Profibus-DP

For RSi “S” Series

Variable Frequency Drive Instruction Manual

890049-10-00

BENSHAW

Applied Motor Controls

Safety Information

Carefully read and follow all safety instructions in this manual to avoid unsafe operating conditions, property damage, personal injury, or death. Please keep this manual for future reference.

Safety symbols in this manual

⚠ Danger

Indicates an imminently hazardous situation which, if not avoided, could result in severe injury or death.

⚠ Warning

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

ⓘ Caution

Indicates a potentially hazardous situation which, if not avoided, could result in minor injury or property damage.

ⓘ Caution

- ESD (Electrostatic discharge) from the human body may damage sensitive electronic components on the PCB. Therefore, be extremely careful not to touch the PCB or the components on the PCB with bare hands while you work on the I/O PCB.
- Turn off the power to the inverter before making wiring connections. Otherwise, malfunctions including faulty network communication may occur.
- When installing the option board, ensure that the option board is properly connected to the connector on the inverter. Faulty connections may damage the inverter or the option board.
- Check the parameter units before settings the function codes. Wrong units may lead to faulty network communication.

Table of Contents

Chapter 1. Introduction

This Profibus-DP communication module allows the “S” Series inverter to be connected to Profibus network. **The module cannot be installed in the “SW” Series inverter.**

- The drive can be controlled and monitored by the program of a PLC or other master module and they can be integrated with a PC to simplify total Factory Automation.
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- With a single communication line, multiple drives can be operated simultaneously, reducing the installation cost compared to a system that is not using a network. Also, simple wire installation can cut down installation and maintenance labor hours.

- Factory automation can be also easily operated by mixed-used development of auxiliary devices of PLC and other control systems such as PC for controlling the inverter.

Chapter 2. Package Components

Benshaw Part #: PC-100091-00

This product contains:

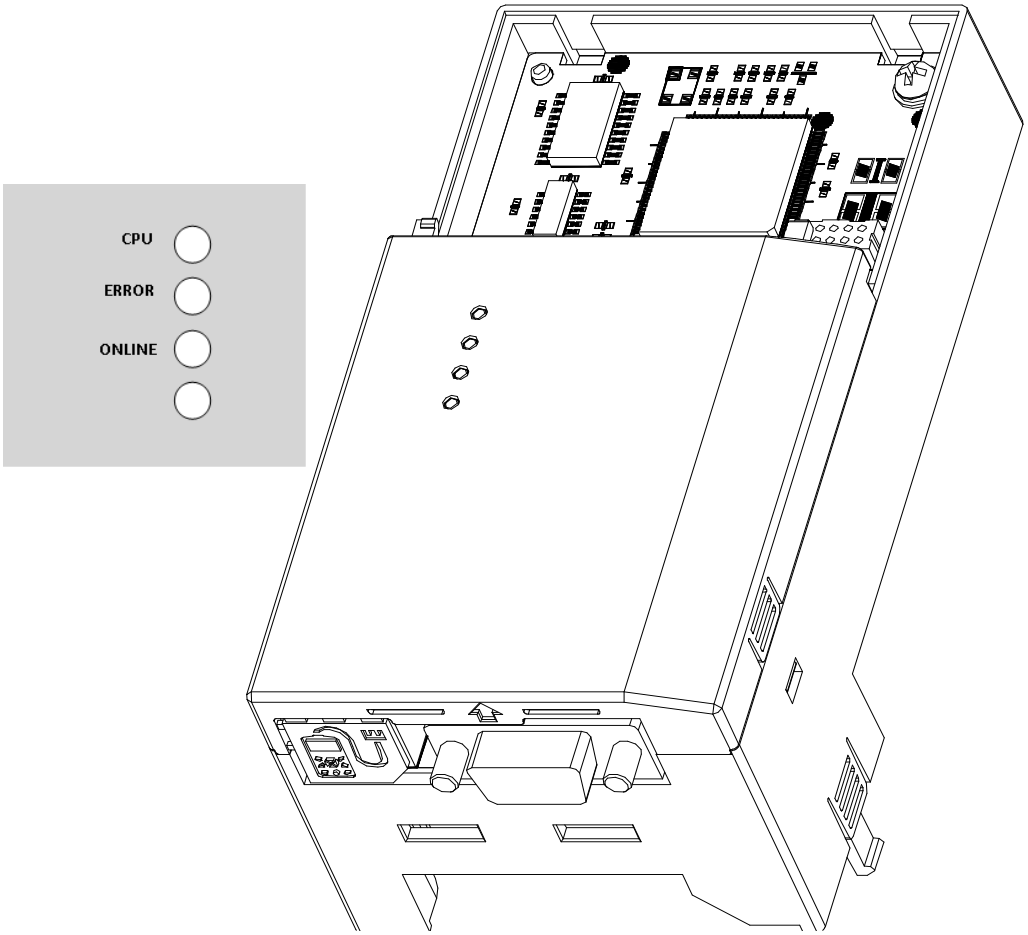
1 x Profibus-DP Communication Module
1 x Profibus connector
1 x Brass Standoff (M3xL23)
1 x Brass Standoff (M3xL17.3)
1 x Mounting Screw (M3xL8)
1 x Instruction Manual

Note: GSD file for Profibus required. Download at Benshaw.com. GSD file contains the information of Profibus-DP communication module. The Profibus configuration software needs the GSD file.

Chapter 3. Technical Specifications

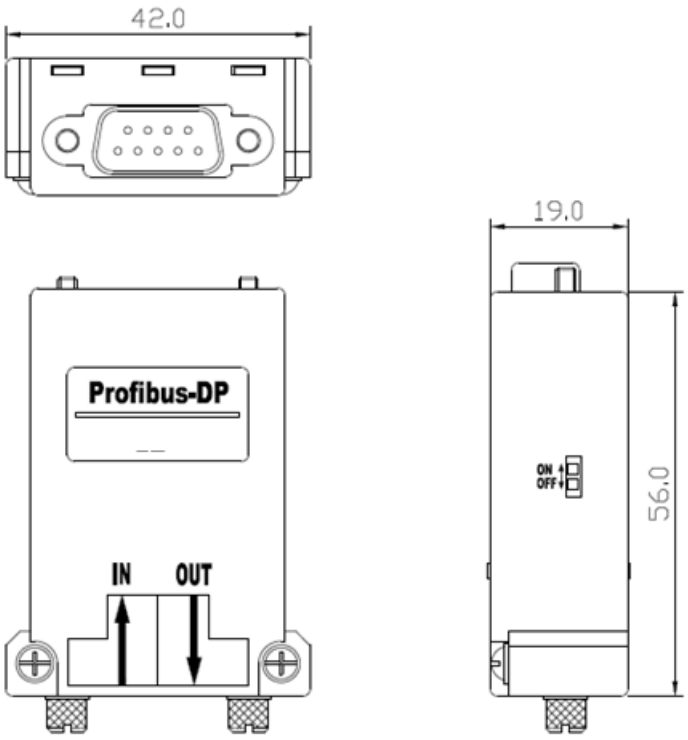
Device Type	Profibus DP Slave
Auto Baud rate Detect	Supported
Synchronization Mode	Supported
Freeze Mode	Supported
Max. Input Length	8 words
Max. Output Length	8 words
Baud rate Support	9.6K, 19.2K, 93.75K, 187.5K, 500K, 1.5M, 3M, 6M, 12M
Modular Station	Supported
Max. Module	2
Max. Connectable Number of Nodes	Max. 32 nodes without repeater (including master module)
LED	3 LEDs (ONLINE, ERR, and CPU)
Communication Connector	9 Pin D-sub

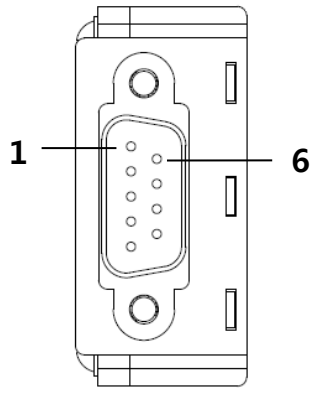
Chapter 4. Module Layout and Installation



Profibus-DP Communication Module

4.1 Profibus-DP Connector



PROFIBUS Connector	Pin	Signal	Description
	1	None	None
	2	M24	24V output GND
	3	RxD/TxD-P	Transmitter/Receiver data Plus
	4	CTRL-P	Control signal for a repeater
	5	DGND	Signal GND
	6	VP	5V for terminating resistance
	7	P24	24V output Plus
	8	RxD/TxD-N	Transmitter/Receiver data Negative
	9	CTRL-N	Control signal for a repeater

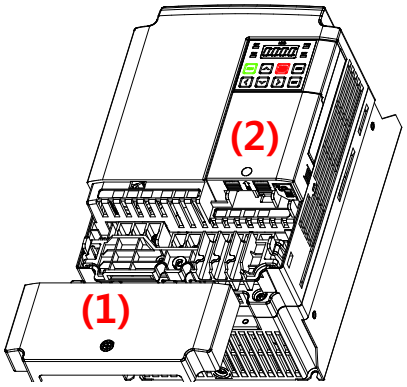
note) The product only uses Pin No's. 3, 5, 6 and 8 signals.

4.2 Installation

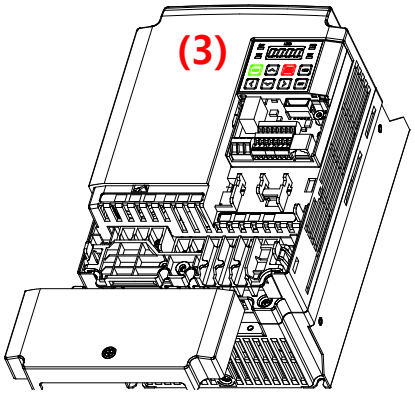
⚠ Warning

- **Do not install or remove the communication module to or from the inverter while the inverter is turned on.**
- **Ensure that the charge in the capacitors inside the inverter is completely discharged before installing or uninstalling the communication module.**

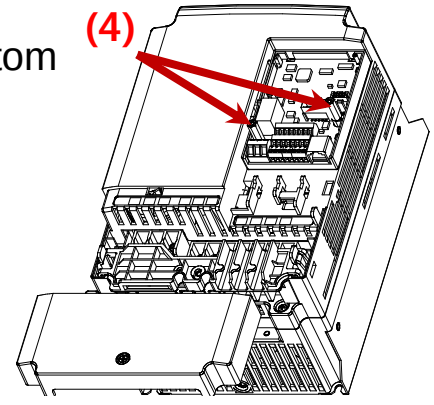
■ Loosen the front cover screws to remove the front cover (1) and remove I/O cover (2).



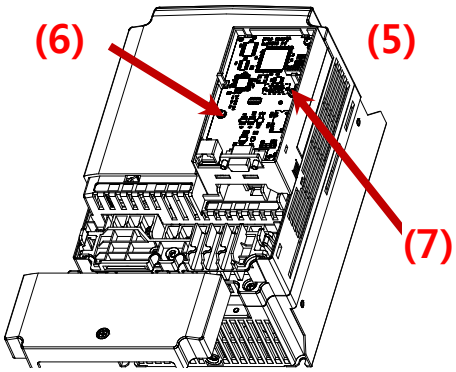
■ Remove the keypad (3).



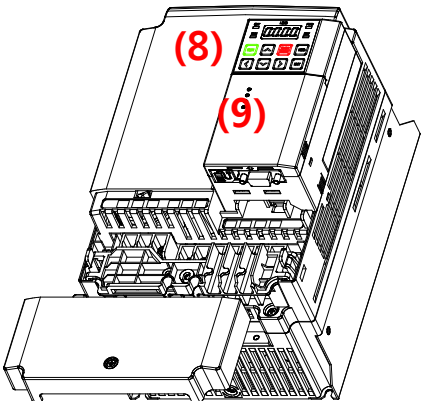
■ Remove a screw (bottom left) from the I/O board and install the provided brass standoffs (4), longer one at bottom left.



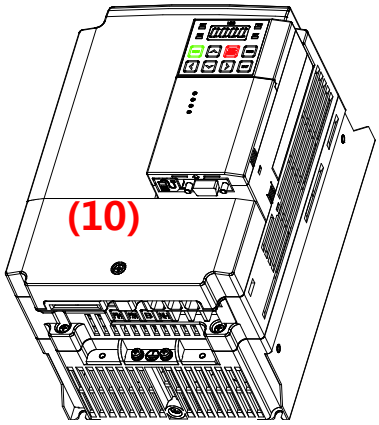
■ Mount Profibus-DP communication Module (5) and install the removed screw (6) and the supplied screw (7).



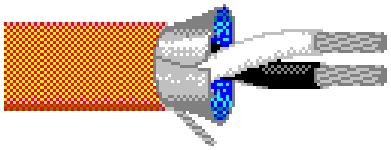
■ Install the keypad (8) first, then the communication module cover (9).



■ Install the front cover (10) and installation is completed.



Chapter 5. Network Cable Specifications

Classification	Description	
AWG	22	
Conductor Material	BC-Bare Copper	
Insulation Material	PE-Polyethylene	
Insulation Tension	0.035 inch	
Inner Shield Material	Aluminum Foil-Polyester, Tape/Braid Shield	
Electrostatic Capacity	8500pF/ft	
Specific Impedance	150Ω	
Total number of Conductors	2 Core	

5.1 Maximum Distance according to the Baud rate

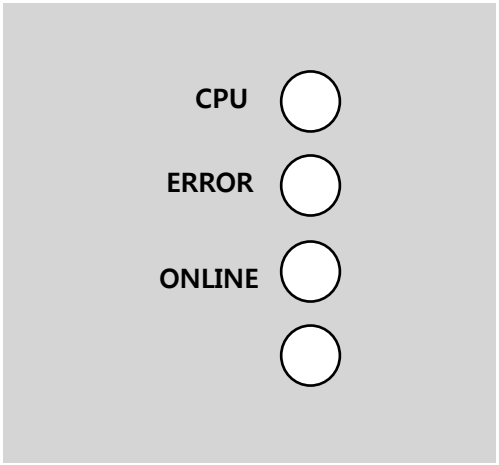
The total BUS length of a network differs based on the baud rate. The communication quality is not guaranteed when the total distance exceeds the total BUS length limit as below.

Baud rate	Max. Segment Length	Max. Extension Distance
12 Mbps	1,000 m / 3,278 feet	10,000 m / 32,786 feet
6 Mbps	1,000 m / 3,278 feet	10,000 m / 32,786 feet
3 Mbps	1,000 m / 3,278 feet	10,000 m / 32,786 feet
1.5 Mbps	1,000 m / 3,278 feet	10,000 m / 32,786 feet
500 kbps	400 m / 1,311 feet	4,000 m / 13,114 feet
187.5 kbps	200 m / 655 feet	2,000 m / 6,557 feet
93.75 kbps	100 m / 327 feet	1,000 m / 3,278 feet
19.2 kbps	100 m / 327 feet	1,000 m / 3,278 feet
9.6 kbps	100 m / 327 feet	1,000 m / 3,278 feet

Chapter 6. Status Diagnosis and LED Indication

6.1 LED Display

The Profibus-DP Module has 3 LED's. Refer to the below tables for indication, troubleshooting and diagnostics.



LED	Color	Description
CPU	Green	LED active "Blinking" when communication between the inverter and the module is operating correctly, no faults.
ERR	Red	LED active "Blinking" when there is a fault with the Profibus-DP communication module.
ONLINE	Green	LED always "On" when Profibus-DP communication module is on-line, operating normally.

6.2 LED information & Troubleshooting

LED	LED Status	Module Status	Cause	Troubleshooting
CPU	OFF	Failure in power supply	Power supply unplugged or connection failure between the inverter and Profibus-DP module.	Check power supply. Check the inverter's malfunction. Check the connection between Profibus-DP module and the connector at inverter.
	Blinking every second	Normal	Normal operation	-
ERR	OFF	Normal	Normal operation	-
	Blinking every second (with CPU LED together)	The communication is interrupted.	The communication is not available between the inverter and the communication module.	Check inverter's malfunction. Check the connection between Profibus-DP module and the connector at inverter.
	Blinking every second (alternating with CPU LED)	CONFIG ERROR	Master's configuration data is different from Profibus-DP module's configuration.	Check the configuration data set on Master and the internal configuration data at the inverter.

LED	LED Status	Module Status	Cause	Troubleshooting
ON-LINE	OFF	Off-Line	Master doesn't work for communication in the network.	Start the communication from Master.
			Disconnect with the connector.	Check pin number of connector and the termination resistor.
			There is no master in the network.	Check Master status.
			Wrong setting of station ID	Check if the station ID set in the Profibus communication module via keypad is the same as the station ID set with the Configuration tool and a that it is a unique number in the network.

LED	LED Status	Module Status	Cause	Troubleshooting
			Network Configuration Fault	Check the maximum length limit of segment. Check the number of nodes in the segment, including a repeater. Check if the connections in the network are over 126 stations including repeater.
	ON	On-Line	Network, Station, Parameterization and Configuration are normal	-

Chapter 7. Description of Parameters

7.1 Profibus-DP Communication Parameter List

Code Number	Parameter Name	Initial Value	Range	Definition
CM.06	FBus S/W Ver	-	-	Indicates the version of the Profibus-DP communication module.
CM.07	FBus ID	1	1 ~ 125	Set up the station of Profibus-DP module.
CM.09	FBus Led	-	-	View the ON/OFF data of the LED's on the LED Keypad.
CM.30	ParaStatus Num	3	0~8	Set up the number of output addresses to monitor.
CM.31	Para Status-1	0x000A	0~0xFFFF	Set up Status addresses which will be read by Master.
CM.32	Para Status-2	0x000E	0~0xFFFF	
CM.33	Para Status-3	0x000F	0~0xFFFF	
CM.34	Para Status-4	0x0000	0~0xFFFF	
CM.35	Para Status-5	0x0000	0~0xFFFF	
CM.36	Para Status-6	0x0000	0~0xFFFF	
CM.37	Para Status-7	0x0000	0~0xFFFF	
CM.38	Para Status-8	0x0000	0~0xFFFF	
CM.50	Para Ctrl Num	2	0~8	Set up the number of output addresses to control.
CM.51	Para Control-1	0x0005	0~0xFFFF	Set up control addresses controlled by Profibus DP Master.
CM.52	Para Control-2	0x0006	0~0xFFFF	
CM.53	Para Control-3	0x0000	0~0xFFFF	
CM.54	Para Control-4	0x0000	0~0xFFFF	
CM.55	Para Control-5	0x0000	0~0xFFFF	
CM.56	Para Control-6	0x0000	0~0xFFFF	

Code Number	Parameter Name	Initial Value	Range	Definition
CM.57	Para Control-7	0x0000	0~0xFFFF	
CM.58	Para Control-8	0x0000	0~0xFFFF	
CM.68	FBus Swap Sel	0	0~1	0 : No 1 : Yes
CM.94	Comm Update	0	0:NO 1:YES	Update keypad parameters relating to communication.
Pr.12	Lost Cmd Mode	"None"	"None" "Free-Run" "Dec" "Hold Input" "Hold Output" "Lost Preset"	If Lost Command occurs, sets up the Inverter action.
Pr.13	Lost Cmd Time	1.0	0.1~120.0 sec	Sets up Lost Command occurrence time
Pr.14	Lost Preset F	0	0~600.00 Hz	Sets up speed of Lost Preset

7.1.1. CM.06 - Fbus S/W Ver

CM.06 indicates the version of the communication module installed in the inverter.

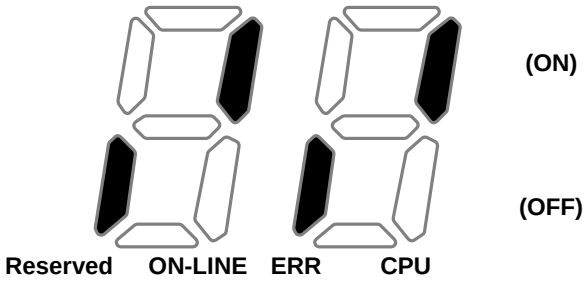
7.1.2. CM.07 - FBus ID

CM.07 sets the value of Station ID at Profibus-DP module. Station ID can be set up within the range of 1~125 and it cannot be duplicated. It needs to check if the set Station ID is not equal to another Station ID in network.
If the value of Station ID is changed, set ‘CM.94 (Comm Update)’ to ‘1’ to apply the changed value of Station ID to Profibus-DP Communication module.

7.1.3. CM.09 - Fbus LED

The ON/OFF state of the 3 communications module LED's is displayed at the keypad parameter CM.09 The display LED segments represent the 3 LED's according to:
(Left -> Right) ONLINE, ERR, and CPU

(Ex: CM.09 LED Status)



7.1.4. CM.30 - ParaStatus Num

This parameter determines how many addresses of status/monitoring information will be read by the Master through Profibus-DP communication. It can be set from 0 to 8. Para Status has to be set to the number of Para Status addresses (From CM.31 to CM.38).
For example, If CM.30 is set to '3', Para Status should be set from CM.31 to CM.33. If CM.30 is set to '6', Para Status should be set from CM.31 to CM.36. If the number of Para status is changed, set 'CM.94 (Comm Update)' to '1' to apply the changes to Profibus-DP Communication module.

7.1.5. CM.31 ~ CM.38 - Para Status 1~8

Enter the addresses of the status parameters to be read by the Master through Profibus-DP communication. Para Status 1~8 are set in the form of inverter addresses. They set up the addresses for the common inverter area in the inverter keypad. The keypad parameter address is entered and saved in the form of:
0x1000 + ('Group number' x 0x100) + ('Code number').

For example, if DI Status Parameter IN.90 is set as Para Status-1, it has to be set to 0x155A.
0x1000 + 0x05 x 0x100 + 0x5A (Decimal 90) = 0x155A

Group	Group Number	Group	Group Number
dr Group	1	CM Group	7
bA Group	2	AP Group	8
Ad Group	3	(Reserved)	9
Cn Group	4	(Reserved)	10
In Group	5	PRT Group	11
OU Group	6	M2 Group	12

7.1.6. CM.50 - Para Ctrl Num

This parameter determines how many addresses of control information will be sent to the inverter from the Master through Profibus-DP communication. It can be set from 0 to 8. Para Ctrl Num has to be set to the number of Para Control addresses (From CM.51 to CM.58).

For example, If CM.50 is set to ‘2’, Para Control addresses should be set in CM.51 and CM.52. If CM.50 is set to ‘5’, Para Control addresses should be set in CM.51 to CM.55. If the number of Para Ctrl Num is changed, set ‘CM.94 (Comm Update)’ to ‘1’ to apply the changes to the Profibus-DP communication module.

7.1.7. CM.51 ~ CM.58 - Para Control 1~8

Enter the addresses of the control parameters to be sent by the Master through Profibus-DP communication. Para Control 1~8 are set in the form of inverter addresses. They set up the addresses for the common inverter area in the inverter keypad. The keypad parameter address is entered and saved in the form of:
0x1000 + (‘Group number’ x 0x100) + (‘Code number’).

For example, if Acc Time parameter dr.03 is set as Para Control-1, it has to be set to 0x1103.
0x01 x 0x1000 + 0x01 x 0x100 + 0x03 (Decimal 3) = 0x1103

Group	Group Number	Group	Group Number
dr Group	1	CM Group	7
bA Group	2	AP Group	8
Ad Group	3	Reserved	9
Cn Group	4	Reserved	10
In Group	5	PRT Group	11
OU Group	6	M2 Group	12

7.1.8. CM.94 - Comm Update

CM.07	Station ID setting
CM.30	The number of Para Status setting
CM.50	The number of Para Control setting
CM.94	Comm Update

After changing Station ID, the number of Para Status and the number of Para Control, set the Comm Update to ‘1 (Yes)’ to apply changed values to the Profibus-DP communication module.

7.1.9. CM.68 - Profibus Bit Swap

Inverter data is word which is sent divided into byte at the time of data transmission. At this time, whether transmitting to MSB-LSB or to LSB-MSB will be elected. Initial value is MSB-LSB.

	Setting Value	Location on the KeyPad
FBus Swap Sel	0 : No 1 : Yes	CM Group - 68

7.1.10. Pr.12 - Lost Cmd Mode

When controlling the inverter speed through communications, you can select the inverter response (operating mode) when a network failure occurs (including a connection failure between the inverter and communication). Choices for Pr.12 include Decel, Hold Input, Hold Output or Preset Frequency (Pr.14).

Set Value	Function
"None"	Maintains the previous status.
"Free-Run"	Lost Command Trip occurs and Free Run stops.
"Dec"	Lost Command Trip occurs and stops by Trip deceleration time.
"Hold Input"	Lost Command Warning occurs and operates by the previous operation reference.
"Hold Output"	Lost Command Warning occurs and operates at the previous operation speed.
"Lost Preset"	Lost Command Warning occurs and operates at the speed set up in the Pr.14.

7.1.11. Pr.13 - Lost Cmd Time

Set the delay time for the inverter to respond to a communications loss. The inverter will operate based on the Pr.12 setting after the delay time set in Pr.13. Delay time can be set between "0.1" and "120" seconds.

7.1.12. Pr.14 - Lost Preset Frequency

When the lost command mode (Pr.12) is set to Preset Frequency, set the operating speed for continued inverter operation. The Preset Frequency can be set between the start frequency and the max frequency [Hz].

Revision History

No	Date	Edition	Changes
0	2021-02-27	First Release	

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