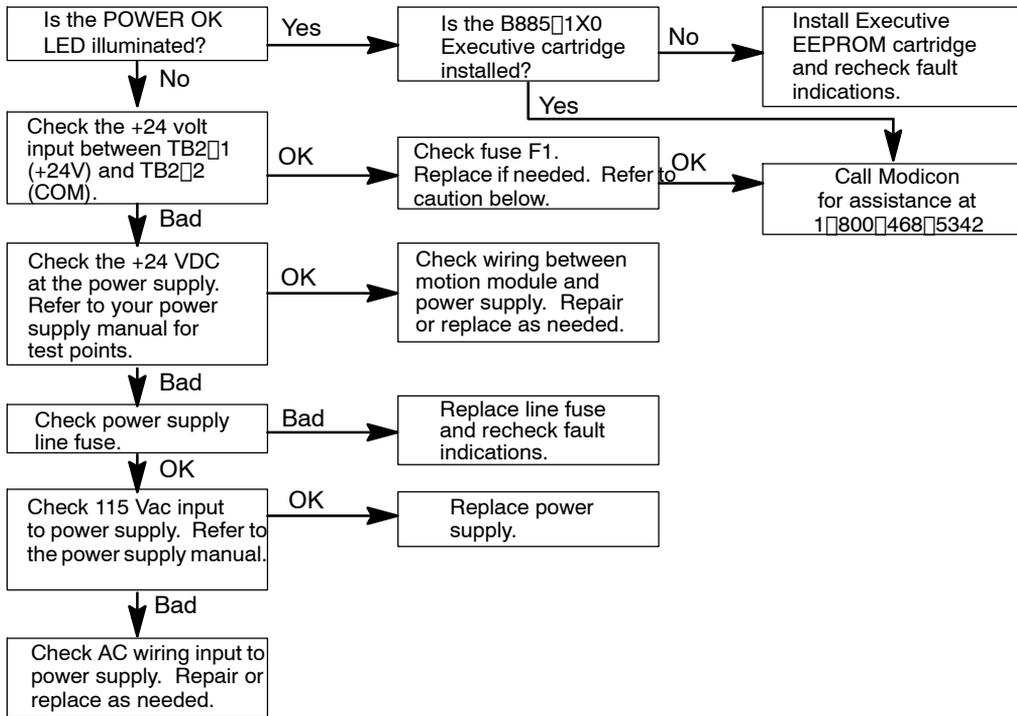


Figure 20 Symptom Tree1: Dead Unit



Caution: Replace fuse with Bussman type GMA-2A (2A, 250V fast-acting) fuse only. If a future high input voltage condition causes the internal power supply crowbar circuitry to activate, a fuse other than the GMA-2A may allow damage to the circuitry before the fuse clears.

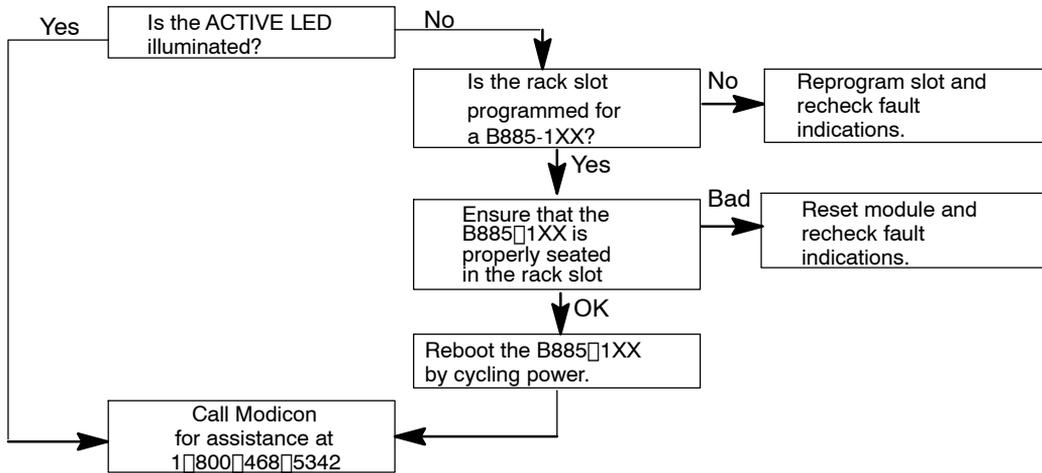


Figure 21 Symptom Tree 2: No Communication to the 984 PLC

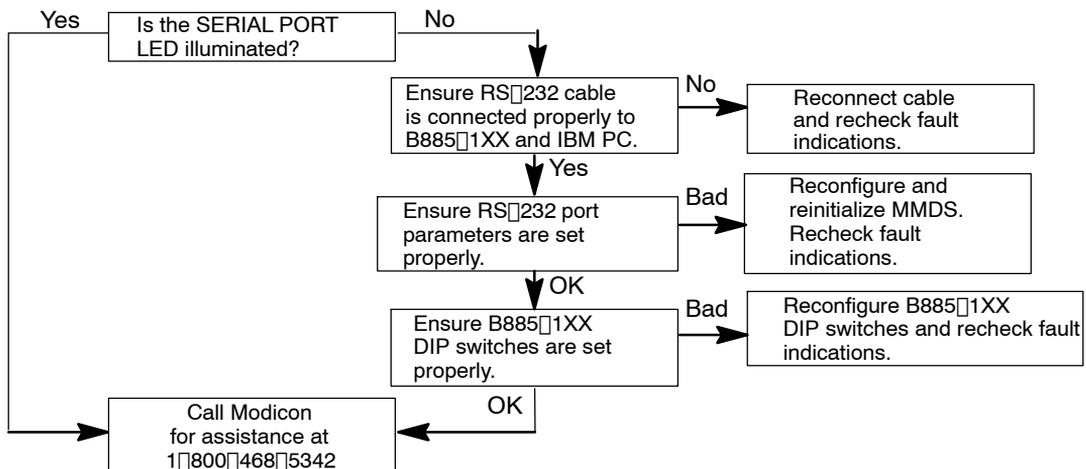


Figure 22 Symptom Tree 3: No Communication to MMDS

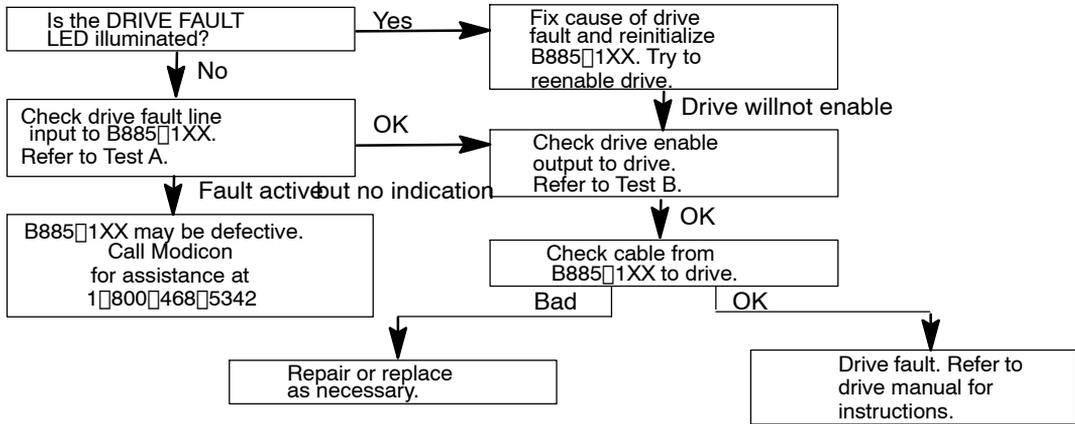


Figure 23 Symptom Tree 4: Drive Will Not Enable

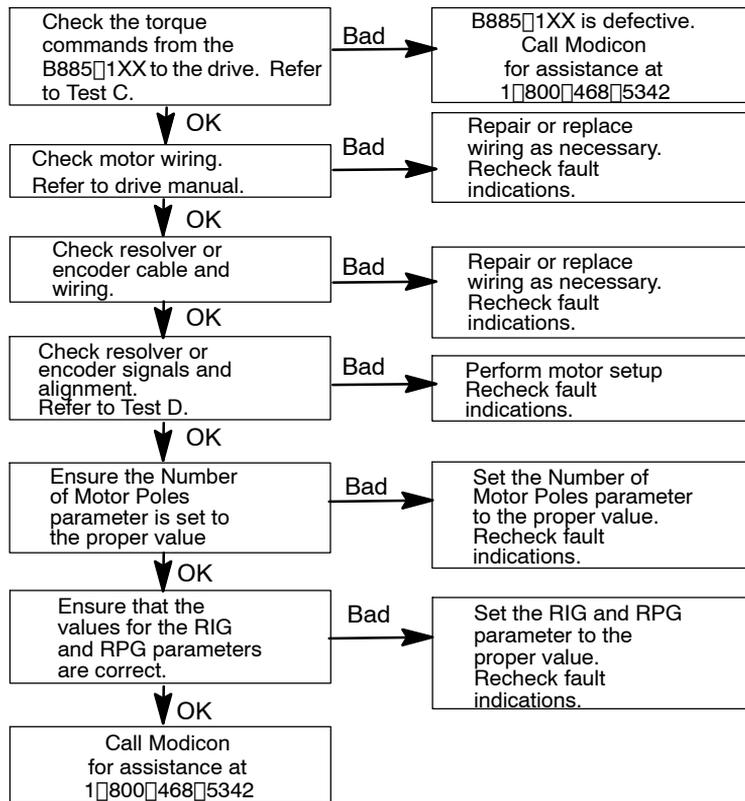


Figure 24 Symptom Tree 5: Motor Does Not Turn (Drive Enables)

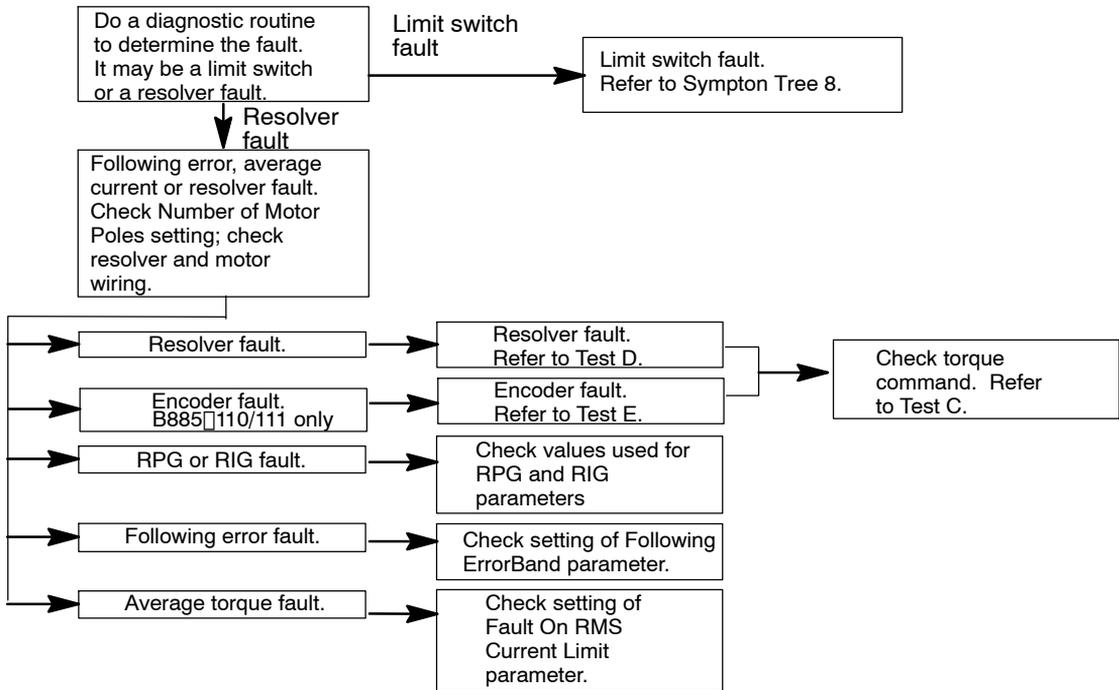


Figure 25 Symptom Tree 6: Drive Enables and Motor Turns, But Faults

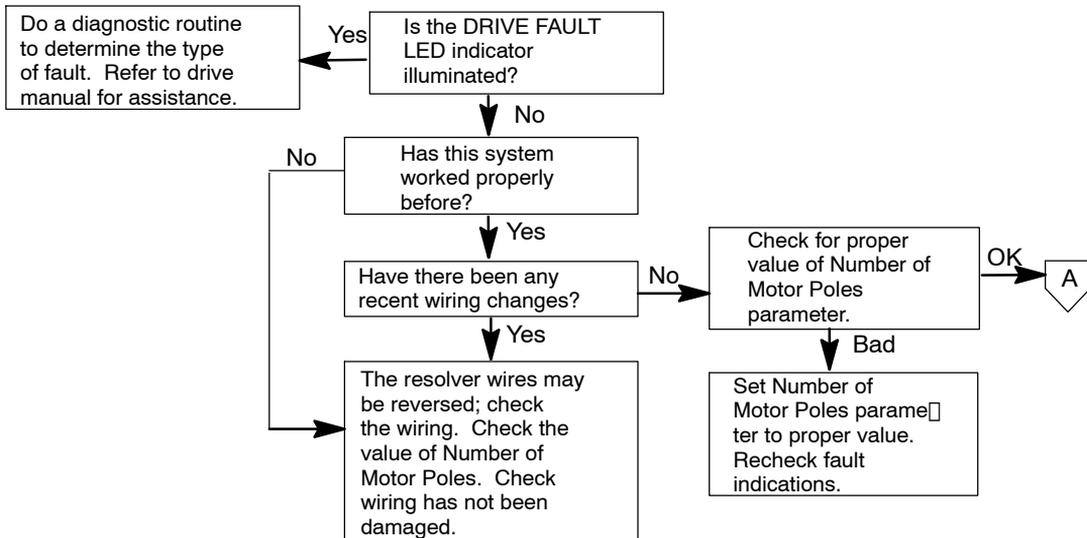


Figure 26 Symptom Tree 7A: Motor Runaway, Lockup, Jerky Motion or Oscillation

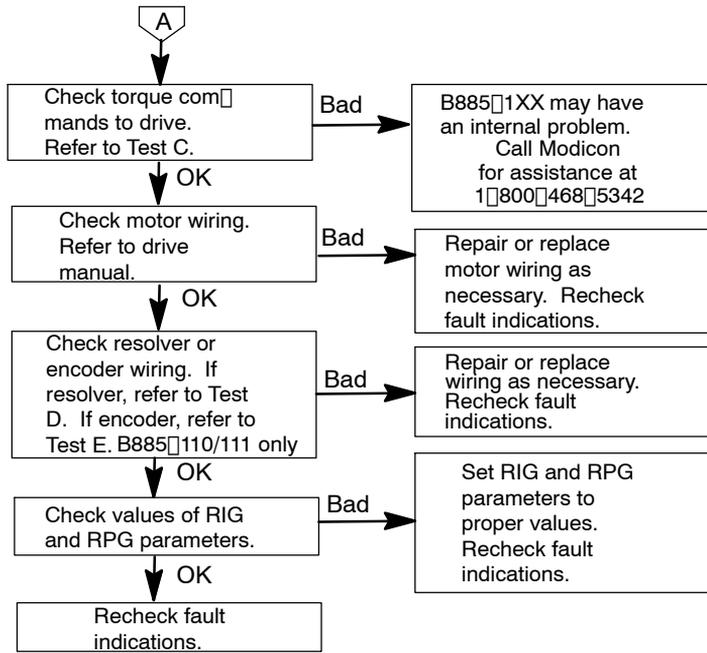


Figure 27 Symptom Tree 7B: Motor Runaway, Lockup, Jerky Motion or Oscillation



Note: Runaway is defined as uncontrollable takeoff at high speed. This can occur with either dc or brushless motors. Lockup, where the motor moves to a pole and stays there, can only occur with brushless motors or defective dc motors. Sometimes instead of locking up, a brushless motor may oscillate wildly around a pole or from pole to pole. Oscillation can also be caused by improper setting of the RIG, RPG, and ATC gains.

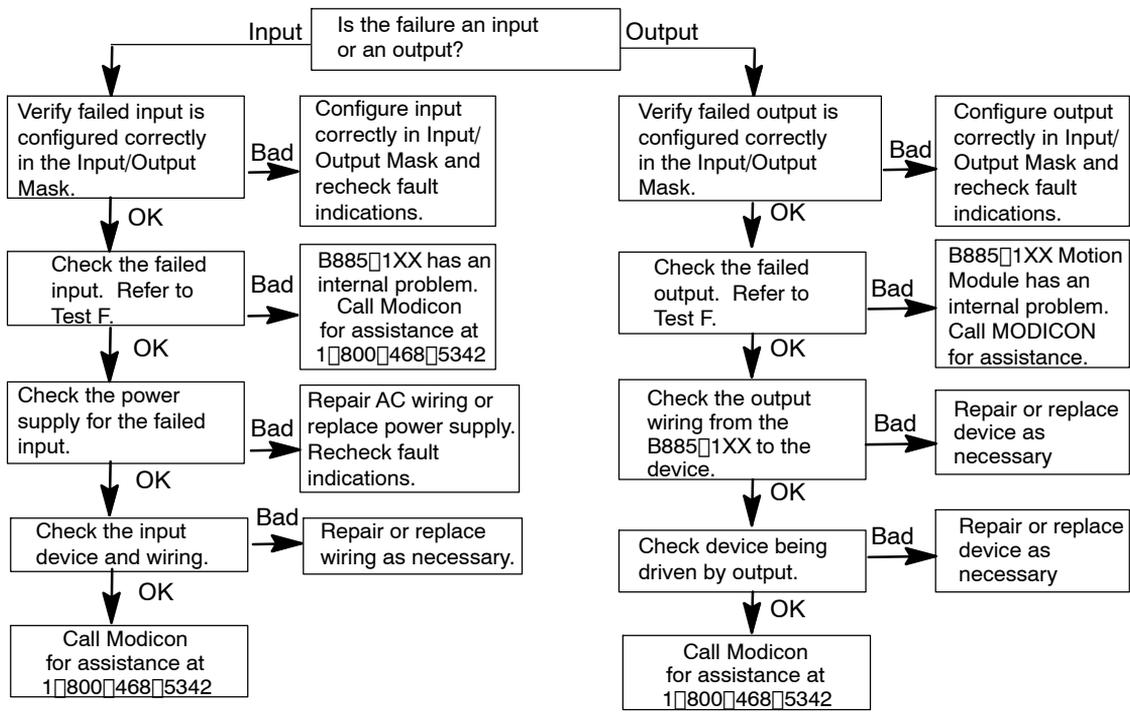


Figure 28 Symptom Tree 8: Discrete I/O Not Working

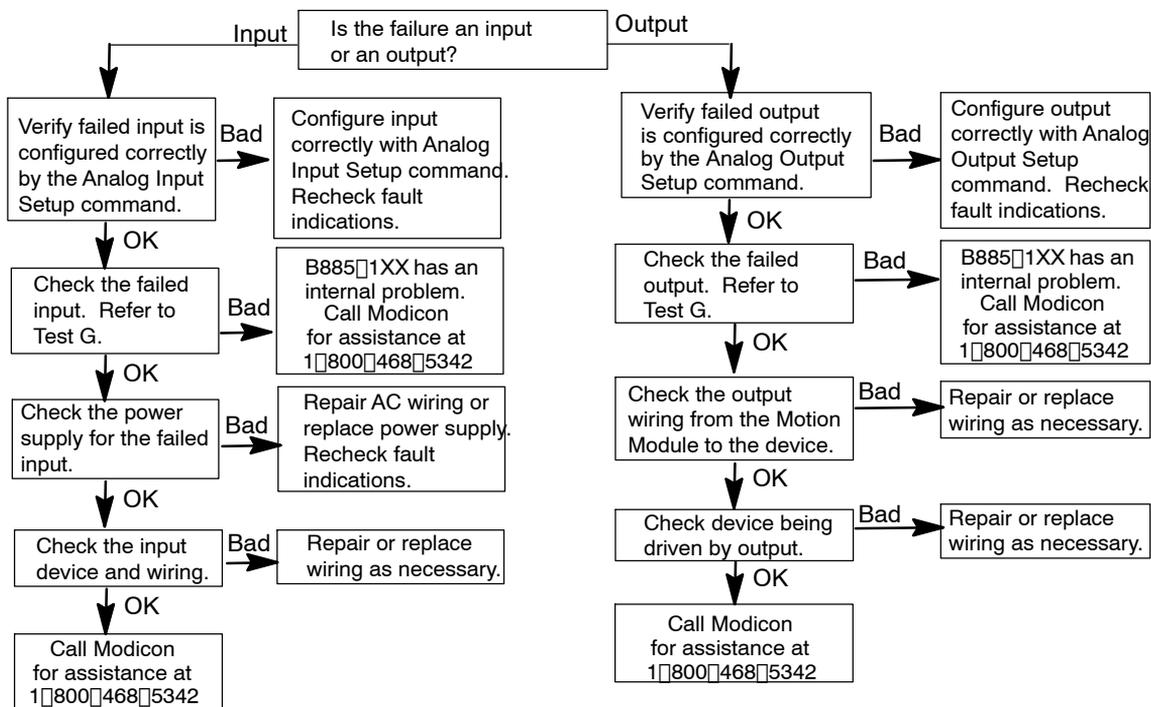


Figure 29 Symptom Tree 9: Analog I/O Not Working

B.4.1 Symptom Tree 10: Servo Stability and Dynamics Problems

The motor, load, drive and B885-1XX can cause problems with stability and performance. These problems don't cause fault indications unless they are gross problems. We cover 8 problems followed by their possible solutions:

1. Overshoot on Stopping

You're trying to operate the system with an Acceleration Time Constant (ATC) that is too low for the acceleration capability of the motor, drive and load. Possible solutions:

- Increase the ATC parameter or decrease the Linear Acceleration and Linear Deceleration parameters.
- Decrease the Speed parameter.
- Increase the Current Limit parameter.
- Use a motor and drive with a higher acceleration capability.
- Use the Linear Acceleration and Linear Deceleration parameters. If you are using them, decrease them.



Note: If you are using Velocity Feed Forward, some overshoot is normal.

2. Low-Frequency Oscillation (10 Hz or Less)

You may be operating with Rate Loop Proportional Gain (RPG) or Rate Loop Integral Gain (RIG) parameters that are too low with respect to the ATC. Another cause could be a low RPG/RIG ratio. This may also indicate drive wiring problems. Possible solutions:

- Increase ATC.
- Increase both the RPG and RIG parameters.
- Try increasing the RPG value or decreasing the RIG value.
- Check the wiring from the motion module to the drive, then to the motor. Then check the wiring from the resolver back to the motion module.
- Make sure you have grounded the motor.
- Check for high inertia load, backlash or loosely coupled load.

3. High-Frequency Oscillation (Greater than 10 Hz)

You are setting the Rate Loop Proportional Gain (RPG) parameter too high with respect to resonances in the motor and load combination. Possible solutions:

- Reduce the RPG parameter.
- Load inertia should be less than 3 to 5 times the motor inertia. Servo stability can be a problem above this range.
- Check for backlash.

4. Servo not Stiff at Rest (Feels Spongy)

You are setting the Rate Loop Proportional Gain (RPG) and Rate Loop Integral Gain (RIG) parameters too low. Possible solutions:

- Increase the RPG and RIG parameters in that order.
- If you can't get the servo stiff enough without oscillation, you should stiffen the mechanics of the load. Then try increasing the RPG and RIG.
- You may need to change to a larger motor or drive.

- Load inertia should be less than 3 to 5 times the motor inertia. Servo stability can be a problem above this range.
- On a brushless system, sponginess may mean the motor is locked on a pole. Try jogging the motor to see if it is locked on a pole or if it is servoing.

5. Servo Noisy Random Hash and Vibration

This is caused by electrical noise on the resolver wiring. Possible solutions:

- Check all shielding and grounding. Connect shields to ground at the motion module only. Check the resolver wiring.
- Route power wiring away from signal wiring.

6. Unstable Servo due to Backlash

This is caused by backlash (lost motion) between the motor and resolver shaft. Backlash means the motor is operating under two different load conditions. This can cause oscillations. Possible solutions:

- Eliminate any backlash.
- Lower the performance of the axis to stabilize the axis.

7. Cogging at High Speed

This is usually caused by lack of symmetry between the sine and cosine signals being fed from the resolver to the motion module. Other causes are improper Motor Resolver Setup, defective coupling between motor and resolver, or non-continuous load. Possible solutions:

- Refer to the *Single-Axis Software System (SASS) Motion User Guide* (GM-MOTN-001) to check the Motor Resolver Setup.
- Check the resolver signals; refer to Test Procedure D, Section B.4.2.4.

8. Brushless Motor Rotates Part of Revolution or Stalls

A stalled or locked brushless motor is not a servo dynamics problem. It indicates a wiring or equipment problem. Possible solutions:

- Check the resolver signals and wiring; see Test Procedure D, Section B.4.2.4

The following items could also cause this problem: Load too big for motor. Current Limit parameter set too low. Number of Motor Poles parameter set incorrectly. Loose or broken resolver coupling. Motor Resolver Setup performed incorrectly. Refer to the *Single-Axis Software System (SASS) Motion User Guide* (GM-MOTN-001).

B.4.2 Test Procedures

Seven test procedures are used in conjunction with some of the symptom trees, to help you track down the problems with the B885-1XX system. They are:

Test Procedure Descriptions	
Test	Description
A	Drive Fault
B	Drive Enable
C	Drive Torque Commands
D	Resolver and Motor Signals
E	Encoder and Motor Signals
F	Discrete Inputs and Outputs
G	Analog Inputs and Outputs



Note: We recommend you use a digital voltmeter with 3-1/2 digits resolution and 0.5% accuracy.

B.4.2.1 Test A: Drive Fault

The drive controls the drive fault line. What it indicates depends on the drive. For example, with Cyberline drives, the fault signal can indicate over-temperature, improper bus voltage, or improper torque commands.

Step 1 Using a dc voltmeter, measure the drive fault signal at the B885-1XX between TB1-1 (FLT+) and TB1-2 (COM). When there is no drive fault, the drive pulls this signal low (<+1 Vdc). When there is a drive fault, this signal goes high (+10 ...+15 Vdc), assuming the drive has power. Refer to Figure 30 and Figure 31.

Step 2 If the fault line measures high when there is no fault, ensure the fault line is not going through a relay or motor contactor.

Step 3 If the fault line reads low, but the drive still shows fault status through its LEDs, the drive could be defected. Call Modicon for assistance at 1-800-468-5342.

The B885-1XX re-enables when all three of these conditions are satisfied:

- The condition that caused the fault has been corrected, and
- the B885-1XX is not receiving a fault signal at its input, and
- the B885-1XX receives an enable command from the program.



Caution: Depending on how you write your control software, it may be possible for your B885-1XX to fault and then re-enable without warning or manual intervention.

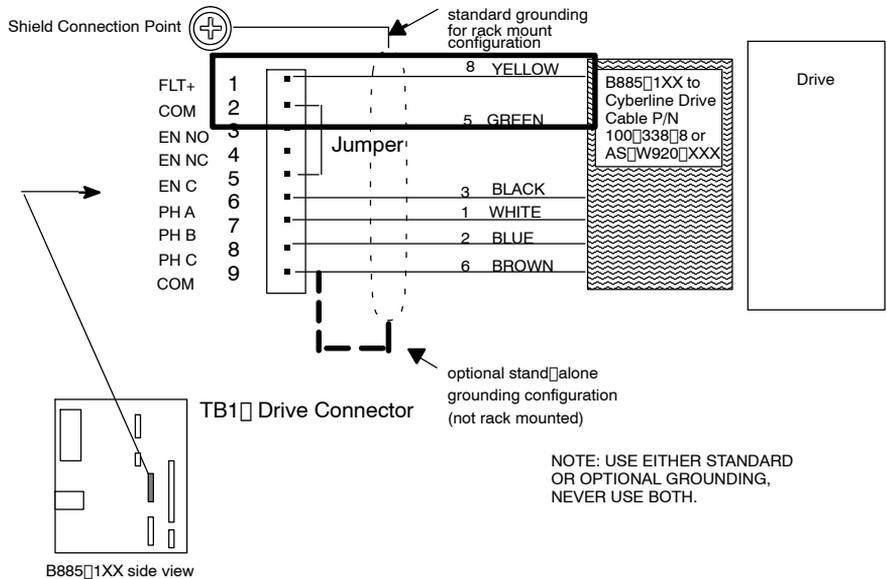


Figure 30 Drive Fault Test Points on the motion module

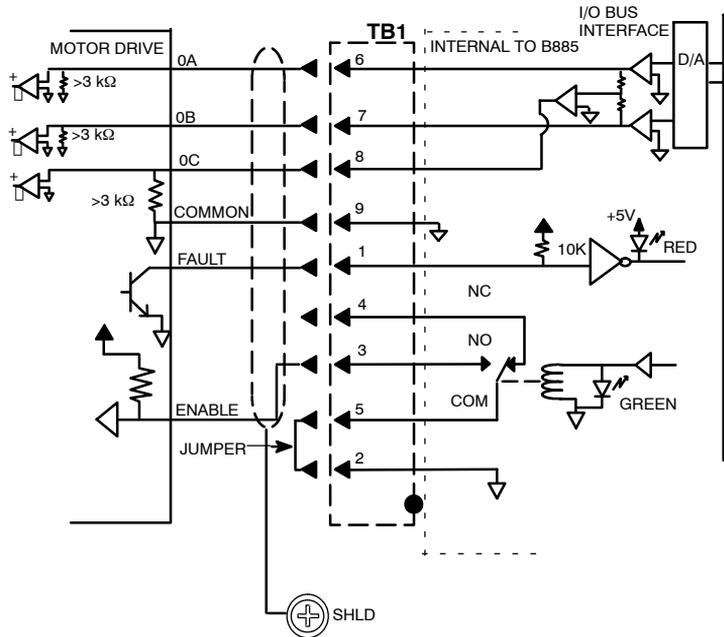


Figure 31 Motor Drive Wiring TB1

B.4.2.2 Test B: Drive Enable

Both N.O. and N.C. dry contacts and their common are available at TB1 of the B885-1XX for the enable logic.

Cyberline Drives:

When using Cyberline series drives, a logic low must be supplied at the drive s enable input to enable the drive.

Typical wiring connects the Drive Enable Contact (N.O.) output of the B885-1XX, TB1-3 (EN NO), to the enable input connector of the drive and the B885-1XXs Drive Enable Common, TB1-5 (EN C), to the drive s enable common input. Refer to Figure 32.



Note: If you are using a drive type other than Cyberline, proceed to Step 5.

Step 1 Using MMDS, ensure that the drive enable output is disabled.

Step 2 Using a dc voltmeter, verify the N.O. enable contact output is between +10 Vdc ... 15 Vdc by measuring from TB1-3 and TB1-9, and the drive enable common is <+1 Vdc by measuring from TB1-5 to TB1-9.

Step 3 Using MMDS, ensure that the drive enable output is enabled.

Step 4 Using a dc voltmeter, verify the N.O. enable contact output is <+1 Vdc by measuring from TB1-3 to TB1-9.



Note: If Step 1 through Step 4 are successful and the drive still fails to enable, refer to the drive manual for troubleshooting.

Other Drives:

Step 5 Using MMDS, ensure that the drive enable output is disabled.

Step 6 Remove the wiring from pins TB1-3, TB1-4 and TB1-5. Using an ohmmeter, verify an open between pins TB1-3 and TB1-5 and a short between pins TB1-4 and TB1-5.

Step 7 Using MMDS, ensure that the drive enable output is enabled.

Step 8 Using an ohmmeter, verify a short between pins TB1-3 and TB1-5 and an open between pins TB1-4 and TB1-5.

If correct indications are obtained for each step and the problem persists, call Modicon for assistance at 1-800-468-5342.

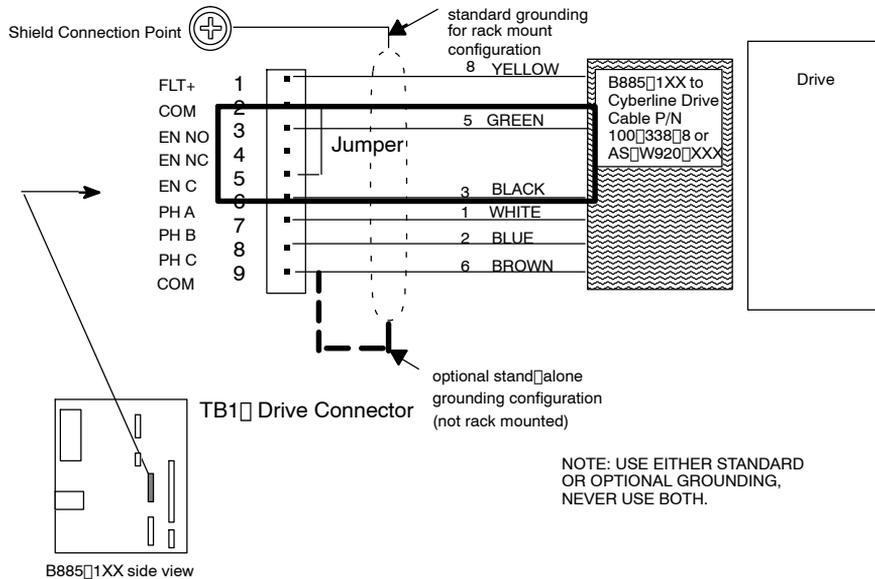


Figure 32 Drive Enable Test Points on the B885-1XX

B.4.2.3 Test C: Drive Torque Commands

Step 1 Set the system as follows:

- a. Disconnect load from the motor.
- b. Wire the B885-1XX and drive as normal.
- c. Supply power to the B885-1XX.
- d. Enable drive.
- e. Motor not moving.

Step 2 With an ac voltmeter, measure the torque command outputs from the B885-1XX at TB1. These measurements are with respect to the common line, TB1-9. Refer to Figure 33.

Torque Command Phase Voltages

Signal	TB1	Voltage Expected
Phase A	6	< +1.0 Vac
Phase B	7	< +1.0 Vac
Phase C	8	< +1.0 Vac

Step 3 If these readings are correct, the torque command is being supplied by the B885-1XX. Suspect the components in the system from this point to the drive and motor, in this order:

- cable from the B885-1XX to the drive
- drive
- drive to motor wiring
- motor

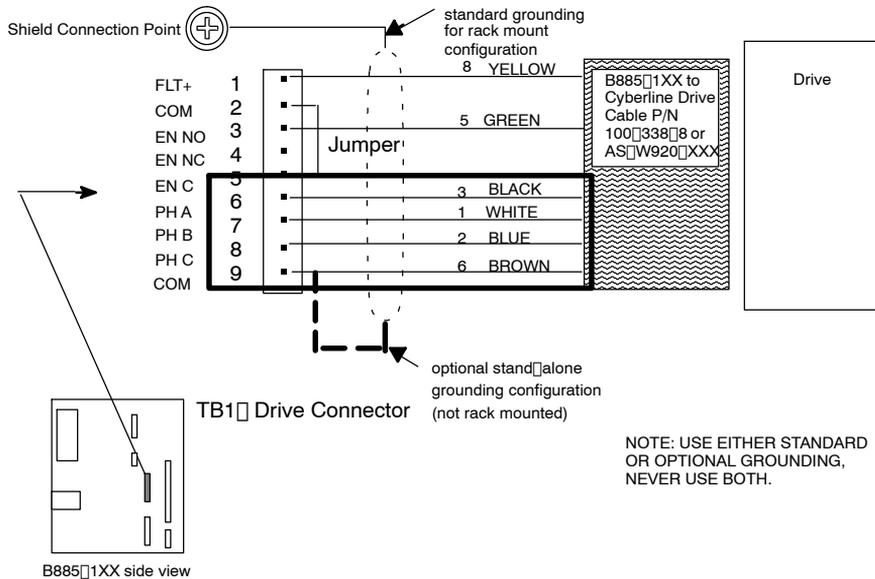


Figure 33 Current Command Test Points on the B885-1XX

B.4.2.4 Test D: Resolver and Motor Signals

DC Motors:

A Current Limit value below 20 may cause runaway with dc motors. Check this parameter before you suspect a hardware problem.

Step 1 The feedback connections on the armature leads may be crossed wired. Either reverse feedback by swapping sine positive with cosine positive and sine negative with cosine negative or reverse motor armature leads at the motor.

Step 2 If the motor operates in a stable manner, but, rotates in the wrong direction when given a move command. Then, reverse both motor armature leads and the sine and cosine connections. This returns one of these sets of connections back to the way it was originally.

Brushless Motors:

It is very difficult to make generalizations about problems with brushless ac motor systems. Sometimes a system exhibits any one of several symptoms depending on where the motor is when enabled and what you command it to do. Here are suggestions on what to check:

- Check for an open or missing wire to a motor, resolver, or motion module terminal.
- Check the motor phases between the drive and the motor, they may be reversed. See motor wiring details in the drive manual.

- Check the sine and cosine connections between the resolver and the B885-1XX, they may be reversed.
- Check the motor poles parameter setting, an incorrect number may have been used.
- Resolver not aligned with motor.

Resolver:

- Step 3** Check the reference signal output from the B885-1XX. Using an ac voltmeter, measure the reference signal between TB1-11 (REF+) and TB1-12 (REF-). The signal should be 1.8 ... 6 Vac (RMS). If the reading is low or absent, there may be a problem with the B885-1XX. Refer to Figure 34.
- Step 4** Using an ac voltmeter, measure the sine and cosine feedback signals input to the B885-1XX. Measure between TB1-13 (SIN+) and TB1-14 (SIN-), and between TB1-15 (COS+) and TB1-16 (COS-). As you manually turn the motor shaft, these signals should vary between 0 Vac and 2 Vac (RMS). If one or both the readings are absent, there may be a problem with the wiring. If both signals are present and correct, there may be a problem with the B885-1XX.

Reference and Feedback Signal Voltages

Signal	Pin to Pin	Voltage Expected
Reference	11 (+) to 12 (-)	1.8 to 6 Vac
Sine	13 (+) to 14 (-)	0 to 2Vac
Cosine	15 (+) to 16 (-)	0 to 2 Vac



Note: When making these measurements with an oscilloscope, the voltages will be higher than noted. The reference signal measures up to 8.4 Vac and the sine and cosine signals measures up to 2.8 Vac.

Step 5 If the reference voltages and the resolver wiring is correct, check for a loose coupling between the resolver and the motor. If the coupling is loose on a brushless motor, you must realign the resolver with the motor.

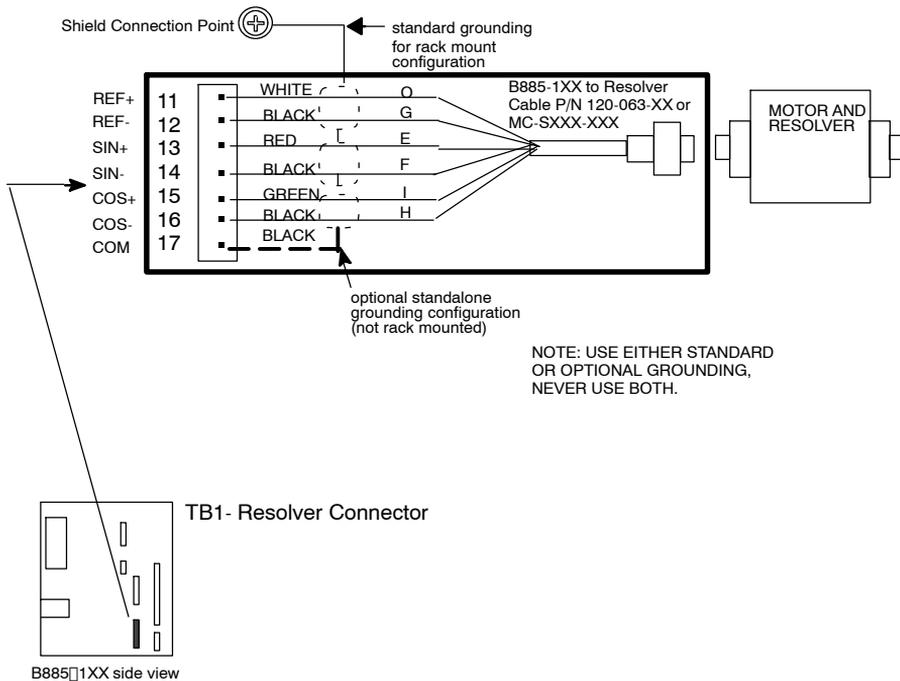


Figure 34 Reference and Feedback Signal Test Points on the B885-1XX

B.4.2.5 Test E: Encoder and Motor Signals (B885-110/111 only)

Motor:

It is very difficult to make generalizations about problems with ac motor systems. Sometimes a system exhibits any one of several symptoms

depending on where the motor is when enabled and what you command it to do. Here are some suggestions on what to check:

- Check for an open or missing wire to a motor, resolver, or B885-1XX terminal.
- Check the motor channels between the drive and the motor, they may be reversed. See motor wiring details in the drive manual.
- Check the channel connections between the encoder and the B885-1XX, they may be reversed.
- Check the motor poles parameter setting, an incorrect number may have been used.

Encoder:

Step 1 Check the power output to the encoder, using a dc voltmeter. For encoder #1, measure the voltage between P1-8 (POWER+) and P1-9 (POWER COM). For encoder #2, measure the signal between P2-8 (POWER+) and P2-9 (POWER COM). The voltage should be either +5 Vdc or +12 Vdc, based on the requirements of the encoder device. Refer to Figure 35.

Step 2 Check the power output at the P4, using a dc voltmeter. When using the B885-1XXs internal supply, check the voltage output at either P4-1 (+5V) or P4-2 (+12V) to P4-4 (POWER COM). The voltage should be either +5 Vdc or +12 Vdc, based on the requirements of the encoder device. When using an external power supply, check the voltage input at P4-3 (EXT. POWER IN) to P4-4 (POWER COM). The voltage should be either +5 Vdc or +12 Vdc, based on the requirements of the encoder device.

Step 3 While turning the motor by hand, check the Channel A signal input to the B885-1XX using an oscilloscope. For encoder #1, measure the signal between P1-1 (A+) and P1-2 (A-). For encoder #2, measure the signal between P2-1 (A+) and P2-2 (A-). The signal observed should be a pulse train.

Step 4 While turning the motor by hand, check the Channel B signal input to the B885-1XX using an oscilloscope. For encoder #1, measure the signal between P1-3 (B+) and P1-4 (B-). For encoder #2, measure the signal between P2-3 (B+) and P2-4 (B-). The signal observed should be a pulse train.



Note: If you check the encoder channels with a dual trace oscilloscope, the Channel A square wave leads the Channel B square wave when turning the motor and encoder in the positive direction. Channel B leads Channel A when turning the motor and encoder in the negative direction.

Step 5 While turning the motor by hand, check the Marker signal input to the B885-1XX using an oscilloscope. For encoder #1, measure the signal between P1-5 (M+) and P1-6 (M-). For encoder #2, measure the signal between P2-5 (M+) and P2-6 (M-). The signal pulses once every encoder revolution.

Step 6 If the signal voltages and the encoder wiring is correct, check for a loose coupling between the encoder and the motor.

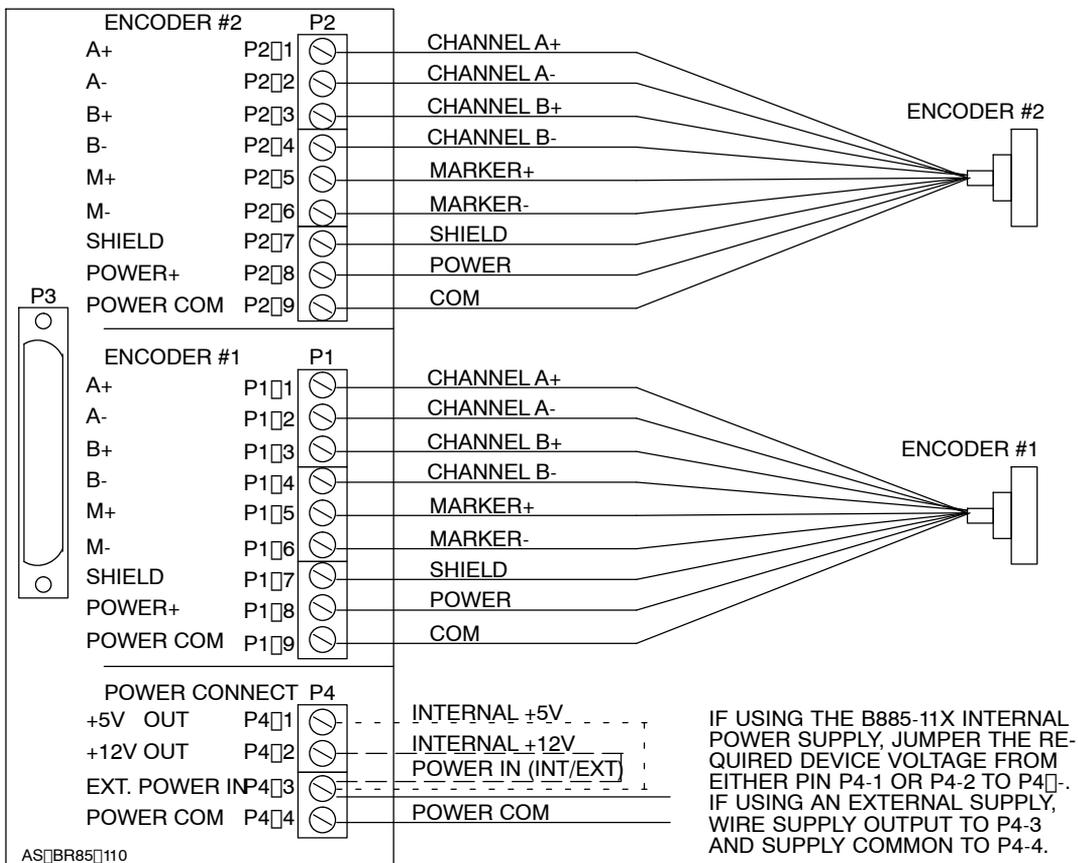


Figure 35 Channel A/B and Marker Signal Test Points on the Breakout Box

B.4.2.6 Test F: Discrete Inputs and Outputs

The following procedures apply to all discrete I/O, regardless of their use as user-configured or predefined points.

The B885-1XX uses TRUE input and output logic. This means that when a voltage of 12 ... 24 Vdc is applied between an input pin and the I/O common pin, the B885-1XX reads that input as active. Likewise, when the B885-1XX activates an output, a voltage, equal to the B885-1XX power supply, is present between the output pin and the I/O common pin.

The LEDs, that indicate an active I/O, are configured so that an active input LED means the input signal has been passed through the optical isolation and into the B885-1XX. An active output LED means the output signal has been passed through the optical isolation and out of the B885-1XX.

Inputs:

- Step 1** Connect the positive output of a 12 ... 24 Vdc power supply to the failed B885-1XX input pin and connect the common output to the input common pin TB2-15. Verify that the corresponding LED is illuminated. Refer to table below and Figure 36.
- Step 2** With the input still activated, verify with MMDS that the proper input register bit is set for the corresponding input.

If either Step 1 or Step 2 fails, there is a problem with the B885-1XX. If both steps were completed successfully, there may be a problem with the input power supply, input switch (if any) or the input wiring.

Outputs:

- Step 3** Using MMDS, set the proper bits of the Output Write command to activate the failed output. Verify that the corresponding LED is illuminated.
- Step 4** With a dc voltmeter, measure from the failed B885-1XX output pin to the output common pin TB2-6. The measured voltage should be equal to the voltage input by the B885-1XXs power supply. Refer to table below and Figure 36.

If either Step 3 or Step 4 fails, there is a problem with the B885-1XX. If both steps were completed successfully, there may be a problem with the output wiring or the device being driven by the output.

I/O Pin Assignments

I/O Signal	TB2 I/O Pin	Common Pin
+LIMIT OK/Input 1	7	10
-LIMIT OK/Input 2	8	10
NOT HOME/Input 3	9	10
Jog +/Input 4	11	15
Jog -/Input 5	12	15
Input 6	13	15
Input 7	14	15
Output 1	3	6
Output 2	4	6
Output 3	5	6

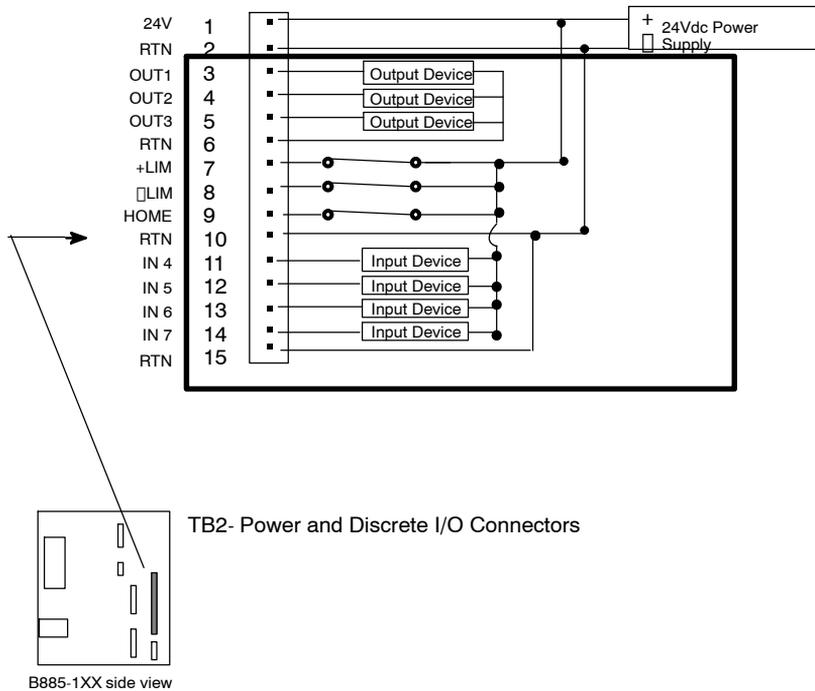


Figure 36 Discrete I/O Test Points on the B885-1XX

B.4.2.7 Test G: Analog Input and Output

Both analog input and output may be user-configurable. You may specify the number of bits per volt input/output, input/output mode, as well as, a binary offset which is applied to the analog voltage.

Inputs:

- Step 1** Using MMDS, ensure that the Analog Input Setup command is configured as follows:
- a. Analog input mode to select User Variable (1).
 - b. Analog input offset equal to 2048.
 - c. Analog input sensitivity equal to 1.
- Step 2** Connect the positive output of a 0 ... 10 Vdc variable power supply to the analog input pin TB3-3 and connect the common output to the input common pin TB3-2. Set the power supply output at +5 Vdc. Refer to Figure 37.
- Step 3** Using MMDS, issue the Analog Input User Variable command to read the analog input. The Analog Input User Variable command should display a reading of 5.
- Step 4** Set the power supply output at +10 Vdc and re-issue the Analog Input User Variable command. The command should display a reading of 10.

If either Step 3 or Step 4 fails, there is a problem with the B885-1XX. If Step 3 or Step 4 were completed successfully, there may be a problem with the input device or the input wiring.

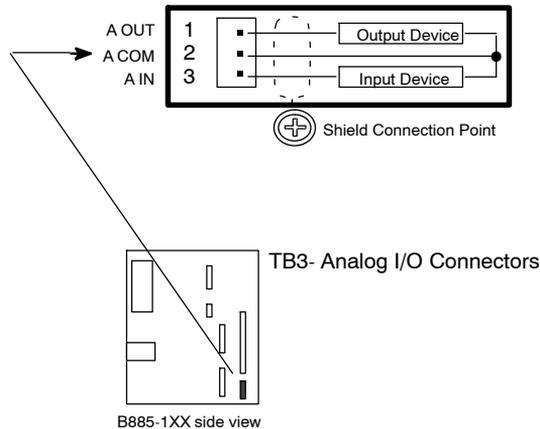


Figure 37 Analog I/O Test Points on the B885-1XX

Outputs:

- Step 5** Using MMDS, ensure that the Analog Output Setup command is configured as follows:
- Analog output mode to select User Variable (4).
 - Analog output offset equal to 2048.
 - Analog output sensitivity equal to 100.
- Step 6** Using MMDS, set the Analog Output User Variable command to +05.00 and issue the command.
- Step 7** Using a dc voltmeter, measure the analog output voltage from pin TB3-1 (A OUT) and to pin TB3-2 (A COM). The output voltage should be + 5 Vdc. Refer to Figure 37.
- Step 8** Set the Analog Output User Variable command to -05.00 and re-issue the command. The output voltage should now be - 5 Vdc.

If either Step 7 or Step 8 fails, there is a problem with the B885-1XX. If Step 7 or Step 8 were completed successfully, there may be a problem with the device driven by the analog output or the output wiring.

B.5 Electrical Noise Problems

Even if you follow all of the grounding, noise suppression and shielding requirements in this document, you may still have problems. Make sure that you followed all of the wiring guidelines. It is easier to install a system properly than to troubleshoot it later. Electrical noise problems can cause intermittent malfunctions in the controller. These can be very difficult and expensive to trace in a finished system. The symptoms, types, sources, causes, and items to check are covered below.

B.5.1 Symptoms of Noise Problems

Some symptoms of noise-related electrical problems are:

- System lockup (freeze)
- Scrambled data on the video display
- Spontaneous system reset
- Jittery axes
- Positioning errors

B.5.2 Types of Electrical Noise

There are three basic types of electrical noise:

- Magnetic* - caused by a changing magnetic field inducing voltages into adjacent wiring or components. A transformer is an example of a device that deliberately uses magnetic coupling.
- Electrostatic* - caused by capacitance coupling from a changing electric field.
- Electromagnetic* - radio waves (RF radio frequencies) transmitted by a device and received (even if unintentionally) by other electrical components.

B.5.3 Sources of Electrical Noise

There are many sources of electrical noise in an industrial environment. These include:

- Relay panels
- Welding equipment
- dc and ac motors
- Lighting systems, especially fluorescent
- Generators
- Motor starters
- Contactors

B.5.4 Causes of Noise Problems

Sometimes noise becomes a problem in an existing installation. Problems that can cause noise are:

- Wire shields shorted to ground or another shield
- Broken shield connection
- Faulty noise suppressors
- Corroded ground connection
- Loose connection
- New wiring nearby
- New (or portable) electrical equipment nearby

B.5.5 Some Items to Check

Here is a list of major items to check:

- Ensure that all large ground wires are solidly attached, free from corrosion and routed as directly as possible to earth ground
- Ensure that all inductive loads have suppressors
- Ensure that all shields are grounded at only one end

Sometimes you may have to experiment with disconnecting one end of common or return wires. Multiple parallel connections of commons and returns can create large circulating electrical currents called ground loops. This is especially true if the equipment ties these to chassis ground. If noise is a problem, try disconnecting duplicate returns or commons one at a time to see if noise lessens. A volt-ohm-meter is useful for tracking down multiple grounds and commons.

B.6 I/O Record Sheet

Copy and use this table to record the functions of all your I/O connections. You should make this filled-in table part of the permanent record of your application.

B885-1XX I/O	Function
Input 1	
Input 2	
Input 3	
Input 4	
Input 5	
Input 6	
Input 7	
Output 1	
Output 2	
Output 3	
Analog input	
Analog output	