Crompton
INTEGRA 1530, 1560, 1580
Communications Guide

Crompton
INSTRUMENTS

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1.1   Modbus^{tm} Overview

This section provides basic information for interfacing the Integra to a Modbus^{tm} network. If background information or more details of the Integra implementation is required please refer to our "Guide to RS485 Communications and the Modbus^{tm} Protocol", available on our CD catalogue or from any recognised supplier.

Integra offers the option of an RS485 communication facility for direct connection to SCADA or other communications systems using the Modbus^{tm} RTU slave protocol. The Modbus^{tm} protocol establishes the format for the master's query by placing into it the device address, a function code defining the requested action, any data to be sent, and an error checking field. The slave's response message is also constructed using Modbus^{tm} protocol. It contains fields confirming the action taken, any data to be returned, and an error-checking field. If an error occurs in receipt of the message, Integra will make no response. If the Integra is unable to perform the requested action, it will construct an error message and send it as it's response.

The electrical interface is 2-wire RS485, via 3 screw terminals. Connection should be made using twisted pair screened cable (Typically 22 gauge Belden 8761 or equivalent). All "A" and "B" connections are daisy chained together. The screens should also be connected to the "Gnd" terminal. To avoid the possibility of loop currents, an Earth connection should be made at only one point on the network.

Line topology may or may not require terminating loads depending on the type and length of cable used. Loop (ring) topology does not require any termination load.

The impedance of the termination load should match the impedance of the cable and be at both ends of the line. The cable should be terminated at each end with a 120 ohm (0.25 Watt min.) resistor.

A total maximum length of 3900 feet (1200 metres) is allowed for the RS485 network. A maximum of 32 electrical nodes can be connected, including the controller.

The address of each Integra can be set to any value between 1 and 247. Broadcast mode (address 0) is not supported.

The maximum latency time of an Integra is 150ms i.e. this is the amount of time that can pass before the first response character is output. The supervisory programme must allow this period of time to elapse before assuming that the Integra is not going to respond.

The format for each byte in RTU mode is:

Coding System: 8-bit per byte

Data Format:	4 bytes (2 registers) per parameter.
	Floating point format (to IEEE 754)
	Most significant register first (Default). The default may be changed if required - See Holding Register "Register Order" parameter.
Error Check Field:	2 byte Cyclical Redundancy Check (CRC)
Framing:	1 start bit
	8 data bits, least significant bit sent first
	1 bit for even/odd parity or no parity
	1 stop bit if parity is used; 1 or 2 bits if no parity

Data Transmission speed is selectable between 2400, 4800, 9600 and 19200 baud.

1.2   Input Registers

Input registers are used to indicate the present values of the measured and calculated electrical quantities.

Each parameter is held in two consecutive 16 bit registers. The following table details the 3X register address, and the values of the address bytes within the message. A tick ($\sqrt{}$) in the column indicates that the parameter is valid for the particular wiring system. Any parameter with a cross (X) will return the value Zero.

Each parameter is held in the 3X registers. Modbus[tm] Function Code 04 is used to access all parameters .

For example, to request:-

Amps 1	Start address	= 0006
	No of registers	= 0002
Amps 2	Start address	= 0008
	No of registers	= 0002

Each request for data must be restricted to 40 parameters or less. Exceeding the 40 parameter limit will cause a Modbus[tm] exception code to be returned.

Address (Register)	Parameter Number	Parameter	Modbus™ Start Address Hex		3 Ø 4 W	3 Ø 3 W	1 Ø 3 W	1 Ø 2 W
			High Byte	Low Byte				
					√	√	√	√
30003	2	Volts 2 (L2 – N 4W or L2 – L3 3W)	00	02	√	√	√	X
30005	3	Volts 3 (L3 – N 4W or L3 – L1 3W)	00	04	√	√	X	X
30007	4	Current 1	00	06	√	√	√	√
30009	5	Current 2	00	08	√	√	√	X
30011	6	Current 3	00	0A	√	√	X	X
30013	7	W Phase 1	00	0C	√	X	√	√
30015	8	W Phase 2	00	0E	√	X	√	X
30017	9	W Phase 3	00	10	√	X	X	X
30019	10	VA Phase 1	00	12	√	X	√	√
30021	11	VA Phase 2	00	14	√	X	√	X
30023	12	VA Phase 3	00	16	√	X	X	X
30025	13	var Phase 1	00	18	√	X	√	√
30027	14	var Phase 2	00	1A	√	X	√	X
30029	15	var Phase 3	00	1C	√	X	X	X
30031	16	Power Factor Phase 1	00	1E	√	X	√	√
30033	17	Power Factor Phase 2	00	20	√	X	√	X
30035	18	Power Factor Phase 3	00	22	√	X	X	X
30037	19	Phase Angle Phase 1	00	24	√	X	√	√
30039	20	Phase Angle Phase 2	00	26	√	X	√	X
30041	21	Phase Angle Phase 3	00	28	√	X	X	X
30043	22	Volts Ave	00	2A	√	√	√	√
30047	24	Current Ave	00	2E	√	√	√	√
30049	25	Current Sum	00	30	√	√	√	√
30053	27	Watts Sum	00	34	√	√	√	√
30057	29	VA Sum	00	38	√	√	√	√
30061	31	var Sum	00	3C	√	√	√	√
30063	32	Power Factor Ave	00	3E	√	√	√	√
30067	34	Average Phase Angle	00	42	√	√	√	√
30071	36	Frequency	00	46	√	√	√	√
30073	37	Wh Import	00	48	√	√	√	√
30075	38	Wh Export	00	4A	√	√	√	√
30077	39	varh Import	00	4C	√	√	√	√
30079	40	varh Export	00	4E	√	√	√	√
30081	41	VAh	00	50	√	√	√	√
30085	43	W Demand Import	00	54	√	√	√	√
30087	44	W Max. Demand Import	00	56	√	√	√	√
30105	53	A Demand	00	68	√	√	√	√
30107	54	A Max. Demand	00	6A	√	√	√	√
30201	101	V L1-L2	00	C8	√	X	√	X
30203	102	V L2-L3	00	CA	√	X	X	X
30205	103	V L3-L1	00	CC	√	X	X	X
30207	104	Average Line to Line Volts	00	CE	√	X	√	X
30225	113	Neutral Current	00	E0	√	X	√	√
30235	118	THD Volts 1	00	EA	√	√	√	√
30237	119	THD Volts 2	00	EC	√	√	√	X
30239	120	THD Volts 3	00	EE	√	√	X	X
30241	121	THD Current 1	00	F0	√	√	√	√
30243	122	THD Current 2	00	F2	√	√	√	X
30245	123	THD Current 3	00	F4	√	√	X	X
30249	125	THD Voltage Mean	00	F8	√	√	√	√
30251	126	THD Current Mean	00	FA	√	√	√	√
30255	128	Power Factor (+Ind/-Cap)	00	FE	√	√	√	√

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1.3 Modbus[tm] Holding Registers and Integra set up

Holding registers are used to store and display instrument configuration settings. All holding registers not listed in the table below should be considered as reserved for manufacturer use and no attempt should be made to modify their values.

The holding register parameters may be viewed or changed using the Modbus[tm] protocol. Each parameter is held in the 4X registers. Modbus[tm] Function Code 03 is used to read the parameter and Function Code 16 is used to write.

Address (Register)	Parameter Number	Parameter	Modbus[tm] Start Address Hex		Valid range	Mode
			High Byte	Low Byte		
40001	1	Demand Time	00	00	Write: 0 but see * below	r/w
40003	2	Demand Period	00	02	8,15,20,30, 60 minutes.	r/w
40007	4	System Voltage	00	06	1V - 400kV	r/wp
40009	5	System Current	00	08	1-9999 A	r/wp
40011	6	System Type	00	0A	See below for values	r/wp
40013	7	Relay Pulse Width	00	0C	3,5,10 (x20mS)	r/w
40015	8	Energy Reset	00	0E	0 only	wo
40019	10	RS485 set-up code	00	12	See table below	r/w
40021	11	Node Address	00	14	1-247	r/w
40023	12	Pulse Divisor	00	16	1,10,100,1000	r/w
40025	13	Password	00	18	0000-9999	r/w
40037	19	System Power	00	24		ro
40041	21	Register Order	00	28	2141.0 only	R/w
40299	150	Secondary Volts	01	2A	Min Vin-Max Vin	r/wp
40307	154	Max Energy Count	01	32	6,7,8 digits	r/wp
40309	155	Analogue Hardware Max	01	34		ro
40311	156	Analogue Hardware Min	01	36		ro
40313	157	Analogue 1 Output Parameter	01	38	See table below (section1.4)	r/wp
40315	158	Analogue 1 Parameter Max	01	3A		ro
40317	159	Analogue 1 Parameter Min	01	3C		ro
40319	160	Analogue 1 Reading Top	01	3E	Analogue 1 Parameter Max	r/wp
40321	161	Analogue 1 Reading Bottom	01	40	Analogue 1 Parameter Min	r/wp
40323	162	Analogue 1 Output Top	01	42	Analogue Hardware Max	r/wp
40325	163	Analogue 1 Output Bottom	01	44	Analogue Hardware Min	r/wp
40329	165	Analogue 2 Output Parameter	01	48	See table below (section1.4)	r/wp
40331	166	Analogue 2 Parameter Max	01	4A		ro
40333	167	Analogue 2 Parameter Min	01	4C		ro
40335	168	Analogue 2 Reading Top	01	4E	Analogue 2 Parameter Max	r/wp
40337	169	Analogue 2 Reading Bottom	01	50	Analogue 2 Parameter Min	r/wp
40339	170	Analogue 2 Output Top	01	52	Analogue Hardware Max	r/wp
40341	171	Analogue 2 Output Bottom	01	54	Analogue Hardware Min	r/wp

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Address (Register)	Parameter Number	Parameter	Modbus^tm Start Address Hex		Valid range	Mode
			High Byte	Low Byte		
40345	173	Analogue 3 Output Parameter	01	58	See table below (section1.4)	r/wp
40347	174	Analogue 3 Parameter Max	01	60		ro
40349	175	Analogue 3 Parameter Min	01	62		ro
40351	176	Analogue 3 Reading Top	01	64	Analogue 3 Parameter Max	r/wp
40353	177	Analogue 3 Reading Bottom	01	60	Analogue 3 Parameter Min	r/wp
40355	178	Analogue 3 Output Top	01	62	Analogue Hardware Max	r/wp
40357	179	Analogue 3 Output Bottom	01	64	Analogue Hardware Min	r/wp
40361	181	Analogue 4 Output Parameter	01	68	See table below (section1.4)	r/wp
40363	182	Analogue 4 Parameter Max	01	70		ro
40363	182	Analogue 4 Parameter Min	01	70		ro
40361	181	Analogue 4 Reading Top	01	68	Analogue 4 Parameter Max	r/wp
40361	181	Analogue 4 Reading Bottom	01	68	Analogue 4 Parameter Min	r/wp
40361	181	Analogue 4 Output Top	01	68	Analogue Hardware Max	r/wp
40361	181	Analogue 4 Output Bottom	01	68	Analogue Hardware Min	r/wp

r/w = read/write r/wp = read and write with password clearance ro = read only wo = write only
Some registers marked wo above may in fact be read, but the value returned is not valuable.
It is perfectly feasible to change Integra set-up using a general purpose Modbus^tm master, but often easier to use the Integra display or Integra configurator software. The Integra configurator software has facilities to store configurations to disk for later retrieval and rapid set up of similarly configured products.

Password Settings marked r/wp require the instrument password to have been entered into the Password register before changes will be accepted. Once the instrument configuration has been modified, the password should be written to the password register again to protect the configuration from unauthorised or accidental change. Power cycling also restores protection. Reading the Password register returns 1 if the instrument is unprotected and 0 if it is protected from changes.

* Demand Time is used to reset the demand period. A value of zero must be written to this register to accomplish this. Writing any other value will cause an error to be returned. Reading this register after instrument restart or resetting demand period gives the number of minutes of demand data up to a maximum of the demand period setting. For example, with 15 minute demand period, from reset the value will increment from zero every minute until it reaches 15. It will remain at this value until a subsequent reset occurs.

Demand Period represents demand time in minutes. The value written must be one of 8,15, 20 or 30,. Writing any other value will cause an error to be returned.

System Voltage in a PT/VT connected system represents the PT/VT primary voltage. In a direct connected (i.e. no PT.VT) system this parameter should be set the same as secondary volts.

System Current is the CT primary current.

System Type is set to '1' for single phase 2 wire, '2' for 3 Phase 3 Wire, '3' for 3 Phase 4 Wire or 4 for single phase 3 wire.

Relay Pulse Width is the width of the relay pulse in multiples of 20 ms. However, only values of 3 (60 ms), 5 (100 ms) or 10 (200 ms) are supported. Writing any other value will cause an error to be returned.

Reset Energy is used to reset the Energy readings. A value of zero must be written to this register to accomplish this. Writing any other value will cause an error to be returned.

RS485 Set-Up Code

Baud Rate	Parity	Stop Bits	Decimal Value
19200	NONE	2	30
19200	NONE	1	14
19200	ODD	1	13
19200	EVEN	1	12
9600	NONE	2	26
9600	NONE	1	10
9600	ODD	1	9
9600	EVEN	1	8
4800	NONE	2	22
4800	NONE	1	6
4800	ODD	1	5
4800	EVEN	1	4
2400	NONE	2	18
2400	NONE	1	2
2400	ODD	1	1
2400	EVEN	1	0

Codes not listed in the table above may give rise to unpredictable results including loss of communication. Exercise caution when attempting to change mode via direct Modbus[tm] writes. Use of a display or the Integra configurator software is recommended.

Node Address is the Modbus[tm] or JC N2 slave address for the instrument. Any value between 1 and 247 can be set.

Pulse Rate Divisor supports only values of 1,10,100 or 1000. Writing any other value will cause an error to be returned.

System Power is the maximum system power based on the values of system type, system volts and system current.

Register Order controls the order in which the Integra receives or sends floating-point numbers: - normal or reversed register order. In normal mode, the two registers that make up a floating point number are sent most significant bytes first. In reversed register mode, the two registers that make up a floating point number are sent least significant bytes first. To set the mode, write the value '2141.0' into this register - the instrument will detect the order used to send this value and set that order for all Modbus[tm] transactions involving floating point numbers.

Secondary Volts indicates the voltage on the VT secondary when the voltage on the Primary is equal to the value of System Volts . The value of this register can be set to between the minimum and maximum instrument input voltage.

Maximum Energy Count controls the number of digits the energy (kWh and kvarh) counters can use before they roll over (i.e. resets to zero). The values of 6, 7 or 8 can be written to this register to indicate the number of digits to use. Other values will be rejected.

Analogue Hardware Minimum and **Analogue Hardware Maximum** indicate respectively the minimum

and maximum output currents that the instrument analogue output hardware is capable of.

Analogue 1 Output Parameter indicates the number of the input parameter that is to be output on analogue output 1. A value of zero signifies the analogue output is unused.

Analogue 1 Parameter Maximum is the maximum value that the selected input parameter can reach.

Analogue 1 Parameter Minimum is the minimum value that the selected input parameter can reach.

Analogue 1 Reading Top represents the upper limit of the parameter value that will be output. This value can range between Parameter Minimum and Parameter Maximum.

Analogue 1 Reading Bottom represents the lower limit of the parameter value that will be output. This value can range between Parameter Minimum and Parameter Maximum.

Analogue 1 Output Top represents the analogue output level that will be achieved when the parameter reading reaches Reading Top. The value of Output Top must be between Analogue Hardware Minimum and Analogue Hardware Maximum.

Analogue 1 Output Bottom represents the analogue output level that will be achieved when the parameter reading reaches Reading Bottom. The value of Output Bottom must be between Analogue Hardware Minimum and Analogue Hardware Maximum.

Analogue 2, 3 and 4 set up values function in the same way as Analogue 1, except of course, they refer to the relevant analogue channel. Analogue 3 and 4 are only relevant for the 1560/1580. Consult the 1560/80 manual for details of autoconfigure operation, which in some circumstances overrides user settings.
Note: Analogue Hardware Maximum and Minimum refer to the factory build hardware limits. It is the same for all analogue channels on a particular instrument.

1.4   Analogue Output setting via Modbus

This section summarises Modbus control of analogue outputs. A more detailed explanation of analogue operation and user settings to achieve the desired output ranges is included in the Integra Installation and Operating Instructions. Review of the relevant section of the Integra instructions in conjunction with the description here may be helpful.

When the values of Output Top is greater than Output Bottom, the analogue output will operate in a conventional non-inverting mode. That is, when the selected metered value increases the analogue output will increase.
When the value of Output Top is less than Output Bottom, the analogue output will operate in inverting mode. That is, as the selected metered value increases the analogue output will decrease. This can also be achieved by reversing Reading Top and Reading Bottom values. Reversing both will self cancel.
When the value of Reading Top is equal to Reading Bottom, the analogue output will operate in Threshold mode, the threshold being the value of Reading Top and Bottom. When the selected metered value rises above the threshold the analogue output will switch to Output Top. When the selected metered value falls below the threshold the analogue output will switch to Output Bottom.
When Output Top is set to the same value as Output Bottom the analogue output will be fixed at the specified value, effectively turning the output into a constant current generator.

The parameters in the table following (next page) may be selected to be represented as analogue outputs. The ranges shown are the limit values for Reading Top and Reading Bottom.

When analogue outputs are used to represent either individual or average power factor, parameters have slightly different meanings.
The sign of the power factor when defining reading top and reading bottom is the sign of the active power : +ve for active power (watts) import and -ve for active power (watts) export.
The reading span which the analogue output represents always includes unity (active power import, zero vars), but subject to this, the range span may be set as desired, using Reading Top and Reading Bottom.
Reading Top value sets the limit value in the "export var" quadrants
Reading Bottom value sets the limit value in the "import var" quadrants
The direction the output moves depends on the Output Top and Output Bottom values.
If Output Top is greater than Output Bottom, then the analogue output value increases as the power factor moves from the "export var" quadrants to the "import var" quadrants. This is the convention normally adopted in European technically influenced areas of the world.
If Output Top is less than Output Bottom, then the analogue output value decreases as the power factor moves from the "export var" quadrants to the "import var" quadrants. This is the convention normally adopted in North American technically influenced areas of the world.

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| Parameter | | System Type | | | |
No.	Name	3 Ø 4 wire	3 Ø 3 wire	1 Ø 3 wire	1 Ø 2 wire
1	Volts 1	0 – 1.2 * Vs	0 – 1.2 * Vs	0 – 1.2 * Vs	0 – 1.2 * Vs
2	Volts 2	0 – 1.2 * Vs	0 – 1.2 * Vs	0 – 1.2 * Vs	
3	Volts 3	0 – 1.2 * Vs	0 – 1.2 * Vs		
4	Current 1	0 – 1.2 * Is	0 – 1.2 * Is	0 – 1.2 * Is	0 – 1.2 * Is
5	Current 2	0 – 1.2 * Is	0 – 1.2 * Is	0 – 1.2 * Is	
6	Current 3	0 – 1.2 * Is	0 – 1.2 * Is		
7	W 1	± 1.44 * Vs * Is		± 1.44 * Vs * Is	± 1.44 * Vs * Is
8	W 2	± 1.44 * Vs * Is		± 1.44 * Vs * Is	
9	W 3	± 1.44 * Vs * Is			
10	VA 1	0 – 1.44 * Vs * Is		0 – 1.44 * Vs * Is	0 – 1.44 * Vs * Is
11	VA 2	0 – 1.44 * Vs * Is		0 – 1.44 * Vs * Is	
12	VA 3	0 – 1.44 * Vs * Is			
13	var 1	± 1.44 * Vs * Is		± 1.44 * Vs * Is	± 1.44 * Vs * Is
14	var 2	± 1.44 * Vs * Is		± 1.44 * Vs * Is	
15	var 3	± 1.44 * Vs * Is			
16	Power Factor 1	± 1		± 1	± 1
17	Power Factor 2	± 1		± 1	
18	Power Factor 3	± 1			
19	Phase Angle 1 deg.	± 180		± 180	± 180
20	Phase Angle 2 deg.	± 180		± 180	
21	Phase Angle 3 deg.	± 180			
22	Voltage (Average)	0 – 1.2 * Vs	0 – 1.2 * Vs	0 – 1.2 * Vs	0 – 1.2 * Vs
24	Current (Average)	0 – 1.2 * Is	0 – 1.2 * Is	0 – 1.2 * Is	0 – 1.2 * Is
25	Current (Sum)	0 – 3.6 * Is	0 – 3.6 * Is	0 – 2.4 * Is	0 – 1.2 * Is
27	W (Sum)	± 4.32 * Vs * Is	± 1.44 * $\sqrt{3}$ * Vs * Is	± 2.88 * Vs * Is	± 1.44 * Vs * Is
29	VA (Sum)	0 – 4. 32 * Vs * Is	0 – 1.44 * $\sqrt{3}$ * Vs * Is	0 – 2.88 * Vs * Is	0 – 1.44 * Vs * Is
31	var (Sum)	± 4. 32 * Vs * Is	± 1.44 * $\sqrt{3}$ * Vs * Is	± 2.88 * Vs * Is	± 1.44 * Vs * Is
32	Power Factor (Average)	± 1	± 1	± 1	± 1
34	Phase Angle (Avg) deg.	± 180	± 180	± 180	± 180
36	Frequency Hz	40 – 70	40 – 70	40 – 70	40 – 70
43	Import Power Demand	0 – 4. 32 * Vs * Is	0 – 1.44 * $\sqrt{3}$ * Vs * Is	0 – 2.88 * Vs * Is	0 – 1.44 * Vs * Is
44	Import Power Max. Dem.	0 – 4. 32 * Vs * Is	0 – 1.44 * $\sqrt{3}$ * Vs * Is	0 – 2.88 * Vs * Is	0 – 1.44 * Vs * Is
53	Current Demand	0 – 3.6 * Is	0 – 3.6 * Is	0 – 2.4 * Is	0 – 1.2 * Is
54	Current Max. Demand	0 – 3.6 * Is	0 – 3.6 * Is	0 – 2.4 * Is	0 – 1.2 * Is
101	Volts L1-L2	0 – 1.2 * $\sqrt{3}$ * Vs		0 – 2.4 * Vs	
102	Volts L2-L3	0 – 1.2 * $\sqrt{3}$ * Vs			
103	Volts L3-L1	0 – 1.2 * $\sqrt{3}$ * Vs			
104	Volts Line-Line (Avg)	0 – 1.2 * $\sqrt{3}$ * Vs		0 – 2.4 * Vs	
113	Neutral Current	0 – 1.2 * Is		0 – 1.2 * Is	0 – 1.2 * Is
118	THD Va %	0 – 100	0 – 100	0 – 100	0 – 100
119	THD Vb %	0 – 100	0 – 100	0 – 100	
120	THD Vc %	0 – 100	0 – 100		
121	THD Ia %	0 – 100	0 – 100	0 – 100	0 – 100
122	THD Ib %	0 – 100	0 – 100	0 – 100	
123	THD Ic %	0 – 100	0 – 100		
125	THD Voltage (Avg) %	0 – 100	0 – 100	0 – 100	0 – 100
126	THD Current (Avg) %	0 – 100	0 – 100	0 – 100	0 – 100

Vs = System Volts, Is = System Current.

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2 RS485 Implementation of Johnson Controls Metasys

These notes briefly explain Metasys and Crompton Instruments Integra integration. Use these notes with the Metasys Technical Manual, which provides information on installing and commissioning Metasys N2 Vendor devices.

2.1 Application details

The Integra is a N2 Vendor device that connects directly with the Metasys N2 Bus. This implementation assigns 54 key electrical parameters to ADF points, each with override capability.
Components requirements
- Integra with RS485 card and N2 port available.
- N2 Bus cable.

2.2 Metasys release requirements

- Metasys OWS software release 7.0 or higher.
- Metasys NCM311. NCM360.

2.3 Support for Metasys Integration

Johnson Control Systems
System House, Randalls Research Park,
Randalls Way, Leatherhead,
Surrey, KT22 7TS
England

2.4 Support for Crompton Integra operation

This is available via local sales and service centre.

2.5 Design considerations

When integrating the Crompton equipment into a Metasys Network, keep the following considerations in mind.
- Make sure all Crompton equipment is set up, started and running properly before attempting to integrate with the Metasys Network.
- A maximum of 32 devices can be connected to any one NCM N2 Bus.

Vendor Address	1-247 (Limited by co-resident Modbus[tm] protocol)
Port Set-up	
Baud Rate*	9600
Duplex	Half
Word Length	8
Stop Bits*	1
Parity*	None
Interface	RS485

* The user should ensure these values are set as shown on the Integra for compatibility with the N2 network.

2.6 METASYS N2 Integra Point Mapping table

Address	Parameter Description	Units
1	Voltage 1	Volts
2	Voltage 2	Volts
3	Voltage 3	Volts
4	Current 1	Amps
5	Current 2	Amps
6	Current 3	Amps
7	Voltage average	Volts
8	Current average	Amps
9	Power (Watts) Sum	KW
10	VA Sum	kVA
11	var Sum	kvar
12	Power Factor average	
13	Frequency	Hz
14	Active Energy (Import) (6 digits max)	kWh
15	Reactive Energy (Import) (6 digits max)	kvarh
16	Watts Demand (Import)	kWatts
17	Maximum Watts Demand (Import)	kWatts
18	Amps Demand	Amps
19	Maximum Amps Demand	Amps
20	Voltage L1-L2 (calculated)	Volts
21	Voltage L2-L3 (calculated)	Volts
22	Voltage L3-L1 (calculated)	Volts
23	Neutral Current	Amps
24	Active Energy (Import) (less param 1A)	GWh
25	Reactive Energy (Import) (less param 15)	Gvarh
26	THD V1	%
27	THD V2	%
28	THD V3	%
29	THD I1	%
30	THD I2	%
31	THD I3	%
32	THD Vmean	%
33	THD Imean	%
34	Power (Watts) 1	kW
35	Power (Watts) 2	kW
36	Power (Watts) 3	kW
37	VA 1	kVA
38	VA 2	kVA
39	VA 3	kVA
40	var 1	kVAr
41	var 2	kVAr
42	var 3	kVAr
43	PF 1	
44	PF 2	

45	PF 3	
46	PA 1	degrees
47	PA 2	degrees
48	PA 3	degrees
49	A Sum	amps
50	VLL Ave	volts
51	Exp Wh (6 digits max)	kWh
52	Exp Wh (less param 51)	GWh
53	Exp VArh (6 digits max)	kVArh
54	Exp VArh (less param 53)	GVArh
55	Command Register	See note below
56	VAh (6 digits max)	kVAh
57	VAh (less param 56)	GVAh

Command Register: The command register is used to clear energy registers by override with 156001.0 and clear demand registers by override with 156002.0

Energy registers: Principal energy registers are reported in pairs – the one showing the least significant 6 digits and the other showing the overflow, or more significant digits. The total energy since the last reset is found by combining both these registers appropriately. This allows energy register rollover to be postponed, and maintains consistency.
Register pairs are:
14 and 24 (active import energy)
15 and 25 (reactive import energy)
51 and 52 (active export energy)
53 and 54 (reactive export energy)
56 and 57 (apparent energy)

3 Integra Profibus Interface

The Integra Profibus interface implements a "modular" slave, in which the I/O set is not fixed but allows modules, real or virtual, to be selected ("plugged in") at configuration time. The configuration tool will be specific to the manufacturer of the Profibus network Class-1 Master unit. However, the slave device GSD file provides the data to the configuration tool that will associate a module type (e.g. "VA Phase 1") with configuration data.

3.1 GSD file

A copy of the GSD file may be accessed via the website : www.crompton-instruments.com, on the same page as Integra instruction and operation manuals.

3.2 Floating Point Format

As with Modbus, data transfer occurs using IEEE floating point format.
The convention for the four bytes of floating-point data is to transmit and receive it in Big Endian format, that is, the most significant byte is in Data0 and the least significant byte is in Data3.

3.3 Single Parameter access

The system described doesn't allow access to all the Integra parameters simultaneously, as only 50 parameters are available in the configuration table for the Integra. Since the configuration is fixed in operation, modules can't be swapped in and out dynamically to gain access to addition parameters. So in addition to the regular parameter modules, a 'Control' module has been defined. Through the use of its I/O area a single parameter read or write facility is available.

Note: that only one instance of a 'Control' module can be used in an Integra configuration and the module must be placed after other configured modules in the table.

In order to reference the parameters, the Modbus numbering convention is used. These are shown in section 1.3.

The table below illustrates the contents of the I/O area of the Control module.

Output Bytes	Input Bytes
Command	Echo command
Modbus address hi	Echo address hi
Modbus address lo	Echo address lo
Data0 write	Data0 read
Data1 write	Data1 read
Data2 write	Data2 read
Data 3 write	Data3 read
Status	Status/error

3.4 Functionality of the PLC Function Block

The PLC programmer will need to implement a function block that can fulfil the following requirements.

3.4.1 Reading

In order to execute a read of parameter values from the Control module of the Integra, the sequence of events is as follows:

The Command should initially be null (i.e. zero). The Modbus Address is written into the output fields, then the 'Read floating-point value from an input register" (the value 4), or read floating-point value from a

holding register' (the value 3) is written to the command field.

The slave checks for a change in the command field as indication that there is a command to action and that the rest of the fields are valid and ready for use.

The slave will return the appropriate value in the data field, together with a confirmation/rejection value in the status field. The master checks for the command field to be echoed in the input data as indication that the rest of the fields are valid, and ready for reading. A zero in the status field indicates the command completed correctly. A non-zero value indicates an error has occurred.

The sequence is completed by outputting the null-command (zero) and awaiting confirmation (zero) from the echo-command byte.

This last step is important since Profibus transmits the I/O data continuously and repeatedly, so the slave device looks for the change in the command field to initiate the action. If this step is omitted, even though the data field may have been changed the slave will take no action unless it detects a change in the command field.

3.4.2   Writing

In order to write parameter values using the Control module, the sequence of events is as follows:

The Command should initially be null (i.e. zero). The Modbus Address is written into the output fields, then the value to be written is placed in the data field. The next item to be put into the data area is the command 'Write floating point value to Holding Register' (the value 16), written to the command field.

The slave checks for a change in the command field as indication that there is a command to action and that the rest of the fields are valid and ready for use.

The slave will return the appropriate value in the data field, together with a confirmation/rejection value in the status field. The master checks for the command field to be echoed in the input data as indication that the rest of the fields are valid, and ready for reading. A zero in the status field indicates the command completed correctly. A non-zero value indicates an error has occurred.

The sequence is completed by outputting the null-command (zero) and awaiting confirmation (zero) from the echo-command byte.

This last step is important since Profibus transmits the I/O data continuously and repeatedly, so the slave device looks for the change in the command field to initiate the action. If this step is omitted, even though the data field may have been changed the slave will take no action unless it detects a change in the command field.

3.5   Common Problems

The most common reasons why a single parameter read or write fails are:
The Command field contains a value not supported by the module. (Values 0, 3, 4, and 16 are permissible).
The Modbus Address is incorrect. Correct Modbus address values can be found in the table of available parameters contained in this guide.
A parameter is being written to that requires the password to be entered in the password register before it can be changed.

4 The LonWorks Interface

This section details the LonMark Objects that make up the network interface of the Integra 1530/1560/1580 Meter or transducer.
The Implementation contains eight objects: Voltmeter, Ammeter, Power meter, Energy Meter, Demand Ammeter, Demand Power, Power Quality and Bus Generator. In addition, there is a ninth object known as the Node object which is used by network management tools and/or customised device plug-ins (Windows application) to manage the eight primary objects.

4.1 XIF File

A copy of the XIF file may be accessed via the website : www.crompton-instruments.com, on the same page as Integra instruction and operation manuals.

4.2 Overview and Device Functional Profile

A device using these object profiles will typically be used in industrial power and energy metering applications.
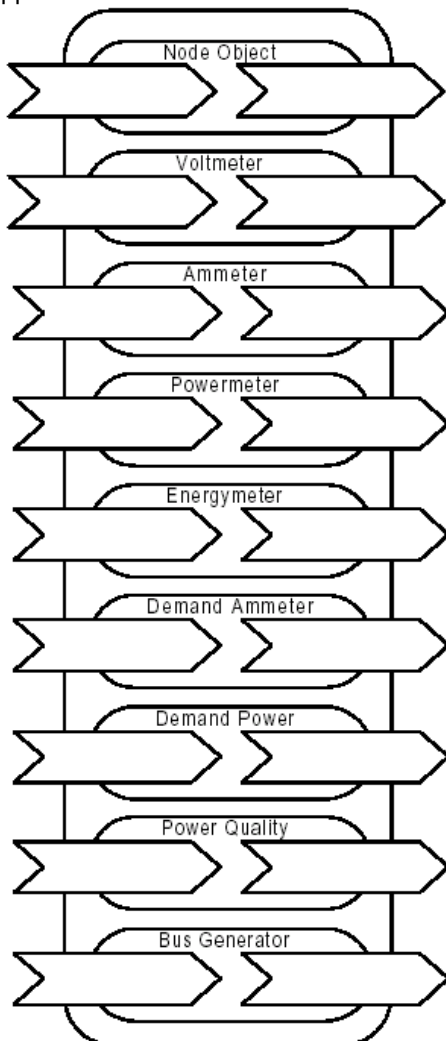
Device Functional Profile

4.3   Node Object

4.3.1   Network Variables

Object Request
```
network input SNVT_obj_request nviRequest
```
Refer to the LONMARK Application Layer Interoperability Guidelines for definition.

4.3.2   Object Status

```
network output SNVT_obj_status nvoStatus
```
Refer to the LONMARK Application Layer Interoperability Guidelines for definition.

4.3.3   Configuration Properties

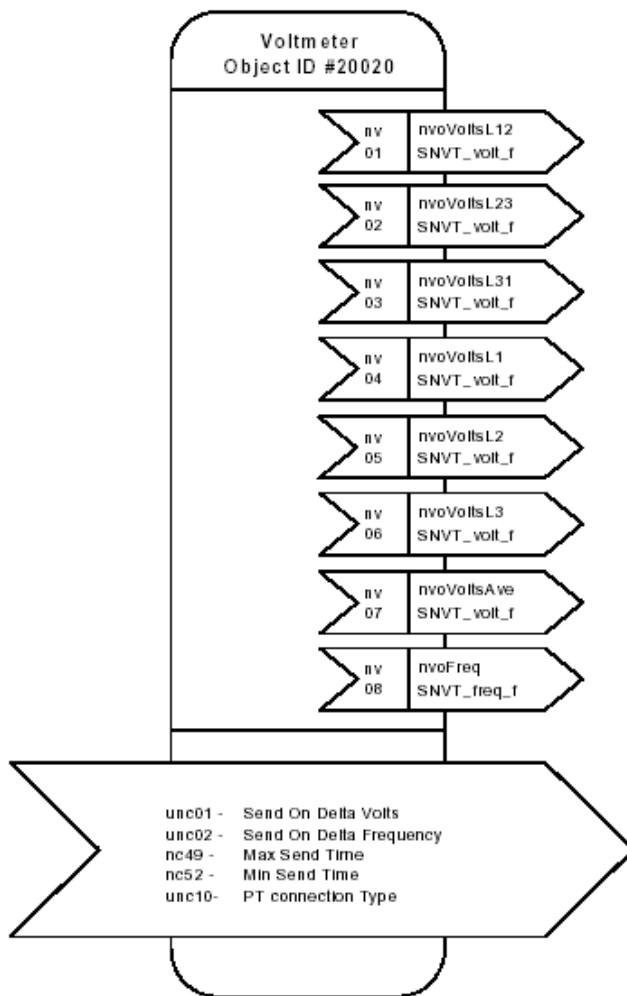**Device Label**
```
network input config SNVT_str_ascii nciDeviceLabel
```
This configuration property can optionally be used to provide more descriptive physical location information than can be provided by the Neuron Chip's 6-byte location string.
Valid Range: Any NUL terminated ASCII string less than 31 bytes total in length.
Default Value: The default value is an ASCII string containing all zeroes.
SCPT/UCPT Reference: SCPTlocation (17)

4.4   Voltmeter Functional Profile

Voltmeter
Object ID #20020

nv 01 — nvoVoltsL12 SNVT_volt_f
nv 02 — nvoVoltsL23 SNVT_volt_f
nv 03 — nvoVoltsL31 SNVT_volt_f
nv 04 — nvoVoltsL1 SNVT_volt_f
nv 05 — nvoVoltsL2 SNVT_volt_f
nv 06 — nvoVoltsL3 SNVT_volt_f
nv 07 — nvoVoltsAve SNVT_volt_f
nv 08 — nvoFreq SNVT_freq_f

unc01 -   Send On Delta Volts
unc02 -   Send On Delta Frequency
nc49 -   Max Send Time
nc52 -   Min Send Time
unc10-   PT connection Type

4.4.1   Voltmeter Network Variables

Voltage Between Phases (Corresponds to Modbus register 101,102,103,1,2,3)
```
network output SNVT_volt_f nvoVoltsL12
```
This output network variable reports the voltage measured from phase L1 to phase L2 in a 3 phase power system.
```
network output SNVT_volt_f nvoVoltsL23
```
This output network variable reports the voltage measured from phase L2 to phase L3 in a 3 phase power system.
```
network output SNVT_volt_f nvoVoltsL31
```
This output network variable reports the voltage measured from phase L3 to phase L1 in a 3 phase power system.
```
network output SNVT_volt_f nvoVoltsL1
```
If applicable based on PT Connection Type, this output network variable reports the voltage measured from phase L1 to the Neutral conductor in a 3 phase power system.
```
network output SNVT_volt_f nvoVoltsL2
```
If applicable based on PT Connection Type, this output network variable reports the voltage measured from phase L2 to the Neutral conductor in a 3 phase power system.
```
network output SNVT_volt_f nvoVoltsL3
```
If applicable based on PT Connection Type, this output network variable reports the voltage measured from phase L3 to the Neutral conductor in a 3 phase power system.
Valid Range: -1E38…1E38 (Volts)
Default Service Type: Acknowledged

Voltage Average (Corresponds to Modbus register 22)
```
network output SNVT_volt_f nvoVoltsAve;
```
This output network variable is used to report the average voltage across all of the Phases.
Valid Range: -1E38…1E38 (Volts)
Default Service Type: Acknowledged

Voltage Frequency (Corresponds to Modbus register 36)
```
network output SNVT_freq_f nvoFreq;
```
This output network variable, if provided, is used to report the nominal fundamental frequency of the voltage in the Power System.
Valid Range: -1E38…1E38 Hertz
Default Service Type: Acknowledged

Voltmeter Configuration Properties
PT Connection Type (Corresponds to Modbus holding register 6)
```
network input config UCPTptConnType nciPTConnType
```
This input network configuration variable is used to describe the connection arrangement of the Potential Transformers used to connect 3 phase voltage to the meter.
Valid Range: The valid range is specified by the enumeration list,
UNKNOWN : 0
SINGLE_PHASE : 1
THREE_PHASE_THREE_WIRE : 2
THREE_PHASE_FOUR_WIRE : 3
Default Value: The default value is UNKNOWN (0). The gateway will update this configuration property when it has
extracted the contents of Modbus Holding register #6 from the connected meter.
SCPT/UCPT Reference: UCPTptConnType (10)

Voltage Send on Delta
```
network input config UCPTsendDeltaVolts nciSendOnDeltaV
```
Specifies the maximum amount that any of the retrieved Voltmeter points of SNVT type
SNVT_volts_f can change without an update occurring on the associated network variable.
Valid Range: -1E38…1E38 (Volts)
Default Value: The default value is 0.
SCPT/UCPT Reference: UCPTsendDeltaVolts (01)

Frequency Send on Delta
```
network input config UCPTsendDeltaFreq nciSendOnDeltaF
```
Specifies the maximum amount that any of the retrieved Voltmeter points of SNVT type SNVT_freq_f can change without an update occurring on the associated network variable.
Valid Range: -1E38…1E38 (Hertz)

Default Value: The default value is 0.
SCPT/UCPT Reference: UCPTsendDeltaVolts (02)
Minimum Send Time
`network input config SNVT_time_sec nciMinSendTime;`
Indicates the minimum period between output network variable transmissions.
Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to 0 allows
the maximum refresh according to the SendOnDelta value.
Default Value: 1 second.
SCPT/UCPT Reference: SCPTminSendTime (52)
Maximum Send Time (Heartbeat)
`network input config SNVT_time_sec nciVMaxSendTime;`
This input configuration network variable defines the maximum period of time that expires before an
automatic update occurs on the network variables.
Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to 0 disables
the automatic update mechanism.
Default Value: The default value is 1800.0 seconds (30 minutes)
SCPT/UCPT Reference: SCPTmaxSendTime (49)

4.5   Ammeter Functional Profile
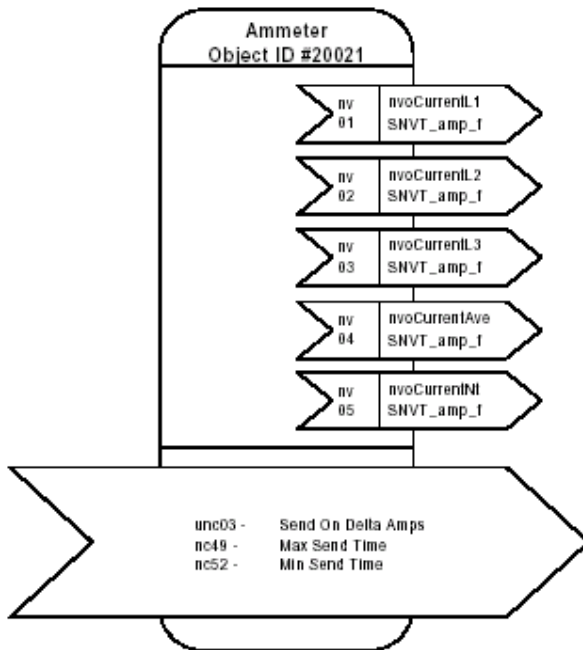
4.5.1   Ammeter Network Variables

Current (Corresponds to Modbus register– 4, 5, 6)
`network output SNVT_amp_f nvoCurrentL1`
This output network variable reports the current measured flowing on phase L1 in a 3 phase power system.
`network output SNVT_amp_f nvoCurrentL2`
This output network variable reports the current measured flowing on phase L2 in a 3 phase power system.
`network output SNVT_amp_f nvoCurrentL3`
This output network variable reports the current measured flowing on phase L3 in a 3 phase power system.

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Valid Range: -1E38….1E38 (Amperes)
Default Service Type: Acknowledged

Average Current (Corresponds to Modbus register– 24)

```
network output SNVT_amp_f nvoCurrentAve;
```

This output network variable, if provided, is used to report the average of the three phase currents
(IL1, IL2, & IL3) in the Power System.
Valid Range: -1E38….1E38 (Amperes)
Default Service Type: Acknowledged

Neutral Current (Corresponds to Modbus register 113)

```
network output SNVT_amp_f nvoCurrentNt;
```

This output network variable reports the current measured flowing with respect to Neutral.
Valid Range: -1E38….1E38 (Amperes)
Default Service Type: Acknowledged

4.5.2   Ammeter Configuration Properties

Voltage Send on Delta

```
network input config UCPTsendDeltaAmps nciSendOnDeltaA
```

Specifies the maximum amount that any of the retrieved Ammeter points can change without an
update occurring on the associated network variable.
Valid Range: -1E38…1E38 (Amperes)
Default Value: The default value is 0.
SCPT/UCPT Reference: UCPTsendDeltaAmps (03)

Minimum Send Time

```
network input config SNVT_time_sec nciMinSendTime;
```

Indicates the minimum period between output network variable transmissions.
Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to
0 allows
the maximum refresh according to the SendOnDelta value.
Default Value: 1 second.
SCPT/UCPT Reference: SCPTminSendTime (52)

Maximum Send Time (Heartbeat)

```
network input config SNVT_time_sec nciVMaxSendTime;
```

This input configuration network variable defines the maximum period of time that expires before an
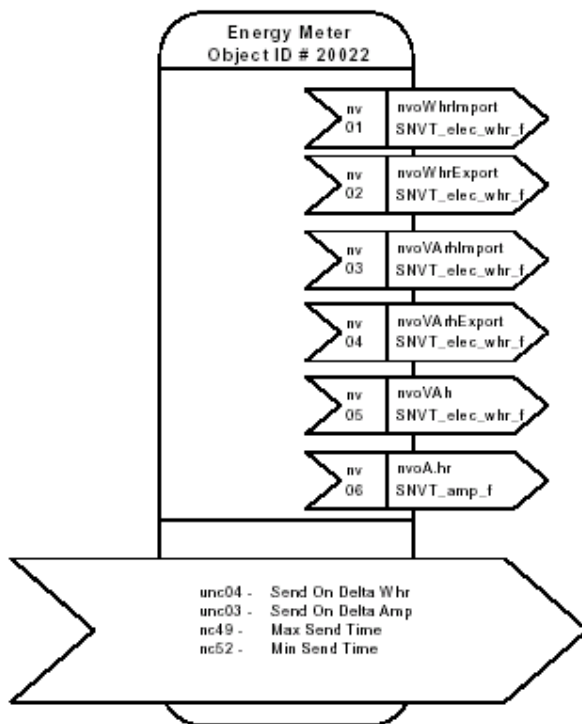automatic update occurs on the network variables.
Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to
0 disables
the automatic update mechanism.
Default Value: The default value is 1800.0 seconds (30 minutes)
SCPT/UCPT Reference: SCPTmaxSendTime (49)

4.6 Energy Meter Functional Profile

4.6.1 Energy Meter Network Variables

Energy Import (Corresponds to Modbus register 37)
`network output SNVT_elec_whr_f nvoWhrImport`
This output network variable reports the 3 phase Energy Import measured in a 3 phase power system.

Energy Export (Corresponds to Modbus register 38)
`network output SNVT_elec_whr_f nvoWhrExport`
This output network variable reports the 3 phase Energy Export measured in a 3 phase power system.

Reactive Energy Import (Corresponds to Modbus register 39)
`network output SNVT_elec_whr_f nvoVarhImport`
This output network variable reports the 3 phase Reactive Energy Import measured in a 3 phase power system.

Reactive Energy Export (Corresponds to Modbus register 40)
`network output SNVT_elec_whr_f nvoVarhExport`
This output network variable reports the 3 phase Reactive Energy Export measured in a 3 phase power system.

Real Energy (Corresponds to Modbus register 41)
`network output SNVT_elec_whr_f nvoVAh`
This output network variable reports the total 3 phase Real Energy measured in a 3 phase power system.
Valid Range: 0 to 1E38 (Watt-hour)
Default Service Type: Acknowledged

Amphours (Corresponds to Modbus register 42)
`network output SNVT_amp_f nvoAhr`
This output network variable reports the current consumption in Amps.
Valid Range: -1E38 .. 1E38 Amps
Default Service Type: Acknowledged

4.6.2 Energy Meter Configuration Properties

Energy Send on Delta
`network input config UCPTsendDeltaVolts nciSendOnDeltaV`
Specifies the maximum amount that any of the retrieved Energy Meter points of SNVT type

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SNVT_elec_whr_f can change without an update occurring on the associated network variable.
Valid Range: 0 to 1E38 (Watt hour)
Default Value: The default value is 0.
SCPT/UCPT Reference: UCPTsendDeltaWhr (04)

Current Send on Delta
```
network input config UCPTsendDeltaAmp nciSendOnDeltaF
```
Specifies the maximum amount that any of the retrieved Energy Meter points of SNVT type
SNVT_amp_f can change without an update occurring on the associated network variable.
Valid Range: -1E38…1E38 (Hertz)
Default Value: The default value is 0.
SCPT/UCPT Reference: UCPTsendDeltaAmp (03)

Minimum Send Time
```
network input config SNVT_time_sec nciMinSendTime;
```
Indicates the minimum period between output network variable transmissions.
Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to 0 allows
the maximum refresh according to the SendOnDelta value.
Default Value: 1 second.
SCPT/UCPT Reference: SCPTminSendTime (52)

Maximum Send Time (Heartbeat)
```
network input config SNVT_time_sec nciVMaxSendTime;
```
This input configuration network variable defines the maximum period of time that expires before an
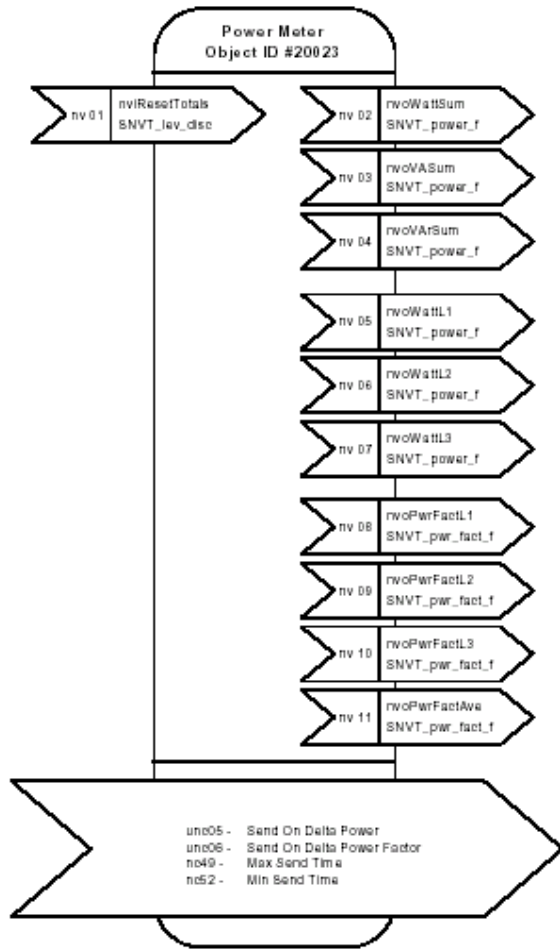automatic update occurs on the network variables.
Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to 0 disables
the automatic update mechanism.
Default Value: The default value is 1800.0 seconds (30 minutes)
SCPT/UCPT Reference: SCPTmaxSendTime (49)

4.7   Power Meter Functional Profile

4.7.1   Power Meter Network Variables

Watts Sum (Corresponds to Modbus register 27)
`network output SNVT_power_f nvoWattSum`
This output network variable reports the total 3 phase instantaneous real power measured in a 3 phase power system.

VA Sum (Corresponds to Modbus register 29)
`network output SNVT_power_f nvoVASum`
This output network variable reports the total 3 phase instantaneous power measured in a 3 phase power system.

VAr Sum (Corresponds to Modbus register 31)
`network output SNVT_power_f nvoVArSum`
This output network variable reports the total 3 phase Instantaneous reactive power measured in a 3 phase power system.
Valid Range: -1E38 .. 1E38 watts
Default Service Type: Acknowledged

Watts L1, L2, L3 (Corresponds to Modbus register 07, 08, 09)
`network output SNVT_power_f nvoWattL1`
This output network variable reports the instantaneous real power measured on Phase 1 of a 3 phase power system.
`network output SNVT_power_f nvoWattL2`
This output network variable reports the instantaneous real power measured on Phase 2 of a 3 phase power system.

```
network output SNVT_power_f nvoWattL3
```
This output network variable reports the instantaneous real power measured on Phase 3 of a 3 phase power system.

Power Factor L1.L2,L3 (Corresponds to Modbus register 16, 17, 18)
```
network output SNVT_pwr_fact_f nvoPwrFactL1
```
This output network variable reports the Power Factor measured on Phase 1 of a 3-phase power system.
```
network output SNVT_pwr_fact_f nvoPwrFactL2
```
This output network variable reports the Power Factor measured on Phase 2 of a 3-phase power system.
```
network output SNVT_pwr_fact_f nvoPwrFactL3
```
This output network variable reports the Power Factor measured on Phase 3 of a 3-phase power system.

Average Power Factor (Corresponds to Modbus register 32)
```
network output SNVT_pwr_fact_f nvoPwrFactr
```
This output network variable reports the total 3 phase true power factor measured in a 3 phase power system.
Valid Range: -1.0 .. 1.0 (0.00005)
Default Service Type: Acknowledged

Reset Totals (Corresponds to Modbus holding register 8)
```
network input SNVT_lev_disc nviResetTotals
```
This input network variable resets all accumulated power readings when the value of zero (0) is written to it.
Valid Range: 0
Default Service Type: Acknowledged

4.7.2   Power Meter Configuration Properties

Power Send on Delta
```
network input config UCPTsendDeltaPwr nciSendOnDeltaP
```
Specifies the maximum amount that any of the retrieved Power meter points of SNVT type SNVT_power_f can change without an update occurring on the associated network variable.
Valid Range: -1E38…1E38 (Volts)
Default Value: The default value is 0.
SCPT/UCPT Reference: UCPTsendDeltaPwr (05)

Power Factor Send on Delta
```
network input config UCPTsendDeltaPwrFact nciSendOnDeltaPF
```
Specifies the maximum amount that any of the retrieved Power meter points of SNVT type SNVT_pwr_fact_f can change without an update occurring on the associated network variable.
Valid Range: -1 to 1
Default Value: The default value is 0.
SCPT/UCPT Reference: UCPTsendDeltaPwrFact (06)

Minimum Send Time
```
network input config SNVT_time_sec nciMinSendTime;
```
Indicates the minimum period between output network variable transmissions.
Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to 0 allows
the maximum refresh according to the SendOnDelta value.
Default Value: 1 second.
SCPT/UCPT Reference: SCPTminSendTime (52)

Maximum Send Time (Heartbeat)
```
network input config SNVT_time_sec nciVMaxSendTime;
```
This input configuration network variable defines the maximum period of time that expires before an automatic update occurs on the network variables.
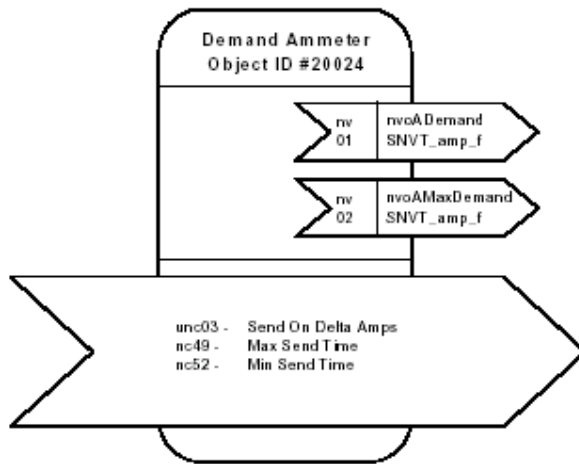Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to 0 disables
the automatic update mechanism.
Default Value: The default value is 1800.0 seconds (30 minutes)
SCPT/UCPT Reference: SCPTmaxSendTime (49)

4.8   Demand Ammeter Functional Profile

4.8.1   Demand Ammeter Network Variables

Demand Current (Corresponds to Modbus register 53)
```
network output SNVT_amp_f nvoADemand
```
This output network variable reports the demand current
Valid Range: -1E38 .. 1E38 Amps
Default Service Type: Acknowledged
Maximum Demand Current (Corresponds to Modbus register 54)
```
network output SNVT_amp_f nvoAMaxDemand
```
This output network variable reports the maximum demand current
Valid Range: -1E38 .. 1E38 Amps
Default Service Type: Acknowledged

4.8.2   Demand Ammeter Configuration Properties

Current Send on Delta
```
network input config UCPTsendDeltaAmps nciSendOnDeltaA
```
Specifies the maximum amount that any of the retrieved Demand Ammeter points can change without
an update occurring on the associated network variable.
Valid Range: -1E38 to 1E38
Default Value: The default value is 0.
SCPT/UCPT Reference: UCPTsendDeltaPwrFact (06)
Minimum Send Time
```
network input config SNVT_time_sec nciMinSendTime;
```
Indicates the minimum period between output network variable transmissions.
Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to
0 allows
the maximum refresh according to the SendOnDelta value.
Default Value: 1 second.
SCPT/UCPT Reference: SCPTminSendTime (52)
Maximum Send Time (Heartbeat)
```
network input config SNVT_time_sec nciVMaxSendTime;
```
This input configuration network variable defines the maximum period of time that expires before an
automatic update occurs on the network variables.
Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to
0 disables
the automatic update mechanism.
Default Value: The default value is 1800.0 seconds (30 minutes)
SCPT/UCPT Reference: SCPTmaxSendTime (49)

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4.9   Demand Power Meter Functional Profile
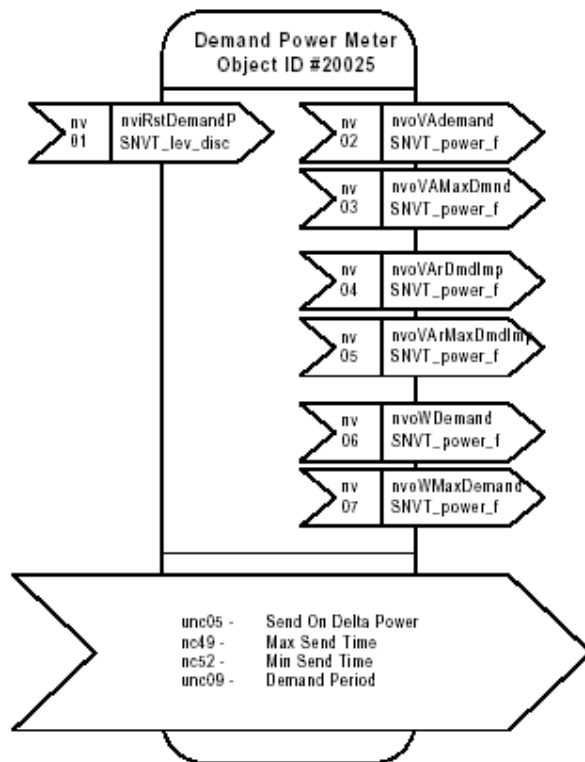
4.9.1   Demand Power Meter Network Variables

Power Demand (Corresponds to Modbus register 51)
```
network output SNVT_power_f nvoVAdemand
```
VA demand.
Power Max Demand (Corresponds to Modbus register 52)
```
network output SNVT_power_f nvoVAMaxDmnd
```
VA Maximum demand.
Valid Range: -1E38 .. 1E38 watts
Default Service Type: Acknowledged
Reactive Power Demand (Corresponds to Modbus register 47)
```
network output SNVT_power_f nvoVarDmdImp
```
VA Maximum demand.
Reactive Power Max Demand (Corresponds to Modbus register 48)
```
network output SNVT_power_f nvoVarMaxDmdImp
```
VA Maximum demand.
Valid Range: -1E38 .. 1E38 watts
Default Service Type: Acknowledged
Watts Demand (Modbus input 43)
```
network output SNVT_power_f nvoWDemand
```
This output network variable reports the three phase total real power demand.
Watts Max Demand (Modbus input 44)
```
network output SNVT_power_f nvoWMaxDemand
```
This output network variable reports the peak three phase total real power demand which has occurred since peak demand was last reset.
Valid Range: -1E38….1E38 (Watts)
Default Service Type: Acknowledged
Reset Demand Period (Modbus holding – 1)
```
network input SNVT_lev_disc nviRstDemandP
```
Writing the proper value to this input network variable causes the demand period to be reset.

Valid Range: 0
Default Service Type: Acknowledged

4.9.2   Demand Power Meter Configuration Properties

Demand Period (Modbus holding – 2)
```
network input config UCPTdemandPeriod nciDmdPeriod
```
This input network configuration variable specifies the time interval used when calculating the power demand.
Valid Range: 8, 15, 20 or 30 minutes
Default Value: The default value is 30 minutes
SCPT/UCPT Reference: UCPTdemandPeriod(09)

Power Send on Delta
```
network input config UCPTsendDeltaPwr nciSendOnDeltaP
```
Specifies the maximum amount that any of the retrieved Demand Power meter points can change without an update occurring on the associated network variable.
Valid Range: -1E38 to 1E38
Default Value: The default value is 0.
SCPT/UCPT Reference: UCPTsendDeltaPwr (05)

Minimum Send Time
```
network input config SNVT_time_sec nciMinSendTime;
```
Indicates the minimum period between output network variable transmissions.
Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to 0 allows
the maximum refresh according to the SendOnDelta value.
Default Value: 1 second.
SCPT/UCPT Reference: SCPTminSendTime (52)

Maximum Send Time (Heartbeat)
```
network input config SNVT_time_sec nciVMaxSendTime;
```
This input configuration network variable defines the maximum period of time that expires before an automatic update occurs on the network variables.
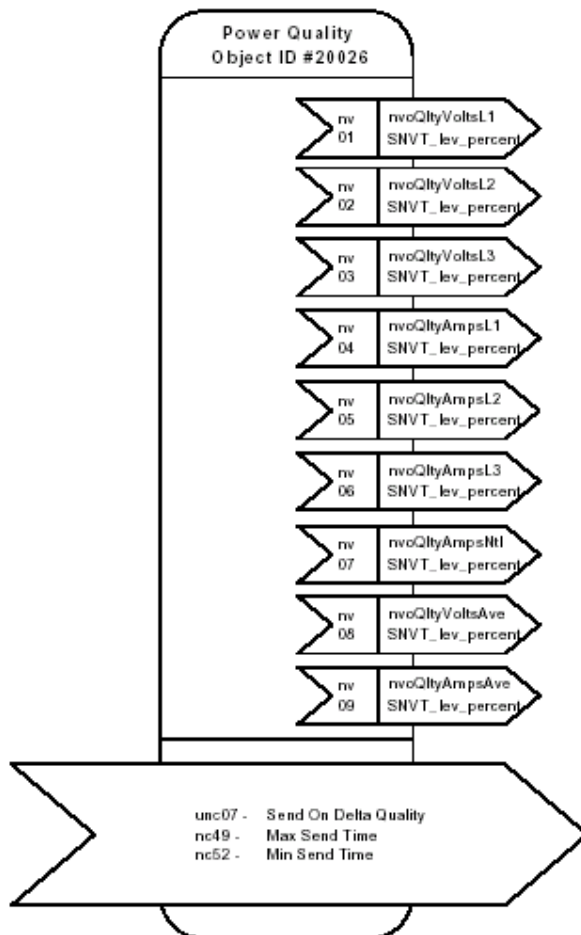Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to 0 disables
the automatic update mechanism.
Default Value: The default value is 1800.0 seconds (30 minutes)
SCPT/UCPT Reference: SCPTmaxSendTime (49)

4.10 Power Quality Meter

Power Quality
Object ID #20026

nv 01	nvoQltyVoltsL1 SNVT_lev_percent
nv 02	nvoQltyVoltsL2 SNVT_lev_percent
nv 03	nvoQltyVoltsL3 SNVT_lev_percent
nv 04	nvoQltyAmpsL1 SNVT_lev_percent
nv 05	nvoQltyAmpsL2 SNVT_lev_percent
nv 06	nvoQltyAmpsL3 SNVT_lev_percent
nv 07	nvoQltyAmpsNtl SNVT_lev_percent
nv 08	nvoQltyVoltsAve SNVT_lev_percent
nv 09	nvoQltyAmpsAve SNVT_lev_percent

unc07 -   Send On Delta Quality
nc49 -   Max Send Time
nc52 -   Min Send Time

4.10.1 Power Quality Network Variables

Quality of Phase Voltages (Corresponds to Modbus register 118, 119, 120)
`network output SNVT_lev_percent nvoQV1`
This output network variable reports the Total Harmonic Distortion (THD) of the voltage on Phase 1 in a 3 phase power system.
`network output SNVT_lev_percent nvoQV2`
This output network variable reports the Total Harmonic Distortion (THD) of the voltage on Phase 2 in a 3 phase power system.
`network output SNVT_lev_percent nvoQV3`
This output network variable reports the voltage measured from phase L3 to phase L1 in a 3 phase power system.
Valid Range: 0% .. 100% (0.5%) the SNVT has a range of -163.84% .. 163.83% (0.005%)
Default Service Type: Acknowledged
Quality of Phase Currents (Corresponds to Modbus register 121, 122, 123)
`network output SNVT_lev_percent nvoQA1`
This output network variable reports the Total Harmonic Distortion (THD) of the current on Phase 1 in a 3 phase power system.
`network output SNVT_lev_percent nvoQA2`
This output network variable reports the Total Harmonic Distortion (THD) of the current on Phase 2 in a 3 phase power system.
`network output SNVT_lev_percent nvoQA3`
This output network variable reports the Total Harmonic Distortion (THD) of the current on Phase 3 in

a 3 phase power system.

Valid Range: 0% .. 100% (0.5%) the SNVT has a range of -163.84% .. 163.83% (0.005%)

Default Service Type: Acknowledged

Quality of Current to Neutral (Corresponds to Modbus register 124)

`network output SNVT_lev_percent nvoQANt`

This output network variable reports the Total Harmonic Distortion (THD) of the current with respect to Neutral.

Quality of Average Voltage (Corresponds to Modbus register 125)

`network output SNVT_lev_percent nvoQVave`

This output network variable reports the Total Harmonic Distortion (THD) of the average voltage.

Quality of Average Current (Corresponds to Modbus register 126)

`network output SNVT_lev_percent nvoQAave`

This output network variable reports the Total Harmonic Distortion (THD) of the average current.

Valid Range: 0% .. 100% (0.5%) the SNVT has a range of -163.84% .. 163.83% (0.005%)

Default Service Type: Acknowledged

4.10.2 Power Quality Meter Configuration Properties

Quality Send on Delta

`network input config UCPTsendDeltaQlty nciSendOnDeltaQ`

Specifies the maximum amount that any of the retrieved Quality meter points can change without an update occurring on the associated network variable.

Valid Range: -163.84% to 163.83%

Default Value: The default value is 0.

SCPT/UCPT Reference: UCPTsendDeltaQlty (07)

Minimum Send Time

`network input config SNVT_time_sec nciMinSendTime;`

Indicates the minimum period between output network variable transmissions.

Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to 0 allows

the maximum refresh according to the SendOnDelta value.

Default Value: 1 second.

SCPT/UCPT Reference: SCPTminSendTime (52)

Maximum Send Time (Heartbeat)

`network input config SNVT_time_sec nciVMaxSendTime;`

This input configuration network variable defines the maximum period of time that expires before an automatic update occurs on the network variables.

Valid Range: The valid range is any value between 0.0 seconds and 6553.4 seconds. Setting the value to 0 disables

the automatic update mechanism.

Default Value: The default value is 1800.0 seconds (30 minutes)

SCPT/UCPT Reference: SCPTmaxSendTime (49)

4.11 Common Problems

If the LonWorks interface is not functioning correctly, confirm that communications parameters are set currently in the Integra. This topic is covered in the Integra Installation manual. This manual also gives a guide to the service indicator LED, and status indication of the LonWorks interface.