

# **XtraDrive SERIES AC SERVO DRIVER**

## **XtraDrive-DP Embedded PROFIBUS**

### **User Manual**



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# About This Manual

This manual is intended for users who want to easily integrate the XtraDrive-DP system into a PROFIBUS network. It explains how to connect XtraDrive-DP to a PROFIBUS network and how to use standard tools to set up the behavior and functionality of the XtraDrive-DP on the PROFIBUS network.

This manual contains the following chapters:

- ◆ **Chapter 1, Introducing XtraDrive-DP**, describes the XtraDrive-DP servo driver and provides an introduction to PROFIBUS networking.
- ◆ **Chapter 2, Installing XtraDrive-DP**, describes how to connect XtraDrive-DP to PROFIBUS.
- ◆ **Chapter 3, Working with XtraDrive-DP**, describes the process of setting up and configuring XtraDrive-DP to work on a PROFIBUS network.
- ◆ **Appendix A, XtraDrive-DP GSD File**, provides a link to the most updated GSD file.
- ◆ **Appendix B, XtraDrive-DP Parameters List**, provides a list of configurable XtraDrive-DP parameters.
- ◆ **Appendix C, XtraDrive-DP Alarms, Warnings and Faults**, provides a list of system errors.
- ◆ **Appendix D, Working with XtraWare**, provides an overview of the PC-based XtraWare software.
- ◆ **Appendix E, Example of Using XtraDrive-DP**, describes how to set up and control an XtraDrive-DP slave. The DP configuration tool used in this example is the S7 SIMATEC Manager.

## **Related Documents**

The following books provide additional information:

- ◆ *XtraDrive User Manual*, Catalog No. 8U0108
- ◆ *XtraWare User's Manual*, Catalog No. 8U0109
- ◆ *XtraDrive Short Form Installation Guide*, Catalog No. 8U0107

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# Safety Precautions

In this manual, safety precautions are classified as WARNING or CAUTION. It is extremely important that you pay close attention to these precautions.

The following symbols are used:



## WARNING

---

Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious personal injury.

---



## CAUTION

---

Indicates a potentially hazardous situation, which, if not avoided, could result in minor or moderate personal injury and/or damage to the equipment. In some instances, items described in a CAUTION could also result in a serious accident.

---

Read the following safety precautions thoroughly before installation, operation, maintenance or inspection of the XtraDrive-DP.

## Installation



### WARNING

---

After voltage resistance testing, wait at least five minutes before servicing the product.

*Failure to observe this warning could result in electric shock.*

---



### CAUTION

---

Never use the equipment near flammable materials, or where it may be exposed to splashes of water or corrosive or flammable gases.

*Failure to observe this caution could result in electric shock or fire.*

---

## Wiring



### WARNING

---

XtraDrive grounding must be in accordance with the national code and consistent with sound local practices.

*Failure to observe this warning could result in electric shock or fire.*

---





## CAUTION

---

Do not connect three-phase power supply to XtraDrive output terminals U, V, and W.

*Failure to observe this caution could result in personal injury or fire.*

---

Securely tighten screws on the terminal block and ground terminals of power input and motor connections.

---

When using a 400V XtraDrive, the amount of current leaking from the power line increases. Therefore, use cables and isolation materials rated for 400V, and keep the wires as short as possible.

---

# Inspection and Maintenance



## WARNING

---

Be sure to turn power OFF before inspection or maintenance.

*Failure to observe this warning could result in electric shock.*

---

Never open the terminal cover while power is ON, and never turn power ON when the terminal cover is open.

*Failure to observe this warning could result in electric shock.*

---

After turning power OFF, wait at least five minutes before servicing the product.

*Failure to observe this warning could result in residual electric charges causing electric shock.*

---



## CAUTION

---

Never change wiring while power is ON.

*Failure to observe this warning could result in electric shock or personal injury.*

---

## Receiving



### CAUTION

---

Use the specified combination of servomotor and XtraDrive.

*Failure to observe this caution could result in fire or equipment failure.*

---

## Operation



### CAUTION

---

To avoid accidents, perform a test run of the servomotor with no load.

*Failure to observe this caution could result in personal injury.*

---

Before starting operation with a load connected, set up user constants suitable for the machine.

*Failure to do so could result in overrun failure. When the load moves vertically, incorrect setting of the user constants may cause the load to fall.*

---

Before starting operation with a load connected, make sure emergency-stop procedures are in place.

*Failure to observe this caution could result in personal injury.*

---

During operation, do not touch the XtraDrive's heat sink.

*Failure to observe this caution could result in burns.*

---

Motor overload protection is internally provided. For further information, refer to the *XtraDrive User Manual*, Catalog No. 8U0108.

---

# General Precautions

To ensure safe application, the following must be noted:

- ◆ The drawings presented in this manual are sometimes shown without covers or protective guards. Always replace the cover or protective guard as specified first, and then operate the products in accordance with the manual.
- ◆ The drawings presented in this manual are typical examples and may not match the product you received.
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# Chapter 1

## Introducing XtraDrive-DP

### About This Chapter

This chapter provides a brief overview of XtraDrive-DP and its use on a PROFIBUS network.

- ◆ **What is XtraDrive?**, page 2, provides a brief introduction to XtraDrive-DP.
- ◆ **Product Overview**, page 4, provides a list of XtraDrive-DP and PROFIBUS specifications.
- ◆ **Introduction to PROFIBUS**, page 9, provides an introduction to PROFIBUS.
- ◆ **Parameterization**, page 11, provides an overview of the Parameterization stage.
- ◆ **Configuration**, page 12, provides an overview of the Configuration stage.
- ◆ **Data Exchange**, page 12, provides an overview of the data exchange stage.
- ◆ **GSD File**, page 13, provides a brief description of the GSD files.

# What is XtraDrive?

XtraDrive is a family of state-of-art, high-precision AC servo drivers. XtraDrive is based on a unique proprietary control technology, offering solutions for the most demanding applications.

XtraDrive characteristics include:

- ◆ Advanced servo control
  - ❖ High-precision During Movement (NCT Algorithm)
  - ❖ Oscillation Canceling Algorithm (OCA)
- ◆ Automatic tuning of servo parameters for optimal setting time
- ◆ Integrated positioner by various programmable motion profile modes
- ◆ 1.5 Axis (Master-Slave with automatic offset correction)
- ◆ Two analog inputs for general purpose usage
- ◆ Network connectivity

## **XtraDrive with Embedded PROFIBUS (XtraDrive-DP)**

XtraDrive-DP provides all the benefits of working with the XtraDrive family of products, while running on PROFIBUS network.

XtraDrive-DP uses PROFIBUS' standard diagnostic features to provide continuous diagnostics, as well as driver status and information about runtime error in motion commands.

XtraDrive-DP has PROFIBUS product certification according to EN 50170 and IEC 61158.

As XtraDrive-DP has the same parameter set, system variables, motion commands and programming functions as the rest of the XtraDrive family, it functions in a familiar and easy to-use manner. Refer to the XtraDrive and XtraWare User Manuals for detailed information about using XtraDrive.

Even when XtraDrive is connected to a network, you can use XtraWare for tuning, oscilloscope functions, program editing and program download. Refer to the *XtraWare User's Manual* for detailed information about the XtraWare software.

# Product Overview

Below are the specifications for the XtraDrive-DP and the PROFIBUS interface.

## XtraDrive-DP Specifications

Servo motor capacity (kW)	0.5 1.0 1.5 2.0 3.0
Voltage	3-Phase 400 VAC
Command input	PROFIBUS, Analog, pulse train
Integrated positioner	Various programmable motion profile modes
Encoder I/F	A/B (Z) encoder, serial encoder: 13, 16 or 17 -bit (incremental/absolute value)
Protection functions	Overcurrent, overvoltage, undervoltage, overload, regeneration error, main circuit voltage error, heat sink overheat, overspeed, encoder error overrun, parameter error
Digital inputs	7
Digital outputs	7
Analog input	2 at +/- 10 VDC at rated torque
Analog output	2 at +/- 10 VDC at rated torque
Speed control range	1 to 6500 rpm
Speed-voltage regulation	Rated voltage +/- 10%: 0% (at rated speed)
Speed-load regulation	0-100% load: 0.01% max. (at rated speed)



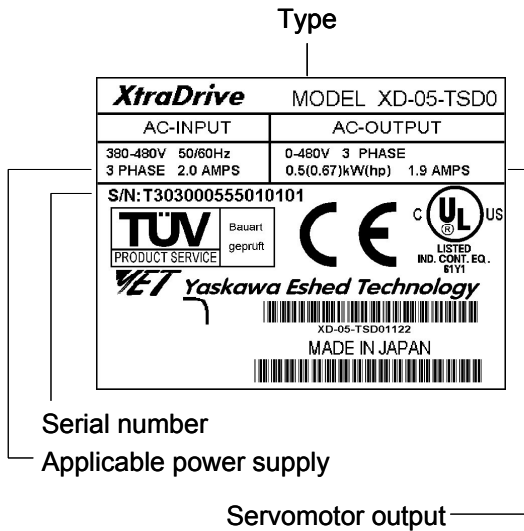
External torque limitation	Input voltage +/- 12 V max.
Ambient/storage temperature	0-55° C/ -20 to -85° C
Ambient/storage humidity	90% or less (with no condensation)
Dimensions for 400W model 0.5, 1.0, 1.5 kW	LxWxH 180x110x160
Dimensions for 400W model 2, 3 kW	LxWxH 180x110x250

## PROFIBUS Interface Specifications

Maximum Expansion	126 stations max.		
Communication	RS-485		
Auto-configuring	GSD file		
PROFIBUS Profile	DP		
PROFIBUS Port	9-pin D-shell		
Node Address	0-125 decimal Set by rotary switches (2 digit hex number)		
Segment distance	100 meters (327 feet) to 1200 meters (3270 feet)		
Baud Rate	Selectable from 9.6 kbps to 12 Mbps		
LED Indicators: BF - Bus failure SF - System failure	BF	Green	Data exchange
		Red	No communication
		Blinking Red	Communication but not in data exchange
	SF	Off	Everything OK
		Red	System failure
		Blinking Red	Warning or alarm

## Nameplate

A nameplate is attached to each XtraDrive-DP, providing the drive's model number and other product information. The information from this nameplate is used, for example, when placing orders for XtraDrive-DPs.

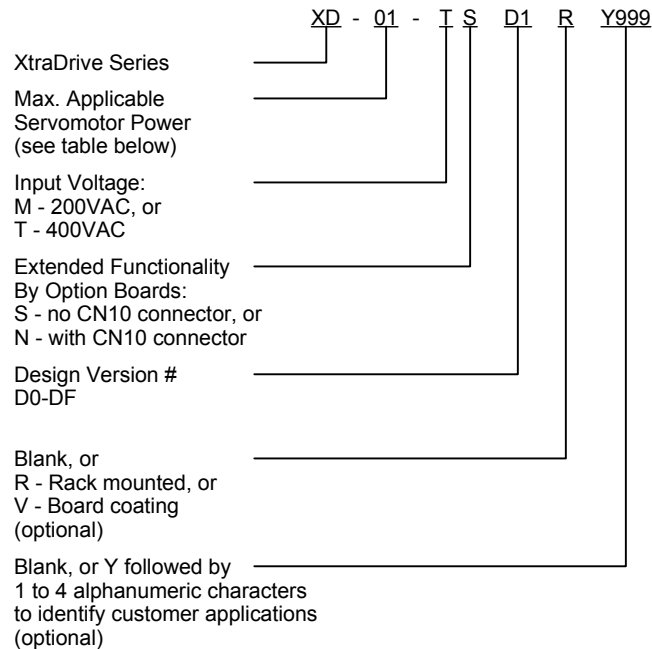


The following information is included on the nameplate:

- ◆ Serial number
- ◆ Applicable power supply
- ◆ Servomotor output

## Type Description

This section specifies the model type information for each XtraDrive-DP.



Output Capacity Code	Max. Applicable Servomotor Power (kW)
05	0.50
10	1.0
15	1.5
20	2.0
30	3.0

# Introduction to PROFIBUS

PROFIBUS (Process Field Bus) is a vendor-independent, open-field bus standard used in a wide variety of industries, including manufacturing, process and building automation. Many certified PROFIBUS products are available, including sensors, motor drives and starters, PLCs, remote I/O systems, and so on.

There are three types of PROFIBUS products:

◆ **Fieldbus Message Specification (FMS)**

This version is designed as a general-purpose solution for communication tasks at the cell level, and can also be used for extensive and complex communication tasks.

◆ **Process Automation (PA)**

This version is designed for process automation. It permits sensors and actuators to be connected on one common bus line. This version can be used for data communication and power over the bus using 2-wire technology according to IEC 1158-2.

◆ **Decentralized Periphery (DP)**

This version is designed for communication between automation control systems and distributed I/O at the device level. This version can be used in place parallel signal transmission with 24V or 0 to 20 mA.

## PROFIBUS-DP

PROFIBUS-DP is a master/slave communication profile, which allows up to 126 stations on each bus. These stations perform connection-oriented communication and have a transmission rate of up to 12 Mbps. The length of the messages between the master and slave is up to 256 bytes. Information transferred from the master to the slave is called *Output*, and information transferred from the slave to the master is called *Input*.

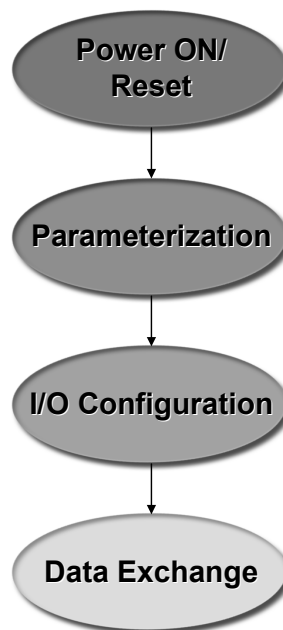
PROFIBUS allows:

- ◆ Peer-to-peer (user data communication) or multicast (control commands)
- ◆ Cyclic master/slave user data communication
- ◆ Control commands which allow synchronization of I/O

During integration of the XtraDrive-DP to the PROFIBUS network, you set up the data types and parameter values that will be transferred over the network, and then transfer this information to the master. The master then uses this information to control the XtraDrive-DP during data exchange.

This process is composed of four steps:

- ◆ **Power ON/Reset** - In this step communications are initialized between the XtraDrive-DP and the PROFIBUS network.
- ◆ **Parameterization** - In this step the parameters that you have chosen to determine XtraDrive-DP's behavior and operation are downloaded to the XtraDrive-DP slave. More detail is provided on page 11.
- ◆ **I/O Configuration** - In this step the structure of the input and output data that will be transferred between the master and the XtraDrive-DP during data exchange is downloaded to the XtraDrive-DP slave. More detail is provided on page 12.
- ◆ **Data Exchange** - In this step cyclic exchange of data and slave diagnostics is performed.



## Parameterization

During the Parameterization stage, the master downloads PROFIBUS bus parameters and XtraDrive parameters to the XtraDrive-DP. Parameterization needs to be performed only once, when the XtraDrive-DP is powered on, or after a power failure or other system restart.

The first seven bytes of a parameterization message are standard for all PROFIBUS slaves. Among other information, these first seven bytes include:

- ◆ Response monitoring time - control time for bus activity to the slave
- ◆ TSDR - minimum slave response time
- ◆ Freeze/Sync mode
- ◆ Lock or unlock slave for this master
- ◆ Master address
- ◆ Ident number - identification number for verification

Bytes 8-244 can contain additional user-defined parameters specifically for the XtraDrive-DP. Refer to *XtraDrive-DP Parameters* in *Chapter 3, Working with XtraDrive-DP* for further details.

Using a PROFIBUS DP configuration tool, you select the desired module's parameters and values. (Refer to *Appendix B, XtraDrive-DP Parameters List*, for a list of all available XtraDrive-DP parameters. Refer to *Appendix E, Example of Using XtraDrive-DP* for an example of how to use the S7 SIMATIC Manager to set up, parameterize and configure an XtraDrive-DP to work on a PROFIBUS network.)

### NOTE:



After the parameterization stage, the XtraDrive-DP resets its servo circuit.

## Configuration

In the Configuration stage, you define the structure of the input and output messages that will be transmitted between the master and XtraDrive-DP during data exchange. Inputs and outputs include XtraDrive-DP system variables, physical I/O state, flags and motion commands. This stage is performed using a PROFIBUS DP configuration tool.

This information will later be downloaded to the XtraDrive-DP slave during the Configuration stage. Configuration is also performed only once, after Parameterization, when the XtraDrive-DP is powered on, or after a power failure or other system restart.

XtraDrive-DP's I/O configuration modules are all contained in the GSD file that you loaded into the PROFIBUS DP configuration tool.

## Data Exchange

During the data exchange stage the master reads inputs from the XtraDrive-DP and writes outputs to the XtraDrive-DP. These inputs and outputs are determined according to what you have defined during the Configuration stage.



## GSD File

Every product that runs on a PROFIBUS network has a GSD file (device data file) associated with it. The GSD file contains a superset of all the parameters available for a particular product. It also describes the data that can be transmitted between the master and slave during data exchange.

The information provided in a GSD file has a precisely defined format, which enables the PROFIBUS DP configuration tool to automatically use this information when configuring the bus system.

The GSD file is loaded only once, at the beginning of the setup process. Refer to *Appendix E, Example of Using XtraDrive-DP* for a complete example of how to use a PROFIBUS DP configuration tool. Information can also be downloaded from PROFIBUS' website: [www.profibus.com](http://www.profibus.com). A copy of the most updated GSD file (YETM07AA.GSD) for the XtraDrive-DP can be downloaded from YET's website: [www.yetmotion.com](http://www.yetmotion.com) or from [www.profibus.com](http://www.profibus.com).



## Chapter 2

# Installing XtraDrive-DP

### About This Chapter

This chapter describes how to connect an XtraDrive-DP to a PROFIBUS network. It provides a brief description of PROFIBUS network architecture, and gives instructions for setting the node address of each XtraDrive-DP.

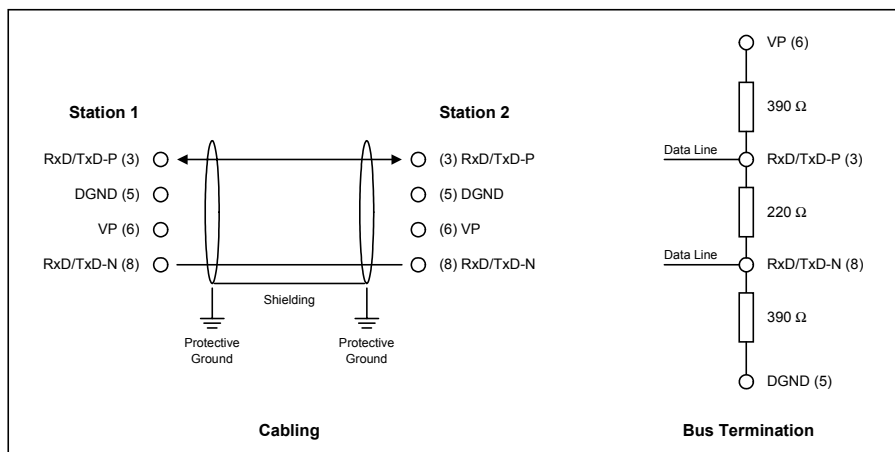
## Connecting an XtraDrive-DP

XtraDrive-DP servo drives are connected to a PROFIBUS network via a standard RS-485 communication cable.

For information on how to connect other XtraDrive series products to peripheral devices, as well as for examples of main circuit wiring and I/O signal connections, refer to *Chapter 3, Wiring* in the *XtraDrive User Manual*.

## The PROFIBUS Network

PROFIBUS devices are connected in a bus structure. Up to 32 stations (master or slaves) can be connected in one segment, and multiple buses may be connected if line amplifiers are used. The bus has an active bus terminator at the beginning and end of each segment. To ensure error-free operation, both bus terminations must always be powered up.



When more than 32 stations are used, repeaters (line amplifiers) must be used to connect the individual bus segments.

The maximum cable length depends on the transmission speed and cable type (see Table 2). The specified cable length can be increased by the use of repeaters. The use of more than three repeaters in series is not recommended.

## Electrical Characteristics

The following table provides electrical characteristics for network communication cables.

**Table 1: Line Parameters**

Parameter	Line A	Line B
<b>Impedance</b>	135 ...165 W (3 to 20 Mhz)	100 ...130 W (f >100kHz)
<b>Capacity</b>	<30 pF/m	<60 pF/m
<b>Resistance</b>	<110 W /km	-
<b>Wire gauge</b>	>0,64 mm	>0,53 mm
<b>Conductor area</b>	>0,34 mm	>0,22 mm

## Transmission Line Lengths

The following table shows the cable lengths to be used at different transmission speeds.

**Table 2: Line Lengths for Different Transmission Speeds**

Baud rate (kbit/s)	9.6	19.2	93.75	187.5	500	1500	3000-12000
Length line A (m)	1200	1200	1200	1000	400	200	100
Length line B (m)	1200	1200	1200	600	200	-	-

## Connection Cables

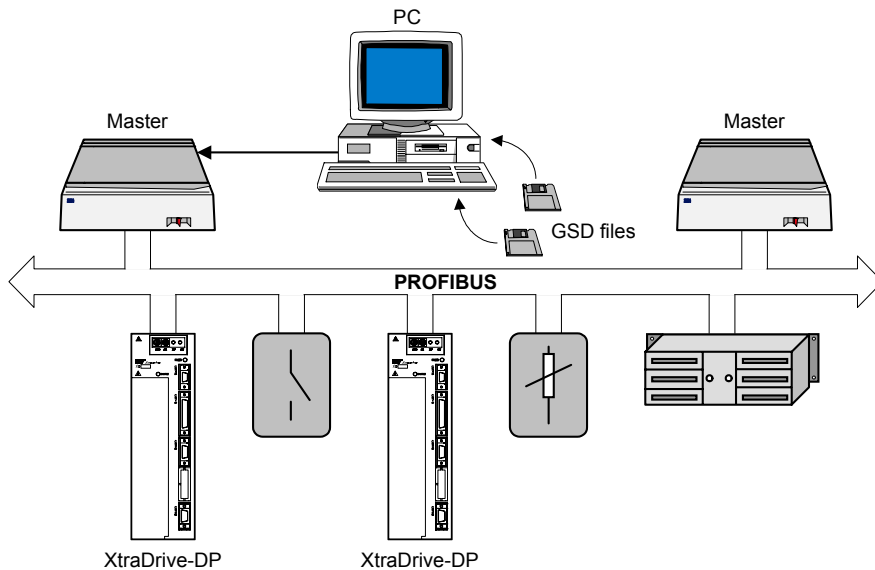
The following are examples of cables that may be used to connect XtraDrive-DP to a PROFIBUS network:

- ◆ Desina - PROFIBUS cable - Catalog no. 3DRX 22X 02R
- ◆ Siemens - PROFIBUS cable - Catalog no. V45467-G16-C85-G1

# Connecting XtraDrive-DP to a PROFIBUS Network

## Overview

The diagram below shows a typical configuration of XtraDrive-DPs on a PROFIBUS network.



A typical configuration consists of the following components:

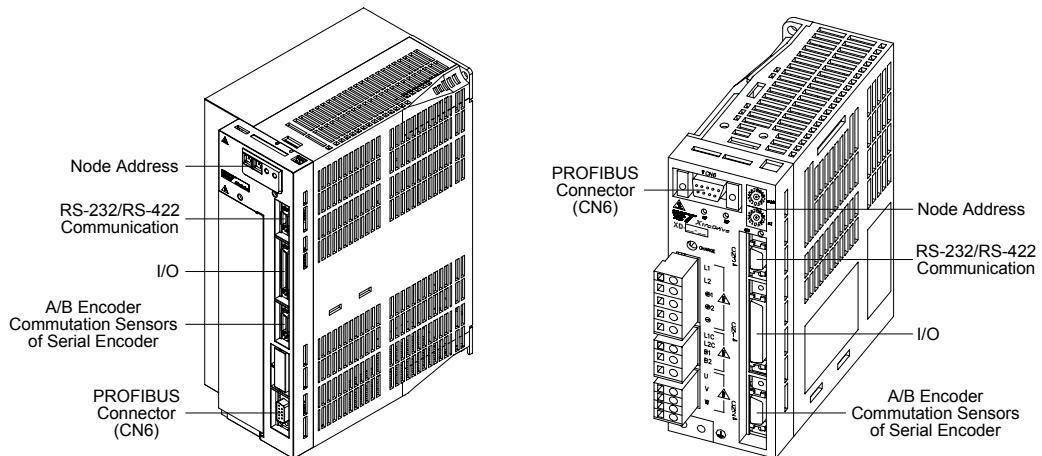
- ◆ Using a PC-based configuration tool, you create a project containing parameterization and configuration information for the XtraDrive-DP, which is then downloaded to a master.
- ◆ A master receives this information from a PC and then uses it to control the activity of the XtraDrive-DP slaves.

- ◆ XtraDrive-DP slaves receive commands from the master and produce data that are sent back to the master. Information is continuously and cyclically transmitted between the master and the XtraDrive-DP over the PROFIBUS network during data exchange.
- ◆ Other types of slaves may be connected to the PROFIBUS network as well.

## PROFIBUS Connection Port (CN6)

Use a 9-pin D-sub connector to connect to a PROFIBUS network, using RS-485 communications.

The diagrams below show the various connection ports on an XtraDrive-DP. The placement of the various ports varies on different models. However, the PROFIBUS connection port is always labeled CN6.

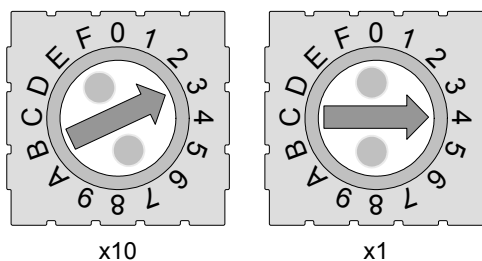


For information about other connections on the XtraDrive-DP, refer to the *XtraDrive User Manual*.

## Setting the Node Address

The second stage of the installation process is setting the node address.

Set the PROFIBUS node address by rotating the rotary switches located on the front of the XtraDrive-DP. Use a small flat screwdriver to set the switches to an available node address, from 0 to 125. Note that x10 represents the hexadecimal sixteens place (MSB) and x1 represents the units place (LSB). For example, to set a node address of 52, you should set rotary switches to 34 Hex, meaning that the MSB dial (x10) should be turned to 3 and the LSB dial (x1) should be turned to 4.



The status of the node address rotary switches is only read immediately after power on. You should take note of this fact when changing the node address.



## LED Indicators

The front of the XtraDrive-DP contains two LEDs that indicate the XtraDrive-DP's status. One of the LEDs displays bus information and the other displays system information.

Each of the LEDs can have three states.

- ◆ System failure LED
  - ❖ When the LED is green, no system failure has occurred.
  - ❖ When the LED is red, a system failure has occurred.
  - ❖ When the LED is blinking red, a warning or alarm has occurred.



**NOTE:**

If the system failure LED indicates that a warning message or alarm has been received, refer to the *XtraDrive User Manual* for further information.

- ◆ Bus failure LED
  - ❖ When the LED is green, data exchange is taking place.
  - ❖ When the LED is red, no communication is taking place.
  - ❖ When the LED is blinking red, communication is taking place but the XtraDrive-DP is not performing data exchange.



# Chapter 3

## Working with XtraDrive-DP

### About This Chapter

This chapter discusses the main stages of working with XtraDrive-DP on a PROFIBUS network, the various types of parameters that can be set and diagnostics available for XtraDrive-DP.

- ◆ **Overview**, page 24, provides an introduction to XtraDrive-DP functionality and how it fits into a PROFIBUS network.
- ◆ **Setting Up XtraDrive-DP**, page 25, describes the major steps involved in setting up, parameterizing and configuring a PROFIBUS network.
- ◆ **Sending Commands**, page 33, describes the steps to follow in order to send commands during data exchange.
- ◆ **Setting XtraDrive-DP Parameters**, page 37, describes three different methods for setting parameters on the XtraDrive-DP.
- ◆ **Reading Variables**, page 39, describes how to define variables that that will be used to transmit data during data exchange.
- ◆ **Downloading XtraDrive-DP Programs**, page 40, provides two methods for downloading programs to an XtraDrive-DP.

- ◆ **Starting Program Synchronization**, page 41, describes how to synchronize the starting of programs on multiple XtraDrive-DP slaves.
- ◆ **Diagnostics**, page 42, describes the structure of alarm, warning and error messages from XtraDrive-DP.

## Overview

In order to take advantage of PROFIBUS network functionality, the XtraDrive-DP must be configured in a specific way. Firstly, a GSD file is installed via a PROFIBUS DP configuration tool, enabling access to all the parameters associated with the XtraDrive-DP. Once the GSD file has been installed, by selecting the required module, you define a set of parameters and/or the data exchange I/O structure to be used.

# Setting Up XtraDrive-DP

## Installing GSD Files

The first step in setting up an XtraDrive-DP is to install its associated GSD file, according to the requirements of the configuration tool you are using.

## Using Modules to Set Up XtraDrive-DP

The next step is to select the XtraDrive-DP modules that will be used in your application.

The XtraDrive GSD file (YETM07AA.GSD) provides a list of modules you can choose to setup the XtraDrive-DP for specific applications.

During this stage, you use a standard configuration tool to set the parameters and determine the structure of the data that is transferred during data exchange. Later, these parameters are sent to the XtraDrive-DP during the parameterization and configuration stages.

The following modules are used for setting up applications:

- ◆ System Setup (mandatory), page 26
- ◆ Digital I/O, page 26
- ◆ Command, page 27
- ◆ XtraDrive Status, page 28
- ◆ System Profile, page 29
- ◆ Pulse-Train Input, page 29
- ◆ Speed Control (Analog Reference), page 30

- ◆ Torque Control (Analog Reference), page 30
- ◆ Position Variables, page 30
- ◆ Speed Variables, page 31
- ◆ Torque Variables, page 31
- ◆ Get Parameters, page 32

The order of the fields in each module is fixed, but the placement of the module changes according to your definitions.

For a detailed explanation of variables and commands, refer to the *XtraWare User's Manual*.

## **System Setup**

This module determines the XtraDrive-DP's mode of operation. Selecting this module is mandatory.

The system setup parameters are:

- ◆ Control method
- ◆ Stop mode
- ◆ Setting system limits
- ◆ Motor direction
- ◆ Turning off the motor

## **Digital I/O**

This module is used for defining and reading XtraDrive-DP's external input and output.

The digital I/O parameters are:

- ◆ Type of response for each signal input
- ◆ Digital data that will be transmitted for each output.

The following table shows the digital I/O module I/O map:

Digital I/O (input)		
Offset	Size (bytes)	
0	4	Inputs_state
4	4	Outputs_state

## Command

This module is used for sending XtraDrive-DP's commands from the master.

The command module parameters are:

- ◆ User units
- ◆ Default profile value of velocity, acceleration and jerk smoothing time
- ◆ Program definitions

The following table shows the command module I/O map:

Command (output)		
Offset	Size (bytes)	
0	2	ID
2	1	Op_Code
3	1	Mode
4	4	Command_Parameter_1
8	4	Command_Parameter_2
12	4	Command_Parameter_3
16	4	Command_Parameter_4
20	4	Command_Parameter_5

## XtraDrive Status

This module is used for reading the XtraDrive-DP's status by the master.

The following table shows the XtraDrive status module I/O map:

XtraDrive Status (input)		
Offset	Size (bytes)	
0	4	Status_word
4	4	Clock
8	1	Mode_of_operation
9	1	Command_mode



## System Profile

This module is used for reading the XtraDrive-DP's system profile.

The following table shows the system profile module I/O map:

System profile (input)		
Offset	Size (bytes)	
0	4	Profile_velocity
4	4	Profile_acceleration
8	4	Jerk_smoothing_time
12	4	Max_profile_velocity
16	4	Max_profile_acceleration
20	2	CW_Torque_limit
22	2	CCW_Torque_limit
24	2	Application_gain
26	1	Motion_end_window
27	1	Exact_mode

## Pulse-Train Input

This module is used for reading the pulse-train.

The pulse-train parameters are:

- ◆ Pulse-Train gear
- ◆ Synchronized window

## Speed Control (Analog Reference)

This module is used to determine the speed control's mode of operation.

The speed control parameters are:

- ◆ Velocity control loop
- ◆ Acceleration
- ◆ Speed

## Torque Control (Analog Reference)

This module is used to determine the torque control's mode of operation.

The torque control parameters are:

- ◆ Torque limits
- ◆ Emergency stop
- ◆ Speed limit

## Position Variables

This module is used for reading the XtraDrive-DP's position variables.

The following table shows the position variables module I/O map:

Position variables (input)		
Offset	Size (bytes)	
0	4	Target_position
4	4	Position_demand_value
8	4	Position_actual_value
12	4	Following_error_actual_value
16	4	User_encoder

## Speed Variables

This module is used for reading the XtraDrive-DP's speed variables.

The following table shows the speed variables module I/O map:

Speed variables (input)		
Offset	Size (bytes)	
0	4	Target_velocity
4	4	Velocity_demand_value
8	4	Velocity_actual_value

## Torque Variables

This module is used for reading the XtraDrive-DP's torque variables.

The following table shows the torque variables module I/O map:

Speed variables (input)		
Offset	Size (bytes)	
0	4	Target_position
4	4	Position_demand_value

## Get Parameters

This module is used for reading the answer to the Get Parameters command.

**NOTE:**

In order to use the **Get Parameters** module, you must also choose **Command**.

The following table shows the get parameters module I/O map:

Speed variables (input)		
Offset	Size (bytes)	
0	2	ID
2	2	Number
4	2	Value

# Sending Commands

Perform the following steps in order to send commands during data exchange:

- 1 Select the command module (see *Setting Up XtraDrive-DP*, page 25).
- 2 During data exchange, the master sends the command to the XtraDrive-DP.

The command message contains the following fields:

- ◆ ID - A numeric identifier that is used to associate between the command and the relevant command response or diagnostic.
- ◆ Op\_code - Shown in the table on page 34.
- ◆ Mode:
  - ❖ **Immediate** (Mode 2): Use this mode in order to issue a single command for immediate execution (for example, changing the state of an output while a program is running, or lowering the gain while the motor is enabled).
  - ❖ **Program download** (Mode 4): Use this mode when downloading a program to the XtraDrive-DP.
  - ❖ **Sequential** (Mode 3): Use this mode when the master sends a command stream that should be executed as a program (for example, move the motor and wait for the motion to complete, wait for input, or execute another move).
- ◆ Command Parameter 1 — Command parameter 5 - Command arguments.

The table below lists all the commands and their opcodes (in decimal format):

Name	Op_Code	Command Parameters		
		1	2	3
ACCELERATION	64	Acceleration		
CALL	66	Label		
CONTROL	69	ON=1/OFF=0		
DELAY	144	Delay [ms]		
END	70			
GAIN	71	Gain [%]		
GET_PAR	85	Parameter Number		
GO	112	Target	Motion Time [ms]	
GO_D	128	Target	Motion Time [ms]	
GO_H	117	Target		
GO_TO	73	Label		
HARD_HOME	131	Torque [0.1% of rated]	Speed	
HOME_C	133	Speed		
HOME_SW	132	Speed to switch	Return Speed	
HOME_SW_C	130	Speed to switch	Speed to C-pulse	
IF*	105	Variable Index		
IF_INPUT	89	Input Number		
INPUT_CASE	97	Inputs Mask	Inputs State	
JERK_TIME	74	Time [us]		
LABEL	88	Label		

\* This command has 5 parameters. For more information, refer to the *XtraWare User's Manual*.

Name	Op_Code	Command Parameters		
		1	2	3
LOOP	75	Loop Level	Number of cycles	Label
MOVE	113	Distance	Motion Time [ms]	
MOVE_D	129	Distance	Motion Time [ms]	
MOVE_H	118	Distance		
MOVE_R	119	Distance		
PT_FOLLOWER	101	ON=1/OFF=0		
RETURN	77			
RUN	78	Label		
SET_OUT	79	Output Number	ON=1/OFF=0	
SET_PAR	80	Parameter Number	Value	
SET_VAR	81	Variable	Value	
SET_ZERO_POSITION	95			
SLIDE	115	Speed		
SLIDE_ANALOG	102			
SPEED	83	Speed		
SPEED_CONTROL	100	Speed Control		
START	82			
STOP	84	Control ON=0/ Control OFF=1		
STOP_MOTION	99			
TORQUE	116	Torque [0.1% of rated]		
TORQUE_ANALOG	103			
TORQUE_LIMITS	87	CW [0.1% of max]	CCW [0.1% of max]	
WAIT_EXACT	145	Timeout [ms]		

Name	Op_Code	Command Parameters		
		1	2	3
WAIT_FOR_START	146			
WAIT_INPUT	147	Input Number	Timeout [ms]	
WAIT_STOP	148	Timeout [ms]		
WAIT_VARIABLE_GT	149	Variable	Value	
WAIT_VARIABLE_LT	150	Variable	Value	



# Setting XtraDrive-DP Parameters

XtraDrive-DP parameters define how the XtraDrive-DP will operate.

Refer to *Appendix B, XtraDrive-DP Parameters List* for a complete list of all XtraDrive-DP parameter modules, their parameter numbers and descriptions. More detail is provided in the *XtraDrive User Manual*.

Parameters can be set using any of three methods:

- ◆ **Setting Parameters at Parameterization** Error! Reference source not found., below, describes parameters that are set using a PROFIBUS DP configuration tool during initial configuration.
- ◆ **Setting Parameters During Data Exchange**, page 38, describes how to change parameters using external commands during data exchange.
- ◆ **Setting Parameters with XtraWare**, page 38, describes the option to change parameters using XtraWare and download them to the XtraDrive-DP.

## Setting Parameters at Parameterization

You select the relevant modules and define the value of the parameters with a PROFIBUS DP configuration tool, and download them to the master. Refer to *Appendix E, Example of Using XtraDrive-DP*.

## Setting Parameters During Data Exchange

Using this method, you can modify parameters using the SET\_PAR command during data exchange. To enable the ability to set parameters during data exchange, you must first select the Command module during configuration. Then, during data exchange, you use the SET\_PAR command to change selected parameters. See *Command* on page 27 for further details.

## Setting Parameters with XtraWare

XtraWare is an advanced PC-based software tool that can be used to change parameters. An overview of XtraWare's functionality is provided in *Appendix D, Working with XtraWare*.



### NOTE:

- ◆ Only XtraWare may change password-protected parameters.
- ◆ XtraWare may not change parameters that have been set and configured with the PROFIBUS DP configuration tool.

XtraWare can be downloaded from YET's website:  
[www.yetmotion.com](http://www.yetmotion.com).

# Reading Variables

You define the variables you want to read by choosing at least one of the following modules during configuration (see *Setting Up XtraDrive-DP*, page 25). The variables are read in a predefined, fixed order. You can choose one or more of these modules and define the order of the modules, but not the order of the variables within the modules.

Timeline refers to the lapse time for the transfer of a message between the PROFIBUS I/O map and the XtraDrive-DP.

Module	Offset	Size	Description	Timeline (µs)
XtraDrive Status	0	4	Status_word	125
	4	4	Clock	2000
	8	1	Mode_of_operation	2000
	9	1	Command_mode	2000
System Profile (optional)	0	4	Profile_velocity	2000
	4	4	Profile_acceleration	2000
	8	4	Jerk_smoothing_time	2000
	12	4	Max_profile_velocity	2000
	16	4	Max_profile_acceleration	2000
	20	2	CW_Torque_limit	2000
	22	2	CCW_Torque_limit	2000
	24	2	Application_gain	2000
	26	1	Motion_end_window	2000
27	1	Exact_mode	2000	

Module	Offset	Size	Description	Timeline (µs)
Position Variables	0	4	Target_position	125
	4	4	Position_demand_value	2000
	8	4	Position_actual_value	125
	12	4	Following_error_actual_value	125
	16	4	User_encoder	2000
Speed Variables	0	4	Target_velocity	2000
	4	4	Velocity_demand_value	2000
	8	4	Velocity_actual_value	2000
Torque Variables	0	2	Target_torque	2000
	2	2	Torque_demand_value	2000

## Downloading XtraDrive-DP Programs

You can download programs to an XtraDrive-DP in one of two ways:

- ◆ From a PC via the serial port to the XtraDrive-DP, by using the XtraWare software. This is the recommended method.
- ◆ Via the PROFIBUS network during data exchange, by downloading a program line by line. In the command, the mode field is set to program download (mode 4) and the ID field is set to the program's line number to be downloaded.

### NOTE:

In order to download programs to the XtraDrive-DP during data exchange, you must first chose the Command module during configuration.



For further information, refer to the *XtraDrive User Manual*.

# Starting Program Synchronization

XtraDrive-DP is designed to enable the synchronization of the start of programs on a group of drives, within a maximum time gap of 125  $\mu$ sec. To enable this functionality, use the PROFIBUS SYNC command.

SYNC is a PROFIBUS control command, which is sent (broadcast) to multiple slaves simultaneously. After the slaves receive the SYNC command from the master, output is frozen in its current state and new outputs are not sent to XtraDrive-DP until the next SYNC command.

Start program synchronization includes the following steps:

- ◆ You add to program the WAIT\_TO\_START command, before first movement command.
- ◆ During data exchange, the master sends a RUN < label > command to each XtraDrive.
- ◆ The program runs until the first movement is ready to be executed (location in MCB - Motion Command Buffer).
- ◆ The master checks if the status word's 8th bit (Ready for Start) is set to 1 in each drive.
- ◆ The master sends a SYNC command to the group of XtraDrives.
- ◆ During data exchange, the master sends a START command to each XtraDrive.
- ◆ (Mode - broadcast). The command will not execute until the next SYNC command.
- ◆ The master sends a second SYNC command to the group of XtraDrives.

# Diagnostics

A PROFIBUS network enables a slave to report back to the master regarding problems on the network.

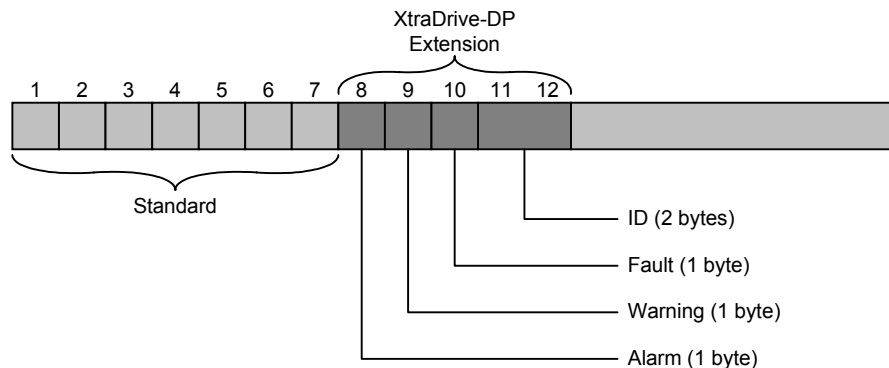
Diagnostics take place during the normal process of data exchange. To initiate a diagnostics request, XtraDrive-DP sends an error flag in the frame control to the master. The master then sends a diagnostic request that is answered by XtraDrive-DP.

The master can request diagnostic information at different times:

- ◆ Before downloading parameters, to make sure the field device is available.
- ◆ Before entering the data exchange mode, to validate parameters and configuration and make sure the field device is ready.
- ◆ During data exchange, whenever indicated by the field device.

The XtraDrive-DP diagnostic information that is sent to the master consists of standard PROFIBUS diagnostic information, plus additional diagnostic information for the XtraDrive-DP: alarms, warnings, faults and command IDs.

The structure of an XtraDrive-DP diagnostic message is shown in the following diagram:



The following information is contained in a diagnostic message:

- ◆ Bytes 1-6 contain standard PROFIBUS diagnostic information.
- ◆ Byte 7 contains information about the length of the extension in the message that will contain the required XtraDrive-DP diagnostics.

The next five bytes contain diagnostic information specifically for the XtraDrive-DP. This is shown graphically in the diagram on page 42.

- ◆ Byte 8 contains a code for alarms.  
Alarm messages refer to XtraDrive-DP states.  
After receiving an alarm message, in order to continue work you must restart the XtraDrive-DP.
- ◆ Byte 9 contains a code for warnings.  
Warning messages refer to problems that may become alarms, such as decreasing battery voltage.
- ◆ Byte 10 contains a code for faults.  
Fault messages refer to XtraDrive-DP motion commands, and can appear only at command execution.
- ◆ Bytes 11 and 12 contain a command ID (relevant only for faults), where the ID specifies the command that caused the fault.

**NOTE:**



Refer to the *Appendix C, XtraDrive-DP Alarms, Warnings and Faults* for a complete list of alarm, warning and fault messages.

To solve problems resulting from alarm or fault messages, refer to the *XtraDrive User Manual*. To solve problems resulting from warning messages, refer to the *XtraWare User's Manual*.

# **XtraDrive-DP's Response to Clear Data Control Command**

When XtraDrive-DP receives a Clear Data control command (sent by master class 1), it performs the following steps:

- ◆ Stops all motion, if the motion command is executing.
- ◆ Turns the servo off.
- ◆ Keeps the last state of XtraDrive-DP's digital output.



# Appendix A

## XtraDrive-DP GSD File

The GSD file contains all the parameters available for use on the XtraDrive-DP. Download the most updated GSD file (YETM07AA.GSD) from [www.yetmotion.com](http://www.yetmotion.com) or from [www.profibus.com](http://www.profibus.com) before beginning to work with the XtraDrive-DP.



# Appendix B

## XtraDrive-DP Parameters List

Module	Name	Description
System Parameters	Pn000.0: Direction Selection	<b>Direction Selection:</b> 0 — Forward direction 1 — Reverse direction
	Pn000.1: Control Method Selection	<b>Control Method Selection:</b> 0 — Speed (analog) 2 — Torque (analog) 3 — Speed (contact) 4 — Speed (contact/analog) 6 — Speed (contact)/torque (analog) 9 — Torque (analog)/speed (analog) A — Speed control (analog)/zero clamp C — NCT: Position control (pulse train) D — NCT: Programming mode
	Pn000.2	<b>Reserved</b>
	Pn000.3	<b>Reserved</b>
	Pn001.0: Servo OFF/Alarm Stop Mode	<b>Servo OFF/Alarm Stop Mode:</b> 0 — Apply dynamic brake (stop) 1 — Apply & release dynamic brake (stop) 2 — Stop without dynamic brake (coast)

Module	Name	Description
System Parameters	Pn001.1: Overtravel Stop Mode	<b>Overtravel Stop Mode:</b> 0 — Same as Pn001.0 1 — Maximum torque Pn406, servo lock 2 — Maximum torque Pn406, coast state
	Pn001.2: AC/DC Power Input	<b>AC/DC Power Input Selection:</b> 0 — Input AC power via L1, L2, L3 terminals 1 — Input DC power via +1, - terminals
	Pn001.3: Warning Code Output	<b>Warning Code Output Selection:</b> 0 — ALO1, 2, 3 output alarm codes only 1 — ALO1, 2, 3 output both alarms & warnings
	Pn002.0: Speed Control (Uses T-REF)	<b>Speed Control Option (T-REF Terminal Allocation):</b> 0 — None 1 — External torque limit input 2 — Torque feed-forward input 3 — External torque limit when P/N-CL=ON
	Pn002.1: Torque Control (V-REF)	<b>Torque Control Option (V-REF Terminal Allocation):</b> 0 — None 1 — VREF is external speed limit input
	Pn002.2: Absolute Encoder Usage	<b>Absolute Encoder Usage:</b> 0 — Use as absolute encoder 1 — Use as incremental encoder 2 — Absolute encoder with multiturn limit
	Pn002.3	<b>Not Used</b>

Module	Name	Description
System Parameters	Pn103: Inertia Ratio	<b>Inertia Ratio:</b> This parameter enables you to enter a rough estimation of your system's external load, as a percentage of the motor's inertia.
	Pn110.0	<b>Reserved</b>
	Pn110.1	<b>Reserved</b>
	Pn110.2	<b>Reserved</b>
	Pn110.3	<b>Reserved</b>
	Pn200.0: Reference Pulse Form	<b>Reference Pulse Form:</b> 0 — Sign & pulse, positive logic 1 — CW & CCW, positive logic 2 — AB (x1), positive logic 3 — AB (x2), positive logic 4 — AB (x4), positive logic 5 — Sign & pulse, negative logic 6 — CW & CCW, negative logic 7 — AB (x1), negative logic 8 — AB (x2), negative logic 9 — AB (x4), negative logic
	Pn200.1: Error Counter Clear Signal Form	<b>Error Counter Clear Signal Form:</b> 0 — Clear error counter when signal=high 1 — Clear error counter on signal rising edge 2 — Clear error counter when signal=low 3 — Clear error counter on signal falling edge

Module	Name	Description
System Parameters	Pn200.2: Clear Operation	<b>Clear Operation:</b> 0 — Clear error counter at base block 1 — Does not clear error counter 2 — Clear error counter on alarm 3 — Clear signal ignore
	Pn200.3: Filter	<b>Filter Selection:</b> 0 — Reference input filter: line driver 1 — Reference input filter: open collect
	Pn205: Multi-turn Limit Setting	<b>Multi-turn Limit Setting:</b> This parameter periodically clears the encoder's counter (that is, returns the setting to 0) after a predefined ratio of motor-to-load axis revolutions.
	Pn2A9: Quick Stop Deceleration (High)	<b>Quick Stop Deceleration (High):</b> This parameter, together with Pn2A8, defines the motor's deceleration when a STOP command is issued.
	Pn2A8: Quick Stop Deceleration (Low)	<b>Quick Stop Deceleration (Low):</b> This parameter, together with Pn2A9, defines the motor's deceleration when a STOP command is issued.
	Pn505: Overflow Level	<b>Overflow Level:</b> This parameter defines the Position error overflow level. The units are user units x 256.
	Pn506: Brake to Servo OFF Time	<b>Brake Reference Servo OFF Delay Time:</b> This parameter sets the delay between the time when the Brake Reference signal is issued until the servo is off.
	Pn507: Brake Reference Output Speed Level	<b>Brake Reference Output Speed Level:</b> Speed level for brake reference output during motor operation

Module	Name	Description
System Parameters	Pn508: Brake Reference On Time	Timing for brake reference output during motor operation
	Pn509: Momentary Hold Time	<b>Momentary Hold Time:</b> This parameter determines if an alarm is generated when a power loss occurs.
	Pn600: Regenerative Resistor Capacity	<b>Regenerative Resistor Capacity:</b> This parameter specifies the capacity for an external regenerative resistor.
Digital I/O	Pn502: Rotation Detection Level	<b>Rotation Detection Level:</b> This parameter sets the speed at which the servo amplifier determines that the servomotor is running and, if so, to output an appropriate signal.
	Pn504: /NEAR Signal Width	<b>/NEAR Signal Width</b>
	Pn500: Positioning Completed Width	<b>Positioning Completed Width:</b> This parameter sets the number of error pulses and adjusts the output timing of the positioning completed signal.
	Pn503: Speed Coincidence Signal Output Width	<b>Speed Coincidence Signal Output Width:</b> This parameter sets the required conditions for speed coincidence output.

Module	Name	Description
Digital I/O	Pn2D0.0: Program Input 1	<b>Program Input 1:</b> 0 — SI0 (CN1-40) 1 — SI1 (CN1-41) 2 — SI2 (CN1-42) 3 — SI3 (CN1-43) 4 — SI4 (CN1-44) 5 — SI5 (CN1-45) 6 — SI6 (CN1-46) 7 — ON 8 — OFF
	Pn2D0.1: Program Input 2	<b>Program Input 2:</b> Refer to Pn2D0.0, page 52.
	Pn2D0.2: Program Input 3	<b>Program Input 3:</b> Refer to Pn2D0.0, page 52.
	Pn2D0.3: Program Input 4	<b>Program Input 4:</b> Refer to Pn2D0.0, page 52.
	Pn2D1.0: Emergency Input	<b>Emergency Input:</b> 0 — SI0 (CN1-40) 1 — SI1 (CN1-41) 2 — SI2 (CN1-42) 3 — SI3 (CN1-43) 4 — SI4 (CN1-44) 5 — SI5 (CN1-45) 6 — SI6 (CN1-46) 7 — OFF 8 — ON



Module	Name	Description
Digital I/O	Pn2D1.1: Motion Input (125 $\mu$ sec)	<b>Fast Input Detection (125 <math>\mu</math>sec):</b> 0 — SI0 (CN1-40) 1 — SI1 (CN1-41) 2 — SI2 (CN1-42) 3 — SI3 (CN1-43) 4 — SI4 (CN1-44) 5 — SI5 (CN1-45) 6 — SI6 (CN1-46)
	Pn2D1.2: Program Input 5	<b>Program Input 5:</b> Refer to Pn2D0.0, page 52.
	Pn2D1.3: Program Input 6	<b>Program Input 6:</b> Refer to Pn2D0.0, page 52.
	Pn2C7.0: Home Switch Input	<b>Home Switch Input:</b> 0 — SI0 (CN1-40) 1 — SI1 (CN1-41) 2 — SI2 (CN1-42) 3 — SI3 (CN1-43) 4 — SI4 (CN1-44) 5 — SI5 (CN1-45) 6 — SI6 (CN1-46) 7-F — Home failure
	Pn2C7.1: Home Switch Polarity	<b>Home Switch Polarity:</b> 0 — Normally closed (0 Volt logic) 1 — Normally open 2 — Home failure
	Pn2C7.2	<b>Reserved</b>
	Pn2C7.3	<b>Reserved</b>
	Pn50A.0	<b>Reserved</b>

Module	Name	Description
Digital I/O	Pn50A.1: /S-ON Input	<b>/S-ON Signal Mapping (Servo ON when Low):</b> 0 — SI0 (CN1-40) 1 — SI1 (CN1-41) 2 — SI2 (CN1-42) 3 — SI3 (CN1-43) 4 — SI4 (CN1-44) 5 — SI5 (CN1-45) 6 — SI6 (CN1-46) 7 — ON 8 — OFF 9 — SI0 (CN1-40) (Negative Logic) A — SI1 (CN1-41) (Negative Logic) B — SI2 (CN1-42) (Negative Logic) C — SI3 (CN1-43) (Negative Logic) D — SI4 (CN1-44) (Negative Logic) E — SI5 (CN1-45) (Negative Logic) F — SI6 (CN1-46) (Negative Logic)
	Pn50A.2: /P-CON Input	<b>/P-Con Signal Mapping (P-control when Low):</b> Refer to Pn50A.1, page 54.
	Pn50A.3: P-OT Input	<b>P-OT Signal Mapping (Overtravel when High):</b> Refer to Pn50A.1, page 54.
	Pn50B.0: N-OT Input	<b>N-OT Signal Mapping (Overtravel when High):</b> Refer to Pn50A.1, page 54.
	Pn50B.1: /ALM-RST Input	<b>/ALM-RST Signal Mapping (Alarm Reset when Low):</b> Refer to Pn50A.1, page 54.

Module	Name	Description
Digital I/O	Pn50B.2: /P-CL Input	<b>/P-CL Signal Mapping (External Forward Torque Limit Enable according to Pn404):</b> Refer to Pn50A.1, page 54.
	Pn50B.3: /N-CL Input	<b>/N-CL Signal Mapping (External Reversed Torque Limit Enable):</b> Refer to Pn50A.1, page 54.
	Pn50C.0: /SPD-D Input	<b>/SPD-D Signal Mapping</b> <b>Internal Speed Selection — Selects direction (0 — Forward; 1 — Reversed)</b> Refer to Pn50A.1, page 54.
	Pn50C.1: /SPD-A Input	<b>/SPD-A Signal Mapping</b> <b>Internal Speed Selection — Defines internal speed together with /SPD-B</b> Refer to Pn50A.1, page 54.
	Pn50C.2: /SPD-B Input	<b>/SPD-B Signal Mapping.</b> <b>Internal Speed Selection — Defines internal speed together with /SPD-A</b> Refer to Pn50A.1, page 54.
	Pn50C.3: /C-SEL Input	<b>/C-SEL Signal Mapping (Control Mode Switching):</b> Refer to Pn50A.1, page 54.
	Pn50D.0: /ZCLAMP Input	<b>/ZCLAMP Signal Mapping (Zero Clamping):</b> Refer to Pn50A.1, page 54.
	Pn50D.1: /INHIBIT Input	<b>/INHIBIT Signal Mapping (Disabling Pulse-Train Input):</b> Refer to Pn50A.1, page 54.

Module	Name	Description
Digital I/O	Pn50D.2: /G-SEL Input	<b>/G-SEL Signal Mapping (Gain Switching):</b> Refer to Pn50A.1, page 54.
	Pn50D.3	<b>Reserved</b>
	Pn2D2.0: /COIN Output	<b>/COIN Signal Mapping:</b> 0 — Disabled 1 — SO1 (CN1-25,26) 2 — SO2 (CN1-27,28) 3 — SO3 (CN1-29,30)
	Pn2D2.1: Program Output 1	<b>Program Output 1:</b> Refer to Pn2D2.0, page 56.
	Pn2D2.2: Program Output 2	<b>Program Output 2:</b> Refer to Pn2D2.0, page 56.
	Pn2D2.3: Program Output 3	<b>Program Output 3:</b> Refer to Pn2D2.0, page 56.
	Pn50E.0: /COIN Output	<b>/COIN Signal Mapping:</b> Refer to Pn2D2.0, page 56.
	Pn50E.1: /V-CMP Output	<b>/V-CMP Signal Mapping:</b> Refer to Pn2D2.0, page 56.
	Pn50E.2: /TGON Output	<b>/TGON Signal Mapping:</b> Refer to Pn2D2.0, page 56.
	Pn50E.3: /S-RDY Output	<b>/S-RDY Signal Mapping:</b> Refer to Pn2D2.0, page 56.
	Pn50F.0: /CLT Output	<b>/CLT Signal Mapping:</b> Refer to Pn2D2.0, page 56.
	Pn50F.1: /VLT Output	<b>/VLT Signal Mapping:</b> Refer to Pn2D2.0, page 56.

Module	Name	Description
Digital I/O	Pn50F.2: /BK Output	<b>/BK Signal Mapping:</b> Refer to Pn2D2.0, page 56.
	Pn50F.3: /WARN Output	<b>/WARN Signal Mapping:</b> Refer to Pn2D2.0, page 56.
	Pn510.0: /NEAR Output	<b>/NEAR Signal Mapping:</b> Refer to Pn2D2.0, page 56.
	Pn510.1	<b>Not Used</b>
	Pn510.2	<b>Not Used</b>
	Pn510.3	<b>Not Used</b>
	Pn512.0: SO1 Output Reversal	<b>Output Signal Reversal for SO1 (CN1-25, 26):</b> 0 — Output signal not reversed 1 — Output signal reversed
	Pn512.1: SO2 Output Reversal	<b>Output Signal Reversal for SO2 (CN1-27, 28):</b> 0 — Output signal not reversed 1 — Output signal reversed
	Pn512.2: SO3 Output Reversal	<b>Output Signal Reversal for SO3 (CN1-29, 30):</b> 0 — Output signal not reversed 1 — Output signal reversed
	Pn512.3	<b>Not Used</b>

Module	Name	Description
Command	Pn2A3: Work Speed Default (High)	<b>Work Speed Default (High):</b> This parameter, together with Pn2A2, defines the default value of the profile speed variable.
	Pn2A2: Work Speed Default (Low)	<b>Work Speed Default (Low):</b> This parameter, together with Pn2A3, defines the default value of the profile speed variable.
	Pn2A5: Work Acceleration Default (High)	<b>Work Acceleration Default (High):</b> This parameter, together with Pn2A4, defines the default value of the profile acceleration variable.
	Pn2A4: Work Acceleration Default (Low)	<b>Work Acceleration Default (Low):</b> This parameter, together with Pn2A5, defines the default value of the profile acceleration variable.
	Pn2A6: Work Jerk - Smoothing Time	<b>Work Jerk-Smoothing Time Default:</b> This parameter defines the default value of the jerk-smoothing time variable.
	Pn2B1: Position Units Ratio Number (High)	<b>Position Units Ratio Numerator (High):</b> This parameter, together with Pn2B0, sets the numerator to be used in the ratio to convert position units from user units to encoder counts.
	Pn2B0: Position Units Ratio Number (Low)	<b>Position Units Ratio Numerator (Low):</b> This parameter, together with Pn2B1, sets the numerator to be used in the ratio to convert position units from user units to encoder counts.

Module	Name	Description
Command	Pn2B3: Position Units Ratio Den (High)	<b>Position Units Ratio Denominator (High):</b> This parameter, together with Pn2B2, sets the denominator to be used in the ratio to convert position units from user units to encoder counts.
	Pn2B2: Position Units Ratio Denominator (Low)	<b>Position Units Ratio Denominator (Low):</b> This parameter, together with Pn2B3, sets the denominator to be used in the ratio to convert position units from user units to encoder counts.
	Pn2B5: Speed Units Ratio Numerator (High)	<b>Speed Units Ratio Numerator (High):</b> This parameter, together with Pn2B4, sets the numerator to be used in the ratio to convert speed units from user speed units to encoder counts/msec.
	Pn2B4: Speed Units Ratio Numerator (Low)	<b>Speed Units Ratio Numerator (Low):</b> This parameter, together with Pn2B5, sets the numerator to be used in the ratio to convert speed units from user speed units to encoder counts/msec.
	Pn2B7: Speed Units Ratio Denominator (High)	<b>Speed Units Ratio Denominator (High):</b> This parameter, together with Pn2B6, sets the denominator to be used in the ratio to convert speed units from user speed units to encoder counts/msec.

Module	Name	Description
Command	Pn2B6: Speed Units Ratio Denominator (Low)	<b>Speed Units Ratio Denominator (Low):</b> This parameter, together with Pn2B7, sets the denominator to be used in the ratio to convert speed units from user speed units to encoder counts/msec.
	Pn2B9: Acceleration Units Ratio Numerator (High)	<b>Acceleration Units Ratio Numerator (High):</b> This parameter, together with Pn2B8, sets the numerator to be used in the ratio to convert acceleration units from user acceleration units to encoder counts/(10 msec) <sup>2</sup> .
	Pn2B8: Acceleration Units Ratio Numerator (Low)	<b>Acceleration Units Ratio Numerator (Low):</b> This parameter, together with Pn2B9, sets the numerator to be used in the ratio to convert acceleration units from user acceleration units to encoder counts/(10 msec) <sup>2</sup> .
	Pn2BB: Acceleration Units Ratio Denominator (High)	<b>Acceleration Units Ratio Denominator (High):</b> This parameter, together with Pn2BA, sets the denominator to be used in the ratio to convert acceleration from user acceleration units to encoder counts/(10 msec) <sup>2</sup> .
	Pn2BA: Acceleration Units Ratio Denominator (Low)	<b>Acceleration Units Ratio Denominator (Low):</b> This parameter, together with Pn2BB, sets the denominator to be used in the ratio to convert acceleration units from user acceleration units to encoder counts/(10 msec) <sup>2</sup> .



Module	Name	Description
Command	Pn2C0: Motion End Window	<b>Motion End Window:</b> This parameter defines the default value of the window of acceptable position errors after a motion has been completed.
	Pn2C1: Torque Slope	<b>Torque Slope:</b> This parameter defines the default value, as 0.1% of the rated torque/1 msec, for the torque slope command.
	Pn2CC: AutoStart User Program	<b>Auto-Start User Program:</b> This parameter specifies the label number (1-99) of the user program to start when the power is turned on. If the value is set to 0, then no program is automatically run.
Pulse-Train Input	Pn202: Pulse-Train Gear Ratio (Numerator)	<b>Pulse-Train Electronic Gear Ratio (Numerator):</b> When using pulse train, this parameter sets the numerator to be used in the electronic gear function.
	Pn203: Pulse-Train Gear Ratio (Denominator)	<b>Pulse-Train Electronic Gear Ratio (Denominator):</b> When using pulse train, this parameter sets the denominator to be used in the electronic gear function.
	Pn2C4: Synchronized Window (Pulse-Train)	<b>Synchronized Window for Pulse-Train:</b> This parameter defines the window of acceptable synchronization errors in a dynamic motion, as used by the Follower_Synchronize flag.

Module	Name	Description
Speed Control — Analog Reference	Pn305: Soft Start Acceleration Time	<b>Soft Start Acceleration Time:</b> This parameter sets the interval between the time when the servomotor starts until it reaches maximum speed (contact reference).
	Pn306: Soft Start Deceleration Time	<b>Soft Start Deceleration Time:</b> This parameter sets the interval between the time when the servomotor reaches maximum speed until it stops (contact reference).
	Pn307: Speed Reference Filter Time	<b>Speed Reference Filter Time Constant</b>
	Pn308: Speed Feedback Filter Time	<b>Speed Feedback Filter Time Constant</b>
	Pn300: Speed Reference Input Gain	<b>Speed Reference Input Gain:</b> This parameter sets the voltage range for the V-REF (CN1-5) speed reference input, based on the host controller or external circuit's output range.
	Pn100: Speed Loop Gain	<b>Speed Loop Gain:</b> When NCT is not used, this parameter, together with Pn101, enables you to ensure that the speed error (the difference between the internal speed command and the actual speed) is as small as possible.

Module	Name	Description
Speed Control — Analog Reference	Pn101: Speed Loop Integral Time	<b>Speed Loop Integral Time Constant:</b> When NCT is not used, this parameter, together with Pn100, enables you to ensure that the speed error (the difference between the internal speed command and the actual speed) is as small as possible.
	Pn401: Torque Reference Filter Time	<b>Torque Reference Filter Time Constant:</b> This parameter sets the torque reference's filter time constant in the servo amplifier; the smaller the value, the faster the speed control response is.
	Pn408.0: Notch Filter Selection	<b>Notch Filter Selection:</b> 0 — Disabled 1 — Use notch filter for torque ref
	Pn408.1	<b>Not Used</b>
	Pn408.2	<b>Not Used</b>
	Pn408.3	<b>Not Used</b>
	Pn409: Notch Filter Frequency	<b>Notch Filter Frequency:</b> This parameter, together with Pn40A, sets the frequency at which the notch filter is effective.
	Pn40A: Notch Filter Width	<b>Notch Filter Width:</b> This parameter, together with Pn409, sets the frequency at which the notch filter is effective.

Module	Name	Description
Speed Control — Analog Reference	Pn109: Feed Forward (Speed Control)	<p><b>Feed-Forward (Speed Control):</b> When NCT is not used, this parameter is used to shorten positioning time, as well as to differentiate a speed reference at the host controller to generate a torque feed-forward reference and then input this reference together with the speed reference to the servo amplifier.</p> <p>This parameter is applicable only in Speed Control (analog) mode.</p>
	Pn102: Position Loop Gain	<p><b>Position Loop Gain:</b> When NCT is not used, this parameter increases stiffness and reduces position error during the trajectory following.</p>
	Pn301: Speed 1	<p><b>Speed 1:</b> In Speed Control (contact reference) mode, this parameter, together with Pn302 and Pn303, enables you to select the motor's speed.</p>
	Pn302: Speed 2	<p><b>Speed 2:</b> In Speed Control (contact reference) mode, this parameter, together with Pn301 and Pn303, enables you to select the motor's speed.</p>

Module	Name	Description
Speed Control — Analog Reference	Pn303: Speed 3	<b>Speed 2:</b> In Speed Control (contact reference) mode, this parameter, together with Pn301 and Pn302, enables you to select the motor's speed.
	Pn304: Jog Speed	<b>Jog Speed:</b> This parameter sets the motor's speed when operating the servomotor from a panel or digital operator.
	Pn501: Zero Clamp Level	<b>Zero Clamp Level:</b> This parameter sets the motor speed level at which zero clamp is performed.
Torque Control — Analog Reference	Pn400: Torque Reference Input Gain	<b>Torque Reference Input Gain:</b> This parameter sets the voltage range for the T-REF (CN1-9) torque reference input, based on the host controller or external circuit's output range.
	Pn402: Forward Torque Limit	<b>Forward Torque Limit:</b> This parameter sets the maximum forward torque limit when torque is limited due to equipment conditions.
	Pn403: Reverse Torque Limit	<b>Reverse Torque Limit:</b> This parameter sets the maximum reverse torque limit when torque is limited due to equipment conditions.
	Pn404: Fwd External Torque Limit	<b>Forward External Torque Limit:</b> This parameter sets the maximum forward torque limit when torque is limited by an external contact input.

Module	Name	Description
Torque Control — Analog Reference	Pn405: Reverse External Torque Limit	<b>Reverse External Torque Limit:</b> This parameter sets the maximum reverse torque limit when torque is limited by an external contact input.
	Pn406: Emergency Stop Torque	<b>Emergency Stop Torque:</b> This parameter specifies the stop torque applied for overtravel when using the input signal for prohibiting forward or reverse rotation.
	Pn407: Speed Limit (Torque Control)	<b>Speed Limit During Torque Control:</b> This parameter sets a speed limit for the motor when torque control is selected, and is used to prevent excessive equipment speed during torque control.

# Appendix C

## XtraDrive-DP Alarms, Warnings and Faults

### Alarm Messages

A represents an alarm code that is described in more detail in the *XtraDrive User Manual*. Instructions on how to handle these alarms are also provided there.

Code	Alarm Message
64	A.02: Parameter Breakdown
65	A.03: Main Circuit Encoder Error
66	A.04: Parameter Setting Error
67	A.05: Servomotor and Amplifier Combination Error
68	A.10: Overcurrent or Heat Sink Overheated
69	A.30: Regeneration Error Detected
70	A.32: Regenerative Overload
71	A.40: Overvoltage
72	A.41: Undervoltage
73	A.51: Overspeed

Code	Alarm Message
74	A.71: Overload: High Load
75	A.72: Overload: Low Load
76	A.73: Dynamic Brake Overload
77	A.74: Overload of Surge Current Limit Resistor
78	A.7A: Heat Sink Overheated
79	A.81: Absolute Encoder Backup Power Supply Error
80	A.82: Encoder Checksum Error
81	A.83: Absolute Encoder Battery Error
82	A.84: Absolute Encoder Data Error
83	A.85: Absolute Encoder Overspeed
84	A.86: Encoder Overheated
85	A.B1: Reference Speed Input Read Error
86	A.B2: Reference Torque Input Read Error
87	A.BF: System Alarm
88	A.C1: Servo Overrun Detected
89	A.C2: Phase finding error
90	A.C8: Absolute Encoder Clear Error and Multi-Turn Limit Setting Error
91	A.C9: Encoder Communications Error
92	A.CA: Encoder Parameter Error
93	A.CB: Encoder Echoback Error
94	A.CC: Multi-Turn Limit Disagreement
95	A.D0: Position Error Overflow
97	A.F1: Power Line Open Phase



## Warning Messages

Code	Warning Message
112	A.91: Overload
113	A.92: Regenerative Overload

## Fault Messages

Code	Fault Message
1	Sequential buffer full
2	Immediate buffer full
4	Too many program lines/Invalid program line number
5	Message checksum error*
6	SET_VAR: Invalid variable index
7	Variable is read-only
8	Wrong op_code
9	SET_ZERO_POSITION: Unable to SET_ZERO_POSITION while executing motion
10	Reply buffer full
11	Incomplete message received*
12	Message too long*
13	C-phase parameter not set
14	Invalid input assignment
15	SET_OUT: Invalid output assignment
16	Selected traced I/O not in use*
17	Command prohibited in present control method

Code	Fault Message
18	Parameter storing fault — during auto tuning*
19	Parameter storing fault
20	Motor moving during CONTROL_ON
22	Auto tuning available in Programming Control mode only*
23	Program already running
24	Variable does not exist*
25	Wrong user units setting
26	Wrong setting profile speed acceleration or jerk
27	Invalid parameter
28	EEPROM read buffer full
31	Home Command: Both speeds are in the same direction
33	Hard Home: Torque exceeded torque limits
128	Reference to invalid label
129	Command not applicable in this programming mode
130	Can't perform this motion with present profile acceleration
131	Can't perform this motion with present profile speed
134	Too low speed
135	SET_VAR: Variable value out of range
136	Program flow error
137	Moving time is too short with present profile jerk time
139	Home sensor not defined
140	Motion cannot be executed while CONTROL_OFF
141	TORQUE_LIMITS: Invalid torque limits
142	Invalid or duplicated label
143	Invalid input number
144	Invalid output number

Code	Fault Message
146	Auto tuning already in progress*
149	Unable to switch CONTROL_ON
151	Positive overtravel
152	Negative overtravel
192	Command buffer full
193	Duplicate Configuration module
194	Command parameter out of range
195	Parameterization fail
196	Configuration fail
197	Wrong GSD file version
198	Parameterization timeout
199	Servo circuit communication error
200	Servo circuit internal watchdog error
201	Wrong station address*
202	Command disabled in PROFIBUS data exchange*
205	Error buffer full

\* These messages are displayed only in XtraWare.



# Appendix D

## Working with XtraWare

XtraWare is an advanced PC-based software tool for the setup, optimal tuning and user programming of the XtraDrive family of products.

Using XtraWare, you are able to perform a variety of functions:

- ◆ Write and download a user program
- ◆ Immediately execute control commands
- ◆ Tune
- ◆ Set up
- ◆ Edit parameters
- ◆ Display alarms
- ◆ Perform jog operation
- ◆ Monitor
- ◆ Provide help
- ◆ See system status with a Watch window
- ◆ See a graphic representation of changes in parameter values

For further details, refer to the *XtraWare User's Manual*.

XtraWare can be downloaded from YET's website:

[www.yetmotion.com](http://www.yetmotion.com).



# Appendix E

## Example of Using XtraDrive-DP

### About This Chapter

This appendix provides an example of the usage of XtraDrive-DP on a PROFIBUS network. First it shows how to use the S7 SIMATIC Manager to define the parameterization and configuration processes and then it shows how to implement the application during data exchange.

## Specifications

The following is a list of the system and application tasks to be carried out in this example:

- ◆ The XtraDrive-DP will drive a rotary motor with 16-bit encoder.
- ◆ The master will instruct the XtraDrive-DP to perform the following tasks:
  - ❖ Make a movement of 34.7 degrees at a speed not higher than 1000 RPM.
  - ❖ At the end of the movement, the XtraDrive-DP output #1 (CN1-25, 26) will be set to HIGH.
- ◆ An S7 SIMATIC Manager is used on the network.

# Workflow

The following main steps must be performed to carry out the above specifications:

- 1 Initialization conditions:
  - ❖ Definition of movement units — 0.1 degrees
  - ❖ Assignment of output #1
- 2 Send the Movement command.
- 3 Set the output.

The workflow has three stages, as follows:

- 1 **System Setup**, page 76, describes how to set up the hardware components used in this example.
- 2 **Application Setup**, page 78, describes how to set up the commands used to transfer data.
- 3 **Application Execution During Data Exchange**, page 81, describes how to execute the application during data exchange.

## System Setup

System setup is composed of three steps:

- 1 Install the XtraDrive GSD File. An updated file (YETM07AA.GSD) can be downloaded from YET's website, <http://www.yetmotion.com>.

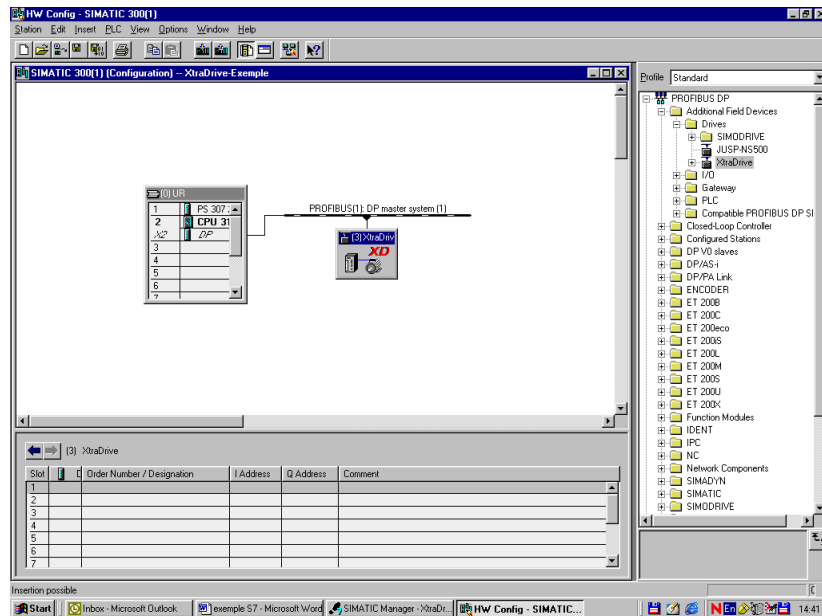
From the *S7's Options* menu, select **Install New GSD**.

When the GSD file is loaded, the XtraDrive-DP's name appears in the list of drives in the *Catalog* window.



- 2 Select and define the network components: the PLC, XtraDrive-DP, transmission rate, and so on.  
 Select the hardware components to be used on the PROFIBUS network, starting with the master (including its specific CPU and power supply), and then the network (for example, determining the profile and transmission rate). Once this has been carried out, you must determine the slave XtraDrive-DP and its address. It is important to ensure that this is the same as the address set by the rotary switches on the XtraDrive-DP's front panel.

The picture below displays the system setup as shown in the S7 SIMATIC Manager:



- 3 Select the System Parameters module.

**NOTE:**

The three steps described above must be performed for any application.



Once you have finished setting the system definitions and configuration, you can continue with the specific application.

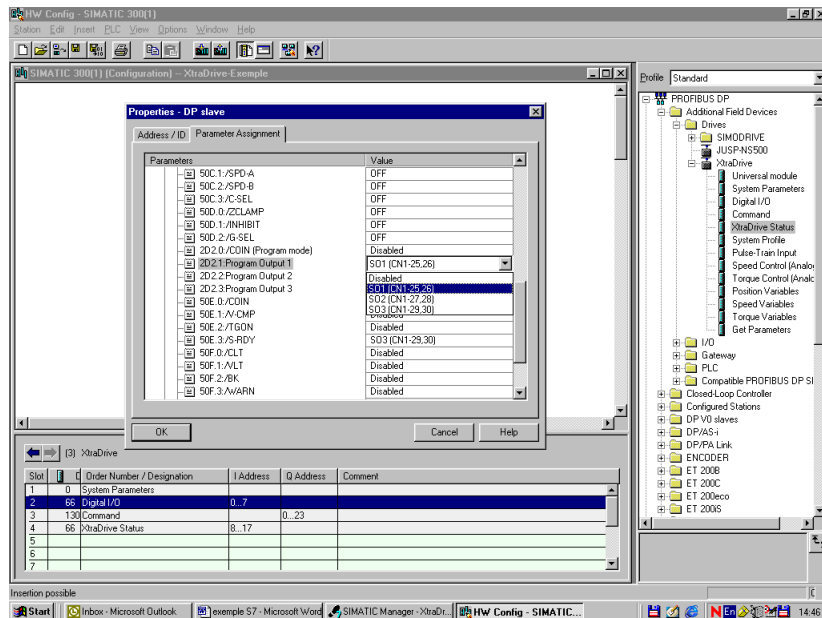
## Application Setup

In this example, the application setup is composed of three steps:

- 1 Select the Digital I/O module. This module must be selected for output assignment.

### Pn2D2.1: Program Output 1 = SO1(CN1-25,26)

The following screen displays this parameter selected:



- 2 Select the Command module. This module enables a master to send motion commands during data exchange, as well as allows you set the parameters related to the commands.

In this example, you must define the parameters as follows:

#### ❖ User Units

- Position Units — 0.1 degree

**Pn2B1/0: Pos.Unts Ratio Num = 65536**

**Pn2B3/2: Pos.Unts Ratio Den = 3600**

- Speed Units — 1 RPM  
**Pn2B5/4: Spd.Unts Ratio Num = 65536**  
**Pn2B7/6: Spd.Unts Ratio Den = 60000**
- Acceleration Units — 1 rad/sec<sup>2</sup>  
**Pn2B9/8: Acc.Unts Ratio Num = 65536**  
**Pn2BB/A: Acc.Unts Ratio Den = 62832**

For explanations about how to determines these values, refer to the *XtraDrive User Manual*.

❖ Work Speed

- Default value for working speed — 1000 RPM  
**Pn2A3/2: Work Spd Default = 1000**

❖ Work Acceleration

- Work acceleration default — 10000 rad/sec<sup>2</sup>  
**Pn2A5/4: Work Accel. Default = 10000**

- 3** Select the XtraDrive Status module. While it is not mandatory to select this module, it is helpful in enabling you to retrieve the XtraDrive's working status.

You have now defined the user units, working speed and acceleration, assigned output #1 and defined the structure of I/O data. The XtraDrive is now ready to run the application.

The I/O map for this application is shown below:

<b>Input</b>		
<b>Offset</b>	<b>Size (bytes)</b>	<b>Content</b>
0	4	Digital Input
4	4	Digital Output
8	4	Status_word
12	4	Clock
16	1	Mode_of_operation
17	1	Command_mode

<b>Output</b>		
<b>Offset</b>	<b>Size (bytes)</b>	<b>Content</b>
0	2	ID
2	1	OP_code
3	1	Mode
4	4	Command_Parameter_1
8	4	Command_Parameter_2
12	4	Command_Parameter_3
16	4	Command_Parameter_4
20	4	Command_Parameter_5

# Application Execution During Data Exchange

The master must send the following commands in Sequential Mode:

```
CONTROL          ON
MOVE_D           3470      -1
SET_OUT          1         ON
```

Three messages will be transferred to XtraDrive-DP during data exchange, as follows:

◆ Message 1 — For the CONTROL ON command:

Byte #	0-1	2	3	4-7	8-11	12-15	16-19	20-23
Value	0x0001	0x45	0x03	0x00000001	0x00000000	0x00000000	0x00000000	0x00000000
Explanation	ID	OP_code	Mode	Command Parameter 1	Command Parameter 2	Command Parameter 3	Command Parameter 4	Command Parameter 5

◆ Message 2 — For the MOVE\_D command:

Byte #	0-1	2	3	4-7	8-11	12-15	16-19	20-23
Value	0x0002	0x81	0x03	0x00000E10	0xFFFFFFFF	0x00000000	0x00000000	0x00000000
Explanation	ID	OP_code	Mode	Command Parameter 1	Command Parameter 2	Command Parameter 3	Command Parameter 4	Command Parameter 5

◆ Message 3 — For the SET\_OUT command:

Byte #	0-1	2	3	4-7	8-11	12-15	16-19	20-23
<b>Value</b>	0x0003	0x4F	0x03	0x00000001	0x00000001	0x00000000	0x00000000	0x00000000
<b>Explanation</b>	ID	OP_code	Mode	Command Parameter 1	Command Parameter 2	Command Parameter 3	Command Parameter 4	Command Parameter 5

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