QASI

Installation and Programming Manual

This manual covers the QASI Quantum AS-i master.

Effective: February 6, 2013

Niobrara Research & Development Corporation
P.O. Box 3418 Joplin, MO 64803 USA

Telephone: (800) 235-6723 or (417) 624-8918
Facsimile: (417) 624-8920
http://www.niobrara.com

Modicon, Square D, SY/MAX, Compact, Quantum, M340, Momentum, Premium are trademarks of Schneider-Electric.

Subject to change without notice.

Contents

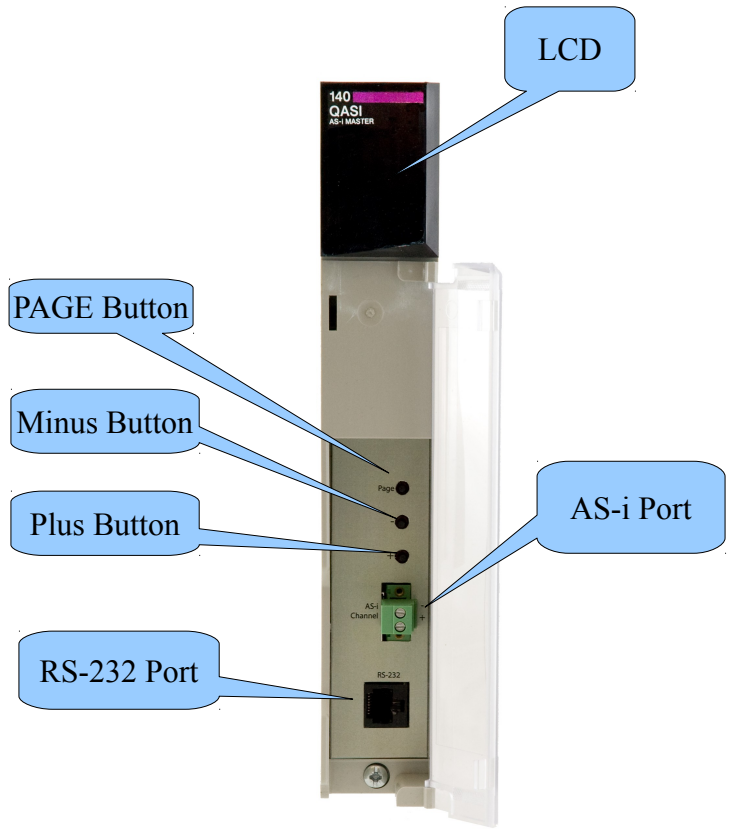
Figures

Tables

1 Introduction

The Niobrara QASI is a Modicon Quantum compatible module that allows the PLC system to control a local network of AS-Interface I/O devices. The QASI is a standard single-width I/O module that resides in any slot in any local, remote, or distributed I/O rack.

Figure 1.1: QASI Front Panel



The QASI can operate in either of two different field-selectable modes: AS-i 3.0 mode

and EIA 921 compatibility mode. The AS-i 3.0 mode supports the newer features of AS-i version 3.0 which includes analog I/O support and 62 possible I/O devices. The EIA 921 model emulates the Schneider Electric 140 EIA 921 00 AS-i version 1.1 master. By selecting the EIA 921 compatible mode, the user may substitute a QASI for the EIA 921 without changing the PLC configuration.

Figure 1.2: Typical Configuration

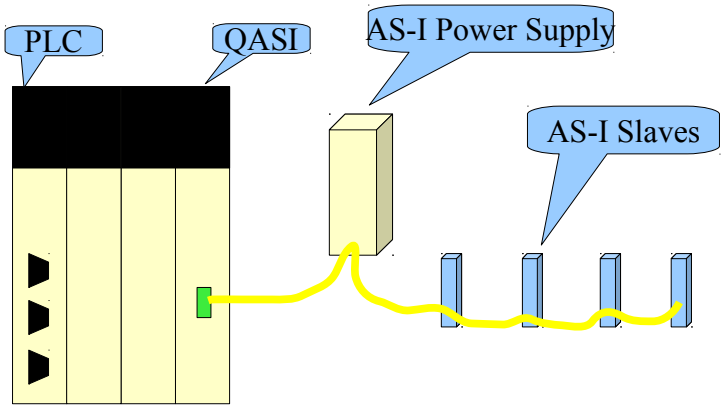


Figure 1.2 shows a typical configuration where a QASI is installed in a Quantum PLC rack. The QASI is connected to a standard AS-i power supply, and the AS-i slave I/O connected through the standard AS-i 2-wire network.

2 Installation

Module Installation

- Mount the QASI in any slot in the Quantum local, remote, or distributed rack.
- Tighten the mounting screw to ensure that the card will not accidentally be removed.
- Connect the AS-i power supply to the QASI's removable green connector observing proper polarity of the cable wires. Standard AS-i cables use the blue wire for (-) and then brown wire for (+).
- Connect the AS-i power supply to the AS-i daisy chain.
- Proceed to Chapter for more information about configuration.

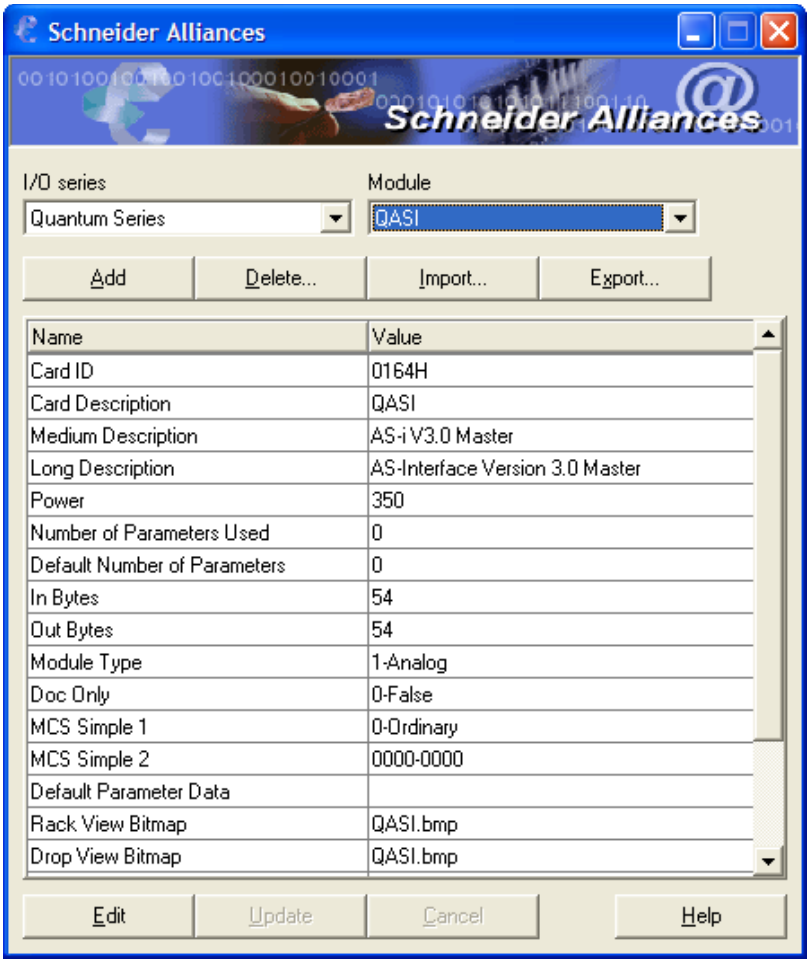
Software Installation

The QASI_SETUP.EXE file includes this user manual, the QASI.fwl firmware file, the FWLOAD.EXE firmware loader utility, the NRDTOOL.EXE register viewer utility, the Schneider Alliance file for ProWORX32, and a useful DFB for operating the QASI in Unity Pro. The latest version of this file is located at www.niobrara.com. Follow the link for “Download Area”, select “QASI”.

ProWORX32 Configuration

The Schneider Alliances tool in ProWORX32 is used to add the QASI to a Quantum system by using the following instructions:

1. Close an open copy of ProWORX32.
2. Select Start, Programs, ProWORX32, Schneider Alliances.
3. Select the “Import...” button.
4. Select “OK” to “Prompt to overwrite existing modules”.
5. Browse to C:\Niobrara\QASI\ and select “Niobrara_QASI.SAF” then select “Open”.
6. Select “OK” for Import Completed Successfully.
7. Close the Schneider Alliances tool.

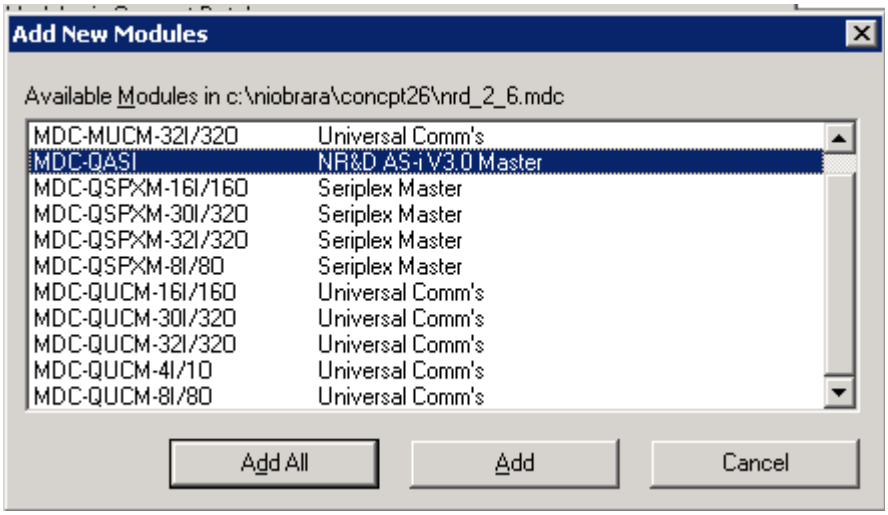


The QASI is now added to ProWORX32.

Concept 2.6 Configuration

The Niobrara MDC file is used with the "Modconnect Tool" in Concept to add the QASI into the Concept programming environment. Install CONCEPT26_SETUP.EXE from the Niobrara CD or from the www.niobrara.com then follow these instructions:

1. Close Concept.
2. Select Start, Programs, Concept, Modconnect Tool.
3. Select File, Open Installation File.
4. Browse to C:\Niobrara\CONCPT26\ and select the file NRD_2_6.MDC.
5. Select the line MDC-QASI.



6. Select "Add".
7. Select "File, Save Changes"
8. Select "File, Exit"

The QASI is now ready for use within Concept.

Unity Pro Configuration

The QASI is used as a GEN ANA IO card in Unity Pro as shown in Figure 2.1: Unity Pro GEN ANA IO Configuration. The QASI will use 27 words of %IW and 27 words of %MW for the I/O. The "Configuration registers" are not used.

> NOTE: QASI's with a firmware date of 09OCT2012 or later have the ability to allow a Quantum processor to read the QASI's internal registers across the backplane. Another data window is used to read this data. When using this window, the user should configure the QASI in Unity Pro with 29 words of %IW and 28 words of %MW, as shown in Figure 3.10.

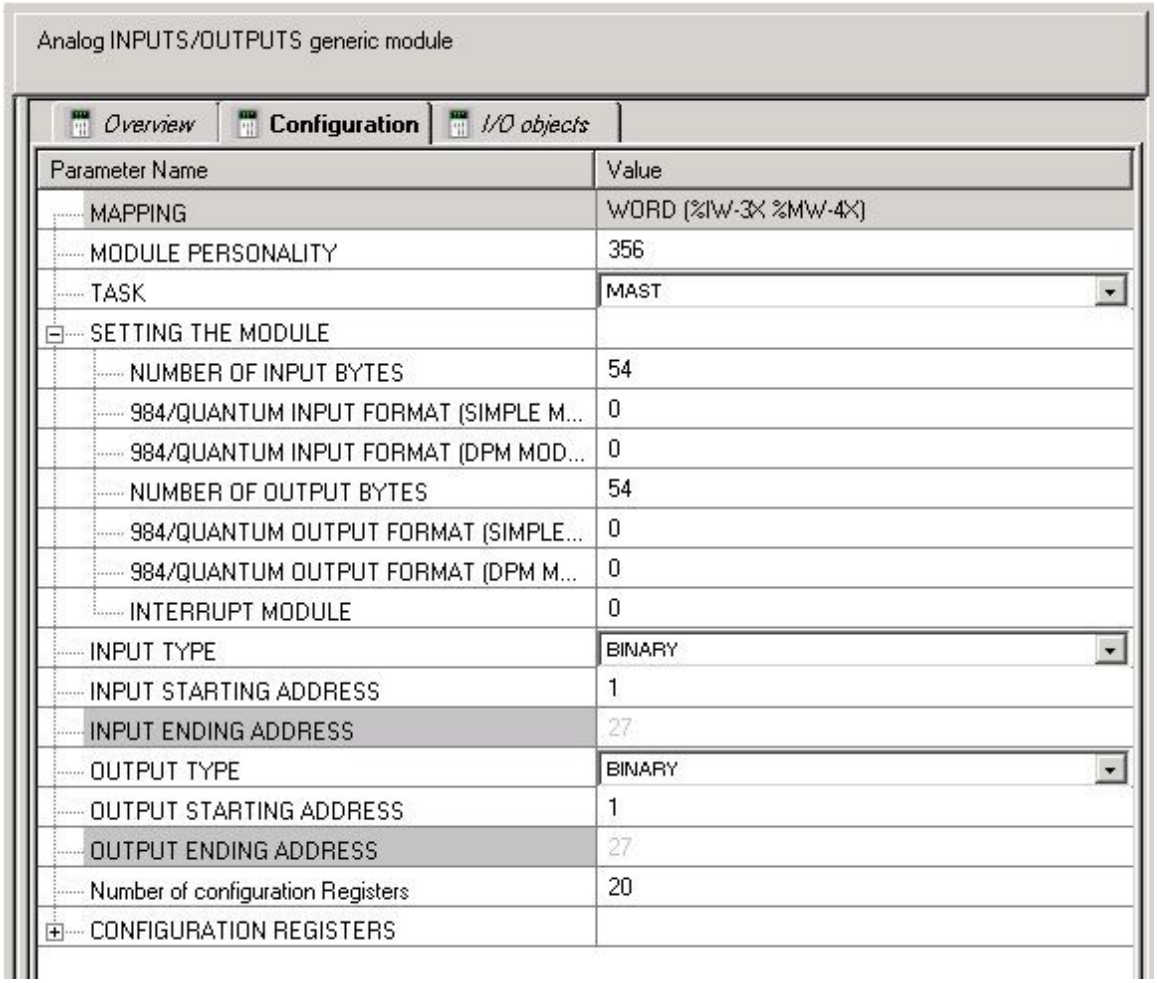


Figure 2.1: Unity Pro GEN ANA IO Configuration

A Derived Function Block named QASI_Exchange is included in the \Niobrara\QASI\ folder. This DFB may be imported into Unity Pro 4.1 from inside a project by right clicking on the "Derived FB Types" structure and selecting "Import".

This DFB will include a number of Derived Data Types that all start with QASI (see Figure 3.2: Unity Pro DDT List). Several of these DDTs are used internally within the QASI_Exchange DFB and all start with QASI_IS_. The DDTs of interest to the programmer are described in the next chapter and include:

- QASIInput – the 27 words of rack Input
- QASIOutput – the 27 words of rack output
- QASIConfig – the structure that defines the attached AS-i slaves and their configuration parameters.
- QASIAnalogIn – the structure that provides all of the possible AS-i analog input values as well as the status bitmaps of the AS-i network.
- QASIAnalogOut – the structure that determines all of the possible AS-i analog output data.

Power Supply

The QASI operates on 24Vdc, which is supplied an appropriate AS-I power supply such as the Modicon TSX Sup power supply. The QASI's removable power supply connector pin-out is shown in Figure 2.2. The standard color code for an AS-i network is for the (-) wire to be blue and the (+) wire to be brown. Consult the AS-i network or power supply documentation for more information.

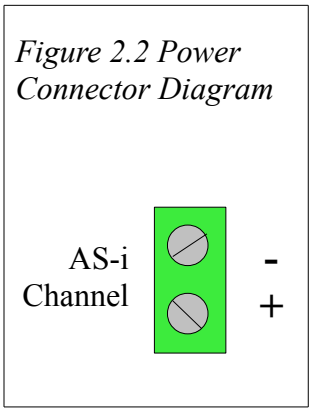


Figure 2.2 Power Connector Diagram

RS-232 Serial Port

The bottom port of the QASI is a standard Modicon pin out RJ45 RS-232 port. The pin out is shown in Table 2.1: RJ45 RS-232 Pinout. The Niobrara MM1 cable is used to connect Port 1 of the QASI is to the a standard 9-pin serial port on a PC. This connection would rarely be used since all features of the QASI may be accessed through front panel, or the Quantum backplane. This port may be used to load firmware into the QASI when new firmware becomes available. It may also be used as a pass-through port for AS-i software running on a PC. It also supports Modbus RTU communications at 19200,N,8,1

to address 255.

Table 2.1: RJ45 RS-232 Pinout

Pin	Function
1	+5Vdc
2	DSR (pulled high)
3	Data TX
4	Data RX
5	Signal GND
6	RTS
7	CTS
8	Chassis GND

Figure 2.3 Serial Port Diagram

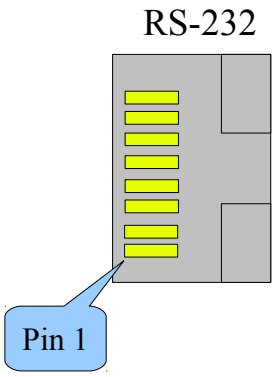
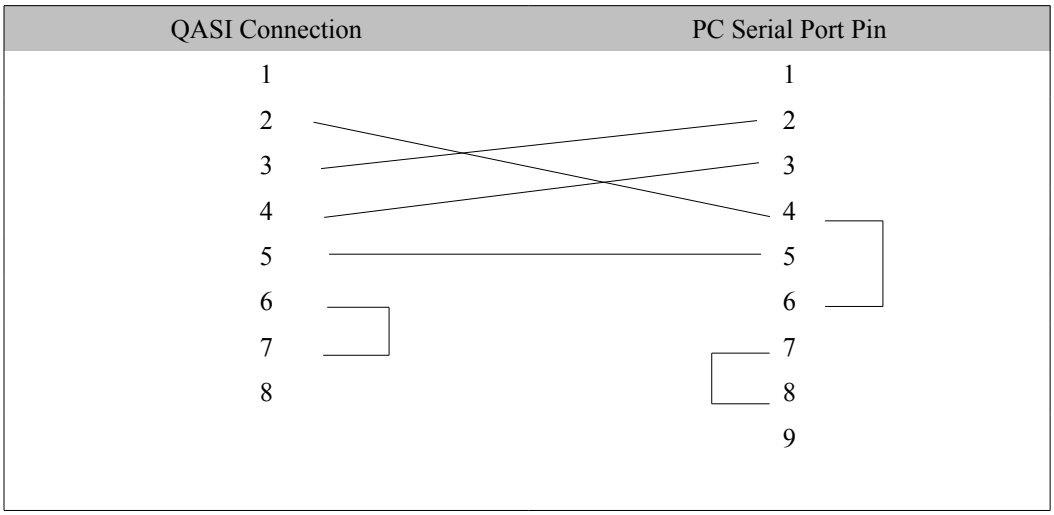


Figure 2.4.: MM1 Serial Cable



Updating the QASI Firmware

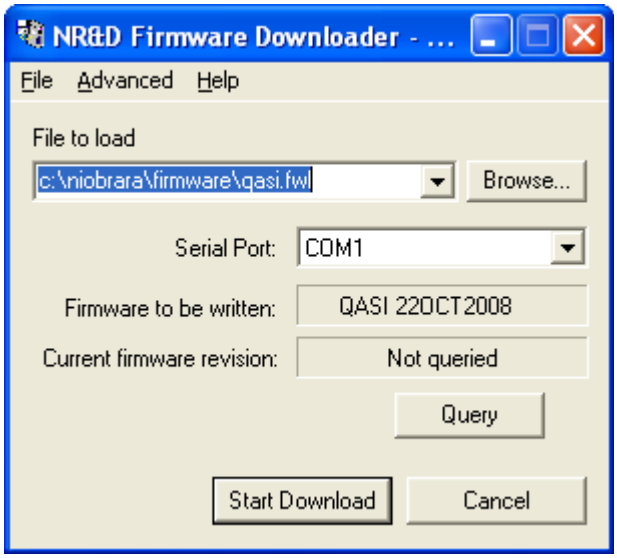
On occasion it may be necessary to update the operating system of the QASI. The FWLOAD program is used to install the QASI firmware through the RS-232 serial port.

1. Remove the QASI from the Quantum rack.
2. Hold down the "Page" key while replacing the QASI in the rack. The screen on the QASI will power up and eventually show "FIRMWARE LOADER".

3. Start FWLOAD.EXE. The Windows Start Menu link is "Start, Programs, Niobrara, QASI, FWLOAD QASI Firmware".
4. Click on the Browse button and select QASI.FWL.
5. Ensure that the proper PC serial port is selected (COM1).
6. Connect the MM1 cable from the QASI port 1 to the selected PC serial port.

7. Press the “Start Download” button. FWLOAD will open a progress bar to show the status of the download.
8. Press either the + or – keys on the QASI to return to normal operation. Or, simply cycle power on the QASI to return the unit to normal operation. The module is ready for use.

Figure 2.5: FWLOAD Screen



3 AS-i 3.0 Operation

The QASI supports AS-Interface Mode 3.0 operation. This mode supports the newer features of AS-i including:

- Analog I/O Slaves
- Up to 62 discrete I/O module support with A/B addressing
- Individual Device Alarms

> **Note**: The QASI may operate in AS-i version 3.0 mode or 140EIA921 emulation mode. To verify the operating mode, press the **Page** button until viewing the **Status** page. Now press the + or – key to see the page with the **F/W Version** and **Mode** displayed. If the QASI is in 140EIA921 emulation mode, it may be returned to version 3.0 mode by pressing and holding both the + and – keys at the same time for 5 seconds while the module is powered. The display will change to show "Change Mode" and then reboot into the new mode. See section Mode Change on page 58.

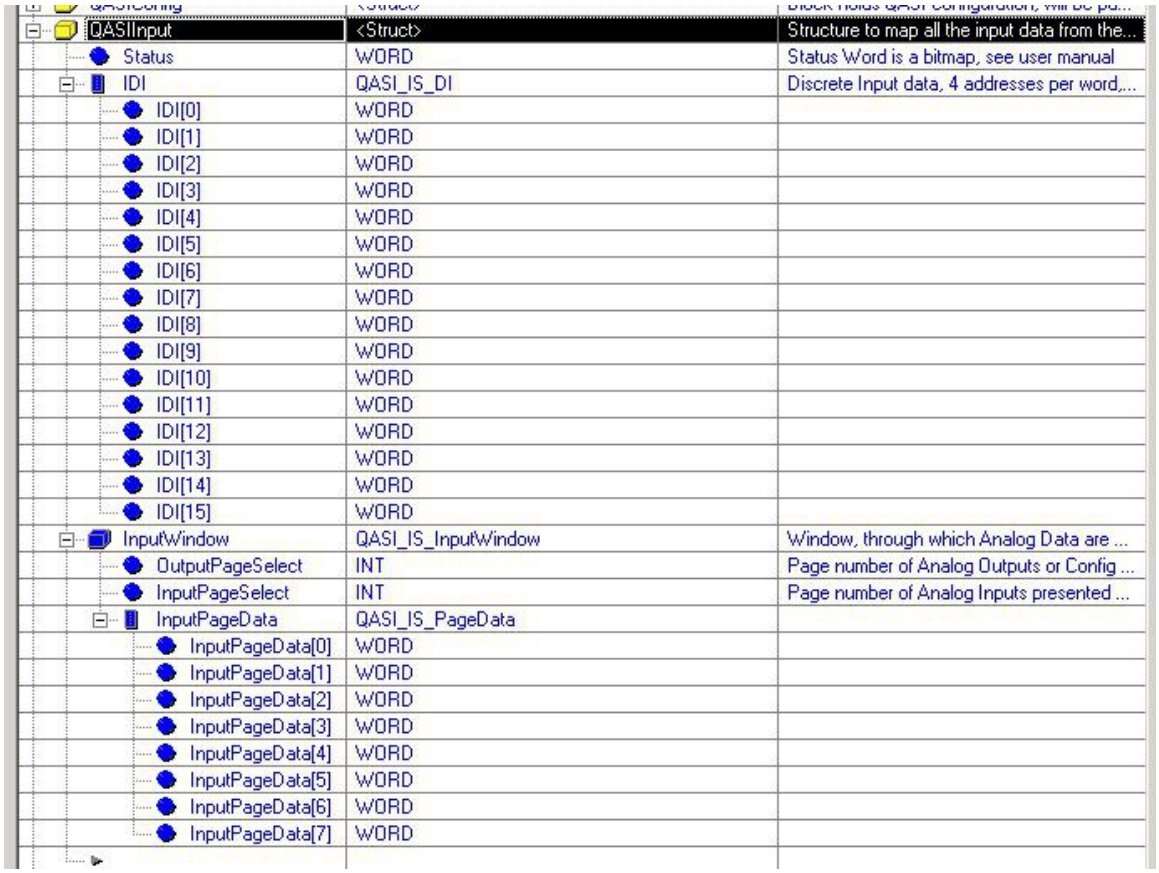
The version 3.0 AS-i network allows for many more words of I/O than may be Traffic Copped to an individual Quantum I/O module. The QASI gets past this limitation by implementing a "windowing" scheme to move blocks of data through the Quantum backplane. This method requires minimal PLC programming and works in the local, remote, and distributed I/O racks.

The QASI is listed in the Traffic Cop as an I/O module with a Module ID of 356(dec) or 0164(hex) with 27 input words and 27 output words.

Rack Inputs

The QASI in Version 3.0 mode uses 27 words of input Traffic Copped as 3x (%IW) registers. These inputs are divided into three groups:

- Status (word 1)
- Discrete Inputs for Slaves 1A...31B (words 2..17)
- Analog/Status Data Window (words 18..27)



QASIInput	<Struct>	Structure to map all the input data from the...
Status	WORD	Status Word is a bitmap, see user manual
IDI	QASI_IS_DI	Discrete Input data, 4 addresses per word,...
IDI[0]	WORD	
IDI[1]	WORD	
IDI[2]	WORD	
IDI[3]	WORD	
IDI[4]	WORD	
IDI[5]	WORD	
IDI[6]	WORD	
IDI[7]	WORD	
IDI[8]	WORD	
IDI[9]	WORD	
IDI[10]	WORD	
IDI[11]	WORD	
IDI[12]	WORD	
IDI[13]	WORD	
IDI[14]	WORD	
IDI[15]	WORD	
InputWindow	QASI_IS_InputWindow	Window, through which Analog Data are ...
OutputPageSelect	INT	Page number of Analog Outputs or Config ...
InputPageSelect	INT	Page number of Analog Inputs presented ...
InputPageData	QASI_IS_PageData	
InputPageData[0]	WORD	
InputPageData[1]	WORD	
InputPageData[2]	WORD	
InputPageData[3]	WORD	
InputPageData[4]	WORD	
InputPageData[5]	WORD	
InputPageData[6]	WORD	
InputPageData[7]	WORD	

Figure 3.1: QASI Input Structure in Unity Pro

Status (word 1)

Input word 1 provides a bitmap of the status of the module. IEC bit 0 is the least significant bit (bit 16 in 984LL).

Table 3.1: Status Word (Input Word 1)

Bit (IEC)	Bit (984)	Meaning When On	Meaning When Off
0	16	AS-I Bus Config OK	AS-I Bus Config Not OK
1	15	Slave With Address 0 Present	Slave With Address 0 Not Present
2	14	Automatic Address Available	Automatic Address Not Available
3	13	Automatic Addressing Possible	Automatic Addressing Impossible
4	12	Protected Mode	Configuration Mode
5	11	Normal Operation Active	Normal Operation Inactive
6	10	AS-i Power Failure	AS-i Power Normal
7	9	AS-i Bus in Offline mode	AS-i Bus Not in Offline mode
8	8	Peripheral Error Active	No Peripheral Errors
9	7	Not Used	Not Used
10	6	Not Used	Not Used
11	5	Not Used	Not Used
12	4	Not Used	Not Used
13	3	Not Used	Not Used
14	2	Not Used	Not Used
15	1	QASI has been configured	QASI is not configured

Discrete Input Data (words 2..17)

Input Words 1 through 16 provide the discrete data bits for the 62 possible AS-i slaves. Each slave has four possible AS-i inputs D0...D3. If the AS-i input is ON then the corresponding PLC input bit will be turned ON.

NOTE: Slaves that do not support extended A/B addressing are always configured as an "A" slave address.

EXAMPLE: Slave 4A has Input D0=1, D1=0, D2=1, and D3=0. Slave 5A has all four inputs OFF (0). Slave 6A has all four inputs ON (1). Slave 7A has input D0=1 and inputs D1, D2, and D3 = 0. Rack Input word 3 would have the value 1F05 (hex) = 7941 (dec).

Table 3.2: AS-i Discrete Inputs

Distribution	**MSB**								**LSB**							
Word Bit (IEC)	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Word Bit (984)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Slave Input	**D3**	**D2**	**D1**	**D0**	**D3**	**D2**	**D1**	**D0**	**D3**	**D2**	**D1**	**D0**	**D3**	**D2**	**D1**	**D0**
Word 2	Slave 3A				Slave 2A				Slave 1A				Unused			
Word 3	Slave 7A				Slave 6A				Slave 5A				Slave 4A			
Word 4	Slave 11A				Slave 10A				Slave 9A				Slave 8A			
Word 5	Slave 15A				Slave 14A				Slave 13A				Slave 12A			
Word 6	Slave 19A				Slave 18A				Slave 17A				Slave 16A			
Word 7	Slave 23A				Slave 22A				Slave 21A				Slave 20A			
Word 8	Slave 27A				Slave 26A				Slave 25A				Slave 24A			
Word 9	Slave 31A				Slave 30A				Slave 29A				Slave 28A			
Word 10	Slave 3B				Slave 2B				Slave 1B				Unused			
Word 11	Slave 7B				Slave 6B				Slave 5B				Slave 4B			
Word 12	Slave 11B				Slave 10B				Slave 9B				Slave 8B			
Word 13	Slave 15B				Slave 14B				Slave 13B				Slave 12B			
Word 14	Slave 19B				Slave 18B				Slave 17B				Slave 16B			
Word 15	Slave 23B				Slave 22B				Slave 21B				Slave 20B			
Word 16	Slave 27B				Slave 26B				Slave 25B				Slave 24B			
Word 17	Slave 31B				Slave 30B				Slave 29B				Slave 28B			

Input Window Data

The Input Window data is normally only accessed through the TBLK block in 984LL or with the QASI_Exchange DFB in Unity Pro.

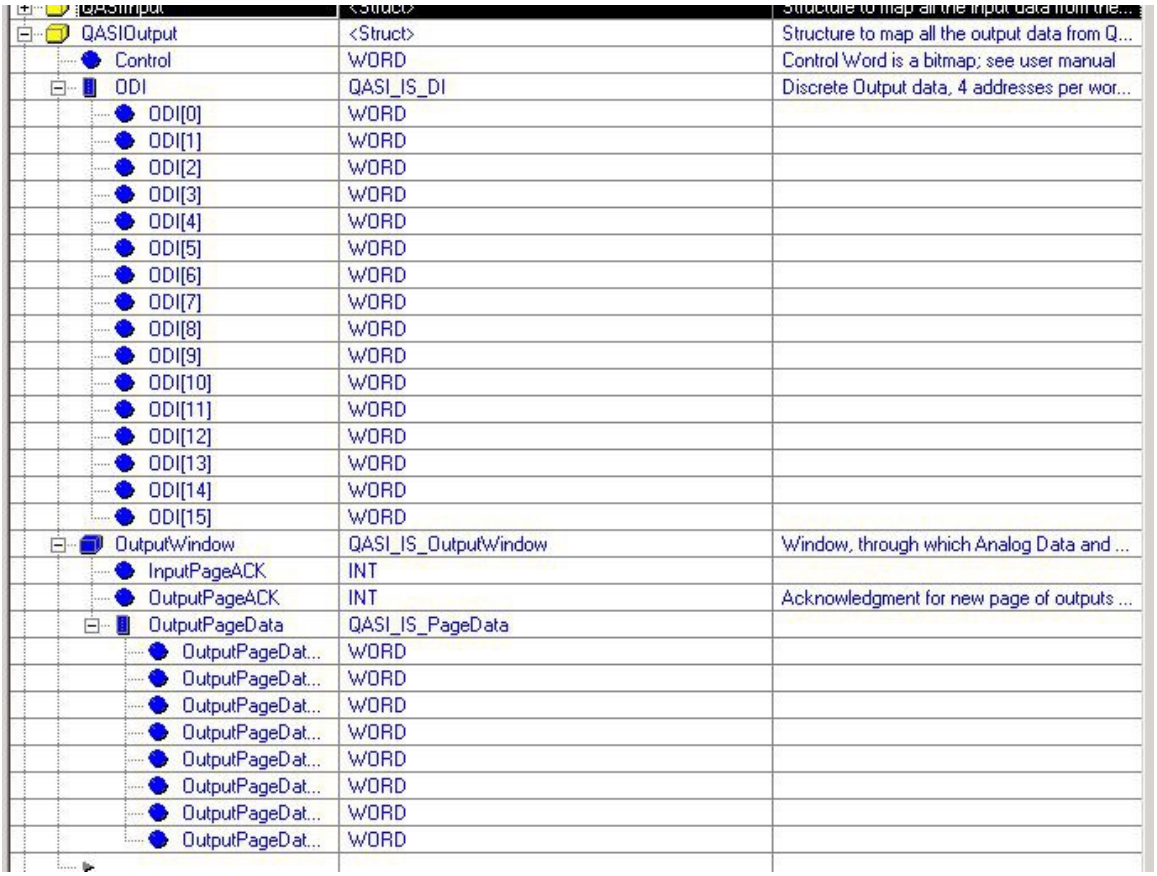
Table 3.3: Window Input Registers

Register	Description
Word 18	Output Page Select
Word 19	Input Page Select
Word 20	Input Page Data word 0
Word 21	Input Page Data word 1
Word 22	Input Page Data word 2
Word 23	Input Page Data word 3
Word 24	Input Page Data word 4
Word 25	Input Page Data word 5
Word 26	Input Page Data word 6
Word 27	Input Page Data word 7

Rack Outputs

The QASI in Version 3.0 mode uses 27 words of outputs Traffic Copped as 4x (%MW) registers. These Outputs are divided into three groups:

- Control (word 1)
- Discrete Outputs for Slaves 1A...31B (words 2..17)
- Analog/Control Data Window (words 18..27)



QASIOutput	<Struct>	Structure to map all the output data from Q...
Control	WORD	Control Word is a bitmap; see user manual
ODI	QASI_IS_DI	Discrete Output data, 4 addresses per wor...
ODI[0]	WORD	
ODI[1]	WORD	
ODI[2]	WORD	
ODI[3]	WORD	
ODI[4]	WORD	
ODI[5]	WORD	
ODI[6]	WORD	
ODI[7]	WORD	
ODI[8]	WORD	
ODI[9]	WORD	
ODI[10]	WORD	
ODI[11]	WORD	
ODI[12]	WORD	
ODI[13]	WORD	
ODI[14]	WORD	
ODI[15]	WORD	
OutputWindow	QASI_IS_OutputWindow	Window, through which Analog Data and ...
InputPageACK	INT	
OutputPageACK	INT	Acknowledgment for new page of outputs ...
OutputPageData	QASI_IS_PageData	
OutputPageDat...	WORD	
OutputPageDat...	WORD	
OutputPageDat...	WORD	
OutputPageDat...	WORD	
OutputPageDat...	WORD	
OutputPageDat...	WORD	
OutputPageDat...	WORD	
OutputPageDat...	WORD	

Figure 3.3: Rack Outputs in Unity Pro

Control (word 1)

Output word 1 provides a bitmap of the control of the module. IEC bit 0 is the least significant bit (bit 16 in 984LL).

Table 3.4: Control Word (Output Word 1)

Bit (IEC)	Bit (984)	Meaning When On	Meaning When Off
0	16	Not Used	
1	15	Set Offline AS-i mode	
2	14	Set Data Exchange active	
3	13	Set Configuration Mode	Set Protected Mode
4	12	Disable Auto Address Assignment	
5	11	Enable Global LOS	
6	10	Not Used	
7	9	Not Used	
8	8	Not Used	
9	7	Not Used	
10	6	Not Used	
11	5	Not Used	
12	4	Not Used	
13	3	Not Used	
14	2	Not Used	
15	1	Trigger QASI to re-read configuration block	Normal Operation

The trigger QASI to re-read configuration block bit (bit 15) corrupts the currently stored configuration on the falling edge. This clears the Status word bit 15 (IEC) which forces the PLC logic to load the Configuration Block into the QASI.

Discrete Output Data (words 2..17)

Input Words 1 through 16 provide the discrete data bits for the 62 possible AS-i slaves. Each slave has four possible AS-i outputs D0...D3. If the PLC output bit is ON then the corresponding AS-i output bit will be turned ON.

EXAMPLE: Slaves 27B, 26B, and 25B are commanded to have all outputs OFF (0) while Slave 24B has outputs D1 and D2 ON (1) with D0 and D3 OFF (0). Rack Output word 16 would have the value 0007 (hex) = 7 (dec).

Table 3.5: AS-i Discrete Outputs

Distribution	**MSB**								**LSB**							
Word Bit (IEC)	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Word Bit (984)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Slave Output	**D3**	**D2**	**D1**	**D0**	**D3**	**D2**	**D1**	**D0**	**D3**	**D2**	**D1**	**D0**	**D3**	**D2**	**D1**	**D0**
Word 2	Slave 3A				Slave 2A				Slave 1A				Unused			
Word 3	Slave 7A				Slave 6A				Slave 5A				Slave 4A			
Word 4	Slave 11A				Slave 10A				Slave 9A				Slave 8A			
Word 5	Slave 15A				Slave 14A				Slave 13A				Slave 12A			
Word 6	Slave 19A				Slave 18A				Slave 17A				Slave 16A			
Word 7	Slave 23A				Slave 22A				Slave 21A				Slave 20A			
Word 8	Slave 27A				Slave 26A				Slave 25A				Slave 24A			
Word 9	Slave 31A				Slave 30A				Slave 29A				Slave 28A			
Word 10	Slave 3B				Slave 2B				Slave 1B				Unused			
Word 11	Slave 7B				Slave 6B				Slave 5B				Slave 4B			
Word 12	Slave 11B				Slave 10B				Slave 9B				Slave 8B			
Word 13	Slave 15B				Slave 14B				Slave 13B				Slave 12B			
Word 14	Slave 19B				Slave 18B				Slave 17B				Slave 16B			
Word 15	Slave 23B				Slave 22B				Slave 21B				Slave 20B			
Word 16	Slave 27B				Slave 26B				Slave 25B				Slave 24B			
Word 17	Slave 31B				Slave 30B				Slave 29B				Slave 28B			

Output Window Data

The Output Window Data is normally only accessed through the TBLK block in 984LL or with the QASI_Exchange DFB in Unity Pro.

Table 3.6: Window Output Registers (Words 18..27)

Register	Description
Word 18	Input Page Ack
Word 19	Output Page Ack
Word 20	Output Page Data word 0
Word 21	Output Page Data word 1
Word 22	Output Page Data word 2
Word 23	Output Page Data word 3
Word 24	Output Page Data word 4
Word 25	Output Page Data word 5
Word 26	Output Page Data word 6
Word 27	Output Page Data word 7

Data Window Operation

The data windows reserved in the rack input and output words are used to pass 8 words of data in and 8 words of data out through the backplane on every PLC scan. Three simple 984LL networks with a few TBLK, BLKM, and AD16 elements (or a DFB in Unity Pro) are all that is needed to configure the QASI and move all possible analog data to/from the PLC to the AS-i network.

Three data structures are required within the PLC for normal AS-i Version 3.0 operation of the QASI:

- Configuration Block
- Analog Output Data
- Analog Input Data/Operation Status

Configuration Block

The Configuration Block consists of 88 words with the first 64 used to set the Permanent Configuration Data (PCD) for each of the possible slaves. The PCD value includes the I/O configuration nybble, IO Code nybble, Extended ID1 code nybble, and ID2 code

nybble. These values are used as the expected configuration in the protected mode.

NOTE: Slaves that do not support the extended profile ID2 must have the hex value F loaded into the PCD.

EXAMPLE: Slave 2A is a Telemecanique ASI 20MT414OS 4in/4out discrete module. This module has a AS-i profile of 7.0.E where IO Code = 7, ID code = 0, ID1 = E, and ID2 = F. The value loaded into Control Block word 2 should be 70EF (hex) = 28911 (dec).

EXAMPLE: Slave 10A is a Bihl+Wiedemann 2 channel analog output card with a profile of 7.3 with the IO Code = 7, ID Code = 3, default ID1 code = F, and ID2 code = 5. The value loaded into Control Block word 10 should be 73F5 (hex) = 29685 (dec).

Table 3.7: Configuration Block (PCD words 0..63)

Word	Description		Word	Description
0	Not Used		32	Not Used
1	Perm. Config. Data 1A		33	Perm. Config. Data 1B
2	PCD 2A		34	PCD 2B
3	PCD 3A		35	PCD 3B
4	PCD 4A		36	PCD 4B
5	PCD 5A		37	PCD 5B
6	PCD 6A		38	PCD 6B
7	PCD 7A		39	PCD 7B
8	PCD 8A		40	PCD 8B
9	PCD 9A		41	PCD 9B
10	PCD 10A		42	PCD 10B
11	PCD 11A		43	PCD 11B
12	PCD 12A		44	PCD 12B
13	PCD 13A		45	PCD 13B
14	PCD 14A		46	PCD 14B
15	PCD 15A		47	PCD 15B
16	PCD 16A		48	PCD 16B
17	PCD 17A		49	PCD 17B
18	PCD 18A		50	PCD 18B
19	PCD 19A		51	PCD 19B
20	PCD 20A		52	PCD 20B

Word	Description		Word	Description
21	PCD 21A		53	PCD 21B
22	PCD 22A		54	PCD 22B
23	PCD 23A		55	PCD 23B
24	PCD 24A		56	PCD 24B
25	PCD 25A		57	PCD 25B
26	PCD 26A		58	PCD 26B
27	PCD 27A		59	PCD 27B
28	PCD 28A		60	PCD 28B
29	PCD 29A		61	PCD 29B
30	PCD 30A		62	PCD 30B
31	PCD 31A		63	PCD 31B

Words 64 though 79 of the Control Block set the Permanent Parameters of each AS-i slave. Each slave has four bits of Permanent Parameters available for use. Refer to the slave's documentation for the description of these parameters.

EXAMPLE: Slave 10A is a 2 channel analog output card where P0=0 (means P1 and P3 determine the operating mode of ch1 and ch2), P1=0 (ch1 in voltage mode), P2=1 (peripheral fault is indicated on a broken wire), and P3=1 (ch2 in current mode). If slaves 8A, 9A, and 11A all have their parameters set to 0 then word 66 would have the value 00C0 (hex) = 192 (dec).

Table 3.8: AS-i Permanent Parameters (words 64..79)

Word	MSB								LSB							
Word Bit (IEC)	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Word Bit (984)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Parameters	**P3**	**P2**	**P1**	**P0**	**P3**	**P2**	**P1**	**P0**	**P3**	**P2**	**P1**	**P0**	**P3**	**P2**	**P1**	**P0**
64	Slave 3A				Slave 2A				Slave 1A				Unused			
65	Slave 7A				Slave 6A				Slave 5A				Slave 4A			
66	Slave 11A				Slave 10A				Slave 9A				Slave 8A			
67	Slave 15A				Slave 14A				Slave 13A				Slave 12A			
68	Slave 19A				Slave 18A				Slave 17A				Slave 16A			
69	Slave 23A				Slave 22A				Slave 21A				Slave 20A			

Word	MSB		LSB	
70	Slave 27A	Slave 26A	Slave 25A	Slave 24A
71	Slave 31A	Slave 30A	Slave 29A	Slave 28A
72	Slave 3B	Slave 2B	Slave 1B	Unused
73	Slave 7B	Slave 6B	Slave 5B	Slave 4B
74	Slave 11B	Slave 10B	Slave 9B	Slave 8B
75	Slave 15B	Slave 14B	Slave 13B	Slave 12B
76	Slave 19B	Slave 18B	Slave 17B	Slave 16B
77	Slave 23B	Slave 22B	Slave 21B	Slave 20B
78	Slave 27B	Slave 26B	Slave 25B	Slave 24B
79	Slave 31B	Slave 30B	Slave 29B	Slave 28B

The List of Projected Slaves (LPS) is a bitmap of the AS-i slave addresses that are expected to be connected to the QASI. The LPS is stored in the Control Block words 80 through 83. The bit corresponding to a given slave should be set ON for the QASI to control the device.

EXAMPLE: Slaves 1A, 2A, and 15A are to be attached to the QASI. Control Block word 80 would be loaded with a value of x8006 (hex) or 32774 (decimal).

EXAMPLE: Only Slaves 16A, 20A, and 30A are expected on the network. Word 81 would have the value 4011(hex) = 16401(dec).

Table 3.9: AS-i List of Projected Slaves (LPS)

Word	MSB								LSB							
Word Bit (IEC)	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Word Bit (984)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
80	**15A**	**14A**	**13A**	**12A**	**11A**	**10A**	**9A**	**8A**	**7A**	**6A**	**5A**	**4A**	**3A**	**2A**	**1A**	**N/A**
81	**31A**	**30A**	**29A**	**28A**	**27A**	**26A**	**25A**	**24A**	**23A**	**22A**	**21A**	**20A**	**19A**	**18A**	**17A**	**16A**
82	**15B**	**14B**	**13B**	**12B**	**11B**	**10B**	**9B**	**8B**	**7B**	**6B**	**5B**	**4B**	**3B**	**2B**	**1B**	**N/A**
83	**31B**	**30B**	**29B**	**28B**	**27B**	**26B**	**25B**	**24B**	**23B**	**22B**	**21B**	**20B**	**19B**	**18B**	**17B**	**16B**

The List of Offline Slaves (LOS) is a special bitmap that instructs the QASI to pay special attention to the slaves selected in this table. These slaves are critical to the operation of the AS-i network system and while the AS-i network is in protected mode, if

any of the selected slaves is offline then the network will be halted.

Table 3.10: AS-i List of Offline Slaves (LOS)

Word	MSB								LSB							
Word Bit (IEC)	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word Bit (984)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
84	15A	14A	13A	12A	11A	10A	9A	8A	7A	6A	5A	4A	3A	2A	1A	N/A
85	31A	30A	29A	28A	27A	26A	25A	24A	23A	22A	21A	20A	19A	18A	17A	16A
86	15B	14B	13B	12B	11B	10B	9B	8B	7B	6B	5B	4B	3B	2B	1B	N/A
87	31B	30B	29B	28B	27B	26B	25B	24B	23B	22B	21B	20B	19B	18B	17B	16B

Analog Output Block

The Analog Output Block is a structure of 128 words in the PLC that controls all of the possible AS-i analog output slaves. Each slave has a possible four channels.

EXAMPLE: Slave 18 channel 1 is to be commanded to a value of 1234(dec). Analog Output Block word 73 would be loaded with the value 1234(dec).

EXAMPLE: Slave 25 channel 3 is controlled by Analog Output Block word 103.

NOTE: Slave channel 0 is reserved but may not be used.

Table 3.11: Analog Output Registers (Words 1..128)

Wrd	Slv	Ch.		Wrd	Slv	Ch		Wrd	Slv	Ch		Wrd	Slv	Ch
1	0	N/A		33	8	1		65	16	1		97	24	1
2		N/A		34		2		66		2		98		2
3		N/A		35		3		67		3		99		3
4		N/A		36		4		68		4		100		4
5	1	1		37	9	1		69	17	1		101	25	1
6		2		38		2		70		2		102		2
7		3		39		3		71		3		103		3
8		4		40		4		72		4		104		4
9	2	1		41	10	1		73	18	1		105	26	1
10		2		42		2		74		2		106		2

Wrd	Slv	Ch.		Wrd	Slv	Ch		Wrd	Slv	Ch		Wrd	Slv	Ch
11		3		43		3		75		3		107		3
12		4		44		4		76		4		108		4
13	3	1		45	11	1		77	19	1		109	27	1
14		2		46		2		78		2		110		2
15		3		47		3		79		3		111		3
16		4		48		4		80		4		112		4
17	4	1		49	12	1		81	20	1		113	28	1
18		2		50		2		82		2		114		2
19		3		51		3		83		3		115		3
20		4		52		4		84		4		116		4
21	5	1		53	13	1		85	21	1		117	29	1
22		2		54		2		86		2		118		2
23		3		55		3		87		3		119		3
24		4		56		4		88		4		120		4
25	6	1		57	14	1		89	22	1		121	30	1
26		2		58		2		90		2		122		2
27		3		59		3		91		3		123		3
28		4		60		4		92		4		124		4
29	7	1		61	15	1		93	23	1		125	31	1
30		2		62		2		94		2		126		2
31		3		63		3		95		3		127		3
32		4		64		4		96		4		128		4

Analog Input Block

The Analog Input Block is a structure of 144 words in the PLC that the QASI populates with data from all of the possible AS-i analog input slaves as well as network device status.

The first 128 words provide the analog input values from the four channels of each possible slave. Unused channels are set to a value of 0.

EXAMPLE: Slave 2 channel 4's data is placed into Analog Input Block word 12.

EXAMPLE: Slave 16 channel 2's data is placed into Analog Input Block word 66.

NOTE: Slave channel 0 is reserved will always be set to a value of 0.

Table 3.12: Analog Input Registers (Words 1..128)

Wrd	Slv	Ch.		Wrd	Slv	Ch		Wrd	Slv	Ch		Wrd	Slv	Ch
1	0	Cycle time (mS)		33	8	1		65	16	1		97	24	1
2		N/A		34		2		66		2		98		2
3		N/A		35		3		67		3		99		3
4		N/A		36		4		68		4		100		4
5	1	1		37	9	1		69	17	1		101	25	1
6		2		38		2		70		2		102		2
7		3		39		3		71		3		103		3
8		4		40		4		72		4		104		4
9	2	1		41	10	1		73	18	1		105	26	1
10		2		42		2		74		2		106		2
11		3		43		3		75		3		107		3
12		4		44		4		76		4		108		4
13	3	1		45	11	1		77	19	1		109	27	1
14		2		46		2		78		2		110		2
15		3		47		3		79		3		111		3
16		4		48		4		80		4		112		4
17	4	1		49	12	1		81	20	1		113	28	1
18		2		50		2		82		2		114		2
19		3		51		3		83		3		115		3
20		4		52		4		84		4		116		4
21	5	1		53	13	1		85	21	1		117	29	1
22		2		54		2		86		2		118		2
23		3		55		3		87		3		119		3
24		4		56		4		88		4		120		4
25	6	1		57	14	1		89	22	1		121	30	1
26		2		58		2		90		2		122		2

Wrd	Slv	Ch.		Wrd	Slv	Ch		Wrd	Slv	Ch		Wrd	Slv	Ch
27		3		59		3		91		3		123		3
28		4		60		4		92		4		124		4
29	7	1		61	15	1		93	23	1		125	31	1
30		2		62		2		94		2		126		2
31		3		63		3		95		3		127		3
32		4		64		4		96		4		128		4

The List of Activated Slaves (LAS) is a bitmap of slaves that are configured in the List of Projected Slaves (LPS) and are also detected.

Table 3.13: List of Activated Slaves (LAS)

Word	MSB								LSB							
Word Bit (IEC)	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Word Bit (984)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
129	**15A**	**14A**	**13A**	**12A**	**11A**	**10A**	**9A**	**8A**	**7A**	**6A**	**5A**	**4A**	**3A**	**2A**	**1A**	**N/A**
130	**31A**	**30A**	**29A**	**28A**	**27A**	**26A**	**25A**	**24A**	**23A**	**22A**	**21A**	**20A**	**19A**	**18A**	**17A**	**16A**
131	**15B**	**14B**	**13B**	**12B**	**11B**	**10B**	**9B**	**8B**	**7B**	**6B**	**5B**	**4B**	**3B**	**2B**	**1B**	**N/A**
132	**31B**	**30B**	**29B**	**28B**	**27B**	**26B**	**25B**	**24B**	**23B**	**22B**	**21B**	**20B**	**19B**	**18B**	**17B**	**16B**

The List of Detected Slaves (LDS) is a bitmap of every AS-i slave detected on the network. This list may show slaves that are not included in the List of Projected Slaves (LPS).

Table 3.14: List of Detected Slaves (LDS)

Word	MSB								LSB							
Word Bit (IEC)	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Word Bit (984)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
133	**15A**	**14A**	**13A**	**12A**	**11A**	**10A**	**9A**	**8A**	**7A**	**6A**	**5A**	**4A**	**3A**	**2A**	**1A**	**N/A**
134	**31A**	**30A**	**29A**	**28A**	**27A**	**26A**	**25A**	**24A**	**23A**	**22A**	**21A**	**20A**	**19A**	**18A**	**17A**	**16A**
135	**15B**	**14B**	**13B**	**12B**	**11B**	**10B**	**9B**	**8B**	**7B**	**6B**	**5B**	**4B**	**3B**	**2B**	**1B**	**N/A**
136	**31B**	**30B**	**29B**	**28B**	**27B**	**26B**	**25B**	**24B**	**23B**	**22B**	**21B**	**20B**	**19B**	**18B**	**17B**	**16B**

Certain slaves may support the flagging of peripheral faults. The List of Peripheral Faults

shows which slaves are reporting a fault. A bit set ON (1) indicates a fault.

EXAMPLE: Only Slave 29B is reporting a peripheral fault. Word 140 would have a value of 2000(hex) = 8192(dec).

Table 3.15: List of Peripheral Faults (LPF)

Word	MSB								LSB							
Word Bit (IEC)	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word Bit (984)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
137	15A	14A	13A	12A	11A	10A	9A	8A	7A	6A	5A	4A	3A	2A	1A	N/A
138	31A	30A	29A	28A	27A	26A	25A	24A	23A	22A	21A	20A	19A	18A	17A	16A
139	15B	14B	13B	12B	11B	10B	9B	8B	7B	6B	5B	4B	3B	2B	1B	N/A
140	31B	30B	29B	28B	27B	26B	25B	24B	23B	22B	21B	20B	19B	18B	17B	16B

The List of Corrupted Slaves (LCS) shows a map of the slaves responsible for at least one configuration error since powering up the QASI.

Table 3.16: List of Corrupted Slaves (LCS)

Word	MSB								LSB							
Word Bit (IEC)	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word Bit (984)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
141	15A	14A	13A	12A	11A	10A	9A	8A	7A	6A	5A	4A	3A	2A	1A	N/A
142	31A	30A	29A	28A	27A	26A	25A	24A	23A	22A	21A	20A	19A	18A	17A	16A
143	15B	14B	13B	12B	11B	10B	9B	8B	7B	6B	5B	4B	3B	2B	1B	N/A
144	31B	30B	29B	28B	27B	26B	25B	24B	23B	22B	21B	20B	19B	18B	17B	16B

984LL Configuration Example

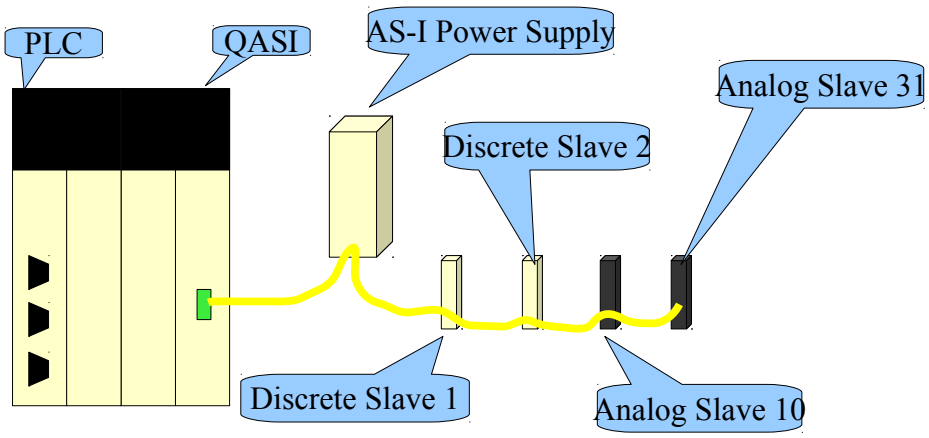
In this example, the QASI is configured as follows:

- Traffic copped for registers 300001-300027 and 400001-400027.
- Configuration Table is in registers 400100-400187.
- Analog Output Table is in 400201-400328.
- Analog Input Table is in 400401-400544.

The AS-i network consists of the following devices:

- Telemecanique 4in/4out I/O model ASI 20MT4140S at slave 1 with profile 7.0.F.E. The Permanent Parameters are 0 for this slave.
- Telemecanique 4in/4out I/O model ASI 20MT4140S at slave 2 with profile 7.0.F.E. The Permanent Parameters are 0 for this slave.
- Bihl+Wiedemann 2-channel analog output model BWU1412 at slave 10 with profile 7.3.F.5. The Permanent Parameters are set to
- Bihl+Wiedemann 4-channel thermocouple analog input model BWU2243 at slave 31 with profile 7.3.F.E. The Permanent Parameters are set to E (hex) to enable the 60Hz filter (P0 OFF) and enable channels 1-4 (P1, P2, and P3 ON).
- The discrete I/O Telemecanique slaves are critical to the operation of the system so they will be included in the List of Offline Slaves (LOS). If either of these slaves goes offline then the AS-i network will be forced offline. The two analog slaves may go offline and the network will continue to operate because they are not included in the LOS.

Figure 3.4: Example Configuration



The non-zero registers in the Configuration Block in the PLC is shown in Table 3.17: Configuration Block (non-zero values).

Table 3.17: Configuration Block (non-zero values)

PLC Register	Value (dec)	Value (hex)	Description

400101	28926	70FE	Discrete I/O Slave 1
400102	28926	70FE	Discrete I/O Slave 1
400110	29685	73F5	Analog Output Slave 10A
400131	29694	73FE	Analog Input Slave 31A
400171	57344	E000	Permanent Parameters Slaves 31A-28A
400180	1030	0406	List of Projected Slaves 15A-1A
400181	32767	8000	List of Projected Slaves 31A-16A
400184	6	0006	List of Offline Slaves 15A-1A

The following 984LL segments are shown from ProWorx32 screens.

The Configuration Block Network moves the data from PLC registers 100 through 178 whenever the QRIO indicates that it is not configured. In this network, the NCBT block tests the “Configured” bit in the QASI status word, and passes power to the other blocks when the QASI is unconfigured. The AD16 block copies “Output Page Select” from 3:00018 to “Output Page ACK” at 4:00019. This value is an index telling the PLC which block of the configuration to post next, and 4:00019 tells the QASI that we have done it. The TBLK instruction actually moves the requested block. In this example, the configuration block begins at 4:00100 in the PLC. It is important that the center input to TBLK is powered; this prevents TBLK from automatically incrementing the index.

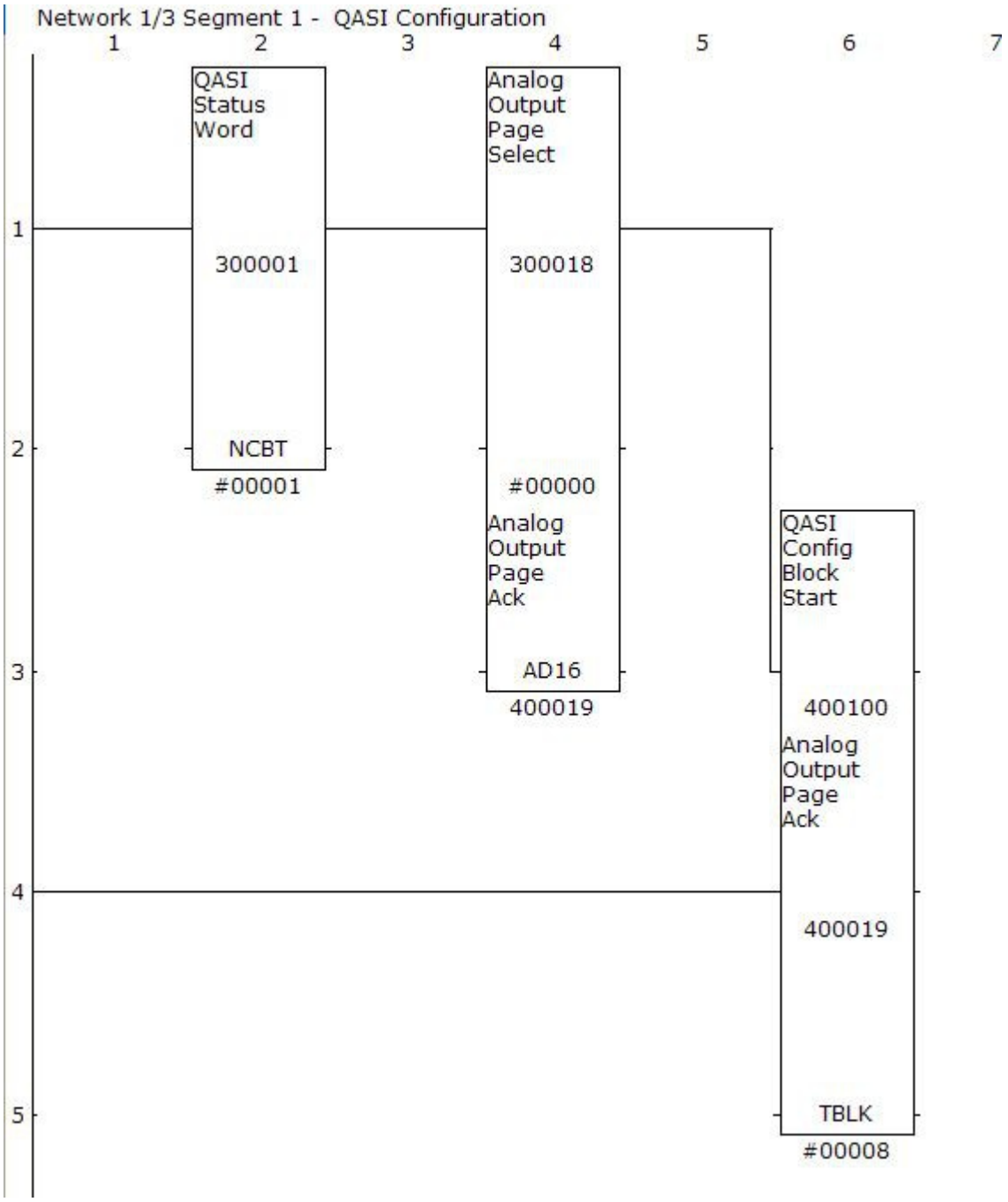


Figure 3.5: Configuration Block Network

The movement of the Analog Output Block works just like the Configuration Block, but is triggered by an NOBT block, so is only active when the “Configured” bit is SET.

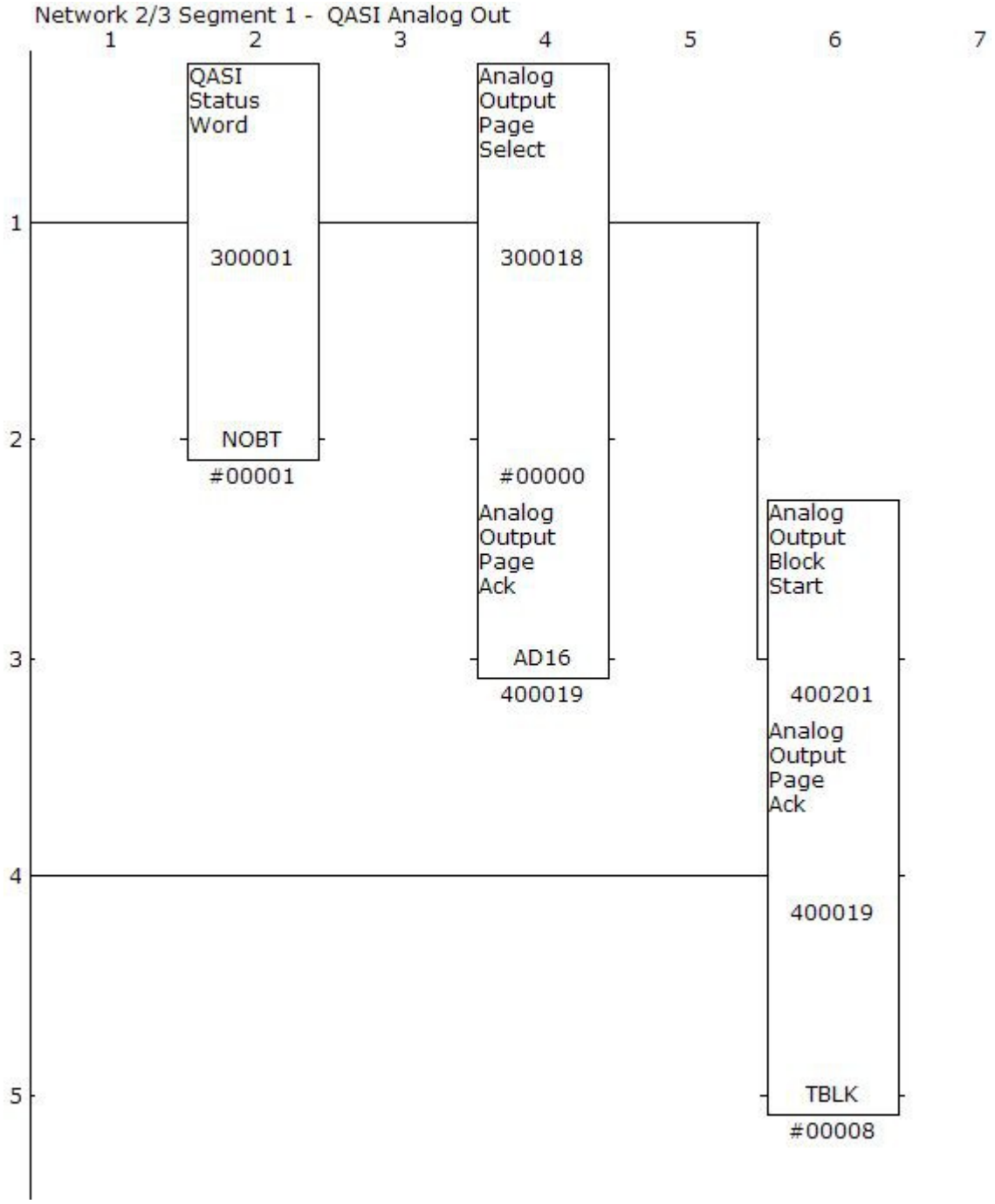


Figure 3.6: Analog Output Block Network

The Analog Input Block includes 16 words of status at the end of the Analog Inputs; the status includes LAS, LDS, LPF, and LCS.

The movement of the Analog Input Block works in a similar way as the outputs and configuration, but is slightly more complicated.

Moving the inputs uses the BLKT instruction, but apparently cannot source its registers from 3x registers. Thus the BLKM:

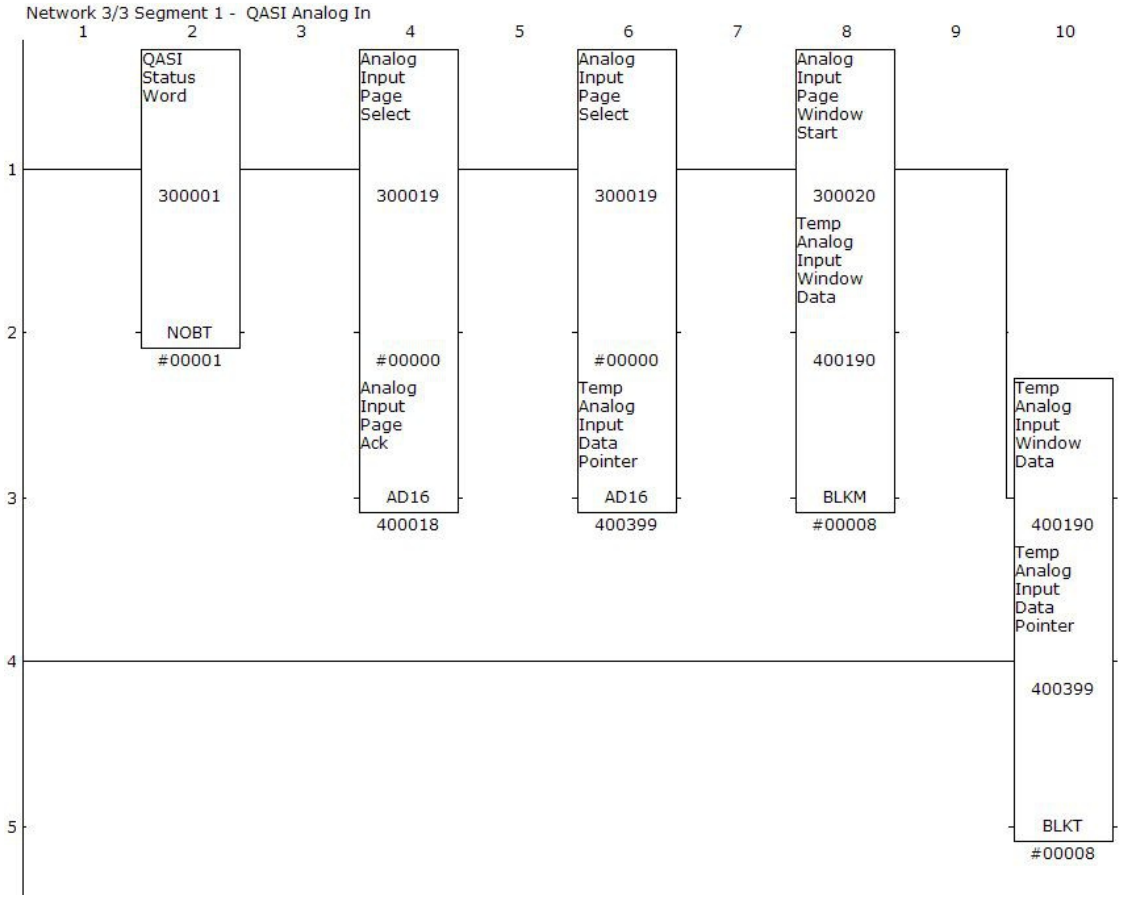


Figure 3.7: Analog In Block Network

The NOBT instruction is same as the Analog Outputs example. The first AD16 block copies the "Input Page Select" register to the "Input Page ACK" register. The second AD16 places this same index at 4:00399–the BLKT instruction will look here for its index and the table of Analog Inputs will follow, starting at 4:00400. The BLKM instruction simply copies the 8 registers of data from the QASI's 3x registers to a temporary block of 4x registers, which is used as the source register for the BLKT. As before, the BLKT's 2nd input is held ON to prevent it from fiddling with the index.

Unity Pro Configuration Example

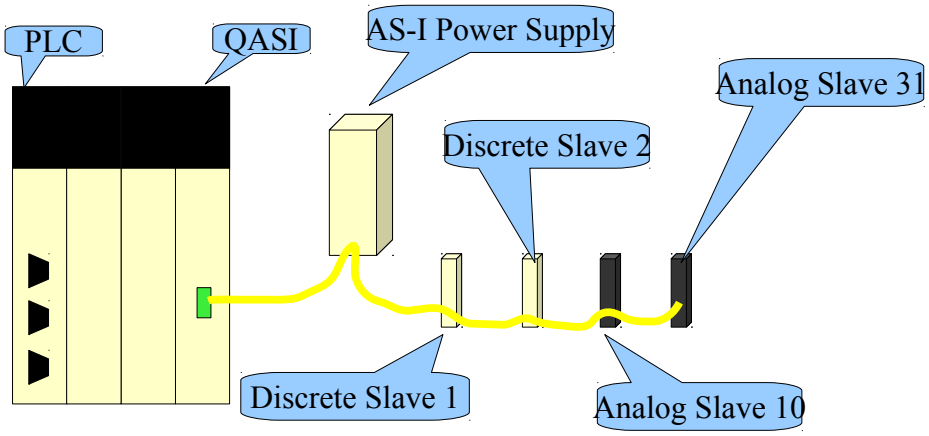
The same network configuration in the 984LL example is now done in a Unity Pro system:

- General Ana IO Module configured for addresses %IW1-27 and %MW1-27 and are named Qasi01_inputs and Qasi01_outputs respectively.
- DFB_QASI_Exchange has been imported (See Figure 3.9).
- Configuration Table is named Qasi01_Config_Block.
- Analog Output Table is named Qasi01_Analog_Out_Block.
- Analog Input Table is named Qasi01_Analog_In_Block.

The AS-i network consists of the following devices:

- Telemecanique 4in/4out I/O model ASI 20MT4140S at slave 1 with profile 7.0.F.E (Qasi01_Config_Block.PCD_A[1] = 16#70FE). The Permanent Parameters are 0 for this slave (Qasi01_Config_Block.PP[0] = 0).
- Telemecanique 4in/4out I/O model ASI 20MT4140S at slave 2 with profile 7.0.F.E (Qasi01_Config_Block.PCD_A[2] = 16#70FE). The Permanent Parameters are 0 for this slave.
- Bihl+Wiedemann 2-channel analog output model BWU1412 at slave 10 with profile 7.3.F.5 (Qasi01_Config_Block.PCD_A[10] = 16#73F5). The Permanent Parameters are set to
- Bihl+Wiedemann 4-channel thermocouple analog input model BWU2243 at slave 31 with profile 7.3.F.E (Qasi01_Config_Block.PCD_A[1] = 16#73FE). The Permanent Parameters are set to E (hex) to enable the 60Hz filter (P0 OFF) and enable channels 1-4 (P1, P2, and P3 ON) (Qasi01_Config_Block.PP[0] = 0).
- The discrete I/O Telemecanique slaves are critical to the operation of the system so they will be included in the List of Offline Slaves (LOS). If either of these slaves goes offline then the AS-i network will be forced offline. The two analog slaves may go offline and the network will continue to operate because they are not included in the LOS.

Figure 3.8: Example Configuration



The non-zero registers in the Configuration Block in the PLC is shown in Table 3.18: Configuration Block (non-zero values).

Table 3.18: Configuration Block (non-zero values)

PLC Register	Value (dec)	Value (hex)	Description
400101	28926	70FE	Discrete I/O Slave 1
400102	28926	70FE	Discrete I/O Slave 1
400110	29685	73F5	Analog Output Slave 10A
400131	29694	73FE	Analog Input Slave 31A
400171	57344	E000	Permanent Parameters Slaves 31A-28A
400180	1030	0406	List of Projected Slaves 15A-1A
400181	32767	8000	List of Projected Slaves 31A-16A
400184	6	0006	List of Offline Slaves 15A-1A

The following 984LL segments are shown from ProWorx32 screens.

The Configuration Block Network moves the data from PLC registers 100 through 178 whenever the QRIO indicates that it is not configured. In this network, the NCBT block tests the “Configured” bit in the QASI status word, and passes power to the other blocks when the QASI is unconfigured. The AD16 block copies “Output Page Select” from 3:00018 to “Output Page ACK” at 4:00019. This value is an index telling the PLC which

block of the configuration to post next, and 4:00019 tells the QASI that we have done it. The TBLK instruction actually moves the requested block. In this example, the configuration block begins at 4:00100 in the PLC. It is important that the center input to TBLK is powered; this prevents TBLK from automatically incrementing the index.

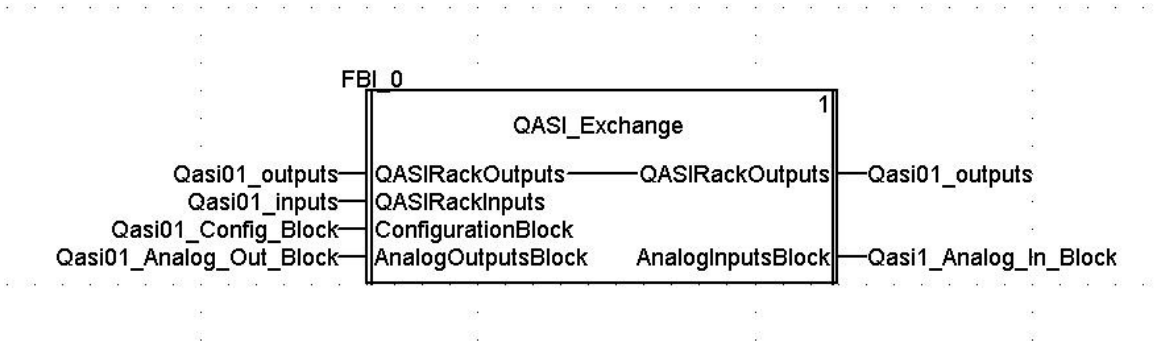
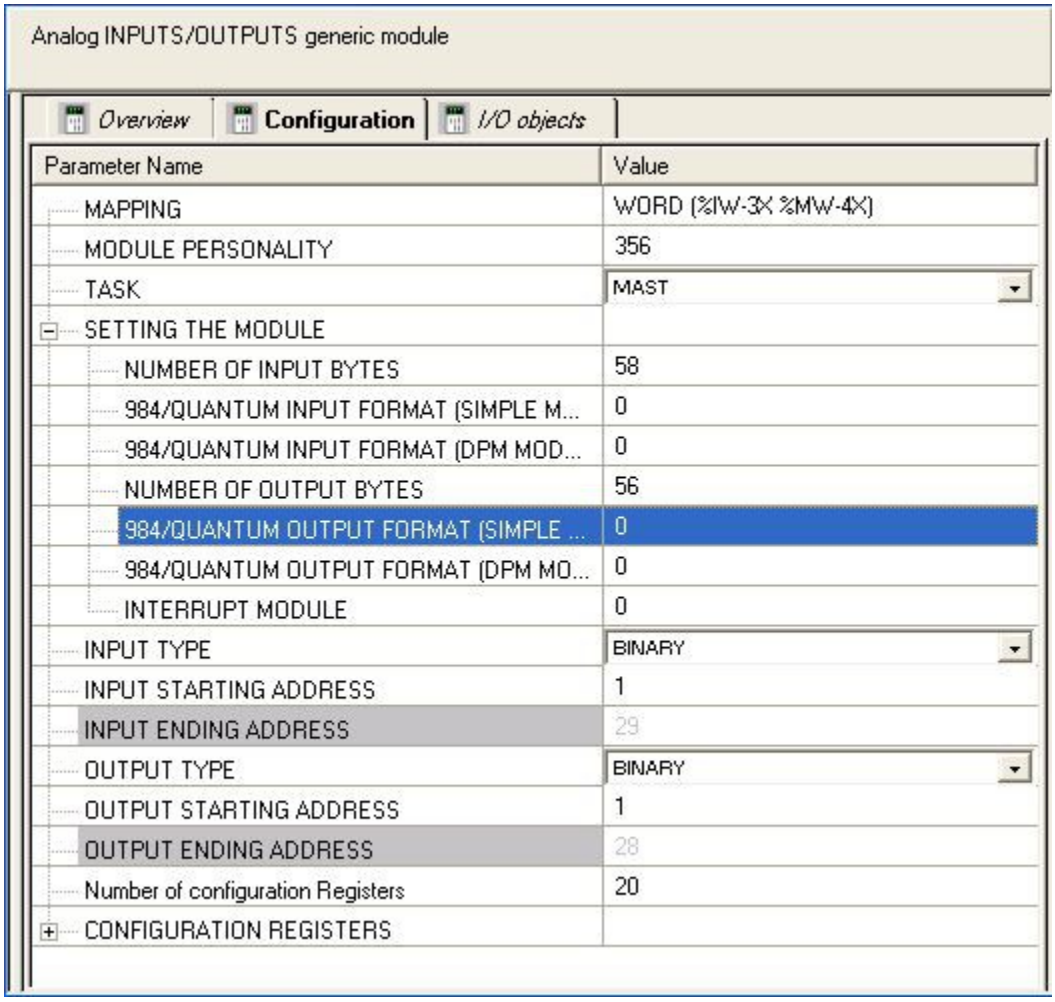


Figure 3.9: Unity QASI_Exchange DFB

Register Read Window

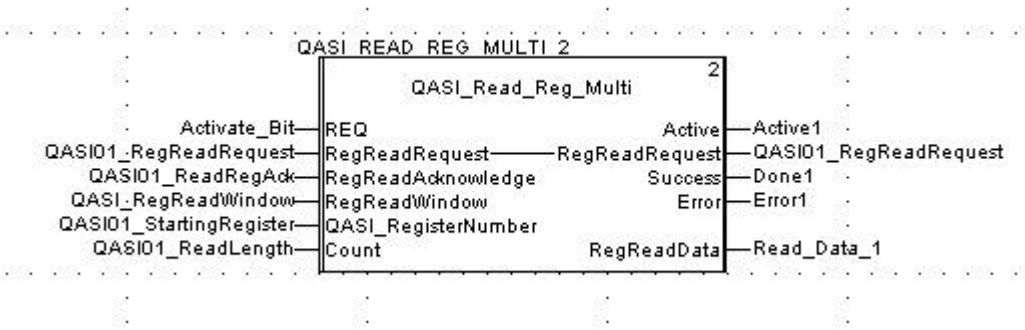
QASI's with a firmware date of 09OCT2012 or later have the ability to allow a Quantum processor to read the QASI's internal registers across the backplane. Another data window is used to read this data. When using this window, the user should configure the QASI in Unity Pro with 29 words of %IW and 28 words of %MW, as shown in Figure 3.10.

Figure 3.10: Unity GEN ANA IO Configuration for Register Reads



A Derived Function Block named QASI_Read_Reg_Multi is included in the \Niobrara\QASI\ folder. This DFB may be imported into Unity Pro from inside a project by right clicking on "Derived FB Types" and selecting "Import." An example of this DFB is shown in Figure 3.11.

Figure 3.11: Unity Read_Reg_Multi DFB



The DFB contains five inputs, four outputs, and one input/output. The inputs are:

- REQ – This is a BOOL that the PLC raises to start the register read.
- RegReadAcknowledge – This is the 28th %MW assigned to the QASI. It provides feedback to the DFB that a single register has been read.
- RegReadWindow – This is the 29th %MW assigned to the QASI. It provides the DFB with the location of the actual data to be read.
- QASI_RegisterNumber – This the starting 4x register number that is to be read from the QASI. The register list for the QASI may be found on page 63.
- Count – This is the number of consecutive registers to be read from the QASI.

The outputs are:

- Active – This is a BOOL that the DFB raises while it is performing the register read.
- Success – This is a BOOL that the DFB raises when it has completed the register read successfully.
- Error – This is a BOOL that the DFB raises when it encounters a problem, and exits the task without completing.
- RegReadData – This is an array of 32 INTs. It is the location into which the DFB saves all the requested data.

The input/output is:

- RegReadRequest – This is the location of the 28th %IW in the QASI. The DFB uses this register to tell the QASI which register to read.

Register Read Operation

The DFB is initiated by the rising edge of the REQ input. The DFB then executes a series of register reads to the QASI that fills the requirements of the

QASI_RegisterNumber and Count inputs. While this action is being performed, the Active output will be high. When the DFB completes its task successfully, the Success output goes high. If the DFB encounters an error, the Error output goes high. In both cases, the Active output will go low when the Success or Error output goes high, and the DFB will leave all three outputs in this state until the DFB is activated again. To activate the DFB again, the user will send the REQ input to low, then raise it to high again. This will reset the state of the Active output to high, and the states of Success and Error to low until the DFB once again finishes.

4 EIA 921 Emulation

The QASI is capable of emulating the Modicon 140 EIA 921 00 AS-i Bus master. In this mode, the QASI can support a maximum of 31 discrete slaves, each with 4 inputs and 4 outputs. To use the card in this fashion, select the 140EIA92100 module from the Traffic Cop in the programming software. A list of registers for this emulation mode are listed below.

> **Note**: The QASI may operate in AS-i version 3.0 mode or 140EIA921 emulation mode. To verify the operating mode, press the **Page** button until viewing the **Status** page. Now press the + or – key to see the page with the **F/W Version** and **Mode** displayed. If the QASI is in Version 3.0 mode, it may be changed to the 140EIA921 mode by pressing and holding both the + and – keys at the same time for 10 seconds while the module is powered. The display will change to show "Change Mode" and then reboot into the new mode.

Inputs

The 140EIA921 mode provides the PLC with 13 words of inputs. Normally these words are Traffic Copped as 3x (%IW) registers. These words are broken into four groups:

- Input Data (words 1-8)
- List of Active Slaves (words 9-10)
- List of Detected Slaves (words 11-12)
- Status (word 13)

Input Data

Input Words 1 through 8 provide the discrete data bits for the 31 possible AS-i slaves as shown in Table Table 4.1: AS-i Bus Inputs. Each slave has four possible AS-i inputs D0...D3. If the AS-i input is ON then the corresponding PLC input bit will be turned ON.

Table 4.1: AS-i Bus Inputs

Distribution	MSB								LSB							
Word Bit (IEC)	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Word Bit (984)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Slave Input	**D3**	**D2**	**D1**	**D0**	**D3**	**D2**	**D1**	**D0**	**D3**	**D2**	**D1**	**D0**	**D3**	**D2**	**D1**	**D0**
Word 1	Slave 3				Slave 2				Slave 1				Unused			
Word 2	Slave 7				Slave 6				Slave 5				Slave 4			
Word 3	Slave 11				Slave 10				Slave 9				Slave 8			
Word 4	Slave 15				Slave 14				Slave 13				Slave 12			
Word 5	Slave 19				Slave 18				Slave 17				Slave 16			
Word 6	Slave 23				Slave 22				Slave 21				Slave 20			
Word 7	Slave 27				Slave 26				Slave 25				Slave 24			
Word 8	Slave 31				Slave 30				Slave 29				Slave 28			

List of Active Slaves

Input Words 9 and 10 provide the status of the List of Active Slaves (LAS) for the 31 possible AS-i slaves. The bit for a given slave will be set ON if the slave is included in the List of Projected Slaves (LPS) and if the slave is also detected (LDS) by the QASI.

Table 4.2: Active Slaves (LAS)

Words	MSB								LSB							
Word Bit (IEC)	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Word Bit (984)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Word 9	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 10	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

List of Detected Slaves

Input words 11 and 12 provide the bitmap of the List of Detected Slaves (LDS). The QASI will set the bit ON for a given slave when it detects the slave on the AS-i network. Slaves do not need to be in the List of Projected Slaves (LPS) to be detected.

Table 4.3: Detected Slaves (LDS)

Words	MSB								LSB							
Word Bits (IEC)	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Word Bits (984)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Word 11	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 12	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

Status

Input word 13 provides a bitmap of the status of the operation of the QASI.

Table 4.4: Status Word (Word 13)

Bit (IEC)	Bit (984)	Meaning When On	Meaning When Off
0	16	AS-I Bus Config OK	AS-I Bus Config Not OK
1	15	Slave With Address 0 Present	Slave With Address 0 Not Present
2	14	Automatic Address Available	Automatic Address Not Available
3	13	Automatic Addressing Possible	Automatic Addressing Impossible
4	12	Protected Mode	Configuration Mode
5	11	Normal Operation Active	Normal Operation Inactive
6	10	AS-i Power Failure	AS-i Power Normal
7	9	AS-i Bus in Offline mode	AS-i Bus Not in Offline mode
8-15	1-8	Not Used	Not Used

Outputs

The 140EIA921 mode provides the PLC with 9 words of outputs. Normally these words are Traffic Copped as 4x (%MW) registers. These words are broken into two groups:

- Output Data (words 1-8)
- Control (word 9)

AS-i Outputs

Output words 1 though 8 are used to control the discrete AS-i outputs. Each of the possible 31 slaves have four possible outputs D0...D3. Setting the output bit ON will turn on the corresponding AS-i output.

Table 4.5: AS-i Bus Outputs

Distribution	**MSB**								**LSB**							
Word Bit (IEC)	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Word Bit (984)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Slave Output	**D3**	**D2**	**D1**	**D0**	**D3**	**D2**	**D1**	**D0**	**D3**	**D2**	**D1**	**D0**	**D3**	**D2**	**D1**	**D0**
Word 1	Slave 3				Slave 2				Slave 1				Unused			
Word 2	Slave 7				Slave 6				Slave 5				Slave 4			
Word 3	Slave 11				Slave 10				Slave 9				Slave 8			
Word 4	Slave 15				Slave 14				Slave 13				Slave 12			
Word 5	Slave 19				Slave 18				Slave 17				Slave 16			
Word 6	Slave 23				Slave 22				Slave 21				Slave 20			
Word 7	Slave 27				Slave 26				Slave 25				Slave 24			
Word 8	Slave 31				Slave 30				Slave 29				Slave 28			

Control Word

Output word 9 is used to set the operating control of the QASI.

Table 4.6: Control Word (Word 9)

Bit (IEC)	Bit (984)	Meaning When On	Meaning When Off
0	16	Not Used	Not Used
1	15	Set to Offline Mode	Set to Online Mode
2	14	Set Data Exchange Active	Set Data Exchange Inactive
3	13	Configuration Mode	Protected Mode
4-15	12-1	Not Used	Not Used

Please refer to the manual for the 140EIA92100 for further information pertaining to this operating mode.

5 Front Panel Operation

Push Buttons

The front panel include a Page, (+), and (–) push buttons.

- Page – The Page button steps though the various screens available. The screen options will depend on the operating mode of the QASI (V3.0 or EIA941).
  .
- Minus – The (–) push button decrements the slave device shown on the screen. It may also be used to move between multiple screens when the up or down arrows are shown on the screen.
- Plus – The (+) push button increments the slave device shown on the screen. It may also be used to move between multiple screens when the up or down arrows are shown on the screen.

NOTE: Holding the Page button while powering up the QASI will enter Firmware Download mode. To return to normal operation, press the (+) or (–) buttons or cycle power on the QASI. See section Updating the QASI Firmware on page 15.

NOTE: Holding the Page button for 5 seconds while in a normal operating mode will enter the Remap Address screen. This screen allows the user to manually change the slave address of a given AS-i slave. See section Manual Slave Addressing on page 58.

NOTE: Holding both the (+) and (–) buttons down for 5 seconds will toggle the operating mode of the QASI between Version 3.0 mode and 140EIA921 mode. See section Mode Change on page 58.

NOTE: The first button press when the backlight is dim simply brightens the backlight and is otherwise ignored.

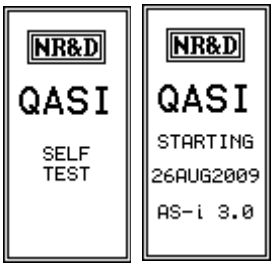
LCD Screen

The QASI includes a high resolution LCD screen main screen to assist the user in configuring and troubleshooting the AS-i network. AS-i slave parameters and I/O values may be observed as well as alarm conditions and status of the QASI itself.

Backlight

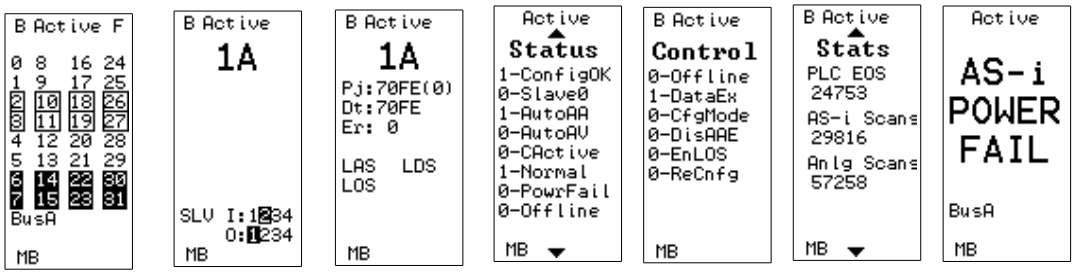
The LCD backlight will illuminate on any button press. The timeout for the backlight is configured through Modbus drop 255 register 7003 and defaults to 300 seconds. The first button press when the backlight is dim simply brightens the backlight and is otherwise ignored.

Boot Sequence Screens



The QASI boot sequence will first show the "Self Test" screen. After passing the self test, the module proceeds to the "Starting Screen". This screen displays the firmware version "26AUG2009" of the QASI and the operating mode "AS-i 3.0" or "EIA-921". The Starting screen then changes to the Main screen which normally shows an overview of the AS-i network.

Operating Screens



Overview

Each of the operating screens of the QASI share some common features.

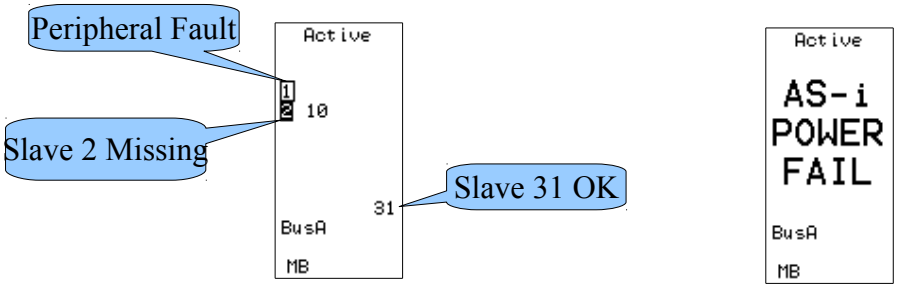
- The upper left corner may show a flashing "B" which indicates active control of the AS-i network.
- The upper right corner may show a flashing "F" which indicates a fault on the AS-i network.
- The word "Active" at the top of the screen indicates that the QASI is properly traffic copped in the PLC and that the PLC is in RUN. If "Active" is not displayed, verify that the PLC is running and that the slot has been properly configured. Also verify that the QASI is in the correct mode to match the PLC configuration (V3.0 or EIA mode).
- Some screens (Status, Control, and Stats) contain multiple pages of data as indicated byte the small up and down arrows near the top and bottoms of the display. Pressing the (+) and (-) buttons will step through these pages.
- The MB in the lower left corner indicates Modbus serial traffic on the RS-232 port.

Bus Page

The Bus Page screen generally shows the status of the AS-i slaves. This page is the

default screen the module reverts to after the backlight timer expires.

- There are 32 possible numbers that may be displayed, one for each AS-i device.
- Numbers that are flashing indicate an AS-i slave that is detected but not projected. Verify that the List of Projected Slaves (LPS) is correct in the Configuration Block.
- Numbers that are inverted indicate an AS-i slave that is projected but not detected.
- Numbers within a box indicate a peripheral fault in an active slave.
- The BusA or BusB indicates which 32 A or B devices are displayed (V3.0 mode only). The (+) and (-) buttons may be used to switch between BusA and BusB.
- Whenever the QASI fails to receive proper power supply voltage on the AS-i port then the screen will show "AS-i POWER FAIL".

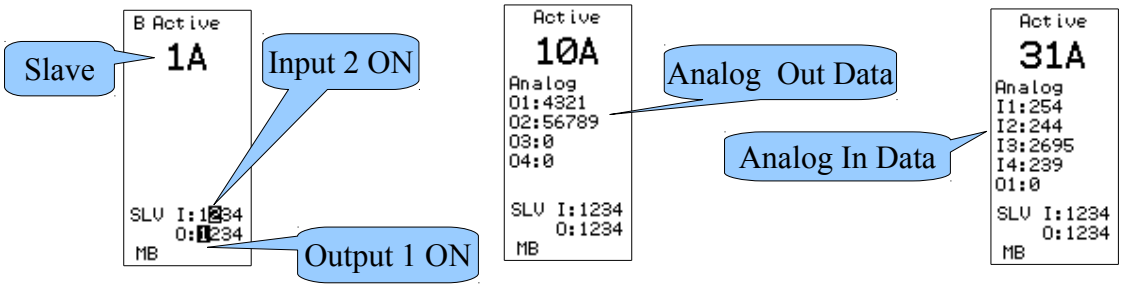


SLV Page

Pressing the page button from the Bus page will move to the SLV page. There are 64 possible screens on the SLV, one for each possible AS-i device. (EIA compatible mode only has 32 screens as it does not support "B" slaves.) Pressing the (+) and (-) buttons will step through the possible SLV screens.

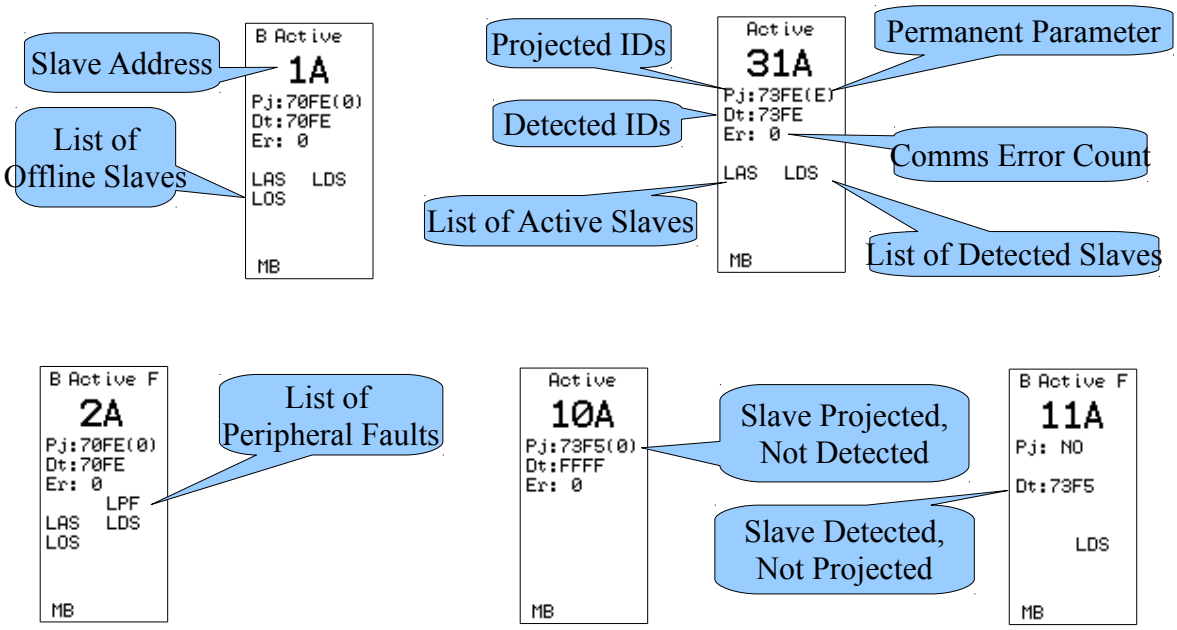
The SLV screens show the status of the individual I/O slave. The possible four discrete Inputs and Outputs are shown near the bottom of the screen. If an Input or Output is active then the number will be inverted.

Analog modules will show possible analog input values if they are not equal to 7FFF(hex). Available space dictates how many analog output values are displayed.



Device Configuration Page

Pressing the Page button progresses from the SLV page to the Device Configuration page. This page provides detailed information about each AS-i slave.



- The Slave Address appears in large bold letters at the top. Mode 3.0 supports 0A-31B while EIA mode only supports 0-31(A).
- Pj: shows the projected profile for the slave in hexadecimal followed by the Permanent Parameter in parenthesis (also in hex).
- Dt: shows the detected profile of the slave. Missing slaves will show FFFF for a detected profile.
- Er: is the count of communication errors with this slave. This value is cleared on power up.
- Several three character abbreviations may be listed below the Er counter. These indicate the status of the bitmap entry in the appropriate list.
    - LAS = List of Active Slaves – LAS indicates that the device is detected and matches the projected profile and operating properly.
    - LDS = List of Detected Slaves – LDS indicates that the device is detected.
    - LPF = List of Peripheral Faults – LPF indicates that the device is reporting a peripheral fault.
    - LOS = List of Offline Slaves – LOF indicates that the slave is included in the LOS in the Configuration Block. If this device has a communication or configuration fault then the AS-i network will be stopped.

Status Page

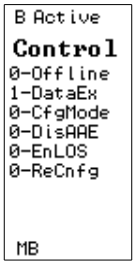
The Status page shows two screens of information about the Rack Input word 0 status and the operation mode and firmware versions of the QASI itself. Pressing the (+) and (-) buttons will move between the three status screens.

- ConfigOK - indicates that the AS-i slaves match the projected profile.
- Slave0 - indicates that Slave 0 is present on the network.
- AutoAA – indicates that the QASI is allowed to automatically assign Slave 0 if present to a missing slave address. This assignment is possible only if the profile of the missing slave exactly matches the detected profile of slave 0 and only one slave is missing.
- AutoAU – indicates automatic programming of address 0 is available.
- Cactive – indicates the AS-i state of the operation of the network.
    - “1” = QASI is in “Configuration Mode”
    - “0” = QASI is in “Protected Mode”
- Normal – indicates the QASI is in normal operation.
- PowrFail – indicates the QASI cannot see normal AS-i power on the network.
- Offline – QASI is in “Offline Mode” when set.
- PerphOK – “1” indicates no peripheral faults reported by any slave. “0” indicates at least one peripheral fault. Check the LPF for more information.
- Conf'd - “1” indicates that the QASI in Mode 3.0 has been successfully configured by the PLC. The QASI will not control the AS-i network until it has been properly configured by the PLC.
- AS-i Ver – The reported version number of the AS-i master board.
- AS-i Mode – The operating mode of the QASI: Version 3.0 or 140EIA941 emulation.
- F/W Ver – The firmware version of the QASI.

- Boot Ver – The version of the boot code of the QASI.
- Serial # - The serial number of the QASI.

Control Page

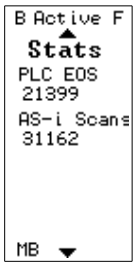
The Control page shows the bits from the Rack Control Word.

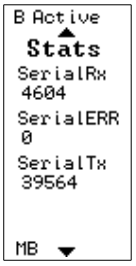


- Offline – "1" indicates that the AS-i network is forced offline.
- DataEx - "1" indicates that data is being exchanged with the AS-i slaves.
- CfgMode - "0" indicates that the AS-i network is in "Protected" mode while "1" indicates "Configuration" mode.
- DisAAE - "1" indicates the Auto Addressing of Slave 0 is disabled.
- EnLOS - "1" indicates the global List of Offline Slaves is enabled. If any slave goes offline, then the entire network will be forced offline.
- ReCnfg - "1" indicates that the PLC desires to reconfigure the Control Block data. The falling edge of this bit triggers the "Cnf'g" bit to be cleared in the Status word which causes the PLC program to reconfigure the QASI.

Stats Page

The Stats page shows counters for PLC backplane scans, AS-i network scans, AS-i analog update scans, and serial port statistics. All counters are reset on power-up and roll over at 65535.





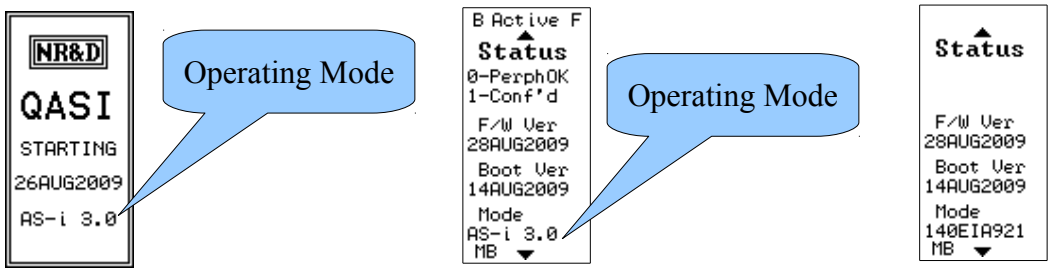
- PLC EOS – This counter is incremented each time the Quantum PLC generates an End of Scan signal to the QASI. This counter will only increment when the QASI

is properly configured within the PLC.

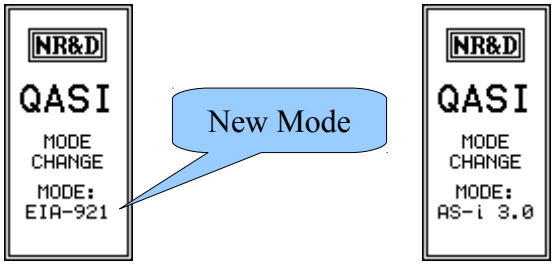
- AS-i Scans – This counter is incremented with each discrete I/O scan of the network.

Mode Change

The QASI may operate in AS-i V3 mode or optionally as an emulation of the Modicon 140EIA92100 card. The QASI will display the operating mode during booting and also on the second screen of the Status Page.



Changing operating modes is a simply as holding down both the (+) and (-) buttons at the same time while the QASI is powered. After five seconds of holding both buttons down, the screen will show "Mode Change" with the new mode and then reboot.



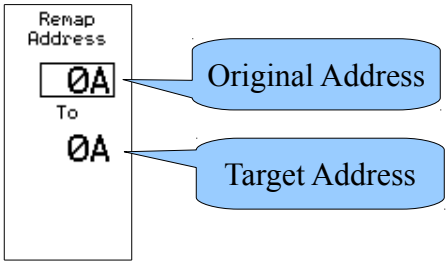
Manual Slave Addressing

The QASI includes a feature to allow the user to quickly change the AS-i network slave address of an attached device through the front panel.

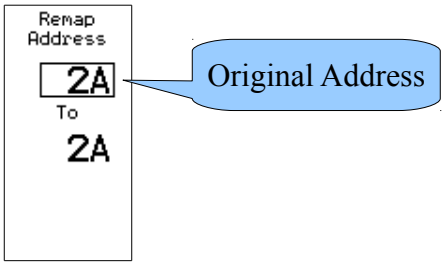
WARNING: Remapping slave address may cause unpredictable behavior on an online system resulting in equipment damage and personal injury or death.
WARNING: Assigning duplicate slave addresses to multiple AS-i slaves will result in unpredictable behavior that may result in loss of control of the system resulting in equipment damage and personal injury or death.
WARNING: Remapping is allowed with the QASI in any control state: Offline,

Protected, and Configuration.

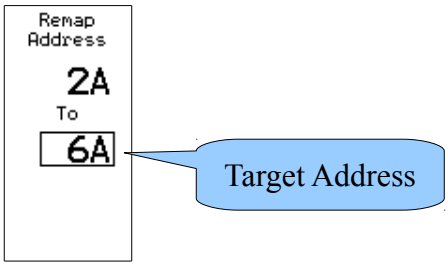
1. Hold the Page button down for five seconds while the QASI is powered.



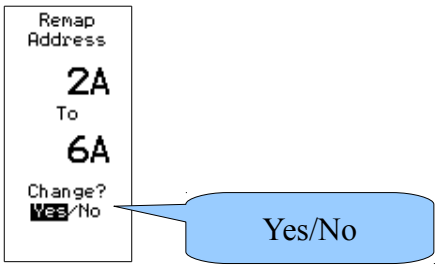
2. Press the (+) or (-) buttons to select the slave address to be modified.



3. Press the Page button to advance to then target field.
4. Press the (+) or (-) buttons to select the target slave address.



5. Press the Page button to advance to the Yes/No field.

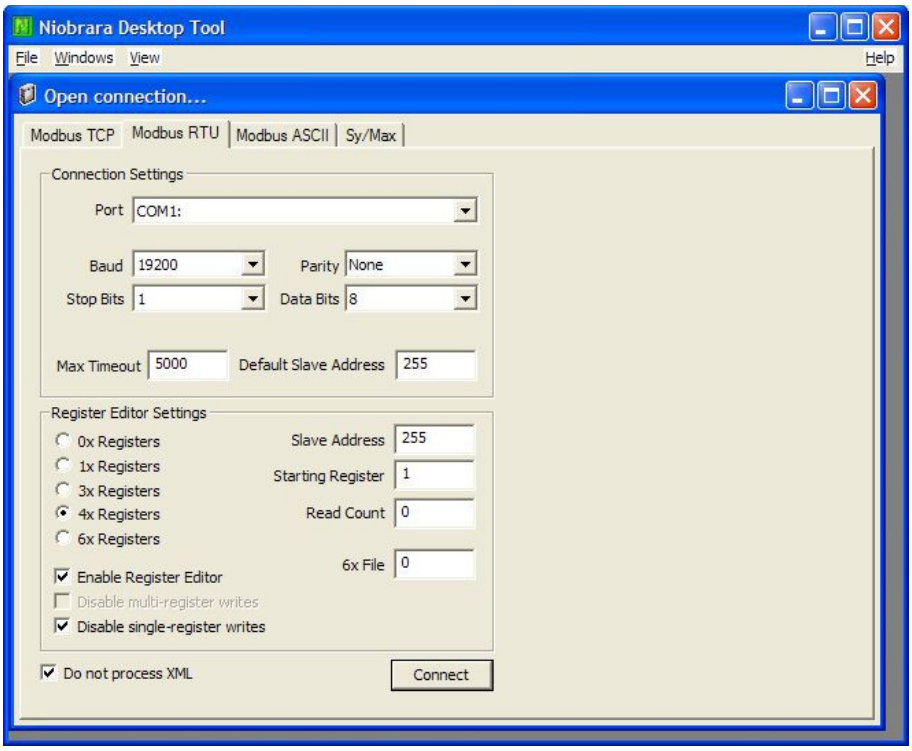


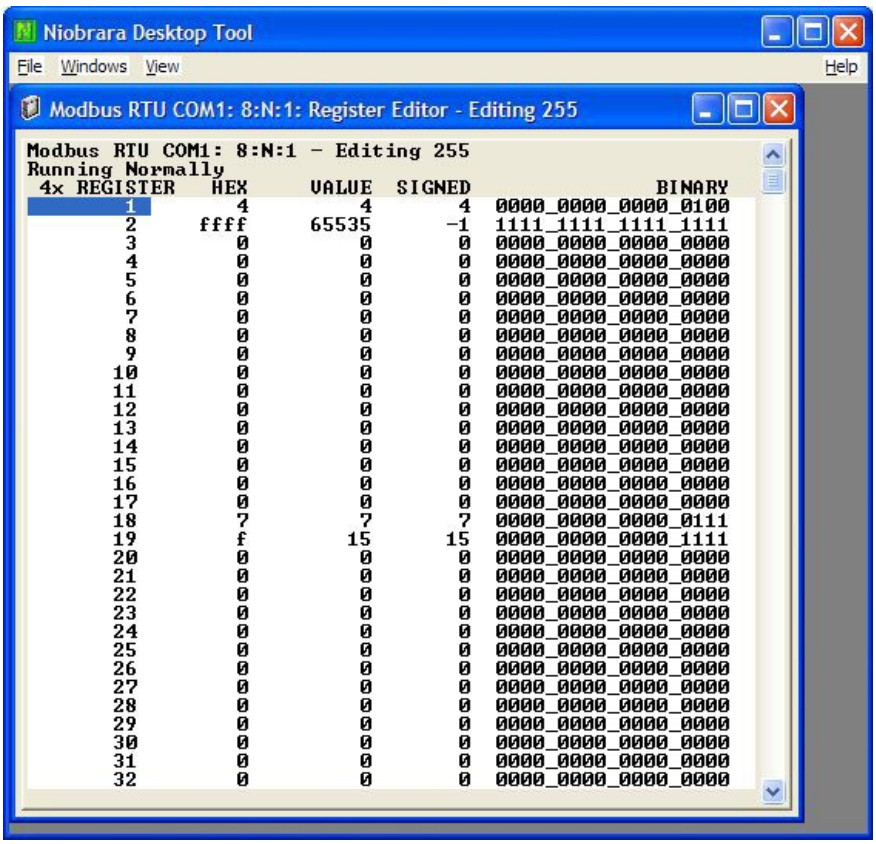
6. Press the (+) or (-) buttons to select Yes to modify the address or No to cancel the modification.

6 Register List

The QASI RS-232 serial port supports Modbus RTU at 19200,N,8,1 as Modbus Slave 255. The Niobrara NRDTOOL.EXE program may be used to communicate with the QASI using Modbus RTU for troubleshooting.

1. Connect the PC RS-232 serial port to the QASI using an MM1 cable.
2. From the Start Menu, choose Start, Programs, Niobrara, NRDTOOL.
3. Select File, Open Connection.
4. Select the Modbus RTU tab.
5. Choose the proper Port (COM1:)
6. Select Baud = 19200.
7. Select Parity = None.
8. Select Stop Bits = 1.
9. Select Data Bits = 8.
10. Select Register Editor Settings = 4x Registers
11. Select Enable Register Editor checkbox.
12. Select Disable single-register writes.
13. Select Do not process XML.
14. Enter Slave Address = 255.
15. Enter Starting Register = 1.
16. Enter Read Count = 0.
17. Press Connect.





4x REGISTER	HEX	VALUE	SIGNED	BINARY
1	4	4	4	0000_0000_0000_0100
2	ffff	65535	-1	1111_1111_1111_1111
3	0	0	0	0000_0000_0000_0000
4	0	0	0	0000_0000_0000_0000
5	0	0	0	0000_0000_0000_0000
6	0	0	0	0000_0000_0000_0000
7	0	0	0	0000_0000_0000_0000
8	0	0	0	0000_0000_0000_0000
9	0	0	0	0000_0000_0000_0000
10	0	0	0	0000_0000_0000_0000
11	0	0	0	0000_0000_0000_0000
12	0	0	0	0000_0000_0000_0000
13	0	0	0	0000_0000_0000_0000
14	0	0	0	0000_0000_0000_0000
15	0	0	0	0000_0000_0000_0000
16	0	0	0	0000_0000_0000_0000
17	0	0	0	0000_0000_0000_0000
18	7	7	7	0000_0000_0000_0111
19	f	15	15	0000_0000_0000_1111
20	0	0	0	0000_0000_0000_0000
21	0	0	0	0000_0000_0000_0000
22	0	0	0	0000_0000_0000_0000
23	0	0	0	0000_0000_0000_0000
24	0	0	0	0000_0000_0000_0000
25	0	0	0	0000_0000_0000_0000
26	0	0	0	0000_0000_0000_0000
27	0	0	0	0000_0000_0000_0000
28	0	0	0	0000_0000_0000_0000
29	0	0	0	0000_0000_0000_0000
30	0	0	0	0000_0000_0000_0000
31	0	0	0	0000_0000_0000_0000
32	0	0	0	0000_0000_0000_0000

Modbus/TCP Index 0 or 1 will access the “data” registers of the QASI. These registers are all Modbus Holding Registers (4x).

3x Registers

Register	Dir	Description
1	R	Status Word
2	R	IDI 3..1A
3	R	IDI 7..4A
…	R	…
17	R	IDI 31..28B
18	R	Output Page Select
19	R	Input Page Select
20	R	Input Page Data[0]
…	R	…
27	R	Input Page Data[7]
28-32	R	Reserved

4x Registers

Register	Dir	Description
1	R	Control Word
2	R	ODI 3..1A
3	R	ODI 7..4A
…	R	…
17	R	ODI 31..28B
18	R	Input Page Ack
19	R	Output Page Ack
20	R	Output Page Data[0]
…	R	…
27	R	Output Page Data[7]
28-32	R	Reserved
33-64	R	Input data (copy of 3×1-32)
100-131	R	Actual Configuration for 32 drops (read from device). Hex format(0xABCD: A=IO, B=ID, C=ID1, D=ID2)
133-163	R	Actual Configuration for 32 “B” drops (read from device). Hex format(0xABCD: A=IO, B=ID, C=ID1, D=ID2)
201-231	R	Stored config for 31 drops (read from AS-i controller). Hex format(0xABCD: A=IO, B=ID, C=ID1, D=ID2)

Register	Dir	Description
233-263	R	Stored config for 31 “B” drops (read from AS-i controller). Hex format(0xABCD: A=IO, B=ID, C=ID1, D=ID2)
301-331	R/W	Count of “corrupted data telegrams” for each “A” device on network.
333-363	R/W	Count of “corrupted data telegrams” for each “B” device on network.
401-408	R	List of Corrupted Slaves (one bit per drop, LSB=0)
501-508	R	List of slaves with Peripheral Faults (one bit per drop, LSB=0)
601-631	R	Status of Analog Inputs, per drop. Bit x8000 set if Active, bit x4000 set if message refused, error in low byte
701-731	R	Status of Analog Outputs, per drop. Bit x8000 set if Active, bit x4000 set if message refused, error in low byte
1001-1256	R	Analog Input Table, as windowed to PLC
1501-1756	R	Analog Output Table, as windowed from PLC
3000-3087	R	Configuration Table, as windowed from PLC
4096-5119	R	Image of AS-i OEM board's DPRAM. (Displayed as hex, registers 0×1000 - 0x13FF). Mostly for debug purposes.
5200	R	Length, in words, of Parameter Data received from PLC
5201-5232	R	Parameters received from PLC
8170	R/W	Remap Slave command (Hi byte = old, Lo byte = new address). Reads back response from AS-i master board (0 = OK)
8174	R/W	Reboot, Factory defaults commands, LCD capture.
8175	R/W	Crashinfo access
8177-86	R	Module Name/Firmware revision string.
8188	R	Module ID 0×9990

6x files

File #	Dir	Description
60600	R	Image of LCD screen buffer (identical to CRPS, etc.)
100	R/W	Config: LPS [1)]
101	R/W	Config: PCD [2)]
102	R/W	Config: PP [3)]
201	R/W	Config: Input Map. Allows Input data or Status to be mapped to 32 PLC backplane registers
202	R/W	Config: Output Map. Allows Output data or Config to be drawn from 32 PLC backplane registers

[1)] List of Projected Slaves

[2)] Permanent Configuration Data

3) Permanent Parameter

QASI Configuration Block

Block Offset	QASI Register (4x)	Config
0	3000	N/A
1	3001	PCD 1A
2	3002	PCD 2A
3	3003	PCD 3A
4	3004	PCD 4A
5	3005	PCD 5A
6	3006	PCD 6A
7	3007	PCD 7A
8	3008	PCD 8A
9	3009	PCD 9A
10	3010	PCD 10A
11	3011	PCD 11A
12	3012	PCD 12A
13	3013	PCD 13A
14	3014	PCD 14A
15	3015	PCD 15A
16	3016	PCD 16A
17	3017	PCD 17A
18	3018	PCD 18A
19	3019	PCD 19A
20	3020	PCD 20A
21	3021	PCD 21A
22	3022	PCD 22A
23	3023	PCD 23A
24	3024	PCD 24A
25	3025	PCD 25A
26	3026	PCD 26A
27	3027	PCD 27A
28	3028	PCD 28A
29	3029	PCD 29A
30	3030	PCD 30A

Block Offset	QASI Register (4x)	Config
31	3031	PCD 31A
32	3032	N/A
33	3033	PCD 1B
34	3034	PCD 2B
35	3035	PCD 3B
36	3036	PCD 4B
37	3037	PCD 5B
38	3038	PCD 6B
39	3039	PCD 7B
40	3040	PCD 8B
41	3041	PCD 9B
42	3042	PCD 10B
43	3043	PCD 11B
44	3044	PCD 12B
45	3045	PCD 13B
46	3046	PCD 14B
47	3047	PCD 15B
48	3048	PCD 16B
49	3049	PCD 17B
50	3050	PCD 18B
51	3051	PCD 19B
52	3052	PCD 20B
53	3053	PCD 21B
54	3054	PCD 22B
55	3055	PCD 23B
56	3056	PCD 24B
57	3057	PCD 25B
58	3058	PCD 26B
59	3059	PCD 27B
60	3060	PCD 28B
61	3061	PCD 29B
62	3062	PCD 30B
63	3063	PCD 31B
64	3064	PP 3..0A

Block Offset	QASI Register (4x)	Config
65	3065	PP 7..4A
66	3066	PP 11..8A
67	3067	PP 15..12A
68	3068	PP 19..16A
69	3069	PP 23..20A
70	3070	PP 27..24A
71	3071	PP 31..28A
72	3072	PP 3..0B
73	3073	PP 7..4B
74	3074	PP 11..8B
75	3075	PP 15..12B
76	3076	PP 19..16B
77	3077	PP 23..20B
78	3078	PP 27..24B
79	3079	PP 31..28B
80	3080	LPS 15..1A
81	3081	LPS 31..16A
82	3082	LPS 15..1B
83	3083	LPS 31..16B
84	3084	LOS 15..1A
85	3085	LOS 31..16A
86	3086	LOS 15..1B
87	3087	LOS 31..16B

QASI Analog Outputs Block

When the QASI is operating in “Mode 2”, the following block of registers will exist in the PLC, and will be continuously copied out to the QASI after the configuration cycle is complete.

Block Offset	QASI Register	Meaning
1	1501	N/A
2	1502	N/A
3	1503	N/A
4	1504	N/A

Block Offset	QASI Register	Meaning
5	1505	Device 1, Analog Output Channel 1
6	1506	Device 1, Analog Output Channel 2
7	1507	Device 1, Analog Output Channel 3
8	1508	Device 1, Analog Output Channel 4
9	1509	Device 2, Analog Output Channel 1
10	1510	Device 2, Analog Output Channel 2
11	1511	Device 2, Analog Output Channel 3
12	1512	Device 2, Analog Output Channel 4
13	1513	Device 3, Analog Output Channel 1
14	1514	Device 3, Analog Output Channel 2
15	1515	Device 3, Analog Output Channel 3
16	1516	Device 3, Analog Output Channel 4
17	1517	Device 4, Analog Output Channel 1
18	1518	Device 4, Analog Output Channel 2
19	1519	Device 4, Analog Output Channel 3
20	1520	Device 4, Analog Output Channel 4
21	1521	Device 5, Analog Output Channel 1
22	1522	Device 5, Analog Output Channel 2
23	1523	Device 5, Analog Output Channel 3
24	1524	Device 5, Analog Output Channel 4
25	1525	Device 6, Analog Output Channel 1
26	1526	Device 6, Analog Output Channel 2
27	1527	Device 6, Analog Output Channel 3
28	1528	Device 6, Analog Output Channel 4
29	1529	Device 7, Analog Output Channel 1
30	1530	Device 7, Analog Output Channel 2
31	1531	Device 7, Analog Output Channel 3
32	1532	Device 7, Analog Output Channel 4
33	1533	Device 8, Analog Output Channel 1
34	1534	Device 8, Analog Output Channel 2
35	1535	Device 8, Analog Output Channel 3
36	1536	Device 8, Analog Output Channel 4
37	1537	Device 9, Analog Output Channel 1
38	1538	Device 9, Analog Output Channel 2
39	1539	Device 9, Analog Output Channel 3

Block Offset	QASI Register	Meaning
40	1540	Device 9, Analog Output Channel 4
41	1541	Device 10, Analog Output Channel 1
42	1542	Device 10, Analog Output Channel 2
43	1543	Device 10, Analog Output Channel 3
44	1544	Device 10, Analog Output Channel 4
45	1545	Device 11, Analog Output Channel 1
46	1546	Device 11, Analog Output Channel 2
47	1547	Device 11, Analog Output Channel 3
48	1548	Device 11, Analog Output Channel 4
49	1549	Device 12, Analog Output Channel 1
50	1550	Device 12, Analog Output Channel 2
51	1551	Device 12, Analog Output Channel 3
52	1552	Device 12, Analog Output Channel 4
53	1553	Device 13, Analog Output Channel 1
54	1554	Device 13, Analog Output Channel 2
55	1555	Device 13, Analog Output Channel 3
56	1556	Device 13, Analog Output Channel 4
57	1557	Device 14, Analog Output Channel 1
58	1558	Device 14, Analog Output Channel 2
59	1559	Device 14, Analog Output Channel 3
60	1560	Device 14, Analog Output Channel 4
61	1561	Device 15, Analog Output Channel 1
62	1562	Device 15, Analog Output Channel 2
63	1563	Device 15, Analog Output Channel 3
64	1564	Device 15, Analog Output Channel 4
65	1565	Device 16, Analog Output Channel 1
66	1566	Device 16, Analog Output Channel 2
67	1567	Device 16, Analog Output Channel 3
68	1568	Device 16, Analog Output Channel 4
69	1569	Device 17, Analog Output Channel 1
70	1570	Device 17, Analog Output Channel 2
71	1571	Device 17, Analog Output Channel 3
72	1572	Device 17, Analog Output Channel 4
73	1573	Device 18, Analog Output Channel 1
74	1574	Device 18, Analog Output Channel 2

Block Offset	QASI Register	Meaning
75	1575	Device 18, Analog Output Channel 3
76	1576	Device 18, Analog Output Channel 4
77	1577	Device 19, Analog Output Channel 1
78	1578	Device 19, Analog Output Channel 2
79	1579	Device 19, Analog Output Channel 3
80	1580	Device 19, Analog Output Channel 4
81	1581	Device 20, Analog Output Channel 1
82	1582	Device 20, Analog Output Channel 2
83	1583	Device 20, Analog Output Channel 3
84	1584	Device 20, Analog Output Channel 4
85	1585	Device 21, Analog Output Channel 1
86	1586	Device 21, Analog Output Channel 2
87	1587	Device 21, Analog Output Channel 3
88	1588	Device 21, Analog Output Channel 4
89	1589	Device 22, Analog Output Channel 1
90	1590	Device 22, Analog Output Channel 2
91	1591	Device 22, Analog Output Channel 3
92	1592	Device 22, Analog Output Channel 4
93	1593	Device 23, Analog Output Channel 1
94	1594	Device 23, Analog Output Channel 2
95	1595	Device 23, Analog Output Channel 3
96	1596	Device 23, Analog Output Channel 4
97	1597	Device 24, Analog Output Channel 1
98	1598	Device 24, Analog Output Channel 2
99	1599	Device 24, Analog Output Channel 3
100	1600	Device 24, Analog Output Channel 4
101	1601	Device 25, Analog Output Channel 1
102	1602	Device 25, Analog Output Channel 2
103	1603	Device 25, Analog Output Channel 3
104	1604	Device 25, Analog Output Channel 4
105	1605	Device 26, Analog Output Channel 1
106	1606	Device 26, Analog Output Channel 2
107	1607	Device 26, Analog Output Channel 3
108	1608	Device 26, Analog Output Channel 4
119	1619	Device 27, Analog Output Channel 1

Block Offset	QASI Register	Meaning
110	1610	Device 27, Analog Output Channel 2
111	1611	Device 27, Analog Output Channel 3
112	1612	Device 27, Analog Output Channel 4
113	1613	Device 28, Analog Output Channel 1
114	1614	Device 28, Analog Output Channel 2
115	1615	Device 28, Analog Output Channel 3
116	1616	Device 28, Analog Output Channel 4
117	1617	Device 29, Analog Output Channel 1
118	1618	Device 29, Analog Output Channel 2
129	1629	Device 29, Analog Output Channel 3
120	1620	Device 29, Analog Output Channel 4
121	1621	Device 30, Analog Output Channel 1
122	1622	Device 30, Analog Output Channel 2
123	1623	Device 30, Analog Output Channel 3
124	1624	Device 30, Analog Output Channel 4
125	1625	Device 31, Analog Output Channel 1
126	1626	Device 31, Analog Output Channel 2
127	1627	Device 31, Analog Output Channel 3
128	1628	Device 31, Analog Output Channel 4

Qasi Analog Input Block

When the QASI is operating in “Mode 2”, the following block of registers will exist in the QASI, and will be continuously copied into the PLC after the configuration cycle is complete.

Block Offset	QASI Register	Meaning
1	1001	N/A
2	1002	N/A
3	1003	N/A
4	1004	N/A
5	1005	Device 1, Analog Input Channel 1
6	1006	Device 1, Analog Input Channel 2
7	1007	Device 1, Analog Input Channel 3

Block Offset	QASI Register	Meaning
8	1008	Device 1, Analog Input Channel 4
9	1009	Device 2, Analog Input Channel 1
10	1010	Device 2, Analog Input Channel 2
11	1011	Device 2, Analog Input Channel 3
12	1012	Device 2, Analog Input Channel 4
13	1013	Device 3, Analog Input Channel 1
14	1014	Device 3, Analog Input Channel 2
15	1015	Device 3, Analog Input Channel 3
16	1016	Device 3, Analog Input Channel 4
17	1017	Device 4, Analog Input Channel 1
18	1018	Device 4, Analog Input Channel 2
19	1019	Device 4, Analog Input Channel 3
20	1020	Device 4, Analog Input Channel 4
21	1021	Device 5, Analog Input Channel 1
22	1022	Device 5, Analog Input Channel 2
23	1023	Device 5, Analog Input Channel 3
24	1024	Device 5, Analog Input Channel 4
25	1025	Device 6, Analog Input Channel 1
26	1026	Device 6, Analog Input Channel 2
27	1027	Device 6, Analog Input Channel 3
28	1028	Device 6, Analog Input Channel 4
29	1029	Device 7, Analog Input Channel 1
30	1030	Device 7, Analog Input Channel 2
31	1031	Device 7, Analog Input Channel 3
32	1032	Device 7, Analog Input Channel 4
33	1033	Device 8, Analog Input Channel 1
34	1034	Device 8, Analog Input Channel 2
35	1035	Device 8, Analog Input Channel 3
36	1036	Device 8, Analog Input Channel 4
37	1037	Device 9, Analog Input Channel 1
38	1038	Device 9, Analog Input Channel 2
39	1039	Device 9, Analog Input Channel 3
40	1040	Device 9, Analog Input Channel 4
41	1041	Device 10, Analog Input Channel 1
42	1042	Device 10, Analog Input Channel 2

Block Offset	QASI Register	Meaning
43	1043	Device 10, Analog Input Channel 3
44	1044	Device 10, Analog Input Channel 4
45	1045	Device 11, Analog Input Channel 1
46	1046	Device 11, Analog Input Channel 2
47	1047	Device 11, Analog Input Channel 3
48	1048	Device 11, Analog Input Channel 4
49	1049	Device 12, Analog Input Channel 1
50	1050	Device 12, Analog Input Channel 2
51	1051	Device 12, Analog Input Channel 3
52	1052	Device 12, Analog Input Channel 4
53	1053	Device 13, Analog Input Channel 1
54	1054	Device 13, Analog Input Channel 2
55	1055	Device 13, Analog Input Channel 3
56	1056	Device 13, Analog Input Channel 4
57	1057	Device 14, Analog Input Channel 1
58	1058	Device 14, Analog Input Channel 2
59	1059	Device 14, Analog Input Channel 3
60	1060	Device 14, Analog Input Channel 4
61	1061	Device 15, Analog Input Channel 1
62	1062	Device 15, Analog Input Channel 2
63	1063	Device 15, Analog Input Channel 3
64	1064	Device 15, Analog Input Channel 4
65	1065	Device 16, Analog Input Channel 1
66	1066	Device 16, Analog Input Channel 2
67	1067	Device 16, Analog Input Channel 3
68	1068	Device 16, Analog Input Channel 4
69	1069	Device 17, Analog Input Channel 1
70	1070	Device 17, Analog Input Channel 2
71	1071	Device 17, Analog Input Channel 3
72	1072	Device 17, Analog Input Channel 4
73	1073	Device 18, Analog Input Channel 1
74	1074	Device 18, Analog Input Channel 2
75	1075	Device 18, Analog Input Channel 3
76	1076	Device 18, Analog Input Channel 4
77	1077	Device 19, Analog Input Channel 1

Block Offset	QASI Register	Meaning
78	1078	Device 19, Analog Input Channel 2
79	1079	Device 19, Analog Input Channel 3
80	1080	Device 19, Analog Input Channel 4
81	1081	Device 20, Analog Input Channel 1
82	1082	Device 20, Analog Input Channel 2
83	1083	Device 20, Analog Input Channel 3
84	1084	Device 20, Analog Input Channel 4
85	1085	Device 21, Analog Input Channel 1
86	1086	Device 21, Analog Input Channel 2
87	1087	Device 21, Analog Input Channel 3
88	1088	Device 21, Analog Input Channel 4
89	1089	Device 22, Analog Input Channel 1
90	1090	Device 22, Analog Input Channel 2
91	1091	Device 22, Analog Input Channel 3
92	1092	Device 22, Analog Input Channel 4
93	1093	Device 23, Analog Input Channel 1
94	1094	Device 23, Analog Input Channel 2
95	1095	Device 23, Analog Input Channel 3
96	1096	Device 23, Analog Input Channel 4
97	1097	Device 24, Analog Input Channel 1
98	1098	Device 24, Analog Input Channel 2
99	1099	Device 24, Analog Input Channel 3
100	1100	Device 24, Analog Input Channel 4
101	1101	Device 25, Analog Input Channel 1
102	1102	Device 25, Analog Input Channel 2
103	1103	Device 25, Analog Input Channel 3
104	1104	Device 25, Analog Input Channel 4
105	1105	Device 26, Analog Input Channel 1
106	1106	Device 26, Analog Input Channel 2
107	1107	Device 26, Analog Input Channel 3
108	1108	Device 26, Analog Input Channel 4
119	1119	Device 27, Analog Input Channel 1
110	1110	Device 27, Analog Input Channel 2
111	1111	Device 27, Analog Input Channel 3
112	1112	Device 27, Analog Input Channel 4

Block Offset	QASI Register	Meaning
113	1113	Device 28, Analog Input Channel 1
114	1114	Device 28, Analog Input Channel 2
115	1115	Device 28, Analog Input Channel 3
116	1116	Device 28, Analog Input Channel 4
117	1117	Device 29, Analog Input Channel 1
118	1118	Device 29, Analog Input Channel 2
129	1129	Device 29, Analog Input Channel 3
120	1120	Device 29, Analog Input Channel 4
121	1121	Device 30, Analog Input Channel 1
122	1122	Device 30, Analog Input Channel 2
123	1123	Device 30, Analog Input Channel 3
124	1124	Device 30, Analog Input Channel 4
125	1125	Device 31, Analog Input Channel 1
126	1126	Device 31, Analog Input Channel 2
127	1127	Device 31, Analog Input Channel 3
128	1128	Device 31, Analog Input Channel 4
129	1129	LAS 15..1A
130	1130	LAS 31..16A
131	1131	LAS 15..1B
132	1132	LAS 31..16B
133	1133	LDS 15..1A
134	1134	LDS 31..16A
135	1135	LDS 15..1B
136	1136	LDS 31..16B
137	1137	LPF 15..1A
138	1138	LPF 31..16A
139	1139	LPF 15..1B
140	1140	LPF 31..16B
141	1141	LCS 15..1A
142	1142	LCS 31..16A
143	1143	LCS 15..1B
144	1144	LCS 31..16B