

User Guide

Profibus Module

For Digistart soft starters

Part Number: 0477-0010-03

Issue: 3



www.controltechniques.com

General Information

The manufacturer accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation or adjustment of the optional parameters of the equipment or from mismatching the starter with the motor.

The contents of this guide are believed to be correct at the time of printing. In the interests of commitment to a policy of continuous development and improvement, the manufacturer reserves the right to change the specification of the product or its performance, or the content of the guide without notice.

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1. Introduction

The Profibus Module can be used with Digistart CS and Digistart IS soft starters to allow the starter to be connected to a serial communications network using the Profibus protocol.

2. Important User Information

Observe all necessary safety precautions when controlling the soft starter remotely. Alert personnel that machinery may start without warning.

It is the installer's responsibility to follow all instructions in this manual and to follow correct electrical practice.

3. Installation



Remove mains and control voltage from the soft starter before attaching or removing accessories. Failure to do so may damage the equipment.

Install the Profibus Module using the following procedure:

1. Remove control power and mains supply from the soft starter.
2. Attach the module to the soft starter as illustrated.
3. Set the module address to match the address set in the Master configuration tool.
4. Apply control power to the soft starter.
5. Insert the network connector and power up the module.

3.1 Physical installation

1. Fully pull out the top and bottom retaining clips on the module.
2. Line up the module with the comms port slot.
3. Push in the top and bottom retaining clips to secure the module to the starter.

Figure 3-1 Attach the module to the starter

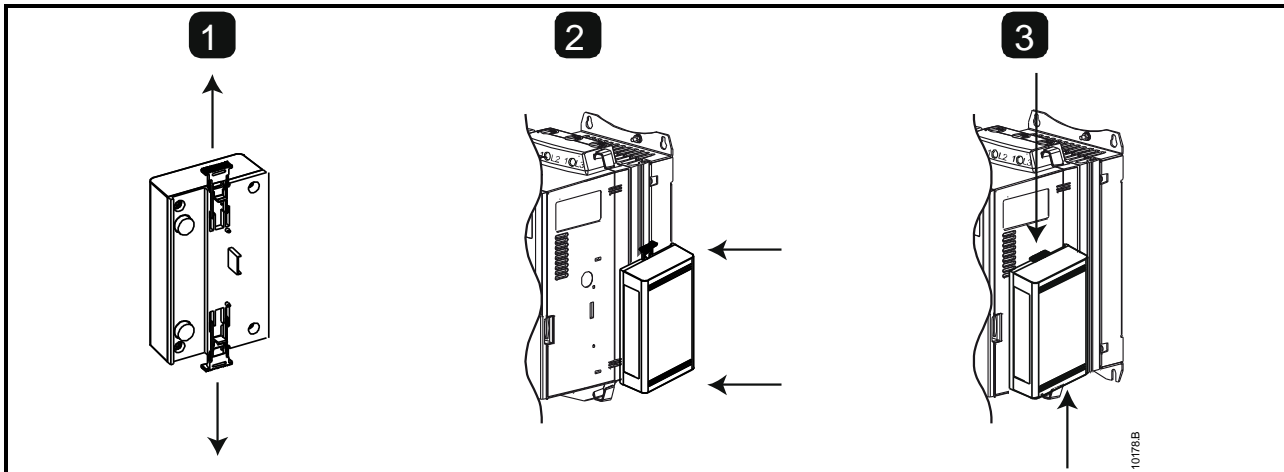
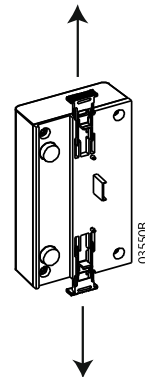


Figure 3-2 Remove the module from the starter

Remove the Profibus Module using the following procedure:

1. Remove control power and mains supply from the soft starter.
2. Disconnect all field wiring from the module.
3. Fully pull out the top and bottom retaining clips on the module.
4. Pull the module away from the soft starter.



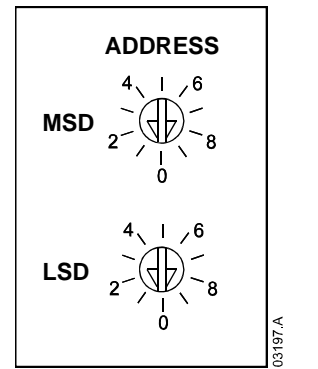
4. Profibus Module Connection and Configuration

4.1 Adjustment

Figure 4-1 Adjustment switches

Before powering up the Profibus Module, set the two rotary switches so that the module address matches the address set in your Master configuration tool (the diagram shows the factory default setting for the rotary switches).

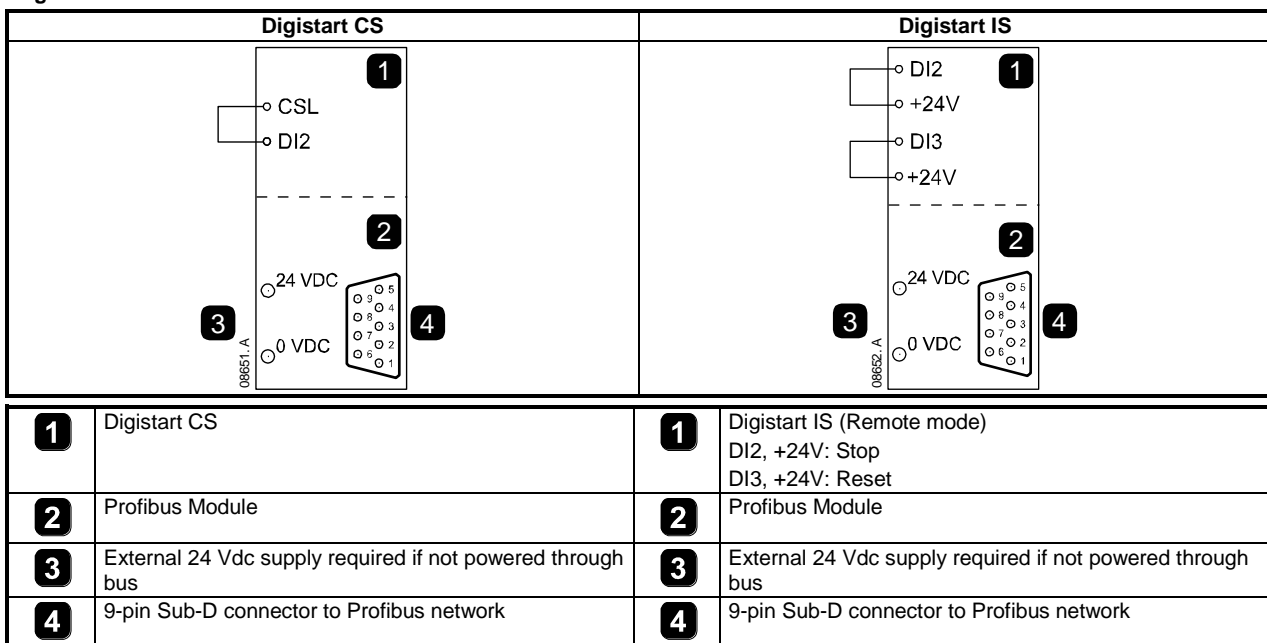
The module automatically detects the network data rate.
e.g. MSD = 2 and LSD = 1 corresponds to address 21.



4.2 Connection

The module connects to the Profibus network via a standard 9-pin Sub-D connector.
The Profibus Module can be powered either through the network cable or externally (24 Vdc).

Figure 4-2 Profibus Module connections



If emergency stop is not required, change the setting of Pr 3A or connect a link across C53, C54.

Input links are required across the stop and reset inputs if the soft starter is being operated in Remote mode. In Local mode, links are not required.

NOTE Digistart IS Pr 30 *Comms in Remote* selects whether the soft starter will accept Start, Stop or Reset commands from the Serial Network Master while in Remote mode. See the Digistart IS User Manual for parameter details.

9-pin Sub-D connector	
Pin No.	Assignment
1	Shield
2	24 Vdc negative (optional)
3	RxD/TxD-P
4	Not used
5	DGND
6	VP (end of bus slave only)
7	24 Vdc positive (optional)
8	RxD/TxD/-N
9	DGND

4.3 Power Status LED (Red) and Bus Status LED (Green)

Figure 4-3 Feedback LEDs

		OFF	ON
1	Power status (red)	Module not powered up	Module powered up and ready to go online
2	Bus status (green)	No connection, offline or data exchange failure	Module online and in data exchange state

NOTE If communication fails between the module and the network, the Bus Status LED will go off. When communication is restored, the Bus Status LED will come back on.

NOTE When a communications failure occurs, the soft starter may trip if the Communication Timeout parameter for the network is set greater than zero. When communication is restored, the soft starter must be reset.

5. Master Configuration

5.1 Configuration

Import the latest .gsd file into your Master configuration tool. This file is available from www.controltechniques.com.

If your Master uses on-screen icons, two graphic bitmap files are available from the website. SSPM_N.bmp indicates normal mode. SSPM_D.bmp indicates diagnostic mode.

NOTE The Profibus Module has a slave address range of 0 to 99.

If the Profibus network fails, the module will leave data exchange mode after the network watchdog timeout period has expired. This timeout period is set at the Master configuration tool.

A Communication Timeout parameter in the GSD file sets how soon after this event the soft starter will be forced into a trip state. The user can adjust the Communication Timeout parameter in the GSD file to any setting between 0 and 100 seconds. The default setting is 10 seconds.

NOTE If the Communication Timeout parameter is set to 0, the current state of the soft starter will remain unchanged on a network failure. This gives the user the option of operating the soft starter via local control, but is NOT failsafe.

5.2 Operating modules

The GSD file contains three operating modules, supporting data I/O structures as follows:

Table 5-1 Data structures

Data Structure	Basic Module	Extended Module	Parameter Upload/Download Module
Soft Starter Control I/O on page 7	✓	✓	✓
Soft Starter Monitoring I/O on page 8	✗	✓	✓
Soft Starter Programming I/O on page 10	✗	✗	✓

The Basic Module allows the user to start and stop the soft starter and read limited information on operating status.
 The Extended Module defines additional bytes allowing the user to read soft starter operating data such as actual motor current and motor temperature.
 The Parameter Upload/Download Module allows the user to read and write soft starter parameter values (only applicable to Digistart IS soft starters).

6. Data Structures

6.1 Soft Starter Control I/O Data Structure

Master > Slave control word is structured as follows:

Table 6-1 Control I/O data structure

Byte 0							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	Reserved	Reserved	Quick stop	Motor set		Reserved	Reserved
Byte 1							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	Reserved	Reserved	Reserved	Reset	Reserved	Reserved	Fwd run

Quick stop bit

When Fwd run bit changes from 1 to 0:

- 0 = stop action will be a soft stop (as selected on the soft starter).
- 1 = stop action will be a quick stop (i.e. coast to stop).

NOTE The Quick stop bit must be set to 0 before the soft starter can perform a start.

Motor set bits

Selects which parameter set to use when starting:

- 0 = selected from soft starter remote input (programmable input must be set to 'Motor Set Select')
- 1 = soft starter primary motor set (ensure soft starter programmable input is not set to 'Motor Set Select')
- 2 = soft starter secondary motor set (ensure soft starter programmable input is not set to 'Motor Set Select')
- 3 = reserved

NOTE If Pr 3A *Input A Function* for Digistart IS is set to motor set select, this will cause a conflict with motor set selection via serial communications.

Slave > Master status word is structured as follows:

Table 6-2 Status word structure

Byte 0							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Ramping	Local ²	Motor current (% FLC) ¹					
Byte 1							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	Reserved	Reserved	Reserved	Warning ²	Fault	On	Ready

¹ Motor current (% FLC) represents current as a percentage of the set motor full load current. A maximum value of 63 represents 200% full load current. To convert this value to a readable percentage, divide by 0.315. For models IS0430N and smaller this value will be 10 times greater than the value displayed on the keypad.

² Only available on Digistart IS soft starters.

- Ready** is set when the soft starter is ready to start the motor.
- On** is set when the soft starter is starting, running or soft stopping the motor.
- Warning** is set when the soft starter detects a warning condition.
- Fault** is set when the soft starter has tripped.
- Ramping** is set when the soft starter is starting or soft stopping the motor.
- Local** is set when the soft starter is set to Local mode.

6.2 Soft Starter Monitoring I/O Data Structure

Table 6-3 Monitoring I/O data structure

Master > Slave output byte is structured as follows:

Byte 2
Operating data request (Data request numbers 1 to 14)

Slave > Master input bytes, in response to an operating data request, are structured as follows:

Byte 2	
Echo data request number	
Byte 3	
Bits 7 to 1 <i>Reserved</i>	Bit 0 = 1: Invalid data request number
Byte 4	
Data value - high byte	
Byte 5	
Data value - low byte	

NOTE An invalid data request number will result in the Invalid data request number bit being set = 1.

Data values are defined as follows:

Table 6-4 Data values

Data Request Number	Data Value High Byte	Data Value Low Byte
0	<i>Reserved</i>	<i>Reserved</i>
1	Soft starter product type code: 4 = Digistart CS 8 = Digistart IS	Soft starter software version number
2	Trip/Warning code	Soft starter status
3 ¹	Average current (high byte)	Average current (low byte)
4	Motor 2 temperature	Motor 1 temperature
5	<i>Reserved</i>	Percentage power factor
6		Power (kW)
7		Power (kVA)
8		Average voltage
9 ¹		L1 current
10 ¹		L2 current
11 ¹		L3 current
15	<i>Reserved</i>	<i>Reserved</i>

¹ For models IS0430N and smaller this value will be 10 times greater than the value displayed on the keypad.

NOTE Data request numbers 5 to 11 are only valid for Digistart IS starters. Digistart CS starters will return zero values.

Input bytes for data request numbers 6 and 7 are defined as follows:

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
High Byte	Power scale factor				Power high nibble			
Low Byte	Power low byte							

Powerscale functions as follows:

- 0 = multiply Power by 10 to get W
- 1 = multiply Power by 100 to get W
- 2 = Power is represented in kW
- 3 = multiply Power by 10 to get kW

6.2.1 Soft starter status

The low byte data value of data request number 2 reports soft starter status.

Bits 0 to 3 function as follows:

Table 6-5 Status byte

Value (decimal) Bits 0 to 3	Soft Starter Status
0	Unknown (communication error between module and soft starter)
1	Ready to start (waiting)
2	Starting (soft starting)
3	Running (running – full voltage at the motor)
4	Stopping (soft stopping)
5	Not ready (restart or thermal delay and Run simulation)
6	Fault (tripped)
7 ¹	Menu or Logs Menu open (cannot start)
8 ¹	Jog Forward (slow speed)
9 ¹	Jog Reverse (slow speed)

¹ Only available on Digistart IS soft starters.

6.2.2 Trip Codes

Table 6-6 Trip messages

Trip Code	Trip Name	Digistart CS	Digistart IS
1	Excess start time	●	●
2	Motor overload (thermal model)	●	●
3	Motor thermistor	●	●
4	Current imbalance	●	●
5	Frequency (Mains supply)	●	●
6	Phase sequence	●	●
7	Instantaneous overcurrent		●
8	Power loss/Power circuit	●	●
10	Heatsink overtemperature		●
11	Motor connection Tx		●
12	Input A trip		●
13	FLC too high (FLC out of range)		●
14	Unsupported option (function not available in inside delta)		●
15	Starter communication (between module and soft starter)	●	●
16	Network communication (between module and network)	●	●
17	Internal fault x (where x is the fault code detailed in the table below).		●
20 ¹	Ground fault		●
23	Parameter out of Range		●
24	Input B trip		●
26	L1 phase loss		●
27	L2 phase loss		●
28	L3 phase loss		●
29	L1-T1 shorted		●
30	L2-T2 shorted		●
31	L3-T3 shorted		●
32	Motor 2 overload (thermal model)		●
33 ²	Time-overcurrent (Bypass overload)	●	●
35	Battery/clock		●
36	Thermistor circuit		●
37	RTD/PT100 A		●
38 ¹	RTD/PT100 B		●
39 ¹	RTD/PT100 C		●
40 ¹	RTD/PT100 D		●
41 ¹	RTD/PT100 E		●
42 ¹	RTD/PT100 F		●
43 ¹	RTD/PT100 G		●
45	RTD/PT100 X Circ		●

Trip Code	Trip Name	Digistart CS	Digistart IS
46	Analog input trip		●
47	Overpower		●
48	Underpower		●
255	No trip	●	●

¹ Available with Digistart IS only if the appropriate option card is fitted.

² For Digistart IS, time-overcurrent protection is only available on internally bypassed models.

Internal Fault x

The table below details the internal fault code associated with trip code 17.

Table 6-7 Internal fault X

Internal fault	Message displayed on the keypad
70	Current Read Err Lx
71	
72	
73	Power On in Simulation mode
74	Motor connection Tx
75	
76	
77	Firing fail SCRx
78	
79	
80	VZC Fail Px
81	
82	
83	Low Control Volts
84	Internal fault X Contact your local supplier with the fault code (X).
85	
86	
87	
89	
90	
91	
92	
93	
94	
95	
96	
97	
98	

6.3 Soft Starter Programming I/O Data Structure

The Soft Starter Programming I/O Data Structure allows the user to upload (read) and download (write) soft starter parameter values over the network.

Master > Slave output bytes are structured as follows.

Table 6-8 Programming output byte structure

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 3	Parameter number to read/write							
Byte 4	<i>Reserved</i>	<i>Reserved</i>	<i>Reserved</i>	<i>Reserved</i>	<i>Reserved</i>	Write parameter	Read parameter	<i>Reserved</i>
Byte 5	High byte parameter value to write to soft starter/ zero data values for read							
Byte 6	Low byte parameter value to write to soft starter/ zero data values for read							

Slave > Master input bytes are structured as follows.

Table 6-9 Programming input byte structure

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 6	Echo parameter number							
Byte 7	Reserved	Reserved	Reserved	Parameter access level	Write access denied	Invalid parameter value	Invalid parameter number	
Byte 8	High byte parameter value read from soft starter							
Byte 9	Low byte parameter value read from soft starter							

Parameter access level is defined as follows:

0 = Read only

1 = Operator (Digistart IS parameter groups 1 to 14)

2 = Supervisor (Digistart IS parameter groups 15 and 16)

NOTE This operating module only functions with Digistart IS soft starters.

7. Profibus Diagnostics and Modes

7.1 Profibus Diagnostic Telegram and Flag

The Profibus Module supports external diagnostics. The following telegram will be sent to the Master if the soft starter trips or if a parameter is changed at the soft starter.

Table 7-1 Profibus diagnostic telegram structure

Diagnostic Telegram Data Structure	
Byte 0	User diagnostic length (Always set = 3)
Byte 1	Trip code
Byte 2	Changed parameter number (Digistart IS only)

7.1.1 Profibus Trip Code

When the soft starter trips, a diagnostic flag is set at the Master and the trip code is reported in Byte 1. When the soft starter is reset, the diagnostic flag and trip code data are reset = 0, provided the trip condition does not still exist (see *Soft Starter Monitoring I/O Data Structure* on page 8 for trip codes).

7.1.2 Changed Parameter Number

If a parameter is changed via the keypad, the affected parameter number is reported in Byte 2. When the Master reads or writes the changed parameter, Byte 2 is reset = 0.

A changed parameter number does not set a diagnostic flag.

7.2 Profibus Freeze Mode

The Profibus Module supports Freeze Mode.

In Freeze Mode, inputs are only updated with new data from the soft starter when another Freeze action is carried out. An Un-Freeze action returns the Profibus Module to normal operation.

7.3 Profibus Sync Mode

The Profibus Module supports Sync Mode.

In Sync Mode, commands to the soft starter are not processed until another Sync action is carried out. An Un-Sync action returns the Profibus Module to normal operation.

7.4 Profibus Clear Mode

If the Master sends a global Clear command, the Profibus Module will send a Quick Stop command to the soft starter.

8. Specifications

Enclosure

Dimensions 40 mm (W) x 166 mm (H) x 90 mm (D)
Weight 250 g
Protection IP20

Mounting

Spring-action plastic mounting clips (x 2)

Connections

Soft starter 6-way pin assembly
Contacts Gold flash
Network DB9 female
External power supply 2-way removable screw type
Maximum cable size 2.5 mm²

Settings

Network address
Setting MSD and LSD rotary switches
Range 0 to 99
Data rate
Setting Auto-detect
Range 9.6 kb/s to 12.0 Mb/s

Power

Consumption (steady state, maximum) 35 mA at 24 Vdc
Reverse polarity protected
Galvanically isolated

Certification

C✓ IEC 60947-4-2
CE IEC 60947-4-2

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