



Allen-Bradley

**Bulletin 1395 Discrete
Adapter Board**

Catalog No. 155258

Installation & Operation Manual

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Introduction

Manual Objectives

This manual contains the information necessary to help you perform the following functions on the Bulletin 1395 Discrete Adapter Board option:

- Install Hardware
- Verify correct Adapter Board input and output wiring
- Configure the Adapter control to the Drive and its application

This manual is intended for use by personnel familiar with the functions of solid state Drive equipment. Qualified personnel must thoroughly familiarize themselves with both the 1395 control and hardware before attempting to configure the Adapter Board to the Drive.

Documentation

Information pertaining to the 1395 Drive is provided in several different documents which includes a main Installation Manual in addition to peripheral manuals on optional adapter boards.

This manual describes the functionality for Discrete Adapter firmware version 3.xx (The “xx” designator may vary but does not effect information in this manual).

Description of Equipment

Adapter boards provide an interface between external devices and the 1395 Main Control Board. The Discrete Adapter Board allows the 1395 Drive to be controlled using discrete devices such as pushbuttons, relays, potentiometers, and by analog signals. The Discrete Adapter has the following features:

- **Four Discrete Inputs** – Can be either 120V AC or 24V DC and are programmable to any of the 16 Logic command Bits.
- **Two Discrete Contact Outputs** – Programmable to any of the 16 Logic status Bits.
- **Four Analog Inputs** – Configurable to represent any of the 1395 signal inputs or the input of another Adapter Board. Programmable Gain and Offset provides maximum interface flexibility.
- **Four Analog Outputs** – Configurable to represent any of the 1395 signal outputs or the output of another Adapter Board. Programmable Gain and Offset provides interface flexibility.
- **DC Power Supply** – A $\pm 10V$ DC Power Supply is provided to power potentiometers connected to the analog inputs.

Adapter Specifications

A listing of board specifications and features is provided in Table 1.A. Any specifications pertaining directly to procedures detailed in this manual, will be stated where necessary in the manual.

Table 1.A
Discrete Board Specifications

| Type | Use |
|------------------|--|
| Digital Inputs | 24V DC or 120V AC, 10mA. NOTE: A separate board and part number is used for each voltage rating. |
| Discrete Outputs | Dry relay contacts rated at 0.6 Amps at 125V AC or 2.0 Amps at 30V DC. |
| Analog Inputs | 0 to (\pm) 10V DC, Differential Input Impedance - 20K ohms |
| Power Supply | 10 to +10V DC ,10 mA maximum Output Impedance - 200 ohms |
| Analog Outputs | + 10V DC, 4 mA maximum - 10V DC, 4 mA maximum |
| Firmware Version | 3.xx |

Hardware Description

Chapter Objective

Chapter 2 contains a general description of the major hardware components of the Discrete Adapter Board. It is not intended to be an all encompassing technical description of each hardware component. This chapter provides basic information to help you:

- Identify the discrete board input configuration.
- Understand the hardware requirements necessary to interface the Discrete board with peripheral devices.

The Discrete Adapter Board connects directly to the Main Control Board using either Port A or Port B of the Microbus Interface. This interface supplies the Adapter Board with all logic voltages and communication capabilities. All user connections to the board are made at Terminal Block TB-3 located at the bottom of the 1395 Drive.

Digital Inputs

The Discrete Adapter Board contains four programmable discrete inputs. The two standard configurations allow for either 120V AC signals or 24V DC signals. These optically coupled inputs provide a means for external control of the 1395 via pushbuttons, relays, switches, etc. Digital Input 1 is typically operated from a Normally closed device, while Digital Inputs 2 through 4 are typically operated from Normally open devices. Terminal Block TB-3 is used to make the external connections.

- TB3-47 Input Common
- TB3-48 Digital Input 1
- TB3-49 Digital Input 2
- TB3-50 Digital Input 3
- TB3-51 Digital Input 4

Digital Outputs

Two programmable discrete outputs are provided through control of two on-board relays. Connector J3 is used to make the external connections to the normally open contacts. The contact rating is 0.6A at 125V AC and 2.0A at 30V DC. These outputs allow the 1395 to signal various operating states of the Drive.

- TB3- 45, 46 Digital Output 1
- TB3-43, 44 Digital Output 2

Analog Inputs

The Discrete card contains four programmable 12-bit analog to digital inputs. These inputs allow a $\pm 10V$ DC analog signal to be converted to a ± 2048 digital signal, thus providing 4.88 millivolts per bit resolution. Through programming of associated Scale and Offset parameters the effective range of the converted signal can be extended to ± 32767 . The converted analog signal can be used to control any of the 1395 run-time parameters. External connections are made to Terminal Block TB-3.

- TB3-30 Analog Input 1 +
- TB3-29 Analog Input 1 –
- TB3-28 Analog Input 2 +
- TB3-27 Analog Input 2 –
- TB3-26 Analog Input 3 +
- TB3-25 Analog Input 3 –
- TB3-24 Analog Input 4+
- TB3-23 Analog Input 4 –

Analog Outputs

The Discrete card contains four programmable 11-bit digital to analog outputs. These outputs allow a ± 1024 times 2 or ± 2048 drive signal to be converted to a $\pm 10V$ DC analog output, thus giving 9.76 millivolts per bit resolution. Through programming of associated Scale and Offset parameters the effective range of the Drive signal can be extended to ± 32767 . The digital Drive signal can be any of the 1395 run-time parameters. External connections are made to Terminal Block TB-3.

- TB3-37 Analog Output 1 +
- TB3-36 Analog Output 2 +
- TB3-35 Analog Output 3 +
- TB3-34 Analog Output 4 +
- TB3-41 Analog Output 1 –
- TB3-40 Analog Output 2 –
- TB3-39 Analog Output 3 –
- TB3-38 Analog Output 4 –

Board Hardware Configuration

There are two board configuration options available for the Discrete Adapter Board I/O, 120V AC or 24V DC. The 120V AC Adapter Board configuration has a bank of four two watt resistors located directly above J3. These resistors drop the 120V AC down, and it is then sent through a rectifier and opto-isolator. The 24V DC version also has a bank of smaller resistors. As this is the only difference between the boards, it provides an easy method of identification.



ATTENTION: Verify the voltage rating of the Digital Input. If 115V AC is impressed across a digital input rated for 24V DC, damage to the input circuit will occur.

Firmware Location

This board contains firmware version 3.xx. [Figure 2.1](#) shows the physical location of the chips.

[Figure 2.1](#) illustrates the major hardware points on the board. The primary function of the board is to provide scaling and transfer of feedback signals coming from discrete I/O and being sent to the Main Control Board.

Figure 2.1
Discrete Adapter Board Component Locations

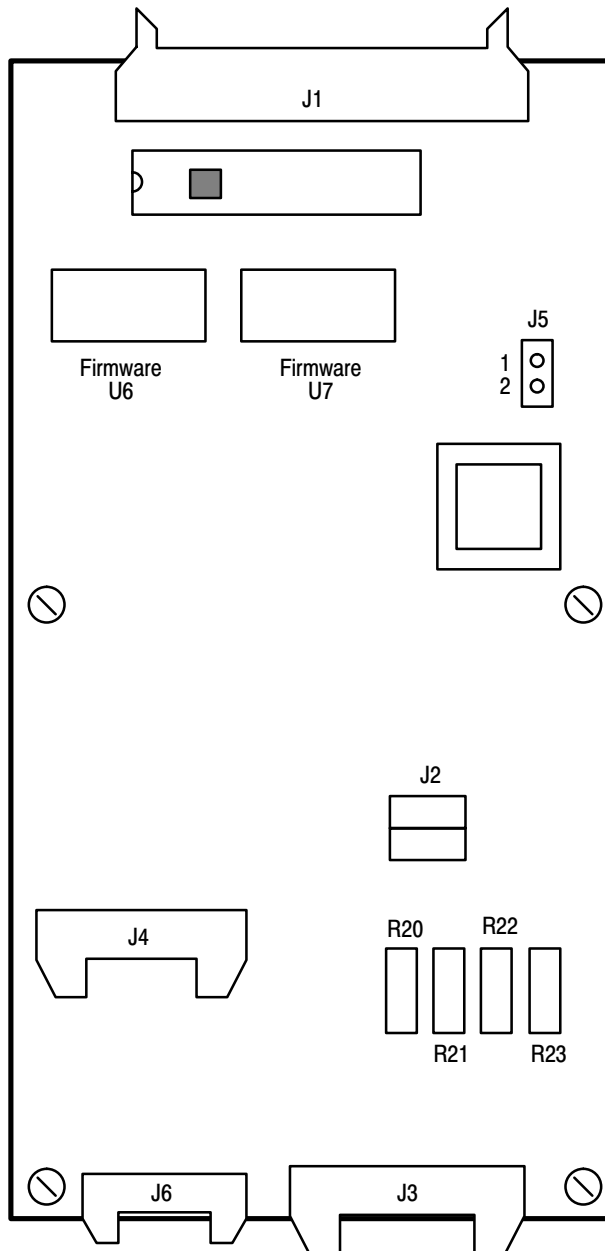


Table 2.A
Discrete Adapter Board Connections

| Conn | Type | Purpose |
|-------------|------------------|---|
| J1 | 60 Pin Ribbon | Connection to Main Control Board |
| J3 | 12 Discrete Wire | Connection for Digital I/O Hardware Devices via TB32 terminals 43 – 52. |
| J4 | 20 Discrete Wire | Connection for Analog I/O Hardware Devices via TB3 terminals 23 – 42. |
| J6 | 9 Pin Ribbon | Serial I/O (Not currently used) |

Table 2.B
Discrete Adapter Board Jumpers

| Jumper | Position |
|---------------|----------------------------|
| J5 | Factory Set (Do Not Alter) |
| J2 | Factory Set (Do Not Alter) |

Control Description

Introduction

Chapter 3 contains a general description of the 1395 Discrete Adapter Board program. This description is intended to provide sufficient background information to support other procedures in this manual, and to help you to:

- Understand how to configure the board.
- Understand how to interface the board with discrete I/O.
- Understand how to configure the Analog I/O for any application.

Parameter Overview

The Discrete Adapter Board contains two types of parameters, Configurable and Set-Up. Configuration parameters ([Table 3.A](#)) control and monitor the run-time operation of the 1395, while Set-Up parameters ([Table 3.B](#)) program the Adapter Board functions. The Discrete Adapter has 10 Configuration parameters and 22 Set-Up parameters. Programming the Set-Up parameters is accomplished with the 1395 Programming Terminal or through another intelligent device connected to the 1395 such as a PLC. Reference the 1395 Installation & Maintenance Manual for an explanation of programming techniques.

All adapter parameters are referenced by a unique 1395 system parameter number. However, the parameter number is dependent on whether the Adapter Board is connected to Port A or Port B of the 1395. The following shows the parameter number ranges for Port A and Port B.

- Port A Configuration Parameters (400 – 499)
- Port A Set-Up Parameters (550 – 599)
- Port B Configuration Parameters (300 – 399)
- Port B Set-Up Parameters (500 – 549)

Table 3.A
Configuration Parameters

| Port A | Port B | Name | Function |
|--------|--------|----------------|---------------------------------------|
| 400 | 300 | Digital Input | Fast Source, Discrete Input to Drive |
| 401 | 301 | Analog In 1 | Fast Source, Analog 1 Input to Drive |
| 402 | 302 | Analog In 2 | Fast Source, Analog 2 Input to Drive |
| 403 | 303 | Analog In 3 | Fast Source, Analog 3 input to Drive |
| 404 | 304 | Analog In 4 | Fast Source, Analog 4 Input to Drive |
| 450 | 350 | Digital Output | Fast Sink, Discrete Output from Drive |
| 451 | 351 | Analog Out 1 | Fast Sink, Analog 1 Output from Drive |
| 452 | 352 | Analog Out 2 | Fast Sink, Analog 2 Output from Drive |
| 453 | 353 | Analog Out 3 | Fast Sink, Analog 3 Output from Drive |
| 454 | 354 | Analog Out 4 | Fast Sink, Analog 4 Output from Drive |

Table 3.B
Set-Up Parameters

| Port A | Port B | Description | Program Terminal Units | | Internal Units | |
|-----------|-----------|--------------------------|------------------------|-----------|----------------|---------|
| | | | Default | Range | Default | Range |
| 550 | 500 | ADC Scale 1 | 1 | (-16, 16) | 2048 | ± 32767 |
| 551 | 501 | ADC Offset 1 | 0 | (-20, 20) | 0 | ± 4096 |
| 552 | 502 | ADC Scale 2 | 1 | (-16, 16) | 2048 | ± 32767 |
| 553 | 503 | ADC Offset 2 | 0 | (-20, 20) | 0 | ± 4096 |
| 554 | 504 | ADC Scale 3 | 1 | (-16, 16) | 2048 | ± 32767 |
| 555 | 505 | ADC Offset 3 | 0 | (-20, 20) | 0 | ± 4096 |
| 556 | 506 | ADC Scale 4 | 1 | (-16, 16) | 2048 | ± 32767 |
| 557 | 507 | ADC Offset 4 | 0 | (-20, 20) | 0 | ± 4096 |
| 558 | 508 | Digital Out 1 | 10 at Zero Spd | (0,15) | 10 | 0 - 15 |
| 559 | 509 | Digital Out 2 | 5 Drive Running | (0,15) | 5 | 0 - 15 |
| 560 - 574 | 510 - 524 | Not Used | | | | |
| 575 | 525 | DAC Scale 1 | 1 | (-1, 1) | 32767 | ± 32767 |
| 576 | 526 | DAC Offset 1 | 0 | (-20, 20) | 0 | ± 4096 |
| 577 | 527 | DAC Scale 2 | 1 | (-1, 1) | 32767 | ± 32767 |
| 578 | 528 | DAC Offset 2 | 0 | (-20, 20) | 0 | ± 4096 |
| 579 | 529 | DAC Scale 3 | 1 | (-1, 1) | 32767 | ± 32767 |
| 580 | 530 | DAC Offset 3 | 0 | (-20, 20) | 0 | ± 4096 |
| 581 | 531 | DAC Scale 4 | 1 | (-1, 1) | 32767 | ± 32767 |
| 582 | 532 | DAC Offset 4 | 0 | (-20, 20) | 0 | ± 4096 |
| 583 (1) | 533 (1) | Digital In 1 | 11 Stop | (0,15) | 11 | 0 - 15 |
| 584 | 534 | Digital In 2 | 9 Jog 2 | (0,15) | 9 | 0 - 15 |
| 585 | 535 | Digital In 3 | 12 Start | (0,15) | 12 | 0 - 15 |
| 586 | 536 | Digital In 4 | 14 Drv Flts | (0,15) | 14 | 0 - 15 |
| 587 - 598 | 537 - 548 | Not Used | | | | |
| 599 | 549 | Adapter Board Identifier | 3.xx | - | | |

(1) Digital In 1 is designed for use with a Normally Closed (NC) operator device. Applying positive control voltage to Digital In 1 (Terminal TB-3 - 48) will cause the bit specified to be set to zero. With no voltage applied to Digital In 1, the bit will be one.

Installation

Introduction

This chapter is a detailed procedure for the proper installation and electrical interconnection of the Bulletin 1395 Discrete Adapter Board. Procedures you will perform in this chapter include:

- Verification of proper unpacking and inspection
- Verification of proper mounting
- Verification of proper wiring

Receiving

It is your responsibility to thoroughly inspect the equipment before accepting shipment from the freight company. You must take the responsibility for noting any damage. Do Not accept shipment before checking all items received against the purchase order, and noting any missing or damaged items on the Freight bill.

If any concealed damage is found later during unpacking, it is your responsibility to notify the freight agent. Leave the shipping container intact and request that the freight agent make a visual inspection of the shipment.

ESD Precautions



ATTENTION: The CMOS devices used on the control circuit boards can be destroyed or damaged by static charges. If personnel will be working near static sensitive devices, they must be appropriately grounded. If you are not familiar with static control procedures, before servicing, reference Allen-Bradley Publication 8000-4.5.2, Guarding against Electrostatic Damage or any other applicable ESD protection handbook.

Unpacking & Inspection

Remove all packing material from around the board, including the anti-static bag. The Discrete Adapter Board is a static sensitive device, and special precautions should be taken while handling the board. The circuit card can be damaged by Electro-Static Discharge. It is possible to make contact with an ESD sensitive component during installation. Therefore personnel must be properly grounded. Grounding should be accomplished with a wrist strap which is connected to an approved ground.

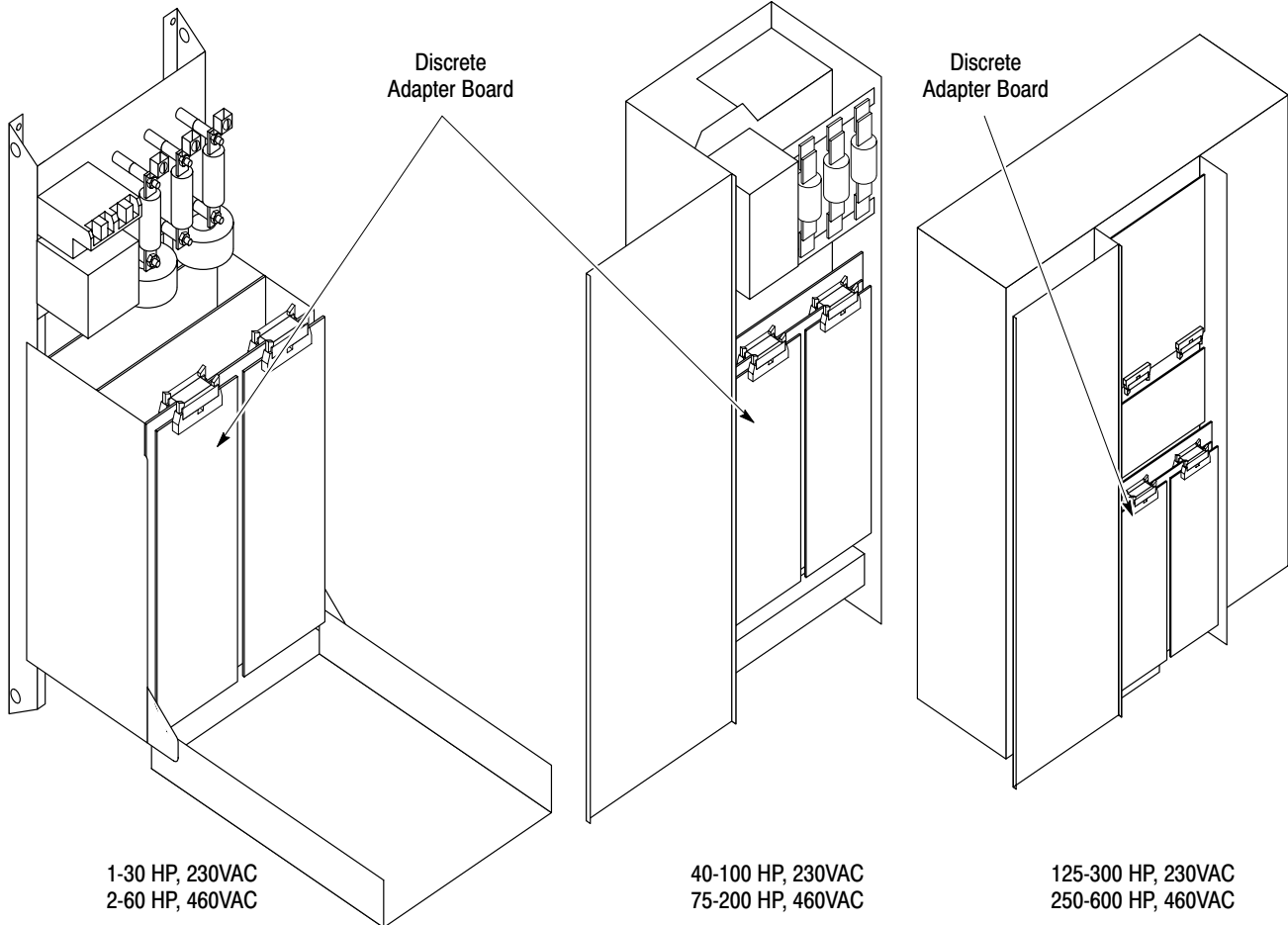
If the board will not be installed when it is unpacked, it should be stored in a clean dry place in the anti-static bag. The storage temperature must be between 0°C (32°F) and +60°C (140°F) with a maximum humidity of 95% non-condensing, to guard against damage to temperature sensitive components.

Mounting

On 1 – 100 HP 230V and 2 – 200 HP 460V the Discrete Adapter Board is mounted on the front of the swing out panel (refer to system drawings. Two possible adapter board mounting positions are provided. When looking at the mounting positions from the front, the right position corresponds to Port B and the left to Port A. The port used is dependent on the specific application of the Drive.

After determining which port the Discrete Adapter Board will be connected to, mount the board using the five panel screws and one phillips head screw (Figure 4.1 illustrates the Discrete Board in Port A). On 125 – 300 HP 230V and 250 – 600 HP drives, the Discrete board is mounted on a swing out panel below the Unit Power Supply near the bottom of the cabinet (refer to system drawings for component locations on units higher than 600 HP).

Figure 4.1
Discrete Adapter Board Location

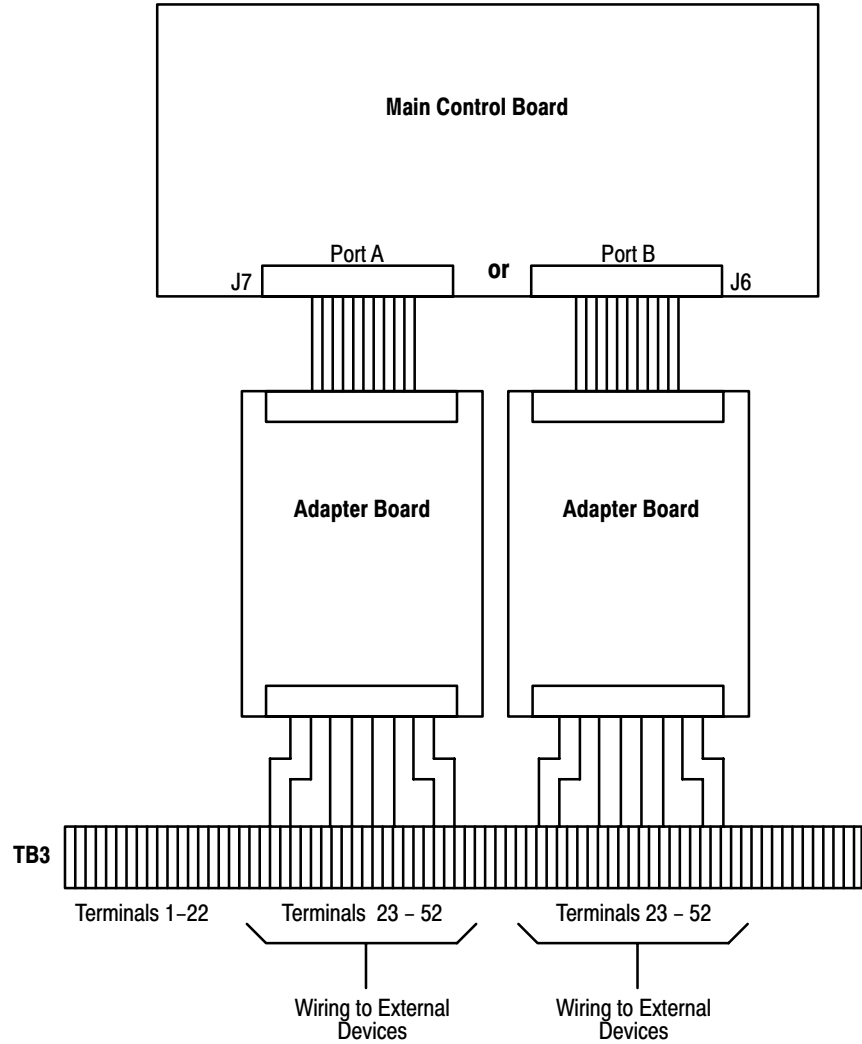


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Connections to Drive

The Discrete Adapter Board can be connected to either Microbus Port A or B on the Drive through a ribbon cable connector J1 located at the top of the board. Connection to TB3 is made through two connectors, J3 and J4. Looking into the Drive, Port A is located on the left side, and Port B is located on the right as seen in [Figure 4.2](#). The parameters used to configure the Drive depend upon which port is utilized.

Figure 4.2
Connection of External Devices to the 1395 Drive



External wiring is connected to the terminal block at the bottom of the 1395 enclosure. Terminals 23 through 52 are reserved for wiring the Discrete Adapter board to external I/O devices. Refer to the Discrete Adapter Block Diagram and Hardware Connection Diagrams [Figure 4.3](#) through [Figure 4.9](#), for information on the terminals and corresponding I/O.

Figure 4.3
Discrete Adapter Block Diagram

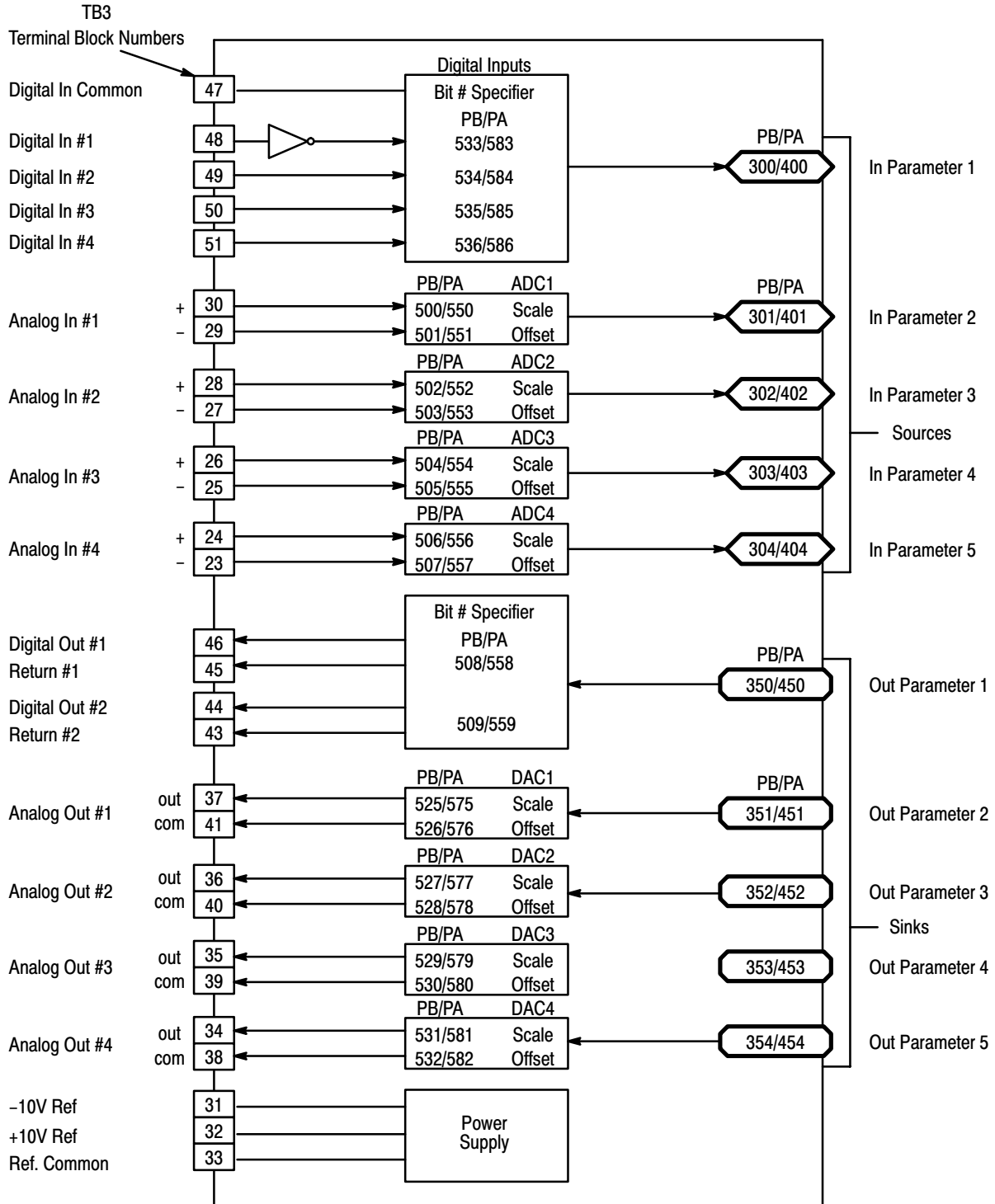


Figure 4.4
Hardware Connection Diagram

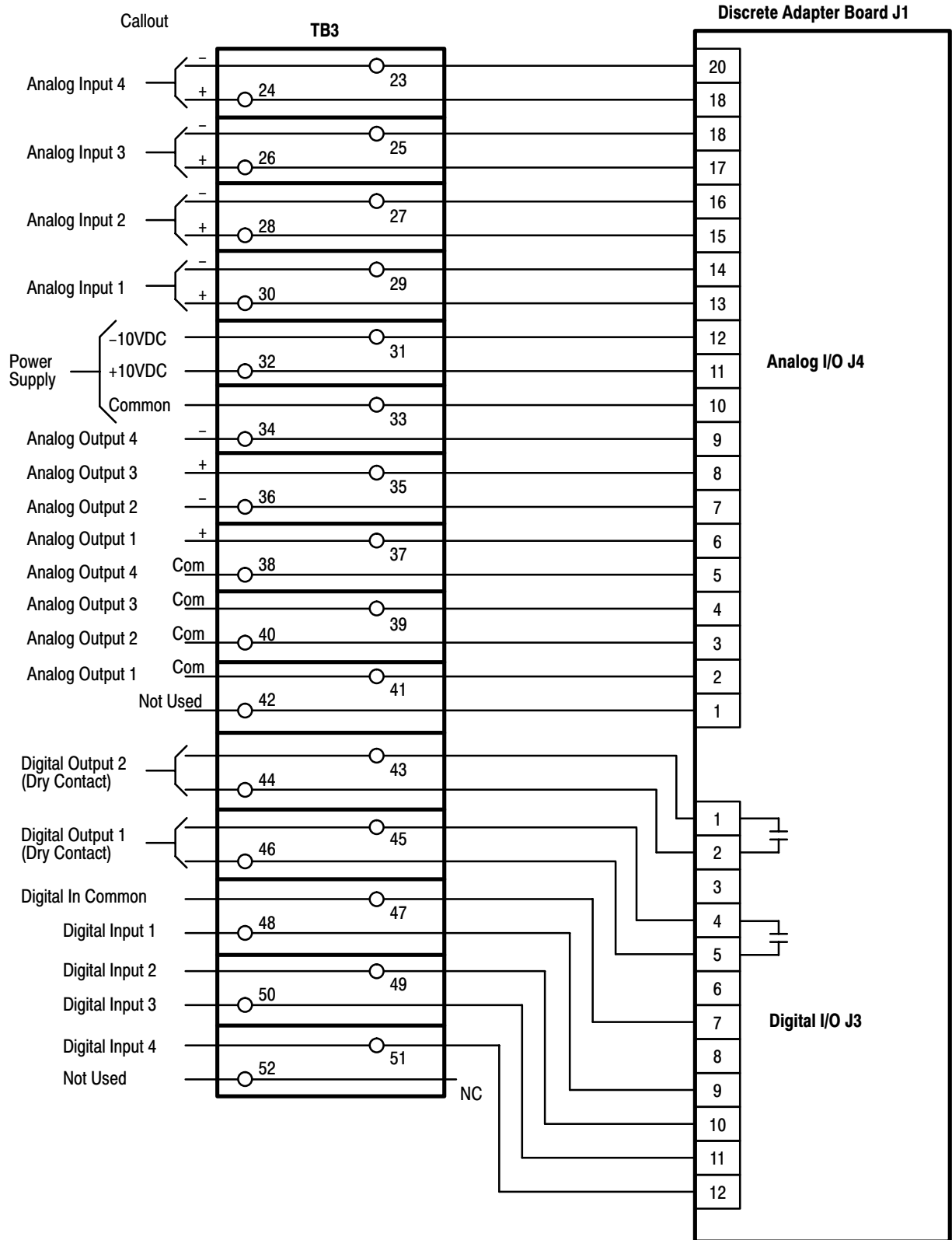


Figure 4.5
Typical 115 VAC Digital Input Connections Using Internal Power Source

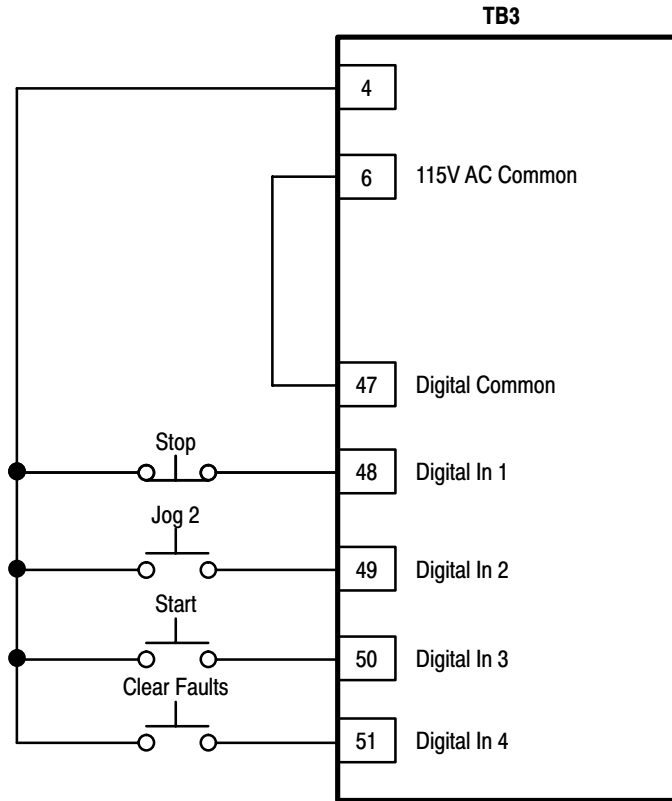


Figure 4.6
Typical 115 VAC Digital Input Connections Using External Power Source

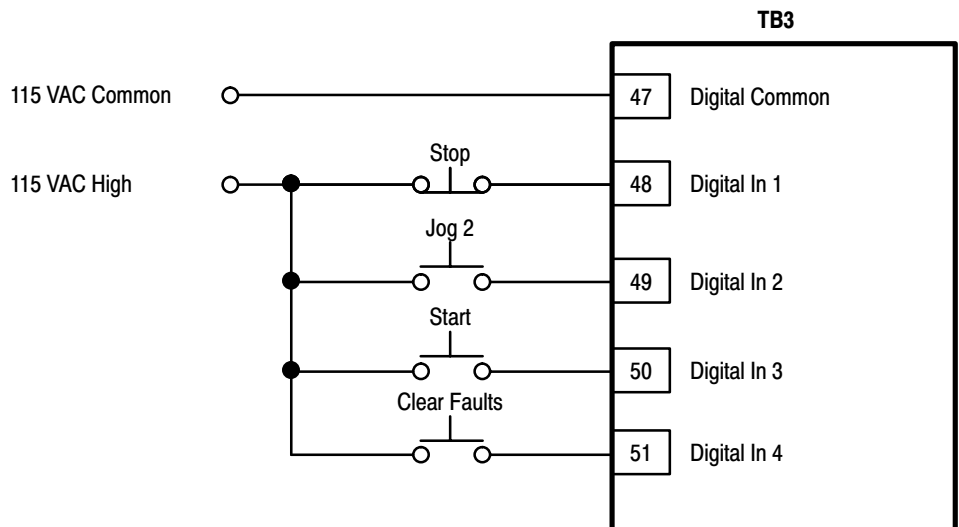


Figure 4.7
Typical 24 DC Digital Input Connections Using External Power Source

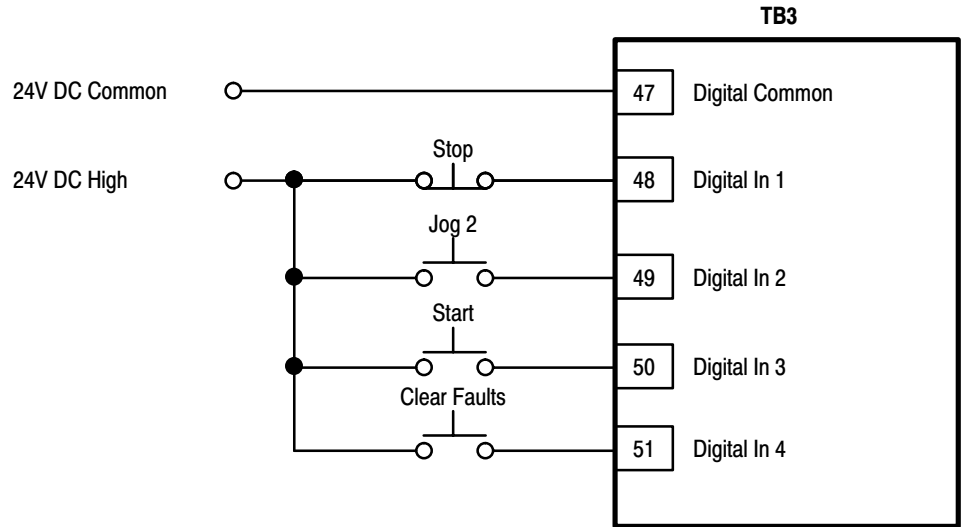


Figure 4.8
Typical Analog Input Connections for Unidirectional Operation

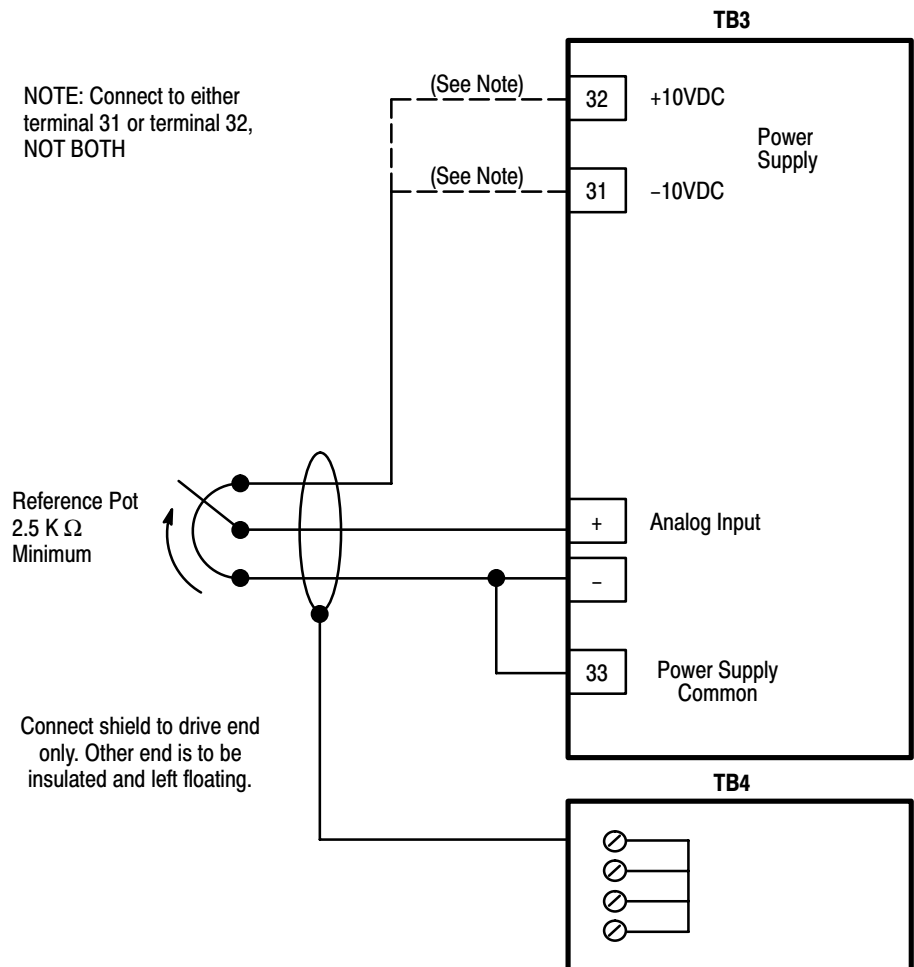


Figure 4.9
Typical Analog Input Connections for Bidirectional Operation

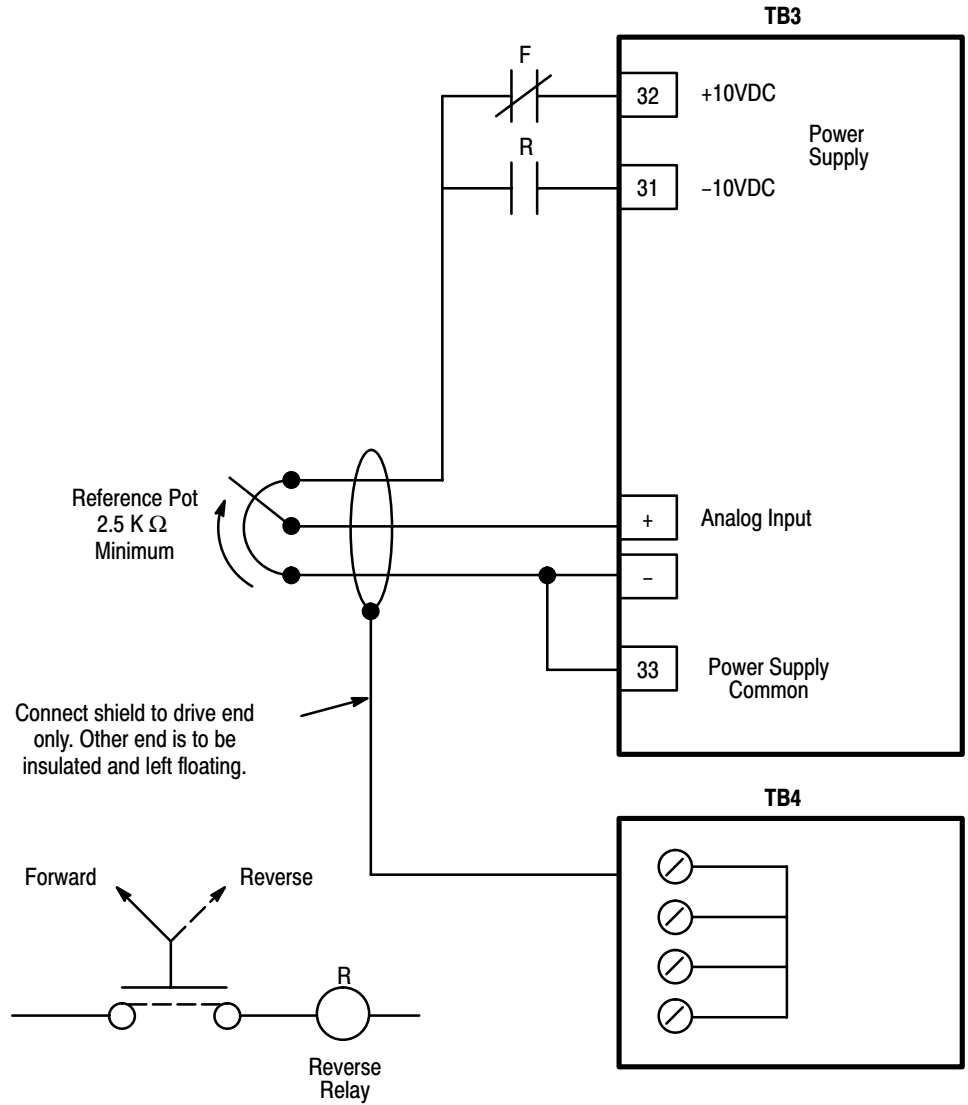


Figure 4.10
Typical Analog Output Connections

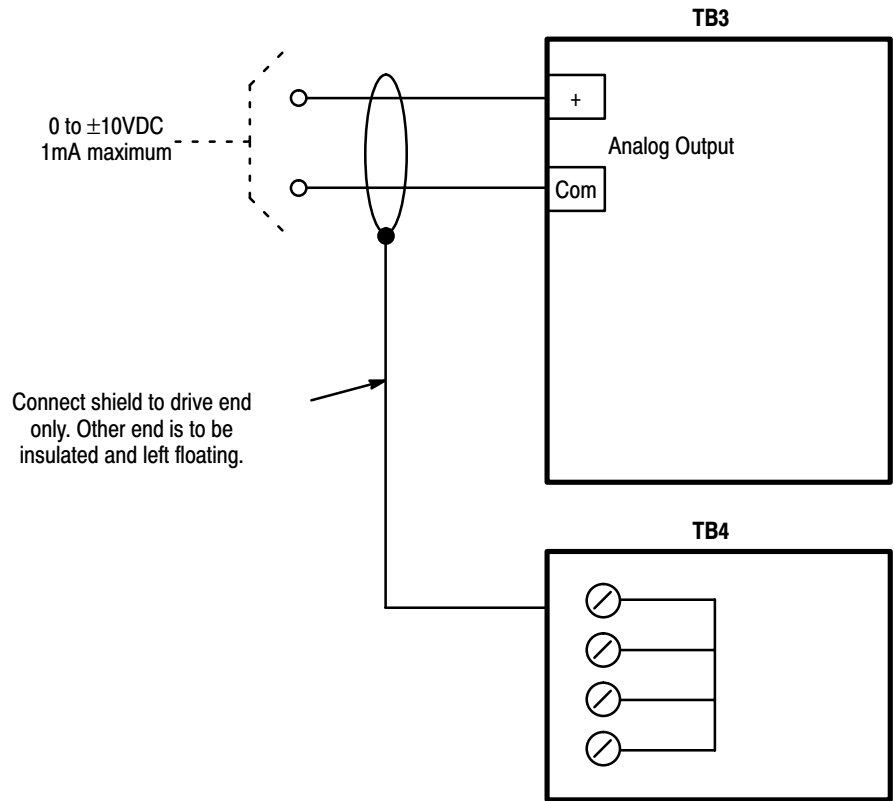
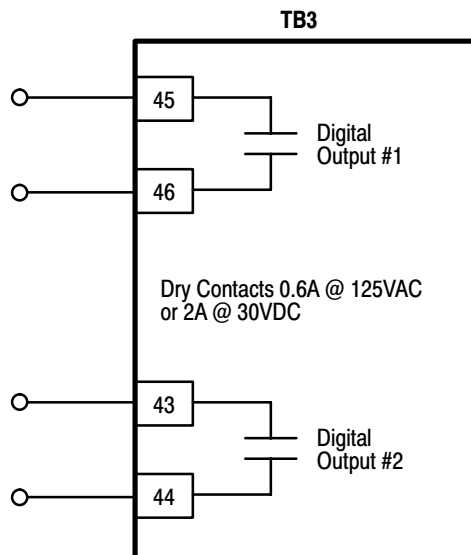


Figure 4.11
Typical Digital Output Connections



Start-Up

Chapter Objectives

This chapter will provide basic procedures that include initial adjustments and configuration of drive control. Procedures you will perform in this chapter include the following:

- Establish Configuration Links between Drive and Discrete Board.
- Program Discrete Adapter Set-Up Parameters.

Terminology

Parameter – Memory location used to store drive set-up data, or to monitor real time input or output information. Each parameter is assigned a name and number which does not change.

Set-Up Parameter – Parameter whose values do not change during normal operation of the drive. The Set-Up Parameters are used for scaling and calibration of specific drive functions which are application and/or hardware dependent.

Configuration Parameter – Parameter whose value may be changed during normal operation of the drive. The Configuration Parameters are used to input reference and feedback information to the drive, and to provide monitoring points for control signals. The Configuration Parameters are one of two types, termed source or sink parameters. Refer to the Bulletin 1395 Installation and Maintenance manual for a detailed description of source and sink parameters.

Source – Parameter which may be used as a source of data for input to a sink.

Sink – Parameter which acts as an input of data from a source.

Linking – The process of connecting a Sink parameter to a Source parameter.

Tools & Test Equipment

The following equipment is necessary to perform Start-Up procedures:

- Bulletin 1300 Programming Terminal
- Multimeter with an input impedance of 1 megohm minimum
- Test Leads
- Assorted screwdrivers (Phillips and blade type)

Parameter Set-Up Description

After hard wiring the I/O to the Discrete Adapter board terminals, you must set up parameters in the drive using the Program Terminal to allow for data flow between the Discrete board and the drive. As was shown in Figure 4.4, each terminal has parameters associated with it. Set-Up parameters are used to program the Adapter board functions, and consist of Parameters 550 through 559 for Port A, and 500 through 549 for Port B. Configuration parameters allow the Discrete adapter to communicate with the Drive, and must be linked to a parameter in the drive (refer to the 1395 Installation and Maintenance Manual and read the description of configuration links). Which Configuration parameters are used, is also dependent on which adapter port you use. Configuration parameters in the 400 series are used with Port A, and Configuration parameters in the 300 series are used with Port B. A detailed description of these parameters is provided in Chapter 8, Control Description, of this manual.

Each Set-Up parameter associated with a specific input/output is used to define the device connected to that input/output. Often there is more than one Set-Up parameter associated with the I/O. Analog inputs and outputs require two for scaling and offset of the value. Figure 5.1 shows the parameters required for each I/O device used.

To use this board with the Bulletin 1395, you must link the Configuration parameters to the proper parameter in the drive. This sets up the LINK files so that during run-time operation the proper parameters are transferred to and from the Discrete Adapter Board.

Example Start-Up Configuration (Linking)

The following is provided as an example of start-up configuration of the Discrete Adapter Board: Your actual configuration is dependent upon specific application requirements.

In Figure 5.1 the Discrete Adapter board is connected to Port A of the 1395 Drive. All external wiring to the Discrete Adapter board will be terminated at terminal block TB3 located on the bottom of the drive. Because the adapter is connected to Port A, the 400 series configuration parameters are used to communicate information to/from the drive.

The configuration shown provides the following setup:

- The digital inputs are connected to source parameter 400, which in turn is linked to parameter 151 (logic command 2). When a digital input changes state, this information will be transferred directly to Logic command 2 via parameter 400. Parameters 583 through 586 specify which bit of Parameter 400 (and thus 151) will be effected by each digital input.

- The example shows two analog inputs connected to Parameters 400 and 401. In addition, these parameters are linked to drive Parameters 154 and 157 respectively. When an analog input is applied to analog input # 1, the signal is converted to a digital value and directed to Parameter 401. Since Parameter 401 is linked to Parameter 154 the digital value is directly transferred to Parameter 154 (External Velocity Ref). The same applies to all other analog inputs.
- For the case of analog outputs and digital outputs, the information transfer is handled in the same manner. However, data is passed from the drive to the Discrete Adapter Board.

In all cases it is important to note that once a configuration link is established, data is transferred between the linked parameters automatically. Nothing further needs to be done.

Digital Input/Output Set-Up

The Digital Inputs and Outputs are provided to allow discrete signals to control drive operation.

Each input can be set-up to control a specific bit in the Discrete Adapter logic parameter. The Discrete Adapter logic parameter is a Port Sensitive number (Parameter 400 in [Figure 5.1](#)). Parameters 583 through 586 control which bit in the logic parameter is controlled by each digital input.

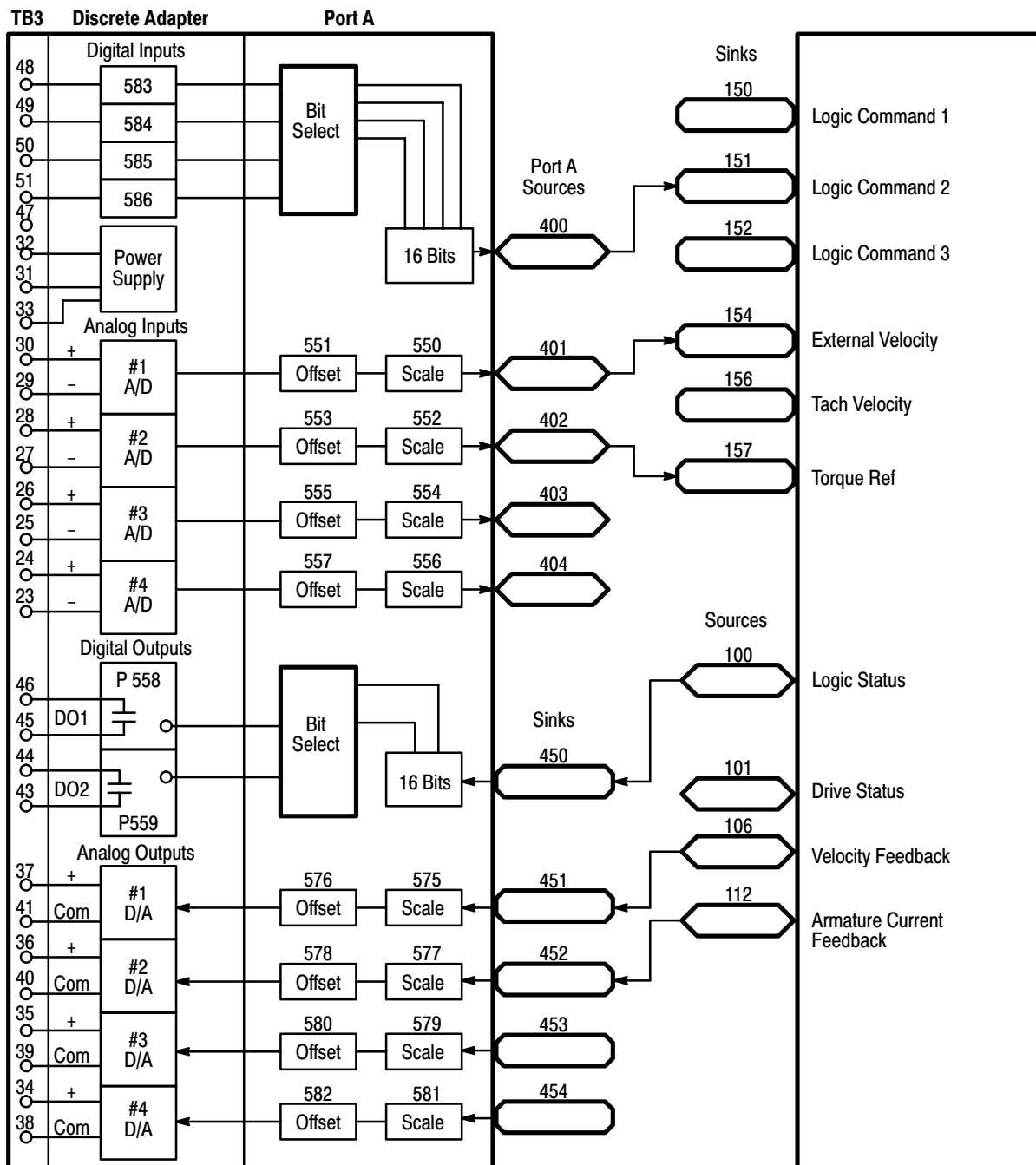
Digital outputs are setup similar to digital inputs with the exception that Parameters 558 and 559 control the mapping of the outputs.

Analog Input/Output Set-Up

The analog I/O requires more extensive set-up than the digital I/O. You must adjust Scale and Offset parameters for each discrete analog device. Also, each device has a specific Variable parameter, which you must link to a Drive Variable parameter to transfer information. An example for both analog input and output devices follows:

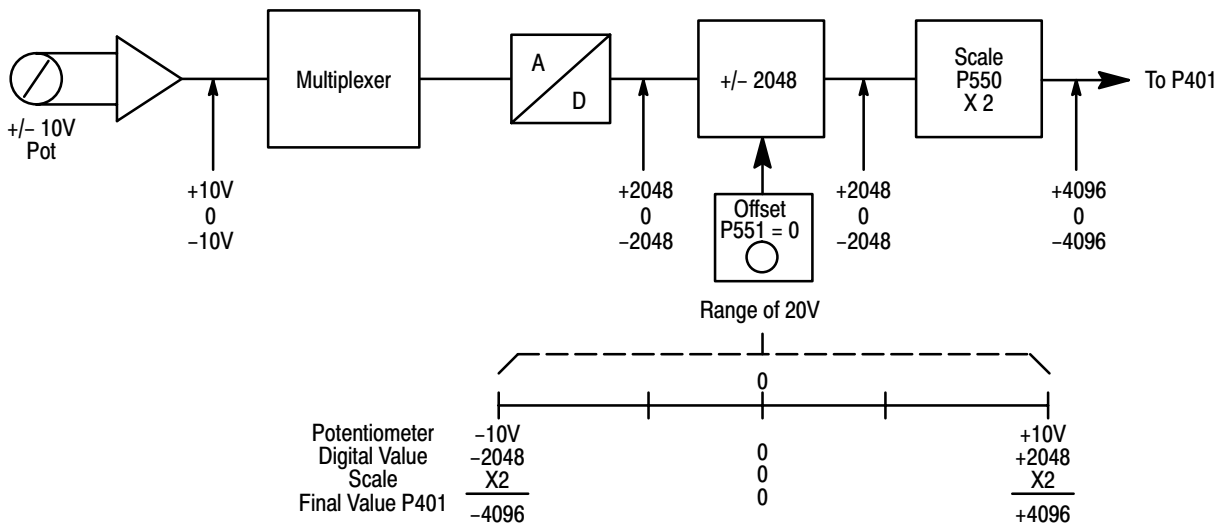
The drive works with internal drive units. Every parameter entered into the drive is internally converted to these units. Each parameter is a 16 bit word, which allows a range of ± 32767 internal units. The drive is scaled so that 4096 is equal to one unit of the quantity being regulated. A $\pm 10V$ DC signal applied to an analog input is converted to a digital value of ± 2048 , providing a total range of 4096. When calibrating analog inputs, a scale factor is applied to this value, to provide an effective range of ± 32767 (16 times 2048). The offset parameter determines the offset in volts, applied to the raw analog value before the scale factor is applied. This allows you to shift the range of the analog input by ± 4096 .

Figure 5.1
Discrete Adapter Board Start-Up Configuration Example



Analog Input 1 and Analog Input 2 will be used in detailing the scaling and offset parameters. At Analog Input 1, between TB3 terminals 29 and 30, a potentiometer with a range of ± 10 V DC has been connected. Parameter 401 has been linked to Parameter 154 (Velocity Reference) in the drive, which gives the potentiometer control of the external velocity reference. To calibrate the pot to control 100% base speed in both directions, the scaling parameter must be adjusted. The default value of the scale parameters allows a total range of 4096, -2048 to $+2048$. This allows only 50% base speed in each direction. By setting a scale factor of 2 in Parameter 550, the digital input is multiplied by 2, providing a range of -4096 to $+4096$, or 100% base speed in both directions. If the user wanted a range of ± 2 times base speed, the scale factor would have to be 4 (Base Speed = 4096, 2 times Base Speed = 8192, 2048 times 4 = 8192). Parameter 551, Offset, will remain at the default value of zero, allowing the input range to be -10 V to $+10$ V. The range of the offset parameter is ± 20 VDC (Figure 5.2).

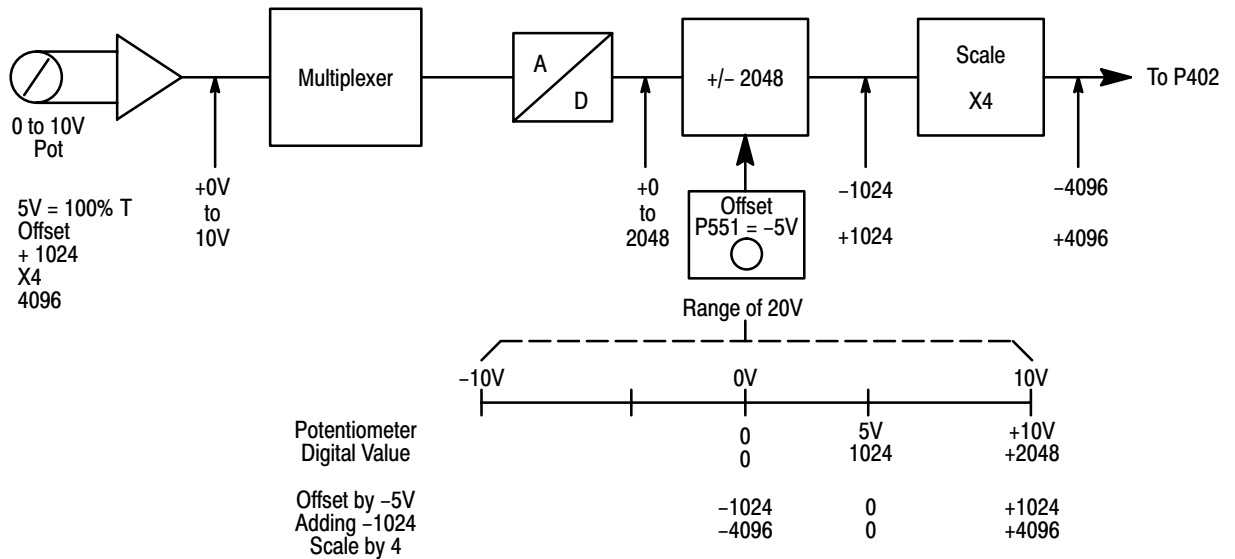
Figure 5.2
Example: Potentiometer ± 10 V Range to Control 0 to $\pm 100\%$ Base Speed



For Analog Input 2, a 0 to 10 volt potentiometer will be used to adjust the Torque Reference from -100% to $+100\%$. To accomplish this, both the scale and offset parameters will need to be adjusted. By linking Parameter 402 to Parameter 157, Torque Reference, the potentiometer connected to Analog Input 2 becomes the Torque Reference Signal. This signal must be scaled and offset in order to get the entire $\pm 100\%$ in the 0 – 10 volt range. A digital range of 8192 must now be scaled for an analog range of 10 volts, and must be offset so 5 volts on the potentiometer will indicate 0% Torque.

As seen in Figure 5.3, the offset voltage adds the corresponding digital value to the range. In this case, an offset of -5 volts adds a digital value of -1024 to the range. This causes 0 volts on the potentiometer to register as -1024 digital internal to the Drive. This can then be scaled so that 0 volts sends a digital value of -4096 for -100% Torque.

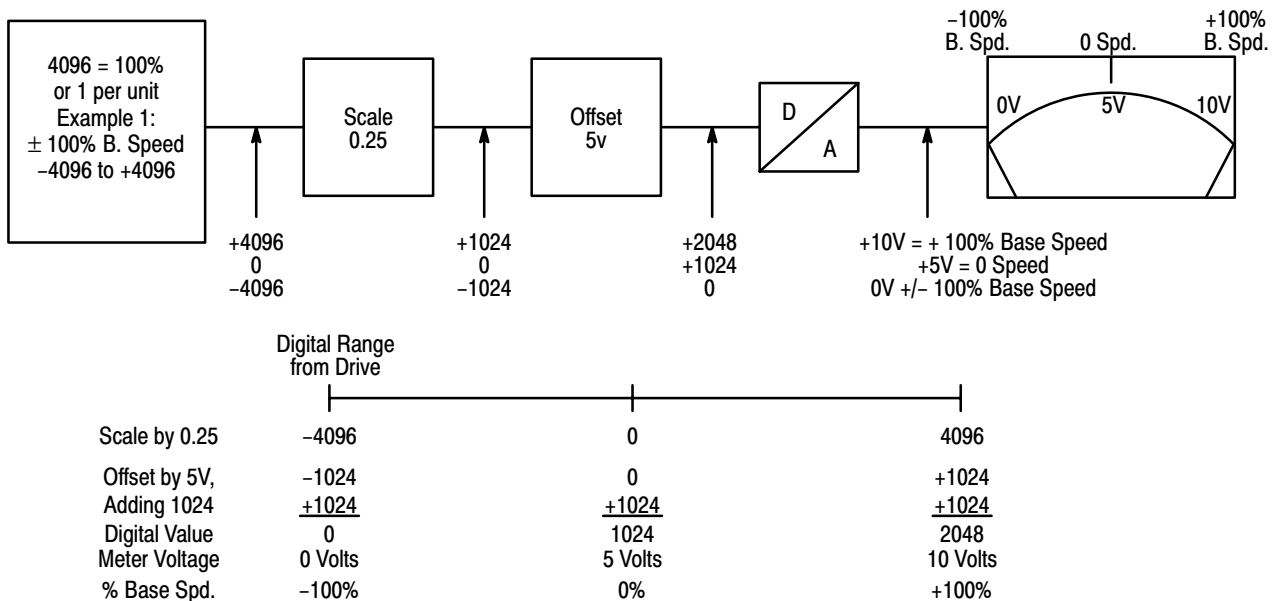
Figure 5.3
Example: Potentiometer 0 to 10V Range to Control
 $\pm 100\%$ to $\pm 100\%$ Torque Reference



Analog outputs are set up similar to analog inputs. Each output has a scale and offset parameter, along with a specific variable parameter used for linking. Differences occur because of the direction of information flow. The drive sends a digital value in drive units, which must be matched to the voltage of the monitoring device. As in the analog inputs, the analog output converts a ± 2048 to ± 10 V DC. Thus, when the drive sends $\pm 100\%$ Base Speed (equal to ± 4096) it must be scaled by 0.5 to be in the proper range ($4096 \times 0.5 = 2048$). Offset can be ± 20 V DC, even though the physical limit is ± 10 V DC. This allows you to offset the signal anywhere within the entire range.

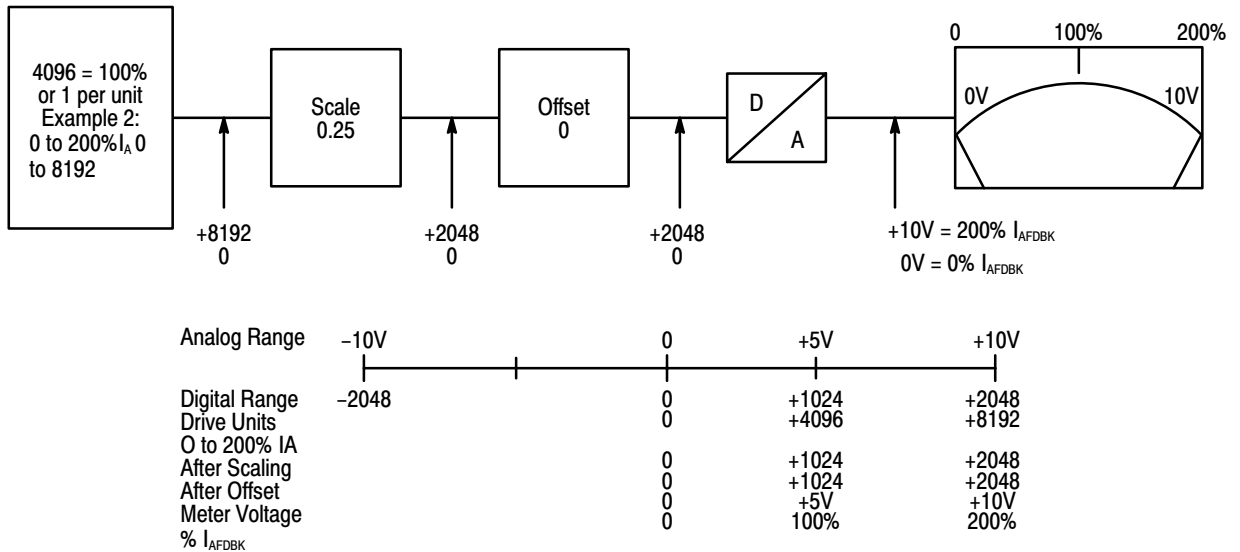
Analog Output 1 and Analog Output 2 will be used as examples in detailing the scaling and offset parameters. At Analog Output 1, a meter with a range of 0 to 10 V DC has been connected. Parameter 451 has been linked to Parameter 106, Velocity Feedback. In order for the meter to indicate speed in both directions, the scale and offset parameters must be adjusted (see Figure 5.4). Working in the opposite direction as the analog inputs, apply the scaling factor first. The drive will send a ± 4096 digital value to indicate $\pm 100\%$ velocity feedback, for a total digital range of 8192. The meter, having an analog range of 0 to 10V DC, requires a digital range of 2048. By applying a scale factor of 0.25 this is accomplished ($8192 \times 0.25 = 2048$). In order to have the 0 to 10V DC meter indicate $\pm 100\%$ feedback, an offset must be applied. Offset parameters for analog outputs will again add the corresponding digital value to the range. In this case, an offset of 5 volts adds a digital value of 1024 to the range. This will allow full range deflection on the 0 to 10 volt meter, with 5 volts indicating zero speed.

Figure 5.4
Example 1: Analog Output
+/- 100% Speed Indication



As shown in Figure 5.5, another 0 to 10V DC meter is connected to Digital-To-Analog (D/A) output number 2. In this example, Parameter 452 which feeds the D/A is linked to drive Parameter 112, Armature Current Feedback. In this example we assume that armature Current Feedback will vary between 0% and 200% rated current. This means the drive digital signal will vary between 0 and 8192 and the D/A signal must vary between 0 and 2048 for a 0 to 10V DC output. In this case, programming Parameter 577 to a value of 0.25 will provide the correct scaling ($0.25 \times 8192 = 2048$). Setup Parameter 578 can remain at zero volts offset because a DC offset is not required in this example (Refer to Figure 5.5).

Figure 5.5
Example 2: Analog Output
0 to 200% Current Indication



Troubleshooting and Maintenance

Introduction

This section describes the Discrete adapter board fault diagnostics and how they are processed by the 1395 Drive.

All Adapters provide initial fault handling based on conditions within their environment, and then signal the 1395 which provides further disposition based on system requirements. Faults are divided into three categories as described below.

Hard Faults

Hard Faults are non-recoverable. That is, the 1395 Drive must either be RESET or POWER-CYCLED in order to clear the faulted condition. An Adapter Board transmits a fault to the 1395 Main Computer Board through the Dual-Port Ram as explained in the 1395 Instruction Manual. A Hard Fault in an Adapter is designed to create an ECOAST stop.

Soft Faults

Soft Faults occur when an Adapter detects a condition which may result in undesirable operation. The Adapter takes appropriate action within it's domain to guard against further operation and signals the condition to the 1395 Drive. In addition, the fault may be cleared and normal operation resumed at the point the fault occurred.

Warning Faults

Conditions detected within the system that may produce Soft Faults if the condition is allowed to persist

Discrete Fault Messages

The fault messages available on the Discrete Adapter Board are:

- DS-01-DISCRETE OK
Indicates no faults are present in the Adapter.
- DS-31-ILLEGAL FAULT – Hard Fault
Indicates an Internal Adapter error. Replace Discrete Adapter.
- DS-54-DP HANDSHAKE – Soft Fault
The 1395 Main Computer Board is no longer maintaining communications with the Adapter through Dual-Ported RAM. Ensure proper connection to Microbus interface. Replace Adapter Board, replace Main Board.
- DS-64-ILLEGAL MODE – Soft Fault
The 1395 Main Computer commanded an illegal mode for this Adapter. Clear Fault, replace Adapter, replace Main Board.

Adapter Troubleshooting

Each processor or Adapter provides its own set of sophisticated diagnostics which the user can examine to help determine the nature of problems that may arise. Maintenance is done at the board level. Examining the diagnostic/fault messages available determines whether a board should be replaced. The malfunctioning board may be returned to Allen-Bradley for further disposition.

Periodic Maintenance

Preventive Maintenance



ATTENTION: Servicing energized industrial control equipment can be hazardous. Severe injury or death can result from electrical shock, burn, or unintended actuation of controlled equipment.

Recommended practice is to disconnect and lock out control equipment from power sources, and allow stored energy in capacitors to dissipate, if present. If it is necessary to work in the vicinity of energized equipment, the safety related work practices of NFPA 70E, Electrical Safety Requirements for Employee Workplaces, must be followed.

Periodic Inspection – Industrial control equipment should be inspected periodically. Inspection intervals should be based on environmental and operating conditions, and adjusted as indicated by experience. An initial inspection within 3 to 4 months after installation is suggested. Applicable parts of the following guidelines should be used:

Contamination – If inspection reveals that dust, dirt, moisture or other contamination has reached the control equipment, the cause must be eliminated. This could indicate an incorrect or ineffective enclosure, unsealed enclosure openings (conduit or other) or incorrect operating procedures. Dirty, wet or contaminated parts must be replaced unless they can be cleaned effectively by vacuuming or wiping.

Terminals – Loose connections can cause overheating that can lead to equipment malfunction. Check the tightness of all terminals and bus bar connections and securely tighten any loose connections. Replace any parts or wiring damaged by overheating.

Solid State Devices – Solid state devices require little more than a periodic visual inspection. Printed circuit boards should be inspected to determine whether all ribbon cables are properly seated in their connectors. Board locking tabs should also be in place. Necessary replacements should be made only at the PC board or plug-in component level. Solvents should not be used on printed circuit boards. Where blowers are used, air filters if supplied should be cleaned or changed periodically depending on the specific environmental conditions encountered. For additional information see NEMA Standards Publication No. ICS 1.1-1984 entitled: “Safety Guidelines for the Application, Installation and Maintenance of Solid State Control”.



ATTENTION: Use of other than factory recommended test equipment for solid state controls may result in damage to the control or test equipment or unintended actuation of the controlled equipment.

Static Sensitive Items – While performing maintenance on the 1395 Drive and the Discrete Adapter, special precautions must be observed in handling or touching certain static sensitive components in the cabinet. All circuit cards and SCR's in the drive can be damaged by Electro-Static Discharge. If personnel will make contact with an ESD sensitive component during maintenance, they must be grounded. Grounding should be accomplished with a wrist strap which is connected to an approved ground.

Tests and Records

Final Check Out – After maintenance or repair of industrial controls, always test the control system for proper functioning under controlled conditions that avoid hazards in the event of a control malfunction.

“Keep Good Maintenance Records” – This rule will be most helpful in locating possible intermittent problems by pointing to a particular area of recurring trouble within the overall system. Further, good maintenance records will help reduce major costly shutdowns by demanding the use of proper test equipment and an appropriate inventory of spare parts. For additional information see NFPA 70B, “Recommended Practice for Electrical Equipment Maintenance,” published by the National Fire Protection Association.

Parameter Table

Chapter Objective

This chapter contains the information required to assist the user in programming the drive for a specific application after initial start-up. Drives are shipped programmed with default values and are preconfigured for the options installed.

Terminology

Configuration – The process of linking Sink to Source parameters. For a description of configuration, refer to Chapter 5 in this manual.

Configuration Parameters – Parameters used to transfer data between the drive control and external devices. The Configuration Parameters are categorized into two types:

- Source Parameters
- Sink Parameters

Drive Units – The actual value of the parameter as it is stored within the drive parameter table. The drive units may be converted to engineering units or to hexadecimal for display using the Programming Terminal, or may be displayed directly in drive units. All internal values in the drive are in terms of Per Unit numbering.

Engineering Units – A label given to parameter data which specifies what units are to be used to display the parameter value on the Programming Terminal. Examples of engineering units include: RPM, % etc.

Fast Parameter – Fast parameters are all parameters whose values are updated every 2 milliseconds. Fast parameters are used for the real time data input and output of the drive. Fast parameters are NOT backed up in non-volatile memory.

Non-Volatile Memory – Data memory in the drive which retains the values of all data even when power is disconnected from the drive control. EEPROM (Electrically Erasable Programmable Read Only Memory) chips are used for the 1395 non-volatile memory to store some of the drive parameters.

Parameter Table – Table of parameter entries for all Configuration parameters used in the drive.

Parameter Entry – Information stored in the drive which contains the parameter number, parameter data and all other information related to the specific parameter.

Parameter – Memory location used to store drive data. Each parameter is given a number called the parameter number. The parameter value may be specified in decimal, or in hexadecimal. When specified in hexadecimal, the word “Hex” will appear after the parameter value.

Source Parameter – Fast parameter used as a source of data.

Sink Parameter – Fast parameter used to receive data input.

Parameter Table

[Table 8.A](#) provides you with an abbreviated listing of the Discrete Adapter Board configuration parameters. The configuration parameters in the drive are categorized into the following groups by parameter number:

- #300 – #309 = Port B Source parameters
- #350 – #359 = Port B Sink parameters
- #400 – #409 = Port A Source parameters
- #450 – #459 = Port A Sink parameters
- #500 – #524 = Port B (Source) Setup parameters
- #525 – #549 = Port B (Sink) Setup parameters
- #550 – #574 = Port A (Source) Setup parameters
- #575 – #599 = Port A (Sink) Setup parameters

The column headings in [Table 8.A](#) are defined as follows:

Dec – Parameter number in decimal

Hex – Parameter number in hexadecimal

Name – Parameter name as it appears on the Programming Terminal.

Units – Indicates the units displayed for the parameter value using the Programming Terminal and displaying the parameter value using engineering units.

Init – Parameter value as it will appear after the drive Initialize command has been sent from the Programming Terminal or the external device connected to Port A or B. The Init values are the same as the Default values listed in the Parameter Descriptions section of this chapter.

Min – Minimum allowable value for the parameter. If no min value is given, the parameter has not been assigned a minimum limit.

Max – Maximum allowable value for the parameter. If no max value is given, the parameter has not been assigned a maximum limit.

EE – Indicates whether the parameter can be backed up in EEPROM.

Function – Indicates the related control function for the parameter.

Port – Indicates port that parameter is associated with.

Table 8.A
Parameter Table

| Param Number | | | | | | | | | |
|--------------|------|------------------|-------|------|-----|-----|----|---------------|--------|
| DEC | HEX | NAME | UNITS | INIT | MIN | MAX | EE | FUNCTION | PORT |
| 300 | 12CH | B>Digital Input | | | | | | Configuration | Port B |
| 301 | 12DH | B>Analog In 1 | | | | | | Configuration | Port B |
| 302 | 12EH | B>Analog In 2 | | | | | | Configuration | Port B |
| 303 | 12FH | B>Analog In 3 | | | | | | Configuration | Port B |
| 304 | 130H | B>Analog In 4 | | | | | | Configuration | Port B |
| 305 | 131H | Not Used | | | | | | Configuration | Port B |
| to | to | | | | | | | | |
| 349 | 150H | | | | | | | | |
| 350 | 15EH | B>Digital Output | | | | | | Configuration | Port B |
| 351 | 15FH | B>Analog Out 1 | | | | | | Configuration | Port B |
| 352 | 160H | B>Analog Out 2 | | | | | | Configuration | Port B |
| 353 | 161H | B>Analog Out 3 | | | | | | Configuration | Port B |
| 355 | 162H | B>Analog Out 4 | | | | | | Configuration | Port B |
| 355 | 163H | Not Used | | | | | | Configuration | Port B |
| to | to | | | | | | | | |
| 359 | 167H | Not Used | | | | | | Configuration | Port B |
| 400 | 190H | A>Digital Input | | | | | | Configuration | Port A |
| 401 | 191H | A>Analog In 1 | | | | | | Configuration | Port A |
| 402 | 192H | A>Analog In 2 | | | | | | Configuration | Port A |
| 403 | 193H | A>Analog In 3 | | | | | | Configuration | Port A |
| 404 | 194H | A>Analog In 4 | | | | | | Configuration | Port A |
| 405 | 195H | Not Used | | | | | | Configuration | Port A |
| 406 | 196H | Not Used | | | | | | Configuration | Port A |
| to | to | | | | | | | | |
| 409 | 199H | Not Used | | | | | | Configuration | Port A |
| 450 | 1C2H | A>Digital Output | | | | | | Configuration | Port A |
| 451 | 1C3H | A>Analog Out1 | | | | | | Configuration | Port A |
| 452 | 1C4H | A>Analog Out2 | | | | | | Configuration | Port A |
| 453 | 1C5H | A>Analog Out3 | | | | | | Configuration | Port A |
| 454 | 1C6H | A>Analog Out4 | | | | | | Configuration | Port A |
| 455 | 1C7H | Not Used | | | | | | Configuration | Port A |
| to | to | | | | | | | | |
| 459 | 1CBH | Not Used | | | | | | Configuration | Port A |
| 500 | 1F4H | B>ADC Scale 1 | VLT | 1 | -16 | 16 | EE | Set-Up | Port B |

Table 8.A (cont.)
Parameter Table

| Param Number | | | | | | | | | |
|--------------|------|----------------|-------|------|-----|-----|----|----------|--------|
| DEC | HEX | NAME | UNITS | INIT | MIN | MAX | EE | FUNCTION | PORT |
| 501 | 1F5H | B>ADC Offset 1 | Vlt | 0 | -20 | 20 | EE | Set-Up | Port B |
| 502 | 1F6H | B>ADC Scale 2 | Vlt | 1 | -16 | 16 | EE | Set-Up | Port B |
| 503 | 1F7H | B>ADC Offset 2 | Vlt | 0 | -20 | 20 | EE | Set-Up | Port B |
| 504 | 1F8H | B>ADC Scale 3 | Vlt | 1 | -16 | 16 | EE | Set-Up | Port B |
| 505 | 1F9H | B>ADC Offset 3 | Vlt | 0 | -20 | 20 | EE | Set-Up | Port B |
| 506 | 1FAH | B>ADC Scale 4 | Vlt | 1 | -16 | 16 | EE | Set-Up | Port B |
| 507 | 1FBH | B>ADC Offset 4 | Vlt | 0 | -20 | 20 | EE | Set-Up | Port B |
| 508 | 1FCH | Digital Out 1 | | 0 | 0 | 15 | EE | Set-Up | Port B |
| 509 | 1FDH | Digital Out 2 | | 5 | 0 | 15 | EE | Set-Up | Port B |
| 510 | 1FEH | Not Used | | | | | EE | Set-Up | Port B |
| to | | | | | | | | | |
| 524 | 20CH | Not Used | | | | | EE | Set-Up | Port B |
| 525 | 20DH | B>DAC Scale 1 | | 1 | -1 | 1 | EE | Set-Up | Port B |
| 526 | 20EH | B>DAC Offset 1 | Vlt | 1 | -20 | 20 | EE | Set-Up | Port B |
| 527 | 20FH | B>DAC Scale 2 | | 1 | -1 | 1 | EE | Set-Up | Port B |
| 528 | 210H | B>DAC Offset 2 | Vlt | 0 | -20 | 20 | EE | Set-Up | Port B |
| 529 | 211H | B>DAC Scale 3 | | 1 | -1 | 1 | EE | Set-Up | Port B |
| 530 | 212H | B>DAC Offset 3 | Vlt | 0 | -20 | 20 | EE | Set-Up | Port B |
| 531 | 213H | B>DAC Scale 4 | | 1 | -1 | 1 | EE | Set-Up | Port B |
| 532 | 214H | B>DAC Offset 4 | Vlt | 0 | -20 | 20 | EE | Set-Up | Port B |
| 533 | 215H | B>Digital In 1 | | 11 | 0 | 15 | EE | Set-Up | Port B |
| 534 | 216H | B>Digital In 2 | | 9 | 0 | 15 | EE | Set-Up | Port B |
| 535 | 217H | B>Digital In 3 | | 12 | 0 | 15 | EE | Set-Up | Port B |
| 536 | 218H | B>Digital In 4 | | 14 | 0 | 15 | EE | Set-Up | Port B |
| 537 | 219H | Not Used | | | | | EE | Set-Up | Port B |
| to | | | | | | | | | |
| 548 | 224H | Not Used | | | | | EE | Set-Up | Port B |
| 549 | 225H | B>DS: | | 3.xx | - | - | EE | Status | Port B |
| 550 | 226H | A>ADC Scale 1 | | 1 | -16 | +16 | EE | Set-Up | Port A |
| 551 | 227H | A>ADC Offset 1 | Vlt | 0 | -20 | +20 | EE | Set-Up | Port A |
| 552 | 228H | A>ADC Scale 2 | | 1 | -16 | +16 | EE | Set-Up | Port A |
| 553 | 229H | A>ADC Offset 2 | Vlt | 0 | -20 | +20 | EE | Set-Up | Port A |
| 554 | 22AH | A>ADC Scale 3 | | 1 | -16 | +16 | EE | Set-Up | Port A |
| 555 | 22BH | A>ADC Offset 3 | Vlt | 0 | -20 | +20 | EE | Set-Up | Port A |

**Table 8.A (cont.)
Parameter Table**

| Param Number | | | | | | | | | |
|--------------|------|-----------------|-------|------|-----|-----|----|----------|--------|
| DEC | HEX | NAME | UNITS | INIT | MIN | MAX | EE | FUNCTION | PORT |
| 556 | 22CH | A>ADC Scale 4 | | 1 | -16 | +16 | EE | Set-Up | Port A |
| 557 | 22DH | A>ADC Offset 4 | Vlt | 0 | -20 | +20 | EE | Set-Up | Port A |
| 558 | 22EH | A>Digital Out 1 | | 10 | 0 | 15 | EE | Set-Up | Port A |
| 559 | 22FH | A>Digital Out 2 | | 5 | 0 | 15 | EE | Set-Up | Port A |
| 560 | 230H | Not Used | | | | | EE | Set-Up | Port A |
| to | | | | | | | | | |
| 574 | 23EH | Not Used | | | | | EE | Set-Up | Port A |
| 575 | 23FH | A>DAC Scale 1 | | 1 | -1 | +1 | EE | Set-Up | Port A |
| 576 | 240H | A>DAC Offset 1 | | 0 | -20 | +20 | EE | Set-Up | Port A |
| 577 | 241H | A>DAC Scale 2 | | 1 | -1 | +1 | EE | Set-Up | Port A |
| 578 | 242H | A>DAC Offset 2 | Vlt | 0 | -20 | +20 | EE | Set-Up | Port A |
| 579 | 243H | A>DAC Scale 3 | | 0 | -1 | +1 | EE | Set-Up | Port A |
| 580 | 244H | A>DAC Offset 3 | Vlt | 0 | -20 | +20 | EE | Set-Up | Port A |
| 581 | 245H | A>DAC Scale 4 | | 0 | -1 | +1 | EE | Set-Up | Port A |
| 582 | 246H | A>DAC Offset 4 | Vlt | 0 | -20 | +20 | EE | Set-Up | Port A |
| 583 | 247H | A>Digital In 1 | | 11 | 0 | 15 | EE | Set-Up | Port A |
| 584 | 248H | A>Digital In 2 | | 9 | 0 | 15 | EE | Set-Up | Port A |
| 585 | 249H | A>Digital In 3 | | 12 | 0 | 15 | EE | Set-Up | Port A |
| 586 | 24AH | A>Digital In 4 | | 14 | 0 | 15 | EE | Set-Up | Port A |
| 587 | 24BH | Not Used | | | | | | Set-Up | Port A |
| to | | | | | | | | | |
| 598 | 256H | Not Used | | | | | | | |
| 599 | 257H | A>DS: | | | | | | Status | Port A |

Parameter Descriptions

This section provides you with a description of the parameters in the Bulletin 1395 Discrete adapter. Information is provided in the following format:

Parameter – AAA [Parameter Name]
– BBB [Parameter Name]

Use:

Program Terminal Units:

Maximum Value:

Minimum Value:

Default Value:

Description:

A description of the information you will find in each category is provided here:

Parameter AAA – The parameter number if the adapter is installed in port A.

Parameter BBB – The parameter number if the adapter is installed in port B.

[Parameter Name] – The parameter name as viewed on the program terminal.

Use – A brief description of the parameter function.

Programming Terminal Units – The scaled engineering units which are displayed on the program terminal.

Minimum Value – The minimum parameter value as displayed on the program terminal.

Maximum Value – The maximum parameter value as displayed on the program terminal.

Default Type – The default parameter value as displayed on the program terminal.

Description – A description of the use and operation of the parameter.

Configuration Parameters

This section describes for you in detail each of the Configuration parameters available on the Discrete Adapter Board. All Configuration parameters are 16-bit words. In order for a Configuration parameter to affect system operation, it's source and/or destination must be programmed in the 1395.

Parameter 400 - [A > Digital Input]

300 - [B > Digital Input]

Use: Status of Discrete Input

Program Terminal Units: None

Description: This parameter is a Fast Source used to transmit the status of the four digital inputs on the Adapter Board to the drive. The four digital inputs can be mapped to any of the 16 bits in this parameter. Typically, this parameter is linked to one of the Logic Commands in the drive which allows for Start, Stop, and Jog Control. The actual bit mapping is determined by the Set-Up parameters explained in the Set-Up Parameter section.

Parameter 401 - [A > Analog In 1]

301 - [B > Analog In 1]

Use: Digital value of Analog Input 1 Signal

Program Terminal Units: None

Minimum Value: - 32767

Maximum Value: 32767

Default Value: None

Description: This parameter is a Fast Source used to convert a $\pm 10V$ DC signal to a ± 32767 digital value. This digital value can then be linked to one of the drive input parameters such as Velocity Reference, Torque Reference, Process Trim Reference, etc. Through programming of the associated Set-Up parameters a Scale Factor and Offset can be applied to the input before it is displayed or sent to the drive.

Parameter 402 - [A > Analog In 2]

302 - [B > Analog In 2]

Use: Digital value of Analog Input 2 Signal

Program Terminal Units: None

Minimum Value: -32767

Maximum Value: +32767

Default Value: None

Description: This parameter is a Fast Source used to convert a $\pm 10V$ DC signal to a ± 32767 digital value. This digital value can then be linked to one of the drive input parameters such as Velocity Reference, Torque Reference, Process Trim Reference, etc. Through programming of the Set-Up configuration parameters a Scale Factor and Offset can be applied to the input before it is displayed or transferred to the drive.

Parameter 403 - [A > Analog In 3]

303 - [B > Analog In 3]

Use: Digital value of Analog Input 3 Signal

Program Terminal Units: None

Minimum Value: -32767

Maximum Value: 32767

Default Value: None

Description: This parameter is a Fast Source used to convert a $\pm 10V$ DC signal to a ± 32767 digital value. This digital value can then be linked to one of the drive input parameters such as Velocity Reference, Torque Reference, Process Trim Reference, etc. Through programming of the associated Set-Up parameters a Scale Factor and Offset can be applied to the input before it is displayed or transferred to the drive.

Parameter 404 - [A > Analog In 4]

304 - [B > Analog In 4]

Use: Digital Value of Analog Input 4 Signal

Program Terminal Units: None

Minimum Value: - 32767

Maximum Value: 32767

Default Value: None

Description: This parameter is a Fast Source used to convert a $\pm 10V$ DC signal to a ± 32767 digital value. This digital value can then be linked to one of the drive input parameters such as Velocity Reference, Torque Reference, Process Trim Reference, etc. Through programming of the associated Set-Up parameters a Scale Factor and Offset can be applied to the input before it is displayed or transferred to the drive.

Parameter 450 - [A > Digital Output]

350 - [B > Digital Output]

Use: Status of Digital Outputs

Program Terminal Units: None

Description: This parameter is a Fast Sink used to transmit the status of two discrete bits of data from the 1395 to the relay outputs on the Adapter Board. The two digital outputs can be mapped to any of the 16 bits in this parameter. Typically, this parameter is linked to Logic Status in the 1395 which allows for indication of Drive Running, At Zero Speed, Drive Faulted, etc. The actual bit mapping is determined by the Set-Up parameters explained in the Set-Up Parameter section. The Digital Outputs are updated every 20 milliseconds.

Parameter 451 - [A > Analog Out 1]

351 - [B > Analog Out 1]

Use: Digital Value of Analog Output 1 Signal

Program Terminal Units: None

Minimum Value: -32767

Maximum Value: 32767

Default Value: None

Description: This parameter is a Fast Sink which converts a ± 32767 digital value to a $\pm 10V$ DC output. This digital value can then be linked to one of the drive output parameters such as Velocity Feedback, Torque Command, Flux Command, etc. Through programming of the associated Set-Up parameters a Scale Factor and Offset can be applied to the output before it is converted to the analog signal.

Parameter 452 - [A > Analog Out 2]

352 - [B > Analog Out 2]

Use: Digital Value of Analog Output 2 Signal

Programming Terminal Units: None

Minimum Value: -32767

Maximum Value: 32767

Default Value: None

Description: This parameter is a Fast Sink which converts a ± 32767 digital value to a $\pm 10V$ DC output. This digital value can then be linked to one of the drive output parameters such as Velocity Feedback, Torque Command, Flux Command, etc. Through programming of the associated Set-Up parameters a Scale Factor and Offset can be applied to the output before it is converted to the analog signal.

Parameter 453 - [A > Analog Out 3]

353 - [B > Analog Out 3]

Use: Digital Value of Analog Output 3 Signal

Program Terminal Units: None

Minimum Value: -32767

Maximum Value: 32767

Default Value: None

Description: This parameter is a Fast Sink which converts a ± 32767 digital value to a $\pm 10V$ DC output. This digital value can then be linked to one of the drive output parameters such as Velocity Feedback, Torque Command, Flux Command, etc. Through programming of the associated Set-Up parameters a Scale Factor and Offset can be applied to the output before it is converted to the analog signal.

Parameter 454 - [A > Analog Out 4]

354 - [B > Analog Out 4]

Use: Digital Value of Analog Output 4 Signal

Program Terminal Units: None

Maximum Value: 32767

Minimum Value: -32767

Default Value: None

Description: This parameter is a Fast Sink which converts a ± 32767 digital value to a ± 10 VDC output. This digital value can then be linked to one of the drive output parameters such as Velocity Feedback, Torque Command, Flux Command, etc. Through programming of the associated configuration parameters a Scale Factor and Offset can be applied to the output before it is converted to the analog signal.

Set-Up Parameters

Set-Up parameters control how the Discrete Adapter manipulates data. Specifically they allow programming the bit positions for digital inputs and outputs along with scale factors and offsets for analog inputs and outputs.

Parameter 550 - [A > ADC Scale 1]

500 - [B > ADC Scale 1]

Use: Scale Factor for Analog Input 1

Program Terminal Units: None

Maximum Value: +16

Minimum Value: -16

Default Value: 1

Description: This parameter determines the scale factor or Gain for Analog Input 1. A ± 10 VDC signal applied to Analog Input 1 is converted to a ± 2048 digital value used by the drive. Before the digital value is displayed or transferred to the drive the Scale Factor is applied, thus allowing an effective digital range of ± 32767 (16 times 2048). The absolute digital value is clamped at 32767.

Parameter 551 - [A > ADC Offset 1]

501 - [B > ADC Offset 1]

Use: Offset for Analog Input 1

Programming Terminal Units: Volts

Maximum Value: +20 VDC

Minimum Value: -20 VDC

Default Value: 0V DC

Description: This parameter determines the offset applied to the raw Analog Input 1 value before the Scale Factor is applied. This allows the User to shift the range of the analog input.

**Parameter 552 - [A > ADC Scale 2]
502 - [B > ADC Scale 2]**

Use: Scale factor for Analog Input 2
Program Terminal Units: None
Minimum Value: -16
Maximum Value: +16
Default Value: 1

Description: This parameter determines the scale factor or Gain for Analog Input 2. A $\pm 10V$ DC signal applied to Analog Input 2 is converted to a ± 2048 digital value used by the drive. Before the digital value is displayed or transferred to the drive the Scale Factor is applied, thus allowing an effective digital range of ± 32767 (16 times 2048). The absolute digital value is clamped at 32767.

**Parameter 553 - [A > ADC Offset 2]
503 - [B > ADC Offset 2]**

Use: Offset for Analog Input 2
Program Terminal Units: Volts
Minimum Value: -20 VDC
Maximum Value: +20 VC
Default Value: 0

Description: This parameter determines the offset applied to the raw Analog Input 2 value before the Scale Factor is applied. This allows the User to shift the range of the analog input.

**Parameter 554 - [A > ADC Scale3]
504 - [B > ADC Scale 3]**

Use: Scale factor for Analog Input 3
Program Terminal Units: None
Minimum Value: -16
Maximum Value: +16
Default Value: 1

Description: This parameter 554 determines the scale factor or Gain for Analog Input 3. A $\pm 10V$ DC signal applied to Analog Input 1 is converted to a ± 2048 digital value used by the drive. Before the digital value is displayed or transferred to the drive the Scale Factor is applied, thus allowing an effective digital range of ± 32767 (16 times 2048). The absolute digital value is clamped at 32767.

**Parameter 555 - [A > ADC Offset 3]
505 - [B > ADC Offset 3]**

Use: Offset for Analog Input 3

Units: Volts

Minimum Value: -20 VDC

Maximum Value: +20 VDC

Default Value: 0V DC

Description: This parameter determines the offset applied to the raw Analog Input 3 value before the Scale Factor is applied. This allows the User to shift the range of the analog input.

**Parameter 556 - [A> ADC Scale 4]
506 - [B> ADC Scale 4]**

Use: Scale Factor for Analog Input 4

Program Terminal Units: None

Minimum Value: -16

Maximum Value: +16

Default Value: 1

Description: This parameter determines the scale factor or Gain for Analog Input 4. The parameter has a range of ± 16 with a default value of 1. A ± 10 V DC signal applied to Analog Input 4 is converted to a ± 2048 digital value used by the drive. Before the digital value is sent to the drive the Scale Factor is applied, thus allowing an effective digital range of ± 32767 (16 times 2048). The absolute digital value is clamped at 32767.

**Parameter 557 - A> [ADC Offset 4]
507 - B> [ADC Offset 4]**

Use: Offset for Analog Input 4

Program Terminal Units: Volts

Maximum Value: +20 VDC

Minimum Value: -20 VDC

Default Value: 0 VDC

Description: This parameter determines the offset applied to the raw Analog Input 4 value before the Scale Factor is applied. This allows the User to shift the range of his analog input.

**Parameter 558 - [A> Digital Out 1]
508 - [B> Digital Out 1]**

Use: Maps Digital Output 1
Program Terminal Units: None
Maximum Value: 15
Minimum Value: 0
Default Value: 10

Description: This parameter has a range of 0 to 15. It establishes which bit of Discrete Output parameter 450/350 controls the Output 1 relay. When the bit is set the relay contact closes. The default value for this parameter is 10 which is the bit corresponding to “At Zero Speed” when parameter 450/350 is linked to Logic Status.

**Parameter 559 - [A> Digital Out 2]
509 - [B> Digital Out 2]**

Use: Maps Digital Output 2
Program Terminal Units: None
Minimum Value: 0
Maximum Value: 15
Default Value: 5

Description: This parameter has a range of 0 to 15. It establishes which bit of Discrete Output parameter 450/350 controls the Output 2 relay. When the bit is set the relay contact closes. The default value for this parameter is 5 which is the bit corresponding to “Drive Running” when parameter 450/350 is linked to Logic Status.

**Parameter 575 - [A> DAC Scale 1]
525 - [B> DAC Scale 1]**

Use: Scale Factor for Analog Output 1
Program Terminal Units: None
Minimum Value: -1
Maximum Value: +1
Default Value: +1

Description: This parameter determines the scale factor or Gain for Analog Output 1. A ± 32767 digital value from the Drive is converted to a $\pm 10V$ DC signal. Before the digital value is converted the Scale Factor is applied, thus allowing an effective digital range of ± 2048 ($32767/16 = 2048 = 10V$ DC). This is achieved by programming the Scale Factor to .0625 or 1/16.

**Parameter 576 - [A> DAC Offset 1]
526 - [B> DAC Offset 1]**

Use: Offset for Analog Output 1
Program Terminal Units: Volts
Minimum Value: -20V DC
Maximum Value: +20V DC
Default Value: 0

Description: This parameter determines the offset applied to the raw Analog Output 2 value after the Scale Factor is applied. This allows a shift in the range of the analog output.

**Parameter 577 - [A> DAC Scale 2]
527 - [B> DAC Scale 2]**

Use: Scale factor for Analog Output 2
Program Terminal Units: None
Minimum Value: -1
Maximum Value: +1
Default Value: +1

Description: This parameter determines the scale factor or Gain for Analog Output 2. A ± 32767 digital value from the drive is converted to a $\pm 10V$ DC signal. Before the digital value is converted the Scale Factor is applied, thus allowing an effective digital range of ± 2048 ($32767/16 = 2048 = 10V$ DC). This is achieved by programming the Scale Factor to 0.0625 or 1/16.

**Parameter 578 - [A> DAC Offset 2]
528 - [B> DAC Offset 2]**

Use: Offset for Analog Output 2
Program Terminal Units: Volts
Minimum Value: -20V DC
Maximum Value: +20V DC
Default Value: 0V DC

Description: This parameter determines the offset applied to the raw Analog Output 2 value after the Scale Factor is applied. This allows a shift in the range of this analog output.

**Parameter 579 - [A> DAC Scale 3]
529 - [B> DAC Scale 3]**

Use: Scale for for Analog Output 3
Program Terminal Units: None
Minimum Value: -1
Maximum Value: +1
Default Value: +1

Description: This parameter determines the scale factor or Gain for Analog Output 3. A ± 32767 digital value from the drive is converted to a $\pm 10V$ DC signal. Before the digital value is converted the Scale Factor is applied, thus allowing an effective digital range of ± 2048 ($32767/16 = 2048 = 10V$ DC). This achieved by programming the Scale Factor to 0.0625 or 1/16.

**Parameter 580 - [A> DAC Offset 3]
530 - [B> DAC Offset 3]**

Use: Offset for Analog Output 3
Program Terminal Units: Volts
Minimum Value: -20 VDC
Maximum Value: +20 VDC
Default Value: 0VDC

Description: This parameter determines the offset applied to the raw Analog Output 3 value after the Scale Factor is applied. This allows the User to shift the range of his analog output.

**Parameter 581 - [A> DAC Scale 4]
531 - [B> DAC Scale 4]**

Use: Scale Factor for Analog Output 4
Program Terminal Units: None
Maximum Value: +1
Minimum Value: -1
Default Value: +1

Description: This parameter determines the scale factor or Gain for Analog Output 4. A ± 32767 digital value from the Drive is converted to a $\pm 10V$ DC signal. Before the digital value is converted the Scale Factor is applied, thus allowing an effective digital range of ± 2048 ($32767/16 = 2048 = 10V$ DC). This achieved by programming the Scale Factor to 0.0625 or 1/16.

Parameter 582 - [A> DAC Offset 4]

532 - [B> DAC Offset 4]

Use: Offset for Analog Output 4

Program Terminal Units: Volts

Minimum Value: -20V DC

Maximum Value: +20V DC

Default Value: 0V DC

Description: This parameter determines the offset applied to the raw Analog Output 4 value after the Scale Factor is applied. This allows the User to shift the range of his analog output.

Parameter 583 - [A> Digital In 1]

533 - [B> Digital In 1]

Use: Maps Digital Input 1

Program Terminal Units: None

Minimum Value: 0

Maximum Value: 15

Default Value: 11

Description: This parameter establishes which bit of the Digital Input parameter is affected by Digital Input 1. Digital Input 1 is designed for use with Normally Closed operator devices. Connecting Digital Input 1 (Terminal TB3 – 48) to Digital Common (Terminal TB3 – 47) will cause the bit specified by this parameter to be set to 0. Removing the connection will cause the bit to be set to 1. The default value for this parameter is 11 which is the bit corresponding to STOP when the Digital Input parameter is linked to Logic Command.

Parameter 584 - [A> Digital In 2]

534 - [B> Digital In 2]

Use: Maps Digital Input 2

Program Terminal Units: None

Minimum Value: 0

Maximum Value: 15

Default Value: 9

Description: This parameter has a range of 0 to 15. It establishes which bit of the Digital Input parameter is affected by Digital Input 2. Connecting Digital Input 2 (Terminal TB3 – 49) to Digital Common (Terminal TB3 – 47) will cause the bit specified by this parameter to be set to 1. Removing the connection will cause the bit to be set to 0. The default value for this parameter is 9 which is the bit corresponding to JOG2 when the Digital Input parameter is linked to Logic Command.

Parameter 585 - [A> Digital In 3]

535 - [B> Digital In 3]

Use: Maps Digital Input 3

Program Terminal Units: None

Minimum Value: 0

Maximum Value: 15

Default Value: 12

Description: This parameter has a range of 0 to 15. It establishes which bit of the Digital Input parameter is affected by Digital Input 3. Connecting Digital Input 3 (Terminal TB3 – 50) to Digital Common (TB3 – 47) will cause the bit specified by this parameter to be set to 1. Removing the connection will cause the specified bit to be set to 0. The default value for this parameter is 12 which is the bit corresponding to START when the Digital Input parameter is linked to Logic Command.

Parameter 586 - [A> Digital In 4]

536 - [B> Digital In 4]

Use: Maps Digital Input 4

Program Terminal Units: None

Minimum Value: 0

Maximum Value: 15

Default Value: 14

Description: This parameter has a range of 0 to 15. It establishes which bit of the Digital Input parameter is affected by Digital Input 4. Connecting Digital Input 4 (Terminal TB3 – 51) to Digital Common (TB3 – 47) will cause the bit specified by this parameter to be set to 1. Removing the connection will cause the specified bit to be set to 0. The default value for this parameter is 14 which is the bit corresponding to CLEAR FAULTS when the Digital Input parameter is linked to Logic Command.

Parameter 599 - [A> DS: VERSION]

549 - [B> DS: VERSION]

Use: Adapter card identifier

Program Terminal Units: None

Description: This parameter identifies the Adapter card type and firmware version number.



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