Schlumberger

UniConn Reference Guide

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Revision History

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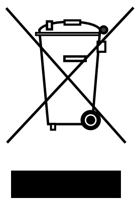
A	07-May-2004	Edited and converted to EDMS in preparation for product commercialization.	**Author:** K. Engel
B	26-Jan-2005	Edited UniConn Operating Specifications table according to the IEC standards.	**Author:** O.Pearce
C	07-Apr-2005	Added all the pertinent data related to variable speed UniConn and added chapter for expansion cards.	**Author:** O.Pearce
D	01-Mar-2006	Added a WellView chapter.	**Author:** O.Pearce
E	30-Apr-2008	This manual is converted to a reference guide format. Complete review of all sections. Incorporated InTouch data from rev D release. Theory of Operation section added.	**Author:** Max Kante
F	21-Jul-2009	New release of software (StarView).	**Author:** OPearce
G	23-Oct-2013	Updated the VSD MVD theory and configuration sections. Corrected the controller AC power supply specification. Minor format changes and corrections. Added DHT TRIP and Tool Fault Alarm section to the Configuration chapter.	**Author:** A.El-kadri, D Perry

Regulatory Compliance

Waste management



IMPORTANT INFORMATION FOR CORRECT DISPOSAL OF THE EQUIPMENT

This symbol means that the equipment cannot be discarded in a rubbish-bin. At its end of life, the equipment and/or its components must be treated, following Schlumberger Environmental procedures, in compliance with Schlumberger QHSE Policy and applicable laws and regulations on waste management.

Foreword

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Product description

1 Product description

The Schlumberger UniConn is a motor controller that provides protection, monitoring and control, and data acquisition for fixed- and variable-speed three-phase induction motor systems. This unit and its optional expansion cards monitors:

- motor currents and voltages
- Variable Speed Drive (VSD) parameters
- control supply voltage
- external switch contacts
- process analog signals
- data from downhole tool systems
- backspin monitor inputs
- remote SCADA commands

The UniConn provides motor and drive shutdown under adverse conditions and allows safe, automatic system restarts. The UniConn expansion card system allows interfacing to downhole tools, VSDs, and communication systems.

The UniConn is particularly suited for controlling oilfield production pump motors for electric submersible pump (ESP) systems using either fixed speed or variable speed drive (VSD) systems. The self-contained unit incorporates a display and keypad for local control and operation. The compact size makes it suitable for mounting in most VSD and switchboard enclosures. See Figure 1-1.

The integrated keypad and display incorporates full Hand-Off-Auto and Start control for the motor so externally wired switches are not required. The keypad has been designed to use symbols as the UniConn can support several languages. Presently, the UniConn supports English, Russian and Spanish.

The control wiring for the UniConn is connected to removable terminal assemblies on the unit. The terminal assemblies snap in and out for easy connection or removal. The assemblies are organized logically according to function. External annunciation lamps can be connected to the outputs on the UniConn for improved visibility to on-site personnel.

The user inputs and outputs, shown in Figure 1-2 and Figure 1-1, can be configured for various alarm functions, input scales, output functions, etc. See Table 1-1 for a function summary.

Table 1-1: User I/O interface summary

User I/O	Description
Contactor Relay	This is a digital output reserved for contactor operation. This relay has additional circuits to prevent contactor dropout during brownout conditions. The relays is NO / NC / COM dry contact type.
Digital Outputs	These digital outputs can be configured for various output options.
Digital Inputs	The digital inputs accept logic type switched signals and can be used to provide feedback to the UniConn from external switch gear.
Analog Outputs	The analog outputs provide a current output for control of external dial displays, valves, etc.
Analog Inputs	The analog inputs can operate with voltage inputs or current inputs individually. The inputs can be scaled to match a wide range of data types.

The input connections normally used for three phase motor control applications are shown in Figure 1-3 are summarized in Table 1-2.

Table 1-2: Power and 3 phase interface summary

Receptacle	Description
Power	This is the power supply interface for AC and DC.
PT	This is the external potential transformer (PT) interface designed to monitor 3 phase voltages for fixed speed or VSD systems.
CT	This current transformer (CT) input is designed to work with a burden module and proprietary CT module for monitoring 3 phase current on fixed speed or VSD systems.
Back Spin	This input is designed for the Back Spin Shunt for the purpose of monitoring spin conditions of electric submersible pumps (ESP) when the system power is off. Detects a spinning motor prior to engaging power to the ESP.

Fuse and certificate illustrations are shown in Figure 1-4.

The product options and accessories for the UniConn are shown in Figure 1-5.

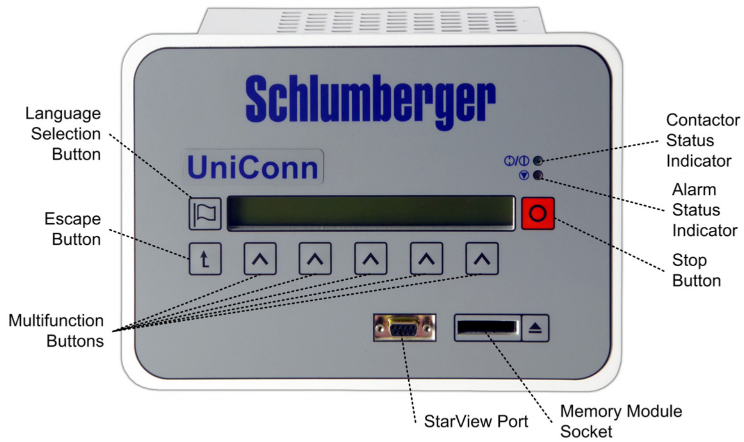


Figure 1-1: UniConn front view

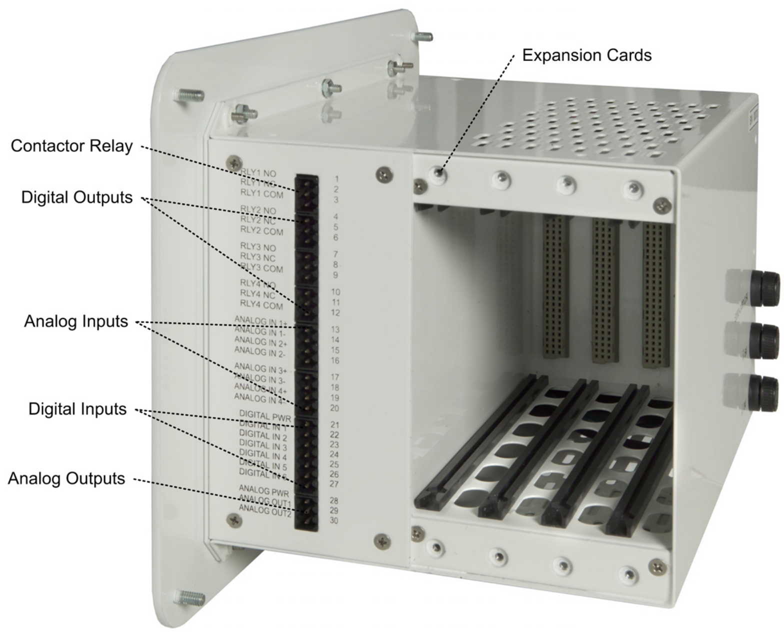


Figure 1-2: UniConn side view

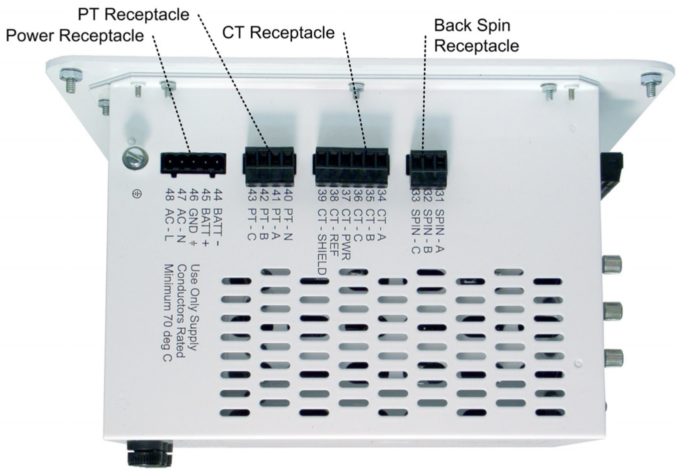


Figure 1-3: UniConn bottom view

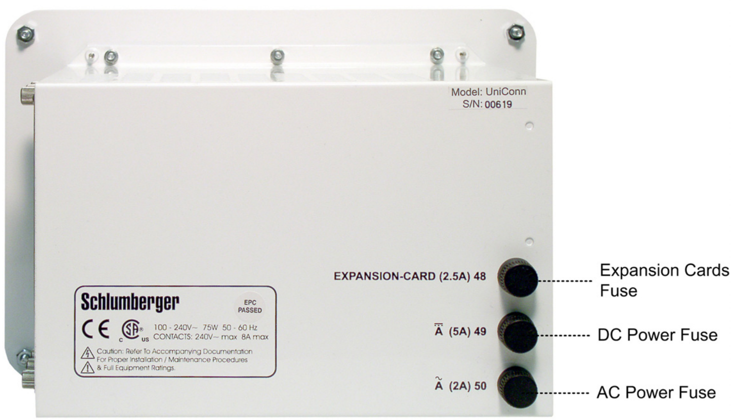


Figure 1-4: UniConn back view

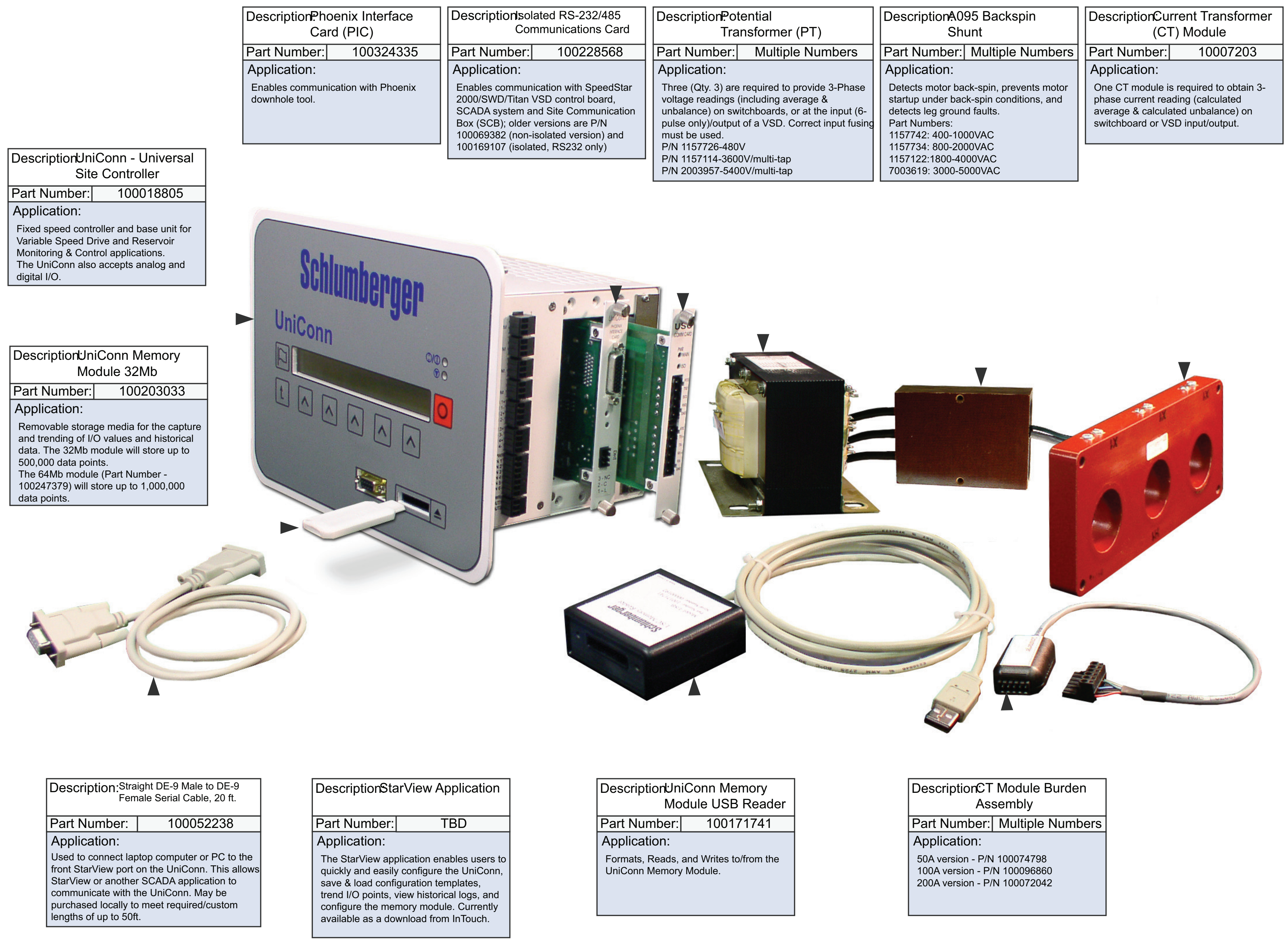


Figure 1-5: UniConn controller and available accessories

1.1 Using This Manual

This manual is a complete reference guide to the UniConn platform and peripherals. This reference guide is not designed for field deployment but to function as a complete product summary. For field deployment, application manuals are available which only include portions of the reference guide relevant to the UniConn configuration.

Presently the UniConn can be configured as the following:

- UniConn Fixed Speed
- UniConn Variable Speed
- UniConn WellWatcher
- UniConn Phoenix

Presently the available UniConn peripherals are:

- FSK Interface Card (FIC)
- Phoenix Interface Card (PIC)
- Communication Card
- Modbus TCP Card
- MVD Communication Card
- Extreme DHT Card

The Table of Contents presents the protection and control features provided by the UniConn with chapter references for detailed information.

To obtain a fundamental understanding of the system features and their use, it is recommended that all users read chapter 4: Theory of Operation. This chapter explains in detail the characteristics of each UniConn feature and their peripherals.

To obtain a understanding of the UniConn menu system and their use, it is recommended that all users read chapter 4.1: Operator interface. This chapter describes the UniConn user interface, how to navigate the UniConn menus, and how to set and change parameters. It also explains the alarm operation and the controller modes of operation. Appendix B: Screen Menu Map provides a detailed map of the UniConn menu structure and all screens.

Chapters 5: Installation and 6: Configuration provide advanced information on how to connect and operate the UniConn for fixed-speed and variable-speed motor controller. Combined with chapter 7: Commissioning, these sections provide important application information to assist in the startup stage of an ESP installation. Chapter 9: Troubleshooting provides assistance, if problems are encountered. The remaining chapters provide additional information related to the use of the UniConn.

Additional information can be found in

- Chapter 3: Specifications
- Chapter 8: Maintenance
- Chapter Appendix E: Interconnection Diagram
- Chapter Appendix G: Termination Table
- Chapter Appendix H: Symbol Table.

QHSE

2 QHSE

2.1 Overview

There are four indicators of the special type of care needed with equipment that are used in the text of this manual:

Danger

Potential Severity:	Catastrophic
Potential Loss:	Personnel
Hazard Category:	Electrical

Indicates major or catastrophic severity with high potential loss.

Warning

Potential Severity:	Serious
Potential Loss:	Personnel
Hazard Category:	Electrical

Indicates danger to personnel and could possibly result in loss of life or serious injury.

Caution

Potential Severity:	Light
Potential Loss:	Personnel
Hazard Category:	Electrical

Indicates danger to equipment and could result in relatively serious or minor injury, or faulty operation.

Note

Indicates special care needs to be taken.

It is the operator's responsibility to ensure that all personnel working with or near the equipment are aware of the risk described. Failure to heed precautions provided in this manual can result in serious or possibly even fatal injury to personnel, and/or damage to the products or to the related equipment and systems.

Danger

Using this product in a manner not specified by the manufacturer could result in protection impairment.

Note

Only qualified personnel are eligible to install equipment described in this manual, paying special attention to warning notes located throughout the manual.

Danger

Potential Severity:	Major
Potential Loss:	Environmental
Hazard Category:	Electrical, Machinery equipment hand tools, Toxic corrosive hazardous substances

All field users should use their local electrical standards, technical guidelines, and laws unless Schlumberger's standards are more stringent in which case they should be used.

Note

Most of Schlumberger guidelines are based on the NFPA 70 (NEC) book.

Note

Qualified personnel are people entrusted by their employer with installation, assembly, commissioning, and operation of the equipment within the intent and constraints of the operating instructions in this manual and the warning information on the equipment itself. Qualified personnel must have the following minimum training and qualifications:

- Special training in electrical equipment, in accordance with the standards of safety engineering
- Hydrostatic pressure testing mandatory training as specified by Artificial Lift Pressure Operations Manual (InTouch ID 4392112)
- CPR training
- First aid training
- Personal protective equipment (PPE) training
- Fire safety training.

Note

For reasons of clarity, these operating instructions do not contain all details of all types of equipment and also cannot take into account every conceivable installation, operation, or maintenance circumstance. Consult InTouchSupport.com if further information is required or if particular problems occur that are not adequately detailed in the operating instructions. The contents of this instruction manual shall not become part of, or modify any prior or existing agreement, commitment, or legal relationship.

2.2 Danger to Personnel

Danger

Potential Severity:	Catastrophic
Potential Loss:	Assets, Environmental, Personnel
Hazard Category:	Electrical, Explosives

This product is not suitable for operation in hazardous locations or areas with an explosive atmosphere.

Warning

Potential Severity:	Serious
Potential Loss:	Personnel
Hazard Category:	Electrical

Lethal voltages are present when equipment is running. Do not open panels or remove protective coverings until equipment is powered down.

The following precautions should be followed by qualified personnel when working on or around a unit.

- Never work alone on equipment that has power applied to it. Be sure someone is nearby to give assistance in case of an accident.
- Ensure lock-out, tag-out (LOTO) procedures are used whenever possible.
- Beware of defective equipment. If equipment components or connections look loose, corroded, or damaged in any way, do not operate. Contact InTouchSupport.com immediately for further action.
- Ensure that power to the system is OFF when connecting or disconnecting equipment.
- The power terminals and control terminals may carry a voltage even when the connected equipment is not active.
- Non-observance of warning notices can result in death, severe personal injury, or considerable property damage.

2.3 Danger to Equipment

Caution

Potential Severity:	Light
Potential Loss:	Assets
Hazard Category:	Electrical, Machinery equipment hand tools

Failure to observe the following precautions can result in damage or destruction of equipment.

Observe the following precautions when working on or around a unit:

- Do not attempt to access voltage on the interface boards. The probes may damage the board and cause a hazard or equipment failure. Terminals are available external to the unit enclosure for measurement purposes.
- Ensure that the operating facility is dry and dust-free. Incoming air flow must not contain any gases, vapors, or dusts that are electrically conductive or detrimental to functioning. Air containing dust must be filtered.

- Ensure the operating environment is moisture free or non-condensing for high humidity applications. Excessive humidity or condensation may cause hazardous operation of the unit.
- Damage or destruction can result if the unit is incorrectly connected.
- The unit should be stored in the original transportation package to prevent damage during handling.

2.4 Danger to the Environment

Caution

Potential Severity:	Light
Potential Loss:	Assets, Environmental
Hazard Category:	Machinery equipment hand tools

Failure to observe the following precautions may result in damage to the environment.

The following information pertains to the safe disposal of the equipment manufactured by Schlumberger's Edmonton Technology Center (ETC) in accordance with Canadian environmental standards. Operators are required to follow safe disposal methods.

2.4.1 Circuit Boards

Circuit boards require additional disposal care. Canadian Environmental Law states that the circuit boards require disposal, and in some cases, recycling by an approved waste vendor.

Note

Check with local environmental law and Schlumberger HSE advisor for specific procedures for disposal of above mentioned component.

The circuit boards used in this equipment may contain lead solder and solder paste. The boards should be disposed of according to local regulations.

2.5 QHSE UniConn Specific

This section covers all safety hazards and precautions not mentioned above, which is specific to the UniConn.

2.5.1 Danger to Personnel

Warning

Potential Severity: Serious
Potential Loss: Personnel
Hazard Category: Electrical

Lethal voltages are present when equipment is running. Do not adjust wire connections until equipment is powered down.

The following precautions should be followed by qualified personnel when working on or around a UniConn:

- Do not touch the power connections on power terminals 46, 47, 48 while the UniConn is in operation. High voltages, 110VAC to 240VAC, exist on these terminals.
- Do not touch the power connections on power terminals 44, 45 while the UniConn is in operation. Low voltage, 24VDC, but high power exists on these terminals. These voltages may exist even when the system is powered down, due to capacitor charge.
- Do not touch the connections on the relay terminals 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 while the UniConn is in operation. These relay connections may be switching high voltages. These voltages may exist even when the UniConn is powered down as these switched voltages may not be part of the UniConn power. Check all external connected device power supplies.
- Do not touch the connections on Back Spin terminals while the UniConn is in operation. High voltages exist on this terminal. These voltages may exist even when the UniConn is powered down as the power system may be energised. Always check terminals with voltage sensing equipment before working on a system. Power down the system before working on these terminals.

2.5.2 Danger to Equipment

Caution

Potential Severity: Light
Potential Loss: Assets
Hazard Category: Electrical

Failure to observe the following precautions can result in damage or destruction of equipment.

Observe the following precautions when working on or around a UniConn:

- Do not connect conventional 5 Amp CT modules onto the UniConn terminals 34, 35, 36, 37, 38, 39 as device failure will occur. Use the correct burden modules and CT module as detailed in the Spare Parts list.

Note
The burden module is only applicable when the UniConn is used as a fixed speed or variable speed motor controller.

- Ensure that the operating facility is dry and dust-free. Incoming air flow must not contain any gases, vapors, or dusts that are electrically conductive or detrimental to functioning. Air containing dust must be filtered.
- The unit should be stored in its transportation packaging to prevent damage during handling.

2.5.3 Danger to the Environment

Caution

Potential Severity:	Light
Potential Loss:	Environmental
Hazard Category:	Electrical, Fire flammable

The UniConn uses a lithium battery and capacitors which may be damaging to the environment if not properly handled.

Observe the following when working with the UniConn and replacement parts:

- The UniConn uses a lithium battery. Ensure battery replacement is of the identical type as issued by Schlumberger or this may void the warranty.
- Do not puncture or incinerate the battery.
- The battery is safe for disposal. Follow local safety practices for the proper disposal of Lithium batteries or return to Schlumberger for disposal.
- Do not incinerate dispose of the UniConn as the electrical components inside may off gas. Follow local safety practices for the proper disposal of electronic equipment or return to Schlumberger for disposal.

2.6 Phoenix Interface Card HSE Considerations

This section covers all safety hazards and precautions not mentioned above, which is specific to the Phoenix Interface Card (PIC).

2.6.1 Danger to Personnel

Warning

Potential Severity:	Serious
Potential Loss:	Personnel
Hazard Category:	Electrical

Lethal voltages are present when equipment is running. Do not open panels or remove protective coverings until equipment is powered down. Never work on the choke and fuse assembly while the ESP is powered. Power to the ESP should be isolated prior to the commencement of any work.

The following precautions should be followed by qualified personnel when working on or around a PIC:

- Do not touch DHT output terminal while the PIC is in operation. High voltages exist on this terminal. These voltages may exist even when the system is powered down, due to capacitor charge. Consult drawings and schematics for further details. Always check terminals with voltage sensing equipment before working on a system.

2.6.2 Danger to Equipment

Caution

Potential Severity:	Light
Potential Loss:	Automotive
Hazard Category:	Electrical

Failure to observe the following precautions can result in damage or destruction of equipment.

Observe the following precautions when working on or around a PIC:

- Do not attempt to access voltages on the circuit boards. The probes may damage the board and cause a hazard or equipment failure. Terminals are available external to the unit enclosure for measurement purposes.
- Ensure that the operating facility is dry and dust-free. Incoming air flow must not contain any gases, vapors, or dusts that are electrically conductive or detrimental to functioning. Air containing dust must be filtered.
- Damage or destruction can result if the unit is incorrectly connected.
- The unit should be stored in its transportation packaging to prevent damage during handling.

- Disconnect the choke assembly from the transformer and high voltage system prior to any insulation (Megger) test. Always test with the negative lead to cable phase and the positive lead to earth ground.
- Never spark discharge the cable.

2.7 QHSE UniConn Variable Speed Drive Specific

This section covers all safety hazards and precautions not mentioned above which is specific to the UniConn Variable Speed Drive.

2.7.1 Danger to Personnel

Warning	Potential Severity:	Serious
	Potential Loss:	Personnel
	Hazard Category:	Electrical

Lethal voltage is present when the VSD is running. Do not adjust wire connections until equipment is powered down.

2.7.2 Danger to Equipment

Caution	Potential Severity:	Light
	Potential Loss:	Assets
	Hazard Category:	Electrical

Failure to observe the following precautions can result in damage or destruction of equipment.

Observe the following precaution when working on or around a UniConn VSD:

- Do not disconnect the VSD communication cable during operation. The VSD will shut down.

Specifications

3 Specifications

3.1 UniConn

Table 3-1: UniConn Specifications

Dimensional	*Dimensions Box*	5.5 in (139.7 mm) H x 8.3 in (210.8 mm) W x 6 in (152.4 mm) D
	Dimensions Faceplate	7.5 in (190.5 mm) H x 10.5 in (266.7 mm) W
	Mounting	Indoor use only. External applications must be mounted in NEMA 3R or NEMA 4X rated enclosure.
	Shipping Weight	8 lbm (3.6 kg)

Operating	*Power Supply AC*	100 to 240 volts AC, 75 W, 50/60 Hz. Voltage fluctuations of ±10% of nominal voltage. Category II over-voltage (300 V_{rms} max. over-range)
	Power Supply AC typical	100 to 240 volts AC, 2.25 W, 50/60 Hz
	Power Supply DC	24 volts DC ±10 percent at 3A
	Power Supply DC typical	24 volts DC ±10 percent at 0.075 A, 1.8 W
	Protection	Ingress protection rating of IP20 (no special protection)
	Temperature Operating CE/CSA Compliant	-40 degF (-40 degC) to 131 degF (55 degC)
	Temperature Operating Absolute Maximum	-40 degF (-40 degC) to 167 degF (75 degC)
	Temperature Storage	-40 degF (-40 degC) to 185 degF (85 degC)
	Digital Outputs	120 volts AC max., 8 A max. 10–28 volts DC, 8 A max.
	Digital Inputs	0 to 24 volts DC DC power provided on connector number 21 DIGITAL POWER
	Analog Outputs	0 to 20 mA in current sink mode. DC power provided on connector number 28 ANALOG PWR
	Analog Inputs	0 to 10 volts DC. 1 percent precision 0 to 20 mA, 26 mA over-range, 5% precision
	Maintenance Port	RS232 (DCE) 8-N-1
	Expansion Chassis	24 volts DC, 24 W max, all four cards combined.
Operating Environment	*Humidity % (Percent)*	Maximum relative humidity (RH) of 80 percent (non condensing) at 31 degC decreasing linearly to 50 percent at 40 degC
	Altitude (Meters)	6,562 ft (2,000 m)
	Environmental Pollution Degree	Pollution degree 2 according To IEC/CSA /UL 61010-1
	Installation	Non-hazardous locations

3.2 UniConn Current Transformer Module

Table 3-2: UniConn Current Transformer Module. *200A RMS, 1000:1*

Dimensional	*Dimensions*	3.5 in. (88.9 mm) H x 0.75 in. (19.1 mm) W x 8.4 in. (214 mm) L
	Dimensions with mounting brace	3.7 in. (94 mm) H x 2.25 in. (57.1 mm) W x 8.5 in. (216 mm) L
	Cable hole diameter	1.5 in. (38.1 mm)
	Shipping Weight	
Operating	*Ratio*	1000:1
	Current Nominal	200A RMS
	Current Maximum	600% Over-range (1200A RMS) for less than 1 second.
Accuracy	*10–100% of rated load*	5% over rated operating temperature. 5 - 50A when using 50A burden module 10 - 100A when using 100A burden module 20 - 200A when using 200A burden module
	25–100% of rated load	2% over rated operating temperature. 12 - 50A when using 50A burden module 25 - 100A when using 100A burden module 50 - 200A when using 200A burden module
Temperature	*Operating*	0 degC (32 degF) to 85 degC (185 degF)
	Storage	- 40 degC (-40 degF) to 85 degC (185 degF)
Note	*Designed to operate with UniConn CT modules only.*	

3.3 Phoenix Interface Card version 2 (PICv2)

Table 3-3: PICv2 Specifications

Part Number	101095702 [1]
Engineering Port	RS232 (DCE), DE-9 (DB9) Conforms to EIA RS-232 standards
Operating Temperature	-40 degF (-40 degC) to 158 degF (+70 degC)
Storage Temperature	-40 degF (-40 degC) to 185 degF (+85 degC)
Card Dimensions	PCB Size: 3.937 in (100 mm) x 6.299 in (160 mm) Eurocard 3U compliant (IEC 60297-3)
Faceplate Dimensions	5.100 in (129.5 mm) x 0.780 in (19.8 mm)
Shipping Weight	0.45 lbm (0.2 kg)
Power Supply	24 VDC ±10%

[1] Part Number XXXXXXXXX is obsolete and is not CE compliant.

3.4 FSK Interface Card (FIC)

Table 3-4: FIC Specifications

Dimensions	PCB Size: 100 mm (3.937 in) x 160 mm (6.299 in)
	Eurocard 3U compliant (IEC 60297-3)
FIC power	18-28 volts DC, 10 W
FIC power (no gauges)	24 volts DC, 1.5 W
FIC power (gauges only)	8.25 W, 150 mA max
DHT Output rating	59 V, 150 mA
Maximum Number of Gauges	4 (Total channel current must not exceed 150 mA)
Supported Gauge Types	PQG/HPQG/NPQG/ NHPQG/DPG-PS/NDPG-PS/DPG-TA/NLQG
Input Signal Voltage	70 mV - 3 V_{rms}
Input Signal Frequency	1200 Hz/2400 Hz with 720 Hz capture range
Cable Voltage Status	Short circuit and open line detection
Temperature Operating	-40 degC (–40 degF) to +70 degC (+158 degF)
Temperature Storage	-40 degC (–40 degF) to +85 degC (+185 degF)

3.5 Extreme DHT Card

Table 3-5: Hotline Extreme Card Specifications

Dimensions	PCB Size: 100 mm (3.937 in) x 160 mm (6.299 in) Eurocard 3U compliant (IEC 60297-3)
Extreme power	18-28 VDC, 10 W
Extreme power (no gauges)	24 VDC, 1.5 W
Extreme power (gauges only)	8.25 W, 10 mA max
DHT Output rating	15 V, 4 mA
Maximum Number of Gauges	1
Supported Gauge Types	Hotline gauge and RTD only
Input Signal Voltage	1 mV - 3 V_{rms}
Input Signal Frequency	1200 Hz/2400 Hz with 720 Hz capture range
Cable Voltage Status	Short circuit and open line detection
Temperature Operating	-40 degF (-40 degC) to +131 degF (+55 degC)
Temperature Storage	-40 degF (-40 degC) to +185 degF (+85 degC)
Maintenance Port	RS232 (DCE) 8-N-1

3.6 Communication Card

Table 3-6: Schlumberger Communication Card Specifications

Part Number	101120028 [1]	
Board Size	PCB Size: 100 mm (3.937 in) x 160 mm (6.299 in)	
	Eurocard 3U compliant (IEC 60297-3)	
Temperature Operating	-40 degC (-40 degF) to 85 degC (185 degF)	
Temperature Storage	-40 degC (-40 degF) to 85 degC (185 degF)	
Power Supply	24 VDC ±10%, 30 mA , 0.75 W	
RS-232	Conforms to EIA RS-232 standards	
	Connectivity	5-pin 5.08 mm pitch terminal block
	Termination	High frequency filter
RS-485	Conforms to EIA RS-485 standards	
	Connectivity	6-pin 5.08 mm pitch terminal block
	Termination	220-ohm (differential)

[1] PCB P/N: 101120031

3.7 Modbus TCP/IP Communication Card

Table 3-7: Modbus® TCP/IP Communication Card Specifications

Dimensions	Card	PCB Size: 3.937 in (100 mm) x 6.299 in (160 mm) Eurocard 3U compliant (IEC 60297-3)
	Faceplate	5.100 in (129.5 mm) x 0.780 in (19.8 mm)
Shipping Weight		0.28 lbm (0.13 kg)
Power Supply		24 volts DC ±10%, 27 mA, 0.65 W
Temperature	Operating	-40 degF (-40 degC) to 185 degF (+85 degC)
	Storage	-40 degF (-40 degC) to 185 degF (+85 degC)
Protocol	TCP/IP	Transmission Control Protocol (TCP) in accordance to standard RFC 793. Internet Protocol (IP) in accordance to standard RFC 791.
Interface	Ethernet	Ethernet: Version 2.0 / IEEE 802.3
Engineering Port	RS232	RS232 (DCE) Conforms to EIA RS-232 standard

3.8 MVD Card

Table 3-8: MVD card specifications

Dimensions	Card	PCB Size: 3.937 in (100 mm) x 6.299 in (160 mm) Eurocard 3U compliant (IEC 60297-3)
	Faceplate	5.100 in (129.5 mm) x 0.780 in (19.8 mm)
Shipping Weight		0.28 lbm (0.13 kg)
Power Supply		24 volts DC +/- 10%, 27 mA, 0.65 W
Temperature	Operating	–40 degF (-40 degC) to 185 degF (+85 degC)
	Storage	–40 degF (-40 degC) to 185 degF (+85 degC)
Protocol	UDP/IP	User Datagram Protocol (UDP) in accordance with standard RFC 768. Internet Protocol (IP) in accordance to standard RFC 791.
Interface	Ethernet	Version 2.0 / IEEE 802.3

3.9 NEMA 3R Enclosure

Table 3-9: NEMA 3R Enclosure Specifications

Parameters	**Operating range or data**
Dimensions	14.6 in. (371 mm) H x 14 in. (356 mm) W x 9 in. (228 mm) D
Mounting	8 mounting holes 0.375 in (9.5 mm) diameter.
Suggested mounting bolt size	1/4 in or M8 (8 mm)
Shipping Weight	With UniConn = 29 lbm (13.2 kg) Without UniConn = 21 lbm (9.6 kg)

3.10 NEMA 4X Enclosure

Table 3-10: NEMA 4X Enclosure Specifications

Dimensions	15 in (381 mm) H x 18.2 in (462 mm) W x 9.25 in (235 mm) D
Mounting	8 mounting holes 0.375 in (9.5 mm) diameter.
Suggested mounting bolt size	1/4 in or M8 (8 mm)

Shipping Weight	With UniConn = 37 lbm (16.8 kg) Without UniConn = 29 lbm (13.2 kg)

Theory of Operation

4 Theory of Operation

This section contains operational information and underlying theory of how the UniConn systems work. Details on configuration are in section 6: Configuration.

4.1 Operator interface

The UniConn interface is designed to be multi-functional and multi-language. All the symbols used are international and the language menu can be dynamically changed. This section describes the basic concepts of the UniConn user interface such as:

- menu navigation
- operating modes
- parameter editing
- alarms
- security

This is the basic UniConn operation common to all UniConn platforms. For alternate UniConn modes, the menu features will be described in the specific section.

4.1.1 User Interface

The UniConn user interface shown in Figure 4-1 consists of a two-line display, three fixed-function keys, five multi-function keys, and two indicator lights.

Figure 4-1: The UniConn user interface

4.1.2 Display

The two-line by forty character display provides view screens of the current controller status and values. The keypad provides local access to controller settings. The display supports characters for multiple languages.

Table 4-1: Main Screen Types

STATUS SCREEN	Displays the current controller readings, alarms, and state information.
CONTROL SCREEN	Allows the selection of the controller operation and clearing of alarms and lockouts.
MENU SCREEN(S)	Access to controller settings, logs, editing of parameters, and display of additional live readings of metered variables.

The **Status Screen** is the default screen that is visible on the controller when it is first approached. After a time of inactivity the default screen will appear. The default screen will vary in appearance depending on the operational state of the UniConn as shown below

```
12:23:10              Well No.1       OFF: 0003h46
MANUAL_OFF
```

UniConn is OFF

```
12:23:10              Well No.1       OFF: 0003h46
HAND_MODE
```

UniConn with HAND mode activated.

```
12:23:10              Well No.1       OFF: 0003h46
AUTO_MODE                           Start:0028m24
```

UniConn with AUTO mode activated.

```
12:23:10             Well No.1        OFF: 0003h46
HAND_MODE              2327V     60.1Hz      89A
```

UniConn with contactor closed.

The first screen is with the contactor open. The top line shows the current time, the well site name, and the OFF time. The bottom line rotates through a list of the active alarms (currently showing a latched underload alarm).
The second screen is with HAND mode activated. The system is not yet started.
The third screen is with AUTO mode activated. The system has not yet started and the count down is shown.
The fourth screen is with the contactor closed and the system started. The top line again shows the well and time information. The bottom line shows a rotating list of any active alarms plus some live motor readings (average three-phase volts, frequency, and current).

Note

Users may customize the status screen to suit user preferences. Refer to 6.14: Custom Screens (p. 6-134) for details.

Note

Custom/scrolling screens are disabled by default and must be enabled through StarView.

The **Control Screen** is activated by pressing any of the five multi-function keys. This screen is used to control the mode of operation of the controller.

```
12:23:10              Well No.1              OFF:
   MENU                  HAND        AUTO
```

UniConn is OFF

```
12:23:10              Well No.1        OFF: 0003h46
   MENU                  HAND        AUTO      START
```

UniConn with HAND mode activated. ***HAND*** *is Blinking*

```
12:23:10             Well No.1           RUN:000m46
HAND_MODE               HAND        AUTO      BYPASS
```

UniConn with contactor closed. ***HAND*** *is blinking*

```
12:23:10             Well No.1           RUN:000m46
HAND_MODE               HAND        AUTO      UNLOCK
```

UniConn with contactor open. System in lockout

```
12:23:10             Well No.1           RUN:000m46
   MENU     UNLATCH     HAND        AUTO      START
```

UniConn with contactor open and latched alarm. ***HAND*** *blinking*

The first screen is with the system off.
The second screen is with the HAND mode activated and the START button appears. The system has not yet started.
The third screen is with the system running in HAND mode. The HAND button is blinking.
The fourth screen is with the system manually stopped. The system becomes locked.
The fifth screen is with the system automatically stopped with an alarm present. The alarm requires *unlatching* prior to restarting.

The **Menu** screen is activated by pressing the multifunction key `MENU`.This enters the remainder of the UniConn configuration and operation menus.

4.1.3 Fixed Function Keys

There are three keys of which the function does not change. These are defined in the table below.

Table 4-2: Fixed Function Keys

	OFF KEY: This key is used to stop the motor and prevent starts. After this key is pressed the controller is in OFF Mode and will not automatically restart. Remote start commands are also ignored. This key is the only control key on the UniConn keypad. All other control functions are accessed through the menu system. This key is always functional and may be used at any time. **Note** This key is not used for WellWatcher applications.
	ESCAPE KEY: This key is used to move up one level in the menu structure and to exit from the menu screens to the Control Screen and Status Screen. It is also used to cancel out of editing a parameter without affecting the original value.
	LANGUAGE KEY: This key toggles the display through the available languages on the controller. For example, on a controller with English, Russian, and Spanish, pressing this key three times would change the display in the following manner: ENG > RUS >SPA> ENG. The currently displayed menu screen does not change, only the display language. If no other language is available this key will bring up the Control Screen.

4.1.4 Multifunction Keys

There are five identical multifunction keys on the UniConn. These keys are associated with the UniConn menu navigation, parameter editing, start actions, etc. The function of the key will change with the menu.

Table 4-3: Multifunction keys

	Used to select the label on the display immediately above the key. The key-press will perform the action described by the label. If there is no label above a key, then pressing that key will have no effect. The first key press of any of these keys will cause the display to enter the Control Screen from the Status Screen.

4.1.5 Indicator Lights

There are two lights on the UniConn used to indicate the status of the controller and motor system.

Table 4-4: Indicator light summary

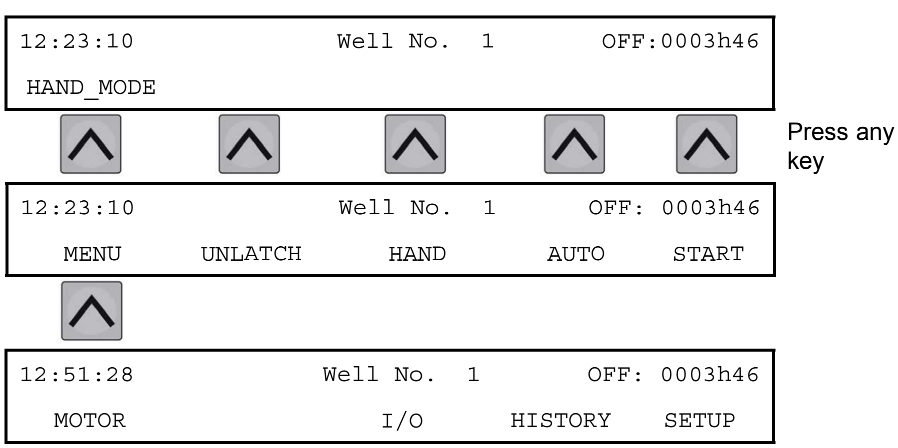
	The green indicator light indicates the status of the contactor operation. When this light is on the contactor is closed. On a fixed-speed switchboard this means the motor is energized. On a variable speed drive system the drive has applied power to the motor.
	The red indicator light indicates the presence of an alarm condition in the operation of the controller when on (solid). The controller has, or is about to, shut down the motor due to a detected fault condition. When this light is flashing, the controller is timing down to an automatic restart. If this light is OFF all alarms are clear, or the controller is in OFF mode.

4.1.6 Navigating the Menu

Navigating the UniConn menu structure is accomplished using the five multifunction keys and Escape key. These six keys are also used to perform all of the following functions from within the menu structure:

- change all parameters
- edit strings, numbers, and actions
- change the controller mode of operation
- view and navigate the event log and controller statistics record

The menu structure is accessed from the Status Screen which follows with the Control Screen and then pressing the key associated with the 'MENU' label. This is illustrated below



Main menu screen access

The Main Menu Screen is split into the following categories:

Table 4-5: Screen Summary. *Menu*

MOTOR VSD WW IntelliZone	The Motor Table contains readings, settings, and alarms related to the protection and monitoring of the motor. If the UniConn is being used to operate a Variable Speed Drive, then this key will be labelled **VSD** and will also provide access to the VSD monitoring and control screens (in addition to the standard Motor screens). If the UniConn is being used for WellWatcher applications, then this key will be labelled **UniConn WW**. If the UniConn is being used for IntelliZone applications, then this key will be labelled **IntelliZone** Live readings and corresponding alarm settings from downhole monitoring system – when installed - will also appear under this menu.
I/O	The I/O Table (Input/Output Table) consists of readings, settings, and alarms related to the user analog and digital inputs/outputs for optional surface equipment on the well.
HIST	The History Table allows the user to browse the Event Log and other statistical information on the UniConn, as well as access to data trend status (using UniConn Memory Module).
SETUP	The Setup Table contains the basic settings for operation of the UniConn, including settings related to the operation of expansion cards.

The top line of the display shows the present table parameter and the bottom line displays the choices for modifying that parameter plus ‘NEXT’ and ‘PREV’ (previous) keys for browsing through the other parameters in the table. Pressing the Escape key while in a menu table returns to the Main Menu Screen.

Pressing the Escape key several times in succession will exit from the Main Menu Screen to the Control Screen and then finally to the Status Screen.

4.1.7 Mode of Operation

The UniConn has three modes of operation: Hand, Auto, and Off. Hand and Auto modes are selected from the Control Screen. Off is selected at any time by pressing the Off key.

Table 4-6: Modes of operation

HAND	The motor can only be started by pressing the Start key.
AUTO	The motor will start automatically when all alarms are clear and when the restart timer completes its countdown cycle. If all alarms are clear the Start key in the Control Menu can also be used to bypass the restart timer countdown. Remote Start/Stop commands from SCADA communication systems are only allowed in Auto mode.
OFF	The motor is OFF and all starts (local, remote, and automatic) are prevented.

When the controller is OFF (with no alarms latched from the last shutdown), the Control Screen appears as shown below, with three keys labeled for actions ('MENU', 'HAND', and 'AUTO'). The Menu key will take the user into the Main Menu Screen, while the other two are used to put the controller into either Hand or Auto mode.

```
12:51:27              Well No.  1                OFF
   MENU                     HAND        AUTO
```

Controller OFF, no alarms latched from last shutdown

Pressing the Hand key puts the controller into Hand mode and shows a screen like that shown below. The label on the Hand key flashes to indicate that the controller is in Hand mode. As well, the OFF time of the controller has been added to the right section of the top line.

```
12:23:10              Well No.  1       OFF: 0003h46
HAND_MODE                   HAND        AUTO     START
```

Controller in Hand mode

Pressing the Start key will start the motor. The timer in the top right will change to display the run time of the motor, and the Status Screen will appear like the screen shown below. The green light will be on to indicate the motor is running, and the red light will be OFF (no alarms) or ON (alarms present). In the rotating list of any active alarms that is shown on the left side of the bottom row the label 'HAND_MODE' also appears to indicate the mode.

To run the controller in Auto mode the key labeled 'AUTO' is pressed in the Control Screen. This can be done from either Hand or Off mode, including while the motor is running in Hand mode.

When the mode is switched from Off to Auto the controller will automatically restart when the restart timer countdown has completed. This countdown is displayed on the Status Screen, as shown below

```
12:23:10              Well No.  1       OFF: 0003h46
AUTO_MODE                              START: 0026m04
```

Controller in Hand mode

The Start key in the Control Screen can be used to bypass the restart timer countdown. The Control Screen has two other actions associated with mode control: the 'UNLATCH' and 'UNLOCK' keys. The Unlatch key is only visible when there are latched alarms from the last shutdown, and similarly the Unlock key is only present during a lockout condition. All active alarms present at the time of a shutdown are latched and are marked with an asterisk (*) next to the alarm name in the rotating list of the Status Screen. A lockout condition occurs to prevent automatic restarts in the event of repeated failures to start due to the same alarm. Certain alarms have specific restart counters associated with them to control when a lockout condition occurs. Screens below shows sample Status and Control Screens when latched alarms are present on the controller. The ‘Underload’ alarm has been latched and was present when the controller shut down the well (52 seconds in the past). Any other latched alarms will be displayed at one-second intervals in the rotating list. The Control Screen now has the Unlatch key enabled. Pressing this key will clear the latched alarms and disables the Unlatch key.

```
12:23:10            Well No.  1       OFF: 0003h46
UNDERLOAD*
```

```
12:23:10            Well No.1         OFF: 0003h46
   MENU      UNLATCH     HAND      AUTO      START
```

Alarms latched and present on controller

A sample Control Screen with the Unlock key enabled is shown below. During a Lockout condition the Display Screen will have the word ‘LOCKOUT’ in the rotating alarm list.

Note

Note that the Unlock key is the same key as the Start key. The Lockout condition must be cleared to enable the “Start” key in both Hand and Auto mode. Lockout prevents automatic restarting of the motor.

```
12:23:10            Well No.1         OFF: 0003h46
   MENU                  HAND      AUTO      START
```

Unlock key enabled

4.1.8 Edit Parameters

Parameter values using the UniConn display and keypad are typically edited by entering an edit screen using the ‘EDIT’ key whenever it appears as an option. There are several distinct types of editable parameters:

Table 4-7: Edit parameter types

NUMBERS	Integer and decimal numbers used to set analog value points, times, and percentages.
STRINGS	Text based names used as labels for alarms, and descriptive names.

DISCRETE VALUES	Used to select from a list of specific actions or items.
TIME and DATE	Used to set the current time and date of the controller.
PASS CODES	Pass Code entry, and setting for security access.

4.1.9 Edit Numbers

Screen below shows a generic edit screen for a number. In the example, the number being edited appears as the ‘12.4’ in the screen. The decimal point is fixed in terms of location, and may have more digits to the right for numbers with two or more decimal places. The decimal is not present for integer values. The ‘X’ represents the unit of measure (i.e., ‘A’ for amps, ‘Hz’ for hertz, ‘%’ for percentages). Units will not be present for numeric values without units.

```
VariableName:                                12.4X
  ACCEPT       <<         >>         DEC      INC
```

Edit screen (generic for number editing)

Editing the number value is done with the multifunction keys, one digit at a time. The digit currently being edited will flash on the display. The ‘>’ keys are used to move to another digit, including digits placeholders that are blank (for example, the hundreds place holder to the left of the ‘12’). The ‘INC’ (increment) and ‘DEC’ (decrement) keys are used to increase and decrease the value of the current digit. These keys may be pressed and held to auto-increase or auto-decrease. Increasing past the number ‘9’ or decreasing past '0' will also increment or decrement the digit to the left of the current digit (i.e., a carry value). The ‘ACCEPT’ key must be used to apply the changes. The number value is not updated until this key is pressed. The Escape key can be used to cancel out of the edit screen without accepting any changes. If the display times out from inactivity (no keypad activity) any changes to the number will also not be updated. Parameters that have minimum and maximum values will not allow the user to enter a number outside of the acceptable range.

4.1.10 Edit Strings

Strings are edited in the same manner as numbers. Screen below shows the template for string edits.

```
VariableName:                              String1
  ACCEPT       <<         >>         DEC      INC
```

Edit screen for strings

The current alphanumeric digit being edited will be flashing on the display. As in the case with numbers, the ‘<< and >>’ keys are used to increase and decrease digits. Unlike numbers which have maximum values, strings have a maximum number of allowed characters (for example, eight characters for alarm names) and the ‘<<’ key will not move past this length. The ‘INC’ and ‘DEC’ keys are used to scroll through the alphabet and numbers. To minimize the amount of scrolling done during string editing, the character choice is restricted to upper case letters, numbers, and a few special characters. The ‘ACCEPT’ key must be used to apply the change.

Hint

Lower case letters can be edited via StarView.

4.1.11 Edit Discrete Values

Discrete values are specific actions or settings selected from an enumerated list. This can be a simple list like YES and NO, or a complex list like the alarm actions list described below which shows two screens for editing discrete values.

```
VariableName:                                      YES
  ACCEPT                                 NO       YES
```

```
VariableName:                                ListItem1
  ACCEPT                                DEC       INC
```

Edit screen(s) for discrete values

The first screen shows the editing of a discrete value parameter with only two choices (for example: ON or OFF, YES or NO). The two choices are set to specific keys to change the setting. The ‘ACCEPT’ key must be used to apply the changes. The edit screen for discrete values with more than two options is shown in the second screen. The ‘INC’ and ‘DEC’ keys are used to scroll through the discrete list of settings. The list will wrap around to the first or last item with these keys. The ‘ACCEPT’ key must be used to apply the changes. Note that there are no ‘<<’ or ‘>>’ keys since the entire word is the editable value.

4.1.12 Edit Time and Date

This controller time and date is used for the time-stamping of events in the log. Setting the time and date is done using the screen shown below. The editable parameters are separated into the month, day of the month, year, hour (24–hour clock), minute, and second. The numbers in each of these parameters are not edited on a digit basis like the numbers in numeric values, but rather as if they were a list of discrete values. For example, the hour is set by scrolling through a list of the numbers 00 through 24.

```
Clock:                            Sep 23, 2005 21:42:00
  ACCEPT        <<          >>          DEC        INC
```

Edit screen for time and date

The parameter currently being edited will be flashing on the display. The ‘<<’ and ‘>>’ keys are used to move to the next editable parameter. The ‘INC’ and ‘DEC’ keys are used to change the values of the parameter by scrolling through the list. For example, these keys are used to scroll through the months when editing the month, and through the numbers 00 to 59 when editing the minutes or seconds. The ‘ACCEPT’ key must be used to apply the changes. The controller will not allow an impossible date to be entered like the 31st of February.

4.1.13 Security

Security in the UniConn has four levels:

Table 4-8: Security Levels

CONTROL	Controls access to the Hand and Auto keys in the Control Screen. The user must enter a Pass Code when one of these keys is pressed to change the mode of the controller. The exception is that the Off key will always switch the controller to Off.
VIEW	Controls access to viewing parameters and set points in the Menu Tables. The Pass Code must be entered at the top level Menu Screen to enter any of the Motor, Field, Log, Stats, or Setup screens.
EDIT	Controls access to the editing of set points. The Pass Code must be entered at the time any key labeled ‘EDIT’ is pressed to enable changing of a parameter.
SUPERVISOR	Controls the access to the ‘Reset to Factory Defaults’ and ‘Clear Log’ menu settings. This is used to prevent the erasure of the record of events for auditing purposes.

Entering a Pass Code is done through the screen shown below. As each of the five digits of the code is entered an asterisk (*) will be shown on the right side of the top line to acknowledge the completed keystroke. The sample screen shows the state in which the first three digits of the code have been entered.

```
Enter New Pass Code:                               ***
    0/1         2/3         4/5         6/7        8/9
```

Pass code entry screen

Once all five digits are entered, the Pass Code is verified. If the code is wrong, the message `CODE REJECTED - TRY AGAIN` is displayed on the bottom line of the display and the display defaults to the Status Screen.

Setting a Pass Code to '00000' will clear the code and disable that security level. The message `PASS CODE DISABLED` will appear on the bottom line to verify the security level has been turned off.

The security level does not become effective immediately upon password entry. The user must exit to the Status Screen for the security level to activate. The security level will also activate if the unit times out to the Status Screen from inactivity.

4.1.14 Edit Security Code

Pass Codes are used for security access in the controller. The screen shown below shows the screen used to edit the Pass Codes for the security levels described in section 4.1.13: Security.

```
Enter New Pass Code:
   0/1        2/3        4/5        6/7      8/9
```

```
Enter New Pass Code:                                ***
   0/1        2/3        4/5        6/7      8/9
```

Edit screen for pass codes

As the user enters each digit of the five-digit Pass Code an asterisk (*) appears on the right side of the top line to acknowledge the entry. Each key is used to enter two digits. The key on the far left is used to enter both a zero (0) and a one (1).

When the new Pass Codes are entered the user will be prompted to re-enter the code to confirm the number. The new Pass Code is not accepted unless the same code is entered both times.

To change an existing Pass Code, the existing code must be entered prior to entering the new one.

To clear an existing code, change the Pass Code to '00000'. This will also disable that security level.

4.2 Automatic Start

Automatic start is a UniConn function that will permit a start after the processing of a trip or alarm condition. This provides some autonomous control to the UniConn to start systems with user defined conditions.

- For details on how to enable/disable and configure automatic starts see section 4.2.1: Shutdown Cause.
- For details on how to configure number of starts see section 4.2.2: Starts.
- For details on progressive time delay see section 4.2.3: Progressive Time Delay.

For an overview of the UniConn start modes and an explanation of HAND, OFF AUTO, see section 4.1.7: Mode of Operation.

The restart parameters for live data are part of the UniConn alarm system and are explained in section 4.3: Alarms.

The control menus for automatic start are defined below and shown below.

- Shutdown Cause
- Starts
- Progressive Time Delay

```
12:51:27              Sitename00             OFF
  MENU                   HAND       AUTO
```

```
12:51:28              Sitename00    OFF: 0003h46
  MOTOR                  I/O      HISTORY  SETUP
```

```
   UniConn            V1.304r1     Serial:     7
           ADJ                      PREV    NEXT
```

Multiple times

```
Shutdown Cause:       MANUAL_OFF     Delay003m00
           ADJ                      PREV    NEXT
```

```
Starts –        Now:00 Allowed:00 Remaining:00
           ADJ                      PREV    NEXT
```

```
Progressive Time Delay:                    0min
         ADJ                      PREV    NEXT
```

4.2.1 Shutdown Cause

These menu parameters define the criteria for shutdowns and represent global default settings. There is some overlap in functionality of each global parameter and specific alarm options. Most of the UniConn operating parameters have a user setting for a restart.

Example

Global parameter for **Default Restarts** may be three, but the user defined **Restarts** for a current overload may be five.

The menu as shown in , shows the fault code of the last shutdown. In this case **MANUAL_OFF** indicates the UniConn shut down due to activation of the **OFF** button on the keypad. The **Delay0030m00** indicates the time remaining for an automatic start.

The adjustable parameters within this menu are:

Term	Definition
Automatic Starts	Global setting to enable or disable the automatic start feature on the UniConn. This also enables or disables all live parameter settings for **Restarts**.
Manual Start Wait	Applies the **Default Restart Delay** to manual starts.
Hold Start	Applies an additional delay, in seconds, to the **Default Restart Delay**. This delay is applied to all alarm parameter restarts. **Example** This may be used in situations where multiple UniConn share the same power supply. The start of each one can be staggered as to not overload the power supply system.
Soft-start Delay	The UniConn can be configured to operate a soft-start device in parallel with the main contactor (UniConn RLY1). The soft-start device would be connected to UniConn relays RLY2, RLY3 or RLY4. The functioning time of the soft-start is set by the user. Once the soft-start time elapses, the relay configured for "soft start done" becomes energized. **Note** The Relay (RL2, RL3, RL4) requires configuration to select the Soft-Start Done function.

Default Restarts	Sets the number of default restarts globally. Each specific alarm parameter contains custom settings for **Restarts** which over-ride the **Default Restarts.** See section 4.3: Alarms.
Default Restart Delay	Sets the default time delay to apply to automatic starts or optionally manual starts. Each specific alarm parameter contains custom settings for **Restart Delay** which over-ride the **Default Restart Delay** . See section 4.3: Alarms.

A block diagram of an automatic start sequence, to show all the delays and counters, is shown in Figure 4-2. As shown the alarm parameter has been customised for 3 **Restarts** with a 10 minute **Restart Delay** before each start.

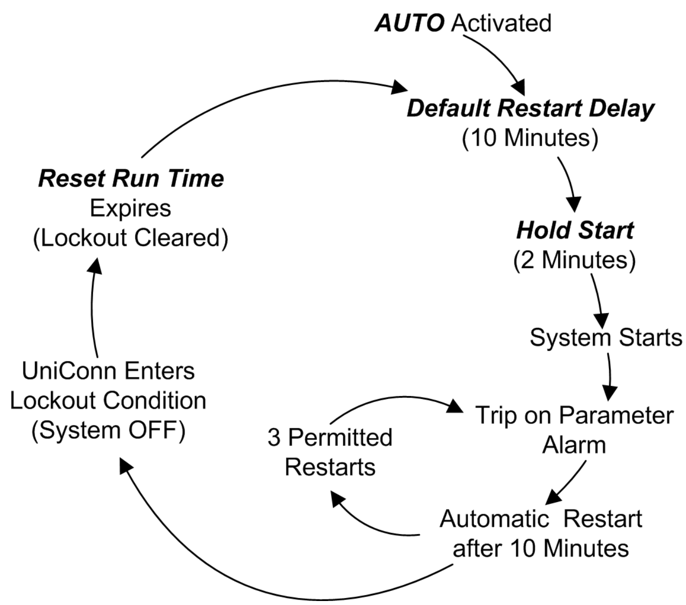


Figure 4-2: Automatic Start block diagram

4.2.2 Starts

This menu summarizes the status of the automatic start system and provides access for global resets and secure resets. Each of these status parameters are saved for each specific alarm type.

Term	Definition
Now	Indicates how many starts have taken place with the active alarm type.
Allowed	Indicates how many starts are permitted with the active alarm type.
Remaining	Indicates how many starts are remaining with the active alarm type.

Example

The **Shutdown Cause** was current overload and this was the second alarm trip. The defined restart parameters for current overload are five **Restarts** and a **Restart Delay** of 10 minutes. The menu would show:

Now:03 Allowed:05 Remaining:02.

During operation if a different alarm shutdown the UniConn, the parameters above would reflect the specific restart values of the different alarm. Once the overload alarm returns, the parameters in the example would continue where they left off.

The adjustable parameters within this menu are:

Term	Definition
Reset Run Time	This parameter enables a reset of all automatic restart functions. This enables the UniConn to self clear a lockout condition after a user defined time delay. **Example** An analog input configured to permit 3 restarts with a delay of 10 minutes. After the 3'rd restart, the UniConn will enter a lockout condition. After the **Reset Run Time** expires, perhaps I hour, the lockout condition is cleared and the analog alarm restarts are once again enabled.
Release Lockout Method	This parameter permits a lockout condition to be cleared from the UniConn control screen, or restrict access to clearing the lockout. Restricted access is possible within this menu, not the control screen.
Release Lockout	This parameter represents the function of the secure version of clearing the lockout as detailed above.

4.2.3 Progressive Time Delay

Term	Definition
Progressive Time Delay	This parameter adds additional time to each repetitious shutdowns. Restarts will progressively take longer.

4.3 Alarms

UniConn alarms are associated with all measured and monitored values.

These alarms have parameters that define when and what they do when they become active. A sample of an alarm menu which has the standard format is shown below.

```
Name:                                            Live Value
 LOW_ALARM      ADJ        HI_ALARM     PREV      NEXT
```

Generic alarm screen

The top line displays the name of the metered variable and the current live value measured by the controller. The ‘NEXT’ and ‘PREV’ (previous) keys are used to scroll through the screens within the table. The ‘ADJ’ key is used to edit settings specific to that measured variable and may not be present for all variables.

The ‘HI_ALRM’ and ‘LOW_ALRM’ are the alarms associated with the high and low limits on the metered variable. If the alarm condition is currently active, the label will be flashing. Pressing the keys associated with these tags will bring up the screens to edit the alarm set points and actions.

Each alarm has the following settings associated with it:

<table>
<tr><th>Term</th><th>Definition</th></tr>
<tr><td>NAME</td><td>A user-editable name associated with the alarm. This is the label that will be displayed on the screen when the alarm is active and that will be entered into the log.</td></tr>
<tr><td>ACTION</td><td>The action that the alarm performs. Selectable alarm actions are:
<table>
<tr><th>Term</th><th>Definition</th></tr>
<tr><td>BYPASS</td><td>Perform no action. Nothing is logged and a shutdown will not occur.</td></tr>
<tr><td>LOG</td><td>Logs the occurrence of the alarm condition in the Event Log.</td></tr>
<tr><td>STOP</td><td>Performs a shutdown of the motor. Automatic restarts can occur in Auto mode.</td></tr>
<tr><td>LOG+STOP</td><td>Performs a shutdown of the motor and logs the shutdown and alarm occurrence in the Event Log. Automatic restarts can occur in Auto mode.</td></tr>
</table></td></tr>
<tr><td>SETPOINT</td><td>The alarm becomes active when the metered live value violates this set point value. The set point has the same units as the metered value. For analog variables there are two types of set points: high and low. High set points trigger an alarm when the metered value exceeds the value of the set point. Low set points trigger an alarm when the metered value falls below the set point. For digital inputs, the set point is the digital state the controller will alarm on: either ‘OPEN’ or ‘CLOSE’.</td></tr>
</table>

TRIP TIME (seconds)	The time duration that the alarm must be active before STOP actions occur. Timing begins each time the metered value violates the set point. This value can be used to reduce nuisance trips in metered variables that are ‘noisy’ or have a lot of variation in the live reading.
RESTARTS	The maximum number of restarts allowed for shutdowns by this alarm before a lockout condition is generated to prevent automatic restarts. This feature is provided to limit the number of manual and automatic starts of a motor to a safe level. It prevents excessive cycling that could lead to equipment damage.
RESTART DELAY (minutes)	The countdown time that must elapse before an automatic restart can occur. All alarms must also be clear before the restart occurs. The restart countdown can be manually bypassed by pressing the Start key from the Control Screen during the countdown.
START BYPASS (seconds)	A temporary bypass time delay added to the Trip Time for starting only. A setting of 0.0 seconds disables this function. Any other number bypasses the alarm to allow a start and keeps it bypassed for the time set. A temporarily bypassed alarm will be displayed on the Status Screen when active but will not cause a shutdown.
MAINTENANCE BYPASS (minutes)	Maintenance Bypass allows for the temporary bypass of a specific alarm, during UniConn operation, for on the fly wiring changes or maintenance procedure such as chemical injection. This bypass timer is available for Digital Input Alarms, Underload Alarm and VSD Underload Alarm. To activate a Maintenance Bypass for an alarm, the Maintenance Bypass timer value must be entered. The 'BYPASS' will then appear as a soft-key on the main menu indicating that this feature is available but not active. The 'BYPASS' soft-key must be pressed and held for five seconds to activate. The UniConn will display the message `MAINTENANCE BYPASS INITIATED` and the 'BYPASS' soft-key will change to '*BYPASS'. Once the timer has expired the bypassed alarm will become active. The Maintenance Bypass function must be reset and activated each time it is to be used as the UniConn clears the timer value and deactivates this function after each use.

4.4 Power Supply

The UniConn power supply is a universal input AC power supply with an alternate DC inputs available. See 3.1: UniConn for further details. The AC power terminals GND, AC-N and AC-L (PINS 46-48) are located on the terminal block on bottom of the UniConn. A block diagram of the power inputs is shown in Figure 4-3.

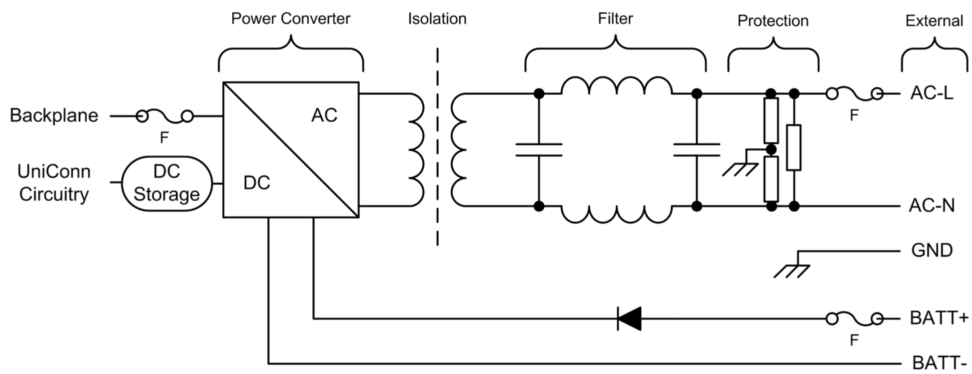


Figure 4-3: AC Power input block diagram

The AC power supply is monitored to measure the RMS voltage and detect power anomalies to ensure a safe shutdown without data loss or system damage. The AC supply voltage is also critical to the operation of the motor contactor. The *DC Storage* within the power supply permits the UniConn to function through power loss for up to 1 second and ensures total system control. The supply frequency can be monitored if Phase C potential transformer (PT) is connected. See section 4.5.1: Frequency Measurement on Voltage Input for details.

The DC power inputs are optionally available on terminals BATT+ and BATT- (PINS 45 and 44) for use with 24V systems. The UniConn will not produce DC power on these pins. The UniConn can operate using AC power and switch to DC power, if available, in the event AC power fails.

The power input monitored parameters are:

Table 4-9: Power supply parameters

Parameter	Operation
HIGH FREQUENCY	Monitor condition where the AC frequency exceeds a specified maximum. The alarm appears as HIGH_FREQ on the display.
LOW FREQUENCY	Monitor condition where the AC frequency drops below a specified minimum. The alarm appears as LOW FREQ on the display.
HIGH SUPPLY	Monitor condition where the AC RMS voltage exceeds a specified maximum. The alarm appears as HIGH_SUPPLY on the display.

Parameter	Operation
LOW SUPPLY	Monitor condition where the AC RMS voltage drops below a specified minimum value and apply the deviation to a six point curve to determine the alarm duration The low supply alarm is used to disconnect power to the motor contactor to prevent contactor ratcheting during power brown-out conditions. The time curve of this alarm should never be adjusted so that the set point for low supply is below the pickup voltage of the contactor coil. Any time delays for curve points below the pick up voltage should be as fast as possible (0.1s) to avoid ratcheting (dithering) during brown-out and short-circuit conditions. The alarm appears as LOW_SUPPLY on the display.

Note

When operating with DC power the Table 4-9 parameters are requires to be disabled.

4.4.1 Power Supply Alarm

The UniConn monitors internal power in order to determine if a power down is imminent. Once the alarm is activated, the UniConn performs a backup of internal memory and prepares the system for a power down. The internal power alarm is labelled as:

Alarm	Description
POWERFAIL	This indicates the internal voltage has reached a critical level and a UniConn power down is imminent.

Note

This alarm will function with the UniConn powered by AC or DC.

4.5 Voltage Input

The UniConn contains three AC potential transformer (PT) voltage inputs for the purpose of measuring and monitoring 3 phase motor voltage. The monitored parameters are:

Table 4-10: Voltage Input Parameters

Parameter	Operation
Overvolts	Monitor condition where voltage exceeds a specified maximum value. The three phase RMS average or each individual phase RMS voltage is monitored for overload. Used to protect a system from voltage surges.
Undervolts	Monitor condition where voltage drops below a specified minimum value and apply the deviation to a six point curve to determine the alarm duration. Used to protect a system from voltage droops and brown-outs. The alarm curve is designed to account for the voltage drop during a motor or system start.
Rotation	Monitor the phase voltage sequence A-B-C to ensure the motor is powered in the correct sequence. This prevents the motor from running backwards if the power supply to the motor is reversed. **Note** The detection of rotation change will not work if the cable phases were reversed beyond the switchboard PT or CT sensing connections. Rotation can be detected from either the current or voltage and thus appears in both the Load and Volts screens.
Unbalance	Monitor condition where voltage A-B-C magnitude are no-longer matched and apply the deviation to a six point curve to determine the alarm duration. The three phase RMS average is compared to the individual phases to calculate unbalance. The unbalance is displayed as a percent of line voltage. The alarm curve is designed to account for the voltage unbalance during a motor or system start.

The results of these measurements can be combined with the current inputs to determine the system power and power factor.

The potential transformer (PT) inputs are located on terminals PT-A, PT-B, PT-C and PT-N (PIN 40 - 43) and operate in a WYE “Y” configuration.

Term	Definition
PT-A, B, C	UniConn PT inputs for phase voltage A, B, C
PT-N	The neutral point connection for the three phase voltage.

A block diagram of the voltage inputs is shown in Figure 4-4.

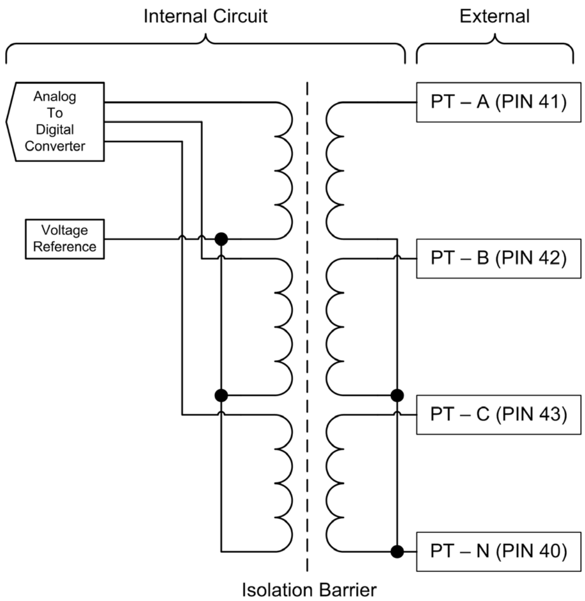


Figure 4-4: PT inputs block diagram

The PT input voltage is limited. See 3.1: UniConn for details. Additional PT may be cascaded in order to interface to high voltage systems as shown in Figure 4-5.

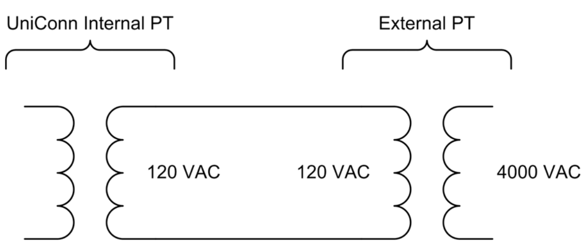


Figure 4-5: PT inputs cascade to 4000VAC

The PT inputs can be scaled to match external PTs and calibrated to account for transformer tolerance.

4.5.1 Frequency Measurement on Voltage Input

The UniConn monitors the three phase system frequency using the signal present on phase C (PIN 43). For monitored three phase systems the frequency measurement will operate normally.

For systems that do not use three phase voltage monitoring, but wish to monitor frequency on the UniConn power, PT PIN 40 and PIN 43 must be connected to PIN 48 and PIN 47 as shown in Figure 4-6.

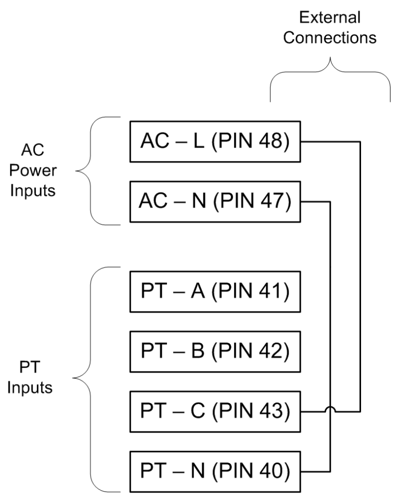


Figure 4-6: Frequency measurement connection block diagram.. *For systems not configured for three phase voltage monitoring.*

4.6 Current Input

The UniConn contains three AC current transformer (CT) inputs for the purpose of measuring and monitoring 3 phase motor current. A proprietary current transformer burden module is required to connect the external CT to the UniConn. The monitored parameters are:

Table 4-11: Current input parameters

Parameter	Description
OVERLOAD	Monitor condition where current exceeds a specified maximum value. The three phase RMS average or each individual phase RMS current is monitored for overload. Used to protect a system from a failing motor or motor cable while still permitting a motor start. The overload alarm has a 16 point time curve associated with it. The individual points in this curve can be edited for special applications. The set point is typically set to 15% higher than the *motor running current*. The alarm appears as **OVERLOAD** on the display.
UNDERLOAD	Monitor condition where current drops below a specified minimum value. Used to indicate a motor is not efficiently pumping fluid or has air-locked. The set point is typically set to 20% below the *motor running current*. The alarm appears as **UNDERLOAD** on the display.
ROTATION	This feature is shared with the voltage inputs. Monitoring of rotation can be either voltage mode or current mode. For details see . The alarm appears as **ROTATION** on the display.

Parameter	Description
UNBALANCE	Monitor condition where current A-B-C magnitude are no-longer matched. The three phase RMS average is compared to the individual phases to calculate unbalance. The set point is typically set to 20%. The alarm appears as **C_UNBAL** on the display.
STALL	Stall is a condition where the motor stops rotating. The impedance of the power cables and motor winding create a scenario where the power requirements are high but this is not a short circuit. The criteria used to define a stall condition must consider the OVERLOAD current required during a motor start. The set point must be set less than the name plate *motor start amps* and is typically set to three times the *motor rated current*. The alarm appears as **STALL** on the display.
SHORT CIRCUIT	This is a condition where a short circuit occurs. This indicates a serious fault has occurred in the cable to the motor or within the motor. The criteria used to define a short circuit must consider the current used in a STALL condition. The set point is typically set to six times the *motor rated current*. The alarm appears as **SHORT_CCT** on the display.
Motor Amps	This is the nameplate rating of the maximum continuous motor amps. This value is used to calculate STALL and SHORT_CCT.

The results of these measurements can be combined with the voltage inputs to determine the system power and power factor.

The CT inputs are located on terminals CT-A, CT-B, CT-C, CT-PWR, CT-REF and CT-SHIELD (PIN 34 - 39).

Term	Definition
CT-A, B, C	UniConn CT inputs for phase current A, B, C
CT-PWR	UniConn CT input for power monitoring. Not implemented at this time.
CT-REF	Reference signal point for the three phase current measurement.
CT_SHIELD	A ground shield to protect the current signals from electrical noise.

Warning

Potential Severity:	Serious
Potential Loss:	Assets, Information
Hazard Category:	Electrical

These inputs are designed for the burden module only. Do not directly connect the CT leads to the UniConn.

A block diagram of the CT input is shown in Figure 4-7.

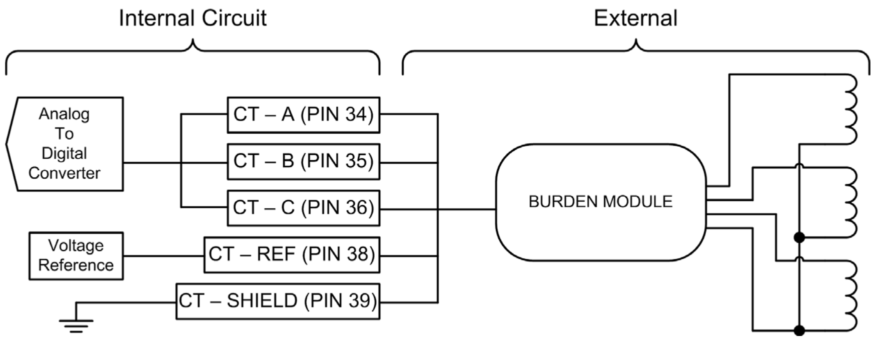


Figure 4-7: CT inputs block diagram

The CT inputs can be scaled to match external CTs and calibrated to account for transformer tolerances.

4.6.1 Under Load Tracking

The UniConn can optionally use under load tracking feature to characterise over time an acceptable under load value up to a minimum setting. This characterised value becomes the reference point for the under load alarm. This accounts for motor current drift over time due to changing well characteristics and permits the UniConn to not alarm on a set under load value but to follow the drift, and alarm based on the drift point value.

Note
When the under load tracking is activated, the normal under load setting is bypassed for the under load tracking setting.

4.6.2 Burden Module

The UniConn CT inputs measure voltage. A burden module is required to convert the current from the CT into a voltage prior to interfacing to the UniConn. The burden module is available for four topologies.

Term	Definition
50, 100, 200	Designed to provide full scale signal for 50A, 100A, 200A systems using a proprietary CT Module. See section 4.6.3: CT Module for details.
5:XX	Designed to interface with standard 5 amp output CT modules. These CT modules are available in a large variety of ratios such as 50:5, 100:5, 200:5, 1000:5 etc.

4.6.3 CT Module

This current transformer is designed to only operate with the UniConn using the 50A, 100A, 200A burden modules. See section 4.6.2: Burden Module. The CT module contains 3 CTs integrated within a single module. Each module is pre-wired in a WYE “Y” topology. See 3.2 for further details.

The CT turns ratio is fixed as 1000:1. The CT module output current mode of operation is set by selecting the appropriate burden module for the application.

Note
Sizing the burden module is critical to ensure the maximum amount of current signal is sent to the UniConn. See 'UniConn Current Transformer Burden Module Selection' InTouch Content ID 4386187.

For installation information see section 5.3: Current Transformer Module.

4.7 Backspin Input

The UniConn contains a 3 phase backspin input for the purpose of detecting motor rotation while the motor is not powered. The motor rotation may be the result of well characteristics continuing to flow or fluid in the pipe draining back into the formation. Depending on the requirement, the UniConn can be configured to not start the motor while rotation is present or start only if below a rotation threshold.

The UniConn backspin input measures the frequency of the motor rotation and has alarm parameters associated with the frequency detection setting. There is a configurable time delay that the UniConn must wait before starting once the alarm has cleared. This timer will not start during a spin condition and the UniConn will remain in the alarm state until the rotation drops below threshold, at which point the timer will start

Backspin detection is designed to detect very small signals and functions with the system off. During system operation, system harmonics can create false triggers on frequency measurement.

To interface to the high voltage motor cables a A095 Backspin Shunt is required. See section 4.7.1: A095 BackSpin Shunt for details. A block diagram of the backspin input is shown in Figure 4-8.

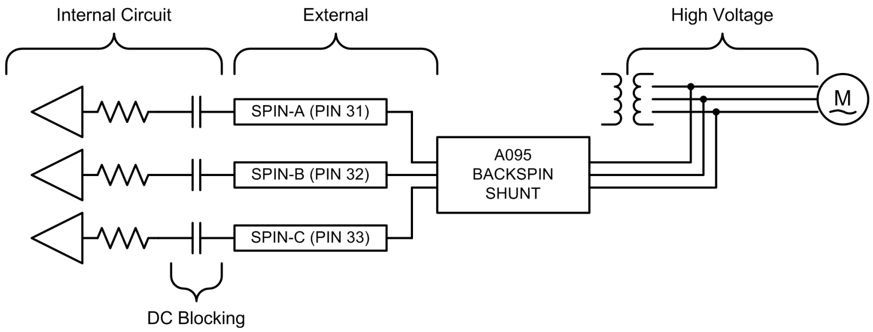


Figure 4-8: Block diagram BackSpin

The backspin input contains a DC blocking filter. For applications where a downhole tool (DHT) is used with an electric submersible pump (ESP), the DC power for the DHT will not affect the UniConn. The motor rotation signal pass through the DC blocking filter unaffected.

Warning

Potential Severity: Serious
Potential Loss: Assets, Process
Hazard Category: Electrical, Machinery equipment hand tools

Starting a motor which is spinning in reverse direction creates a very large current in order to stop the motor, then start the motor in the correct direction. Damage to motor winding may result.

4.7.1 A095 BackSpin Shunt

The A095 backspin shunt is design to protect backspin detection equipment from the high voltage motor lines. During a motor spin scenario the system is off and the backspin voltage are very low. During system operation backspin voltage matches that of the motor and may range in the 480VAC to 5000VAC. The A095 product line is sized to operate in voltage ranges:

- 800V – 2000V
- 1800V – 4000V
- 400V – 1000V
- 3000V – 5000V

These voltage ranges are chosen to provide the maximum spin signal and provide safe operation for the line voltage in use.

The A095 is designed to operate with Delta “Δ” or Wye “Y” three phase systems. For grounded transformer system ensure the transformer ground and Backspin shunt ground are at the same point.

Warning

Potential Severity:	Serious
Potential Loss:	Personnel
Hazard Category:	Electrical

Do not adjust terminal connections during operation as these inputs may reach 300VAC during a fault condition.

4.8 Leg Ground

The UniConn performs leg ground measurement using the Backspin input. Leg ground measures the phase-ground voltage and unbalance which indicates insulation degradation and ground fault problems. A single-phase dead short will show a 100% reading. A 110% reading is indicative of a backspin shunt wiring fault.

The UniConn uses the Backspin input measurements of frequency and voltage to determine motor rotation and line voltage. For leg ground, only line voltage is necessary.

Leg ground measurement requires an A095 Backspin shunt. See section 4.7.1: A095 BackSpin Shunt for details.

Warning

Potential Severity:	Serious
Potential Loss:	Assets
Hazard Category:	Electrical

Leg ground measurements with an A095 Backspin Shunt only works with non-grounded DELTA systems. For grounded WYE systems a D095 Ground Fault Monitor must be used. See UniConn Ground Fault Protection Explained — InTouch Content ID 4261792 for further details.

4.9 Digital Output

The digital outputs on the UniConn are relay outputs capable of switching either AC (120/240 V Hazardous Circuits) or DC (10-28 V Extra Low Voltage) at loads of up to 8 A. The outputs are 'dry contacts' meaning the switching voltage is not supplied from the UniConn and must be supplied as part of the switchboard wiring. All digital outputs have the relay normally open (RLYx NO), common (RLYx COM), and normally closed (RLYx NC) contacts brought out to terminals.

Caution

Potential Severity:	Light
Potential Loss:	Personnel
Hazard Category:	Electrical

Digital outputs must be connected to 120/240 V Hazardous Circuits OR 10–28 V Extra Low Voltage circuits exclusively. **Do not mix control voltage types**. In order to operate the UniConn within the CE certification the digital outputs must not be connected to more than 240 volts AC.

The first digital output (RLY1 terminals) is reserved for switchboard contactor control. This relay has additional hardware to prevent contactor dropout in brown-out or low-power conditions. This output is also tied to the motor shutdown event from alarms and the Off key. The green LED displays the status of this relay. In VSD applications this relay still operates as a contactor that can be used to indicate VSD run status (i.e., if power is applied to the motor).

The remaining digital outputs (RLY2 to RLY4) are user configurable with the function detailed below:

Term	Definition
OFF	Relay operation is disabled and left in the OFF position. The normally open terminal is electrically open, and the normally closed terminal is closed.
ON	The relay is held in the ON position. The normally open terminal is closed and the normally closed terminal is open. This can be used for an external device to detect power failure to the controller as the relay will go OFF when power is removed.
BLINK	The relay turns ON and OFF at a one-second interval.
COIL	The relay behaves as a SCADA output coil for remote control applications. The SCADA system writes to a telemetry register as a bit value 0 or 1 to control this output.
CONTACTOR	The relay follows the motor contactor relay status (i.e., ON when the contactor is ON). This also follows the green LED on the UniConn faceplate. This function is often used to control an external lamp for improved visibility of the controller run status.
RESTART	The relay is ON when the controller restart timer is counting down for an automatic restart. This follows the flashing red LED status. This function is often used to control an external lamp for improved visibility of the controller status.
On Alarm	The relay is ON when the controller is in an alarm condition. This function follows the solid red LED status. This function is often used to control an external lamp for improved visibility of the controller status.
BLOCKING	The relay is ON when something (alarm, hold start, etc.) is blocking an automatic restart and also when the motor is running. The relay is OFF when the contactor is OFF and no alarms are present.

SOFTSTART_DONE	The relay turns ON when the Soft-start Delay has expired. During a soft-start application, Relay1 (CONTACTOR) is connected to the soft-start relay and turns ON when a start occurs. This parameter is used to turn on a second relay to control the full operation. This relay will drop out when Relay1 drops out to stop the motor.

The 'ALARMING' option requires the user to specify the alarm source. The selections are:

Term	Definition
UNICONN	The relay will actuate on any alarm generated by the UniConn
VSD_OVERLOAD	When operating with a VSD, the relay will actuate on an Overload alarm generated by the VSD.
VSD_UNDERLOAD	When operating with a VSD, the relay will actuate on an Underload alarm generated by the VSD.
VSD_COM	When operating with a VSD, the relay will actuate when communication is established with the VSD and de-energizes upon loss of communications.
DHT_TRIP	While operating with a Downhole Tool expansion card, the relay will actuate if any downhole alarms are active for the duration of their respective trip time.
AIN#_HI/Lo	The UniConn is capable of signaling the Analog Lo/Hi alarm state via the digital output relays.

A block diagram of the UniConn digital output relay is shown in Figure 4-9. As shown the relay is configured to actuate a motor contactor.

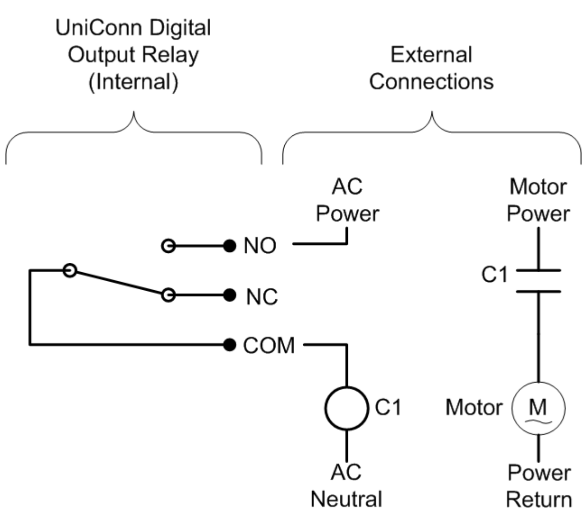


Figure 4-9: UniConn Digital Output Block Diagram

Note

The configuration shown in Figure 4-9 is best suited to the digital output 1 (RLY1) as there is additional circuitry to protect against brown-out or low power conditions.

4.10 Analog Input

The UniConn contains four differential analog inputs with a 12 bit analog to digital converter. Each of these inputs can independently operate in voltage or current mode. For current mode the UniConn can optionally provide power for the loop current. For specification details see 3.1: UniConn.

Note

The UniConn Analog PWR output (Pin 28) is current limited and cannot provide power to remote devices. The UniConn provides the power for 4–20mA control loop only.

The four analog input channels on the controller are used to interface to external analog devices or Remote Telemetry Devices (RTD) like pressure or temperature units. The range and scale settings for the analog inputs operate in a similar manner to the analog outputs.

The UniConn analog inputs operate in the range of 0–10V or 0–22mA current loop measurement. These operating ranges can be scaled to function as 0–5V, 2–8V, 4–20mA, etc.

For voltage measurements the inputs are differential with an operating range up to 10V. Each input contains over-voltage protection which activate in the 20 to 24 VDC range. Therefore the differential data of 10V can swing up to the 20V without data corruption.

For current loop measurements the UniConn provides 24 VDC, ’ANALOG PWR’ (PIN 28) to provide the current loop power, or an external power supply may be used. Each input contains over-voltage protection which activate in the 20 to 24 VDC range, so external power supply must operate below this value.

A block diagram of one UniConn analog input is shown in Figure 4-10.

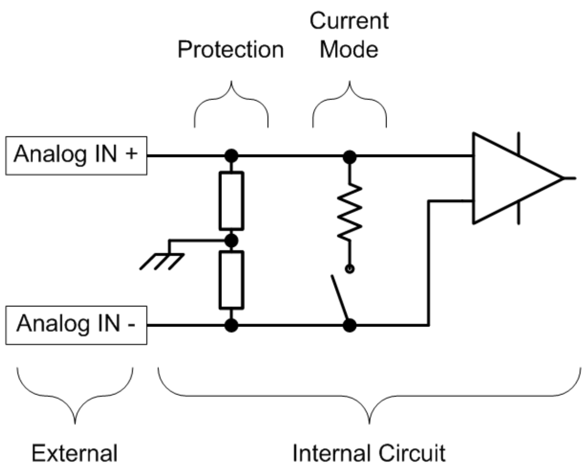


Figure 4-10: Analog input block diagram

The analog inputs have an accuracy of 1% in voltage mode and 5% in current mode. If necessary the inputs can be calibrated to 0.1% using an accurate multi-meter. Each input can be scaled from 0% to 100% to match engineering units scaled from 0 to 32000 data points. 0% represents 0V or 0mA and 100% represents 10V or 20mA. In current mode the inputs can read up to 22mA for alarm purposes.

Each analog input can be configured with parameters shown in Table 4-12.

Table 4-12: Analog Input Settings

Parameter	Description
Name	Name the data type, i.e. Pressure, temperature, Temp1, etc.
Input type	Voltage or current mode, i.e. 0-10 V or 0-20 mA.
Raw Maximum	Configuration setting on UniConn to map to Scaled Maximum
Raw Minimum	Configuration setting on UniConn to map to Scaled Minimum
Scaled Maximum	Maximum reading of device in engineering units, i.e. 200 psi
Scaled Minimum	Minimum reading of device in engineering units, i.e. 0 psi

The ‘Name’ parameter can be used to change the name of the analog input channel to something more descriptive on the display. For example, a wellhead pressure sensor might be labeled ‘WH Press’. The maximum number of characters permitted is ten.

The ‘Input Type’ parameter determines whether the analog input channel operates as a voltage input or current loop input. This parameter can be set to either '0–10v' for voltage mode or '0-20 mA' for current mode.

The ‘Raw Maximum’ and ‘Raw Minimum’ parameters are used to set the 0-10 volts and 0-20 mA ranges to other ranges. The raw values are expressed as a percentage of the maximum input voltage or current. This is used to interface to devices that have ranges like 0-1 volts, 1-5 volts, or 4-20 mA.

The ‘Scaled Maximum’ and ‘Scaled Minimum’ parameters are used to set the Engineering units the user wishes to see within the bounds of 0% and 100%. These Engineering units may represent pressure, temperature, voltage, current, etc.

The configuration of these inputs can be performed using the UniConn interface or the StarView program utility.

4.10.1 Loop Topologies

The UniConn analog inputs can monitor a variety of external devices such as pressure, temperature, transducers and remote telemetry devices (RTD). The devices can be either voltage signalling or current signalling. The connection options of these devices are detailed below.

4.10.1.1 Voltage Mode

The analog inputs configured for voltage inputs have a basic circuit topology shown in Figure 4-11. This is not entirely accurate as the end device would typically require a power supply.

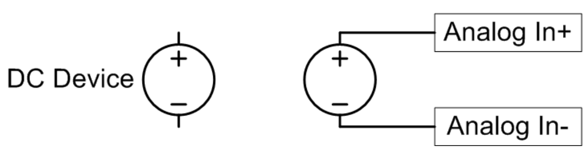


Figure 4-11: Analog input voltage mode single device

Figure 4-12 shows an external power supply which provides power to the device.

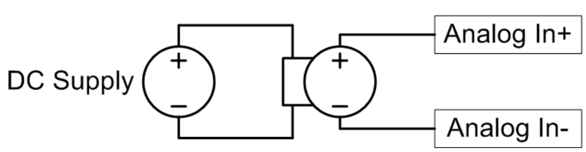


Figure 4-12: Analog input voltage mode DC powered device

4.10.1.2 Current Mode

The analog inputs configured for current inputs have a basic circuit topology shown in Figure 4-13. For the current loop to function a power supply is required to drive it.

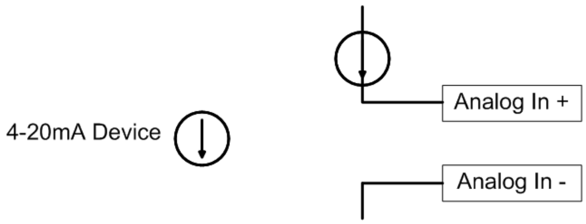


Figure 4-13: Analog input current mode single device

The UniConn can provide the power for the current loop using the ANALOG PWR (PIN 28) as shown in Figure 4-14.

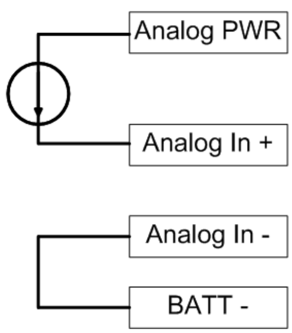


Figure 4-14: Analog input using UniConn powered loop

Note
The UniConn Analog PWR output pin is current limited and cannot provide power to remote devices. The UniConn provides the power for 4–20mA control loop only.

Figure 4-15 shows another version of the UniConn powered current loop. The current path is shown as dashed line. The analog output is used as the return path with the analog output configured to operate at 22mA. The 4–20mA loop data is unaffected by using the analog output in this manner as the 22mA setting is outside of the valid data range.

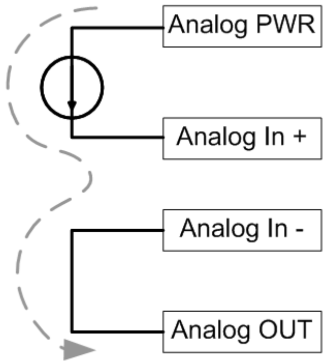


Figure 4-15: Analog input using analog output as return

Figure 4-16 shows an RTD type device which uses an external power supply to power the device and drive the current loop. The return path can be any ground return used for the power supply.

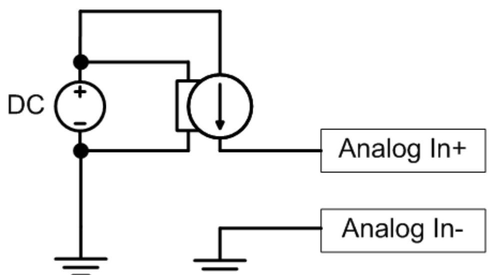


Figure 4-16: Analog input with external power for RTD and loop

Figure 4-17 shows an RTD type device which uses an external power supply and the UniConn provides power for the current loop. The current loop must return to the UniConn as shown. Alternately the return path could use the analog output as shown in Figure 4-15.

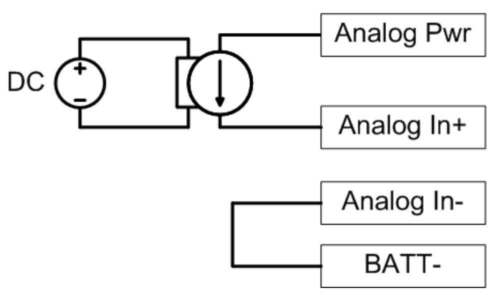


Figure 4-17: Analog input with external powered RTD and UniConn powered loop

4.11 Digital Input

Digital inputs are designed to provide logic information in the form of Open / Close, On / Off, High / Low, 1 / 0, etc. The UniConn contains 6 digital inputs (Pin 22 to 27) which are designed to be switched with dry contacts. The switching voltage, 24 volts DC available on Pin 21, is supplied internally from the UniConn via the DIGITAL PWR terminal. These inputs can be independently configured to respond to either an Open or Close condition. A sample digital input circuit is shown in Figure 4-18.

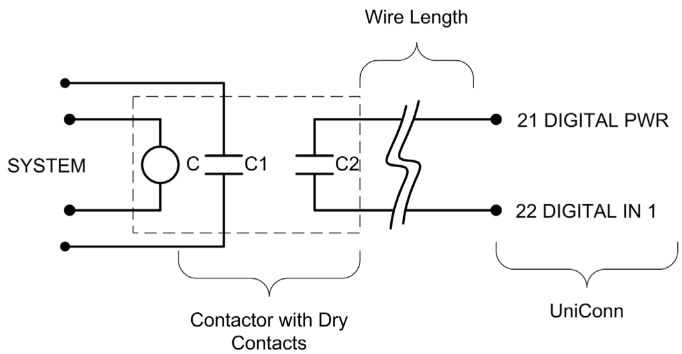


Figure 4-18: Digital input dry contacts

The digital inputs contain internal alarms to indicate power and voltage faults. See section 4.11.2: Digital Input Alarm

If the length of the digital input wiring is very long, the DC switching power can be subject to significant voltage droop. The recommendation is to use an additional relay to provide the switched signal to the UniConn. The power to drive the relay would be according to the clients' discretion. The placement of the relay would be near to the UniConn as shown in Figure 4-19.

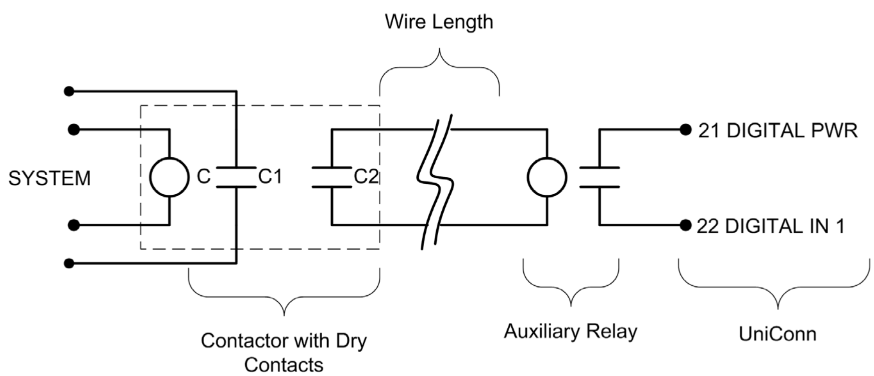


Figure 4-19: Digital input with auxiliary relay

The digital inputs should always be wired in a fail safe connection so that loss of power or a break in the digital input wiring will trigger the input. The UniConn should be set to alarm on a switch open condition and the external switch set to hold the switch closed during normal operation. In addition to catching a fault condition from the external device, the controller will also receive an alarm condition in the case of external device power failure or a break in the signal wires.

The UniConn configuration can accept both types of inputs, normally open and normally closed.

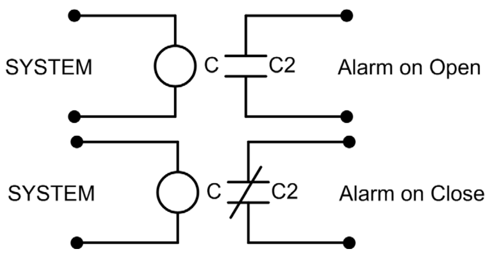


Figure 4-20: Digital input fail safe considerations

4.11.1 Digital Input HOA

Hand, Off, Auto (HOA) represents a traditional mechanical switch to ensure that only one of the three modes function at one time. The UniConn HOA functions on the keypad already emulate this operation. Review section 4.1.7: Mode of Operation for details. Alternately the digital input may be configured to operate as a HOA permitting the use of traditional mechanical switches.

The digital input Hand, Off, Auto operational features are summarised in Table 4-13.

Table 4-13:

HOA Function	Description
NORMAL	The digital input is configured for normal operation. HOA mode is disabled. See section 4.11: Digital Input.

HOA Function	Description
START	Momentary closure on any digital input configured for START will place the UniConn in START mode provided the UniConn is in HAND or AUTO mode and no alarms are present. If the UniConn is in a lockout condition, activating a START will first clear the lockout, a subsequent START will place the UniConn in START mode. Latched alarms are automatically cleared during a START. Maintenance Bypass mode can be activated if START is held closed more than 5 seconds. If digital inputs are used for HAND and AUTO mode selection and there is a requirement to toggle between these modes, this can be done by holding in START while switching modes. **Note** Recommendation is to not configure more than one input for START. Once a digital input is configured for START, normal digital operation (Alarming and Restarting) for that input will be disabled. START from the UniConn’s keypad will function normally when using START from digital input. START from digital input is activated by closing the circuit and cannot be configured to START on open circuit.
HAND	Closing the circuit will place the UniConn in HAND mode and override HAND/AUTO control from the UniConn’s keypad. Once a digital input is configured for HAND, normal digital operation (Alarming and Restarting) for that input will be disabled. HAND mode can only be activated by closing the circuit and cannot be configured to activate on open circuit **Note** Only one digital input should be configured for HAND mode. When HAND is not activated (open circuit) and AUTO mode is not activated, the UniConn will be placed in MANUAL OFF mode.

HOA Function	Description
AUTO	Closing the circuit will place the UniConn in AUTO mode and override HAND/AUTO control from the UniConn's keypad. Once a digital input is configured for AUTO, normal digital operation (Alarming and Restarting) for that input will be disabled. AUTO mode can only be activated by closing the circuit and cannot be configured to activate on open circuit. **Note** Only one digital input should be configured for AUTO mode. When AUTO mode is not activated (open circuit) and HAND mode is not activated, the UniConn will be placed in MANUAL OFF mode.

See section 5.7: Digital Input HOA for sample wire connection details.

4.11.2 Digital Input Alarm

The UniConn digital inputs have been designed to survive wiring faults and high voltage transients. There are two digital alarms:

Alarm Label	Description
U_IO_PFail	Indicates that a short to ground has occurred somewhere on the digital inputs (DIGITAL IN pin 22 to 27). With this alarm active, the entire digital input system may be effected as the digital power (DIGITAL PWR pin 21) is shared amongst all inputs.
U_IO_V_HI	Indicates that a high voltage fault exists somewhere on the digital inputs (DIGITAL IN pin 22 to 27). This may be due to a wiring fault where high voltage or AC voltage has been connected to the digital input.

4.12 Analog Output

The UniConn contains two analog outputs with a 12 bit digital to analog converter. Each of these outputs operate independently to control the 0–20mA loop current. The UniConn can optionally provide power for the loop current. See 3.1: UniConn for details.

Note
The UniConn Analog PWR output pin is current limited and cannot provide power to remote devices. The UniConn provides the power for 4–20mA control loop only.

The two analog output channels can be used for external control of devices such as an electronic valve or meter. The range and scale settings for the analog outputs operate in a similar manner to the analog inputs.

The analog outputs operate in the range of 0-22mA and can be configures to operate in 4–20mA, 10–15mA, etc. The UniConn provides 24 VDC, 'ANALOG PWR' (PIN 28) to power the current loop, or an external power supply may be used. Each output contains over-voltage protection which activate in the 20 to 24 VDC range so the external power supply must operate below this value. The analog output is ground referenced so the UniConn must be installed as the last element in the current loop. A block diagram of the analog outputs is shown in Figure 4-21.

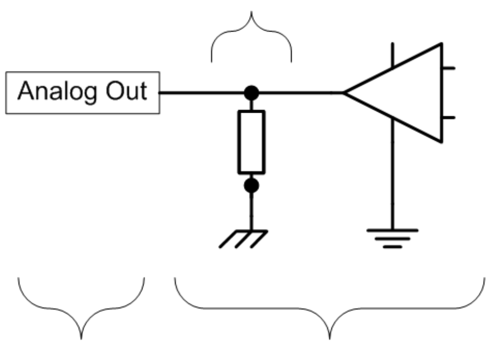


Figure 4-21: Analog output block diagram

The UniConn analog outputs have an accuracy of 5% and if necessary can be calibrated to 0.1% using an accurate multi-meter. Each output can be scaled from 0% to 100% to match engineering units scaled from 0 to 65535 data points. 0% represents 0mA and 100% represents 20mA. The output can be over-range set to 110% for alarm purposes.

Each analog output can be configured with the parameters shown in Table 4-14.

Table 4-14: Analog Output Settings

Parameter	Description
Name	Name of the data type, i.e. Pressure, temperature, Temp1, etc.
Source	Parameter that drives the analog output value, i.e. Analog In 1, Power Factor, etc. see Table 4-15.
Scaled Maximum	Maximum reading of the device in engineering units, i.e. 200 PSI
Scaled Minimum	Minimum reading of the device in engineering units, i.e. 0 PSI
Raw Maximum	Configuration setting on the UniConn to map to Scaled Maximum
Raw Minimum	Configuration setting on the UniConn to map to Scaled Minimum

The 'Name' parameter can be used to change the name of the analog output channel to something more descriptive on the display. For example, average voltage might be labeled 'Avg Volts'. The maximum number of characters possible is ten.

The 'Source' parameter represents analog outputs that may be bound to the parameters shown in Table 4-15. In this manner live data may be mapped to auxiliary displays or other devices.

Table 4-15: Analog Output Source Settings

Remote input	Manual setting of the analog output using the set point. This can be performed using the keypad, StarView or remote SCADA.
Analog 1 to 4	UniConn analog output can be mapped to the UniConn analog inputs.
Fixed Speed parameters	Power factor, Average Volts, Average Amps, etc.
VSD parameters	Variable speed drive parameters such as Run frequency, etc.
DHT	Downhole tool interface card parameters such as Pump intake pressure, Bottom hole temperature, Vibration, etc.

The 'Scaled Maximum' and 'Scaled Minimum' parameters are used to set the Engineering units the user wishes to see within the bounds of 0% and 100%. These Engineering units may represent pressure, temperature, voltage, current, etc.

The 'Raw Maximum' and 'Raw Minimum' parameters are used to set the 0-20mA range and equate to 0–100%. The parameters are expressed as a percentage of the maximum current. Similar to the analog inputs, the analog outputs can be scaled to the desired output within 0-20mA or 0-22mA over-range.

The configuration of these outputs can be performed using the UniConn interface or the StarView program utility.

4.12.1 Loop Topologies

The UniConn analog outputs can control a variety of external devices such as panel meters, valves, etc. using a 4-20mA control loop. The connection options of these devices are detailed below.

Figure 4-22 shows a basic device connection. This example would represent a display panel with a dial. The UniConn provides power to drive and control the 4-20mA loop.

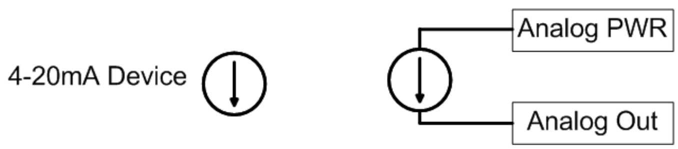


Figure 4-22: Analog Output Single Device

Figure 4-23 shows an external power supply which provides power to the 4-20mA device. The external device requires power to function. The UniConn provides power to drive and control the 4-20mA loop, but not operational power for the device.

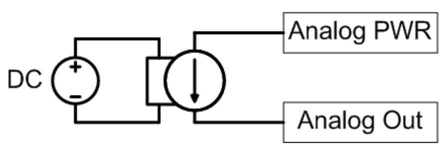


Figure 4-23: Single device with external DC power

Figure 4-24 shows an external power supply which provides power to the 4-20mA device and provides the control power for the 4-20mA loop. The UniConn performs the loop control only.

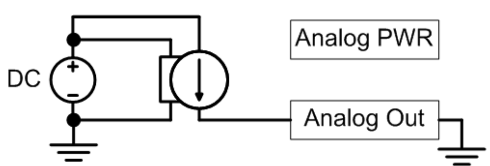


Figure 4-24: External DC power to device and loop

Note

The UniConn internal protection activates in the 20 to 24 VDC range. Therefore the nominal voltage on the analog output pins must not exceed this value.

Figure 4-25 is a similar configuration to the one above with an additional device added. The UniConn performs the loop control which controls two devices.

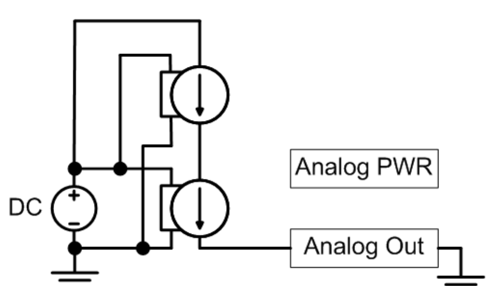


Figure 4-25: Multi device DC power to device and loop

Caution

Potential Severity: Light
Potential Loss: Assets
Hazard Category: Electrical

In the above two configurations, the UniConn DC ground (BATT – pin 44) and the power supply ground must be common. This cannot be earth ground. If grounds are not common, unexpected loop currents and noise will exist.

4.13 Maintenance Port

The UniConn contains a maintenance port connector located on the front of the UniConn face plate. This port is designed for configuration and commissioning and works best with the software package StarView, a Microsoft Windows-based configuration program.

The maintenance port conforms to EIA/TIA–232–E and connects to a computer via an RS232 serial cable using Modbus protocol. The communications setting for this port are summarised in Table 4-16: Communication parameter summary

Note
The UniConn maintenance port is not designed for SCADA applications as the communications priority is secondary to the expansion ports.

The maintenance port is also used to apply updates to the UniConn firmware. Refer to Appendix D: UniConn Firmware Upgrade for more information.

4.13.1 Serial Port Pass Through Mode

Pass Through mode is when the UniConn passes traffic from one serial port to another, without processing the data which is being passed through. The UniConn is capable of passing traffic between serial ports running at different baud rates, and between RS-232 and RS-485 ports. Please note that any applications/devices using the pass through must take into consideration the fact that the “other” port may be operating with different parameters – the UniConn merely buffers the data and passes it through, so any issues of timing (i.e.: poll delays, etc) must be taken into account. Note that the UniConn assumes that the traffic being passed through will be modbus-like in nature; therefore the maximum number of characters in each discrete transmission should not exceed 263 bytes in either direction.

Note

Please note that the Pass Through Mode does not yet have support in StarView. This presence of this feature does not affect any other functionality of the UniConn, but it should be considered in field trial state. Note that the pass through mode will shut itself down, if the string “abcdef” (case sensitive) is detected in the traffic stream.

4.14 Expansion Ports

The UniConn contains four expansion ports for use with proprietary expansion cards. These cards provide added functionality for communications and downhole tool (DHT) interface. Each port operates independently and can be configured for either RS232 or RS485. Each port has the following communication parameters:

Table 4-16: Communication parameter summary

Parameter	Description
Name	The ‘Name’ parameter is used to give the port a more descriptive name when using a specific expansion card like a downhole tool card or communications card. For example, when using the Communication Card to connect UniConn to a SCADA system, the name could be changed to ‘SCADA’.
Function	The ‘Function’ parameter is used to configure the port for a specific function. See Table 4-17: UniConn Expansion Port options for details.
Site Address	Used to set the address the port responds to or uses to query a card as a master. This address is typically protocol specific. For example, when using Modbus this parameter has a range of 00 to 254.
Baud Rate	This parameter selects the serial port communications speed. It is a discrete list of supported baud rates from 300 to 57600 baud.
Hardware/Parity	Used to set the hardware and parity settings for the communications port. The data format displayed on this screen is: Data Bits, Parity, Stop Bits, Physical Protocol (i.e., ‘8, NONE, 1, RS232’ is a port set to 8 Data Bits, No Parity, 1 Stop Bit, and RS232) The following hardware settings are available: • Data Bits: 7, 8 • Parity: None, Odd, Even • Stop Bits: 1, 2 • Physical Protocol: RS232, RS485 All of these options are selected using the EDIT button and scrolling through all available options. When ACCEPT is pressed the display string will update with the current setting.

Parameter	Description
Prekey Delay	A delay that occurs prior to message transmission. This is usually used for radios that required a key-up time to activate the carrier transmission frequency.
Postkey Delay	A delay that occurs after the message has been sent. The communications channel is not released until this delay has finished.
Access	When operating as a communications slave port, as in a SCADA system, setting this parameter to VIEW-ONLY causes the controller to ignore incoming write commands. Read commands can still gather data from the controller, but the SCADA system cannot be used to change set points or start or stop the motor. Setting this to FULL allows both read and write commands.
Control State	This parameter is used to force the port alarm to active, or clear existing port alarm.

These parameters are used to configure the specific communications settings of the ports. Similar to the maintenance port, these settings can be used to manually adjust all communications properties.

Table 4-17: UniConn Expansion Port options

Port Option	Description
DISABLED	The expansion port is disabled. Any installed card will not be functional for control applications. **Note** Though the communications between the controller and the card will be disabled, the card will still be powered from the UniConn Expansion Card backplane.
MODBUS SLAVE	The port will function as a Modbus RTU slave device for SCADA/espWatcher applications. The 'Site Address', 'Baud Rate', 'Hardware/Parity', 'Prekey Delay', 'Postkey Delay', and 'Allow Incoming Writes' parameters must be configured to work with the SCADA/espWatcher system.
AUTODETECT MASTER	This function is used to support plug-and-play operation of cards where the UniConn acts as the master (i.e., queries the card for data). Certain cards that were designed for plug-and-play operation will function with this setting. Option Port 4 (the rear-most slot) by default is set to this to enable plug-and-play expansion cards.
PHOENIX DHT	For use specifically with the Phoenix Interface Card. This setting enables the operation of specific functions in the UniConn associated with the Phoenix Interface Card to support the family of Phoenix downhole tools.
SWD S3 VSD	For use specifically with the UniConn Communication Card connected to a SpeedStar S3 Sine Wave Drive Variable Speed Drive.

Port Option	Description
SS2K S3 VSD	For use specifically with the UniConn Communication Card connected to a Speedstar 2000+ S3 Variable Speed Drive.
VARISTAR / TITAN VSD	For use specifically with the UniConn Communication Card connected to a SpeedStar Titan or a Varistar Variable Speed Drive (VSD).
FSK TOOL	For use specifically with the FSK Interface Card. This feature changes the UniConn to operate in WellWatcher mode.
SPEEDSTAR MVD	For use specifically with the UniConn MVD Card connected to a SpeedStar Medium Voltage Drive (MVD).
MODBUS TCP/IP	For use specifically with the MODBUS TCP/IP card to connect to Ethernet based TCP/IP networks using standard Internet Protocol (IP) addressing. The port will function as a Modbus TCP slave device for SCADA/espWatcher applications. The 'Site Address' parameters must be configured to work with the SCADA/espWatcher system.
SWD S7+ VSD	For use specifically with the UniConn Communication Card connected to a SpeedStar Toshiba S7+ Sine Wave Drive Variable Speed Drive.
SS2K S7+ VSD	For use specifically with the UniConn Communication Card connected to a Speedstar 2000+ Toshiba S7+ Variable Speed Drive.
EXTREME DHT	For use specifically with the Extreme DHT card. The setting enables the operation of specific functions in the UniConn associated with the Extreme DHT interface Card to support the family of Extreme downhole tools. This function is only supported in the Artificial Lift mode and not in RMC applications (UniConn Well Watcher mode). **Note** The Extreme card must be loaded with firmware 1.36 or higher.
MODBUS MASTER	For use with the standard UniConn Communications Card or Modbus TCP/IP Card. The UniConn can be configured to operate as a Modbus Master (MBM). There are 16 analog input channels (1 – 8 can be configured for alarming; 9 – 16 cannot be configured for alarming), 8 analog output channels, 8 discrete input channels, and 8 discrete output channels available. For further information please refer to Appendix K: Modbus Master Functionality.

As more expansion cards are developed, more supported functions will be added to this list.

Each expansion card has specific communication settings. Either RS232/RS485, baud rates, etc. Consult the specific expansion card section for details or InTouchSupport.com.

Note: Two DHT Alarm

The UniConn will detect and alarm on the condition that 2 DHT interface cards are present and/or configured in Artificial Lift configurations. The UniConn can only have one DHT card at any one time in AL mode (i.e.: one of PIC V1, PIC V2, or Extreme). Multiple FIC cards are allowed in RMC applications, so this alarm is only applicable for Artificial Lift installations. There are no user configurable settings for the 2 DHT Alarm.

4.15 Battery

The UniConn contains an internal lithium-ion battery that backs up the power to the Real-Time Clock (RTC) and Static Random Access Memory (SRAM). The battery is used by the RTC and SRAM only when power to the UniConn has been removed. The battery has an expected lifetime of greater than 5 years on standby and should normally not need to be replaced during the lifetime of an operating controller.

For maintenance information see section 8.3: Battery

The SRAM stores the user configurable settings of the UniConn. The user settings which are lost during battery removal, when the UniConn not powered, are summarised in Table 4-18. In StarView the parameters are shown in Figure 4-26.

Table 4-18: UniConn parameters lost during battery removal

Parameters	Details
Time of day	Resets to chip factory default on battery loss.
Log	All log entries
Operational statistics	Overall Run time, Overall Off Time, Shutdown Cause, Auto Restart Time, etc Random values on battery loss.

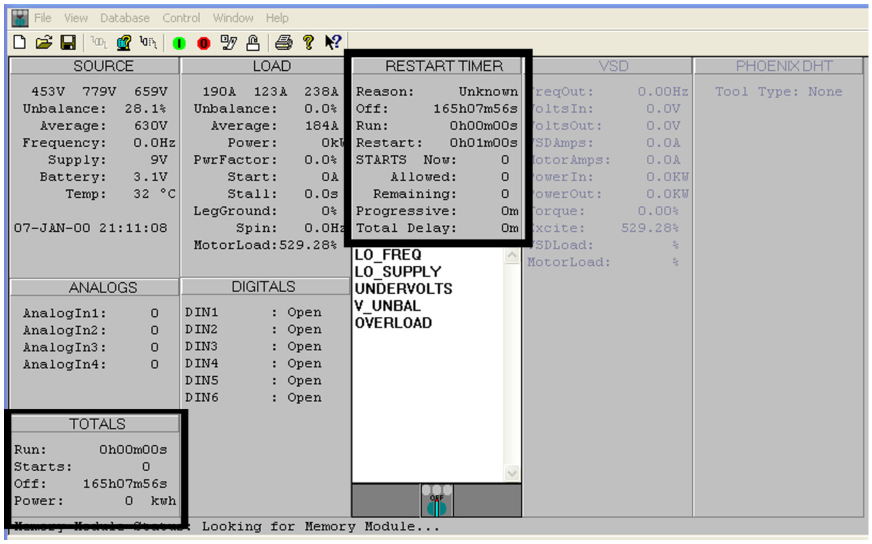


Figure 4-26: StarView lost battery parameters

Note

Upon restoration of power, all the registers that do not have default values associated with them will contain random values. A "Clear All Statistical and Log History" is strongly recommended to reset these registers. Clearing of the History cannot be performed from the UniConn keypad but using StarView.

4.15.1 Low Battery Alarm

The UniConn constantly monitors the voltage on the battery and will generate a battery alarm once the battery voltage exceeds a specific operating range.

Alarm	Description
U_BATTERY	Indicates that the battery voltage has exceeded a specific operating range detailed below. The battery should be replaced. • Battery voltage greater than 4.0V will generate an alarm. Voltage higher than 4.0V are displayed as 0V on the UniConn as this may also indicate a disconnected battery. • Battery voltage less than 2.5V will generate an alarm.

Caution

Potential Severity: Light
Potential Loss: Environmental
Hazard Category: Electrical

Consult the QHSE section for information on the battery.

4.16 Temperature

The UniConn is designed to operate in a wide temperature range. The temperature specifications are shown in section 3.1: UniConn. The **Temperature Operating CE/CSA Compliant** indicate the operating range required in order to maintain certification. The **Temperature Operating Absolute Maximum** indicates the operating temperatures that may jeopardise the reliability of the UniConn.

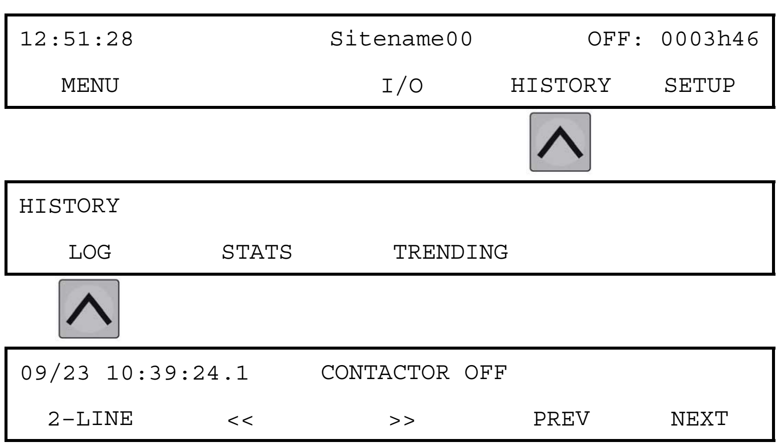
The UniConn contains an internal temperature sensor and an alarm.

Alarm	Description
U_TEMP	Indicates that the operating temperature of the UniConn has exceeded temperature boundaries. • -40 deg C or below will initiate the alarm • + 85 deg C or higher will initiate the alarm.

Note
The UniConn will continue to operate with the alarm active. The alarm is a notification indication only.

4.17 Event log

The UniConn Event Log is designed to maintain a record of recent UniConn activity. These events can be user parameter changes, user activity, analog I/O changes, alarms, starts, shutdowns, etc. The log is stored in internal memory and will wrap to the start of memory once the log space is full. Optionally the event log can be manually cleared. Below shows the log screens.



```
09/23 10:39:24.1   CONTACTOR             OFF
09/23 10:39:24.1   UNDERLOAD LOCKOUT     SHUTDOWN
```

The top line of the display shows the current log record. Each event is logged with a date and time. The time-stamp logs events to 1/100th of a second to capture the order the events occurred. The **NEXT**and **PREV**keys are used to scroll through the log one event at a time.

The log screens can operate in two modes. One line or two line mode is changed using the **2–LINE** key. The last screen above shows the two modes of viewing. The key labels are not visible in two-line mode. Each of the five keys are used for the same function in as in the one-line log display. Pressing the ‘2-LINE’ key again will revert the display back to one-line.

The **>>** keys are used to quickly scroll up or down eight events at a time.

4.17.1 Alarm Logging

Only alarms with the alarm action parameter set to **LOG**or **LOG+STOP** are logged. An alarm that is set to **STOP** will be logged if it is the cause of a shutdown.

Alarm logging events occur when the alarm condition is entered (a set point is violated). The length of time the alarm condition was active and the magnitude of the violation are logged as part of the event for certain alarms. If the alarm did not clear before the alarm time parameter timed out the alarm will cause a shutdown that will be logged immediately following the alarm condition log entry.

The following list shows an example sequence of logged events:

Log Screen	Description
09/21 20:05:00.0 CONTACTOR ON	The contactor was turned ON, either from a start key press, an automatic restart, or a remote SCADA command.
09/21 20:05:00.1 UNDERLOAD ALARM	The underload condition was detected by the controller and logged.
09/21 20:05:08.1 CONTACTOR OFF	The alarm never cleared and the alarm time timed out. The controller turned the motor contactor OFF.

Log Screen	Description
09/21 20:05:08.1 UNDERLOAD SHUTDOWN	The underload condition is entered into the log as the cause of the shutdown.
09/21 20:05:08.1 UNDERLOAD LOCKOUT	A controller is put into lockout. This occurs when the number of restarts that failed due to this alarm has reached the restarts parameter count.

If an alarm condition is entered but clears prior to the alarm time being reached, the event log will look like the following:

09/21 20:05:08.1 LO_SUPPLY 0.4s 89	The supply voltage dropped below the low set point for 0.4 s. A magnitude of 89 V was recorded as the low point.

Note

Some analog measurements can vary in magnitude. If the alarm set points for the analog value are set too close, the log can be filled with events as the alarm condition is continually entered and cleared. To prevent this, alarm set points can be raised or reduced to widen the acceptable range of values.

4.17.2 Log Parameter Changes

Parameter changes by the user are also recorded in the event log. However, since it is not possible to store a descriptive tag name with every parameter, the telemetry location is used to identify the parameter. Telemetry locations are identified by **[ ]** brackets.

09/28 14:38:37.0 [30267]= 13	Parameter #30267 in the telemetry tables, the analog input 1 low set point, was changed to a value of 13.

For parameters with discrete lists the list position is recorded. The telemetry reference can be used to interpret the list items.

4.18 Statistics

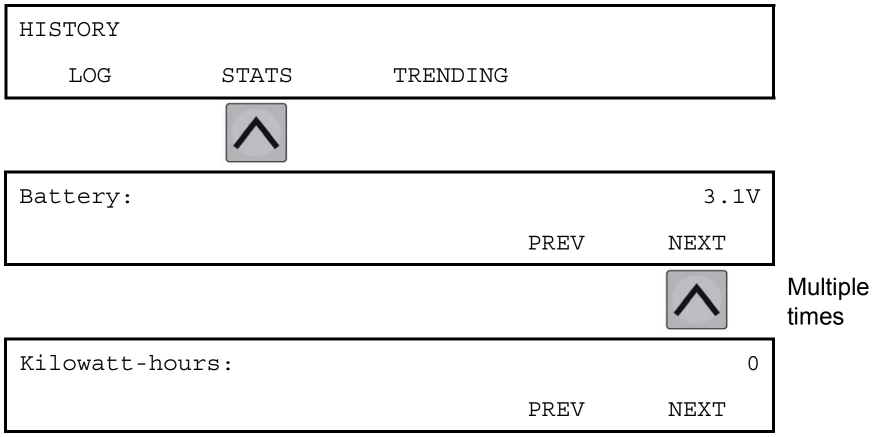
The UniConn contains statistics on the health and cycle operation of the system. See Table 4-19 for a summary. These parameters represent the present state of operation of the UniConn.

Table 4-19: UniConn Statistics menu summary

Parameter	Description
Battery	Battery voltage of the UniConn internal battery. This battery provided backup power to the real time clock (RTC) and ram memory. Typical values are 3.0V to 3.3V.
Internal Temp	The temperature inside the UniConn.
Shutdown Cause	This parameter displays the cause of the last shutdown and the timer delay until the next automatic restart.
Starts	This parameter shows the current automatic restarts counter, the total number of allowed starts until lockout and the remaining starts allowed until lockout.
Progressive Time Delay	This parameter is shows the delay with each automatic restart. This allows a longer time for an alarm condition to clear after an attempted restart failed on this alarm.
Overall Run Time	The total time the controller has spent with the Contactor Relay ON.
Overall Off Time	The total time the controller has spent with the Contactor Relay OFF.
Overall Starts	The number of starts the controller has had since commissioning. This represents the number of starts the pump and motor have gone through, an indication of the wear on the equipment that affects its run life.
Cycle Run Time	The time spent during the last ON cycle.
Cycle Off Time	The time spent during the last OFF cycle.
Kilowatt Hours	Monitors the power of the system for an approximation of the operating costs. **Note** The controller measurements have not been certified for measurement of power consumption for power billing purposes. This is an estimation only.

The Statistics screen is viewed on the UniConn as shown below.

```
12:51:28            Sitename00        OFF: 0003h46
   MENU                   I/O       HISTORY     SETUP
```



Statistics screens

4.19 Miscellaneous Settings

The UniConn has some basic configuration screens for security, UniConn name, preferred units, etc. These parameters are summarised in Table 4-20.

Table 4-20: UniConn basic settings

Parameter	Description
Site Name	This parameter is used to give the controller a unique identifier for each well site or installation location.
Clock	Set the UniConn internal clock.
psi, C,bpd	This parameter sets the preferred display units.
Control Pass Code	See 4.1.13: Security for details.
View Pass Code	See 4.1.13: Security for details.
Edit Pass Code	See 4.1.13: Security for details.
Supervisor Pass Code	See 4.1.13: Security for details.
Screen Time-out	This parameter is used to set the length of time before the display will dim and revert to the Status screen from inactivity. Once a key is pressed, the display will go to full brightness.
Contrast	This parameter sets the level of contrast between the active and inactive pixel states.
Reset to factory defaults	This parameter restores the controller to the set point values it shipped with. All user edits and configuration changes are lost.

4.20 NEMA 3R Enclosure Construction Details

The enclosure is made out of painted galvanized steel and is intended for indoor or outdoor use. The enclosure provides protection against falling rain and any damage against formation of ice. NEMA 3R can be approximated to the IEC Ingress Protection rating of IP 32, for installation outdoors on-shore in non-hazardous areas. Refer to Figure 4-27.

Figure 4-27: UniConn NEMA 3R

4.21 NEMA 4X Enclosure Construction Details

The enclosure is made out of 316 type 4 stainless steel and is intended for indoor or outdoor use. The enclosure provides protection against corrosion, windblown dust and rain, splashing water, hose-directed water, and damage from external ice formation. NEMA 4X can be approximated to the IEC Ingress Protection rating of IP 56, for installation outdoors on/off-shore in non-hazardous areas. Refer to Figure 4-28.

Figure 4-28: UniConn NEMA 4X

4.22 Variable Speed Drive

Variable speed motor control uses a variable speed drive (VSD) to control speed/frequency of the motor. The UniConn changes modes to operate as a VSD controller. All the motor protection requirements are set using the UniConn and using the feedback from the VSD the UniConn performs the motor protection. The available voltage and frequency can be changed by the VSD. In the event a VSD trip situation occurs the VSD turns off the output. In the event the UniConn detects a trip condition, the VSD is instructed to turn off the output. Figure 4-29 shows a simplified block diagram of a UniConn VSD system.

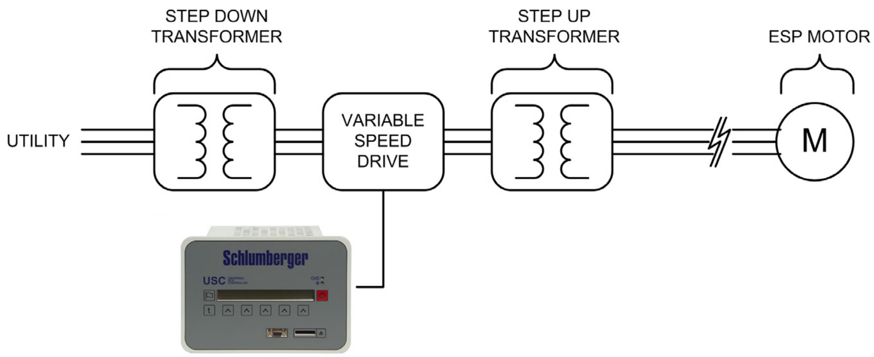


Figure 4-29: UniConn VSD interface

The UniConn uses a serial communication cable to interface to the VSD. A communications card is required which is inserted into one of four slots in the UniConn.

Warning

Potential Severity: Serious
Potential Loss: Assets
Hazard Category: Electrical, Machinery equipment hand tools

The UniConn can operate as a fixed speed motor controller or a variable speed motor controller. Configuration parameters exist for both modes of operation and care should be taken not to confuse the two types. Ensure motor protection parameters for VSD are used when operating with a VSD. Vice-versa for fixed speed motor control.

4.22.1 Variable Speed Drive Controls

The variable Speed drive (VSD) is a self contained drive system controlled by the UniConn. The UniConn accepts operation / configuration parameters via the keypad, SCADA or StarView and sends these parameters to the VSD. Table 4-21 summarises these parameters as viewed on the UniConn display.

Table 4-21: VSD control parameters

Parameter	Description
Ramp Frequency	The **Ramp Frequency** is used to calculate the acceleration / deceleration times during operation. This parameter sets the frequency at which the **Acceleration Ramp Time** and **Deceleration Ramp Time** parameters occur. The **Ramp Frequency** is fixed at 90.00Hz and cannot be changed.

Parameter	Description
Maximum Speed	The maximum speed is used to set the upper operating frequency limit. The VSD will not operate above this limit. This parameter cannot be changed while the VSD is running. For fields or wells with 60 Hz power, the speed should be set as Equation 4-2. For fields or wells with 50 Hz power, the speed should be set as Equation 4-1 – i.e., conditions where motor loading reaches 100%. Load HP includes HP consumption of pump, protector, intake/gas separator and gas handling device (AGH/Poseidon – when used). **Equation 4-1:** $50 \text{ x } \sqrt{(\text{Motor HP at 50 Hz/Load HP at 50 Hz})}$ **Equation 4-2:** $60 \text{ x } \sqrt{(\text{Motor HP at 60 Hz/Load HP at 60 Hz})}$ **Note** An applications Engineer should be consulted to verify the above calculations are applicable to the ESP system as a whole.
Minimum Speed	The minimum speed is used to set the lower operating frequency limit. The VSD will not operate below this limit except when performing a ramp from a start or to a stop. This parameter cannot be changed while the VSD is running.
Target Speed	This setting allows adjustment of the desired VSD / motor running frequency in Hertz. When the VSD is running, changing this setting ramps the VSD to the new frequency as soon as the ACCEPT key is pressed. The ramp rate depends on the acceleration / deceleration settings. This screen is also accessible from the live values screen in the motor table.
90 Hz Accel Ramp Time	This parameter sets the time to accelerate from 0 Hz to the **Ramp Frequency**. Target speed changes are affected by this value. 90 Hz represents the maximum frequency. *Acceleration time to x Hz (seconds) = Accel Ramp Time * (x – Start-Up freq.)/Ramp freq.*
90 Hz Decel Ramp Time	This parameter sets the time to decelerate from the **Ramp Frequency** to 0 Hz. Target speed changes are affected by this value. 90 Hz represents the maximum frequency. *Deceleration time to x Hz (seconds) = Decel Ramp Time * (x / Ramp freq.)*
Base Speed	This value sets the frequency at which the maximum output voltage of the VSD is output. The Volts/Hertz curve for the VSD is constructed using these parameters. • Base Speed • VSD Base Frequency Voltage Selection (for applicable VSDs) • Fixed Base Voltage

Parameter	Description
VSD Base Freq Volt Sel	The **VSD Base Frequency Voltage Selection** parameter determines how the output voltage of the VSD behaves. The following three options are available for the **S3**: • Input: The output voltage tracks the input voltage to the VSD. ESP applications typically use this setting. • Fixed: The VSD maintains a fixed output voltage according to the **Fixed Base Voltage** parameter. For the **SpeedStar S7+/VariStar ST7**: This parameter Enables/Disables the Voltage Compensation function. This function provides an output waveform adjustment that compensates for changes in the input voltage.
Base Voltage	**S3** - This parameter sets the output voltage of the VSD when the **Base Frequency Voltage Selection** is set to **Fixed**. **S7+** - This parameter sets the maximum value of the output voltage of the drive. With Voltage Compensation disabled, this value is the output voltage at the base frequency. Regardless of the programmed value, the output voltage cannot be higher than the input voltage. The actual output voltage will be influenced by the input voltage of the VSD and the Supply Voltage Compensation setting above. See InTouch ID# 5709381 for more details on voltage compensation. **MVD** - Sets the value for motor rated voltage and the voltage at the base speed.
PWM Carrier Freq	**S3/S7+/ST7** - This PWM Carrier Frequency sets the pulse width modulation (PWM) carrier frequency (the frequency at which the VSD transistors switch). This parameter can be changed while running on SS2K VSDs. This parameter is fixed and cannot be changed on SWD VSDs to protect the SWD filter. **MVD** - The carrier freq is fixed and cannot be changed with or without a SW filter.
V/Hz Pattern	**S3/S7+/ST7** - The Volts/Hertz Pattern selects one of six different voltage/frequency characteristics for motor control. For ESP applications the setting 'Constant Torque' is recommended. • Constant Torque • Variable Torque • Automatic Torque Boost • Automatic Torque Boost with Energy Savings • Vector Control • Vector Control with Energy Savings This is a feature of the VSD drive and the VSD manual should be consulted for further details. **MVD** - • Constant Torque • Square Function - This values for this pattern need to be set using WiTool. • Five Point - The values for the 5 points need to be set using WiTool **Tip** For ESP applications the setting "Constant Torque" is recommended.

Parameter	Description
Startup Frequency	This setting controls the frequency at which the inverter begins to operate during a start. The VSD starts at this frequency and ramps to the **Target Speed**. This parameter can be set between 0 and 10 Hz, and is typically set to around 7 Hz for ESP applications. **Warning** Potential Severity:Serious Potential Loss: Assets Hazard Category:Electrical, Machinery equipment hand tools For DHT applications where a three-phase choke is used with the DHT interface card, setting this frequency too low may result in damage to the DHT interface card.
Startup Voltage Boost	This parameter controls the amount of voltage added to the starting voltage to provide increased torque for acceleration. For LV VSDS you may change voltage Boost anywhere from 0–30%. MVDs are limited to 0–10%.
Catch A Spinning Motor	This setting allows the VSD to start safely into a spinning motor (either forward or reverse direction). The VSD will detect the rotation speed and adjust the VSD output voltage and frequency to match before applying power.
Stop Mode	This parameter controls how the VSD stops the motor in a shut down. The two options are: • Coast: Power is removed from the motor allowing it to coast to a stop. • Decel: The VSD powers the motor to a controlled stop according to the **Ramp Frequency** and **Deceleration Ramp Time**.
Rotation Direction	This parameter allows the VSD to run in the opposite direction. This can be toggled between ‘0’ and ‘1’ to change the rotation from the previous operating condition. This is used during commissioning in the event the pump operates backwards, to avoid having to make wiring changes. The change to the rotation direction takes effect on the next start. The **Rotation Direction** is also controlled by **Reverse While Running**.
Reverse While Running	This is a one-shot parameter used to reverse the direction of motor operation while the VSD is running. The VSD will decelerate and start in the other direction automatically. The **Rotation Direction** parameter will automatically be changed to indicate the new direction.
Accel/Decel Pattern	The **Acceleration / Deceleration Pattern** sets the acceleration and deceleration patterns used to ramp up/down the frequency according to the acceleration and deceleration times on the voltage / frequency curve. The following options can be selected: • Linear (recommended for ESP applications) • S-Pattern **Danger** Potential Severity:Major Potential Loss: Assets Hazard Category:Electrical Consult InTouch before using a pattern other than 'linear'

Parameter	Description
VSD Thermal OL	This parameter sets the thermal overload protection level for the motor. **S3** - This is adjustable from 10% to 100% of the VSD rated current. **S7+/ST7** - This feature can only be turned ON/OFF
VSD Thermal Stall	**S3/S7+/ST7** - This setting controls the activation level of the stall protection. It is adjustable from 10% to 200% of the rated VSD current. When the stall level is reached the VSD will begin stalling by lowering the frequency and voltage to prevent overcurrent tripping. If the stall does not clear within the time limits of the VSD a trip will occur **MVD** - This setting is triggered due to an overload or high temperature. When turned on and the conditions are present the drive will decelerate the motor speed to the value set in overload speed reduction level to protect the equipment against overload. If the stall does not clear within the time limits of the VSD a trip will occur.
Overload Speed Reduction level	**MVD** - This setting sets the speed reduction level as a percentage when Thermal Stall is ON.
Speed Force	This feature is used to force the VSD to operate at a specific frequency during an event captured on the UniConn digital inputs. For details see section 4.22.2: Speed Force.
Rocking Starts	This feature rotates the motor in short bursts in the even of a stuck motor or heavy load. For details see section 4.22.3: Rocking Start.
VSD Jump Frequency VSD Jump Width	These screens allow setting of up to 3 frequency bands that act as dead zones for the **Target Speed.** For details see section 4.22.4: Jump Frequency.
Feedback	Feedback Parameters For details see section 4.22.5: Feedback.
Extended Ramp	This feature permits customizing the ramp rate beyond the capability of the VSD. For details see section 4.22.6: Extended Ramp Rate.
TypeForm Reset	Reset the VSD to the VSD factory defaults.
VSD Information	These screens contain information on the VSD. These are viewable parameters only. This is typically used for troubleshooting purposes.

Operating parameters are summarized in Table 4-22.

Table 4-22: VSD operating parameters

Parameter	Description
VSD Frequency	This is the VSD run frequency, i.e. the frequency output by the VSD. This should typically be the same as the **Target Speed** while the VSD is running, although the value will change as the VSD ramps up or down.

Parameter	Description
VSD Load	This is the live value of the VSD output current and the percentage loading of the full rated VSD output current. The current is an average of all three of the VSD phases measured by the drive and displayed by the UniConn. There are no UniConn alarms associated with this parameter. Alarming is performed using the **VSD Motor Amps**.
VSD Motor Amps	This screen displays the calculated value of the current delivered by the VSD to the motor. This value is calculated from the VSD Drive Amps read from the drive and the VSD Transformer Ratio. Two alarms are associated with this parameter: • VSD Underload (VSD UL) Typically set to 85% of nominal operating current. Setting this value is subjective as there are dependencies on pumping fluid. However, VSD Underload should not be less than 60% of motor nameplate current. • VSD Overload (VSD OL) Typically set to 110% of nominal operating current. Using a VSD, there is no issue with motor inrush currents. These two alarms use the standard UniConn alarm configurations detailed in section 4.3: Alarms. The VSD Overload alarm uses an inverse time curve. For proper operation these parameters require the output transformer ratio to be set. The VSD can only monitor the output power which is not necessarily the motor power if a transformer is used. The UniConn can provide the motor protection taking into account the transformer ratio.
VSD Voltage	The UniConn displays VSD voltage which represents the incoming RMS voltage to the drive and the output RMS voltage. The output voltage will vary during motor operation.
VSD Power	The UniConn displays VSD Power which represents the incoming power to the drive and the output power to the motor. The output power will vary during motor operation
VSD Alarm Control	VSD Alarm Control provides access to settings that control how the UniConn acts on alarms from the VSD and on the communication link between the UniConn and VSD. VSD alarms are detailed in Appendix C.13.1: Low Voltage (LV) VSD Shutdown Codes and Appendix C.13.1.1: MVD Shutdown Codes. For more information consult the VSD Operating Manual.

4.22.2 Speed Force

Speed Force is used to force the VSD to change to a specific frequency during an alarm event. The UniConn digital inputs are used as the alarm source.

When the selected digital input goes into an alarm condition the VSD **Target Speed** will change to the **Speed Force Frequency**. If the input alarm clears the **Target Speed** will return to its normal setting. During the change in motor speed the **Accel/Decel Ramp Times** are used.

Note

The speed force function will not work if the associated digital input alarm is set to bypass.

Table 4-23: Speed force

Parameter	Description
Speed Force Source	This sets which digital input is used for the speed force. Digital inputs 1 to 6 are available.
Speed Force Freq	This sets the VSD output frequency / motor speed to use when speed force is activated..

4.22.3 Rocking Start

The rocking start is used to agitate a stuck pump or used during a pump startup in sanded well condition. The rocking start feature once configured, operates only once and must be re-configured if repeat rocking starts are required. The parameters are summarized in Table 4-24.

Table 4-24: Rocking start parameters

Parameter	Description
Rocking Cycles	Rocking cycles represents how many rotation pulses are to occur. This does not represent a change in direction.
Rocking Target Freq	The rocking target frequency represents the frequency the VSD drive will generate for the motor during the rocking feature.
Rocking Method	The rocking method represents different rocking patterns. • 1: STOP – JOG REVERSE – STOP – JOG FORWARD • 2: JOG REVERSE – JOG FORWARD • 3: JOG REVERSE – JOG REVERSE – JOG FORWARD – JOG FORWARD

The **Rocking Method** is performed by the number of **Rocking Cycles** at the frequency set by **Rocking Target Frequency**. Refer to Figure 4-30.

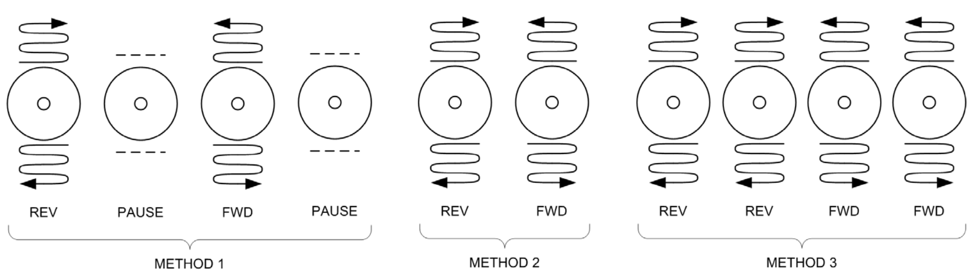


Figure 4-30: Rocking methods

Refer to InTouch Content ID 3928493 for important information on using Rocking Start.

Warning

Potential Severity: Serious
Potential Loss: Assets
Hazard Category: Machinery equipment hand tools

Rocking Start should only be used as a last resort for starting.

4.22.4 Jump Frequency

The jump frequency applies to the frequency zones, or motor speed, where the VSD drive is not to operate. This is used to prevent the VSD from changing to a motor speed that would resonate the ESP pump.

The UniConn can configure up to 3 frequency bands that act as dead zones for the target frequency. The VSD will not operate in these dead bands except during acceleration ramp up on start and decelerate ramp down on stop.

Example

Setting the VSD Jump Frequency to 10 Hz with a width of 2 Hz will result in a dead band from 8-12 Hz.

Table 4-25: Jump frequency parameters

Parameter	Description
VSD Jump Frequency	The centre frequency location where the jump is to occur.
VSD Jump Width	The spread from the centre frequency the dead band occupies.

4.22.5 Feedback

The UniConn provides a feedback feature to control motor speed to attain a target value. Using feedback , the UniConn constantly monitors the feedback data and incrementally changes the VSD output frequency. The rate of change and the amount of change is configurable. During operation the VSD output frequency will fluctuate up and down.

Table 4-26 describes the configuration parameters.

Table 4-26: Feedback parameters

Parameter	Description
VSD Speed Source	• Analog input 1 to 4 as a target. The UniConn will control the VSD speed/frequency based on the value on this input. • Analog input 1 to 4 as feedback. The UniConn will control the VSD speed/frequency to try and match the value of the analog input. • Pump intake pressure for when a Phoenix Interface Card is used. This parameter acts similar to **Analog input 1 to 4 as feedback**. If the intake pressure increases the UniConn can be configured to slow down the VSD. • Pump discharge pressure for when a Phoenix Interface Card is used. This parameter acts similar to **Analog input 1 to 4 as feedback**. If the discharge pressure increases the UniConn can be configured to slow down the VSD. • VSD motor amps. This parameter acts similar to **Analog input 1 to 4 as feedback**. If the motor amps increase the UniConn can be configured to slow down the VSD. • Target speed. Feedback is disabled and the UniConn will control the VSD to match this frequency.
If Feedback Increases	This parameter defines the action the UniConn should perform with a analog input change. The sensor operation may be proportional or inversely proportional with changes to motor speed. So basically, if analog feedback increases, what should the UniConn do?
Feedback Set point	The analog input target value. The VSD will change motor speed to attempt to match the target value. This value is an engineering unit which is defined by the analog input configuration. For details see section 4.10: Analog Input.
Feedback Step Size	This parameter defines by what amount the motor speed should change during each change step. If configured too large for the application the feedback will constantly hunt and exceed the feedback value. If configured too small the UniConn will not be able to maintain control, the feedback data will exceed **Feedback Values** and the system will alarm.
Feedback Step Interval	This parameter defines how often the change step takes place. This time takes into account how long a change in motor speed will take to effect the sensor on the analog input. Configuration considerations are similar to **Feedback Step Size**. **Note** A change in motor speed may take 10 minutes for a pressure change on surface to be detected.
Feedback Values	These parameters set the maximum and minimum range of the feedback window. The UniConn will perform feedback operations within this range. If the UniConn is unable to maintain control within range, the system will alarm. These parameters have no units associated with them as the data type will vary.

Parameter	Description
Feedback Deadband	The deadband is a range of values around the target value for which the UniConn will make no speed adjustments to the VSD. Outside of the deadband range, the UniConn will make an adjustment in an attempt to reach the target value. **Note** Starting with firmware version 1.401r1, the UniConn is able to adjust the deadband of the VSD feedback mode between the range of 0.1% and 10.0%, with a factory default setting of 1.0%. Previous versions of firmware were limited to a non-adjustable 1.0% deadband.

The implementation of the feedback parameters are very flexible and can best be explained with examples.

Example

A remote analog signal on analog input 1 will control the speed of the VSD. The UniConn feedback parameters will be configured as:

Parameter	Configuration
VSD Speed Source	Analog input 1 as target
Analog input 1	Configure to ensure engineering units reflect the engineering units of Hz.
If Feedback Increases Feedback Set point Feedback Step Size Feedback Step Interval Feedback Values Feedback Deadband	N/A

Example

The UniConn analog 1 is connected to a surface pressure sensor. The UniConn is expected to operate the VSD to maintain a specific surface pressure.

The UniConn feedback parameters will be configured as:

Parameter	Configuration
VSD Speed Source	Analog input 1 as feedback.
Analog input 1	Configure the analog input 1 to ensure the input data is converted to engineering units that reflect the pressure readings of the sensor.
If Feedback Increases	If feedback increases (pressure rises) then the UniConn should control the VSD to reduce motor speed.
Feedback Step Size	Configure the UniConn to increment motor speed changes by a specific value.
Feedback Step Interval	Configure the UniConn to perform the **Feedback Step Size** in a specific interval.
Feedback Values	Configure the maximum and minimum pressure values in which the system will operate.
Feedback Deadband	Set the desired deadband value.
Feedback set point	Set the desired operating pressure.

Additional information can be found InTouch Content ID 4193860

4.22.6 Extended Ramp Rate

The extended ramp rate (ERR) is an enhancement to the standard ramp rate available on the VSD. This feature provides the ability to customize a ramp rate far longer than what the VSD can normally provide. The ERR operates in the region between **Min Speed** and **Target Speed**. The VSD will use the standard ramp process from the **Start Up Frequency** to the **Min Speed** then switch to ERR to the **Target Speed**. Table 4-27 summarizes these parameters.

Table 4-27: Extended ramp rate parameters

Parameter	Description
Extended Ramp Rate	Function to enable or disable this feature
Extended Ramp Step Size	The amount the speed/frequency will change during each step. This entry is limited to 0.01Hz ↔ 1Hz.
Extended Ramp Step Interval	The time duration between each step change. This entry is limited to 1s ↔ 1000s.

The **Extended Ramp Rate** target is the **Target Speed**. To calculate the duration of a ramp use the following.

Equation 4-3: VSD ramp time

$$\frac{\textit{Target Speed - Min Speed}}{\textit{Step Size}} \times \textit{Step Interval} = \textit{Ramp Time}$$

To calculate the **Extended Ramp Step Size** and **Extended Ramp Step Interval** based on a target ramp time use the following:

Equation 4-4: VSD ramp time using Step Interval and Step Size

$$\textit{Step Interval} = \frac{\textit{Ramp Time} \times \textit{Step Size}}{\textit{Target Speed - Min Speed}}$$

$$\textit{Step Size} = \frac{\textit{Target Speed - Min Speed}}{\textit{Ramp Time}} \times \textit{Step Interval}$$

For configuration information see section 6.12.3.1: Extended Ramp Rate.

4.23 UniConn Phoenix

The UniConn configured as a UniConn Phoenix performs the following functions:

- Logging and trending of Phoenix Interface Card (PIC) data.
- Provides Human Machine Interface (HMI) for the PIC.
- SCADA interconnectivity for PIC data.
- Alarming of PIC parameters
- Support for PIC generation 1 and PIC generation 2.

Note
The UniConn will only support one installed PIC.

Caution

Potential Severity: Light
Potential Loss: Information
Hazard Category: Electrical

The UniConn when operating with PIC generation 2 requires a minimum UniConn firmware of 1.200r6.

The UniConn interface integrates the PIC functions in to the MOTOR menu screens. The screen access is shown below. This is one of three screens visible during PIC startup. Once the PIC is operating, additional PIC data screens become available before this screen.

```
12:51:28              Sitename00               OFF
  MOTOR       I/O                   HISTORY    SETUP
```

```
Port Func:          1:MBS 2:NONE 3:NONE 4:NONE
                                      PREV      NEXT
```

Mutiple times

```
PIC Status:                                  Tool OK
            I/O                       PREV      NEXT
```

UniConn Phoenix PIC status

During PIC startup the sequence of the status messages displayed by the UniConn is shown in Table 4-28.

Table 4-28: UniConn PIC status messages

Status parameter	Description
No Comms	The UniConn cannot established communication with the PIC. The PIC may be booting.
PIC Reset	The UniConn has sent a RESET command to the PIC. The user can also initiate a RESET command using the UniConn keypad.
Boot Testing	The PIC is performing a self diagnostic.
Initializing	The UniConn provides the PIC the configuration settings.
Tool OK	The PIC is functioning properly.

The UniConn will display additional fault messages, shown in Table 4-29, onto the same status screen. Appendix C.14: UniConn Phoenix Interface Card (PIC) shows the summary of all PIC status messages and registers.

Table 4-29: UniConn PIC error messages

Status Errors	Description
Tool Short	The PIC reports a tool short.
Tool Open	The PIC reports a tool open.
CL Not Set	The PIC reports that CL is not set. See section 4.25.1.5: Current Leakage and section 6.13.3: Configure PIC using UniConn.

Status Errors	Description
PIC Fault	There is a fault in the downhole tool, the link between downhole tool and PIC, or the PIC. **Note** The fault code will be displayed in the log when a “PIC Fault” occurs. Description of fault codes can be found in UniConn Alarms Shutdown Codes (InTouch ID 4104120).

Once the PIC is operating the UniConn will display the detected tool type. See section 4.25.1.2 Tool Types and section 6.13.3: Configure PIC using UniConn for details. The PIC software version is also viewable on the UniConn.

The UniConn can provide additional data which the PIC has not been designed to perform. Additional features provided by the UniConn are:

- Differential pressure calculation. See section 4.23.1: Differential Pressure.
- Rapid sampling mode timer. See section 4.23.2: Rapid Sampling Rate Timer
- Routing/mapping of PIC data to analog outputs. See section 4.23.3: Analog Output Mapping.

4.23.1 Differential Pressure

Differential pressure feature can only be applied to the Phoenix downhole tool family that support two pressures. See Table 4-30. The UniConn performs this calculation, provides configurable alarm set points and avails the data in the Modbus map.

Table 4-30: Differential pressure compatible tools

Tool Types	Pressure Parameters
XT, Select Type 1, Select Standard, CTS Double Pressure	Differential pressure is calculated using: [Discharge Pressure – Intake Pressure]
Select Advance tool	Differential Pressure is calculated using: [Discharge Pressure – Remote 2 Pressure]
Select Lite, CTS Single Pressure, Ultra Lite	Not available

Configuration of differential pressure is detailed in section 6.13.3.4: Differential Pressure.

4.23.2 Rapid Sampling Rate Timer

Rapid sampling rate (RSR) is a function of the Phoenix Interface Card and is detailed in section 4.25.1.6: Rapid Sampling Rate. The UniConn Phoenix provides a timer to disable RSR mode after a pre-configured period.

Note
RSR mode works only with the Phoenix XT family of downhole tools.

Hint
Recommendation is to limit RSR mode to 30 minutes or less to ensure the other DHT sensor readings are updated. During RSR mode the Cz, Cf reference parameters are not used and hence an accuracy drift may occur over time. If left unchecked, the actual monitored data in RSR mode will become inaccurate. Additionally the temperature, vibration, etc are not monitored in RSR mode. See InTouch Content ID 3914646 for further details.

4.23.3 Analog Output Mapping

The UniConn provides two analog outputs which can be configured to output data generated by the PIC. The UniConn can take specific analog data from the PIC telemetry map and output this data to the analog outputs for applications which require PIC data provided as an analog input. See section 4.12: Analog Output for details.

A summary of PIC parameters that can be mapped to the UniConn analog outputs is shown in Table 4-31. Consult the Phoenix DHT manual and section 4.25.1.2 Tool Types for details.

Table 4-31: UniConn Phoenix analog output mapping

Map Parameter	Description
Pump Intake Press	Pump intake pressure.
Pump Discharge Press	Pump discharge pressure.
Pump Flow Rate	Pump flow rate.
BHT	Bottom hole temperature.
TM	Motor temperature.
VIB	Vibration. This represents the single 'X' axis vibration only.

Map Parameter	Description
LkA_HI	Current leakage active. See section 4.25.1.5: Current Leakage for details.

4.24 UniConn WellWatcher

The UniConn configured as a UniConn WellWatcher performs the following functions:

- Logging and trending of FSK Interface Card (FIC) data.
- Provides Human Machine Interface (HMI) for the FIC.
- SCADA interconnectivity for FIC data.
- Alarming of FIC parameters

Note

The UniConn WellWatcher will support up to four installed FIC.

4.25 Expansion Cards

4.25.1 Phoenix Interface Card

The Phoenix Interface Card (PIC) is used to provide an interface between the controller (UniConn, ARConn, SoloConn, SCADA, etc.) and a Phoenix Downhole Tool (DHT). The PIC enables the acquisition, viewing, storage of downhole parameters (pressure, temperature, flow rate, vibration, etc.) from the Phoenix DHT, by the controller. This section describes the operation and readings obtained from the Phoenix DHT.

Figure 4-31: Phoenix Interface Card version 2 (PICv2)

The PICv2 replaces the obsolete PICv1 and adds the following features.

- Dry contact relay output (compatible with SoloConn only)
- Single firmware to operate with all Phoenix DHT equipment
- Real time clock and standby battery
- Standard DB9 serial RS232 engineering port access
- Compatible with all Phoenix DHTs.

The connection diagram Figure 4-32 shows a complete system required to acquire data from a DHT installed with an ESP.

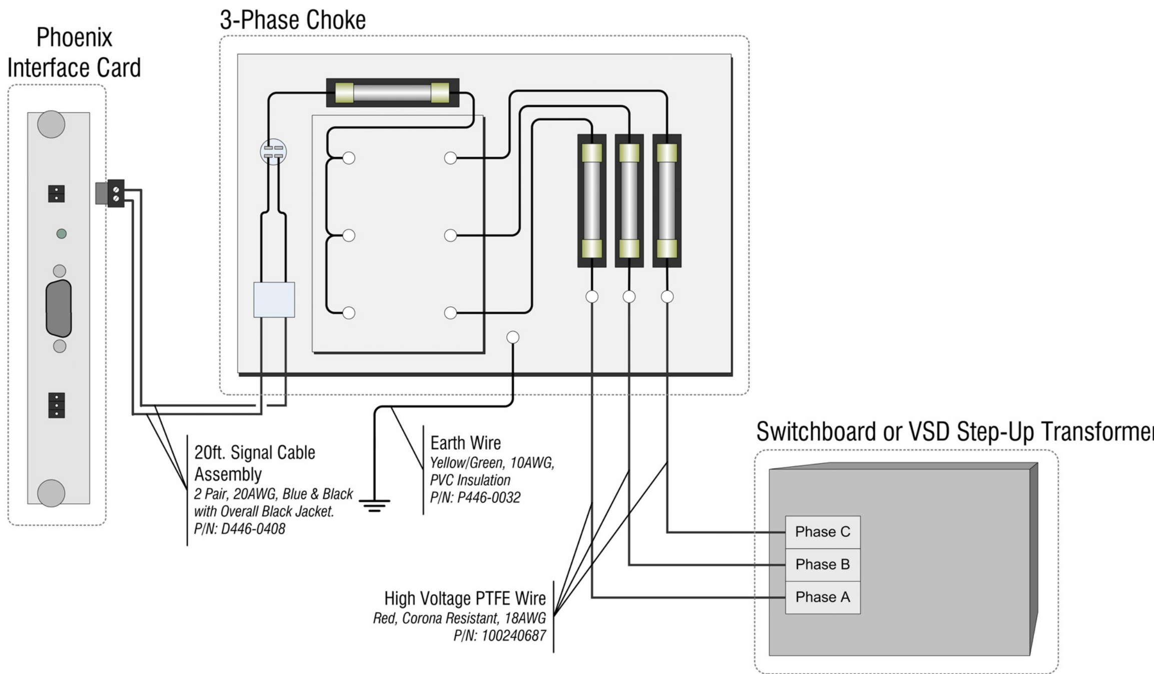


Figure 4-32: PIC Connections Diagram. *ESP System equipped with Phoenix gauges.*

The interface card operates as part of a system. Therefore, it is imperative that the user be familiar with the operation of both the system and the interface card, for both the safety of the operator and the protection of the equipment.

4.25.1.1 Functional Overview

Upon power up the PICv2 cards conduct an internal diagnostics. This is observed by the audible clicks emitted by the relay switching the calibration circuit. Once calibration is complete, the PICv2 generates approximately 100 VDC onto the downhole tool (DHT) output with a current output limited to maximum 30mA. This 100 VDC not only energizes the DHT but provides a return path for the communications system.

The constant current generated by the PICv2 is modulated by the DHT to generate the data packet. The PIC deciphers this modulation into engineering values. The DHT can take approximately one minute to generate the initial data packet.

Note

The surface equipment may need to receive 2 or 3 packets before displaying valid data to the user.

Periodically the PIC reverses the 100 VDC to -100 VDC. This reverses the current in order to conduct cable integrity measurements. For many Electric Submersible Pump (ESP) applications a choke is used to superimpose the power / signal onto the 3-phase power system, allowing the same cable that provide motor power to carry the data from the DHT. Some DHT applications use a dedicated cable to surface (CTS) and most likely do not require a choke.

4.25.1.2 Downhole Tool (DHT)

Tool Types

The PIC design has evolved over time and can support both analog and digital Phoenix tool types. The PICv2 can interface to a wide range of tools listed below.

- Axia gauge
- Phoenix MultiSensor XT
- Phoenix UltraLite
- Phoenix xt150
- Phoenix Select
- Phoenix CTS

The following tool types are not compatible with the PIC:

- PSI, DMT, DMST family of downhole tools
- Surveyor
- PumpWatcher

Phoenix DHT Summary

A summary of the tool and sensor options is show in Table 4-32.

Table 4-32: Phoenix Sensor Summary

DHT Type	**MultiSensor XT**		**xt150**		**Phoenix Select / CTS**					
	XT-0	**XT-1**	**Type-0**	**Type-1**	**Lite**	**Standard**	**Advance**	**CTS-1p**	**CTS-2p**	**Ultra-Lite**
Select Tool Type	**N/A**				**0**	**2**	**3**	**4**	**5**	**6**
Pump Intake Pressure	x	x	x	x	x	x	x	x	x	x
Bottomhole Temperature	x	x	x	x	x	x	x	x	x	
Pump Discharge Pressure		x		x		x	x		x	
Pump Discharge Temperature						x	x		x	

DHT Type	MultiSensor XT		xt150		Phoenix Select / CTS					
	XT-0	XT-1	Type-0	Type-1	Lite	Standard	Advance	CTS-1p	CTS-2p	Ultra-Lite
Select Tool Type	N/A				0	2	3	4	5	6
Pump Discharge Flowrate										
Motor Winding Temperature	x	x	x	x	x	x	x			x
Motor Star-Point Voltage					x	x	x			
ESP DC Active Current Leakage	x	x	x	x	x	x	x	x	x	x
ESP DC Passive Current Leakage	x	x	x	x	x	x	x	x	x	x
Cz	x	x	x	x	x	x	x	x	x	x
Cf	x	x	x	x	x	x	x	x	x	x
Pump / Motor X-axis Vibration	x	x	x	x	x	x	x	x	x	x
Motor Y-axis Vibration					x	x	x	x	x	
Motor Z-axis Vibration					x	x	x	x	x	
Remote-1 X-axis Vibration						x	x			
Remote-1 Y-axis Vibration						x	x			
Remote-1 Z-axis Vibration						x	x			
Remote-2 Pressure							x			
Remote-2 Temperature							x			
Remote-2 X-axis Vibration							x			
Remote-2 Y-axis Vibration							x			
Remote-2 Z-axis Vibration							x			

4.25.1.3 DC Power

The DHT selection for the PICv2 is varied and thus the power requirements are slightly different for each tool. Depending on the tool type chosen, the PICv2 will change the power output to suit the tool. Table 4-33 shows the power requirements for each tool type.

Table 4-33: DHT Power Requirements

Tool Type	Tool Power Normal (mA)	Telemetry Power (mA)	Tool Power Total (mA)	Tool Voltage (VDC)
MultiSensor XT	10	8	18–21	100
UltraLite	16–21	2–4	21–25	100
10 bps CTS	16–21	2–4	21–25	100
12.5 bps CTS	26–28	2–4	28–32	105
Select	16–21	2–4	21–25	100
xt150	16–21	2–4	21–25	100

Note
Maximum DHT power = Tool Power Normal + Telemetry Power.

The PICv2 provides the DC power which passes through the choke onto the 3-phase AC power system. The entire 3-phase AC power system is offset by the DC volts. Figure 4-33 shows the 3-phase AC power (phase A, B and C) as what the user would measure in the field.

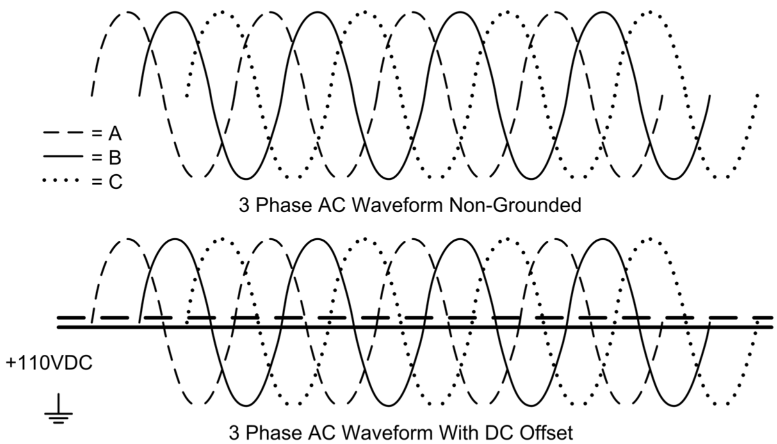


Figure 4-33: 3 Phase Power Offset by DC

The DC offset has no effect on the 3-phase power system. The AC power loop stays within the 3-phase AC system and the DC power loop stays within the DC power system. This works as long as the AC system remains non-grounded.

The PICv2 contains current limiting circuitry to limit current to 30 mA that can be pulled by the DHT. Current used beyond the tool power and telemetry power can be attributed to the 3-phase power system cable leakage or other faults.

4.25.1.4 DHT Communication

The downhole tool and surface system need a physical element to provide a communication path to transmit data from downhole to the user interface at surface. For ESP applications, a 3 phase ESP power cable is used. For CTS applications, a ¼-in instrument line runs from the downhole tool to surface system.

The DHT telemetry can be of two types; digital and analog. The MultiSensor XT is analog, and the UltraLite, CTS, Select, xt85 and xt150 are digital.

Telemetry communication from the DHT is received by the PIC as modulated current pulses on the DC power. For the ESP tools such as MultiSensor XT, UltraLite, Select, and xt150 tools, the communications path is show in Figure 4-34.

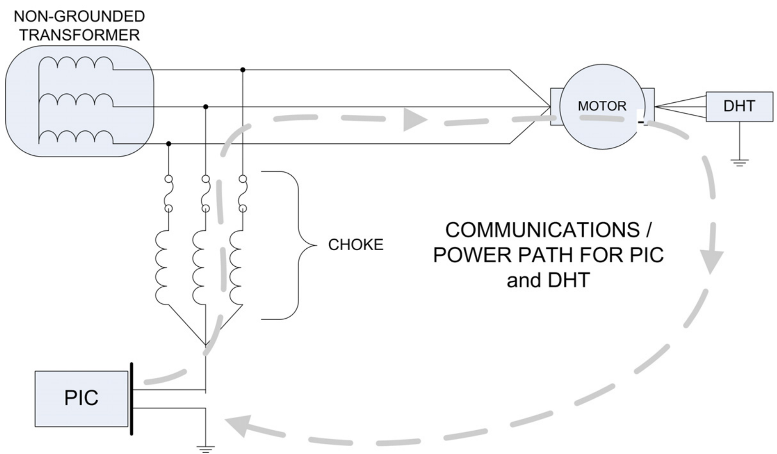


Figure 4-34: ESP DHT Communication Loop

For the CTS tools the path is a single wire-line connection between the PIC and the DHT, as shown in Figure 4-35.

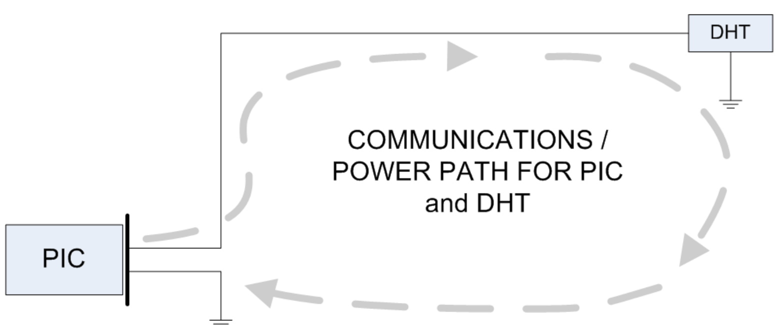


Figure 4-35: CTS DHT Communication Loop

Analog Tools

Data from the analog DHT (i.e., MultiSensor XT) is sent in frames. Every frame is 20 seconds long which consists of one set of analog readings of every parameter monitored by the DHT (Cz, Cf, Pi, Pd, Ti, Tm, Q, and Vi), see Table 4-34.

Table 4-34: MultiSensor data packet

Data Packet	Definition
Cz	Calibration value zero scale

Data Packet	Definition
Cf	Calibration value full scale
Pi	Intake pressure
Pd	Discharge pressure
Ti	Intake temperature
Tm	Motor temperature
Q	Flow rate
Vi	Vibration
Cl	Current leakage

Data transmission is in analog form and thus preceded by the two calibration values Cz and Cf. These calibration values establish the maximum and minimum range where the next data pulses will appear. The PIC then measures the size of the data pulses within this range and stores each pulse as Pi, Pd, etc. Over time the maximum and minimum range values may change, but this will not effect the data. A single MultiSensor XT data frame is shown in Figure 4-36.

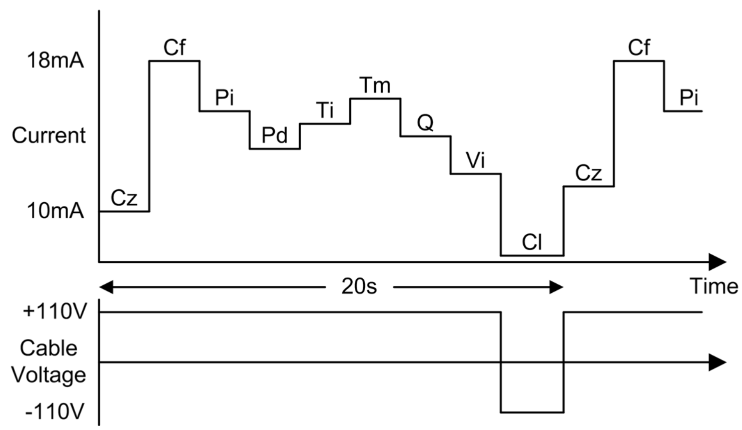


Figure 4-36: MultiSensor XT data frame

As shown in Figure 4-36, the end of every 20 second data frame the PICv2 reverses the polarity of the DC volts transmitted to the DHT. The DHT is equipped with a blocking circuit so all the current flow is stopped. This procedure is to:

- Conduct the current leakage (Cl) measurement. This indicates the health of the ESP power cable.
- Reset the communication status with the DHT to restart the data packet.

Digital Tools

Digital DHTs (i.e., UltraLite, CTS, Select, xt150) represent a large range of deployment options. The available sensors per tool is shown in Table 4-32.

These tools use digital communications so there is no need for calibration data on each frame. The data is modulated on top of the DHT DC power and consists of a “0” or “1”. A sample data segment is shown in Figure 4-37.

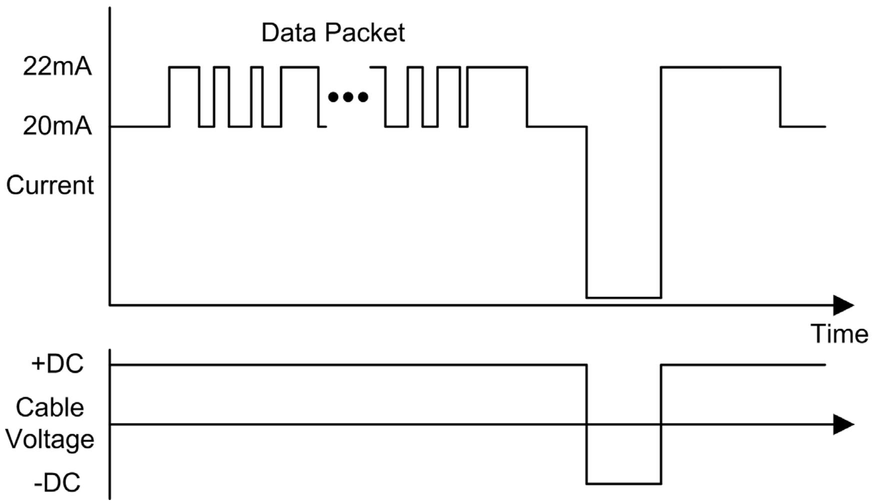


Figure 4-37: Digital tool data segment

On powers up the DHT transmits a synchronizing packet and then the data stream begins. The data stream consists of pressure, temperature, vibration, vibration spectrum and diagnostics.

To optimize data performance the DHT telemetry has been broken up and prioritized. Depending on the tool type, some measurements like pressure and temperature are sent to PICv2 more often while the rest are sent less often and interleaved with the pressure and temperature telemetry.

At the end of each data cycle (that is, all measurements have been received at least once) the PICv2 reverses the polarity of the DC volts transmitted to the DHT, shown in Figure 4-37, to measure current leakage of the system. This process lasts for two seconds and then returns to normal data transmission mode.

4.25.1.5 Current Leakage

The Phoenix Interface Card telemetry system operates as a current loop. For the analog tools (MutliSensor XT), all data parameters are represented as varying magnitude of current. For the digital tools (UltraLite, CTS, Select and xt150) the data parameters are represented as fixed changes in current. For either system, current loop calibration is performed prior to data transmissions to null out the system leakage. These values are represented as Cz and Cf (calibration zero scale and calibration full scale).

The PIC also monitors system leakage and stores these values:

- Current Leakage Active
- Current Leakage Passive

The system leakage indicates the health of the system. Cable degradation, wire splice degradation, motor winding degradation, etc. all contribute to current leakage.

Note

Excessive current leakage, as in a system failure condition, may push the analog telemetry beyond the current limit point (section 4.25.1.3: DC Power) resulting in corrupted data.

Current Leakage Active

This is a PIC measured value during the -DC application of power. This determines how much of the current is not used by the DHT, but lost to the system. These measured values lose accuracy during the operation of an ESP. Figure 4-36 shows where the CI is acquired in the data frame.

Current Leakage Passive

Current leakage Passive (CLP) is is used to determine the leakage within the running system. This is a PIC calculated value based on the change in Cz when the ESP is running. See section 4.25.1.4: DHT Communication for details. CLP is set at the factory during PIC calibration. The sensitivity of the PIC current measurement is very high so a 'set CLP' is performed to 'zero' the PIC. During field commissioning a 'set CLP' is performed to 'zero' the entire current loop system.

Over time the system leakage may increase. See Figure 4-38. The present CLP value can be compared to the previous CLP value to show the amount the leakage has changed. Performing a 'set CLP' zeros this reference point. Alarm points may be set based on the CLP value.

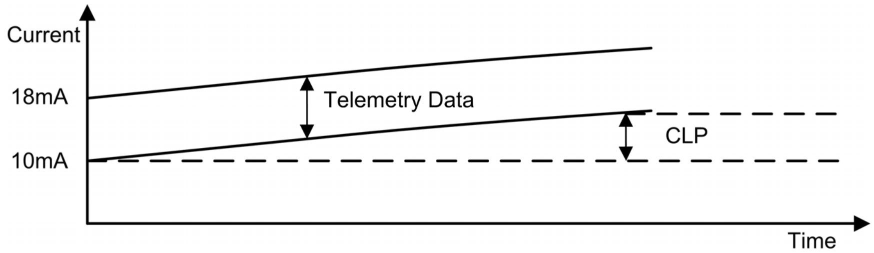


Figure 4-38: CLP

4.25.1.6 Rapid Sampling Rate

The Phoenix Interface Card and the Multisensor XT tools support a rapid sampling mode for intake pressure only.

There may be circumstances in which more detail is required for intake pressure. Enabling this feature causes the DHT to transmit intake pressure continuously and will remain locked in this mode until the feature is disabled. This mode changes the telemetry time from 20 seconds per frame to 1 second per frame.

---

eg Example

During commissioning the operator wishes to view the intake pressure of the ESP motor. Rather than waiting 20 seconds per update, RSR can provide updated information every second.

---

i Note

RSR mode only provides intake pressure telemetry.

---

h Hint

Recommendation is to limit RSR mode to 30 minutes or less to ensure the other DHT sensor readings are updated. During RSR mode the Cz, Cf reference parameters are not used and hence an accuracy drift may occur over time. If left unchecked, the actual monitored data in RSR mode will become inaccurate. Additionally the temperature, vibration, etc are not monitored in RSR mode. See InTouch Content ID 3914646 for further details.

4.25.1.7 Vibration Averaging

The vibration averaging was introduced due to spikes in the vibration. This command sets the vibration average of vibration readings from downhole tool. Its range is from 1 to 32 and default is 16. Vibration Averaging of 1 removes averaging. This command is for digital tools only.

4.25.1.8 Swap Remotes

This command is used on Select Advance tools (2 remotes) and only on very rare and special cases where the remotes are hooked up in a reverse configuration for some physical reason.

Note
Using this command to swap remotes when they have not been physically swapped will produce erroneous and confusing results to other surface equipment and telemetries.

4.25.1.9 Post Averaging

The post averaging, also called smoothing algorithm, was introduced due to high sensitivity to noise in XT tools. Post averaging is a filter in the firmware that further reduces the noise in the signals. This command is for analog tool XT only.

4.25.2 FIC Theory of Operation

The FSK Interface Card (FIC) is designed to operate with the WellWatcher family of FSK gauges. The FIC provides controlled power (regulated current) to the gauges which have no power source of their own. The communication is simple (one direction only). The gauges start transmitting the data to the FIC automatically as soon as they are powered on.

A diagram of the FIC modules is shown in Figure 4-39.

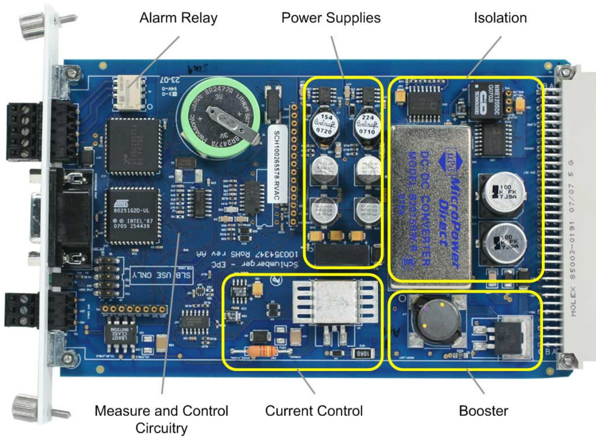


Figure 4-39: FIC modules

A block diagram of the FIC is shown in Figure 4-40.

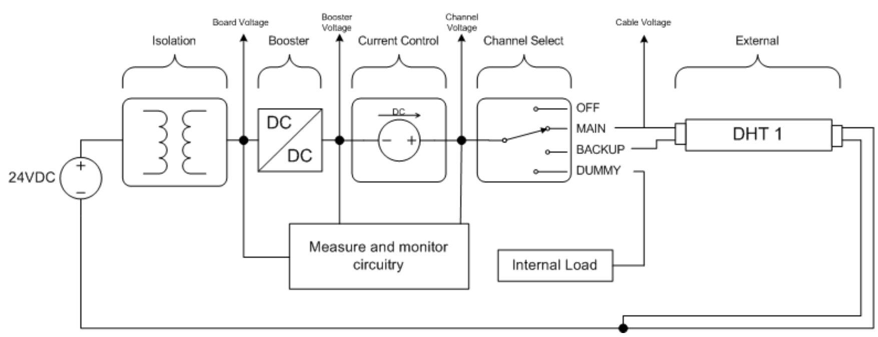


Figure 4-40: FIC block diagram

4.25.2.1 Power Supply

The power enters the card from the 96–pin connector and passes through an isolated power supply. The isolation is used to prevent fault conditions from entering the card or any card fault conditions from entering the power supply system.

4.25.2.2 Booster Voltage

The FIC booster voltage is available to increase the voltage on the channel in order to offset the effects of long cable runs. The booster section converts the 24V up to a maximum of 59V. This elevated voltage is used to compensate for additional gauges or voltage drops on long downhole cables.

The booster voltage can be set manually or operated in automatic mode. For manual operation an understanding of gauge power requirements and cable conditions is required. See section 6.13.8.1: Booster Voltage for details.

Caution

Potential Severity:	Light
Potential Loss:	Assets, Information
Hazard Category:	Electrical

If the Booster Voltage is set too high and the Channel Current set too low, excessive power will be dissipated on the FIC Current Control module, which will cause the FIC to overheat and may result in premature card failure.

Automatic Mode

Auto mode is available for setting the booster voltage. The FIC will evaluate the optimum voltage to provide based on the power required for the gauges. The booster voltage will start at a maximum value and slowly reduce to optimum. The FIC compares the voltage across the current control module and attempts to make this as small as possible while still maintaining power for the gauges.

Note

The gauge current still needs to be set manually as the FIC cannot determine the number of gauges present during the power up sequence.

4.25.2.3 Current Control

The current control ensures the supplied current matches the downhole tool (DHT) requirements and represents the actual current supplied down the cable. The current control also provides a high input impedance to maximize the DHT data signal. The current setting depends on the number and type of gauges. Refer to the downhole tool specification for appropriate values. Table 4-35: Gauge Specification shows some gauge characteristics.

Note

Table 4-35 shows sample gauge characteristics only. The gauge specifications provided with the gauge must be used to configure the FIC. IntelliZone gauges do not require coefficients.

Table 4-35: Gauge Specification

Gauge Type	Current requirement per gauge	Telemetry Current	Number of possible gauges	Serial Number
PQG	25	15	3	1 – 99 (last two digits of SN)
NPQG	20	15	4	1 – 99 (last two digits of SN)
NDPG	22	15	4	1 – 99 (last two digits of SN)
DPG-PS	30	N/A	1	1 One gauge only
DPG-TA	55	N/A	1	1 (lower gauge), 2 (higher gauge). 2 gauges only.
IntelliZone	42	15	3	1 – 99 (last two digits of SN)

4.25.2.4 Channel Setting

The channel on the FIC can be configured for one of the following:

OFF: Channel is open, no power on the cable.

Main: FIC card powers the main/primary cable.

Backup: FIC card powers the backup/secondary cable.

Dummy: Test purpose, the FIC powers an internal load or *dummy* load.

Note

Do not leave the card at *Dummy* setting for too long time, since it is heating the board. This setting is meant for quick manufacturing tests to confirm circuit functionality. For EQ tests or SIT use external loads.

4.25.2.5 FIC Diagnostic

The FIC offers several live measurements for diagnostic purposes. They can be viewed on the acquisition display (if available) or through StarView **Slot Information** window.

Term	**Definition**
Booster Voltage	Voltage output of the Booster circuit. If the channel is set to Main and Channel Current is zero, this voltage is identical to Channel Voltage. If the channel is set to Main and Channel current is more than zero, Booster voltage will be several volts higher than Channel voltage.
Cable Voltage	Exact voltage on top of the downhole cable.
Channel Voltage	Voltage input to the switch to downhole cable. When the switch is in OFF position, this voltage is equal to the Booster voltage. When the switch is in MAIN or BACKUP position, Channel voltage is equal to the Cable voltage. When the switch is in DUMMY position, this voltage is applied to internal dummy load.
Channel Current	Current supplied down the cable.
Backup Voltage	Cable voltage when the backup cable is used.
Channel Signal Voltage	Approximation of the signal strength measurement. When the signal is coming from the gauge, this value will fluctuate between zero and 1000 mV.

Several WellWatcher status messages are also available to help with diagnostic in Table 4-36.

Table 4-36: WellWatcher Status Messages

Message	Description
Boot Mode Set (BOOTING)	FIC is in boot mode
Short Circuit Protection Mode (SHORT CIRCUIT PROTECT)	The board has detected a short circuit on the cable and now is in Short circuit protection mode. In short circuit protection mode, the board will disconnect the line for about two minutes and than try to connect back for 6 seconds and keep doing so until the short circuit is removed.
Open Line (OPEN)	Indicates the open line.
Short Line (SHORT)	Indicates the short circuit on the line.
Booster Voltage too High (Booster Volts HI)	The Booster voltage is set too high and it needs to be adjusted for optimal operation mode.
Booster Voltage too Low (Booster Volts LO)	The Booster voltage is set too low and it needs to be adjusted for optimal operation mode.
Down Cable Not connected	Downhole Cable is not switched ON.
Gauge X Time Out (Tool Time Out)	No valid data for gauge X.
Channel ON	The channel setting is MAIN or BACKUP.
Channel OFF	The channel setting is OFF or DUMMY.
Hardware Error	ADC does not work properly. When this happens the autobooster and the short circuit detection/protection are not functional.
No Comms	No communication between acquisition unit and FIC.

4.25.2.6 Measure and Control Circuitry

Measure the circuitry monitors following these parameters:

- Monitoring of all power parameters for the downhole gauges
- On board power monitoring
- Temperature monitoring
- Real time clock control

These parameters are accessible in the Modbus® map.

Control circuitry is the “brain” of the card and it is in charge of all external communication, control of channel electrical parameters, gauge data processing and trending.

Gauge serial numbers and coefficients are saved in FIC on-board memory. If the FIC is replaced with a new card, these settings are lost and have to be redone.

The FIC channel electrical settings are stored and processed by the card. If the card is not used stand alone, but within a controller, channel electrical settings will be set and stored by controller. During the reboot, the controller will overwrite the card electrical settings; therefore, even if the FIC has been replaced by the second card, its channel electrical settings will be preserved.

The FIC on-board memory is used for data trending only if the card is used standalone (as SoloConn WellWatcher). If the card is installed into the higher level acquisition unit (UniConn, ARConn), data trending is managed by the acquisition unit.

4.25.2.7 FIC Engineering Port

The engineering port (DE-9 connector on the front plate) is an RS-232 port which is used for configuration of the FIC for the gauges, for trending and for troubleshooting. This port communicates using the Modbus protocol. The default settings are 38400 baud, address to 0xFF (for StarView communication setting use: **Using a Direct One to One Link**). The whole Modbus map is available through this port, if needed.

4.25.2.8 FIC Back Port

FIC back port is RS-485 COM port located at the back 96–pins connector of the card. This port communicates using Modbus protocol and the whole FIC map is available. The port parameters, including address and baud rate, are user selectable.

4.25.3 Communication Card Operation

The Communication Card provides an isolated RS-232 and RS-485 serial port for systems using a standard Eurocard form factory.

The Communication Card has no processing power. It is a purely electronics hardware device that isolates communications and converts it from RS-232 voltage levels to RS-485.

The signals to and from an acquisition system enter the Communication Card through a standard RS–232 interface on the backplane section, then they are isolated and made available at RS-232 connector or further converted to RS-485 and made available at RS-485 connector.

The card is characterized by two LEDs (lights) and two terminal block receptacles. The Tx and Rx LEDs indicate active communication channels in the transmit and receive directions respectively. Figure 4-41 shows these sections on the card.

Figure 4-41: 3rd Generation Communication Card

The Communication Card represents one communication channel of the acquisition system: RS-232 and RS-485 connectors **cannot** be used at the same time because they are using the same communication port on the card's backplane connector.

There are no settings to be done on the card, signals are always present on both connectors if the card is powered. However, the acquisition system into which the card is installed has to have the slot configured.

Note
The system into which the card is installed must have the communication parameters for the backplane section for a particular slot set as RS-232 regardless of the desired external protocol and Communication Card face plate connections.

4.25.4 Modbus® TCP/IP Card Operation

The Modbus® TCP/IP card is designed to connect to Ethernet based TCP/IP networks using standard Internet Protocol (IP) addressing. The end device must be capable of decoding Modbus®. The IP address can be manually configured or left as default for one to one connections. The Ethernet communication interface is isolated for enhanced noise immunity.

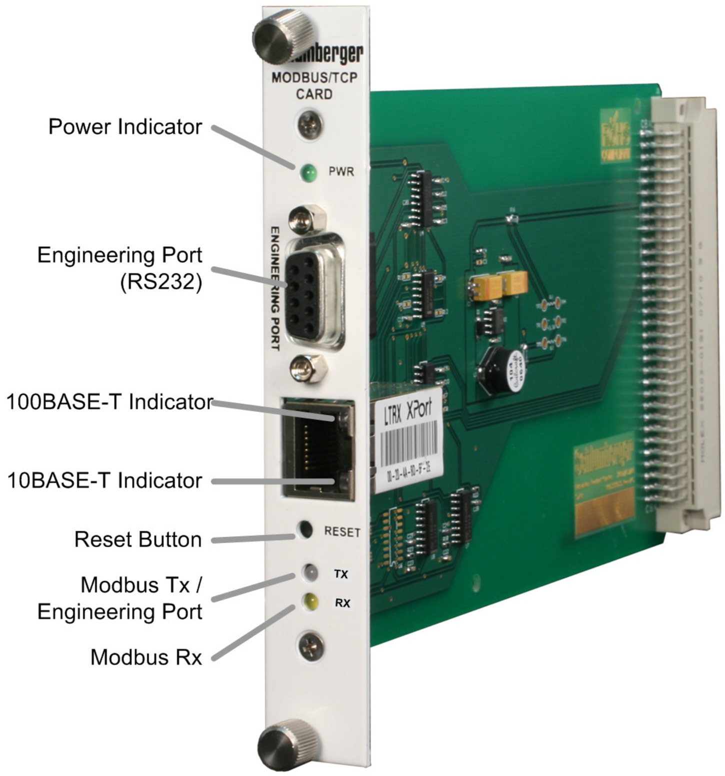


Figure 4-42: Modbus® TCP/IP card

Table 4-37: Faceplate I/O and indicators

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Power Indicator</td><td colspan="2">Indicates the card is powered.</td></tr>
<tr><td>Engineering Port</td><td colspan="2">This is used primarily to configure the Ethernet interface module with an IP address. Additional module configuration and diagnostics can also be performed.</td></tr>
<tr><td rowspan="7">100BASE-T Indicator</td><td colspan="2">The Ethernet interface has detected a 100 Mb/s (Megabits per second) link.</td></tr>
<tr><th>Ethernet Status LED</th><th>Status</th></tr>
<tr><td>Off</td><td>System is Off</td></tr>
<tr><td>Solid Amber</td><td>Half duplex link detected</td></tr>
<tr><td>Blinking Amber</td><td>Half duplex link with data activity</td></tr>
<tr><td>Solid Green</td><td>Full duplex link detected</td></tr>
<tr><td>Blinking Green</td><td>Full duplex with data activity</td></tr>
</table>

Item	Description	
10BASE-T Indicator	The Ethernet interface has detected a 10 MB/s (Mega Bits per second) link.	
	Ethernet Status LED	**Status**
	Off	System is Off
	Solid Amber	Half duplex link detected
	Blinking Amber	Half duplex link with data activity
	Solid Green	Full duplex link detected
	Blinking Green	Full duplex with data activity
Reset Button	Reset the Ethernet module or place it into configuration mode.	
Modbus® Tx / Engineering Port	Modbus® Tx indicator. This indicates the Modbus® data transmitted before the data has been 'wrapped' into the TCP/IP packet.	
	Serial Communication Status LEDs	**Status**
	Blinking Green	Indicates Modbus® data is entering the Ethernet module.
	Blinking Red	Indicates data activity on the engineering port. This should only be active during configuration.
	Blinking Red / Green	Indicates engineering port and Modbus® data activity occuring at the same time. User potentially trying to program card without disabling the back port communication of the controller.
Modbus® Rx	**Serial Communication Status LEDs**	**Status**
	Blinking Yellow	Modbus® Rx indicator. Indicates data received on the Modbus® side.

The Modbus® protocol is encapsulated within the TCP/IP protocol. The Modbus® TCP/IP card functions by taking standard Modbus® data packet from the backplane, wraps the packet inside a TCP/IP packet and sends the packet onto the network *cloud*. The TCP/IP packet contains a destination address which routes it through the network to the receiving Modbus® TCP/IP device. See Figure 4-43.

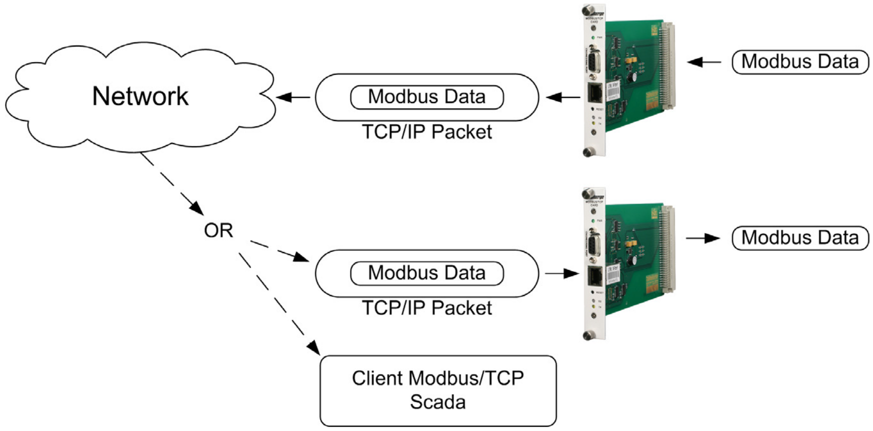


Figure 4-43: Modbus® TCP/IP data path

Note

The Ethernet module is connected to the backplane for Modbus® data and connected to the Engineering port for configuration. These ports cannot be used simultaneously. The Modbus® data interface on the host system must be disabled prior to using the Engineering port.

4.25.5 MVD Card

The Medium Voltage Drive Card (MVD Card) is designed to interface to the Medium Voltage Drive using standard User Datagram Protocol (UDP). The MVD Card is factory configured for the MVD and no field configuration is possible. The Ethernet communication interface is isolated for enhanced noise immunity. See Figure 4-44.

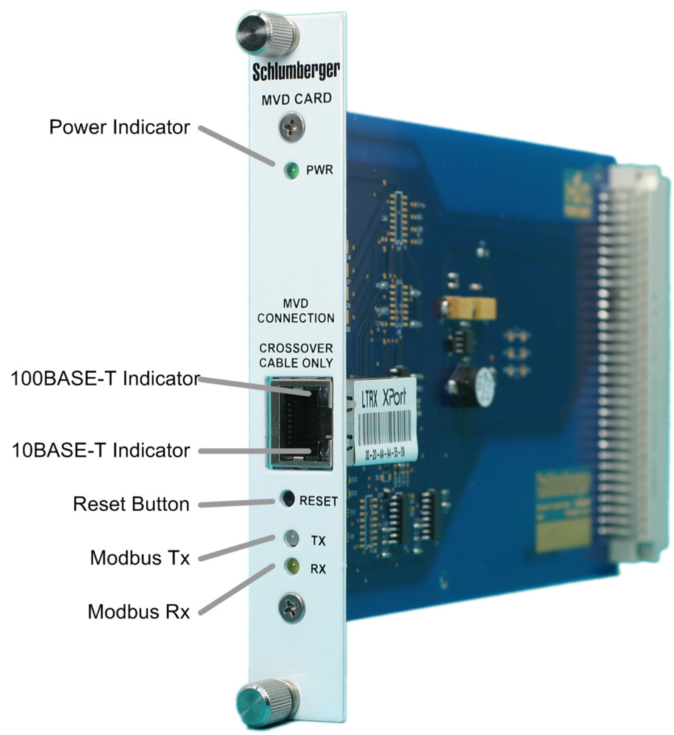


Figure 4-44: MVD card

Table 4-38: Faceplate I/O and indicators

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Power Indicator</td><td colspan="2">Indicates the card is powered.</td></tr>
<tr><td rowspan="7">100BASE-T Indicator</td><td colspan="2">The Ethernet interface has detected a 100 MB/s (Mega Bits per second) link.</td></tr>
<tr><td>Led</td><td>Status</td></tr>
<tr><td>Off</td><td>System is Off</td></tr>
<tr><td>Solid Amber</td><td>Half duplex link detected</td></tr>
<tr><td>Blinking Amber</td><td>Half duplex link with data activity</td></tr>
<tr><td>Solid Green</td><td>Full duplex link detected</td></tr>
<tr><td>Blinking Green</td><td>Full duplex with data activity</td></tr>
<tr><td rowspan="6">10BASE-T Indicator</td><td colspan="2">The Ethernet interface has detected a 10 MB/s (Mega Bits per second) link.</td></tr>
<tr><td>Off</td><td>Off</td></tr>
<tr><td>Solid Amber</td><td>Half duplex link detected</td></tr>
<tr><td>Blinking Amber</td><td>Half duplex link with data activity</td></tr>
<tr><td>Solid Green</td><td>Full duplex link detected</td></tr>
<tr><td>Blinking Green</td><td>Full duplex with data activity</td></tr>
<tr><td>Reset Button</td><td colspan="2">Reset the Ethernet module or place it into configuration mode.</td></tr>
</table>

Item	Description
Modbus Tx	Blinking Green Modbus Tx indicator. This indicates the data transmitted before the data has been 'wrapped' into the UDP packet.
Modbus Rx	Blinking Yellow Modbus Rx indicator. Indicates data received on the Modbus side.

The MVD Card contains an automatic reset circuit which will activate if communications fail or stop. This reset re-synchronise the link between the MVD Card and the MVD.

4.26 Prestart

For details on Prestart functionality, please refer to (p. K-21).

Installation

5 Installation

Refer to Appendix E: Interconnection Diagram and Appendix G: Termination Table for the recommended wiring connections. All local electrical codes and standards must be adhered to.

Caution

Potential Severity: Light
Potential Loss: Assets, Personnel
Hazard Category: Electrical

All supply, control, and signal wiring detailed in this section must be insulated for 300 V minimum and rated to 158 degF (70 degC) minimum.

The UniConn should be flush-mounted on the door of the switchboard or VSD low-voltage compartment. All control wiring may be terminated directly to the controller within the low-voltage compartment. The keypad and display face should be protected from the external elements by a windowed dead-front door that covers the entire area of the UniConn keypad membrane. Figure 5-1 shows the cutout dimensions and hole locations for mounting the UniConn on the low-voltage door.

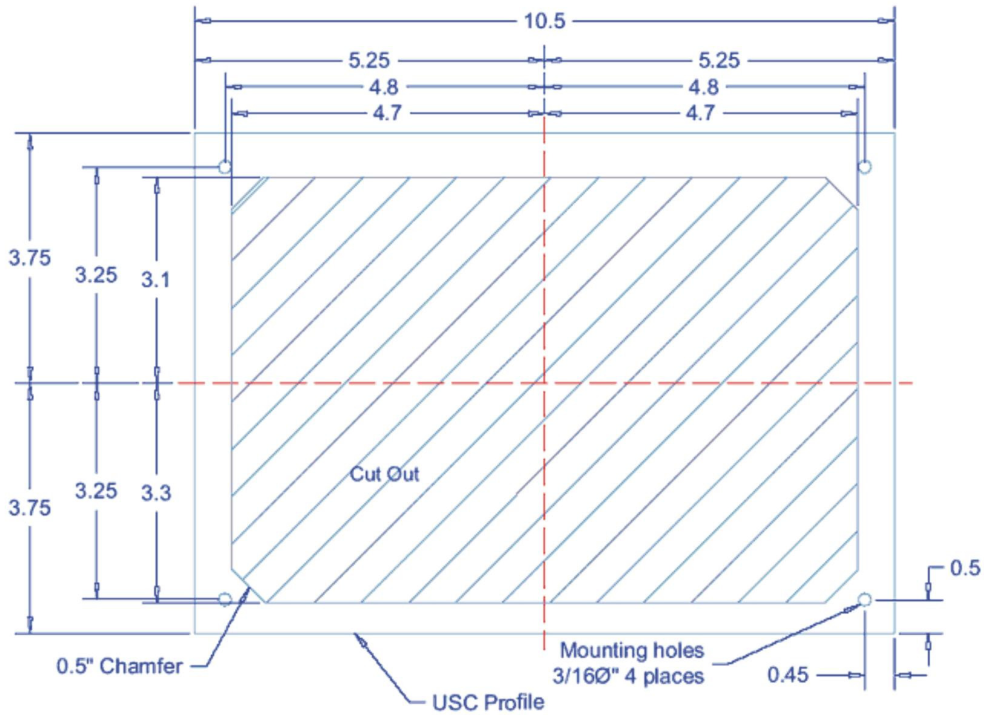


Figure 5-1: Dimensional data for door cutout and holes

For monitoring applications where switchboard or VSD does not exist on the wellsite, the UniConn must be installed in an enclosure that meets environmental protection requirements. Refer to Appendix A: Spare Parts , for UniConn equipped with a NEMA-3R rated outdoor enclosure (see in Figure 5-2). The same argument applies where the UniConn is also used as controller, but space does not permit installation in existing switchboard/VSD.

Figure 5-2: UniConn with NEMA 3R Enclosure

Caution

Potential Severity: Light
Potential Loss: Personnel
Hazard Category: Electrical

If the equipment is not connected and used according to the instructions in this document the protection provided by this equipment may be impaired.

The UniConn should be mounted such that a minimum 2–inch clearance is maintained around the box at all times (with the exception of cable connections). This is required to provide adequate heat dissipation.

For applications where it is required to retrofit a UniConn into an existing SpeedStar 2000 (also SpeedStar 2000+ and SpeedStar Sine Wave Drive) to replace the Reda HMI, a kit with all the necessary hardware exists. Refer to Appendix A: Spare Parts for the appropriate part number.

5.1 Power Supply

The UniConn may be powered from either an AC or 24 – volt DC source. Number 16 AWG is the minimum recommended wire size and 70 degC is minimum temperature specification of the cable for the power supply connections.

The UniConn supply circuit must not be rated at more than 15 A. The supply connections must also be installed with a circuit breaker (or equivalent device) to allow the UniConn to be isolated from the supply for servicing and maintenance. The circuit breaker must be installed as close as practical to the UniConn.

When UniConn power uses an external AC source, the UniConn has an internal universal power supply that can accept single-phase 100 to 240 V_{rms} power at 50 or 60 Hz.

For DC power sources, the controller must be supplied with 24 volts DC stable to within 10% connected to the BATT-POS and BATT-NEG terminals. When operating from a DC supply, the AC supply monitoring variables will not have valid readings and all alarms should be bypassed. The DC terminals may be used for battery backup of the AC source.

The AC and DC supplies are fused separately. The fuses are located on the back of the UniConn. The AC fuse is labelled with ‘Ã’, and the DC fuse with ‘Ā’. The fuse ratings are also labelled on the back of the controller. Do not use fuses of a different size. See Table A-1: UniConn Spare Parts for details.

5.2 UniConn Grounding

The UniConn unit should be connected to earth ground using the chassis ground stud located on the bottom of the unit. Pin 46 GND found on the bottom connections of the enclosure is internally connected to the chassis.

The UniConn is typically installed in a switchboard or VSD enclosure and the ground stud connection should be made to a terminal block that is solidly connected to the system earth ground. Proper connection from the UniConn enclosure to system earth ground must be made from the chassis ground stud using a pressure ring washer (lock washer) equivalent to those supplied with the UniConn.

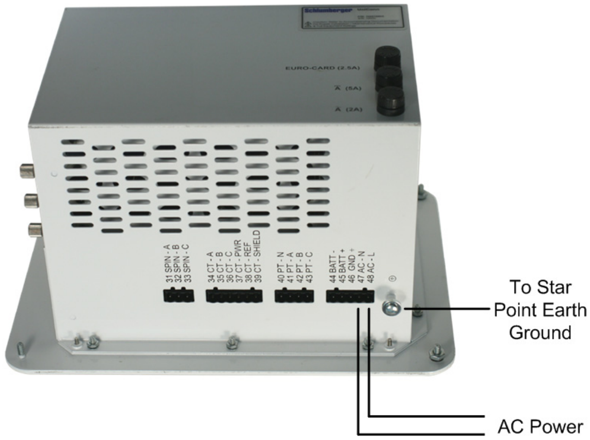


Figure 5-3: Diagram - UniConn Grounding_P.png

Special consideration is needed when using the analog input / output connections (Pin 13 to 30) on the UniConn to interface to other equipment at the well site.

- Analog inputs are differential.
- Analog outputs must use the UniConn ground.
- Interface cables typically use a shield and must be grounded.

When shielded cables are used the shield must be grounded at one point only. Preferably close to the system ground point or near the end device.

5.2.1 Analog Input

The UniConn employs full-differential inputs on the front end of the Analog Inputs. The negative input should not be connected to the UniConn earth ground when used with single-ended output devices. These devices should be grounded to earth at their location and their ground signal connected to the UniConn analog input negative terminal only. This will help to avoid ground loop currents that can potentially affect the operation of the equipment. See Figure 5-4 and Figure 5-5.

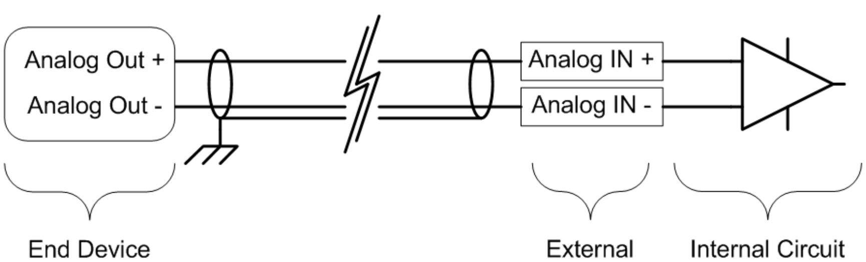


Figure 5-4: Differential inputs on differential device

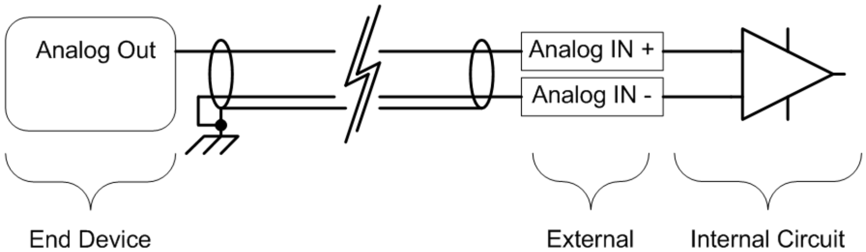


Figure 5-5: Differential inputs on single end device

5.2.2 Analog Output

The analog output are ground coupled within the UniConn and therefore must operate as the last element in the loop. The shield must be earth grounded near the end device and the loop return must be DC grounded on the UniConn (Pin 44).

5.2.3 Digital Input

The digital inputs operate with external dry contacts using the UniConn digital power to drive the logic. A shielded cable must be grounded at one point either near the end device or on the UniConn system ground.

5.3 Current Transformer Module

The UniConn uses a proprietary current module rather than conventional 0-5 A current transformers to measure motor currents. The system consists of two main components – a three-phase Current Transformer (CT) Module (see in Figure 5-6) and a Burden Module (see in Figure 5-7), which determines the ratio of the CT. In switchboards, the CT module is installed in the switchboard high voltage compartment. The motor leads must pass through the CT module for measurement of motor currents. The measurement connection to the UniConn is brought back on a low-voltage signal cable. The cable is pre-wired to a plug for quick connection to the UniConn.

Figure 5-6: UniConn CT Module . *For use with 50, 100, 200 amp burden modules.*

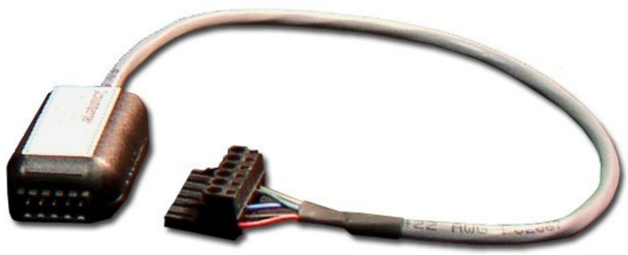


Figure 5-7: UniConn burden module. *50, 100, 200 amp type*

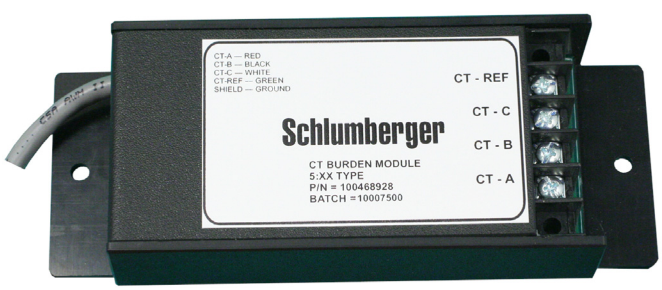


Figure 5-8: UniConn burden module. *5 amp input type*

This system can also be used to obtain three phase current information and protection for VSD applications at the point where the CT Module is installed.

Example

Installing the CT Module on the secondary side of step-up transformer used with a SpeedStar SWD provides current unbalance information on running motor current.

Caution

Potential Severity: Light
Potential Loss: Assets
Hazard Category: Machinery equipment hand tools

Do not make any other connection to the UniConn current module terminals as this may damage the UniConn circuitry.

The CT module is sized to the application and is available in 50 A, 100 A, and 200 A sizes. Using the correct size maximizes the current reading resolution. A list of the part numbers for the CT Modules can be found in Table A-2: UniConn spare parts for artificial lift fixed speed.

5.4 Potential Transformer

The voltage inputs on the UniConn require 120 volts AC nominal voltage levels for monitoring the three-phase supply voltages ahead of the contactor. Since switchboard voltages are typically much higher than this, external potential transformers (PTs) are used to provide voltage level translation from the high-voltage signals. Three individual PTs are required for full high-speed three-phase monitoring applicable with both switchboards and VSDs. With VSDs, the three-phase voltage measurement can be done either at the input or output of the VSD itself, at the secondary (output) side of step-up transformer used with the VSD, or at other point of interest.

Note

Installation at VSD input only applicable for six-pulse VSDs.

Caution

Potential Severity: Light
Potential Loss: Assets
Hazard Category: Electrical

Three-phase voltage measurement at output of VSD or at secondary side of step-up transformer would only yield good data when done on output of filtered VSD (used with SWD or SpeedStar 2000/2000+ equipped with R992 load filter).

The PTs must be connected to the UniConn in Wye configuration with the neutral point terminated at the instrumentation transformer common point. The connection to the motor cables should be Delta for the UniConn to read phase-phase voltages. Refer to Appendix E: Interconnection Diagram for a diagram of how the PTs are wired in switchboards.

The phase voltage ratio at the selected tap (for example, a 480:120 V PT) must be entered in the voltage adjustment screen in the Motor Table.

The recommended wiring gauge for the PT connections is #14 AWG. Refer to Table A-2: UniConn spare parts for artificial lift fixed speed for Schlumberger P/N of available Potential Transformer models.

5.5 Backspin Shunt

The A095 Backspin Shunt is installed in the high-voltage compartment of a switchboard and must be connected to the motor leads. If a step-up transformer is used after the switchboard the shunt must be installed on the motor side of the transformer.

The three high-voltage leads of the shunt are connected to the motor cables and the green wire is connected to the 'star-point' transformer, switchboard or system ground. Ensure the transformer ground is connected to the switchboard ground for applications with a step-up transformer.

Do not make any other connection to the backspin inputs other than the A095 Backspin Shunt.

Refer to Table A-2: UniConn spare parts for artificial lift fixed speed for Schlumberger P/N of available A095 backspin shunt models.

Danger	Potential Severity:	Catastrophic
	Potential Loss:	Personnel
	Hazard Category:	Electrical

Lethal voltage is present on the Backspin shunt connection if disconnected while live.

5.6 Analog inputs

The user analog inputs on the UniConn can be used to measure voltage signals in the 0-10 V range or 0-20 mA current loop signals. Range and scale settings on each analog input channel can be used to set the measurement to any value within the range. For example, the 0-20 mA current measurement can be scaled to measure a 4-20 mA signal so that the zero (0) point is at 4 mA. The analog inputs are full-differential inputs. They may be connected to ground-referenced systems by connecting the negative connection to the ground of the analog system. This ground should not be connected to the UniConn ground to avoid noise issues.

When operated in voltage mode the analog input terminals have an input impedance of 50 kOhm per channel or 100 kOhm differential. When operated in current mode the input resistance is 400 ohms for standard 4-20 mA current loop applications

5.7 Digital Input HOA

A sample wiring connection for digital input Hand, Off, Auto connection is shown in Figure 5-9.

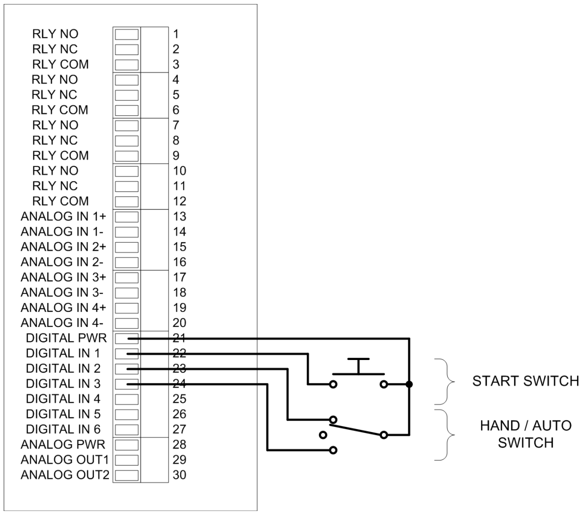


Figure 5-9: Digital input HOA sample wiring

5.8 Expansion Cards

Expansion cards are installed in the UniConn by removing the cover plate on one of the card slots and sliding the card firmly into the slot. The card should slide freely along the guides and be seated so that the faceplate is flush with the UniConn enclosure. The card thumbscrews should be tightened to hold the card in place, but should not be used to seat the card.

Expansion card wiring should be performed in accordance with the specific requirements of that card.

The expansion card chassis is fused separately from UniConn. This fuse is located on the back of the UniConn with the power supply fuses. Use only fuses with the rating labelled near the fuse holder. Refer to Figure 1-5: UniConn controller and available accessories to view UniConn controller and available accessories.

5.8.1 Phoenix Interface Card Installation

This section describes how to install and the Phoenix Interface Card (PIC).

5.8.1.1 Install the PIC

Caution

Potential Severity: Light
Potential Loss: Assets
Hazard Category: Electrical

The Phoenix Interface Card (PIC) is not “hot-swappable”. Power to the PIC must be turned off prior to insertion of the card into an expansion card slot.

To install the PIC in the card slot:

1. Turn off the power to the controller or acquisition system.
2. Remove the cover plate or existing card from the expansion slot, if applicable.
3. Insert the card in the slot make sure the faceplate labels appear right side up. Rails inside the expansion card chassis ensure that the card connector will line up and mate with the socket.

   Caution

   Potential Severity: Light
   Potential Loss: Assets
   Hazard Category: Machinery equipment hand tools

   The card should never be forcefully pushed in. If an alignment issue does not allow the card to properly mate the card should be retracted and slowly pushed into the socket.

4. Tighten the thumbscrews to ensure a good connection to the socket. It is normal for the card to be tightly fit when installed.
5. Connect the downhole tool wires from surface choke.

Table 5-1: Downhole Tool Connection Terminals

Pin	Pin Name	Description
2	DH CHASSIS	Downhole Tool power return connection. This connection is made via terminal blocks to the TB1-2 terminal of the Phoenix three-phase choke console/plate.
1	DH LINE	Downhole Tool power connection. This connection is made via terminal blocks to the TB1-1 terminal of the Phoenix three-phase choke console/plate.

To remove the card from the system:

1. Turn off the power to the controller or acquisition system.

2. Disconnect downhole tool wires, if applicable.
3. Unscrew the thumbscrews.
4. Slowly pull on both thumbscrews simultaneously until the card is freed from the socket connection.

5.8.1.2 Calibration Coefficients Key Installation

The Cyber-Key must be installed on the Phoenix Interface Card (generation 1) in order for the DHT telemetry data to be correct. When inserted properly the label on the MultiSensor XT key will be facing outward on the Card.

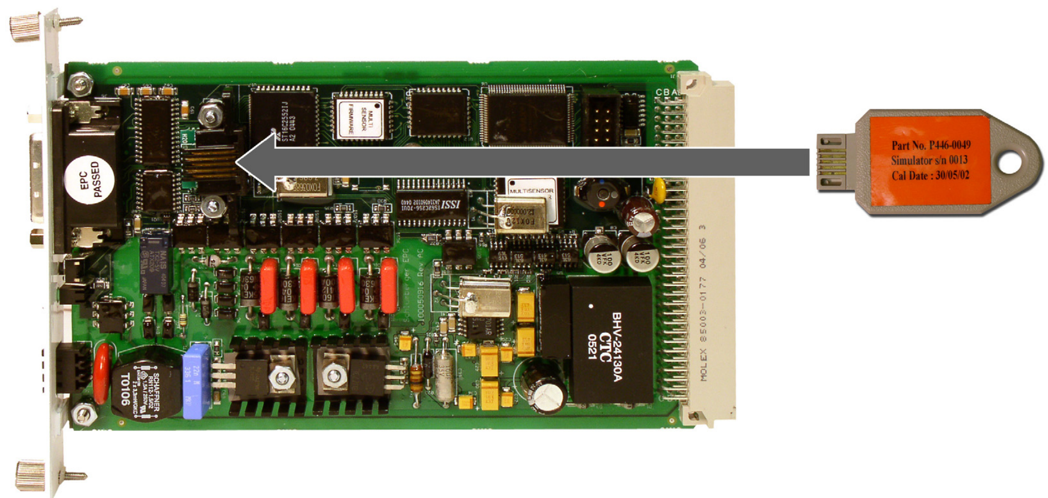


Figure 5-10: Inserting MultiSensor XT calibration key on the Phoenix Interface Card

The Cyber-Key should be secured to the card using the screw and stand-off provided.

Note

PIC generation 2 does not require a Cyber-Key as the DHT coefficients are downloaded to the PIC using StarView.

5.8.1.3 PIC Downhole Tool Connection

Warning

Potential Severity: Serious
Potential Loss: Personnel
Hazard Category: Electrical

Lethal voltages are present when equipment is running. Never work on the choke and fuse assembly while the ESP is powered. All wiring connections must be made with the system powered off.

The connection to the Phoenix three-phase choke is made on the Downhole Tool quick-connect terminal plug on the expansion card faceplate. Two connections must be made on this terminal plug to the tool. Refer to Table 5-2 for the connections.

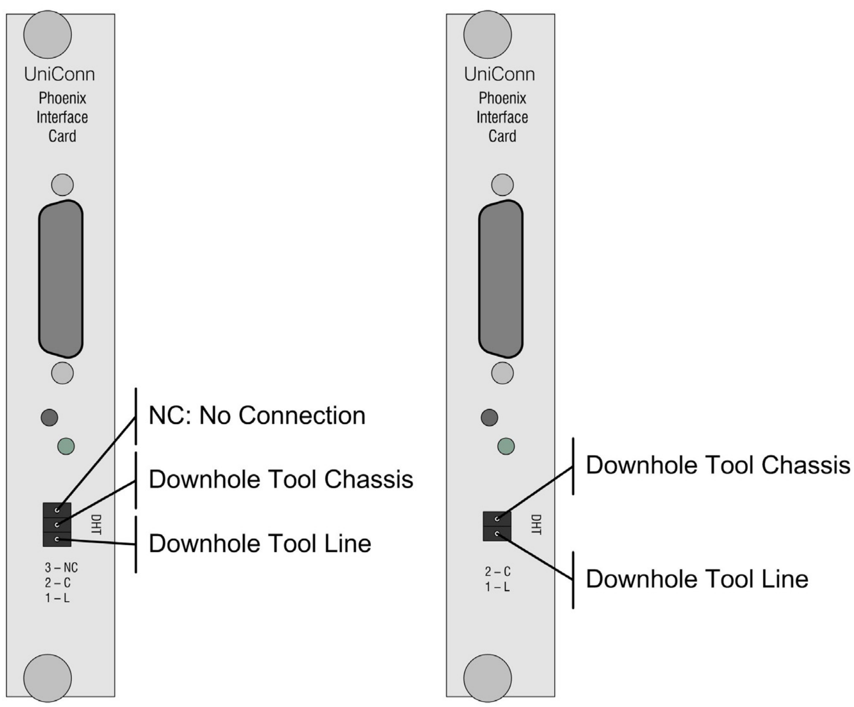


Figure 5-11: Phoenix Interface Card pin descriptions

Table 5-2: Downhole Tool Connection Terminals

PIN #	PIN NAME	DESCRIPTION
3 (3 pin cards)	N.C. (Not present on 2 pin cards)	Do not make a connection to this pin - doing so may impair the operation of the PIC.

PIN #	PIN NAME	DESCRIPTION
2	DH CHASSIS	Downhole Tool power return connection. This connection is made via terminal blocks to the TB1-2 terminal of the Phoenix three-phase choke console/plate.
1	DH LINE	Downhole Tool power connection. This connection is made via terminal blocks to the TB1-1 terminal of the Phoenix three-phase choke console/plate.

Warning

Potential Severity: Serious
Potential Loss: Personnel
Hazard Category: Electrical

When powered, the DH_CHASSIS and DH_LINE wires carry approximately 120 V DC. When these wires are connected to the choke console they may carry power of up to 200 V AC or DC even when the Phoenix Interface Card is not powered due to voltages coming back from the ESP system. Extreme caution must be used when dealing with this connection.

5.8.2 FSK Interface Card Installation

Warning

Potential Severity: Serious
Potential Loss: Information
Hazard Category: Electrical

The FSK Interface Card (FIC) is not “hot-swappable.” Power to the card must be turned off prior to insertion or removal of the card in order to avoid causing damage to the card.

Figure 5-12: FSK Interface Card

5.8.2.1 FIC External Wiring Connections

The FIC contains three external connectors:

- downhole tools (not used in ARConn application)
- relay dry contacts (future application)
- the Engineering port.

Status LED indicates whether there is a good power supply.

FIC Downhole Tool Connection

The DHT (downhole tool) cable can be connected to the FIC either through the primary channel or the secondary channel. For ARConn applications, the main channel connection is taken to the rear of the unit and this connector on FIC face plate is used for diagnostic purposes only. The primary channel is the main channel and is used in most installations. See Figure 5-13.

UniConn FSK Interface Card
P/N: 100265463

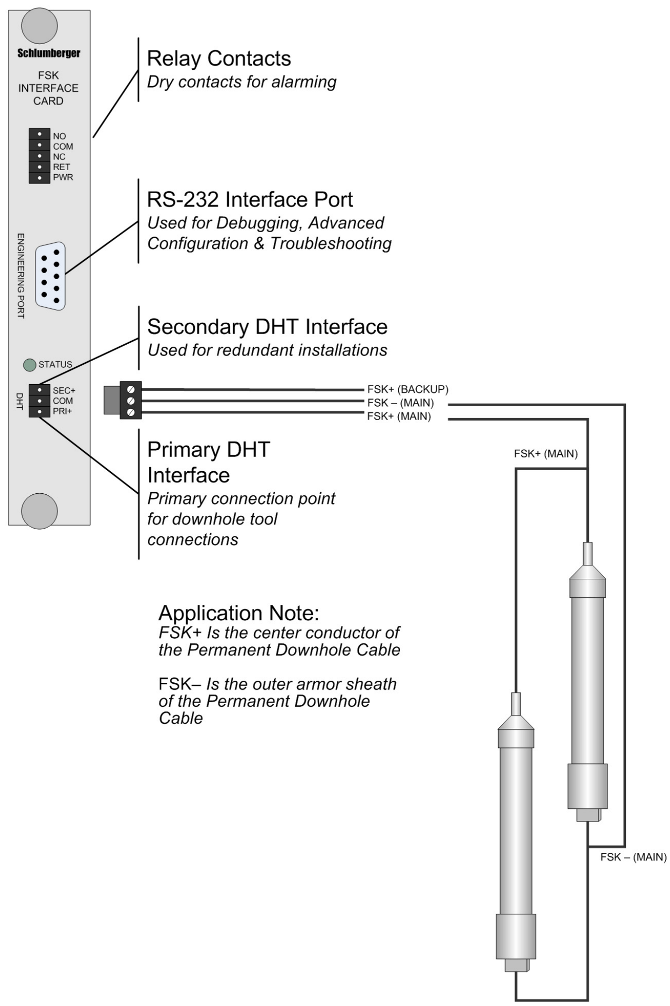


Figure 5-13: FIC Connections

Note

The secondary channel is the backup channel. The secondary channel is a backup connection through a duplicate downhole cable, which is connected to the same gauges. This is for redundancy, only and it is optional. It does not mean that FIC can handle two channels simultaneously.

The main channel connection wiring must be performed in the following sequence using the DHT connector:

Caution

Potential Severity:	Light
Potential Loss:	Assets
Hazard Category:	Electrical

Ensure the system has no electrical power during wiring.

1. Connect PRI+ to cable FSK+ (typically the center conductor of the Permanent Downhole Cable).
2. Connect COM to cable FSK- (typically the casing of the well).

The Permanent Downhole Cable wired to the FIC card has to be properly isolated from other circuits it can come in proximity with to prevent the cable from becoming a hazardous live cable.

5.8.3 Comm Card Installation

Caution

Potential Severity:	Light
Potential Loss:	Assets
Hazard Category:	Electrical

The card is not “hot-swappable”. Power to the card must be turned off prior to insertion of the card into an expansion card slot.

1. Turn off the power to the controller or acquisition system.
2. Remove the cover plate or existing card from the expansion slot, if applicable.
3. Insert the card in the slot make sure the faceplate labels appear right side up. Rails inside the expansion card chassis ensure that the card connector will line up and mate with the socket.

Caution

Potential Severity: Light
Potential Loss: Assets
Hazard Category: Machinery equipment hand tools

The card should never be forcefully pushed in. If an alignment issue does not allow the card to properly mate the card should be retracted and slowly pushed into the socket.

4. Tighten the thumbscrews to ensure a good connection to the socket. Alternate tightening of the thumbscrews to ensure a flush fit.

Note

The RX- and RX+ inputs are differentially terminated internally with a 220-ohm load. DO NOT terminate this line externally. Remove any termination resistor that may be present on the communications cable.

5. Front plate connection.
   - The top terminal block receptacle is specifically for RS-232 functionality.
   - The bottom terminal block receptacle is specifically for RS-485 functionality.

Caution

Potential Severity: Light
Potential Loss: Information
Hazard Category: Electrical

The RS-232 and RS-485 ports cannot be used simultaneously on a single communication card. Doing so will corrupt data.

To remove the card from the system:

1. Turn off the power to the controller or acquisition system.
2. Unscrew the thumbscrews.
3. Slowly pull on both thumbscrews simultaneously until the card is freed from the socket connection.

5.8.3.1 Wiring Connections RS-232

Table 5-3 shows the Communication Card connector assignments for the RS-232 interface. The fourth column represents an example of pin assignment for DE9 receptacle. Figure 5-14 shows the wiring connections.

Table 5-3: Communicaiton Card RS-232 Connector Pin Assignment

PIN Number (top to bottom)	PIN NAME	FUNCTION	DE9 receptacle female
1	RTS	Request to Send	7
2	TXD	RS-232 Transmit Data	2
3	DCD	Data Carrier Detect	8
4	RXD	RS-232 Receive Data	3
5	GND	Isolated Signal Ground (do not use to ground the shield, as this will introduce noise).	5

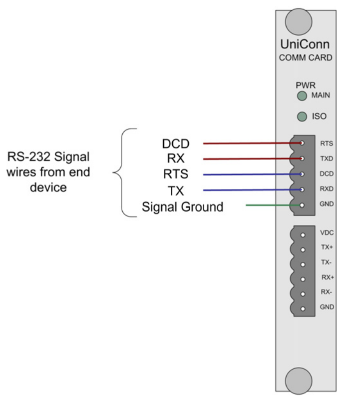


Figure 5-14: Communication Card and RS-232

Note

The transmit signals from the end device connect to the receive pins on the Communication Card.

5.8.3.2 Wiring Connection RS-485

Table 5-4: Communication Card RS-485 Pin Assignment shows the Communication Card connector assignments for the RS-485 interface.

Table 5-4: Communication Card RS-485 Pin Assignment

PIN Number (top to bottom)	PIN NAME	FUNCTION
1	VDC	Isolated DC supply voltage (normally not connected)
2	TX+	RS-485 Transmit Positive
3	TX-	RS-485 Transmit Negative

PIN Number (top to bottom)	PIN NAME	FUNCTION
4	RX+	RS-485 Receive Positive
5	RX-	RS-485 Receive Negative
6	GND	Isolated Signal Ground (do not use to ground the shield, as this will introduce noise).

The Communication Card has DIP switches which allow for the configuration for most use cases. Table 5-5: Hardware settings for the Communication Card lists the 8 DIP switches which are available to be configured on the Communication Card and offers an explanation on the function of each switch. The Communication Card ships with the RX termination resistor on (switche 1 off and 2 turned on), 4–wire mode on (switches 3 and 4 turned off), and RX bias resistors on (switches 5 and 6 on, switches 7 and 8 turned off). The configuration of the card will need to be decided and changed based upon installation conditions.

Table 5-5: Hardware settings for the Communication Card

DIP Switch	Default Setting	Switch Off	Switch On
1	Off	No Tx Term. No resistive termination on differential transmit pair.	Tx Term. 220 Ohm terminates differential transmit pair.
2	On	No Rx Term. No resistive termination on differential receive pair.	Rx Term. 220 Ohm terminates differential receive pair.
3	Off	4 Wire. No short circuit.	2 Wire. Short circuit between Tx- and Rx- pair.
4	Off	4 Wire. No short circuit.	2 Wire. Short circuit between Tx+ and Rx+ pair.
5	On	No Rx bias. No pull-up resistor.	Rx bias. 4.75kohm pull-up resistor on Rx+ to 5V.
6	On	No Rx bias. No pull-down resistor.	Rx bias. 4.75kohm pull-down resistor on Rx- to signal ground.
7	Off	No Tx bias. No pull-up resistor.	Tx bias. 4.75kohm pull-up resistor on Tx+ to 5V.
8	Off	No Tx bias. No pull-down resistor.	Tx bias. 4.75kohm pull-down resistor on Tx- to signal ground.

RS-485 can be operated in two modes, 2-wire or 4-wire. To use the two-wire mode, ensure that the termination resistors on switches 3 and 4 are turned on and connect the RS-485 cable as shown in Figure 5-15: Communication Card and 2-Wire RS-485.

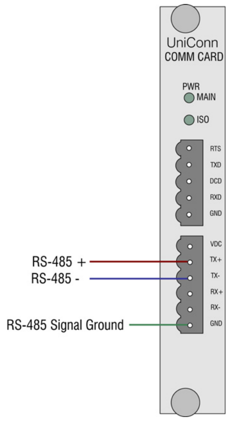


Figure 5-15: Communication Card and 2-Wire RS-485

To use 4-wire mode ensure that the termination resistors on switches 3 and 4 are turned off and connect the RS-485 cable as shown in Figure 5-16: Communication Card and 4-Wire RS-485. The RS-485 4–wire connection can be used for interfacing to RS-422 networks as well.

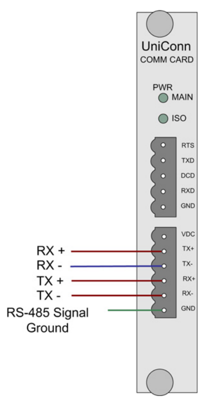


Figure 5-16: Communication Card and 4-Wire RS-485

The RS-485 network topology requires a daisy chained serial style connection between nodes. Ensure that the differential receive pair of the last Communication Card node in the chain is terminated and that all other cards are not terminated. In other words, switch 2 should be turned on for the last Communication Card in the daisy chain and turned off for all other Communication Cards.

Hint

Do not follow a star and hub network topology. This topology is not supported by RS-485 standards and will lead to reflection issues resulting in poor communication performance.

Biasing should be turned on only as required by the installation in order to force all nodes into listen mode. In electrically noisy environments or with long cable runs, biasing may be required.

5.8.3.3 Recommended Cabling

RS-485 is recommended for most SCADA applications, as well as connecting to an Site Communication Box (SCB), since it provides greater noise immunity and supports longer cable distances than RS-232. For RS-485 applications, shielded twisted pair cable is recommended.

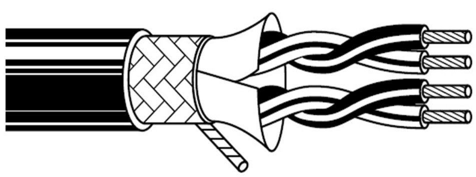


Figure 5-17: Shielded Twisted Pair Cable

For maximum effectiveness, the shield on the shielded twisted pair cable should be connected to earth ground at one end only. Do not confuse earth ground with signal ground. Connecting the shield to the RS-485 or RS-232 signal ground may introduce noise into the communication card.

Note

The system must be earth grounded in order to meet CE requirements.

5.8.4 Modbus® TCP/IP Card Installation

5.8.4.1 Install the Modbus TCP/IP Card

Caution

Potential Severity:	Light
Potential Loss:	Assets
Hazard Category:	Electrical

The card is not “hot-swappable”. Power to the card must be turned off prior to insertion of the card into an expansion card slot. Failure to do so could result in equipment damage to either the card or the controller.

1. Turn off the power to the controller or acquisition system.
2. Remove the cover plate or existing card from the expansion slot, if applicable.
3. Insert the card in the slot make sure the faceplate labels appear right side up. Rails inside the expansion card chassis ensure that the card connector will line up and mate with the socket.

   Caution

Potential Severity:	Light
Potential Loss:	Assets
Hazard Category:	Machinery equipment hand tools

   The card should never be forcefully pushed in. If an alignment issue does not allow the card to properly mate the card should be retracted and slowly pushed into the socket.

4. Tighten the thumbscrews to ensure a good connection to the socket. Alternate tightening of the thumbscrews to ensure a flush fit.
5. Front plate connection.
   - The 8P8C modular connector (“RJ45”) connection on the front plate can be connected to a network hub, switch, or router using a standard Ethernet cable.
   - For connection to the Engineering Port, a standard male to female RS-232 serial cable is required.

To remove the card from the system:

1. Turn off the power to the controller or acquisition system.
2. Unscrew the thumbscrews.
3. Slowly pull on both thumbscrews simultaneously until the card is freed from the socket connection.

5.8.4.2 Wiring Connection

The card has two connections on the front plate:

- RJ45 connection (standard Ethernet connection): Used to connect to TCP/IP networks. The end device must be capable of decoding Modbus.
- Engineering Port (standard RS-232): Used to configure the Ethernet interface IP address.

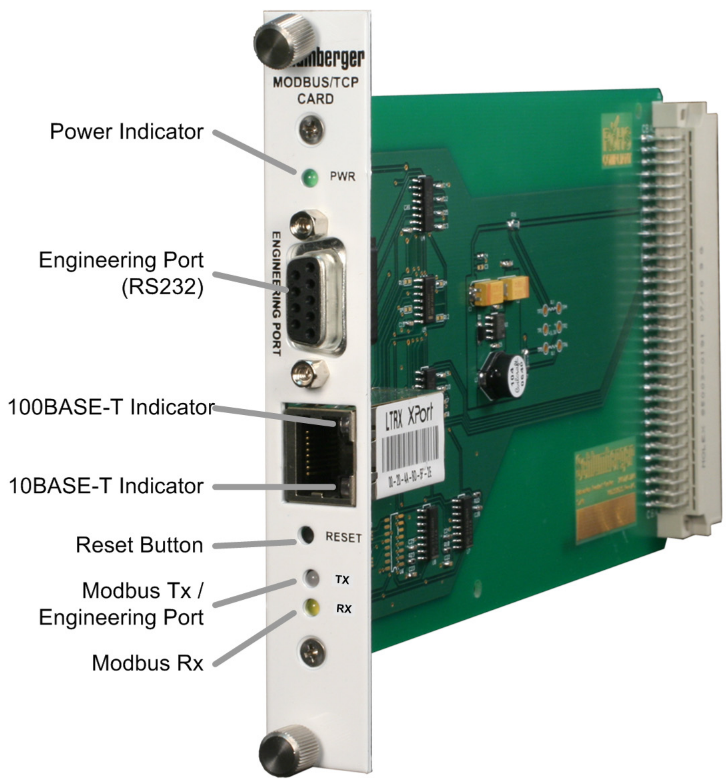


Figure 5-18: Modbus TCP/IP Card

Note

These connections cannot be used simultaneously. The Modbus data interface on the host system must be disabled prior to using the Engineering port.

5.8.5 MVD Card

Ensure that the power to the system is turned off before installing the card.

Prior to installation the cover plate must be removed from the expansion card slot. The card should be installed so that the faceplate labels appear right side up. Rails inside the expansion card chassis ensure that the card connector will line up and mate with the socket.

The card should never be forcefully pushed in. If an alignment issue does not allow the card to properly mate the card should be retracted and slowly pushed into the socket. The thumbscrews should be tightened to ensure a good connection to the socket. Alternate tightening of the thumbscrews to ensure a flush fit.

To remove the card unscrew the thumbscrews and slowly pull on both thumbscrews simultaneously until the card is free from the socket connection.

The RJ45 connection on the front plate connects to the Medium Voltage Drive onto the Ethernet receptacle. A crossover cable is required. For spare parts see Table A-10: UniConn MVD Card spare parts.

Configuration

6 Configuration

This section contains configuration information for all UniConn systems. Details on function or operation is in section 4: Theory of Operation.

6.1 Automatic Start

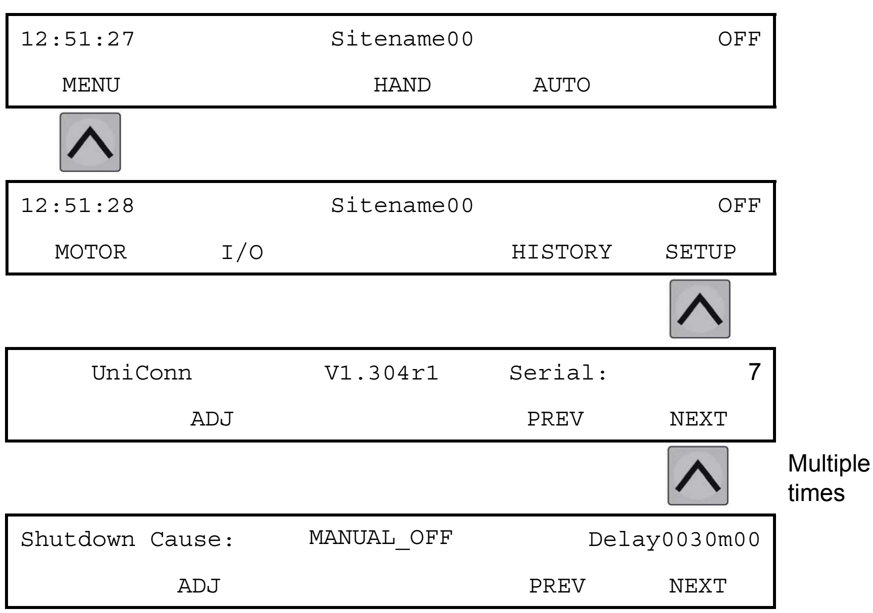
Automatic start is a UniConn function that will permit a start after the processing of a trip or alarm condition. For a detailed explanation of theory of operation of this feature see section 4.2: Automatic Start

These parameters can be configured using the UniConn keypad or StarView. StarView is software program used to interface to the UniConn for configuration and diagnostics. Review section 10: Using StarView for further details.

For a full listing of the automatic Start configuration screens see Appendix B.1: Automatic Start Screen Map.

6.1.1 Configure Global Auto Start using UniConn

To configure the global auto start parameters navigate into the SETUP menu to the Shutdown Cause screen as shown below



```
Starts –              Now:00 Allowed:00 Remaining:00
          ADJ                        PREV     NEXT
```

```
Progressive Time Delay:                        0min
          ADJ                        PREV     NEXT
```

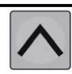
Global Automatic Start configuration menu

To configure the following parameters:

- Automatic Starts
- Manual Start Wait
- Hold Start
- Soft-start Delay
- Default Restarts
- Default Restart Delay

Navigate into the **Shutdown Cause** screen shown below

```
Shutdown Cause:     MANUAL_OFF          Delay0030m00
          ADJ                        PREV     NEXT
```



```
Automatic Starts:                                ON
 Edit                                PREV     NEXT
```

```
Manual Start Wait:                               NO
 Edit                                PREV     NEXT
```

```
Hold Start:                                      0s
 Edit                                PREV     NEXT
```

```
Soft-start Delay:                              2.0s
 Edit                                PREV     NEXT
```

```
Default Restarts:                                 5
 Edit                                PREV     NEXT
```

```
Default Restart Delay:                        30min
 Edit                                PREV     NEXT
```

Shutdown Cause menu

Note

For the Soft-start delay, one of the UniConn relay outputs (RL2, RL3, RL4) must be configured to use this feature. See section 6.7: Digital Output and section 4.9: Digital Output for details.

To configure the following parameters:

- Reset Run Time
- Release Lockout Method
- Release Lockout

Navigate into the **Starts** screen shown below

```
Starts –              Now:00 Allowed:00 Remaining:00
          ADJ                       PREV     NEXT
```

```
Reset Run Time:                               60min
 Edit                               PREV     NEXT
```

```
Release Lockout Method:                     CONTROL
 Edit                               PREV     NEXT
```

```
Release Lockout:                                 NO
 Edit                               PREV     NEXT
```

Starts menu

The **Progressive Time Delay** menu is single level only.

6.1.2 Configure Global Automatic Start using StarView

In StarView, open the controller configuration menu. **Database — Controller**. The following screen will appear. The indicated square box represents the timer and restart parameters.

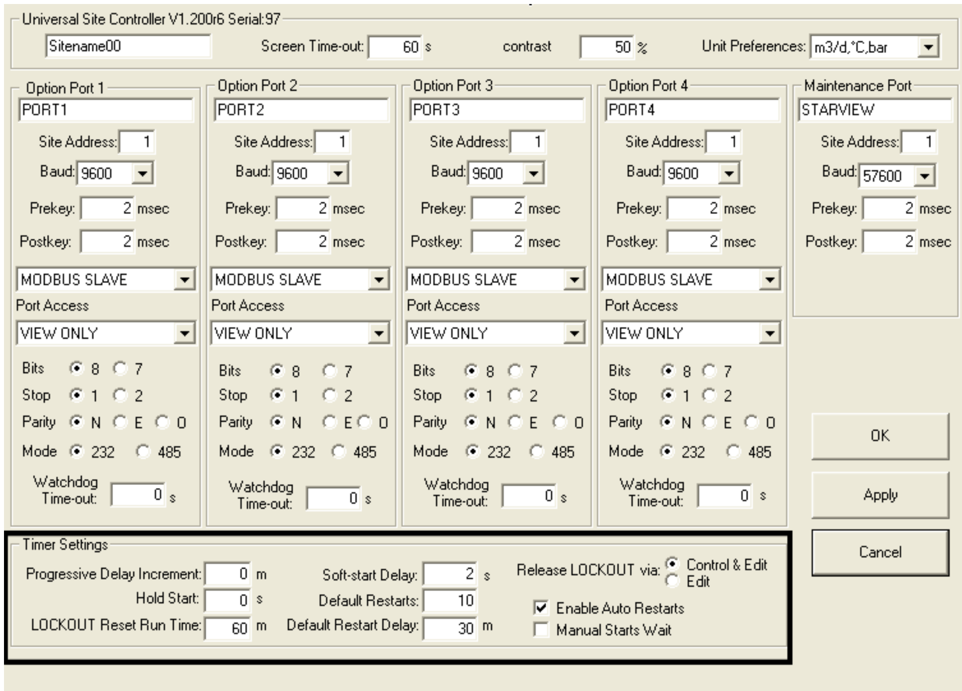


Figure 6-1: Controller Timer Settings screen

To enable all the parameters for automatic restart the check box — Enable Auto Restarts — must be enabled as shown in Figure 6-1.

6.2 Power Supply

The UniConn power inputs can be calibrated and configured to alarm on voltage and frequency. The parameters can be configured using the UniConn keypad or StarView. For a full listing of the UniConn voltage configuration screens see Appendix B.2: Power Input Screen Map.

6.2.1 Configure Power Input using UniConn

To configure the voltage alarms navigate to the **Supply Volts** screen shown below. Calibration can be performed by accessing the **ADJ** screen.

```
12:51:28           Sitename00        OFF: 0003h46
  MOTOR      I/O                HISTORY    SETUP
```

```
Port Func:         1:MBS  2:NONE  3:NONE  4:NONE
                                    PREV      NEXT
```

Mutiple times

```
Supply Volts:                                  118V
 SUPPLY_LO    ADJ     SUPPLY_HI    PREV     NEXT
```

Supply Volts screen

The high supply and low supply alarm can be configured by accessing the **SUPPLY_HI** and **SUPPLY_LO** screens. The alarm parameters are summarised in section 4.3: Alarms. The low supply contains a curve configuration shown below.

```
Supply Volts:                                  118V
 SUPPLY_LO    ADJ     SUPPLY_HI    PREV     NEXT
```

```
Action:                                      BYPASS
 Edit                              PREV     NEXT
```

Multiple times

```
01:        92% of Setpoint Trip Time:          5.0s
PERCENT    TIME                    PREV     NEXT
```

Multiple times

```
06:        60% of Setpoint Trip Time:          0.1s
PERCENT    TIME                    PREV     NEXT
```

SUPPLY_LO configuration screens

To configure the frequency alarms navigate to the **Frequency** screen shown below. The alarm parameter are summarised in section 4.3: Alarms.

```
12:51:28              Sitename00                OFF
  MOTOR       I/O                  HISTORY   SETUP
```

```
Port Func:        1:MBS  2:NONE  3:NONE  4:NONE
                                     PREV     NEXT
```

Mutiple times

```
Frequency                                     0.0Hz
LO_FREQ             HI_FREQ        PREV     NEXT
```

Frequency screen

6.2.2 Configure Power Input using StarView

StarView is software program used to interface to the UniConn for configuration and diagnostics. Review section 10: Using StarView for further details. The power supply configuration menu is shared with the voltage configuration. In StarView, open the menu tabs: **Database — Source**.

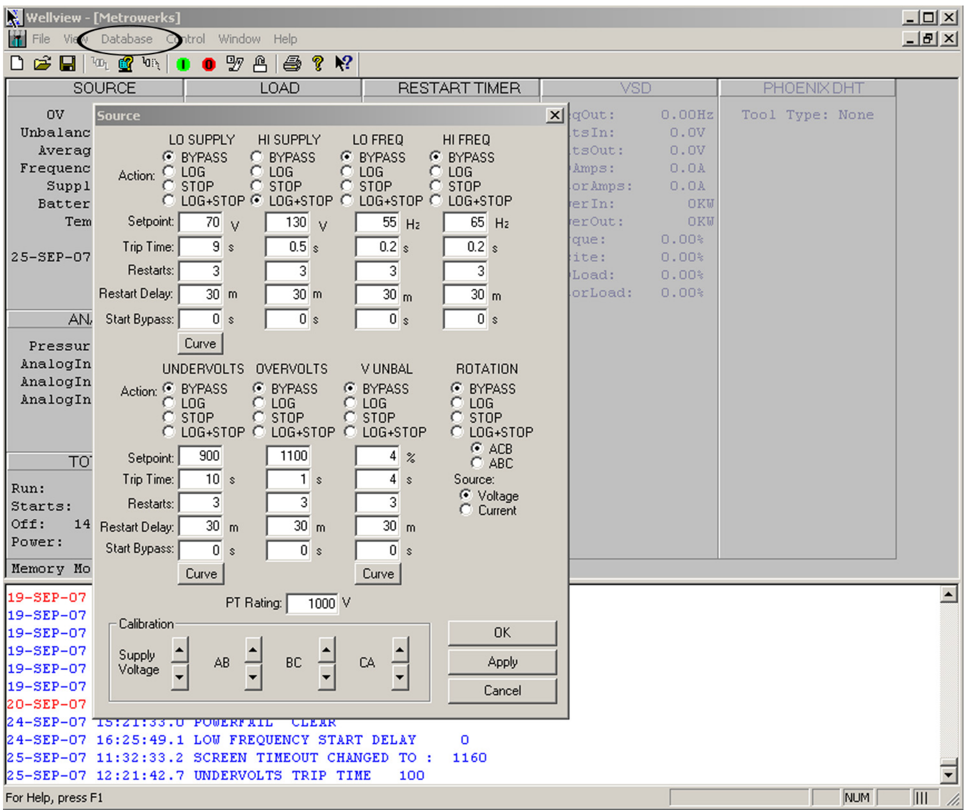


Figure 6-2: StarView Source window

The supply configuration portion is located on the top half of the window shown in Figure 6-3.

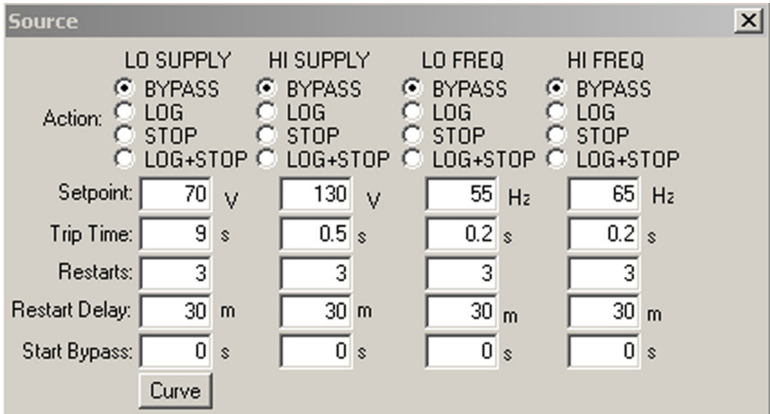


Figure 6-3: Power Supply configuration

The curve configuration is shown in Figure 6-4.

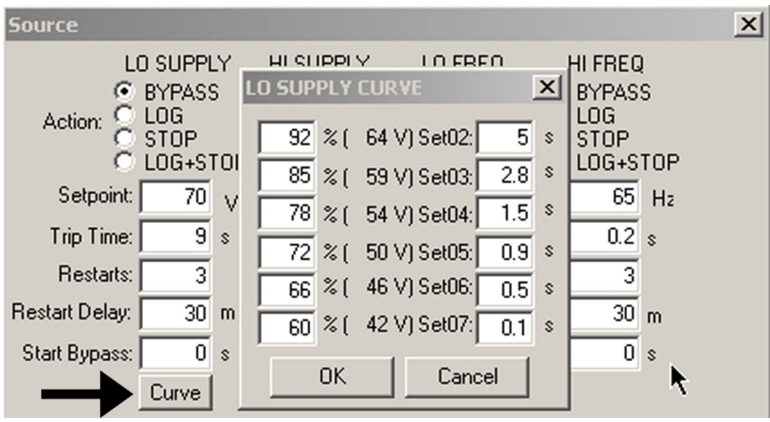


Figure 6-4: LOW_SUPPLY configuration curve

To activate the new settings click on **Apply**.

6.3 Voltage Input

The UniConn potential transformer (PT) inputs can be configured to interface with a fixed speed or variable speed motor control systems or any system where three phase voltage monitoring is necessary. The parameters can be configured using the UniConn keypad or StarView.

For a full listing of the UniConn voltage configuration screens see Appendix B.3: Volts Input Screen Map.

Danger

Potential Severity: Catastrophic
Potential Loss: Personnel
Hazard Category: Electrical

Line voltage are lethal. Measured voltage values must be performed by qualified personnel.

6.3.1 Configure Voltage Inputs Using UniConn

To configure the voltage inputs navigate to the 'Volts' screen as shown below

```
12:51:28              Sitename00         OFF: 0003h46
  MOTOR       I/O                    HISTORY     SETUP
```

```
Port Func:          1:MBS 2:NONE 3:NONE 4:NONE
                                        PREV      NEXT
```

Mutiple times

```
Volts:       0V         0V        0V      Unbal:     0.0%
ROTATION    ADJ          V_UNBAL            PREV      NEXT
```

Volts screen

The ADJ key enters the PT ratings and calibration menu as shown below

```
Volts:       0V         0V        0V      Unbal:     0.0%
ROTATION    ADJ          V_UNBAL            PREV      NEXT
```

```
PT Rating                                           4000V
 Edit                                     PREV      NEXT
```

```
Voltage Calibration:              0V       0V         0V
   AB          BC           CA         PREV      NEXT
```

Volts configuration screens

The PT rating is typically set as the 3 phase system voltage or may have a measured value entered. The voltage calibration is used to fine tune the individual phase voltage to correct for PT measurement errors.

6.3.1.1 Over Voltage

To configure the over voltage protection navigate to the **Average Voltage** menu shown below and select **OVERVOLTS**.

```
12:51:28              Sitename00          OFF: 0003h46
  MOTOR        I/O                   HISTORY     SETUP
```

```
Port Func:           1:MBS 2:NONE 3:NONE 4:NONE
                                        PREV     NEXT
```

Mutiple times

```
Average Voltage:                                    0V
UNDERVOLTS             OVERVOLTS        PREV     NEXT
```

Average Voltage configuration screen

The alarm parameters can be accessed as shown below. For explanation of each alarm parameter see section 4.3: Alarms.

```
Average Voltage:                                    0V
UNDERVOLTS             OVERVOLTS        PREV     NEXT
```

```
Action:                                         BYPASS
 Edit                                 PREV     NEXT
```

```
Alarm Setpoint:                                  1100V
 Edit                                 PREV     NEXT
```

```
Alarm Trip Time:                                  1.0s
 Edit                                 PREV     NEXT
```

```
Restarts:                                            3
 Edit                                 PREV     NEXT
```

```
Restart Delay:                                   30min
```

```
Edit                                        PREV     NEXT
```

```
Start Bypass:                                        0.0s
 Edit                                       PREV     NEXT
```

OVERVOLTS configuration screens

6.3.1.2 Undervolts

To configure the under voltage protection navigate to the **Average Voltage** menu shown in the previous section and select **UNDERVOLTS**. The alarm parameters are identical to the screens shown in the OVERVOLTS configuration screens with additional screens for under load curve settings. For explanation of each alarm parameter see section 4.3: Alarms.

Curve Settings

The under load curve settings are accessed after the under load configuration screens as shown below. The configurable parameters are percent deviation from set point and the alarm trip time.

```
Average Voltage:                                       0V
UNDERVOLTS          OVERVOLTS         PREV       NEXT
```

```
Action:                                            BYPASS
 Edit                                       PREV     NEXT
```

Mutiple times

```
01:        92% of Setpoint    Trip Time:             5.0s
PERCENT    TIME                            PREV      NEXT
```

Mutiple times

```
06:        60% of Setpoint    Trip Time:             0.1s
PERCENT    TIME                            PREV      NEXT
```

Under volts curve configuration screens

6.3.1.3 Rotation

To configure the rotation navigate to the rotation menu shown below

```
Volts:       0V        0V       0V     Unbal:     0.0%
ROTATION    ADJ          V_UNBAL          PREV      NEXT
```

```
Detection:                                         Volts
  Edit                                 PREV      NEXT
```

```
Action:                                              LOG
  Edit                                 PREV      NEXT
```

```
Alarm On:                                            ACB
  Edit                                 PREV      NEXT
```

ROTATION configuration screens

Term	**Definition**
Detection	Configure for either monitor VOLTS or CURRENT for the three phase sequence.
Action	Set the alarm action to perform. LOG, STOP, LOG STOP, BYPASS.
Alarm On	Set the three phase sequence to alarm on ABC or ACB.

6.3.1.4 Unbalance

The voltage unbalance is configured as a percentage of the line voltage. As shown below, an unbalance setting of 4% on a 4000V system would represent 10V unbalance. Additional screens follow for unbalance curve settings.

```
Volts:       0V        0V       0V     Unbal:     0.0%
ROTATION    ADJ          V_UNBAL          PREV      NEXT
```

```
Action:                                              LOG
  Edit                                 PREV      NEXT
```

```
Alarm Setpoint:                                     4.0%
  Edit                                 PREV      NEXT
```

```
Alarm Trip Time:                                    4.0s
  Edit                                 PREV      NEXT
```

```
Restarts:                                              3
```

```
 Edit                                    PREV      NEXT
```

```
Restart Delay:                                    30min
 Edit                                    PREV      NEXT
```

```
Start Bypass:                                      0.0s
 Edit                                    PREV      NEXT
```

V_UNBAL configuration screens

Curve Settings

The unbalance curve settings are accessed after the configuration screens as shown below

```
Volts:      0V       0V       0V     Unbal:      0.0%
ROTATION    ADJ        V_UNBAL         PREV      NEXT
```

```
Action:                                             LOG
 Edit                                    PREV      NEXT
```

Mutiple times

```
01:         150% of Setpoint    Trip Time:         2.0s
PERCENT     TIME                       PREV        NEXT
```

Mutiple times

```
06:         800% of Setpoint    Trip Time:         0.1s
PERCENT     TIME                       PREV        NEXT
```

V_UNBAL curve configuration screens

6.3.2 Configure Voltage Input using StarView

StarView is software program used to interface to the UniConn for configuration and diagnostics. Review section 10: Using StarView for further details.
In StarView, open the voltage configuration menu from the menu tabs: **Database — Source**.

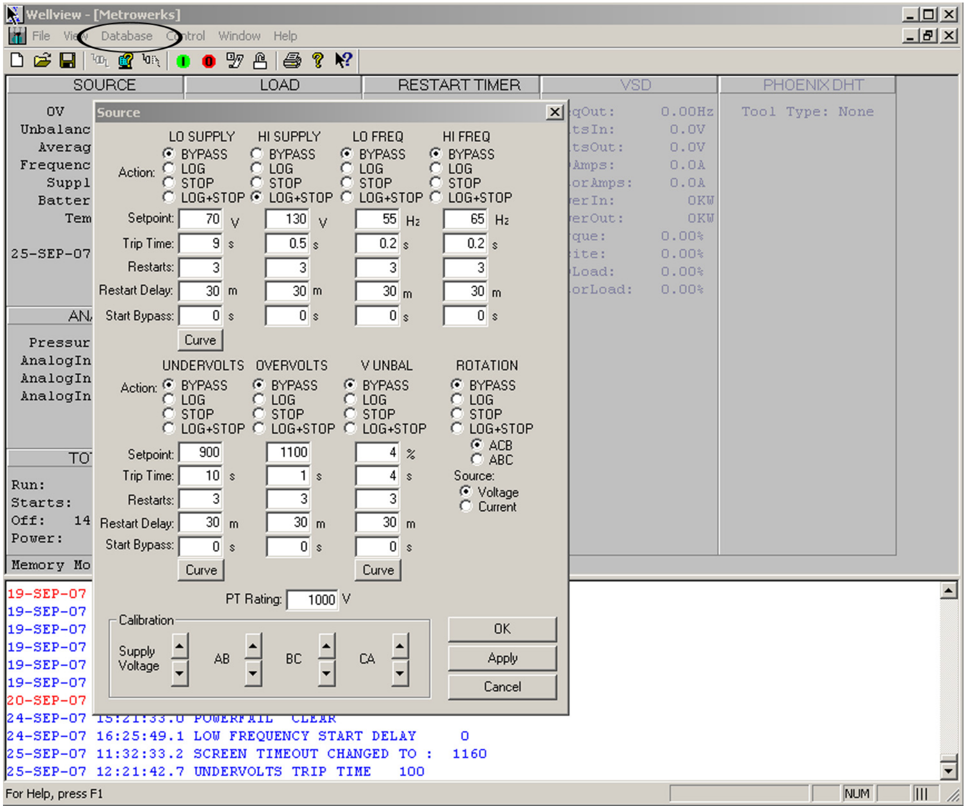


Figure 6-5: StarView Source window

The voltage configuration portion is located on the bottom half of the window shown in Figure 6-6. All voltage parameters are presented on this window.

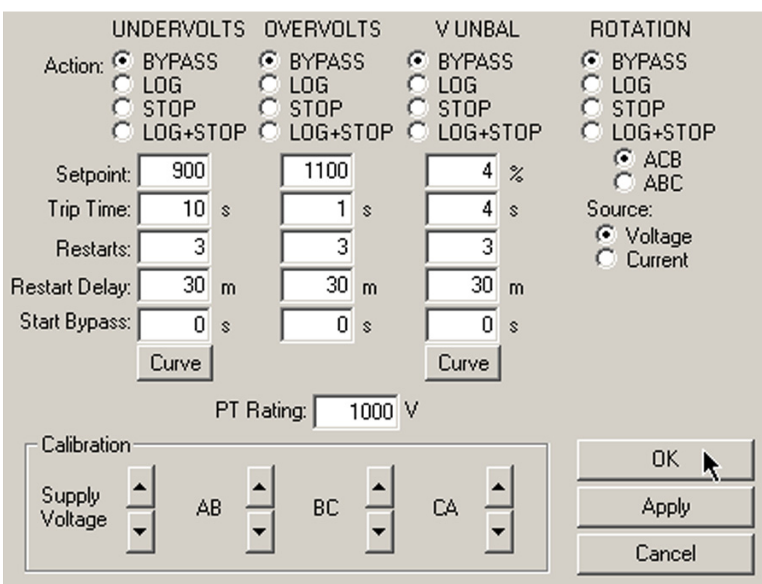


Figure 6-6: Voltage configuration

The curve configuration is shown in Figure 6-7.

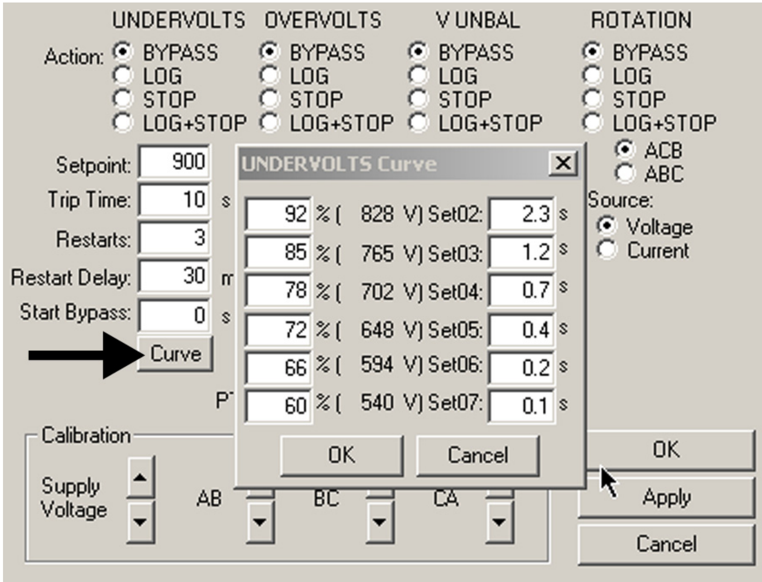


Figure 6-7: Voltage configuration curve

To activate the new settings click on **Apply**.

6.4 Current Input

The UniConn current transformer (CT) inputs can be configured to interface with a fixed speed or variable speed motor control systems or any system where three phase current monitoring is necessary. The parameters can be configured using the UniConn keypad or StarView.

For a full listing of the UniConn current configuration screens see Appendix B.4: Current Input Screen Map.

Danger

Potential Severity: Catastrophic
Potential Loss: Personnel
Hazard Category: Electrical

Do not disconnect CT cable from the burden module during system operation. Open circuit CT wires will reach lethal voltage. Ensure the system is powered down prior to changing or servicing CT wiring.

6.4.1 Configure Current Inputs Using UniConn

To configure the current inputs navigate to the **Load** screen shown below.

```
12:51:28          Sitename00        OFF: 0003h46
  MOTOR      I/O                 HISTORY    SETUP
```

```
Port Func:        1:MBS 2:NONE 3:NONE 4:NONE
                                  PREV     NEXT
```

Mutiple times

```
Load:      0A        0A        0A    Unbal:   0.00%
ROTATION   ADJ         C_UNBAL         PREV     NEXT
```

Load screen

The ADJ key enters the CT ratings and calibration menu as shown below. Enter the phase CT rating that matches the CT in use. The load calibration values are used to adjust for system anomalies.

```
Load:      0A        0A        0A    Unbal:   0.00%
ROTATION   ADJ         C_UNBAL         PREV     NEXT
```

```
Phase CT rating::                               200A
 Edit                              PREV      NEXT
```

```
Load Calibration:              0A        0A        0A
    A           B           C        PREV      NEXT
```

Load configuration screens

6.4.1.1 Over Current

To configure the over current protection navigate to the **Average Amps** menu shown below.

```
12:51:28          Sitename00        OFF: 0003h46
  MOTOR      I/O                 HISTORY    SETUP
```

```
Port Func:        1:MBS 2:NONE 3:NONE 4:NONE
                                  PREV     NEXT
```

Mutiple times

```
Average Amps:                                    0A
```

```
UNDERLOAD                 OVERLOAD        PREV       NEXT
```

The alarm parameters and curve settings can be accessed as shown below. For detailed explanation of each alarm parameter see section 4.3: Alarms.

```
Average Amps:                                          0A
UNDERLOAD                 OVERLOAD        PREV       NEXT
```

```
Action:                                            BYPASS
 Edit                                     PREV       NEXT
```

Mutiple times

```
Start Bypass:                                        0.0s
 Edit                                     PREV       NEXT
```

Alarm Settings screens

```
01:         110% of Setpoint     Trip Time:          8.0s
PERCENT     TIME                        PREV         NEXT
```

Mutiple times

```
14:         700% of Setpoint     Trip Time:          0.5s
PERCENT     TIME                         PREV        NEXT
```

Curve settings screens

The over load curve settings are accessed after the over load configuration screens as shown above. The configurable parameters are *percent deviation from set point* and the *alarm trip time*.

6.4.1.2 Under Current

To configure the under current protection navigate to the **Average Amps** menu shown in the previous section. The alarm parameters and curve settings can be accessed as shown below.

```
Average Amps:                                          0A
UNDERLOAD                 OVERLOAD        PREV       NEXT
```

```
Action:                                            BYPASS
 Edit                                     PREV       NEXT
```

```
UL Tracking Target:                        85%
  Edit                          PREV    NEXT
```

```
UL Tracking Filter:                        OFF
  Edit                          PREV    NEXT
```

UL Tracking screens

```
Action:                                 BYPASS
  Edit                          PREV    NEXT
```

Mutiple times

```
Start Bypass:                             0.0s
  Edit                          PREV    NEXT
```

Alarm Settings screens

The under load tracking parameters are explained in section 4.6.1: Under Load Tracking.

6.4.1.3 Rotation

This menu is shared with the voltage section. See section 6.3.1.3: Rotation for details.

6.4.1.4 Unbalance

To configure the current unbalance protection navigate to the **Load** menu shown previously. The alarm parameters can be accessed as shown below. For detailed explanation of each alarm parameter see section 4.3: Alarms.

```
Load:      0A       0A      0A    Unbal:  0.00%
ROTATION  ADJ        C_UNBAL        PREV    NEXT
```

```
Action:                                 BYPASS
  Edit                          PREV    NEXT
```

Mutiple times

```
Start Bypass:                             0.0s
  Edit                          PREV    NEXT
```

Alarm Settings screens

6.4.1.5 Stall

To configure the stall protection navigate to the **Stall Time** menu shown below.

```
12:51:28            Sitename00        OFF: 0003h46
  MOTOR       I/O                 HISTORY    SETUP
```

```
Port Func:           1:MBS 2:NONE 3:NONE 4:NONE
                                     PREV     NEXT
```

Mutiple times

```
Stall Time:       191.1s            Start:      0A
 STALL                 SHORT_CCT    PREV      NEXT
```

Stall Time menu

The alarm parameters can be accessed as shown below.

```
Stall Time:        191.1s          Start:       0A
 STALL                  SHORT_CCT  PREV       NEXT
```

```
Action:                                     BYPASS
  Edit                              PREV      NEXT
```

```
Alarm Setpoint:                               300A
  Edit                              PREV      NEXT
```

```
Alarm Trip Time:                              0.5s
  Edit                              PREV      NEXT
```

STALL configuration screens

6.4.1.6 Short Circuit

To configure the stall protection navigate to the **Stall Time** menu shown above. The alarm parameters screens are identical to the Stall screens shown above.

6.4.1.7 Motor Amps

The UniConn displays motor load as a percent of rated motor current. This value is on the motor name plate. Enter the name plate rating as shown below.

```
Motor Load:                                      0.00%
               ADJ                    PREV       NEXT
```

```
Rated Motor Amps:                               177.0A
 Edit
```

Motor Load configuration screens

6.4.2 Configure Current Inputs Using StarView

StarView is software program used to interface to the UniConn for configuration and diagnostics. Review section 10: Using StarView for further details.
In StarView, open the current configuration menu from the menu tabs: Database — Load.

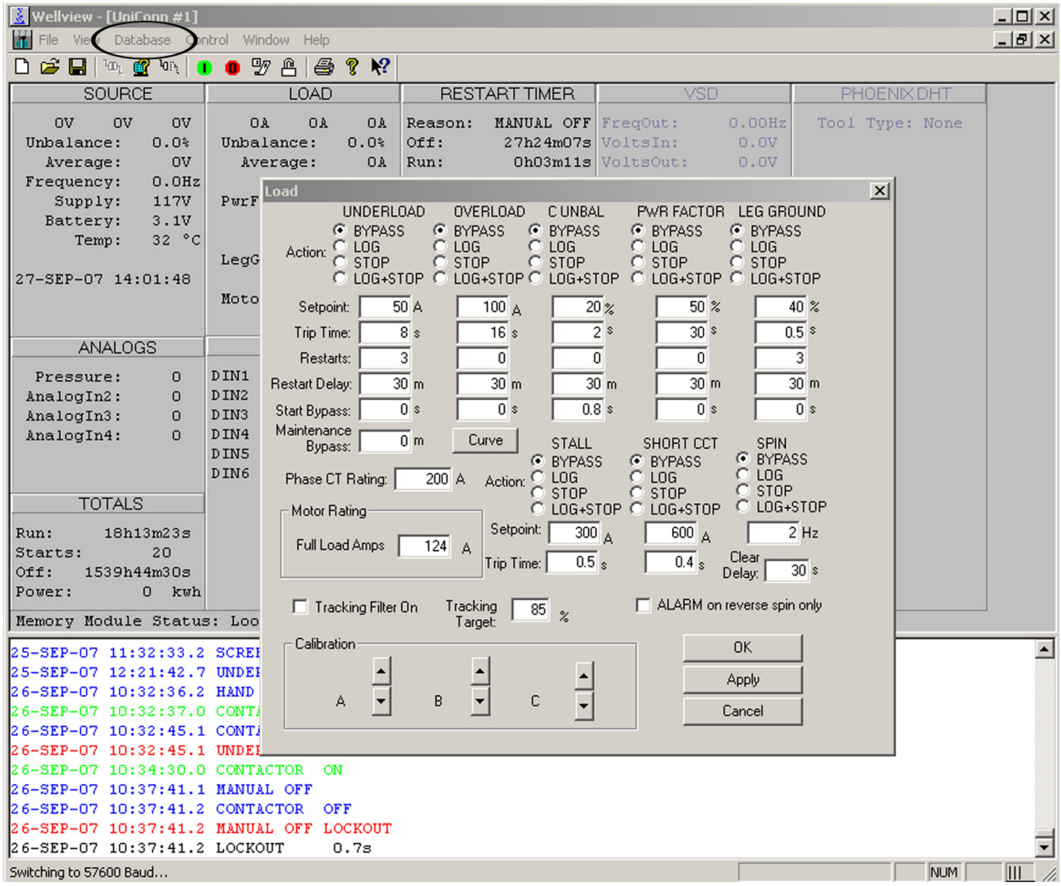


Figure 6-8: StarView Load window

The current configuration window is shown in Figure 6-9.

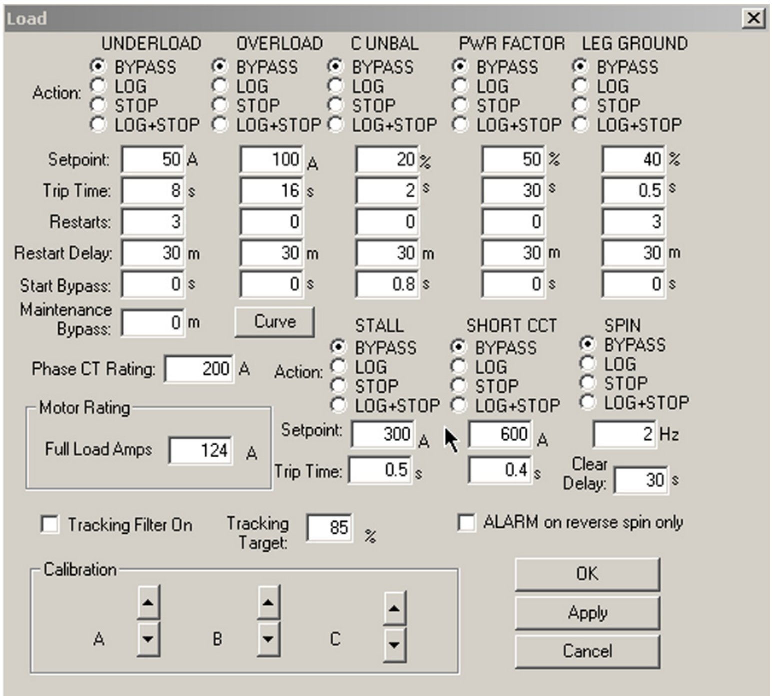


Figure 6-9: Load configuration

The curve configuration is shown in Figure 6-10. Using the **Predefined Curves** drop down menu, curve settings can be saved and restored.

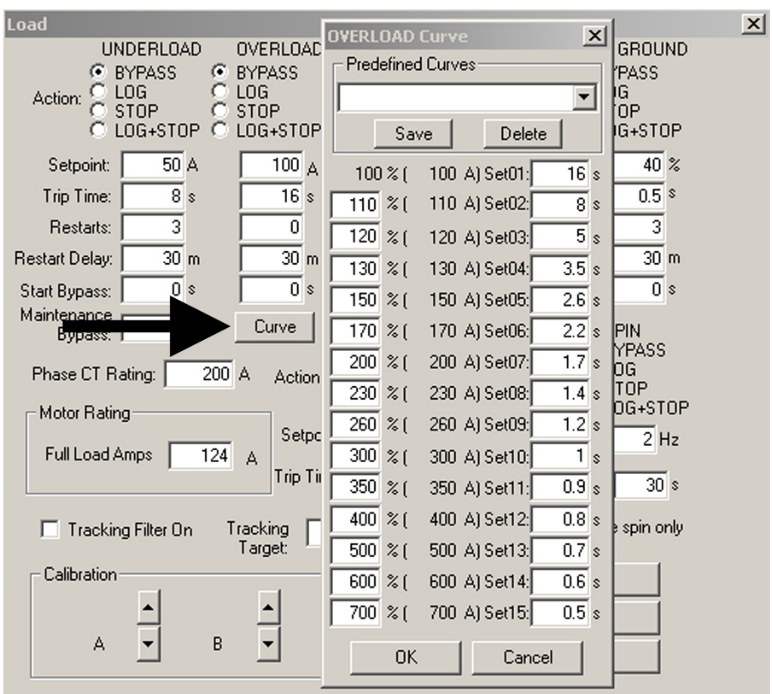


Figure 6-10: Load configuration curve

Caution

Potential Severity: Light
Potential Loss: Assets, Process
Hazard Category: Electrical

A good understanding of motor operation is necessary prior to modifying the curve settings. Incorrect UniConn alarming or motor damage may result.

6.5 Backspin

The UniConn Backspin inputs can be configured to detect and alarm on forward or reverse rotation. The parameters can be configured using the UniConn keypad or StarView.

6.5.1 Configure Backspin using UniConn

To configure the Backspin inputs navigate to the **Motor Spin** screen as shown below.

```
12:51:28              Sitename00          OFF: 0003h46
   MOTOR       I/O                     HISTORY     SETUP
```

```
Port Func:          1:MBS  2:NONE  3:NONE  4:NONE
                                           PREV      NEXT
```

Mutiple times

```
Motor Spin (FORWARD):                               0.0Hz
                          SPIN          PREV      NEXT
```

Backspin screen

The *FORWARD* indication represents the detected rotation direction of the motor or the last known rotation direction. The **SPIN** configuration screen is shown below. For explanation of each alarm parameter see section 4.3: Alarms.

```
Motor Spin (FORWARD):                               0.0Hz
                          SPIN          PREV      NEXT
```

```
Action:                                          LOG+STOP
                            SPIN        PREV      NEXT
```

Mutiple times

```
ALARM on reverse spin only:                  NO
   EDIT                          PREV     NEXT
```

Backspin configuration screens

6.5.2 Configure Backspin using StarView

StarView is software program used to interface to the UniConn for configuration and diagnostics. In StarView, open the Backspin configuration menu from the menu tabs: **Database — Load**.

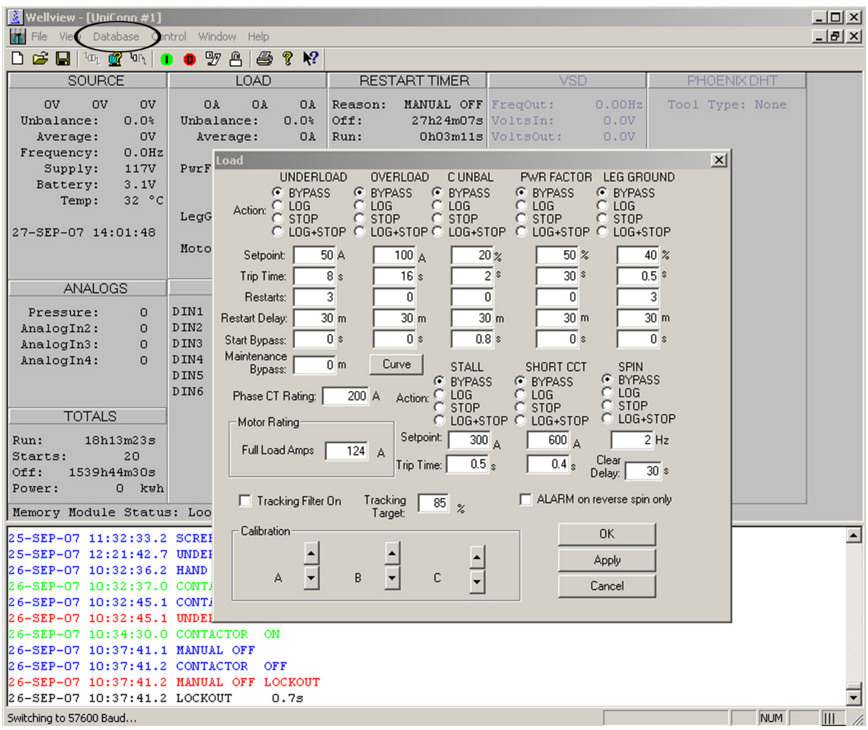


Figure 6-11: StarView Load window

The Backspin configuration portion is located on the middle right of the window shown in Figure 6-12. The **Hz** sets the threshold of detection. The **Clear Delay** sets the timer once the alarm has cleared.

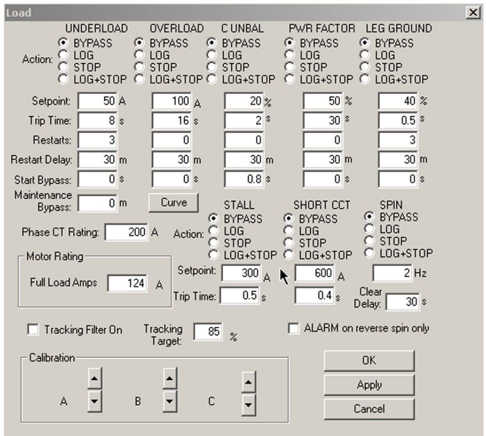


Figure 6-12: Backspin configuration

6.6 Leg Ground

The UniConn Leg Ground and an A095 can be configured to provide unbalance and ground fault protection on delta systems.

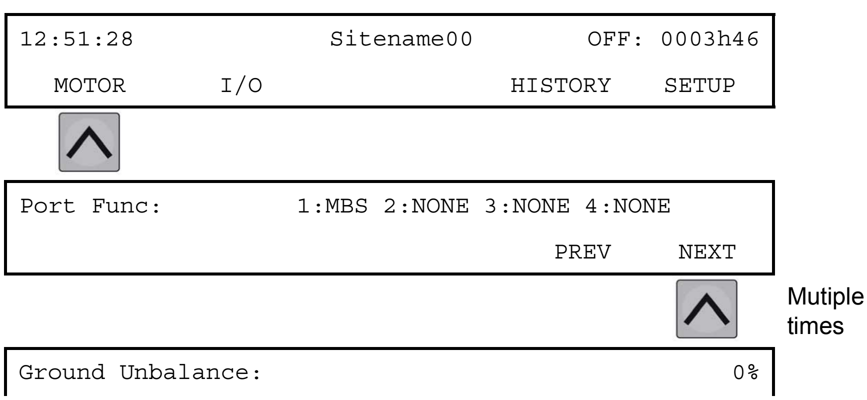
The parameters can be configured using the UniConn keypad or StarView. For details on the alarm parameters see section 4.3: Alarms.

StarView is software program used to interface to the UniConn for configuration and diagnostics. Review section 10: Using StarView for further details.

For a full listing of the UniConn Leg Ground configuration screens see Appendix B.6: Leg Ground Screen Map.

6.6.1 Configure Leg Ground using UniConn

To configure the Leg Ground navigate to the **Ground Unbalance** screen shown below.



```
                LEG_GROUND      PREV      NEXT
```

Ground Unbalance screen

The alarm parameters are configured as shown below. Typical values are shown.

```
Ground Unbalance:                               0%
                LEG_GROUND      PREV      NEXT
```

```
Action:                                     BYPASS
 Edit                           PREV      NEXT
```

Mutiple times

```
Start Bypass:                                 0.0s
 Edit                           PREV      NEXT
```

Ground Unbalance configuration screens

6.6.2 Configure Leg Ground using StarView

In StarView, open the Leg Ground configuration menu from the menu tabs: **Database — Load**.

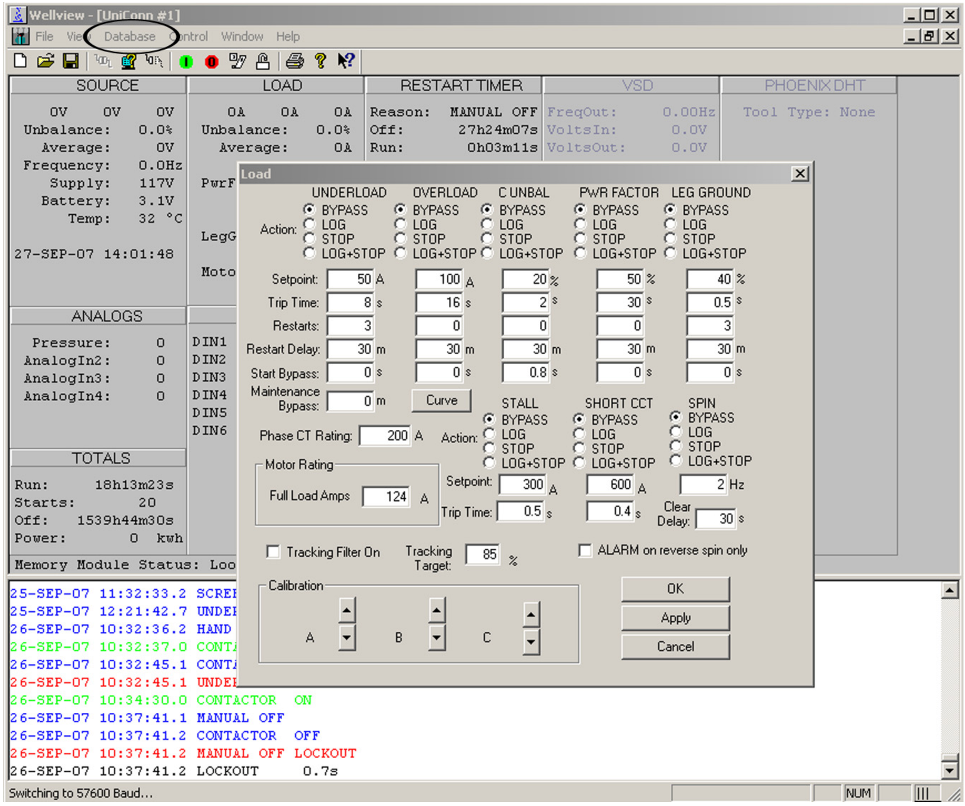


Figure 6-13: StarViewLoad_P.png

The Leg Ground parameters are located on the top right of the screen shown in Figure 6-14.

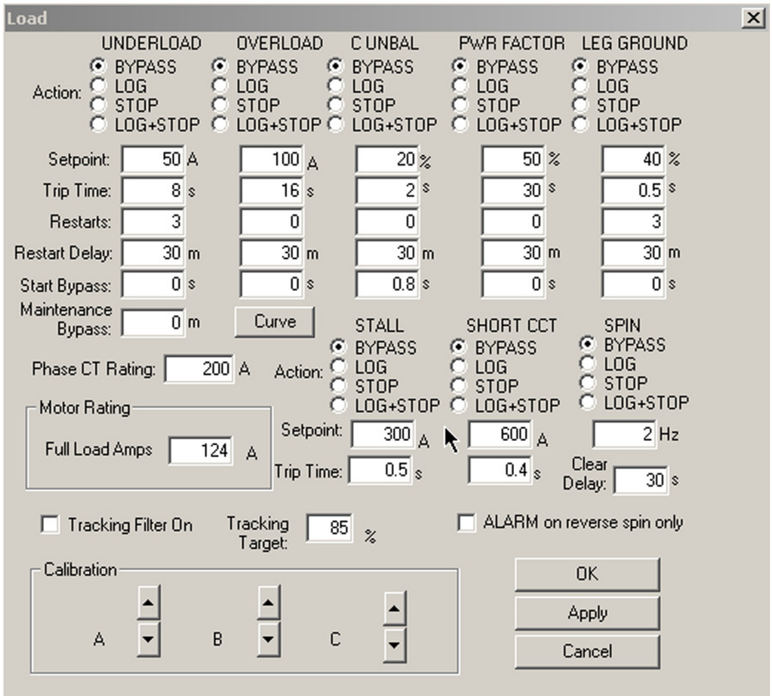


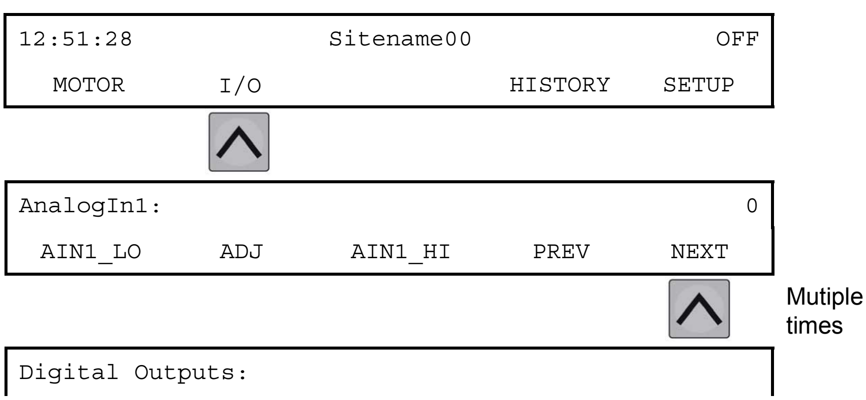
Figure 6-14: StarView Leg Ground parameters

6.7 Digital Output

All three user UniConn digital outputs, (RELAY2, RELAY3, and RELAY4) are configurable. RELAY1 is reserved as a contactor output relay and is not configurable. All relays all have normally open and normally closed terminals.

6.7.1 Configure Digital Outputs Using UniConn

To configure the digital outputs using the UniConn navigate to the 'Digital Outputs:' screen as shown below.



```
 RELAY2            RELAY3     PREV     NEXT
```

UniConn Digital Outputs Screen

Below shows the screens to configure the parameters.

```
Digital Outputs:
 RELAY2            RELAY3     PREV     NEXT
```

```
Name:                                RELAY2
 Edit                          PREV    NEXT
```

```
Digital Output Action:                  OFF
 Edit                          PREV    NEXT
```

```
Select Relay Alarm Source:          UniConn
 Edit                          PREV    NEXT
```

UniConn Digital Outputs Configuration Screen

6.7.2 Configure Digital Outputs using StarView

Navigate to the Digital Outputs screen by double clicking in the area indicated in Figure 6-15.

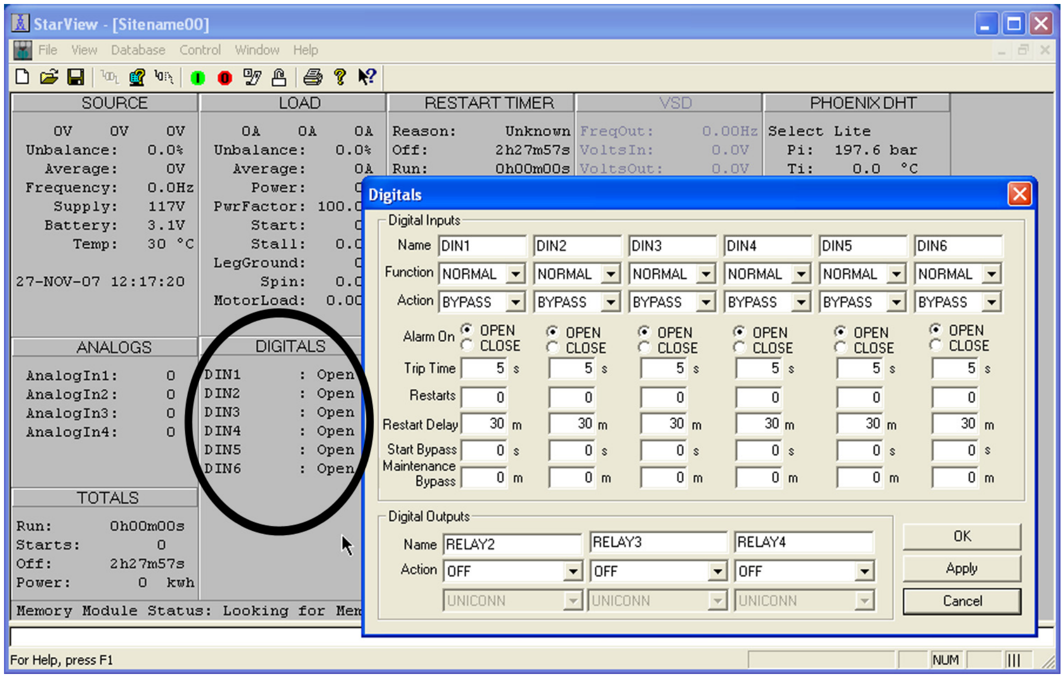


Figure 6-15: StarView digital input screen

The configurations controls are shown in Figure 6-16. The alarm action can be selected from the drop down list.

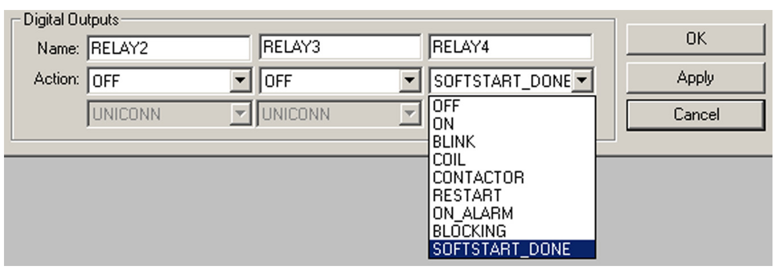


Figure 6-16: StarView digital output controls

A second drop down box becomes available on the selection of the alarm action 'ON_ALARM'.

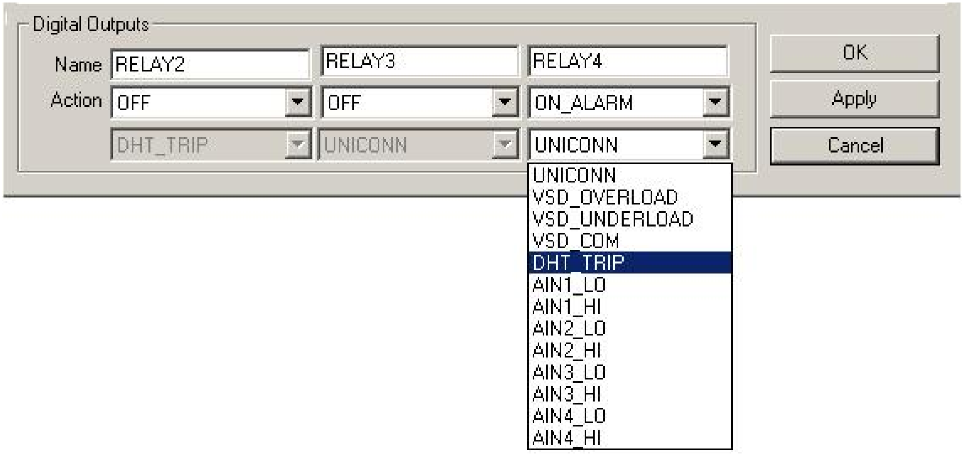


Figure 6-17: StarView digital output controls on alarm

6.8 Analog Input

The analog inputs are 0–10 Vdc or 4-20 mA current loops that can be used to monitor external sensors and RTDs. The parameters can be configured using the UniConn keypad or StarView.

6.8.1 Decimal Places

Special care must be applied when using numbers and decimal places on the UniConn. The numbers are arbitrarily stored in the Modbus table / memory map based on the specific data type requirements.

The decimal point "." is not incorporated into the UniConn and values are displayed as determined from the data type in memory.

Example

Data type for frequency is XX.X. This is stored in memory as XXX with a type parameter to indicate a decimal place.

To incorporate a decimal to the analog readings the user must perform the scaling.

Example

For values expected to be XX.XX, the user settings on the UniConn would be XXXX.

For analog data which becomes incorporated into additional UniConn controls as feedback parameters, IE surface pressure, speed setings, etc. The decimal values must be carefully evaluated to ensure that the analog data provided is in the expected scaling of the UniConn feedback system.

6.8.2 Alarms

Each analog channel has two alarms associated with it:

- the high set point alarm
- the low set point alarm.

Each set point can be configured for an alarm action. Each of these alarms may be bypassed if not required.

6.8.2.1 StarView Modes and Alarm Options

StarView can operate with the controller on two modes:

- ESP mode (default mode)
- WellWatcher mode.

ESP mode supports alarming on the analog inputs. WellWatcher mode does not support analog alarming.

Shown in Figure 6-18 is the StarView screen as it should appear with the controller in ESP mode.

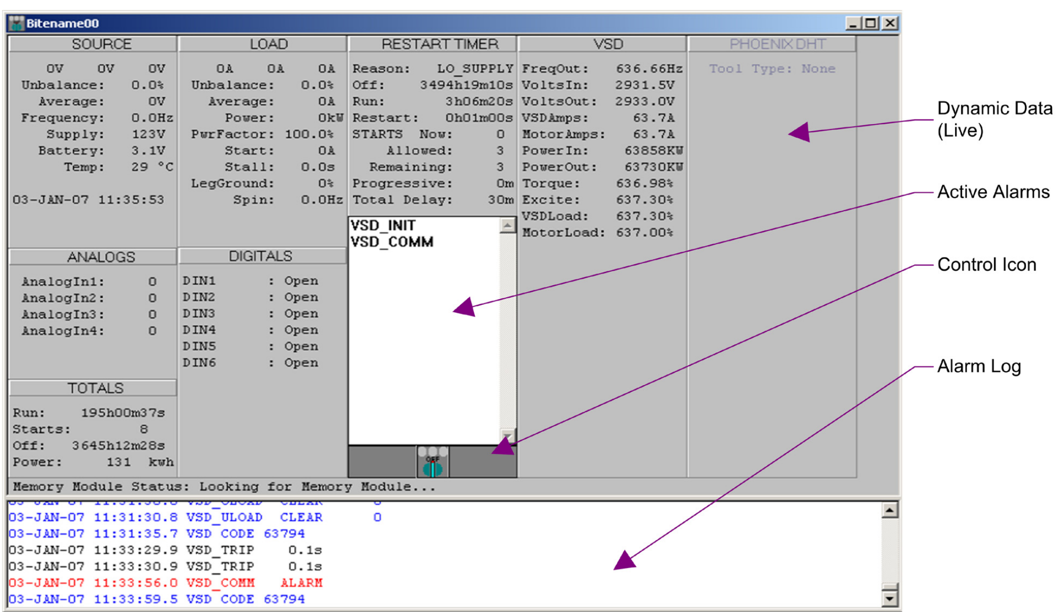


Figure 6-18: ESP mode site window

Shown in Figure 6-19 is the StarView screen as it should appear with the controller in WellWatcher mode.

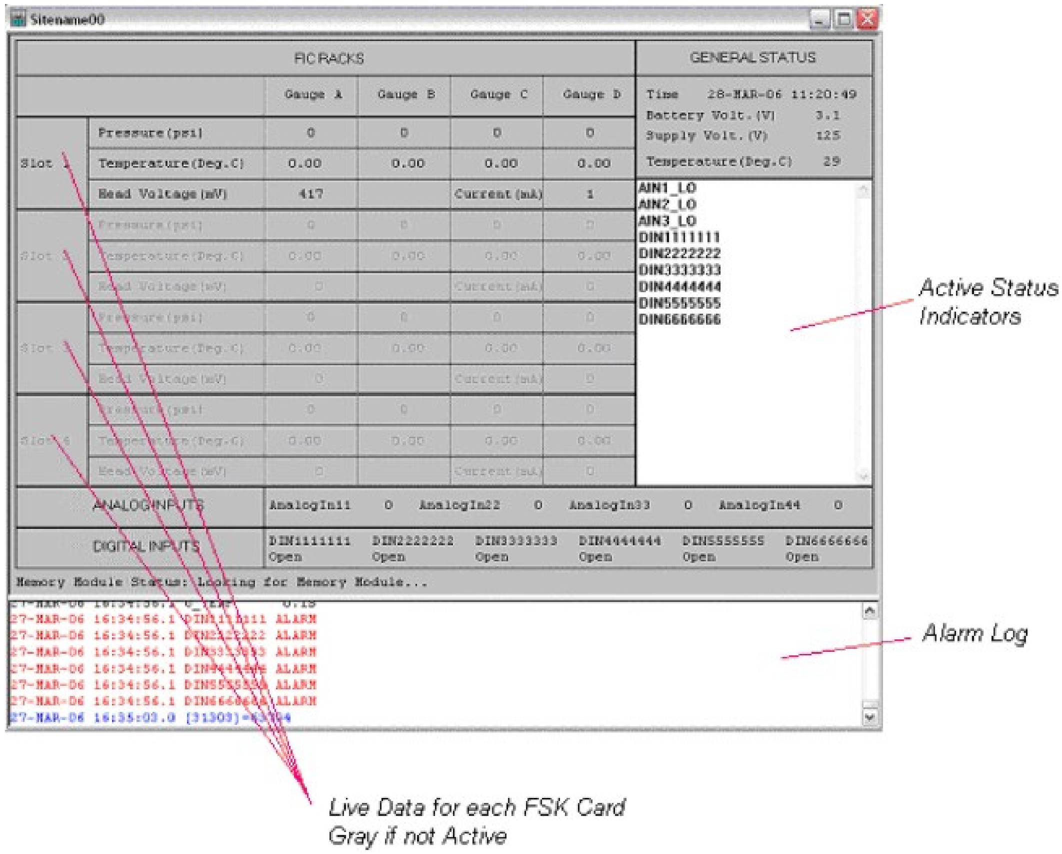


Figure 6-19: WellWatcher mode site window

6.8.2.2 Analog Lo/Hi Alarm to Relay

To configure Analog Lo/Hi Alarm to Relay in StarView, double click the “DIGITALS” section and select from the list boxes accordingly:

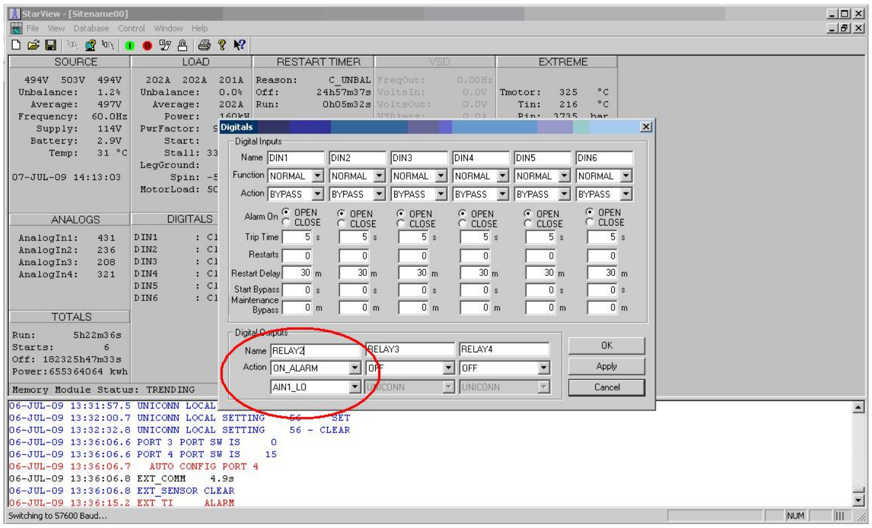


Figure 6-20: Analog Lo/Hi alarm to relay Digitals window

The selected action should be “ON_ALARM”. In this example, the AIN1_LO alarm was selected for RELAY2.

6.8.3 Configure Analog Inputs Using UniConn

Access the I/O screen and navigate to the ADJ screen as shown below. The ADJ menu enters the configuration parameters for the analogs.

```
12:51:28              Sitename00              OFF
   MOTOR      I/O                HISTORY   SETUP
```

```
AnalogIn1:                                      0
  AIN1_LO     ADJ       AIN1_HI      PREV     NEXT
```

I/O Configuration Menu

Configuration of the analog inputs using the UniConn can best be explained with the following examples.

6.8.3.1 Examples

---

eg **Example: Sensor with 0 V reference**

A pressure sensor measures 0-1000 psi and sends out a proportional 0-10 V signal.

Pressure gage specification:

- 0 psi at 0 V
- 1000 psi at 10 V

There is a direct relationship to the UniConn analog input voltage and the Raw % range.

$$\frac{0V}{10V} \equiv \frac{0\%}{100\%}$$

Applying these two relationships results in:

$$\frac{0\%}{100\%} \equiv \frac{0\,psi}{1000\,psi}$$

These values correspond to the Scaled analog settings as shown below.

```
Scaled Minimum:                                  0
 Edit                            PREV      NEXT
```

```
Scaled Maximum:                               1000
 Edit                            PREV      NEXT
```

Scaled Minimum and Maximum Screens

Setting Summary:

- Raw Maximum = 100%
- Raw Minimum = 0%
- Scaled Maximum = 1000
- Scaled Minimum = 0

Example: Sensor with 0mA reference

A temperature probe measures a 25-150 degC (77 to 302 degF) range on a 0-20 mA loop.

Temperature probe specifications:

- 25 degC at 0 mA
- 150 degC at 20 mA

There is a direct relationship to the UniConn analog input current and the Raw % range.

$$\frac{0mA}{20mA} \equiv \frac{0\%}{100\%}$$

Applying these two relationships results in:

$$\frac{25°C}{150°C} \equiv \frac{0\%}{100\%}$$

Setting Summary:
- Raw Maximum = 100%
- Raw Minimum = 0%
- Scaled Maximum = 150
- Scaled Minimum = 25

---

eg **Example: Sensor with two points, voltage mode**

A pressure sensor measures 3000-12000 psi and sends out a proportional 1-5 V signal.

Pressure gauge specification:
- 3000 psi at 1 V
- 12000 psi at 5 V

UniConn analog input specification:
- 0 to 10 V, 4096 discrete data points
- 1% accuracy

There is a direct relationship to the UniConn analog input voltage and the Raw % range:

$$\frac{0V}{10V} \equiv \frac{0\%}{100\%}$$

To restrict the display range to match that of the pressure sensor, the ratio below must be maintained.

$$\frac{1V}{5V} \equiv \frac{10\%}{50\%}$$

The 10% and 50% values are entered for the Raw % values as shown below.

$$\frac{10\%}{50\%} \equiv \frac{3000\,psi}{12000\,psi}$$

```
Raw Minimum:                                   10%
 Edit                        PREV      NEXT
```

```
Raw Maximum:                                   50%
 Edit                        PREV      NEXT
```

Raw Minimum and Maximum Screens

These values correspond to the Scaled analog settings as shown below.

```
Scaled Minimum:                               3000
 Edit                        PREV      NEXT
```

```
Scaled Maximum:                              12000
 Edit                        PREV      NEXT
```

Scaled Minimum and Maximum

Setting Summary:

- Raw Maximum = 50%
- Raw Minimum = 10%
- Scaled Maximum = 12000
- Scaled Minimum = 3000

A chart representing the data points is shown in Figure 6-21. The data is linear but does not equal zero at 0% full scale.

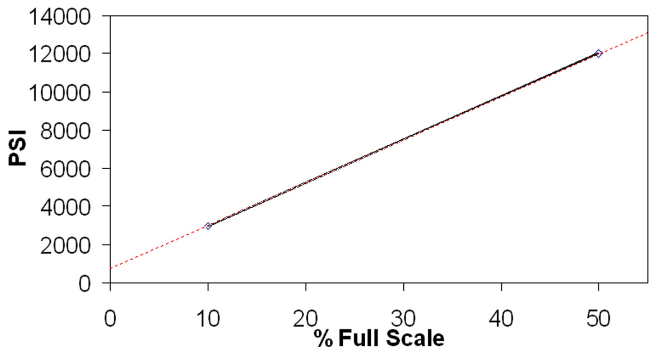


Figure 6-21: 10-50% vs 3000-12000psi

The resolution for this configuration follows this relationship:

$$\frac{100\%}{4096\,points} \equiv \frac{50\%}{x} \rightarrow x = 2048\,points$$

$$\frac{100\%}{4096\,points} \equiv \frac{10\%}{x} \rightarrow x = 409.6\,points \approx 410\,points$$

$$\therefore \frac{12000\,psi}{2048\,points} \Leftrightarrow \frac{3000\,psi}{410\,points} \rightarrow \frac{9000\,psi}{(2048-410)\,points}$$

$$\rightarrow \frac{9000\,psi}{1638\,points} = 5.49\,{}^{psi}\!/\!_{point}$$

The engineering units for this pressure transducer on the UniConn will have a resolution of approximately 5 psi.

Alarm trigger points can be set to client requirements.

---

eg **Example: Sensor with two points, current mode**

A temperature sensor generates a 4-15 mA signal to measure a 10-200 degC (50 to 392 degF) signal.

Temperature sensor specification:

- 10 degC at 4 mA
- 200 degC at 15 mA

UniConn analog input specification:

- 4 to 20 mA (26 mA over-range or 130%), 4096 discrete data points. Determine how many points available within the 100% range.

$$\frac{20mA}{100\%} \equiv \frac{26}{130\%} \rightarrow \frac{130\%}{4096\text{points}} \equiv \frac{100\%}{3151\text{points}}$$

- 5% accuracy.

There is a direct relationship to the UniConn analog input current and the Raw % range.

$$\frac{0mA}{20mA} \equiv \frac{0\%}{100\%}$$

To relate 4 mA to the Raw % range:

$$4mA \rightarrow \frac{4mA}{20mA} \equiv \frac{x}{100\%} \rightarrow x = 20\%$$

To relate the 15 mA to the Raw % range:

$$15mA \rightarrow \frac{15mA}{20mA} \equiv \frac{x}{100\%} \rightarrow x = 75\%$$

For a loop current of 4 mA the temperature is 10 degC. For a loop current of 15 mA the temperature is 200 degC. This results in:

$$\frac{10°C}{200°C} \equiv \frac{20\%}{75\%}$$

Setting Summary:

- Raw Maximum = 75%
- Raw Minimum = 20%
- Scaled Maximum = 200
- Scaled Minimum = 10

The measurement resolution for this configuration follows the relationship:

$$\frac{130\%}{4096\,points} \equiv \frac{75\%}{x} \rightarrow x = 2363\,points$$

$$\frac{130\%}{4096\,points} \equiv \frac{20\%}{x} \rightarrow x = 630.15 = 630\,points$$

$$\frac{200°C}{2363\,points} \Leftrightarrow \frac{10°C}{630\,points} \rightarrow \frac{(200-10)°C}{(2363-630)\,points}$$

$$\rightarrow \frac{190°C}{1733\,points} = 0.109\,{}^{°C}\!/_{point}$$

The engineering units for this temperature transducer on the UniConn will have a resolution of approximately 0.11 degC.

6.8.4 Configure the Analog Inputs Using StarView

This section will detail the configuration of the analog inputs with StarView in ESP mode.

To access the analog configuration, double-click in the ANALOG tablet. The following configuration menu will appear.

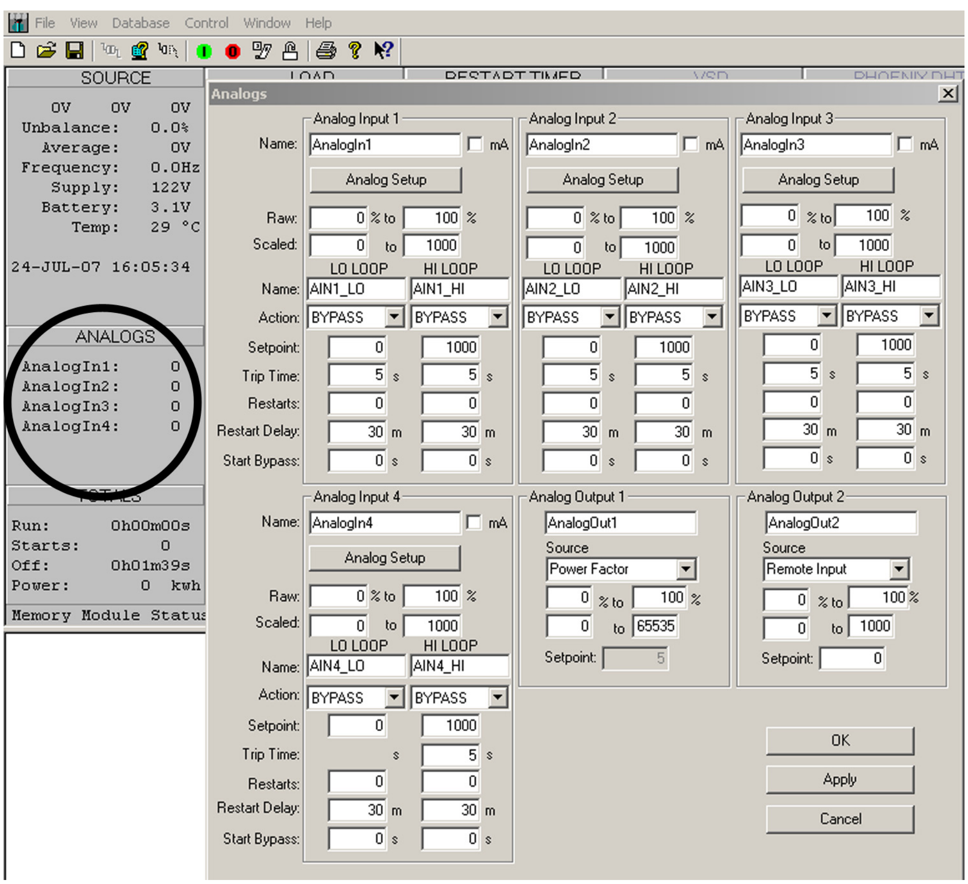


Figure 6-22: StarView Analog Menu

The analog inputs can be configured in two manners:

- The transducer specifications indicate a range of values starting at 0 V.
- Transducer specifications have known values at two points, i.e. max and min values.

The Analog Setup windows shown in Figure 6-23 provides configuration options for each analog input. StarView automatically performs calculations to assist in configuration.

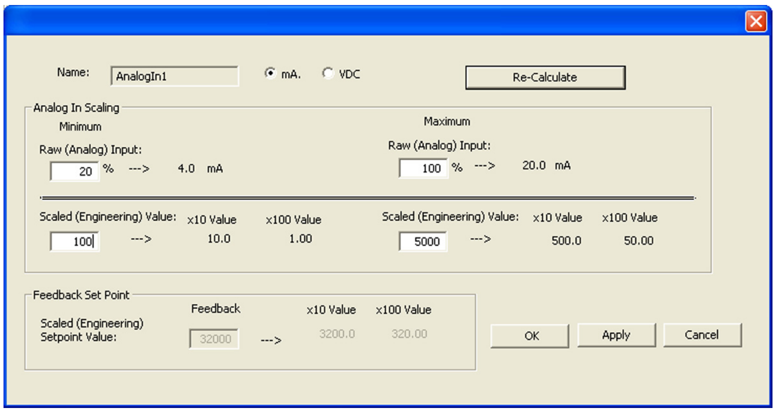


Figure 6-23: - StarView analog input configuration screen

Configuration of the analog inputs using StarView can best be explained with examples.

6.8.4.1 Examples

Example: Voltage Transducer

Configure the UniConn analog input number 1 to convert the analog voltage values of a pressure gauge to engineering units. The specifications provide two data points.

Pressure gauge specification:

- 5000 psi at 1 V
- 20000 psi at 5 V

UniConn analog input specification:

- 0 to 10 V, 4096 discrete data points.
- 1% accuracy.

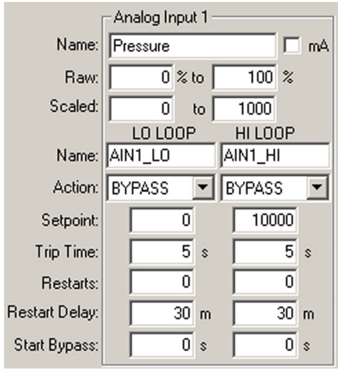


Figure 6-24: Default analog settings

There is a direct relationship to the UniConn analog input voltage and the Raw % range.

$$\frac{0V}{10V} \equiv \frac{0\%}{100\%}$$

Figure 6-24 shows these default values.

To restrict the display range to match that of the pressure transducer, the ratio below must be maintained:

$$\frac{1V}{5V} \equiv \frac{10\%}{50\%}$$

The 10% and 50% values are entered for the Raw % values.

$$\frac{10\%}{50\%} \equiv \frac{5000\,psi}{20000\,psi}$$

These values correspond to the Scaled analog settings as shown in Figure 6-25.

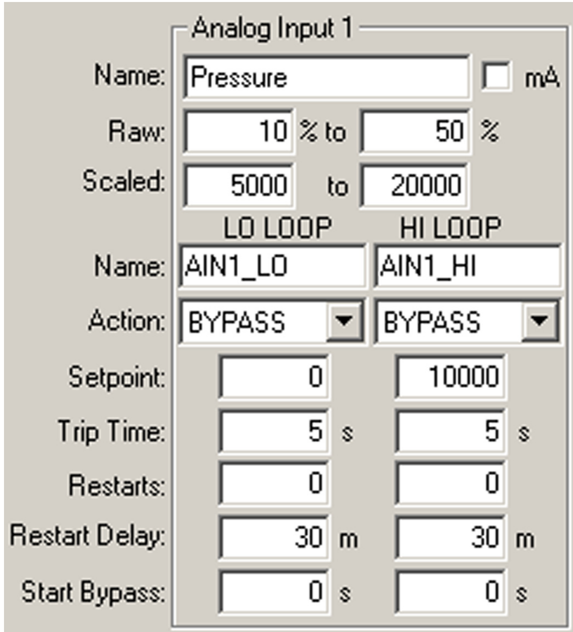


Figure 6-25: Analog inputs raw and scaled updated

The resolution for this configuration follows this relationship:

$$\frac{100\%}{4096\,points} \equiv \frac{50\%}{x} \rightarrow x = 2048\,points$$

$$\frac{100\%}{4096\,points} \equiv \frac{10\%}{x} \rightarrow x = 409.6\,points = 410\,points$$

$$\frac{20000\,psi}{2048\,points} \Leftrightarrow \frac{5000\,psi}{410\,points} \rightarrow \frac{(20000-5000)\,psi}{(2048-410)\,points}$$

$$\rightarrow \frac{15000\,psi}{1638\,points} = 9.16\,{}^{psi}\!/_{point}$$

The engineering units for this pressure transducer on the UniConn will have a resolution of approximately 9 psi.

Alarm trigger points are set to client requirements as shown in Figure 6-26. If pressure drops below 9950 this represents an undesirable situation and the system should stop. For pressure greater than 15000, which is a low probability in this case, simply logging the result is sufficient.

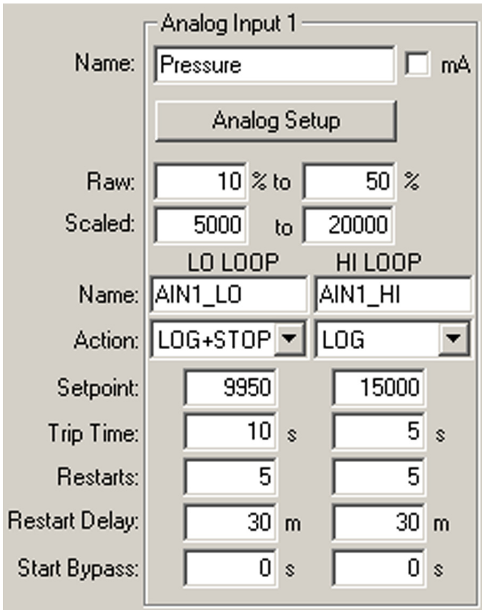


Figure 6-26: Analog inputs alarm points

6.8.5 Higher Accuracy

The UniConn analog input accuracy error is 1% for voltage mode and 5% for current mode. To attain higher precision than 1% the Raw % values can be adjusted.

Note
This procedure is a calibration method and requires the pressure transducer to provide maximum and minimum values, or a precision multi-meter with a DC power supply to simulate the pressure transducer.

Set the pressure transducer to 20000 psi. The output voltage should be 5.0 V. Figure 6-27 shows the analog configuration window next to the StarView main display. This way we can adjust the Raw % values and observe the resulting pressure display.

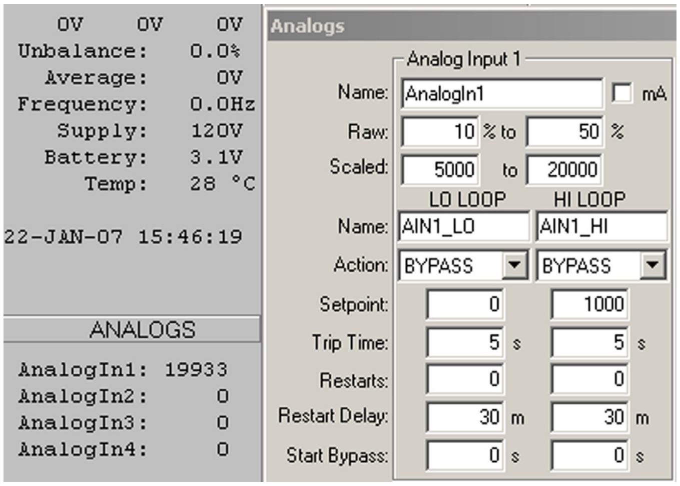


Figure 6-27: Setting vs displayed

Figure 6-28 shows the Raw % high setting of 49.75% with the pressure result of 20003. This is within the 10 psi resolution determined above. The 49.75% setting is achieved by adjusting this value starting at 49.90%, 49.80%, etc.

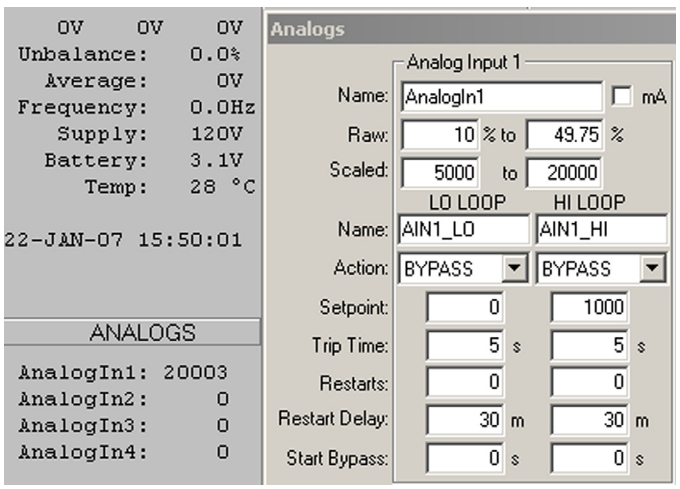


Figure 6-28: Raw % high setting

Figure 6-29 shows the Raw % low setting of 9.8% with the pressure result of 5004 psi. The 9.8% setting is achieved by adjusting this value starting at 9.95%, 9.90%, etc.

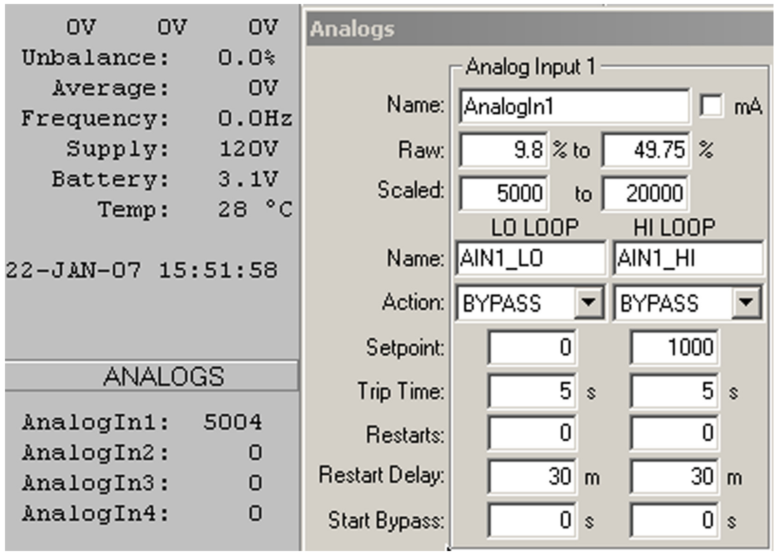


Figure 6-29: Raw % low setting

This method achieves an accuracy error of 0.05%.

---

eg Example: Current Transducer

Configure the UniConn analog input number 1 to convert the analog current values of a temperature gauge to engineering units. The transducer uses the 4-20 mA current loop standard. The specifications provide two data points.

Temperature gauge specification:

- 0 degC at 4 mA
- 180 degC at 15 mA

UniConn analog input specification:

- 4 to 20 mA (26 mA over-range or 130%), 4096 discrete data points.

$$\frac{20mA}{100\%} \equiv \frac{26}{130\%} \rightarrow \frac{130\%}{4096\text{points}} \equiv \frac{100\%}{3151\text{points}}$$

- 5% accuracy.

There is a direct relationship to the UniConn analog input current and the Raw % range.

$$\frac{0mA}{20mA} \equiv \frac{0\%}{100\%}$$

To restrict the display range to match that of the temperature transducer the ratio must be maintained.

$$4mA \rightarrow \frac{4mA}{20mA} \equiv \frac{x}{100\%} \rightarrow x = 20\%$$

For a loop current of 4 mA the temperature is 0 degC.

$$15mA \rightarrow \frac{15mA}{20mA} \equiv \frac{x}{100\%} \rightarrow x = 75\%$$

For a loop current of 15 mA the temperature is 180 degC. Figure 6-30 shows the final configuration.

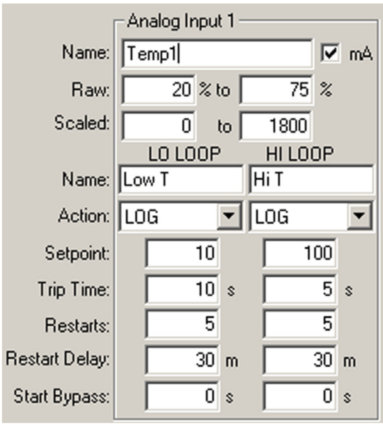


Figure 6-30: Temperature configuration current

The resolution for this configuration follows this relationship:

$$\frac{130\%}{4096\,points} \equiv \frac{75\%}{x} \rightarrow x = 2363\,points$$

$$\frac{130\%}{4096\,points} \equiv \frac{20\%}{x} \rightarrow x = 630.15 = 630\,points$$

$$\frac{200°C}{2363\,points} \Leftrightarrow \frac{10°C}{630\,points} \rightarrow \frac{(200-10)°C}{(2363-630)\,points}$$

$$\rightarrow \frac{190°C}{1733\,points} = 0.109\,{}^{°C}\!/_{point}$$

The engineering units for this temperature transducer on the UniConn will have a resolution of approximately 0.1 degC. Alarm trigger points can be set to client requirements. .

Example: Temperature Transducer with Voltage Outputs

Configure the UniConn analog input number 1 to convert the analog voltage values of a temperature gauge to engineering units.

Temperature gauge specification:

- 0 degC at 0 V
- 200 degC at 10 V

This relationship is direct one to one with the configuration shown in Figure 6-31. Alarm and trigger points have been set as shown.

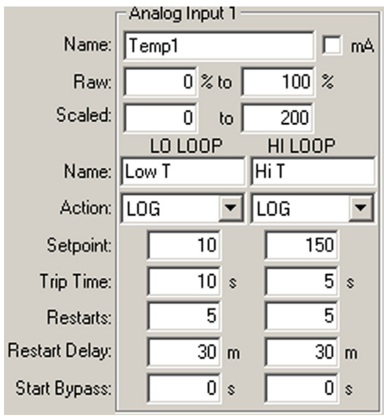


Figure 6-31: Temperature configuration volts

6.9 Digital Inputs

The six digital inputs on the controller are used to monitor external switches for a status change. These status changes can be used to activate alarms. Section describes the basic alarm features of the UiConn.

The Digital input alarm has an additional parameter called 'Alarm On' and can be configured either as open or closed.

Table 6-1: Digital Input alarm types

OPEN	The alarm occurs when the switching power, from the DIGITAL PWR terminal, is not detected on the input terminal. i.e., the switch is open.
CLOSE	The alarm occurs when switching power, from the DIGITAL PWR terminal, is detected on the input terminal. i.e., the external switch has closed.

> **Note**
> Use of normally open or normally closed external switches combined with the UniConn alarm on open or closed provides a variety of configuration possibilities.

6.9.1 Digital Inputs using UniConn

To configure the digital inputs using the UniConn keypad, navigate to the Digital Inputs screen as shown below.

```
12:51:28            Sitename00            OFF
  MOTOR      I/O              HISTORY    SETUP
```

```
AnalogIn1:                                  0
  AIN1_LO    ADJ      AIN1_HI    PREV    NEXT
```

Mutiple times

```
Digital Inputs:
  DIN1                DIN2       PREV    NEXT
```

UniConn Digital Inputs Screen

Below shows the screens used to configure the digital inputs. These alarm screens are identical for all UniConn parameters. For addition detail on these alarm screens see section 4.3: Alarms.

```
Digital Inputs:
  DIN1                DIN2       PREV    NEXT
```

```
Name:                                    DIN1
  Edit                           PREV    NEXT
```

```
Digital Input Function:                NORMAL
  Edit                           PREV    NEXT
```

```
Action:                                BYPASS
  Edit                           PREV    NEXT
```

```
Alarm On:                                OPEN
  Edit                           PREV    NEXT
```

```
Alarm Trip Time:                          5.0s
 Edit                          PREV     NEXT
```

```
Restarts:                                    0
 Edit                          PREV     NEXT
```

```
Restart Delay:                           30min
 Edit                          PREV     NEXT
```

```
Start Bypass:                             0.0s
 Edit                          PREV     NEXT
```

```
Maintenance Bypass:                       0min
 Edit                          PREV     NEXT
```

UniConn Digital Inputs Configuration Screens

6.9.2 Digital Inputs using StarView

Navigate to the Digital Inputs screen by double clicking in the area indicated in Figure 6-32. The digital control window will appear.

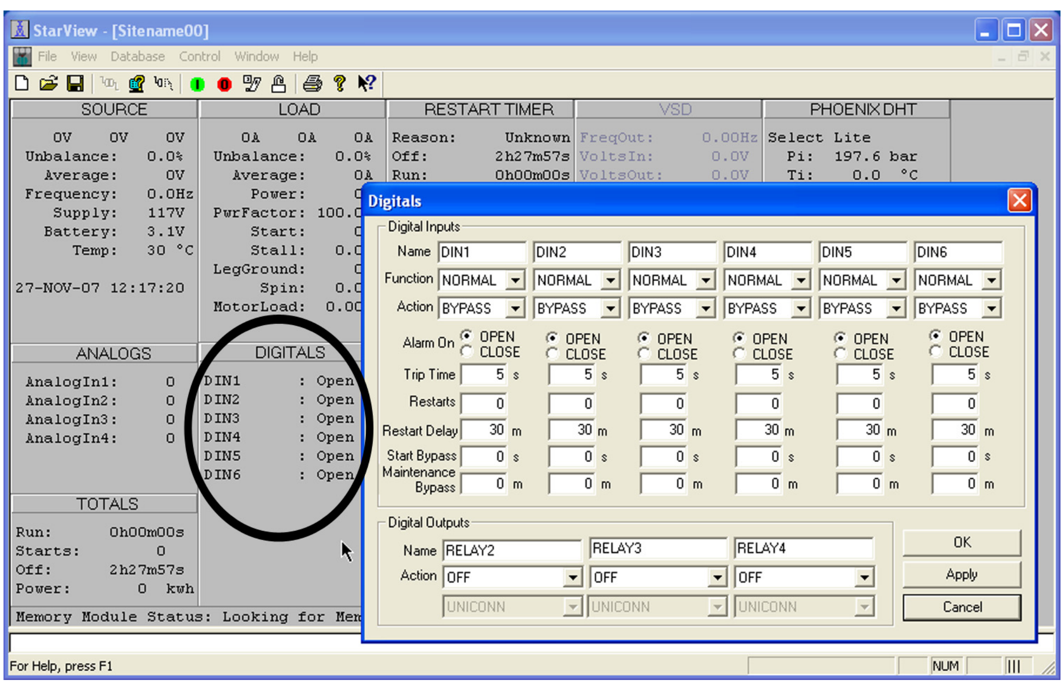


Figure 6-32: StarView Digital Input Screen

6.9.3 Digital Input HOA

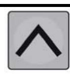
The parameters can be configured using the UniConn keypad or StarView.

For wiring connection refer to section 5.7: Digital Input HOA.

6.9.3.1 HOA using UniConn

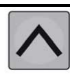
To configure the digital inputs for Hand, Off, Auto, using the UniConn keypad, navigate to the Digital Input screen as shown below.

```
Digital Inputs:
  DIN1                 DIN2        PREV      NEXT
```



```
Name:                                        DIN1
 Edit                              PREV      NEXT
```

```
Digital Input Function:                    NORMAL
 Edit                              PREV      NEXT
```



```
Digital Input Function:                    NORMAL
 APPLY                             PREV      NEXT
```

```
Digital Input Function:                     START
 APPLY                             PREV      NEXT
```

```
Digital Input Function:                 HAND_MODE
 APPLY                             PREV      NEXT
```

```
Digital Input Function:                 AUTO_MODE
 APPLY                             PREV      NEXT
```

Digital input HOA configuration screens

Note

Ensure the digital location of the HOA functions match the wire connections to the switches.

6.9.3.2 HOA using StarView

Navigate to the Digital Inputs screen by double clicking in the area indicated in Figure 6-32. The digital control window will appear. The control window as shown in Figure 6-33 contains a row for HOA control options.

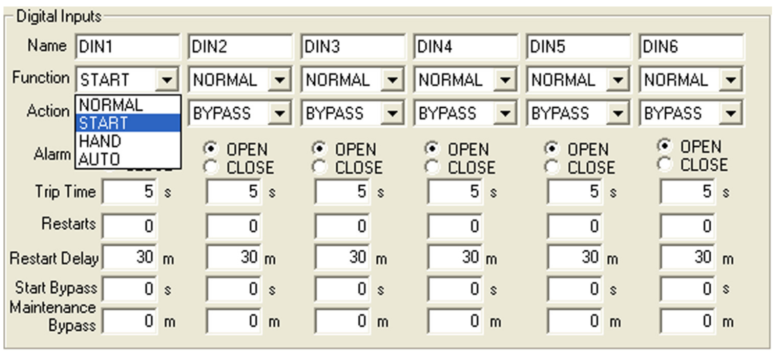


Figure 6-33: Digital HOA configuration

6.10 Analog Output

The user analog outputs are 4-20 mA current loops that can be used by a SCADA system for external control of other devices like an electronic valve or meter. The output value may also be set from the UniConn keypad.

Caution

Potential Severity:	Light
Potential Loss:	Assets
Hazard Category:	Electrical

Failure to observe the following precautions may result in damage to the UniConn and connected equipment.

The UniConn provides a 24–volt output for biasing of loop circuits. Alternatively an external supply may be used in excess of 24 V to drive the 4-20 mA current loop system. The analog outputs are ground references to the UniConn internal ground and therefore the UniConn must be the last element in the 4-20 mA loop.

The range and scale settings for the analog outputs operate in a similar manner to the analog inputs. The UniConn analog output currents are capable of 0-22 mA full scale.

6.10.1 Alarms

There are no alarm points associated with the analog outputs. These values are generated by the controller, not monitored like the input parameters, and therefore have no alarms.

6.10.2 Configure Analog Outputs Using UniConn

To configure the analog outputs using the UniConn navigate to the ’AnalogOut’ screen as shown below.

```
12:51:28              Sitename00              OFF
  MOTOR       I/O                HISTORY   SETUP
```

```
AnalogIn1:                                      0
 AIN1_LO      ADJ      AIN1_HI    PREV     NEXT
```

Mutiple times

```
AnalogOut1::                                    0
              ADJ                 PREV     NEXT
```

UniConn Analog Output Screen

Below shows the screens to configure the parameters.

```
AnalogOut1::                                    0
              ADJ                 PREV     NEXT
```

```
Name:                                  AnalogOut1
 Edit                             PREV     NEXT
```

```
Select Source:                       Remote Input
 Edit                             PREV     NEXT
```

```
Scaled Maximum:                             65535
```

```
 Edit                                   PREV      NEXT
```

```
Scaled Minimum:                                      0
 Edit                                   PREV      NEXT
```

```
Raw Maximum:                                   100.00%
 Edit                                   PREV      NEXT
```

```
Raw Minimum:                                     0.00%
 Edit                                   PREV      NEXT
```

```
Setpoint:                                            0
 Edit                                   PREV      NEXT
```

UniConn Analog Output Configuration Screens

The 'Select Source:' screen menu is shown below. The source options will function only when the application supports it. I.e. Pump Intake Pressure is functional when there is a Phoenix Interface Card installed. The figure shows the functional groupings.

```
AnalogOut1::                                         0
              ADJ                       PREV      NEXT
```

```
Name:                                       AnalogOut1
 Edit                                   PREV      NEXT
```

```
Select Source:                            Remote Input
 Edit                                   PREV      NEXT
```

```
Select Source:                            Remote Input
  ACCEPT       <<          >>         DEC       INC
```

```
Select Source:                               AnalogIn1
  ACCEPT       <<          >>         DEC       INC
```

Mutiple times

```
Select Source:                               AnalogIn4
```

```
 ACCEPT       <<          >>          DEC       INC
```

UniConn Analog Inputs

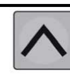
```
Select Source:                          Power Factor
 ACCEPT       <<          >>          DEC       INC
```

Mutiple times

```
Select Source:                             kilowatts
 ACCEPT       <<          >>          DEC       INC
```

UniConn Fixed Speed

```
Select Source:                     Pump Intake Press
 ACCEPT       <<          >>          DEC       INC
```



Mutiple times

```
Select Source:                                LKA_HI
 ACCEPT       <<          >>          DEC       INC
```

UniConn PIC

```
Select Source:                             AnalogIn1
 ACCEPT       <<          >>          DEC       INC
```

UniConn Analog Output Select Source Screens

6.10.3 Configure Analog Outputs Using StarView

Navigate to the Digital Outputs screen by double clicking in the area indicated in Figure 6-34.

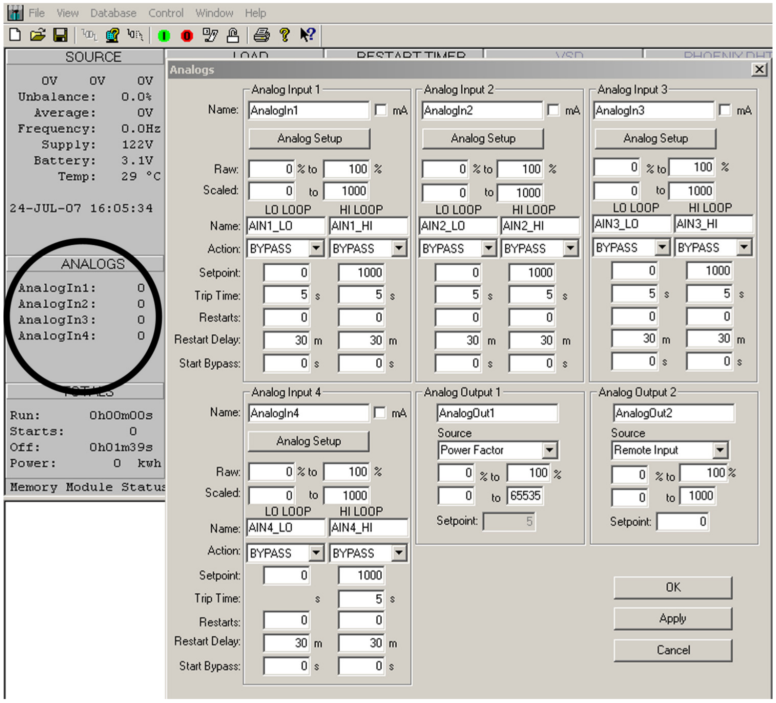


Figure 6-34: StarView Analog IO Screen

The configurations controls are shown in Figure 6-35. The source options can be selected from the drop down list. The 'Setpoint' is only available for the source 'Remote Input' which represents user inputs or SCADA inputs.

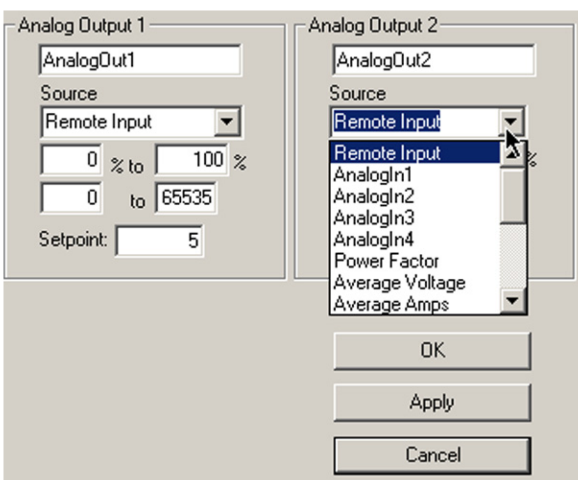


Figure 6-35: StarView Analog Output Control Screen

6.10.4 Calibration

The UniConn analog outputs are accurate to within 5% and if necessary can be calibrated to 0.1%. A calibrated MultiMeter is required for this procedure.

Calibration can be performed using StarView or the UniConn keypad. This section will focus on StarView.

Connect the multi-meter as shown in Figure 6-36.

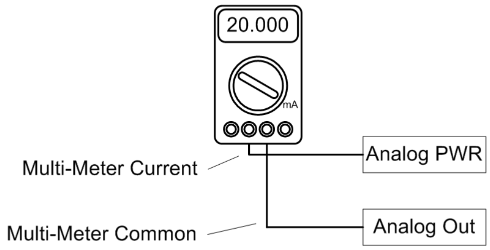


Figure 6-36: Calibrate analog output using multi-meter

Using StarView set the percent range, analog scale, and set point as shown. Click 'Apply' to activate. The analog scale of 0 to 200 is used to represent analog output current of 20mA during calibration. This scale may be set to 0-20, 0-2000, etc. As shown, the multi-meter reads 20.238 mA and the target is 20.000mA.

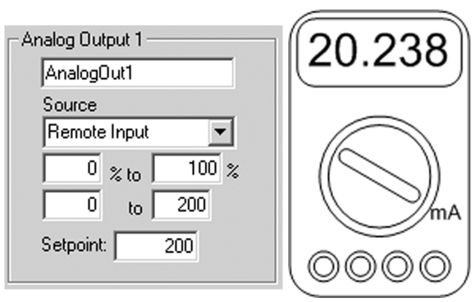


Figure 6-37: StarView screen with meter 20.238mA

Using StarView, change the percent scale as shown in Figure 6-38. The multi-meter reads a value below the target 20.000mA.

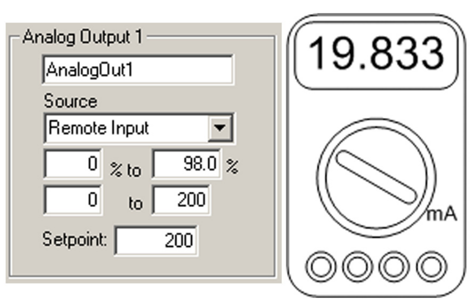


Figure 6-38: StarView screen with meter 19.833mA

Using the UniConn navigate to the 'Raw Maximum' screen and edit the percentage as shown below. Press 'ACCEPT' to apply the setting.

```
Raw Maximum:                                    98.00%
```

```
ACCEPT      <<        >>        DEC      INC
```

UniConn Raw Maximum 98%

Iteratively increase the percentage until the multi-meter matches the target set point 20.000 mA. As shown in Figure 6-39 the meter reads 20.002 which represents an error 0.01%, which is acceptable. If necessary, add another decimal place to the percentage and adjust values for 0% error.

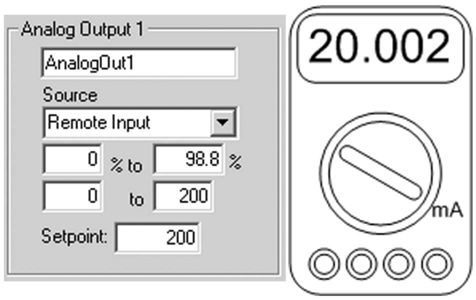


Figure 6-39: StarView screen with meter 20.002mA

As a test, change the 'Setpoint' to 100 as shown in Figure 6-40. The multi-meter should change accordingly. Note the additional decimal point on the percentage to create the 0% error.

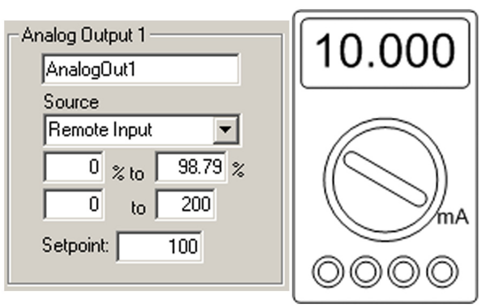


Figure 6-40: StarView screen with meter 10.000mA

6.10.5 Examples

The following examples demonstrate the use of scaling and manipulating raw values.

---

eg **Example**

Average voltage mapped to 0-20 mA

The UniConn is operating with 120 volts AC rated PT inputs. Map the 3 phase average voltage within a range of 0-200 volts AC to represent 0-20 mA.

Select Source:		Average Voltage
Edit	PREV	NEXT

Select source

Analog output requirement:

- 0 mA at 0 V
- 20 mA at 200 V

There is a direct relationship to the UniConn analog output current and the Raw % range.

Equation 6-1:

$$\frac{0mA}{20mA} \equiv \frac{0\%}{100\%}$$

Applying these two relationships results in:

Equation 6-2:

$$\frac{0\%}{100\%} \equiv \frac{0V}{200V}$$

These values correspond to the Scaled analog settings as shown below.

Scaled Minimum:		0
Edit	PREV	NEXT

Scaled minimum

Scaled Maximum:		200
Edit	PREV	NEXT

Scaled Maximum

Setting summary:

- Raw Maximum = 100%
- Raw Minimum = 0%
- Scaled Maximum = 200
- Scaled Minimum = 0

Example

Analog input mapped to analog output

The values of analog input 1 are to be mapped to analog output 1. Analog 1 has been scaled to read 0-1000. Analog output requirement:

- 0 mA at 0 analog input
- 20 mA at 1000 analog input.

There is a direct relationship to the UniConn analog input current and the Raw % range.

Equation 6-3:

$$\frac{0mA}{20mA} \equiv \frac{0\%}{100\%}$$

Applying these two relationships results in Equation 6-4.

Equation 6-4:

$$\frac{0mA}{20mA} \equiv \frac{0}{1000}$$

Setting summary:

- Raw Maximum = 100%
- Raw Minimum = 0%
- Scaled Maximum = 1000
- Scaled Minimum = 0

6.10.5.1 More Examples

eg **Example: Intake pressure mapped to analog output**

Require a 4–20mA signal for a pressure range of 0 to 5000psi. Review of the Modbus register for the DHT tool indicates a decimal placement of X.X.

Setting summary:

- Raw Maximum = 100%
- Raw Minimum = 20%
- Scaled Maximum = 50000
- Scaled Minimum = 0

eg **Example: Motor temperature mapped to analog output**

Require a 4–20mA signal for a temperature range of 0 to 400F. Review of the Modbus register for the DHT tool indicates a decimal placement of X.X.

Setting summary:

- Raw Maximum = 100%
- Raw Minimum = 20%
- Scaled Maximum = 4000
- Scaled Minimum = 0

eg **Example: Vibration mapped to analog output**

Require a 4–20mA signal for a vibration range of 0 to 5G. Review of the Modbus register for the DHT tool indicates a decimal placement of X.XXX.

Setting summary:

- Raw Maximum = 100%
- Raw Minimum = 20%
- Scaled Maximum = 5000
- Scaled Minimum = 0

Example: VSD Running Frequency mapped to analog output
Require a 4–20mA signal for a frequency range of 0 to 90Hz. Review of the Modbus register for the DHT tool indicates a decimal placement of X.XX.

Setting summary:
- Raw Maximum = 100%
- Raw Minimum = 20%
- Scaled Maximum = 9000
- Scaled Minimum = 0

6.11 Expansion Port

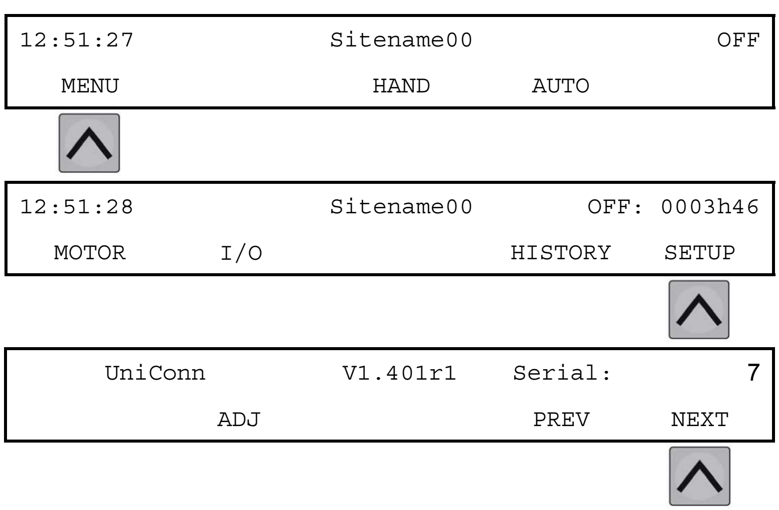
The parameters can be configured using the UniConn keypad or StarView. Detailed configuration requirements can be found in each expansion port card section. For details on the alarm parameters see section 4.3: Alarms.

StarView is software program used to interface to the UniConn for configuration and diagnostics. Review section 10: Using StarView for further details.

For a full listing of the UniConn Expansion Port configuration screens see Appendix B.11: Expansion Port Screen Map.

6.11.1 Configure Expansion Port Using UniConn

To configure the Expansion Port navigate to the **Option Ports** screen shown below.



```
Maintenance Port:                                     1
STARVIEW                               PREV      NEXT
```

```
Option Ports:
 PORT1                  PORT2          PREV      NEXT
```

Option Port screen

The communications configuration screens are generic for all communications settings and are detailed below. See Appendix B.11: Expansion Port Screen Map for a full screen map.

```
Option Ports:
 PORT1                  PORT2          PREV      NEXT
```

```
Name:                                             PORT1
  Edit                                 PREV      NEXT
```

```
Function:                                      DISABLED
  Edit                                 PREV      NEXT
```

```
Site Address:                                         1
  Edit                                 PREV      NEXT
```

```
Baud Rate:                                         9600
  Edit                                 PREV      NEXT
```

```
8,NONE,1,RS232:
  Edit                                 PREV      NEXT
```

```
Prekey Delay:                                       2ms
  Edit                                 PREV      NEXT
```

```
Postkey Delay:                                      2ms
  Edit                                 PREV      NEXT
```

```
Access:                                       VIEW-ONLY
  Edit                                 PREV      NEXT
```

```
Control State:                              CLEAR
 EDIT                             PREV      NEXT
```

Generic communication configuration screens

6.11.2 Configure Expansion Port Using StarView

In StarView, open the **Option Port** configuration menu from the menu tabs: **Database — Controller**.

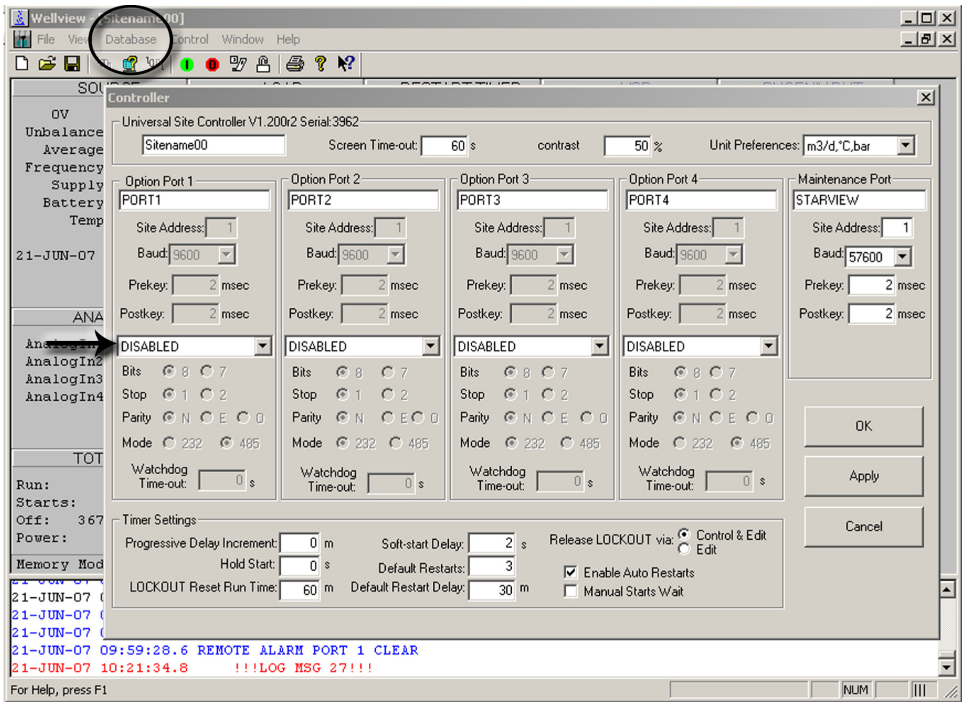


Figure 6-41: StarView Option Port screen

Note

The communication parameters will automatically be configured for all functions except **Modbus Slave**.

6.12 Variable Speed Drive

The UniConn Variable Speed Drive (VSD) should arrive pre-configured for VSD operation. In the event that this is not the case, or a new UniConn is being commissioned, this section will detail how to set up and configure the UniConn for a VSD.

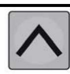
An installed communication card is required to interface to the VSD. See section 4.14: Expansion Ports and section 4.25.3: Communication Card Operation for details.

6.12.1 Configure UniConn for VSD using UniConn

Using the UniConn keypad navigate to the **Option Port** screen as shown in previous sections. This is where the communication card is installed.

Within the **Option Port** screens navigate to the **Function** screen to select the VSD type as shown below.

```
Option Ports:
 PORT1                    PORT2         PREV       NEXT
```



```
Name:                                              PORT1
  Edit                                  PREV       NEXT
```

```
Function:                                       DISABLED
  EDIT                                  PREV       NEXT
```

UniConn VSD enable screen

6.12.2 Configure UniConn for VSD using StarView

StarView is software program used to interface to the UniConn for configuration and diagnostics.

In StarView, open the ’Option Port’ configuration menu from the menu tabs: Database — Controller. See Figure 6-42. Select the VSD type from the drop down list.

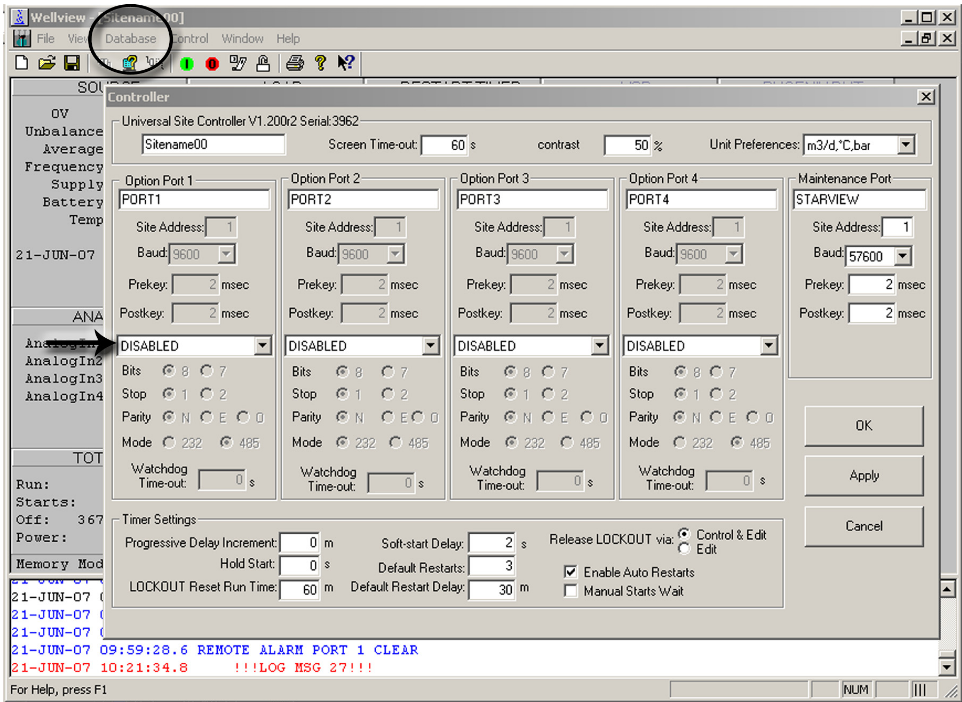


Figure 6-42: StarView Option Port Screen

6.12.3 Configure VSD using UniConn

The UniConn has two locations for displaying of VSD parameters. Configuration and Operation.

To configure the VSD on the UniConn navigate to the VSD configuration screen as shown below.

```
12:51:27          Sitename00              OFF
   MENU                HAND       AUTO
```

```
12:51:28          Sitename00     OFF: 0003h46
   VSD       I/O                HISTORY   SETUP
```

```
      UniConn      V1.401r1     Serial:     7
             ADJ                PREV      NEXT
```

```
VSD Setting:
```

```
            ADJ                        PREV      NEXT
```

UniConn VSD configuration access

The configuration screens are shown below. For a complete screen map see Appendix B.15: Variable Speed Drive Screen Map.

```
VSD Settings:                                     OFF
           ADJ                        PREV      NEXT
```

```
Ramp Frequency:                               90.00Hz
                                      PREV      NEXT
```

```
Maximum Speed:                                60.00Hz
                                      PREV      NEXT
```

Multiple times

```
VSD Type Form:                              0 Decimal
                                      PREV      NEXT
```

UniConn VSD configuration (Applicable only for the SpeedStar S3, S7+ and the VariStar ST7)

To view and change the operation of the VSD navigate into the VSD menu shown below. These screens are located in the motor menu section of the UniConn screen map. The fixed speed motor screens follow the VSD screens and the configuration is optional. For a complete view of the VSD operation screen see Appendix B.15.2: VSD Operation Screen Map.

```
12:51:28              Sitename00                  OFF
   VSD        I/O                   HISTORY    SETUP
```

```
Port Func:         1:VSD 2:NONE 3:NONE 4:NONE
                                      PREV      NEXT
```

```
VSD Frequency:                                 0.00Hz
                                      PREV      NEXT
```

UniConn VSD operation access

6.12.3.1 Extended Ramp Rate

The configuration of extended ramp rate is best explained using examples.

Example

Set the desired ramp time to 12 minutes. Determine the **Step Interval** and **Step Size**. The UniConn VSD is configured with the following.

- Target speed = 60Hz
- Minimum speed = 20Hz

Apply equation Equation 4-4. First arbitrarily select a **Step Size** of 1Hz.

Equation 6-5: VSD ramp time vs step interval

$$12\mathit{minutes} = 720\mathit{seconds}$$

$$\mathit{Step\ Interval} = \frac{720s \times 1Hz}{60Hz - 20Hz} = 18s$$

The VSD will perform a step of 1Hz every 18 seconds to reach the target speed of 60Hz from the starting minimum speed of 20Hz.

Example

Same example as above but with the **Step Interval** set to 2 seconds. Determine the **Step Size**.

Equation 6-6: VSD ramp time vs step size

$$12\mathit{minutes} = 720\mathit{seconds}$$

$$\mathit{Step\ Size} = \frac{60Hz - 20Hz}{720s} \times 2s = 0.11$$

$$\therefore \mathit{Ramp\ Time} = \frac{60Hz - 20Hz}{0.11} \times 2 = 727s = 12\mathit{minutes}\ 7\mathit{seconds}$$

6.12.4 Configure VSD using StarView

Upon connecting to the UniConn with StarView the screen shown in Figure 6-43 will appear.

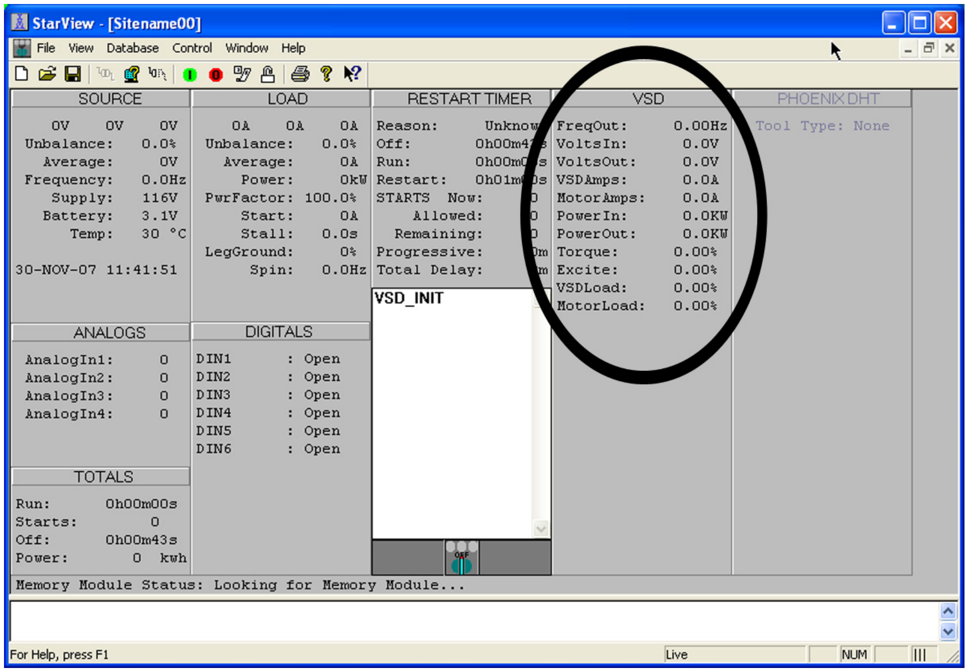


Figure 6-43: VSD enabled

The VSD configuration parameters are shown in Figure 6-44. These are the most commonly used configuration parameters.

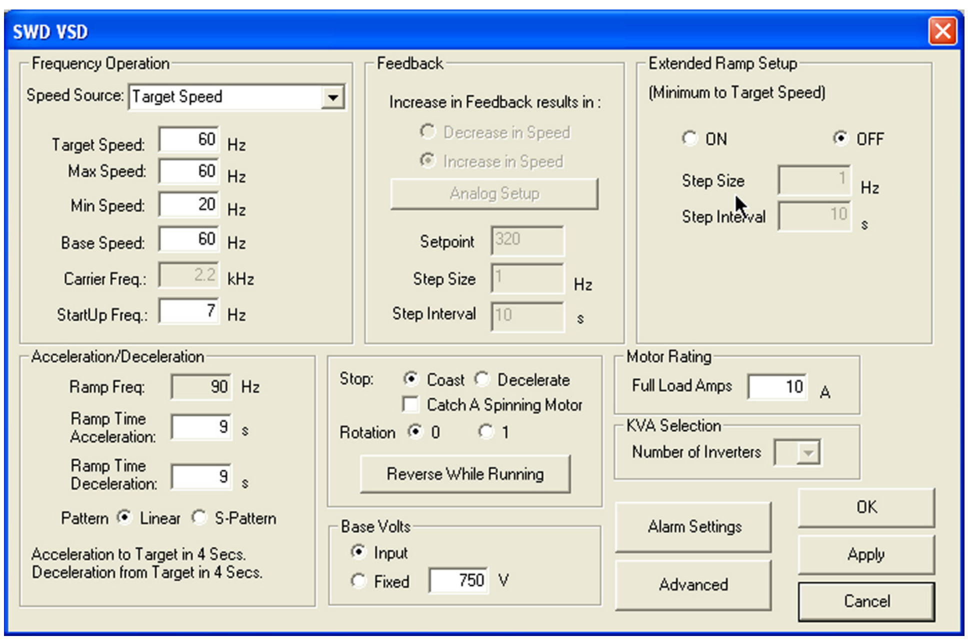


Figure 6-44: VSD configuration

VSD alarm configuration screen is shown in Figure 6-45.

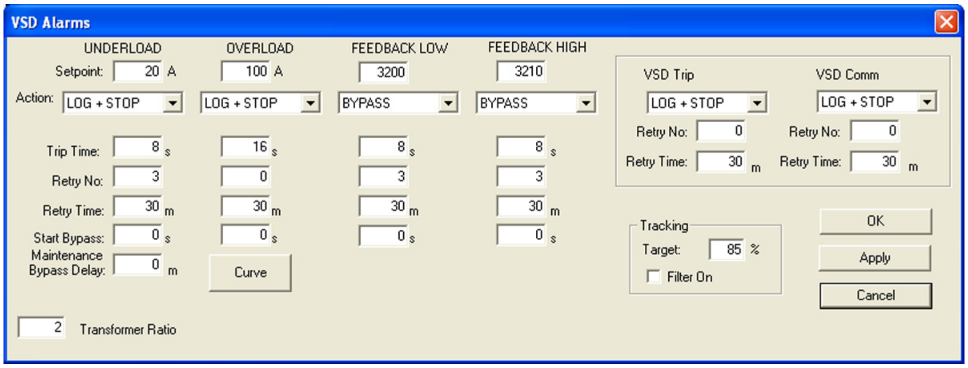


Figure 6-45: VSD alarms

Advanced configuration is shown in Figure 6-46.

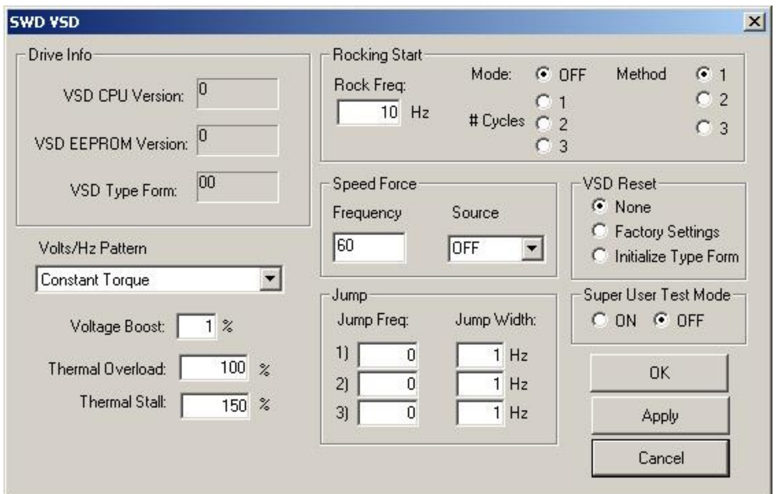


Figure 6-46: VSD advanced configuration

Warning

Potential Severity:	Serious
Potential Loss:	Assets
Hazard Category:	Electrical, Machinery equipment hand tools

These advanced parameters should only be changed by qualified personnel.

6.12.5 Feedback

The configuration of feedback is best explained using an example.

Example

Using a surface pressure transducer connected to the UniConn analog input 4, configure the UniConn to maintain a surface pressure of 150 psi. The surface pressure takes approximately 30 seconds to reflect downhole changes. The rate of change the motor will be defaulted to is 1 Hz and the change interval will be 40 seconds.

Pressure transducer specifications:

- 4 to 20 mA
- 0 to 1000 psi

1. Configure the analog input 4 for the pressure transducer.
   Set the raw minimum and raw maximum (0% to 100%) based on specifications.

   Equation 6-7: 4mA convert to 20%

   $$4mA \rightarrow \frac{4mA}{20mA} \equiv \frac{x}{100\%} \rightarrow x = 20\%$$

   - Raw minimum = 20%
   - Raw maximum = 100%

   Set the scaled minimum and scaled maximum. These represent the Engineering units to associate with the 20% and 100%.
   - Scaled minimum = 0
   - Scaled maximum = 1000

   On the UniConn ensure the units are correctly set to PSI. On the keypad press the keys: **MENU** — **SETUP** — **ADJ** — **NEXT** until the units menu appears. Change or confirm PSI.

2. Configure the feedback parameters. On the UniConn navigate to the VSD configuration screens as shown in .
   - if Feedback Increases = Decrease Speed
   - Feedback set point = 150
   - Feedback step size = 1 Hz
   - Feedback Step Interval = 40 s

6.12.5.1 Configure Feedback Deadband Using StarView

To adjust the feedback deadband via StarView, double click the VSD section of the live view. Select a feedback mode, then set the deadband accordingly.

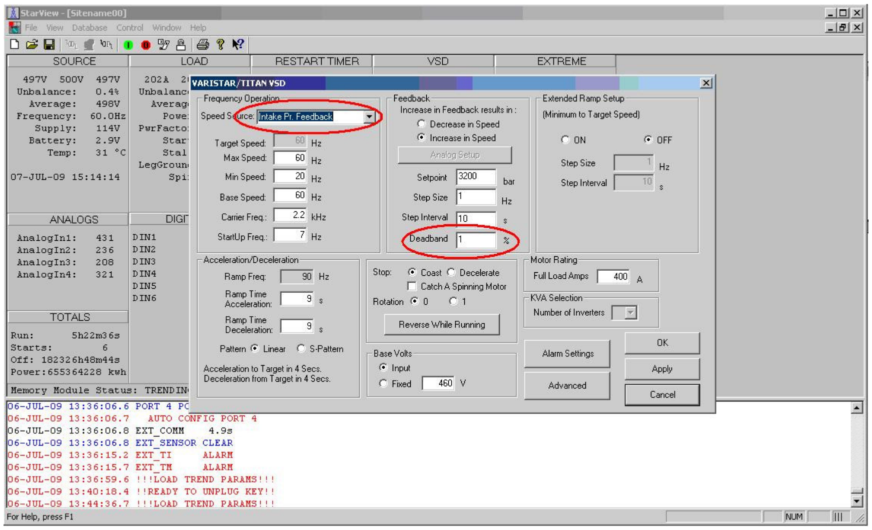
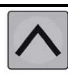


Figure 6-47: Feedback Deadband Configure Screen

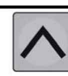
6.12.5.2 Configure Feedback Deadband Using UniConn

To configure the Feedback Dead via the UniConn front keypad:

```
12:51:27          Sitename00          OFF
  MENU                HAND     AUTO
```



```
12:51:28          Sitename00          OFF
  MENU                I/O     HISTORY   SETUP
```



```
    UniConn       V1.401r1    Serial:   175
          ADJ                  PREV     NEXT
```

```
VSD Settings
          ADJ                  PREV     NEXT
```

```
Ramp Frequency:                     90.00Hz
 Edit                          PREV     NEXT
```

Multiple times

```
Feedback Deadband:                             1.0%
 Edit                              PREV      NEXT
```

6.12.6 Adjustable Variable Speed Drive Feedback Deadband

Starting with firmware version 1.401r1, the UniConn is able to adjust the deadband of the VSD feedback mode between the range of 0.1% and 10.0%, with a factory default setting of 1.0%. Previous versions of firmware were limited to a non-adjustable 1.0% deadband.

The deadband is a range of values around the target value for which the UniConn will make no speed adjustments to the VSD. Outside of the deadband range, the UniConn will make an adjustment in an attempt to reach the target value. To configure the Feedback Dead via the UniConn front keypad:

```
12:51:27       Sitename00             OFF
 MENU              HAND    AUTO
   ↓
```

```
12:51:28       Sitename00             OFF
  MOTOR    I/O            HISTORY  SETUP
                                     ↓
```

```
    UniConn     V1.401r1   Serial:   175
          ADJ               PREV   NEXT
                                     ↓
```

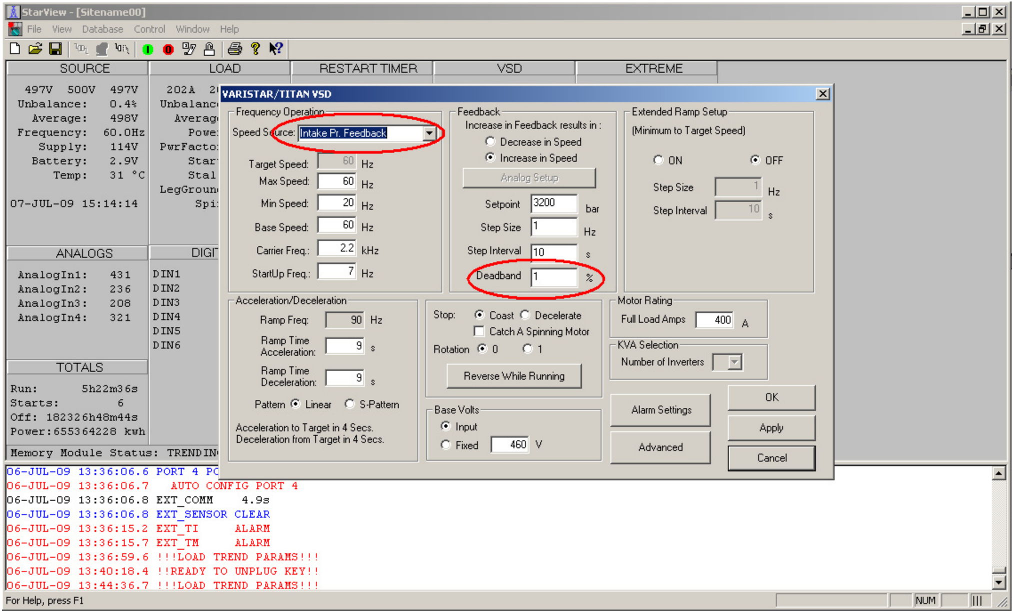
```
VSD Settings
          ADJ               PREV   NEXT
          ↓
```

```
Ramp Frequency:                    90.00Hz
                            PREV   NEXT
                                     ↓
                                     ↓  (multiple times)
                                     ↓
```

```
Feedback Deadband:                    1.0%
  EDIT                     PREV   NEXT

   ↓
```

To adjust the feedback dead via StarView, double click the VSD section of the live view. Select a feedback mode, then set the deadband accordingly.



6.12.7 MVD Comm Card Setup

This section is a guide to setup the UinConn with the MVD. The UniConn's relay 2 (RLY2) is programmed to de-energize when UniConn loses communication with the MVD. Therefore, when the MVD trips on a 'Spare Input 1' fault, it means that the UniConn and the MVD have lost communication.

Note

The UniConn relay is configured to energize when actively communicating with the MVD and de-energize when communications is lost. This fail-safe configuration ensures that if the UniConn loses power while the MVD is still running, the relay will de-energize causing the MVD to trip as the UniConn can no longer provide protection.

---

1. The MVD should come pre-wired from the factory for the UniConn RLY2 to be connected to the MVD digital input 5, as shown in Figure 6-48 and Figure 6-49. Ensure this is the case and proceed to the next step.

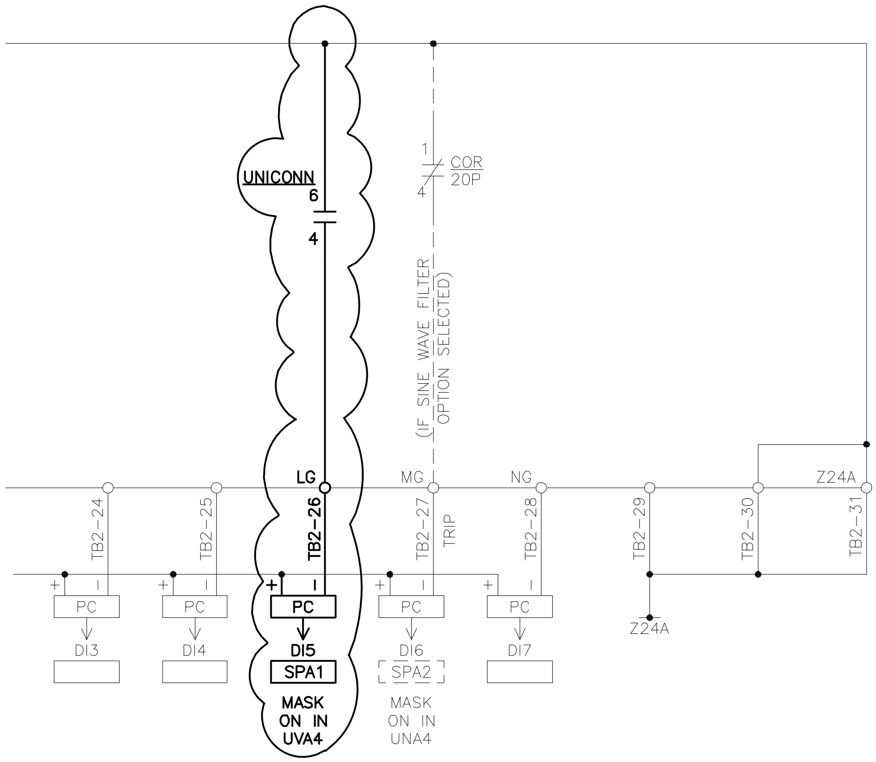


Figure 6-48: UniConn Digital out at the MVD

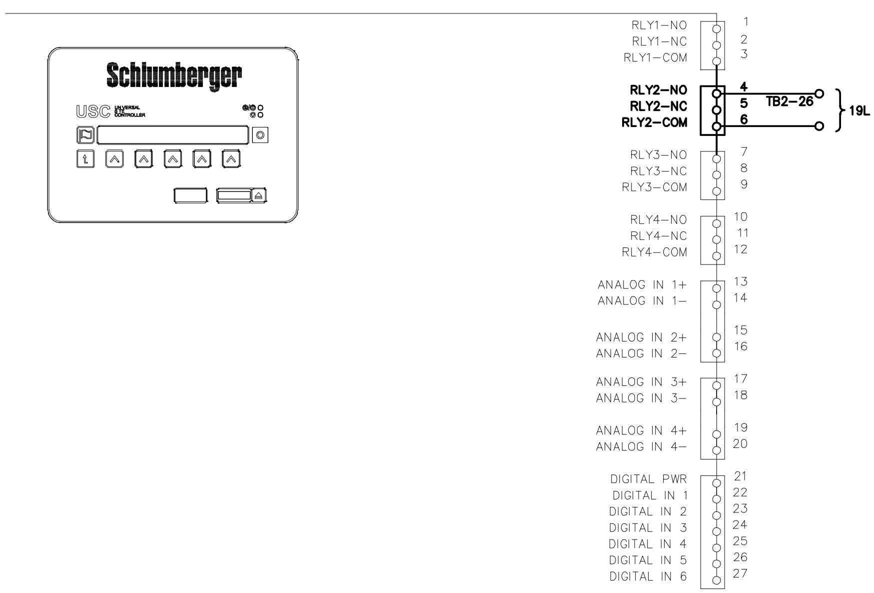


Figure 6-49: UniConn RLY2 to TB2–26 in the MVD

2. Verify digital input 5 (DI5) is mapped to Spare Input 1 (SPA1) using WiTool.

Digital Input 5 (Map to SPA1):
DI5_IX = 1
DI5_BN = C
Mask on in DI_EX1 (Bit C)
Mask on in UVA4 (Bit 0)

3. Verify COR is connected to DI6. Verify that DI6 is mapped to SPA2 using WiTool.

Digital Input 6 (Map to SPA2):
DI6_IX = 2
DI6_BN = A
Mask on in DI_EX2 (Bit A)
Mask on in UVA4 (Bit 1)

Warning

Potential Severity:	Serious
Potential Loss:	Information
Hazard Category:	Electrical

Other than the digital inputs DI5 and DI6, none of the other analog/digital inputs of the MVD should be used, as they could potentially interfere with the UniConn's operation. All existing Analog/Digital IOs connected directly to the MVD need to be disconnected and connected to UniConn.

4. Verify none of the digital inputs of the drive are mapped to the following points since they are utilized by UniConn:

- SEL DI – (Local/Remote Selection – Bit 7 of DI_EX4)
- DIR0 DI - (Motor Direction Selection from Local – Bit 6 of DI_EX4)
- EXT0 – (Local Start Command – Bit D of DI_EX1)
- SPA1 – (Spare Input 1 – Bit C of DI_EX1)

5. Verify that none of the other digital inputs other than DI5 and DI6 and analog inputs are not being used by ensure the parameters below have the following setting:

   - Digital Input 1:
     DI1_IX = 0
     DI1_BN = 0
   - Digital Input 2:
     DI2_IX = 0
     DI2_BN = 0
   - Digital Input 3:
     DI3_IX = 0
     DI3_BN = 0
   - Digital Input 4:
     DI4_IX = 0
     DI4_BN = 0
   - Digital Input 7:
     DI7_IX = 0
     DI7_BN = 0
   - Analog Inputs:
     AIN1_AS = DUST
     AIN2_AS = DUST
   - DI_G = 0
     SCAN_RCV01_AS = DUST
     SCAN_RCV02_AS = DUST
     SCAN_RCV03_AS = DUST
     SCAN_RCV04_AS = DUST
     SCAN_RCV05_AS = DUST
     SCAN_RCV06_AS = DUST
     SCAN_RCV07_AS = DUST
     SCAN_RCV08_AS = DUST
     SCAN_RCV09_AS = DUST
     SCAN_RCV010_AS = DUST

Hint
Changes to analog/digital inputs and outputs do not take effect until they have been written to the EEPROM and power has been cycled to the MVD.

6. Connect laptop to the UniConn and launch StarView.
7. Once connected to the UniConn ensure that it is setup for an MVD.

8. Open the “Digitals” window and configure relay 2 to action on “ON_ALARM” and “VSD_COM” as seen in Figure 6-51: StarView Digital Output Setup 2

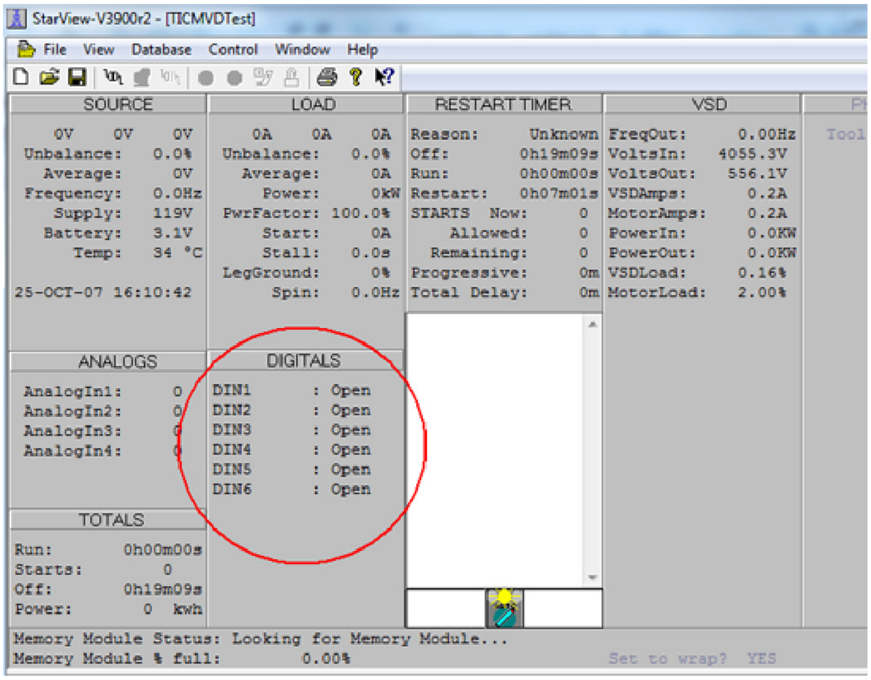


Figure 6-50: StarView Digital Output Setup

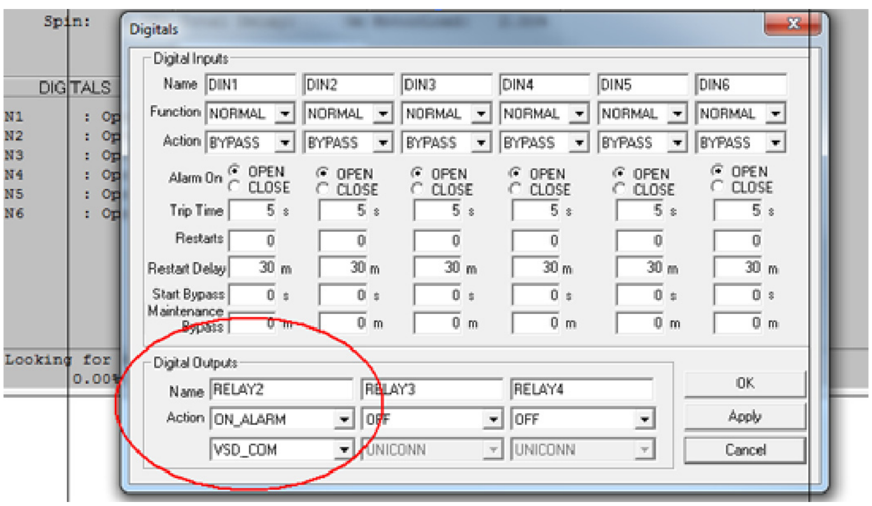


Figure 6-51: StarView Digital Output Setup 2

9. Proceed to program the UniConn according to your application.

Function Test

As a test for communication:

1. Change the following parameters in the UniConn (or StarView):

- Ramp Time Acceleration = 90s

- Ramp Time Deceleration = 84s

2. Check the following two parameters in the MVD to make sure they have the following values:
   - CR_RATE_ACC (if using Toshiba keypad, Fundamental>Accel/Decel>Acceleration Rate 1) = 60S
   - CR_RATE_DEC (if using Toshiba keypad, Fundamental>Accel/Decel> Deceleration Rate 1) = 56S

Note

These two values are suppose to be different from what the UniConn reports. This is because the UniConn bases these times on the drive ramping up to 90Hz and the MVD bases these values on CS_MOTOR_FREQ

---

3. Change the parameters in UniConn back to what they originally were and make sure the values for CR_RATE_ACC and CR_RATE_DEC also change inside the MVD.
4. Disconnect the cross-over ethernet cable from the MVD card, wait a few seconds, and make sure that StarView and UniConn display the 'VSD Comm' error, and the keypad on the MVD displays the 'Spare Input 1' fault, as shown in Figure 6-52: VSD Comm error in StarView on left and Spare Input 1 fault on Toshiba Keypad on right.

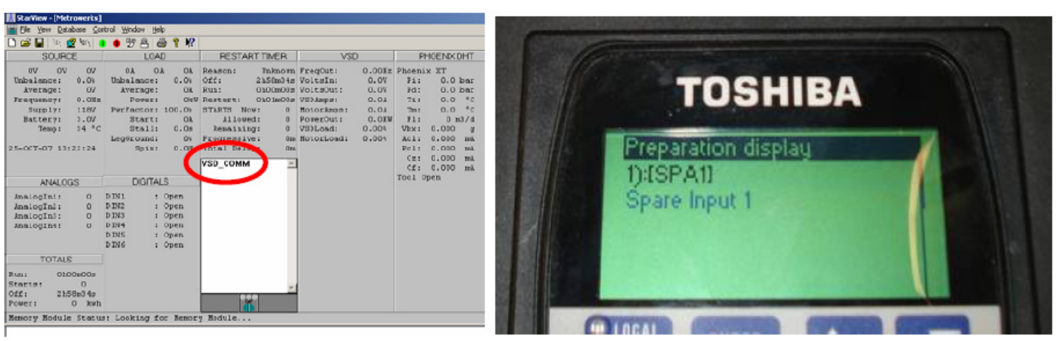


Figure 6-52: VSD Comm error in StarView on left and Spare Input 1 fault on Toshiba Keypad on right

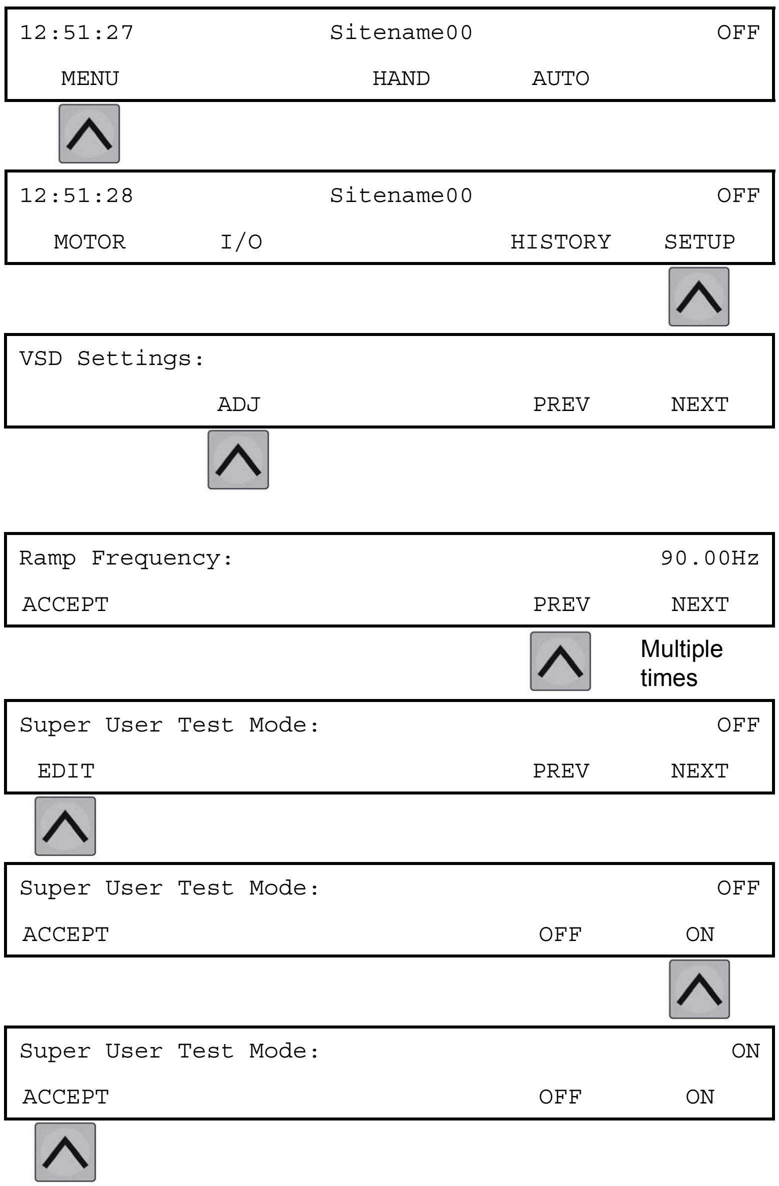
---

Note

If the drive doesn't trip after removing the ethernet cable, make sure input 5 is properly setup and enabled to map 'Spare Input 1'.

6.12.8 Configure Super User Test Mode for Low Voltage VSDs using UniConn

Super User Test mode is a mode in which Toshiba drives will ignore DC bus undervoltage and underload alarms. This is to be used during maintenance and troubleshooting. To set Super User Test Mode via the UniConn keypad, follow the menu map:



> **Note**
> The Super User Test Mode is only applicable to Low Voltage Toshiba drives.

6.12.9 Configure Super User Test Mode for Low Voltage VSDs using StarView

To enable Super User Test mode via StarView, first select the VSD option under the Database menu.

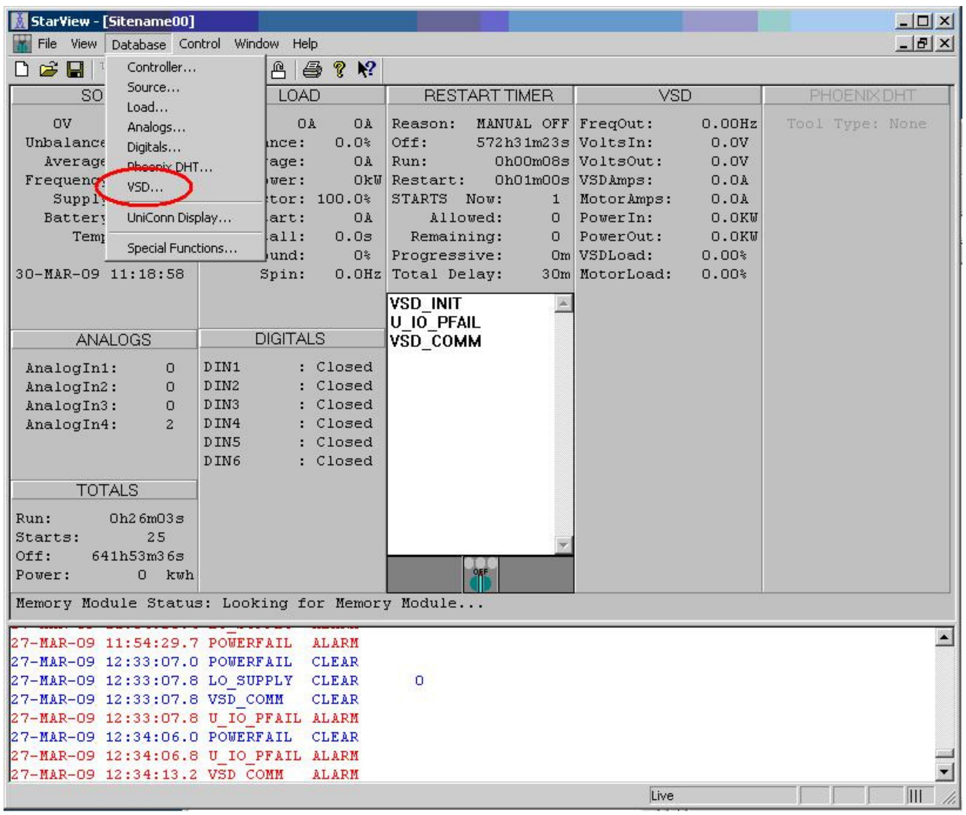


Figure 6-53: VSD Window

From the VSD screen, click the Advanced button.

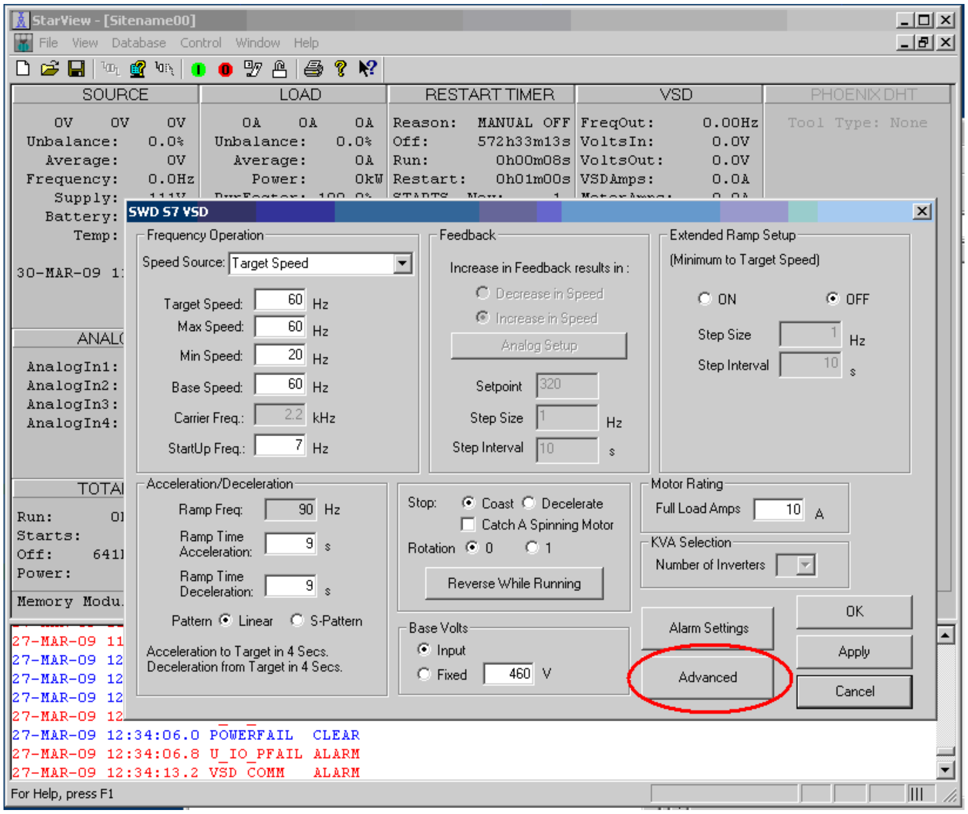


Figure 6-54: Advanced Option

Finally, select Super User Test mode as required, and click the Apply or OK button.

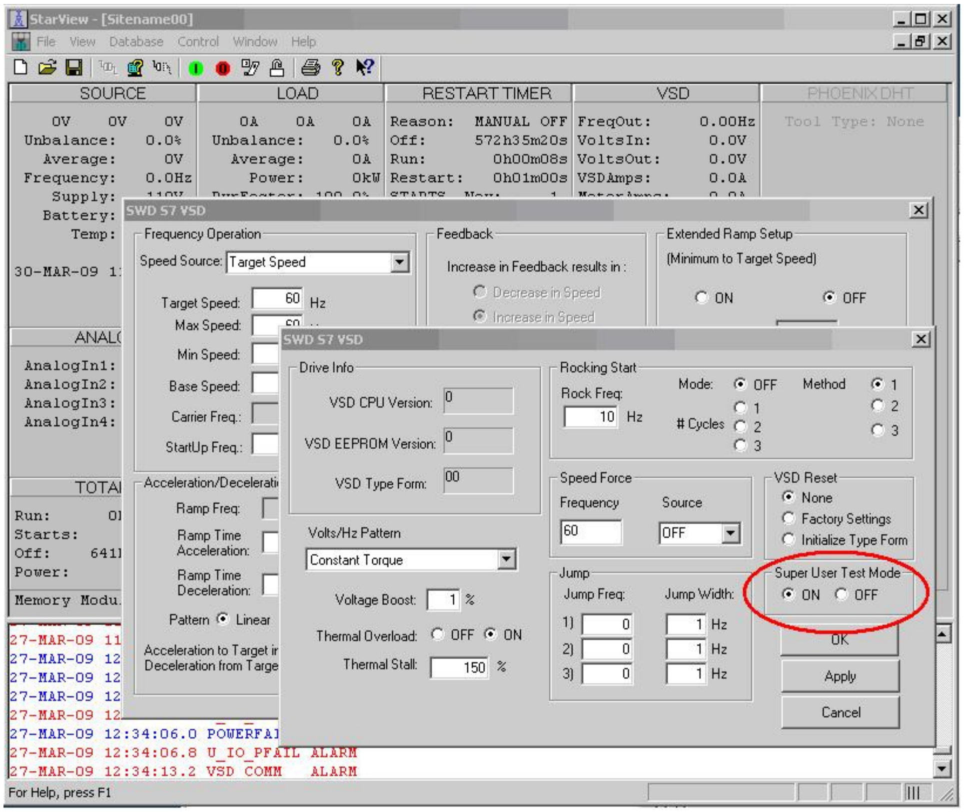


Figure 6-55: Select Super User Test Mode

6.12.10 Medium Voltage Drive 15kV+ Support

As of version 1.405r1 the UniConn can now support MVDs with an input voltage rating greater than 15kV. The difference compared with MVDs with an input voltage rating less than 15kV is in the scaling of the input voltage reading: in the former (higher than 15kV input) there is no decimal place; in the latter there is a single decimal place of precision. As of version 1.407r1 there is no decimal place for either cases.

To enable this feature via the front UniConn keypad, perform the following sequence:

```
12:51:27       Sitename00          OFF
 MENU             HAND     AUTO
   ↓
```

```
12:51:28       Sitename00          OFF
  MOTOR    I/O            HISTORY  SETUP
                                     ↓
```

UniConn V1.402r1 Serial: 175 ADJ PREV NEXT ↓
VSD Settings: ADJ PREV NEXT ↓
Ramp Frequency: 90.00Hz PREV NEXT ↓ ↓ (multiple times) ↓
MVD Input Voltage Above 15kV: NO EDIT PREV NEXT ↓
MVD Input Voltage Above 15kV: NO ACCEPT NO YES

To configure an MVD with an input voltage rating greater than 15kV using StarView, double click the VSD dialog by double clicking the VSD live area:

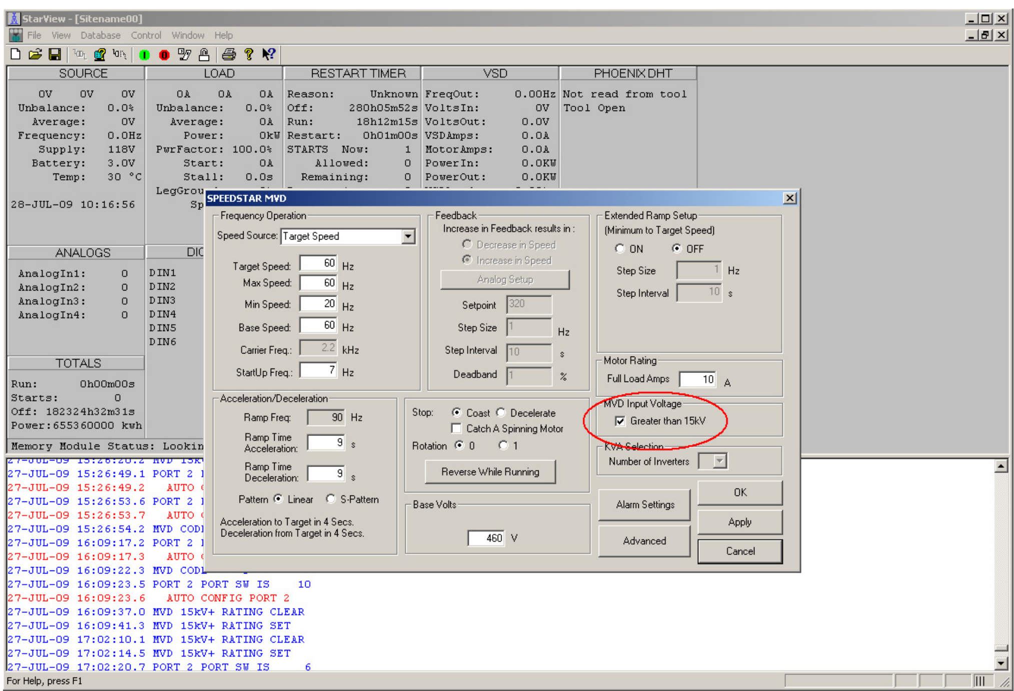


Figure 6-56: MVD Settings Page – Enable 15kV

Note that the checkbox to select MVD input voltage range will only be available if the UniConn has been configured with an MVD. This setting has no effect on any of the other drives.

6.12.11 MVD Startup Voltage Boost 10%

There are no special usage instructions for this feature. Enter the startup voltage boost as usual – however, if an MVD has been selected, this value will be limited to 10.0%.

6.13 Expansion Cards

6.13.1 Configure the UniConn for a PIC

Using the UniConn keypad and menu screens navigate to the 'Option Port' configuration screen as shown below.

```
12:51:28            Sitename00              OFF
  MOTOR       I/O                HISTORY   SETUP
```

```
      UniConn         V1.304r1   Serial:       7
              ADJ                  PREV     NEXT
```

```
Maintenance Port:
STARVIEW                           PREV     NEXT
```

```
Option Ports:
  PORT1                 PORT2      PREV     NEXT
```

UniConn 'Option Port' menu

Within the 'Option Port' menu configure the UniConn as shown below.

```
Option Ports:
 PORT1                  PORT2      PREV     NEXT
```

```
Name:                                     PIC-01
```

```
 Edit                                      PREV       NEXT
```

```
Function:                                      PHOENIX DHT
 Edit                                      PREV       NEXT
```

```
Site Address:                                            1
 Edit                                      PREV       NEXT
```

```
Baud Rate:                                            9600
 Edit                                      PREV       NEXT
```

```
8,NONE,1,RS485
 Edit                                      PREV       NEXT
```

```
Prekey Delay:                                          2ms
 Edit                                      PREV       NEXT
```

```
Postkey Delay:                                         2ms
 Edit                                      PREV       NEXT
```

```
Access:                                          VIEW-ONLY
 Edit                                      PREV       NEXT
```

```
Control State:                                       CLEAR
 EDIT                                      PREV       NEXT
```

UniConn PIC communication settings

Note

As shown the PIC is installed in PORT1. The PIC can operate in any of the 4 UniConn option ports.

Note

The UniConn will only support one installed PIC.

6.13.2 Configure the UniConn for PIC using StarView

StarView is software program used to interface to the UniConn for configuration and diagnostics.

In StarView, open the 'Option Port' configuration menu from the menu tabs: Database — Controller. See Figure 6-57.

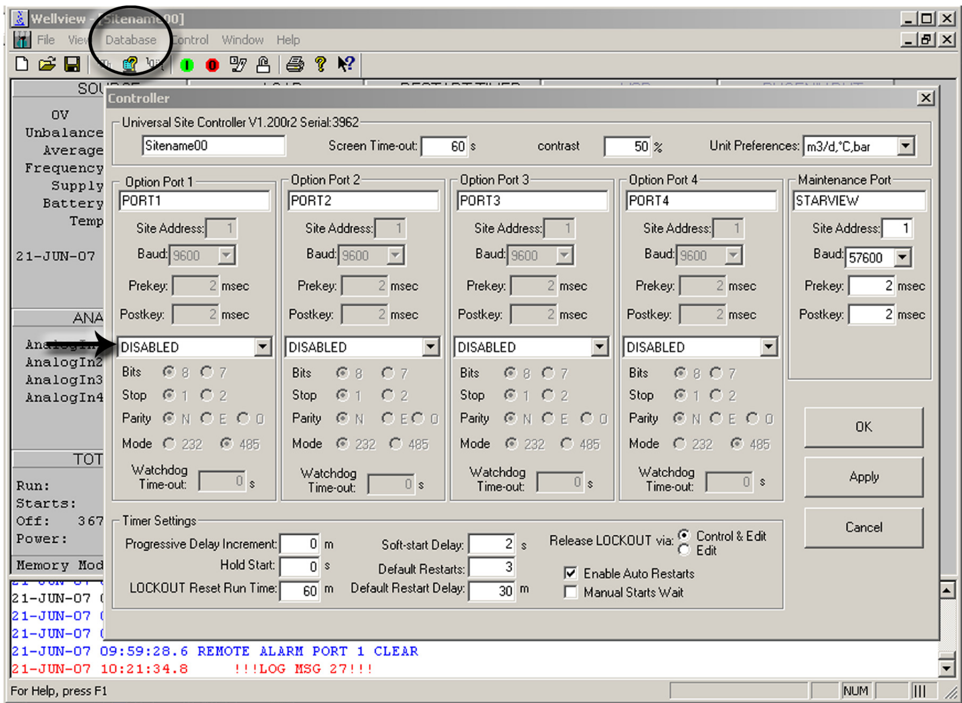


Figure 6-57: StarView port configuration screen

Change the card type from DISABLED to PHOENIX DHT and click 'Apply'. See Figure 6-58. StarView will automatically configure the remaining communication parameters.

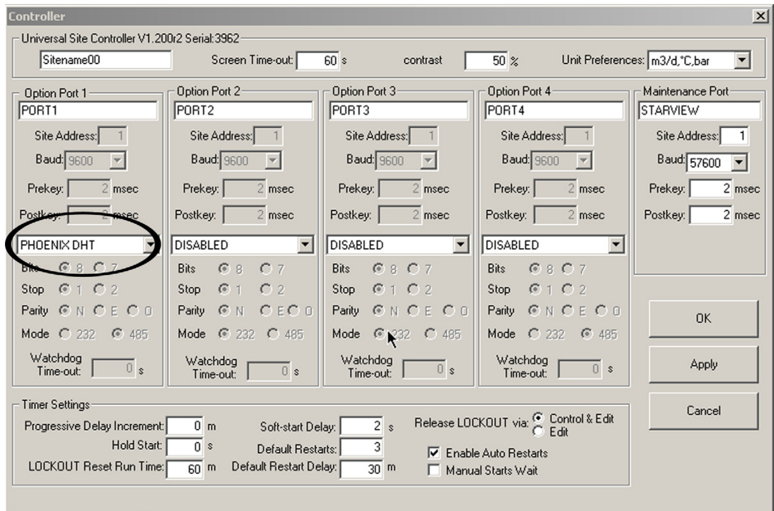


Figure 6-58: StarView port configured for PIC

Once the UniConn port has been configured the PIC begins the initialization process and the internal relay can be heard actuating.

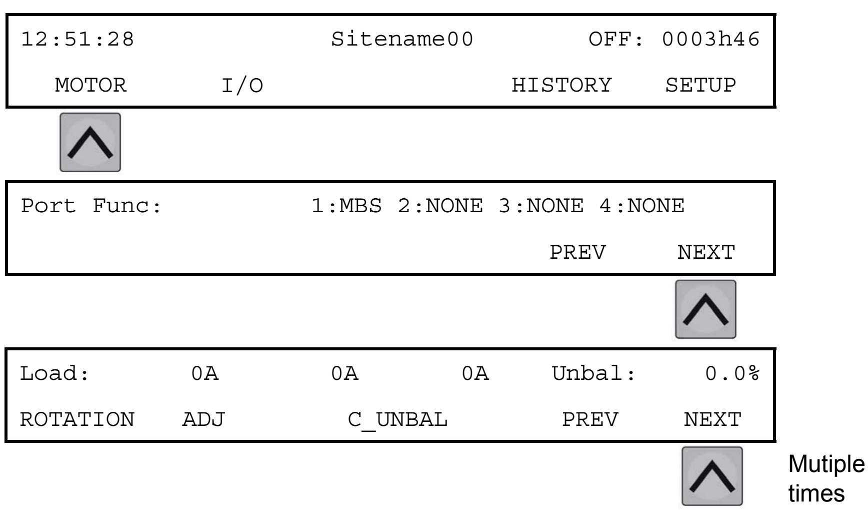
Note

The required port settings are 8 Data bits, 1 Stop bit, No Parity and RS-485 mode.

6.13.3 Configure PIC using UniConn

For basic UniConn operation review the 'Using UniConn Interface OverView'.

Using the UniConn keypad navigate through the MOTOR menu to 'Pump Intake Press' as shown below. For more detail on UniConn PIC menus see Appendix B.13: UniConn PIC Screen Map.



```
Pump Intake Press:                      294.0bar
 PI_LO     RSR      PHI_HI     PREV     NEXT
```

```
Pump Discharge Press:                     0.0bar
 PD_LO              PD_HI      PREV     NEXT
```

```
Pump Flow Rate:                           0m3/d
FLOW_LO            FLOW_HI     PREV     NEXT
```

```
Differential Pressure:                   -294bar
DIFFP_LO           DIFFP_HI    PREV     NEXT
```

```
Bottom Hole Temperature:                    0.0C
                     BHT       PREV     NEXT
```

```
Motor Winding Temperature:                  0.0C
                     TM        PREV     NEXT
```

```
Pump/Ax Vibration:                        0.000g
                     VIB       PREV     NEXT
```

```
DC Current Leakage Passive:             0.000mA
                    LKP_HI     PREV     NEXT
```

```
DC Current Leakage Active:              0.000mA
DH_CALIB            LKA_HI     PREV     NEXT
```

```
PIC Status:                          CL NOT Set
                               PREV     NEXT
```

```
Tool Type Live:                      PHOENIX XT
            ADJ                PREV     NEXT
```

```
PIC Software Version:                     2.100
                               PREV     NEXT
```

PIC screens in 'Motor' menu

Each PIC parameter has registers for user settings. Review the UniConn basics for information on changing parameters.

Note

Depending on the DHT tool in use some of the data screens will be non-functional as the DHT does not provide that data.

6.13.3.1 Calibration

Calibration of current leakage is required during commissioning. This process sets a leakage current reference for the entire system such that changes in leakage current can be monitored. On the UniConn PIC **MOTOR** menu navigate to the location shown below.

```
DC Current Leakage Active:                             0.000mA
DH_CALIB                        LKA_HI          PREV     NEXT
```

```
Cz:  10.000                                         CF: 18.000
                                                PREV     NEXT
```

```
PIC Status:                                         CL Not Set
 PIC Reset                                      PREV     NEXT
```

```
Last Time:                            Jun 21, 2009 16:12:52
  SET CLP                                       PREV     NEXT
```

DH_CALIB menu

The 'Set CLP' logs a time stamp when this procedure was performed. The Cz and Cf values are measured during PIC operation with the DHT.

The 'PIC Status' will indicate if the calibration reference has been set. If 'CL Not Set' is displayed, navigate to the 'Set CLP' menu.

Warning

Potential Severity:	Serious
Potential Loss:	Assets
Hazard Category:	Machinery equipment hand tools

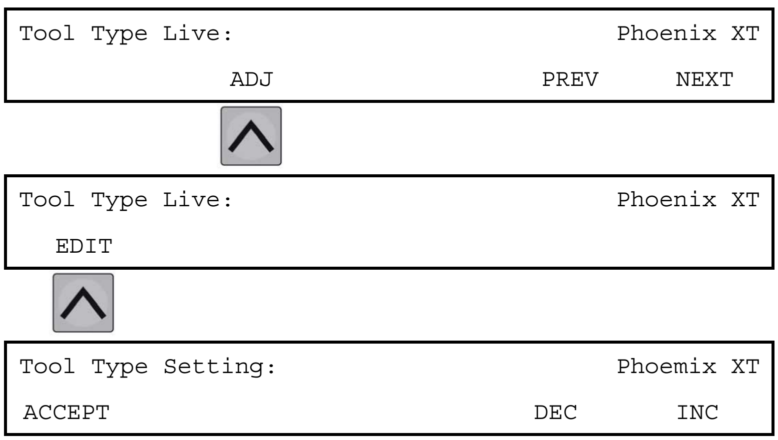
If the Current Leakage Passive (CLP) is not set during commissioning, monitoring of leakage current is not possible and the health of the downhole system, over time, will be unknown. CLP should be set with the ESP off or just before start up.

Note

When using Phoenix Select and CTS tools, the 'Set CLP' command may not be processed immediately after it is pressed. Wait at least one minute after initiating Set CLP for the status to change.

6.13.3.2 DHT Configuration

The PIC is capable of interfacing to a variety of DHT. Within the menu shown below the type of DHT can be selected. The DHT tools displayed will change dependant on the firmware installed in the PIC. For further details see section 4.25.1.2 Tool Types.



Tool Type menu

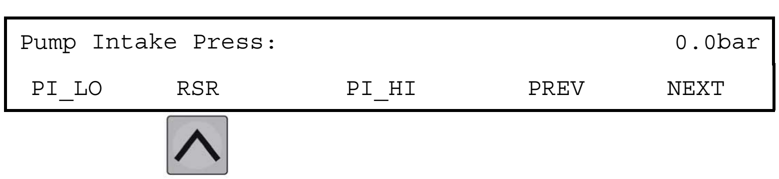
Note

The PIC generation 2 automatically detects the tool type and thus the **EDIT** feature is not available for the **Tool Type Setting**.

Once the PIC begins communicating with the DHT, the specific DHT detected by the PIC will be displayed in the UniConn 'Tool Type Live:' menu.

6.13.3.3 Rapid Sampling Rate

Rapid Sampling Rate (RSR) is a feature with the Multisensor XT tools and is enabled as shown below.



```
Rapid Sampling Time Level:                  0min
                               PREV     NEXT
```

```
RSR Enable:                                  OFF
 Edit                          PREV     NEXT
```

```
Rapid Sampling Time Setting:                0min
 EDIT                          PREV     NEXT
```

Rapid Sampling Rate Multisensor XT tools only

6.13.3.4 Differential Pressure

Differential pressure is not available from Phoenix Interface Card (PIC) but is an extended feature provided by the UniConn through the calculation of two pressures. On the UniConn navigate through the MOTOR menu to the location shown below.

```
Supply Volts:                            –294bar
 DIFFP_LO          DIFFP_HI      PREV     NEXT
```

Differential pressure screen

The alarm configuration screen options are common throughout the UniConn screens. See section 4.3: Alarms for details.

6.13.3.5 Vibration Averaging

Note

Vibration averaging is only available with the PIC generation 2.

To configure the vibration averaging navigate in the **MOTOR** menu to the location shown below.

```
DC Current Leakage Active:               0.000mA
DH_CALIB          LKA_HI         PREV     NEXT
```

```
Cz:10.000                              Cf:18.000
                               PREV     NEXT
```

Multiple times

```
Vibrations Averaging:                              16
 EDIT                              PREV      NEXT
```

Average Vibration Menu

6.13.3.6 Swap Remotes

Note

Swap Remotes is only available with the PIC generation 2 used with the Phoenix Select Advance DHT.

To configure the Swap remote navigate in the **MOTOR** menu to the location shown below.

```
DC Current Leakage Active:                    0.000mA
DH_CALIB                LKA_HI      PREV      NEXT
```

```
Cz:10.000                                    Cf:18.000
                                   PREV      NEXT
```

Multiple times

```
Swap Remotes:                                     OFF
 EDIT                              PREV      NEXT
```

Swap Remote menu

If **Swap Remotes** is enabled for the Select Advance DHT, the Tool Type Live menu, see the Tool Type menu, will display the tool type as shown below.

```
Tool Type Live:            Select Advance (swapped)
 EDIT                              PREV      NEXT
```

Tool Type Live menu

6.13.3.7 Configure PIC diagnostic

In order to access the PIC diagnostic window via the UniConn front keypad:

```
12:51:27                Sitename00                OFF
   MENU                    HAND       AUTO
```

```
12:51:28              Sitename00              OFF
  MOTOR                  I/O      HISTORY   SETUP
```

```
Port Func:       1:NONE 2:NONE 3:NONE 4:PIC
                                   PREV      NEXT
```

Multiple times

```
DC Current Leakage Active:               0.185mA
DH_CALIB                LKA_HI     PREV      NEXT
```

```
Cz:10.788                              Cf:18.562
                                   PREV      NEXT
```

Multiple times

(the PIC Diagnostic screens all appear in this group of menu screens)

6.13.3.8 Configure DHT (Downhole Tool) Trip Alarm to Relay

The UniConn is capable of signaling the DHT Trip alarm state via the digital output relays. Once a digital output relay is configured for DHT Trip, the relay will actuate if any downhole alarms are active for the duration of their respective trip time. To configure the DHT Trip to Relay feature via the UniConn front keypad, navigate to the Digital Output section (see section 6.7.1: Configure Digital Outputs Using UniConn) and set Digital Output Action for the appropriate digital output to “On Alarm”, then set Relay Alarm Source to “DHT TRIP”.

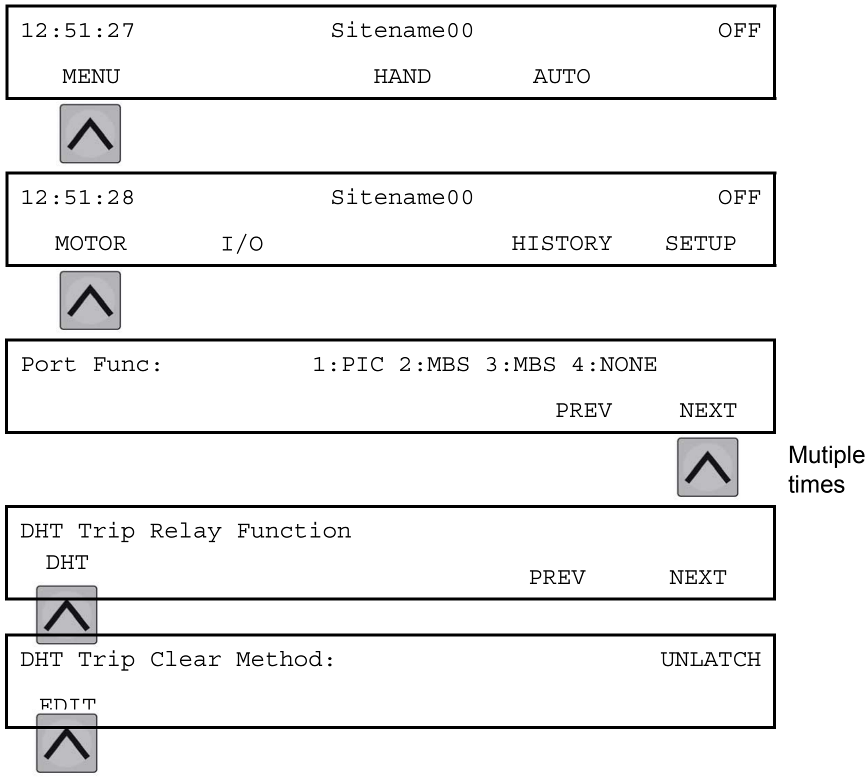
```
Digital Output Action:                       OFF
 Edit                              PREV      NEXT
```

```
Select Relay Alarm Source:              DHT Trip
 Edit                              PREV      NEXT
```

The DHT Trip Clear Method allows the DHT Trip alarm to be cleared in either of two ways:

1. Auto – the DHT Trip alarm automatically clears when PIC alarms are no longer present

2. Unlatch – The DHT Trip alarm clears when the Unlatch button is pressed from the UniConn control screen or through StarView.



6.13.3.9 Configure Tool Fault Alarm

The UniConn can be configured to trip when Tool Faults are present. If any of the following Phoenix Tool Faults are active and TOOL FAULT action is set to STOP or LOG+STOP, a trip will occur:

- Open Circuit
- Short Circuit
- Tool Short Circuit
- CF Dropped
- PSU not booting
- Tool Stuck
- Tool Stuck RSR
- Negative Saturation
- PIC Other Tool Fault
- PIC Non Tool Fault

Trip Time duration can also be configured to specify the amount of time a Tool Fault needs to be active before a trip occurs. To configure Tool Fault Action and Trip Time in the UniConn:

```
12:51:27              Sitename00             OFF
   MENU                  HAND       AUTO
```

```
12:51:28              Sitename00             OFF
   MOTOR      I/O                HISTORY   SETUP
```

```
Port Func:          1:PIC 2:MBS 3:MBS 4:NONE
                                   PREV     NEXT
```

Mutiple times

```
PIC Alarm Control
 Tool
                   PIC Comms     PREV     NEXT
```

```
Action:                                      LOG
 EDIT                            PREV     NEXT
```

```
Alarm Trip Time:                            10.0
 EDIT                            PREV     NEXT
```

```
Ignore PIC alarms during tool fault:  NO
 EDIT                            PREV     NEXT
```

Selecting “Ignore PIC alarms during tool fault” will allow all regular PIC alarms (such as pressure alarms, temperature alarms, vibration, etc.) to be ignored when a Tool Fault is active. This is useful in situations where readings become erroneous because of a Tool Fault but the user doesn’t want these erroneous readings to cause a trip. To ignore PIC alarms when a tool fault is present, set “Ignore PIC alarms during tool fault” to YES.

```
Ignore PIC alarms during tool fault:  YES
 EDIT                            PREV     NEXT
```

6.13.4 Configure PIC using StarView

StarView should appear with the PIC enabled as shown in Figure 6-59. If this is not the case review section 6.13.2: Configure the UniConn for PIC using StarView.

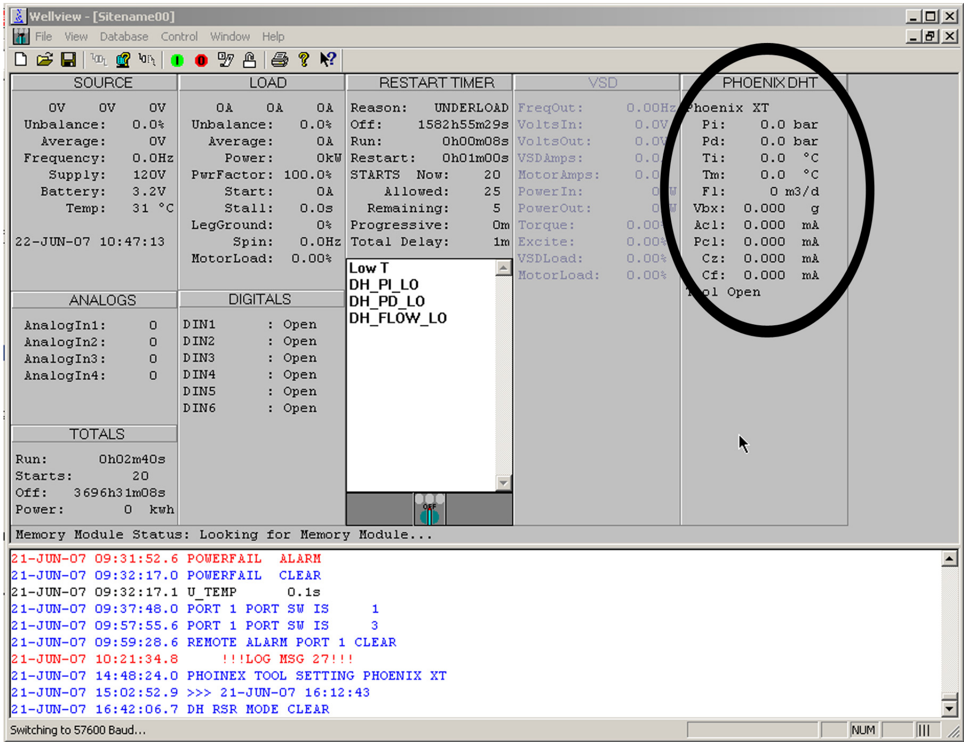


Figure 6-59: StarView screen with PIC enabled

Double click on the PHOENIX DHT tab and the following window should appear.

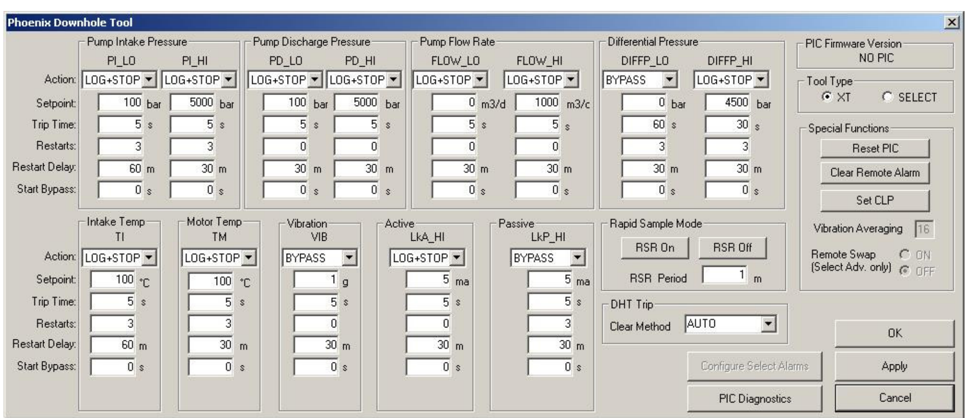


Figure 6-60: StarView PIC configuration menu

Private – Customer Use

All the PIC alarm control are available, tool type can be changed, Rapid Sampling Rate (RSR), etc.

6.13.4.1 Configure PIC diagnostics

In order to access the PIC diagnostic data via StarView, double click on the PHOENIX tool area, to bring up the Phoenix Downhole Tool dialog. Then, click on the PIC Diagnostics button.

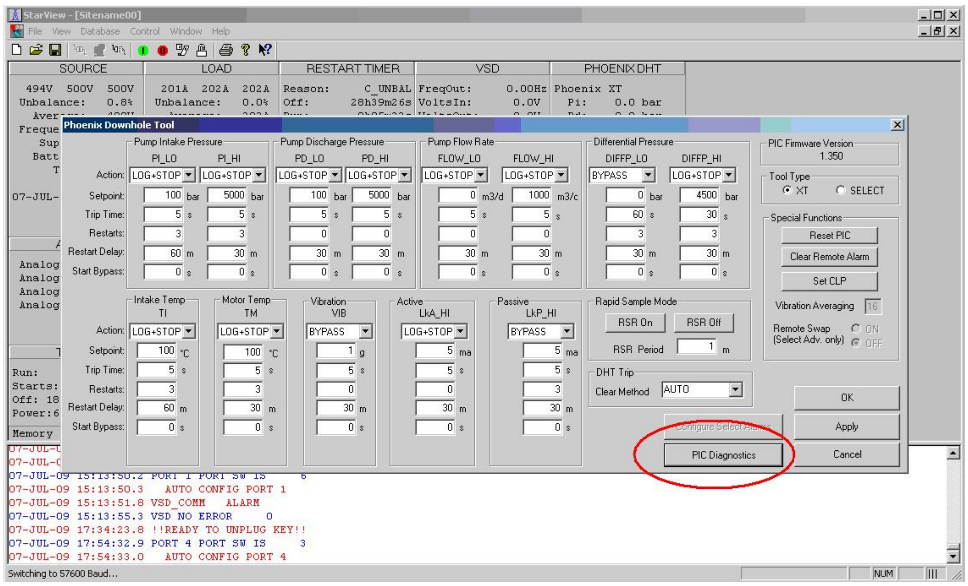


Figure 6-61: PIC Diagnostics Bottom

The PIC Diagnostic Data dialog is as follows:

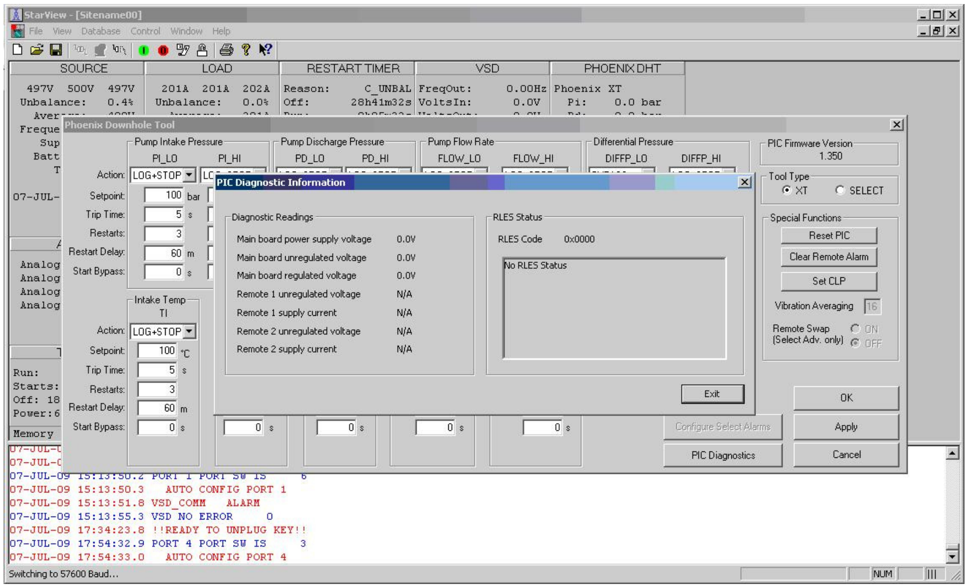


Figure 6-62: PIC Diagnostic Data Dialog

6.13.4.2 Phoenix Downhole Tool Window

The PIC settings and alarms can be modified in the Phoenix Downhole Tool window.

1. Connect to the SoloConn Phoenix using StarView.

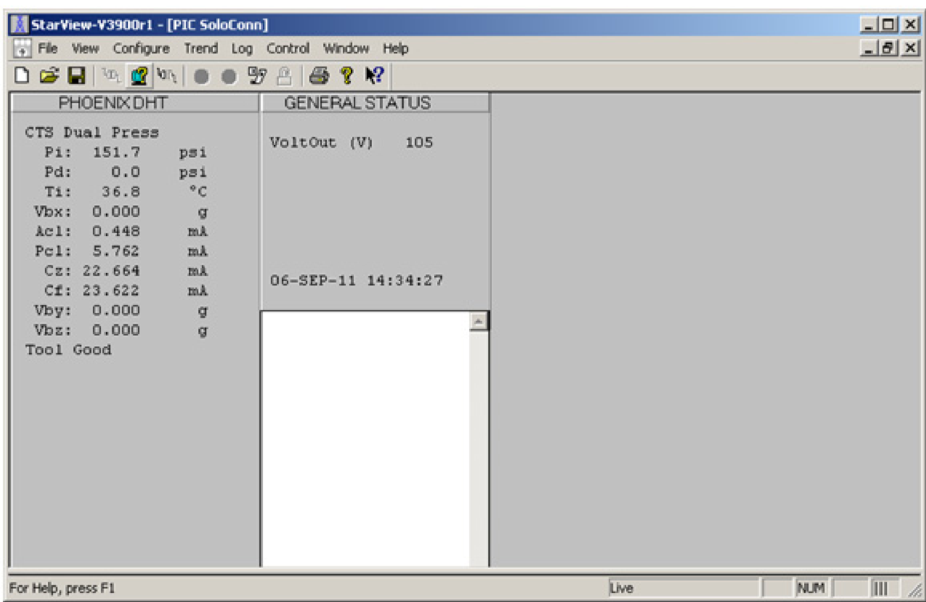


Figure 6-63: Live Window (SoloConn Main Window)

2. Click **File->New** to open Live window.

3. On StarView, click **Configure->Alarms** (or double click **PHOENIX DHT** panel) to open the Phoenix Downhole Tool window shown in Figure 6-64.

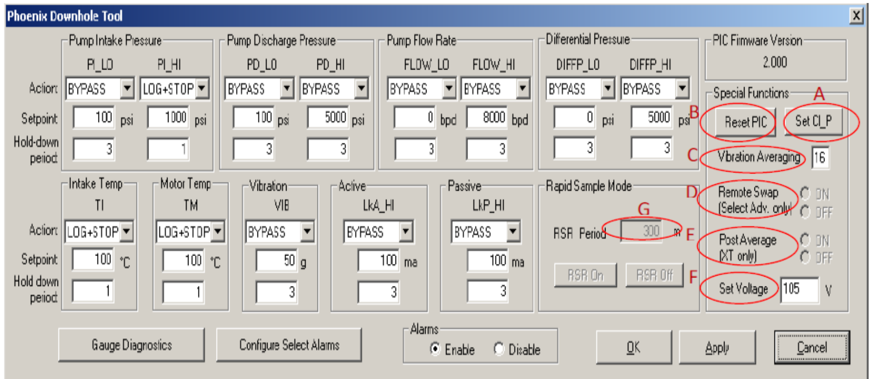


Figure 6-64: Phoenix Downhole Tool Window

Set CLP

Click **Set CL_P** button (item A in Figure 6-64) to set CLP. When CLP is not set, StarView displays CLP Not Set on PHOENIX DHT panel. If not other tool faults, StarView display will change to Tool Good after CLP is set.

Reset PIC

Click **Reset PIC** button (item B in Figure 6-64) to reset SoloConn Phoenix card. Reset PIC is necessary when user wants to change tool voltage.

Vibration Average

Note: Digital tools only

The Vibration Average feature is available for digital tools (xt150, UltraLite, etc.) only.

---

1. Click **Vibration Averaging** button (item C in Figure 6-64) to set how often vibration is averaged.
2. Type the desired number in the box next to the button.

   The default is 16. This means that the PIC accumulates 16 vibration readings from downhole tool then averages them before it is sent to client system or displayed on StarView. The purpose is to avoid jumpy vibration data.
3. Click **Apply** to save and apply settings.

Remote Swap

Note: Select Advance tools only

The Remote Swap function is available for Select Advance tools only.

Click **Remote Swap** button (item D inFigure 6-64) to indicate whether 2 remotes are swapped or not during installation.

Post Average

Note: MultiSensor XT tools only

The Post Average function is available for MultiSensor XT tools only.

Click **Post Average** button (item E in Figure 6-64) to turn XT smoothing algorithm on or off. The default is on, so XT parameters are smoothed before they are sent to client system or displayed on StarView. The purpose of this function is to avoid spiky XT parameters.

Set Voltage

Click **Set Voltage** button (item F in Figure 6-64) to change SoloConn Phoenix output voltage for downhole tool. The default is 105 volts. To change it, input the desired voltage in the box next to the button then click **Apply**. A message window pops up as shown in Figure 6-65 below.

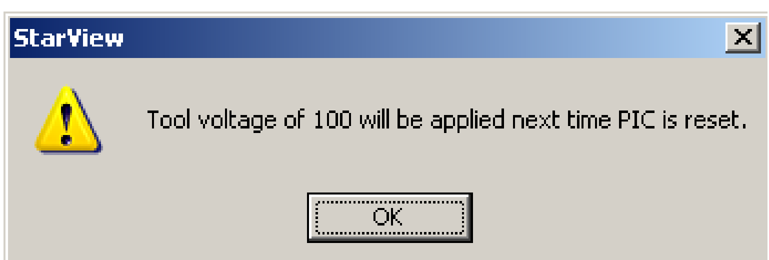


Figure 6-65: Set Voltage Warning Window

Note

The SoloConn Phoenix card must be reset in order for the new voltage to take into effect. This command is used for cases such as installations with long cable or a DHT drawing higher current. Please contact InTouch for assistance when necessary.

Rapid Sample Mode

Note: MultiSensor XT tools only

The Rapid Sample Rate (RSR) mode function is available for MultiSensor XT tools only.

Rapid sample mode allows client to observe intake pressure more often. It is enabled only when a XT tool is connected. To set rapid sample mode (also called RSR mode).

1. Set the time in the box (item G in Figure 6-64) next to RSR Period
2. Click on the **RSR On** button.

   When RSR mode is on, intake pressure updates every second while other parameters will not get updated until RSR period expires or user turns it off by clicking **RSR Off** button.

Note

Calibration is not performed while RSR is on.

6.13.5 Configure the UniConn for a FIC

To enable the operation of the FIC, the UniConn must be configured for a FIC. This configuration is carried out using the UniConn keypad as shown below.

Apply power to the UniConn with the FIC installed (in slot 1) and configure UniConn Port1 as shown below.

Note

If no keys are pressed the display time-out will commence and the display will return to the UniConn Main Screen after time-out has elapsed.

Note

Note there may be more than one FIC installed. This procedure details how to configure a FIC in SLOT #1. Configuration for additional FIC is identical.

```
12:51:28          Sitename00      OFF: 0003h46
  MOTOR     I/O               HISTORY    SETUP
```

```
     UniConn         V1.304r1    Serial:      7
            ADJ                  PREV     NEXT
```

```
Maintenance Port:
STARVIEW                          PREV     NEXT
```

```
Option Ports:
 PORT1               PORT2        PREV     NEXT
```

UniConn FIC Setup with FIC Installed in Port 1

```
Option Ports:
  PORT1                 PORT2     PREV     NEXT
```

```
Name:                                    FIC-01
 Edit                             PREV     NEXT
```

```
Function:                                   FIC
 Edit                             PREV     NEXT
```

```
Site Address:                                 1
 Edit                             PREV     NEXT
```

```
Baud Rate:                                 9600
 Edit                             PREV     NEXT
```

```
8,NONE,1,RS485
 Edit                             PREV     NEXT
```

```
Prekey Delay:                                   2ms
 Edit                          PREV      NEXT
```

```
Postkey Delay:                                  2ms
 Edit                          PREV      NEXT
```

```
Access:                                   VIEW-ONLY
 Edit                          PREV      NEXT
```

```
Control State:                                CLEAR
 EDIT                          PREV      NEXT
```

UniConn FIC Configuration

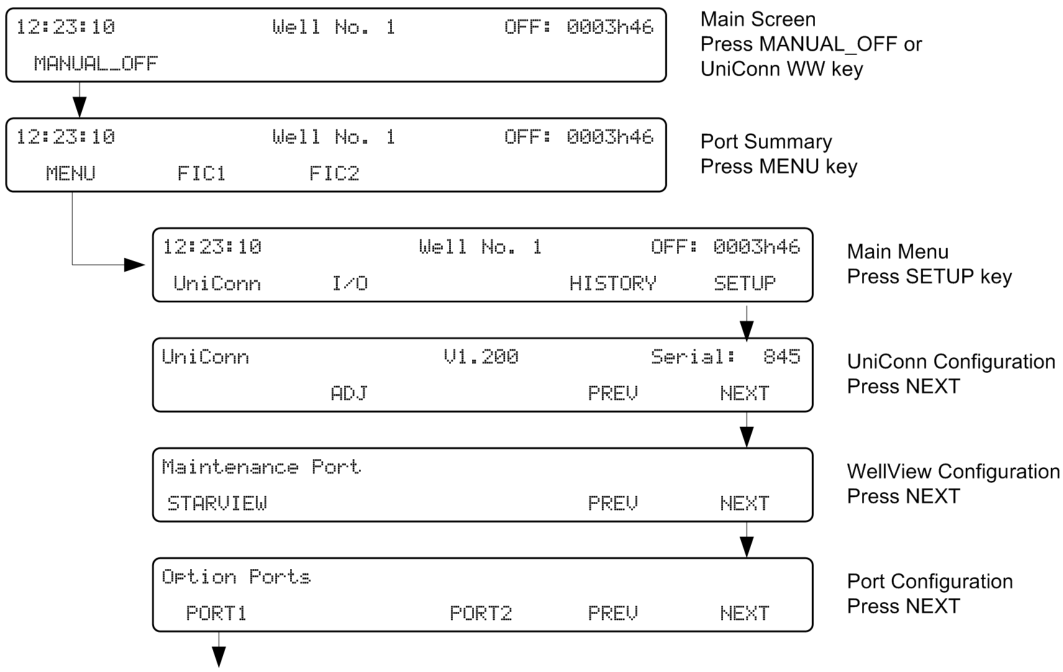


Figure 6-66: UniConn FIC Setup with FIC Installed in Port 1

Option Ports PORT1 PORT2 PREV NEXT	Port Configuration Press PORT1
Name: FIC-01 EDIT PREV NEXT	Port Name EDIT to change. Name can be set to anything. Recommend FIC-XX where XX represents the FIC serial number.
Function: FIC EDIT PREV NEXT	Port Function This must be set to FIC
Site Address: 1 EDIT PREV NEXT	Site Address This must be set to 1
Baud Rate: 9600 EDIT PREV NEXT	Baud Rate This must be set to 9600
8,NONE,1,RS485 EDIT PREV NEXT	Port Setting Use INC DEC to select the parameters and ACCEPT it. Repeat EDIT INC DEC ACCEPT for remaining parameters
Prekey Delay: 2ms EDIT PREV NEXT	Prekey Delay This must be set to 2ms
Postkey Delay: 2ms EDIT PREV NEXT	Postkey Delay This must be set to 2ms
Access: VIEW-ONLY EDIT PREV NEXT	Port Access Level Remain as default VIEW-ONLY
Control State: CLEAR EDIT PREV NEXT	Control State This must be set to CLEAR

Figure 6-67: UniConn FIC Configuration

Repeat the above steps if additional FIC are present. Configure PORT2, PORT3 or PORT4 as shown above.

Note

As of version 1.305r1 only Port Name and Port Function for FIC are required to be configured manually. All other settings are automatically configured.

Table 6-2: UniConn FIC Port Settings Summary

Site Address	1
Data Bits	8
Parity	NONE
Stop Bits	1

Mode	RS 485
Prekey Delay	2 ms
Postkey Delay	2 ms
Access	View Only

6.13.6 Configure the UniConn for a FIC using StarView

Prior to connecting StarView to the UniConn configure the communications.

The Site window of a UniConn with a FIC installed is substantially different in appearance and functionality to the site window without a FIC. If the UniConn for WellWatcher has not bee previously configured, the default window may appear as shown in Figure 6-68.

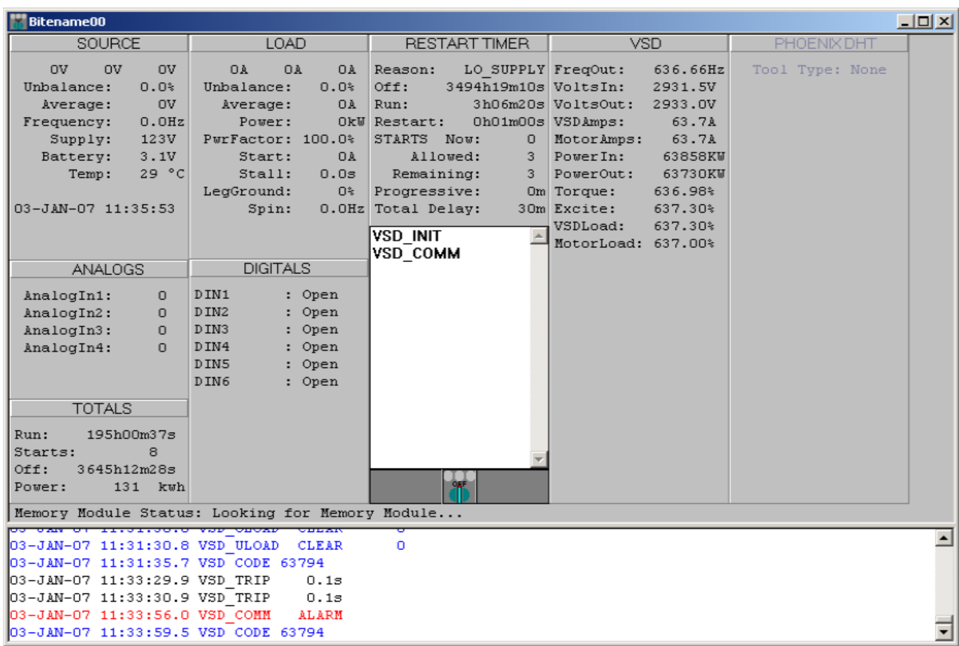


Figure 6-68: Default Site Window

Once the UniConn is configured the windows and menus should appear as shown in Figure 6-69. If the screen do not appear as those described below, then the configuration needs to be reviewed as detailed in 6.13.6.1: Configuration process.

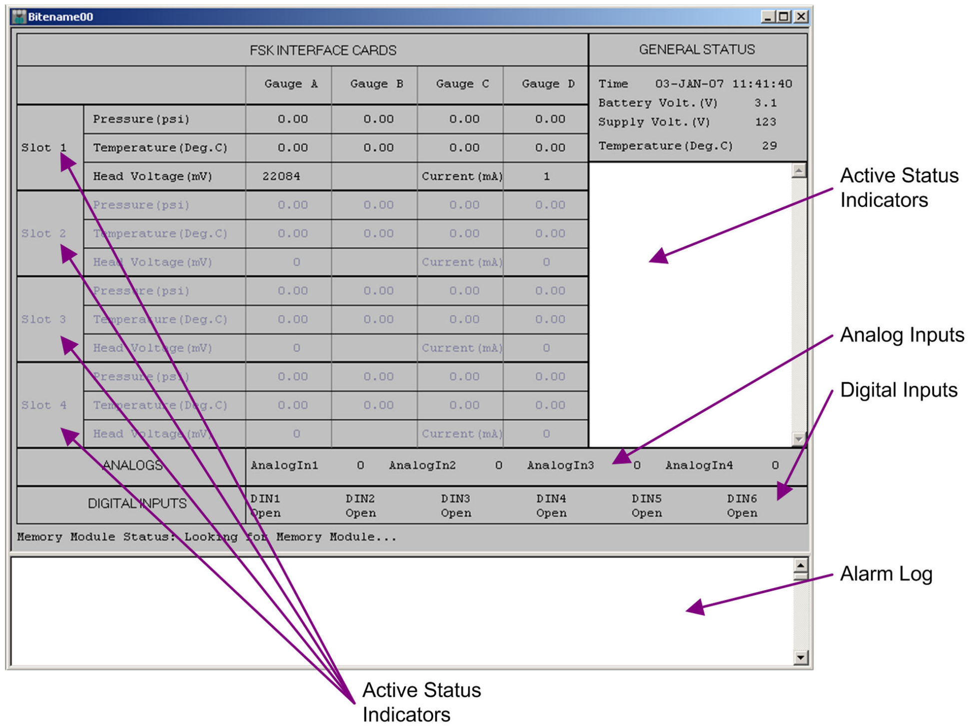


Figure 6-69: WellWatcher Mode Site Window

6.13.6.1 Configuration process

StarView will automatically change to WellWatcher mode if the connected UniConn has been configured for WellWatcher. This will only occur if one of the UniConn slots has been previously configured for a FIC.

StarView can also be used to configure a UniConn for a FIC. StarView will automatically configure the communication parameters for the FIC (contrary to configuration via UniConn, where all the parameters have to be entered manually).

1. Connect StarView to the UniConn using front Maintenance port. Use a standard serial cable.
2. Wait until the database is uploaded and then choose **Database** menu **Controller** command.
3. The controller window will appear in Figure 6-70. Select the Option Port the FIC has been installed into and set the device type to FSK TOOL.

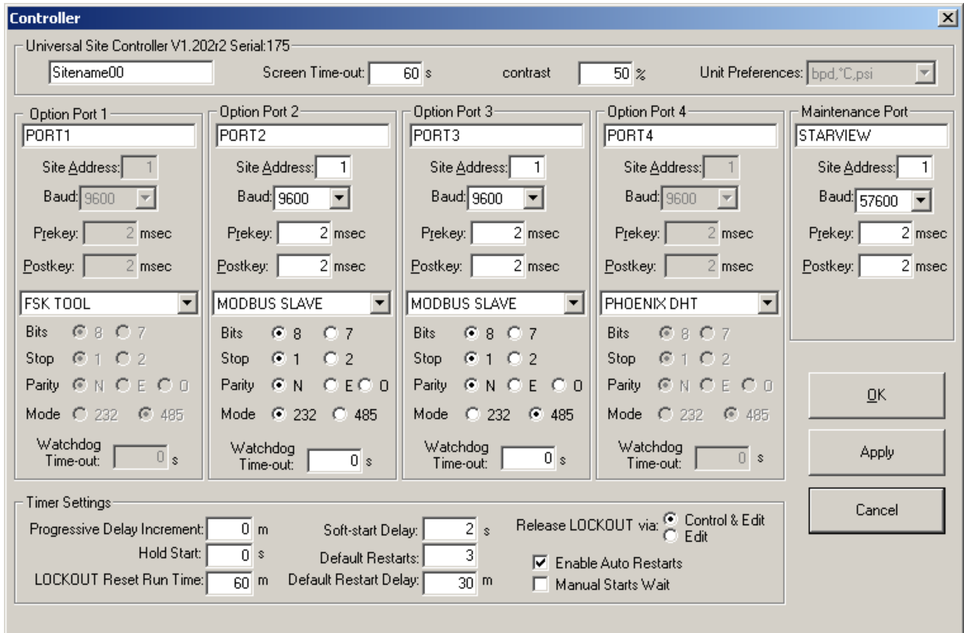


Figure 6-70: Controller Window

4. Click **OK** button to verify the settings.
5. A warning will appear as shown in Figure 6-71. Click **Yes**.

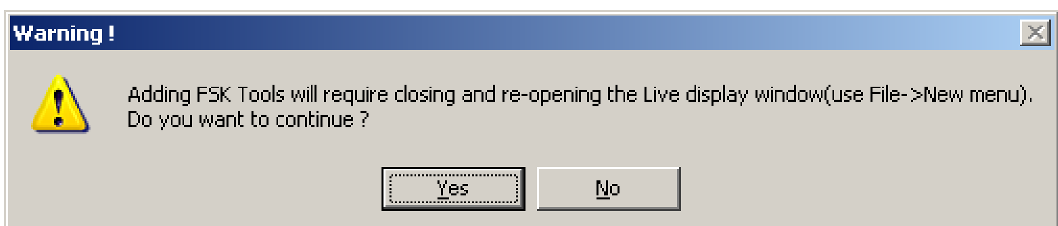


Figure 6-71: Warning Message

6. The StarView session must be closed and reopened to enter WellWatcher mode.
7. The site window should now look like Figure 6-69.

Note

The UniConn is capable of supporting up to a maximum of four FIC.

Note
StarView will automatically configure the UniConn for the card type selected. For the FIC this configuration will set the communications mode to RS–485.

The exact appearance of the site window is dependent on the number of cards installed into the UniConn expansion slots. When viewing the UniConn display window has two major sections separated by a window splitter bar. The upper section is a view of dynamic data.

The lower section is a view of the event log. The mouse cursor can grab the window splitter bar and move it horizontally so as to change the proportion of each section shown. The alarm log is updated in a first in, first out fashion. The log is automatically scrolled whenever a new entry occurs. New entries are placed at the bottom of the log.

6.13.7 FIC Card Configuration

FIC card configuration consists of gauge serial numbers and coefficients settings, FIC clock setting, and FIC front and back communication port settings. These settings are saved on the card. If the card is replaced with a second card, the settings are lost and have to be redone.

StarView software is required to configure the FIC with the gauge serial numbers and coefficients through the FIC engineering port. The firmware download option is also available.

The FIC requires configuration in order to display correct values from the gauges.

The FIC card offers a possibility to map up to four gauges. The configuration of the gauge positions defines where the downhole data is retrieved (in the Modbus table). A gauge position is also associated with the set of coefficients that are used to convert the raw data coming from the downhole gauges into engineering data.

This configuration procedure assumes the FIC card contains no configuration information and the option is available to clear the FIC to ensure this.

6.13.7.1 StarView Communication Parameters

To configure the FIC perform the following steps.

1.	Start StarView.
2.	Configure the communications port by selecting **File** menu **Communications** command as shown in Figure 6-72. • Baud = 38400 • Prekey = N/A • Postkey = N/A • Reply Wait = 100 • Retries = 5 • Com = user defined • Check boxes = Using a Direct One to One Link.
3.	Using serial cable connect the PC to the Engineering Port of the FIC to be configured.
4.	Select **File** menu and then **Configure FIC Board** command.
5.	View/change FIC configuration as required.

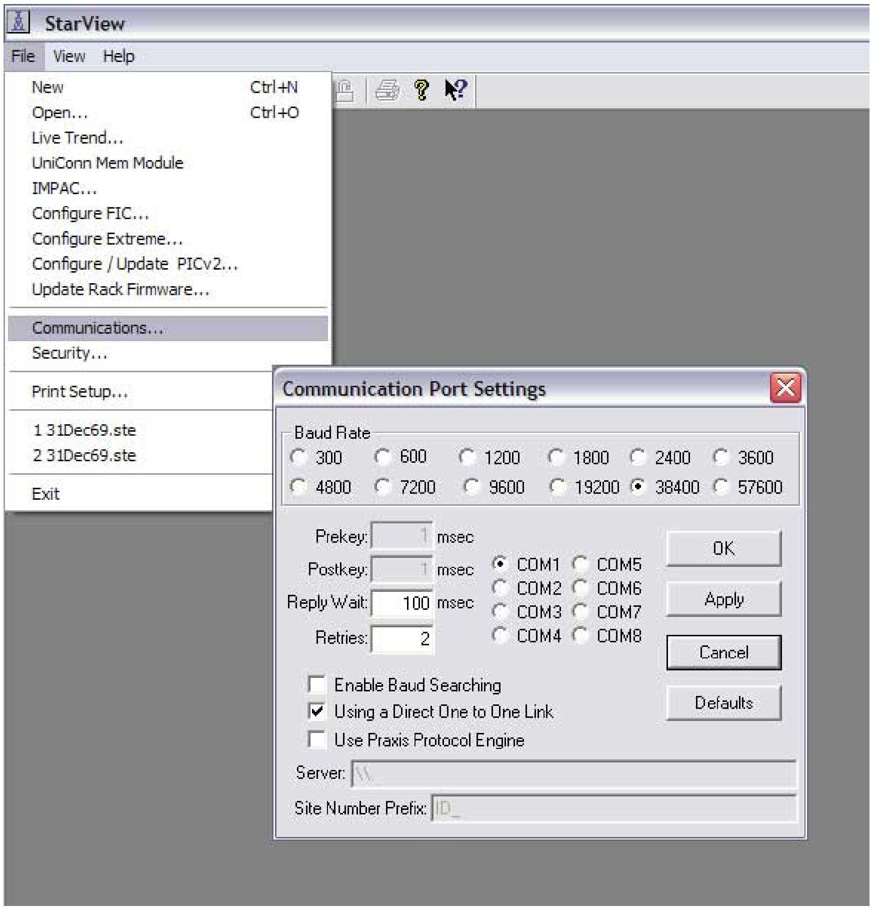


Figure 6-72: StarView FIC Communication Parameters

6.13.7.2 StarView FIC Configuration Window

The FIC configuration window is used to configure a single FIC for use with up to four gauges for each card. See Figure 6-73.

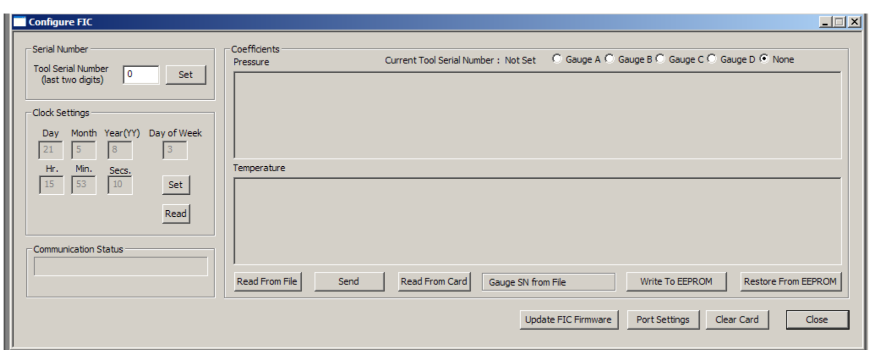


Figure 6-73: StarView FIC Configuration Window

6.13.7.3 Clear the FIC

To ensure the FIC configuration is site-specific a “Clear Card” feature is available. This removes all stored coefficients, resets serial numbers and rear port settings. Ensure this feature is used prior to configuring the FIC.

Clear card command requires setting of the FIC engineering port address as well. Use recommended **Auto** setting unless the card is used in SoloConn WW application.

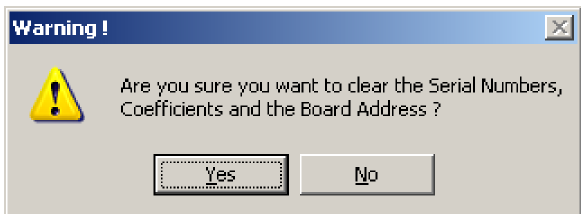


Figure 6-74: Clear Card Warning Dialog

Figure 6-75: FIC address

6.13.7.4 Set the FIC Clock

This procedure uses the PC clock to set the time for the FIC. The Hr., Min., and Secs. represent the PC time. To view the FIC clock click on the **Read** button shown in and the values will be displayed under the PC time field. To synchronize the FIC to PC time, click the **Set** button.

Term	Definition
Day	Day of the month.
Month	1=January, 2=Febuary, 12=December
Year	Last two digits of the year. For 2007, year = 07.
Day of Week	Day of the week. 1=Monday, 2=Tuesday, 7=Sunday
Hr. Min. Secs.	These are the PC clock settings in 24 hour format.

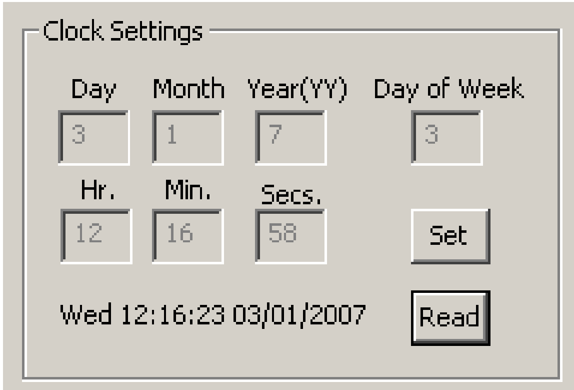


Figure 6-76: Clock Setting Window

6.13.7.5 Set the FIC Gauge Serial Number

With the NPQG "Gauge A" (for example) selected, set the **Tool Serial Number** to match the last two digit of the gauge serial number. For this example use "01". Click **Set**. The "Gauge A" position is now linked to the gauge. For serial numbers of different types of gauges refer to Figure 6-77 the gauge user manuals.

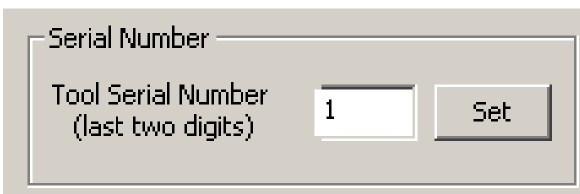


Figure 6-77: Tool Serial Number Window

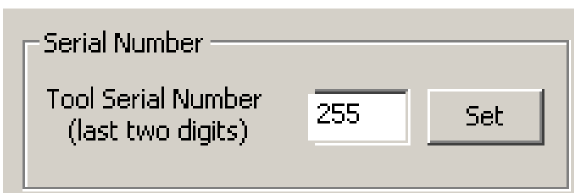


Figure 6-78: Blank Tool Serial Number

Note
If not all gauges are required ensure the value of 255 is set as the address for unused position.

6.13.7.6 Set the FIC Gauge Coefficients

Downhole gauges come with a set of coefficients in a file (**.coe**).

Note

The coefficient file numbers have to match the gauge serial number for correct measurements.

The coefficients are used by the FIC to convert the raw data sent by the gauge to actual readings of temperature and pressure (engineering units). The correct set of coefficients for each gauge must be downloaded.

Note

For explanation purposes, Gauge A will be used as an example.

Select the “Gauge A”, “Gauge B”, etc. for the associated tool, as shown in Figure 6-79. “Gauge A” is selected and a serial number assigned.

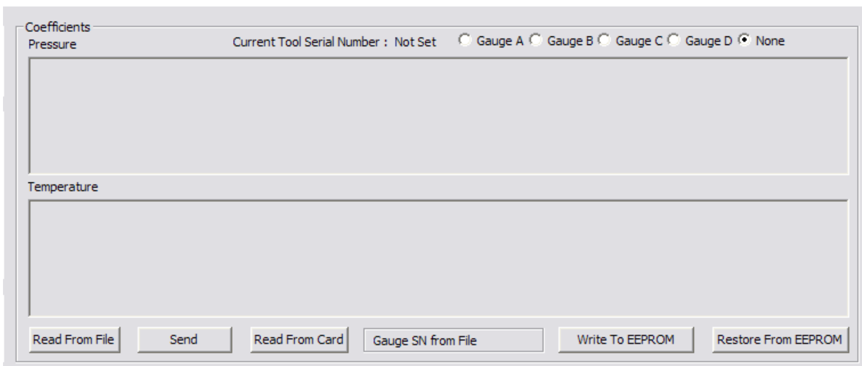


Figure 6-79: Tool Coefficients Window

Click **Read From Card** to confirm no coefficients are defined. Figure 6-80 shows the blank gauge coefficients matrix.

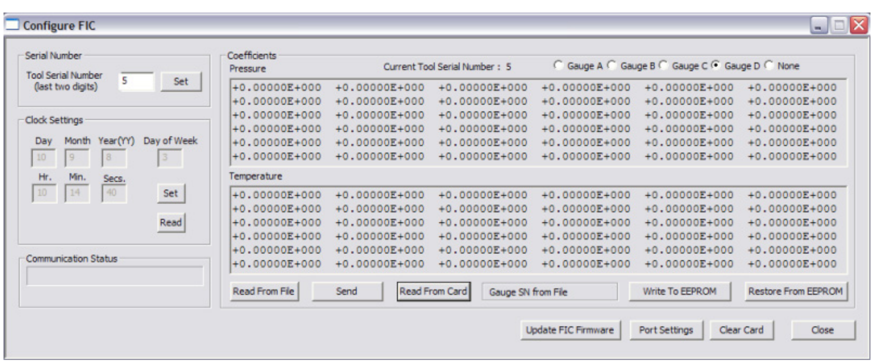


Figure 6-80: Blank Coefficient Window

To load coefficients from a file, click on the **Read From File** button, and select the gauge coefficients file from the file browser.

Once selected the coefficients will be loaded into the selected gauge location by pressing **Send** button as shown in Figure 6-81.

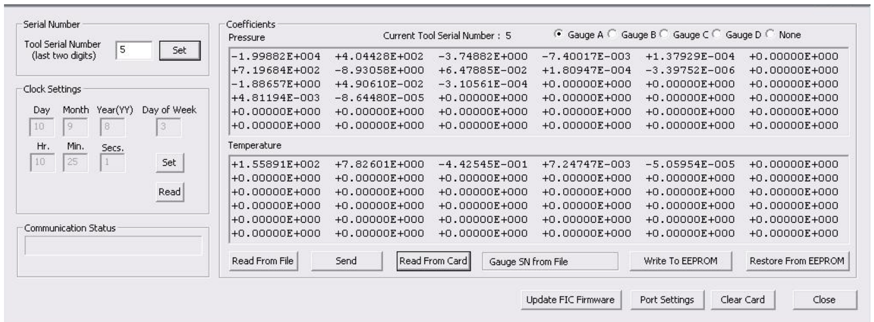


Figure 6-81: Sample Tool Coefficients Window

6.13.7.7 Save the FIC Settings

To send the coefficients to the FIC, use the **Send** button. The coefficients are now active in the FIC until the power is removed from the board. To make these new coefficients permanent click the **Write to EEPROM** button. This will transfer the coefficients to nonvolatile storage memory. Figure 6-82 shows the transfer status.

Figure 6-82: Write to EEPROM Status

Restore from EEPROM button will restore the card settings to those since the last **Write to EEPROM**.

6.13.7.8 Configure FIC Ports

FIC front and back ports are configured by clicking on the button **Port Setting** in **Configure FIC** dialog box. The dialog box appears as shown in Figure 6-83.

The settings of the ports are determined by the application of FIC card.

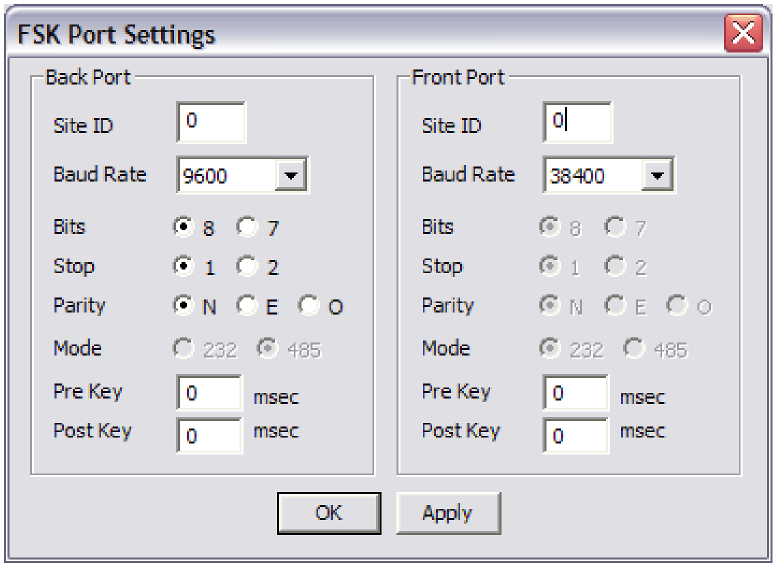


Figure 6-83: Configure FSK Port Settings

Back port baud rate for card installed in UniConn is 9600 baud, and ARConn is 38400 baud. For the card within SoloConn, the baud rate of the back port is set as per client requirements, if this port is used for SCADA connection.

The address of the back port for the FIC installed in UniConn should be **0** (use **Auto** setting when clearing the card, 6.13.7.3: Clear the FIC) or **1**. The address is the same for all four UniConn slots.

The address of the back port for the FIC installed in ARConn should be **0** (use **Auto** setting when clearing the card) or the number of the slot in which the card is installed (**1–16**).

Choosing **0** for the address setting will prompt the card to look for external hardware ID defined by the backplane, which will yield 1 for UniConn and SoloConn, or 1–16 for ARConn.

The back port address of the card installed in SoloConn should be set as per client requirements.

The front (engineering) port setting should be left as per default (38400 baud, address 0) if the card is used within a UniConn or ARConn, and changed only if the SoloConn application requires it.

Note

Write down the changed settings in order to be able to communicate with the card in the future, without going through settings retrieval process.

6.13.8 Configure UniConn WellWatcher

Caution

Potential Severity: Light
Potential Loss: Assets
Hazard Category: Electrical

The FIC has an auto restart feature that will power up the downhole cable with the electrical tool configuration previously entered. Therefore, the electrical settings must be correctly configured to match the downhole tool before physically connecting the downhole cable. Incorrect settings may cause a permanent damage to the downhole tools.

The electrical settings may be adjusted using StarView, or, in same cases, the Acquisition Unit user interface.

If the FIC is used stand alone (within SoloConn WellWatcher), electrical settings will be saved on the card itself. If the FIC is installed into higher level acquisition unit (UniConn, ARConn), then the acquisition unit itself will be in charge of electrical settings, and it will overwrite FIC settings with every reboot.

The electrical settings (detailed explanations in section) include:

- Setting the current
- Setting the booster voltage
- Selecting the channel.

The FIC electrical settings may be configured using a manual procedure:

1. Calculating the FIC gauge current
2. Calculating the booster voltage setting.

The FIC electrical settings may be configured using an automatic procedure.

1. Calculating the FIC gauge current
2. Let the FIC determine the booster voltage.

6.13.8.1 Booster Voltage

The following are some formulas useful for determining card electrical characteristics.

V Booster (mV) = Total Current (mA) x R Cable + Gauge Volts (V)

Total Current = Gauge Current x Number of Gauges + Telemetry Current

R Cable = spec ohm/km x Cable Length (km)

Gauge Volts = 20 V

V Cable = R Cable x Total Current

V Booster = V Cable + V Tool

The telemetry current represents the current used during FSK transmission. As each gauge transmits data the other gauges do not. Therefore, this current appears as a constant no matter how many gauges are used.

Example

Three NPQG gauges on a 3.5 km cable (28 ohm cable impedance).

V Booster (mV) = 20 mA x 3 + 15 mA) x 28 ohm/km x 3.5 km + 20,000 mV

V Booster (mV) = 27.35 V = 28 V

If the booster is set too low, the current will be lower than the set point. If the cable resistance is not known, an alternative is to set the booster voltage to ‘auto’ mode.

Note

The booster circuitry increases power dissipation on the card so manual settings should not be used unless necessary. Incorrect booster settings may cause hardware damage.

Automatic Mode

For automatic mode, the gauge current is required to be set by the user based on the number and type of gauges.

1. Set the **Channel State** to OFF.
2. Ensure the downhole cable is connected to the card.
3. Enter the calculated gauge current into the **Channel Current**.
4. Enable **Auto** setting for booster voltage.
5. Set the **Channel State** to MAIN.
6. Watch the value of the booster voltage. It will stabilize after one minute.

6.13.8.2 Configure FIC Using UniConn

With the UniConn configured for the FIC, coefficients loaded and the downhole cable connected, the menus below are visible.

Note
The UniConn will not display gauge information for gauges that are disabled.

```
12:51:27              Sitename00              OFF
   MENU        FIC1        FIC2
```

```
FIC1 Status:                          Channel OFF
               ADJ                    PREV   NEXT
```

```
FIC1 Press1_A:                               9098
               ADJ                    PREV   NEXT
```

```
FIC1 Temp1_A:                                 446
               ADJ                    PREV   NEXT
```

Mutiple times

```
FIC1 Booster Voltage:                      32.187
               ADJ                    PREV   NEXT
```

```
FIC1 Channel Voltage:                        9098
                                      PREV   NEXT
```

```
FIC1 BackUp Cable Volts:                      446
                                      PREV   NEXT
```

```
FIC1 Cable Volts:                            5034
                                      PREV   NEXT
```

```
FIC1 Channel current:                         430
               ADJ                    PREV   NEXT
```

```
FIC1 Line Status:                            2316
```

PREV NEXT

UniConn FIC Electrical Settings Menu Map

Note

Booster voltage parameter. 0=Booster Voltage off, 0.001=Booster Voltage in automatic mode, all other values set the Booster Voltage.

The status of the FIC is displayed on the UniConn and accessible in the Modbus telemetry table. For details see the appendix.

6.13.8.3 FIC Electrical Settings Dialog

See 10: Using StarView (p. 10-1) for StarView communication settings.

To adjust FIC settings, StarView has to be connected to the powered unit and in main — live view (**File** menu, **New** command). Double-click on the specific FIC area (on the live screen). This will bring up the FIC settings dialog shown in Figure 6-84. The FIC settings dialog shows some additional information not available on the live screen and the ability to adjust some of the card operational parameters.

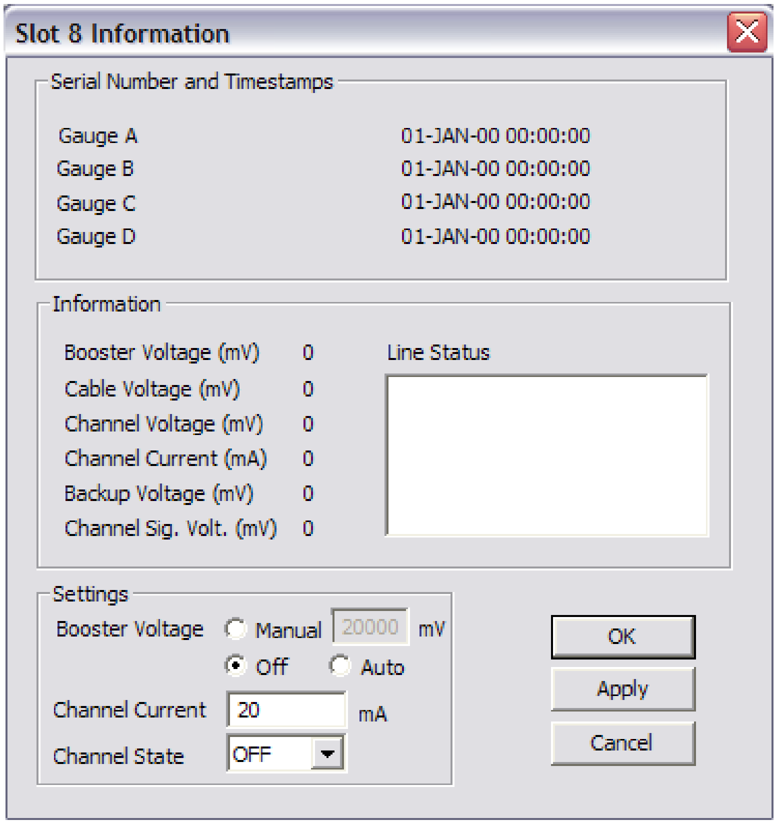


Figure 6-84: Slot Information

Note
Once the electrical parameters are set, the values will fluctuate slightly during the operation of the system. This is a case for all the displayed values.

6.13.9 Configure the UniConn for a Communication Card

The UniConn uses the Modbus RTU (Remote Telemetry Unit) protocol for connection to Supervisory Control And Data Acquisition (SCADA) systems. To connect the UniConn to a SCADA system using RS-232 or RS-485, a communication card must be inserted into one of the UniConn expansion ports.

The Port that the communications card is installed in must be configured for the specific application in the Setup Menu.

```
12:51:28            Sitename00        OFF: 0003h46
  MOTOR      I/O                  HISTORY    SETUP
```

```
UniConn          V1.304r1     Serial:          7
        ADJ                      PREV       NEXT
```

Mutiple times

```
Option Ports:
   PORT3                PORT4     PREV       NEXT
```

```
Name:                                      PORT4
  Edit                           PREV       NEXT
```

```
Function:                           MODBUS SLAVE
  Edit                           PREV       NEXT
```

```
Site Address:                                  1
  Edit                           PREV       NEXT
```

```
Baud Rate:                                  9600
  Edit                           PREV       NEXT
```

```
8,NONE,1,RS485
  Edit                           PREV       NEXT
```

```
Prekey Delay:                                2ms
  Edit                           PREV       NEXT
```

```
Postkey Delay:                               2ms
  Edit                           PREV       NEXT
```

```
Access:                                     FULL
  Edit                           PREV       NEXT
```

```
Control State:                             CLEAR
  EDIT                           PREV       NEXT
```

Configure the UniConn for a communication card

Above show the UniConn menu structure for the settings of a UniConn expansion card installed in port 4.

Specific settings and variables for SCADA systems vary for each application. Refer to the SCADA “master” or “host” device documentation or vendor for the correct SCADA network configuration settings. Refer to Table 6-3 for a list of configurable parameters for SCADA applications.

Note
For SCADA to perform remote control, not just data reads, the port **ACCESS** parameter must be set to **FULL**.

Note
The only fixed parameter is mode: RS232. This setting refers to the protocol between UniConn and Comm Card. The protocol between Comm Card and SCADA system is chosen simply by connecting to the appropriate connector on the card. RS-232 and RS–485 connectors (protocols) cannot be used simultaneously on the Communication Card.

Table 6-3: Configurable parameters for SCADA applications

Parameter Description	Parameter Value
Function	MODBUS SLAVE
Site Address	1-247 (unique Modbus Slave ID number)
Baud Rate	300 / 1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600
Data Bits/Parity/Stop Bits/Interface	7/8, 1/2, RS–232 / RS–485 (by choosing the connector)
Prekey Delay	0-60,000 ms (recommended values: 2-120 ms)
Postkey Delay	0-60,000 ms (recommended values: 2-120 ms)

6.13.10 Configure the UniConn for a Communication Card using StarView

1. Make sure that Comm card is installed into UniConn.
2. Using StarView and UniConn front Maintenance port (57600 Baud) connect to UniConn.
3. Wait until the database is uploaded and then choose **Database** menu, **Controller** command.

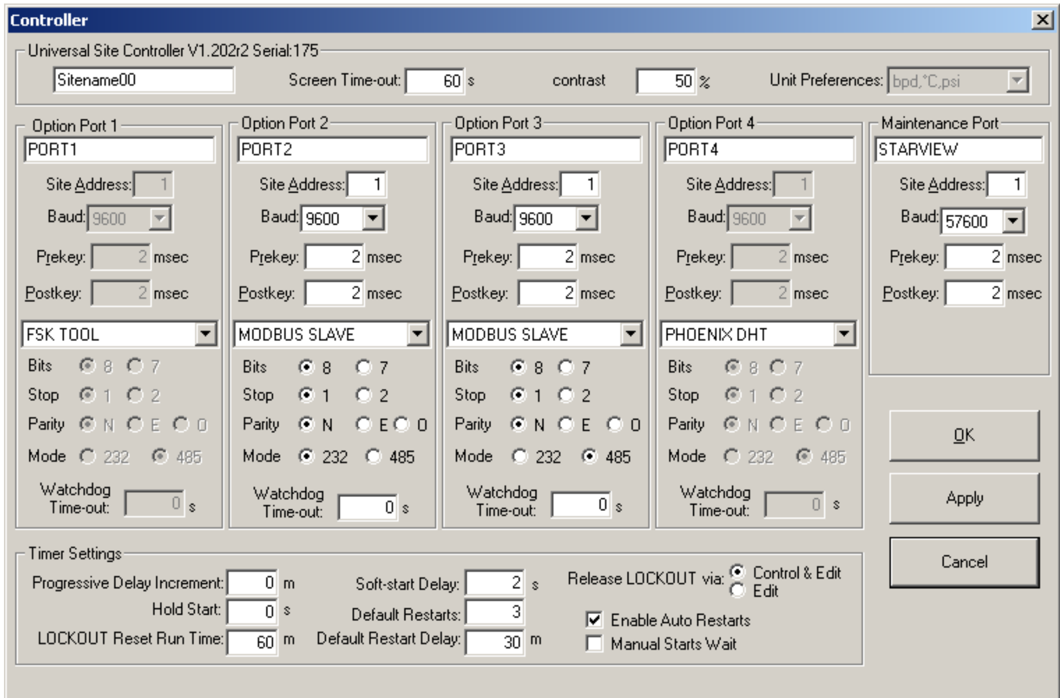


Figure 6-85: Controller Window

4. The UniConn slot that is occupied by Comm card should be set to `MODBUS SLAVE`.
5. Choose port name, site address, baud rate, prekey, postkey, word length, number of stops bits and parity as per client settings. Ensure the mode is set as RS-232 as this setting is related to internal Comm Card UniConn connection.
6. Prepare cable to connect to client system. Screw terminal pinout is available on Comm card front plate as well as the indication of the communication protocol. RS-232 versus RS-485 choice is done simply by connecting to the correct connector.
7. Provide Modbus map of the UniConn to the client, so that master system can be programmed.

6.13.11 Configure Modbus TCP/IP Card

The Modbus TCP/IP card (TCP/IP Card) has been pre-configured at the factory for default Modbus and TCP/IP parameters. While the Modbus default parameters will work with most UniConn configurations, the TCP/IP settings will need to be specifically configured for installation on a live TCP/IP network. See section 6.13.11.1: TCP/IP Card IP Address for details.

6.13.11.1 TCP/IP Card IP Address

The Modbus® TCP/IP Card (TCP/IP Card) is factory pre-configured for the IP address of:

- 192.168.0.1

A personal computer (PC) with a terminal program (such as HyperTerminal) is required to configure the TCP/IP Card.

Note

Ensure the communications interface to the host device (on the backplane) has this connection disabled prior to starting configuration. In a UniConn or ARConn NG, this can by done by disabling the UniConn or ARConn NG card slot that contains the Modbus® TCP/IP card.

Connecting to Card

1. Connect the PC to the Engineering Port of the TCP/IP Card.
2. Prepare the terminal program for an interface of:
   - 9600 baud
   - 8 bits, No parity, One stop bit (8,N,1)
   - Flow control = none
3. Reset the TCP/IP Card by inserting a pin into the RESET hole on the faceplate.
4. Immediately after the RESET, press and hold the “x” key until the TCP/IP Card displays the message shown in Figure 6-86.

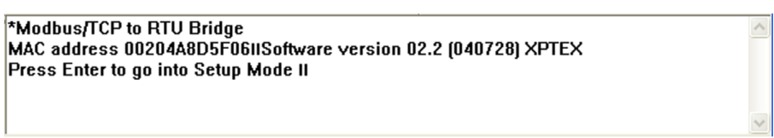
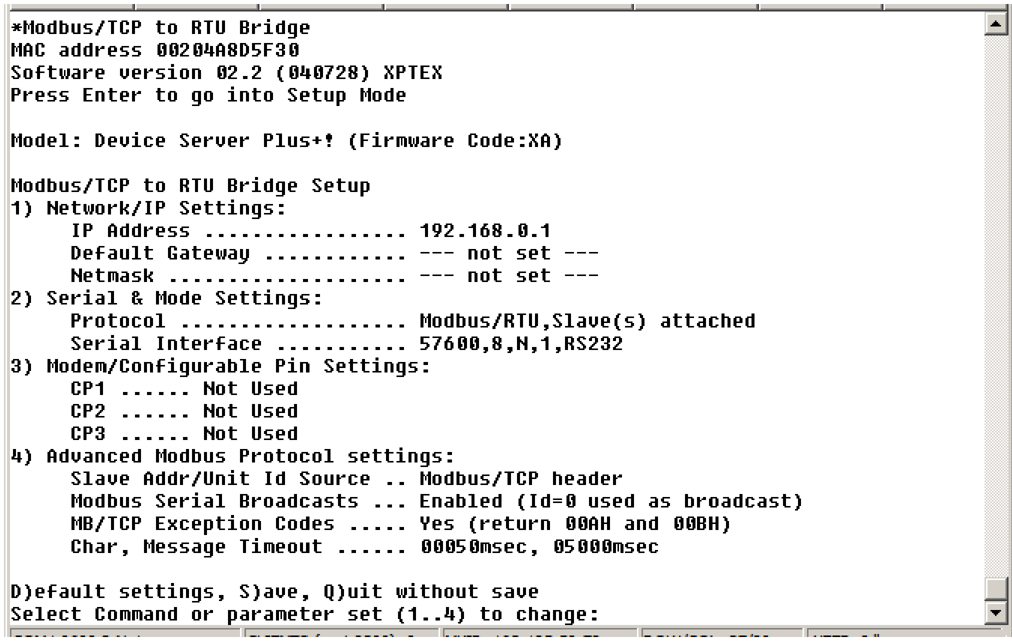


Figure 6-86: TCP/IP Card terminal prompt

5. Press the **Enter** key to continue and the menu will appear as shown in Figure 6-87.



```
*Modbus/TCP to RTU Bridge
MAC address 00204A8D5F30
Software version 02.2 (040728) XPTEX
Press Enter to go into Setup Mode

Model: Device Server Plus+! (Firmware Code:XA)

Modbus/TCP to RTU Bridge Setup
1) Network/IP Settings:
     IP Address ................. 192.168.0.1
     Default Gateway ............ --- not set ---
     Netmask .................... --- not set ---
2) Serial & Mode Settings:
     Protocol ................... Modbus/RTU,Slave(s) attached
     Serial Interface ........... 57600,8,N,1,RS232
3) Modem/Configurable Pin Settings:
     CP1 ...... Not Used
     CP2 ...... Not Used
     CP3 ...... Not Used
4) Advanced Modbus Protocol settings:
     Slave Addr/Unit Id Source .. Modbus/TCP header
     Modbus Serial Broadcasts ... Enabled (Id=0 used as broadcast)
     MB/TCP Exception Codes ..... Yes (return 00AH and 00BH)
     Char, Message Timeout ...... 00050msec, 05000msec

D)efault settings, S)ave, Q)uit without save
Select Command or parameter set (1..4) to change:
```

Figure 6-87: TCP/IP Card terminal menu

Changing IP Address

To change the IP Address, IP Gateway and Netmask, follow the steps below. The IP Address, IP Gateway and Netmask static values are dictated by the network to which the connection is made. Please check with IT in order to obtain appropriate values.

1. Input **1** to change the IP Address, IP Gateway and Netmask.
2. Input the first number **A** of the address A.B.C.D. The number must be between 0 and 255. Press **enter**.
3. Input the second number **B** of the address A.B.C.D. The number must be between 0 and 255. Press **enter**.
4. Input the third number **C** of the address A.B.C.D. The number must be between 0 and 255. Press **enter**.
5. Input the fourth number **D** of the address A.B.C.D. The number must be between 0 and 255. Press **enter**.
6. If a Gateway Address is required, input **Y** and follow steps 2 through 5 to input the Gateway Address.
7. If a Netmask is required, input **Y** and follow steps 2 through 5 to input the Gateway Address.
8. If configuration via telnet is desired, input **Y** to change the telnet password. Enter the new password when prompted.

Verifying Card Setting

Once the IP information is configured, ensure that the appropriate **Protocol** and **Serial Interface** settings are selected; see option 2, **Serial and Mode Settings**. The **Protocol** should be set to **Modbus/RTU,Slave(s) attached** and the **Serial Interface** settings will be dictated by the backplane of the controller into which the Communication Card is inserted.

Option 3, **Modem/Configurable Pin Settings** and option 4, **Advanced Modbus Protocol settings** should be changed only when required by installation conditions.

Tip
Ensure parameters are saved prior to disconnecting. Input **S** to save or **Q** to discard edits and quit without saving.

Configuring TCP/IP Address

Configure TCP/IP Address for Local Area Network

To configure the Modbus® TCP/IP card for connection to a local area network (LAN) the following are required:

- A valid TCP/IP address.
- A valid Gateway address.
- A valid Netmask.
- An RJ45 Ethernet network cable.

Configure TCP/IP Address for Direct Computer Connection

To configure the Modbus® TCP/IP card for a direct connection to a computer the following are required:

- A valid TCP/IP address.
  Typically of the 192.168.0.X where X can be any number between 2 and 255
- A valid Gateway address.
  Typically 192.168.0.1
- A valid Netmask.
  Typically 255.255.255.0

- An RJ45 Ethernet crossover network cable.

Note
Some computers are capable of auto-switching and thus a RJ45 Ethernet crossover cable may not be required.

6.13.11.2 Configure UniConn for Modbus TCP/IP Card

The UniConn uses the Modbus RTU (Remote Telemetry Unit) protocol for connection to Supervisory Control And Data Acquisition (SCADA) systems. To connect the UniConn to a SCADA system using Modbus TCP/IP over Ethernet, a Modbus TCP/IP Card (TCP/IP Card) must be inserted into one of the UniConn expansion ports.

The port that the TCP/IP Card is installed in must be configured for the specific application in the Setup Menu.

```
Option Ports:
 PORT3                  PORT4    PREV    NEXT
```

```
Name:                                   PORT4
 Edit                            PREV    NEXT
```

```
Function:                       MODBUS TCP/IP
 Edit                            PREV    NEXT
```

```
Site Address:                               1
 Edit                            PREV    NEXT
```

```
Baud Rate:                              57600
 Edit                            PREV    NEXT
```

```
8,NONE,1,RS485
 Edit                            PREV    NEXT
```

```
Prekey Delay:                             2ms
 Edit                            PREV    NEXT
```

```
Postkey Delay:                            2ms
 Edit                            PREV    NEXT
```

```
Access:                                          FULL
 Edit                                  PREV     NEXT
```

```
Control State:                                  CLEAR
 EDIT                                  PREV     NEXT
```

Configure the UniConn for a TCP/IP card

Above show the UniConn menu structure for the settings of a UniConn expansion card installed in port 4.

Specific settings and variables for SCADA systems vary for each application. Refer to the SCADA “master” or “host” device documentation or vendor for the correct SCADA network configuration settings. Refer to Table 6-4 for a list of configurable parameters for SCADA applications.

Note

The only fixed parameter is mode: RS232. This setting refers to the protocol between UniConn and TCP/IP Card. The protocol between TCP/IP Card and SCADA system is Modbus over TCP/IP.

Table 6-4: Configurable parameters for TCP/IP SCADA applications

Parameter Description	**Parameter Value**
Function	MODBUS TCP/IP
Site Address	1-247 (unique Modbus Slave ID number)
Baud Rate	300 / 1200 / 2400 / 4800 / 9600 / 19200 / 38400 / **57600** (default) Recommended Setting: 57600 baud. **Note** Changes to the baud rate will also require configuring the TCP/IP card using the Engineering Port.
Data Bits/Parity/Stop Bits/Interface	7/**8**, **1**/2, **RS–232** / RS–485 Required Setting: **RS232, 8–N-1**
Prekey Delay	0-60,000 ms (recommended values: **2**-120 ms) Recommended Setting: 2ms.
Postkey Delay	0-60,000 ms (recommended values: **2**-120 ms) Recommended Setting: 2ms.

6.13.11.3 Configure the UniConn for a Modbus TCP/IP Card using StarView

1. Make sure that Modbus TCP/IP Card (TCP/IP Card) is installed into UniConn.
2. Using StarView and UniConn front Maintenance port (57600 Baud) connect to UniConn (choose **File** menu and **New** command).
3. Wait until the database is uploaded and then choose **Database** menu, **Controller** command.
   See item “a” in Figure 6-88.

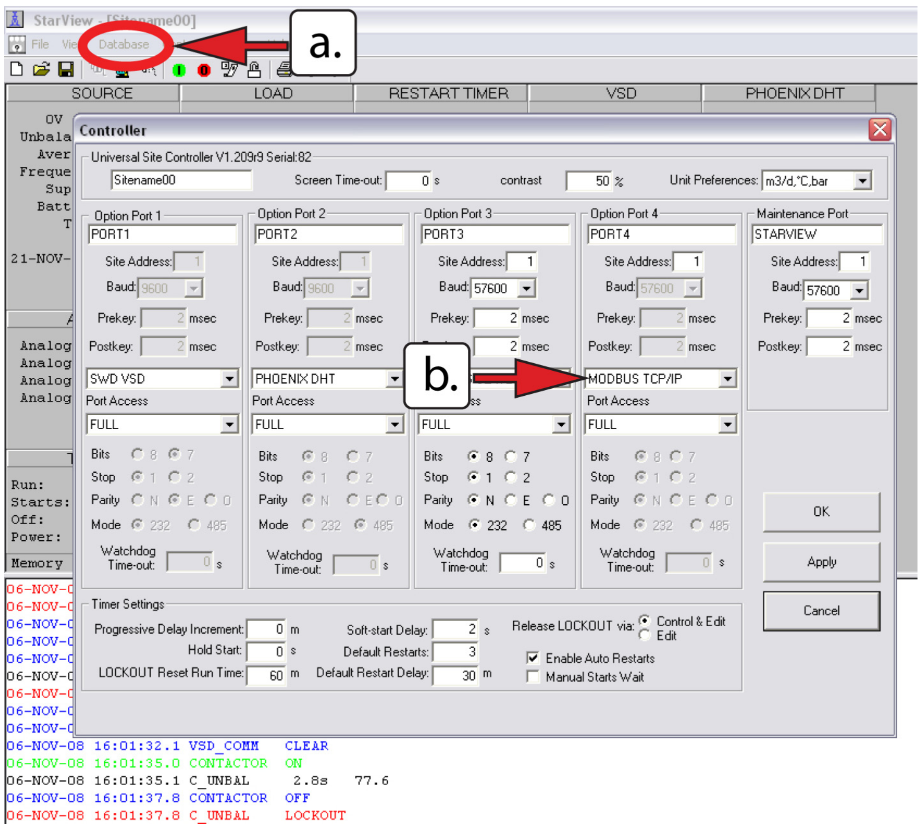


Figure 6-88: StarView Controller Window

4. The UniConn slot that is occupied by the Modbus TCP/IP Card should be set to `MODBUS TCP/IP`.
   See item “b” in Figure 6-88.
5. Choose port name, site address, baud rate, prekey, postkey, word length, number of stops bits and parity as per client settings. Ensure the mode is set as RS-232 as this setting is related to internal TCP/IP Card UniConn connection.

6. Prepare cable to connect to client system. Ethernet terminal is available on faceplate of TCP/IP Card.
7. Provide Modbus map of the UniConn to the client, so that master system can be programmed.

6.13.12 MVD Card

The Medium Voltage Drive Card MVD Card does not support field configuration.

6.13.12.1 Configure UniConn for MVD Card

The UniConn uses the Medium Voltage Drive Card (MVD Card) to connect to a Medium Voltage Drive. To connect the UniConn to a MVD system using Ethernet UDP, a MVD Card must be inserted into one of the UniConn expansion ports.

The port that the MVD Card is installed in must be configured for the specific application in the Setup Menu.

```
12:51:28            Sitename00          OFF: 0003h46
   MOTOR       I/O                   HISTORY     SETUP
```

```
      UniConn           V1.304r1    Serial:         7
               ADJ                     PREV      NEXT
```

Multiple times

```
Option Ports:
  PORT3                       PORT4      PREV      NEXT
```

```
Name:                                           PORT4
  Edit                                 PREV      NEXT
```

```
Function:                                MODBUS SLAVE
  Edit                                 PREV      NEXT
```

```
Site Address:                                       1
  Edit                                 PREV      NEXT
```

```
Baud Rate:                                       9600
```

```
Edit                                    PREV        NEXT
```

```
8,NONE,1,RS485
Edit                                    PREV        NEXT
```

```
Prekey Delay:                                        2ms
Edit                                    PREV        NEXT
```

```
Postkey Delay:                                       2ms
Edit                                    PREV        NEXT
```

```
Access:                                             FULL
Edit                                    PREV        NEXT
```

```
Control State:                                     CLEAR
EDIT                                    PREV        NEXT
```

Configure the UniConn for a communication card

Above show the UniConn menu structure for the settings of a UniConn expansion card installed in port 4. The MVD card may be installed in any of the four available ports.

Specific settings and variables for SCADA systems vary for each application. Refer to the SCADA “master” or “host” device documentation or vendor for the correct SCADA network configuration settings. Refer to Table 6-5 for a list of configurable parameters for SCADA applications.

Note

The only fixed parameter is mode: RS232. This setting refers to the protocol between UniConn and MVD Card. The protocol between MVD Card and SCADA system is Modbus over TCP.

Note

As of version 1.305r1 only Port Function for MVD is required to be configured manually. All other settings are automatically configured.

Table 6-5: Configurable parameters for MVD applications

Parameter Description	Parameter Value
Function	MODBUS SLAVE
Site Address	1-247 (unique Modbus Slave ID number)
Baud Rate	300 / 1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 Set as 9600
Data Bits/Parity/Stop Bits/Interface	7/8, 1/2, RS–232 / RS–485 (by choosing the connector) Set as RS232 N-8-1
Prekey Delay	0-60,000 ms (recommended values: 2-120 ms) Set as 2ms
Postkey Delay	0-60,000 ms (recommended values: 2-120 ms) Set as 2ms

6.13.12.2 Configure the UniConn for an MVD Card using StarView

1. Make sure that MVD Card is installed into UniConn.
2. Using StarView and UniConn front Maintenance port (57600 Baud) connect to UniConn (choose **File** menu and **New** command).
3. Wait until the database is uploaded and then choose **Database** menu, **Controller** command.

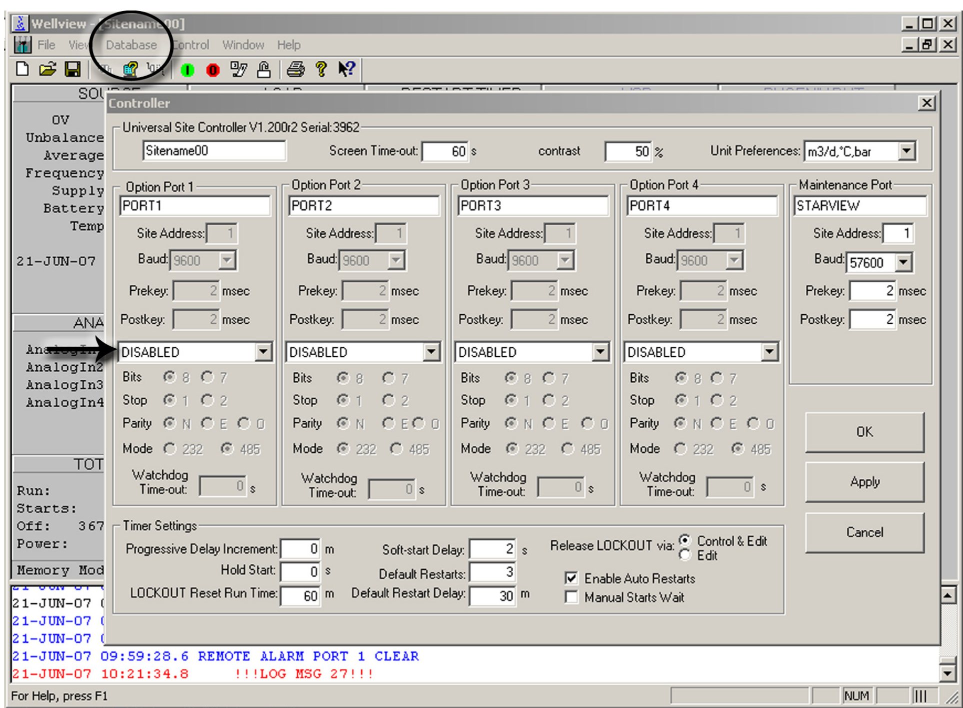
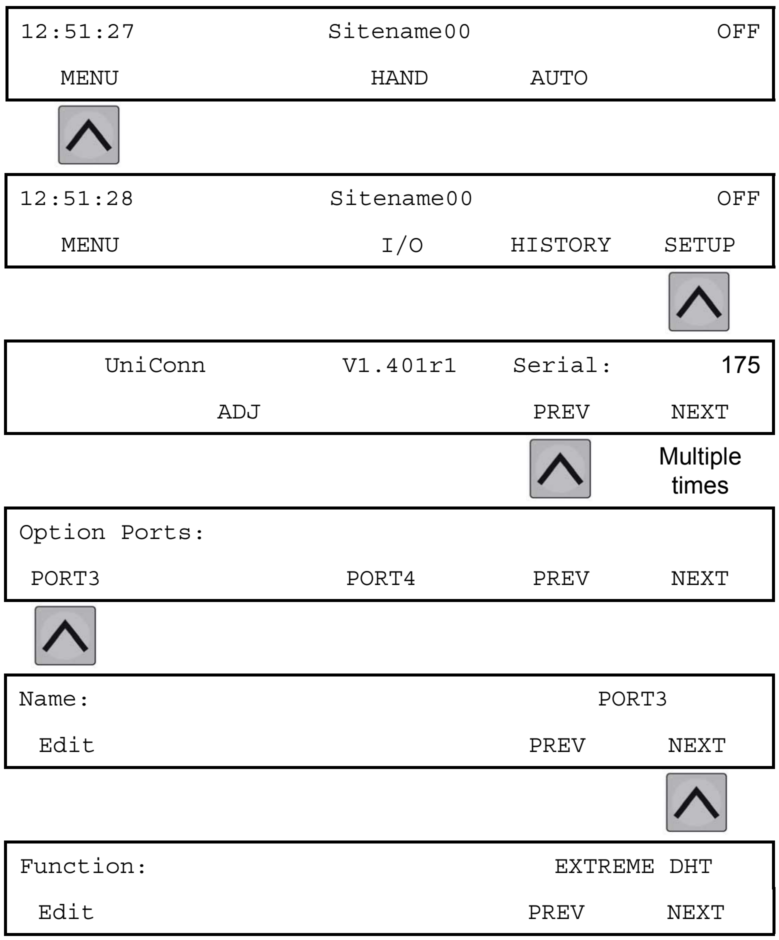


Figure 6-89: Controller Window

4. The UniConn slot that is occupied by MVD Card should be set to SPEEDSTAR MVD.

6.13.13 Configure Extreme DHT card using UniConn

To configure the Extreme card from the UniConn front keypad:



The previous example shows option port 3 being configured for the Extreme DHT card.

6.13.14 Configure Extreme DHT card using StarView

To configure the Extreme card via StarView, double click the section named Restart Timer to bring up the controller dialog and select EXTREME DHT from the drop down list.

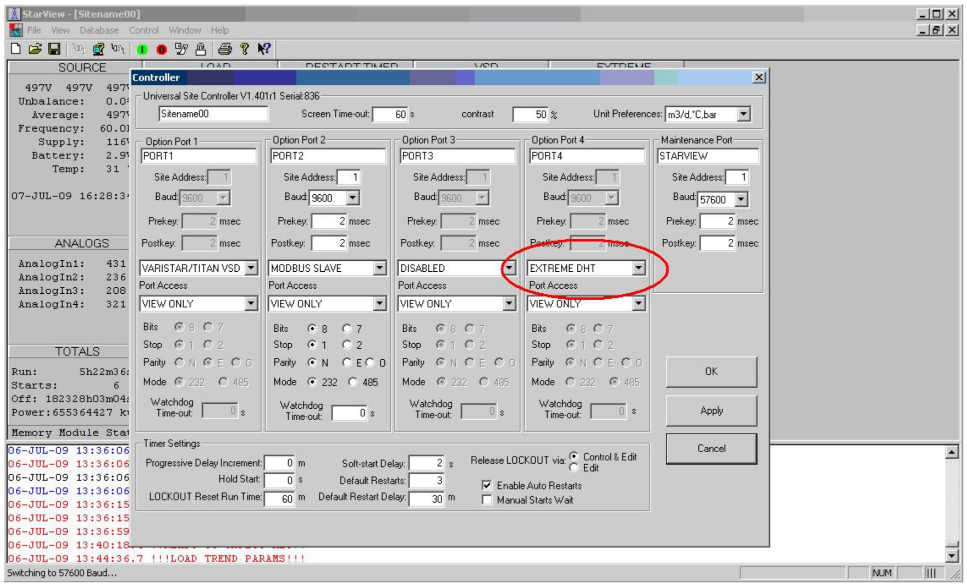


Figure 6-90: StarView Controller window EXTREME DHT selection

6.14 Custom Screens

In order to be able to display more information, as well as allow the field users to customize the data displayed, the UniConn has changed its status screen display. The status screen will now scroll horizontally (similar to a stock ticker) so that more information can be displayed. The following table lists few of the possible items which can be selected for display using the StarView software application. A maximum of 32 points can be selected at any one time. StarView will not necessarily enable all the items for display; for example, the FIC data points would not be included in the selectable list unless the UniConn was in WellWatcher mode.

Modbus Register	Description
2103	Supply voltage
2104	Frequency
2105	Spin
2136	Pump Intake Pressure
2229	FIC Slot 1 Bank A Pressure
2230	FIC Slot 1 Bank A Temperature

6.14.1 Configure Custom Screens

Certain parameters controlling the operation of the custom screens feature are configurable via the UniConn keypad. These are: Screen scrolling speed, scrolling pause, pause after fast-forwarding, and using short or long text.

For each of these parameters, press the Edit soft key and change the parameters as required. The menu path is as follows:

```
12:51:27          Sitename00          OFF
  MENU              HAND     AUTO
```

```
12:51:28          Sitename00          OFF
  MOTOR     I/O             HISTORY  SETUP
```

```
     UniConn      V1.304r1  Serial:     7
            ADJ              PREV    NEXT
```

```
Site Name:                     Sitename00
 Edit                        PREV    NEXT
```

Multiple times

```
Custom Screen Scrolling Speed:          0
 Edit                        PREV    NEXT
```

```
Custom Screen Pause:                    1
 Edit                        PREV    NEXT
```

```
Custom Screen FF Pause:                 1
 Edit                        PREV    NEXT
```

```
Custom Screen Short Text:               1
 Edit                        PREV    NEXT
```

Users may interact with the customized screens by using the Escape key (the up-arrow key located furthest left on the bottom row of soft-keys). Pressing the escape key will advance, or “fast-forward” the display to the next item. The ESC key will still back out of menus just like before – this fast forwarding function is only applicable when the UniConn is currently at the top level menu (i.e.: the status screen).

6.14.2 Configure Custom Screens using StarView

The custom status screens can be configured using the StarView application. Connect StarView to the UniConn, and then under the Database menu, select the UniConn Display option.

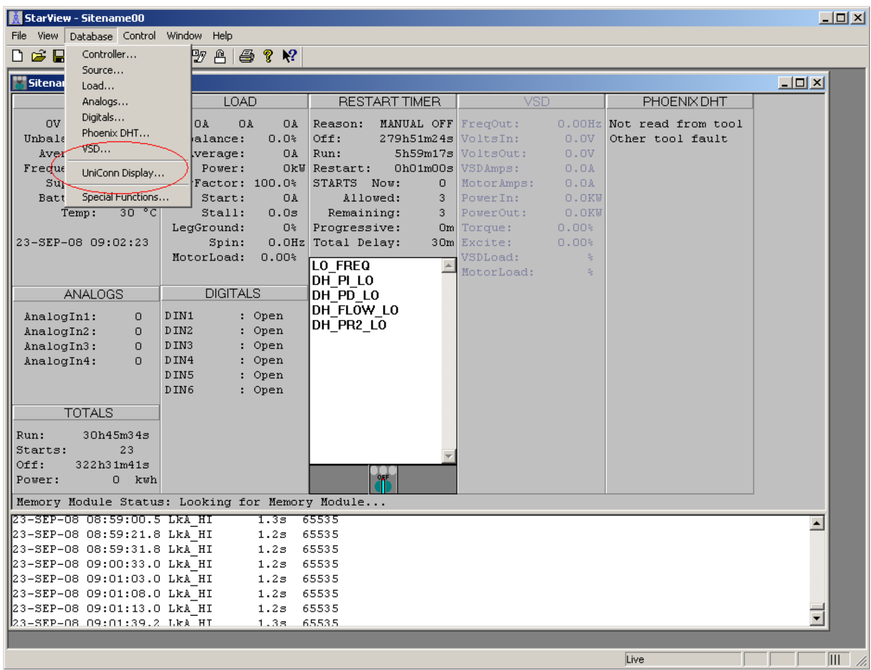


Figure 6-91: StarView Database>UniConn Display Menu Selection

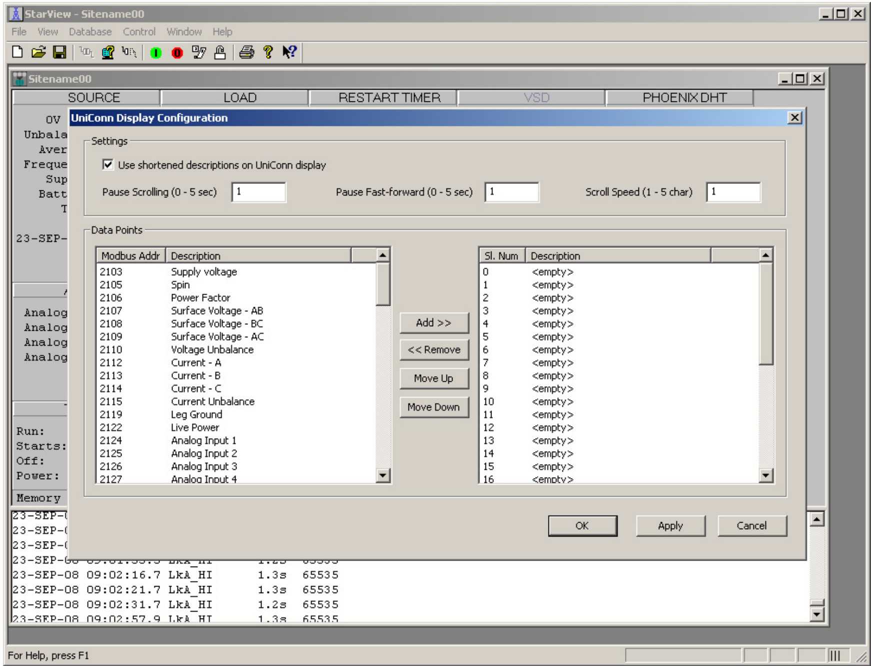


Figure 6-92: StarView UniConn Display Configuration Window

The left side listbox shows all of the items available for display. The right side listbox shows the currently selected items that the UniConn is displaying. Note that the UniConn will always show its sitename and the run/off statistics – these two items are not configurable and always present.

To add a display item to the UniConn status screen:

1. Select the item in the left listbox
2. Click the Add>> button

To remove a display item from the UniConn status screen:

1. Select the item in the right side listbox.
2. Click the <<Remove button

To change the order that the items are shown on the UniConn status screen, select the item to move in the right side listbox, and click Move Up or Move Down buttons. Once changes are complete, the user may use one of the three following buttons:

- **OK** Write the changes to the UniConn and closes the dialog box.
- **Apply**Writes the changes to the UniConn and leaves the dialog box open.
- **Cancel**Cancels the changes and closes the dialog box.

At the top of the UniConn Display Configuration window there is one checkbox and three textboxes. The function of these is as follows:

- **Pause Scrolling** is the number of seconds that the UniConn will pause the horizontal scrolling of the display, whenever the next item lines up to the left of the status screen.
- **Pause Fast-forward** is the number of seconds the UniConn will pause the horizontal scrolling of the display, whenever the field operator fast-forwards the status screen to the next display item.

Note
Use the UniConn keypad Escape key to fast-forward the status screen.

- **Scroll Speed** is the number of characters per second that the UniConn will shift the display to the left.
- **Shortened Descriptions** toggles between a full-length description and a shortened description for each data item on the UniConn display.

Example
The long description of the UniConn supply voltage reading is “Supply Volts”, but the shortened version is “SupplyV”. Click the Apply button to send any changes to the UniConn.

6.15 Configure Serial Port Pass Through Mode

To enable Pass Through mode via the UniConn front keypad:

12:51:27	Sitename00		OFF
MENU	HAND	AUTO	

12:51:28	Sitename00		OFF
MENU	I/O	HISTORY	SETUP

UniConn	V1.401r1	Serial:	175
ADJ		PREV	NEXT

Site Name:			Sitename00
EDIT		PREV	NEXT

Multiple times

```
Pass Through Mode:                          Yes
 EDIT                            PREV     NEXT
```

```
Pass Through Port A:                   STARVIEW
 EDIT                            PREV     NEXT
```

```
Pass Through Port B:                      PORT1
 EDIT                            PREV     NEXT
```

```
Pass Thru Mode Timeout:                    300s
 EDIT                            PREV     NEXT
```

```
Pass Thru Activity Timeout:                120s
 Edit                            PREV     NEXT
```

In this example, the UniConn will pass through serial traffic from the STARVIEW port, to PORT1 – unless one of these ports is disabled, the UniConn will pass traffic regardless of the configuration of either one. The Pass Thru Mode Timeout parameter specifies how long the UniConn will stay in pass through mode, before reverting back to normal mode automatically (zero seconds = do not timeout, the UniConn will stay in pass through mode until the user actively shuts it off via the keypad). The Pass Thru Mode Activity Timeout specifies the amount of time that the pass through ports can be idle (i.e.: no traffic) before the UniConn will revert back to normal mode automatically. Again, zero seconds here tells the UniConn to not timeout.

Commissioning

7 Commissioning

This section contains tips and information related to the commissioning and startup of a UniConn when used in fixed and variable speed applications in a switchboard or SpeedStar 2000 or SWD.

Warning

Potential Severity:	Serious
Potential Loss:	Personnel
Hazard Category:	Electrical

Ensure the QHSE section is reviewed for the specific UniConn system.

The UniConn ships with its set points and parameters in a default configuration. Before starting the UniConn it is important to change these factory defaults to meet the site-specific requirements.

Prior to startup and proceeding with the following checks, the field engineer should fill out the *UniConn Commissioning Record* located in Appendix A: Spare Parts of this manual. This record contains the site-specific information used to configure the UniConn.

7.1 Fixed Speed

Fixed speed represents UniConn operation configured for switchboards or non - variable speed drive applications.

7.1.1 UniConn/Switchboard Verification

For the safety of the ESP equipment and operating personnel it is important to perform a series of routine checks before startup.

☐ **1.** Once the switchboard is installed at the site it is necessary to check all wiring connections, including the grounding connection between the switchboard and earth ground. A ‘tug and pull’ test will locate any loose connections.

☐ **2.** The PT settings must be verified against the *UniConn Commissioning Record*. Refer to Figure E-1 of Appendix E: Interconnection Diagram to assist in the setting of PT taps. This drawing should also be located on the inside door of the high-voltage compartment of the switchboard.

☐ **3.** The CT Burden Module rating must be consistent with the motor current rating in the *UniConn Commissioning Record*. The CT Burden Module is connected to the UniConn CT Inputs and is mounted with the controller inside the switchboard low-voltage compartment. The ampere rating of the switchboard must not exceed the range of the CT Burden Module.

☐ **4.** Ensure that the main disconnect, breaker CT-1, and breaker CT-2 are all OPEN.

☐ **5.** Verify the phase wiring is correct: Phase A (RED) on the left, Phase B (BLACK) in the center, and Phase C (BLUE) on the right. It is important to ensure that the phase wiring is correct at the main disconnect, vacuum contactor, transformer primary inputs, transformer secondary inputs, wellhead junction box, and motor lead connections.

☐ **6.** With power applied to the switchboard, a qualified electrician should verify the incoming voltage at the main disconnect.

☐ **7.** With the disconnect closed, the voltages on the PT primaries should be verified to be within the UniConn input range (0-120 volts AC).

7.1.2 UniConn Parameter Setup

Perform the following steps to set up UniConn parameters:

1. After verifying the checks in the *UniConn/Switchboard Verification* section, close the CT-1 breaker. The UniConn will display the Status Screen after the firmware loads. It is common to have active alarms displayed at this time.

2. The parameters in the Motor Table should be set according to the values in the UniConn COMMISSIONING RECORD.

Note
Note that the PT Ratio should be set to the highest voltage within the range of PT2, PT3, and PT4 taps. Refer to Appendix E: Interconnection Diagram or this diagram posted inside the switchboard to find this value.

3. Compare the UniConn Voltage readings with measurements taken with a calibrated voltmeter by a qualified electrician. Adjust the UniConn settings as required ( ).

4. The supply voltage should not be within 5% of either the High or Low alarm levels. Adjust these alarm settings if required.

5. The phase Rotation must be ABC. Check the phasing if the UniConn displays ACB for the Rotation value ( ).

6. The settings in the Field Table must be set according to the site specific equipment connected to the analog and digital inputs.

7. After all parameters are set there should be no active alarms.

Recommended protection settings for switchboard controller applications can be found in Appendix I: Recommended Settings.

7.1.3 Startup Procedures

Perform the following procedures to start up a UniConn:

Step	Action
1.	The **OVERLOAD** and **STALL** alarms may temporarily display during startup. These alarms should clear within the alarm time delay and will not shut down the drive under normal circumstances. **Note** Note the three-phase current measurements with an ammeter and adjust the UniConn readings if required ( ).
2.	Observe the Start Amps value. If the **STALL** alarm is used (i.e., not set to **BYPASS**) its set point must be set below the **Start Amps** value.

7.2 Variable Speed Drive

Variable speed drive (VSD) represents the UniConn operation configured for VSD.

7.2.1 UniConn/VSD Verification

For the VSD, perform all relevant Startup and Commissioning steps as detailed in the respective drive manual. For example:

- *Section 8 of the SpeedStar and VariStar 2000+ and SWD Operations Manual* (InTouch ID 4197006)
- *Section 8 of SpeedStar 519 VSD - SWD Operations Manual* (InTouch ID 4933237)

Disregard any procedures for the HMI in the drive manuals.

1. Verify that power is available on the UniConn. Simply check whether the display is lit to see this. To check the incoming voltage level on the UniConn, check the displayed value in Supply Volt screen under MOTOR/VSD menu table and compare this value to the actual incoming voltage as measured using voltmeter on the UniConn incoming power supply port. If different, press ADJ button in Supply Volt screen and calibrate the reading against the measured value.

2. Verify that communication between the Toshiba inverter control board and the UniConn is established properly. To do this, ensure that VSD Comm (*) alarm does not appear (along with other active alarm(s)). If VSD Comm* appears, go into main Menu screen and select Unlatch – then go back into Status Screen and ensure that VSD Comm (*) alarm has disappeared. Another way to ensure this is to go under VSD menu table, go into VSD Alarm Control window, and make sure that “VSD Comm” is displayed solidly and does not blink.

```
VSD Alarm Control:                                    0
VSD Comm                VSD Trip       PREV      NEXT
```

3. If the VSD Comm display still blinks:
   - **a.** Check that the proper communication cable is used between UniConn Communication Card and the Toshiba inverter control board. The correct P/N for this cable for an S3 is 100184396, for an S7+ is 100220873, and for an MVD is 100448078. Also ensure that the cable is firmly connected at both ends.
   - **b.** Ensure that the correct Communication Card is used (either P/N 100228568 or P/N 100357924 depending on the drive) and it has been inserted properly into one of UniConn expansion card slots. Both screws on the card face plate should be screwed in until the face plate is flush with the UniConn side wall.
   - **c.** Check the Function setting of the expansion card slot where the Communication Card is inserted – make sure it is set either to SWD (when used with Speedstar SWD) or SS2K VSD (when used with Speedstar 2000/2000+).

7.2.2 UniConn Parameter Setup

Go into the *VSD Setting* screen under **SETUP** menu, and set the following parameters at the minimum, for typical ESP applications. For configuration details see section 4.22.1: Variable Speed Drive Controls.

Target Speed

Set as the desired operating speed.

Maximum Speed

Set according to the following equations:

Equation 7-1:

$$50 \text{ x } \sqrt{(\text{Motor HP at 50 Hz/Load HP at 50 Hz})}$$

Equation 7-2:

$$60 \text{ x } \sqrt{(\text{Motor HP at 60 Hz/Load HP at 60 Hz})}$$

Minimum speed

Should be set at the minimum frequency where the ESP can still pump fluid to surface. This needs to be confirmed through the DesignPro software or other sizing program used.

Ramp Frequency and Accel Ramp Time

Should be set to reflect how fast or slow the user would like to ramp up from **Start-Up Frequency** to **Target Speed**.

Decel Ramp time

Should be set as per the formula above, ONLY if **Stop Mode** is set to **DECEL**.

Base Speed

Should be set to the *maximum planned running speed*. This is the frequency at which the drive is capable of delivering its full power rating – the speed where its output voltage equals input voltage for LV VSD. For the **MVD** Base Speed should not be set higher than the parameter CS_MOTOR_FREQ inside the MVD, which normally has a default value of 60.00 Hz. If the base speed needs to be set higher, the parameter CS_MOTOR_FREQ should also be set to this higher value inside the MVD. Note that the value in CS_MOTOR_FREQ should be written directly through the WiTool with UniConn disconnected. The change should then be written to the EEPROM of the MVD via WiTool, and power should be cycled for the change to take effect. Note that CS_MOTOR_FREQ represents the motor rated frequency.

(S3/S7+/ST7) Base Frequency Voltage Select

S3 - Default should be set to **Input Voltage**.

S7+/ST7 - Default should be set to **Voltage Compensation On**.

Fixed Base Voltage

Set **(S3) Base Frequency Voltage Select** to **Fixed**.

PWM Carrier Frequency

Required only when used with SpeedStar 2000 or VariStar 2000+. With SpeedStar SWD or VariStar SWD, it's locked at 2.2 kHz to enable the Sinewave output filter on the drive to properly filter the output harmonics.

Increasing the carrier frequency of the drive is one method to reduce output harmonics of the drive, but doing this above 2.2 kHz will also result in drive's output capacity reduction. The SpeedStar MVD is fixed at 2.048 kHz

V/Hz pattern

Default should be set to **Constant Torque**.

Note

If another pattern is desired consult InTouch before using it.

Startup frequency

Should be set between 7-10 Hz for most ESP applications; setting this too low could lead to the pump stalling during start-up.

Catch a Spinning Motor

For most applications, set to **ON**, to enable restart without having to wait for the whole fluid column to drop through the pump.

Stop Mode

For ESP applications, by default this should be set as **Coast**. **Controlled** mode should only be used in some horizontal pumping applications, where **Ramp Frequency** and **Decel Ramp Time** parameters determine the deceleration rate.

Accel/Decel Pattern

Default should be set to **Linear**.

VSD Thermal Stall

For the S3/S7+/ST7 it should be set just below **(VSD_OL/Transformer Ratio)/VSD Current Rating**, which will reduce the number of shutdowns caused by temporary overload conditions. For the MVD this setting when turned on will reduce the motor speed to the overload speed reduction level during an overload or high temperature condition.

(MVD) Overload Speed Reduction Level

For the MVD this is the level that the MVD will reduce its speed in order to avoid an overload trip if VSD Thermal Stall is set to ON.

Rocking Method, Rocking Target Frequency and Number of Rocks

Refer to to see the actual pattern applied on each of the **Rocking Method** option; also consult InTouch Content ID 3928493 before activating this option; set **Number of Rocks** to 0 in order to deactivate the rocking start.

VSD Jump Frequency 1

Set as the ESP assembly's natural resonance frequency.

VSD Speed Source

For most applications, setting this to **Target Speed** means the drive will run on the speed entered in **Target Speed** parameter. Setting this to **Analog In 1/2/3/4** means the running speed will be following the signal level connected to the selected Analog Input channel.

Go to the *VSD Menu* and set the following:

1. In the **VSD Motor Amps** window, click **ADJ** to set the **Transformer Ratio**. As an initial value enter the nameplate voltage rating at input/nameplate voltage rating at output tap selected.

   Example

   The step-up transformer used has input voltage nameplate rating of 480 V and the output voltage nameplate rating on the selected tap is 2650 V. The **Transformer Ratio** should be set as *480 V/2650 V = 0.18*.

2. Enable the **Tracking Underload** feature, which can be accessed through **VSD Motor Amps** window. Select **VSD_UL**, then scroll down the menu under it.
3. Set the **VSD Under Load** and **VSD Overload** setpoints on the **VSD Motor Amps**, along with their associated protection setup - number of allowed auto restarts, auto restart delay, and bypass time during startup. By default, for overload, the number of auto restart attempts should be set to zero.
4. Set the **Low Supply Volts** and **High Supply Volts** protection set points associated with **Supply Volt level**, along with their associated protection setup - number of allowed auto restarts, auto restart delay, and bypass time during startup. This only applies to the UniConn supply voltage.

7.2.3 Startup Procedures

To start up the UniConn, perform the following procedures:

1. Ensure that all steps in *UniConn/VSD verification* chapter have been carried out and no problems are encountered.
2. Follow all the steps in ”Start Up and Commissioning” as outlined in the *SpeedStar and VariStar 2000+ and SWD Operations Manual* (InTouch ID 4197006).
3. Set up the UniConn up with all the minimum parameters described in UniConn Parameter Setup section above.

4. Verify that no alarm(s) are active and/or latched and the unit is not locked out. If any of these condition(s) are active, unlock the unit, unlatch the active latched alarm(s) and clear all other active alarm(s) by rectifying their cause(s).

   a. Select **HAND/AUTO** operation mode, then press **START**. If the unit is locked out or any alarm is still latched, the **START** button will not appear in the display when **HAND/AUTO** mode is selected.

   b. Calibrate the **VSD Motor Amps** reading by adjusting **Transformer Ratio**. Do this by comparing displayed initial VSD Motor Amps value to the average of three-phase measured motor current obtained using a multimeter.

   c. Reset the **Underload** and **Overload current** settings of the VSD. The settings should be a percent of the stable **VSD Motor Amps** on the final set **Target Speed**. The following are typical values for Underload and Overload setpoints:
      - Underload = 85%
      - Overload = 110%

   Note
   VSD Underload should not be less than 60% of motor nameplate current.

   d. Once all external signals and subsystems have been connected to the drive, run the drive for a reasonable period of time to confirm proper operation and that no faults or shutdowns occur.

   e. Download the configuration/history/data for future reference.

7.3 Phoenix Interface Card

7.3.1 Configure UniConn Phoenix

This section is a point form configuration process to configure the UniConn Phoenix. For greater detail refer to section 6.13.1: Configure the UniConn for a PIC and 6.13.2: Configure the UniConn for PIC using StarView.

1. Ensure calibration key has been installed onto the PIC and the PIC is install into slot 1 on the UniConn.

2. Configure StarView port for Site Address =1, 57600 baud, Prekey delay = 2ms, Postkey delay = 2ms.

3. Start StarView and connect the serial cable to the UniConn Engineering port. In StarView choose **File** — **New** , confirm site 1 — **OK**.

4. Configure PORT1 communications parameters for Site Address = 1, 9600 baud, 8 bits, No parity, 1 stop bit, RS-485 (8,NONE,1,RS485). Prekey delay = 2ms, Postkey delay = 2ms.
   - On the UniConn, navigate to the **Option Ports** screen: **MENU — SETUP — NEXT — NEXT — PORT1**.

5. Using StarView, set the UniConn clock. Click on menu **Control — Time Synchronize**.
   - On the UniConn, navigate to the UniConn screen: **MENU — SETUP — ADJ — NEXT — EDIT**.

7.3.2 Configure the PIC

This section is a point form configuration process to configure the PIC. For greater detail refer to section 6.13.3: Configure PIC using UniConn and 6.13.4: Configure PIC using StarView.

1. Connect cable from the choke to PIC downhole tool (DHT) connector. The screw terminal pin out is available on the PIC front plate (use L and C terminals).

Note

For Phoenix CTS tools the choke is not used.

Danger

Potential Severity:	Major
Potential Loss:	Personnel
Hazard Category:	Electrical

For ESP applications high voltage may be present on the DHT choke. Ensure the power system is powered down prior to connecting DHT cable to the PIC.

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2. Using StarView, double click on the **PHOENIX DHT** window and confirm that the correct tool type is selected.
   - On the UniConn, navigate to the **'Tool Type Live:'** screen and select: **MENU — MOTOR—PREV — PREV — ADJ**.

3. RSR = OFF.
   - On the UniConn navigate to the '**Pump Intake Press:**' screen and select: **RSR — NEXT — EDIT — OFF**.

4. Reset the PIC. Wait for 1 minute while the PIC performs self diagnostics.
   - On the UniConn, navigate to the '**DC Current Leakage Active**:' screen and select: **DH_CALIB — NEXT — PIC Reset**.

- Optionally the output voltage may be verified. With PIC DHT cable disconnected, approximately 120 volts DC between **DHT_C** (Chassis) and **DHT_L** (Line) connections should be present for approximately 16 seconds, 120 volts DC for two seconds and -120 volts DC for two seconds.

Caution

Potential Severity:	Light
Potential Loss:	Personnel
Hazard Category:	Electrical

When checking output voltage between **DH_C** and **DH_L** connections, ensure that the probes of the multimeter firmly contact the locking screws of the connector supplied with the PIC in order to get reliable reading.

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5. PIC data should be present. Observe the Cz and Cf values. These should be approximately Cz=10mA, Cf=18mA. Observe the Active Leakage Active (Acl) value. This should be approximately 0.000mA to 0.050mA.
   - On the UniConn, navigate to the '**DC Current Leakage Active:**' screen. Press **DH_CALIB** to view Cz and Cf.**MENU — MOTOR — PREV — PREV — PREV — PREV — DH_CALIB**.

6. Set the Cl_P. Passive leakage will change to match Active leakage. Ensure the VSD and ESP are not powered.
   - On the UniConn navigate to the '**DC Current Leakage Active:**' screen and select **DH_CALIB — NEXT — NEXT — Set CLP**.

7. Set alarm parameters as necessary.

Once all the steps above have been performed the commissioning of the Phoenix Interface Card is complete and the system can be started.

Maintenance

8 Maintenance

This section describes the routine maintenance that should be performed periodically or as required on the UniConn.

8.1 Display and Keypad

The UniConn should be mounted in a weatherproof enclosure with a weatherproof access door covering the display and keypad. Avoid the use of solvents when cleaning the UniConn keypad or display. An ammonia-free glass cleaner and a soft, non-abrasive cloth can be used to clean the clear plastic covering the display. The rest of the keypad can be cleaned with soap and water or a cleaner designed for plastics.

Perform only as required.

8.2 Fuses

Caution

Potential Severity:	Light
Potential Loss:	Assets
Hazard Category:	Machinery equipment hand tools

Equipment must be de-energized prior to and during fuse replacement.

The socketed fuses on the back of the controller are designed for easy replacement if required. There are three fuses: two for the power supply (one AC, one DC) and one for the internal supply to the Expansion Cards. Remove the old fuse by pushing in on the socket cover and turning it clockwise one-eighth turn. After turning, the fuse and socket cover will pop out and can be removed.

Replace the fuse with one of equivalent rating ONLY. A replacement fuse kit can be ordered from Schlumberger EPC that contains one of each of the fuses used in the UniConn (see Appendix A: Spare Parts for ordering information).

The fuse is reinstalled by pushing in and turning one-eighth turn counterclockwise.

Perform only as required. Refer Table 8-1 to for fuse ratings and types.

Table 8-1: Fuse ratings and types

Fuse	Rating	Type
AC Power	2 A	250 V Slow Blow
DC Power	5 A	250 V Fast Blow
Expansion Cards	2.5 A	250 V Fast Blow

8.3 Battery

If the ‘U_BATTERY’ alarm displays constantly on the controller, the battery needs to be replaced. The recommendation is that the unit be returned to the factory for installation.

Note
Removal of the battery with the UniConn powered off will result in the loss of log data, and will reset the real-time clock to the default value.

Caution

Potential Severity: Light
Potential Loss: Assets
Hazard Category: Electrical

The battery may only be replaced with the replacement listed in Appendix A: Spare Parts. This is a custom part and must be ordered from Schlumberger. It is recommended that the unit be returned to the factory for replacement.

Perform only as required.

8.4 Real-Time Clock

Since all real-time clocks drift over time, it is recommended that the time be periodically synchronized with a central time standard. This can be done either through a PC using StarView, a Scada system, or by setting locally using the display and keypad.

Perform once per year or as required.

8.5 Firmware Upgrades

Firmware updates are applied to the UniConn using the maintenance port located on the front of the UniConn. A standard RS232 serial cable is used to connect the UniConn maintenance port to a serial port on a PC. The port used by the Firmware Loader Utility is now configurable, so any valid serial COM port on the PC may be used for the UniConn firmware upgrade..

See section Appendix D: UniConn Firmware Upgrade for details.

8.6 Schlumberger Factory Contact Information

For factory maintenance, servicing, or warranty work contact:
Contact Information

Schlumberger Canada Ltd., Edmonton Technology Center
9803-12 Ave SW
Edmonton, Alberta, Canada
T6X 0E3

For technical support contact http://intouchsupport.com/.

Troubleshooting

9 Troubleshooting

For troubleshooting the UniConn during startup or if a malfunction occurs during operation, refer to . Locate the symptom which most closely resembles what you are experiencing and perform the recommended remedial actions.

9.1 UniConn Fixed Speed

Table 9-1: UniConn fixed speed troubleshooting

Symptom	Cause and Remedy
The UniConn has power on the AC or DC terminals but the display does not turn on and the unit does not operate.	The fuse for the power supply has blown. Check and change the fuse according to section 8.2: Fuses. Test and ensure that the fuse does not blow immediately on power-up. If this happens, the UniConn must be returned to the factory.
The controller is in Hand Mode, but there is no 'START' key.	Two causes: 1) The unit is in a lockout condition. Clear the lockout by pressing the 'UNLOCK' button. If the 'START' key appears, the UniConn may be started. 2) There is an active alarm that is preventing a start. The red alarm LED will be ON in this situation and the name of the alarm(s) will be flashing on the status screen. Once the alarm condition clears or is bypassed the 'START' key will appear and the unit can be started.
The UniConn can be started locally, but cannot be started by SCADA.	Two causes: 1) The UniConn must be in AUTO mode for remote starts to work. 2) The Access setting on the Option Port the SCADA is connected to must be set to 'FULL'. 'VIEW-ONLY' access will prevent the remote start command from being written to the UniConn.
The phase voltages read steady but incorrect.	Check that the PT Ratio in the Motor Table is correct. If the errors are the same for all phases, adjust the PT Ratio. For fine tuning of individual phases the Voltage Calibration screen may be used.
Motor currents read steady but incorrect.	Check that the CT Ratio is correct in the Motor table. If the errors are the same for all phases, adjust the CT Ratio. For fine tuning of individual phases the Load Calibration screen may be used.

Symptom	Cause and Remedy
The supply voltage is incorrect.	The AC supply voltage can be adjusted using the Voltage Calibration screen from the 'ADJ' key on the Supply Volts screen.
As motor load increases the Power Factor decreases. This is opposite of what should occur.	The PTs have not been phased correctly. The Rotation must be ABC for correct power factor readings. If it is ACB, the PT phasing must be changed. Power down and change the phasing.
Analog Input values do not correspond to the actual measured values.	The Engineering min/max and Raw min/max values for the Analog Input channel are not set correctly. Refer to section 6.8.3: Configure Analog Inputs Using UniConn and section 6.8.4: Configure the Analog Inputs Using StarView for information on how to set these.
The temperature displays wrong.	The temperature measured is the UniConn internal temperature. This may appear higher than the ambient due to the power dissipated by the UniConn electrical systems.
Expansion Cards are installed but do not operate.	Two causes: 1) The fuse on the expansion card power supply has blown and needs to be replaced. See section 8.2: Fuses for information on how to replace the fuse. 2) The communications settings required by that card are not set properly in the Options Ports menus. Refer to the documentation that came with the Expansion cards for instructions on the required settings.
A SCADA system can read values from the UniConn, but is unable to write any changes.	The Option Port that the SCADA is connected to has its Access set to 'VIEW-ONLY'. For writes to take effect this set point must be 'FULL'.

Note
For advanced troubleshooting, please Contact InTouchSupport.com

9.2 UniConn WellWatcher

Table 9-2: UniConn WellWatcher troubleshooting

Symptom	Cause and Remedy
UniConn displays FIC status erratically.	Ensure prekey/postkey settings for FIC are correct. See section 6.13.5: Configure the UniConn for a FIC. Configure UniConn for a FIC using the StarView program as StarView can perform configurations automatically.

Symptom	**Cause and Remedy**
UniConn shows FIC, but no gauge information.	UniConn shows FIC is present, but no gauge information is displayed. **Example** No temperature and pressure. Gauge coefficients or serial numbers have not been loaded. See section6.13.7: FIC Card Configuration.
Cannot connect SCADA.	Causes: Communication card mode is RS-232 versus RS-485. Refer to the communication parameter between UniConn and the card itself. It has to be set to RS-232 even if the SCADA is connected through the RS-485 network. Both modes are present at all times on Comm Card, choice made by connector to connect to two modes cannot be used simultaneously.
Cannot write to MODBUS register	Cause: Communication card port access set to **View Only**. It can be changed to **Full** using UniConn keypad or StarView.
Different Modbus address for different ports.	All the UniConn ports can be configured for unique Modbus addresses. STARVIEW port and expansion ports 1 to 4.
UniConn in VSD mode.	Change the UniConn mode by setting one of the slots as **FIC**, **StarView –> Database –> Configure** or by dragging and dropping the known good database file (see details in 6.13.6: Configure the UniConn for a FIC using StarView) or by using UniConn keypad (see more details in 6.13.5: Configure the UniConn for a FIC).
Card plugged back in.	The logging will continue. Some data might be lost, see details above.
Memory module data has missing records.	Memory module pulled out without eject button Last page of data will not be recorded (up to 50 or 100 records, depending on type of the card, type of records and position on the page in the given moment), and the **DataBase02** file will not be updated.
Memory module data has missing data but trend is complete.	Memory module pulled out, during trending, without eject button and then re-inserted. Trend will continue but the portion where the memory module was removed is lost.

Table 9-3: StarView Troubleshooting

Symptom	Cause and Remedy
StarView cannot connect to FIC Engineering Port.	Confirm communications settings. See 6.13.6: Configure the UniConn for a FIC using StarView . The rate for FIC engineering port 38400 Baud.
StarView cannot connect to UniConn.	Confirm communications settings. See section 10: Using StarView. The rate for UniConn StarView port 57600 Baud. When connecting not using direct one on one link, address has to be typed in. Check the address and check the prekey and postkey settings.
Error message when running UniConn Mem Module.	Error: Can't Load ft8u245.dll. Memory Module Reader drivers are not installed. Refer to section 11: Trend Data.
Trend reformatted	Data will be overwritten. In case of important data lost, use command **Save Card to File** and send the file through InTouchSupport.com for data recovery.
Found new hardware (card reader)	When the Memory Card Reader is plugged into PC **Found New Hardware** message shows up, even if the drivers are already installed. Each card reader is serialized, and Widows XP distinguishes between them and it will require new installation.
Different clocks in the system	Since the UniConn is modular platform and FIC is meant to be used in different applications, redundancy in system clocks is present. For UniConn WellWatcher clock of interest is UniConn clock, as all the data will be saved with UniConn time stamp. When doing live trending, time will be stamped using PC clock.

9.3 Phoenix Interface Card (PIC)

Refer to InTouch Content ID 4349867 for detailed troubleshooting instructions.

Table 9-4: PIC Troubleshooting Chart

Symptom	Cause	Solution
Card has no power	Fuse for AC output blown.	Check short condition, replace fuse and try it again.
	Fuse for DC output is open.	Check short condition, unplug power, wait for few minutes then try it again.

Symptom	Cause	Solution
Card will not reboot	May not have a bootloader installed.	Return card to product center.
	Program corrupt	Update card firmware.
	Card is damaged.	Replace card.
Card running fine but no measurement available	Tool open	Secure tool connection
	No coefficients for XT	Load coefficients and restart the card.
	Relay is damaged	Replace card.
	Downhole tool or cable is damaged	Fix cable if possible. Downhole tool can't be fixed.
One or more self test failed	Component failure.	Replace card.
Engineering port works but no communication to SCADA system	Site ID of card is set wrong in SCADA.	Correct site ID.
	Invalid start address.	Change start address to 1 and retry.
	Port settings are mismatched.	Use the same settings for card RS-485 port and SCADA system.
	Damaged converter or serial cable.	Replace converter or cable.
	Card is damaged.	Replace card.

Table 9-5: PIC StarView Troubleshooting Chart

Symptom	Cause	Solution
Status messages do not update	The PIC status messages are slow.	The operator must wait 30 seconds for each displayed status to be valid. Ex: **No Comms** may change to another message after 30 seconds to indicate the true status.
Status shows **PIC Fault**	Incorrect tool type specified.	Reset the PIC.
	DHT cable connection is reversed.	Verify cable is connected properly.
Status shows **Tool Open**	DHT cable is disconnected from PIC.	Verify cable is connected properly.
	Choke cable is disconnected from power system.	Verify cable is connected properly
Tool Type not in pick list	Incorrect firmware in PIC.	Install correct PIC firmware type necessary for tool type.

Using StarView

10 Using StarView

StarView is a computer program for management of a wide variety of Schlumberger acquisition systems. StarView provides real-time data display access to the alarm history log, and trend data.

This chapter is a quick introduction to StarView and its general functions. Application specific functions are explained in Configuration and Commissioning sections of the StarView Manual. StarView is a necessary tool for the programming and reading of the memory modules.

10.1 System Requirements

The minimum requirements for StarView software are:

- An IBM compatible Pentium or better computer with a mouse or similar pointing device
- RS-232 serial communication port
- If using Ethernet connectivity on the acquisition unit, then an Ethernet port is also required
- USB port if using a USB-serial adapter
- Microsoft® Windows XP® or Windows 7® operating systems
- A minimum of 15 MB of free hard disk space.

10.2 StarView Installation Procedures

Perform the following procedures for StarView installation:

1. Download the StarView installation setup file from InTouch or insert a USB key with the installation file present.
2. If required, unzip the installation file and double click the Starview*.msi file that is present.

3. If the same version of StarView is already installed you should see the dialog shown in Figure 10-1. Select **Remove StarView**, and click the **Finish** button. Re-run the install program and continue as normal.

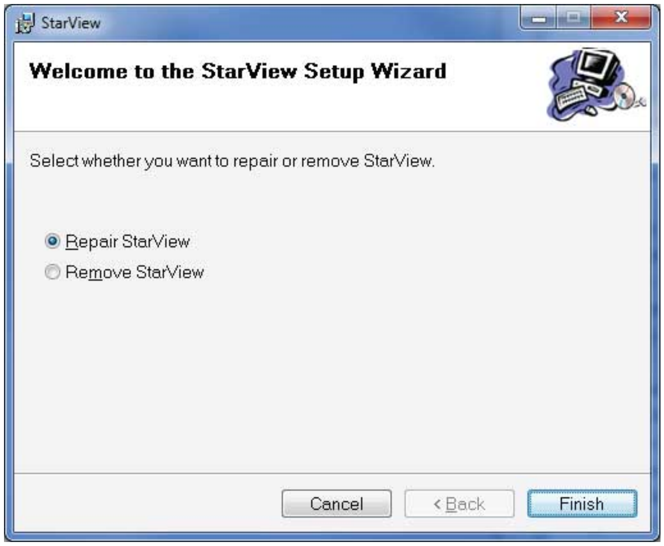


Figure 10-1: StarView Install Dialog

4. The StarView terms of use explaining the limitation of liability is initially presented. After reading the limitations of liability, if in agreement, click the **Next** button.

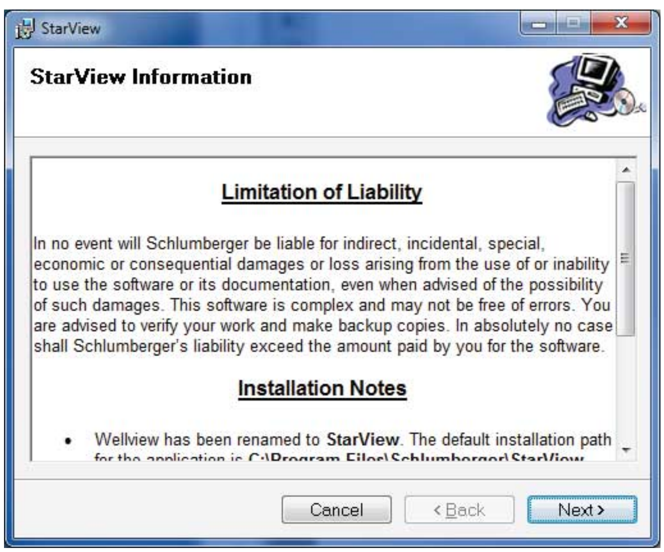


Figure 10-2: StarView Terms of Use

5. On the welcome screen, click the **Next** button.

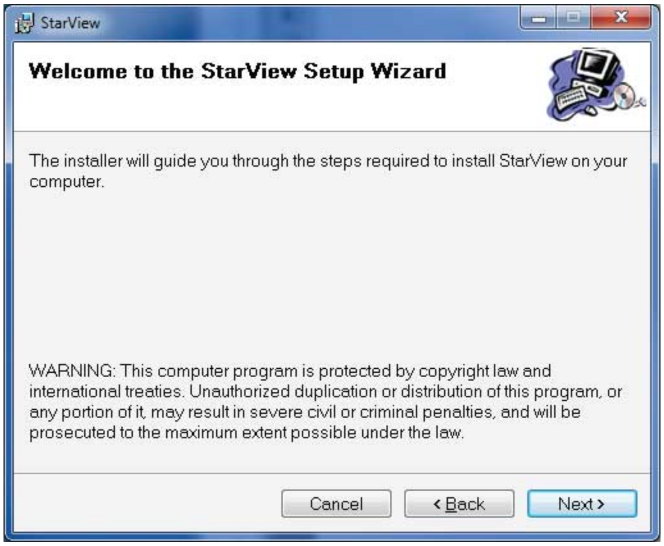


Figure 10-3: StarView Setup Wizard Dialog Box

6. Next, select a folder to hold the StarView application and select whether it should be installed for everyone on the machine or just for the current user.

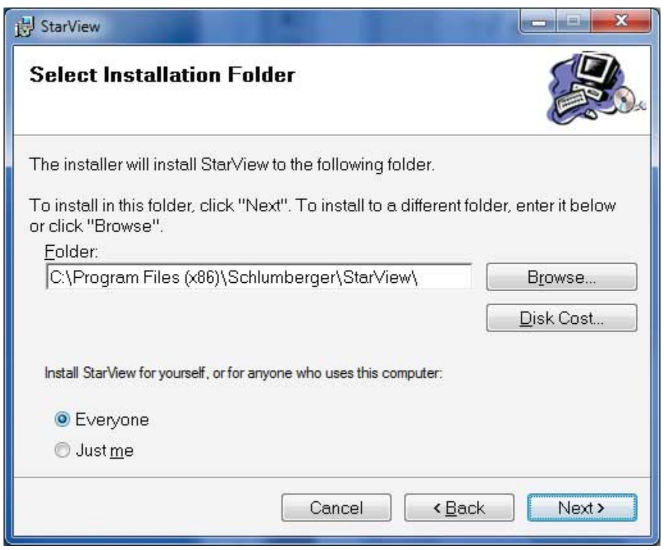


Figure 10-4: StarView Installation Directory

7. Click the **Next** button to start the file copy.

8. After all files have been successfully copied, check to see the **Installation Complete** dialog box.

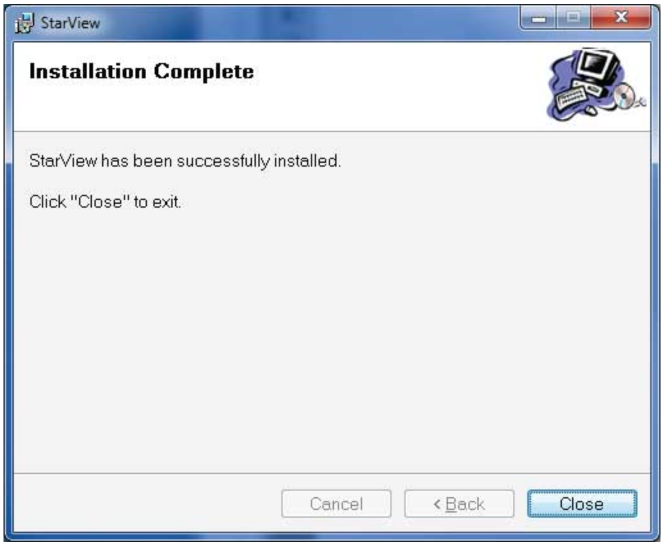


Figure 10-5: StarView Installation Complete Dialog Box

9. Click the **Close** button to finalize the installation.

10.3 Starting StarView

Using the Windows **Start** button, select `Programs/Schlumberger/Starview`. Alternately double-click the StarView icon from the desktop.

10.3.1 Communications Setup

StarView can be connected to the acquisition unit using numerous communications links.

Selecting **File** then **Communications** from the main StarView window brings up the window, shown in Figure 10-6, that allows you to adjust the StarView communication parameters.

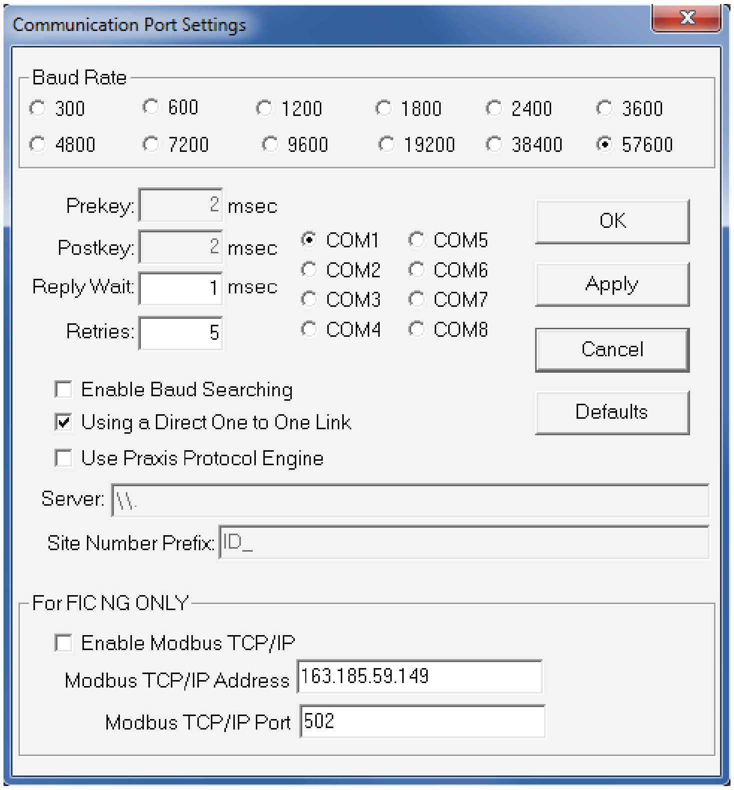


Figure 10-6: StarView Communication Configuration Dialog Box

Proper setting of these parameters is essential when operating via a radio modem communication link.

Term	Definition
Prekey	is the delay between asserting the “RTS” signal and the actual transmission of the data string. This delay gives devices such as half duplex radios, time to key up their transmission circuitry.
Postkey	is the delay to place after the transmission of the data string before releasing the “RTS” line.
Reply Wait	is the time StarView will wait for a reply. Typically, this should be left at the default of 100 milliseconds.
Retries	is the number of retry attempts that StarView will use on failed transactions before moving to the next transaction.

The acquisition unit allows the user to adjust the SCADA baud rate. Changing the baud rate at the end device will disrupt StarView communications. Adjust the baud rate using this dialog box to match the acquisition unit setup. If the baud rate is unknown, the **Enable Baud Searching** can be used to determine the baud rate used by the acquisition unit.

The **Communication Port Settings** dialog allows the choice of PC COM port as well.

Note

Ethernet connectivity setting are only available for the FSK Interface Card NG (FIC NG or IFIC NG). Select enable **Modbus TCP/IP** and enter the **Modbus TCP/IP Address** as well as the **Modbus TCP/IP Port** of the previously configured card.

10.3.2 Direct Connection to Site

Direct one-to-one single site connections are the default when first starting StarView. For direct connection to the end device, the **Using a Direct One to One Link** box should be checked, refer to Figure 10-6: StarView Communication Configuration Dialog Box. Slightly higher speed communications are achieved in this mode since there is no “prekey” and “postkey” delays.

A connection to the live view site is initiated by selecting the **File** and **New** from the StarView main window. Communication with the site automatically starts. StarView automatically starts the live view of the site once it detects the connected acquisition unit. If no unit is connected or detected, the option is given to the user to select any acquisition unit. In this case, the live view for that acquisition unit enters a stop mode. This connection is often used by field service personnel for setting up new installations and performing routine field maintenance.

10.3.3 Indirect Connection to Site

If the **Using a Direct One to One Link** box is not checked, the address prompt will display the Enter Site Address window similar to Figure 10-7. Use the **Site Address** defined for the port that is being accessed. Keep in mind that different ports on the acquisition unit can have different site addresses.

Figure 10-7: Site Address Prompt

Alternately, if a previously saved site file for the desired site is available, opening that file and selecting the **Control** menu, **Communicate** command will establish a link to the site without the site address prompt.

10.4 StarView Menus and Toolbars

Like the site window, the exact appearance of the menus and toolbar are dependent on the state and mode of the acquisition unit. Figure 10-8: StarView Toolbar illustrates the different functionality available from the main StarView toolbar.

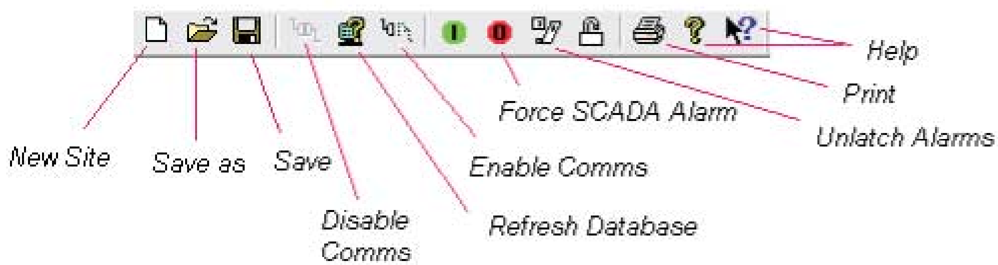


Figure 10-8: StarView Toolbar

10.5 How to Manage Databases

10.5.1 What Is a Database?

The database is a collection of data used to control and configure the acquisition unit. It also contains a “snapshot” of the live values and the event log. StarView constantly updates a copy of this information in memory. When the database is saved to disk, this is a snapshot of the unit settings and data at that moment. This means that when copy of the database is loaded from disk, that is a static “snapshot” of the settings and log information. The usage of database files (an **.ste** extension) allows you to not only read and write, but also to configure the unit to a known state by copying an existing database. However, the configuration of the expansion cards is sometimes stored within the card in question, so the database file may not contain full information.

10.5.2 Saving a Database

10.5.2.1 Acquisition unit → file

1. This transfer requires a site window communicating to the source site, select **File** and **New** from the StarView main window. Refer to Figure 10-9: SoloConn WellWatcher NG Site Window, Figure 10-10: ARConn WellWatcher NG Site Window, Figure 10-11: ESP Site Window, Figure 10-12: UniConn WellWatcher Site Window or Figure 10-13: IntelliZone Site Window for examples.
2. Wait until StarView has obtained the database from the site. The database has been fully captured when the database menu allows access to the database adjustment commands.
3. Use the **File** menu **Save** or **Save as** commands to store the database to a disk file. StarView gives a default path, filename and extension when saving files. The suggested path uses a folder name based on the site name. The filename is derived from the date. The users can change the path or name as they see fit.

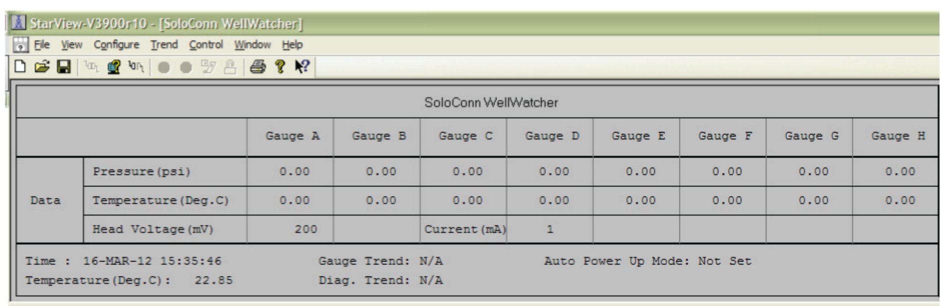


Figure 10-9: SoloConn WellWatcher NG Site Window

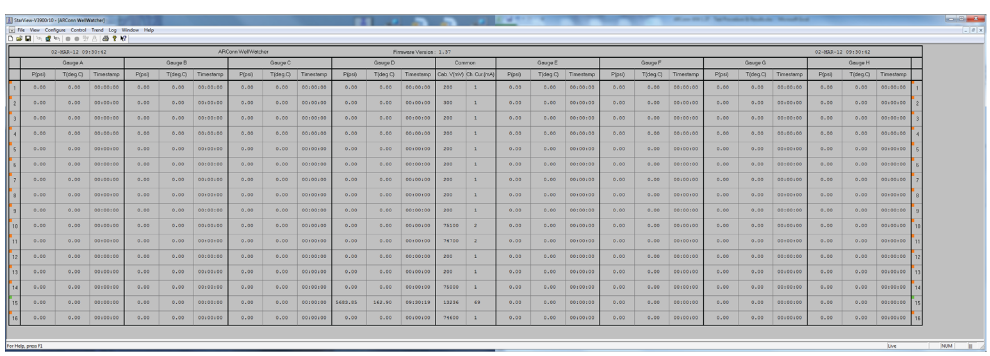


Figure 10-10: ARConn WellWatcher NG Site Window

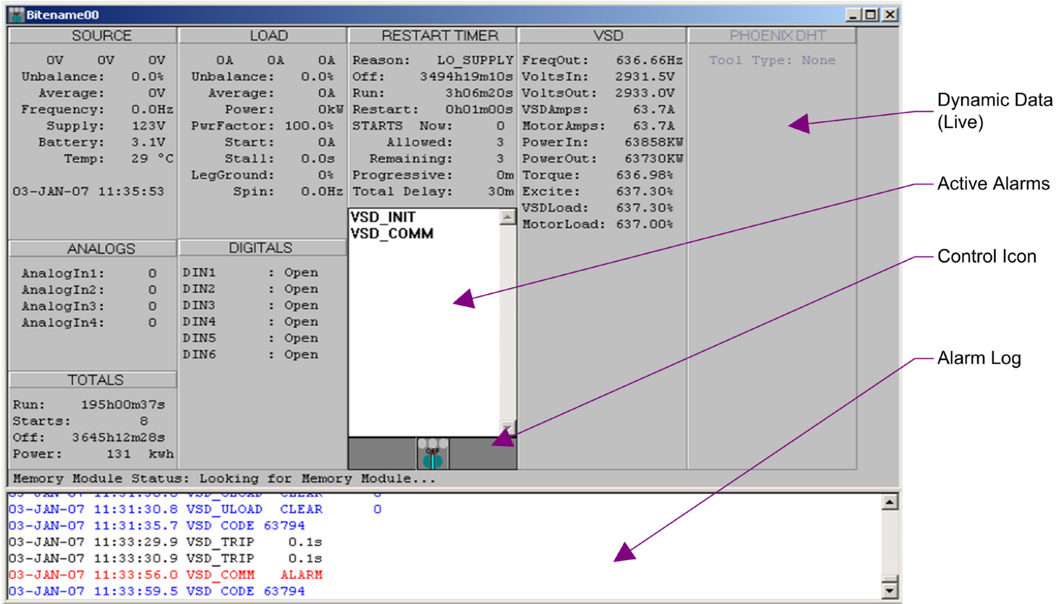


Figure 10-11: ESP Site Window

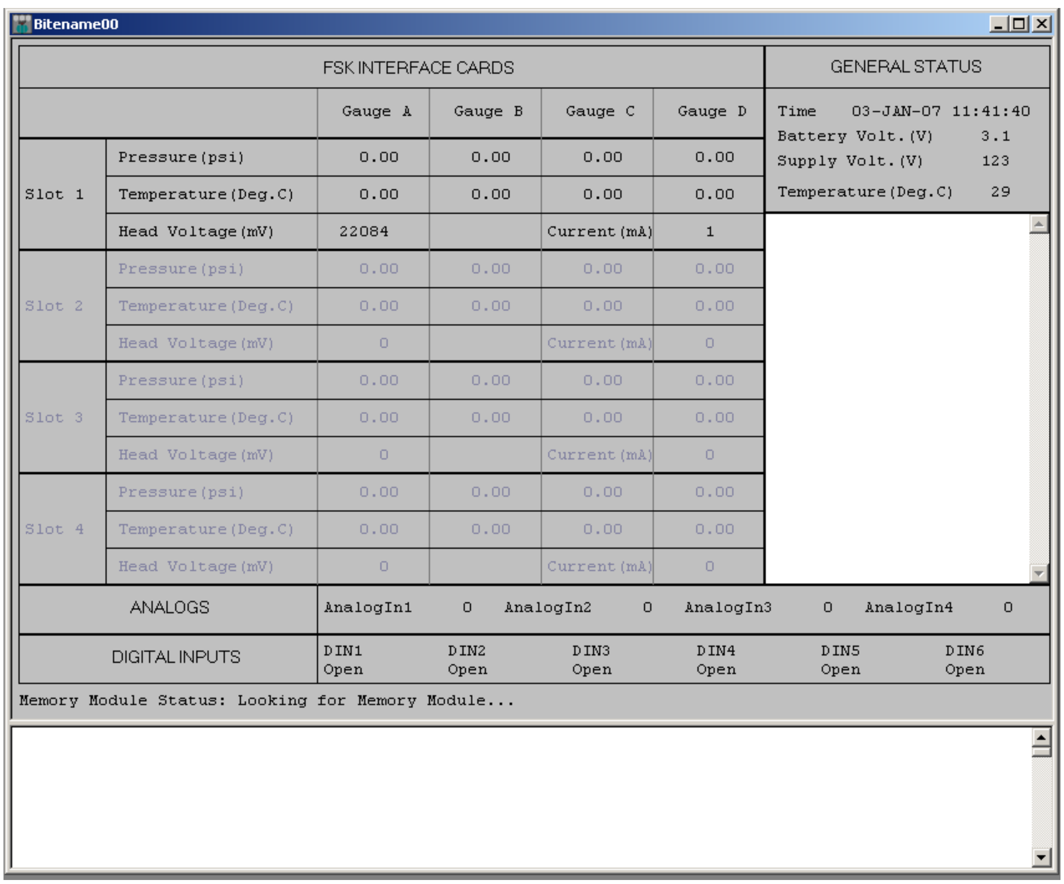


Figure 10-12: UniConn WellWatcher Site Window

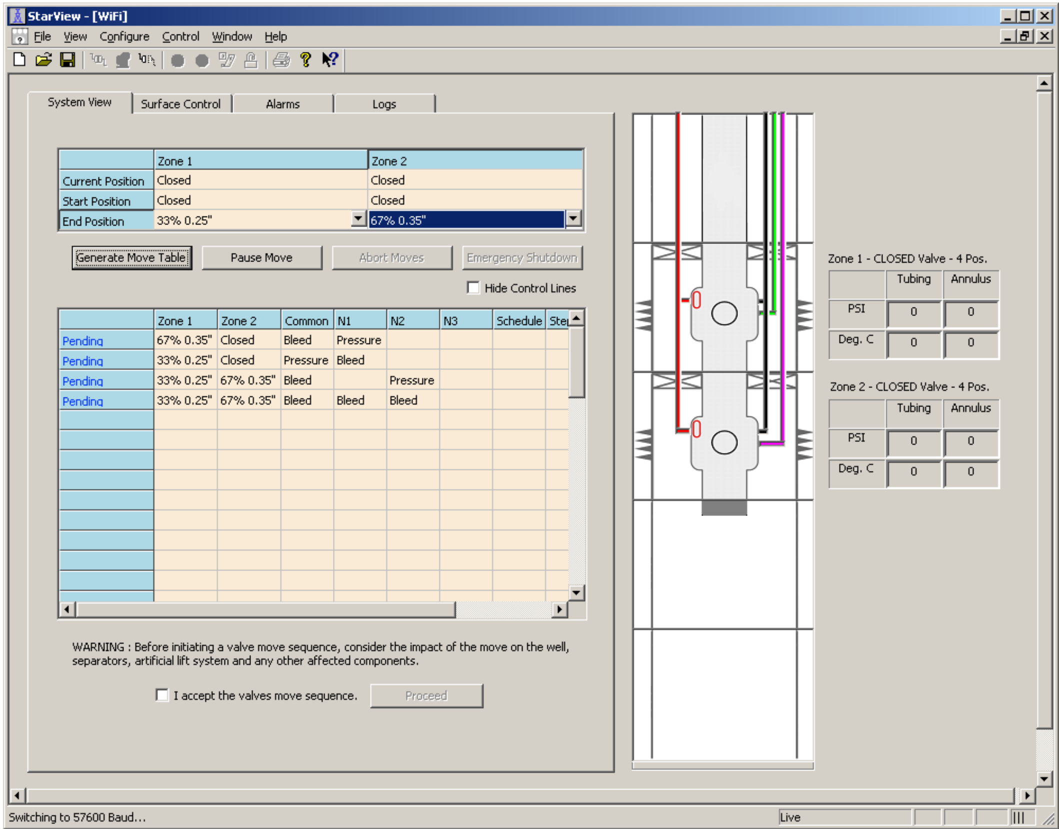


Figure 10-13: IntelliZone Site Window

10.5.2.2 File → Acquisition unit

1. This transfer requires a site window communicating to the target acquisition unit. Select **File** menu **New** command.
2. Read in the source file with the **File** menu **Open** command (opening a saved site window).
3. With the mouse cursor in the source file site window, press and hold down the left mouse key. Drag the mouse to the site window communicating to the target site. Release the left mouse key. See Figure 10-14.

Note

The **File** → **Acquisition unit** option is not available for IntelliZone controller. A **.ste** file cannot be used to overwrite the acquisition unit.

4. A warning message will be presented to the user requiring confirmation to overwrite the data in the target acquisition unit.

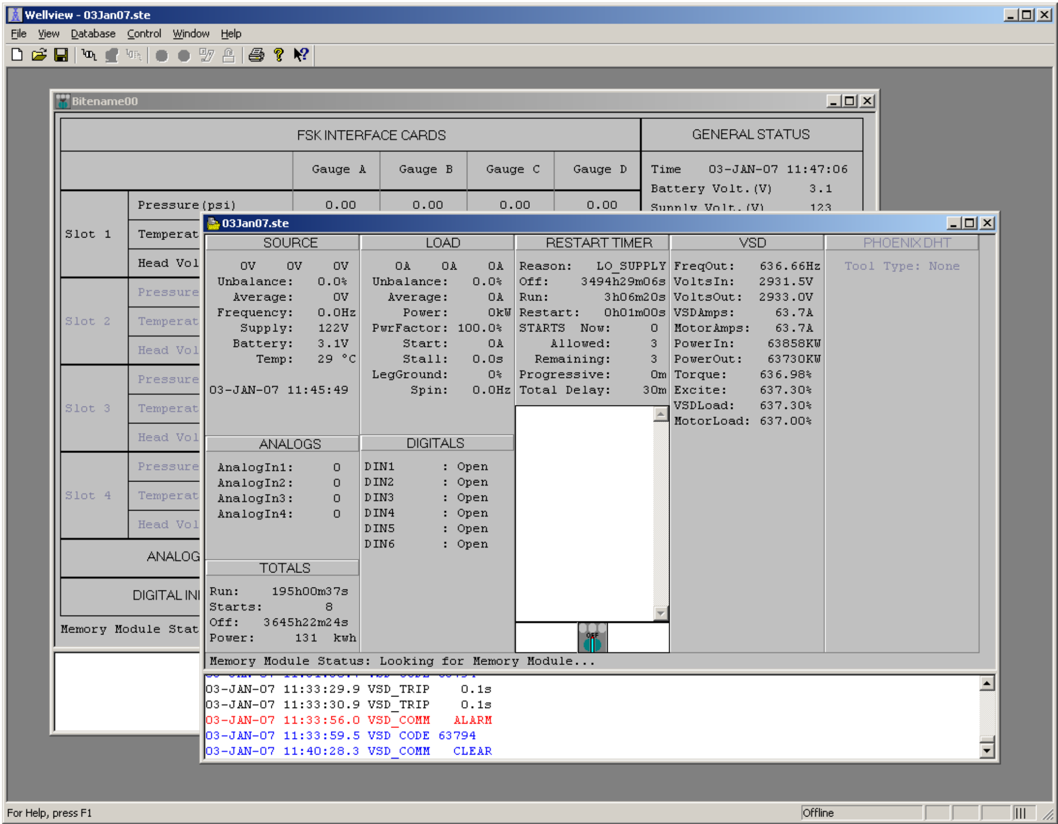


Figure 10-14: Drag and Drop

10.5.2.3 Acquisition unit → Acquisition unit

1. This transfer requires two live site windows. One communicating to the source unit and one communicating to the target.
2. With the mouse cursor in the source file site window, press and hold down the left mouse key. Drag the mouse to the destination site window. Release the left mouse key. This transfer has the same constraints and results as the file to site transfer.

10.5.2.4 File → File

1. This transfer requires reading the source file with the **File** menu **Open** command.
2. Followed by the **File** menu **Save as ...** command. The new name given in the **Save as ...** is the name of the new destination file.

Note

To prevent the inadvertent loss of the communication link, settings that involve SCADA communications and the site name are not changed in a **Acquisition unit** → **Acquisition unit** or a **File** → **Acquisition unit** database transfer.

10.5.3 Adjusting Database Settings

The different commands are offered through menus, which enable viewing and adjusting many acquisition unit settings, as well as those related to the expansion cards installed. The adjustments can be done directly to the acquisition unit database (if connected) or to a file (for later transfer).

Database adjustment dialog boxes have three main action buttons.

Term	Definition
OK button	writes all changes made in the dialog box to the controller database and exits the dialog box.
APPLY button	writes all changes made since entering the dialog box or since the last time the **Apply** button has been pressed but does not exit the dialog box.
CANCEL button	exits the dialog box without writing any changes made since entering the dialog box or pressing the **Apply** button, whichever has occurred last. Use the **Cancel** button to exit when just viewing settings.

Database adjustment commands will require a password if a password has been set up through the **File** menu **Security** command.

Caution

Potential Severity:	Light
Potential Loss:	Assets, Information
Hazard Category:	Electrical

It is assumed that the user understands these settings and is aware of the consequences of incorrectly setting these values. StarView does not limit or protect the user settings that could cause the tool to stop functioning, or cause permanent tool damage.

10.6 Viewing Logs

Log viewing is available when connected to an acquisition unit, or by loading a previously saved database file. Entries are colored according to alarm type:

- **ON** type entries are colored green,

- **OFF** entries are colored blue,
- Alarms in their alarm state and shutdowns are colored red,
- Alarms that have cleared are colored black.

Note

Log viewing capabilities via StarView do not exist for the ARConn NG, Soloconn NG or IFIC NG line of products.

Trend Data

11 Trend Data

11.1 Live Trending with StarView

StarView trend windows allow the trending of live data values in a graphical format. Each trend window can trend up to eight trends. If on a multiple site connection, the trends can come from different sites — acquisition units. The range and color of each trend point can be adjusted.

Note
Live trending is completely independent from data trending into internal memory. Live trending is limited by number of samples and its purpose is to provide a quick graphical display of current data without having to download from the memory.

Maximum number of buffered trend points that can be viewed is 28800. This number of points can be exported to a file as well.

11.1.1 Live Trend Configuration

To open a new StarView live trend window, select the **File** menu **Live Trend...** command.

The configuration can be done while StarView is communicating with the acquisition unit or not. In second case, the configuration should be saved as a default for the future use.

1. The **Trend** menu **Configure** command brings up the **Trender Configuration** window as per Figure 11-1.

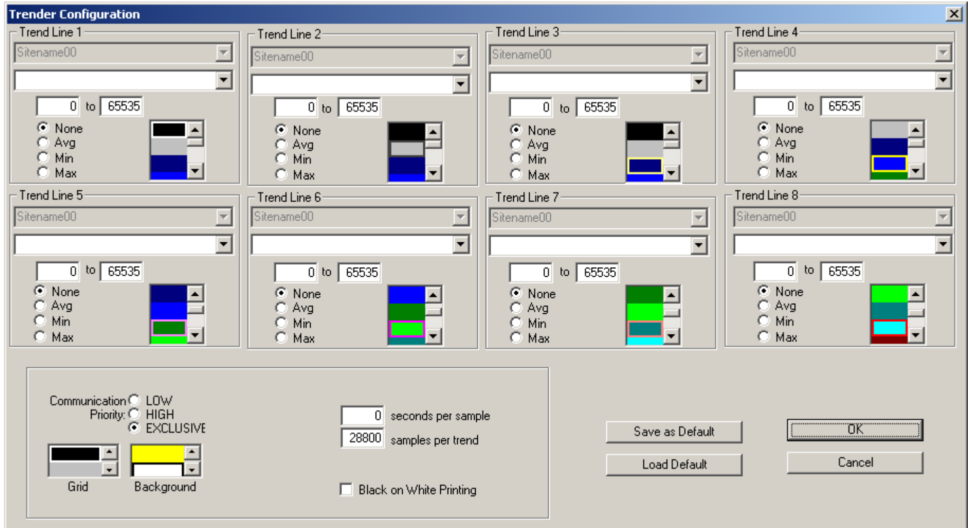


Figure 11-1: Trend Configuration Window

2. Eight trend line configuration areas are available. Top position drop-down menu will be grayed out and set to default if the connection with the site is live. If there is no connection to the site, choose the acquisition hardware that the trend is intended for.

3. Second drop-down menu provides the choice of measurements available for above made selection. Choose one measurement per each trend line up to eight.

4. Editable fields are available for setting the range of measurement. Default values are 0 to 65535, which represent the full scale. If the range of the measurement is not known, leave this settings as default, observe the graphed data for a few minutes, launch the configuration window again, and adjust the range until optimum is achieved to allow the best and most detailed presentation of the graph.

5. The choice between `None`, `Avg`, `Min` or `Max` settings is related to general `seconds per sample` setting (bottom central position in the **Configuration** window). If '0' (as fast as possible) or '1' (one second per sample) is entered for this setting, `None`, `Avg`, `Min` or `Max` settings are not applicable. If 10 seconds per sample setting is chosen, `None` would mean that the measurements are shown as they are in that point of time. `Avg` would mean that ten measurements taken during ten seconds will be averaged and that average value will be displayed as one point on the graph. `Min` or `Max` settings would mean that minimum or maximum value measured in ten seconds period will be displayed.

6. The number of samples per trend can be chosen, but the maximum 28800 is limited by buffer size. The trending will stop when the set number of samples is gathered.

7. **Black on White Printing** check box should be marked if intention is to print black and white while using color printer.

8. The grid and background colors could be changed as well, using scroll menus.

9. The **Communication Priority** setting is used to regulate priorities within StarView. If chosen **LOW**, the trend graph will be updated only after live site window is updated. (No trend data will be lost, though it can only be noticed that several trend points are updated at the same time.) If chosen **HIGH** the live site window will be updated only after trend window. If chosen **EXCLUSIVE**, the live site window will not be updated at all.

10. If the trend configuration is done without connection to the site or if there is a possibility of using the same setup for several different sites, the configuration can be saved and later retrieved by pressing **Save as Default** and **Load Default** buttons.

11. If the trend configuration is done while the trend is running, the reduced options configuration window appears, as per Figure 11-2.

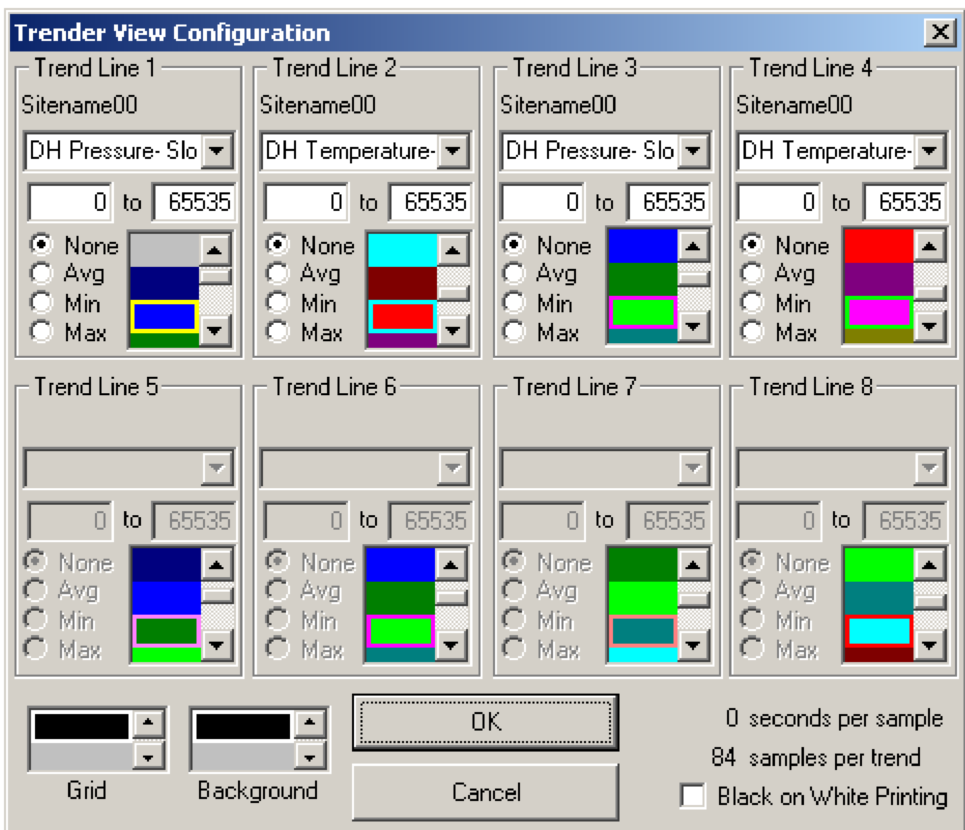


Figure 11-2: Trender View Configuration Window

11.1.2 Live Trending

- To start the live trending choose **Trend** menu **Run** command. The **Live Trend** window will start to populate with data as shown in Figure 11-3. The source for each trend line will be displayed in top-left corner of the window, as well as the current value and color legend for each measurement.
- To stop the trending choose **Trend** menu, **Stop** command. Once stopped the trend cannot be run again, but the new trend has to be launched.
- To reconfigure the trend while running choose **Trend** menu **Configure** command, the reduced options configuration window appears, as shown in Figure 11-3.
- To clear the trend window choose **Trend** menu, **Clear** command.

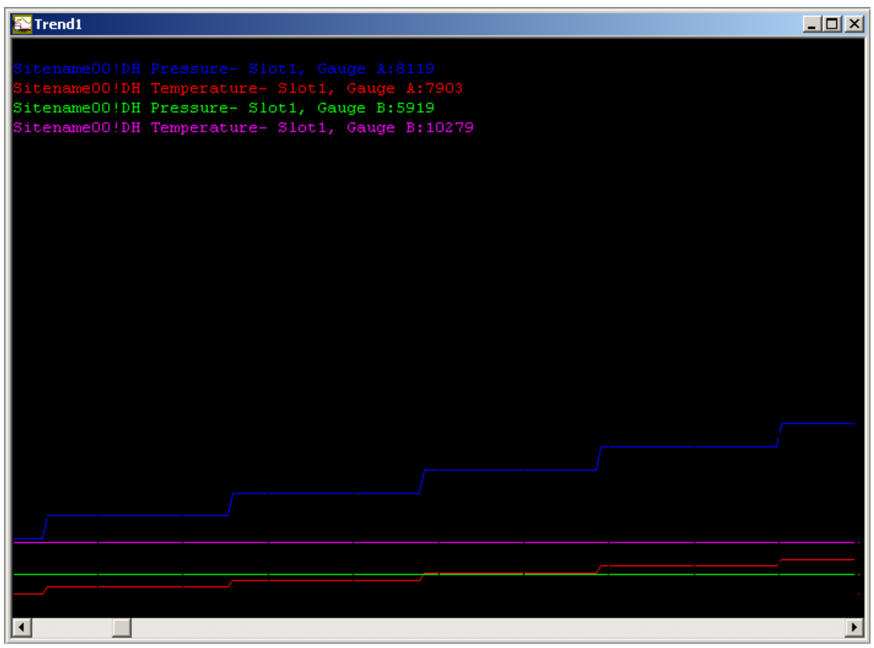


Figure 11-3: Live Trend Sample

11.1.3 Live Trend Export

To export or save the live trend it has to be stopped while the trend window still open.

Live trend can be saved in its graphical form by **File** menu, **Save As** command that will open the file name and destination browser. The file extension is a **.trd** and it can later be opened by StarView. A proposed file name, generated by date, can be changed.

Trend can be exported to the **.csv** or **.txt** file by choosing **File** menu, **Export** command, which prompts for file name, destination, and type.

11.2 UniConn Memory Module Reader

Shown in Figure 11-4 is a photo of a UniConn Memory Module.

Figure 11-4: Memory Module

This card form factor is available in several memory sizes. Currently the UniConn supports 32- and 64-megabit modules. In future larger memory devices will be supported as available.

Shown in Figure 11-5 is a photo of the UniConn Memory Reader.

Figure 11-5: UniConn USB Memory Module Reader

The front of the reader has two LED indicators:

- The green LED lights up when UniConn memory module is inserted and verified.
- The red indicator starts flashing when the reader is communicating with the PC.

The Memory Module socket is located between the two LED indicators. The Memory Module is inserted with orientation as shown in Figure 11-6.

Figure 11-6: Memory Card Insertion

11.2.1 First Time You Run the UniConn Memory Reader

The first time you plug the UniConn memory reader into your computer, you will be prompted to install a device driver.

Note

If you are operating with Windows XP®, please see special instruction at the end of this section.

Do not let Windows update the driver. The StarView application uses the FTD2XX drivers. Windows will try to load a different USB driver. More details will be given in following section.

The install program places the drivers in a subdirectory under the program directory: `C:\Program Files\Schlumberger\StarView\USB Drivers`.

Note

The user may have selected a different location for these files at install time.

Installing the correct drivers will vary depending on the version of Windows you are running. However, the basic procedure is the same. You need to direct Windows to select the driver from directory provided.

11.2.2 Example of a Windows 2000® Installation

1. Plug in the UniConn memory device and the Windows dialog (Figure 11-7) displays.

Figure 11-7: Windows Found New Hardware Dialog Box

2. Click the **Next** button when the Hardware Wizard appears.

3. On the Hardware Wizard dialog box, select `search for a suitable driver for my device (recommended)`, and press the **Next** button.

Figure 11-8: Install Device Drivers Dialog Box

4. On Figure 11-9 dialog select `Specify a location`, and press the **Next** button.

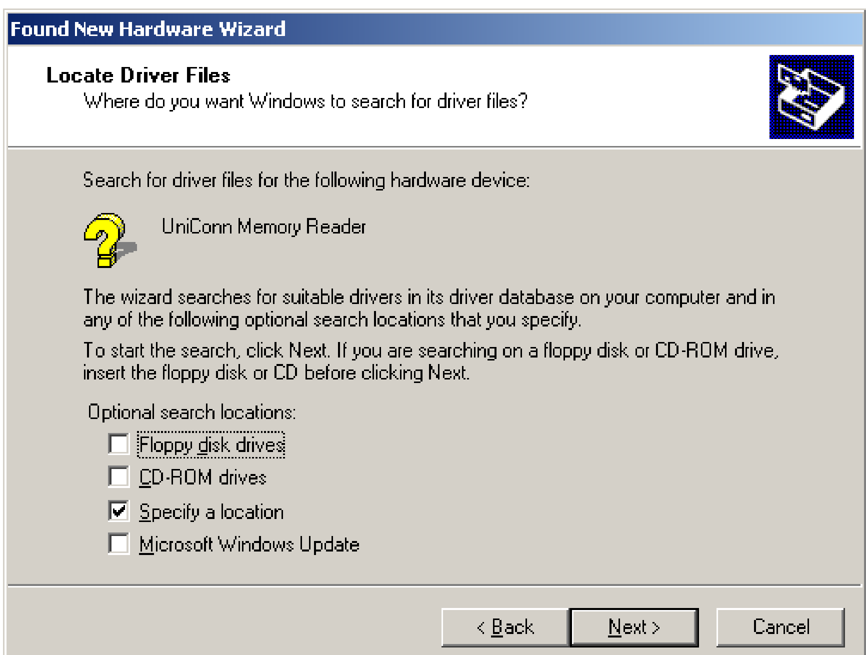


Figure 11-9: Locate Driver Files Dialog Box

5. Use Figure 11-10 dialog to select the drive and folder to load the driver (use the **Browse** button).

Note

You may be prompted to confirm the selected driver. After Windows completes the driver installation, you will see the following dialog (Figure 11-10).

Figure 11-10: Specify Location Dialog Box

6. Notice that after, Windows completes the driver installation the following dialog appears Figure 11-11.

Figure 11-11: Completing New Hardware Dialog Box

At this point the drivers have been successfully installed.

11.2.3 Uninstalling Drivers

When uninstalling devices from Windows 2000, it should always be done through the **Add/Remove Programs** utility (refer to Figure 11-12) since this uses the FTDI driver uninstaller program to remove files and registry entries to leave a clean system. Other methods may leave fragments of the driver that may interfere with future installations.

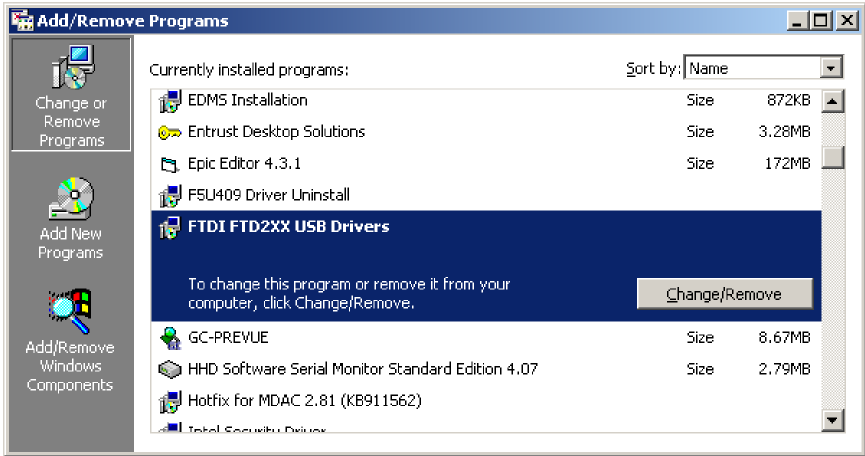


Figure 11-12: Add/Remove Programs Dialog Box

11.2.4 FTD2XX Drivers

To uninstall FTD2XX drivers for USB Memory module device, follow the instructions below:

1. Disconnect the USB reader attached to the PC.
2. Open the **Add/Remove Programs** utility located in `Control Panel/Add/Remove Programs`.
3. Select `FTDI FTD2XX USB Drivers` from the list of installed programs.
4. Click the **Change/Remove** button. This function runs the FTDI uninstaller program.
5. When prompted (refer to Figure 11-13) click the **Continue** button to run the uninstaller, or the **Cancel** button to exit.

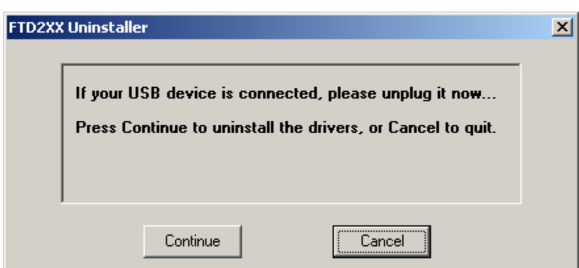


Figure 11-13: FTDI Uninstaller Dialog Box

6. When the uninstaller has finished (refer to Figure 11-14) remove the device from the system and the caption on the **Cancel** button changes to **Finish**. Click the **Finish** button to complete the process.

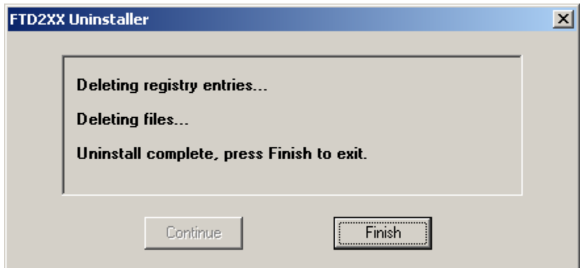


Figure 11-14: FTDI Uninstall Complete Dialog Box

11.2.5 Windows XP Installation

1. If running Windows XP or Windows XP SP 1, temporarily disconnect the PC from the Internet.

   Disconnection from the Internet can be done by either removing the network cable from your PC, or by disabling your network card by going to the **Control Panel/Network and Dial-Up Connections**.

   Right-click on the appropriate connection and select **Disable** from the menu. The connection can be re-enabled after the installation is complete.

   Note
   This is not necessary under Windows XP SP 2 if configured to ask before connecting to Windows Update.

2. Because Windows XP SP 2 can have the settings for Windows Update changed through `Control Panel/System`, select the **Hardware** tab and click **Windows Update**.
3. Connect the device to a spare USB port on your PC and launch the **Windows Found New Hardware Wizard**.
4. If there is no available Internet connection or Windows XP SP 2 is configured to ask before connecting to Windows Update, click **No, not this time** option button from the options available, and then click the **Next** button to proceed with the installation.
5. If there is an available Internet connection, Windows XP silently connects to the Windows Update web site and installs any suitable driver it finds for the device, in preference to the driver manually selected.

11.3 Operation of the UniConn Memory Reader

1. Plug the reader into the USB port of the computer. If the drivers are not installed, there will be a prompt for the installation. Refer to 11.2: UniConn Memory Module Reader.
2. Wait for the red and green lights to light up momentarily and then turn off.
3. Insert the memory module (Figure 11-6 shows the orientation). After a few seconds the green light on the reader will come ON to indicate a valid card. The red light on the reader indicates communication. The blue and red lights on the card itself indicate power supply and communication.
4. Launch StarView.
5. Select **File** menu, **UniConn Mem Module** option. This will bring the Main Memory Module dialog shown in Figure 11-15.

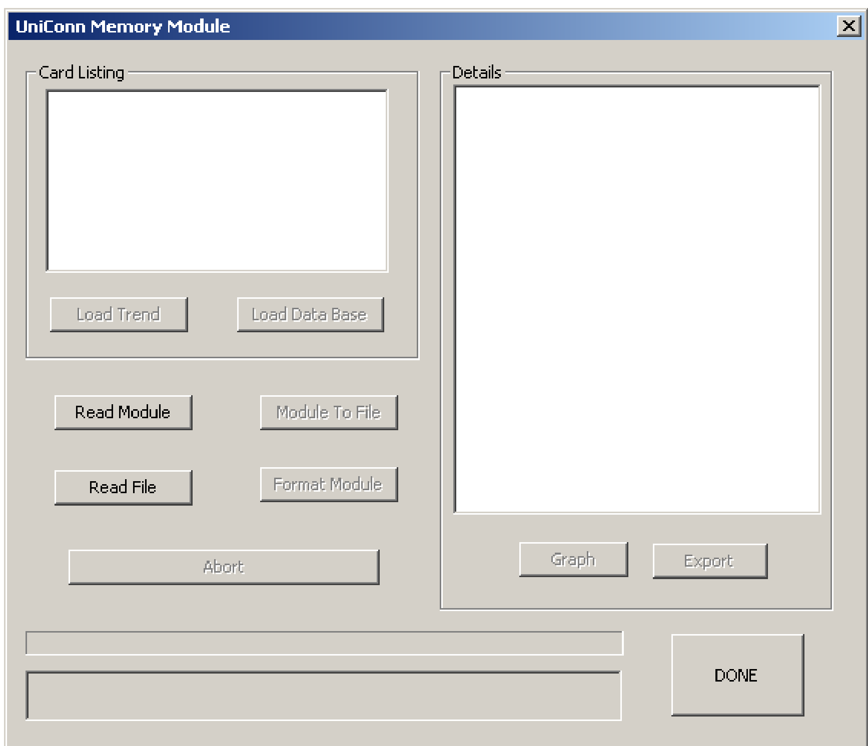


Figure 11-15: UniConn Memory Module Dialog Box

6. Click the **Read Module** button.
7. Notice the **Card Listing** area shows a list of Trends and Db/Logs. There are always two trends displayed: DBase 01 and Trendx 01. DBase 01 file is StarView site file (.ste) before the start of the trending. By default a site (.ste) file is written when the UMM is inserted. More information about site files in 10: Using StarView. Trendx is the actual trended data file.

11.3.1 Create a New Trend Card

1. Click the **Format Module** button.

2. Answer **Yes** to the warning that all data on the card will be lost.

3. Notice the **Select Trends** dialog will be displayed (Figure 11-16).

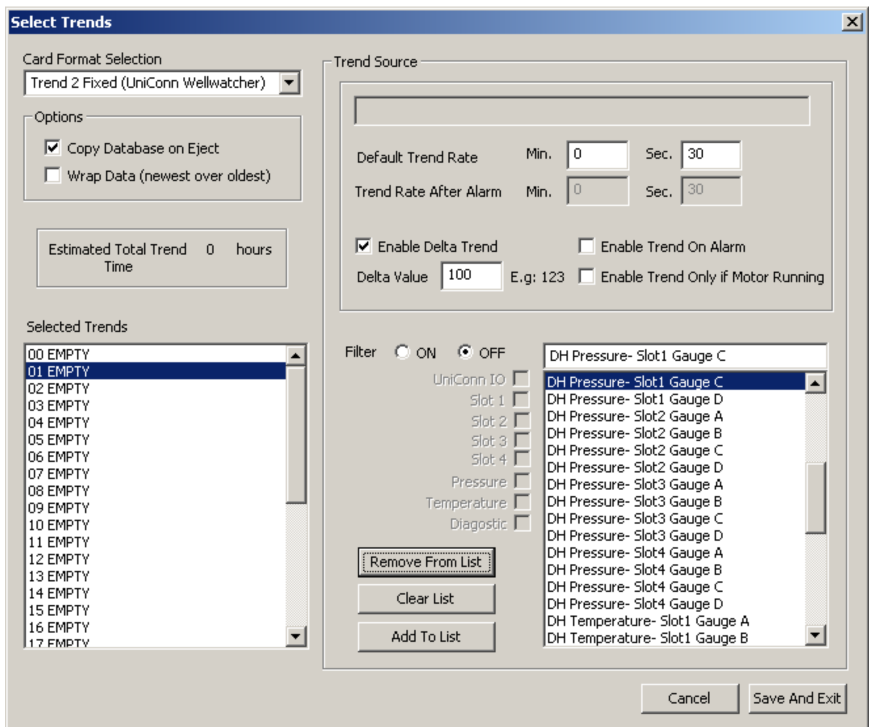


Figure 11-16: Trend Editor

4. In upper-left corner from **Card Format Selection** drop-down menu, choose **Trend 1 Fixed** (UniConn Default), **Trend 2 Fixed** (UniConn WellWatcher) or **Trend 3 Fixed** (UniConn IntelliZone) **Trend 4 Fixed** (Extreme/Sapphire).

5. Select the next actions carefully.

- **Copy Database on Eject** option allows the site file to be saved on the memory card before it is ejected. If this option is checked the third line will show in the card listing: **DBase 02** and it represents the site file as it was immediately before the card is ejected.
- **Wrap Data** (newest over oldest) option provides a choice of whether the trending will stop once the card is full or it will continue and overwrite the oldest data.
- The area in the bottom-right of the window contains the list of all the measurements available.
- Select the measurement for trending.
- Choose **Default Trend Rate** (top-right) for that particular measurement.
- Check or uncheck **Enable Delta Trend** for selected measurement (not available for UniConn IntelliZone Compact). The “delta” trending saves the memory space by recording only the measurements that exceed the previously recorded measurement by “delta” value or the measurement after a time elapsed. The time is defined by **Default Trend Rate**. Enter **Delta Value** if “delta” trending is enabled.
- Click on **Add To List** button to add that measurement to the **Selected Trends** list on the left side.
- If you wish to remove a trend from the list use the **Remove From List** button.
- Notice that the **Estimated Total Trend Time** is changing every time a new trend measurement is added. To conserve the memory space, choose lower trend rate for the less critical measurements.
- Choose **Enable Trend On Alarm** option only if there is an alarm associated with the particular measurement (not applicable for UniConn WW, and not available on UniConn IntelliZone Compact). When the alarm is not active, the measurement will be recorded at default trend rate. While the alarm is active the data is recorded at the trend rate after alarm.
- Use **Enable Trend Only If Motor Running** option to record data only when the ESP is actually running, which also saves the memory space (not applicable for UniConn WW and UniConn IntelliZone Compact).
- Repeat the steps above for each new measurement to be trended (up to 32 trends).

6. Use the **Selection filtering** to enable/disable by selecting the **ON** or **OFF** radio buttons. Once enabled, the contents of trend selection are reduced or expanded by the **Filter** check boxes. This makes it easier to find trend sources without having to browse through unused or unrelated items. These check boxes are grouped in specific categories and these categories differ depending on the record type.
7. Click on **Save and Exit** button and confirm the command.
8. A message will be displayed indicating success.

Note
For a UniConn in WellWatcher mode the **Trend Type** should always be set to **Type 2**.

Note
The period between recorded readings (sample time) can be different for each selected source trend; therefore, chose it carefully to save the memory.

11.3.2 Load a Trend

The trend load procedure assumes that all the steps from one to seven are done, as shown in the introduction of 11.3: Operation of the UniConn Memory Reader.

1. Select a trend from the list, as shown in Figure 11-17.

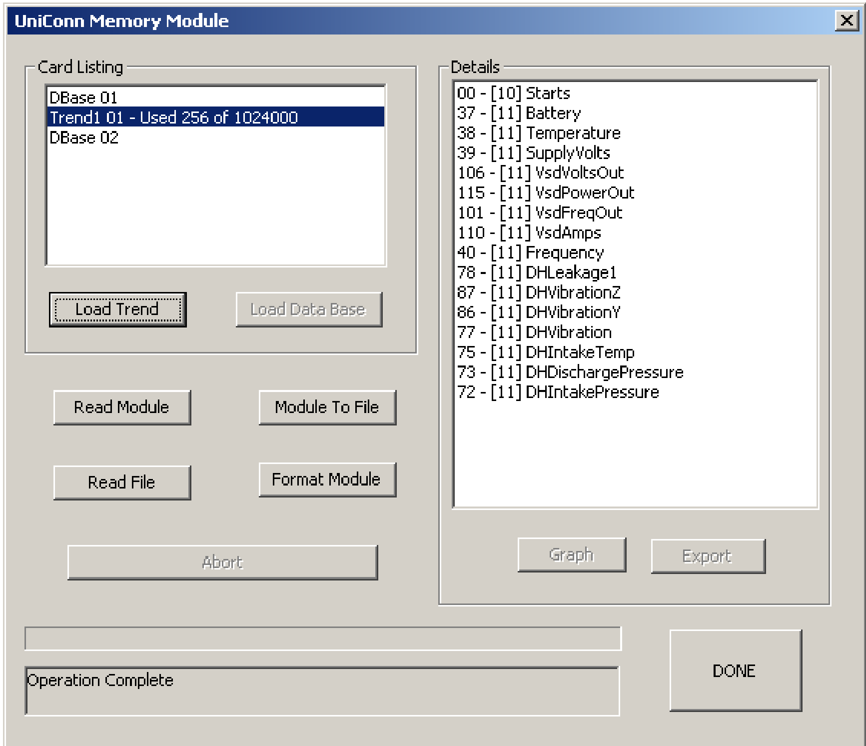


Figure 11-17: Selected Trend

2. Click the **Load Trend** button.

3. Notice the progress bar and the status display area on the bottom will display the trend loading progress.

11.3.3 Graph a Trend

1. When the trend has been loaded, look for the trend sources which will be shown in the **Details** list box

2. Select one or more trend sources (click toggles ON and OFF). If two sources are selected at the same time, they will appear on the same graph. The maximum number of trends per one graph is eight.

3. Click the **Graph** button and the data will be displayed in a graph window in Figure 11-18. The graph window will be in the background of main selection window.

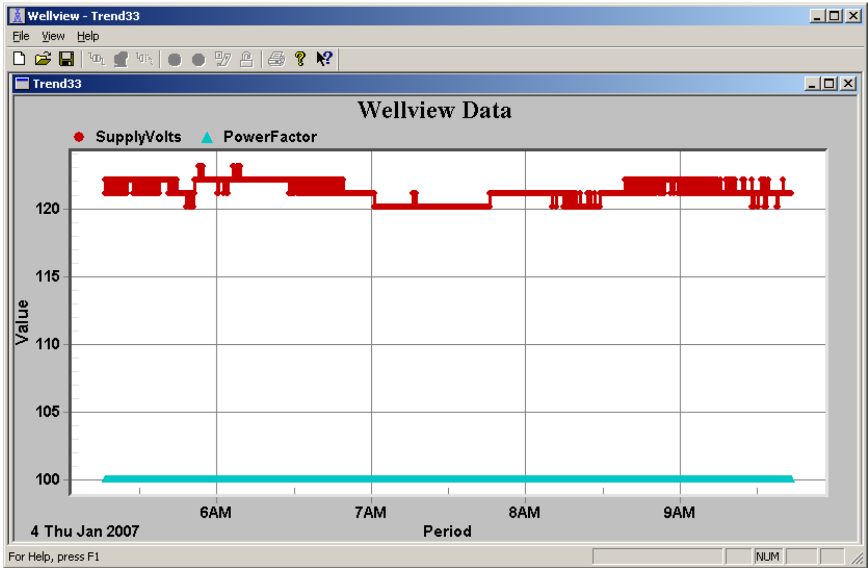


Figure 11-18: WellView Graph

4. Repeat for as many graphs as required.

The graph appearance and settings can be adjusted by right-clicking on the graph area. The user can change all of the graph display parameters.

The right-click on the graph area brings out the menu Figure 11-19 (and associated dialogs) that can also be used to export the graph in a variety of text and graphical packages. The user can also zoom in on a section of the graph by using **Click and Drag** functions.

Figure 11-18 is an example of a UniConn Trend Graph with two plots.

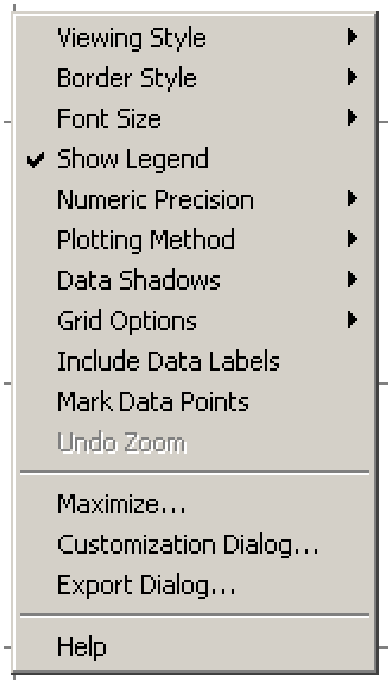
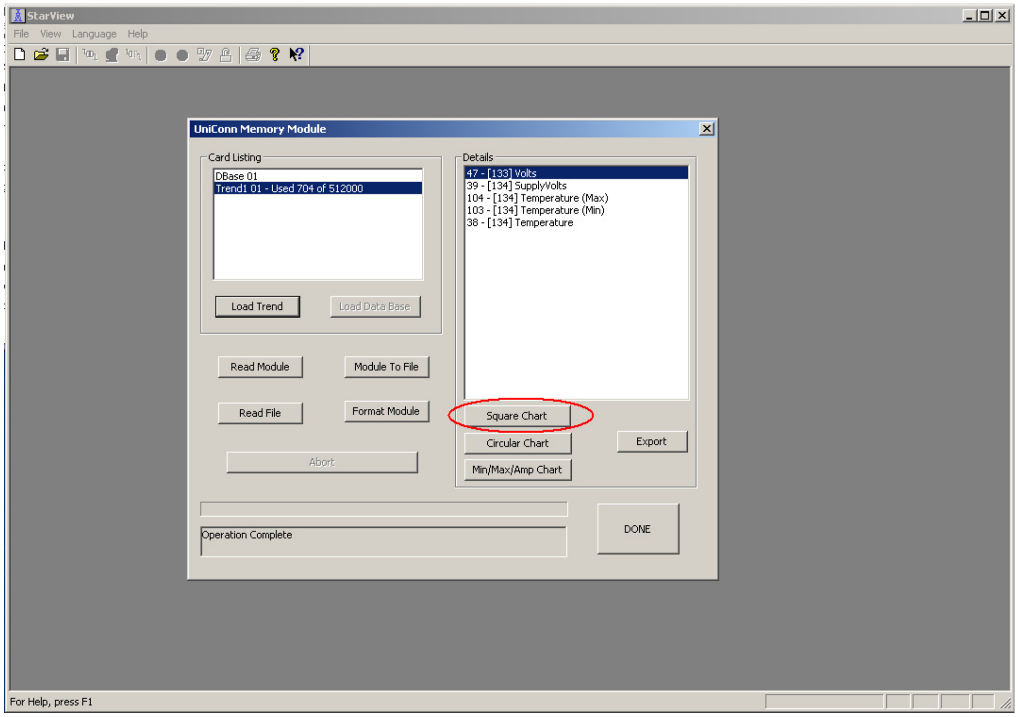


Figure 11-19: Graph Menu

11.3.4 Additional Chart Types

11.3.4.1 Square Charts

Note that the Square Chart button in the UniConn Memory Module dialog has replaced the Graph button which appeared in older versions of StarView. However, there are no functional changes; StarView trend graphing works exactly like it did in all previous versions. The Square Chart button will not be enabled until the UniConn Memory Module has been read (click Read Module or Read File), the trend data has been loaded (click Load Trend), and at least one trend data point has been selected.

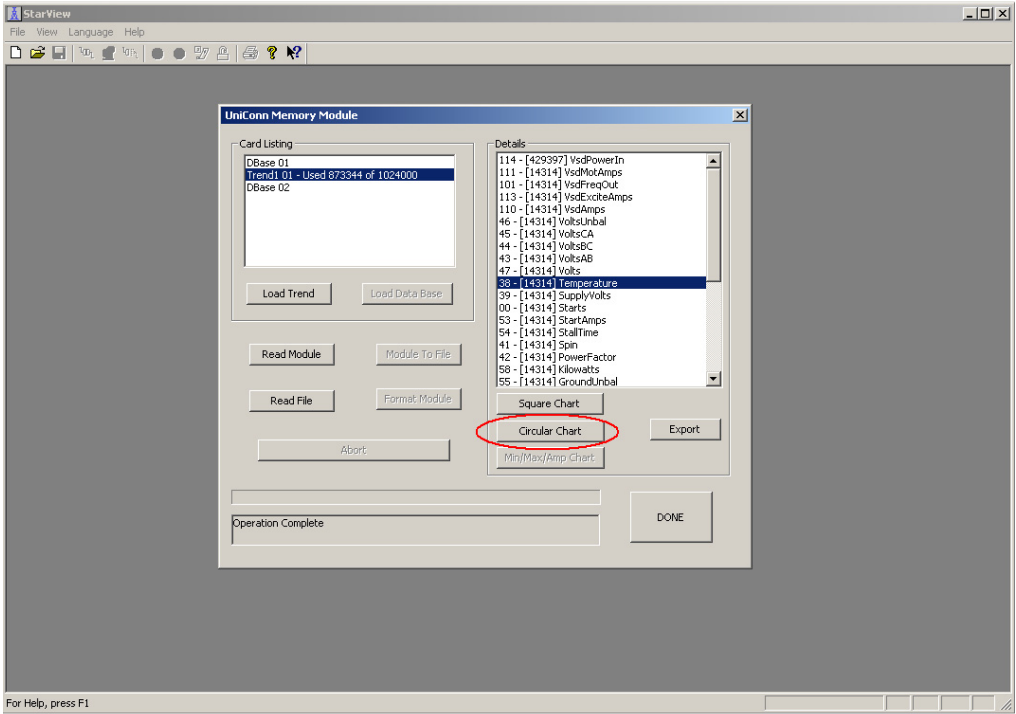


11.3.4.2 Circular and Amp (Min/Max) Charts

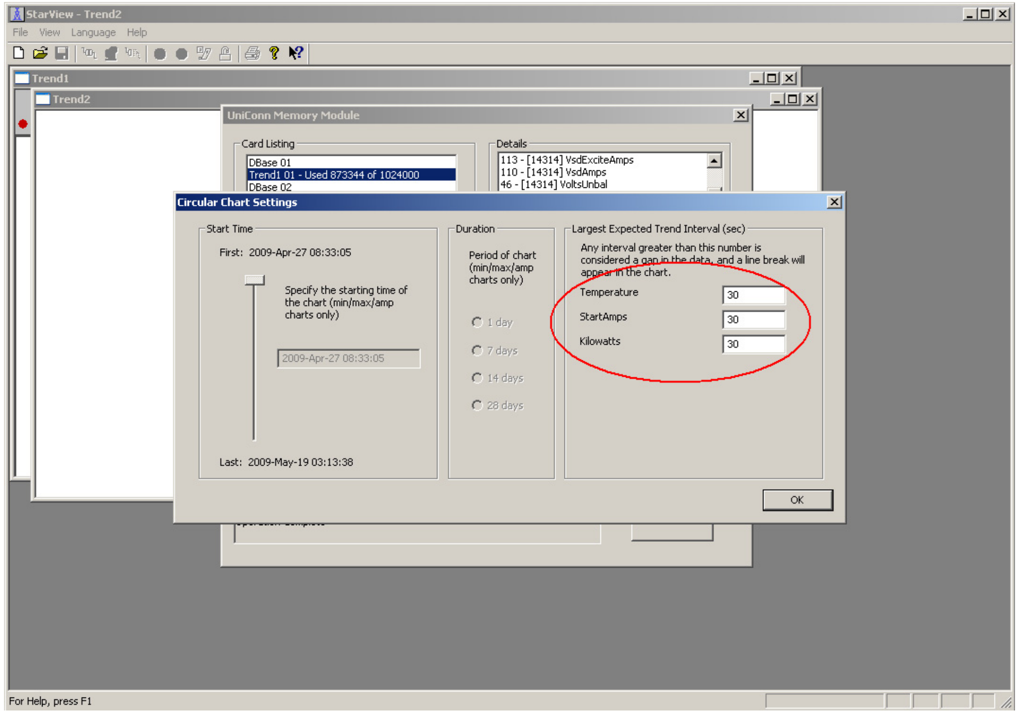
Circular charts of trend data are now available. StarView can also produce an Amp chart approximation, using the min/max trending option. There are no usage instructions nor any special configuration requirements for the UniConn; circular and amp charts are configured and generated using StarView.

Using Circular Charts

StarView can generate circular charts from the trend data on a UniConn Memory Module. The UMM should be configured as before – no special configurations are required for circular trend charts. The Circular Chart button will not be enabled until the UMM has been read (click Read Module or Read File), the trend data has been loaded (click Load Trend), and at least one trend data point has been selected.

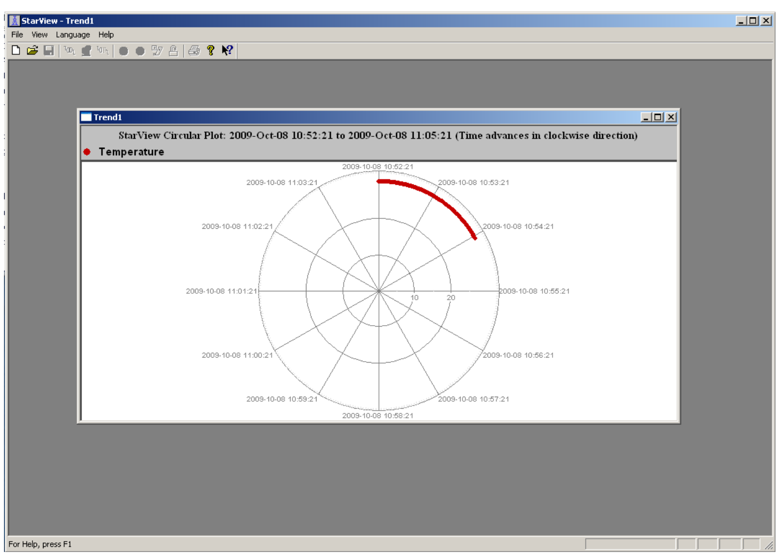


Note that circular charts are much more sensitive to breaks in the trend data than the regular square charts – therefore, StarView will prompt the user to specify the time gap which will be considered a break in the data. For example, if a data point was set to sample every 30 seconds, then a time difference of 31 seconds between samples would be considered a break in the data, and a break in the plot will appear. StarView will set the default data break time for each trend equal to the original sampling period – but the user can specify a different value if required.



Please note that Circular charts can only be plotted to a minimum period of 10 minutes, but that there is no upper limit. The resolution of the circular chart is affected by the period of the plot. For example, in a 1 day circular chart, 24 hours is plotted over a 360° sweep. Therefore, one hour would sweep across 15°; one minute would only occupy 0.25°.

StarView always plots the circular chart using the entire trend data set from beginning to end, and will scale the 360° sweep of the chart accordingly to the timestamps of the first and last sample (subject to the 10 minute minimum period).

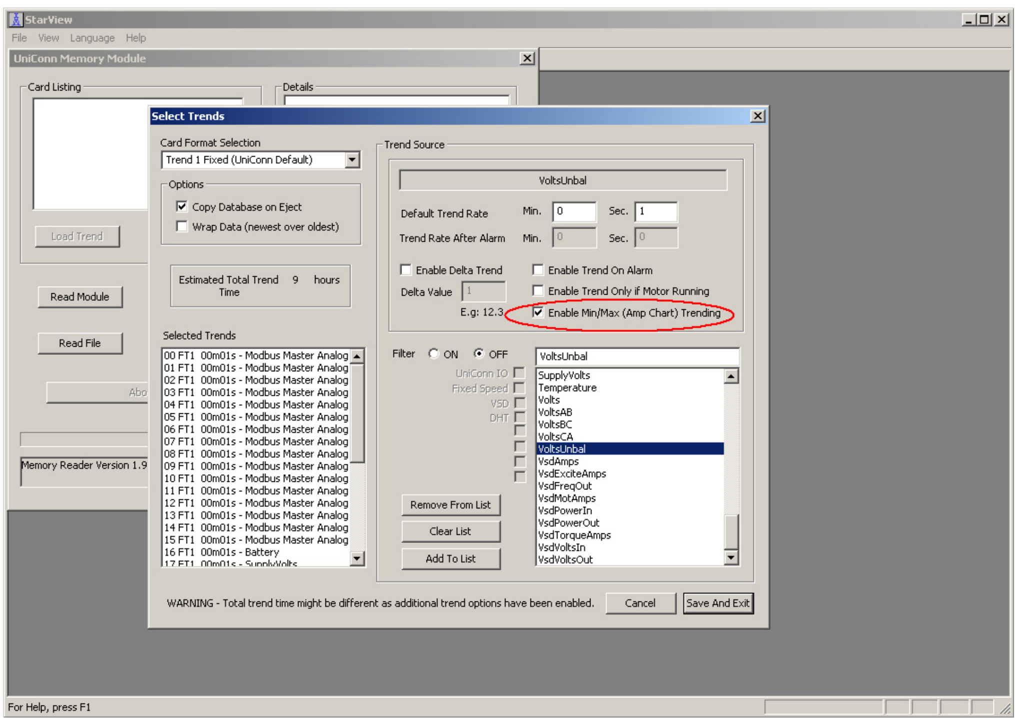


Private – Customer Use

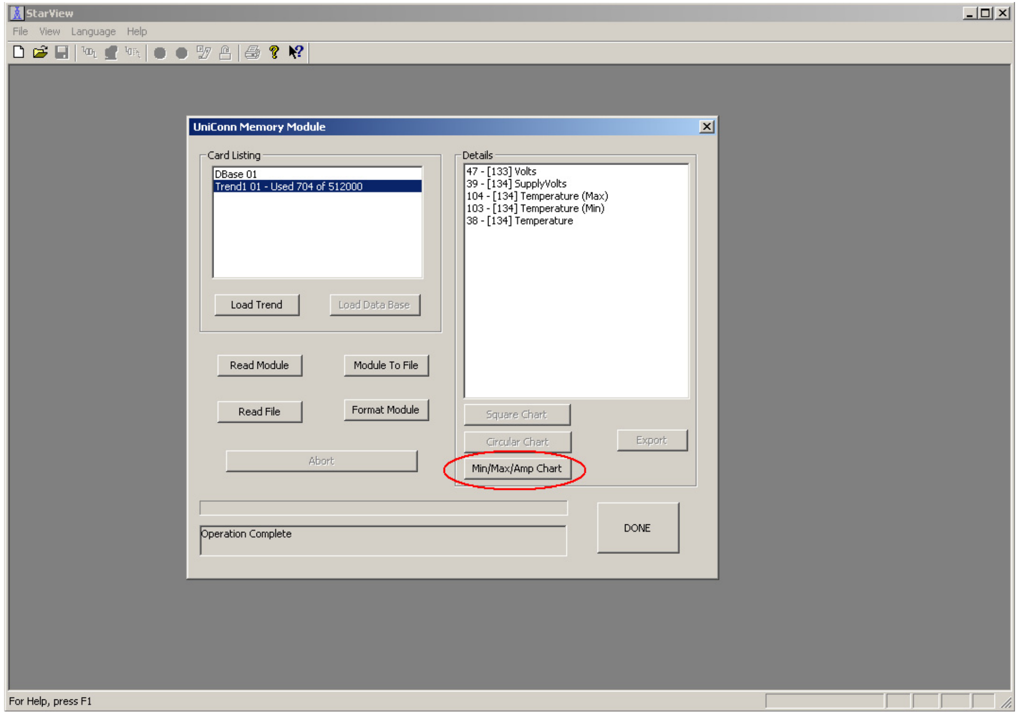
Using Amp (Min/Max) Charts

StarView can generate an amp chart approximation. In order use this feature, the Enable Min/Max (Amp Chart) Trending option must be checked when first configuring the UMM. Please note the following points:

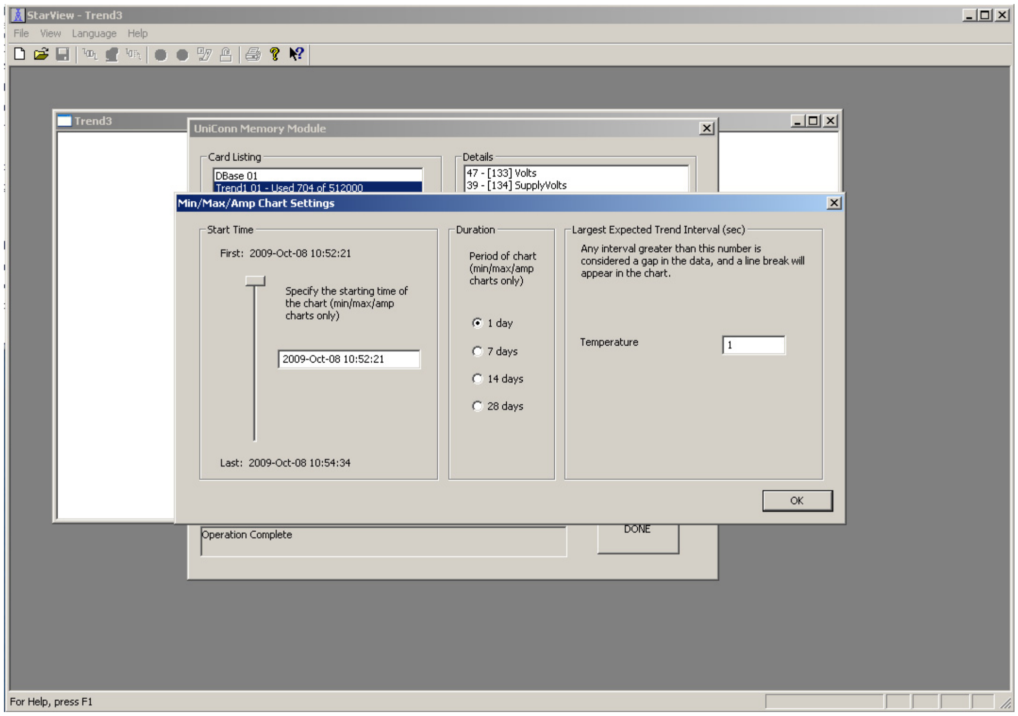
- This amp chart approximation plot can be done on any available data point, not just the “amps” reading.
- There can only be a single data point which has the Min/Max option enabled at any one time, for any one UniConn memory module.
- If the Min/Max trending option is selected, the number of available slots for trend data is reduced from 32 to 30.



Once the UMM is filled with trend data, the amp chart can now be plotted. As usual, in order to process the trend data it must have been read into StarView (click Read Module or Read File), and it must have been loaded in (click Load Trend). The Min/Max/Amp Chart button will be enabled, if Min/Max data is available for any point in the dataset.



Note that amp charts are much more sensitive to breaks in the trend data than the regular square charts – therefore, StarView will prompt the user to specify the time gap which will be considered a break in the data. For example, if a data point was set to sample every 30 seconds, then a time difference of 31 seconds between samples would be considered a break in the data, and a break in the plot will appear. StarView will set the default data break time for each trend equal to the original sampling period – but the user can specify a different value if required. In addition the starting time of the amp chart and the period of the amp chart must be specified, as shown.



Please note that Min/Max/Amp charts can only be plotted in 1, 7, 14, and 28 day periods; the available resolution is dictated by this period. For example, in a 1 day min/max/amp chart, 24 hours is plotted over a 360° sweep. Therefore, one hour would sweep across 15°; one minute would only occupy 0.25°. Since amp charts have a minimum period, small datasets may appear only as a single point or a short plot, as shown below.

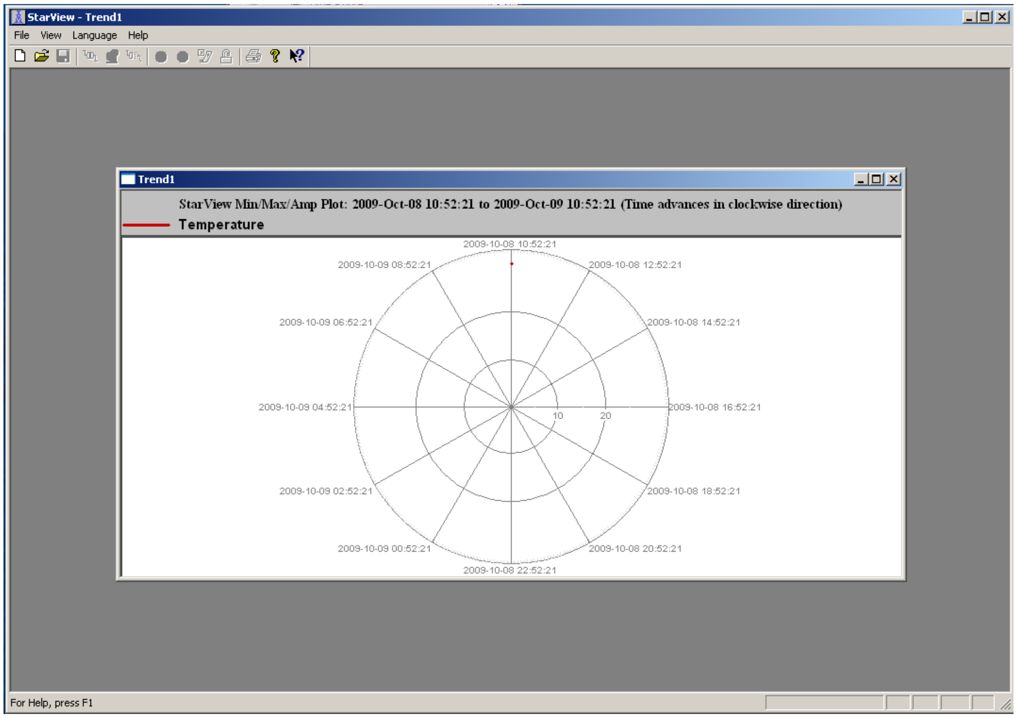


Figure 11-20: Circular Chart with Small Data Set

11.3.5 Export a Trend

1. When the trend has been loaded, look for the trend sources shown in the **Details** list box.
2. Select one or more trend sources (click toggles on and off).
3. Click the **Export** button. A file name dialog box will be presented and the user prompted for a file name and path. Click **OK**.
4. Note that the file will be exported as a .csv (comma separated value) file that may be opened with many programs, including Microsoft® Excel®. Repeat for as many files as required.

Note
Multiple trend sources can be written to one file.

If the Memory Module has to be reused immediately or not, all the measurement sources are exported, but they may or may not be needed later. The simplest and fastest way to save complete module content is to save it to the file, by pressing **Module To File** button. The content of the file can be later viewed and manipulated as if it is an original module, by pressing **Read File** button. Once the UMM content is saved to a file (which takes several minutes), it can be read back any time and loading the trend information will be almost instantaneous.

5. Press **Done** button to exit main UniConn Memory Module window.

11.4 Motor Running/Alarm Rate Trending for Sapphire/Extreme

The UniConn is capable of using special trending modes for Sapphire/Extreme data points. The UniConn can be configured to trend the data points:

- only if the motor is currently running and/or
- to trend at a different rate if the data point is currently in an alarm state

This feature is not configurable via the UniConn front keypad. In StarView, configure the UniConn Memory Module as follows. First, enter the memory module dialog via the File menu:

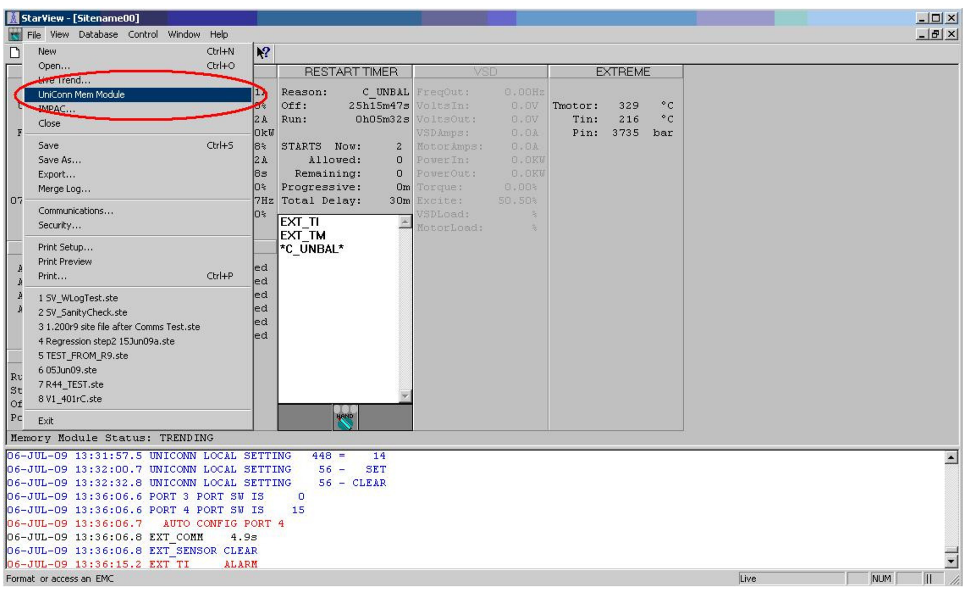


Figure 11-21: StarView File menu

Second, in the UniConn Memory Module Dialog, press the Read Module and then the Format Module buttons:

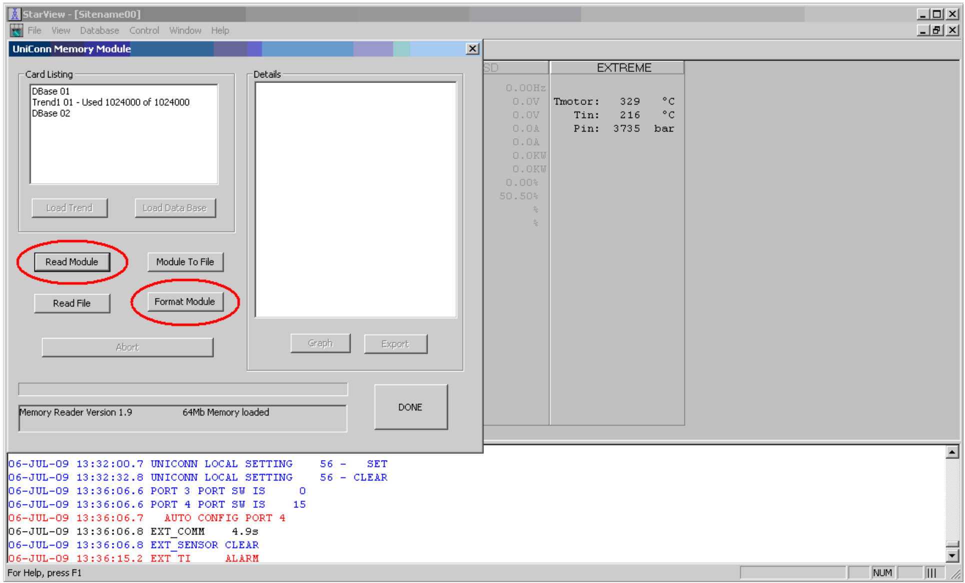


Figure 11-22: UniConn Memory Modudle Dialog

Thirdly, select the appropriate check boxes:

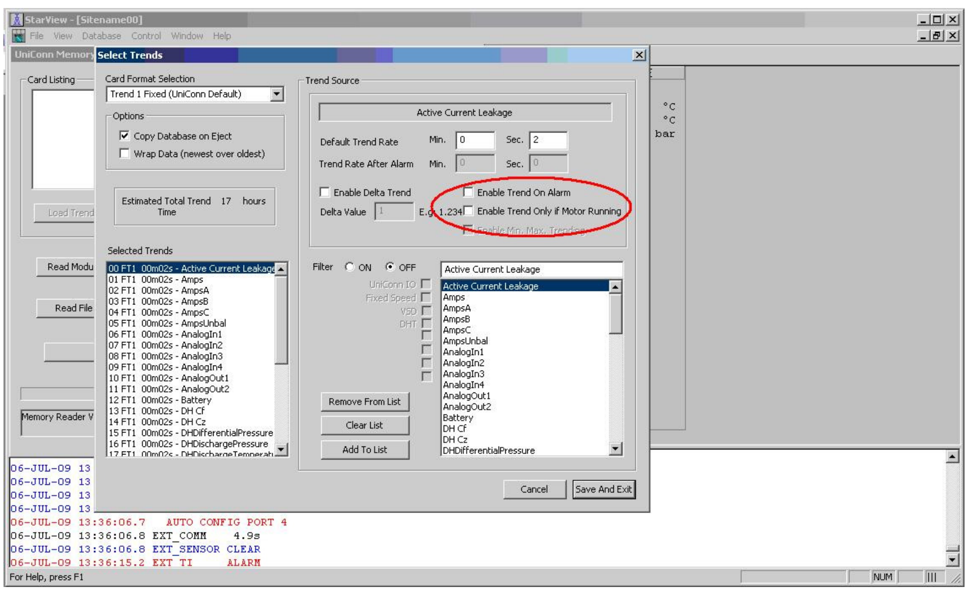


Figure 11-23: Select Trends Window

Intentionally Blank

Spare Parts

A Spare Parts

A.1 UniConn

A.1.1 UniConn General

Table A-1: UniConn Spare Parts

Part Number	Description
100018805	UniConn
100203033	Memory Module 32 Mb
100247379	Memory Module 64 Mb
100171741	Memory Card Reader
100367386	UniConn connector plug 5.08 mm 6 pin
100430125	UniConn connector plug 5.08 mm 5 pin
100064288	UniConn connector plug 5.08 mm 4 pin
100367410	UniConn connector plug 5.08 mm 3 pin
100021308	UniConn connector plug 3.5 mm 7 pin
100021305	UniConn connector plug 3.5 mm 4 pin
100346634	UniConn connector plug 3.5 mm 3 pin
AC20017	Fuse 2A Slow Blow 250V 6.3x32mm Glass
100117397	Fuse 2.5A Fast Blow 250V 6.3x32mm Glass
AC20005	Fuse 5A Fast Blow 250V 6.3x32mm Glass
100073235	Metal Oxide Varistor (MOV)
AC21228	Dust cover for DB9 Female
1157692	Battery Kit for UniConn internal clock
100052238	Serial Cable, RS232 Extension

A.1.2 UniConn Fixed Speed

Table A-2: UniConn spare parts for artificial lift fixed speed

Part Number	Description
100074798	UniConn Current Module (50 A)
100096860	UniConn Current Module (100 A)
100072042	UniConn Current Module (200 A)

Part Number	Description
100468928	CT Module Burden 5:X
AC32106	Control Potential Transformer (CPT), 1 kVA, Multitaps primary 1540-5080 V, secondary 120 V
2003957	Instrument Transformer: Potential 5400/Multi-Tap/120 volts AC
AC05262	A095 Backspin Shunt (400-1000 volts AC)
AC05225	A095 Backspin Shunt (800-2000 volts AC)
AC05226	A095 Backspin Shunt (1800-4000 volts AC)
AC05304	A095 Backspin Shunt (3000-5000 volts AC)
1157114	Instrument Transformer: 3600 Multi-tap/120 V
1157726	Instrument Transformer: 480/120 V

A.1.3 UniConn Variable Speed

Table A-3: UniConn spare parts for artificial lift variable speed

Part Number	Description
100184396	Tosvert Interface Cable
100189002	UniConn VSD Retrofit Kit

A.1.4 UniConn WellWatcher

Table A-4: UniConn for WellWatcher spare parts

Part Number	Description
100296166	UniConn WellWatcher System (NEMA 3R)
100259675	UniConn WellWatcher System (NEMA 4X)
AC91129	Cable gland strain relief
100228568	Comm Card
100291683	Fan Kit

A.1.5 UniConn Phoenix

Table A-5: UniConn Phoenix spare parts

Part Number	Description
100240291	UniConn Phoenix System (NEMA 3R)
100345732	UniConn Phoenix System (NEMA 4X)
AC91129	Cable gland strain relief

A.2 Phoenix Interface Card (PIC)

Table A-6: PICv2 Spares

Part Number	Description
100324335	Phoenix Interface Card
100052238	PIC to PC Data Cable for PIC
100346634	Relay connector plug 3 pin
100346638	DHT connector plug 2 pin
AC21228	Dust cover for engineering port DB9
100078327	Thumb Screw

A.3 FSK Interface Card (FIC)

Table A-7: FIC NG Spare Parts

Part Number	Description
101022827	FIC NG Interface Card
100265463	FIC NG Engineering Cable
100021304	DHT connector 3 pin 3.5 mm
AC21228	Engineering port dust cover
100078327	Thumb Screw

A.4 Communications Card

Table A-8: Communication Card Spare Parts

Part Number	Description
101120028 [1]	Schlumberger Communications Card
100030934	Plug 5.08 mm 5 pin
100367386	Plug 5.08 mm 6 pin
100078327	Thumb Screw

[1] Replaces the UniConn Communications Card (100228568).

A.5 Spare Parts

Table A-9: Modbus TCP/IP Card spare parts

Part Number	Description
100419643	UniConn Modbus TCP/IP Card
AC21228	Dust cover for engineering port
100267826	RS232 Serial Cable
100078327	Thumb Screw

A.6 MVD Card

Table A-10: UniConn MVD Card spare parts

Part Number	Description
100357924	UniConn MVD Card
100448078	Cross-Wired Ethernet Cable 15 feet
100078327	Thumb Screw

Screen Menu Map

B Screen Menu Map

This appendix presents the structure of the UniConn menus graphically.

B.1 Automatic Start Screen Map

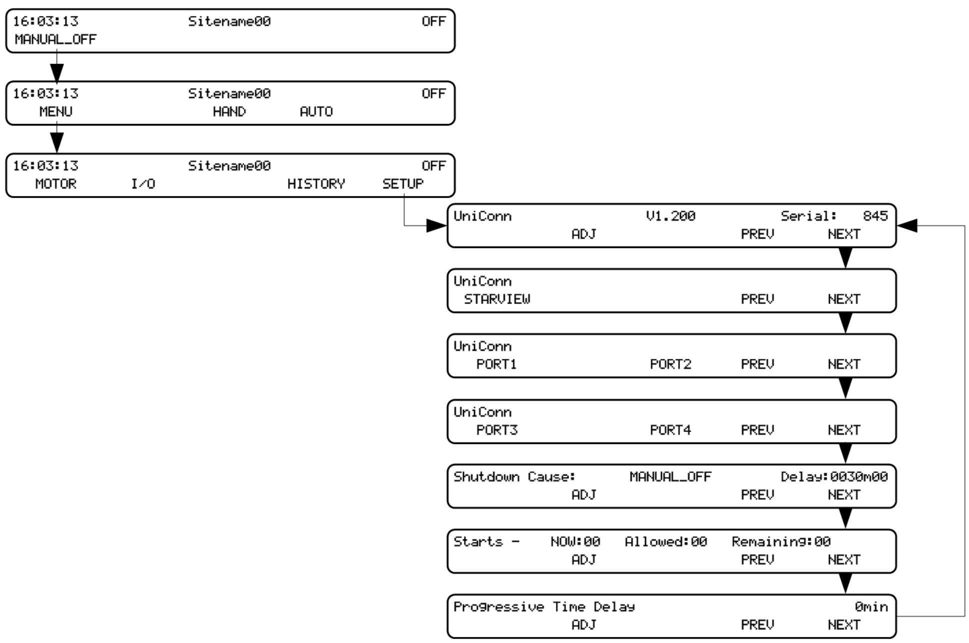


Figure B-1: Auto Start screen map #1.. *Access to start configuration menus*

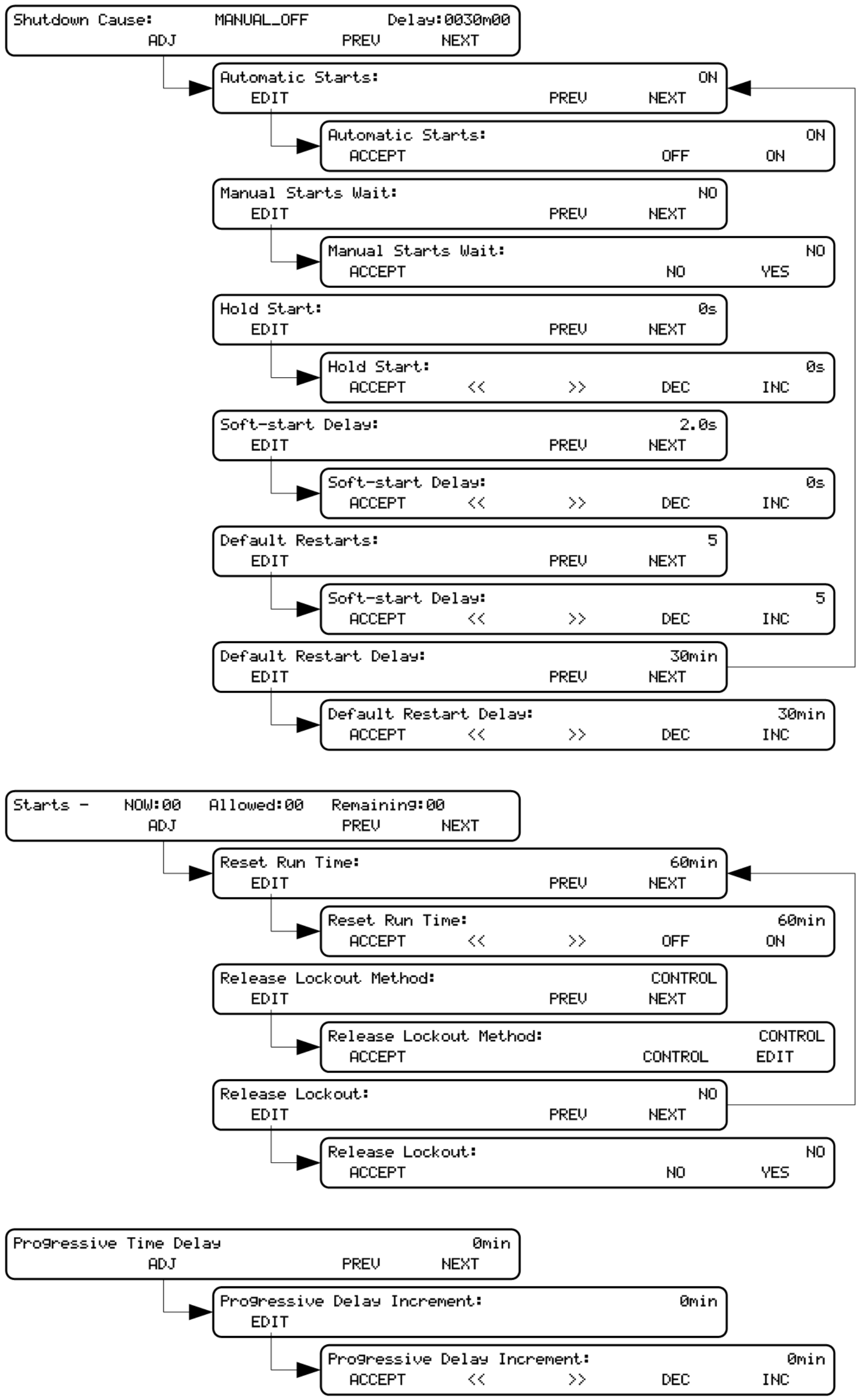


Figure B-2: Automatic Start screen map #2.. *Menu tree*

B.2 Power Input Screen Map

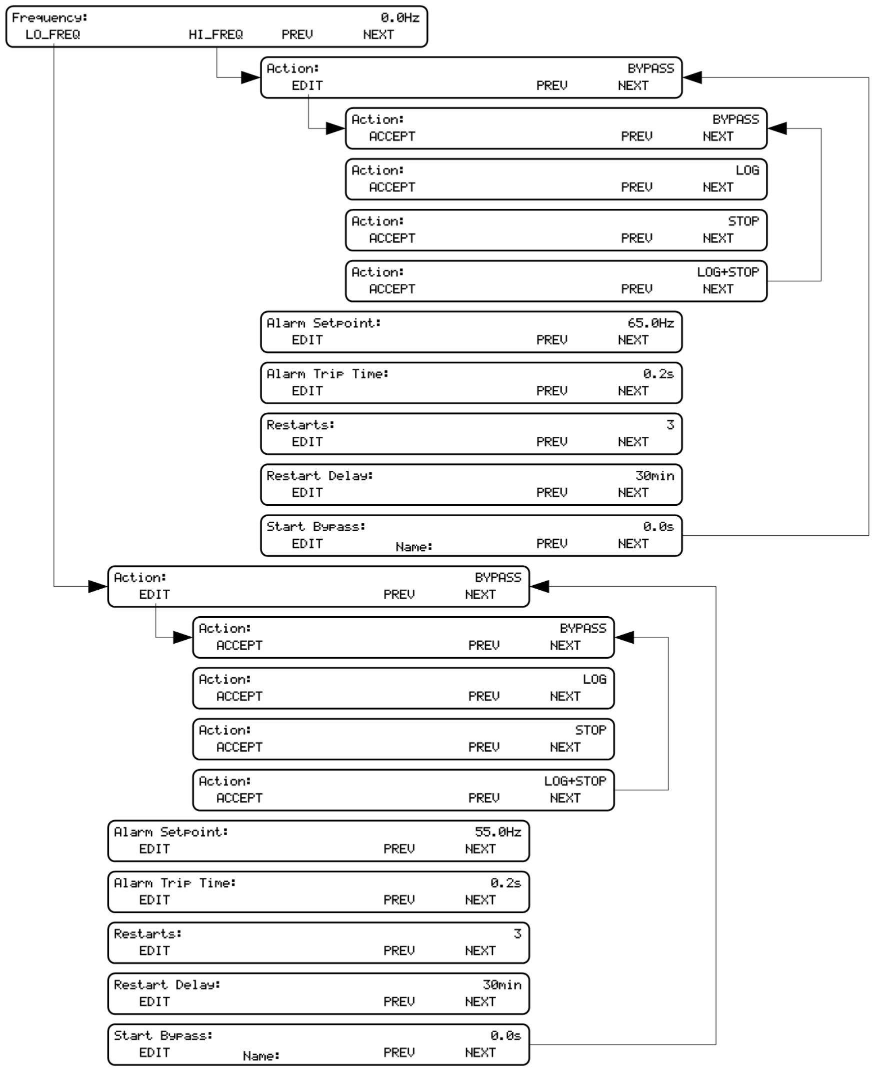


Figure B-3: Power Input menu map.. *Frequency.*

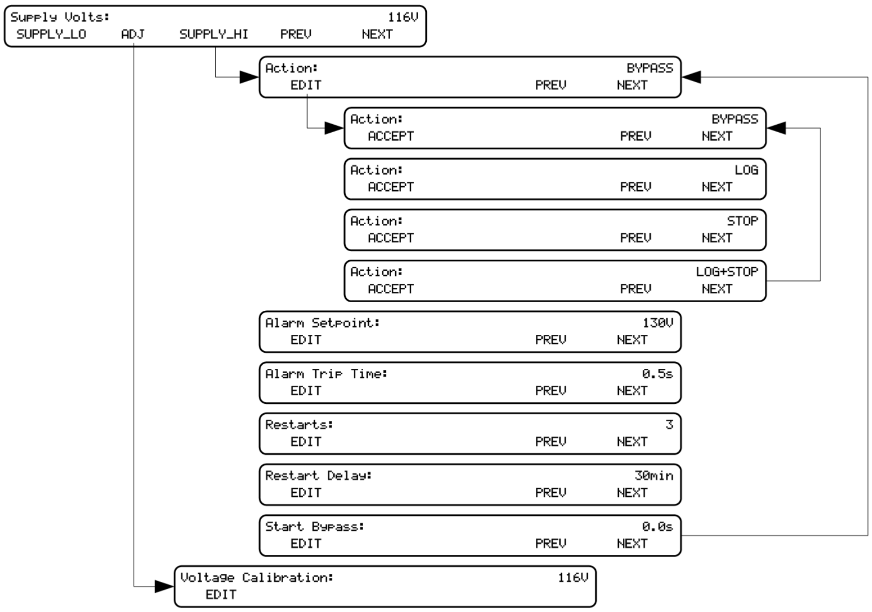


Figure B-4: Power Input menu map.. *Supply Volts ADJ and SUPPLY_HI.*

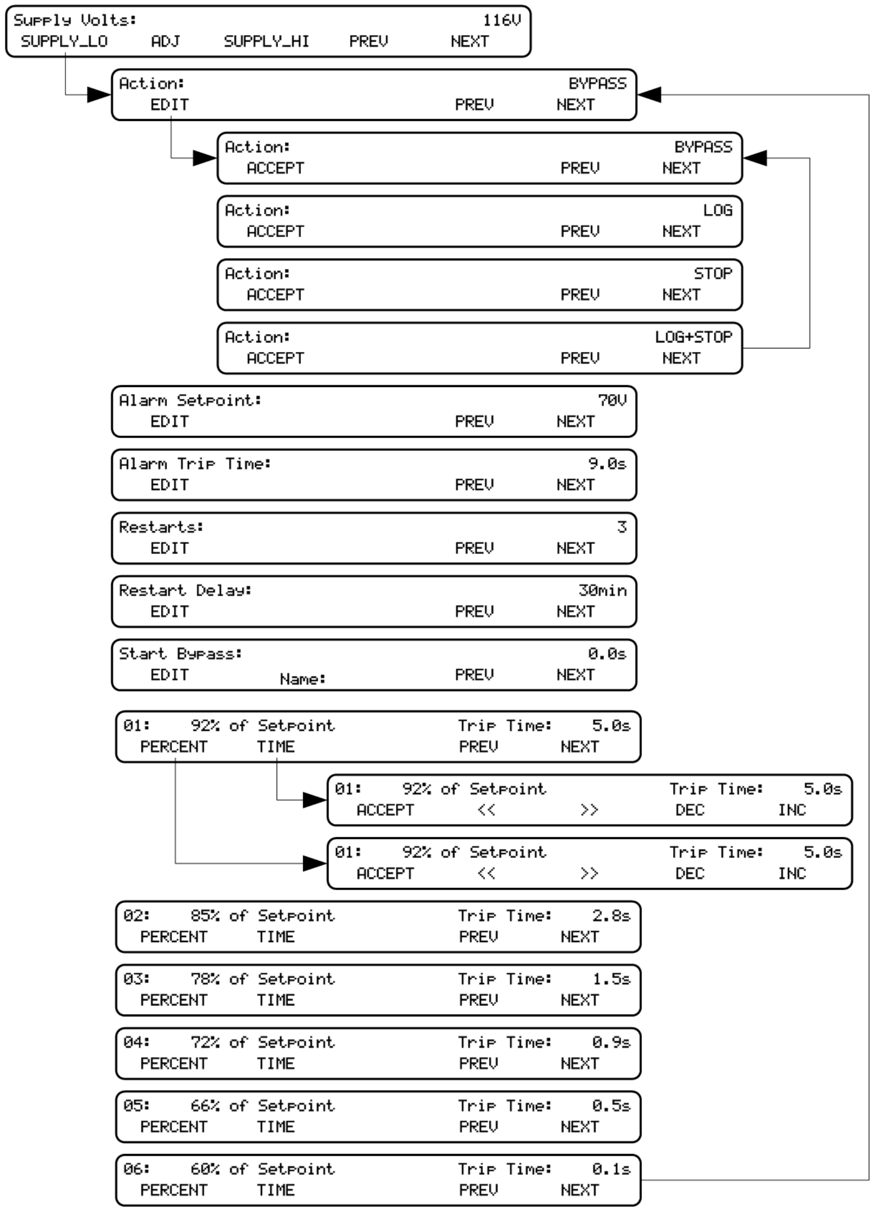


Figure B-5: Power Input menu map.. *Supply Volts SUPPLY_LO.*

B.3 Volts Input Screen Map

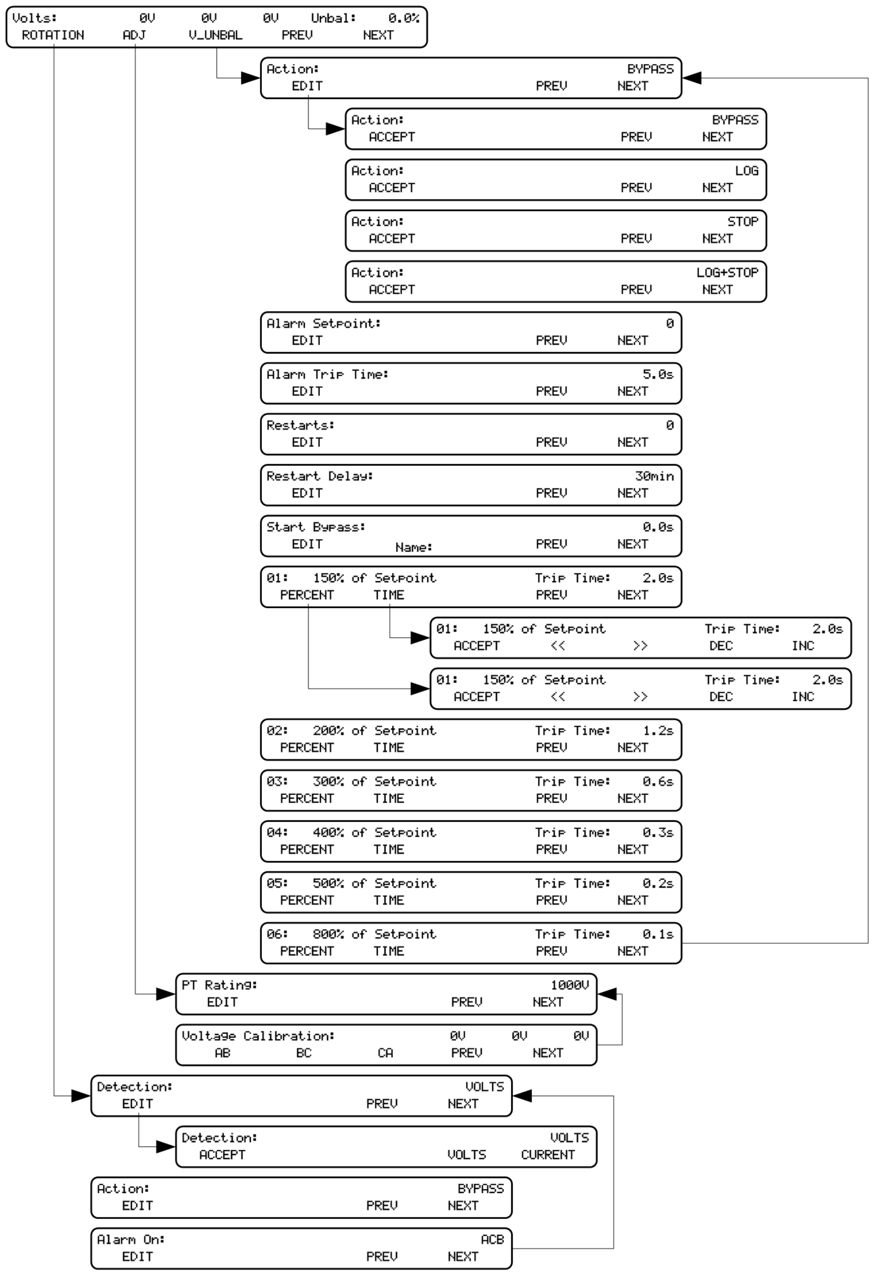


Figure B-6: UniConn Volts menu map

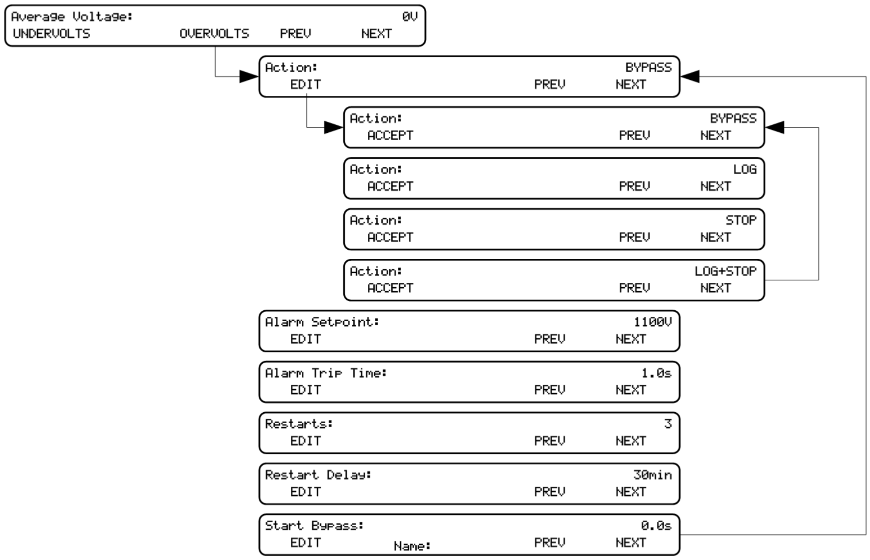


Figure B-7: UniConn Average Voltage menu map. *OVERVOLTS*

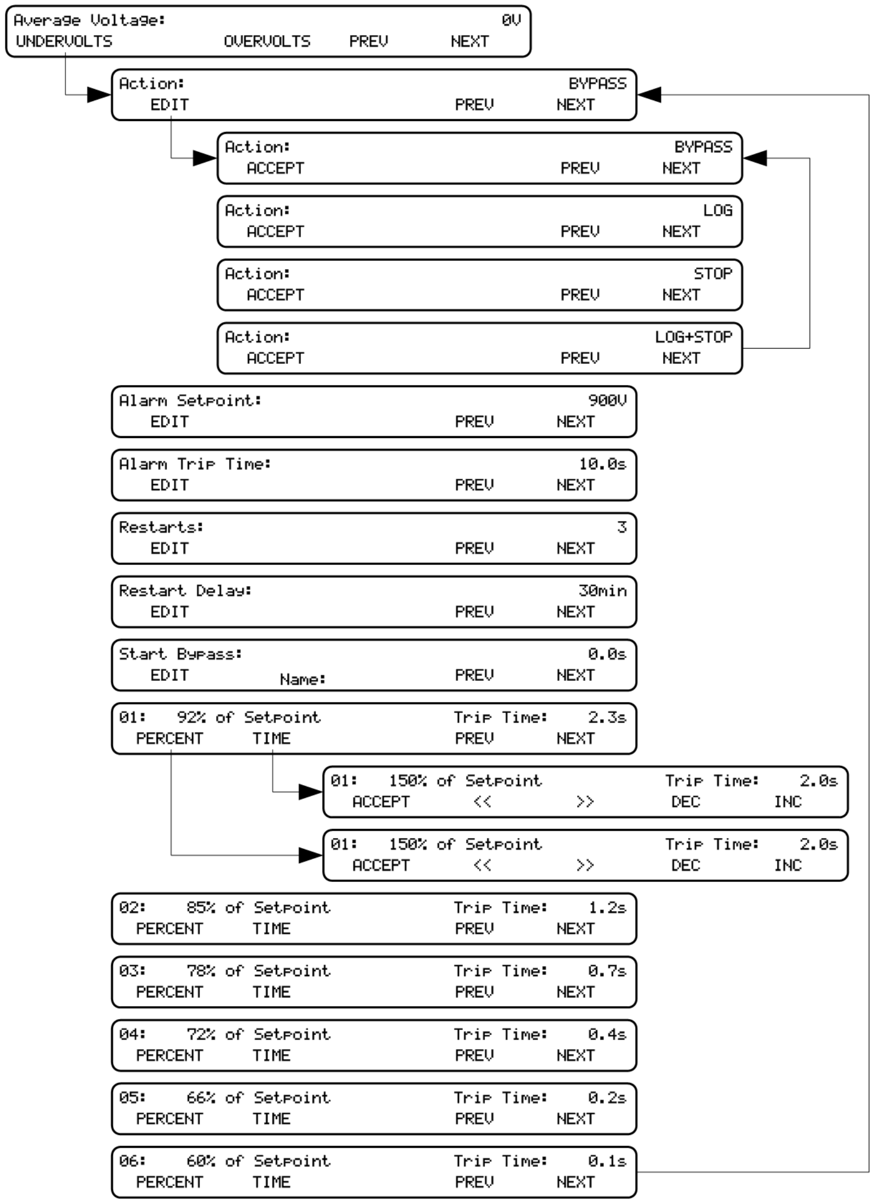


Figure B-8: UniConn Average Voltage menu map. *UNDERVOLTS*

B.4 Current Input Screen Map

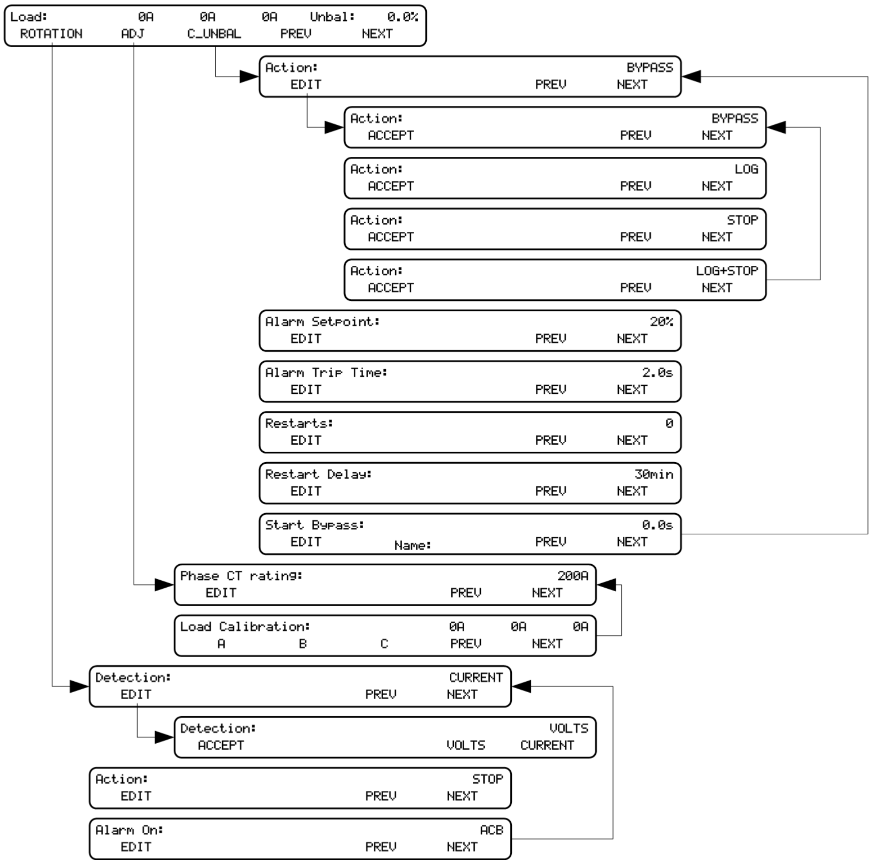


Figure B-9: Current Input menu map.. *Load configuration.*

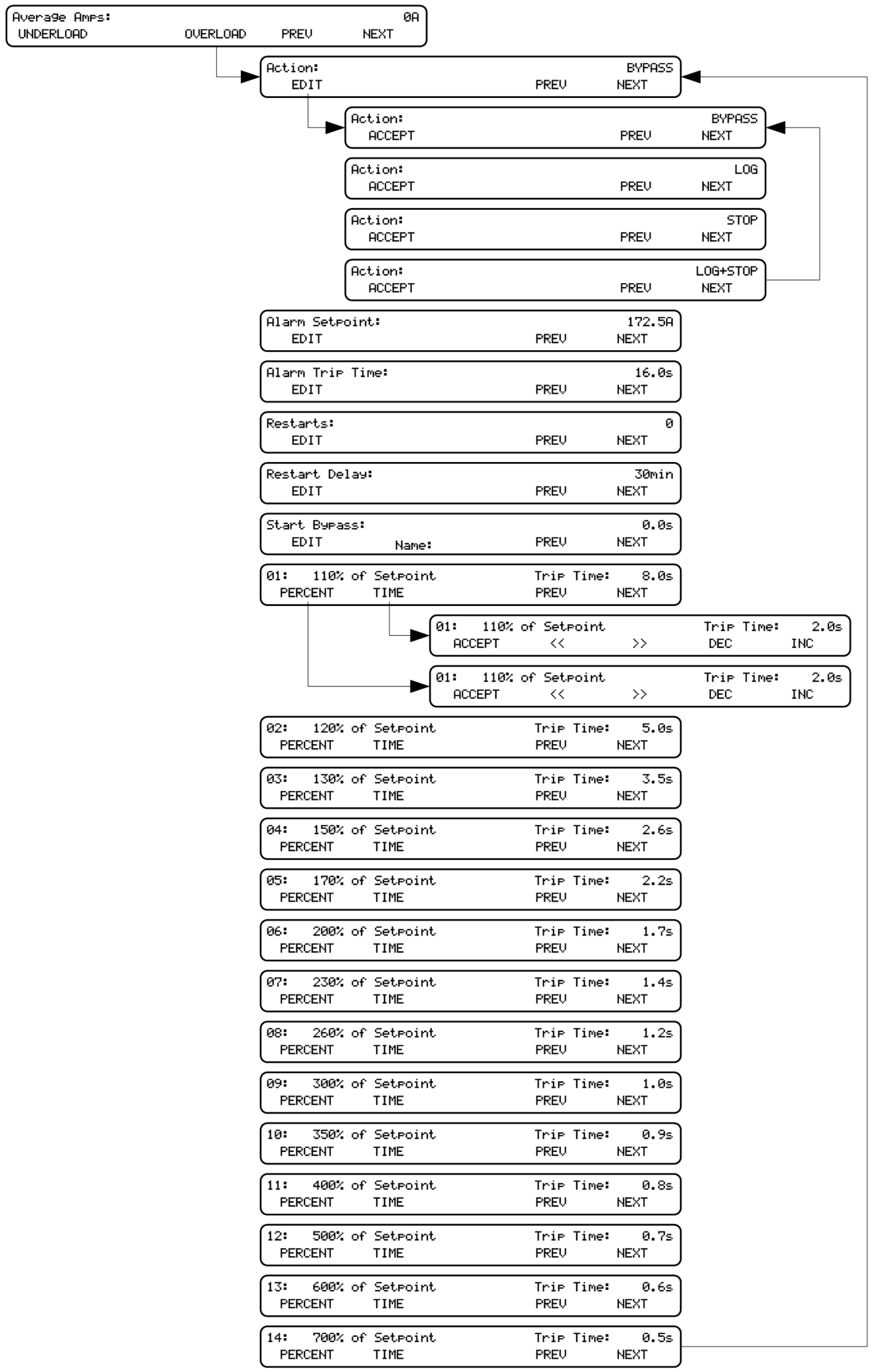


Figure B-10: Current Input menu map.. *OVERLOAD.*

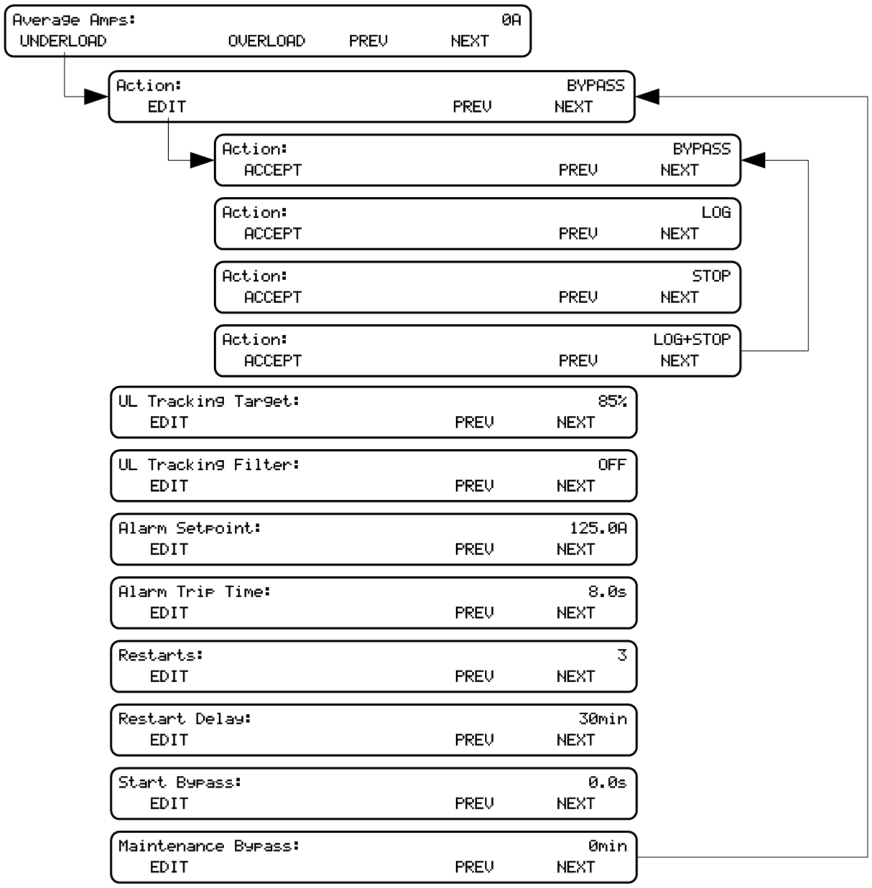


Figure B-11: Current Input menu map.. *Average Amps UNDERLOAD.*

Figure B-12: Current Input menu map.. *Motor load.*

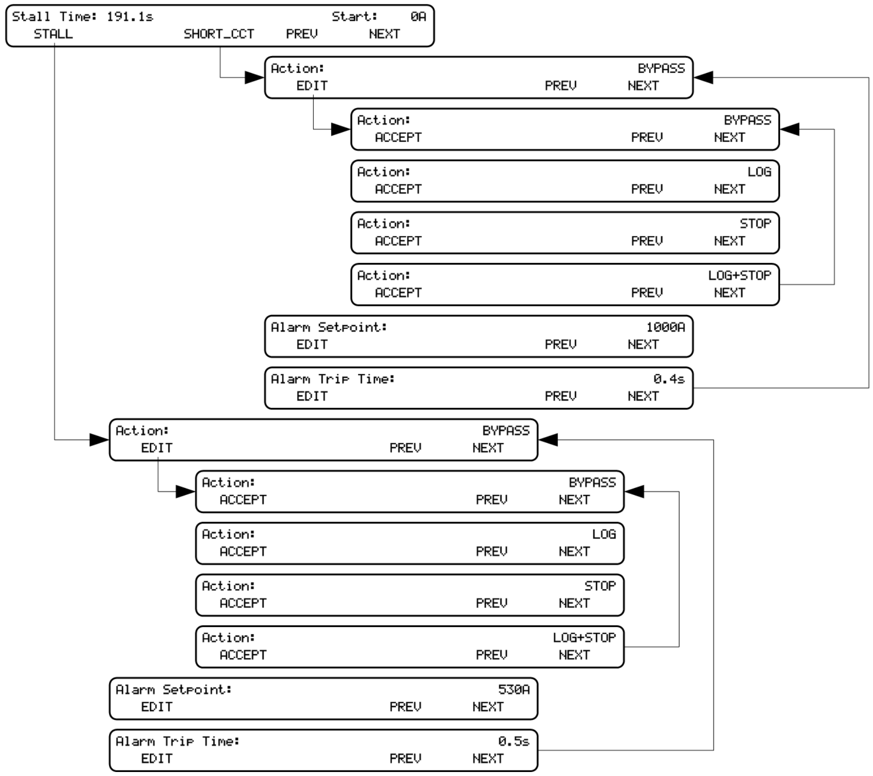


Figure B-13: Current Input menu map.. *Stall Time.*

B.5 BackSpin Screen Map

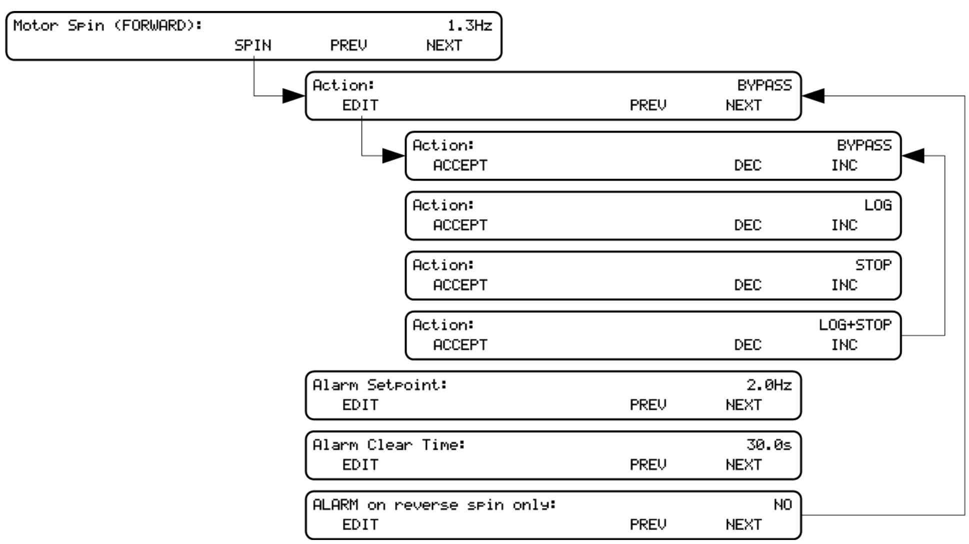


Figure B-14: BackSpin menu map

B.6 Leg Ground Screen Map

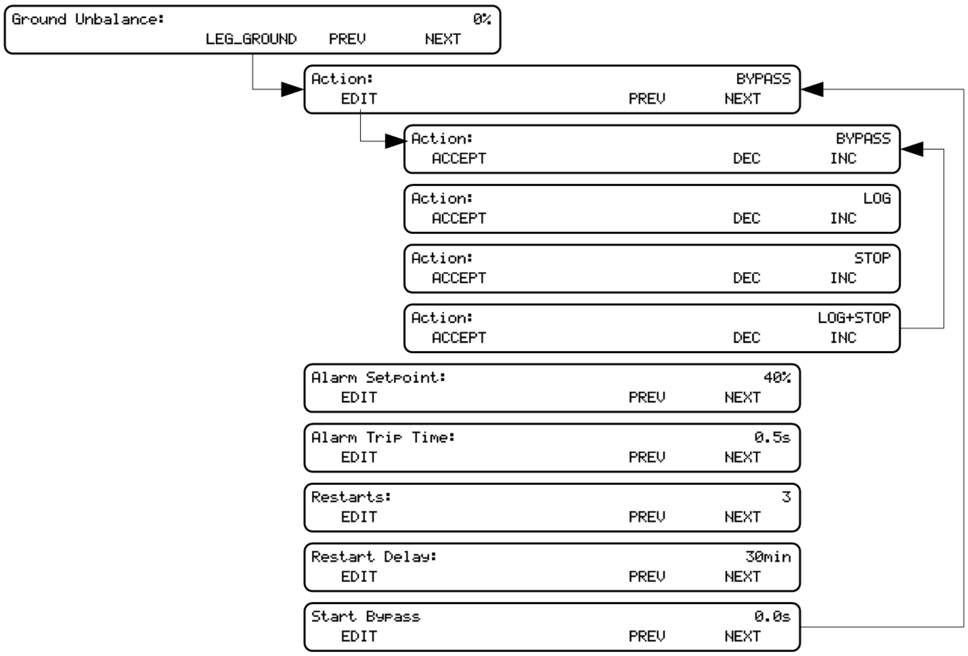


Figure B-15: Ground Unbalance menu map

B.7 Digital Output Screen Map

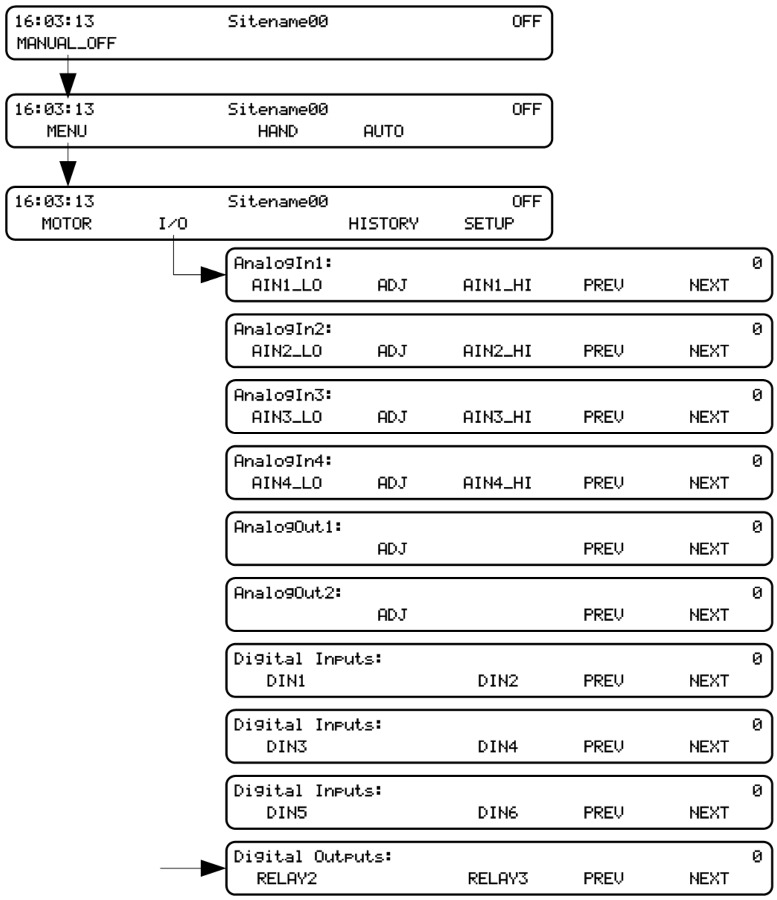


Figure B-16: UniConn digital output map 1

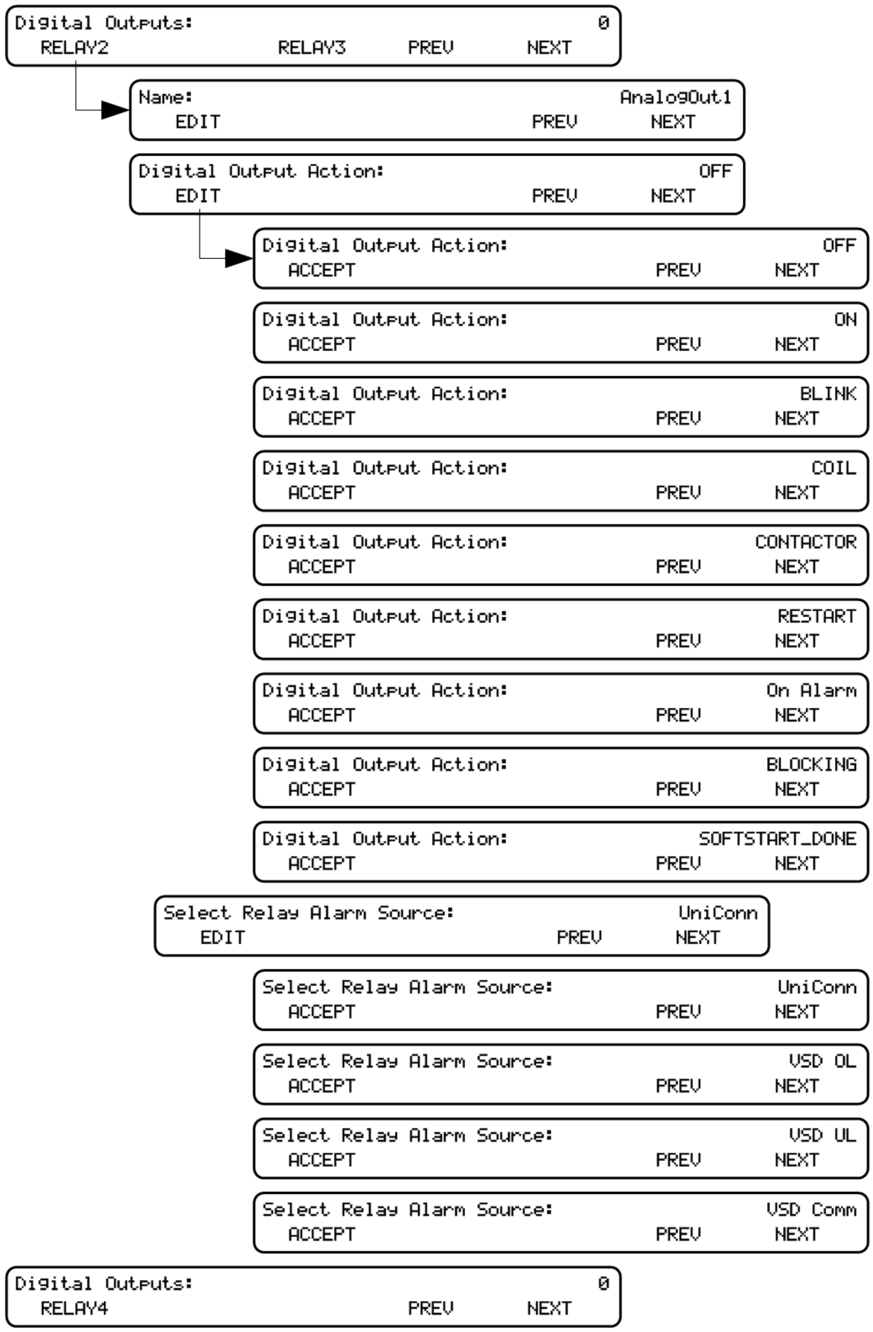


Figure B-17: UniConn digital output map 2

B.8 Analog Input Screen Map

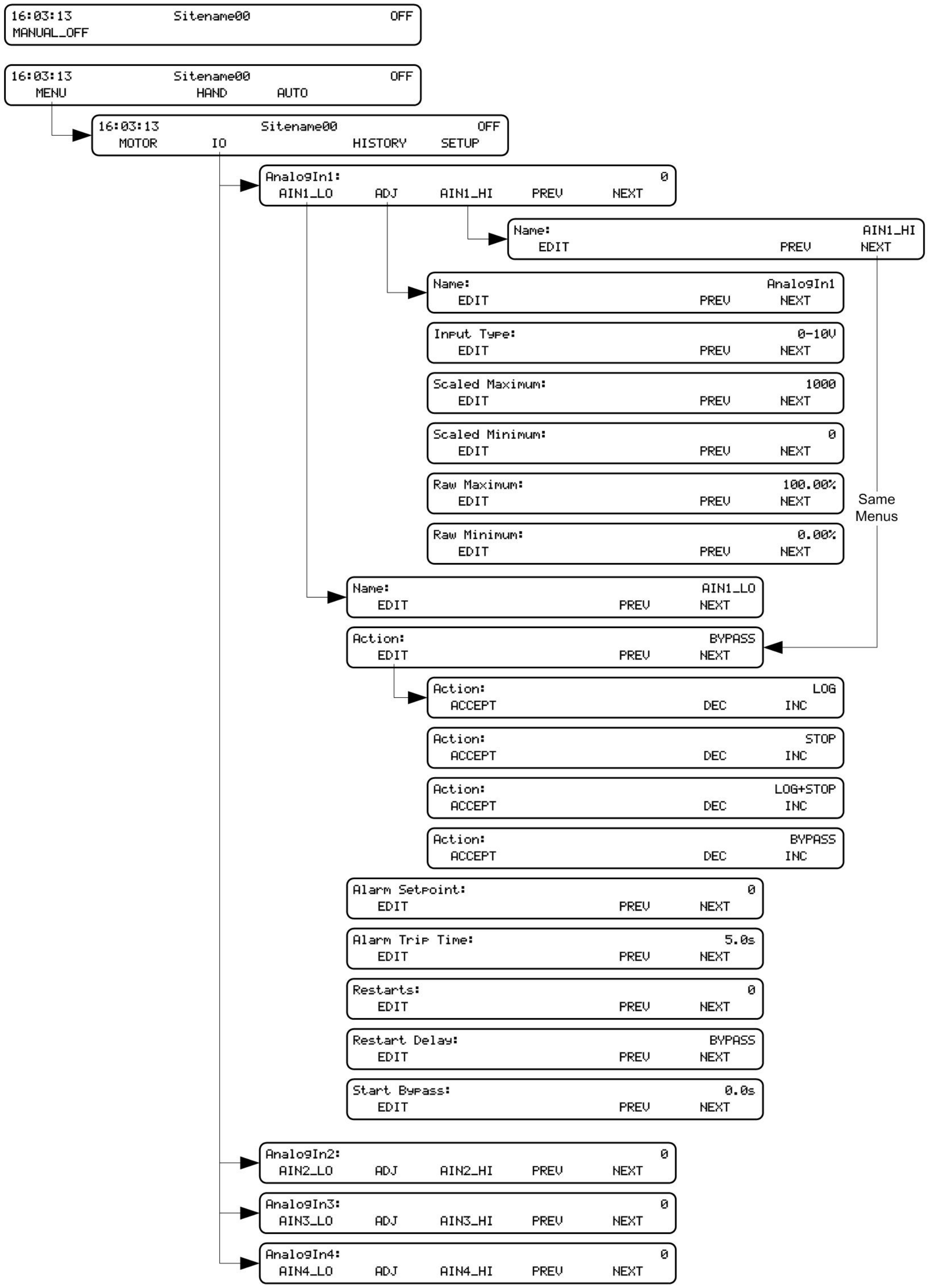


Figure B-18: UniConn analog input menu map

B.9 # Digital Input Screen Map

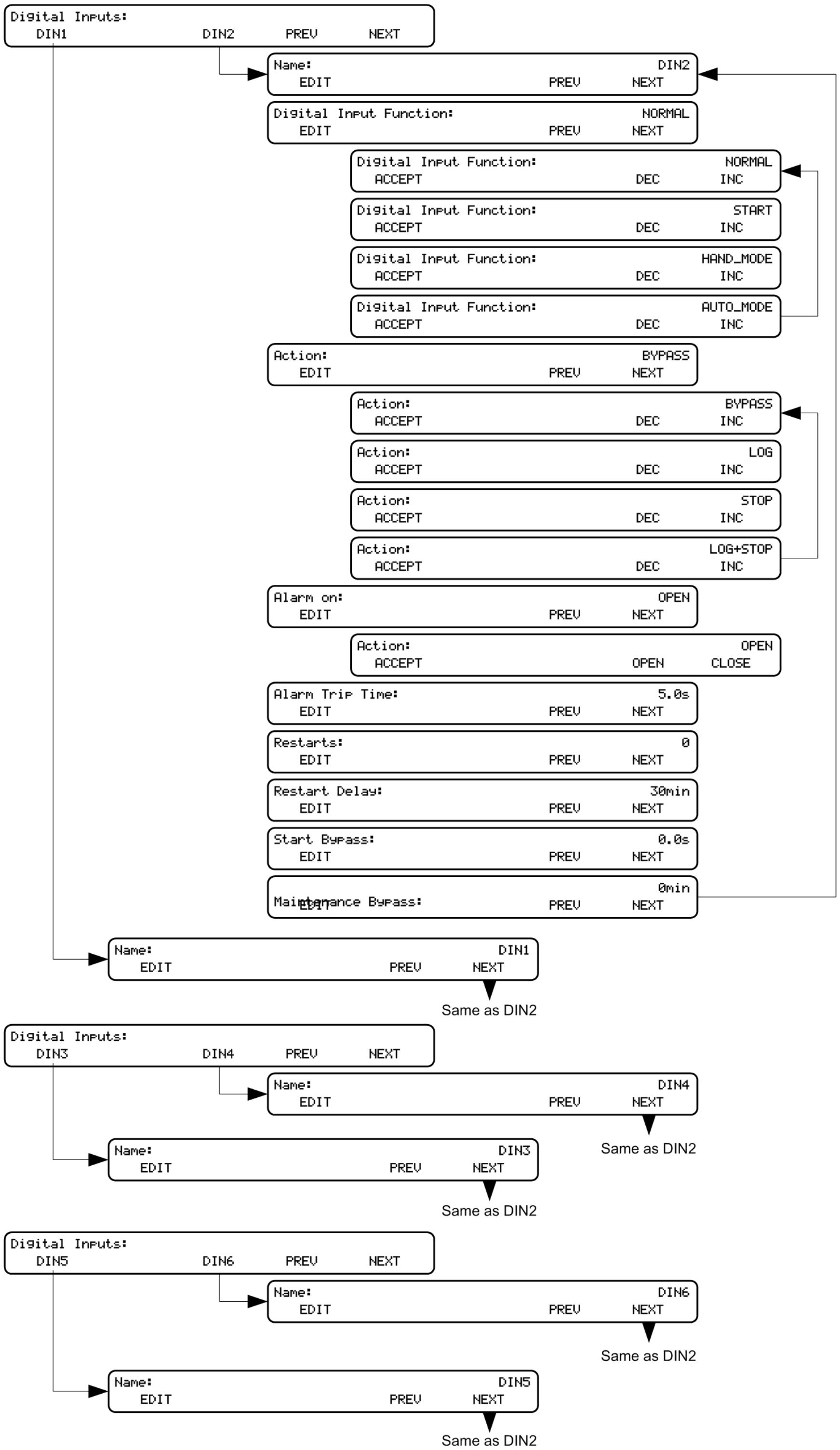


Figure B-19: Digital input screen map

B.10 Analog Output Screen Map

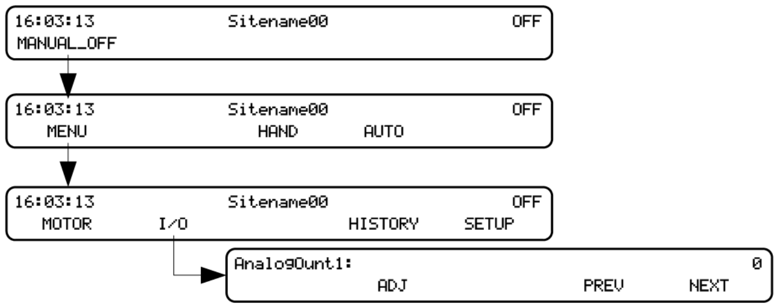


Figure B-20: UniConn analog output map 1

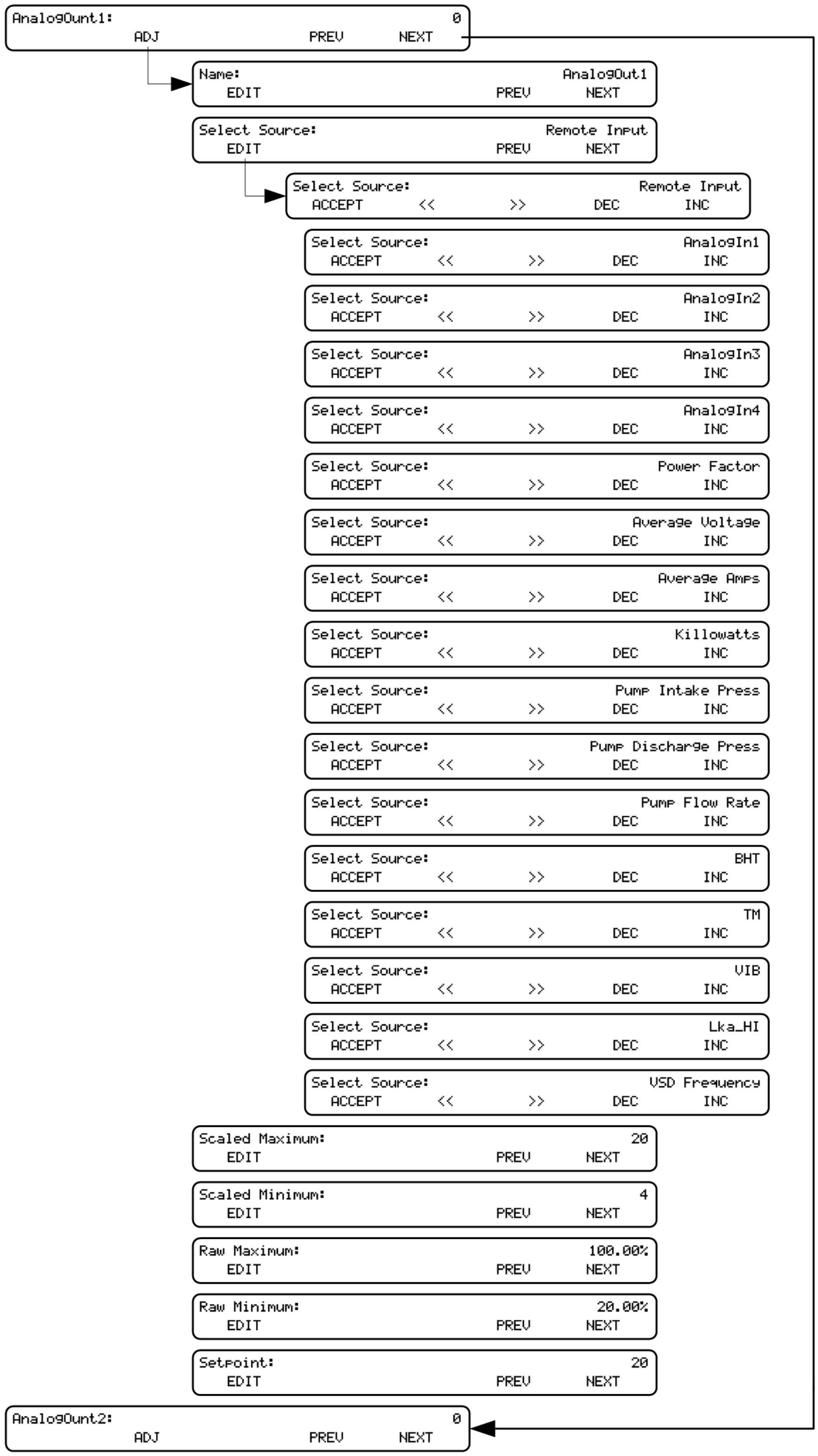


Figure B-21: UniConn analog output map 2

B.11 Expansion Port Screen Map

Note

Not all screens shown in the menu map will appear for all UniConn applications — only applicable screens are shown.

Example

If a UniConn port is disabled, then no other configuration screens will be shown for that port.

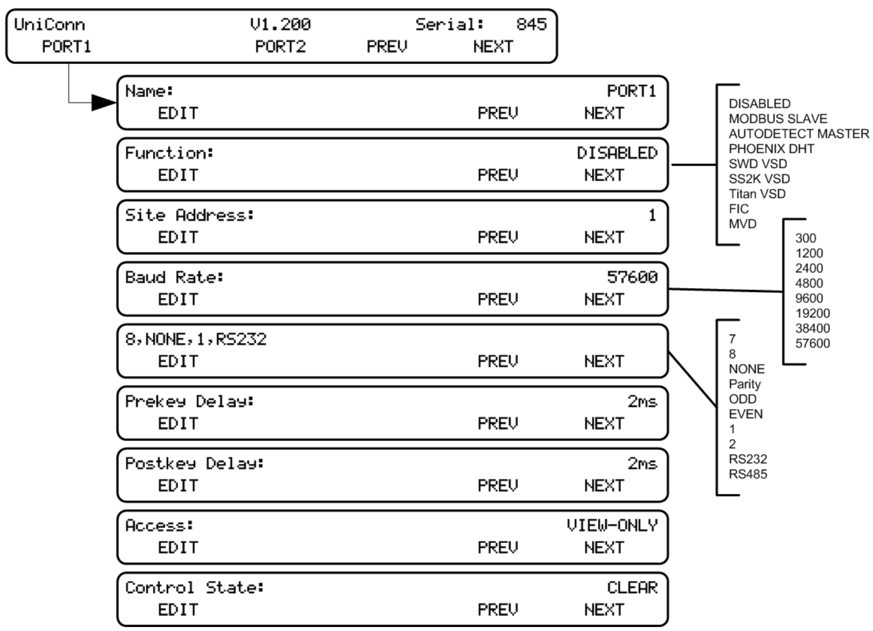


Figure B-22: Option port menu map

B.12 Maintenance Port Screen Map

```
Maintenance Port:
 STARVIEW                     PREV      NEXT

        Name:                                STARVIEW
          EDIT                       PREV      NEXT

        Site Address:                               1
          EDIT                       PREV      NEXT

        Baud Rate:                              57600
          EDIT                       PREV      NEXT

        Prekey Delay:                             2ms
          EDIT                       PREV      NEXT

        Postkey Delay:                            2ms
          EDIT                       PREV      NEXT

        Access:                                  FULL
          EDIT                       PREV      NEXT

        Control State:                          CLEAR
          EDIT                       PREV      NEXT
```

Figure B-23: Maintenance port menu map

B.13 UniConn PIC Screen Map

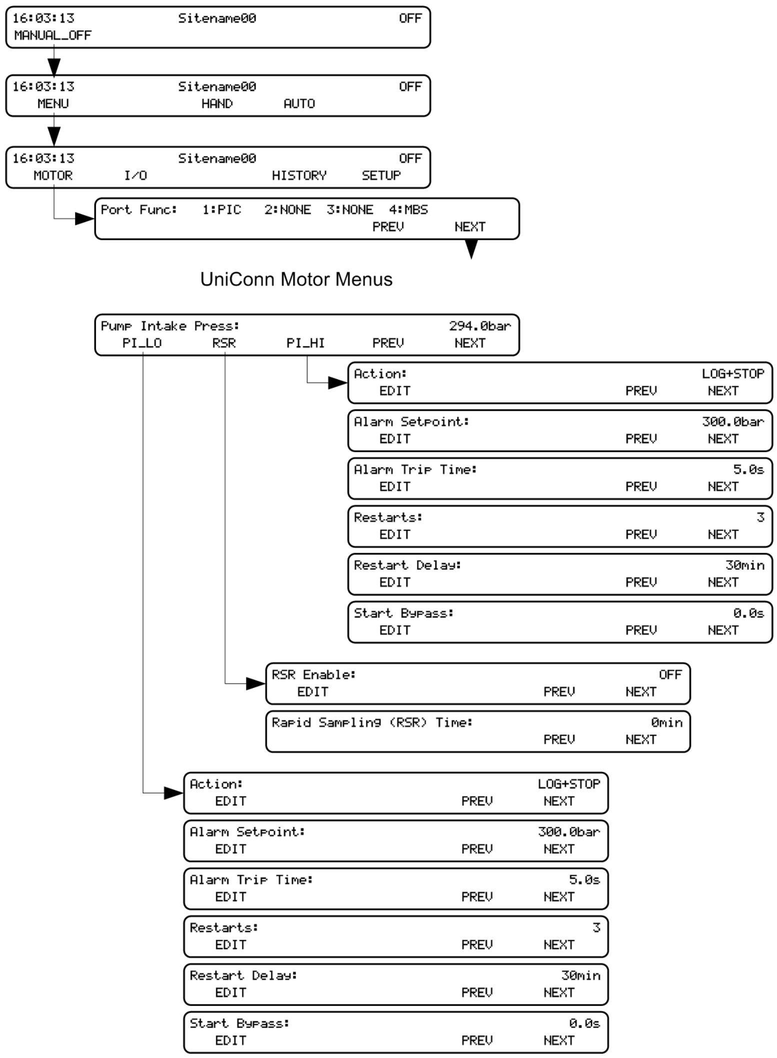


Figure B-24: UniConn PIC Screen Map #1

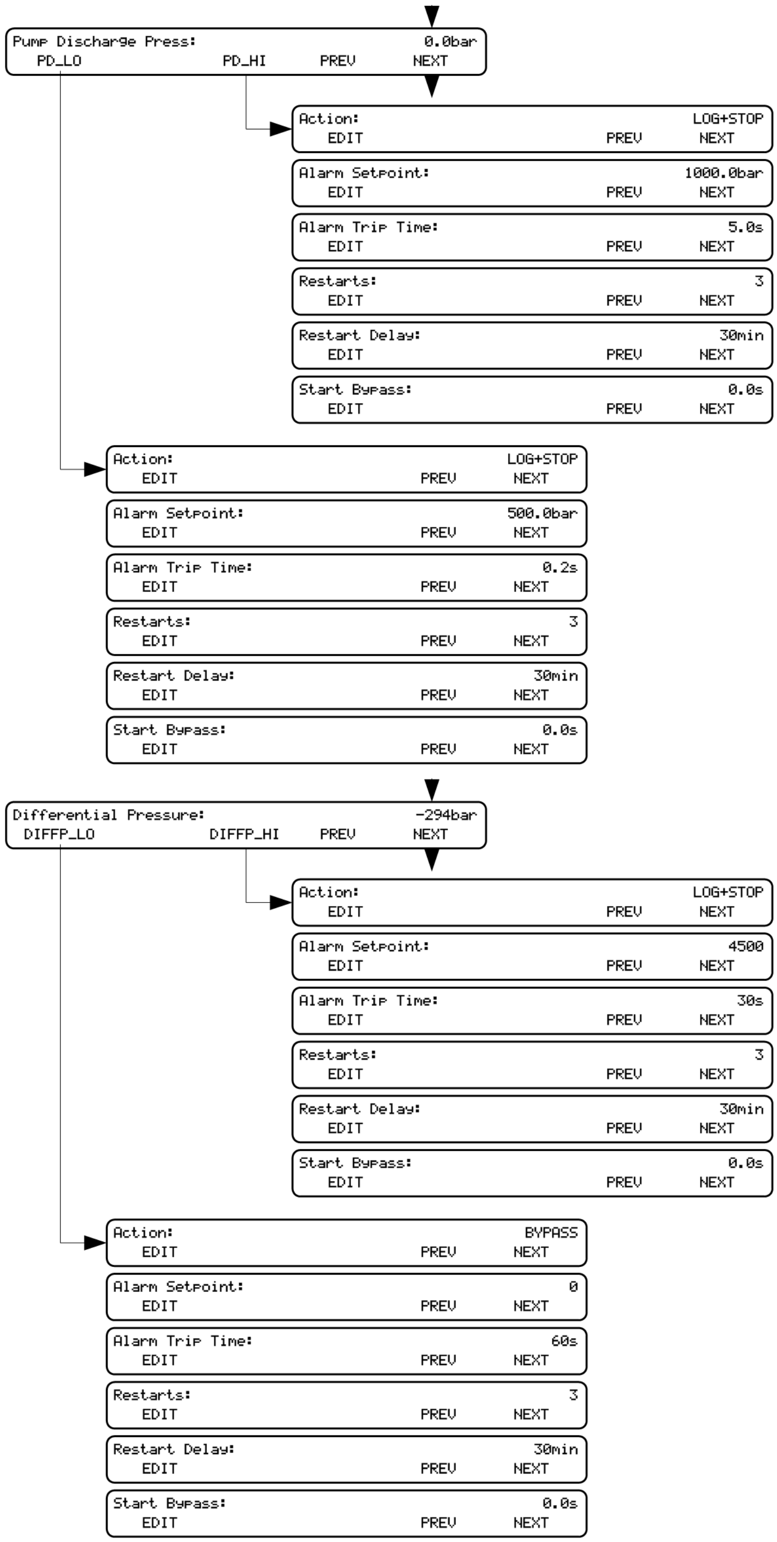


Figure B-25: UniConn PIC Screen Map #2

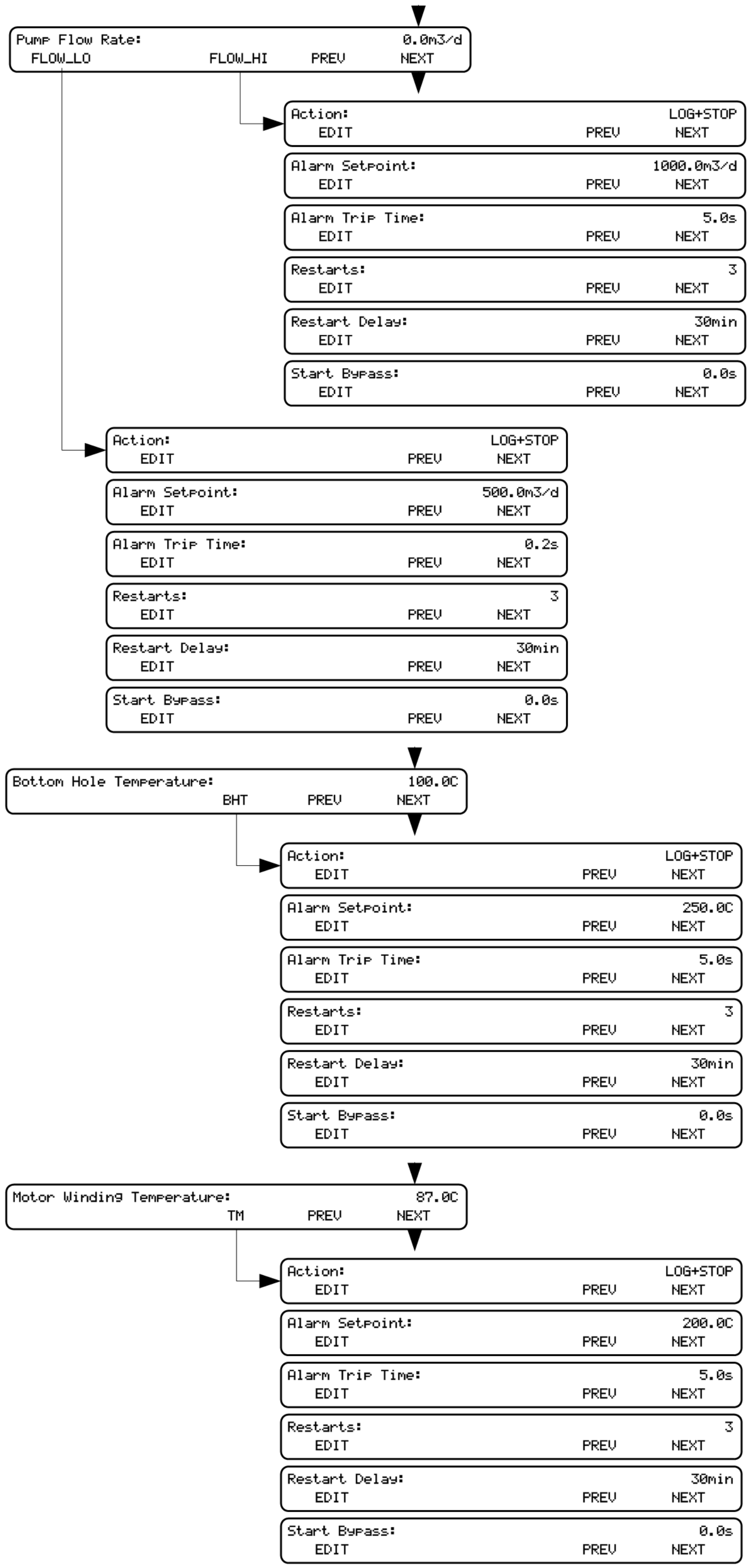


Figure B-26: UniConn PIC Screen Map #3

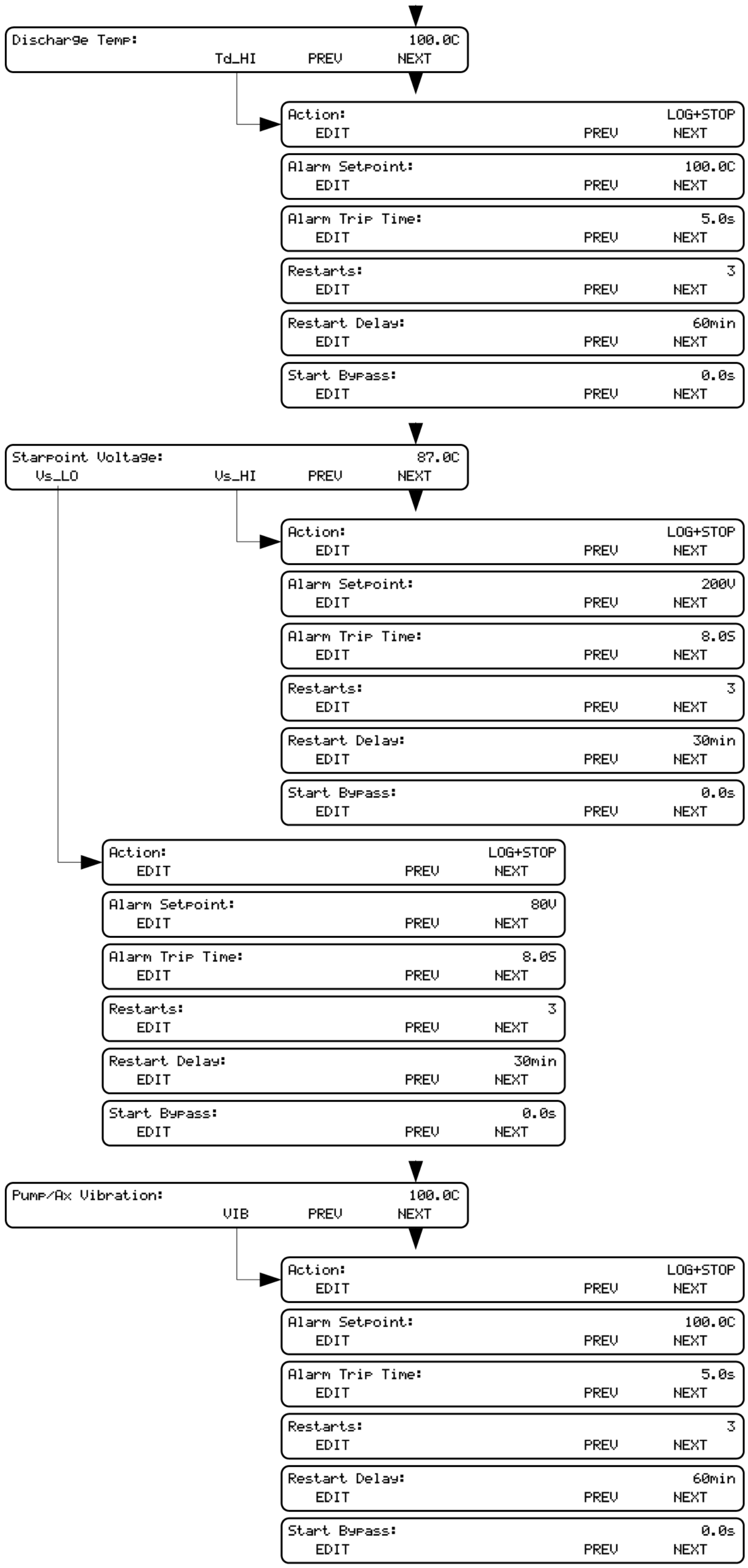


Figure B-27: UniConn PIC Screen Map #4

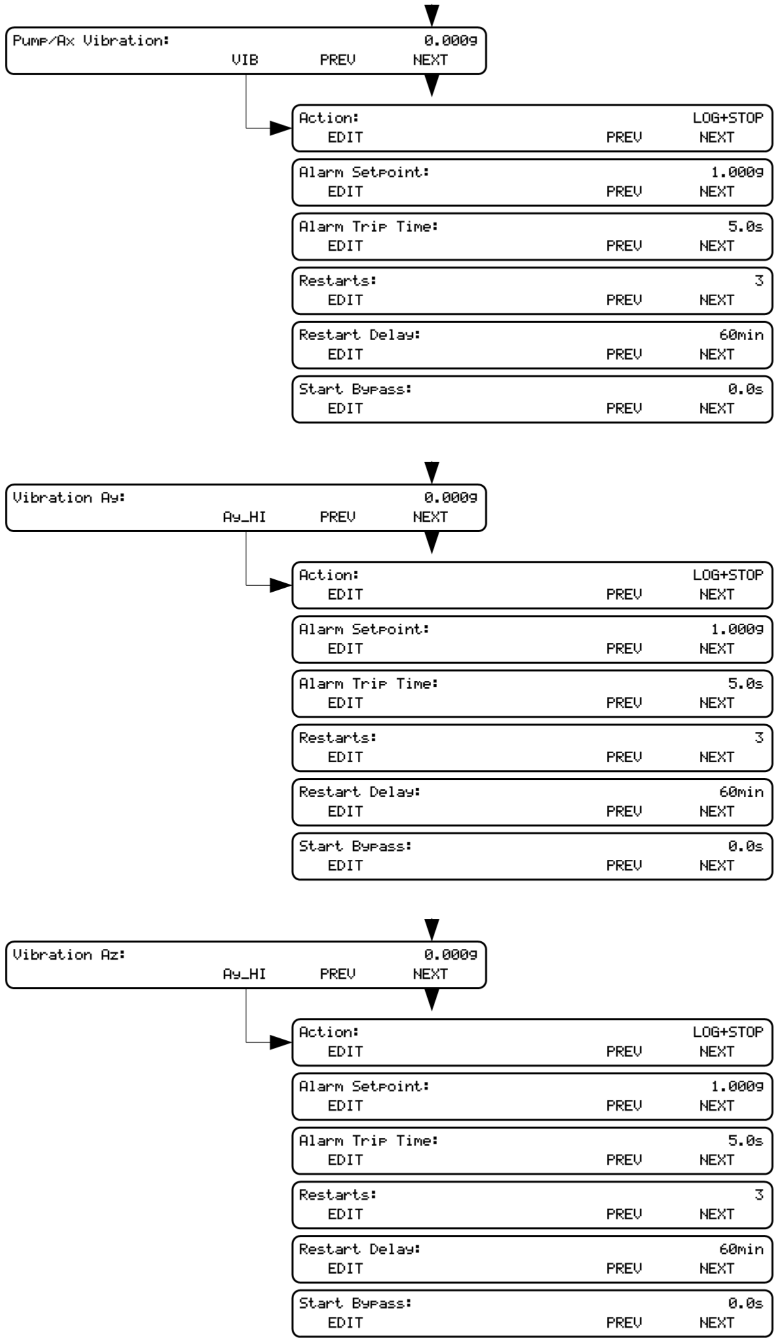


Figure B-28: UniConn PIC Screen Map #5

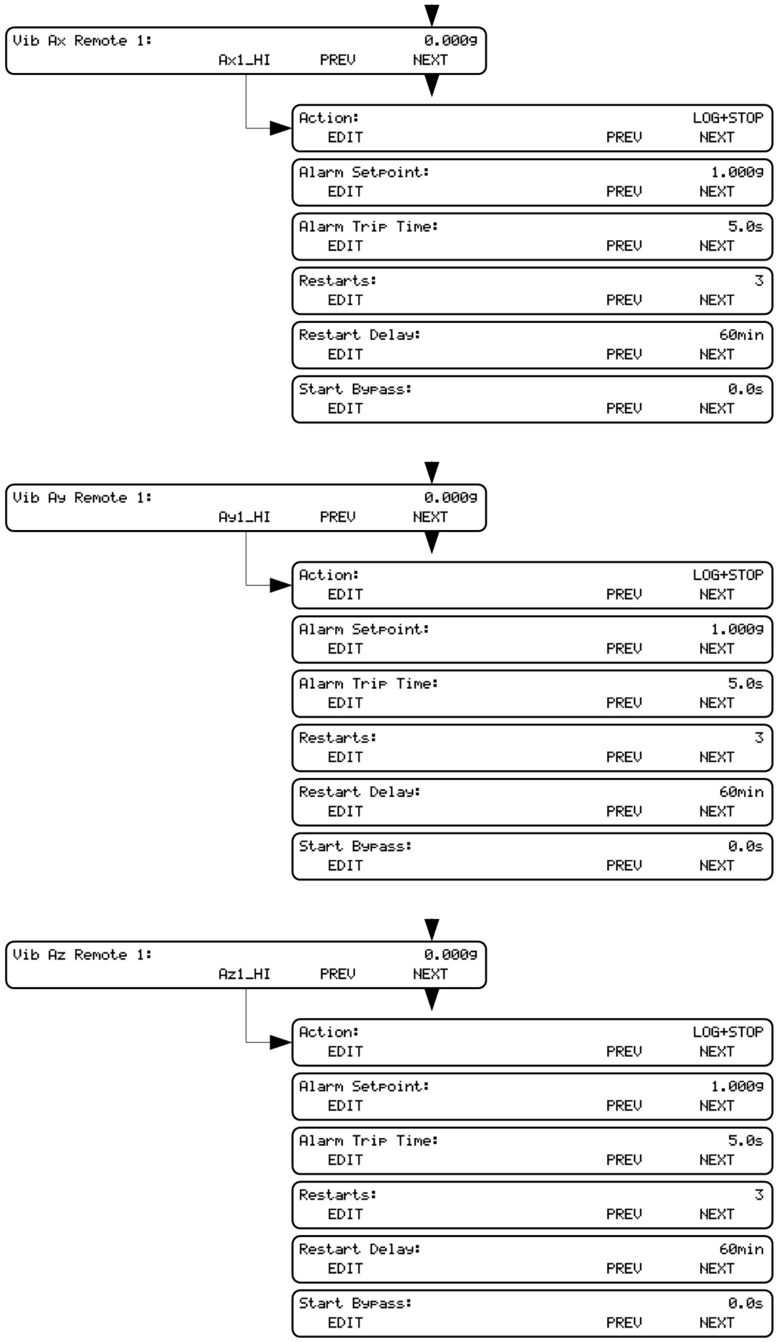


Figure B-29: UniConn PIC Screen Map #6

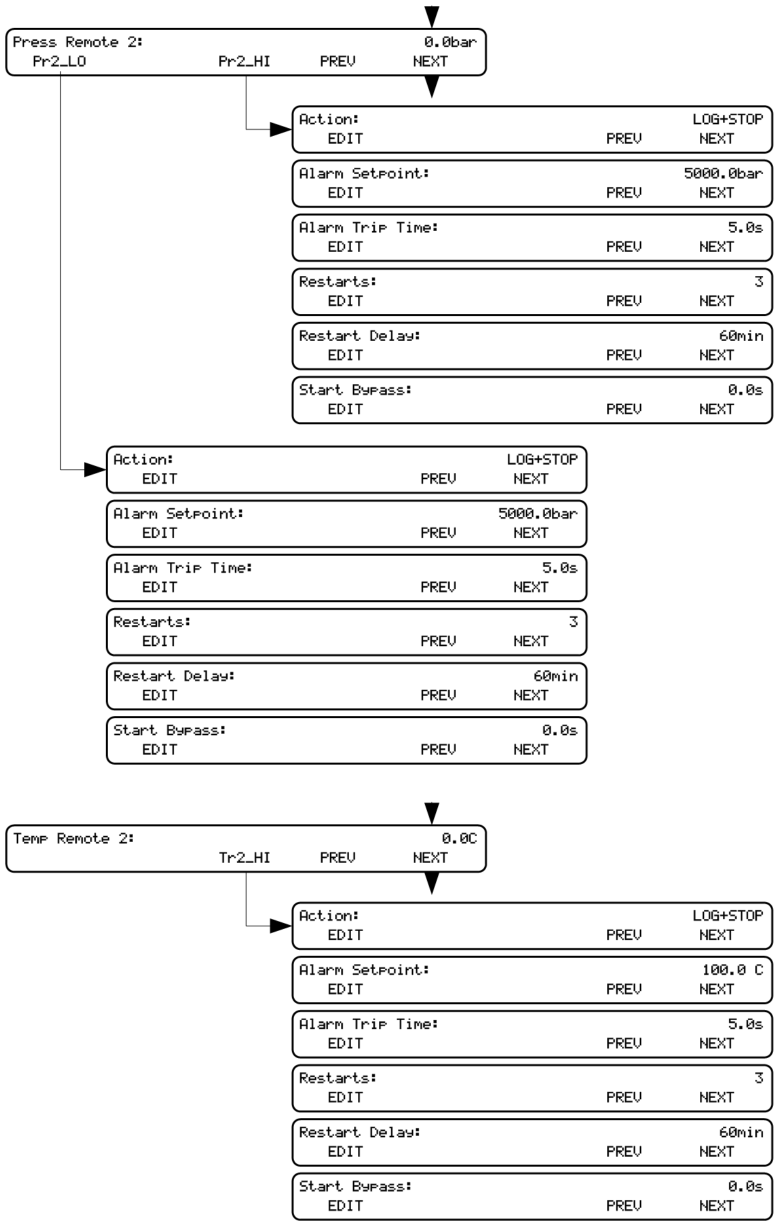


Figure B-30: UniConn PIC Screen Map #7

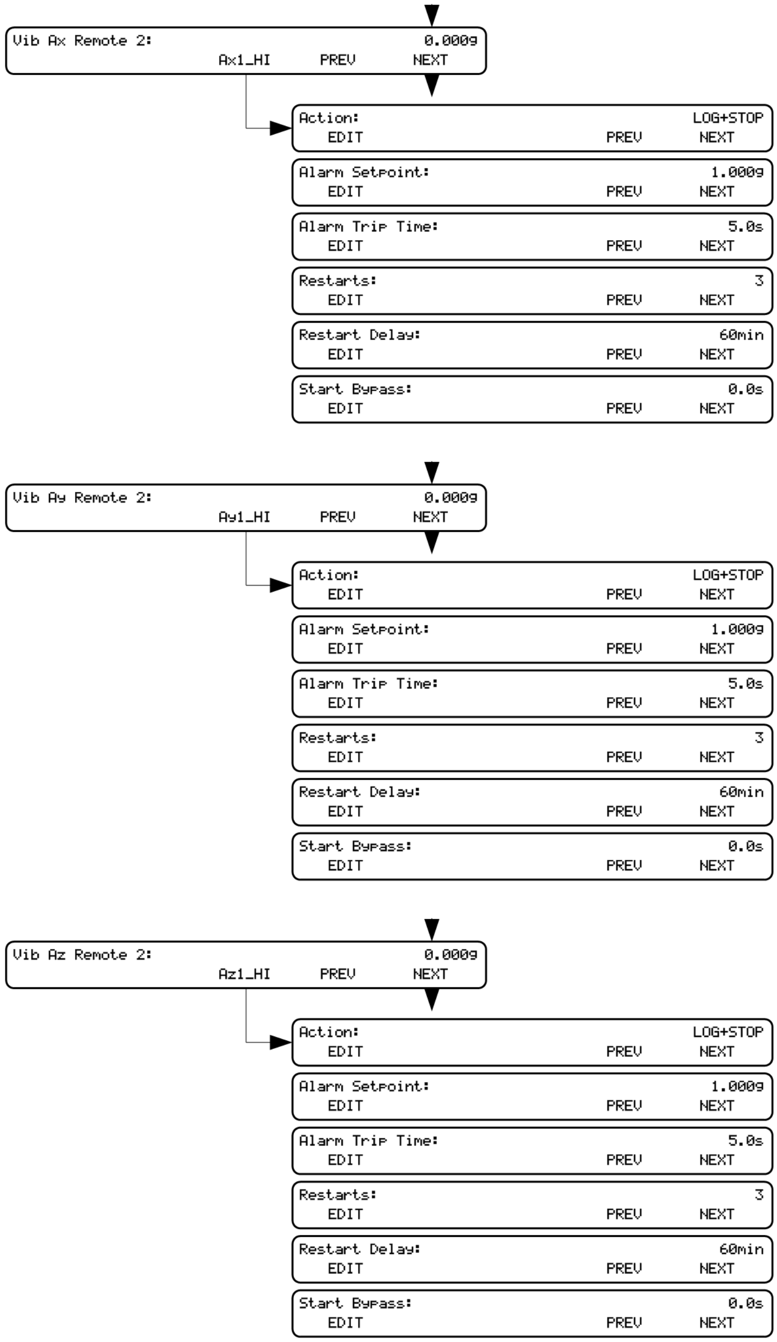


Figure B-31: UniConn PIC Screen Map #8

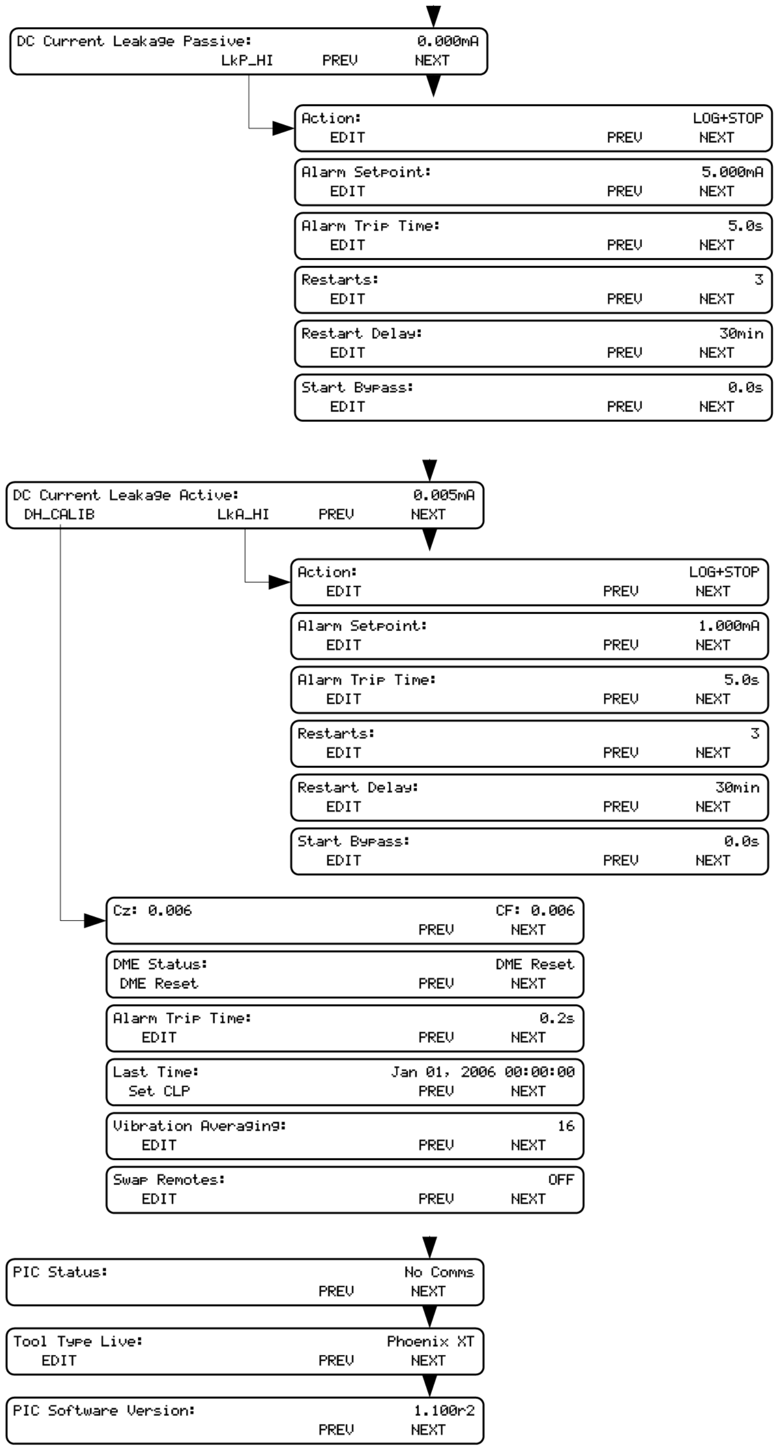


Figure B-32: UniConn PIC Screen Map #9

B.14 UniConn WellWatcher

Figure B-33: Status Screen and Figure B-34: Status Screen Continued show UniConn FIC status menu and port configuration menu.

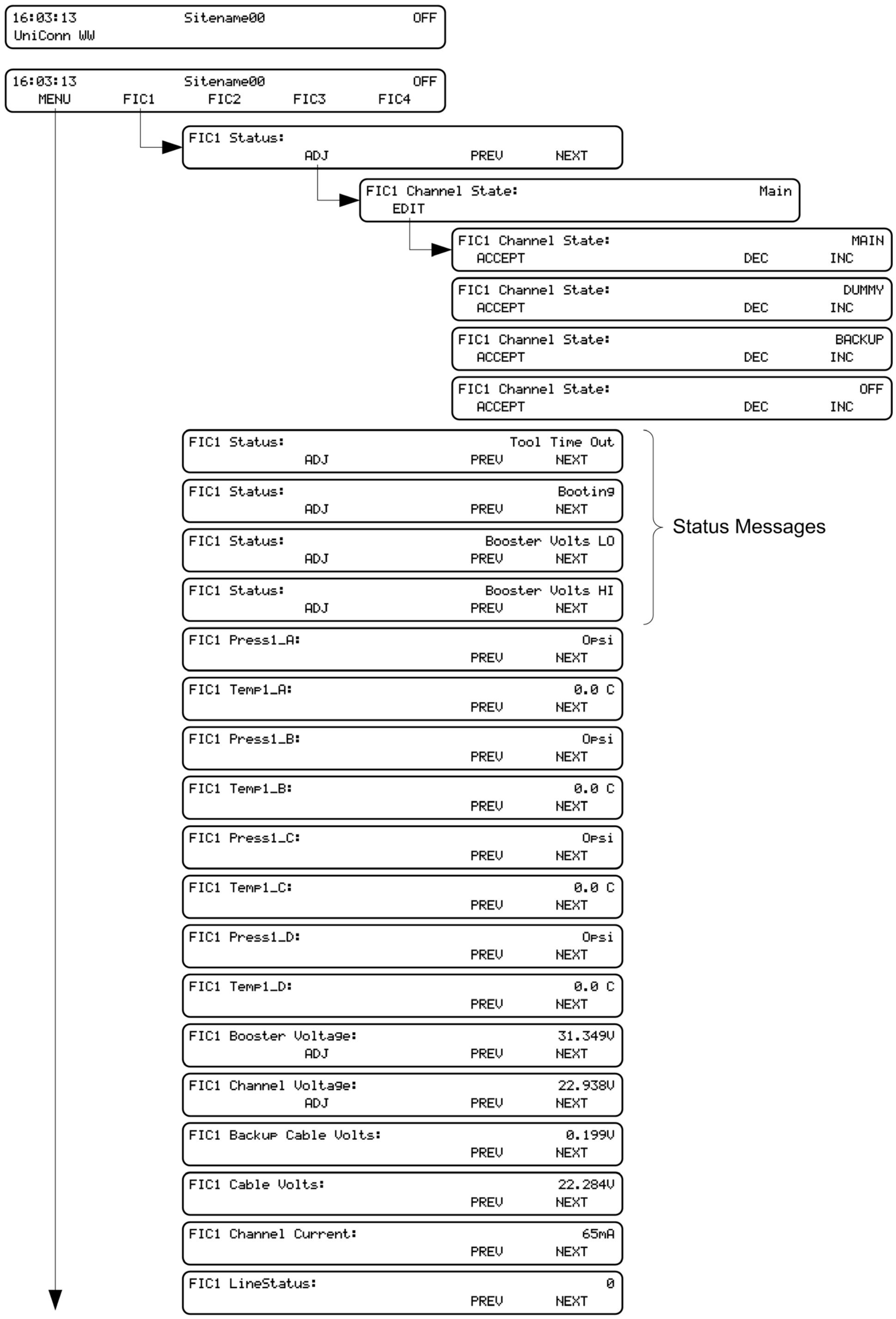


Figure B-33: Status Screen

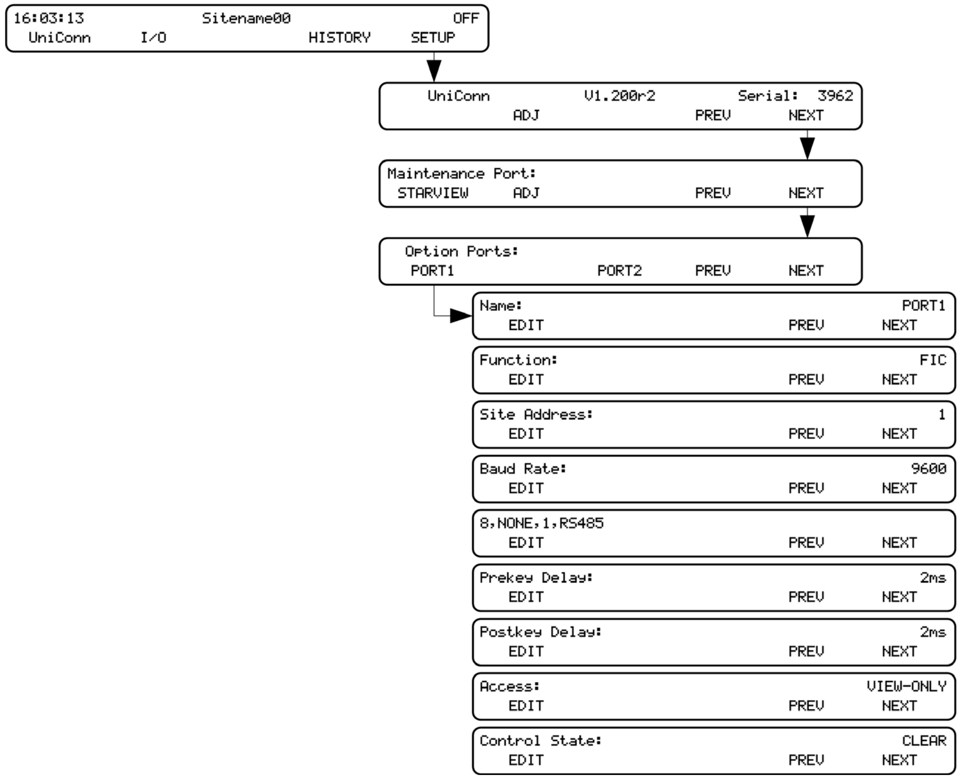


Figure B-34: Status Screen Continued

B.15 Variable Speed Drive Screen Map

B.15.1 VSD Configuration Screen Map

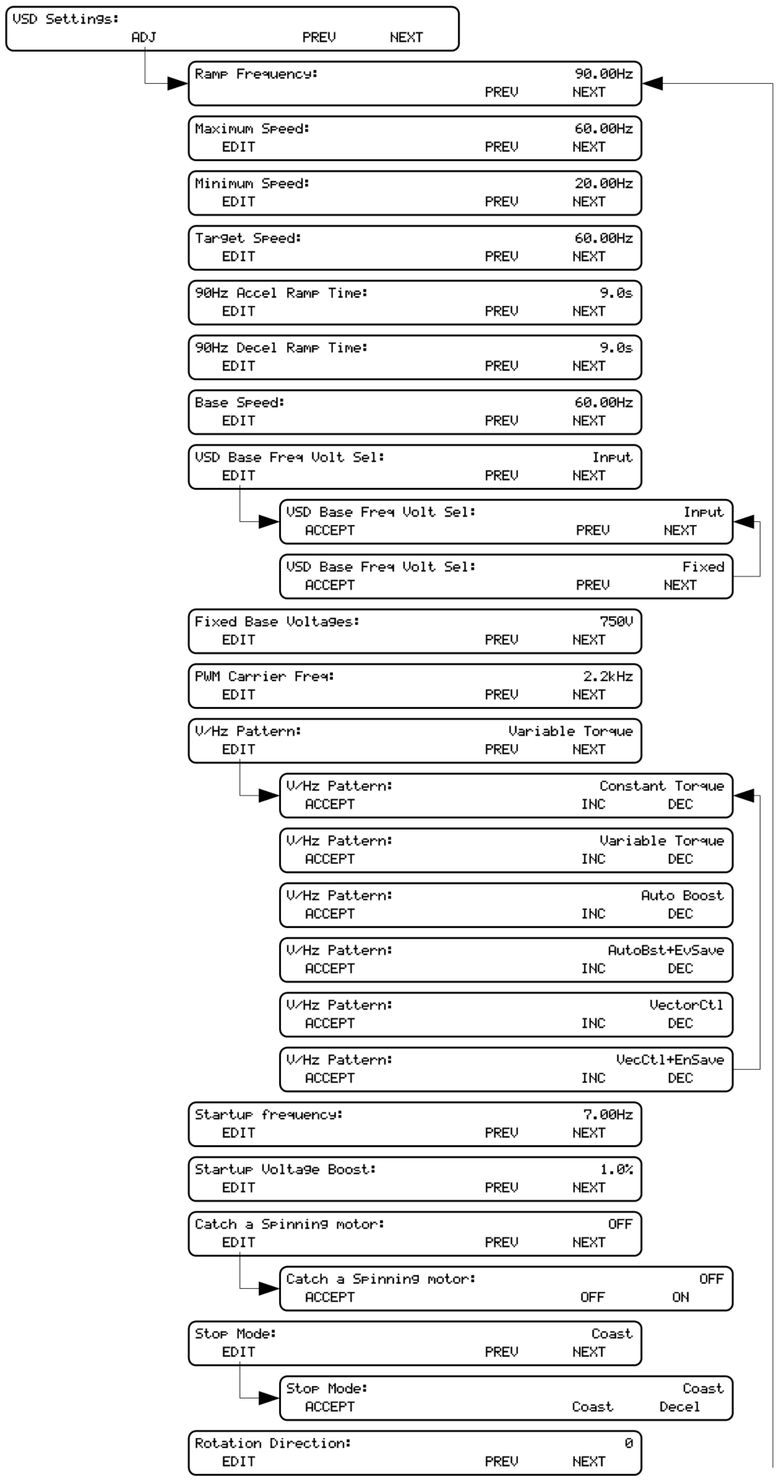


Figure B-35: UniConn VSD configuration. *Part 1*

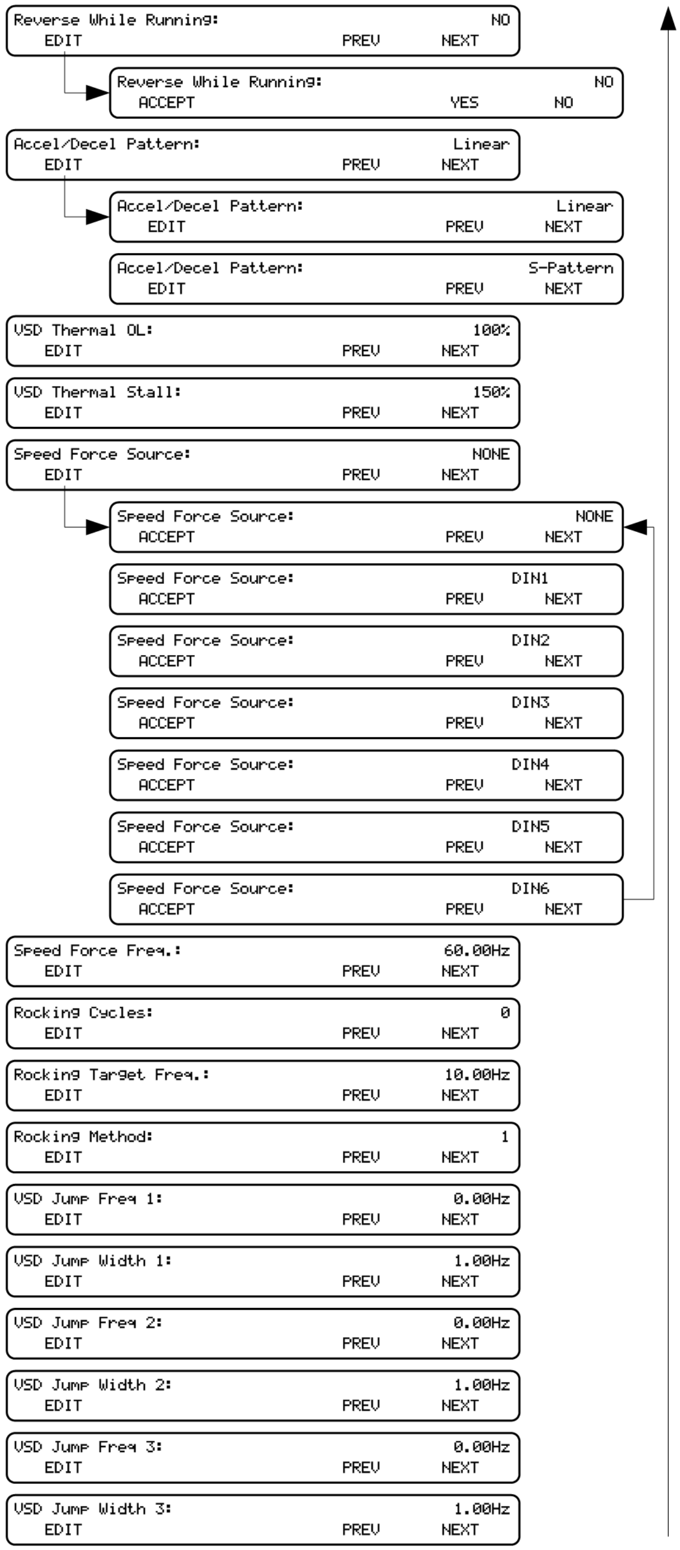


Figure B-36: UniConn VSD configuration. *Part 2*

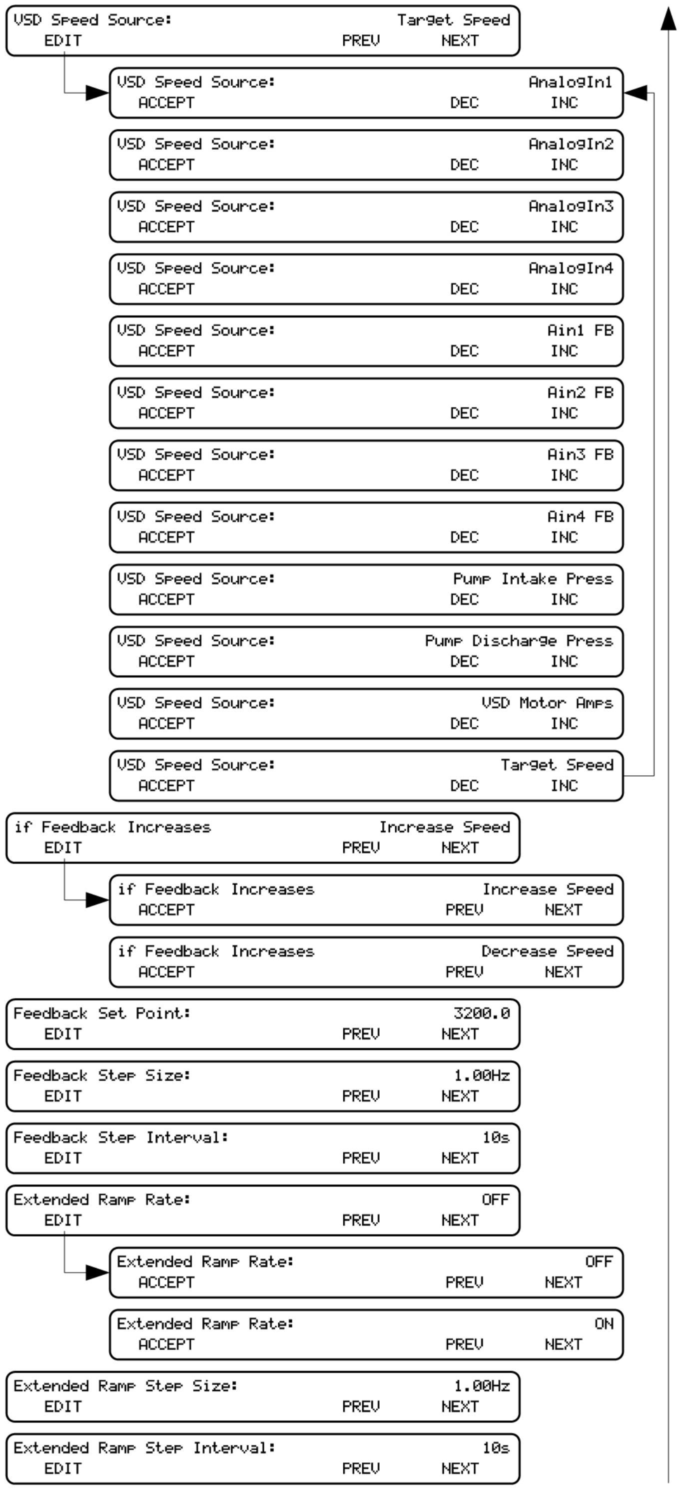


Figure B-37: UniConn VSD configuration. *Part 3*

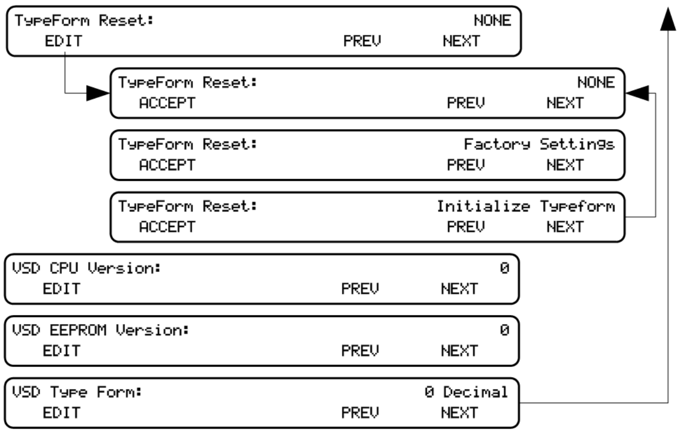


Figure B-38: UniConn VSD configuration. *Part 4*

B.15.2 VSD Operation Screen Map

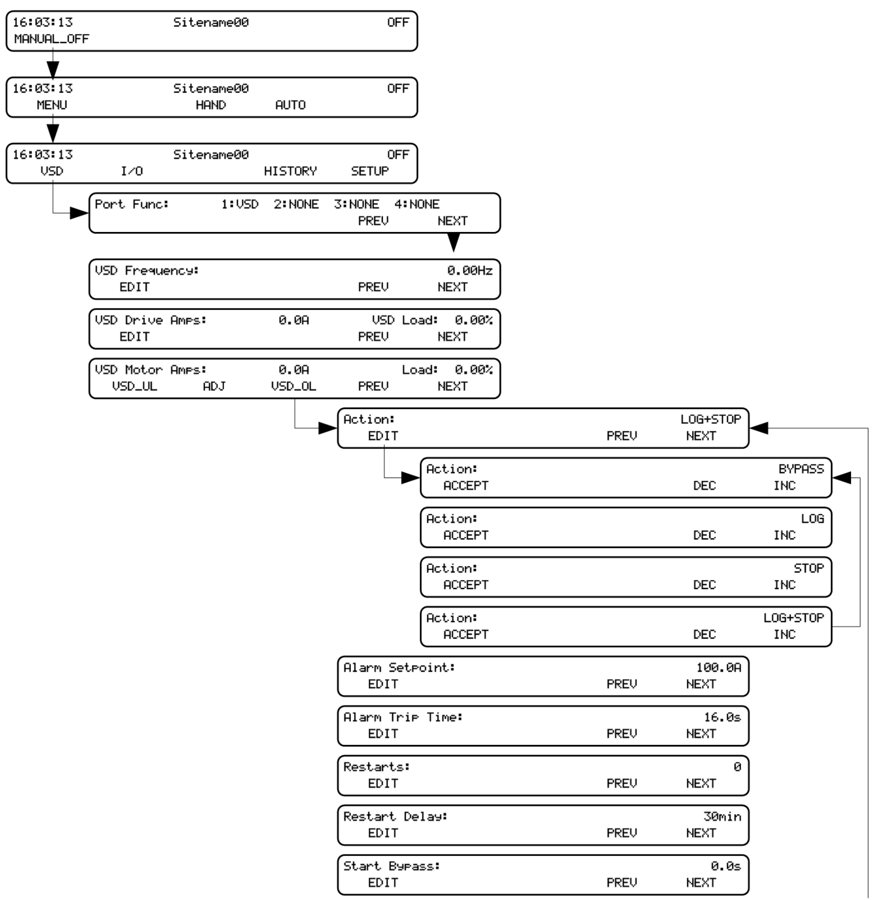


Figure B-39: UniConn VSD operation menu map

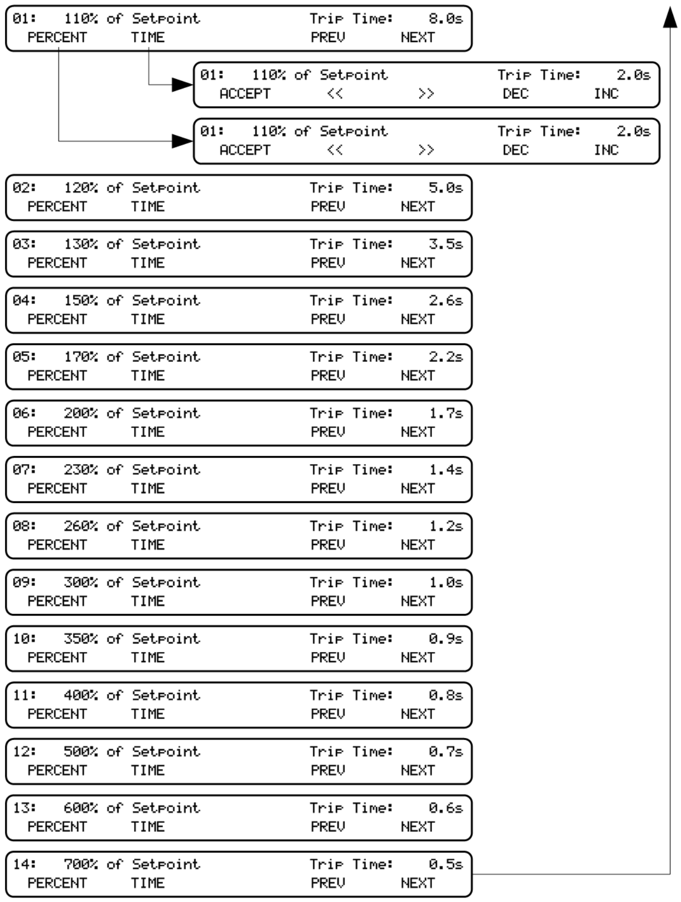


Figure B-40: UniConn VSD operation menu map. *VSD Motor Amps*

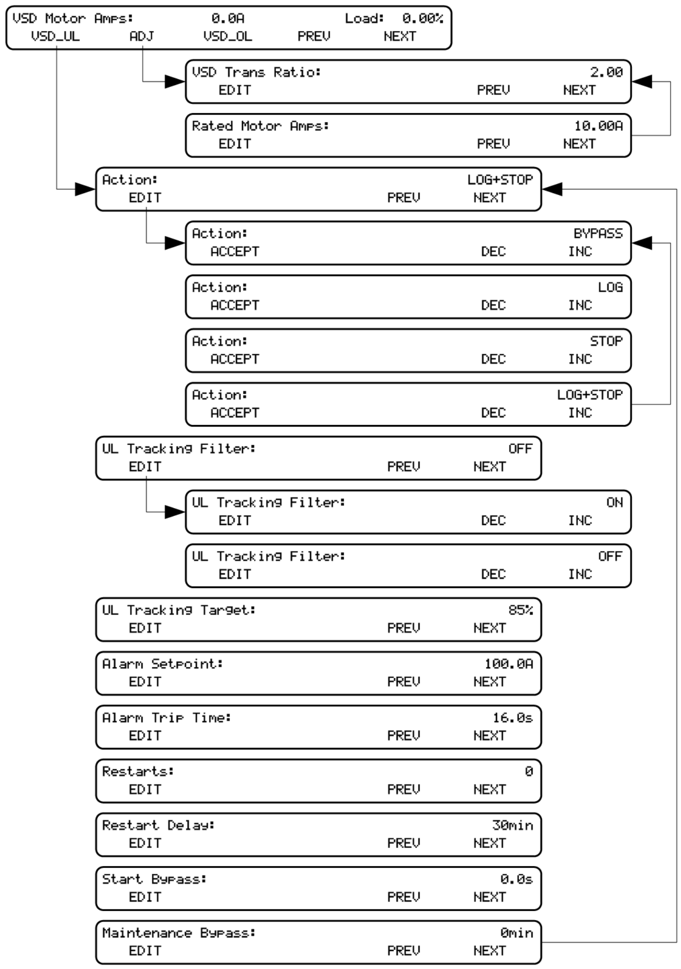


Figure B-41: UniConn VSD operation menu map

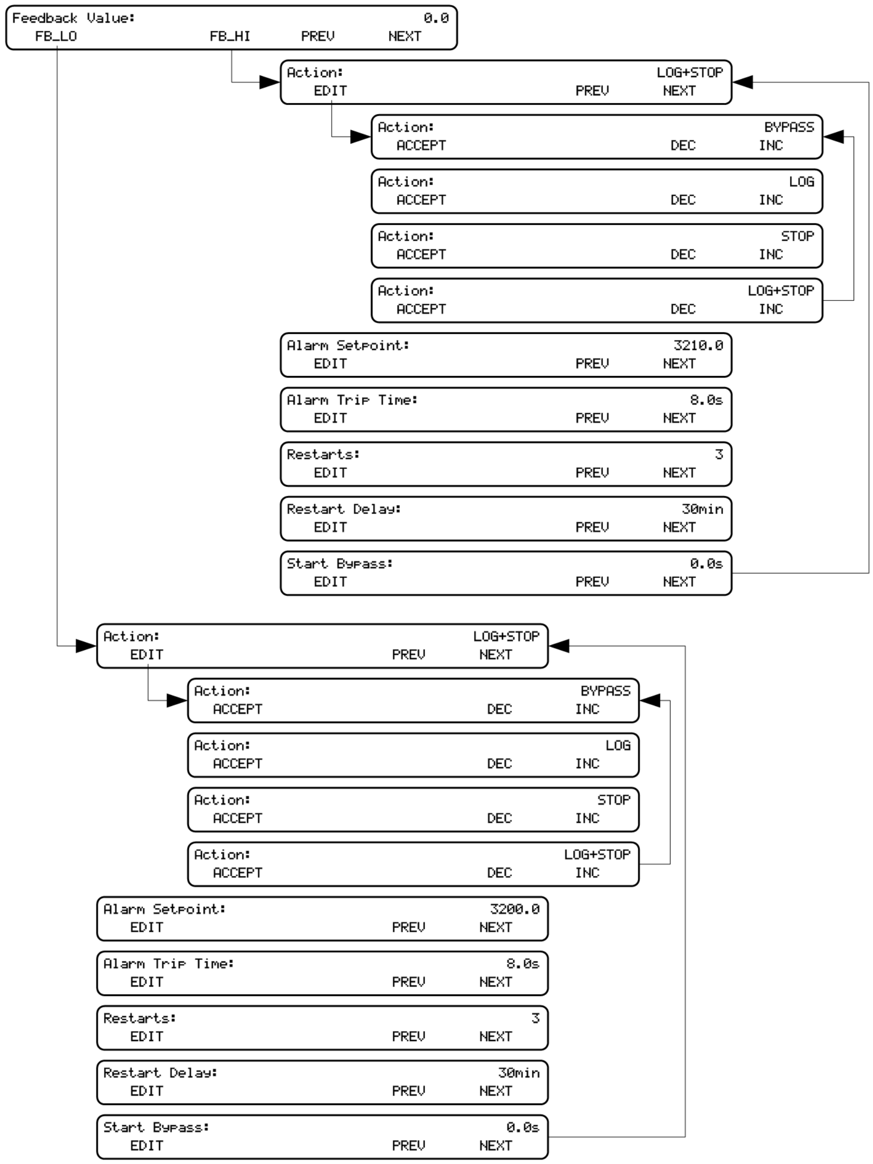


Figure B-42: UniConn VSD operation menu map. *Feedback Value*

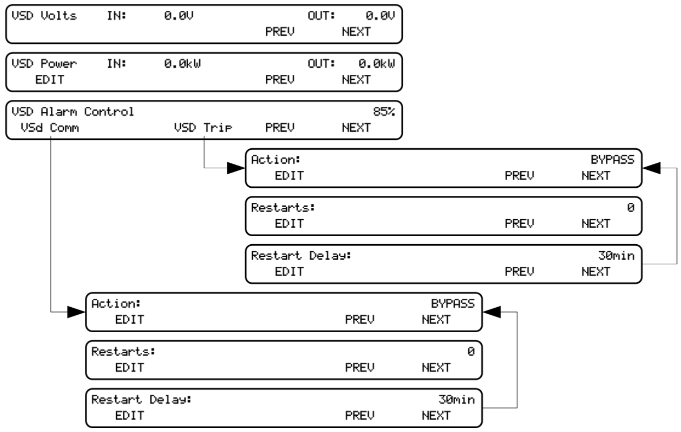


Figure B-43: UniConn VSD operation menu map

Modbus telemetry

C Modbus telemetry

Note
This section only provides a summary of the Modbus slave telemetry tables and alarm codes. For a complete and up-to-date list, refer to Telemetry Tables and Alarm Codes for the UniConn Controller(InTouch ID 4104120).

Legend for table heading **Type** .

Term	Definition
UINT	Unsigned integer. Length = 2 bytes
SINT	Signed integer Length = 2 bytes
UINT L	Unsigned integer long. Length = 4 bytes
DIS	Discrete. Length = 1 bit
FLOAT	Floating point (ANSI/IEEE Std 754-1985)

C.1 General

Table C-1: UniConn Status

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Remote Motor Stop	00001	MB1_SET_REMOTE	N/A	DIS	W	0	1	N/A
Clear Port Alarm	00002	mbwRelease	N/A	DIS	W	0	1	N/A
Remote Motor Start	00003	MB1_CLEAR_START	N/A	DIS	W	0	1	N/A
Clear Latched Motor Alarms	00004	MB1_CLEAR_LATCHES	N/A	DIS	W	0	1	N/A
Clear Motor Lockouts	00005	MB1_CLEAR_LOCKOUT	N/A	DIS	W	0	1	N/A
UniConn Locked Out?	10413	MB1_LOCKOUT	N/A	DIS	R	0	1	N/A
Controller Mode	10414	MB1_MANUALOFF	N/A	DIS	R	0	1	N/A
Controller Mode	10415	MB1_HAND	N/A	DIS	R	0	1	N/A
Controller Mode	10416	MB1_AUTO	N/A	DIS	R	0	1	N/A

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Motor Running Status	10432	MB1_CONTACTOR	N/A	DIS	R	0	1	N/A
Unit of Measurement	40054	mbwUnitPreference	N/A	UINT	RW	0	7	0
Latched Alarms 0	32041	mbwfLatches0	N/A	UINT	R	N/A	N/A	N/A
Latched Alarms 1	32042	mbwfLatches1	N/A	UINT	R	N/A	N/A	N/A
Latched Alarms 2	32043	mbwfLatches2	N/A	UINT	R	N/A	N/A	N/A
Latched Alarms 3	32044	mbwfLatches3	N/A	UINT	R	N/A	N/A	N/A
Latched Alarms 4	32045	mbwfLatches4	N/A	UINT	R	N/A	N/A	N/A
Alarms 0	32049	mbwfAlarms0	N/A	UINT	R	N/A	N/A	N/A
Alarms 1	32050	mbwfAlarms1	N/A	UINT	R	N/A	N/A	N/A
Alarms 2	32051	mbwfAlarms2	N/A	UINT	R	N/A	N/A	N/A
Alarms 3	32052	mbwfAlarms3	N/A	UINT	R	N/A	N/A	N/A
Alarms 4	32052	mbwfAlarms4	N/A	UINT	R	N/A	N/A	N/A
Number of Auto Restart Attempts Done	32065	mbwStarts	ea	UINT	R	0	65,535	N/A
No.of Allowed Auto restarts Attempts	32066	mbwActiveStarts	ea	UINT	R	0	65,535	N/A
Off Delay	32071	mbwMSWSecsOffDelay	sec.	UINT L	R	0	65,535	N/A
Time to Auto Restart	32073	mbwMSWSecsToStart	sec.	UINT L	R	0	65,535	N/A
Current Run Time	32077	mbwMSWSecsRunCycle	HH: MM: SS	UINT L	R	0		N/A
Current Off Time	32079	mbwMSWSecsOffCycle	HH: MM: SS	UINT L	R	0		N/A
Total Run Time	32081	mbwMSWSecsRunTotal	HH: MM: SS	UINT L	R	0		N/A
Total Off Time	32083	mbwMSWSecsOffTotal	HH: MM: SS	UINT L	R	0		N/A
Last shutdown Reason	32089	mbwShutdownLast	N/A	UINT	R	N/A	N/A	N/A
UniConn Internal Battery Voltage	32102	mbwUBattery	V/10	UINT	R	0	65,535	N/A
UniConn Internal Temperature	32103	mbwUTemperature	oC/oF	UINT	R	0	65,535	N/A

C.2 Automatic Start

Note

This section only provides a summary of the Modbus slave telemetry tables. For Modbus master telemetry tables, refer to Telemetry Tables and Alarm Codes for the UniConn Controller(InTouch ID 4104120).

Table C-2: Automatic Start

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Hold Start	40096	mbwStagger	sec.	UINT	R/W	0	30,000	0
Progressive Delay Increment	40097	mbwProgDelaySet	min.	UINT	R/W	0	1,000	0
Lockout Reset Runtime	40098	mbwTimerResetTime	min.	UINT	R/W	1	9,999	60
Soft-start delay	40099	mbwSoftStart	sec./10	UINT	R/W	0	36,000	20
Default Restart Attempt(s)	40101	mbwDefaultRetries	ea	UINT	R/W	0	25	3
Default Restart Delay	40102	mbwDefaultRetryTime	min.	UINT	R/W	1	3,000	30
Release Lockout via …	40051	MB1_EDITONLY _UNLOCK	N/A	DIS	R/W	0	1	
Manual Start Wait ?	40052	MB1_MANUAL_STARTS _WAIT	N/A	DIS	R/W	0	1	
Enable Auto Restarts ?	40053	MB1_AUTO_RESTARTS	N/A	DIS	R/W	0	1	
Allowed Auto restart Attempts	42067	mbwStartsAllowed	ea	UINT	RW	0	65,535	N/A
Progressive Time Dalay	42068	mbwProgDelay	min.	UINT	RW	0	65,535	N/A
Time to Auto Restart	32073	mbwMSWSecsToStart	sec.	UINT L	R	0	65,535	N/A

C.3 Power Supply

Table C-3: Power Supply. *General*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
UniConn Supply voltage	32104	mbwSupply	V	UINT	R	0	65,535	N/A
UniConn Supply Frequency	32105	mbwFrequency	Hz/10	UINT	R	0	65,535	N/A

Table C-4: Power Supply. *High Supply*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Trip Setpoint	40188	mbwSupplyHiTripPt	V	UINT	R/W	50	250	130
Trip Time	40189	mbwSupplyHiTripTime	sec./10	UINT	R/W	1	30,000	5
Trip Action	40190	mbwSupplyHiAction	N/A	UINT	R/W	0	3	3
Number of Restarts	40191	mbwSupplyHiRetries	ea	UINT	R/W	0	25	3
Restart Time	40192	mbwSupplyHiRetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass	40193	mbwSupplyHiStartDelay	sec./10	UINT	R/W	0	30,000	0

Table C-5: Power Supply. *Low Supply*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Trip Setpoint	40194	mbwSupplyLoTripPt	V	UINT	R/W	50	250	100
Trip Time	40195	mbwSupplyLoTripTime	sec./10	UINT	R/W	1	30,000	90
Trip Action	40196	mbwSupplyLoAction	N/A	UINT	R/W	0	3	3
Number of Restarts	40197	mbwSupplyLoRetries	ea	UINT	R/W	0	25	3
Restart Time	40198	mbwSupplyLoRetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass	40199	mbwSupplyLoStartDelay	sec./10	UINT	R/W	0	30,000	0
Curve Point1 Trip Level	40200	mbwSupplyLoPercent1	%	UINT	R/W	30	100	92
Curve Point1 Trip Time	40201	mbwSupplyLoSetTime1	sec./10	UINT	R/W	0	2,000	50
Curve Point2 Trip Level	40202	mbwSupplyLoPercent2	%	UINT	R/W	30	100	85
Curve Point2 Trip Time	40203	mbwSupplyLoSetTime2	sec./10	UINT	R/W	0	2,000	28
Curve Point3 Trip Level	40204	mbwSupplyLoPercent3	%	UINT	R/W	30	100	78

Curve Point3 Trip Time	40205	mbwSupplyLoSetTime3	sec./10	UINT	R/W	0	2,000	15
Curve Point4 Trip Level	40206	mbwSupplyLoPercent4	%	UINT	R/W	30	100	72
Curve Point4 Trip Time	40207	mbwSupplyLoSetTime4	sec./10	UINT	R/W	0	2,000	9
Curve Point5 Trip Level	40208	mbwSupplyLoPercent5	%	UINT	R/W	30	100	66
Curve Point5 Trip Time	40209	mbwSupplyLoSetTime5	sec./10	UINT	R/W	0	2,000	5
Curve Point6 Trip Level	40210	mbwSupplyLoPercent6	%	UINT	R/W	30	100	60
Curve Point6 Trip Time	40211	mbwSupplyLoSetTime6	sec./10	UINT	R/W	0	2,000	1

Table C-6: Power Supply. *Supply High Frequency*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Setpoint	40119	mbwFreqHiTripPt	Hz/10	UINT	R/W	400	900	650
Trip Time	40120	mbwFreqHiTripTime	sec./10	UINT	R/W	1	30,000	2
Trip Action	40121	mbwFreqHiAction	N/A	UINT	R/W	0	3	3
Number of Restarts	40122	mbwFreqHiRetries	ea	UINT	R/W	0	25	3
Restart Time	40123	mbwFreqHiRetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass	40124	mbwFreqHiStartDelay	sec./10	UINT	R/W	0	30,000	0

Table C-7: Power Supply. *Supply Low Frequency*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Setpoint	40125	mbwFreqLoTripPt	Hz/10	UINT	R/W	400	900	550
Trip Time	40126	mbwFreqLoTripTime	sec./10	UINT	R/W	1	30,000	2
Trip Action	40127	mbwFreqLoAction	N/A	UINT	R/W	0	3	3
Number of Restarts	40128	mbwFreqLoRetries	ea	UINT	R/W	0	25	3
Restart Time	40129	mbwFreqLoRetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass	40130	mbwFreqLoStartDelay	sec./10	UINT	R/W	0	30,000	0

C.4 Voltage Input

Table C-8: Voltage Input. *General*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
PT Rating (:120)	40144	mbwVoltsPT	V	UINT	R/W	120	6,000	1,000
Surface voltage - AB	32108	mbwVolts_AB	V	UINT	R	0	65,535	N/A
Surface voltage - BC	32109	mbwVolts_BC	V	UINT	R	0	65,535	N/A
Surface voltage - AC	32110	mbwVolts_CA	V	UINT	R	0	65,535	N/A
Surface voltage - average	32112	mbwVolts	V	UINT	R	0	65,535	N/A

Table C-9: Voltage Input. *Over volts*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Setpoint	40145	mbwVoltsHiTripPt	V	UINT	R/W	0	6,000	1,100
Trip Time	40146	mbwVoltsHiTripTime	sec./10	UINT	R/W	1	30,000	10
Trip Action	40147	mbwVoltsHiAction	N/A	UINT	R/W	0	3	3
Number of Restarts	40148	mbwVoltsHiRetries	ea	UINT	R/W	0	25	3
Restart Time	40149	mbwVoltsHiRetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass	40150	mbwVoltsHiStartDelay	sec./10	UINT	R/W	0	30,000	0

Table C-10: Voltage Input. *Under volts*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Setpoint	40151	mbwVoltsLoTripPt	V	UINT	R/W	0	6,000	900
Trip Time	40152	mbwVoltsLoTripTime	sec./10	UINT	R/W	1	30,000	40
Trip Action	40153	mbwVoltsLoAction	N/A	UINT	R/W	0	3	3

Number of Restarts	40154	mbwVoltsLoRetries	ea	UINT	R/W	0	25	3
Restart Time	40155	mbwVoltsLoRetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass	40156	mbwVoltsLoStartDelay	sec./10	UINT	R/W	0	30,000	0
Curve Point1 Trip Level	40157	mbwVoltsLoPercent1	%	UINT	R/W	30	100	92
Curve Point1 Trip Time	40158	mbwVoltsLoSetTime1	sec./10	UINT	R/W	0	2,000	23
Curve Point2 Trip Level	40159	mbwVoltsLoPercent2	%	UINT	R/W	30	100	85
Curve Point2 Trip Time	40160	mbwVoltsLoSetTime2	sec./10	UINT	R/W	0	2,000	12
Curve Point3 Trip Level	40161	mbwVoltsLoPercent3	%	UINT	R/W	30	100	78
Curve Point3 Trip Time	40162	mbwVoltsLoSetTime3	sec./10	UINT	R/W	0	2,000	7
Curve Point4 Trip Level	40163	mbwVoltsLoPercent4	%	UINT	R/W	30	100	72
Curve Point4 Trip Time	40164	mbwVoltsLoSetTime4	sec./10	UINT	R/W	0	2,000	4
Curve Point5 Trip Level	40165	mbwVoltsLoPercent5	%	UINT	R/W	30	100	66
Curve Point5 Trip Time	40166	mbwVoltsLoSetTime5	sec./10	UINT	R/W	0	2,000	2
Curve Point6 Trip Level	40167	mbwVoltsLoPercent6	%	UINT	R/W	30	100	60
Curve Point6 Trip Time	40168	mbwVoltsLoSetTime6	sec./10	UINT	R/W	0	2,000	1

Table C-11: Voltage Input. *Voltage unbalance*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Voltage unbalance	32111	mbwVoltsUnbal	%/10	UINT	R	0	65,535	N/A
Trip Setpoint	40169	mbwVoltsUnbalTripPt	%/10	UINT	R/W	10	1,000	40
Trip Time	40170	mbwVoltsUnbalTripTime	sec./10	UINT	R/W	1	30,000	40
Trip Action	40171	mbwVoltsUnbalAction	N/A	UINT	R/W	0	3	3
Number of Restarts	40172	mbwVoltsUnbalRetries	ea	UINT	R/W	0	25	3
Restart Time	40173	mbwVoltsUnbalRetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass	40174	mbwVoltsUnbalStartDelay	sec./10	UINT	R/W	0	30,000	0

Curve Point1 Trip Level	40175	mbwVoltsUnbalPercent1	%	UINT	R/W	100	999	150
Curve Point1 Trip Time	40176	mbwVoltsUnbalSetTime1	sec./10	UINT	R/W	0	2,000	20
Curve Point2 Trip Level	40177	mbwVoltsUnbalPercent2	%	UINT	R/W	100	999	200
Curve Point2 Trip Time	40178	mbwVoltsUnbalSetTime2	sec./10	UINT	R/W	0	2,000	12
Curve Point3 Trip Level	40179	mbwVoltsUnbalPercent3	%	UINT	R/W	100	999	300
Curve Point3 Trip Time	40180	mbwVoltsUnbalSetTime3	sec./10	UINT	R/W	0	2,000	6
Curve Point4 Trip Level	40181	mbwVoltsUnbalPercent4	%	UINT	R/W	100	999	400
Curve Point4 Trip Time	40182	mbwVoltsUnbalSetTime4	sec./10	UINT	R/W	0	2,000	3
Curve Point5 Trip Level	40183	mbwVoltsUnbalPercent5	%	UINT	R/W	100	999	500
Curve Point5 Trip Time	40184	mbwVoltsUnbalSetTime5	sec./10	UINT	R/W	0	2,000	2
Curve Point6 Trip Level	40185	mbwVoltsUnbalPercent6	%	UINT	R/W	100	999	800
Curve Point6 Trip Time	40186	mbwVoltsUnbalSetTime6	sec./10	UINT	R/W	0	2,000	1

C.5 Current Input

Table C-12: Current Input. *General*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
CT Rating (:5)	40215	mbwAmpsCT	A	UINT	R/W	5	2,000	100
Current - phase A	32113	mbwAmps_A	A	UINT	R	0	65,535	N/A
Current - phase B	32114	mbwAmps_B	A	UINT	R	0	65,535	N/A
Current - phase C	32115	mbwAmps_C	A	UINT	R	0	65,535	N/A
Current unbalance	32116	mbwAmpsUnbal	%/10	UINT	R	0	65,535	N/A
Current - average	32117	mbwAmps	A	UINT	R	0	65,535	N/A

Starting Current	32118	mbwStartAmps	A	UINT	R	0	65,535	N/A
Stall time	32119	mbwStallTime	sec./10	UINT	R	0	65,535	N/A

Table C-13: Current Input. *Motor*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Short Circuit Trip Setpoint	40216	mbwAmpsShortCctTripPt	A	UINT	R/W	0	12,000	600
Short Circuit Trip Time	40217	mbwAmpsShortCctTripTime	sec./10	UINT	R/W	0	30,000	4
Short Circuit Trip Action	40218	mbwAmpsShortCctAction	N/A	UINT	R/W	0	3	0
Stall Trip Setpoint	40219	mbwAmpsStallTripPt	A	UINT	R/W	0	12,000	300
Stall Trip Time	40220	mbwAmpsStallTripTime	sec./10	UINT	R/W	1	30,000	5
Stall Trip Action	40221	mbwAmpsStallAction	N/A	UINT	R/W	0	3	0

Table C-14: Current Input. *Overload*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Setpoint	40222	mbwAmpsHiTripPt	A	UINT	R/W	0	2,000	100
Trip Time	40223	mbwAmpsHiTripTime	sec./10	UINT	R/W	1	30,000	160
Trip Action	40224	mbwAmpsHiAction	N/A	UINT	R/W	0	3	3
Number of Restarts	40225	mbwAmpsHiRetries	ea	UINT	R/W	0	25	0
Restart Time	40226	mbwAmpsHiRetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass	40227	mbwAmpsHiStartDelay	sec./10	UINT	R/W	0	30,000	0
Curve Point1 Trip Level	40228	mbwAmpsHiPercent1	%	UINT	R/W	100	999	110
Curve Point1 Trip Time	40229	mbwAmpsHiSetTime1	sec./10	UINT	R/W	0	2,000	80
Curve Point2 Trip Level	40230	mbwAmpsHiPercent2	%	UINT	R/W	100	999	120
Curve Point2 Trip Time	40231	mbwAmpsHiSetTime2	sec./10	UINT	R/W	0	2,000	50

Curve Point3 Trip Level	40232	mbwAmpsHiPercent3	%	UINT	R/W	100	999	130
Curve Point3 Trip Time	40233	mbwAmpsHiSetTime3	sec./10	UINT	R/W	0	2,000	35
Curve Point4 Trip Level	40234	mbwAmpsHiPercent4	%	UINT	R/W	100	999	150
Curve Point4 Trip Time	40235	mbwAmpsHiSetTime4	sec./10	UINT	R/W	0	2,000	26
Curve Point5 Trip Level	40236	mbwAmpsHiPercent5	%	UINT	R/W	100	999	170
Curve Point5 Trip Time	40237	mbwAmpsHiSetTime5	sec./10	UINT	R/W	0	2,000	22
Curve Point6 Trip Level	40238	mbwAmpsHiPercent6	%	UINT	R/W	100	999	200
Curve Point6 Trip Time	40239	mbwAmpsHiSetTime6	sec./10	UINT	R/W	0	2,000	17
Curve Point7 Trip Level	40240	mbwAmpsHiPercent7	%	UINT	R/W	100	999	230
Curve Point7 Trip Time	40241	mbwAmpsHiSetTime7	sec./10	UINT	R/W	0	2,000	14
Curve Point8 Trip Level	40242	mbwAmpsHiPercent8	%	UINT	R/W	100	999	260
Curve Point8 Trip Time	40243	mbwAmpsHiSetTime8	sec./10	UINT	R/W	0	2,000	12
Curve Point9 Trip Level	40244	mbwAmpsHiPercent9	%	UINT	R/W	100	999	300
Curve Point9 Trip Time	40245	mbwAmpsHiSetTime9	sec./10	UINT	R/W	0	2,000	10
Curve Point10 Trip Level	40246	mbwAmpsHiPercent10	%	UINT	R/W	100	999	350
Curve Point10 Trip Time	40247	mbwAmpsHiSetTime10	sec./10	UINT	R/W	0	2,000	9
Curve Point11 Trip Level	40248	mbwAmpsHiPercent11	%	UINT	R/W	100	999	400
Curve Point11 Trip Time	40249	mbwAmpsHiSetTime11	sec./10	UINT	R/W	0	2,000	8
Curve Point12 Trip Level	40250	mbwAmpsHiPercent12	%	UINT	R/W	100	999	500
Curve Point12 Trip Time	40251	mbwAmpsHiSetTime12	sec./10	UINT	R/W	0	2,000	7
Curve Point13 Trip Level	40252	mbwAmpsHiPercent13	%	UINT	R/W	100	999	600
Curve Point13 Trip Time	40253	mbwAmpsHiSetTime13	sec./10	UINT	R/W	0	2,000	6

Curve Point14 Trip Level	40254	mbwAmpsHiPercent14	%	UINT	R/W	100	999	700
Curve Point14 Trip Time	40255	mbwAmpsHiSetTime14	sec./10	UINT	R/W	0	2,000	5

Table C-15: Current Input. *Underload*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Setpoint	40256	mbwAmpsLoTripPt	A	UINT	R/W	0	1600	50
Trip Time	40257	mbwAmpsLoTripTime	sec./10	UINT	R/W	1	30000	80
Trip Action	40258	mbwAmpsLoAction	N/A	UINT	R/W	0	3	3
Number of Restarts	40259	mbwAmpsLoRetries	ea	UINT	R/W	0	25	3
Restart Time	40260	mbwAmpsLoRetryTime	min.	UINT	R/W	1	3000	30
Start Bypass	40261	mbwAmpsLoStartDelay	sec./10	UINT	R/W	0	30000	0
Maintenance Bypass	40262	mbwAmpsLoMaintenance Delay	min.	UINT	R/W	0	6000	0

Table C-16: Current Input. *Unbalance*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Trip Setpoint	40265	mbwAmpsUnbalTripPt	%/10	UINT	R/W	10	1000	200
Trip Time	40266	mbwAmpsUnbalTripTime	sec./10	UINT	R/W	1	30000	20
Trip Action	40267	mbwAmpsUnbalAction	N/A	UINT	R/W	0	3	3
Number of Restarts	40268	mbwAmpsUnbalRetries	ea	UINT	R/W	0	25	0
Restart Time	40269	mbwAmpsUnbalRetryTime	min.	UINT	R/W	1	3000	30
Start Bypass	40270	mbwAmpsUnbalStartDelay	sec./10	UINT	R/W	0	30000	8

Table C-17: Current Input. *Rotation*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Trip Setpoint	10041	MB1_ROTATION_TRIPPT	N/A	UINT	R/W	0	1	0

Detection Source	10042	MB1_ROTATION_SRC_I	N/A	DIS	R/W	0	1	0
Trip Action	40131	mbwRotationAction	N/A	UINT	R/W	0	3	2

C.6 Backspin

Table C-18: Backspin. *Motor Spin*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Frequency w/Motor OFF	32106	mbwSpin	Hz/10	UINT	R	0	65,535	N/A
Frequency Trip Setpoint	40212	mbwSpinTripPt	Hz/10	UINT	R/W	3	1,000	20
Frequency Clear Time	40213	mbwSpinClearTime	sec./10	UINT	R/W	150	30,000	300
Frequency Trip Action	40214	mbwSpinAction	N/A	UINT	R/W	0	3	3

Table C-19: Ground Unbalance. *Leg Ground*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Leg Ground	32120	mbwGroundUnbal	%/10	UINT	R	0	65,535	N/A
Trip Setpoint	40132	mbwGroundUnbalTripPt	%/10	UINT	R/W	0	1,000	400
Trip Time	40133	mbwGroundUnbalTripTime	sec./10	UINT	R/W	1	30,000	5
Trip Action	40134	mbwGroundUnbalAction	N/A	UINT	R/W	0	3	3
Number of Restarts	40135	mbwGroundUnbalRetries	ea	UINT	R/W	0	25	3
Restart Time	40136	mbwGroundUnbalRetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass	40137	mbwGroundUnbalStartDelay	sec./10	UINT	R/W	0	30,000	0

C.7 Digital Output

Table C-20: Digital Output. *Digital 1*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Name	41040 - 41044	mbwDOut1Name	unitless	UINT	R/W	N/A	N/A

Note
Digital Output 1 is reserved for contactor operation and does not support the same parameters as Digital Output 2, 3, 4.

Table C-21: Digital Output. *Digital 2*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Action	40116	mbwDOut2Action	unitless	UINT	R/W	0	8
Source	40468	mbwRelay2AlarmSrc	unitless	UINT	R/W	0	3
Name	41045 - 41049	mbwDOut2Name	unitless	UINT	R/W	N/A	N/A

Table C-22: Digital Output. *Digital 3*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Source	40469	mbwRelay3AlarmSrc	unitless	UINT	R/W	0	3
Action	40117	mbwDOut3Action	unitless	UINT	R/W	0	8
Name	41050 - 41054	mbwDOut2Name	unitless	UINT	R/W	N/A	N/A

Table C-23: Digital Output. *Digital 4*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Action	40118	mbwDOut4Action	unitless	UINT	R/W	0	8
Source	40470	mbwRelay4AlarmSrc	unitless	UINT	R/W	0	3
Name	41055 - 41059	mbwDOut4Name	unitless	UINT	R/W	N/A	N/A

C.8 Analog Input

Table C-24: Analog Input. *Analog 1*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
High Raw Value	40271	mbwAIn1HiRaw	%/100	UINT	R/W	0	11,000
Low Raw Value	40272	mbwAIn1LoRaw	%/100	UINT	R/W	0	10,000
High Engineering Value	40273	mbwAIn1HiEng	unitless	UINT	R/W	0	65,535
Low Engineering Value	40274	mbwAIn1LoEng	unitless	UINT	R/W	0	65,535
High Trip Setpoint	40275	mbwAIn1HiTripPt	unitless	UINT	R/W	0	65,535
High Trip Time	40276	mbwAIn1HiTripTime	sec./10	UINT	R/W	1	30,000
High Trip Action	40277	mbwAIn1HiAction	unitless	UINT	R/W	0	3
High Trip Number of Restarts	40278	mbwAIn1HiRetries	ea	UINT	R/W	0	25
High Trip Restart Time	40279	mbwAIn1HiRetryTime	min.	UINT	R/W	1	3,000
High Trip Start Bypass	40280	mbwAIn1HiStartDelay	sec./10	UINT	R/W	0	30,000
Low Trip Setpoint	40281	mbwAIn1LoTripPt	unitless	UINT	R/W	0	65,535
Low Trip Time	40282	mbwAIn1LoTripTime	sec./10	UINT	R/W	1	30,000

Low Trip Action	40283	mbwAIn1LoAction	unitless	UINT	R/W	0	3
Low Trip Number of Restarts	40284	mbwAIn1LoRetries	ea	UINT	R/W	0	25
Low Trip Restart Time	40285	mbwAIn1LoRetryTime	min.	UINT	R/W	1	3,000
Low Trip Start Bypass	40286	mbwAIn1LoStartDelay	sec./10	UINT	R/W	0	30,000

Table C-25: Analog Input. *Analog 2*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
High Raw Value	40287	mbwAIn2HiRaw	%/100	UINT	R/W	0	11,000
Low Raw Value	40288	mbwAIn2LoRaw	%/100	UINT	R/W	0	10,000
High Engineering Value	40289	mbwAIn2HiEng	unitless	UINT	R/W	0	65,535
Low Engineering Value	40290	mbwAIn2LoEng	unitless	UINT	R/W	0	65,535
High Trip Setpoint	40291	mbwAIn2HiTripPt	unitless	UINT	R/W	0	65,535
High Trip Time	40292	mbwAIn2HiTripTime	sec./10	UINT	R/W	1	30,000
High Trip Action	40293	mbwAIn2HiAction	unitless	UINT	R/W	0	3
High Trip Number of Restarts	40294	mbwAIn2HiRetries	ea	UINT	R/W	0	25
High Trip Restart Time	40295	mbwAIn2HiRetryTime	min.	UINT	R/W	1	3,000
High Trip Start Bypass	40296	mbwAIn2HiStartDelay	sec./10	UINT	R/W	0	30,000
Low Trip Setpoint	40297	mbwAIn2LoTripPt	unitless	UINT	R/W	0	65,535
Low Trip Time	40298	mbwAIn2LoTripTime	sec./10	UINT	R/W	1	30,000
Low Trip Action	40299	mbwAIn2LoAction	unitless	UINT	R/W	0	3
Low Trip Number of Restarts	40300	mbwAIn2LoRetries	ea	UINT	R/W	0	25

Low Trip Restart Time	40301	mbwAIn2LoRetryTime	min.	UINT	R/W	1	3,000
Low Trip Start Bypass	40302	mbwAIn2LoStartDelay	sec./10	UINT	R/W	0	30,000

Table C-26: Analog Input. *Analog 3*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
High Raw Value	40303	mbwAIn3HiRaw	%/100	UINT	R/W	0	11,000
Low Raw Value	40304	mbwAIn3LoRaw	%/100	UINT	R/W	0	10,000
High Engineering Value	40305	mbwAIn3HiEng	unitless	UINT	R/W	0	65,535
Low Engineering Value	40306	mbwAIn3LoEng	unitless	UINT	R/W	0	65,535
High Trip Setpoint	40307	mbwAIn3HiTripPt	unitless	UINT	R/W	0	65,535
High Trip Time	40308	mbwAIn3HiTripTime	sec./10	UINT	R/W	1	30,000
High Trip Action	40309	mbwAIn3HiAction	unitless	UINT	R/W	0	3
High Trip Number of Restarts	40310	mbwAIn3HiRetries	ea	UINT	R/W	0	25
High Trip Restart Time	40311	mbwAIn3HiRetryTime	min.	UINT	R/W	1	3,000
High Trip Start Bypass	40312	mbwAIn3HiStartDelay	sec./10	UINT	R/W	0	30,000
Low Trip Setpoint	40313	mbwAIn3LoTripPt	unitless	UINT	R/W	0	65,535
Low Trip Time	40314	mbwAIn3LoTripTime	sec./10	UINT	R/W	1	30,000
Low Trip Action	40315	mbwAIn3LoAction	unitless	UINT	R/W	0	3
Low Trip Number of Restarts	40316	mbwAIn3LoRetries	ea	UINT	R/W	0	25
Low Trip Restart Time	40317	mbwAIn3LoRetryTime	min.	UINT	R/W	1	3,000
Low Trip Start Bypass	40318	mbwAIn3LoStartDelay	sec./10	UINT	R/W	0	30,000

Table C-27: Analog Input. *Analog 4*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
High Raw Value	40319	mbwAIn4HiRaw	%/100	UINT	R/W	0	11,000
Low Raw Value	40320	mbwAIn4LoRaw	%/100	UINT	R/W	0	10,000
High Engineering Value	40321	mbwAIn4HiEng	unitless	UINT	R/W	0	65,535
Low Engineering Value	40322	mbwAIn4LoEng	unitless	UINT	R/W	0	65,535
High Trip Setpoint	40323	mbwAIn4HiTripPt	unitless	UINT	R/W	0	65,535
High Trip Time	40324	mbwAIn4HiTripTime	sec./10	UINT	R/W	1	30,000
High Trip Action	40325	mbwAIn4HiAction	unitless	UINT	R/W	0	3
High Trip Number of Restarts	40326	mbwAIn4HiRetries	ea	UINT	R/W	0	25
High Trip Restart Time	40327	mbwAIn4HiRetryTime	min.	UINT	R/W	1	3,000
High Trip Start Bypass	40328	mbwAIn4HiStartDelay	sec./10	UINT	R/W	0	30,000
Low Trip Setpoint	40329	mbwAIn4LoTripPt	unitless	UINT	R/W	0	65,535
Low Trip Time	40330	mbwAIn4LoTripTime	sec./10	UINT	R/W	1	30,000
Low Trip Action	40331	mbwAIn4LoAction	unitless	UINT	R/W	0	3
Low Trip Number of Restarts	40332	mbwAIn4LoRetries	ea	UINT	R/W	0	25
Low Trip Restart Time	40333	mbwAIn4LoRetryTime	min.	UINT	R/W	1	3,000
Low Trip Start Bypass	40334	mbwAIn4LoStartDelay	sec./10	UINT	R/W	0	30,000

C.9 Digital Input

Table C-28: Digital Input 1

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Name	41145 - 41149	mbwAux1Name	N/A	UINT	R/W	N/A	N/A	N/A
Digital Input 1	10289	MB1_AUX1	N/A	DIS	R	0	1	N/A
Alarm On	10033	MB1_AUX1_TRIPPT	N/A	DIS	R	0	1	0
Trip Time	40335	mbwAux1TripTime	sec./10	UINT	R/W	1	30,000	50
Trip Action	40336	mbwAux1Action	N/A	UINT	R/W	0	3	0
Number of Restarts	40337	mbwAux1Retries	ea	UINT	R/W	0	25	0
Restart Time	40338	mbwAux1RetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass Delay	40339	mbwAux1StartDelay	sec./10	UINT	R/W	0	30,000	0
Maintenance Delay	40340	mbwAux1MaintenanceDelay	min.	UINT	R/W	0	6,000	0
HOA Function	40923	mbwDIn1Action	N/A	UINT	R/W	0	3	0

Table C-29: Digital Input 2

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Name	41150 - 41154	mbwAux2Name	N/A	UINT	R/W	N/A	N/A	N/A
	10290	MB1_AUX2	N/A	DIS	R	0	1	N/A
Alarm On	10034	MB1_AUX2_TRIPPT	N/A	DIS	R	0	1	0
Trip Time	40341	mbwAux2TripTime	sec./10	UINT	R/W	1	30,000	50
Trip Action	40342	mbwAux2Action	N/A	UINT	R/W	0	3	0
Number of Restarts	40343	mbwAux2Retries	ea	UINT	R/W	0	25	0
Restart Time	40344	mbwAux2RetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass Delay	40345	mbwAux2StartDelay	sec./10	UINT	R/W	0	30,000	0
Maintenance Delay	40346	mbwAux2MaintenanceDelay	min.	UINT	R/W	0	6,000	0
HOA Function	40924	mbwDIn2Action	N/A	UINT	R/W	0	3	0

Table C-30: Digital Input 3

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default

Name	41155 - 41159	mbwAux3Name	N/A	UINT	R/W	N/A	N/A	N/A
Digital Input 3	10291	MB1_AUX3	N/A	DIS	R	0	1	N/A
Alarm On	10035	MB1_AUX3_TRIPPT	N/A	DIS	R	0	1	0
Trip Time	40347	mbwAux3TripTime	sec./10	UINT	R/W	1	30,000	50
Trip Action	40348	mbwAux3Action	N/A	UINT	R/W	0	3	0
Number of Restarts	40349	mbwAux3Retries	ea	UINT	R/W	0	25	0
Restart Time	40350	mbwAux3RetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass Delay	40351	mbwAux3StartDelay	sec./10	UINT	R/W	0	30,000	0
Maintenance Delay	40352	mbwAux3MaintenanceDelay	min.	UINT	R/W	0	6,000	0
HOA Function	40925	mbwDIn3Action	N/A	UINT	R/W	0	3	0

Table C-31: Digital Input 4

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Name	41160 - 41164	mbwAux4Name	N/A	UINT	R/W	N/A	N/A	N/A
Digital Input 4	10292	MB1_AUX4	N/A	DIS	R	0	1	N/A
Alarm On	10036	MB1_AUX4_TRIPPT	N/A	DIS	R	0	1	0
Trip Time	40353	mbwAux4TripTime	sec./10	UINT	R/W	1	30,000	50
Trip Action	40354	mbwAux4Action	N/A	UINT	R/W	0	3	0
Number of Restarts	40355	mbwAux4Retries	ea	UINT	R/W	0	25	0
Restart Time	40356	mbwAux4RetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass Delay	40357	mbwAux4StartDelay	sec./10	UINT	R/W	0	30,000	0
Maintenance Delay	40358	mbwAux4MaintenanceDelay	min.	UINT	R/W	0	6,000	0
HOA Function	40926	mbwDIn4Action	N/A	UINT	R/W	0	3	0

Table C-32: Digital Input 5

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Name	41165 - 41169	mbwAux5Name	N/A	UINT	R/W	N/A	N/A	N/A
Digital Input 5	10293	MB1_AUX5	N/A	DIS	R	0	1	N/A
Alarm On	10037	MB1_AUX5_TRIPPT	N/A	DIS	R	0	1	0
Trip Time	40359	mbwAux5TripTime	sec./10	UINT	R/W	1	30,000	50
Trip Action	40360	mbwAux5Action	N/A	UINT	R/W	0	3	0
Number of Restarts	40361	mbwAux5Retries	ea	UINT	R/W	0	25	0
Restart Time	40362	mbwAux5RetryTime	min.	UINT	R/W	1	3,000	30

Start Bypass Delay	40363	mbwAux5StartDelay	sec./10	UINT	R/W	0	30,000	0
Maintenance Delay	40364	mbwAux5MaintenanceDelay	min.	UINT	R/W	0	6,000	0
HOA Function	40927	mbwDIn5Action	N/A	UINT	R/W	0	3	0

Table C-33: Digital Input 6

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Name	41170 - 41174	mbwAux6Name	N/A	UINT	R/W	N/A	N/A	N/A
Digital Input 6	10294	MB1_AUX6	N/A	DIS	R	0	1	N/A
Alarm On	10038	MB1_AUX6_TRIPPT	N/A	DIS	R	0	1	0
Trip Time	40365	mbwAux6TripTime	sec./10	UINT	R/W	1	30,000	50
Trip Action	40366	mbwAux6Action	N/A	UINT	R/W	0	3	0
Number of Restarts	40367	mbwAux6Retries	ea	UINT	R/W	0	25	0
Restart Time	40368	mbwAux6RetryTime	min.	UINT	R/W	1	3,000	30
Start Bypass Delay	40369	mbwAux6StartDelay	sec./10	UINT	R/W	0	30,000	0
Maintenance Delay	40370	mbwAux6MaintenanceDelay	min.	UINT	R/W	0	6,000	0
HOA Function	40928	mbwDIn6Action	N/A	UINT	R/W	0	3	0

C.10 Analog Output

Table C-34: Analog Output. *Analog 1*

Description	**Modbus Address**	**Tag Name**	**Unit**	**Type**	**Read, Write or Both (R/W)**	**Min**	**Max**
Source	40103	mbwAOut1Action	See Notes	UINT	R/W	0	16
Low Raw Value	40104	mbwAOut1LoRaw	%/100	UINT	R/W	0	10,000
High Raw Value	40105	mbwAOut1HiRaw	%/100	UINT	R/W	0	11,000
Low Engineering Value	40106	mbwAOut1LoEng	unitless	UINT	R/W	0	65,535
High Engineering Value	40107	mbwAOut1HiEng	unitless	UINT	R/W	0	65,535
Setpoint Value	40108	mbwAOut1SetPt	unitless	UINT	R/W	0	65,535

Table C-35: Analog Output. *Analog 2*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Source	40109	mbwAOut2Action	See Notes	UINT	R/W	0	16
Low Raw Value	40110	mbwAOut2LoRaw	%/100	UINT	R/W	0	10,000
High Raw Value	40111	mbwAOut2HiRaw	%/100	UINT	R/W	0	11,000
Low Engineering Value	40112	mbwAOut2LoEng	unitless	UINT	R/W	0	65,535
High Engineering Value	40113	mbwAOut2HiEng	unitless	UINT	R/W	0	65,535
Setpoint Value	40114	mbwAOut2SetPt	unitless	UINT	R/W	0	65,535

C.11 Expansion Port

Map pending.

C.12 Maintenance Port

Map pending.

C.13 Variable Speed Drive (VSD)

Table C-36: VSD Modbus Map. *Speedstar SWD, 2000, Titan and VariStar*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max	Default
Run Frequency	32166	mbwFreqOut	Hz/100	UINT	R	0	65,535	N/A
Input Voltage	32170	mbwVoltsIn	LV VSDs - V/10 MVD — V	UINT	R	0	65,535	N/A

Output Voltage	32171	mbwVoltsOut	LV VSDs - V/10 MVD - V	UINT	R	0	65,535	N/A
Drive Loading	32174	mbwLoad	%/100	UINT	R	0	65,535	N/A
Output Amps	32175	mbwAmps	A/10	UINT	R	0	65,535	N/A
Motor Amps	32176	mbwMotorAmps	A/10	UINT	R	0	65,535	N/A
Input Power	32179	mbwPowerIn	kW/10	UINT	R	0	65,535	N/A
Ouput Power	32180	mbwPowerOut	kW/10	UINT	R	0	65,535	N/A
Transformer Ratio	40717	mbwTRatio	N/A	UINT	R/W	1	1,000	1
Motor Name Plate Current Rating	40767	mbwMotorRating	A	UINT	R/W	1	3,000	3
Motor Loading Percentage	32136	mbwMotorPercent	%/100	UINT	R	0	65,535	N/A
Speed Source	40921	mbwSpeedSource	N/A	UINT	R/W	0	11	0
Target Frequency	40856	mbwTargetSpeed	Hz/100	UINT	R/W	2,000	9,000	5,000
Minimum Speed	40857	mbwLowLim	Hz/100	UINT	R/W	2,000	9,000	
Maximum Speed	40858	mbwUpLim	Hz/100	UINT	R/W	2,000	9,000	
90Hz Deceleration Ramp Time	40859	mbwDecelRampTime	sec./10	UINT	R/W	1	1,000	
90Hz Acceleration Ramp Time	40860	mbwAccelRampTime	sec./10	UINT	R/W	1	1,000	
Feedback Loop Setpoint	40760	mbwFBSetPoint	N/A/10	UINT	R/W	0	65,535	32,000
Feedback Loop Step Size	40761	mbwFBAdjVal	Hz/100	UINT	R/W	1	100	100
Feedback Loop Step Interval	40762	mbwFBAdjTime	sec.	UINT	R/W	1	10,000	10
Feedback Polarity	40766	mbwFBPol	N/A	UINT	R/W	0	1	0
Extended Ramp Rate On/Off	40763	mbwSlowAdj	N/A	UINT	R/W	0	1	0
Extended Ramp Rate Step Size	40764	mbwSlowAdjVal	Hz/100	UINT	R/W	1	100	100
Extended Ramp Rate Step Interval	40765	mbwSlowAdjTime	sec.	UINT	R/W	0	10,000	10
Stop Mode	40862	mbwStopMode	N/A	UINT	R/W	0	1	0
PWM Carrier Frequency	40863	mbwPwmCarrierHz	kHz/10	UINT	R/W	5	30	22
Base Frequency	40864	mbwFullFreq	Hz/100	UINT	R/W	3,000	12,000	

Base Voltage	40865	mbwFullVolts	V	UINT	R/W	0	LV VSDs - 750 MVD - 7200	
Start Frequency	40866	mbwStartupFreq	Hz/100	UINT	R/W	0	1,000	
Base Frequency Voltage Select	40868	mbwVHzPattern	N/A	UINT	R/W	0	3584	0
Startup Voltage Boost	40870	mbwVoltBoost	%/10	UINT	R/W	0	LV VSDs – 300 MVD - 100 (10.0%)	
Thermal OverLoad Setpoint	40871	mbwThermOL	%	UINT	R/W	0	200	100
Overload Speed Reduction Level	40872	mbwThermStall	%	UINT	R/W	0	200	150
Jump Frequency 1	40873	mbwJFreq1	Hz/100	UINT	R/W	0	9000	0
Jump Width 1	40874	mbwJWidth1	Hz/100	UINT	R/W	0	9000	100
Jump Frequency 2	40875	mbwJFreq2	Hz/100	UINT	R/W	0	9000	0
Jump Width 2	40876	mbwJWidth2	Hz/100	UINT	R/W	0	9000	100
Jump Frequency 3	40877	mbwJFreq3	Hz/100	UINT	R/W	0	9000	0
Jump Width 3	40878	mbwJWidth3	Hz/100	UINT	R/W	0	9000	100
MVD - Feedback Deadband	40929	mbwVSDFBDeadBand	%/10	Unsigned Integer	R/W	1	100	10
Reverse While Running	00010	MB1_REV_onthefly	N/A	DIS	R/W	0	1	0
Catch a Spinning Motor	00040	MB1__CASM_MODE	N/A	DIS	R/W	0	1	0
Rotation Direction	00044	MB1__DIRECTION	N/A	DIS	R/W	0	1	
MVD - Input Voltage above 15kV	00058	MB1_MVD_10X_SCALE	N/A	DIS	R/W	0	1	0
Acceleration / Decceleration Pattern	40882	mbwADcelPat	N/A	UINT	R/W	0	65,535	0
Rocking Start Frequency	40883	mbwRockTargetFreq	Hz	UINT	R/W	0	LV VSDs – 10 MVD - 20	5
Rocking Start - Number of Rocks	40715	mbwNumberofRocks	ea	UINT	R/W	1	3	1
Rocking Start - Pattern	40716	mbwRockingMethod	N/A	UINT	R/W	0	3	0

Speed Force Source	40713	mbwSpeedForceSource	N/A	UINT	R/W	0	6	0
Speed Force Frequency	40714	mbwSpeedForceFreq	Hz	UINT	R/W	10	80	60
Tracking Underload - Target	40263	mbwULTrackTarget	%	UINT	R/W	10	100	85
Tracking Underload Enabled	40264	mbwULFilterFactor	N/A	UINT	R/W	0	1	0
LV VSDs -CPU Version	32181	mbwCPUVer	N/A	UINT	R	N/A	N/A	N/A
LV VSDs -EEPROM Version	32182	mbwEEPROMVer	N/A	UINT	R	N/A	N/A	N/A
LV VSDs - Type Form	32184	mbwTypeForm	N/A	UINT	R	N/A	N/A	N/A

C.13.1 Low Voltage (LV) VSD Shutdown Codes

Table C-37: LV VSD Shutdown Codes

Decimal Value from UniConn	Hexadecimal Value from Toshiba Manuals	Description From Toshiba Manuals
00	00	VSD No Error
01	01	VSD Overcurrent (Acceleration)
02	02	VSD Overcurrent (Deceleration)
03	03	VSD Overcurrent (Run)
04	04	VSD Load-End Overcurrent
05	05	VSD U-Phase Short Circuit
06	06	VSD V-Phase Short Circuit
07	07	VSD W-Phase Short Circuit
08	08	VSD Lost Input Phase
9	09	VSD Lost Output Phase
10	0A	VSD Overvoltage (Acceleration)
11	0B	VSD Overvoltage (Deceleration)
12	0C	VSD Overvoltage (Run)
13	0D	VSD Inverter Overload
14	0E	VSD Motor Overload
15	0F	VSD DBR (Dynamic Braking Resistor) Overload
16	10	VSD Overheat Trip
17	11	VSD Emergency

Decimal Value from UniConn	Hexadecimal Value from Toshiba Manuals	Description From Toshiba Manuals
18	12	VSD EEProm Write Failure
19	13	VSD EEProm Read Failure
20	14	VSD Unused
21	15	VSD RAM Error
22	16	VSD ROM Error
23	17	VSD CPU Error
24	18	VSD Communication Error
25	19	VSD Gate Array Fault
26	1A	VSD Current Select
27	1B	VSD Option PCB Error
28	1C	VSD Option ROM Error
29	1D	VSD Low Current Trip
30	1E	VSD Undervoltage Trip
31	1nteF	VSD Unused
32	20	VSD Overtorque Trip
33	21	VSD Earth Fault (Soft)
34	22	VSD Earth Fault (Hard)
35	23	VSD Open
36	24	VSD DBR (Dynamic Braking Resistor) Overcurrent
37	25	VSD DC Overcurrent
38	26	VSD DC Overcurrent
39	27	VSD DC Overcurrent
40	28	VSD Auto-Tuning Error
41	29	VSD Inverter Typeform Error

C.13.1.1 MVD Shutdown Codes

Table C-38: MVD Shutdown Codes

MVD Shutdown Codes	32185, 32186, 32187, 32188, 32189, 32190
Value	Description
49	Instantaneous Output OverCurrent
55	Power Module U Overheat
56	Power Module V Overheat
57	Power Module W Overheat

58	U Phase HCT Fault
59	W Phase HCT Fault
60	Control Board Slave CPU Fault
61	Control Board Slave Master Fault
64	Transformer Overheat
65	Instantaneous Output OverCurrent B Bank
68	Rectifier Fuse Fault U Phase Positive Bus
69	Rectifier Fuse Fault U Phase Negative Bus
70	Rectifier Fuse Fault V Phase Positive Bus
71	Rectifier Fuse Fault V Phase Negative Bus
72	Rectifier Fuse Fault W Phase Positive Bus
73	Rectifier Fuse Fault W Phase Negative Bus
74	U Phase HCT Fault B Bank
75	W Phase HCT Fault B Bank
82	Motor Overspeed By Speed Sensor
83	Output Overfrequency
86	Pulse Generator or Sensorless Feedback Fault
87	Resolver Feedback Fault
90	Motor Rotation Failure
91	Motor Reverse Rotation Fault
92	Pulse Generator Feedback dn/dt Fault
95	Failure To Synchronize During Transfer
96	DC Bus Charging Failure
100	IGBT Overcurrent Device UA1
101	IGBT Overcurrent Device UA4
102	IGBT Overcurrent Device UB1
103	IGBT Overcurrent Device UB4
104	IGBT Overcurrent Device VA1
105	IGBT Overcurrent Device VA4
106	IGBT Overcurrent Device VB1
107	IGBT Overcurrent Device VB4
108	IGBT Overcurrent Device WA1
109	IGBT Overcurrent Device WA4
110	IGBT Overcurrent Device WB1
111	IGBT Overcurrent Device WB4
112	Control Board Programmable Logic Device Fault
115	Door Switch Fault

120	Spare Input 4 Time delayed Fault
121	Spare Input 3 Time delayed Fault
122	Spare Input 2 Time delayed Fault
123	Spare Input 1 Time delayed Fault
124	Spare Input 4 Fault
125	Spare Input 3 Fault
126	Spare Input 2 Fault
127	Spare Input 1 Fault
128	Input Power Failure
129	Control Power Failure
131	Time Delayed Ground Fault
132	U Phase Positive DC Overvoltage
133	U Phase Negative DC Overvoltage
134	V Phase Positive DC Overvoltage
135	V Phase Negative DC Overvoltage
136	W Phase Positive DC Overvoltage
137	W Phase Negative DC Overvoltage
143	Phase Lock Loop Synchronizing Error
145	DC Bus Undervoltage
146	5 Minutes RMS Overload Fault
147	20 Minutes RMS Overload Fault
148	Undercurrent Time Delayed Fault
150	Current Limit Time Delayed Fault
151	Drive Cooling Fan Time Delayed Fault
155	Input Contactor Open
159	Heavy Electrical Fault
161	DC Bus Undervoltage On B Bank
167	Drive Cooling Fan Time Delayed Fault Both Banks
174	Drive Output Voltage Phase Lost
175	Input Voltage Phase Lost
176	Positive DC Bus Undervoltage B Bank
177	Negative DC Bus Undervoltage B Bank
178	Positive DC Bus Undervoltage
179	Negative DC Bus Undervoltage
180	AC Link Reactor Time Delayed Overheat
182	System Configuration Error
183	Parameter Error

185	Output Open Circuit
186	Time Delayed Ground Fault
187	Phase Lock Loop Phase Rotation Error
188	Input Breaker Tripped
189	Low Frequency Overload
191	Capture Failure
194	Drive Side Communication Board CPU Error
195	Drive Side Communication Board Transmission Error
199	Number of Motors Connected Fault
200	Spare Input 4 Time delayed Fault
201	Spare Input 3 Time delayed Fault
202	Spare Input 2 Time delayed Fault
203	Spare Input 1 Time delayed Fault
204	Spare Input 4 Fault
205	Spare Input 3 Fault
206	Spare Input 2 Fault
207	Spare Input 1 Fault
208	External Safety Switch Open
209	External Interlock Open
210	Display Interlock Switch Open
211	Speed Reference Lost
212	Quick Stop Initiated While Running
213	Input Power Failure
215	Output Contact Failure
221	Master/Slave Drive Faulted
222	Intermediate Electrical Fault
223	Start Interlock
224	Precharge Contactor Open
225	Analog Input Fault
226	Master Station Communication Transmission Error
227	Communication Failure From Other Drive
230	Motor Overheat
231	Load Equipment Brake Not Healthy
235	Automatic Tuning Interlock
239	Display E-Stop
240	Spare Input 2 Interlock

241	Spare Input 1 Interlock
244	Input Voltage Low Start Interlock
246	DC Voltage Low Start Interlock
247	Output Contactor Closed Without Command
253	Motor Cooling Fan Stopped
254	Speed Feedback High Start Interlock
255	Start Command Issued Before Ready
256	Automatic Restart Function is in Operation
257	Undercurrent Alarm+G249
264	Spare Input 4 Time delayed Alarm
265	Spare Input 3 Time delayed Alarm
266	Spare Input 2 Time delayed Alarm
267	Spare Input 1 Time delayed Alarm
268	Spare Input 4 Alarm
269	Spare Input 3 Alarm
270	Spare Input 2 Alarm
271	Spare Input 1 Alarm
272	Drive Side Communication Board CPU Error
273	Drive Side Communication Board Transmission Error
274	Master Station Communication Transmission Error
275	Communication Failure From Other Drive
276	Speed Reference Lost
277	Residual Motor Voltage Interlock
282	Output Contactor Open Time Delayed
286	Heavy Fault
287	Light Fault
292	Time Delayed Motor Cooling Fan Stopped
293	Load Equipment Brake Fault
295	System Change In Progress
301	Spare Input 1 Interlock
302	Spare Input 2 Interlock
306	Display Interlock Switch Open
307	Speed Reference Lost
308	Quick Stop Initiated While Running
311	Output Contactor Failure
317	Master/Slave Drive Faulted

318	Intermediate Electrical Fault
320	Precharge Contactor Open
321	Analog Input Fault
322	Master Station Communication Transmission Error
323	Communication Failure From Other Drive
324	Time Delayed Motor Cooling Fan Stopped
325	Load Equipment Brake Fault
326	Motor Overheat
327	Load Equipment Brake Not Healthy
331	Automatic Tuning Interlock
333	Spare Input 1 Fault
334	Spare Input 2 Fault
335	Time Delayed Ground Fault
336	Power Module Overheat
337	Drive Cooling Fan Stopped
338	Power Module Overheat B Bank
339	Drive Cooling Fan Stopped Both Banks
340	AC Link Reactor Overheat
341	Motor Temperature Sensor Fault
342	Motor Overheat
343	Motor Overheat Alarm
344	Motor Overload Alarm
345	Current Limit Alarm
346	Ground Fault Alarm
347	Precharge Contactor Failure
348	Speed Reference Lost Alarm
349	Motor Cooling Fan Stopped
352	Speed Reference Lost Alarm
353	Drive Cooling Fan Stopped
354	Motor Soft Stall Alarm
355	Drive Cooling Fan Stopped Both Banks
356	AC Link Reactor Overheat
357	Motor Temperature Sensor Fault
358	Motor Overheat
359	Motor Overheat Alarm
360	Analog Input Fault
361	Failure To Synchronize During Transfer

362	Ground Fault Alarm
363	Precharge Contactor Failure
364	Current Unbalance Between A and B Bank
365	Motor Cooling Fan Stopped
366	Time Delayed Ground Fault
367	Stop Request
368	Ground Fault Alarm
370	Fuse Failure
371	Fuse Failure B Bank
376	Output Contactor Closed Without Command
378	Gate Power Supply Failure
380	Output Contactor Closed Without Command B Bank
382	Gate Power Supply Failure B Bank
383	Light Fault
384	Spare Input 4 Time delayed Fault
385	Spare Input 4 Fault
387	Door Switch Open
393	Input Contactor Open
398	Heavy Electrical Fault
399	Heavy Electrical Fault Except Power Supply Failure

C.14 UniConn Phoenix Interface Card (PIC)

The UniConn Modbus map for the PIC is the same for all tool types. Not all registers are used with all tool types so non used registers populated with zero. Modbus map summary can also be found in InTouch Content ID 4104120.

Legend for table heading **Type** .

Term	Definition
UINT	Unsigned integer. Length = 2 bytes
SINT	Signed integer Length = 2 bytes
UINT L	Unsigned integer long. Length = 4 bytes
DIS	Discrete. Length = 1 bit

FLOAT	Floating point (ANSI/IEEE Std 754-1985)

Table C-39: UniConn PIC Map. *Summary*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Pump Intake Pressure	32137	mbwDH_Pi	(bar/psi)/10	UINT	R	0	65,535
Pump Discharge Pressure	32138	mbwDH_Pd	(bar/psi)/10	UINT	R	0	65,535
Pump Differential Pressure	32162	mbwDH_DiffP	(bar/psi)	SINT	R	-10,000	10,000
Pump Discharge Flowrate	32139	mbwDH_Flow	bpd/m3/d	UINT	R	0	65,535
Bottomhole Temperature	32140	mbwDH_Ti	(C/F)/10	UINT	R	0	65,535
Motor Winding Temperature	32141	mbwDH_Tm	(C/F)/10	UINT	R	0	65,535
ESP Vibration	32142	mbwDH_Vibration	g/1000	UINT	R	0	65,535
ESP DC Current Leakage Active	32143	mbwDH_Leakage	mA/1000	UINT	R	0	65,535
ESP DC Current Leakage Passive	32148	mbwDH_Leakage2	mA/1000	UINT	R	0	65,535
Phoenix Interface Card Status	32144	mbwDH_Status	unitless	UINT	R	0	65,535
Cz	32145	mbwLeakCz	mA/1000	UINT	R	0	65,535
Cf	32146	mbwLeakCf	mA/1000	UINT	R	0	65,535
Activate/Stop Rapid Sample Rate	00007	MB1_DME_RSR	unitless	DIS	W	0	1

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Pump Discharge Temperature	32149	mbwDH_Td	(C/F)/10	UINT	R	o	65,535
Motor Star-Point Voltage	32150	mbwDH_Vs	V/10	UINT	R	0	65,535
Motor Y-axis Vibration	32151	mbwDH_Ay	g/1000	UINT	R	0	65,535
Motor Z-axis Vibration	32152	mbwDH_Az	g/1000	UINT	R	0	65,535
Remote-1 X-axis Vibration	32153	mbwDH_Ax1	g/1000	UINT	R	0	65,535
Remote-1 Y-axis Vibration	32154	mbwDH_Ay1	g/1000	UINT	R	0	65,535
Remote-1 Z-axis Vibration	32155	mbwDH_Az1	g/1000	UINT	R	0	65,535
Remote-2 Pressure	32156	mbwDH_Pr2	(bar/psi)/10	UINT	R	0	65,535
Remote-2 Temperature	32157	mbwDH_Tr2	(C/F)/10	UINT	R	0	65,535
Remote-2 X-axis Vibration	32158	mbwDH_Ax2	g/1000	UINT	R	0	65,535
Remote-2 Y-axis Vibration	32159	mbwDH_Ay2	g/1000	UINT	R	0	65,535
Remote-2 Z-axis Vibration	32160	mbwDH_Az2	g/1000	UINT	R	0	65,535
Phoenix DHT Type	40706	mbwDHToolType		UINT	R	0	1
Select Tool Type	32161	mbwDH_TT	unitless	UINT	R	0	7
PIC Firmware version	32165	mbwDH_CodeVer	unitless	UINT	R	N/A	N/A
Reset Phoenix Interface Card	00009	MB1_DME_RST	unitless	DIS	W	0	1
PIC Vibration Averaging	40704	mbwDH_VibAvg	unitless	UINT	R/W	1	32

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
PIC Swap Remotes	10046	MB1_DH_SWAP_REMOTES	unitless	DIS	R/W	0	1

Table C-40: Phoenix Interface Card status register

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Phoenix Interface Card Status	32144	mbwDH_Status	unitless	UINT	R	0	22

Table C-41: Phoenix Interface Card status index

Value	Message
0	Phx Card Reset
1	Boot Testing
2	PIC Init
3	Tool Good
4	Tool Timeout
5	Tool Short
6	Tool Open
7	CL Not Set
8	Other
9	PIC Communication
10	Cf Dropped
11	PSU not booting
12	Tool Stuck
13	Tool Stuck RSR
14	Neg Saturation
15	Short Circuit
16	Other Tool Fault
17	Non Tool Fault
18	Panel under volts
19	Panel over volts
20	Exc Int Leak
21	Power latch failed

Value	Message
22	ADC Failed

Table C-42: UniConn PIC map - Pressure. *Intake*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
High Trip Setpoint	40503	mbwDHPiHiTripPt	(bar/psi)/10	UINT	R/W	0	65,535
High Trip Time	40504	mbwDHPiHiTripTime	sec/10	UINT	R/W	1	30,000
High Trip Action	40505	mbwDHPiHiAction	unitless	UINT	R/W	0	3
High Trip No. of Restarts	40506	mbwDHPiHiRetries	ea	UINT	R/W	0	25
High Trip Restart Time	40507	mbwDHPiHiRetryTime	min.	UINT	R/W	1	3,000
High Start Bypass Time	40508	mbwDHPiHiStartDelay	sec/10	UINT	R/W	0	30,000
Low Trip Setpoint	40509	mbwDHPiLoTripPt	(bar/psi)/10	UINT	R/W	0	65,535
Low Trip Time	40510	mbwDHPiLoTripTime	sec/10	UINT	R/W	1	30,000
Low Trip Action	40511	mbwDHPiLoAction	unitless	UINT	R/W	0	3
Low Trip No. of Restarts	40512	mbwDHPiLoRetries	ea	UINT	R/W	0	25
Low Trip Restart Time	40513	mbwDHPiLoRetryTime	min.	UINT	R/W	1	3,000
Low Start Bypass Time	40514	mbwDHPiLoStartDelay	sec/10	UINT	R/W	0	30,000

Table C-43: UniConn PIC map - Pressure. *Discharge*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
High Trip Setpoint	40515	mbwDHPdHiTripPt	(bar/psi)/10	UINT	R/W	0	65,535
High Trip Time	40516	mbwDHPdHiTripTime	sec/10	UINT	R/W	1	30,000
High Trip Action	40517	mbwDHPdHiAction	unitless	UINT	R/W	0	3

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
High Trip No. of Restarts	40518	mbwDHPdHiRetries	ea	UINT	R/W	0	25
High Trip Restart Time	40519	mbwDHPdHiRetryTime	min.	UINT	R/W	1	3,000
High Start Bypass Time	40520	mbwDHPdHiStartDelay	sec/10	UINT	R/W	0	30,000
Low Trip Setpoint	40521	mbwDHPdLoTripPt	(bar/psi)/10	UINT	R/W	0	65,535
Low Trip Time	40522	mbwDHPdLoTripTime	sec/10	UINT	R/W	1	30,000
Low Trip Action	40523	mbwDHPdLoAction	unitless	UINT	R/W	0	3
Low Trip No. of Restarts	40524	mbwDHPdLoRetries	ea	UINT	R/W	0	25
Low Trip Restart Time	40525	mbwDHPdLoRetryTime	min.	UINT	R/W	1	3,000
Low Start Bypass Time	40526	mbwDHPdLoStartDelay	sec/10	UINT	R/W	0	30,000

Table C-44: UniConn PIC map - Pressure. *Remote-2*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
High Trip Setpoint	40617	mbwDH_Pr2HiTripPt	(bar/psi)/10	UINT	R/W	0	65,535
High Trip Time	40618	mbwDH_Pr2HiTripTime	sec./10	UINT	R/W	1	30,000
High Trip Action	40619	mbwDH_Pr2HiAction	unitless	UINT	R/W	0	3
High Trip No. of Restarts	40620	mbwDH_Pr2HiRetries	ea	UINT	R/W	0	25
High Trip Restart Time	40621	mbwDH_Pr2HiRetry Time	min.	UINT	R/W	1	3,000
High Start Bypass Time	40622	mbwDH_Pr2HiStart Delay	sec./10	UINT	R/W	0	30,000
Low Trip Setpoint	40623	mbwDH_Pr2LoTripPt	(bar/psi)/10	UINT	R/W	0	65,535
Low Trip Time	40624	mbwDH_Pr2LoTripTime	sec./10	UINT	R/W	1	30,000
Low Trip Action	40625	mbwDH_Pr2LoAction	unitless	UINT	R/W	0	3

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Low Trip No. of Restarts	40626	mbwDH_Pr2LoRetries	ea	UINT	R/W	0	25
Low Trip Restart Time	40627	mbwDH_Pr2LoRetry Time	min.	UINT	R/W	1	3,000
Low Start Bypass Time	40628	mbwDH_Pr2LoStart Delay	sec./10	UINT	R/W	0	30,000

Table C-45: UniConn PIC map - Flow

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
High Trip Setpoint	40527	mbwDHFlowHiTripPt	bfpd or m3/d	UINT	R/W	0	65,535
High Trip Time	40528	mbwDHFlowHiTripTime	sec/10	UINT	R/W	1	30,000
High Trip Action	40529	mbwDHFlowHiAction	unitless	UINT	R/W	0	3
High Trip No. of Restarts	40530	mbwDHFlowHiRetries	ea	UINT	R/W	0	25
High Trip Restart Time	40531	mbwDHFlowHiRetry Time	min.	UINT	R/W	1	3,000
High Start Bypass Time	40532	mbwDHFlowHiStart Delay	sec/10	UINT	R/W	0	30,000
Low Trip Setpoint	40533	mbwDHFlowLoTripPt	bfpd or m3/d	UINT	R/W	0	65,535
Low Trip Time	40534	mbwDHFlowLoTripTime	sec/10	UINT	R/W	1	30,000
Low Trip Action	40535	mbwDHFlowLoAction	unitless	UINT	R/W	0	3
Low Trip No. of Restarts	40536	mbwDHFlowLoRetries	ea	UINT	R/W	0	25
Low Trip Restart Time	40537	mbwDHFlowLoRetry Time	min.	UINT	R/W	1	3,000
Low Start Bypass Time	40538	mbwDHFlowLoStart Delay	sec/10	UINT	R/W	0	30,000

Table C-46: UniConn PIC map - Temperature. *Bottom Hole*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Trip Setpoint	40539	mbwDHTiHiTripPt	(C/F)/10	UINT	R/W	0	65,535
Trip Time	40540	mbwDHTiHiTripTime	sec/10	UINT	R/W	1	30,000
Trip Action	40541	mbwDHTiHiAction	unitless	UINT	R/W	0	3
Trip No. of Restarts	40542	mbwDHTiHiRetries	ea	UINT	R/W	0	25
Trip Restart Time	40543	mbwDHTiHiRetryTime	min.	UINT	R/W	1	3,000
Start Bypass Time	40544	mbwDHTiHiStartDelay	sec/10	UINT	R/W	0	30,000

Table C-47: UniConn PIC map - Temperature. *Motor Winding*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Trip Setpoint	40545	mbwDHTmHiTripPt	(C/F)/10	UINT	R/W	0	65,535
Trip Time	40546	mbwDHTmHiTripTime	sec/10	UINT	R/W	1	30,000
Trip Action	40547	mbwDHTmHiAction	unitless	UINT	R/W	0	3
Trip No. of Restarts	40548	mbwDHTmHiRetries	ea	UINT	R/W	0	25
Trip Restart Time	40549	mbwDHTmHiRetryTime	min.	UINT	R/W	1	3,000
Start Bypass Time	40550	mbwDHTmHiStartDelay	sec/10	UINT	R/W	0	30,000

Table C-48: UniConn PIC map - Temperature. *Remote-2*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
High Trip Setpoint	40629	mbwDH_Tr2HiTripPt	(C/F)/10	UINT	R/W	0	65,535
High Trip Time	40630	mbwDH_Tr2HiTripTime	sec./10	UINT	R/W	1	30,000
High Trip Action	40631	mbwDH_Tr2HiAction	unitless	UINT	R/W	0	3
High Trip No. of Restarts	40632	mbwDH_Tr2HiRetries	ea	UINT	R/W	0	25

High Trip Restart Time	40633	mbwDH_Tr2HiRetryTime	min.	UINT	R/W	1	3,000
High Start Bypass Time	40634	mbwDH_Tr2HiStartDelay	sec./10	UINT	R/W	0	30,000

Table C-49: UniConn PIC map - Vibration. *X-axis*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Trip Setpoint	40551	mbwDHVibHiTripPt	g/1000	UINT	R/W	0	65,535
Trip Time	40552	mbwDHVibHiTripTime	sec/10	UINT	R/W	1	30,000
Trip Action	40553	mbwDHVibHiAction	unitless	UINT	R/W	0	3
Trip No. of Restarts	40554	mbwDHVibHiRetries	ea	UINT	R/W	0	25
Trip Restart Time	40555	mbwDHVibHiRetryTime	min.	UINT	R/W	1	3,000
Start Bypass Time	40556	mbwDHVibHiStartDelay	sec/10	UINT	R/W	0	30,000

Table C-50: UniConn PIC map - Vibration. *Y-axis*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Trip Setpoint	40587	mbwDH_AyHiTripPt	g/1000	UINT	R/W	0	65,535
Trip Time	40588	mbwDH_AyHiTripTime	sec./10	UINT	R/W	1	30,000
Trip Action	40589	mbwDH_AyHiAction	unitless	UINT	R/W	0	3
Trip No. of Restarts	40590	mbwDH_AyHiRetries	ea	UINT	R/W	0	25
Trip Restart Time	40591	mbwDH_AyHiRetryTime	min.	UINT	R/W	1	3,000
Start Bypass Time	40592	mbwDH_AyHiStartDelay	sec./10	UINT	R/W	0	30,000

Table C-51: UniConn PIC map - Vibration. *Z-axis*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Motor Z-axis Vibration Trip Setpoint	40593	mbwDH_AzHiTripPt	g/1000	UINT	R/W	0	65,535
Motor Z-axis Vibration Trip Time	40594	mbwDH_AzHiTripTime	sec./10	UINT	R/W	1	30,000
Motor Z-axis Vibration Trip Action	40595	mbwDH_AzHiAction	unitless	UINT	R/W	0	3
Motor Z-axis Vibration Trip No. of Restarts	40596	mbwDH_AzHiRetries	ea	UINT	R/W	0	25
Motor Z-axis Vibration Trip Restart Time	40597	mbwDH_AzHiRetryTime	min.	UINT	R/W	1	3,000
Motor Z-axis Vibration Start Bypass Time	40598	mbwDH_AzHiStartDelay	sec./10	UINT	R/W	0	30,000

Table C-52: UniConn PIC map - Vibration. *Remote-1 X-axis*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Trip Setpoint	40599	mbwDH_Ax1HiTripPt	g/1000	UINT	R/W	0	65,535
Trip Time	40600	mbwDH_Ax1HiTripTime	sec./10	UINT	R/W	1	30,000
Trip Action	40601	mbwDH_Ax1HiAction	unitless	UINT	R/W	0	3
Trip No. of Restarts	40602	mbwDH_Ax1HiRetries	ea	UINT	R/W	0	25
Trip Restart Time	40603	mbwDH_Ax1HiRetry Time	min.	UINT	R/W	1	3,000
Start Bypass Time	40604	mbwDH_Ax1HiStart Delay	sec./10	UINT	R/W	0	30,000

Table C-53: UniConn PIC map - Vibration. *Remote-1 Y-axis*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Trip Setpoint	40605	mbwDH_Ay1HiTripPt	g/1000	UINT	R/W	0	65,535
Trip Time	40606	mbwDH_Ay1HiTripTime	sec./10	UINT	R/W	1	30,000
Trip Action	40607	mbwDH_Ay1HiAction	unitless	UINT	R/W	0	3
Trip No. of Restarts	40608	mbwDH_Ay1HiRetries	ea	UINT	R/W	0	25
Trip Restart Time	40609	mbwDH_Ay1HiRetry Time	min.	UINT	R/W	1	3,000
Start Bypass Time	40610	mbwDH_Ay1HiStart Delay	sec./10	UINT	R/W	0	30,000

Table C-54: UniConn PIC map - Vibration. *Remote-1 Z-axis*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Trip Setpoint	40611	mbwDH_Az1HiTripPt	g/1000	UINT	R/W	0	65,535
Trip Time	40612	mbwDH_Az1HiTripTime	sec./10	UINT	R/W	1	30,000
Trip Action	40613	mbwDH_Az1HiAction	unitless	UINT	R/W	0	3
Trip No. of Restarts	40614	mbwDH_Az1HiRetries	ea	UINT	R/W	0	25
Trip Restart Time	40615	mbwDH_Az1HiRetry Time	min.	UINT	R/W	1	3,000
Start Bypass Time	40616	mbwDH_Az1HiStart Delay	sec./10	UINT	R/W	0	30,000

Table C-55: UniConn PIC map - Vibration. *Remote-2 X-axis*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Trip Setpoint	40635	mbwDH_Ax2HiTripPt	g/1000	UINT	R/W	0	65,535
Trip Time	40636	mbwDH_Ax2HiTripTime	sec./10	UINT	R/W	1	30,000
Trip Action	40637	mbwDH_Ax2HiAction	unitless	UINT	R/W	0	3
Trip No. of Restarts	40638	mbwDH_Ax2HiRetries	ea	UINT	R/W	0	25

Trip Restart Time	40639	mbwDH_Ax2HiRetry Time	min.	UINT	R/W	1	3,000
Start Bypass Time	40640	mbwDH_Ax2HiStart Delay	sec./10	UINT	R/W	0	30,000

Table C-56: UniConn PIC map - Vibration. *Remote-2 Y-axis*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Trip Setpoint	40641	mbwDH_Ay2HiTripPt	g/1000	UINT	R/W	0	65,535
Trip Time	40642	mbwDH_Ay2HiTripTime	sec./10	UINT	R/W	1	30,000
Trip Action	40643	mbwDH_Ay2HiAction	unitless	UINT	R/W	0	3
Trip No. of Restarts	40644	mbwDH_Ay2HiRetries	ea	UINT	R/W	0	25
Trip Restart Time	40645	mbwDH_Ay2HiRetry Time	min.	UINT	R/W	1	3,000
Start Bypass Time	40646	mbwDH_Ay2HiStart Delay	sec./10	UINT	R/W	0	30,000

Table C-57: UniConn PIC map - Vibration. *Remote-2 Z-axis*

Description	**Modbus Address**	**Tag Name**	**Unit**	**Type**	**Read, Write or Both (R/W)**	**Min**	**Max**
Trip Setpoint	40647	mbwDH_Az2HiTripPt	g/1000	UINT	R/W	0	65,535
Trip Time	40648	mbwDH_Az2HiTripTime	sec./10	UINT	R/W	1	30,000
Trip Action	40649	mbwDH_Az2HiAction	unitless	UINT	R/W	0	3
Trip No. of Restarts	40650	mbwDH_Az2HiRetries	ea	UINT	R/W	0	25
Trip Restart Time	40651	mbwDH_Az2HiRetry Time	min.	UINT	R/W	1	3,000
Start Bypass Time	40652	mbwDH_Az2HiStart Delay	sec./10	UINT	R/W	0	30,000

Table C-58: UniConn PIC map - Current Leakage. *Active*

Description	**Modbus Address**	**Tag Name**	**Unit**	**Type**	**Read, Write or Both (R/W)**	**Min**	**Max**
Trip Setpoint	40557	mbwDHLeakHiTripPt	mA/1000	UINT	R/W	0	65,535
Trip Time	40558	mbwDHLeakHiTripTime	sec/10	UINT	R/W	1	30,000

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Trip Action	40559	mbwDHLeakHiAction	unitless	UINT	R/W	0	3
Trip No. of Restarts	40560	mbwDHLeakHiRetries	ea	UINT	R/W	0	25
Trip Restart Time	40561	mbwDHLeakHiRetryTime	min.	UINT	R/W	1	3,000
Start Bypass Time	40562	mbwDHLeakHiStartDelay	sec/10	UINT	R/W	0	30,000

Table C-59: UniConn PIC map - Current Leakage. *Passive*

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
Trip Setpoint	40563	mbwDHLeak2HiTripPt	mA/1000	UINT	R/W	0	65,535
Trip Time	40564	mbwDHLeak2HiTripTime	sec./10	UINT	R/W	1	30,000
Trip Action	40565	mbwDHLeak2HiAction	unitless	UINT	R/W	0	3
Trip No. of Restarts	40566	mbwDHLeak2HiRetries	ea	UINT	R/W	0	25
Trip Restart Time	40567	mbwDHLeak2HiRetryTime	min.	UINT	R/W	1	3,000
Start Bypass Time	40568	mbwDHLeak2HiStartDelay	sec./10	UINT	R/W	0	30,000

Table C-60: UniConn PIC map - Star-Point Voltage

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
High Trip Setpoint	40575	mbwDH_VsHiTripPt	V/10	UINT	R/W	0	65,535
High Trip Time	40576	mbwDH_VsHiTripTime	sec./10	UINT	R/W	1	30,000
High Trip Action	40577	mbwDH_VsHiAction	unitless	UINT	R/W	0	3
High Trip No. of Restarts	40578	mbwDH_VsHiRetries	ea	UINT	R/W	0	25
High Trip Restart Time	40579	mbwDH_VsHiRetryTime	min.	UINT	R/W	1	3,000

Description	Modbus Address	Tag Name	Unit	Type	Read, Write or Both (R/W)	Min	Max
High Start Bypass Time	40580	mbwDH_VsHiStartDelay	sec./10	UINT	R/W	0	30,000

C.15 UniConn FSK Interface Card (FIC)

Table C-61: Bit locations for FIC Line Status register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Table C-62: FIC Line Status register

Bit	Name	Description
0	Open Line	If set to 1, it indicates an open line.
1	Short Line	If set to 1, it indicates short circuit line.
2	Booster Voltage too High	If set to 1, it means that booster voltage setting is too high. Adjustment of the booster voltage needed for optimum operation.
3	Booster Voltage too low	If set to 1, it means that booster voltage is set too low . Adjustment of the booster voltage needed for optimum operation.
4	Short Circuit Protection Mode	If set to 1, it means that the board has detected a short circuit and now is in short circuit protection mode. In short circuit protection mode, the board will disconnect the line for about two minutes and then try to connect back for six seconds and keep doing so until the short circuit is removed.
5	N/A	Reserved for future use
6	N/A	Reserved for future use
7	Down Cable Not connected	If set to 1 means, it that the Downhole Cable is not switched ON.
8	Gauge A TimeOut	If set to 1, it means there is no valid data for gauge A.
9	Gauge B TimeOut	If set to 1, it means there is no valid data for gauge B
10	Gauge C TimeOut	If set to 1, it means there is no valid data for gauge C.
11	Gauge D TimeOut	If set to 1, it means there is no valid data for gauge D.
12	Electrical setting changed through engineering port	This bit will change to 1 whenever an electrical setting is changed through the engineering RS–232 port.
13	N/A	Reserved for future use
14	Hardware Error	This bit is set to 1 when the ADC does not work properly. When this happens, the auto booster and the short circuit detection/protection are not functional.
15	Boot Mode	If set to 1, it means that the board is in boot mode (firmware boot).

Legend for table heading **Type** .

Term	Definition
UINT	Unsigned integer. Length = 2 bytes
SINT	Signed integer Length = 2 bytes
UINT L	Unsigned integer long. Length = 4 bytes
DIS	Discrete. Length = 1 bit
FLOAT	Floating point (ANSI/IEEE Std 754-1985)

***:** Channel State Setting: 0 – OFF, 1 – MAIN, 2 – DUMMY, 3 – BACKUP.

****:** Channel Current Setting: 0 – 150, corresponds to 0 – 150 mA.

*****:** Booster Voltage Setting: 0 – OFF, 1 – AUTO, 20000-65535 corresponds 20000-65535 mV.

******:** Line status register.

Table C-63: Voltage and Current Settings

Description	Modbus Address	Type	Name	Access
Slot 1 FIC Channel State Setting *	40907	U INT	mbwFIC1Channelstate	RW
Slot 1 FIC Channel Current Setting **	40908	U INT	mbwFIC1Channelcurrent	RW
Slot 1 FIC Booster Voltage Setting ***	40909	U INT	mbwFIC1boostervolts	RW
Slot 2 FIC Channel State Setting *	40910	U INT	mbwFIC2Channelstate	RW
Slot 2 FIC Channel Current Setting **	40911	U INT	mbwFIC2Channelcurrent	RW
Slot 2 FIC Booster Voltage Setting ***	40912	U INT	mbwFIC2boostervolts	RW
Slot 3 FIC Channel State Setting *	40913	U INT	mbwFIC3Channelstate	RW
Slot 3 FIC Channel Current Setting **	40914	U INT	mbwFIC3Channelcurrent	RW
Slot 3 FIC Booster Voltage Setting ***	40915	U INT	mbwFIC3boostervolts	RW
Slot 4 FIC Channel State Setting *	40916	U INT	mbwFIC4Channelstate	RW
Slot 4 FIC Channel Current Setting **	40917	U INT	mbwFIC4Channelcurrent	RW
Slot 4 FIC Booster Voltage Setting ***	40918	U INT	mbwFIC4boostervolts	RW

Table C-64: Diagnostics

Description	Modbus Address	Type	Name	Access
Slot 1 Booster Voltage ***	32202	U INT	mbwS1BoosterVolts	R
Slot 1 Channel Voltage	32203	U INT	mbwS1ChannelVolts	R
Slot 1 Backup Cable Voltage	32204	U INT	mbwS1BUCableVolts	R
Slot 1 Cable Voltage	32205	U INT	mbwS1CableVolts	R
Slot 1 Channel Current	32206	U INT	mbwS1ChannelCurrent	R
Slot 1 Channel Signal Voltage	32207	U INT	mbwS1ChanSigVoltage	R
Slot 1 Line Status ****	32208	U INT	mbwS1LineStatus	R
Slot 2 Booster Voltage ***	32209	U INT	mbwS2BoosterVolts	R
Slot 2 Channel Voltage	32210	U INT	mbwS2ChannelVolts	R
Slot 2 Backup Cable Voltage	32211	U INT	mbwS2BUCableVolts	R
Slot 2 Cable Voltage	32212	U INT	mbwS2CableVolts	R
Slot 2 Channel Current	32213	U INT	mbwS2ChannelCurrent	R
Slot 2 Channel Signal Voltage	32214	U INT	mbwS2ChanSigVoltage	R
Slot 2 Line Status ****	32215	U INT	mbwS2LineStatus	R
Slot 3 Booster Voltage ***	32216	U INT	mbwS3BoosterVolts	R
Slot 3 Channel Voltage	32217	U INT	mbwS3ChannelVolts	R
Slot 3 Backup Cable Voltage	32218	U INT	mbwS3BUCableVolts	R
Slot 3 Cable Voltage	32219	U INT	mbwS3CableVolts	R
Slot 3 Channel Current	32220	U INT	mbwS3ChannelCurrent	R
Slot 3 Channel Signal Voltage	32221	U INT	mbwS3ChanSigVoltage	R
Slot 3 Line Status ****	32222	U INT	mbwS3LineStatus	R
Slot 4 Booster Voltage ***	32223	U INT	mbwS4BoosterVolts	R
Slot 4 Channel Voltage	32224	U INT	mbwS4ChannelVolts	R
Slot 4 Backup Cable Voltage	32225	U INT	mbwS4BUCableVolts	R
Slot 4 Cable Voltage	32226	U INT	mbwS4CableVolts	R
Slot 4 Channel Current	32227	U INT	mbwS4ChannelCurrent	R
Slot 4 Channel Signal Voltage	32228	U INT	mbwS4ChanSigVoltage	R
Slot 4 Line Status ****	32229	U INT	mbwS4LineStatus	R

Table C-65: Gauges A, B, C, D Data 16 bit Format

Description	Modbus Address	Type	Name	Access
Slot 1 Gauge A Pressure Engineering Value 16 bit	32230	U INT	mbwPress1_A	R

Description	Modbus Address	Type	Name	Access
Slot 1 Gauge A Temperature Engineering Value 16 bit	32231	U INT	mbwTemp1_A	R
Slot 1 Gauge B Pressure Engineering Value 16 bit	32232	U INT	mbwPress1_B	R
Slot 1 Gauge B Temperature Engineering Value 16 bit	32233	U INT	mbwTemp1_B	R
Slot 1 Gauge C Pressure Engineering Value 16 bit	32236	U INT	mbwPress1_C	R
Slot 1 Gauge C Temperature Engineering Value 16 bit	32237	U INT	mbwTemp1_C	R
Slot 1 Gauge D Pressure Engineering Value 16 bit	32238	U INT	mbwPress1_D	R
Slot 1 Gauge D Temperature Engineering Value 16 bit	32239	U INT	mbwTemp1_D	R
Slot 2 Gauge A Pressure Engineering Value 16 bit	32242	U INT	mbwPress2_A	R
Slot 2 Gauge A Temperature Engineering Value 16 bit	32243	U INT	mbwTemp2_A	R
Slot 2 Gauge B Pressure Engineering Value 16 bit	32244	U INT	mbwPress2_B	R
Slot 2 Gauge B Temperature Engineering Value 16 bit	32245	U INT	mbwTemp2_B	R
Slot 2 Gauge C Pressure Engineering Value 16 bit	32248	U INT	mbwPress2_C	R
Slot 2 Gauge C Temperature Engineering Value 16 bit	32249	U INT	mbwTemp2_C	R
Slot 2 Gauge D Pressure Engineering Value 16 bit	32250	U INT	mbwPress2_D	R
Slot 2 Gauge D Temperature Engineering Value 16 bit	32251	U INT	mbwTemp2_D	R
Slot 3 Gauge A Pressure Engineering Value 16 bit	32254	U INT	mbwPress3_A	R
Slot 3 Gauge A Temperature Engineering Value 16 bit	32255	U INT	mbwTemp3_A	R
Slot 3 Gauge B Pressure Engineering Value 16 bit	32256	U INT	mbwPress3_B	R
Slot 3 Gauge B Temperature Engineering Value 16 bit	32257	U INT	mbwTemp3_B	R
Slot 3 Gauge C Pressure Engineering Value 16 bit	32260	U INT	mbwPress3_C	R
Slot 3 Gauge C Temperature Engineering Value 16 bit	32261	U INT	mbwTemp3_C	R

Description	Modbus Address	Type	Name	Access
Slot 3 Gauge D Pressure Engineering Value 16 bit	32262	U INT	mbwPress3_D	R
Slot 3 Gauge D Temperature Engineering Value 16 bit	32263	U INT	mbwTemp3_D	R
Slot 4 Gauge A Pressure Engineering Value 16 bit	32266	U INT	mbwPress4_A	R
Slot 4 Gauge A Temperature Engineering Value 16 bit	32267	U INT	mbwTemp4_A	R
Slot 4 Gauge B Pressure Engineering Value 16 bit	32268	U INT	mbwPress4_B	R
Slot 4 Gauge B Temperature Engineering Value 16 bit	32269	U INT	mbwTemp4_B	R
Slot 4 Gauge C Pressure Engineering Value 16 bit	32272	U INT	mbwPress4_C	R
Slot 4 Gauge C Temperature Engineering Value 16 bit	32273	U INT	mbwTemp4_C	R
Slot 4 Gauge D Pressure Engineering Value 16 bit	32274	U INT	mbwPress4_D	R
Slot 4 Gauge D Temperature Engineering Value 16 bit	32275	U INT	mbwTemp4_D	R

Table C-66: Slot 1: Full ASCII Gauge Serial Number

Description	Modbus Address	Type	Name	Access
Slot 1 Gauge A-Full ASCII Gauge S/N	32321	U INT	mbwS1FullSNA1	R
Slot 1 Gauge A-Full ASCII Gauge S/N	32322	U INT	mbwS1FullSNA2	R
Slot 1 Gauge A-Full ASCII Gauge S/N	32323	U INT	mbwS1FullSNA3	R
Slot 1 Gauge B Full ASCII Gauge S/N	32324	U INT	mbwS1FullSNB1	R
Slot 1 Gauge B Full ASCII Gauge S/N	32325	U INT	mbwS1FullSNB2	R
Slot 1 Gauge B Full ASCII Gauge S/N	32326	U INT	mbwS1FullSNB3	R
Slot 1 Gauge C Full ASCII Gauge S/N	32327	U INT	mbwS1FullSNC1	R
Slot 1 Gauge C Full ASCII Gauge S/N	32328	U INT	mbwS1FullSNC2	R
Slot 1 Gauge C Full ASCII Gauge S/N	32329	U INT	mbwS1FullSNC3	R

Description	Modbus Address	Type	Name	Access
Slot 1 Gauge D Full ASCII Gauge S/N	32330	U INT	mbwS1FullSND1	R
Slot 1 Gauge D Full ASCII Gauge S/N	32331	U INT	mbwS1FullSND2	R
Slot 1 Gauge D Full ASCII Gauge S/N	32332	U INT	mbwS1FullSND3	R

Table C-67: Slot 1: Last two digits of Serial Number (User Allocated)

Description	Modbus Address	Type	Name	Access
Slot 1 Gauge A S/N (2 last digits)	42333	U INT	mbwS12DSNA	RW (Engineering Port) R (UniConn)
Slot 1 Gauge B S/N (2 last digits)	42334	U INT	mbwS12DSNB	RW (Engineering Port) R (UniConn)
Slot 1 Gauge C S/N (2 last digits)	42335	U INT	mbwS12DSNC	RW (Engineering Port) R (UniConn)
Slot 1 Gauge D S/N (2 last digits)	42336	U INT	mbwS12DSND	RW (Engineering Port) R (UniConn)

Table C-68: Slot 1: Gauge Type and status

Description	Modbus Address	Type	Name	Access
Slot 1 Channel FSK Simulation	42337	U INT	mbwS1ChanFSKSim	RW (Engineering Port) R (UniConn)
Slot 1 Gauge A Measure Status	32338	U INT	mbwS1GaugeAStatus	R
Slot 1 Gauge A Type	32339	U INT	mbwS1GaugeAType	R
Slot 1 Gauge B Measure Status	32340	U INT	mbwS1GaugeBStatus	R
Slot 1 Gauge B Type	32341	U INT	mbwS1GaugeBType	R
Slot 1 Gauge C Measure Status	32342	U INT	mbwS1GaugeCStatus	R
Slot 1 Gauge C Type	32343	U INT	mbwS1GaugeCType	R

Description	Modbus Address	Type	Name	Access
Slot 1 Gauge D Measure Status	32344	U INT	mbwS1GaugeDStatus	R
Slot 1 Gauge D Type	32345	U INT	mbwS1GaugeDType	R

Table C-69: Slot 2: Full ASCII Gauge Serial Number

Description	Modbus Address	Type	Name	Access
Slot 2 Gauge A-Full ASCII Gauge S/N	32346	U INT	mbwS2FullSNA1	R
Slot 2 Gauge A-Full ASCII Gauge S/N	32347	U INT	mbwS2FullSNA2	R
Slot 2 Gauge A-Full ASCII Gauge S/N	32348	U INT	mbwS2FullSNA3	R
Slot 2 Gauge B Full ASCII Gauge S/N	32349	U INT	mbwS2FullSNB1	R
Slot 2 Gauge B Full ASCII Gauge S/N	32350	U INT	mbwS2FullSNB2	R
Slot 2 Gauge B Full ASCII Gauge S/N	32351	U INT	mbwS2FullSNB3	R
Slot 2 Gauge C Full ASCII Gauge S/N	32352	U INT	mbwS2FullSNC1	R
Slot 2 Gauge C Full ASCII Gauge S/N	32353	U INT	mbwS2FullSNC2	R
Slot 2 Gauge C Full ASCII Gauge S/N	32354	U INT	mbwS2FullSNC3	R
Slot 2 Gauge D Full ASCII Gauge S/N	32355	U INT	mbwS2FullSND1	R
Slot 2 Gauge D Full ASCII Gauge S/N	32356	U INT	mbwS2FullSND2	R
Slot 2 Gauge D Full ASCII Gauge S/N	32357	U INT	mbwS2FullSND3	R

Table C-70: Slot 2: Last Two Digits of Serial Number (User Allocated)

Description	Modbus Address	Type	Name	Access
Slot 2 Gauge A S/N (2 last digits)	42358	U INT	mbwS22DSNA	RW (Engineering Port) R (UniConn)
Slot 2 Gauge B S/N (2 last digits)	42359	U INT	mbwS22DSNB	RW (Engineering Port) R (UniConn)

Description	Modbus Address	Type	Name	Access
Slot 2 Gauge C S/N (2 last digits)	42360	U INT	mbwS22DSNC	RW (Engineering Port) R (UniConn)
Slot 2 Gauge D S/N (2 last digits)	42361	U INT	mbwS22DSND	RW (Engineering Port) R (UniConn)

Table C-71: Slot 2: Gauge Type and Status

Description	Modbus Address	Type	Name	Access
Slot 2 Channel FSK Simulation	42362	U INT	mbwS2ChanFSKSim	RW (Engineering Port) R (UniConn)
Slot 2 Gauge A Measure Status	32363	U INT	mbwS2GaugeAStatus	R
Slot 2 Gauge A Type	32364	U INT	mbwS2GaugeAType	R
Slot 2 Gauge B Measure Status	32365	U INT	mbwS2GaugeBStatus	R
Slot 2 Gauge B Type	32366	U INT	mbwS2GaugeBType	R
Slot 2 Gauge C Measure Status	32367	U INT	mbwS2GaugeCStatus	R
Slot 2 Gauge C Type	32368	U INT	mbwS2GaugeCType	R
Slot 2 Gauge D Measure Status	32369	U INT	mbwS2GaugeDStatus	R
Slot 2 Gauge D Type	32370	U INT	mbwS2GaugeDType	R

Table C-72: Slot 3: Full ASCII Gauge Serial Number

Description	Modbus Address	Type	Name	Access
Slot 3 Gauge A Full ASCII Gauge S/N	32371	U INT	mbwS3FullSNA1	R
Slot 3 Gauge A Full ASCII Gauge S/N	32372	U INT	mbwS3FullSNA2	R
Slot 3 Gauge A Full ASCII Gauge S/N	32373	U INT	mbwS3FullSNA3	R
Slot 3 Gauge B Full ASCII Gauge S/N	32374	U INT	mbwS3FullSNB1	R

Description	Modbus Address	Type	Name	Access
Slot 3 Gauge B Full ASCII Gauge S/N	32375	U INT	mbwS3FullSNB2	R
Slot 3 Gauge B Full ASCII Gauge S/N	32376	U INT	mbwS3FullSNB3	R
Slot 3 Gauge C Full ASCII Gauge S/N	32377	U INT	mbwS3FullSNC1	R
Slot 3 Gauge C Full ASCII Gauge S/N	32378	U INT	mbwS3FullSNC2	R
Slot 3 Gauge C Full ASCII Gauge S/N	32379	U INT	mbwS3FullSNC3	R
Slot 3 Gauge D Full ASCII Gauge S/N	32380	U INT	mbwS3FullSND1	R
Slot 3 Gauge D Full ASCII Gauge S/N	32381	U INT	mbwS3FullSND2	R
Slot 3 Gauge D Full ASCII Gauge S/N	32382	U INT	mbwS3FullSND3	R

Table C-73: Slot 3: Last Two Digits of Serial Number (User Allocated)

Description	Modbus Address	Type	Name	Access
Slot 3 Gauge A S/N (2 last digits)	42383	U INT	mbwS32DSNA	RW (Engineering Port)R (UniConn)
Slot 3 Gauge B S/N (2 last digits)	42384	U INT	mbwS32DSNB	RW (Engineering Port)R (UniConn)
Slot 3 Gauge C S/N (2 last digits)	42385	U INT	mbwS32DSNC	RW (Engineering Port)R (UniConn)
Slot 3 Gauge D S/N (2 last digits)	42386	U INT	mbwS32DSND	RW (Engineering Port)R (UniConn)

Table C-74: Slot 3: Gauge Type and Status

Description	Modbus Address	Type	Name	Access
Slot 3 Channel FSK Simulation	42387	U INT	mbwS3ChanFSKSim	RW (Engineering Port) R (UniConn)
Slot 3 Gauge A Status	32388	U INT	mbwS3GaugeAStatus	R
Slot 3 Gauge A Type	32389	U INT	mbwS3GaugeAType	R
Slot 3 Gauge B Measure Status	32390	U INT	mbwS3GaugeBStatus	R

Description	Modbus Address	Type	Name	Access
Slot 3 Gauge B Type	32391	U INT	mbwS3GaugeBType	R
Slot 3 Gauge C Measure Status	32392	U INT	mbwS3GaugeCStatus	R
Slot 3 Gauge C Type	32393	U INT	mbwS3GaugeCType	R
Slot 3 Gauge D Measure Status	32394	U INT	mbwS3GaugeDStatus	R
Slot 3 Gauge D Type	32395	U INT	mbwS3GaugeDType	R

Table C-75: Slot 4: Full ASCII Gauge Serial Number

Description	Modbus Address	Type	Name	Access
Slot 4 Gauge A-Full ASCII Gauge S/N	32396	U INT	mbwS4FullSNA1	R
Slot 4 Gauge A-Full ASCII Gauge S/N	32397	U INT	mbwS4FullSNA2	R
Slot 4 Gauge A-Full ASCII Gauge S/N	32398	U INT	mbwS4FullSNA3	R
Slot 4 Gauge B Full ASCII Gauge S/N	32399	U INT	mbwS4FullSNB1	R
Slot 4 Gauge B Full ASCII Gauge S/N	32400	U INT	mbwS4FullSNB2	R
Slot 4 Gauge B Full ASCII Gauge S/N	32401	U INT	mbwS4FullSNB3	R
Slot 4 Gauge C Full ASCII Gauge S/N	32402	U INT	mbwS4FullSNC1	R
Slot 4 Gauge C Full ASCII Gauge S/N	32403	U INT	mbwS4FullSNC2	R
Slot 4 Gauge C Full ASCII Gauge S/N	32404	U INT	mbwS4FullSNC3	R
Slot 4 Gauge D Full ASCII Gauge S/N	32405	U INT	mbwS4FullSND1	R
Slot 4 Gauge D Full ASCII Gauge S/N	32406	U INT	mbwS4FullSND2	R
Slot 4 Gauge D Full ASCII Gauge S/N	32407	U INT	mbwS4FullSND3	R

Table C-76: Slot 4: Last Two Digits of Serial Number (User Allocated)

Description	Modbus Address	Type	Name	Access
Slot 4 Gauge A S/N (2 last digits)	42408	U INT	mbwS42DSNA	RW (Engineering Port) R (UniConn)
Slot 4 Gauge B S/N (2 last digits)	42409	U INT	mbwS42DSNB	RW (Engineering Port) R (UniConn)
Slot 4 Gauge C S/N (2 last digits)	42410	U INT	mbwS42DSNC	RW (Engineering Port) R (UniConn)
Slot 4 Gauge D S/N (2 last digits)	42411	U INT	mbwS42DSND	RW (Engineering Port) R (UniConn)

Table C-77: Slot 4: Gauge Type and Status

Description	Modbus Address	Type	Name	Access
Slot 4 Channel FSK Simulation	42412	U INT	mbwS4ChanFSKSim	RW (Engineering Port)R (UniConn)
Slot 4 Gauge A Measure Status	32413	U INT	mbwS4GaugeAStatus	R
Slot 4 Gauge A Type	32414	U INT	mbwS4GaugeAType	R
Slot 4 Gauge B Measure Status	32415	U INT	mbwS4GaugeBStatus	R
Slot 4 Gauge B Type	32416	U INT	mbwS4GaugeBType	R
Slot 4 Gauge C Measure Status	32417	U INT	mbwS4GaugeCStatus	R
Slot 4 Gauge C Type	32418	U INT	mbwS4GaugeCType	R
Slot 4 Gauge D Measure Status	32419	U INT	mbwS4GaugeDStatus	R
Slot 4 Gauge D Type	32420	U INT	mbwS4GaugeDType	R

Table C-78: Gauges A, B, C, D Data 32 bit Floating Point Format

Description	Modbus Address	Type	Name	Access
Slot 1 Gauge A Pressure Engineering Value 32 bit	32421	FLOAT	mbwFPress1_A	R
Slot 1 Gauge A Pressure Engineering Value 32 bit	32422	FLOAT	mbwF2Press1_A	R
Slot 1 Gauge A Temperature Engineering Value 32 bit	32423	FLOAT	mbwFTemp1_A	R
Slot 1 Gauge A Temperature Engineering Value 32 bit	32424	FLOAT	mbwF2Temp1_A	R
Slot 1 Gauge B Pressure Engineering Value 32 bit	32425	FLOAT	mbwFPress1_B	R
Slot 1 Gauge B Pressure Engineering Value 32 bit	32426	FLOAT	mbwF2Press1_B	R
Slot 1 Gauge B Temperature Engineering Value 32 bit	32427	FLOAT	mbwFTemp1_B	R
Slot 1 Gauge B Temperature Engineering Value 32 bit	32428	FLOAT	mbwF2Temp1_B	R
Slot 1 Gauge C Pressure Engineering Value 32 bit	32433	FLOAT	mbwFPress1_C	R
Slot 1 Gauge C Pressure Engineering Value 32 bit	32434	FLOAT	mbwF2Press1_C	R
Slot 1 Gauge C Temperature Engineering Value 32 bit	32435	FLOAT	mbwFTemp1_C	R
Slot 1 Gauge C Temperature Engineering Value 32 bit	32436	FLOAT	mbwF2Temp1_C	R
Slot 1 Gauge D Pressure Engineering Value 32 bit	32437	FLOAT	mbwFPress1_D	R
Slot 1 Gauge D Pressure Engineering Value 32 bit	32438	FLOAT	mbwF2Press1_D	R
Slot 1 Gauge D Temperature Engineering Value 32 bit	32439	FLOAT	mbwFTemp1_D	R
Slot 1 Gauge D Temperature Engineering Value 32 bit	32440	FLOAT	mbwF2Temp1_D	R
Slot 2 Gauge A Pressure Engineering Value 32 bit	32445	FLOAT	mbwFPress2_A	R
Slot 2 Gauge A Pressure Engineering Value 32 bit	32446	FLOAT	mbwF2Press2_A	R
Slot 2 Gauge A Temperature Engineering Value 32 bit	32447	FLOAT	mbwFTemp2_A	R
Slot 2 Gauge A Temperature Engineering Value 32 bit	32448	FLOAT	mbwF2Temp2_A	R
Slot 2 Gauge B Pressure Engineering Value 32 bit	32449	FLOAT	mbwFPress2_B	R

Description	Modbus Address	Type	Name	Access
Slot 2 Gauge B Pressure Engineering Value 32 bit	32450	FLOAT	mbwF2Press2_B	R
Slot 2 Gauge B Temperature Engineering Value 32 bit	32451	FLOAT	mbwFTemp2_B	R
Slot 2 Gauge B Temperature Engineering Value 32 bit	32452	FLOAT	mbwF2Temp2_B	R
Slot 2 Gauge C Pressure Engineering Value 32 bit	32457	FLOAT	mbwFPress2_C	R
Slot 2 Gauge C Pressure Engineering Value 32 bit	32458	FLOAT	mbwF2Press2_C	R
Slot 2 Gauge C Temperature Engineering Value 32 bit	32459	FLOAT	mbwFTemp2_C	R
Slot 2 Gauge C Temperature Engineering Value 32 bit	32460	FLOAT	mbwF2Temp2_C	R
Slot 2 Gauge D Pressure Engineering Value 32 bit	32461	FLOAT	mbwFPress2_D	R
Slot 2 Gauge D Pressure Engineering Value 32 bit	32462	FLOAT	mbwF2Press2_D	R
Slot 2 Gauge D Temperature Engineering Value 32 bit	32463	FLOAT	mbwFTemp2_D	R
Slot 2 Gauge D Temperature Engineering Value 32 bit	32464	FLOAT	mbwF2Temp2_D	R
Slot 3 Gauge A Pressure Engineering Value 32 bit	32469	FLOAT	mbwFPress3_A	R
Slot 3 Gauge A Pressure Engineering Value 32 bit	32470	FLOAT	mbwF2Press3_A	R
Slot 3 Gauge A Temperature Engineering Value 32 bit	32471	FLOAT	mbwFTemp3_A	R
Slot 3 Gauge A Temperature Engineering Value 32 bit	32472	FLOAT	mbwF2Temp3_A	R
Slot 3 Gauge B Pressure Engineering Value 32 bit	32473	FLOAT	mbwFPress3_B	R
Slot 3 Gauge B Pressure Engineering Value 32 bit	32474	FLOAT	mbwF2Press3_B	R
Slot 3 Gauge B Temperature Engineering Value 32 bit	32475	FLOAT	mbwFTemp3_B	R
Slot 3 Gauge B Temperature Engineering Value 32 bit	32476	FLOAT	mbwF2Temp3_B	R
Slot 3 Gauge C Pressure Engineering Value 32 bit	32481	FLOAT	mbwFPress3_C	R
Slot 3 Gauge C Pressure Engineering Value 32 bit	32482	FLOAT	mbwF2Press3_C	R

Description	Modbus Address	Type	Name	Access
Slot 3 Gauge C Temperature Engineering Value 32 bit	32483	FLOAT	mbwFTemp3_C	R
Slot 3 Gauge C Temperature Engineering Value 32 bit	32484	FLOAT	mbwF2Temp3_C	R
Slot 3 Gauge D Pressure Engineering Value 32 bit	32485	FLOAT	mbwFPress3_D	R
Slot 3 Gauge D Pressure Engineering Value 32 bit	32486	FLOAT	mbwF2Press3_D	R
Slot 3 Gauge D Temperature Engineering Value 32 bit	32487	FLOAT	mbwFTemp3_D	R
Slot 3 Gauge D Temperature Engineering Value 32 bit	32488	FLOAT	mbwF2Temp3_D	R
Slot 4 Gauge A Pressure Engineering Value 32 bit	32493	FLOAT	mbwFPress4_A	R
Slot 4 Gauge A Pressure Engineering Value 32 bit	32494	FLOAT	mbwF2Press4_A	R
Slot 4 Gauge A Temperature Engineering Value 32 bit	32495	FLOAT	mbwFTemp4_A	R
Slot 4 Gauge A Temperature Engineering Value 32 bit	32496	FLOAT	mbwF2Temp4_A	R
Slot 4 Gauge B Pressure Engineering Value 32 bit	32497	FLOAT	mbwFPress4_B	R
Slot 4 Gauge B Pressure Engineering Value 32 bit	32498	FLOAT	mbwF2Press4_B	R
Slot 4 Gauge B Temperature Engineering Value 32 bit	32499	FLOAT	mbwFTemp4_B	R
Slot 4 Gauge B Temperature Engineering Value 32 bit	32500	FLOAT	mbwF2Temp4_B	R
Slot 4 Gauge C Pressure Engineering Value 32 bit	32505	FLOAT	mbwFPress4_C	R
Slot 4 Gauge C Pressure Engineering Value 32 bit	32506	FLOAT	mbwF2Press4_C	R
Slot 4 Gauge C Temperature Engineering Value 32 bit	32507	FLOAT	mbwFTemp4_C	R
Slot 4 Gauge C Temperature Engineering Value 32 bit	32508	FLOAT	mbwF2Temp4_C	R
Slot 4 Gauge D Pressure Engineering Value 32 bit	32509	FLOAT	mbwFPress4_D	R
Slot 4 Gauge D Pressure Engineering Value 32 bit	32510	FLOAT	mbwF2Press4_D	R
Slot 4 Gauge D Temperature Engineering Value 32 bit	32511	FLOAT	mbwFTemp4_D	R
Slot 4 Gauge D Temperature Engineering Value 32 bit	32512	FLOAT	mbwF2Temp4_D	R

UniConn Firmware Upgrade

D UniConn Firmware Upgrade

For additional details and latest release information see 'Firmware Upgrade for the UniConn Controller' InTouch Content ID 4085368.

D.1 Requirements

This section describes hardware and software requirements for UniConn firmware upgrade.

D.1.1 Hardware Requirement

The following hardware is required:
- PC with serial port or USB-to-serial port converter
- Standard DB9 serial cable

D.1.2 Software Requirements

The following software is required:
- UniConn firmware executable file,
- StarView software (optional).

Firmware file name format is a `UpgradeVxxxrx.exe`, where numbers after letter ‘V’ stand for version, and number after letter ‘r’ stands for revision. If the revision character is not a number, but letter, that means that firmware is field test prototype. For IntelliZone Compact, the file name is UniConnIZCxxxxrx_yyyymmdd, where the yyyymmdd is the release date of the firmware.

D.1.3 UniConn Requirements

The UniConn must be configured with the following parameters prior to initiating an upgrade.
- Engineering/StarView port configured with baud rate of **57600**.
- Engineering/StarView port access mode set as **FULL**.

Note

The firmware upgrade utility will establish a connection at alternate baud rates, but will not be able to complete the upgrade. This is a known issue and is addressed by using the settings indicated above.

D.2 Procedure

The procedure is divided into three steps. Each of these steps will be described in detail in the following sections:

1. Saving the UniConn settings (best practice). Section Appendix D.2.1
2. Firmware download. Section Appendix D.2.2
3. Restoring the UniConn settings (optional). Section Appendix D.2.3

D.2.1 Saving the UniConn Settings

This step is not necessary. UniConn firmware upgrade procedure automatically restores initial settings. The settings can be saved as a backup. More details available in 10: Using StarView.

1. Connect PC serial port to UniConn Maintenance port (front panel port).
2. On the **File** menu , select **Communications** command from drop-down menu to set communication parameters:
   - 57600 baud
   - Direct One to One Link and Comm port used on the PC.
3. On the **File** menu, click **New** command to establish communication with UniConn.
4. Wait few seconds for database to upload from UniConn and then on the **File** menu, click **Save As** command to save a site (an **.ste**) file to PC hard drive.
5. Close StarView window.

D.2.2 Firmware Download

1. Power the UniConn.
2. Connect a PC serial port to the UniConn Maintenance port (front panel port). Ensure there are no other programs using the connected serial port.

3. Double-click on `'UniConn_Vxxxrx.exe(where xxxxrx specifies the release number)'` firmware file and the firmware will be downloaded automatically (see). The Comm port settings will be done automatically as well.

4. Click **OK** when the loading is finished (look at the progress bar) to close the upgrade utility program.

Note

If the loader fails to detect the UniConn, double check the connections and either:

- Press the “Autoscan” Button
- Manually select the correct COM port

Once done, press the “Upgrade” Button

5. Checking the firmware version can be done manually using UniConn keypad (**MENU**, press **SETUP**).

6. Checking the firmware version using StarView:
   - Connect PC serial port to UniConn Maintenance port (front panel port)
   - On the **File** menu , select **Communications** command from drop-down menu to set communication parameters:
     – 57600 baud
     – Direct One to One Link and Comm port used on the PC.

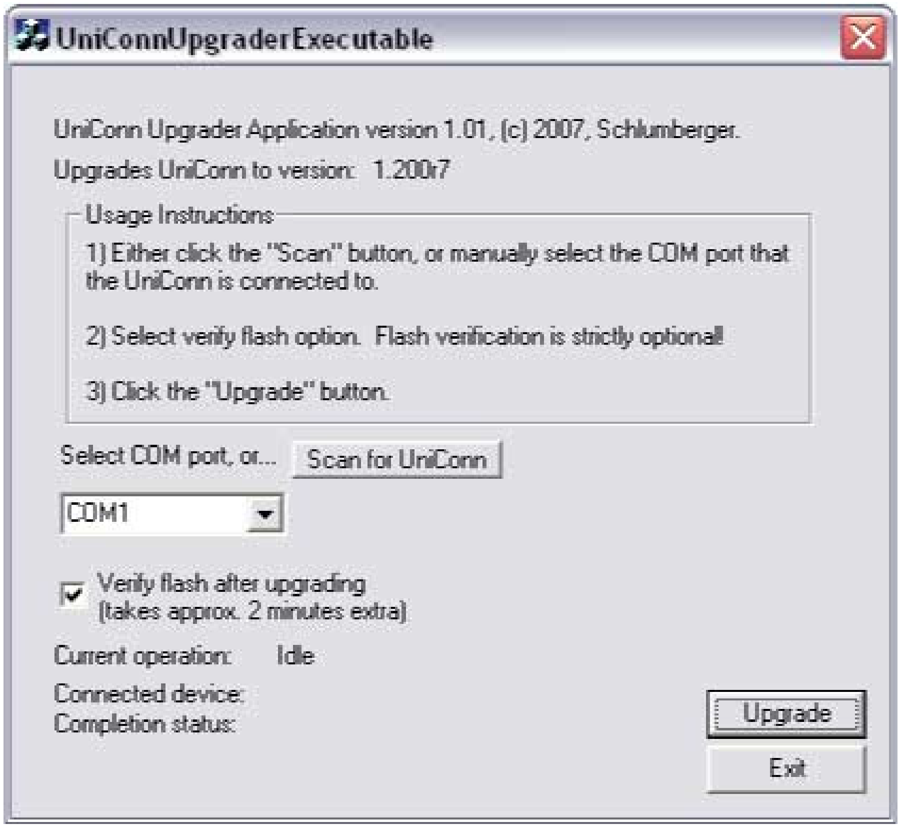


Figure D-1: Firmware Upgrade

- On the **File** menu, click **New** command to establish communication with UniConn.
- Wait few seconds for database to upload from UniConn and then on the **Database** menu, select **Controller** command to display controller dialog (see Figure D-2).
- Firmware version is shown in upper left corner of the window.

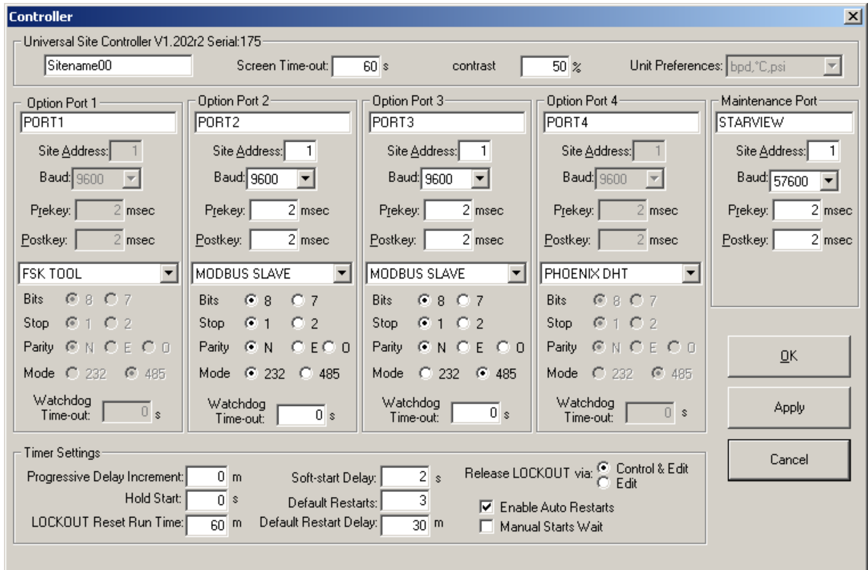


Figure D-2: Controller Dialog Firmware Version

D.2.3 Restoring the UniConn Settings

This step is not mandatory and should be performed as needed. More details are described in 10: Using StarView.

1. Connect PC serial port to UniConn Maintenance port (front panel port)

2. On the **File** menu, click **Communications** command from drop-down menu to set communication parameters:

- 57600 baud
- Direct One to One Link and Comm port used on the PC.

3. On the **File** menu, click **New** command to establish communication with UniConn

4. Wait few seconds for database upload from UniConn and then on the **File** menu, click **Open** command to open previously saved file.

5. Restore sizes of two by opening **StarView** windows, so that both windows are at least partially visible (see Figure D-3). Notice that site windows look differently for different UniConn applications.

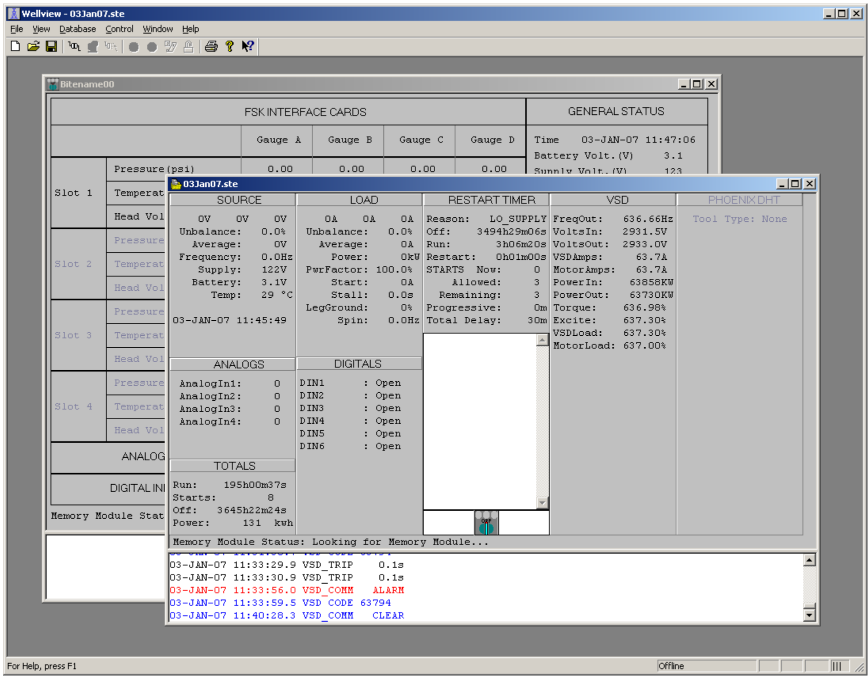


Figure D-3: Drag and Drop

6. Left-click on the saved site window, hold the button and drag the cursor to the live site window.

7. Release over the live site window area.

8. You will be prompted to close and reopen live site window, so that the settings are implemented.

Interconnection Diagram

E Interconnection Diagram

Refer to Figure E-1 for an interconnect diagram for UniConn to a typical switchboard installation.

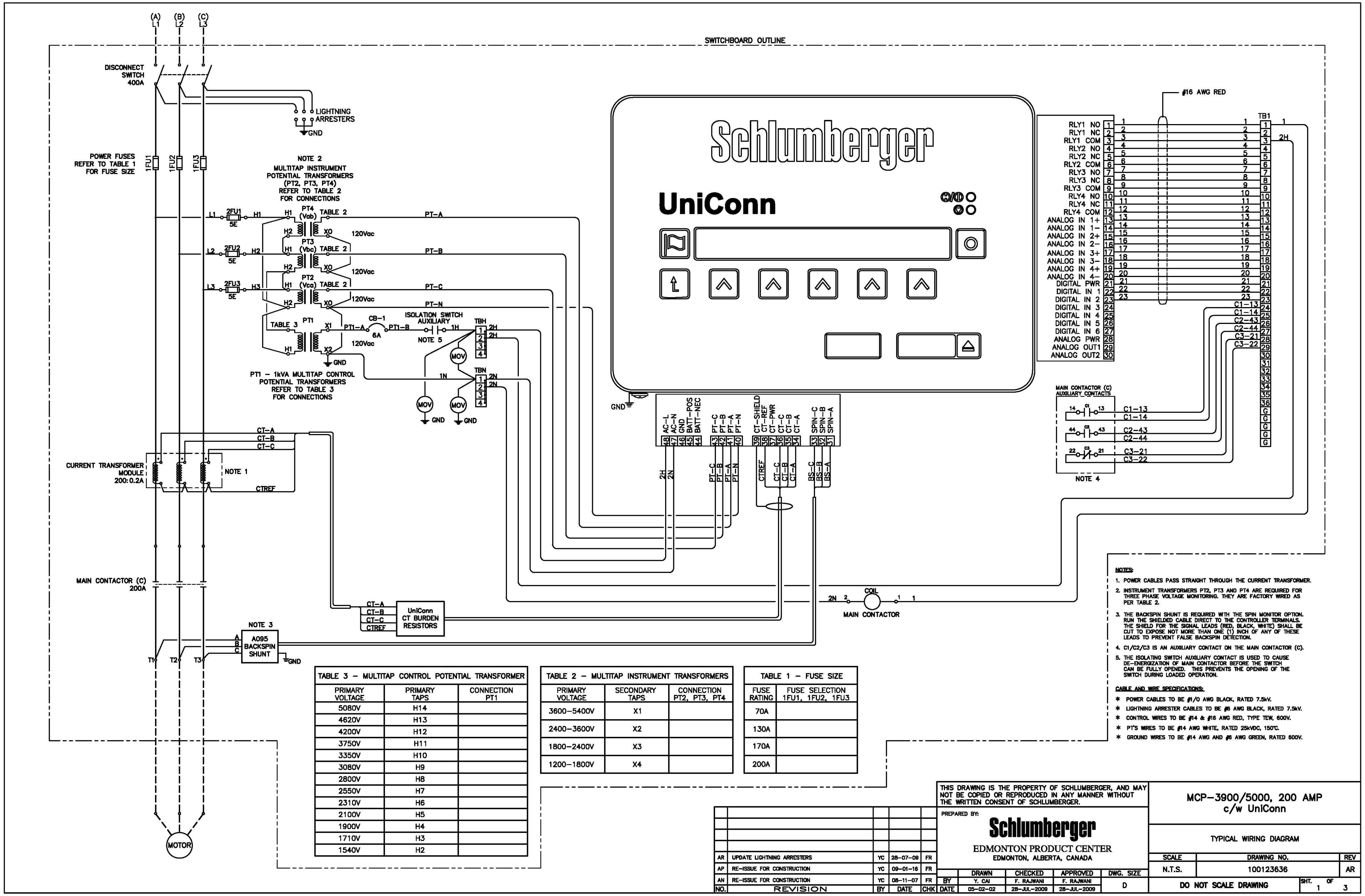


TABLE 3 – MULTITAP CONTROL POTENTIAL TRANSFORMER		
PRIMARY VOLTAGE	PRIMARY TAPS	CONNECTION PT1
5080V	H14	
4620V	H13	
4200V	H12	
3750V	H11	
3350V	H10	
3080V	H9	
2800V	H8	
2550V	H7	
2310V	H6	
2100V	H5	
1900V	H4	
1710V	H3	
1540V	H2	

TABLE 2 – MULTITAP INSTRUMENT TRANSFORMERS		
PRIMARY VOLTAGE	SECONDARY TAPS	CONNECTION PT2, PT3, PT4
3600–5400V	X1	
2400–3600V	X2	
1800–2400V	X3	
1200–1800V	X4	

TABLE 1 – FUSE SIZE	
FUSE RATING	FUSE SELECTION 1FU1, 1FU2, 1FU3
70A	
130A	
170A	
200A	

Figure E-1: UniConn/Switchboard Interconnect Diagram

NEMA 3R/4X Mounting Diagram

F NEMA 3R/4X Mounting Diagram

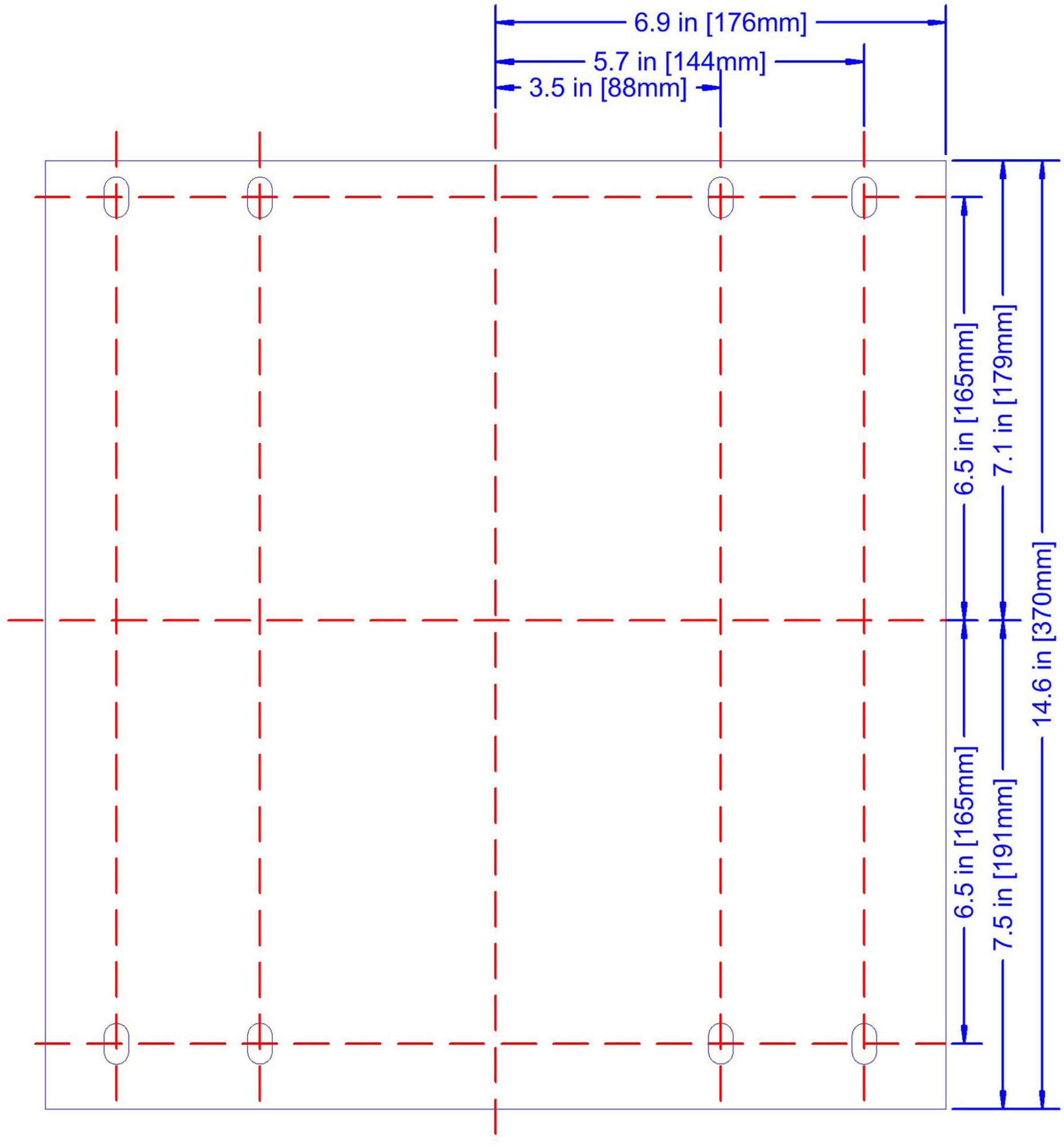


Figure F-1: NEMA 3R mounting diagram

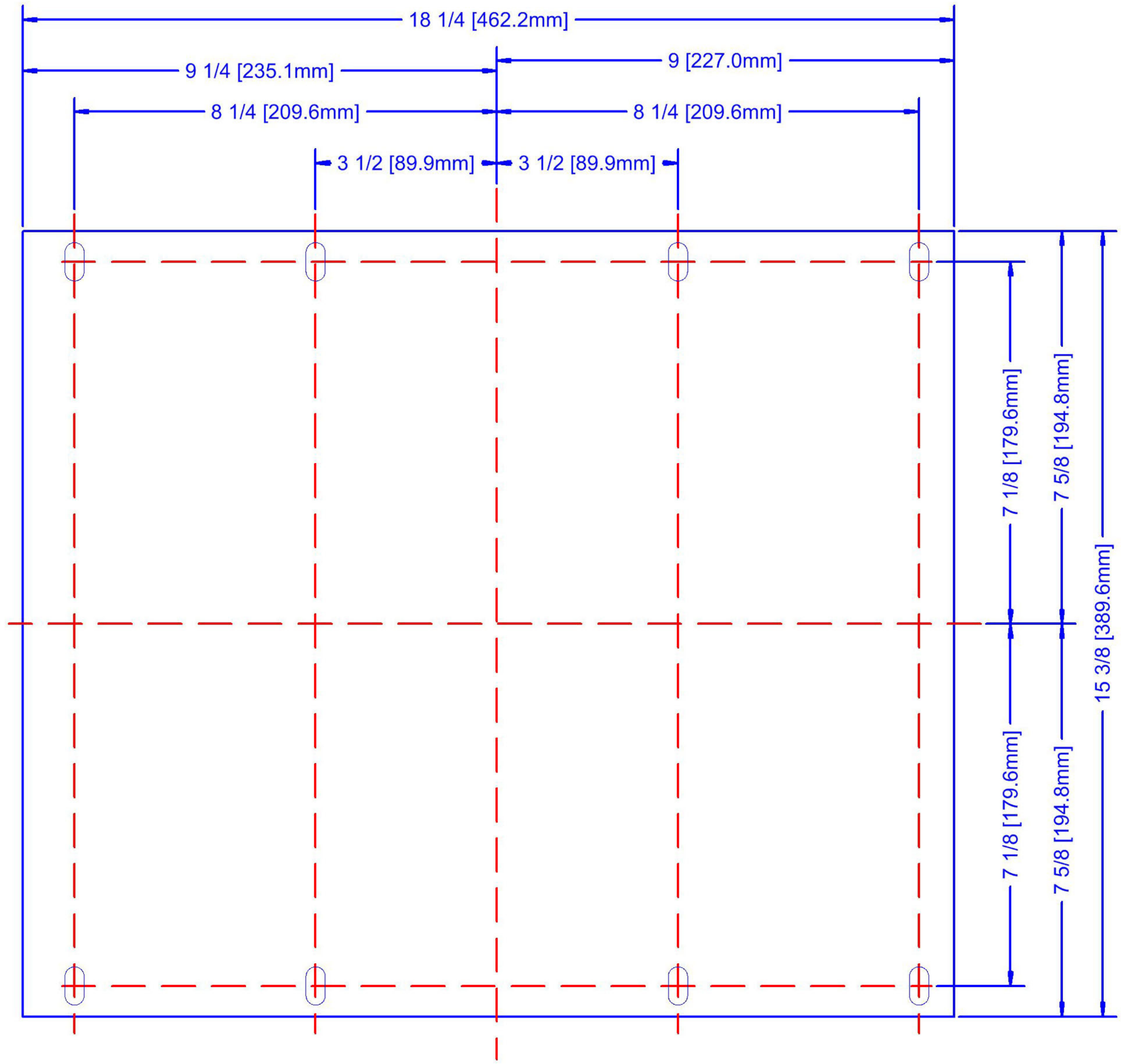


Figure F-2: NEMA 4X mounting diagram

Termination Table

G Termination Table

G.1 UniConn

Table G-1: UniConn Termination Table

TERMINAL	TERMINAL NAME	LOCATION	DESCRIPTION	Special Note
1	RLY 1 NO	Side	Relay 1 (Contactor) Normally Open contact.	Relay 1 is reserved for contactor operation.
2	RLY 1 NC	Side	Relay 1 (Contactor) Normally Closed contact.	
3	RLY1 COM	Side	Relay 1 (Contactor) Common contact.	
4	RLY 2 NO	Side	Relay 2 (Auxiliary Digital Output) Normally Open contact.	
5	RLY 2 NC	Side	Relay 2 (Auxiliary Digital Output) Normally Closed contact.	
6	RLY 2 COM	Side	Relay 2 (Auxiliary Digital Output) Common contact.	
7	RLY 3 NO	Side	Relay 3 (Auxiliary Digital Output) Normally Open contact.	
8	RLY 3 NC	Side	Relay 3 (Auxiliary Digital Output) Normally Closed contact.	
9	RLY 3 COM	Side	Relay 3 (Auxiliary Digital Output) Common contact.	
10	RLY 4 NO	Side	Relay 4 (Auxiliary Digital Output) Normally Open contact.	
11	RLY 4 NC	Side	Relay 4 (Auxiliary Digital Output) Normally Closed contact.	
12	RLY 4 COM	Side	Relay 4 (Auxiliary Digital Output) Common contact.	
13	ANALOG IN 1 +	Side	User Analog Input 1 positive terminal.	
14	ANALOG IN 1 -	Side	User Analog Input 1 negative terminal.	

TERMINAL	TERMINAL NAME	LOCATION	DESCRIPTION	Special Note
15	ANALOG IN 2 +	Side	User Analog Input 2 positive terminal.	
16	ANALOG IN 2 -	Side	User Analog Input 2 negative terminal.	
17	ANALOG IN 3 +	Side	User Analog Input 3 positive terminal.	
18	ANALOG IN 3 -	Side	User Analog Input 3 negative terminal.	
19	ANALOG IN 4 +	Side	User Analog Input 4 positive terminal.	
20	ANALOG IN 4 -	Side	User Analog Input 4 negative terminal.	
21	DIGITAL PWR	Side	User Digital Inputs Switching Power terminal.	
22	DIGITAL IN 1	Side	User Digital Input 1 switch contact.	
23	DIGITAL IN 2	Side	User Digital Input 2 switch contact.	
24	DIGITAL IN 3	Side	User Digital Input 3 switch contact.	
25	DIGITAL IN 4	Side	User Digital Input 4 switch contact.	
26	DIGITAL IN 5	Side	User Digital Input 5 switch contact.	
27	DIGITAL IN 6	Side	User Digital Input 6 switch contact.	
28	ANALOG PWR	Side	User Analog Output Loop Power terminal.	
29	ANALOG OUT1	Side	User Analog Output 1 current sink terminal.	
30	ANALOG OUT2	Side	User Analog Output 2 current sink terminal.	
31	SPIN-A	Bottom	Backspin shunt phase A connection.	Only connect to the Backspin Shunt.
32	SPIN-B	Bottom	Backspin shunt phase B connection.	
33	SPIN-C	Bottom	Backspin shunt phase C connection.	

TERMINAL	TERMINAL NAME	LOCATION	DESCRIPTION	Special Note
34	CT-A	Bottom	Current Module phase A connection.	Only connect to the UniConn Current Module.
35	CT-B	Bottom	Current Module phase B connection.	
36	CT-C	Bottom	Current Module phase C connection.	
37	CT - PWR	Bottom	Current Module ‘phase D’ (power monitor) connection.	
38	CT - REF	Bottom	Current Module reference voltage connection.	
39	CT - SHEILD	Bottom	Current Module shielding connection.	
40	PT-N	Bottom	Potential Transformer Neutral WYE point terminal.	Connect to the Neutral WYE point of the instrument transformers.
41	PT-A	Bottom	Potential Transformer phase A terminal.	
42	PT-B	Bottom	Potential Transformer phase B terminal.	
43	PT-C	Bottom	Potential Transformer phase C terminal.	
44	BATT - NEG	Bottom	DC Power Supply negative terminal.	
45	BATT - POS	Bottom	DC Power Supply positive terminal.	
46	GND	Bottom	Power Supply Chassis Ground terminal.	
47	AC-N	Bottom	AC Power Supply Neutral terminal.	
48	AC-L	Bottom	AC Power Supply Hot terminal.	

G.2 Phoenix Interface Card (PIC)

Table G-2: Phoenix Interface Card termination table

PIN NUMBER	PIN NAME	DESCRIPTION
3 (3 Pin Cards) is not Present on 2 Pin Cards	N.C. Not present on 2 pin cards	Do not make a connection to this pin. Doing so may impair the operation of the PIC.

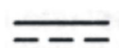
PIN NUMBER	PIN NAME	DESCRIPTION
2	DH CHASSIS	Downhole Tool power return connection. This connection is made via terminal blocks to the TB1-2 terminal of the MultiSensor choke console.
1	DH LINE	Downhole Tool power connection. This connection is made via terminal blocks to the TB1-1 terminal of the MultiSensor choke console.

Symbol Table

H Symbol Table

H.1 UniConn

Table H-1: UniConn Symbol Summary

Symbol	Description	Special Notes
	Direct Current	
	Alternating Current	
	Earth Ground	
	Frame or Chassis terminal	
	Off symbol	Labels the key that will always open the contactor (Relay 1).
	Escape	Menu navigation/Cancel changes.
	Language	Toggle display language.
	Off/On	A LED is associated with this symbol.
	Alarm	A LED is associated with this symbol.
	Protective Conductor Terminal	

Recommended Settings

I Recommended Settings

I.1 Fixed Speed Controller Settings

Table I-1: Recommended FSD Controller Settings

Switchboard Controller Recommended Settings			Alarm Settings				
Parameter	**Setpoint**	**Action**	**Setpoint**	**Trip time (sec)**	**No. of auto restart allowed**	**Restart Delay (min)**	**Start bypass (sec)**
Current	Current unbalance	Log and Stop	20.00%	2.0	0	30	0.0
	Overload	Log and Stop	1.15* Running Amp	16.0	0	30	0.0
	Underload	Log and Stop	0.80* Running Amp	8.0	3	30	0.0
	Short Circuit	Bypass	6* Motor NamePlate Amps	0.4			
	Stall	Bypass	3* Motor NamePlate Amps	0.5			
Voltage	Voltage Unbalance	Log and Stop	5.00%	4.0	3	30	0.0
	Overvolt	Log and Stop	1.1 * Surface voltage	1.0	3	30	0.0
	Undervolt	Log and Stop	0.9 * Surface voltage	4.0	3	30	0.0
Frequency	High frequency	Log and Stop	Supply frequency + 5Hz	0.2	3	30	0.0
	Low frequency	Log and Stop	Supply frequency - 5Hz	0.2	3	30	0.0
Supply volt	High supply volt	Log and Stop	Supply volt + 10V	0.5	3	30	0.0
	Low supply volt	Log and Stop	Supply volt - 10V	9.0	3	30	0.0
Others	Power factor	Log and Stop	50%	0.2	0	30	0.0
	Leg Ground	Log and Stop	40.00%	0.5	3	30	0.0
				Clear Time (sec)	Alarm on Reverse Spin Only		
	Spin	Log and Stop	2.0 Hz	30.0	No		
				Detection			
	Rotation	Stop	ACB	Current			

I.2 Phoenix Interface Card (PIC)

Table I-2: MultiSensor XT recommended protection settings

Switchboard Controller Recommended Settings			Alarm Settings				
Parameter	**Setpoint**	**Action**	**Setpoint**	**Trip time (sec)**	**No. of auto restart allowed**	**Restart Delay (min)**	**Start bypass (sec)**
Pressure	Low Intake pressure	Log & Stop	10 psi above bubble point (Pin > bubble point) or 0.75* normal Pin (Pin < bubble point)	45.0	3	60	0.0
	High Intake pressure	Log & Stop	0.9 * Pin @ static	45.0	3	30	0.0
	Low Discharge pressure	Log	(Pump head -Pi) at max.rate of pump ROR	45.0	3	30	0.0
	High Discharge pressure	Log & Stop	0.9*(Pin @ static + pump head @ zero flow)	45.0	3	60	0.0
	Low Diff. Pressure	Log	Pump head at max.rate of pump ROR	45.0	3	30	0.0
	High Diff. Pressure	Log	Pump head at min.rate of pump ROR	45.0	3	30	0.0
Downhole Flow Rate	Low Flow Rate	Log	Min. rate of pump ROR	45.0	3	30	0.0
	High Flow Rate	Log	Max. rate of pump ROR	45.0	3	30	0.0

Switchboard Controller Recommended Settings			**Alarm Settings**				
Parameter	**Setpoint**	**Action**	**Setpoint**	**Trip time (sec)**	**No. of auto restart allowed**	**Restart Delay (min)**	**Start bypass (sec)**
Temperature	Intake Temperature	Log & Stop	45 degF above normal BHT	45.0	3	60	0.0
	Motor Winding Temperature	Log & Stop	100 degF above normal Motor Winding temp. when running, or 350 degF (for K motors)/500 degF (for X motors) - whichever is lower	45.0	0	30	0.0
Others	Vibration	Log	2.5 * normal vibration level seen	45.0	0	30	0.0
	Current leakage	Log & Stop	5 mA	45.0	0	30	0.0

Commissioning Forms

J Commissioning Forms

J.1 Parameter Checklist

Parameter:	Setpoint:	Action:	Retry No:	Retry Time:	Start Delay:
Password Required?	{NO}				
USC Site Name:					
Set CLOCK:	Time:			Date:	
CT Burden Resitor:	A			P	
OVERLOAD		{LOG+STOP}	{0}	{30}	{0}
UNDERLOAD		{LOG+STOP}	{3}	{30}	{0}
PT1 Tap Setting:				PT2, PT3 and PT4 Tap Setting:	
USC PT Rating:					
SPIN	{2}	{LOG+STOP}		{30}	
LEG GROUND	{40}	{LOG+STOP}	{3	{30}	{0}
STALL	{300}	{BYPASS}	N/A	N/A	N/A
SHORT CCT	{600}	{BYPASS}	N/A	N/A	N/A
C UNBAL	{20}	{LOG+STOP}	{0}	{30}	{0.8}
V UNBAL	{4}	{LOG+STOP}	{3}	{30}	{0}
HI FREQ	{65}	{LOG+STOP}	{3}	{30}	{0}
LO FREQ	{55}	{LOG+STOP}	{3}	{30}	{0}
HI SUPPLY	{130}	{LOG+STOP}	{3}	{30}	{0}
LO SUPPLY	{100}	{LOG+STOP}	{3}	{30}	{0}
ROTATION	{ACB}	{STOP}	N/A	N/A	N/A
PWR FACTOR	{5.0}	{BYPASS}	{0}	{30}	{0}
USC	Version:			Serial:	

J.2 Wellsite Record

PUMP:	Model:		Hp:
MOTOR:	Model:	Volts:	Amps:
TRANSFORMER:	Model:	Volts: /	kVA:

Phase A Amps:	Phase AC Volts:	Rotation:
Phase B Amps:	Phase CB Volts:	Kilowatts:
Phase C Amps:	Phase BA Volts:	Power Factor:
Average Amps:	Average Volts:	Loop 1:
Start Amps:	Voltage Unbalance:	Loop 2:
Current Unbalance:	AC Frequency:	Spin Monitor:
	Supply Volts:	Leg Ground Monitor:

Modbus Master Functionality

K Modbus Master Functionality

The UniConn can be configured to operate as a Modbus Master (MBM). There are 16 analog input channels (1 – 8 can be configured for alarming; 9 – 16 cannot be configured for alarming), 8 analog output channels, 8 discrete input channels, and 8 discrete output channels available. Note that the UniConn can only have a single option port configured as modbus master; it is therefore implied that all modbus slave devices are connected to the UniConn in a multi-drop configuration.

A UniConn Comm card (part #100228568) will need to be installed in the option port which is configured as MBM. The slave device(s) would then be connected to the Comm card via RS-232 or RS-485, but not both at the same time.

MBM analog input/output only supports unsigned values. Floating point, signed integer, and double integer are not supported.

K.1 Configure Modbus Master from UniConn Front Keypad

Configuring the MBM function requires two steps: first, select a UniConn option port to be an MBM; and second, to set the MBM parameters. To assign the MBM function to an option port from the front keypad, use the key press map in the following table:

After assigning the MBM function to an option port, operational parameters can be configured as follows:

Pressing the ADJ key at the Modbus Master Setup screen will allow the operator to edit the main modbus master setup parameters (see section 3.2.3 for details). Pressing the PREV key will navigate the UniConn screen to the individual channels of the modbus master feature.

```
12:51:27       Sitename00            OFF
 MENU              HAND     AUTO
   ↓
```

```
12:51:28       Sitename00            OFF
  MOTOR    I/O           HISTORY  SETUP
                                    ↓
```

```
UniConn      V1.403r1    Serial:    175
          ADJ               PREV    NEXT
                                      ↓
                                      ↓  (multiple times)
```

```
Option Ports:
  PORT1             PORT2    PREV    NEXT
                       ↓  (select port with Comm card,
                           This example uses PORT2)
```

```
PORT2:
  EDIT                       PREV    NEXT
                                      ↓
```

```
Function:                      MODBUS SLAVE
  EDIT                       PREV    NEXT
    ↓
```

```
Function:                      DISABLED
  ACCEPT                     PREV    NEXT
                                      ↓
                                      ↓  (multiple times)
                                      ↓
```

```
Function:                      MODBUS MASTER
  ACCEPT                     PREV    NEXT
    ↓
```

```
Baud Rate:                             9600
  EDIT                     PREV    NEXT
       (baud rate, stop bits, parity, etc
        should be configured to match modbus slave(s))
```

After assigning the MBM function to an option port, operational parameters can be configured as follows:

```
12:51:27       Sitename00             OFF
 MENU             HAND     AUTO
   ↓
```

```
12:51:28       Sitename00             OFF
  MOTOR     I/O           HISTORY  SETUP
              ↓
```

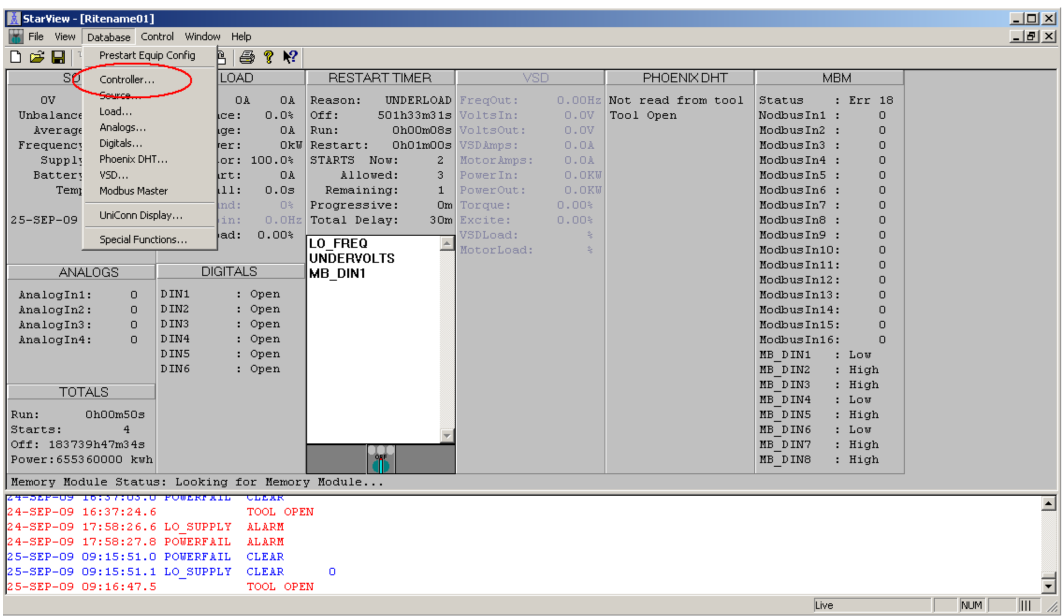
```
AnalogIn1:
AIN1_LO   ADJ     AIN1_HI    PREV    NEXT
                               ↓
                               ↓  (multiple times)
                               ↓
```

```
Modbus Master Setup
          ADJ                PREV    NEXT
                               ↓
                               ↓  (will scroll through
                               ↓   the individual MBM
                               ↓   channels)
```

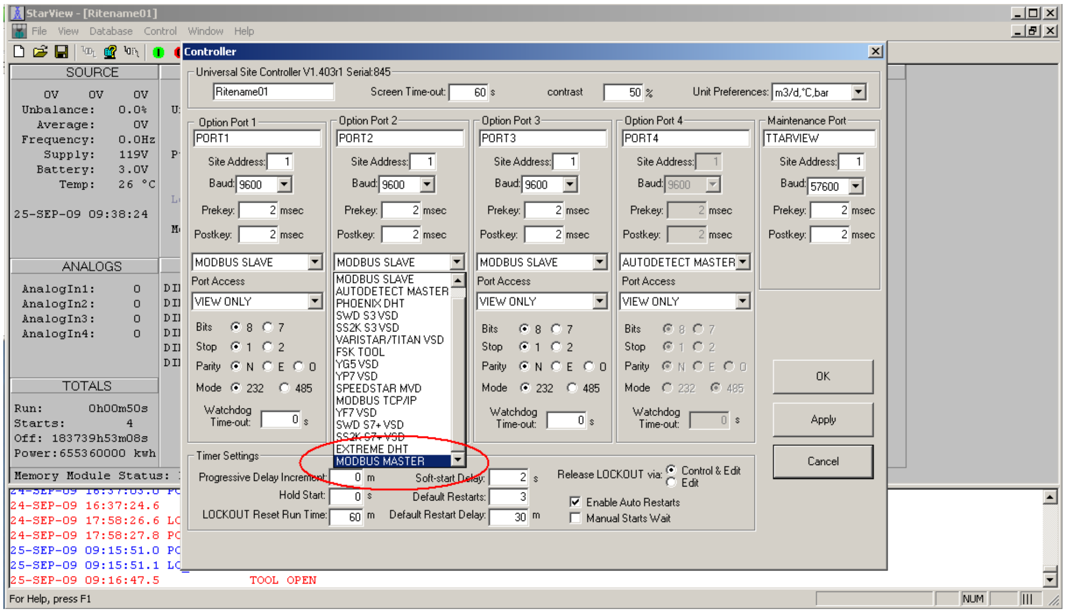
Pressing the ADJ key at the Modbus Master Setup screen will allow the operator to edit the main modbus master setup parameters (see section 3.2.3 for details). Pressing the PREV key will navigate the UniConn screen to the individual channels of the modbus master feature.

K.2 Configure Modbus Master from StarView

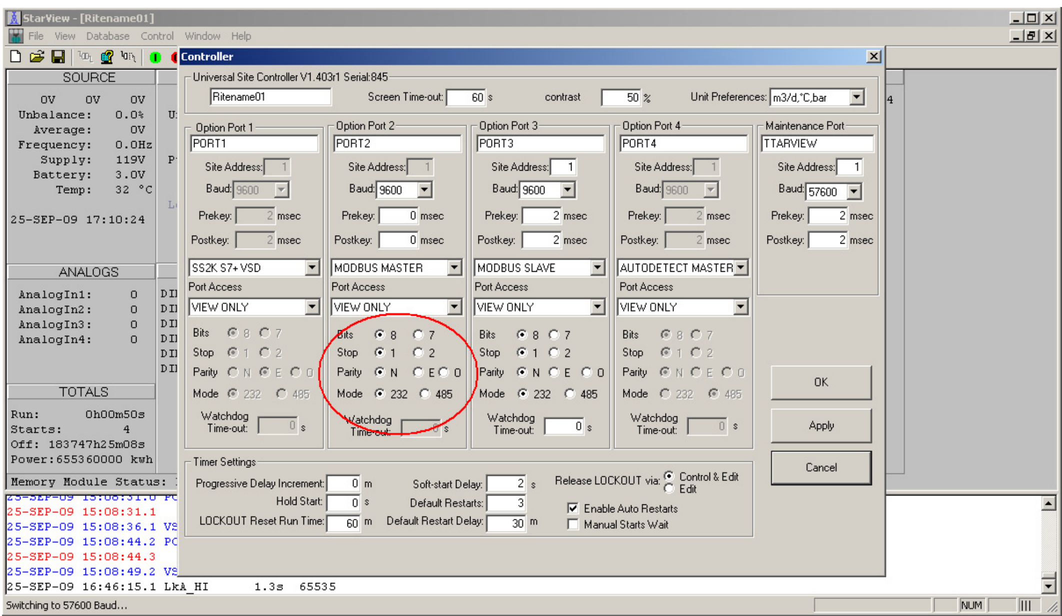
Configuring MBM using StarView requires two steps: assigning the MBM function to an option port; then setting the operation parameters. To assign the MBM function to a port, select the controller dialog:



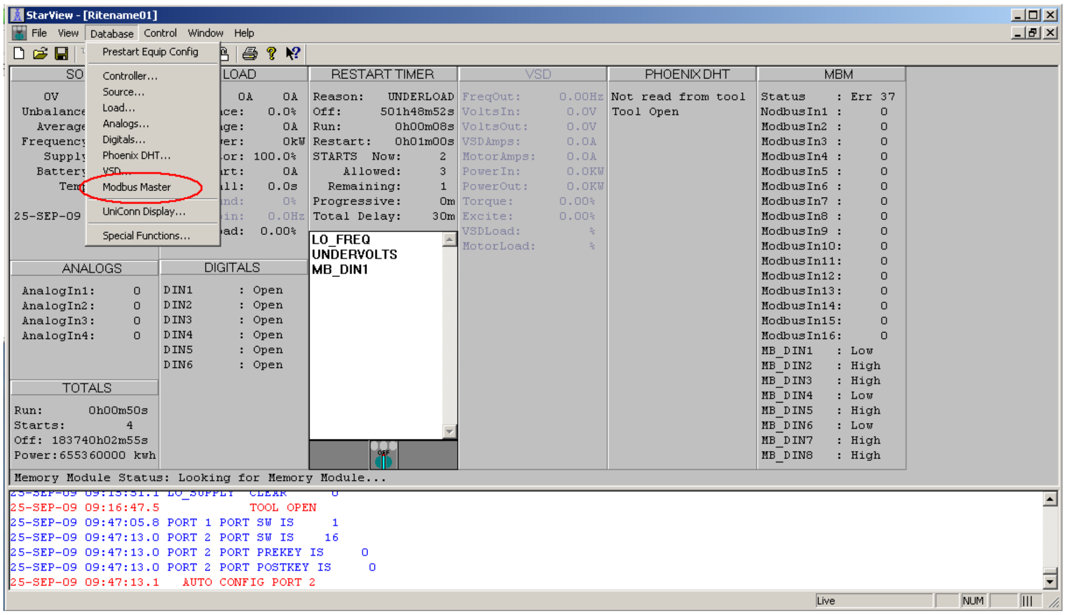
In the controller dialog, select the Modbus Master function for one of the option ports. Note that the port function Autodetect Master is similar in name, but is not correct – the option desired here is Modbus Master. This particular example assigns MBM to option Port2:



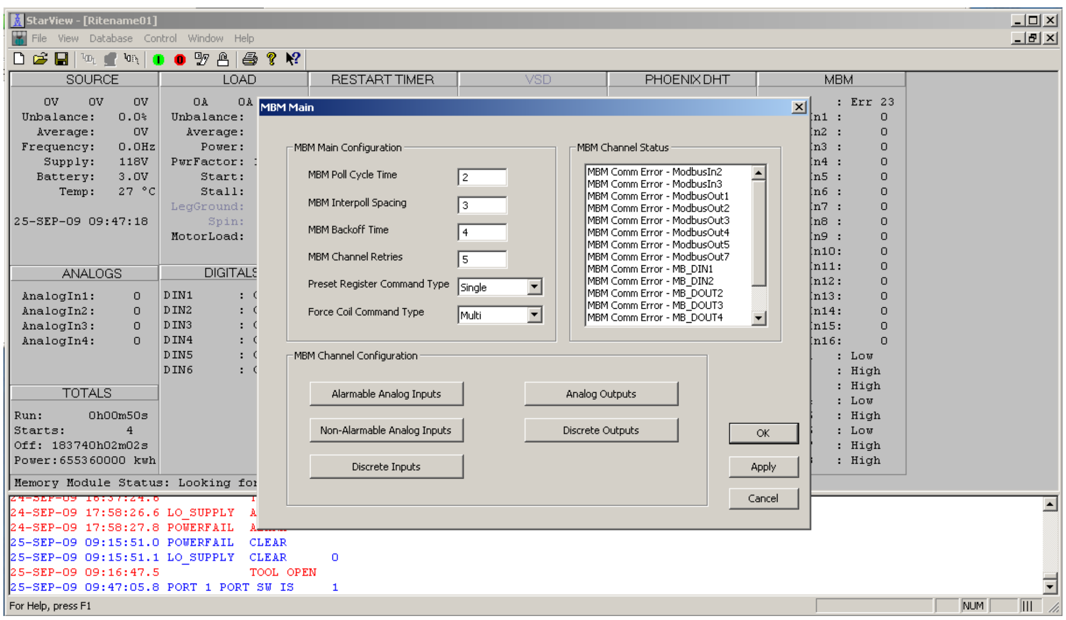
The physical characteristics of Port2 should be configured at this point. i.e.: set the desired baud rate, parity, stop bits, etc.



The second step is to configure the actual MBM operational parameters. Select the Modbus Master dialog by double clicking the MBM pane in the live view, or selecting from the menu as follows:



The MBM Main dialog allows the operator to configure the overall MBM operational parameters, access the individual channel configuration dialogs, and also shows the communication status for each channel.

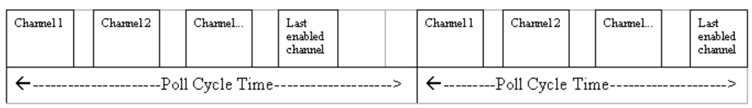


K.3 Modbus Master Parameters

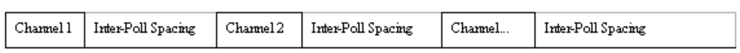
K.3.1 Modbus Master Main Parameters

The following is a list of the MBM main configuration parameters, and a description of their function. These main parameters affect the operation of ALL MBM channels.

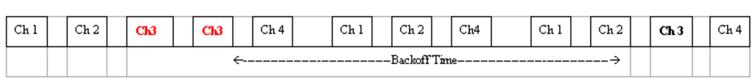
- MBM Poll Cycle Time – defines the amount of time in milliseconds that the polling cycle will repeat, on a best effort basis. For example, if the poll cycle time was set to 60000 msec, the UniConn would attempt to poll each MBM channel once per minute. Note that under certain conditions, the UniConn may not be able to poll the slave devices at the specified rate. i.e.: if there were too many MBM channels enabled over a slow link or if there were an abnormally high number of retries.



- MBM Interpoll Spacing – defines the minimum amount of time in milliseconds that the UniConn will wait after polling and receiving a response from a single channel before polling the next MBM channel. Note that the interpoll spacing should be significantly less than the poll cycle time.



- MBM Backoff Time – the amount of time in seconds that the UniConn will wait before attempting to communicate with a slave device if the number of retries has been exceeded due to a communication error. Communication errors include bad CRCs, invalid commands, or no response. This backoff time is advantageous in situations where two or more separate devices (using separate IDs) are connected to the UniConn in a multi-drop configuration, and one of the devices stop communicating. Since the UniConn will stop polling the non-responsive device for a period of time, the communication with the other (responding) devices can be more efficient.



- MBM Channel Retries – the number of times the UniConn will attempt to communicate with a non-responsive slave device, before “backing off” from the associated channel.

- Preset Register Command Type – specifies which Modbus command to use when writing register values to the slave device; Single means that MBM will use the modbus command 6 for single register write; Multi means that MBM will use the command 16 for multiple register write.
- Force Coil Command Type – specifies the Modbus command to use when writing coil values to the slave device; Single means that MBM will use the modbus command 5 for single coil write; Multi means that MBM will use the command 15 for multiple coil write.

K.3.2 Modbus Master Alarmable Analog Inputs

The following is a list of the configuration parameters for configuring analog input channels 1 – 8, including the setting up of alarms. For these channels, MBM will read values from the slave device – these values are available for display, monitoring, and trending purposes as well as for alarming.

- Name – the name given to the MBM channel.
- Channel Enabled – the MBM channel is active if this is checked.
- Site ID – the modbus address/device ID of the slave device (1-247).
- Modbus Register – the modbus register of the slave device which is to be read from. Note that the 3xxxx alias for input registers (Read Only) and 4xxxx alias for holding registers (Read/Write or Write Only) needs to be included as a part of the modbus register address specification. For some Modbus slave devices the input/holding register is not provided as an alias (3xxxx/4xxxx). Example: If the slave device provides a pressure reading then it is a live value and therefore it would normally be an input register (read only register). If the manufacturer specifies that the modbus register is 500, the alias would be 500 + 30001 = 30501. 30501 would be the input register alias and thus would be the modbus register setting for the MBM. Unfortunately some manufacturers do not correctly implement the Modbus standard and therefore they may choose to provide the value as a holding register (read/write register). For these devices, the modbus register would be 500 + 40001 = 40501.
- Resolution – the scale of the value that the slave device will provide; MBM can handle slave values of 8 to 16 bits; the 1:1 option directs MBM to ignore the raw and scaled parameters.
- Raw (Lo/Hi) – specifies the expected minimum and maximum values which the slave device will provide, as a percentage between 0% and 100%. For example, let's say the slave device provides an 8-bit value, and that values between 26 and 229 are expected. An 8-bit number has a maximum possible value of 255 – and so 255 would be a 100% raw value. A value of 26 would be (26/255)*100 = approximately 10%. Similarly, (229/255)*100 =

approximately 90%. Therefore, if the slave device was expected to provide an 8-bit value between 26 and 229, the raw limits should be set at 10% and 90%. See section 3.2.3 for a list of raw value limits.

- Scaled (Lo/Hi) – specifies the corresponding scaled value that is desired. This scaled value is the one used by the UniConn display, alarm, logging, and trending sub-systems. Further to the example given above for the Raw (Lo/Hi) parameter: let's say that the 8-bit slave device reading of 26 – 229 represents a pressure reading of between 125 and 1125 psi. The Scaled Lo/Hi values should be set at 125 and 1125, respectively. The UniConn will then produce a number between 125 and 1125 for this particular MBM analog input channel. Note that the MBM will always assume that the scaling is linear.
- Alarm (Lo/Hi) – the name given to the MBM channel Lo/Hi alarms.
- Action (Lo/Hi) – the action to take when this alarm trips; possible actions are bypass, log, stop, and log+stop.
- Setpoint (Lo/Hi) – the alarm trip level. The Lo alarm state will occur if the scaled value is below the setpoint; the Hi alarm will occur if it is above.
- Trip Time (Lo/Hi) – the amount of time (in seconds) that the MBM channel can be in an alarm state, before the UniConn will trip the system.
- Restarts (Lo/Hi) – the number of times the UniConn will restart the pump after tripping on this particular alarm, if it is in Auto mode.
- Restart Delay (Lo/Hi) – the amount of time (in minutes) before the UniConn will attempt a restart after a trip.
- Start Bypass (Lo/Hi) – the amount of time (in seconds) immediately after starting the pump that the UniConn will ignore the alarm condition. After this period expires, the UniConn will monitor the alarm as usual.

K.3.3 Modbus Master Non-Alarmable Analog Inputs

The following is a list of the configuration parameters for analog input channels 9 – 16. For these channels, MBM will read values from a slave device – these values are available for displaying, monitoring, and trending but are not considered for alarming purposes.

- Name – the name given to the MBM channel.
- Channel Enabled – the MBM channel is active if this is checked.
- Site ID – the modbus address/device ID of the slave device (1-247).
- Modbus Register – the modbus register of the slave device which is to be read from. Note that the 3xxxx alias for input registers (Read Only) and 4xxxx alias for holding registers (Read/Write or Write Only) needs to be

included as a part of the modbus register address specification. For some Modbus slave devices the input/holding register is not provided as an alias (3xxxx/4xxxx). Example: If the slave device provides a pressure reading then it is a live value and therefore it would normally be an input register (read only register). If the manufacturer specifies that the modbus register is 500, the alias would be 500 + 30001 = 30501. 30501 would be the input register alias and thus would be the modbus register setting for the MBM. Unfortunately some manufacturers do not correctly implement the Modbus standard and therefore they may choose to provide the value as a holding register (read/write register). For these devices, the modbus register would be 500 + 40001 = 40501.

- Resolution – the scale of the value that the slave device will provide; MBM can handle slave values of 8 to 16 bits; the 1:1 option directs MBM to ignore the raw and scaled parameters.
- Raw (Lo/Hi) – specifies the expected minimum and maximum values which the slave device will provide, as a percentage between 0% and 100%. For example, let's say the slave device provides an 8-bit value, and that values between 26 and 229 are expected. An 8-bit number has a maximum possible value of 255 – and so 255 would be a 100% raw value. A value of 26 would be (26/255)*100 = approximately 10%. Similarly, (229/255)*100 = approximately 90%. Therefore, if the slave device was expected to provide an 8-bit value between 26 and 229, the raw limits should be set at 10% and 90%. See section 3.2.3 for a list of raw value limits.
- Scaled (Lo/Hi) – specifies the corresponding scaled value that is desired. This scaled value is the one used by the UniConn display, alarm, logging, and trending sub-systems. Further to the example given above for the Raw (Lo/Hi) parameter: let's say that the 8-bit slave device reading of 26 – 229 represents a pressure reading of between 125 and 1125 psi. The Scaled Lo/Hi values should be set at 125 and 1125, respectively. The UniConn will then produce a number between 125 and 1125 for this particular MBM analog input channel. Note that the MBM will always assume that the scaling is linear.

K.3.4 Modbus Master Discrete Inputs

The following is a list of the configuration parameters for discrete input channels 1 – 8. For these channels, MBM will read in the state of the specified coil on the slave device. Discrete inputs are can be configured for alarming, but are not available for trending.

- Name – the name given to the MBM channel.
- Channel Enabled – the MBM channel is active if this is checked.
- Site ID – the modbus address/device ID of the slave device (1-247)

- Coil – the modbus discrete register of the slave device which is to be read from. Note that the 1xxxx alias for coils (Read Only) and 0xxxx alias for discrete inputs (Read/Write or Write Only) needs to be included as a part of the modbus register address specification. For some Modbus slave devices the coil/discrete input register is not provided as an alias (1xxxx/0xxxx). Example: If the slave device provides a high pressure switch reading then it is a live value and therefore it would also be a discrete input (read only discrete). If the manufacturer specifies the modbus discrete register as 100 the alias would be 100 + 10001 = 10101. 10101 would be the discrete input alias and therefore would be the Coil setting for the MBM. Unfortunately some manufacturers do not correctly implement the Modbus standard and therefore they may choose to provide the value as a coil (read/write discrete). For these devices the Coil setting would be 100 + 00001 = 00101 or 101.
- Alarm On – specifies the polarity of the alarm, whether it is normally LOW or HIGH.
- Action – the action to take when this alarm trips; possible actions are bypass, log, stop, and log+stop.
- Trip Time – the amount of time (in seconds) that the coil can be in an alarm state before the UniConn will trip the system.
- Restarts (Lo/Hi) – the number of times the UniConn will restart the pump after tripping on this particular alarm, if it is in Auto mode.
- Restart Delay (Lo/Hi) – the amount of time (in minutes) before the UniConn will attempt a restart after tripping on this particular alarm.
- Start Bypass (Lo/Hi) – the amount of time (in seconds) immediately after starting the pump that the UniConn will ignore the alarm condition. After this period expires, the UniConn will monitor the alarm as usual.

K.3.5 Modbus Master Analog Outputs

The following is a list of the configuration parameters for analog output channels 1 – 8.

- Name – the name given to the MBM channel.
- Channel Enabled – the MBM channel is active if this is checked.
- Site ID – the modbus address/device ID of the slave device (1-247)
- Modbus Register – the modbus register of the slave device which is to be written to. Note that the 4xxxx alias for holding registers (Read/Write or Write Only) needs to be included as a part of the modbus register address specification. For some Modbus slave devices the holding register is not provided as an alias (4xxxx). Example: If the slave device has a high pressure alarm setpoint then it is a setting, and therefore it would also be

a holding register (read/write or write only register). If the manufacturer specifies that the modbus register is 600, the alias would be 600 + 40001 = 40601. 40601 would be the holding register alias and therefore would be the Modbus Register setting for the MBM.

- Resolution – the scale of the value that will be provided to the slave device; MBM can produce values of 8 to 16 bits; the 1:1 option directs MBM to ignore the raw and scaled parameters. See the Raw Lo/Hi and Scaled Lo/Hi parameters below for more details. See section 3.2.3 regarding the maximum values of various resolutions.
- Raw (Lo/Hi) – specifies the expected minimum and maximum values of the selected source, as a percentage between 0% and 100%. See the Scaled Lo/Hi parameter below for more details.
- Scaled (Lo/Hi) – specifies the expected minimum and maximum limits of the specified source. For example, let's say that the selected source for this MBM channel is VSD Frequency, which is currently set to have an expected range of 20.00Hz to 60.00Hz. Also, the slave device expects an 8-bit value of between 26 and 229, which corresponds to these frequencies. The VSD Frequency parameter is scaled by x100 to produce 2 decimal places. Therefore, the scaled values should be set to 2000 and 6000. The resolution will be set to 8-bit. The maximum value of an 8-bit number is 255; therefore the Raw Lo parameter should be set to (26/255)*100 = approximately 10%; similarly the Raw Hi parameter should be set to (229/255)*100 = approximately 90%.
- Source – specifies the source of the data value which is to be written to the slave device.
- Setpoint – if Source has been Remote Input, then this setpoint value will be used as the source of the value to be written to the slave device; otherwise, this parameter is not used.
- Register Update – specifies the mode which MBM will use to write values to the slave device; Continuous means that MBM will continually write the value to the slave; On Change means that MBM will write the value only if it has changed since the last write.

K.3.6 Modbus Master Discrete Outputs

- Name – the name given to the MBM channel. Channel Enabled – the MBM channel is active if this is checked.
- Site ID – the modbus address/device ID of the slave device (1-247).
- Coil – the modbus discrete register of the slave device which is to be written to. Note that the 0xxxx alias for discrete inputs (Read/Write or Write Only) needs to be included as a part of the modbus register address specification.

For some modbus slave devices the coil register is not provided as an alias (0xxxx). Example: If the slave device provides a high pressure switch control then it is a setting and therefore it would also be a coil (read/write or write only discrete). If the manufacturer provides the Modbus register as 200 the alias would be 200 + 00001 = 00201 or 201. 201 would be the MBM Coil setting. Action – the Action parameter specifies the source of the logical state, which is to be written to the slave device. For example: Action = CONTACTOR will write HIGH or LOW to the slave coil depending on the state of the contactor; Action = ON_ALARM will write HIGH or LOW to the slave device depending upon the alarm state of the selected alarm source. Alarm Source – specifies the source of the alarm, which will provide the alarm state (LOW or HIGH), which will be written out to the slave device; only applicable if the Action has been specified as ON_ALARM. Coil Action – specifies whether a LOW or a HIGH should be written to the slave device's coil; only applicable if the Action has been set to COIL.

- Coil – the modbus discrete register of the slave device which is to be written to. Note that the 0xxxx alias for discrete inputs (Read/Write or Write Only) needs to be included as a part of the modbus register address specification. For some modbus slave devices the coil register is not provided as an alias (0xxxx). Example: If the slave device provides a high pressure switch control then it is a setting and therefore it would also be a coil (read/write or write only discrete). If the manufacturer provides the Modbus register as 200 the alias would be 200 + 00001 = 00201 or 201. 201 would be the MBM Coil setting.
- Action – the Action parameter specifies the source of the logical state, which is to be written to the slave device. For example: Action = CONTACTOR will write HIGH or LOW to the slave coil depending on the state of the contactor; Action = ON_ALARM will write HIGH or LOW to the slave device depending upon the alarm state of the selected alarm source.
- Alarm Source – specifies the source of the alarm, which will provide the alarm state (LOW or HIGH), which will be written out to the slave device; only applicable if the Action has been specified as ON_ALARM. Coil Action – specifies whether a LOW or a HIGH should be written to the slave device's coil; only applicable if the Action has been set to COIL.
- Coil Action – specifies whether a LOW or a HIGH should be written to the slave device's coil; only applicable if the Action has been set to COIL.

K.4 Raw Value Limits

For reference, here is a list of the maximum values which are allowed for each of the possible choices for MBM resolution. The maximum value, in each case, is 100% of the raw value.

- 8 bit – 255

- 9 bit – 511
- 10 bit – 1023
- 11 bit – 2047
- 12 bit – 4095
- 13 bit – 8191
- 14 bit – 16383
- 15 bit – 32767
- 16 bit – 65535
- 1:1 – MBM will ignore raw and scaled parameters.

K.5 Modbus Master Example (Walkthrough Setup)

For this example A UniConn will be configured as a Modbus Master device, a second UniConn will be configured as a Modbus Slave device. The Master device will poll the slave device's Supply Voltage register (address 42104) and the slave device's Frequency register (42105)

K.5.1 Connecting two UniConns for Modbus Master/Slave operation

To setup two UniConns to for Modbus Master/Slave operation, the following must be done:

1.	Jumper Tx+ and Rx+ together on each UniConn
2.	Jumper Tx- and Rx- together on each UniConn
3.	Connect Tx+/Rx+ wire from Master UniConn to Slave UniConn
4.	Connect Tx-/Rx— wire from Master UniConn to Slave UniConn
5.	Connect Ground wire from Master UniConn to Slave UniConn

K.5.2 Modbus Master port Setup for Master device

The following illustrates how to configure a UniConn for Modbus Master operation.

1.	From the Main Menu, select SETUP
2.	Select NEXT until the Options Ports menus are reached.

3. Select the desired port, Port 1 will be used for this example.
4. Select NEXT to advance to the Port Function screen.
5. Select EDIT then use DEC/INC to select the MODBUS MASTER option.
6. Select ACCEPT.
7. Set the desired Baud Rate. Note: all slave devices must have the same baud rate that is selected for Modbus Master.
8. Configure the hardware settings. Note: when using the UniConn communications card part #100228568, the UniConn must be set to RS–232 even if the connection will be RS–485.
9. Adjust pre key and post key settings if necessary. Note: for baud rates above 19200, post key should be left at 0ms for reliable communications.
10. UniConn communications port is now setup for Modbus Master communications, however, additional parameters will need to be configured in the I/O section.

K.5.3 Modbus Master port setup for slave device

1. Go to the Main Menu and select SETUP, select NEXT until the Option Ports menu is reached.
2. Select desired Port for Modbus Slave. Note: Port 1 will be used for this example. Select NEXT and select EDIT to change Site Address.
3. Select NEXT to advance to Function.
4. Select EDIT and change Function to Modbus Slave if necessary.
5. Select NEXT to advance to Baud Rate screen, then select EDIT to change Baud Rate. Note: Baud rate must be the same as on Master UniConn.
6. Configure the hardware settings. Note: when using the UniConn communications card part# 100228568, the UniConn must be set to RS232 even if the connection will be RS485
7. Configure Prekey Delay and Postkey Delay if necessary. Note: for baud rates greater than 19200, Prekey Delay should be at least 2 or more ms for reliable communications.
8. Select NEXT to advance to Access screen, then select EDIT to change Access. Note: Only change to FULL if the Master Device will be writing to this slave device.
9. UniConn is now configured for Modbus Slave Operation.
10.

K.5.4 Modbus Master Parameters Setup Example

Note

This example is for for polling register 42105

1. Return to the Main Menu
2. Select I/O and select NEXT until Modbus Master screens are reached.
3. Rename the channel to an appropriate name (optional).
4. Select NEXT to advance to the channel enable screen and select EDIT then ON to enable this channel.
5. Select NEXT to advance to the Site Address screen and select the desired Site Address.
6. Select NEXT to advance to the MB Address screen and select the desired Slave device address.
7. Select NEXT to advance to the Resolution screen and select the desired Resolution. Note: if connecting directly to another UniConn and no scaling is required, then 1:1 should be used

The following parameters are ignored if 1:1 Resolution is selected:

- Scaled Maximum
- Scaled Minimum
- Raw Maximum
- Raw Minimum

K.5.5 Modbus Master Low Alarm Setup

1. Go to the main screen for this Modbus Master Channel.
2. For a low alarm, select MB_IN1_LO Name the alarm appropriately (optional).
3. Select NEXT and EDIT, use DEC/INC to select the Action desired for this alarm.
4. Select NEXT and EDIT, use DEC/INC to adjust the desired Setpoint for this alarm.
5. Select NEXT and EDIT, use DEC/INC to adjust the desired Alarm Trip Time for this alarm.
6. Select NEXT and EDIT, use DEC/INC to adjust the desired Restarts for this alarm.

7. Select NEXT and EDIT, use DEC/INC to adjust the desired Restart Delay for this alarm.

8. Select NEXT and EDIT, use DEC/INC to adjust the desired Start Bypass for this alarm.

K.5.6 Modbus Master High Alarm Setup

Got to the main screen for this Modbus Master Channel For a high alarm, select MB_IN1_HI Use the same procedure for low alarm to set the HIGH alarm.

K.5.7 Modbus Master Parameters Setup Example

Note
This example is for for polling register 42105

1. Return to the Main Menu

2. Select I/O and select NEXT until Modbus Master screens are reached.

3. Rename the channel to an appropriate name (optional).

4. Select NEXT to advance to the channel enable screen and select EDIT then ON to enable this channel.

5. Select NEXT to advance to the Site Address screen and select the desired Site Address.

6. Select NEXT to advance to the MB Address screen and select the desired Slave device address.

7. Select NEXT to advance to the Resolution screen and select the desired Resolution.

Note
This register displays a value with 1 decimal place, however, the value stored in the register is without the decimal and multiplied by 10. Scaling will be required. The registers in the UniConn are typically 16-bit. Select the 16-bit option. The maximum value for a 16-bit register is 65535; however, the value we are expecting is multiplied by 10, therefore we need to divide by 65535 by 10 to correctly display the scaled value.

Note

The Scaled number displayed by the Modbus Master device may not be precise due to rounding errors in the scaling calculations. Since we are using full scale for this example, Scaled Minimum should be 0, Raw maximum should be 100.00% and Raw Minimum should be 0.00%. Modbus Master Displaying value read from Slave Device.

K.5.8 Modbus Master Global Settings

In the I/O screens section, select NEXT until the Modbus Master Setup screen is reached. Select ADJ. Modify the Poll Cycle Time if Necessary. Select NEXT and adjust Inter-Poll Spacing if necessary. Select NEXT and adjust Backoff Time if necessary. Select NEXT and adjust Retry Time if necessary. The UniConn has no been configured for Modbus Master operation.

K.6 Lab Bench Test

Two UniConn's with a UniConn Comm card in each UniConn will be required. Also required will be two AC power cables and some wire. For this example UniConn A will be configured as a Modbus Master device and UniConn B will be configured as a Modbus Slave device. UniConn A will poll the UniConn Supply Voltage register (address 42104) and the UniConn Frequency register (42105) from UniConn B. Note: UniConn B should be setup for Fixed Speed, i.e. do not configure any of the UniConn option ports for a VSD.

K.6.1 Connections

1. Connection for monitoring UniConn Frequency on UniConn B.

2. For each UniConn insert a UniConn Comm card in option port 1.

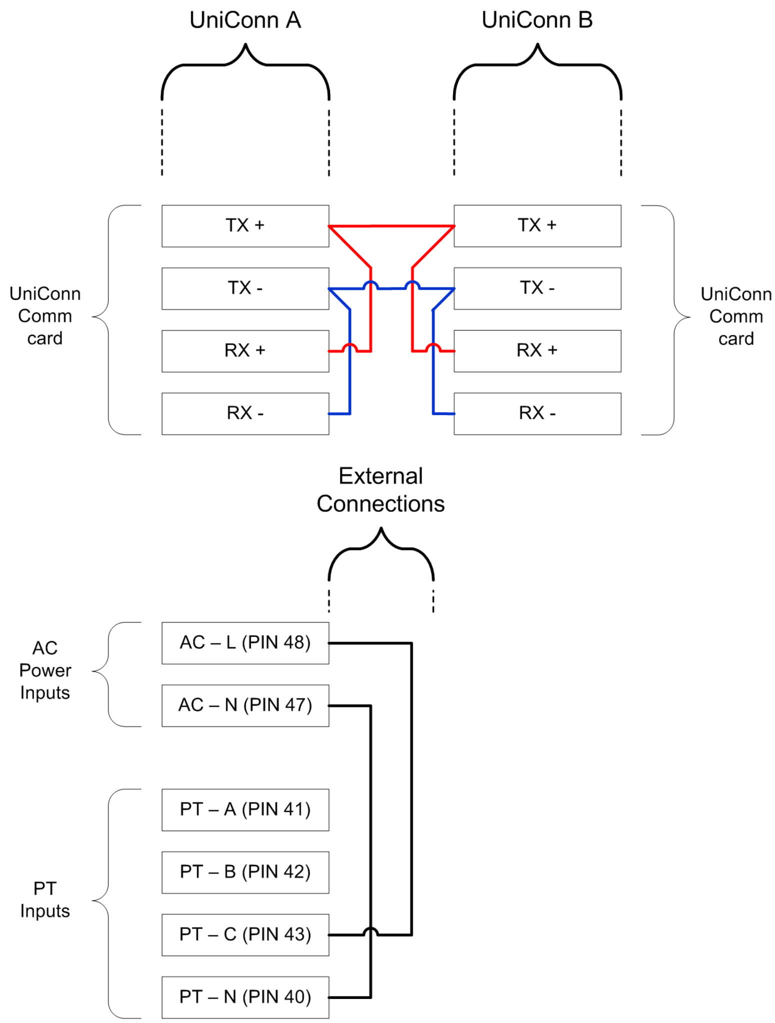


Figure K-1: Connection for communications between UniConn A and UniConn B

3. Connect AC power cables to the UniConn AC power inputs.

K.6.2 Modbus Master port setup for UniConn A

The following illustrates how to configure a UniConn for Modbus Master Operation:

1. Configure option port 1 as Modbus Master

2. Set baud rate = 9600

3. Set communication settings to 8,NONE,1,RS-232 (Data Bits,Parity,Stop Bits,Card setting)

Note
When using the UniConn communications card part #100228568, the UniConn must be set to RS–232 even if the connection will be RS–485.

4. Set prekey and postkey to 0ms.

K.6.3 Modbus Slave port setup for UniConn B

The following illustrates how to configure a UniConn for Modbus Slave Operation:

1. Configure option port 1 as Modbus Slave

2. Set baud rate = 9600

3. Set communication settings to 8,NONE,1,RS-232 (Data Bits,Parity,Stop Bits,Card setting)

Note
When using the UniConn communications card part #100228568, the UniConn must be set to RS–232 even if the connection will be RS–485.

4. Set prekey and postkey to 0ms.

K.6.4 Modbus Master Parameter Setup for UniConn A

Configure UniConn Supply Volts:

1. Return to the Main Menu

2. Select I/O and select NEXT until ModbusIn1 appears.

3. Select ADJ

4. Change name from ModbusIn1 to SupplyV

5. Enable Channel 1 (set to ON)

6. Set Site Address to 1

7. Set MB Address to 42104

8. Set Resolution to 1:1

9. Press the UniConn escape key (button below language key)

10. Setup a low alarm by selecting MB_IN1_LO

11. Change name of alarm to SupplyV_LO

12. Change Action to Log+Stop

13. Set Alarm Setpoint to 90 (for ~120VAC) or 200 (for ~230VAC)

K.6.4.1 Configure UniConn Frequency

1. Return to the Main Menu

2. Select I/O and select NEXT until ModbusIn2 appears

3. Select ADJ

4. Change name from ModbusIn2 to Freq

5. Enable Channel 2 (set to ON)

6. Set Site Address to 1

7. Set MB Address to 42105

8. Set Resolution to 16-bit

> **Note**
> The registers in the UniConn are typically 16-bit.

9. Set Scaled Maximum to 6554

> **Note**
> The maximum value for a 16-bit register is 65535; however, the value we are expecting is multiplied by 10, therefore we need to divide by 65535 by 10 to correctly display the scaled value.

> **Note**
> Note: The Scaled number displayed by the Modbus Master device may not be precise due to rounding errors in the scaling calculations.

10. Set Scaled Minimum to 0

11. Set Raw Maximum to 100.00%

12. Set Raw Minimum to 0.00%

K.6.4.2 Configure Modbus Master Global Settings

1. Return to the Main Menu
2. Select I/O and select NEXT until Modbus Master Setup appears
3. Select ADJ
4. Set MBM Poll Cycle time to 1.000s. UniConn A will poll UniConn B once every second.
5. Set MBM Inter-Poll Spacing to 0.010s.
   If you need to change this value then only increase the value greater than 0.01s to improve communications.
6. Set MBM Backoff Time to 0s.
   Only set this value if more than one Modbus slave.
7. Set MBM Channel Retries to 3.

K.6.5 Begin Test

Values should for SupplyV and Freq should be visible on UniConn A. These values should be the same as UniConn B. When SupplyV_LO alarm on UniConn A is set above the UniConn Supply Volts from UniConn B the alarm will be displayed on UniConn A.

Prestart Configuration

L Prestart Configuration

The Prestart Configuration feature is divided into two parts:

- commissioning wizard
- hidden screens

The commissioning wizard allows the operator to select the type of wellsite during commissioning – i.e.: whether the site uses a fixed speed or variable speed drive, whether a downhole tool is present, etc. After selecting the wellsite type, the UniConn will ask the operator to configure the appropriate settings – for instance, if the user selected a VSD + DHT wellsite type, then UniConn will ask for VSD and DHT settings to be configured. The following is a list of the available UniConn wellsite types:

- fixed speed
- fixed speed + downhole tool
- Variable speed drive
- Variable speed drive and downhole tool
- Downhole Tool (DHT)

The hidden screens portion of this feature allows the user to disable certain screens, parameters, and alarms if they are not applicable to the particular wellsite. The following is a list of the screens which can be hidden:

- Settings, alarms, and configuration screens based on the installation of a Potential Transformer (PT)
- Settings, alarms, and configuration screens based on the installation of a Current Transformer (CT)
- Settings, alarms, and configuration screens based on the installation of a Back Spin Shunt

The UniConn will show a PRESTART status until the operator performs and accepts the prestart configuration. For well sites where the operator prefers to setup the UniConn in the traditional manner, simply accepting the Prestart configuration will clear this alarm (see below). StarView can also be used to clear the PRESTART status.

```
12:51:27        Sitename00               OFF
 MENU              HAND     AUTO
   ↓
```

```
12:51:28        Sitename00             OFF
  MOTOR     I/O           HISTORY  SETUP
                                     ↓
```

```
UniConn      V1.402r1   Serial:   175
          ADJ                PREV   NEXT
                                    ↓
```

```
UniConn Setup Wizard
PRESTART                     PREV   NEXT
   ↓
```

```
UniConn Application Type:      Fixed Spd
  EDIT                       PREV   NEXT
                                     ↓
                                     ↓  (multiple times)
                                     ↓  (see below)
                                     ↓
```

```
(the screens displayed depends on the configuration
 Selected, see below)
```

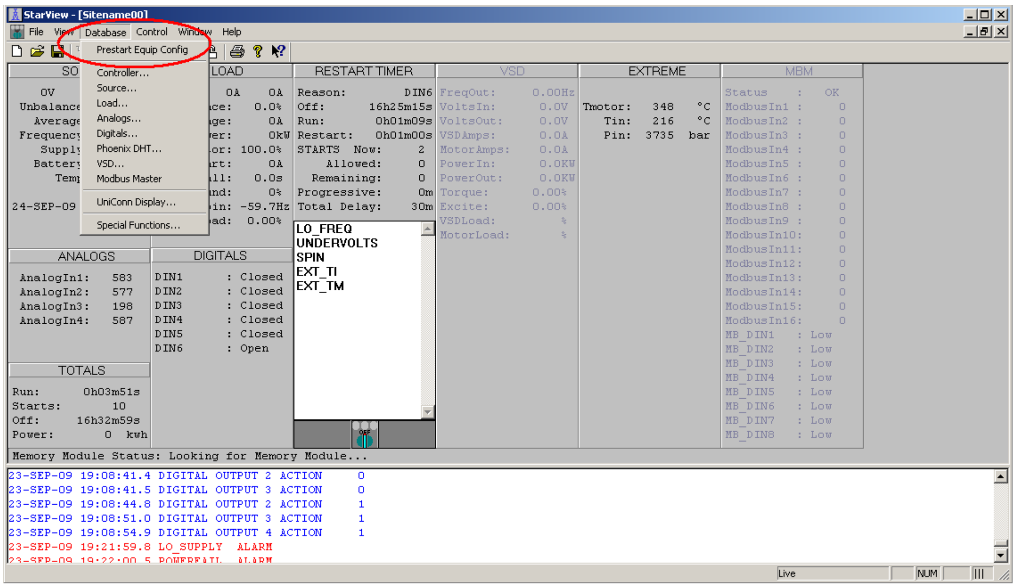
```
Accept Prestart:                        NO
  EDIT                       PREV   NEXT
```

The commissioning portion of the Prestart feature runs like a setup wizard. At the UniConn Application Type screen, the operator should choose the type of well installation (FS, VSD, etc). After selecting the application type, the operator should press NEXT, and configure the next item. The UniConn will show screens which will depend upon the operator's configuration choices – for instance, VSD configuration screens will appear only if a VSD application type was chosen. Please see the respective sections in the UniConn manual for explanations of each of the parameters that appear here.

The hidden screens portion of the Prestart feature also appears in this area; the operator can enable or disable screens, parameters, and alarms accordingly. In particular, the UniConn will ask if the wellsite has a potential transformer, a current transformer, or a backspin shunt installed. Depending on the answers to these questions, the UniConn will either hide or show configuration screens as appropriate. Also, the corresponding alarms will be disabled. For example, if the operator specifies that PT parameters and alarms are to be disabled, then the UniConn will hide all screens associated with PT parameters, and also ignore any associated alarms like under voltage, over voltage, etc. For StarView 3.600r33 or higher, the appropriate lines in the SOURCE and LOAD panes of the live view will be greyed out for each disabled set of parameters.

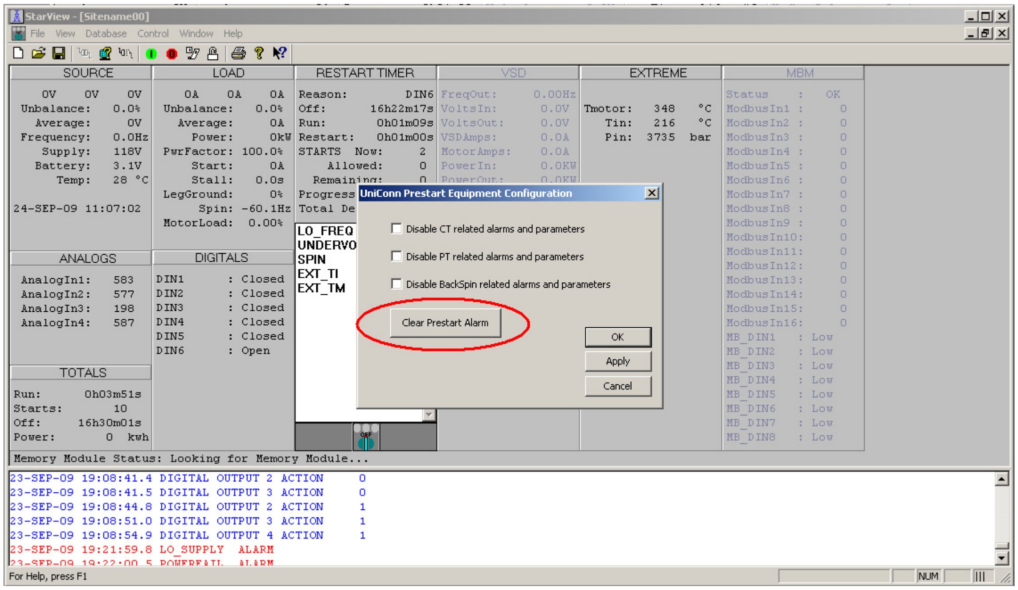
The Accept Prestart screen signifies the end of the commissioning wizard; the operator should change the answer to “YES” and accept the prestart configuration. Accepting will also clear the PRESTART alarm.

StarView does not include the commissioning wizard portion of this feature, as the graphical interface already provides a convenient way to configure all of the relevant parameters. However, the hidden screens portion of the PreStart Configuration feature is accessed as follows:



The operator should then indicate whether or not the wellsite has a Potential Transformer, Current Transformer, or Back Spin Shunt installed as shown. The assumption from factory reset is that all of these parts are installed; therefore, the operator should check the appropriate box if the corresponding part is disabled or missing.

To clear the PRESTART status using StarView, click the button as shown below. StarView will not change any other setting when this button is clicked – the only affect on the UniConn is that the PRESTART alarm status will be cleared.


StarView - [Sitename00]
File View Database Control Window Help
SOURCE
LOAD
RESTART TIMER
VSD
EXTREME
MBM
UniConn Prestart Equipment Configuration
Disable CT related alarms and parameters
Disable PT related alarms and parameters
Disable BackSpin related alarms and parameters
Clear Prestart Alarm
OK
Apply
Cancel
ANALOGS
DIGITALS
TOTALS
Memory Module Status: Looking for Memory Module...
23-SEP-09 19:08:41.4 DIGITAL OUTPUT 2 ACTION 0
23-SEP-09 19:08:41.5 DIGITAL OUTPUT 3 ACTION 0
23-SEP-09 19:08:44.8 DIGITAL OUTPUT 2 ACTION 1
23-SEP-09 19:08:51.0 DIGITAL OUTPUT 3 ACTION 1
23-SEP-09 19:08:54.9 DIGITAL OUTPUT 4 ACTION 1
23-SEP-09 19:21:59.8 LO_SUPPLY ALARM
For Help, press F1
NUM