2400 / 2420 / 2450
Performance Drives

UNICO

A D D E N D U M

80 MHz Expandable Control Module

322198 and 322712

Notices

The information contained in this document is considered accurate to the best knowledge of the supplier at the time of publication. The manufacturer, however, assumes no liability for errors that may exist. The supplier reserves the right to change data and specifications without notice.

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Safety Information

Overview

This section states important safety information that must be followed when installing, operating, and servicing the unit. Study this information carefully before working on or with the units. Failure to follow these instructions may lead to personal injury, death, or damage to the units, motors, or driven equipment.

Additional safety instructions can be found in the *2000 Family / Guide to Installation, Troubleshooting, and Maintenance* as well as the application documentation. Please study and follow those instructions as well.

Conventions Used

The following notation convention is used throughout this document to indicate information important to personal safety or machine hazards.

Attention

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

General Precautions

Attention

Only qualified personnel with the proper skills, instruction, and familiarity with the drive units and their applications should install, start up, operate, troubleshoot, and maintain a drive system. You must be familiar with the electrical and mechanical components of the system to perform the procedures outlined in this document. Failure to comply may result in personal injury, death, and/or equipment damage.

Attention

Failure to take proper precautions for electrical hazard could cause injury or death.

Attention

Failure to follow industry safety standards and instructions in this document could damage drive units and void the manufacturer's warranty.

Attention
The module may be sensitive to electrostatic discharge. Static precautions are required when servicing or repairing the module.

Installation Precautions

Attention
An incorrectly installed or operated drive unit can result in damage to the equipment it controls. Make certain installation and operating specifications are followed.

Attention
The drive units and associated equipment must be properly earth grounded.

Service Precautions

Attention
Always disconnect and lock out all electrical supplies before working on a drive unit or associated equipment. Do this before touching any electrical or mechanical components.

Attention
High voltage may be present even when all electrical power supplies are disconnected. After switching off electrical power, wait at least 15 minutes for bus circuit capacitors to discharge before working on the unit or associated equipment. Use an appropriate voltmeter to further verify that capacitors are discharged before beginning work. Do not rely exclusively on bus voltage indicators. Dangerous voltage levels may remain even when the indicators are off.

Safe Service Practices

Follow industry-recognized safety procedures:

- Use only one hand to hold test equipment probes
- Wear approved eye protection
- Stand on insulated material
- Use an isolated oscilloscope
- Keep unnecessary personnel out of the work area
- Never leave a drive cabinet open or unattended

1 About this Addendum

1.1 Contents

This document is an addendum to the *2000 Family / Guide to Installation, Troubleshooting, and Maintenance*. It provides information necessary to install and maintain the 80 MHz Expandable Control Module for Unico's 2000 family of drives.

The document must be used in conjunction with the *2000 Family / Guide to Installation, Troubleshooting, and Maintenance*. Please refer to that manual for complete information on installing the drive. Information in this addendum supercedes that in the manual when using an 80 MHz Expandable Control Module.

What's covered

- *Safety Instructions*, discusses safety hazards and procedures
- Chapter 2, *Product Overview*, provides module specifications
- Chapter 3, *Electrical Installation*, describes the electrical connections

1.1.1 Intended Audience

The addendum is intended for anyone who will be installing, operating, or maintaining drive units using the 80 MHz Expandable Control Module. Installation should be performed by qualified electrical personnel to ensure that correct electrical practices and applicable electrical codes are applied.

The audience is expected to have a basic knowledge of physical and electrical fundamentals, electrical wiring practices and components, and electrical schematics.

Follow instructions

You can prevent injury and damage to the drive units or equipment by carefully following the procedures outlined in this document.

Follow regulations

All electrical work should conform to the National Electrical Code as well as all state and local government regulations. Please familiarize yourself with these regulations.

Read all manuals first

Read this addendum, together with both the *2000 Family / Guide to Installation, Troubleshooting, and Maintenance* and the application manual, in their entirety before installing drive units.

2 Product Overview

2.1 Specifications

Detailed control module specifications are provided in Table 2-1 through Table 2-6.

Table 2-1—Part Numbers

Component	Order Code	Part Number
Control Modules		
80 MHz Expandable Control Module	G00	322198
80 MHz Expandable Control Module (with right-angle current-regulator connector)	G00	322712

Table 2-2—Processor/Memory Specifications

Central processing unit:	56309 digital signal processor (DSP)
Clock frequency:	80 MHz
Data memory:	128 kilobyte battery-backed static RAM
Scratch pad memory:	1.5 megabyte high-speed RAM
Program memory:	3.0 megabyte flash EPROM

Table 2-3—Input/Output Specifications

Analog	
Inputs:	Three (3) 14-bit analog inputs (±10 V DC or 0 to 20 mA)
	Optional Analog Interface Module: Two (2) 16-bit analog inputs (±10 V DC)
Outputs:	Two (2) 12-bit analog outputs (±10 V DC)
	Optional Analog Interface Module: Two (2) 16-bit analog outputs (±10 V DC)
Digital	
Inputs:	Two (2) programmable isolated inputs
Outputs:	Two (2) programmable contact outputs (Form A contacts rated 250 V AC @ 5 A)
Configurable I/O:	16 or 32 optional isolated I/O points

Table 2-4—Serial Communication Specifications

Asynchronous (Console Port)	
Port:	RS-422/485, isolated, wire terminals
Baud rate:	Application dependent (up to 115.2 kbaud)
Protocol:	Application dependent
Asynchronous (SCI Port)	
Port:	RS-422/485, isolated, RJ-45 telephone jack
Baud rate:	Application dependent (up to 115.2 kbaud)
Protocol:	Application dependent
Synchronous (SSI)	
Port:	Fiber-optic for high-speed drive command
Channels:	Clock synchronization and data channels
Baud rate:	2 Mbaud
Synchronous/Asynchronous	
Port:	Fiber-optic for high-speed communication
Channels:	Clock synchronization and data channels
Baud rate:	Application dependent (up to 1 Mbaud)
Protocol:	Application dependent
Communication Modules	
Provision:	One (1) optional communication module provision
Modules:	Serial Communication Module: Two (2) RS-232/422/485 synchronous/asynchronous ports Fiber-Optic Communication Module: One (1) fiber-optic synchronous/asynchronous port One (1) RS-232/422/485 synchronous/asynchronous port Remote I/O Communication Module: Two (2) Remote I/O interfaces Modbus® Plus Communication Module: One (1) Modbus® Plus interface ControlNet™ Communication Module: One (1) ControlNet™ interface Profibus Communication Module: One (1) Profibus DP interface Ethernet Communication Module: One (1) Ethernet interface

Table 2-5—Feedback Interface Specifications

Built-in interface:	One (1) incremental encoder interface
Provision(s):	Two (2) optional feedback module provisions
Modules:	5 V incremental encoder interface
	5 V incremental encoder interface with repeater
	4 V resolver interface
	4 V dual resolver interface
	2 V resolver interface
	2 V dual resolver interface
	Serial absolute encoder interface
	15 V incremental encoder interface
	Asynchronous serial sincos encoder interface
	Synchronous serial sincos encoder interface
	2-input/2-output analog interface

Table 2-6—Built-In Incremental Encoder Interface Specifications

Power Supply	
Voltage:	5 V DC (±5%), isolated
External load:	480 mA maximum
Input Signals	
Channels:	Differential, A and B quadrature and marker
Required encoder output:	RS-422/RS-485 compatible
Allowable voltage:	±2.7 V maximum
Switching threshold voltage:	±2.4 V
Input current:	±5 to ±60 mA
Common mode voltage:	300 V maximum
Allowable quadrature error:	±36°
Input frequency:	750 kHz maximum (3 MHz after x4 multiplication)
Reference Input	
Signal:	Differential (RS-422/RS-485 compatible) or single-ended
Allowable voltage:	5 V maximum
Switching threshold voltage:	3 V
Input impedance:	100 Ω
Input current:	5 mA minimum
Common mode voltage:	300 V maximum
Test Point	
Analog velocity:	±10 V @ ±250 kHz (1 MHz after x4 multiplication)

3 Electrical Installation

3.1 Overview

This section explains the electrical installation of the control module. Since control signals vary from application to application, refer to the appropriate software documentation for specific wiring instructions. Additional information can be found in the *2000 Family / Guide to Installation, Troubleshooting, and Maintenance.*

3.2 Wiring Standards and Codes

The installation crew is responsible for following the wiring plan produced by the design engineer for the specific application. All wiring must conform to applicable local and national codes.

Attention

The supplier cannot assume responsibility for compliance or noncompliance to any code governing the proper installation of this unit. The following information is intended only as a guide for proper installation. All wiring must conform to the National Electrical Code (NEC), described in publication NFPA No. 70. Local codes may overrule this information.

3.3 Control Module Connections

The control module accepts a variety of analog and digital inputs and outputs, synchronous and asynchronous serial communications, and feedback signals. These control connections are made to either directly to the module or to optional feedback and communication modules that mount on the controller.

The general layout of the external connections to the module is shown in Figure 3-1 and discussed in the sections that follow. Table 3-2 identifies the connectors that plug into the module. Terminal specifications are given in Table 3-1. All wires should be copper with a rating of 167° F (75° C) or higher.

3.3.1 Wiring Precautions

Observe the following precautions when wiring control signals:

- When disconnecting wires from the screw terminals, completely loosen the screws before pulling out the wires
- Tie shields to Logic Common at one end only
- Twist differential (±) current input signals together

Figure 3-1—80 MHz Expandable Control Module (322-198 and 322-712)

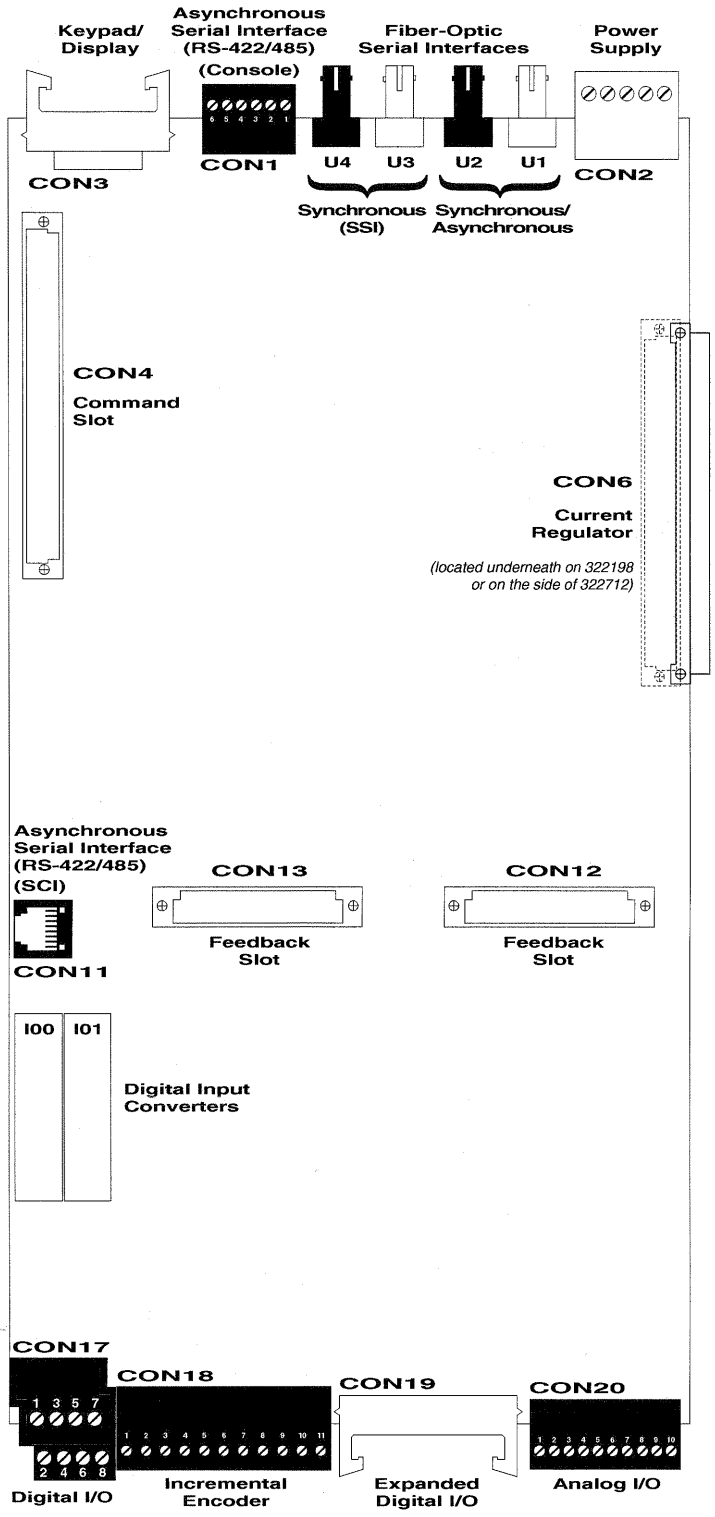


Table 3-1—Control Signal Terminal Specifications

Connector(s)	Acceptable Wire Sizes	Tightening Torque
	AWG (mm^2)	*in•lb (Nm)*
CON2	12 to 24 (3.3-0.21)	4.9 (0.55)
CON17, CON18	12 to 24 (3.3-0.21)	7.1 (0.80)
CON20	16 to 28 (1.3-0.09)	2.2 (0.25)

Table 3-2—Plug-In Connectors

Controller / Connector	Function
Keypad/Display Module	Connects the control module with the Keypad/Display Module that serves as the built-in operator interface.
Communication module slot	Accommodates a variety of communication modules that transfer data serially. For a list of communication modules, refer to Table 2-4.
Feedback module slot(s)	Accommodates the various optional feedback interface modules that provide position, speed, or analog feedback. The module has two feedback slots. For a list of feedback modules, refer to Table 2-5.
Digital I/O converter sockets	Accept the digital I/O converter modules that determine the voltage of the configurable input and output points. The module accepts two converters.
Current Regulator Module	Connects the control module to the Current Regulator Module, a separate module used only with the Expandable Control Module.
Expanded digital I/O	Allows a 16- or 32-bit digital I/O fanning strip to be added to expand the available I/O. Fanning strips use the same I/O converters as the control module.

3.3.2 Asynchronous Serial Connections

The control module provides two separate, optically isolated RS-422/485 serial ports for general asynchronous communications with other devices at up to 115.2 kilobaud. The Console Port uses a wired connection (refer to Table 3-3), while the SCI port uses an RJ-45 telephone jack (see Table 3-4). Specific connections, as well as the syntax of communication, known as the protocol, are discussed in the application manual.

The recommended serial interface connection is the four-wire RS-485. It allows a maximum number of 32 devices on one multidrop serial link. RS-485 uses differential inputs and is, therefore, more immune to noise than single-ended systems such as RS-232. RS-485 can also tolerate higher common-mode voltage levels, thereby allowing it to operate over long distances. The maximum wire length is about 3,900 ft. (1,200 m).

Figure 3-2—Asynchronous Serial Connections

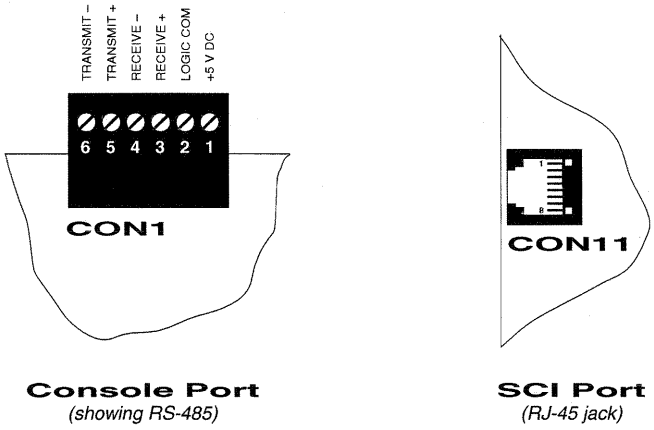


Table 3-3—Asynchronous Serial Connections (Console Port)

Terminal	Signal	Description
1	+5 V DC	Logic power supply for the interface. The interface is not isolated, so this is also the same +5 V DC that powers the drive unit. This terminal can also be used to connect a pull-up resistor in a multidrop network.
2	Logic Common	Logic Common for the interface. It is optically isolated and floats relative to earth ground. With an RS-485 device, connect to the logic common of the external device. When drive units are bussed together as a network, connect the Logic Commons of all drive units to keep the common-mode voltage between them within the –7 V to +12 V specification of RS-485. This terminal can also be used to connect a pull-down resistor in a multidrop network.
3 4	Receive Data (+) Receive Data (–)	Differential signal that passes data into the receiver of the interface.
5 6	Transmit Data (+) Transmit Data (–)	Differential signal that transmits data to the receiving device.

Table 3-4—Asynchronous Serial Pinout (SCI Port)

Pin	Description
1	+5 V DC
2	+5 V DC
3	Receive (+)
4	Receive (–)
5	Transmit (–)
6	Transmit (+)
7	Logic Common
8	Logic Common

3.3.3 Synchronous Serial Interface (SSI) Connections

The control module provides a fiber-optic synchronous serial interface (SSI) for slaving together multiple axes (see Figure 3-3). The SSI protocol is a proprietary protocol that provides accurate communication at high speeds. A master controller generates commands that can be received by multiple slave controllers. The sample clock can also be passed between master and slave(s) for precise time and position synchronization in multiaxis systems.

Interconnection of the fiber-optic signals varies from application to application. In general, the transmit port of the master should be connected to the receive port of the slave and vice versa. Please refer to the application manual for installation instructions and required software settings.

3.3.4 Fiber-Optic Synchronous/Asynchronous Serial Connections

A fiber-optic synchronous/asynchronous serial communications interface is also provided for high-speed data communications (see Figure 3-3).

Interconnection of the fiber-optic signals varies from application to application. In general, the transmit port of the master should be connected to the receive port of the slave and vice versa. Please refer to the application manual for installation instructions and required software settings.

Figure 3-3—Fiber-Optic Serial Connections

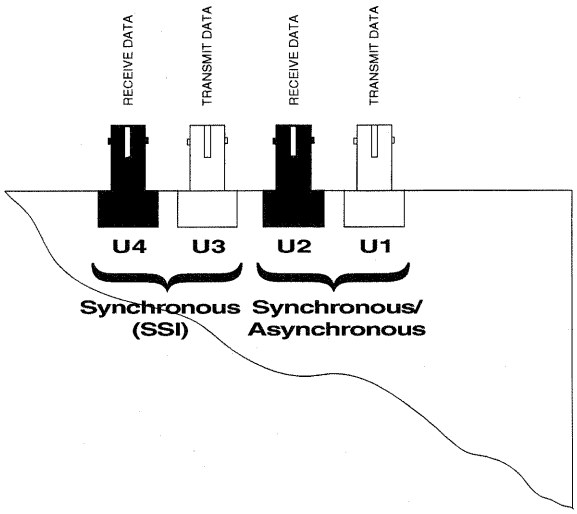


Table 3-5—Fiber-Optic Serial Connections

Connector	Signal	Description
Synchronous/Asynchronous Serial Communications		
U1 U2	Transmit Data Receive Data	Fiber-optic synchronous/asynchronous serial communication signals.
Synchronous Serial Communications (SSI)		
U3 U4	Transmit Data Receive Data	Fiber-optic synchronous serial drive command signals.

3.3.5 Analog I/O Connections

The control module provides three ±10 V DC or 0 to 20 mA inputs and two ±10 V DC outputs. Inputs have 14 bits of resolution and are differential, providing for some common-mode voltage rejection to eliminate ground loops. Outputs have 12 bits of resolution and are referenced to the signal common of the control module. The functionality of each of these signals is determined by the application software.

Figure 3-4—Analog I/O Connections

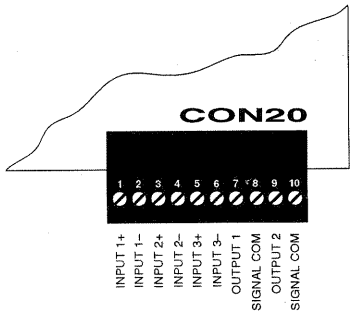


Table 3-6—Analog I/O Connections

Terminal	Signal	Description
1 2	Analog Input 1 (+) Analog Input 1 (–)	Differential analog input 1. *0 to ±10 V DC or 0 to 20 mA* *Input impedance: 400 kΩ or 500 Ω* *To convert to 0 to 20 mA, install a 500 Ω resistor between the terminals.*
3 4	Analog Input 2 (+) Analog Input 2 (–)	Differential analog input 2. *0 to ±10 V DC or 0 to 20 mA* *Input impedance: 400 kΩ or 500 Ω* *To convert to 0 to 20 mA, install a 500 Ω resistor between the terminals.*
5 6	Analog Input 3 (+) Analog Input 3 (–)	Differential analog input 3. *0 to ±10 V DC or 0 to 20 mA* *Input impedance: 400 kΩ or 500 Ω* *To convert to 0 to 20 mA, install a 500 Ω resistor between the terminals.*
7	Analog Output 1	Analog output 1. *0 to ±10 V DC* *Maximum output: 10 mA*
8	Signal Common	Not isolated (is also Signal Common for the drive unit). Provided as a reference voltage for Analog Output 1.
9	Analog Output 2	Analog output 2. *0 to ±10 V DC* *Maximum output: 10 mA*
10	Signal Common	Not isolated (is also Signal Common for the drive unit). Provided as a reference voltage for Analog Output 2.

3.3.6 Digital I/O Connections

The control module provides a number of digital I/O points that can be tailored to an application by installing appropriately rated AC or DC input or output converter modules.

The module provide two inputs and two relay outputs on the module itself and accepts up to 16 or 32 configurable I/O points using an optional fanning strip that mounts beneath 2400, 2420, or 2450 units.

I/O capabilities are summarized in Table 3-7. The application software determines the functionality of each input and output. Refer to the application documentation for specific information on programming these signals. Table 3-8 lists available I/O converters and their voltage ranges. The layout of the on-board digital I/O is shown in Figure 3-5. The layout of fanning strip I/O is shown in Figure 3-6 through Figure 3-8.

Table 3-7—Digital I/O Summary

Bit	Inputs/Outputs
Inputs	
I00 I01	Input converters (mount on module; see Figure 3-5)
Outputs	
O00 O01	Dry-contact relays (on-board module; see Figure 3-5) *Form A contacts rated 250 V AC @ 5 A*
Configurable I/O Points	
C00-C15	Input, output, or relay converters (mount on separate 16-bit or 32-bit I/O fanning strip; see Figure 3-6 through Figure 3-8)
C16-C31	Input, output, or relay converters (mount on separate 32-bit I/O fanning strip; see Figure 3-7 and Figure 3-8)

Table 3-8—I/O Converter Modules

Part Number	Device	Voltage Range
912688	Input converter	90 to 140 V AC
919808	Input converter	180 to 280 V AC
913108	Output converter	12 to 140 V AC
919809	Output converter	180 to 280 V AC
913109	Input converter	2.5 to 28 V DC
913110	Output converter	5 to 60 V DC
915282	Normally open relay	0 to 30 V DC, 0 to 250 V AC
921332	Normally closed relay	0 to 30 V DC, 0 to 250 V AC

Figure 3-5—On-Board Digital I/O

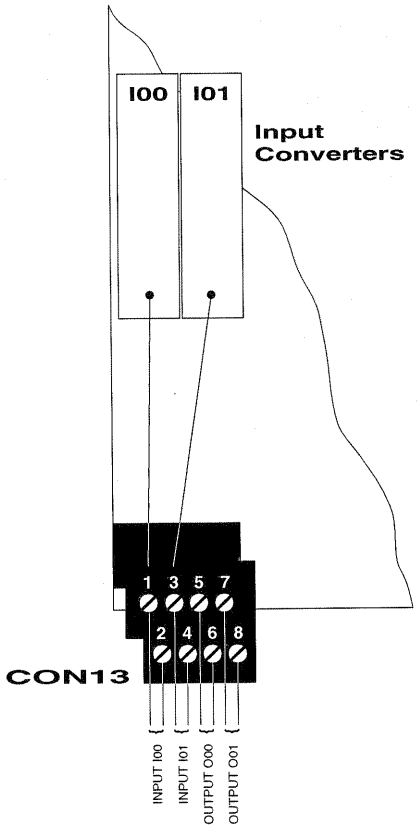


Figure 3-6—16-Bit Fanning Strip Expanded Digital I/O (320102)

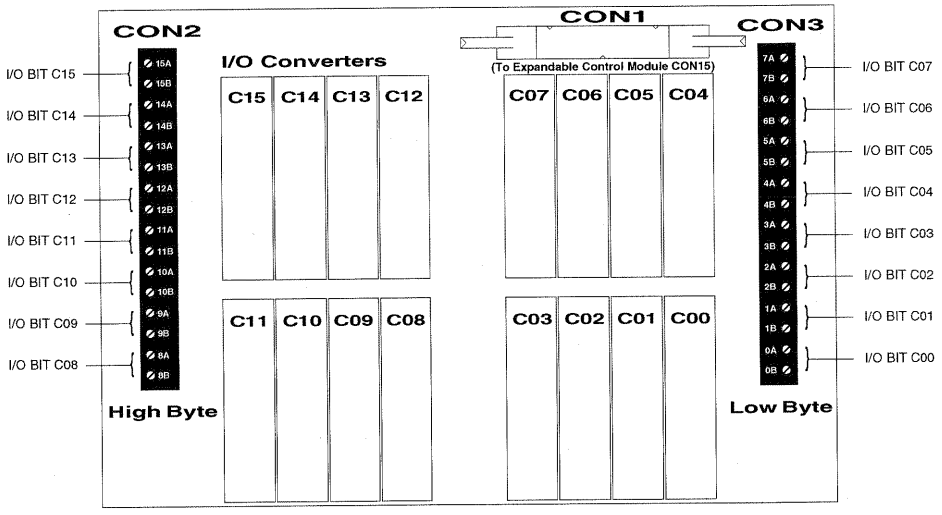


Figure 3-7—32-Bit Fanning Strip Expanded Digital I/O (320146)

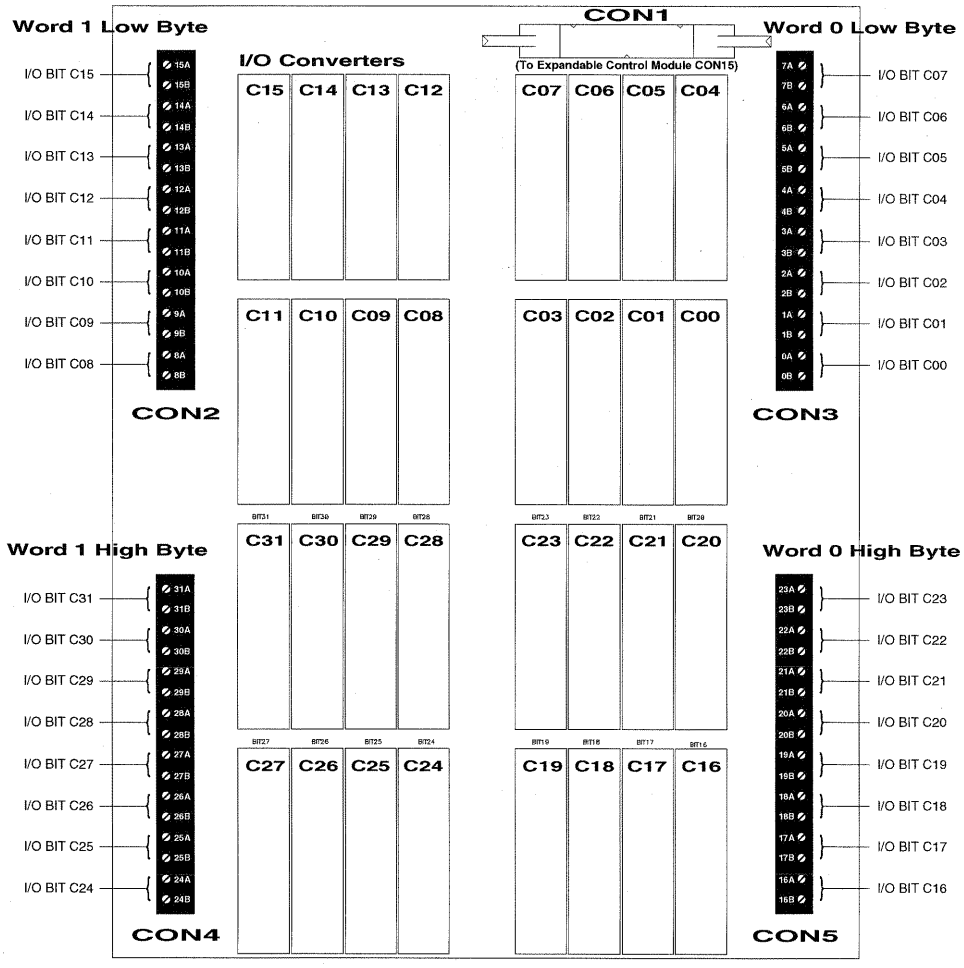
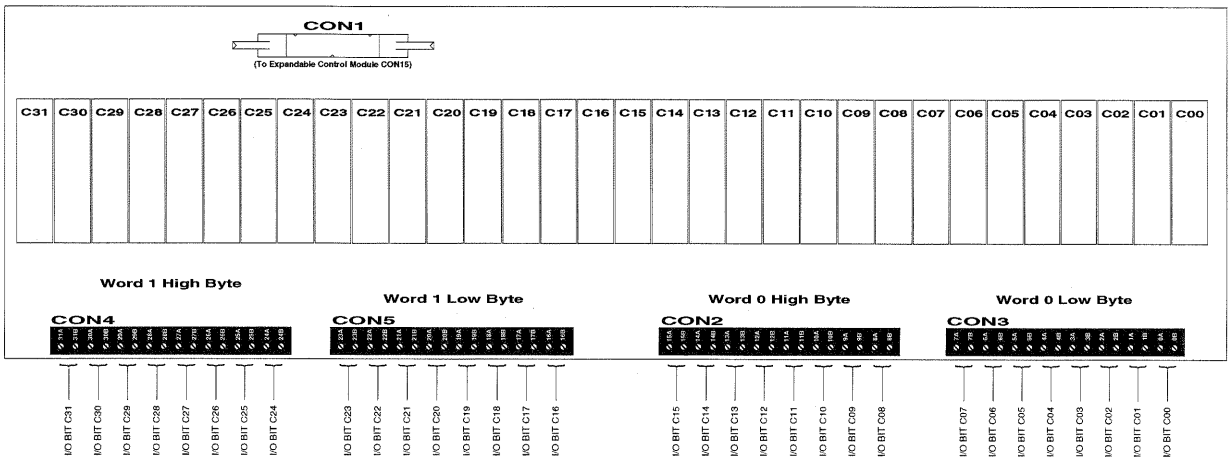


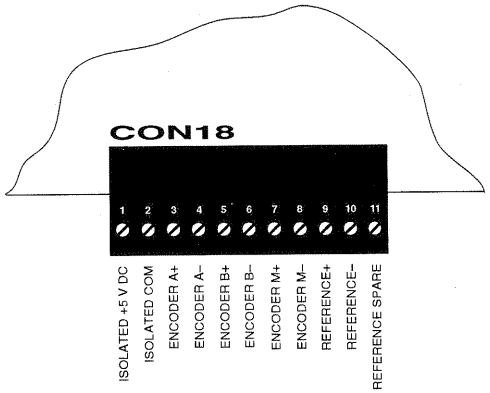
Figure 3-8—32-Bit Fanning Strip Expanded Digital I/O (319437)



3.3.7 Incremental Encoder Interface Connections

The control module has a built-in incremental encoder interface. Refer to the *2000 Family / Guide to Installation, Troubleshooting, and Maintenance* for connection descriptions and wiring diagrams.

Figure 3-9—On-Board Incremental Encoder Connections



3.4 Feedback Modules

A variety of optional feedback interface modules are available for providing closed-loop control of motor velocity and/or position or for obtaining machine or material feedback. These modules mount on the control module. The module accepts two interfaces in addition to its built-in incremental encoder interface. Refer to the *2000 Family / Guide to Installation, Troubleshooting, and Maintenance* for connection information.

3.5 Communication Modules

A variety of optional communication modules is available for interfacing the drive with external devices using popular communication protocols. The module accepts a single communication module. Refer to the *2000 Family / Guide to Installation, Troubleshooting, and Maintenance* for further information.

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