User Guide

SI-PROFINET V2 and SI-PROFINET (HW V03 or later)

0478-0363-03 Issue: 03

Compliance Information

Manufacturer: Nidec Control Techniques Limited ("we", "our")
Registered office: The Gro, Newtown, Powys, SY16 3BE United Kingdom
Registered in: England and Wales, company registration number 01236886
Manufacturer's EU Authorised Representative: Nidec Netherlands B.V., Kubus 155, 3364 DG Sliedrecht, the Netherlands, registered at the Dutch Trade Register under number 33213151; Tel. +31 (0)184 420 555, info.nl@mail.nidec.com

Original instructions
With reference to the UK Supply of Machinery (Safety) Regulations 2008 and the EU Machinery Directive 2006/42/EC, the English version of this Manual constitutes the original instructions. Manuals published in other languages are translations of the original instructions and the English language version of this Manual prevails over any other language version in the event of inconsistency.

Documentation and user software tools
Manuals, datasheets and software that we make available to users of our products can be downloaded from: **http://www.controltechniques.com/support.**
Manuals may be accompanied by an Errata list. This will be located alongside the manuals if applicable.

Warranty and liability
The contents of this Manual are presented for information purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available on request. We reserve the right to modify or improve the designs, specifications or performance of our products at any time without notice. For full details of the warranty terms applicable to the product, contact the supplier of the product.
In no event and under no circumstances shall we be liable for damages and failures due to misuse, abuse, improper installation, or abnormal conditions of temperature, dust, or corrosion, or failures due to operation outside the published ratings for the product, nor shall we be liable for consequential and incidental damages of any kind.
Environmental management
We operate an Environmental Management System which complies with the requirements of ISO 14001:2015. Further information on our Environmental Statement can be found at:
http://www.controltechniques.com/environment.

Restriction and control of hazardous substances
The products covered by this Manual comply with the following legislation and regulations on the restriction and control of hazardous substances:
UK Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
UK REACH etc. (Amendment etc.) (EU Exit) Regulations 2020, European Union REACH Regulation EC 1907/2006
EU restriction of the Use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) - Directive 2011/65/EU
EC Regulation 1907/2006 on the Registration, Evaluation, authorisation, and restriction of Chemicals (REACH)
Chinese Administrative Measures for Restriction of Hazardous Substances in Electrical and Electronic Products 2016/07/01
U.S. Environmental Protection Agency ("EPA") regulations under the Toxic Substances Control Act ("TSCA")
MEPC 68/21 / Add.1, Annex 17, Resolution MEPC.269(68) 2015 Guidelines for the development of the inventory of hazardous materials
The products covered by this Manual do not contain asbestos.
Further information on REACH and RoHS can be found at: **http://www.controltechniques.com/environment**.

Conflict minerals
With reference to the Conflict Minerals (Compliance) (Northern Ireland) (EU Exit) Regulations 2020, the U.S. Dodd-Frank Wall Street Reform and Consumer Protection Act and Regulation (EU) 2017/821 of the European Parliament and of the European Council:
We have implemented due diligence measures for responsible sourcing, we conduct conflict minerals surveys of relevant suppliers, we continually review due diligence information received from suppliers against company expectations and our review process includes corrective action management. We are not required to file an annual conflict minerals disclosure. Nidec Control Techniques Limited is not an issuer as defined by the U.S. SEC.

Disposal and recycling (WEEE)

The products covered by this Manual fall within the scope of the UK Waste Electrical and Electronic Equipment Regulations 2013, EU Directive 2012/19/EU amended by EU Directive 2018/849 (EU) on Waste Electrical and Electronic Equipment (WEEE).

When electronic products reach the end of their useful life, they must not be disposed of along with domestic waste but should be recycled by a specialist recycler of electronic equipment. Our products are designed to be easily dismantled into their major component parts for efficient recycling. Most materials used in our products are suitable for recycling.

Our product packaging is of good quality and can be re-used. Smaller products are packaged in strong cardboard cartons which have a high recycled fibre content. Cartons can be re-used and recycled. Polythene, used in protective film and bags for the ground screws, can be recycled. When preparing to recycle or dispose of any product or packaging, please observe local legislation and best practice.

Contents

1 Safety information

1.1 Warnings, Cautions and Notes

A Warning contains information which is essential for avoiding a safety hazard.

A Caution contains information which is necessary for avoiding a risk of damage to the product or other equipment.

NOTE A Note contains information which helps to ensure correct operation of the product.

1.2 Important safety information. Hazards. Competence of designers and installers

This guide applies to products which control electric motors either directly (drives) or indirectly (controllers, option modules and other auxiliary equipment and accessories). In all cases the hazards associated with powerful electrical drives are present, and all safety information relating to drives and associated equipment must be observed.

Specific warnings are given at the relevant places in this guide.

Drives and controllers are intended as components for professional incorporation into complete systems. If installed incorrectly they may present a safety hazard. The drive uses high voltages and currents, carries a high level of stored electrical energy, and is used to control equipment which can cause injury. Close attention is required to the electrical installation and the system design to avoid hazards either in normal operation or in the event of equipment malfunction. System design, installation, commissioning/start-up and maintenance must be carried out by personnel who have the necessary training and competence. They must read this safety information and this guide carefully.

1.3 Responsibility

It is the responsibility of the installer to ensure that the equipment is installed correctly with regard to all instructions given in this guide. They must give due consideration to the safety of the complete system, so as to avoid the risk of injury both in normal operation and in the event of a fault or of reasonably foreseeable misuse. The manufacturer accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation of the equipment.

1.4 Compliance with regulations

The installer is responsible for complying with all relevant regulations, such as national wiring regulations, accident prevention regulations and electromagnetic compatibility (EMC) regulations. Particular attention must be given to the cross-sectional areas of conductors, the selection of fuses or other protection, and protective ground (earth) connections.

This guide contains instructions for achieving compliance with specific EMC standards. All machinery to be supplied within the European Union in which this product is used must comply with the following directives:

2006/42/EC Safety of machinery.

2014/30/EU: Electromagnetic Compatibility.

1.5 Electrical hazards

The voltages used in the drive can cause severe electrical shock and/or burns, and could be lethal. Extreme care is necessary at all times when working with or adjacent to the drive. Hazardous voltage may be present in any of the following locations:

- AC and DC supply cables and connections
- Output cables and connections
- Many internal parts of the drive, and external option units

Unless otherwise indicated, control terminals are single insulated and must not be touched.

The supply must be disconnected by an approved electrical isolation device before gaining access to the electrical connections.

The STOP and Safe Torque Off functions of the drive do not isolate dangerous voltages from the output of the drive or from any external option unit.

The drive must be installed in accordance with the instructions given in this guide. Failure to observe the instructions could result in a fire hazard.

1.6 Stored electrical charge

The drive contains capacitors that remain charged to a potentially lethal voltage after the AC supply has been disconnected. If the drive has been energized, the AC supply must be isolated at least ten minutes before work may continue.

1.7 Mechanical hazards

Careful consideration must be given to the functions of the drive or controller which might result in a hazard, either through their intended behaviour or through incorrect operation due to a fault. In any application where a malfunction of the drive or its control system could lead to or allow damage, loss or injury, a risk analysis must be carried out, and where necessary, further measures taken to reduce the risk - for example, an over-speed protection device in case of failure of the speed control, or a fail-safe mechanical brake in case of loss of motor braking.

With the sole exception of the Safe Torque Off function, none of the drive functions must be used to ensure safety of personnel, i.e. they must not be used for safety-related functions.

The Safe Torque Off function may be used in a safety-related application. The system designer is responsible for ensuring that the complete system is safe and designed correctly according to the relevant safety standards.

The design of safety-related control systems must only be done by personnel with the required training and experience. The Safe Torque Off function will only ensure the safety of a machine if it is correctly incorporated into a complete safety system. The system must be subject to a risk assessment to confirm that the residual risk of an unsafe event is at an acceptable level for the application.

1.8 Access to equipment

Access must be restricted to authorized personnel only. Safety regulations which apply at the place of use must be complied with.

1.9 Environmental limits

Instructions in this guide regarding transport, storage, installation and use of the equipment must be complied with, including the specified environmental limits. This includes temperature, humidity, contamination, shock and vibration. Drives must not be subjected to excessive physical force.

1.10 Hazardous environments

The equipment must not be installed in a hazardous environment (i.e. a potentially explosive environment).

1.11 Motor

The safety of the motor under variable speed conditions must be ensured.

To avoid the risk of physical injury, do not exceed the maximum specified speed of the motor.

Low speeds may cause the motor to overheat because the cooling fan becomes less effective, causing a fire hazard. The motor should be installed with a protection thermistor. If necessary, an electric forced vent fan should be used.

The values of the motor parameters set in the drive affect the protection of the motor. The default values in the drive must not be relied upon. It is essential that the correct value is entered in the Motor Rated Current parameter.

1.12 Mechanical brake control

Any brake control functions are provided to allow well co-ordinated operation of an external brake with the drive. While both hardware and software are designed to high standards of quality and robustness, they are not intended for use as safety functions, i.e. where a fault or failure would result in a risk of injury. In any application where the incorrect operation of the brake release mechanism could result in injury, independent protection devices of proven integrity must also be incorporated.

1.13 Adjusting parameters

Some parameters have a profound effect on the operation of the drive. They must not be altered without careful consideration of the impact on the controlled system. Measures must be taken to prevent unwanted changes due to error or tampering.

1.14 Electromagnetic compatibility (EMC)

Installation instructions for a range of EMC environments are provided in the relevant Power Installation Guide. If the installation is poorly designed or other equipment does not comply with suitable standards for EMC, the product might cause or suffer from disturbance due to electromagnetic interaction with other equipment. It is the responsibility of the installer to ensure that the equipment or system into which the product is incorporated complies with the relevant EMC legislation in the place of use.

2 Introduction

2.1 Products covered by this User Guide

This User Guide covers the SI-PROFINET V2 and SI-PROFINET HW V03 or later option modules.

The term 'SI-PROFINET' is used in this document to refer to all hardware variants of the current SI-PROFINET and SI-PROFINET V2 option modules, any features not common to all variants will be identified appropriately.

The SI-PROFINET is an option module that provides PROFINET connectivity and can be installed to the following drives:

- Unidrive M200 / M201 (sizes 2 and above)
- Unidrive M300 (sizes 2 and above)
- Unidrive M400 (sizes 2 and above)
- Unidrive M600
- Unidrive M700 / M701 / M702
- Unidrive M800
- Unidrive M88x
- Digitax HD
- Unidrive HS70 / HS71 / HS72
- Commander C200 / C300 (sizes 2 and above)
- Commander C300 PM (sizes 2 and above)

2.2 What is PROFINET?

PROFINET is an Ethernet based industrial network protocol adapting Ethernet hardware and protocols to the real time needs of industrial automation. It is similar to PROFIBUS in that it enables distributed IO control from a PLC.

2.3 Introduction to SI-PROFINET

SI-PROFINET is an option module that allows any suitable Control Techniques variable speed drive to be connected to a PROFINET network as a PROFINET IO slave device.

It is possible to use more than one SI-PROFINET or a combination of SI-PROFINET and other option modules, to add additional functionality such as extended I/O, gateway functionality, or additional PLC features.

2.4 Features / specification

The following features are included in the SI-PROFINET option module:

- Dual 100 BASE-TX RJ45 connectors with support for shielded twisted pair, full-duplex 100 M bps connectivity with auto crossover correction
- Both RJ45 ports operate in full duplex mode as a network switch
- PROFINET Real Time class RT_Class_1 and conformance class A
- Cycle times from 1 ms to 512 ms specified during configuration
- Automatic device replacement using the LLDP protocols
- LED indication of network port activity
- Up to 64 cyclic IO module slots (maximum 32 inputs and 32 outputs configured by network configuration tool and GSDML file)
- Identification and Maintenance functions I&M0 to I&M4 supported

2.5 Firmware version

This product is supplied with the latest firmware version. When retro-fitting to an existing system, all firmware versions should be verified to confirm the same functionality as products of the same type already present. This also applies to products returned from a Nidec Industrial Automation's Service Centre or Repair Centre. If there is any doubt please contact the supplier of the product. The firmware version of the product can be identified by looking at Pr **MM.002** where **MM** is the relevant menu number for the module slot being used.

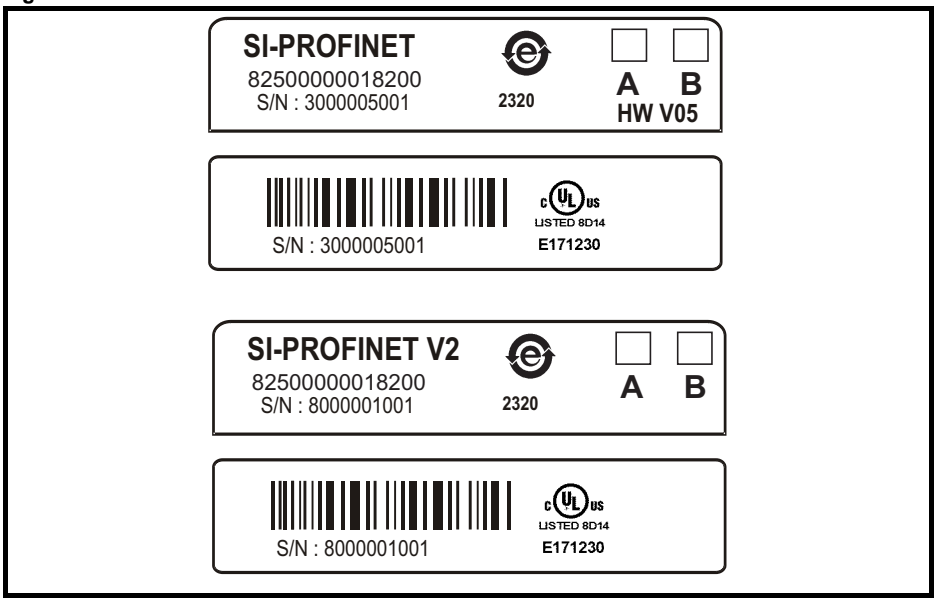
This document covers both the SI-PROFINET V2 and the SI-PROFINET HW V03 and later variants.
The hardware version of the product can be identified by looking at Pr **MM.003**, for the SI-PROFINET V2 this will be 1.00 but will be different for the later hardware variants.
The firmware versions of the SI-PROFINET V2 and SI-PROFINET HW V03 or later modules are not compatible, when updating the firmware care must be taken to ensure the correct firmware is used, the latest version of Connect does prevent downloading incompatible firmware.

2.6 Option module identification

The SI-PROFINET module can be identified by:

1. The label located on the option module.
2. The colour coding across the front of the SI-PROFINET module (yellow/green).

Figure 2-1 SI-PROFINET label details



2.6.1 Date code format

The date code is four numbers. The first two numbers indicate the year and the remaining numbers indicate the week of the year in which the drive was built.

Example:

A date code of 1710 would correspond to week 10 of year 2017.

2.7 Conventions used in this guide

The configuration of the host drive and option module is done using menus and parameters. A menu is a logical collection of parameters that have similar functionality. In the case of an options module, the parameters will appear in menu 15, 16[1] or 17[1,2] depending on which slot the module is installed to. The menu is determined by the number before the decimal point.

The method used to determine the menu or parameter is as follows:

- Pr **S.mm.ppp** - Where **S** signifies the option module slot number and mm.ppp signifies the menu and parameter number of the option module's internal menus and parameters.
- Pr **MM.ppp** - Where **MM** signifies the menu allocated to the option module set-up menu and **ppp** signifies the parameter number.
- Pr **mm.000** - Signifies parameter number 000 in any drive menu.

NOTE [1] - Not available on M200, M201, M300, M400, C200, C300, C300 PM drives.

[2] - Not available on Digitax HD drives.

2.8 SI-PROFINET conventions

When referring to the cyclic data, the terms input and output are with respect to the PROFINET IO controller (PLC).

2.9 PROFINET network controller or PLC?

The terms 'network controller' and 'PLC' are mutually used in this manual to refer to the PROFINET network controller. This is generally a PLC with a PROFINET interface and possibly a programming interface to connect to the programming device or PC. However this interface is not necessary, as the PROFINET interface can be used to program the PLC.

2.10 SI-PROFINET hardware compatibility

The SI-PROFINET V2 module and the HW V03 or later hardware variants all support the basic PROFINET IO functionality, but the SI-PROFINET HW V03 or later variants support additional features, as shown in Table 2-1.

Table 2-1 Hardware compatibility

Feature	SI_PROFINET			
	V2	HW V03	HW V04	HW V05
IP Address set manually	No[1]	No[2]		
Profinet device name	SI-PROFINET[3]	SI-PROFINET		
Web server	No	Yes		
Gateway mode	No	Yes		
VLAN	No	Yes		
Resource monitoring (menu 9)	No	Yes		
RTMoE easy mode (menu 10)	No	Yes		
RTMoE sync (menu 11)	No	Yes		
Modbus (menu 15)	No	Yes		
Profinet fault values (menu 25)	No	Yes		

[1] - The IP address parameters are read-only on SI-PROFINET V2.

[2] - The IP address parameters are writeable but are cleared on initialisation.

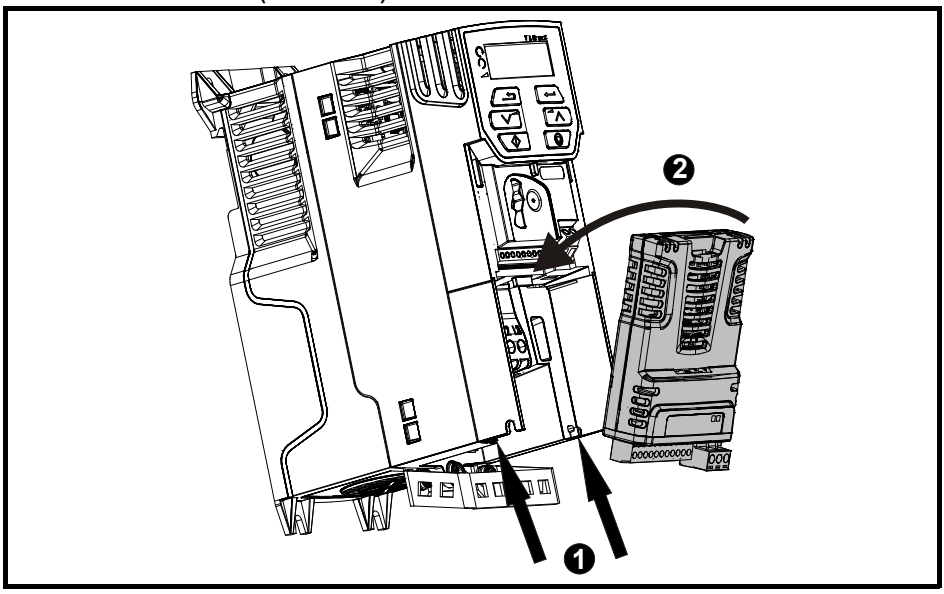
[3] - As of firmware V02.01.01.06, prior to V02.01.01.06 was SI-PROFINETV2.

3 Mechanical installation

WARNING Before installing or removing an option module from any drive, ensure the AC supply has been disconnected for at least 10 minutes and refer to section 1 *Safety information* on page 6. If using a DC bus supply ensure this is fully discharged before working on any drive or option module.

3.1 General installation

Figure 3-1 Installation of an SI option module on Unidrive M200 to M400 (sizes 2 to 4) and Commander C200 / C300 (sizes 2 to 4)

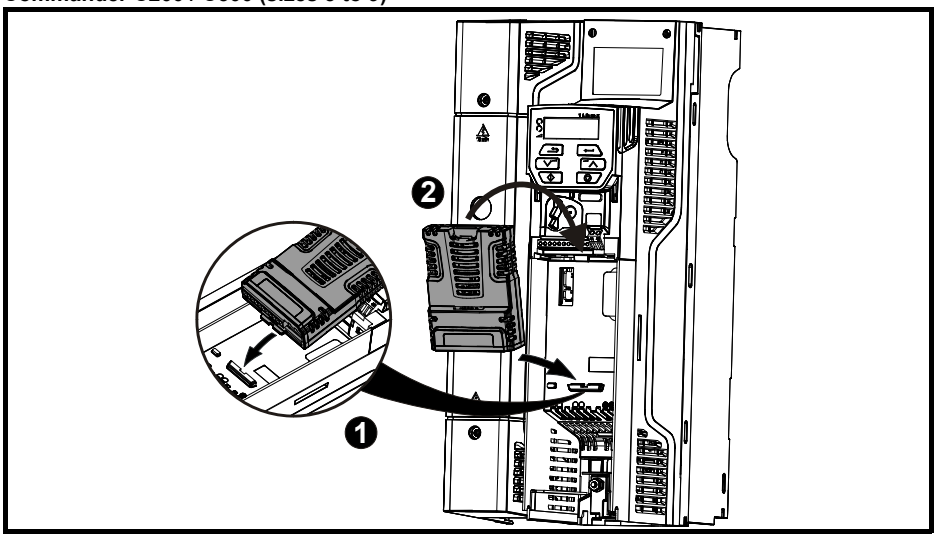


- With the option module tilted slightly backwards, align and locate the two holes in the rear of the option module onto the two tabs (1) on the drive.
- Place the option module onto the drive as shown in (2) until the module clicks into place. The terminal cover on the drive holds the option module in place, so this must be put back on.

NOTE Option modules can only be installed on drives that have the option module slot functionality.

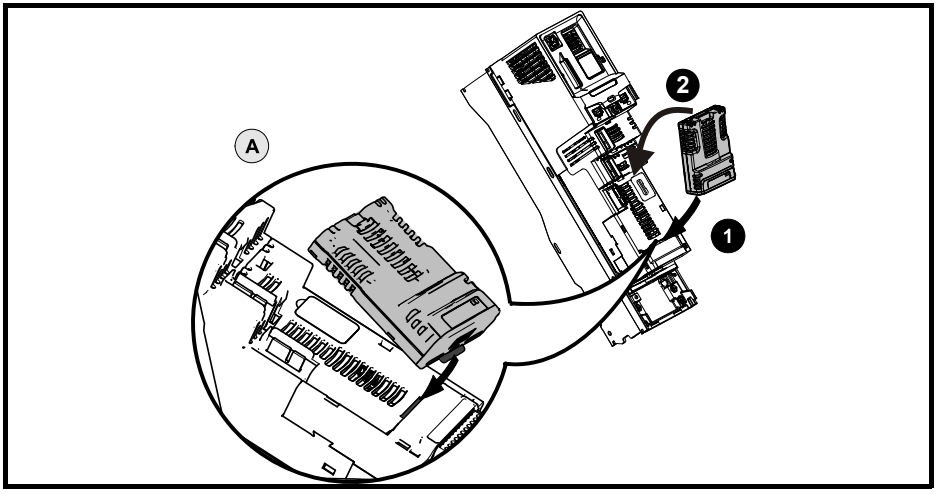
NOTE Figure 3-1 above is for illustration only, the actual option module may be different to the one shown.

Figure 3-2 Installation of an SI option module on Unidrive M200 to M400 (sizes 5 to 9) and Commander C200 / C300 (sizes 5 to 9)



- Place the option module onto the drive as shown in (2) until the module clicks into place. The terminal cover on the drive holds the option module in place, so this must be put back on.

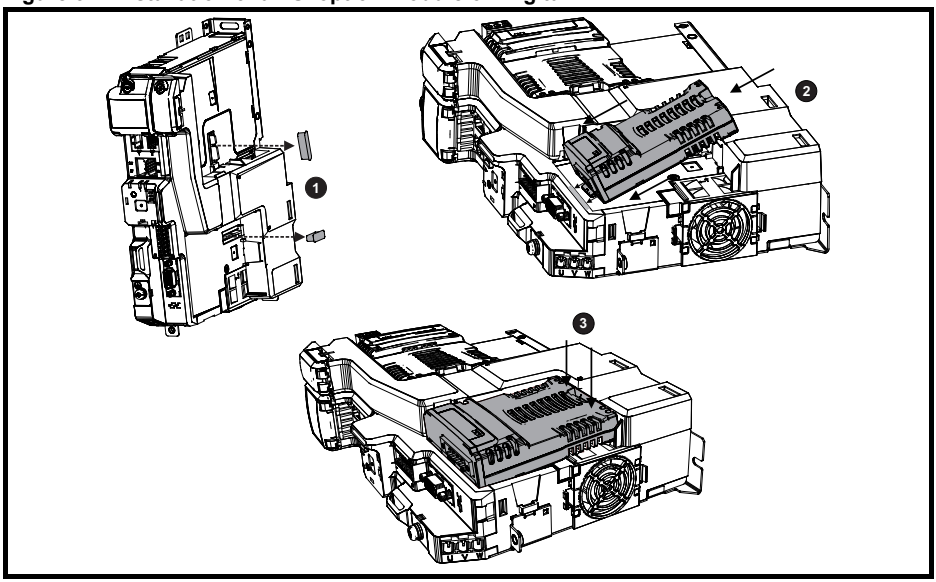
Figure 3-3 Installation of an SI option module on Unidrive M600 to M8xx and HS70, HS71 and HS72



- Move the option module in direction shown (1/2).
- Align and insert the option module tab in to the slot provided, this is highlighted in the detailed view (A).
- Press down on the option module until it clicks into place.

NOTE Option module slots must be used in the following order: Slot 3 (lower), Slot 2 (middle) and then Slot 1 (upper).

Figure 3-4 Installation of an SI option module on Digitax HD



1. Remove the protective interface card covers.

2. Align and insert the option module tab into the slot on the drive plastic.

3. Once the option module tab is located into the slot on the drive, push down at the rear of the option module until it clicks into place.

NOTE Once fitted, the SI option module remains at an angle with respect to the drive.

NOTE When connecting SI option modules, an additional SI option mounting kit is required for the Digitax HD M75X series, if the drive is not supplied with a SI option mounting kit fitted. The SI option mounting kit can be ordered from the supplier of the drive. Refer to the Digitax HD M75X Series Installation and Technical Guide for further information.

4 Electrical installation

4.1 Bus media

The SI-PROFINET option module incorporates two 100 BASE-TX RJ45 interfaces operating in full duplex mode with auto crossover correction.
Both ports have integrated switches and can be connected to other PROFINET devices to create a line network.

4.2 Cabling considerations

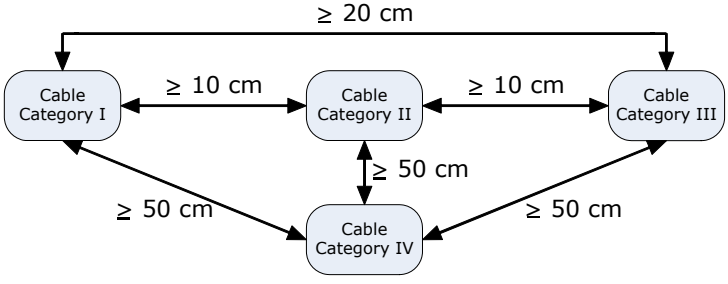
To ensure long-term reliability it is recommended that any cable used is tested using a suitable Ethernet cable tester, this is of particular importance when cables are constructed on site.

When installing fieldbus or communications cables (especially high speed data cables such as PROFINET), consideration should be given to the physical layout and positioning of the cables, in particular the positioning with regards to other cables (power cables etc.). The recommended distances between different category cables is shown in Table 4-1 *Cable properties* on page 16.

Cables belonging to the same category may be placed adjacent to each other with no danger of cross-interference.

Similar category cables can be installed in an earthed metal cable tray / trunking separated from other category cables by earthed metal partitions, provided the cable tray or trunking has a lid so the cables are completely surrounded in an earthed metal enclosure.

Figure 4-1 Recommended cable distances



Category I – sensitive and safe cables.
Communication cables
Data cables
Low voltage power (AC up to 25V / DC up to 60V)

Category II – medium voltage cables.
Cables carrying AC voltages between 25V and 400V
Cables carrying DC voltages between 60V and 400V

Category III – high voltage cables.
Cables carrying AC or DC voltages above 400V
Motor / drive inverter cables

Category IV – water industry cables.
Any cables at risk of direct lightning strikes (e.g. cables running outside, between buildings)

Cables should not be distorted, stretched, crushed or otherwise damaged in any way as this may cause future reliability issues.
Avoid excessive bending during installation, the maximum recommended bending radius is 10 times the cable diameter 75 mm (3.0 in).

NOTE Cabling issues are the single most frequent cause of network downtime.

- Ensure cables are correctly routed i.e. not adjacent to high-power cables etc.
- Wiring must be correct, and the connectors should be of industrial grade with metal shielding.
- Routers or switches must be of industrial and not 'office' quality, as they do not provide the same degree of noise immunity as their industrial counterparts.

4.3 Cable

Copper cables should be shielded twisted pair (STP) and, as a minimum, meet TIA Cat 5e requirements and be certified for use on a PROFINET network. The coloring of the outer sheath is not critical but should be consistent (where possible) to simplify system maintenance and, preferably, for identification purposes comply with the standard PROFINET coloring (yellow/green). PROFINET copper cables are categorized into three different types, the actual type used is mainly determined by the relevant application.

- **Type A** cables are designed for fixed installations where the cable is not subject to any movement.
- **Type B** cables are designed for flexible installations where the cable can be subject to occasional movement or vibration.
- **Type C** cables are designed for special applications where the cable will be subject to frequent or continuous movement or vibration.

4.3.1 Cable properties

The properties for all three types of cables are similar, the only difference between the three types are the size of the individual wires used.

Table 4-1 Cable properties

Impedance	100 Ω ±15 Ω
Loop resistance	<115 Ω/km
Transmission rate	100 M Bit/s
Maximum length	100 m
Number of wires	4
Sheath color	Green
Insulation color	White, Blue, Yellow, Orange

	Type A	Type B	Type C
Wire diameter	0.64 mm	0.75 mm	0.13 mm
Wire CSA	0.32 mm^2 (AWG 22/1)	0.36 mm^2 (AWG 22/7)	AWG 22/7 or AWG 22/19

NOTE Special properties of some copper cables use flame retardant materials which can reduce the maximum length of the cable to less than 100 m. For more information please refer to the cable manufacturer's documentation.

4.4 Maximum network length

The main restriction imposed on Ethernet cabling is the length of a single segment of cable. The SI-PROFINET module has two 100 BASE-TX Ethernet ports, which support segment lengths of up to 100 m. This means that the maximum cable length which can be used between one SI-PROFINET port and another 100 BASE-TX port is 100 m, however it is not recommended that the full 100 m cable length is used.

NOTE The total network length is not restricted by the Ethernet standard, but depends on the number of devices on the network and the transmission media (copper, fibre optic, etc).

4.5 SI-PROFINET terminal descriptions

The SI-PROFINET module has two RJ45 Ethernet ports for connection to a PROFINET network. Each Ethernet port operates in full duplex mode as a network switch and has an LED associated with it to indicate the connection status as shown in Table 4-2.

Table 4-2 LED functionality

State	Meaning
OFF	No Ethernet network connection detected
Steady green	Ethernet connection established
Flashing green	Ethernet message frame detected

Figure 4-2 SI-PROFINET connections

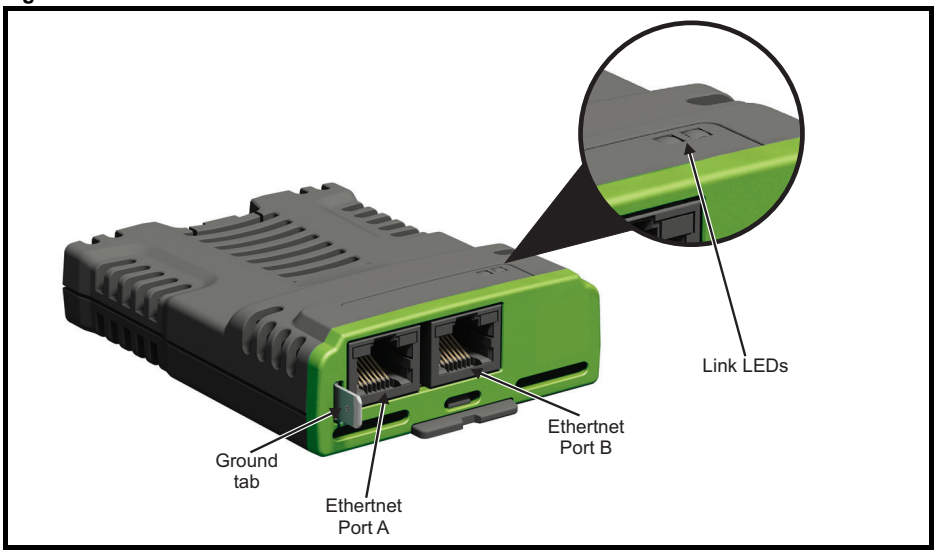
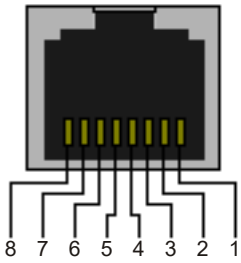


Table 4-3 SI-PROFINET Ethernet connections

Port A / B	
Pin	**Function**
1	Transmit +
2	Transmit -
3	Receive +
4	Not used
5	Not used
6	Receive -
7	Not used
8	Not used



4.6 Module grounding

SI-PROFINET is supplied with a grounding tab on the module that should be connected to the closest possible grounding point using the minimum length of cable. This is normally the drive's ground connection located close to the main power input terminals. This will greatly improve the noise immunity of the module.

NOTE For information on the drive grounding arrangement refer to the relevant drive documentation.

4.7 Network topology

The SI-PROFINET module has two PROFINET ports with integrated switches to allow the use of line networks. However, when using line networks, a break in the connection (for example when replacing a device) will cause all devices downstream from the failure to also stop communicating with the controller.

Other Ethernet network topologies can be used but care must be taken to ensure that the system still operates within the constraints specified by the designer.
Generally a star or tree network structure using separate switches gives improved availability in the event of device failure or replacement. Also, managed switches have a web page interface which can be used to configure the switch to monitor the data traffic on specific ports using any appropriate protocol analyzer.
Although the PROFINET protocol does support all major topologies, line topology networks are normally used for practical and financial reasons, other Ethernet topologies (e.g. star) may not be suitable for real time communications due to their inherent use of switches or other network equipment.

Any network devices used, such as switches, must be capable of RT communications and ideally, also IRT (Isochronous Real Time) communications, although SI-PROFINET does not currently support this protocol. Standard office equipment is not normally suitable and should not be used.

NOTE For the device replacement feature to work, the physical network topology must be configured in the PLC, for further information please refer to the PLC documentation.

4.8 Minimum node-to-node cable length

There is no minimum length of cable recommended in the Ethernet standards. To avoid possible cabling problems, it is recommended that sufficient cable length is provided to ensure adequate bend radii on cables and avoid unnecessary strain on the connectors.

5 Getting started

This chapter is intended to provide a generic guide for setting up SI-PROFINET on a PROFINET network. The setup flowchart (*SI-PROFINET setup flowchart* on page 23) is intended as a guide only, and is provided to detail the stages that are required to achieve a functioning network. It is recommended that this entire chapter is read before attempting to configure a system.

5.1 SI-PROFINET XML file (or GSDML file)

A GSDML (General Station Description Markup Language) file is required to describe the drive interface to a PROFINET controller or PLC. This is an XML formatted file, the structure of which is specified by the PROFIBUS INTERNATIONAL organization (www.profibus.org).

The GSDML file is used in conjunction with the network configuration software to configure the SI-PROFINET module for cyclic data exchange. All relevant drive parameters are available as a 'module' to be added to the cyclic data 'slots'.

Non-specific 'Flexible modules' are also provided so that the user can allocate a parameter within the drive (or option module), that is not directly available as a specific 'module'. There are predefined modules, such as 'Drive Position Feedback' can be selected. These options will be available from a drop-down selection list within the 'Parameters' tab of the 'module' properties.

The GSDML file for SI-PROFINET can be downloaded from the main Control Techniques company website (www.controltechniques.com), providing you are registered or, alternatively, requested from your local Drive Centre or supplier.

SI-PROFINET GSDML File Usage

The SI-PROFINET GSDML file Is not linked to a particular firmware version as some other fieldbus systems require, except in the instance when new features have been added, so, providing the correct associated drive type is used, then the GSDML file should allow the drive to be configured by the PLC or PROFINET controller.

It is important to use the correct file for the particular associated drive, as the file does specify the PROFINET device name, and some system configuration tools may fail to configure the module if this name does not match the name returned by the SI-PROFINET module during configuration.

The SI-PROFINET V2 module prior to firmware version V02.01.01.06 used the device name "SI-PROFINETV2", the device name was changed in firmware V02.01.01.06 and later to "SI-PROFINET", this was to match the previous SI-PROFINET RT module name.

Two GSDML files are provided for each product type, one that uses the GSDML DeviceProfile version V2.2 for older CPUs and the SIMATIC STEP7 configuration tool, the other file uses the GSDML DeviceProfile V2.31 for more recent CPUs and the TIA Portal configuration tool. It is recommended that the later version V2.31 file is used in new applications.

NOTE For further information regarding the use of the GSDML file please refer to the PLC documentation

5.2 Configuring the PROFINET IO communications

SI-PROFINET does not require the module parameters to be configured by the user in order to achieve PROFINET cyclic communications. All the necessary configuration is undertaken by the network controller or PLC during the start-up sequence, and after the network configuration is programmed into the network controller or PLC.

It must be noted that when configuring the cyclic data modules, if a module is configured but the associated drive parameter does not actually exist in the drive, then the PLC will not start up correctly and will indicate a configuration fault.

Parameters of slot option module menus can also be configured for cyclic data communication via proper 'Flexible Modules'. The source of the associated parameter can be set to drive or any possible slot within the 'Flexible Module' parameter properties.

5.3 Setting the IP address

Each device on a network must have it's own unique IP address, if the network is not to be connected to other networks or the Internet, then the assignment of the IP addresses is not critical (although using a standard system is recommended). The issue of address assignment becomes more important when connecting multiple networks together or connecting to the Internet where there is a strong possibility of address duplication unless a standard addressing system is used.

The IP address and subnet mask will be determined during the network configuration setup and, along with the device name, programmed into the module during parameterization.

When selecting IP addresses, the following points should be considered:

- **Reserve adequate address space**: Ensure you have enough reserve address space on your chosen addressing scheme to allow for future expansion
- **Uniqueness**: Ensure all your addresses are unique
- **Avoid reserved addresses**: Some addresses are reserved and should not be used. (e.g. 127.0.0.1 is a loop-back address)
- **Broadcast and system addresses**: The highest and lowest host addresses are used for broadcasts and system addressing and should not be used
- **Use a system**: Adopt a scheme to assign IP addresses, for example, reserve ranges of addresses for specific uses such as servers, routers, work stations etc.

5.4 IP address classes

IP addresses are grouped into five classes, each class has a specific set of addresses and typical situation where it is used. When selecting the class of IP addresses to use, consideration must be given to the number of subnets and hosts that are required.
Table 5-1 shows how the class types are defined.

Table 5-1 IP address class configuration

Class	First byte range	Valid networks	Number of subnets	Host component	Number of hosts
A	1 - 126	1.0.0.1 to 126.255.255.254	126	x.y.z	16,777,214
B	128 - 191	128.0.0.1 to 191.254.255.254	16,382	y.z	65,534
C	192 - 223	192.0.0.1 to 223.255.254.254	2,097,150	z	254
D	224 - 239	Multicast group ID			
E	240 - 255	Reserved			

NOTE Network IDs and host IDs with all 0s or all 1s specify a broadcast address and are therefore not included as valid networks.

Table 5-2 IP address classes

	W				X	Y	Z
Class A	0	Net ID (7 bits)			Host ID (24 bits)		
Class B	1	0	Net ID (14 bits)			Host ID (16 bits)	
Class C	1	1	0		Net ID (21 bits)		Host ID (8 bits)
Class D	1	1	1	0	Multicast group ID (28 bits)		
Class E	1	1	1	1	Reserved (28 bits)		

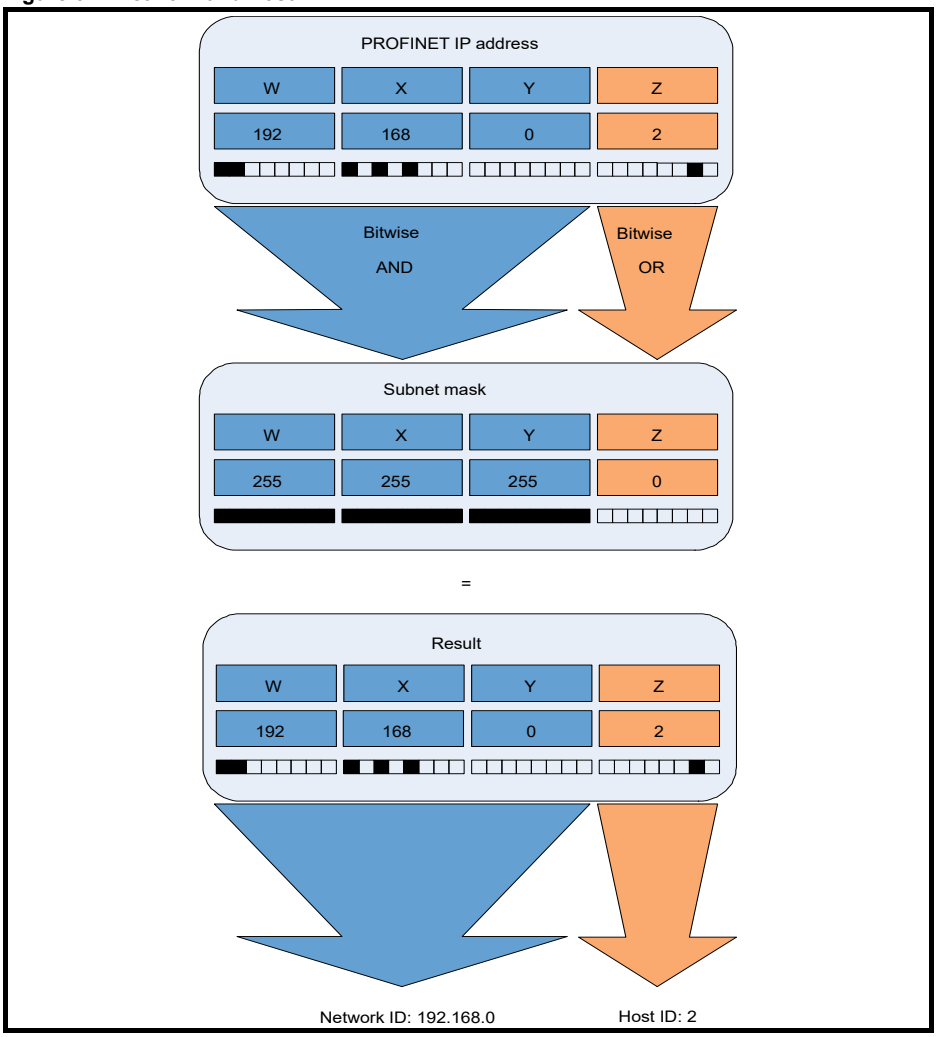
5.5 Subnet mask

The subnet mask defines which part of the IP address constitutes the subnet address and which part constitutes the host address.
The subnet mask is bit-wise ANDed with the IP address to give the network ID, the host ID portion of the IP address is bit-wise ORed with the subnet mask to give the host ID.

- A '1' in the subnet mask indicates that the corresponding bit in the IP address is part of the network or subnet ID address
- A '0' in the subnet mask indicates that the corresponding bit in the IP address is a part of the host ID address

Figure 5-1 *Network and host ID* illustrates an example with a class C IP address.

Figure 5-1 Network and host ID



5.6 PROFINET device name

Every PROFINET device must have a unique device name assigned to it during network configuration. Device names are used by the PLC to communicate with the device for RT messages (cyclic data and alarms). Without a device name, the device will not enter data exchange with the PLC.

The actual choice of device name is not important to the PROFINET IO system itself, however a suitable name should be chosen so that it is easily recognised on the network and identifies the location and function of the device.

A typical device name may contain up to four labels, each label is separated by a dot (.) and may be up to 63 characters long. The device name must also satisfy DNS naming conventions, therefore the following rules must be observed when choosing a device name:

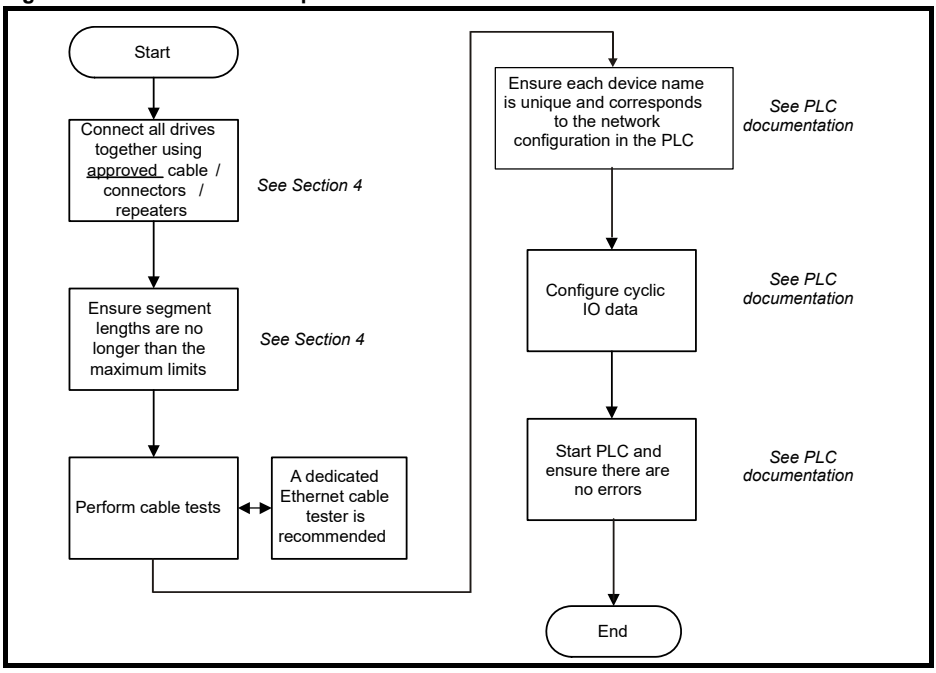
- Maximum length of 127 characters
- Characters must be either letters (lower case), numbers, dashes (-) or dots (.)
- The device name must start with a letter and end with either a letter or number
- The device name must not be of the format n.n.n.n (where n is a number from 0 to 999)
- The device name must not begin with the character sequence 'port-xyz-' (where x,y,z is a number from 0 to 9)

A typical example of a device name could be: **motor-1.conveyor-2.line-3.ct-4**

NOTE

The default name is specified in the GSDML file in the string value 'DNS_CompatibleName'. See Table 2-1

Figure 5-2 SI-PROFINET setup flowchart



6 Additional features

This chapter provides information on the additional functions and features of the SI-PROFINET option module.

6.1 Update time

In contrast to some other fieldbus networks, PROFINET has no single bus cycle where the slowest device determines the update rate for all devices, PROFINET allows different update rates for each device. SI-PROFINET can be configured with an update rate of between 1 ms to the slowest rate of 512 ms; the possible update rates are 1, 2, 4, 8, 16, 32, 64, 128, 256 and 512 ms.
When selecting the update time, it is recommended that the slowest rate necessary is used, this is to minimise the possibility of overloading the network.

6.2 PROFINET transmission cycle

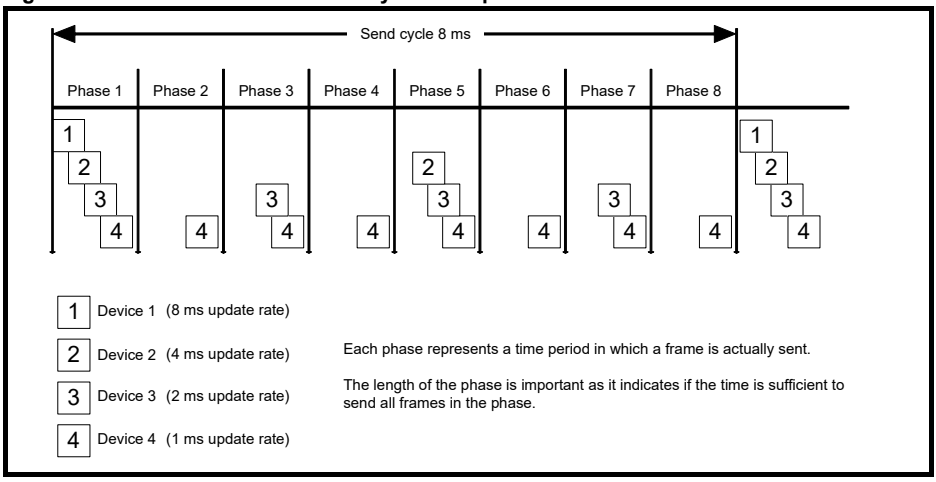
The PROFINET transmission cycle is the time required to update all the devices on the PROFINET network; the length of the PROFINET transmission cycle (send cycle) is determined by the PROFINET device which has the slowest update rate.

The transmission cycle can be split into a number of phases where each phase contains one or more devices with similar update rates, the duration of each phase will be equal to the fastest update rate.

Example:

In the following example (Figure 6-1 *PROFINET transmission cycle example*), a system uses four PROFINET devices, device 1 has an update rate of 8 ms, device 2 has an update rate of 4 ms, device 3 has an update rate of 2 ms and device 4 has an update rate of 1 ms.

Figure 6-1 PROFINET transmission cycle example



The PROFINET transmission cycle is effectively the slowest update rate (8 ms in this example), and the phase time is effectively the quickest update rate (1 ms in this example). The following information is provided for use when designing a PROFINET network to calculate the total and individual transmission cycle times.

6.2.1 Number of phases

The number of phases is determined by the formula:
Number Of Phases = Send Cycle / Fastest Update Rate = 8 ms / 1 ms = 8

6.2.2 Length of phase

The length of each phase is determined by the formula:

Length Of Phase = S;endClockFactor x 31.25 µs = 32 x 31.25 µs = 1 ms

Where:
SendClockFactor is specified in the GSDML file as the 'MinDeviceInterval' value.

6.2.3 Reduction ratio

The reduction ratio acts as a multiplier of the minimum update time and is determined by the formula:

Reduction ratio = Send Cycle Device / Length Of Phase

In this example,

Reduction ratioDevice 1 = 8 ms / 1 ms = 8
Reduction ratioDevice 2 = 4 ms / 1 ms = 4
Reduction ratioDevice 3 = 2 ms / 1 ms = 2
Reduction ratioDevice 4 = 1 ms / 1 ms = 1

The SI-PROFINET module allows the update rate to be configured in one of three ways:

1. **Automatic** - the update time selected is the time that the IO system calculates, based on the configuration, that can be reliably achieved.
2. **Fixed update time** - the user selects the device update rate directly from a selection.
3. **Fixed factor** - the user selects the reduction ratio to be used to multiply the minimum transmission cycle time by to give the device update rate.

6.3 Discovery and Configuration Protocol (DCP)

SI-PROFINET supports the discovery and configuration protocol. This protocol (when correctly configured), is used in the event of device replacement to automatically configure the new device. All the necessary configuration is done by the neighbouring devices when the new device is detected.

6.3.1 Link Layer Discovery Protocol (LLDP)

LLDP is a manufacturer independent layer 2 protocol, defined in accordance with the IEEE802.1AB standard.

During startup and also at regular intervals, LLDP is used to send and receive device information between neighbouring devices. This information includes the device name and port numbers. LLDP messages use a special multicast destination MAC address that 802.1D compliant bridges do not forward, i.e. the LLDP message is only seen by neighbouring devices. If all devices in a network support the LLDP protocol then an accurate network topology view can be presented in the diagnostic tool or PLC.

Information received via LLDP is stored locally on every device, in a structure called Management Information Base (MIB). This information can be retrieved using SNMP (Simple Network Management Protocol) messages.

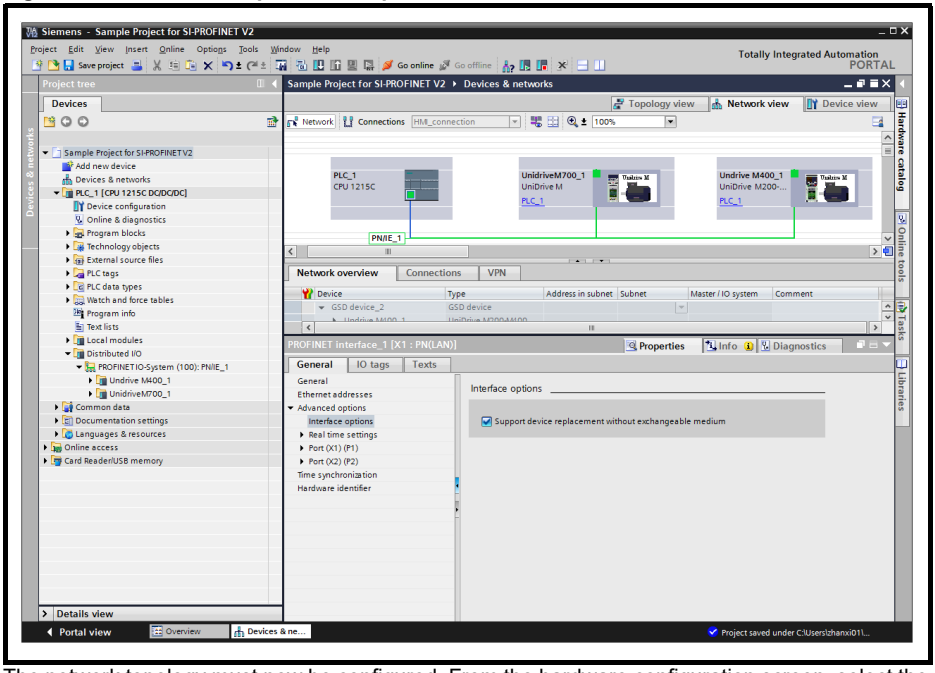
6.3.2 Configuring the network topology for DCP

In order to use the network discovery and configuration protocol, the PLC must be correctly configured and programmed with the physical network topology, the following information is intended as a guide only, for more specific information (in particular for other types of PLCs), then please consult the PLC documentation.

NOTE Although the Siemens PLC is mentioned in this document, Control Techniques does not recommend or endorse any particular PLC or controller manufacturer.

The following information relates to the Siemens S7-1215C PLC.
The PLC must be configured to support device replacement, this is an option in the properties of the PROFINET port. In the device configuration screen of the TIA PORTAL application, open the properties of the PLC PROFINET port, click 'Interface options' under 'Advanced options' as shown in Figure 6-2. Ensure the option 'Support device replacement without exchangeable medium' is selected.

Figure 6-2 PLC device replacement option



The network topology must now be configured. From the hardware configuration screen, select the port, right click it and select 'PROFINET IO Topology…', the topology editor will be displayed, select the 'Graphic view' tab and using 'drag and drop', connect the relevant device ports together to match the physical network wiring. The program must then be compiled and downloaded to the PLC in the normal manner.
Once the PLC has been configured, if a device is replaced then the new device will be automatically configured with the original device's properties, including the device name and IP address.

NOTE For the discovery protocol to work, the replacement device must not have a device name programmed, i.e. it must be blank or unused. If a device name exists in the module and that name is different to the device name set in the network configuration then the PLC will indicate a configuration error and will not enter data exchange with it.

6.4 Identification and Maintenance (I&M)

Identification and Maintenance (I&M) functions can be used to read and change various information about devices, such as manufacturer, ordering information, serial number, etc. This information can be used to assist the user in tracking the drive's life cycle through commissioning/start-up, parameterization, diagnosis, repair, etc. SI-PROFINET supports I&M0 to I&M4 inclusively; I&M0 is mandatory for all PROFINET devices, I&M1 to I&M4 are optional. Each I&M function returns specific information about the device and is explained in the following tables.

6.4.1 I&M0

Table 6-1 I&M0 Description

Attribute		Value (Read only)
Manufacturer ID		0x0160
Order ID	FW<V02.01.01.06	SI-PROFINET V2
	FW>=V02.01.01.06	SI-PROFINET
	HW V03 or later	SI-PROFINET
Serial number		(Pr **S.00.005** x 1,000,000,000 + Pr **S.00.004**)
Hardware revision		(Pr **S.00.003**)
Software revision		(Pr **S.00.002**)
Revision counter		(as read)
Profile ID		(as read)
Profile specific type		(as read)
I&M version		(as read)
I&M supported		(as read)

Manufacturer ID: 2-byte unsigned hexadecimal number assigned by the PROFIBUS business office and specified in the GSDML file.
For Control Techniques this value is 0x0160.

Order ID: 20-byte string to identify the device.
This value is compared with the 'OrderNumber' value in the 'ModuleInfo' section in the GSDML file.

Serial number: 16-byte string indicating the module serial number.
This value is read from Pr **S.00.004** and Pr **S.00.005** of the SI-PROFINET module.

Hardware revision: 2-byte unsigned hexadecimal number indicating the hardware revision of the SI-PROFINET module.
This value is read from Pr **S.00.003** of the SI-PROFINET module.

Software revision: 4-byte value consisting of a single character 'V' and 3 unsigned 8-bit decimal numbers indicating the software revision of the SI-PROFINET module.
This value is taken from Pr **S.00.002** of the SI-PROFINET module.

Revision counter: 2-byte unsigned decimal number.
This value is not changed by SI-PROFINET but can be changed by the network controller.

Profile ID: 2-byte unsigned hexadecimal number indicating the application profile.
Devices not following any particular profile use the generic profile value 0xF600.

Profile specific type: 2-byte unsigned hexadecimal number indicating the application profile specific type. This value is not applicable to devices using the generic profile and in these instances this value will be zero.

I&M version: 2 unsigned 8-bit numbers indicating the version of the implemented I&M functions.

I&M supported: 2-byte unsigned number indicating the availability of the implemented I&M functions as shown in Table 6-2.

Table 6-2 Supported I&M bit descriptions

Bit	Value	Description
0		Profile specific I&M
1	0	I&M1 Not supported
	1	I&M1 Supported
2	0	I&M2 Not supported
	1	I&M2 Supported
3	0	I&M3 Not supported
	1	I&M3 Supported
4	0	I&M4 Not supported
	1	I&M4 Supported
5 to 15		Reserved

6.4.2 I&M1

Table 6-3 I&M1 Description

Attribute	Value (Read/Write)
Drive function (32 bytes)	(User defined)
Drive location (22 bytes)	(User defined)

Drive function: 32-byte string indicating the drive function.
Drive location: 22-byte string indicating the drive location.

6.4.3 I&M2

Table 6-4 I&M2 Description

Attribute	Value (Read/Write)
Installation date	(User defined)

Installation date: 16-byte string indicating the installation or commissioning date of the device. The installation date is in the format DD/MM/YYYY.

6.4.4 I&M3

Table 6-5 I&M3 Description

Attribute	Value (Read/Write)
Descriptor (54 bytes)	(User defined)

Descriptor: 54-byte string used to store additional information on the location, function or maintenance status of the device.

6.4.5 I&M4

Table 6-6 I&M4 Description

Attribute	Value (Read/Write)
Signature (54 bytes)	(User defined)

Signature: 54-byte octet string used to allow parameterization tools to store a security code as a reference for a particular parameterization session and audit trail tools to retrieve the code for integrity checks.

NOTE

All unused bytes of the I&M functions will be set to 0x20 (space).

6.5 Modbus protocol

6.5.1 Modbus TCP/IP port

The port number used for Modbus TCP/IP may be reconfigured to a different port number using Pr **S.15.005** see *Modbus Listening Port* (**S.15.005**) on page 111 for more information. A timer is available to allow a loss of Modbus communication to be managed (see *Modbus Timeout* (**S.15.009**) for more information).

6.5.2 Data structure

Communication between devices is based upon Modbus Application Data Units (ADUs), the ADU consists of 2 parts, the Modbus Application Protocol (MBAP) header and the Modbus Protocol Data Unit (PDU).

Figure 6-3 Modbus Data Structure

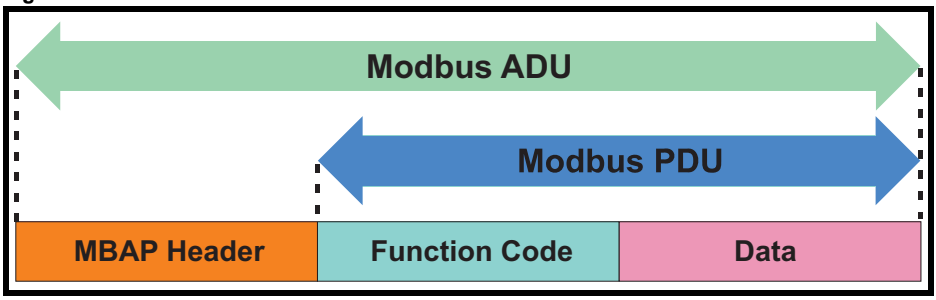


Table 6-7 MBAP Header

Field	Length (Bytes)	Description
Transaction Identifier	2	Uniquely identifies the transaction (0 to 65535)
Protocol Identifier	2	Identifies the protocol (0 = Modbus)
Length	2	Number of following bytes in the message
Unit Identifier	1	Uniquely identifies the destination node (0 to 255)

The unit identifier within the MBAP header is used to identify whether the destination node is the host drive or an option module.

Table 6-8 MBAP Unit Identifier

Unit Identifier	Destination
0 or 255	Drive
1	Slot 1
2	Slot 2
3	Slot 3
4	Slot 4 (onboard Ethernet)
254	Self

6.5.3 Data access

Data access using Modbus TCP/IP takes the form of a request for data by the master, followed by a response from the slave indicating success or failure. If no response is received this indicates that the message has not been received or the message is invalid or the node is unable to reply.

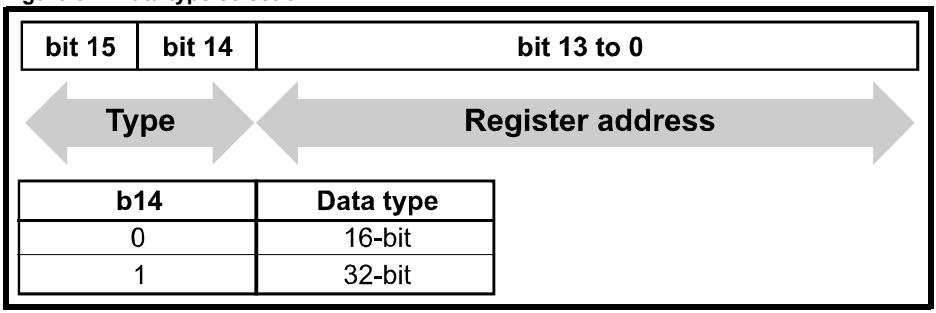
Each drive or option module parameter is internally mapped to a single 16-bit Modbus register, all Modbus function codes access 16-bit registers only. To access a 32-bit parameter, two contiguous Modbus registers must be specified in the request and the 32-bit data access scheme must be used.

6.5.4 32-bit data access

Standard Modbus registers are 16 bits in size and reference a single drive/option module parameter. To access a 32-bit data value the multiple read/write services must be used to transfer a contiguous array of 16-bit registers. To instruct the client to select either 16-bit or 32-bit access bit 14 of the register address is used.

NOTE Bit b15 of the register address is reserved for future use.

Figure 6-4 Data type selection



b14	Data type
0	16-bit
1	32-bit

If 32-bit data type is selected then this effectively adds 16384 (0x4000) to the start register address.

e.g. For drive parameter Pr **01.021** in standard addressing mode, the start register value is 16384 + 120 = 16504 (0x4078)

6.5.5 Register addressing

The Modbus register address is 16 bits in size, of which the upper two bits are used for data type selection leaving 14 bits to represent the parameter address, taking into account the slave increments the address value by 1, this results in a theoretical maximum parameter address of 163.84 (limited to 162.99 in software) when the default standard addressing mode (see *Modbus Register Addressing Mode* (**S.15.013**)) is used.

To access a parameter number above 99 then the modified addressing mode must be used (see *Modbus Register Addressing Mode* (**S.15.013**)), this will allow access to parameter numbers up to 255 but also limit the maximum menu number to 63.

NOTE A reset is not required to activate the change, the addressing mode is effectively made active immediately on changing.

The Modbus slave device increments the register address by 1 before processing the command, this effectively prevents access to parameter Pr **00.000** in the drive or option module.

The table below shows how the start register address is calculated for both addressing modes.

Table 6-9 Start register addressing

CT Parameter	Addressing mode	Protocol register			
s.mm.ppp	Standard	mm * 100 + ppp - 1			
	Modified	mm * 256 + ppp - 1			
Examples					
		16-bit		**32-bit**	
		Decimal	**Hex (0x)**	**Decimal**	**Hex (0x)**
0.01.021	Standard	120	00 78	16504	40 78
	Modified	276	01 14	16660	41 14
0.01.000	Standard	99	00 63	16483	40 63
	Modified	255	00 FF	16639	40 FF
3.70.001	Standard	7000	1B 58	23384	5B 58
	Modified	N/A	N/A	N/A	N/A
0.03.161	Standard	N/A	N/A	N/A	N/A
	Modified	928	03 A0	17312	43 A0

6.5.6 FC03 – Read multiple registers

This function code allows a contiguous array of registers to be read. The maximum number of registers that can be read is 120, this allows up to 120 16-bit parameters or 60 32-bit parameters to be read in a single transaction. If this is exceeded the server will issue an exception response code 2.

Master request data

Byte	Description
7	Function code 0x03
8	Start register address (MSB)
9	Start register address (LSB)
10	Number of 16-bit registers (MSB)
11	Number of 16-bit registers (LSB)

Slave response data

Byte	Description
7	Function code 0x03
8	Length of data in read block (Bytes)
9	Register data (MSB)
10	Register data (LSB)

The normal response includes the function code, number of data bytes in the read block followed by the register data (unless an exception occurs).

If 32-bit parameter addressing is used, then for each parameter read:

- Two 16-bit registers must be used in the request
- The register data in the response will contain 4 bytes of data

Example

To read drive parameters **0.20.021** to **0.20.023** (transaction ID = 42) with 32-bit data access and standard addressing:

Master request data

Byte	Hex value	Description
0-1	00 2A	Transaction ID (42)
2-3	00 00	Protocol ID (0=TCP/IP)
4-5	00 06	Length (Bytes=6)
6	FF	Unit identifier (FF= Drive)
7	03	Function code (3)
8-9	47 E4	Start register (20.20)
10-11	00 06	Number of registers (6)

Slave response data

Byte	Hex value	Description
0-1	00 2A	Transaction ID (42)
2-3	00 00	Protocol ID (0=TCP/IP)
4-5	00 0F	Length (Bytes=15)
6	FF	Unit identifier (FF= Drive)
7	03	Function code (3)
8	0C	Data length (Bytes=12)
9-12	?	Pr **0.20.021** data
13-16	?	Pr **0.20.022** data
17-20	?	Pr **0.20.023** data

6.5.7 FC06 – Write single register

This function code writes a single 16-bit value to a register. The normal response is an echo of the request (unless an exception occurs) returned after the parameter has been written.

The register address can be a 32-bit parameter address but only the lower 16 bits of the value will be written.

Master request data

Byte	Description
7	Function code 0x06
8	Start register address (MSB)
9	Start register address (LSB)
10	Register data (MSB)
11	Register data (LSB)

Slave response data

Byte	Description
7	Function code 0x06
8	Start register address (MSB)
9	Start register address (LSB)
10	Register data (MSB)
11	Register data (LSB)

Example

To write the value 12345 to drive parameter **0.20.001** (transaction ID = 42) using standard addressing:

Master request data

Byte	Hex value	Description
0-1	00 2A	Transaction ID (42)
2-3	00 00	Protocol ID (0=TCP/IP)
4-5	00 06	Length (Bytes=6)
6	FF	Unit identifier (FF= Drive)
7	06	Function code (06)
8-9	07 D0	Start register (**20.000)**
10-11	30 39	Register data (12345)

Slave response data

Byte	Hex value	Description
0-1	00 2A	Transaction ID (42)
2-3	00 00	Protocol ID (0=TCP/IP)
4-5	00 06	Length (Bytes=6)
6	FF	Unit identifier (FF= Drive)
7	06	Function code (6)
8-9	07 D0	Start register (**20.000**)
10-11	30 39	Register data (12345)

6.5.8 FC16 – Write multiple registers

This function code allows a contiguous series of registers to be written. The maximum number of registers that can be written is 120, this allows up to 120 16-bit parameters or 60 32-bit parameters to be read in a single transaction. If this is exceeded the server will issue an exception response code 2.The normal response includes the function code, start register address and number of 16-bit registers written (unless an exception occurs), returned after the parameters have been written.

If 32-bit parameter addressing is used, then for each parameter written:

- Two 16-bit registers must be used in the request
- Four bytes must be specified in the request
- The number of registers written in the response will be twice the number of parameters written

Master request data

Byte	Description
7	Function code 0x10
8	Start register address (MSB)
9	Start register address(LSB)
10	Number of 16-bit registers (MSB)
11	Number of 16-bit registers (LSB)
12	Length of register data to write (Bytes)
13	Register data (MSB)
14	Register data (LSB)

Slave response data

Byte	Description
7	Function code 0x10
8	Start register address (MSB)
9	Start register address (LSB)
10	Number of 16-bit registers written (MSB)
11	Number of 16-bit registers written (LSB)

Example

To write the value 12345 to drive parameters **0.20.021** through **0.20.023** (Transaction ID=42) using standard 32-bit addressing:

Master request data

Byte	Hex value	Description
0-1	00 2A	Transaction ID (42)
2-3	00 00	Protocol ID (0=TCP/IP)
4-5	00 13	Length (Bytes=19)
6	FF	Unit identifier (FF= Drive)
7	10	Function code (16)
8-9	47 E4	Start register (**20.020**)
10-11	00 06	Number of registers (6)
12	0C	Register data length (Bytes)
13-16	00 00 30 39	Register data 0
17-20	00 00 30 39	Register data 1
21-24	00 00 30 39	Register data 2

Slave response data

Byte	Hex value	Description
0-1	00 2A	Transaction ID (42)
2-3	00 00	Protocol ID (0=TCP/IP)
4-5	00 06	Length (Bytes=6)
6	FF	Unit identifier (FF= Drive)
7	10	Function code (16)
8-9	47 E4	Start register (**20.020**)
10-11	00 06	Registers written (6)

6.5.9 FC23 – Read/Write multiple registers

This function code allows a contiguous series of registers to be written and another contiguous series of registers to be read. The maximum number of registers that can be read is 120 and similarly the maximum number of registers that can be written is 120, this allows up to 120 16-bit parameters or 60 32-bit parameters to be read and / or written in a single transaction. If this is exceeded the server will issue an exception response code 2.

Master request data

Byte	Description
7	Function code 0x17
8	Start read register address (MSB)
9	Start read register address (LSB)
10	Number of registers to read (MSB)
11	Number of registers to read (LSB)
12	Start write register address (MSB)
13	Start write register address (LSB)
14	Number of registers to write (MSB)
15	Number of registers to write (LSB)
16	Length of register data to write (Bytes)
17	Register data 0 (MSB)
18	Register data 0 (LSB)

Slave response data

Byte	Description
7	Function code 0x17
8	Length of data in read block (Bytes)
9	Register data (MSB)
10	Register data (LSB)

The normal response includes the function code, number of data bytes in the read block followed by the register data (unless an exception occurs).

If 32-bit parameter addressing is used:

- For each parameter read or written, two 16-bit registers must be used in the request
- For each parameter written, four bytes must be specified in the request
- For each parameter read, four bytes of data will be used in the response

Example

To write the value 12345 to drive parameters **0.20.021** through **0.20.023** and read the values of parameters **0.20.024** through **0.20.026** (Transaction ID=42) using standard addressing:

Master request data

Byte	Hex value	Description
0-1	00 2A	Transaction ID (42)
2-3	00 00	Protocol ID (0=TCP/IP)
4-5	00 17	Length (Bytes=6)
6	FF	Unit identifier (FF= Drive)
7	17	Function code (23)
8-9	47 E7	Start read register (**20.023**)
10-11	00 06	Number of read registers (6)
12-13	47 E4	Start write register (**20.020**)
14-15	00 06	Number of write registers (6)
16	0C	Length of register data to write (Bytes=12)
17-20	00 00 30 39	Register data 0 (12345)
21-24	00 00 30 39	Register data 1 (12345)
25-28	00 00 30 39	Register data 2 (12345)

Slave response data

Byte	Hex value	Description
0-1	00 2A	Transaction ID (42)
2-3	00 00	Protocol ID (0=TCP/IP)
4-5	00 0F	Length (Bytes=15)
6	FF	Unit identifier (FF= Drive)
7	17	Function code (23)
8	0C	Length of data (Bytes=12)
9-12	?? ?? ?? ??	Register data 0 (Pr **20.024**)
13-16	?? ?? ?? ??	Register data 1 (Pr **20.025**)
17-20	?? ?? ?? ??	Register data 2 (Pr **20.026**)

6.5.10 Modbus Exception Response Message

If the master request is rejected then an exception response message will be returned.

Exception Response Message

Byte	Hex value	Description
0-1	?? ??	Transaction ID (defined by Modbus Master)
2-3	00 00	Protocol ID
4-5	00 03	Number of data bytes to follow
6	??	Unit identifier
7	??	Function code (request FC with bit b7 set to 1)
8	??	Exception code 01 = Function code not supported 02 = Invalid register address

The master request function code will be returned but with bit b7 set (e.g. function code 0x03 will be returned as 0x83)

7 Parameter descriptions

7.1 Single line parameter descriptions

This chapter contains the single line parameter descriptions for the SI-PROFINET option module presented in a quick reference format.

The following parameter type coding is used throughout this document.

RW	Read / Write	RO	Read-only	Bit	Bit parameter	Txt	Text string	Date	Date parameter	Time	Time parameter
Chr	Character parameter	Bin	Binary parameter	IP	IP address	Mac	MAC address	Ver	Version number	SMP	Slot, menu, parameter
Num	Number parameter	DE	Destination	ND	No default value	RA	Rating dependent	NC	Non-copyable	PT	Protected
FI	Filtered	US	User save	PS	Power-down save	BU	Unipolar				

Internal Menus

The following table shows the internal menus of the SI-PROFINET module.

Table 7-1 SI-PROFINET Internal Menus

Menu	Description
S.00	Setup
S.02	Ethernet Config.
S.05	Profinet Config.
S.09[1]	Resources
S.10[1]	RTMOE Easy Mode
S.11[1]	RTMOE Sync
S.15[1]	Modbus TCP/IP Setup
S.25[1]	Profinet Fault Values

1 – Not available on the SI-PROFINET V2

S is the slot number where the module is installed.

Table 7-2 below shows the location of the module's setup menu 0 on the drive.

Table 7-2 Setup Menu 0 Location

Slot number	Menu 0 location
1	15
2[1]	16
3[1,2]	17

[1] – Not available on Commander C200/C300 or Unidrive M200/M400

[2] – Not available on Digitax HD

7.1.1 Menu 0 - Setup

Parameter		Range	Default	Type				
S.00.001	Module ID	0 to 65535		RO	Num	ND	NC	PT
S.00.002	Firmware Version	0 to 99999999		RO	Ver	ND	NC	PT
S.00.003	Hardware Version	0.00 to 655.35		RO	Num	ND	NC	PT
S.00.004	Serial Number LS	0 to 99999999		RO	Num	ND	NC	PT
S.00.005	Serial Number MS	0 to 99999999		RO	Num	ND	NC	PT
S.00.006	Module Status	Bootldr-Update (-2), Bootldr-Idle (-1), Initialising (0), OK (1), Config (2), Error (3)		RO	Txt	ND	NC	PT
S.00.007	Module Reset	Off (0) or On (1)	Off (0)	RW	Bit		NC	
S.00.008	Module Default	Off (0) or On (1)	Off (0)	RW	Bit		NC	
S.00.009[1]	Active Alarm Bits	0000000000000000 to 1111111111111111	0000000000000000	RO	Bin		NC	
S.00.010[1]	Active IP Address	0.0.0.0 (0) to 255.255.255.255 (4294967295)		RO	IP	ND	NC	PT
S00.011[1]	Date Code	0 to 65535		RO	Num	ND	NC	PT
S.00.012[1]	Compatibility Mask	000000000000000 to 111111111111111		RO	Bin	ND	NC	PT
S.00.013[1]	Operation Mode	NORMAL (0), LIMITED IN (1), LIMITED (2), LIMITED OUT (3)		RO	Txt	ND	NC	PT
S.00.030	Slot Indicator	0 to 8		RO	Num	ND	NC	PT
S.00.031	Slot Menu Number	0 to 255		RO	Num	ND	NC	PT

[1]- Not available on the SI-PROFINET V2

7.1.2 Menu 2 - Ethernet configuration

Parameter		Range	Default	Type					
S.02.003	Network Status	Initialising (0), Links Down (1), DHCP In Progress (2), No Address (3), Ready (4), Active (5), IP Addr Conflict (6)		RO	Txt	ND	NC	PT	
S.02.004	Network Message Count	0 to 65535 Msg/s		RO	Num	ND	NC	PT	
S.02.006	IP Address	0.0.0.0 (0) to 255.255.255.255 (4294967295)	192.168.1.100 (3232235876)	RW[2]	IP		3	4	US[5]
S.02.007	Subnet Mask	0.0.0.0 (0) to 255.255.255.255 (4294967295)	255.255.255.0 (4294967295)	RW[2]	IP		3	4	US[5]
S.02.008	Default Gateway	0.0.0.0 (0) to 255.255.255.255 (4294967295)	192.168.1.254 (3232236030)	RW[2]	IP		3	4	US[5]
S.02.011	MAC Address	000000000000 (0) to FFFFFFFFFFFF (2^{48} -1)		RO	Mac	ND	NC	PT	
S.02.021[1]	Web Server Enable	Off (0) or On (1)	On (1)	RW	Bit				US
S.02.022[1]	Web Server Port	0 to 65535	80	RW	Num				US
S02.024[1]	Ethernet MTU	158 to 1500 Bytes	1500 Bytes	RW	Num				US
S.02.025[1]	Gateway Mode	Switch (0), Gateway (1), Strict Gateway (2)	Switch (0)	RW	Txt				US
S.02.030[1]	VLAN Enable	Off (0) or On (1)	Off (0)	RW	Bit				US
S.02.031[1]	Drive VLAN ID	1 to 1	1	RW	Num				US

[1]- Not available on the SI-PROFINET V2

[2] - RO for SI-PROFINET V2

[3] - NC for SI-PROFINET V2

[4] - PT for SI-PROFINET V2

[5] - Volatile for SI-PROFINET V2

7.1.3 Menu 5 - PROFINET configuration

Parameter		Range	Default	Type					
S.05.004	Configuration Error	No Error (0), Input Mapping (1), Output Mapping (2), Data Size (3), Param Config (4), Slot Not Avail (5), Read Only Param (6), Out Of Memory (7)	No Error (0)	RO	Txt		NC	PT	
S.05.005[1]	Cyclic data transfers per second	0 to 65535 Messages/s		RO	Num	ND	NC	PT	
S.05.006	Module Revision Counter	0 to 65535		RO	Num	ND		PT	
S.05.007	Profile ID	0 to 65535	62976	RO	Num			PT	
S.05.008	Installation Date	00-00-00 (0) to 31-12-99 (311299)		RO	Date	ND		PT	
S.05.009	Timeout	1 to 10000 ms	100	RO	Num			PT	
S.05.010	Timeout Action	Trip (0), Send Flt values (1), Clear output (2), Hold last (3), No action (4)	No action (4)	RW	Txt			PT	US
S.05.011	Timeout Event Destination	This slot (0), Slot 1 (1), Slot 2 (2), Slot 3 (3), Slot 4 (4)	This slot (0)	RW	Txt			PT	US
S.05.012	Timeout Event Type	No event (0), Trigger Event (1), Trigger Event 1 (2), Trigger Event 2 (3), Trigger Event 3 (4), Trigger Event 4 (5)	No event (0)	RW	Txt			PT	US
S.05.026	Input Consistency Enable	Off (0) or On (1)	Off (0)	RW	Bit				US
S.05.027	Input Consistency Trigger Param	0.00.000 to 4.99.999	0.00.000	RW	SMP				US
S.05.028	Output Consistency Enable	Off (0) or On (1)	Off (0)	RW	Bit				US
S.05.029	Output Consistency Trigger Parameter	0.00.000 to 4.99.999	0.00.000	RW	SMP				US

[1]- Not available on the SI-PROFINET V2

7.1.4 Menu 9 - Resources

Parameter		Range	Default	Type					
S.09.001	Cyclic Tx links free	0 to 255		RO	Num	ND	NC	PT	
S.09.002	Cyclic Rx links free	0 to 255		RO	Num	ND	NC	PT	
S.09.003	Fieldbus Links Free	0 to 255		RO	Num	ND	NC	PT	
S.09.004	Cyclic Mappings Free	0 to 255		RO	Num	ND	NC	PT	
S.09.008	Background cycles per second	0 to 65535		RO	Num	ND	NC	PT	
S.09.010	Synchronous Task % Free	0 to 255 %		RO	Num	ND	NC	PT	
S.09.011	Nonsync link update period	0.00 to 655.35		RO	Num	ND	NC	PT	
S.09.020	Synchronous Task Worst % Free	0 to 255 %		RO	Num	ND	NC	PT	
S.09.021	Max nonsync link update period	0.00 to 655.35		RO	Num	ND	NC	PT	
S.09.030	PCB Temperature	-128 to 127 °C		RO	Num	ND	NC	PT	

NOTE This menu is not available on the SI-PROFINET V2

7.1.5 Menu 10 - RTMoE Easy Mode

Parameter		Range	Default	Type					
S.10.001	Enable	Off (0) or On (1)		RW	Bit				US
S.10.002	Reset	Off (0) or On (1)		RW	Bit		NC		
S.10.003	Default	Off (0) or On (1)		RW	Bit		NC		
S.10.004	Cyclic Messages Per Second	0 to 65535 Messages/s		RO	Num	ND	NC	PT	
S.10.005	Configuration Valid	Off (0) or On (1)		RO	Bit	ND	NC	PT	
S.10.006	Operational	Off (0) or On (1)		RO	Bit	ND	NC	PT	
S.10.007	Active Configuration	None (0), Easy Mode (1), Offline (2)		RO	Txt	ND	NC	PT	
S.10.008	Timeout Count	0 to 65535		RO	Num	ND	NC	PT	
S.10.009	Data Late Count	0 to 65535		RO	Num	ND	NC	PT	
S.10.010	Tx1 Link profile	Std (0), Sync (1)	Std (0)	RW	Txt				US
S.10.011	Tx1 Link number	0 to 255	0	RW	Num				US
S.10.012	Tx1 Source parameter	0.00.000 to 4.99.999	0.00.000	RW	SMP			PT	US
S.10.013	Tx1 Parameter count	0 to 10	0	RW	Num				US
S.10.014	Tx1 Link transmission type	Unicast (0), Broadcast (1), Multicast1 (2), Multicast2 (3), Multicast3 (4), Multicast4 (5), Multicast5 (6), Multicast6 (7), Multicast7 (8), Multicast8 (9), Multicast9 (10), Multicast10 (11)	Unicast (0)	RW	Txt				US
S.10.015	Tx1 Destination address	0.0.0.0 to 255.255.255.255	0.0.0.0	RW	IP				US
S.10.016	Tx1 Message Rate	0 to 100 ms	0 ms	RW	Num				US

S.10.019	Tx1 Link status	Disabled (-31), VLAN disabled (-30), Reserved 29 (-29), Reserved 28 (-28), Reserved 27 (-27), Reserved 26 (-26), Reserved 25 (-25), Reserved 24 (-24), Reserved 23 (-23), Invalid DST IP (-22), SYNC unsupported (-21), MEC offset (-20), Invalid tx rate (-19), Too many mapping (-18), Link busy (-17), Invalid profile (-16), Invalid mapping (-15), Read only param (-14), Msg mismatch (-13), Msg too long (-12), Attrib NA (-11), Attrib RO (-10), Attrib missing (-9), Timeout (-8), In error (-7), Link num in use (-6), Not editable (-5), Invalid link num (-4), Invalid args (-3), Too many links (-2), Out of memory (-1), OK (0), Not running (1), OK sync (2)		RO	Txt	ND	NC	PT	
S.10.020	Tx2 Link profile	Std (0), Sync (1)	Std (0)	RW	Txt				US
S.10.021	Tx2 Link number	0 to 255	0	RW	Num				US
S.10.022	Tx2 Source parameter	0.00.000 to 4.99.999	0.00.000	RW	SMP			PT	US
S.10.023	Tx2 Parameter count	0 to 10	0	RW	Num				US
S.10.024	Tx2 Link transmission type	Unicast (0), Broadcast (1), Multicast1 (2), Multicast2 (3), Multicast3 (4), Multicast4 (5), Multicast5 (6), Multicast6 (7), Multicast7 (8), Multicast8 (9), Multicast9 (10), Multicast10 (11)	Unicast (0)	RW	Txt				US
S.10.025	Tx2 Destination address	0.0.0.0 to 255.255.255.255	0.0.0.0	RW	IP				US
S.10.026	Tx2 Message Rate	0 to 100 ms	0 ms	RW	Num				US

S.10.029	Tx2 Link status	Disabled (-31), VLAN disabled (-30), Reserved 29 (-29), Reserved 28 (-28), Reserved 27 (-27), Reserved 26 (-26), Reserved 25 (-25), Reserved 24 (-24), Reserved 23 (-23), Invalid DST IP (-22), SYNC unsupported (-21), MEC offset (-20), Invalid tx rate (-19), Too many mapping (-18), Link busy (-17), Invalid profile (-16), Invalid mapping (-15), Read only param (-14), Msg mismatch (-13), Msg too long (-12), Attrib NA (-11), Attrib RO (-10), Attrib missing (-9), Timeout (-8), In error (-7), Link num in use (-6), Not editable (-5), Invalid link num (-4), Invalid args (-3), Too many links (-2), Out of memory (-1), OK (0), Not running (1), OK sync (2)		RO	Txt	ND	NC	PT	
S.10.030	Tx3 Link Profile	Std (0), Sync (1)	Std (1)	RW	Txt				US
S.10.031	Tx3 Link number	0 to 255	0	RW	Num				US
S.10.032	Tx3 Source paramter	0.00.000 to 4.99.999	0.00.000	RW	SMP			PT	US
S.10.033	Tx3 Parameter count	0 to 10	0	RW	Num				US
S.10.034	Yx3 Link transmission type	Unicast (0), Broadcast (1), Multicast1 (2), Multicast2 (3), Multicast3 (4), Multicast4 (5), Multicast5 (6), Multicast6 (7), Multicast7 (8), Multicast8 (9), Multicast9 (10), Multicast10 (11)	Unicast (0)	RW	Txt				US
S.10.035	Tx3 Destination address	0.0.0.0 to 255.255.255.255	0.0.0.0	RW	IP				US
S.10.036	Tx3 Message Rate	0 to 100 ms	0 ms	RW	Num				US

S.10.039	Tx3 Link Status	Disabled (-31), VLAN disabled (-30), Reserved 29 (-29), Reserved 28 (-28), Reserved 27 (-27), Reserved 26 (-26), Reserved 25 (-25), Reserved 24 (-24), Reserved 23 (-23), Invalid DST IP (-22), SYNC unsupported (-21), MEC offset (-20), Invalid tx rate (-19), Too many mapping (-18), Link busy (-17), Invalid profile (-16), Invalid mapping (-15), Read only param (-14), Msg mismatch (-13), Msg too long (-12), Attrib NA (-11), Attrib RO (-10), Attrib missing (-9), Timeout (-8), In error (-7), Link num in use (-6), Not editable (-5), Invalid link num (-4), Invalid args (-3), Too many links (-2), Out of memory (-1), OK (0), Not running (1), OK sync (2)		RO	Txt	ND	NC	PT	
S.10.040	Rx1 Link profile	Std (0), Sync (1)	Std (0)	RW	Txt				US
S.10.041	Rx1 Link number	0 to 255	0	RW	Num				US
S.10.042	Rx1 Destination parameter	0.00.000 to 4.99.999	0.00.000	RW	SMP				US
S.10.043	Rx1 Parameter count	0 to 10	0	RW	Num				US
S.10.044	Rx1 Source type	Direct (0), Multicast1 (1), Multicast2 (2), Multicast3 (3), Multicast4 (4), Local (5), Multicast5 (6), Multicast6 (7), Multicast7 (8), Multicast8 (9), Multicast9 (10), Multicast10 (11)	Direct (0)	RW	Txt				US
S.10.045	Rx1 Timeout	0 to 65535 ms	100 ms	RW	Num				US
S.10.046	Rx1 Timeout action	Trip (0), Clear output (1), Hold last (2)	Trip (0)	RW	Txt				US
S.10.047	Rx1 Timeout event destination	This slot (0), Slot 1 (1), Slot 2 (2), Slot 3 (3), Slot 4 (4)	This slot (0)	RW	Txt				US
S.10.048	Rx1 Timeout event type	No Event (0), Event (1), Event1 (2), Event2 (3), Event3 (4)	No Event (0)	RW	Txt				US

S.10.049	Rx1 Link status	Disabled (-31), VLAN disabled (-30), Reserved 29 (-29), Reserved 28 (-28), Reserved 27 (-27), Reserved 26 (-26), Reserved 25 (-25), Reserved 24 (-24), Reserved 23 (-23), Invalid DST IP (-22), SYNC unsupported (-21), MEC offset (-20), Invalid tx rate (-19), Too many mapping (-18), Link busy (-17), Invalid profile (-16), Invalid mapping (-15), Read only param (-14), Msg mismatch (-13), Msg too long (-12), Attrib NA (-11), Attrib RO (-10), Attrib missing (-9), Timeout (-8), In error (-7), Link num in use (-6), Not editable (-5), Invalid link num (-4), Invalid args (-3), Too many links (-2), Out of memory (-1), OK (0), Not running (1), OK sync (2)		RW	Txt	ND	NC	PT	
S.10.050	Rx2 Link profile	Std (0), Sync (1)	Std (0)	RW	Txt				US
S.10.051	Rx2 Link number	0 to 255	0	RW	Num				US
S.10.052	Rx2 Destination parameter	0.00.000 to 4.99.999	0.00.000	RW	SMP				US
S.10.053	Rx2 Parameter count	0 to 10	0	RW	Num				US
S.10.054	Rx2 Source type	Direct (0), Multicast1 (1), Multicast2 (2), Multicast3 (3), Multicast4 (4), Local (5), Multicast5 (6), Multicast6 (7), Multicast7 (8), Multicast8 (9), Multicast9 (10), Multicast10 (11)	Direct (0)	RW	Txt				US
S.10.055	Rx2 Timeout	0 to 65535 ms	100 ms	RW	Num				US
S.10.056	Rx2 Timeout action	Trip (0), Clear output (1), Hold last (2)	Trip (0)	RW	Txt				US
S.10.057	Rx2 Timeout event destination	This slot (0), Slot 1 (1), Slot 2 (2), Slot 3 (3), Slot 4 (4)	This slot (0)	RW	Txt				US
S.10.058	Rx2 Timeout event type	No Event (0), Event (1), Event1 (2), Event2 (3), Event3 (4)	No Event (0)	RW	Txt				US

S.10.059	Rx2 Link status	Disabled (-31), VLAN disabled (-30), Reserved 29 (-29), Reserved 28 (-28), Reserved 27 (-27), Reserved 26 (-26), Reserved 25 (-25), Reserved 24 (-24), Reserved 23 (-23), Invalid DST IP (-22), SYNC unsupported (-21), MEC offset (-20), Invalid tx rate (-19), Too many mapping (-18), Link busy (-17), Invalid profile (-16), Invalid mapping (-15), Read only param (-14), Msg mismatch (-13), Msg too long (-12), Attrib NA (-11), Attrib RO (-10), Attrib missing (-9), Timeout (-8), In error (-7), Link num in use (-6), Not editable (-5), Invalid link num (-4), Invalid args (-3), Too many links (-2), Out of memory (-1), OK (0), Not running (1), OK sync (2)		RO	Txt	ND	NC	PT	
S.10.060	Rx3 Link profile	Std (0), Sync (1)	Std (0)	RW	Txt				US
S.10.061	Rx3 Link number	0 to 255	0	RW	Num				US
S.10.062	Rx3 Destination parameter	0.00.000 to 4.99.999	0.00.000	RW	SMP				US
S.10.063	Rx3 Parameter count	0 to 10	0	RW	Num				US
S.10.064	Rx3 Source type	Direct (0), Multicast1 (1), Multicast2 (2), Multicast3 (3), Multicast4 (4), Local (5), Multicast5 (6), Multicast6 (7), Multicast7 (8), Multicast8 (9), Multicast9 (10), Multicast10 (11)	Direct (0)	RW	Txt				US
S.10.065	Rx3 Timeout	0 to 65535 ms	100 ms	RW	Num				US
S10.066	Rx3 Timeout action	Trip (0), Clear output (1), Hold last (2)	Trip (0)	RW	Txt				US
S.10.067	Rx3 Timeout event destination	This slot (0), Slot 1 (1), Slot 2 (2), Slot 3 (3), Slot 4 (4)	This slot (0)	RW	Txt				US
S.10.068	Rx3 Timeout event type	No Event (0), Event (1), Event1 (2), Event2 (3), Event3 (4)	No Event (0)	RW	Txt				US

S.10.069	Rx3 Link status	Disabled (-31), VLAN disabled (-30), Reserved 29 (-29), Reserved 28 (-28), Reserved 27 (-27), Reserved 26 (-26), Reserved 25 (-25), Reserved 24 (-24), Reserved 23 (-23), Invalid DST IP (-22), SYNC unsupported (-21), MEC offset (-20), Invalid tx rate (-19), Too many mapping (-18), Link busy (-17), Invalid profile (-16), Invalid mapping (-15), Read only param (-14), Msg mismatch (-13), Msg too long (-12), Attrib NA (-11), Attrib RO (-10), Attrib missing (-9), Timeout (-8), In error (-7), Link num in use (-6), Not editable (-5), Invalid link num (-4), Invalid args (-3), Too many links (-2), Out of memory (-1), OK (0), Not running (1), OK sync (2)		RO	Txt	ND	NC	PT	

NOTE This menu is not available on the SI-PROFINET V2

7.1.6 Menu 11 - RTMoE Sync

Parameter		Range	Default	Type					
S.11.001	Preferred Sync Master	0 to 4	1	RW	Num				US
S.11.002	Master Clock Domain	0 to 3	0	RW	Num				US
S.11.005	Grandmaster MAC Address	000000000000 (0) FFFFFFFFFFFF (2^{48}-1)		RO	Mac	ND	NC	PT	
S.11.006	Synchronisation Jitter From Grandmaster	-2147483648 to 2147483647 ns		RO	Num	ND	NC	PT	
S.11.007	Synchronisation Jitter Threshold	500 to 1000000 ns	1000 ns	RW	Num				US
S.11.008	Module Synchronised Flag	Off (0) or On (1)	Off (0)	RO	Bit				
S.11.009	Inhibit Drive Synchronisation	Off (0) or On (1)	Off (0)	RW	Bit				US
S.11.010	PTP Date	00-00-00 (0) to 31-12-99 (311299)		RO	Date	ND	NC	PT	
S.11.011	PTP Time	00:00:00 (0) to 23:59:59 (235959)		RO	Time	ND	NC	PT	
S.11.015	PTP Delay Measurement Select	P2P DELAY (1), OFF (2)	P2P DELAY (1)	RW	Txt				US
S.11.016	PTP Sync Rate	-4 to 0	-4	RW	Num				US
S.11.017	In sync window length	3 to 255 s	20 s	RW	Num				US
S.11.020	Network Error Count	0 to 4294967295		RO	Num	ND	NC	PT	
S.11.022	Interoption Sync Status	MASTER (0), PRODUCER (1), INDEPENDENT (2)		RO	Txt	ND	NC	PT	
S.11.030	Easy Mode Maximum Network Delay	1 to 100 ms	3 ms	RW	Num				US
S.11.040	Rx1 Late Synchronisation Frame Action	Trip (1), Do not use (2), Use (3)	Trip (1)	RW	Txt				US
S11.041	Rx1 Late Synchronisation Frame Destination	This slot (0), Slot 1 (1), Slot 2 (2), Slot 3 (3), Slot 4 (4)	This slot (0)	RW	Txt				US
S.11.042	Rx1 Late Synchronisation Frame Event	No Event (0), Event (1), Event1 (2), Event2 (3), Event3 (4)	No Event (0)	RW	Txt				US
S.11.050	Rx2 Late Synchronisation Frame Action	Trip (1), Do not use (2), Use (3)	Trip (1)	RW	Txt				US
S.11.051	Rx2 Late Synchronisation Frame Destination	This slot (0), Slot 1 (1), Slot 2 (2), Slot 3 (3), Slot 4 (4)	This slot (0)	RW	Txt				US
S.11.052	Rx2 Late Synchronisation Frame Event	No Event (0), Event (1), Event1 (2), Event2 (3), Event3 (4)	No Event (0)	RW	Txt				US
S.11.060	Rx3 Late Synchronisation Frame Action	Trip (1), Do not use (2), Use (3)	Trip (1)	RW	Txt				US

S.11.061	Rx3 Late Synchronisation Frame Destination	This slot (0), Slot 1 (1), Slot 2 (2), Slot 3 (3), Slot 4 (4)	This slot (0)	RW	Txt				US
S.11.062	Rx3 Late Synchronisation Frame Event	No Event (0), Event (1), Event1 (2), Event2 (3), Event3 (4)	No Event (0)	RW	Txt				US

NOTE This menu is not available on the SI-PROFINET V2

7.1.7 Menu 15 - Modbus TCP/IP Setup

Parameter		Range	Default	Type					
S.15.001	Enable	Off (0) or On (1)	On (1)	RW	Bit				US
S.15.002	Reset	Off (0) or On (1)	Off (0)	RW	Bit		NC		
S.15.003	Default	Off (0) or On (1)	Off (0)	RW	Bit		NC		
S.15.004	Modbus Configuration Error	No error (0), Port in use (1), Timeout event (2), Num Connections (3)		RO	Txt	ND	NC	PT	
S.15.005	Modbus Listening Port	0 to 65535	502	RW	Num				US
S.15.006	Maximum Connections	0 to 10	2	RW	Num				US
S.15.007	Maximum Priority Connections	0 to 5	0	RW	Num				US
S.15.008	Maximum Connections Per Client	1 to 10	2	RW	Num				US
S.15.009	Modbus Timeout	1 to 10000 ms	100 ms	RW	Num				US
S.15.010	Modbus Timeout Action	Trip (0), No action (1)	No action (1)	RW	Txt				US
S.15.011	Modbus Timeout Event Destination	This slot (0), Slot 1 (1), Slot 2 (2), Slot 3 (3), Slot 4 (4)	This slot (0)	RW	Txt				US
S.15.012	Modbus Timeout Event Type	No event (0), Trigger Event (1), Trigger Event 1 (2), Trigger Event 2 (3), Trigger Event 3 (4), Trigger Event 4 (5)	No event (0)	RW	Txt				US
S.15.013	Modbus Register Addressing Mode	Standard (0), Modified (1)	Standard (0)	RW	Txt				US
S.15.020	Priority Connection 1	0.0.0.0 to 255.255.255.255	0.0.0.0	RW	IP				US
S.15.021	Priority Connection 2								
S.15.022	Priority Connection 3								
S.15.023	Priority Connection 4								
S.15.024	Priority Connection 5								

NOTE This menu is not available on the SI-PROFINET V2

7.1.8 Menu 25 - Profinet Fault Values

Parameter		Range	Default	Type					
S.25.001 to S.25.032	Output fault value 1 to Output fault value 32	-2147483648 to 2147483647	0	RW	Num			PT	US

NOTE This menu is not available on the SI-PROFINET V2

7.2 Full parameter descriptions

7.2.1 Menu 0 - Module Setup

All parameters in menu 0 within the option module menus are also present in menus 15, 16 or 17 depending on which slot the module is installed in e.g. Pr **3.00.007** (*Module Reset*) is also available in drive parameter Pr **17.007**.

The functionality and properties of the parameters are identical between the two menus.

S.00.001	**Module ID**		
Minimum	0	Maximum	65535
Default	None	Units	None
Type	16 Bit Volatile	Update Rate	Power-up write
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

Pr **S.00.001** displays the ID number for the option module. For SI-PROFINET, this is 434.

S.00.002	**Firmware version**		
Minimum	00.00.00.00 (0)	Maximum	99.99.99.99 (99999999)
Default	None	Units	None
Type	32 Bit Volatile	Update Rate	Power-up write
Display Format	Version Number	Decimal Places	0
Coding	RO, ND, NC, PT		

The firmware version of the option module is in the format of **ww.xx.yy.zz**

S.00.003	**Hardware version**		
Minimum	0.00 (0)	Maximum	655.35 (65535)
Default	None	Units	None
Type	16 Bit Volatile	Update Rate	Power-up write
Display Format	Standard	Decimal Places	2
Coding	RO, ND, NC, PT, BU		

The hardware version of the option module is in the format of **ww.xx.**

S.00.004	**Serial Number LS**		
S.00.005	**Serial Number MS**		
Minimum	0	Maximum	99999999
Default	None	Units	None
Type	32 Bit Volatile	Update Rate	Power-up write
Display Format	Lead Zero Pad	Decimal Places	0
Coding	RO, ND, NC, PT		

The module serial number is available as a pair of 32-bit values where *Serial Number LS* (Pr **S.00.004**) provides the least significant 8 decimal digits, and *Serial Number MS* (Pr **S.00.005**) provides the most significant 8 decimal digits. The reconstructed serial number is ((**S.00.005** x 100000000) + **S.00.004**). For example serial number "0001234567898765" would be stored as **S.00.005** = 12345 and **S.00.004** = 67898765.

S.00.006	Module Status		
Minimum	Bootldr - Update (-2)	Maximum	Error (3)
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Background read
Display Format	Text	Decimal Places	0
Coding	RO, Txt, ND, NC, PT		

This parameter displays the current status of the module. All possible values are shown in the table below.

Value	Text	Description
-2	Bootldr - Update	The bootloader is performing a flash update.
-1	Bootldr - Idle	The bootloader is idle.
0	Initialising	Module is currently initialising.
1	Ok	Module has initialised and has found no errors.
2	Config	A configuration error has been detected in one of the communications protocols or user program.
3	Error	An error has occurred preventing the firmware or user program from running correctly.

S.00.007	Module Reset		
Minimum	Off (0)	Maximum	On (1)
Default	Off (0)	Units	None
Type	1 Bit Volatile	Update Rate	Read every 200 ms
Display Format	Standard	Decimal Places	0
Coding	RW, NC		

Changes to the module's configuration will not take effect until the module has been reset.

To reset the module:

- Set Pr **S.00.007** to On (1).
- When the sequence has been completed, Pr **S.00.007** will be reset to Off (0).
- The module will reset using the updated configuration.

NOTE

This sequence does NOT store the module's configuration parameters in the drive or the module's flash memory. This parameter will change back to Off immediately, and as such the change may not be visible in the display.

S.00.008	Module Default		
Minimum	Off (0)	Maximum	On (1)
Default	Off (0)	Units	None
Type	1 Bit Volatile	Update Rate	Read on module reset
Display Format	Standard	Decimal Places	0
Coding	RW, NC		

If the host drive is defaulted (see the drive user guide for details), it will also clear the current configuration for the slot the module is installed to.

This can be performed as follows:

- Set Pr **S.00.008** to On.
- Reset the module by setting Pr **S.00.007** to On.
- Default parameter values for the module will be loaded.

The module will reset using the default values.

S.00.009	**Active Alarm Bits**		
Minimum	0000000000000000 (0)	Maximum	1111111111111111 (65535)
Default	None	Units	None
Type	16 Bit Volatile	Update Rate	Background
Display Format	Binary	Decimal Places	0
Coding	RO, NC, BU		

This parameter indicates whether an alarm condition is present or not, any alarm conditions present are indicated according to the bit position as shown in the following table.

Bit	Alarm
0	*Reserved*
1	eCMP
2	Modbus
3	*Reserved*
4	*Reserved*
5	File System
6	Too Hot

NOTE This menu is not available on the SI-PROFINET V2

S.00.010	**Active IP Address**		
Minimum	0.0.0.0 (0)	Maximum	255.255.255.255 (4294967295)
Default	None	Units	None
Type	32 Bit Volatile	Update Rate	Written on change
Display Format	IP Address	Decimal Places	0
Coding	RO, ND, NC, PT		

This parameter displays the active IP address.

For further information on the IP address setting refer to Pr **S.02.006** (*IP Address*).

NOTE This menu is not available on the SI-PROFINET V2

S.00.011	Date Code		
Minimum	0	Maximum	65535
Default	None	Units	None
Type	16 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays a number representing the date code for when the option module was manufactured in the form *yyww*, where *yy* is the year and ww is the week number.

For example, a value of 2211 in Pr **S.00.011** would indicate the module was manufactured during week 11 of the year 2022.

NOTE This menu is not available on the SI-PROFINET V2

S.00.012	Capability Mask		
Minimum	000000000000000 (0)	Maximum	111111111111111 (32767)
Default	None	Units	None
Type	16 Bit Volatile	Update Rate	Power-up or reset
Display Format	Binary	Decimal Places	0
Coding	RO, ND, NC, PT		

This is a read only value that shows the capability status of the PROFINET protocol; if the value of bit zero is 1 it indicates that the PROFINET protocol is not available; a value of zero indicates that it is available. This parameter value is determined during manufacture and for SI-PROFINET modules should always 000000000000000 (0).

NOTE This menu is not available on the SI-PROFINET V2

S.00.013	Operation Mode		
Minimum	NORMAL (0)	Maximum	LIMITED-OUT (3)
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Background
Display Format	Text	Decimal Places	0
Coding	RO, Txt, ND, NC, PT		

This is a read only value that shows the operation mode of the module in accordance with the following table.

Value	Text	Description
0	NORMAL	Incoming cyclic data is written to the drive parameters
1	LIMITED-IN	The option module is transitioning from NORMAL to LIMITED mode
2	LIMITED	Incoming cyclic data is not written to the drive parameters
3	LIMITED-OUT	The option module is transitioning from LIMITED to NORMAL mode

NOTE This menu is not available on the SI-PROFINET V2

S.00.030	Slot Indicator		
Minimum	0	Maximum	8
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Written on power-up
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the number of the virtual option slot on the drive that the module is connected to.

S.00.031	Slot Menu Number		
Minimum	0	Maximum	255
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Written on power-up
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the menu number of the option slot on the drive.

e.g.

Slot 1 - Menu 15
Slot 2 - Menu 16
Slot 3 - Menu 17

7.2.2 Menu 2 - Ethernet Configuration

Menu 2 contains all the parameters relating to the configuration of the Ethernet interface on the module.

S.02.003	Network Status		
Minimum	Initialising (0)	Maximum	IP Addr Conflict (6)
Default	Initialising (0)	Units	None
Type	8 Bit Volatile	Update Rate	1 s write
Display Format	Standard	Decimal Places	0
Coding	RO, Txt, ND, NC, PT, BU		

This parameter displays the current status of the Ethernet network as shown in the table below.

Value	Text		Description
0	Initialising		The network interface is being initialised
1	Links Down		No link connection has been detected on either of the Ethernet ports
2	V2	*Reserved*	*Reserved*
	>=HW V03	DHCP In Progress	The Ethernet interface is attempting to obtain the IP address configuration from a DHCP server
3	No Address		The module does not have an IP address.
4	Ready		The network interface has been successfully configured but no data is being received or transmitted
5	Active		The network interface is receiving or transmitting data
6[1]	>=HW V03	IP Addr Conflict	Duplicate IP address detected on the network

[1] - Not available on the SI-PROFINET V2

S.02.004	Network Message Count		
Minimum	0	Maximum	65535
Default	None	Units	Msg/s
Type	16 Bit Volatile	Update Rate	1 s write
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the number of frames that the module is transmitting and/or receiving every second.

S.02.006	IP Address		
Minimum	0.0.0.0 (0)	Maximum	255.255.255.255 (4294967295)
Default	0.0.0.0 (0)	Units	None
Type	32 Bit Volatile	Update Rate	On change
Display Format	IP address	Decimal Places	0
Coding[1]	RW, BU		

In the PROFINET environment, the controller (PLC or PC with PROFINET interface) normally provides the IO device (PROFINET option module mounted on a drive) with its IP address, subnet mask and default gateway address. As a group, these are set as either permanent or temporary

values. (Temporary values are cleared by any reset). In an already operational environment, IO devices are recognised by their name of station - an ASCII descriptive name defined during system start-up via the supervisor (an engineering workstation). When IO device replaced in the field, it will not normally have a name of station, so when it starts up it uses LLDP and DCP to determine from its neighbours the name of station of the device replacing. When successful, it adopts that name of station and the controller can then initialise it. During the start-up the supervisors will normally locates and identify unnamed devices by their MAC and IP address.

When the IP address and subnet mask are set to change and drive parameters saved, the new IP address is saved as permanent in the drive. Note that the controller may later override the setting and alter these values.

For SI-PROFINET V2, the IP address parameters **S.02.006** (*IP Address*), **S.02.007** (*Subnet Mask*) and **S.02.008** (*Default Gateway*) are read only (RO) volatile parameters, requiring a Profinet controller and suitable configuration tool to configure.

For SI-PROFINET (HW V03 or later), the IP address parameters **S.02.006** (*IP Address*), **S.02.007** (*Subnet Mask*) and **S.02.008** (*Default Gateway*) are read write (RW) user-save (US) parameters, but are cleared on initialisation and will be written to by a Profinet controller during commissioning.

NOTE [1] - For SI-PROFINET V2 the coding is RO, NC, PT, BU

S.02.007	**Subnet Mask**		
Minimum	0.0.0.0 (0)	Maximum	4294967295 (255.255.255.255)
Default	0.0.0.0 (0)	Units	None
Type	32 Bit Volatile	Update Rate	On change
Display Format	IP address	Decimal Places	0
Coding[1]	RW, BU		

The subnet mask is normally written to by the controller during the parameterisation phase.

The subnet mask supports IP address routing by allowing the module to determine if destination addresses are either:

- On the same subnet and can therefore be transmitted directly, or
- On a remote network and should therefore, be transmitted through the default gateway.

For SI-PROFINET V2, the IP address parameters **S.02.006** (*IP Address*), **S.02.007** (*Subnet Mask*) and **S.02.008** (*Default Gateway*) are read only (RO) volatile parameters, requiring a Profinet controller and suitable configuration tool to configure.

For SI-PROFINET (HW V03 or later), the IP address parameters **S.02.006** (*IP Address*), **S.02.007** (*Subnet Mask*) and **S.02.008** (*Default Gateway*) are read write (RW) user-save (US) parameters, but are cleared on initialisation and will be written to by a Profinet controller during commissioning.

NOTE [1] - For SI-PROFINET V2 the coding is RO, NC, PT, BU

S.02.008	Default Gateway		
Minimum	0.0.0.0 (0)	Maximum	255.255.255.255 (4294967295)
Default	0.0.0.0 (0)	Units	None
Type	32 Bit Volatile	Update Rate	None
Display Format	IP address	Decimal Places	0
Coding[1]	RW, BU		

This parameter displays the default gateway IP address given to the module by the controller.

For SI-PROFINET V2, the IP address parameters **S.02.006** (*IP Address*), **S.02.007** (*Subnet Mask*) and **S.02.008** (*Default Gateway*) are read only (RO) volatile parameters, requiring a Profinet controller and suitable configuration tool to configure.

For SI-PROFINET (HW V03 or later), the IP address parameters **S.02.006** (*IP Address*), **S.02.007** (*Subnet Mask*) and **S.02.008** (*Default Gateway*) are read write (RW) user-save (US) parameters, but are cleared on initialisation and will be written to by a Profinet controller during commissioning.

NOTE [1] - For SI-PROFINET V2 the coding is RO, NC, PT, BU

S.02.011	MAC Address		
Minimum	000000000000 (0)	Maximum	FFFFFFFFFFFF (2^{48}-1)
Default	None	Units	None
Type	64 bit volatile	Update Rate	Power-up write
Display Format	MAC address	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

Display the MAC address for the Ethernet interface as a 48 bit hexadecimal value.

This is the base MAC address for the module. Because the PROFINET option is a switch, the base MAC is the address used to talk to the option but each port is also a switch port needing its own MAC address. The switch ports are assigned the next two sequential MAC address following the base MAC address.

Only the base MAC address needs to be displayed on the option.

Most significant byte of the MAC address will always be set to 00. The Second most significant byte of the MAC address will always to be set to 0D. The third most significant byte of the MAC address will always to be set to 1E and last three bytes forms the serial number.

S.02.021	Web Server Enable		
Minimum	Off (0)	Maximum	On (1)
Default	On (1)	Units	None
Type	1 Bit User Save	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter enables or disables the web server interface of the module.

NOTE This menu is not available on the SI-PROFINET V2

S.02.022	Web Server Port		
Minimum	0	Maximum	65535
Default	80	Units	None
Type	16 Bit User Save	Update Rate	Read on initialisation
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter specifies the web server port number. This value may be changed for added security.

NOTE This menu is not available on the SI-PROFINET V2

S.02.024	Ethernet MTU		
Minimum	158	Maximum	1500
Default	1500	Units	Bytes
Type	16 Bit User Save	Update Rate	Read on initialisation
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter specifies the Ethernet packet size (Maximum Transmission Unit). This is expressed as the size of IP payload as opposed to Ethernet frame size.

NOTE This menu is not available on the SI-PROFINET V2

S.02.025	Gateway Mode		
Minimum	Switch (0)	Maximum	Strict Gateway (2)
Default	Switch (0)	Units	None
Type	8 Bit User Save	Update Rate	Read on initialisation
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter specifies the operation mode of the gateway in accordance with the following table.

Value	Text
0	Switch
1	Gateway
2	Strict Gateway

By default, the gateway is disabled and the switch operates in normal switch mode, by enabling the gateway mode all packets are filtered by the module and prioritised before being forwarded on. In strict mode the gateway will drop packets from unsupported protocols.

VLAN must be enabled **S.02.030** (*VLAN Enable*) when the gateway is enabled.

NOTE This menu is not available on the SI-PROFINET V2

S.02.030	VLAN Enable		
Minimum	Off (0)	Maximum	On (1)
Default	Off (0)	Units	None
Type	1 Bit User Save	Update Rate	Read on initialisation
Display Format	Standard	Decimal Places	0
Coding	RW		

This parameter controls whether the module will use VLAN tagging.

When used in conjunction with **S.02.031** (*Drive VLAN ID*), network traffic from the interface (Port B) will be tagged with the chosen VLAN identifier.

When default values for *Drive VLAN ID* is set, enabling this parameter will add VLAN prioritisation to all packets helping to ensure real-time packets are not delayed by those of lower priority. If disabled, prioritisation will use the *Diffserv* field in IP traffic only, meaning non-IP traffic can still affect real-time IP traffic.

NOTE This menu is not available on the SI-PROFINET V2

S.02.031	VLAN ID		
Minimum	1	Maximum	1
Default	1	Units	None
Type	8 Bit User Save	Update Rate	Read on initialisation and VLAN-ENABLE
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter specifies the VLAN ID that the interface will be a member of. Any packets entering the switch without this VLAN ID will not be handled.

NOTE This menu is not available on the SI-PROFINET V2

7.2.3 Menu 5 - PROFINET Configuration

Menu 5 contains all the parameters relating the configuration of the PROFINET interface.

S.05.004	Configuration Error		
Minimum	No Error (0)	Maximum	Param Config (4)
Default	No Error (0)	Units	None
Type	8 Bit Volatile	Update Rate	On connect request from controller
Display Format	Standard	Decimal Places	0
Coding	RO, Txt, NC, PT, BU		

This parameter displays the current status of the PROFINET communications and will also display any errors that are detected on the module.

Value	Text	Description
0	No Error	No error detected.
1	Input Mapping	More than 32 parameters (slots) are configured as inputs.
2	Output Mapping	More than 32 parameters (slots) are configured as outputs.
3	Data Size	Data size given in GSDML file does not match actual parameter size.
4	Param Config	Parameter given in connect request is either non-existent or the validation has failed.

S.05.005	Cyclic data transfers per second		
Minimum	0	Maximum	65535
Default	None	Units	Msg/s
Type	16 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter shows the profinet cyclic data transfer rate.

NOTE This menu is not available on the SI-PROFINET V2

S.05.006	Module Revision Counter		
Minimum	0	Maximum	65535
Default	None	Units	None
Type	16 Bit Volatile	Update Rate	Module Reset or save
Display Format	Standard	Decimal Places	0
Coding	RO, ND, PT, BU		

A changed value of the revision counter parameter of PROFINET marks a change of hardware or its parameters. At production, the counter will be set to zero. This value is reserved for the first installation and the first increment. The counter increments from 1 to 65535, wrapping over back to 1 when required.

Criteria to increment the revision counter

- If any other than the SI-PROFINET module is removed or inserted then configuration counter will increment since that is a configuration change.
- Any write access of parameters within the module and its activation.
- If any user save in the drive or in the module.

The counter will reset to zero when the module is defaulted.

S.05.007	Profile ID		
Minimum	0	Maximum	65535
Default	62976	Units	None
Type	16 Bit volatile	Update Rate	Background read
Display Format	Standard	Decimal Places	0
Coding	RO, PT, BU		

This parameter displays the supported profile ID. This is fixed at 62976 (0xF600), which is a profile ID for generic devices.

S.05.008	Installation Date		
Minimum	00-00-00 (0)	Maximum	31-12-99 (311299)
Default	None	Units	None
Type	32 Bit volatile	Update Rate	On initialisation
Display Format	Date	Decimal Places	0
Coding	RO, ND, PT, BU		

This parameter indicates that the date of installation or commissioning of a device or module. This date will be written by controller and cannot be modified by the user via the keypad or comms.

S.05.009	Timeout		
Minimum	1	Maximum	10000
Default	100	Units	ms
Type	16 Bit volatile	Update Rate	Connect request from controller
Display Format	Standard	Decimal Places	0
Coding	RW, PT, BU		

This parameter defines the time period in which the module must receive a cyclic data frame from the controller before any specified action is performed. Default timeout value is 100 ms and it is over-written by the controller when a connect request is received.

S.05.010	Timeout Action		
Minimum	Trip (0)	Maximum	No action (4)
Default	No action (4)	Units	None
Type	8 Bit User Save	Update Rate	Module reset / initialisation
Display Format	Standard	Decimal Places	0
Coding	RW, TE, PT, BU		

This parameter defines the action to take when no cyclic message frame is received within the time period specified by the timeout value in Pr **S.05.009**. All possible values are shown in the table below.

Value	Text	Description
0	Trip	Trip drive with corresponding trip
1	Send flt values[1]	Send configured fault values to output mappings
2	Clear output[2]	PLC output parameter will have their values set to zero
3	Hold last[3]	Hold the last value in output parameters
4	No action[4]	No action

NOTE

[1] - SendFaultValue on SI-PROFINET V2
[2] - Clear Output on SI-PROFINET V2
[3] - Hold Last on SI-PROFINET V2
[4] - No Action on SI-PROFINET V2

S.05.011*	Timeout Event Destination		
Minimum	This slot (0)	Maximum	Slot 4 (4)
Default	This slot (0)	Units	None
Type	8 Bit User Save	Update Rate	Module reset / initialisation
Display Format	Standard	Decimal Places	0
Coding	RW, TE, PT, BU		

This parameter defines the Event task destination if a specified Event task in a compatible module is set to run.

NOTE * The timeout event function has not been implemented with this release.

Value	Text	Description
0	This slot	Trigger event in this slot
1	Slot 1	Trigger event in slot 1
2	Slot 2	Trigger event in slot 2
3	Slot 3	Trigger event in slot 3
4	Slot 4	Trigger event in slot 4

S.05.012*	Timeout Event Type		
Minimum	No event (0)	Maximum	Trigger Event 4 (5)
Default	No event (0)	Units	None
Type	8 Bit User Save	Update Rate	Module reset / initialisation
Display Format	Standard	Decimal Places	0
Coding	RW, TE, PT, BU		

Defines the event to trigger when a timeout occurs. *Timeout Event Destination* (Pr **S.05.011**) must specify an appropriate consumer (option slot) of the event. All event types are listed in the table below.

Value	Text	Description
0	No event	Trigger event in this slot
1	Trigger Event	Trigger module event
2	Trigger Event 1	Trigger module event 1
3	Trigger Event 2	Trigger module event 2
4	Trigger Event 3	Trigger module event 3
5	Trigger Event 4	Trigger module event 4

NOTE * The timeout event function has not been implemented with this release.

S.05.026	Input Consistency Enable		
Minimum	Off (0)	Maximum	On (1)
Default	Off (0)	Units	None
Type	1 Bit User Save	Update Rate	On Profinet Reset, Start-up
Display Format	Standard	Decimal Places	0
Coding	RW		

This parameter is used to enable or disable the user level PROFINET input consistency. It can take the following values:

Value	Text	Description
0	Off	Input consistency is disabled.
1	On	Input consistency is enabled.

S.05.027	Input Consistency Trigger Parameter		
Minimum	0.00.000 (0)	Maximum	4.99.999 (499999)
Default	0.00.000 (0)	Units	None
Type	32 Bit User Save	Update Rate	On Profinet Reset, Start-up
Display Format	Slot Menu Parameter	Decimal Places	0
Coding	RW, BU		

By default, cyclic data is read from the drive (or via inter-option communication to an option module) just before it is transmitted to the PLC. If the user wishes to control the sampling of new data (e.g. if another module is putting data into the drive menu 20 parameters and data should not be transmitted until they have all been updated) then PROFINET input consistency should be enabled and a trigger parameter selected. The following scheme is specified:

- When PROFINET input consistency is disabled, new cyclic data is sampled just prior to transmission. The cyclic data gets updated in background task.
- When PROFINET input consistency is enabled, the value in the PROFINET input consistency trigger parameter is checked at the beginning of the sampling routine. If it is zero then last set of cyclic data is retransmitted. If the value is non-zero then new data is sampled and transmitted, the trigger parameter value is then set to zero.

If read consistency is enabled, then at reset or following a power cycle, the value in the trigger parameter is set to zero.

In the slot number of parameter **S.mm.ppp**, "if **S**=0" means drive, "**S**=1 to 3" means the module in slot 1 to 3, "**S**=4" means factory fit module.

S.05.028	Output Consistency Enable		
Minimum	Off (0)	Maximum	On (1)
Default	Off (0)	Units	None
Type	1 Bit User Save	Update Rate	On Profinet Reset, Start-up
Display Format	Standard	Decimal Places	0
Coding	RW		

This parameter is used to enable or disable the user level PROFINET output consistency. It can take the following values:

Value	Text	Description
0	Off	Output consistency is disabled.
1	On	Output consistency is enabled.

S.05.029	Output Consistency Trigger Parameter		
Minimum	0.00.000 (0)	Maximum	4.99.999 (499999)
Default	0.00.000 (0)	Units	None
Type	32 Bit User Save	Update Rate	On Profinet Reset, Start-up
Display Format	Slot Menu Parameter	Decimal Places	0
Coding	RW, BU		

By default, cyclic data is written to the drive (or via inter-option communication to an option module) just after it is received from the PLC. If the user wishes to control the writing of new data (e.g. if another module is reading data from drive menu 20 parameters and data should only be read when until they have all been updated) then PROFINET output consistency should be enabled and a trigger parameter selected. The following scheme is specified:

- When PROFINET output consistency is disabled, new cyclic data is sampled just prior to transmission. This cyclic data gets updated in background task.
- When PROFINET output consistency is enabled, the value in the PROFINET output consistency trigger parameter is checked at the beginning of the writing routine. If it is zero then data is written to the cyclic data destination parameters and the trigger parameter is set to 1. If the value is non zero the new data is discarded.

If write consistency is enabled, then at reset or following a power cycle, the value in the trigger parameter is set to zero.

In the slot number of parameter **S.mm.ppp**, "if **S**=0" means drive, "**S**=1 to 3" means the module in slot 1 to 3, "**S**=4" means factory fit module.

7.2.4 Menu 9 - Resources

This menu shows the current state of the system resources.

NOTE This menu is not available on the SI-PROFINET V2

S.09.001	Cyclic Tx links Free		
Minimum	0	Maximum	255
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the number of available transmit cyclic links.

S.09.002	Cyclic Rx links Free		
Minimum	0	Maximum	255
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the number of available receive cyclic links.

S.09.003	Fieldbus Links Free		
Minimum	0	Maximum	255
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the number of available transmit and receive process images for fieldbus protocols such as Ethernet/IP.

S.09.004	Cyclic Mappings Free		
Minimum	0	Maximum	255
Default	None	Units	None
Type	16 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the number of available mappings in the system for use in cyclic links.

S.09.008	Background cycles per second		
Minimum	0	Maximum	65535
Default	None	Units	None
Type	16 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the number of times per second the background task is currently executing. The background task is responsible for cyclic data exchange with the drive. With more cyclic data mapped the cycle rate of the task will decrease.

S.09.010	Synchronous Task % Free		
Minimum	0	Maximum	255
Default	None	Units	%
Type	8 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the synchronous task availability as a percentage.

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.09.011	Nonsync link update period		
Minimum	0.00 (0)	Maximum	655.35 (65535)
Default	None	Units	None
Type	16 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	2
Coding	RO, ND, NC, PT, BU		

This parameter displays the update period of the non-synchronous cyclic links.

S.09.020	Synchronous Task Worst % Free		
Minimum	0	Maximum	255
Default	None	Units	%
Type	8 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the worst case free resource of the synchronous task.

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.09.021	Max nonsync link update period		
Minimum	0.00 (0)	Maximum	655.35 (65535)
Default	None	Units	None
Type	16 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	2
Coding	RO, ND, NC, PT, BU		

This parameter displays the maximum update period of the non-synchronous cyclic links.

S.09.030	PCB Temperature		
Minimum	-128	Maximum	127
Default	None	Units	°C
Type	8 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	2
Coding	RO, ND, NC, PT		

This parameter displays the current PCB temperature.

7.2.5 Menu 10 - RTMOE Easy Mode

This menu contains the parameters to configure the Easy Mode cyclic data links.

Easy Mode cyclic links allow configuration of up to 3 transmit and 3 receive links, each link can contain up to 10 sequential parameters.

For each cyclic link, a start parameter and number of consecutive parameters must be defined.

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

NOTE This menu is not available on the SI-PROFINET V2

S.10.001	**Enable**		
Minimum	Off (0)	Maximum	On (1)
Default	On (1)	Units	None
Type	1 Bit User Save	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter enables (1) or disables (0) the Easy Mode cyclic data links.

S.10.002	**Reset**		
Minimum	Off (0)	Maximum	On (1)
Default	Off (0)	Units	None
Type	1 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RW, NC		

This parameter is used to perform a warm reset of the Easy Mode protocol interface. Upon completion, this parameter will revert to Off (0).

S.10.003	Default		
Minimum	Off (0)	Maximum	On (1)
Default	Off (0)	Units	None
Type	1 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RW, NC		

This parameter is used to default the Easy Mode protocol settings to the factory default values. This includes all of the protocol features, configuration, mappings and stored objects.

A protocol reset by means of **S.10.002** (*Reset*) is required to activate the change. Upon completion, this parameter will revert to Off (0).

S.10.004	Cyclic Messages Per Second		
Minimum	0	Maximum	65535
Default	None	Units	Messages/s
Type	16 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the total number of cyclic (Rx and Tx) messages per second. This includes Easy Mode and Offline configurations.

It is recommended that when designing an application, the total number of Ethernet messages is limited to 6000 per second, exceeding this value may result in communication errors or lost messages.

S.10.005	Configuration Valid		
Minimum	Off (0)	Maximum	On (1)
Default	None	Units	None
Type	1 Bit Volatile	Update Rate	Initialisation, Background
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT		

This parameter indicates whether the active configuration is valid.

If the active configuration identified by **S.10.007** (*Active Configuration*) has no configuration errors, then the configuration is valid, and this parameter will be On (1).

If the active configuration is Easy Mode, made effective through **S.10.002** (*Reset*) to On, **S.10.005** (*Configuration Valid*) can be read once **S.10.002** (*Reset*) returns to Off as shown in the associated timing diagram.

If the active configuration is Offline (representing a configuration provided by a PC tool) the configuration was created in conjunction with the user application

S.10.006	Operational		
Minimum	Off (0)	Maximum	On (1)
Default	None	Units	None
Type	1 Bit Volatile	Update Rate	1 ms
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT		

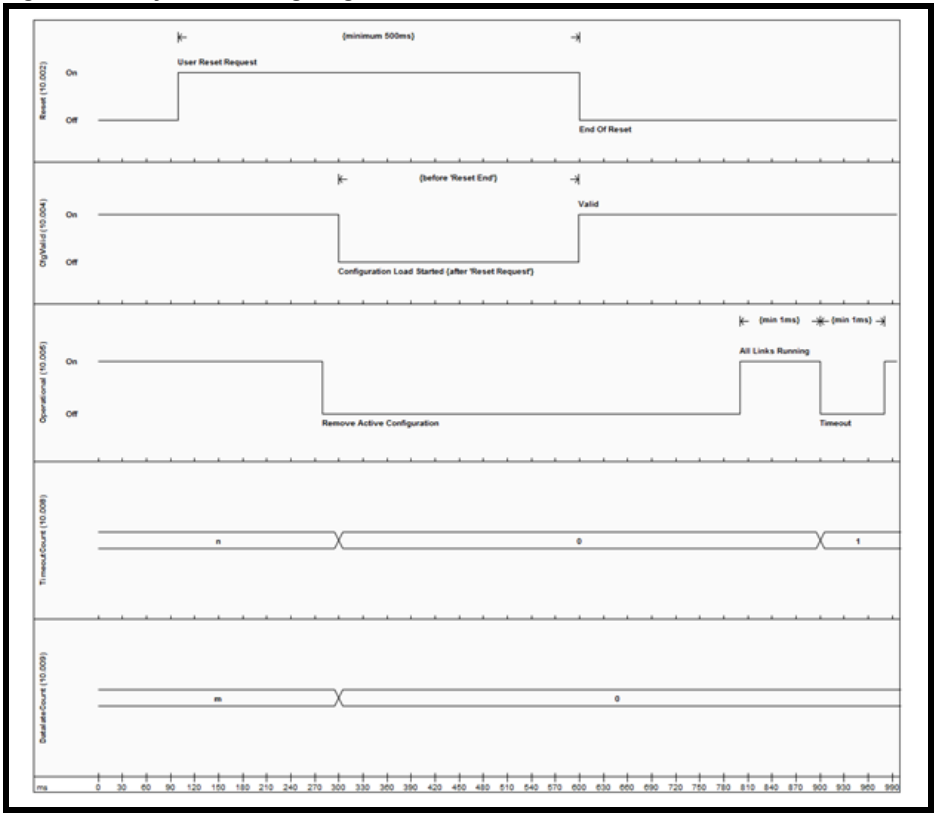
This parameter provides an indication that all links in the active configuration are:

1. Receiving new messages successfully AND
2. Transmitting links, however, this does not mean the destination devices are receiving the messages, this will be dependent on their own state.

A receive link timeout will cause this parameter to become cleared until a new message is received. A single data late event will cause this parameter to be Off until the next cyclic message is received on time. This parameter is updated every 1 ms; if low latency reactions to timeout and data late events are required then appropriate actions should be configured for the appropriate links, see **S.10.046** (*Rx1 Timeout action*) for further details.

A user program utilising cyclic data may use this parameter along with **S.10.005** (*Configuration Valid*) to detect when cyclic communication is operational; once detected if the user program wishes to monitor for timeout events, **S.10.008** (*Timeout Count*) can be used.

Figure 7-1 Easy Mode Timing Diagram



S.10.007	Active Configuration		
Minimum	None (0)	Maximum	Offline (2)
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RO, Txt, ND, NC, PT, BU		

This parameter displays the active configuration source of cyclic data.

The possible values are:

Value	Text	Description
0	None	No active configuration
1	Easy Mode	Configuration is from Easy Mode parameters
2	Offline	Configuration is from PC tools (Machine Control Studio)

S.10.008	Timeout Count		
Minimum	0	Maximum	65535
Default	None	Units	None
Type	16 Bit Volatile	Update Rate	1 ms
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the total number of receive timeout events; the parameter value will wrap over to zero.

A reset of the configuration will clear this count; see Figure 7-1 *Easy Mode Timing Diagram* . Each timeout event will increment this count. The count can be sampled by a user application in order to detect a change since the last sample; this enables custom reaction to a timeout event occurring on any cyclic receive link which has a timeout value configured, irrespective of the timeout action for the link.

If a custom timeout reaction is required on a per-link basis, then the link action must be chosen appropriately in the relevant link timeout action (**S.10.046, S.10.056, or S.10.066**); this could be, for example, 'Clear output', to write zero to all of the cyclic parameters and implement monitoring code for this condition in the user application.

S.10.009	Date Late Count		
Minimum	0	Maximum	65535
Default	None	Units	None
Type	16 Bit Volatile	Update Rate	1 ms
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the total number of receive data late events for synchronous links; the parameter value will wrap over to zero.

A reset of the configuration will clear this count; see Figure 7-1 *Easy Mode Timing Diagram* . Each data late event will increment the count. The count can be sampled by a user application in order to detect a change since the last sample; this enables custom reaction to a data late event occurring on a synchronous cyclic receive link which has a received a message containing a time that is now in the past irrespective the defined action for the link.

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.10.010	Tx1 Link Profile		
Minimum	Std (0)	Maximum	Sync (1)
Default	Std (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt		

This parameter selects Tx1 as a synchronous or non-synchronous link.

Value	Text	Description
0	Std	Standard non-synchronous link
1	Sync	Synchronous link

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.10.011	Tx1 Link number		
Minimum	0	Maximum	255
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter selects the link number for the Tx1 link.

S.10.012	Tx1 Source Parameter		
Minimum	0.00.000 (0)	Maximum	4.99.999 (499999)
Default	0.00.000 (0)	Units	None
Type	32 Bit User Save	Update Rate	Reset
Display Format	Slot Menu Parameter	Decimal Places	0
Coding	RW, PT, BU		

This parameter selects the source parameter for the Tx1 link.

S.10.013	Tx1 Parameter count		
Minimum	0	Maximum	10
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter sets the number of contiguous parameters for the Tx1 link.

S.10.014	Tx1 Transmission type		
Minimum	Unicast (0)	Maximum	Multicast10 (11)
Default	Unicast (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter sets the transmission type for the Tx1 link.

Value	Text	Description
0	Unicast	Link is unicast to the specified IP address (**S.10.015**)
1	Broadcast	Link is broadcast (255.255.255.255)
2	Multicast1	Link is multicast to 239.255.0.1
3	Multicast2	Link is multicast to 239.255.0.2
4	Multicast3	Link is multicast to 239.255.0.3
5	Multicast4	Link is multicast to 239.255.0.4
6	Multicast5	Link is multicast to 239.255.0.5
7	Multicast6	Link is multicast to 239.255.0.6
8	Multicast7	Link is multicast to 239.255.0.7
9	Multicast8	Link is multicast to 239.255.0.8
10	Multicast9	Link is multicast to 239.255.0.9
11	Multicast10	Link is multicast to 239.255.0.10

S.10.015	Tx1 Destination address		
Minimum	0.0.0.0 (0)	Maximum	255.255.255.255 (4294967295)
Default	0.0.0.0 (0)	Units	None
Type	32 Bit User Save	Update Rate	Reset
Display Format	IP Address	Decimal Places	0
Coding	RW, BU		

This parameter specifies the IP address of the destination device for the Tx1 link. If the link transmission type is set to either broadcast or multicast, this parameter will display the appropriate IP address.

S.10.016	Tx1 Message Rate		
Minimum	0	Maximum	100
Default	0	Units	ms
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter defines, in milliseconds, the period at which the Tx1 link will be transmitted.

A value of zero disables the transmission of data.

S.10.019	Tx1 Link Status		
Minimum	Disabled (-31)	Maximum	OK Sync (2)
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RO, Txt, ND, NC, PT		

This parameter displays the status of the Tx1 link.

Value	Text	Description
-31	Disabled	Easy Mode protocol is disabled, or link number is set to 0
-30	VLAN disabled	VLAN is required in Synchronous mode, but it is disabled
-29	Reserved 29	Reserved
-28	Reserved 28	Reserved
-27	Reserved 27	Reserved
-26	Reserved 26	Reserved
-25	Reserved 25	Reserved
-24	Reserved 24	Reserved
-23	Reserved 23	Reserved
-22	Invalid DST IP	The destination IP address is invalid
-21	SYNC unsupported	Sync link does not support mappings to other option parameters

Value	Text	Description
-20	MEC offset	Incorrect MEC offset
-19	Invalid tx rate	Tx rate must be a factor of 1 second
-18	Too many mapping	The number of mapping items exceeds the range supported
-17	Link busy	The link specified is busy
-16	Invalid profile	The profile is invalid
-15	Invalid mapping	The mapped parameter does not exist
-14	read only param	The mapped parameter is read only
-13	Msg mismatch	Link number and direction do not match
-12	Msg too long	Resulting message is too long
-11	Attrib NA	Attribute not avilable
-10	Attrib RO	Attribute is read only
-9	Attrib missing	Attribute is missing
-8	Timeout	Timeout
-7	In error	The link specified is in Error state
-6	Link num in use	The link number specified is already in use
-5	Not editiable	The link specified is not editable
-4	Invalid link num	An invalid link number was specified
-3	Invalid args	Link Number or another argument specified was invalid
-2	Too many links	Maximum number of links in use has been reached
-1	Out of memory	Failed to allocate memory
0	OK	Configuration of link successful
1	Not running	OK. Not running
2	OK sync	Configuration of synchronous link successful

A reset (**S.10.002**) is required to activate any change.

S.10.020	Tx2 Link Profile		
Minimum	Std (0)	Maximum	Sync (1)
Default	Std (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt		

This parameter selects Tx2 as a synchronous or non-synchronous link.

Value	Text	Description
0	Std	Standard non-synchronous link
1	Sync	Synchronous link

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.10.021	Tx2 Link number		
Minimum	0	Maximum	255
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter selects the link number for the Tx2 link.

S.10.022	Tx2 Source parameter		
Minimum	0.00.000 (0)	Maximum	4.99.999 (499999)
Default	0.00.000 (0)	Units	None
Type	32 Bit User Save	Update Rate	Reset
Display Format	Slot Menu Parameter	Decimal Places	0
Coding	RW, PT, BU		

This parameter selects the source parameter for the Tx2 link.

S.10.023	Tx2 Parameter count		
Minimum	0	Maximum	10
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter sets the number of contiguous parameters for the Tx2 link.

S.10.024	Tx2 Transmission type		
Minimum	Unicast (0)	Maximum	Multicast10 (11)
Default	Unicast (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter sets the transmission type for the Tx2 link.

Value	Text	Description
0	Unicast	Link is unicast to the specified IP address (**S.10.025**)
1	Broadcast	Link is broadcast (255.255.255.255)
2	Multicast1	Link is multicast to 239.255.0.1
3	Multicast2	Link is multicast to 239.255.0.2
4	Multicast3	Link is multicast to 239.255.0.3
5	Multicast4	Link is multicast to 239.255.0.4
6	Multicast5	Link is multicast to 239.255.0.5
7	Multicast6	Link is multicast to 239.255.0.6
8	Multicast7	Link is multicast to 239.255.0.7
9	Multicast8	Link is multicast to 239.255.0.8
10	Multicast9	Link is multicast to 239.255.0.9
11	Multicast10	Link is multicast to 239.255.0.10

S.10.025	Tx2 Destination address		
Minimum	0.0.0.0 (0)	Maximum	255.255.255.255 (4294967295)
Default	0.0.0.0 (0)	Units	None
Type	32 Bit User Save	Update Rate	Reset
Display Format	IP Address	Decimal Places	0
Coding	RW, BU		

This parameter specifies the IP address of the destination device for the Tx2 link. If the link transmission type is set to either broadcast or multicast, this parameter will display the appropriate IP address.

S.10.026	Tx2 Message Rate		
Minimum	0	Maximum	100
Default	0	Units	ms
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter defines, in milliseconds, the period at which the Tx2 link will be transmitted.

A value of zero disables the transmission of data.

S.10.029	Tx2 Link status		
Minimum	Disabled (-31)	Maximum	OK sync (2)
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RO, Txt, ND, NC, PT		

This parameter displays the status of the Tx2 link.

Value	Text	Description
-31	Disabled	Easy Mode protocol is disabled, or link number is set to 0
-30	VLAN disabled	VLAN is required in Synchronous mode, but it is disabled
-29	Reserved 29	Reserved
-28	Reserved 28	Reserved
-27	Reserved 27	Reserved
-26	Reserved 26	Reserved
-25	Reserved 25	Reserved
-24	Reserved 24	Reserved
-23	Reserved 23	Reserved
-22	Invalid DST IP	The destination IP address is invalid
-21	SYNC unsupported	Sync link does not support mappings to other option parameters
-20	MEC offset	Incorrect MEC offset
-19	Invalid tx rate	Tx rate must be a factor of 1 second
-18	Too many mapping	The number of mapping items exceeds the range supported
-17	Link busy	The link specified is busy
-16	Invalid profile	The profile is invalid
-15	Invalid mapping	The mapped parameter does not exist
-14	Read only param	The mapped parameter is read only
-13	Msg mismatch	Link number and direction do not match
-12	Msg too long	Resulting message is too long

Value	Text	Description
-11	Attrib NA	Attribute not avilable
-10	Attrib RO	Attribute is read only
-9	Attrib missing	Attribute is missing
-8	Timeout	Timeout
-7	In error	The link specified is in Error state
-6	Link num in use	The link number specified is already in use
-5	Not editiable	The link specified is not editable
-4	Invalid link num	An invalid link number was specified
-3	Invalid args	Link Number or another argument specified was invalid
-2	Too many links	Maximum number of links in use has been reached
-1	Out of memory	Failed to allocate memory
0	OK	Configuration of link successful
1	Not running	OK. Not running
2	OK sync	Configuration of synchronous link successful

A reset (**S.10.002**) is required to activate any change.

S.10.030	Tx3 Link Profile		
Minimum	Std (0)	Maximum	Sync (1)
Default	Std (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt		

This parameter selects Tx3 as a synchronous or non-synchronous link.

Value	Text	Description
0	Std	Standard non-synchronous link
1	Sync	Synchronous link

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.10.031	Tx3 Link Number		
Minimum	0	Maximum	255
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter selects the link number for the Tx3 link.

S.10.032	Tx3 Source Parameter		
Minimum	0.00.000 (0)	Maximum	4.99.999 (499999)
Default	0.00.000 (0)	Units	None
Type	32 Bit User Save	Update Rate	Reset
Display Format	Slot Menu Parameter	Decimal Places	0
Coding	RW, PT, BU		

This parameter selects the source parameter for the Tx3 link.

S.10.033	Tx3 Parameter count		
Minimum	0	Maximum	10
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter sets the number of contiguous parameters for the Tx3 link.

S.10.034	Tx3 Transmission type		
Minimum	Unicast (0)	Maximum	Multicast10 (11)
Default	Unicast (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter sets the transmission type for the Tx3 link.

Value	Text	Description
0	Unicast	Link is unicast to the specified IP address (**S.10.035**)
1	Broadcast	Link is broadcast (255.255.255.255)
2	Multicast1	Link is multicast to 239.255.0.1
3	Multicast2	Link is multicast to 239.255.0.2
4	Multicast3	Link is multicast to 239.255.0.3
5	Multicast4	Link is multicast to 239.255.0.4
6	Multicast5	Link is multicast to 239.255.0.5
7	Multicast6	Link is multicast to 239.255.0.6
8	Multicast7	Link is multicast to 239.255.0.7
9	Multicast8	Link is multicast to 239.255.0.8
10	Multicast9	Link is multicast to 239.255.0.9
11	Multicast10	Link is multicast to 239.255.0.10

S.10.035	Tx3 Destination address		
Minimum	0.0.0.0 (0)	Maximum	255.255.255.255 (4294967295)
Default	0.0.0.0 (0)	Units	None
Type	32 Bit User Save	Update Rate	Reset
Display Format	IP Address	Decimal Places	0
Coding	RW, BU		

This parameter specifies the IP address of the destination device for the Tx3 link. If the link transmission type is set to either broadcast or multicast, this parameter will display the appropriate IP address.

S.10.036	Tx3 Message Rate		
Minimum	0	Maximum	100
Default	0	Units	ms
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter defines, in milliseconds, the period at which the Tx3 link will be transmitted.

A value of zero disables the transmission of data.

S.10.039	Tx3 Link status		
Minimum	Disabled (-31)	Maximum	OK sync (2)
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RO, Txt, ND, NC, PT		

This parameter displays the status of the Tx3 link.

Value	Text	Description
-31	Disabled	Easy Mode protocol is disabled, or link number is set to 0
-30	VLAN disabled	VLAN is required in Synchronous mode, but it is disabled
-29	Reserved 29	Reserved
-28	Reserved 28	Reserved
-27	Reserved 27	Reserved
-26	Reserved 26	Reserved
-25	Reserved 25	Reserved
-24	Reserved 24	Reserved
-23	Reserved 23	Reserved
-22	Invalid DST IP	The destination IP address is invalid

Value	Text	Description
-21	SYNC unsupported	Sync link does not support mappings to other option parameters
-20	MEC offset	Incorrect MEC offset
-19	Invalid tx rate	Tx rate must be a factor of 1 second
-18	Too many mapping	The number of mapping items exceeds the range supported
-17	Link busy	The link specified is busy
-16	Invalid profile	The profile is invalid
-15	Invalid mapping	The mapped parameter does not exist
-14	Read only param	The mapped parameter is read only
-13	Msg mismatch	Link number and direction do not match
-12	Msg too long	Resulting message is too long
-11	Attrib NA	Attribute not avilable
-10	Attrib RO	Attribute is read only
-9	Attrib missing	Attribute is missing
-8	Timeout	Timeout
-7	In error	The link specified is in Error state
-6	Link num in use	The link number specified is already in use
-5	Not editiable	The link specified is not editable
-4	Invalid link num	An invalid link number was specified
-3	Invalid args	Link Number or another argument specified was invalid
-2	Too many links	Maximum number of links in use has been reached
-1	Out of memory	Failed to allocate memory
0	OK	Configuration of link successful
1	Not running	OK. Not running
2	OK sync	Configuration of synchronous link successful

A reset (**S.10.002**) is required to activate any change.

S.10.040	Rx1 Link profile		
Minimum	Std (0)	Maximum	Sync (1)
Default	Std (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt		

This parameter selects Rx1 as a synchronous or non-synchronous link.

Value	Text	Description
0	Std	Standard non-synchronous link
1	Sync	Synchronous link

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.10.041	Rx1 Link number		
Minimum	0	Maximum	255
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter selects the link number for the Rx1 link.

S.10.042	Rx1 Destination parameter		
Minimum	0.00.000 (0)	Maximum	4.99.999 (499999)
Default	0.00.000 (0)	Units	None
Type	32 Bit User Save	Update Rate	Reset
Display Format	Slot Menu Parameter	Decimal Places	0
Coding	RW, BU		

This parameter selects the destination parameter for the Rx1 link.

S.10.043	Rx1 Parameter count		
Minimum	0	Maximum	10
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter sets the number of contiguous parameters for the Rx1 link.

S.10.044	Rx1 Source Type		
Minimum	Direct (0)	Maximum	Multicast10 (11)
Default	Direct (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter sets the transmission type for the Rx1 link.

Value	Text	Description
0	Direct	Link listens to unicast or broadcast messages
1	Multicast1	Link listens to multicast (239.255.0.1)
2	Multicast2	Link listens to multicast (239.255.0.2)
3	Multicast3	Link listens to multicast (239.255.0.3)
4	Multicast4	Link listens to multicast (239.255.0.4)
5	Local	Link listens to local loopback (127.0.0.1)
6	Multicast5	Link listens to multicast (239.255.0.5)
7	Multicast6	Link listens to multicast (239.255.0.6)
8	Multicast7	Link listens to multicast (239.255.0.7)
9	Multicast8	Link listens to multicast (239.255.0.8)
10	Multicast9	Link listens to multicast (239.255.0.9)
11	Multicast10	Link listens to multicast (239.255.0.10)

S.10.045	Rx1 Timeout		
Minimum	0	Maximum	65535
Default	100	Units	ms
Type	16 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter specifies the watchdog timer for the Rx1 link. If no cyclic data is received on the Rx1 link the action taken will be determined by the setting in **S.10.046** (*Rx1 Timeout action*).

NOTE It is good system design to allow for some message loss by setting the timeout duration to be greater than the transmit period by a factor of 2 or more.

S.10.046	Rx1 Timeout action		
Minimum	Trip (0)	Maximum	Hold last (2)
Default	Trip (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the action to be taken in the event of a timeout on the Rx1 link.

Value	Text	Description
0	Trip	Trip drive with slot error and sub-trip code
1	Clear output	PLC output parameters will have their values set to zero
2	Hold last	Hold the last value in output parameters

S.10.047	Rx1 Timeout Event Dest.		
Minimum	This slot (0)	Maximum	Slot 4 (4)
Default	This slot (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the slot in which an event will be triggered if a cyclic data timeout occurs on the Rx1 link.

Value	Text	Description
0	This slot	Trigger module event in this slot
1	Slot 1	Trigger module event in slot 1
2	Slot 2	Trigger module event in slot 2
3	Slot 3	Trigger module event in slot 3
4	Slot 4	Trigger module event in slot 4

NOTE This feature is not currently supported

S.10.048	Rx1 Timeout Event Type		
Minimum	No Event (0)	Maximum	Event3 (4)
Default	No Event (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the event to trigger in the given destination, as specified in **S.10.047** (*Rx1 Timeout Event Dest.*), if a cyclic data timeout occurs on the Rx1 link.

Value	Text	Description
0	No Event	No event triggered
1	Event	Trigger module Event
2	Event1	Trigger module Event 1
3	Event2	Trigger module Event 2
4	Event3	Trigger module Event 3

S.10.049	Rx1 Link status		
Minimum	Disabled (-31)	Maximum	OK sync (2)
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RO, Txt, ND, NC, PT		

This parameter displays the status of the Rx1 link.

Value	Text	Description
-31	Disabled	Easy Mode protocol is disabled, or link number is set to 0
-30	VLAN disabled	VLAN is required in synchronous mode, but it is disabled
-29	Reserved 29	Reserved
-28	Reserved 28	Reserved
-27	Reserved 27	Reserved
-26	Reserved 26	Reserved
-25	Reserved 25	Reserved
-24	Reserved 24	Reserved
-23	Reserved 23	Reserved
-22	Invalid DST IP	The destination IP address is invalid
-21	SYNC unsupported	Sync link does not support mappings to other option parameters
-20	MEC offset	Incorrect MEC offset
-19	Invalid tx rate	Tx rate must be a factor of 1 second
-18	Too many mapping	The number of mapping items exceeds the range supported
-17	Link busy	The link specified is busy

Value	Text	Description
-16	Invalid profile	The profile is invalid
-15	Invalid mapping	The mapped parameter does not exist
-14	Read only param	The mapped parameter is read only
-13	Msg mismatch	Link number and direction do not match
-12	Msg too long	Resulting message is too long
-11	Attrib NA	Attribute not available
-10	Attrib RO	Attribute is read only
-9	Attrib missing	Attribute is missing
-8	Timeout	Timeout
-7	In error	The link specified is in Error state
-6	Link num in use	The link number specified is already in use
-5	Not editable	The link specified is not editable
-4	Invalid link num	An invalid link number was specified
-3	Invalid args	Link Number or another argument specified was invalid
-2	Too many links	Maximum number of links in use has been reached
-1	Out of memory	Failed to allocate memory
0	OK	Configuration of link successful
1	Not running	OK. Not running
2	OK sync	Configuration of synchronous link successful

A reset (**S.10.002**) is required to activate any change.

S.10.050	Rx2 Link profile		
Minimum	Std (0)	Maximum	Sync (1)
Default	Std (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt		

This parameter selects Rx2 as a synchronous or non-synchronous link.

Value	Text	Description
0	Std	Standard non-synchronous link
1	Sync	Synchronous link

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.10.051	Rx2 Link number		
Minimum	0	Maximum	255
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter selects the link number for the Rx2 link.

S.10.052	Rx2 Destination parameter		
Minimum	0.00.000 (0)	Maximum	4.99.999 (499999)
Default	0.00.000 (0)	Units	None
Type	32 Bit User Save	Update Rate	Reset
Display Format	Slot Menu Parameter	Decimal Places	0
Coding	RW, BU		

This parameter selects the destination parameter for the Rx2 link.

S.10.053	Rx2 Parameter count		
Minimum	0	Maximum	10
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter sets the number of contiguous parameters for the Rx2 link.

S.10.054	Rx2 Source type		
Minimum	Direct (0)	Maximum	Multitask10 (11)
Default	Direct (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter sets the transmission type for the Rx2 link.

Value	Text	Description
0	Direct	Link listens to unicast or broadcast messages
1	Multicast1	Link listens to multicast (239.255.0.1)
2	Multicast2	Link listens to multicast (239.255.0.2)
3	Multicast3	Link listens to multicast (239.255.0.3)
4	Multicast4	Link listens to multicast (239.255.0.4)
5	Local	Link listens to local loopback (127.0.0.1)
6	Multicast5	Link listens to multicast (239.255.0.5)

Value	Text	Description
7	Multicast6	Link listens to multicast (239.255.0.6)
8	Multicast7	Link listens to multicast (239.255.0.7)
9	Multicast8	Link listens to multicast (239.255.0.8)
10	Multicast9	Link listens to multicast (239.255.0.9)
11	Multicast10	Link listens to multicast (239.255.0.10)

S.10.055	Rx2 Timeout		
Minimum	0	Maximum	65535
Default	100	Units	ms
Type	16 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter specifies the watchdog timer for the Rx2 link. If no cyclic data is received on the Rx1 link the action taken will be determined by the setting in **S.10.056** (*Rx2 Timeout action*).

Note: It is good system design to allow for some message loss by setting the timeout duration to be greater than the transmit period by a factor of 2 or more.

S.10.056	Rx2 Timeout Action		
Minimum	Trip (0)	Maximum	Hold last (2)
Default	Trip (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the action to be taken in the event of a timeout on the Rx2 link.

Value	Text	Description
0	Trip	Trip drive with slot error and sub-trip code
1	Clear output	PLC output parameters will have their values set to zero
2	Hold last	Hold the last value in output parameters

S.10.057	Rx2 Timeout Event Dest.		
Minimum	This slot (0)	Maximum	Slot 4 (4)
Default	This slot (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the slot in which an event will be triggered if a cyclic data timeout occurs on the Rx2 link.Trigger module event in slot 1

Value	Text	Description
0	This slot	Trigger module event in this slot
1	Slot 1	Trigger module event in slot 1
2	Slot 2	Trigger module event in slot 2
3	Slot 3	Trigger module event in slot 3
4	Slot 4	Trigger module event in slot 4

NOTE This feature is not currently supported

S.10.058	Rx2 Timeout Event Type		
Minimum	No Event (0)	Maximum	Event3 (4)
Default	No Event (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the event to trigger in the given destination, as specified in **S.10.057** (*Rx2 Timeout Event Dest.*), if a cyclic data timeout occurs on the Rx2 link.

Value	Text	Description
0	No Event	No event triggered
1	Event	Trigger module Event
2	Event1	Trigger module Event 1
3	Event2	Trigger module Event 2
4	Event3	Trigger module Event 3

S.10.059	Rx2 Link status		
Minimum	Disabled (-31)	Maximum	OK sync (2)
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RO, Txt, ND, NC, PT		

This parameter displays the status of the Rx2 link.

Value	Text	Description
-31	Disabled	Easy Mode protocol is disabled, or link number is set to 0
-30	VLAN disabled	VLAN is required in synchronous mode, but it is disabled
-29	Reserved 29	Reserved
-28	Reserved 28	Reserved
-27	Reserved 27	Reserved
-26	Reserved 26	Reserved
-25	Reserved 25	Reserved
-24	Reserved 24	Reserved
-23	Reserved 23	Reserved
-22	Invalid DST IP	The destination IP address is invalid
-21	SYNC unsupported	Sync link does not support mappings to other option parameters
-20	MEC offset	Incorrect MEC offset
-19	Invalid tx rate	Tx rate must be a factor of 1 second
-18	Too many mapping	The number of mapping items exceeds the range supported
-17	Link busy	The link specified is busy
-16	Invalid profile	The profile is invalid
-15	Invalid mapping	The mapped parameter does not exist
-14	Read only param	The mapped parameter is read only
-13	Msg mismatch	Link number and direction do not match
-12	Msg too long	Resulting message is too long
-11	Attrib NA	Attribute not available
-10	Attrib RO	Attribute is read only
-9	Attrib missing	Attribute is missing
-8	Timeout	Timeout
-7	In error	The link specified is in Error state
-6	Link num in use	The link number specified is already in use
-5	Not editable	The link specified is not editable
-4	Invalid link num	An invalid link number was specified
-3	Invalid args	Link Number or another argument specified was invalid

Value	Text	Description
-2	Too many links	Maximum number of links in use has been reached
-1	Out of memory	Failed to allocate memory
0	OK	Configuration of link successful
1	Not running	OK. Not running
2	OK sync	Configuration of synchronous link successful

A reset (**S.10.002**) is required to activate any change.

S.10.060	Rx3 Link profile		
Minimum	Std (0)	Maximum	Sync (1)
Default	Std (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt		

This parameter selects Rx3 as a synchronous or non-synchronous link.

Value	Text	Description
0	Std	Standard non-synchronous link
1	Sync	Synchronous link

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.10.061	Rx3 Link number		
Minimum	0	Maximum	255
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter selects the link number for the Rx3 link.

S.10.062	Rx3 Destination parameter		
Minimum	0.00.000 (0)	Maximum	4.99.999 (499999)
Default	0.00.000 (0)	Units	None
Type	32 Bit User Save	Update Rate	Reset
Display Format	Slot Menu Parameter	Decimal Places	0
Coding	RW, BU		

This parameter selects the destination parameter for the Rx2 link.

S.10.063	Rx3 Parameter count		
Minimum	0	Maximum	10
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter sets the number of contiguous parameters for the Rx3 link.

S.10.064	Rx3 Source type		
Minimum	Direct (0)	Maximum	Multicast10 (11)
Default	Direct (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter sets the transmission type for the Rx3 link.

Value	Text	Description
0	Direct	Link listens to unicast or broadcast messages
1	Multicast1	Link listens to multicast (239.255.0.1)
2	Multicast2	Link listens to multicast (239.255.0.2)
3	Multicast3	Link listens to multicast (239.255.0.3)
4	Multicast4	Link listens to multicast (239.255.0.4)
5	Local	Link listens to local loopback (127.0.0.1)
6	Multicast5	Link listens to multicast (239.255.0.5)
7	Multicast6	Link listens to multicast (239.255.0.6)
8	Multicast7	Link listens to multicast (239.255.0.7)
9	Multicast8	Link listens to multicast (239.255.0.8)
10	Multicast9	Link listens to multicast (239.255.0.9)
11	Multicast10	Link listens to multicast (239.255.0.10)

S.10.065	Rx3 Timeout		
Minimum	0	Maximum	65535
Default	100	Units	ms
Type	16 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter specifies the watchdog timer for the Rx2 link. If no cyclic data is received on the Rx1 link the action taken will be determined by the setting in **S.10.066** (*Rx3 Timeout action*).

Note: It is good system design to allow for some message loss by setting the timeout duration to be greater than the transmit period by a factor of 2 or more.

S.10.066	Rx3 Timeout action		
Minimum	Trip (0)	Maximum	Hold last (2)
Default	Trip (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the action to be taken in the event of a timeout on the Rx3 link.

Value	Text	Description
0	Trip	Trip drive with slot error and sub-trip code
1	Clear output	PLC output parameters will have their values set to zero
2	Hold last	Hold the last value in output parameters

S.10.067	Rx3 Timeout Event Dest.		
Minimum	This slot (0)	Maximum	Slot 4 (4)
Default	This slot (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the slot in which an event will be triggered if a cyclic data timeout occurs on the Rx3 link.

Value	Text	Description
0	This slot	Trigger module event in this slot
1	Slot 1	Trigger module event in slot 1
2	Slot 2	Trigger module event in slot 2
3	Slot 3	Trigger module event in slot 3
4	Slot 4	Trigger module event in slot 4

NOTE This feature is not currently supported

S.10.068	Rx3 Timeout event type		
Minimum	No Event (0)	Maximum	Event3 (4)
Default	No Event (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the event to trigger in the given destination, as specified in **S.10.067** (*Rx3 Timeout Event Dest.*), if a cyclic data timeout occurs on the Rx3 link.

Value	Text	Description
0	No Event	No event triggered
1	Event	Trigger module Event
2	Event1	Trigger module Event 1
3	Event2	Trigger module Event 2
4	Event3	Trigger module Event 3

S.10.069	Rx3 Link status		
Minimum	Disabled (-31)	Maximum	OK sync (2)
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RO, Txt, ND, NC, PT		

This parameter displays the status of the Rx3 link.

Value	Text	Description
-31	Disabled	Easy Mode protocol is disabled, or link number is set to 0
-30	VLAN disabled	VLAN is required in synchronous mode, but it is disabled
-29	Reserved 29	Reserved
-28	Reserved 28	Reserved
-27	Reserved 27	Reserved
-26	Reserved 26	Reserved
-25	Reserved 25	Reserved
-24	Reserved 24	Reserved
-23	Reserved 23	Reserved
-22	Invalid DST IP	The destination IP address is invalid
-21	SYNC unsupported	Sync link does not support mappings to other option parameters
-20	MEC offset	Incorrect MEC offset
-19	Invalid tx rate	Tx rate must be a factor of 1 second
-18	Too many mapping	The number of mapping items exceeds the range supported
-17	Link busy	The link specified is busy

Value	Text	Description
-16	Invalid profile	The profile is invalid
-15	Invalid mapping	The mapped parameter does not exist
-14	Read only param	The mapped parameter is read only
-13	Msg mismatch	Link number and direction do not match
-12	Msg too long	Resulting message is too long
-11	Attrib NA	Attribute not available
-10	Attrib RO	Attribute is read only
-9	Attrib missing	Attribute is missing
-8	Timeout	Timeout
-7	In error	The link specified is in Error state
-6	Link num in use	The link number specified is already in use
-5	Not editable	The link specified is not editable
-4	Invalid link num	An invalid link number was specified
-3	Invalid args	Link Number or another argument specified was invalid
-2	Too many links	Maximum number of links in use has been reached
-1	Out of memory	Failed to allocate memory
0	OK	Configuration of link successful
1	Not running	OK. Not running
2	OK sync	Configuration of synchronous link successful

A reset (**S.10.002**) is required to activate any change.

7.2.6 Menu 11 - RTMOE Sync

This menu allows access to the network synchronisation settings.

NOTE This menu is not available on the SI-PROFINET V2

S.11.001	Preferred Sync Master		
Minimum	0	Maximum	4
Default	1	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter determines whether this module will participate in the grandmaster synchronisation scheme; the greater this parameter value, the less likely this module will be in becoming the grandmaster over others with higher preferred values or none specified. A value of zero will ensure that the module will not become grandmaster (effectively turning this functionality off). If more than one module has the same preferred value only one will be chosen as the grandmaster using the IEEE 1588 algorithm.

This parameter does not guarantee that this module will become grandmaster but a value of zero guarantees that this module will not become a grandmaster.

S.11.002	Master Clock Domain		
Minimum	0	Maximum	3
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter specifies the clock domain for the module to act as a grandmaster clock.

S.11.005	Grandmaster MAC Address		
Minimum	000000000000 (0)	Maximum	FFFFFFFFFFFF (2^{48}-1)
Default	None	Units	None
Type	64 Bit Volatile	Update Rate	Background
Display Format	MAC Address	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the MAC address as a 64-bit hexadecimal value of the synchronisation grandmaster (if there is a grandmaster).

S.11.006	Synchronisation Jitter From Grandmaster		
Minimum	-2147483648	Maximum	2147483647
Default	None	Units	ns
Type	32 Bit Volatile	Update Rate	Every 500 ms
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT		

This parameter displays the synchronisation jitter, in nanoseconds, from the Grandmaster. The value is filtered to be human readable.

S.11.007	Synchronisation Jitter Threshold		
Minimum	500	Maximum	1000000
Default	1000	Units	ns
Type	32 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter sets the application tolerable clock jitter, in nanoseconds, from the grandmaster. If **S.11.006** (*Synchronisation Jitter From Grandmaster*) is within the threshold value set in this parameter for the duration set in **S.11.017** (*In sync window length*), the local clock is synchronised to the grandmaster and **S.11.008** (*Module Synchronised Flag*) will be On (1), allowing synchronised cyclic data links to be processed.

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.11.008	Module Synchronised Flag		
Minimum	Off (0)	Maximum	On (1)
Default	Off (0)	Units	None
Type	1 Bit Volatile	Update Rate	Every 10 ms
Display Format	Standard	Decimal Places	0
Coding	RO		

This parameter displays the module's synchronisation status. On = Synchronised, Off = Not synchronised.

S.11.009	Inhibit Drive Synchronisation		
Minimum	Off (0)	Maximum	On (1)
Default	Off (0)	Units	None
Type	1 Bit User Save	Update Rate	Immediate
Display Format	Standard	Decimal Places	0
Coding	RW		

This parameter controls whether the module synchronises with the network grandmaster. On = Drive synchronisation inhibited, Off = Drive synchronisation enabled.

S.11.010	PTP Date		
Minimum	00-00-00 (0)	Maximum	31-12-99 (311299)
Default	None	Units	None
Type	32 Bit Volatile	Update Rate	Every 500 ms
Display Format	Date	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the current date. If the module has no time source it will display the date based on its power-up date of 1st January 1970.

S.11.011	PTP Time		
Minimum	00:00:00 (0)	Maximum	23:59:59 (235959)
Default	None	Units	None
Type	32 Bit Volatile	Update Rate	Every 500 ms
Display Format	Time	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the current time. If the module has no time source it will display the time based on its power-up time of 00:00:00.

S.11.015	PTP Delay Measurement Select		
Minimum	PTP DELAY (1)	Maximum	OFF (2)
Default	PTP DELAY (1)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter selects the peer-to-peer delay measurement.

PTP Delay Measurement is always Peer-to-Peer.

Peer-to-peer delay mechanism provides not only the PTP event transit time information, but also provides the corrections for the propagation delay of the link connected to the port receiving the PTP event message.

OFF disables the PTP messages so that the module will not respond to a PTP delay request message or initiate a PTP delay request message and will therefore not synchronise with the master.

S.11.016	PTP Sync Rate		
Minimum	-4	Maximum	0
Default	-4	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW		

This parameter controls the rate at which PTP Sync frames are sent.

The message rate is determined by raising 2 to the power of this parameter. E.g. a value of -2 results in four sync messages per second.

S.11.017	In sync window length		
Minimum	3	Maximum	255
Default	20	Units	s
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter defines the duration that the jitter **S.11.006** (*Synchronisation Jitter From Grandmaster*) must be below the jitter threshold **S.11.007** (*Synchronisation Jitter Threshold*) for before **S.11.008** (*Module Synchronised Flag*) is set to On (1).

For a system the duration depends upon the number of IEEE1588 capable masters on the network. To use lower values here the number of devices which are capable of acting as a synchronisation master must be kept as low as possible by setting **S.11.001** (*Preferred Sync Master*) to 0 on all interfaces except those who may be master.

S.11.020	Network Error Count		
Minimum	0	Maximum	4294967295
Default	None	Units	None
Type	32 Bit Volatile	Update Rate	Every 500 ms
Display Format	Standard	Decimal Places	0
Coding	RO, ND, NC, PT, BU		

This parameter displays the number of errors detected on the network.

S.11.022	Interoption Sync Status		
Minimum	MASTER (0)	Maximum	INDEPENDENT (2)
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RO, Txt, ND, NC, PT, BU		

This parameter displays the inter-option synchronisation status.

Value	Text	Description
0	MASTER	The module is master but not producing the sync message
1	PRODUCER	The module is master and producing the sync message
2	INDEPENDENT	The module is not master

S.11.030	Easy Mode Maximum Network Delay		
Minimum	1	Maximum	100
Default	3	Units	ms
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter defines the allowable network delay (in milliseconds) for the Easy Mode synchronous transmit cyclic links to arrive at their destination.

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.11.040	Rx1 Late Synchronisation Frame Action		
Minimum	Trip (1)	Maximum	Use (3)
Default	Trip (1)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the action to be taken when a late synchronised frame is received on the Rx1 link.

Value	Text	Description
1	Trip	Trip drive with slot error and sub-trip code
2	Do not use	The data is ignored
3	Use	The data is used immediately

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.11.041	Rx1 Late Synchronisation Frame Destination		
Minimum	This slot (0)	Maximum	Slot 4 (4)
Default	This slot (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the destination (slot) to trigger the event when a late synchronised frame is received on the Rx1 link.

Value	Text	Description
0	This slot	Trigger module event in this slot
1	Slot 1	Trigger module event in slot 1
2	Slot 2	Trigger module event in slot 2
3	Slot 3	Trigger module event in slot 3
4	Slot 4	Trigger module event in slot 4

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.11.042	Rx1 Late Synchronisation Frame Event		
Minimum	No Event (0)	Maximum	Event3 (4)
Default	No Event (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the event number to trigger in the given destination (slot) when a late synchronised frame is received on the Rx1 link.

Value	Text	Description
0	No Event	No Event
1	Event	Trigger module Event
2	Event1	Trigger module Event1
3	Event2	Trigger module Event2
4	Event3	Trigger module Event3

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.11.050	Rx2 Late Synchronisation Frame Action		
Minimum	Trip (1)	Maximum	Use (3)
Default	Trip (1)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the action to be taken when a late synchronised frame is received on the Rx2 link.

Value	Text	Description
1	Trip	Trip drive with slot error and sub-trip code
2	Do not use	The data is ignored
3	Use	The data is used immediately

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.11.051	Rx2 Late Synchronisation Frame Destination		
Minimum	This slot (0)	Maximum	Slot 4 (4)
Default	This slot (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the destination (slot) to trigger the event when a late synchronised frame is received on the Rx2 link.

Value	Text	Description
0	This slot	Trigger module event in this slot
1	Slot 1	Trigger module event in slot 1
2	Slot 2	Trigger module event in slot 2
3	Slot 3	Trigger module event in slot 3
4	Slot 4	Trigger module event in slot 4

S.11.052	Rx2 Late Synchronisation Frame Event		
Minimum	No Event (0)	Maximum	Event3 (4)
Default	No Event (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the event number to trigger in the given destination (slot) when a late synchronised frame is received on the Rx2 link.

Value	Text	Description
0	No Event	No Event
1	Event	Trigger module Event
2	Event1	Trigger module Event1
3	Event2	Trigger module Event2
4	Event3	Trigger module Event3

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.11.060	Rx3 Late Synchronisation Frame Action		
Minimum	Trip (1)	Maximum	Use (3)
Default	Trip (1)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the action to be taken when a late synchronised frame is received on the Rx3 link.

Value	Text	Description
1	Trip	Trip drive with slot error and sub-trip code
2	Do not use	The data is ignored
3	Use	The data is used immediately

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.11.061	Rx3 Late Synchronisation Frame Destination		
Minimum	This slot (0)	Maximum	Slot 4 (4)
Default	This slot (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the destination (slot) to trigger the event when a late synchronised frame is received on the Rx3 link.

Value	Text	Description
0	This slot	Trigger module event in this slot
1	Slot 1	Trigger module event in slot 1
2	Slot 2	Trigger module event in slot 2
3	Slot 3	Trigger module event in slot 3
4	Slot 4	Trigger module event in slot 4

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

S.11.062	Rx3 Late Synchronisation Frame Event		
Minimum	No Event (0)	Maximum	Event3 (4)
Default	No Event (0)	Units	None
Type	8 Bit User Save	Update Rate	Reset
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the event number to trigger in the given destination (slot) when a late synchronised frame is received on the Rx3 link.

Value	Text	Description
0	No Event	No Event
1	Event	Trigger module Event
2	Event1	Trigger module Event1
3	Event2	Trigger module Event2
4	Event3	Trigger module Event3

Synchronous cyclic links are currently only supported on the onboard Ethernet interface (FFE), they are not supported on the SI-PROFINET option module.

7.2.7 Menu 15 - Modbus TCP/IP Setup

This menu allows access to the Modbus TCP/IP communication settings.

NOTE This menu is not available on the SI-PROFINET V2

S.15.001	Enable		
Minimum	Off (0)	Maximum	On (1)
Default	On (1)	Units	None
Type	1 Bit User Save	Update Rate	Background
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter enables or disables the Modbus TCP/IP functionality.

S.15.002	Reset		
Minimum	Off (0)	Maximum	On (1)
Default	Off (0)	Units	None
Type	1 Bit Volatile	Update Rate	Background read, written to 0 on initialisation
Display Format	Standard	Decimal Places	0
Coding	RW, NC		

This parameter performs a warm reset of the Modbus protocol interface.

When the reset is complete, this parameter will revert to Off (0).

S.15.003	Default		
Minimum	Off (0)	Maximum	On (1)
Default	Off (0)	Units	None
Type	1 Bit Volatile	Update Rate	Module reset, protocol reset or protocol enable
Display Format	Standard	Decimal Places	0
Coding	RW, NC		

This parameter, when set to On, will default the Modbus protocol to factory settings, this includes all of the protocol features, configuration, mappings and stored objects.

When the reset is complete, this parameter will revert to Off (0).

S.15.004	Modbus Configuration Error		
Minimum	No error (0)	Maximum	Num Connections (3)
Default	None	Units	None
Type	8 Bit Volatile	Update Rate	Module reset, protocol reset or protocol enable
Display Format	Standard	Decimal Places	0
Coding	RO, Txt, ND, NC, PT, BU		

This parameter will indicate any Modbus configuration error present.

Value	Text	Description
0	No error	No error
1	port in use	Specified port is currently in use by another protocol
2	Timeout event	Timeout trigger event location is not valid
3	Num Connections	The maximum priority connections is greater than the maximum number of connections

S.15.005	Modbus Listening Port		
Minimum	0	Maximum	65535
Default	502	Units	None
Type	16 Bit User Save	Update Rate	5 ms
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter specifies the virtual port number used for the Modbus protocol.

It is the user's responsibility to ensure a valid port number is used, accounting for company security firewalls, etc.

S.15.006	Maximum Connections		
Minimum	0	Maximum	10
Default	2	Units	None
Type	8 Bit User Save	Update Rate	Module reset, protocol reset or protocol enable
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter permits the user to specify the total number of connections that one or more clients can open with the module at any one time.

S.15.007	Maximum Priority Connections		
Minimum	0	Maximum	5
Default	0	Units	None
Type	8 Bit User Save	Update Rate	Module reset, protocol reset or protocol enable
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter defines how many of the maximum connections specified in **S.15.006** (*Maximum Connections*) can be configured as a priority connection. A connection is accepted into the priority connections pool if the client's IP address matches one of the values stored in parameters **S.15.020** (*Priority Connection 1*) to **S.15.023** (*Priority Connection 4*) inclusive.

The priority connections are permanent and, once made, will only be deleted at the request of the client or due to a communications error.

Any connections not in the priority connections pool are kept in the non-priority connections pool. If a client attempts to establish a priority connection and all available non-priority connections are in use, the non-priority connection that has not been used for the longest will be closed to make way for the new priority connection.

S.15.008	Maximum Connections Per Client		
Minimum	1	Maximum	10
Default	2	Units	None
Type	8 Bit User Save	Update Rate	Module reset, protocol reset or protocol enable
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter defines the maximum number of priority connections that any one client can establish. This check is only performed on the connections in the priority connections pool.

S.15.009	Modbus Timeout		
Minimum	1	Maximum	10000
Default	100	Units	ms
Type	16 Bit User Save	Update Rate	Module reset, protocol reset or protocol enable
Display Format	Standard	Decimal Places	0
Coding	RW, BU		

This parameter defines the time period in which the Modbus server must receive a message before any specified action as defined in **S.15.010** (*Modbus Timeout Action*) is performed. When the timeout occurs, bit 2 in the module's alarm parameter **S.00.009** (*Active Alarm Bits*) will be set and the specified action will be performed.

The timeout is enabled when the server receives its first message.

NOTE It is good system design to allow for some message loss by setting the timeout duration to be greater than the transmit period by a factor of 2 or more.

S.15.010	Modbus Timeout Action		
Minimum	Trip (0)	Maximum	No action (1)
Default	No action (1)	Units	None
Type	8 Bit User Save	Update Rate	Module reset, protocol reset or protocol enable
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the action when no message is received within the time period specified in **S.15.009** (*Modbus Timeout*).

Value	Text	Description
0	Trip	Trip the drive and raise error
1	No action	No action performed

S.15.011	Modbus Timeout Event Destination		
Minimum	This slot (0)	Maximum	Slot 4 (4)
Default	This slot (0)	Units	None
Type	8 Bit User Save	Update Rate	Module reset, protocol reset or protocol enable
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the destination slot to trigger the event defined by **S.15.012** (*Modbus Timeout Event Type*) when a timeout occurs.

NOTE This feature is not currently supported.

Value	Text	Description
0	This slot	Trigger module event in this slot
1	Slot 1	Trigger module event in slot 1
2	Slot 2	Trigger module event in slot 2
3	Slot 3	Trigger module event in slot 3
4	Slot 4	Trigger module event in slot 4

S.15.012	Modbus Timeout Event Type		
Minimum	No Event (0)	Maximum	Trigger Event4 (5)
Default	No Event (0)	Units	None
Type	8 Bit User Save	Update Rate	Module reset, protocol reset or protocol enable
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter defines the event to trigger when a Modbus timeout occurs. Parameter **S.15.011** (*Modbus Timeout Event Destination*) must specify an appropriate consumer (slot option) of the event.

Value	Text	Description
0	No Event	No Event
1	Trigger Event	Trigger module Event
2	Trigger Event1	Trigger module Event1
3	Trigger Event2	Trigger module Event2
4	Trigger Event3	Trigger module Event3
5	Trigger Event4	Trigger module Event4

NOTE This feature is not currently supported.

S.15.013	Modbus Register Addressing Mode		
Minimum	Standard (0)	Maximum	Modified (1)
Default	Standard (0)	Units	None
Type	8 Bit User Save	Update Rate	Module reset, protocol reset or protocol enable
Display Format	Standard	Decimal Places	0
Coding	RW, Txt, BU		

This parameter specifies the parameter addressing mode for Modbus communications.

Value	Text	Register address
0	Standard	(mm x 100) + ppp (mm <= 162 and ppp <= 99)
1	Modified	(mm x 256) + ppp (mm <= 63 and ppp <= 255)

Where 'mm' represents the menu number and 'ppp' represents the parameter number within that menu.

In Standard mode, the possible parameter range is 00.001 to 162.99.

For example, to read drive parameter **03.002** (*Speed Feedback*), the Modbus register address is calculated as follows:

Register address$_{Standard}$ = (mm x 100) + ppp = (3 x 100) + 2 = 302.

Register address$_{Modified}$ = (mm x 256) + ppp = (3 x 256) + 2 = 704.

For transmission, the register address must then be converted to hexadecimal, and the 32-bit access mode set by ORing the address with 0x4000 (or adding 16384_{10}) and finally subtracting 1, this would result in an address of 0x412D in this case.

For more information on register addressing, see the beginning of this section.

S.15.020	Priority Connection 1		
S.15.021	Priority Connection 2		
S.15.022	Priority Connection 3		
S.15.023	Priority Connection 4		
S.15.024	Priority Connection 5		
Minimum	0.0.0.0 (0)	Maximum	255.255.255.255 (4294967295)
Default	0.0.0.0 (0)	Units	None
Type	32 Bit User Save	Update Rate	Module reset, protocol reset or protocol enable
Display Format	IP Address	Decimal Places	0
Coding	RW, BU		

Each of these parameters specify an IP address for a priority connection.

NOTE Parameters 20 through 24 must be filled in the order starting from Priority Connection 1 through Priority Connection 5. If a higher numbered Priority Connection is specified without the lower ones being filled, then it will be ignored.

The Control Techniques implementation of Modbus TCP/IP follows the specification provided by the Modbus organisation. Modbus TCP/IP uses the standard Protocol Data Unit (PDU) but without the CRC bytes and encapsulates it within a Modbus TCP/IP Application Data Unit (ADU) for transmission. This means that the Modbus PDU is the same for both standard (RTU) and Ethernet based transmission.

Modbus TCP/IP is one of the most widely supported industrial Ethernet based protocols offering the functionality and simplicity of the Modbus protocol, with the flexibility of Ethernet. Table 7-3 shows the supported Modbus function codes.

Table 7-3 Supported Modbus function codes

Code	Description
3	Read multiple 16 bit registers.
6	Write single 16 bit register.
16	Write multiple 16 bit registers.
23	Read and write multiple 16 bit registers.

7.2.8 Menu 25 - Profinet Fault Values

This menu configures the fault values written to the mapped output parameters when a fault occurs.

NOTE This menu is not available on the SI-PROFINET V2

S.25.001 to S.25.032	Output fault value 1 to Output fault value 32		
Minimum	-2147483648	Maximum	2147483647
Default	0	Units	None
Type	32 Bit User Save	Update Rate	Module reset, protocol reset or protocol enable
Display Format	Standard	Decimal Places	0
Coding	RW, PT		

These parameters specify the fault values for the relevant mapped parameter under fault conditions.

8 Diagnostics

Overview
This section provides basic diagnostic information intended to resolve the most common problems encountered when setting up an SI-PROFINET option module.

Link LEDs
Each of the Ethernet ports provide a status LED for diagnostics and information purposes.

Figure 8-1 SI-PROFINET connections

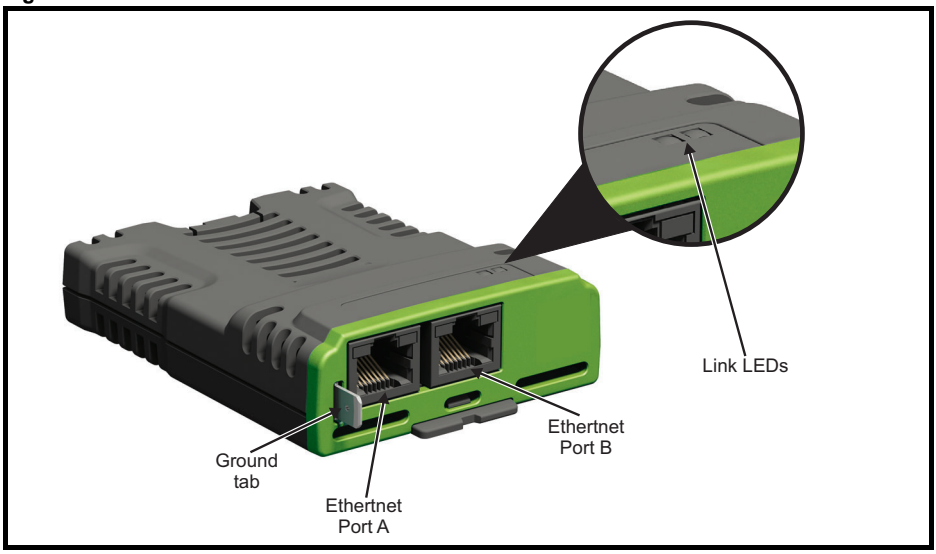


Table 8-1 LED functionality

State	Meaning
OFF	No Ethernet network connection detected
Steady green	Ethernet connection established
Flashing green	Ethernet message frame detected

Drive trip display codes
If the option module detects an error during operation, it will force a trip on the drive. However, the trip string displayed on the drive will only indicate which slot initiated the trip. The exact reason for the trip will be indicated in the drive trip code parameters (Pr **10.020** and Pr **10.070**).
The table overleaf shows the possible trips that will be displayed on the drive when a problem is detected with the option module or when the option module initiates a trip.

Trip	Description
SlotX HF	The drive has detected that an option module is present but is unable to communicate with it due to a hardware fault.
SlotX Error	User trip generated by the option module
SlotX Not Fitted	This trip will occur if a drive slot was previously configured with an option module but on power up, no option module was detected.
SlotX Different	This trip will occur if a drive slot was previously configured with an option module but on power up, a different option module was detected. Replacing the option module with another one of the same ID number will not initiate this trip. The trip will also occur if an option module is installed to a previously unused slot.

Module error codes

If the option module detects an internal error during operation, it will force a trip on the drive and provide a sub-trip string for a clearer definition of the trip. The table below shows the possible module error codes.

Table 8-2 Module error codes

Value	Text	Description
200	Software Fault	Software Fault
201	BG Overrun	Background task overrun
202	Firmware Invalid	Invalid firmware for hardware version
203	Drive Unknown	Unknown drive type
204	Drive Unsupported	Unsupported drive type
205	Mode Unknown	Unknown drive mode
206	Mode Unsupported	Unsupported drive mode
207	FLASH Error	Corrupted Non-volatile FLASH
208	Database Init	Database initialisation error
209	File System Init	File system initialisation error
210	Mem Allocation	Memory allocation error
211	Filesystem Error	File system error
212	Config Save	Configuration file save error
213	Over Temperature	Overheated
214	Drive Timeout	the drive has not responded within watchdog period
215	eCMP Comms Error	eCMP communication failure
216	TO eCMP Slot1	eCMP communication to slot 1 timeout
217	TO eCMP Slot2	eCMP communication to slot 2 timeout
218	TO eCMP Slot3	eCMP communication to slot 3 timeout
219	TO eCMP Slot4[1]	eCMP communication to slot 4 timeout[1]
220	I/O Overload[1]	Digital output current demand too high[1]
221	Factory Settings	Missing factory settings
222	Functional Test	Functional test failure
223	Config Restore	Configuration file restore error
224	Self Test Error	Power on self test error

225	Runtime Config	Runtime configuration error
226	Processor except	Processor exception error
227	Task starvation	System task starvation
228	EEPRPOM Error[1]	EEPROM Initialisation error[1]

NOTE [1] - Reserved on SI-PROFINET V2

PROFINET error codes

If the option module detects a PROFINET error during operation, it will force a trip on the drive and provide a sub-trip string for a clearer definition of the trip.

The error codes used in the SI-PROFINET V2 are different to the SI-PROFINET HW V03 or later modules.

The following table shows the SI-PROFINET V2 error codes

Table 8-3 PROFINET error codes (SI-PROFINET V2)

Value	Text	Description
100	Link Loss	Network link has been lost
101	INIT Switch	Ethernet switch initialisation error
102	INIT TCP/IP	TCP/IP initialisation error
103	INIT Profinet	PROFINET initialisation error
104	Profinet Start	PROFINET start error
105	Profinet Plug	PROFINET plug error
106	Invalid IM	Invalid IM data, EEPROM corrupted
107	CPM watchdog	Cyclic frame timeout
108	Ethernet Failure	Ethernet controller initialisation error

Table 8-4 PROFINET error codes (SI-PROFINET HW V03 or later)

Value	Text	Description
100	Link Loss	Network link has been lost
101	E/IP Timeout	An Ethernet/IP RPI timeout has occurred
102	E/IP Read Param	Invalid read consistency parameter, is parameter read only?
103	E/IP Write Param	Invalid write consistency parameter, is parameter read only?
104	E/IP Fault	An unexpected Ethernet/IP error has occurred
105	Modbus Timeout	The Modbus connection has timed out
106	Cyclic Timeout	Cyclic Rx link timeout
107	Cyclic RX Late	Cyclic Rx data was received late
108	INIT Switch	Ethernet switch initialisation error
109	INIT PTP	IEEE1588 (Precision Time Protocol) initialisation error
110	INIT Cyclic	Cyclic data initialisation error
111	INIT Modbus	Modbus TCP initialisation error
112	INIT SMTP	Email (SMTP) initialisation error
113	INIT EtherNet/IP	EtherNet/IP initialisation error
114	INIT TCP/IP	TCP/IP initialisation error
115	Ethernet Failure	Ethernet controller initialisation error
116	E/IP PLC IDLE	Ethernet/IP PLD Idle

117	Sync Task ORun	Synchronous task overrun
118	INIT Param Chann	Parameter channel Initialisation error
119	Link Overload	Too many links to be handled in the same cycle
120	Mcast Over Limit	Too many multicast addresses being used
121	Init Profinet	Profinet initialisation error
122	Profinet Start	Profinet start error
123	Profinet Plug	Profinet failed to load the slots
124	IM Invalid	Invalid IM data. Default device
125	Profinet Timeout	Profinet cyclic timeout error
126	Capability Error	The selected capability is not available
127	Reserved127	Reserved
128	Reserved128	Reserved
129	Reserved 129	Reserved
130	Drive Sync loss	Synchronisation failure

PROFINET alarm and warnings

If the option module detects an alarm during operation, it will indicate the alarm through the alarm mechanism on the drive.

The following table lists all possible PROFINET alarm conditions:

Bit	Alarm	Description
0	User Program	The user program has generated an alarm
1	eCMP	An eCMP alarm has been generated
2	Modbus	A Modbus alarm has been generated
3	Ethernet/IP	An Ethernet/IP alarm has been generated
4	Reserved[1]	Reserved[2]
5	File System	Full system full alarm has been generated
6	Too Hot	Temperature too high alarm has been generated

[1] - DCP Signaling on SI-PROFINET V2

[2] - A DCP signaling alarm has been generated on SI-PROFINET V2

PROFINET configuration error codes

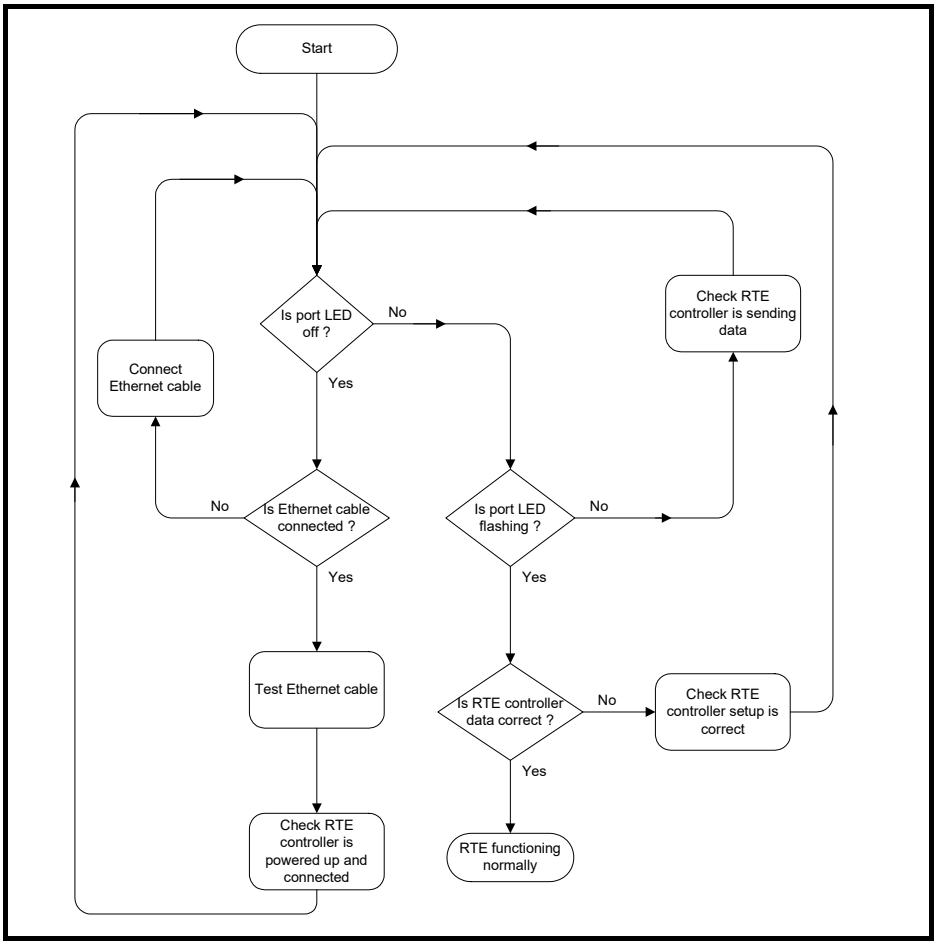
Pr **S.05.004** provides further information if an error in the PLC configuration has been detected.

S.05.004	Configuration Error		
Minimum	No Error (0)	Maximum	Param Config (4)
Default	No Error (0)	Units	None
Type	8 Bit Volatile	Update Rate	On connect request from controller
Display Format	Standard	Decimal Places	0
Coding	RO, Txt, NC, PT, BU		

This parameter displays the current status of the PROFINET communications and will also display any errors that are detected on the module.

Value	Text	Description
0	No Error	No error detected.
1	Input Mapping	More than 32 parameters (slots) are configured as inputs.
2	Output Mapping	More than 32 parameters (slots) are configured as outputs.
3	Data Size	Data size given in GSDML file does not match actual parameter size.
4	Param Config	Parameter given in connect request is either non-existent or the validation has failed.

Diagnostics flowchart



9 Glossary

Address: This is the unique network identification given to a networked device to allow communication on a network. When a device sends or receives data the address is used to determine the source and the destination of the message.

ASCII (American Standard Code for Information Interchange): A standard character encoding mechanism established by ANSI to provide compatibility between data systems and services.

Asynchronous Transmission: Each character transmitted is individually synchronized using start and stop bits.

ANSI (American National Standards Institute): A voluntary organization that represents the USA in the ISO, and is responsible for defining ASCII. Members include manufacturers, common carriers, and other standards organizations such as the IEEE.

Auto-crossover detection: A method used to automatically detect if a crossover or non-crossover network cable is connected.

Bandwidth: The information-carrying capability of a communications channel or line, expressed in Hertz (Hz), between the highest and lowest frequencies of a band.

Baseband Transmission: Direct transmission method whereby the transmission medium carries only one signal at a time usually for distances under ten miles.

BCC (Block Check Character): A control character added to a block in character oriented protocols used for determining if the block was received in error -- such as CRC and LRC.

BCD (Binary Coded Decimal): A digital system that uses six-bit binary codes to represent decimal digits, providing 64 possible combinations.

Binary: A digital system with two states, 1 and 0.

Bit: A contraction of the phrase binary digit, representing the smallest unit of information and the basic unit in data communications, a bit may have the value of 1 or 0.

Bit Rate: The speed at which binary digits (bits) would be transmitted over a communications path and usually expressed in "bits per second" (bps). Bit rate should not be confused with Baud which defines the rate of signal state changes.

Byte: A collection of 8 binary digits that collectively store a value. This may be signed or unsigned.

CCITT (The Consultative Committee International Telegraph and Telephone): The international advisory committee, established under the United Nations that sets international recommendations which often are accepted as standards.

Channel: A data link which connects two devices allowing them to communicate with each other.

Character: Any letter, number, punctuation mark or other sign contained in a message, including characters for control functions and for special symbols.

Checksum: The sum of a group of data provided with the group, for checking purposes.

Control Character: A non-printing character used to initiate, modify, or stop a control function. LF (line feed) is an example of a control character.

Control word: A collection of binary digits that are used to control the drive. Features typically include directional controls, run controls and other similar functions.

CRC (Cyclic Redundancy Check): An error checking control method in which the block check character (BCC) is the remainder after dividing all the serialized bits in a transmitted block by a prespecified binary number.

Crossover lead: A network cable where the terminal connections at one end of the cable are connected straight through to the other end with the exception of the data pair which are transposed.
(Normally used to connect two network devices together as a separate network).

CSMA (Carrier Sense Multiple Access): A contention-based LAN access method where Ethernet devices listen prior to transmitting, send a packet of data, then free the line for other devices to transmit. While stations do not transmit until the line is clear, transmission collisions still occur.

CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance): A CSMA protocol using a slotted TDM to minimize a collision reoccurrence. For optimum results, CSMA/CA will work best if the time slot is short as compared to the length of the packet.

CSMA/CD (Carrier Sense Multiple Access with Collision Detection): A LAN access method where all networked devices listen for transmissions before attempting to transmit. If two or more devices begin transmitting at the same time, each stops for a random period of time before attempting to re-transmit.

Cyclic (implicit or polled) data: Data that is transmitted at regular intervals over the network; sometimes referred to as "Implicit data" or "Polled data".

Data rate: Determines the communication speed of the network, the higher the value the more data can be sent across the network in the same time period.

Decentralised: A processing method where intelligence is located at several remote locations of the same processing system.

Deterministic: A system is deterministic when the output can be predicted with certainty. For communication systems, a deterministic system is one where the messages can be reliably delivered at precise time intervals.

Device: A piece of equipment connected to a network, this may be any type of equipment including repeaters, hubs, network controller or drives.

DHCP (Dynamic Host Configuration Protocol): This is a protocol used to allocate dynamic IP addresses to network devices from a central server.

DNS (Domain Name Server): This is a server that is used to convert a URL such as "www.controltechniques.com" to an IP address such as 129.254.254.106.
Double word: A 32-bit word, this may be signed or unsigned.

Duplex: A communication facility providing transmission in either one direction only (half-duplex) or two directions simultaneously (full-duplex).

Grounding: Describes the electrical safety or shielding connections for the module.

GSDML (General Station Description Markup Language) file: An XML based file that defines the properties of a network device and contains information describing the features available on the device.

Ethernet address: See MAC address.

Explicit data: See Non-cyclic data.

Firewall: A computer or piece of software that restricts connections between different ports. This can be useful when restricting data flow between two network segments.

Frame: The entire sequence of bits and bytes in a transmitted block.

FTP (File Transfer Protocol): A protocol using the TCP/IP protocols commonly used for transferring files over the Internet.

Full-duplex: See Duplex

Gateway: A device that allows devices on different subnets or networks to communicate with each other.

Half-duplex: See Duplex

Hub: A method of connecting computers together on Ethernet. An un-switched hub will repeat any data received on one port to all ports.

HTTP (Hypertext transfer protocol): This is a document specification protocol commonly used in web pages.

Implicit data: See Cyclic data.

IEEE (Institute of Electrical and Electronic Engineers): An international institute that issues its own standards and is a member of ANSI and ISO.

IP: Internet Protocol, this is the protocol used to transmit bytes across an IP network.

IP address: An address that identifies a node uniquely on a subnet or network.

IP subnet: A part of an IP network that consists of a range of addresses that may be accessed by all devices on the same network directly.

ISO (International Standards Organization): The International, voluntary standards organization, closely aligned with the CCITT perhaps best noted for its OSI model and OSI communications protocol. Membership includes other international organizations issuing standards, with ANSI being the American representative.

Jitter: A tendency toward a lack of synchronisation or other impairment caused by the mechanical or electrical changes in communications equipment.

LAN (Local Area Network): The data communications facilities used to provide communications within a limited geographical area, normally up to 6 miles, using the higher data rates normally from 1 Mbps to 1 Gbps. LANs may have bridges or gateways to other networks but are usually confined to a building or cluster or buildings.

Latency: The waiting time, or delay between a device's request message and the response message.

LED: Light Emitting Diode.

Long word: A 32-bit data word that may be signed or unsigned.

LSB: Least Significant Bit/Byte.

MAC address: This is a unique address that is assigned to SI-PROFINET V2 at the time of manufacture; no other device will have this address. The address is used to make connections to the module before the IP address is assigned.

MSB: Most Significant Bit/Byte.

Network controller: The network device which controls the cyclic communication on a network. (*See PLC*).

Network topology: The arrangement of devices and the links connecting the devices on a network.

Node: A device on the network. This may be either a device such as a drive or part of the network such as a repeater.

Non-crossover lead: See Patch lead.

Non-cyclic (explicit) data: Data that is requested or sent as required and not on a regular basis. Sometimes referred to as "Explicit data".

Non-deterministic: A non-deterministic system is one where the output can not be predicted with certainty. For communication systems, a non-deterministic system is one where the messages can not be delivered at precise time intervals.

Octet: A collection of 8 binary digits which form a byte.

OSI Model (Open Systems Interconnection Model): The 7-layer reference model recommended by the ISO to provide a logical structure for network operations protocol.

Parity Bit: An error-checking bit whose binary value (0 or 1) depends on whether the sum of bits with the value 1 in the unit of data being checked is odd or even. If the total number of bits with value 1, including the parity bit (or bits), is even, the unit of data is said to have even parity; if it is odd, it has odd parity.

Patch lead: A network cable where the terminal connections at one end of the cable are connected straight through to the other end on a pin to pin basis. Normally used to connect a network device to a network switch.

PC: Personal Computer.

PDU (Protocol Data Unit): This is the main Modbus message telegram, to which is added the MBAP header to form the complete Modbus telegram.

PLC (Programmable Logic Controller): A digital computer used for automation of electromechanical processes. Sometimes used as a communication specific network controller.

Poll rate: The rate at which cyclic data is sent and received on the network.

Polled data: See Cyclic data.

Protocol: The method of "line discipline" used to control the orderly exchange of information between the stations on a data link or on a data communications network or system.

Router: A device that is used to connect different networks or subnets, in a similar way to a firewall, however a router generally allows significantly less control of the data.

RT (Real Time): A communication system which can accurately deliver messages to within pre-determined time tolerances.

RTE (Real Time Ethernet): An Ethernet based communication system which can accurately deliver messages to within pre-determined time tolerances.

Scan rate: See Poll rate.

Shielding: A connection to provide additional immunity to noise on a network cable.

SMTP (Simple Mail Transfer Protocol): A protocol used for sending email.

SNTP (Simple Network Time Protocol): A protocol used for synchronising time over a network.

Status word: A value that denotes the status of the drive. Each bit within the word will have a specific meaning.

Subnet: A part of a network that has IP addresses in the same range. Devices on the same subnet may communicate directly with other devices on the same subnet without the use of a gateway.

Subnet mask: Defines which part of the IP address constitutes the subnet address and which part constitutes the host device address.

Switch: A device that allows Ethernet devices to be interconnected.

Synchronous Transmission: A constant time interval between characters is used to ensure that all data communications equipment is in step with each other. The opposite of asynchronous transmission, synchronous transmission, does not use start-stop bits surrounding each byte, but relies on the transmitter and receiver to be functioning at a fixed rate of transmission, thereby being a more efficient method of data communication.

TCP (Transmission Control Protocol): This protocol is responsible for ensuring that the data on the network reaches its destination.

TDM (Time Division Multiplexer): A multiplexer designed to apportion its composite link time between its available channels, interleaving data at a higher speed on the main or multiplexed channel. The data signals are then separated to restore the data to the individual input channels.

URL (Uniform Resource Locator): A method used to give a web site a friendly name such as www.controltechniques.com as an alternative to an IP address.

VPN (Virtual Private Network): A method of using a non-secure or public network that allows devices to be connected together as if they were a part of a private network.

Word: A collection of 16 binary digits.

XML (Extensible Markup Language): A document definition that is intended to store and transfer data between applications.

Index

S

W

Nidec
All for dreams

Connect with us

www.controltechniques.com

www.kbelectronics.com

Nidec Control Techniques Limited. Registered Office: The Gro, Newtown, Powys SY16 3BE

Registered in England and Wales. Company Reg. No. 01236886

CONTROL TECHNIQUES

KB

0478-0363-03