



A Sierra Monitor Company

Driver Manual
(Supplement to the FieldServer Instruction Manual)

FS-8700-21 LonWorks

APPLICABILITY & EFFECTIVITY

Effective for all systems manufactured after May 1, 2001

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1. LonWorks Driver Description

The LonWorks driver allows the FieldServer to transfer data to and from devices using LonWorks protocol. The FieldServer can emulate either a Server or Client. The FS-B4011 FieldServer is supplied with a LonWorks Card, while the FS-B2011 and FS-B30 Series FieldServers have a built-in LonWorks Interface. A Fieldbus connection is available on the FieldServer. The FS-B30 and FS-B4011 can handle up to 4096 Network Variables and the FS-B2011 up to 1000 which can be of the Standard Network Variable Types (SNVT) and/or User-defined Network Variable Types (UNVT).

1.1. Clients and Servers

The FieldServer functions as a Client when polling or sending updates on the LonWorks network and as a Server when being polled or receiving updates. The FieldServer can be bound to a maximum number of 15 LonWorks nodes. The FieldServer recommended print limit is 1096.

1.2. Network Variable Updates and Polls

On LonWorks networks, information is transferred using Network Variable Updates and Network Variable Polls. The Client requests Network Variables from the Server using NV Polls and NV Updates occur when a Client sends Network Variables to a Server.

1.3. Network Management

The FieldServer is able to set its own Domain, Subnet and Node ID at start-up using the FieldServer configuration file. Alternatively, the FieldServer is capable of being commissioned and bound by Network Management Tools such as LonMaker® - see Appendix A.9 for further information.

1.4. Explicit and Implicit Addressing

Clients can address Servers using explicit or implicit addressing. Clients using explicit addressing obtain their data transfer parameters directly from the FieldServer configuration file. The FS-B30 and FS-B4011 can handle a maximum of 4096 explicitly addressed nodes and the FS-B2011 up to 1000. Implicit addressing is used when a Network Management Tool such as LonMaker® is used to connect a FieldServer to other LonWorks nodes - the FieldServer is assigned its data transfer (binding) parameters by the Network Management Tool.

1.5. External Interface Files

At start-up the FieldServer creates an external interface file (XIF) called fServer.xif based on the configuration file. The XIF for the default configuration (Primserv.xif) is included on the driver diskette shipped with the FieldServer. The FieldServer differs from most other LonWorks drivers in that it is configurable and therefore its XIF is not fixed for all applications. The list of points available to the network will vary depending on the other networks connected to the FieldServer, and the requirements of the particular application. The recommended procedure for obtaining the XIF file for the FieldServer is to upload it.

1.6. Device Resource files

The STANDARD device resource file covers FieldServer data type support. All Standard Network Variable Types (SNVTs) in this file are available to the user. These SNVTs are listed in Appendix A.3. Please note that due to the sophisticated nature of LonWorks

variables, it may not always be possible to typecast the full information supplied in a LonWorks variable to a simple Data Type contained in another protocol. The FieldServer has Move and Logic functions available which would allow the LonWorks variable to be split up and passed to separate simple data types, thus preventing information loss. The FieldServer supports the sending and receiving of User-defined Network Variable Types (UNVTs) on the LonWorks Network. An UNVT is simply implemented as an array of bytes of user-defined length.

1.7. Functional Blocks and LonMark Objects

The FieldServer provides the capability of defining multiple functional blocks, but only a single LonMark object*. The user can create multiple functional blocks or a LonMark object by filling out the Node Self-Documentation String, and the respective Network Variable Self-documentation String fields in the FieldServer configuration file.

1.8. Network Variable Aliases

The FieldServer currently supports a default of 63 network variable aliases to avoid network variable connection constraints. This number may be increased to a maximum of 4096.

1.9. ATMI ACM enhancement

4096 Network Variables can be supported
Update rate of "acknowledged NV updates" is at least 25 per second.

1.10. Configuration Properties

Configuration Properties (CP's) characterize the behavior of a device in the system. Network installation tools realize this attribute and provide database storage to support maintenance operations. If a device fails and needs to be replaced, the configuration property data stored in the database is downloaded into the replacement device to restore the behavior of the replaced device in the system. Configuration properties are implemented on the FieldServer through configuration network variables. User-defined configuration property types are not supported. Appendix A.13 provides a list of standard configuration property types that are supported.

The information that follows describes how to expand upon the factory defaults provided in the configuration files included with the FieldServer.

* One can only create LonMark Interoperable Products (see www.lonmark.org) by using LonMark objects.

2. Driver Scope of Supply

2.1. Supplied by FieldServer Technologies for this driver

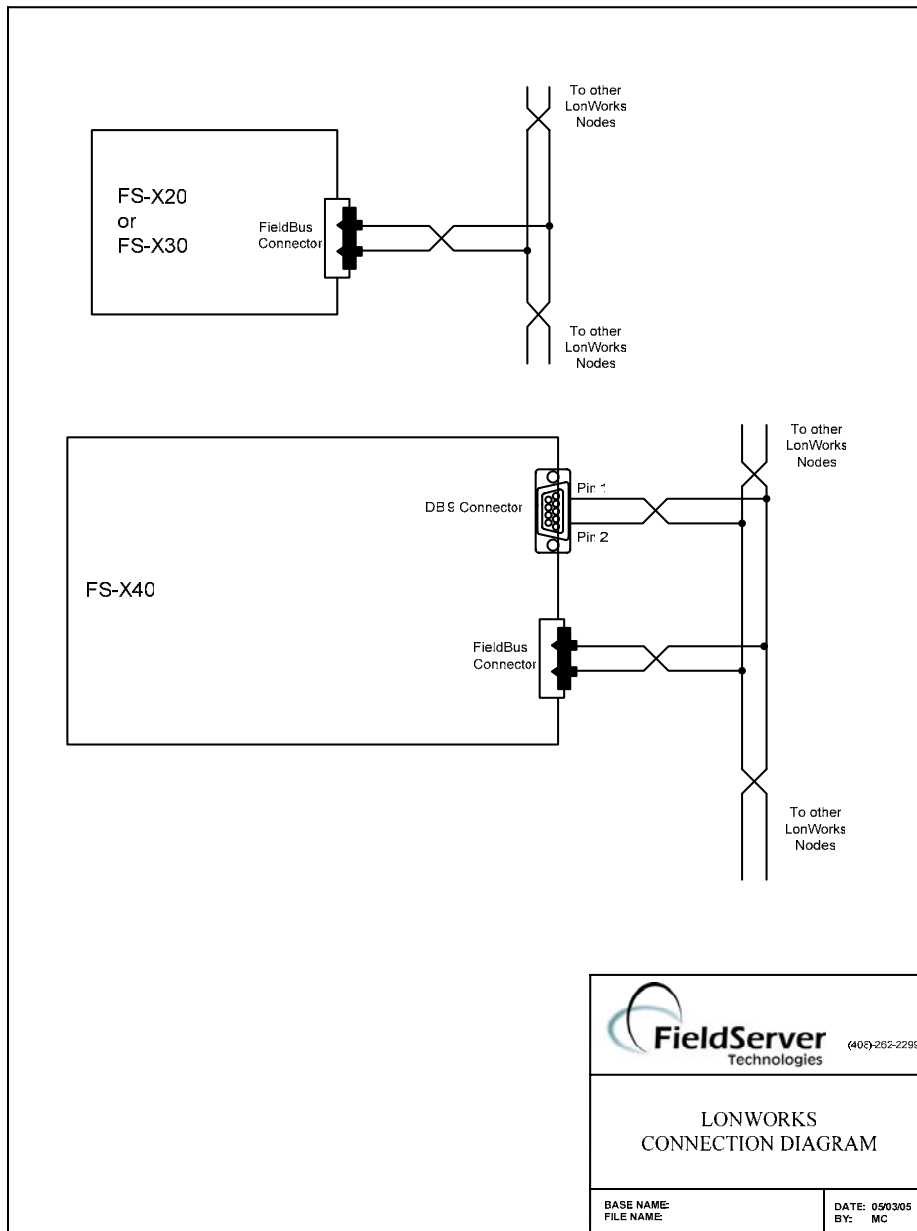
FieldServer Technologies Part #	Description
FS-8700-21	Driver Manual.

2.2. Provided by the Supplier of 3rd Party Equipment

PART #	DESCRIPTION
N/A	LonMaker® Integration Tool from Echelon Corporation (Optional Network Management Software)
N/A	LonWatcher from Distech Controls Inc. (Optional Network Management Software)
N/A	Circon System Integrator from Circon Systems Corporation (Optional Network Management Software)
PCC10	PCCard LonWorks Adapter (Optional)

3. Hardware Connections

LonWorks devices are available with several different physical interfaces. The screw plug supplied with the FieldServer LonWorks interface will connect the FieldServer to the FTT-10 network. The 9 pin D-connector can also be used to connect to the network (FS-B4011 only). The 2-wire twisted-pair connection to the network is polarity insensitive. The FTT-10 network is a free topology network which supports star, loop and/or bus wiring connections. Please refer to the FTT-10A Free Topology Transceiver User's Guide from Echelon Corporation for recommended wiring practices if necessary. The connection diagram below shows how the FieldServer FS-B2011, FS-B30 and FS-B4011 are connected to a LonWorks network:



Configure the remote LonWorks devices according to manufacturer's instructions.

3.1. Service Pin

The service pin is used to commission the FieldServer onto the network using a LonWorks Network Management tool. On FS-X20 FieldServers the node's unique Neuron ID will be displayed on the Error Screen of the RUI Net utility with every service pin press.

3.2. The LonWorks Adapter Card (FS-X40 only)

3.2.1. Port Address Switch

The LonWorks driver has been configured to access the LonWorks card at ISA port address 340 hex. This is the default setting for the card, and the DIP switches must not be modified. The DIP switch setting on the card is as follows:

Switch	Setting
1	ON
2	ON
3	OFF
4	ON
5	OFF
6	OFF
7	OFF
8	OFF

4. Configuring the FieldServer as a LonWorks Client

For a detailed discussion on FieldServer configuration, please refer to the FieldServer Instruction manual. The information that follows describes how to expand upon the factory defaults provided in the configuration files included with the FieldServer (See “.csv” sample files provided with the FieldServer).

This section documents and describes the parameters necessary for configuring the FieldServer to communicate with a LonWorks Driver Server.

4.1. FieldServer¹

Section Title		
FieldServer		
Column Title	Function	Legal Values
System_Address	Network Node ID when domain table setup is required.	1-127
Title	Node self-documentation string and/or Network domain and subnet ID when domain table setup is required.	Up to 40 characters.

Example

```
// FieldServer

FieldServer
System_Address,           Title
10,                      “:D48:S01:&3.2@1;WaterTempSensor”
```

4.2. Data Arrays/Descriptors

Note that in the tables, * indicates an optional parameter, with the bold legal value being the default.

Section Title		
Data_Arrays		
Column Title	Function	Legal Values
Data_Array_Name	Provide name for Data Array	Up to 15 alphanumeric characters
Data_Array_Format	Provide data format. Each Data Array can only take on one format.	FLOAT, BIT, UINT16, SINT16, PACKED_BIT, PACKED_BYTE, UINT32, SINT32
Data_Array_Length	Number of Data Objects. Must be larger than the data storage area required by the Map Descriptors for the data being placed in this array.	1-10,000

¹ Refer to Appendix A.8 for further information

Example

```
// Data Arrays

Data_Arrays
Data_Array_Name,      Data_Format,      Data_Array_Length
DA_AI_01,             Uint16,           200
DA_AO_01,             Uint16,           200
DA_PI_01,             Float,            10
DA_FO_01,             Float,            10
```

4.3. Client Side Connection Descriptions

Section Title		
Connections		
Column Title	Function	Legal Values
Adapter	Adapter Name	LonWorks
Protocol	Specify protocol used	LonWorks
Connection_Type	Specify Network Management	LonMaker®, LonWatcher, Circon_SI, None

Example

```
// Client Side Connections

Connections
Adapter,              Protocol,          Connection_Type
LonWorks,             LonWorks,         LonMaker
```

4.4. Client Side Node Descriptors

Section Title		
Nodes		
Column Title	Function	Legal Values
Node_Name	Provide name for node	Up to 32 alphanumeric characters
Subnet_ID	Server (destination) node's Subnet ID of an explicitly addressed message	1-255
Node_ID	Server (destination) node's Node ID of an explicitly addressed message	1-127
Protocol	Specify protocol used	LonWorks
Adapter	Specify port Adapter used	LonWorks

Example

```
// Client Side Nodes

Nodes
Node_Name,  Subnet_ID,  Node_ID,  Protocol,  Adapter
LON_1,     1,          1,        LonWorks,  LonWorks
```

4.5. Client Side Map Descriptors

4.5.1. FieldServer Related Map Descriptor Parameters

Column Title	Function	Legal Values
Map_Descriptor_Name	Name of this Map Descriptor	Up to 16 alphanumeric characters. See Appendix A.19
Data_Array_Name	Name of Data Array where data is to be stored or fetched from in the FieldServer	One of the Data Array names from "Data Array" section above
Data_Array_Offset	Starting location in Data Array	0 to maximum specified in "Data Array" section above
Lon_Function	Detailed Function of Client Map Descriptor	See Appendix A.1 for a list of valid entries.
Function	Function of Client Map Descriptor	Filled-in according to Table in Appendix A.1

4.5.2. Driver Related Map Descriptor Parameters

Column Title	Function	Legal Values
Node_Name	Name of Node to fetch data from or send data to. Needed for Explicit Addressing.	One of the node names specified in "Client Node Descriptors" above
SNVT_Index	Client or Server Network Variable Index depending on Implicit or Explicit Addressing.	0-4095 – See Appendix A.7
SNVT_Type	Standard network variable type of the data	See Appendix A.3
SNVT_Option	Specifies which record out of a complex SNVT we are after.	See Appendix A.20
SNVT_Units	Specifies the measurement units (e.g. Metric or English)	See Appendix A.21
UNVT_Byte_Length	Specifies the length in bytes of an UNVT.	1-31. See Appendix A.4 to define an UNVT
UNVT_ID	Specifies the Type Number to apply to this particular UNVT.	0 or 146-255. See Appendix A.4.
NV_Min_Value	Network Variable updates with values less than specified in this field will be ignored.	See Appendix A.5
NV_Max_Value	Network Variable updates with values higher than specified in this field will be ignored.	See Appendix A.5
NV_Delta_Value	Network Variable updates where the value's delta change is less than specified in this field will be ignored unless the Max_Scan_Time Condition has been met.	See Appendix A.6
NV_Selfdoc_Text	The Self-Documenting String for this Network Variable.	Normal Text up to a length of 40 characters

4.5.3. Timing Parameters

Column Title	Function	Legal Values
Scan_Interval	Seconds per scan	0-32000 See Appendix A.6
Min_Scan_Time	Minimum Scan Time in seconds.	See Appendix A.6
Max_Scan_Time	Maximum Scan Time in seconds.	See Appendix A.6

4.6. Map Descriptor Example

```
// Client Side Map Descriptors
```

Map_Descriptors	Map_Descriptor_Name,	Data_Array_Name,	Data_Array_Offset,	Lon_Function,	Function,	Node_Name,	SNVT_Index,	SNVT_Type,	Nv_Delta_Value	Min_Scan_Time	Max_Scan_Time	Scan_Interval
TempOut1,	DA_FO_01,	0,	NVUOIMT,	WRBC,	LON_1,	0,	SNVT_Temp_f,	10,	5,	20,	-	
TempOut2,	DA_FO_01,	1,	NVUOIMX,	WRBX,	LON_1,	1,	SNVT_Temp_f,	-,	-,	-,	-	
TempOut3,	DA_FO_01,	2,	NVUOIMC,	WRBC,	LON_1,	1,	SNVT_Temp_f,	-,	-,	-,	20	
TempIn,	DA_FI_01,	0,	NVPIIMT,	RDBC,	LON_1,	-,	SNVT_Temp_f,	-,	-,	-,	5	

This field determines the Map Descriptor's function. See Appendix A.1 for more information.

Explicitly Addressed Client Map Descriptors use this field to point to their relevant Server Map Descriptors. The driver will ignore this field and assign indexes to all Server and Implicitly Addressed Client Map Descriptors in the order they are declared in this file.

Required for Throttling Mode:
This field specifies the minimum change needed for a Network Variable's value to invoke an NV Update.

The Data Array will be sampled and evaluated for delta change once every Min_Scan_Time (seconds)

If found during Min_Scan_Time sampling (Throttling Mode) that Max_Scan_Time has elapsed since the last NV Update, a new NV Update will be transmitted.

For Non-Throttled Client Map Descriptors the Scan_Interval determines the update rate.

5. Configuring the FieldServer as a LonWorks Server

For a detailed discussion on FieldServer configuration, please refer to the FieldServer instruction manual. The information that follows describes how to expand upon the factory defaults provided in the configuration files included with the FieldServer (See “.csv” files on the driver CD).

This section documents and describes the parameters necessary for configuring the FieldServer to communicate with a LonWorks Driver Client.

5.1. Server Side Connection Descriptors

Section Title		
Connections		
Column Title	Function	Legal Values
Adapter	Adapter Name	LonWorks
Protocol	Specify protocol used	LonWorks
Connection_Type	Specify Network Management	LonMaker®, LonWatcher, Circon_SI, None

Example

```
// Server Side Connections

Connections
Adapter,          Protocol,          Connection_Type
LonWorks,         LonWorks,         LonMaker
```

5.2. Server Side Node Descriptors

Section Title		
Nodes		
Column Title	Function	Legal Values
Node_Name	Provide name for node	Up to 32 alphanumeric characters
Protocol	Specify protocol used	LonWorks

Example

```
// Server Side Nodes

Nodes
Node_Name,      Protocol
LON_1,         LonWorks
```

5.3. Server Side Map Descriptors

Section Title		
Map_Descriptors		
Column Title	Function	Legal Values
Map_Descriptor_Name	Name of this Map Descriptor	See Appendix A.2 and Appendix A.19
Data_Array_Name	Name of Data Array where data is to be stored or fetched from in the FieldServer	One of the Data Array names from "Data Array" section above
Data_Array_Offset	Starting location in Data Array	0 to maximum specified in "Data Array" section above
Lon_Function	Detailed Function of Server Map Descriptor	See Appendix A.1 for a list of valid entries.
Function	Function of Server Map Descriptor	SERVER See Appendix A.1
Node_Name	Node Name specified above.	Up to 32 alphanumeric characters
SNVT_Index	Index of data element.	0 - 4095 See Appendix A.7
SNVT_Type	Standard or user-defined network variable type of the data	See Appendix A.3 and Appendix A.4 to define an UNVT
SNVT_Option	Specifies which record out of a complex SNVT we are after.	See Appendix A.20
SNVT_Units	Specifies the measurement units (e.g. Metric or English)	See Appendix A.21
UNVT_Byte_Length	Specifies the length in bytes of an UNVT.	1-31 See Appendix A.4 to define an UNVT
UNVT_ID	Specifies the Type Number to apply to this particular UNVT.	0 or 146-255. See Appendix A.4 to define an UNVT
NV_Min_Value	Network Variable updates with values less than specified in this field will be ignored.	See Appendix A.5
NV_Max_Value	Network Variable updates with values higher than specified in this field will be ignored.	See Appendix A.5
NV_Selfdoc_Text	The Self-Documenting String for this Network Variable.	Normal Text up to a length of 40 characters

5.4. Map Descriptor Example

```
// Server Side Map Descriptors
```

Map_Descriptors	Map_Descriptor_Name,	Data_Array_Name,	Data_Array_Offset,	Lon_Function,	Function,	Node_Name,	SNVT_Index,	SNVT_Type,	Nv_Min_Value,	Nv_Max_Value,	Nv_Selfdoc_text
NviTemp,	DA_FI_01,	0,	NVUI,	Server,	LON_1,	-,	SNVT_Temp_f,	0,	-,	-,	"@01;WaterTemp"
NviTemp,	DA_FO_01,	1,	NVPO,	Server,	LON_1,	-,	SNVT_Temp_f,	0,	150,	150,	"&2,0,0x80,23"
NviTemp,	-,	-,	CFG_NVUI,	Server,	LON_1,	-,	SNVT_Temp_f,	-,	-,	-,	"&2,0,0x80,20"

Server NVUI can be grouped with Client NV Update types and NMFETCHC. Server NVPO can be grouped with Client NV Poll types and NMFETCHC.

Explicitly Addressed Client Map Descriptors use this field to point to their relevant Server Map Descriptors. The driver will ignore this field and assign indexes to all Server and Implicitly Addressed Client Map Descriptors in the order they are declared in this file.

If specified for a Floating point or Integer SNVT then NV Updates with values lower than specified here will not be written to its relevant Data Array location.

If specified for a Floating point or Integer SNVT then NV Updates with values higher than specified here will not be written to its relevant Data Array location.

The Self-documenting String for a Network Variable can be up to 40 characters wide.

Appendix A. Advanced Topics

Appendix A.1. Lon_Function Definitions

Lon_Function	Description	Function Field
NVUI	Network Variable Update Input	SERVER
NVPO	Network Variable Polled Output	
NVPIEXC	Network Variable Polled Input Explicitly addressed Continuously sent	RDBC
NVPIIMC	Network Variable Polled Input Implicitly addressed Continuously sent	
NVUOEXC	Network Variable Update Output Explicitly addressed Continuously sent	WRBC
NVUOEXX	Network Variable Update Output Explicitly addressed and sent on Change	WRBX
NVUOEXT	Network Variable Update Output Explicitly addressed sent in Throttling Mode	WRBC
NVUOIMC	Network Variable Update Output Implicitly addressed Continuously sent	
NVUOIMX	Network Variable Update Output Implicitly addressed and sent on Change	WRBX
NVUOIMT	Network Variable Update Output Implicitly addressed sent in Throttling Mode	"WRBC" See Appendix A.17
NMFETCHC	Network Management Network Variable Fetch Continuously sent (Explicit Addressing only)	RDBC
CFG_NVUI	Configuration Network Variable Update Input	SERVER

Appendix A.2. Map Descriptor Names

As a Server, the LonWorks driver provides a table of network variables for other nodes to read. These nodes access the variables according to Index numbers which are automatically assigned by the driver according to the Map Descriptor definition order in the configuration file. The driver also creates an identification table for configuration nodes to read the name and types of variables available on the FieldServer. Within the LonWorks protocol, this table size is limited to 64K bytes. If you are intending to use a large number of Server mappings (up to 4096), you will need to limit the variable name length. Each Server mapping requires 4 bytes plus the length of the name from this 64K block.

Appendix A.3. SNVT_Type

The following section describes each SNVT as implemented on the FieldServer LonWorks driver.

Data Length – The number of Data Array elements required when specifying a Data Array name under a Map Descriptor.

Suggested Data Array Formats – This field suggests FieldServer Data Array formats in ascending order of storage space required while ensuring data integrity. It is not recommended to store a byte value in a bit Data Array since only the values 0 and 1 will be retained from the byte value resulting in a loss of resolution. If a byte value is stored in a Floating point Data Array, 3 bytes will go to waste. A SNVT with more than one data item may require a float Data Array format to prevent loss of resolution. Since FieldServer Map Descriptors can only work with one type of Data Array format for all the data items in a SNVT, we are sometimes forced to use a Float Data Array element for all data items of which some may only have required a Byte. Fortunately, all SNVT's are short in length and RAM is adequately provided for on the FieldServer. If a loss in resolution can be tolerated, any Data Array format may be used.

The range of FieldServer Data Arrays formats are:

Data Array Format	Description	Values Range
BIT	1-bit	0,1
BYTE	8-bit Byte	0.. 255
SINT16	16-bit Signed Integer	-32,768... 32,767
UINT16	16-bit Unsigned Integer	0.. 65,535
SINT32	32-bit Signed Integer	-2,147,483,647... 2,147,483,647
UINT32	32-bit Unsigned Integer	0.. 4,294,967,295
FLOAT	32-bit Float	-3.40282E38... 3.40282E38

Values Range – These are the only values that will be allowed for the SNVT, e.g. a value of 101 will not be processed in a read or write on SNVT_switch's Value data item.

Invalid Value – The Invalid value is used to force the data item's value should a value outside the value range be encountered in a read or write. Should the invalid value be N/A (Not Applicable), the data item's value will be bounded by the indicated values range, e.g. an incoming read value of 101 will be stored as 100 for SNVT_switch's Value data item. Note that in some cases both the type and raw values are specified. Raw values are not of the same type of the SNVT's measurement type, i.e. they are not scaled.

Data Item – SNVT's containing more than one data item have a name specified for each item. This name can be used in the SNVT_Option field of a Map Descriptor to isolate only this one item.

SNVT_abs_humid	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Absolute humidity
Units	gram/kilogram
Values Range	0.. 655.34
Invalid Value	Raw: 65,535 (0xFFFF) Type: 655.35
SNVT_address	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Neuron Chip Address
Units	16-bit address value
Values Range	16,384 .. 64,767
Invalid Value	N/A
SNVT_alarm	
Data Length	25
Suggested Data Array Formats	Uint16, Float
Data Item 1-6	Alm_Location00, ..Alm_Location05
Measurement	Location array element
Units	8-bit unsigned byte
Values Range	0 .. 255
Invalid Value	N/A
Data Item 7	Object_ID
Measurement	Object ID
Units	object index
Values Range	0 .. 65,535
Invalid Value	N/A
Data Item 8	Alarm_type
Measurement	alarm_type_t
Units	N/A
Values Range	0 .. 254
Invalid Value	255 (0xFF)(AL_NUL)
Data Item 9	Priority_level
Measurement	Priority_level_t
Units	N/A
Values Range	0 .. 11
Invalid Value	255 (0xFF)(PR_NUL)
Data Item 10	Index_to_SNVT
Measurement	Index to NV
Units	index of NV causing alarm
Values Range	0 .. 65,535
Invalid Value	N/A
Data Item 11-14	Alm_Value00, ..Alm_Value03
Measurement	Value array element
Units	specific to NVT
Values Range	0 .. 255
Invalid Value	N/A
Data Item 15	Year
Measurement	Year
Units	year
Values Range	0 .. 3000

Invalid Value	N/A
Data Item 16	Month
Measurement	Month
Units	month of year
Values Range	0 ..12
Invalid Value	N/A
Data Item 17	Day
Measurement	Day
Units	day of month
Values Range	0 ..31
Invalid Value	N/A
Data Item 18	Hour
Measurement	Hour
Units	Hour of day
Values Range	0 ..23
Invalid Value	N/A
Data Item 19	Minute
Measurement	Minute
Units	Minutes
Values Range	0 ..59
Invalid Value	N/A
Data Item 20	Second
Measurement	Second
Units	Seconds
Values Range	0 ..59
Invalid Value	N/A
Data Item 21	Millisecond
Measurement	Millisecond
Units	Milliseconds
Values Range	0 ..999
Invalid Value	N/A
Data Item 22-25	Alm_limit00, ..Alm_limit03
Measurement	Alarm limit array element
Units	specific to NVT
Values Range	0 .. 255
Invalid Value	N/A
SNVT_amp	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Electric current
Units	Amperes
Values Range	-3,276.8... 3,276.7
Invalid Value	N/A
SNVT_amp_ac	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Alternating electric current
Units	Amperes
Values Range	0 .. 65,534
Invalid Value	65,535 (0xFFFF)

SNVT_amp_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Electric current
Units	Amperes
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A
SNVT_amp_mil	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Electric current
Units	Milli-amperes
Values Range	-3,276.8.. 3,276.7
Invalid Value	N/A
SNVT_angle	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Phase/Rotation
Units	Radians
Values Range	0 .. 65.535
Invalid Value	N/A
SNVT_angle_deg	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Angular distance
Units	degrees
Values Range	-359.98 .. 360.00
Invalid Value	Type: 655.34 Raw: 32,767 (0x7FFF)
SNVT_angle_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Phase/Rotation
Units	Radians
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A
SNVT_angle_vel	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Angular velocity
Units	Radians/second
Values Range	-3,276.8 .. 3,276.7
Invalid Value	N/A

SNVT_angle_vel_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Angular Velocity
Units	Radians/Second
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A
SNVT_area	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Area
Units	Square meters (m ²)
Values Range	0 .. 13.1068
Invalid Value	Type: 13.107 Raw: 0xFFFF (65,535)
SNVT_btu_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Thermal Energy
Units	British Thermal Units
Values Range	0 .. 3.40282E38
Invalid Value	N/A
SNVT_btu_kilo	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Thermal Energy
Units	Kilo-British Thermal Units
Values Range	0 .. 65,535
Invalid Value	N/A
SNVT_btu_mega	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Thermal Energy
Units	Mega-British Thermal Units
Values Range	0 .. 65,535
Invalid Value	N/A
SNVT_char_ascii	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	Character
Units	8-bit ASCII Character
Values Range	0 .. 255
Invalid Value	N/A

SNVT_chlr_status	
Data Length	3
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	chlr_run_mode
Measurement	chiller_t
Units	N/A
Values Range	0 .. 4
Invalid Value	255 (0xFF)(CHLR_NUL)
Data Item 2	chlr_op_mode
Measurement	hvac_t
Units	N/A
Values Range	0 .. 17
Invalid Value	255 (0xFF)(HVAC_NUL)
Data Item 3	chlr_state
Measurement	
Units	N/A
Values Range	0 .. 255
Invalid Value	N/A
SNVT_color	
Data Length	3
Suggested Data Array Formats	Float
Data Item 1	L_star
Measurement	Lightness
Units	Lightness
Values Range	0.0 .. 100.0
Invalid Value	N/A
Data Item 2	a_star
Measurement	Redness/Greenness
Units	Redness/Greenness
Values Range	-200.0 .. 200.0
Invalid Value	N/A
Data Item 3	b_star
Measurement	Yellowness/Blueness
Units	Yellowness/Blueness
Values Range	-200.0 .. 200.0
Invalid Value	N/A
SNVT_config_src	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	Config_source_t
Units	N/A
Values Range	0 .. 1
Invalid Value	255 (0xFF)(CFG_NUL)
SNVT_count	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Event Count
Units	Count
Values Range	0 .. 65,535
Invalid Value	N/A

SNVT_count_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Event Count
Units	Count
Values Range	0 .. 3.40282E38
Invalid Value	N/A
SNVT_count_inc	
Data Length	1
Suggested Data Array Formats	Sint16, Float
Data Item 1	
Measurement	Incremental Count
Units	Count
Values Range	-32,768 .. 32,767
Invalid Value	N/A
SNVT_count_inc_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Incremental Count
Units	Count
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A
SNVT_ctrl_req	
Data Length	3
Suggested Data Array Formats	Uint16, Float
Data Item 1	ctl_req_rcvr_id
Measurement	Receiver ID
Units	ID number
Values Range	1 .. 65,535
Invalid Value	0
Data Item 2	ctl_req_sndr_id
Measurement	Sender ID
Units	ID number
Values Range	1 .. 65,534
Invalid Value	65,535 (0xFFFF)
Data Item 3	ctl_req_sndr_pri
Measurement	Sender priority
Units	Priority value
Values Range	0 .. 200
Invalid Value	N/A

SNVT_ctrl_resp	
Data Length	5
Suggested Data Array Formats	Uint16, Float
Data Item 1	ctl_rsp_status
Measurement	control_resp_t
Units	N/A
Values Range	0 .. 5
Invalid Value	255 (0xFF)(CTRLR_NUL)
Data Item 2	ctl_rsp_snd_id
Measurement	Sender ID
Units	ID number
Values Range	1 .. 65,534
Invalid Value	65,535 (0xFFFF)
Data Item 3	ctl_rsp_snd_rlower
Measurement	Sender Range Lower ID
Units	ID number
Values Range	1 .. 65,534
Invalid Value	65,535 (0xFFFF)
Data Item 4	ctl_rsp_snd_rupper
Measurement	Sender Range Upper ID
Units	ID number
Values Range	1 .. 65,534
Invalid Value	65,535 (0xFFFF)
Data Item 5	ctl_rsp_cntrl_id
Measurement	Controller ID
Units	ID number
Values Range	1 .. 65,534
Invalid Value	65,535 (0xFFFF)
SNVT_currency	
Data Length	3
Suggested Data Array Formats	Sint32
Data Item 1	Currency
Measurement	Currency_t
Units	N/A
Values Range	0 .. 56
Invalid Value	255 (0xFF)(CU_NUL)
Data Item 2	Power_of_10
Measurement	Magnitude
Units	Power of 10
Values Range	-128 .. 127
Invalid Value	N/A
Data Item 3	Currency_Value
Measurement	Value
Units	Currency Value
Values Range	-2,147,483,648 .. 2,147,483,647
Invalid Value	N/A

SNVT_date_day	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	days_of_week_t
Units	N/A
Values Range	0 .. 6
Invalid Value	255 (0xFF)
SNVT_defr_mode	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	defrost_t
Units	N/A
Values Range	0 .. 2
Invalid Value	255 (0xFF)(DFM_MODE_NUL)
SNVT_defr_state	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	defrost_state_t
Units	N/A
Values Range	0 .. 4
Invalid Value	255 (0xFF)(DFS_NUL)
SNVT_defr_term	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	defrost_term_t
Units	N/A
Values Range	0 .. 100
Invalid Value	255 (0xFF)(DFT_NUL)
SNVT_density	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Density
Units	Kg/m ³ : kilograms per cubic meter
Values Range	0 .. 32,767.5
Invalid Value	N/A
SNVT_density_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Density
Units	Kilograms per Cubic Meter (kg/m ³)
Values Range	0 .. 3.40282E38
Invalid Value	N/A

SNVT_dev_c_mode	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	device_c_mode_t
Units	N/A
Values Range	0 .. 29
Invalid Value	255 (0xFF)(DCM_NUL)
SNVT_earth_pos	
Data Length	6
Suggested Data Array Formats	Float
Data Item 1	epos_dir_bits
Measurement	Latitude/Longitude
Units	Direction
Values Range	0 .. 255
Invalid Value	N/A
Data Item 2	epos_lat_degs
Measurement	Latitude degrees
Units	Degrees
Values Range	1 .. 90
Invalid Value	255 (0xFF)
Data Item 3	epos_lat_mins
Measurement	Latitude Minutes
Units	Minutes
Values Range	1 .. 59.999
Invalid Value	Raw: 65,535 (0xFFFF) Type: 65.535
Data Item 4	epos_long_degs
Measurement	Longitude Degrees
Units	Degrees
Values Range	1 ..180
Invalid Value	255 (0xFF)
Data Item 5	epos_long_mins
Measurement	Longitude Minutes
Units	Minutes
Values Range	1 .. 59.999
Invalid Value	Raw: 65,535 (0xFFFF) Type: 65.535
Data Item 6	epos_htabv_sea
Measurement	Height Above Sea Level
Units	Meters (m)
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A

SNVT_elapsed_tm	
Data Length	5
Suggested Data Array Formats	Uint16, Float
Data Item 1	etm_day
Measurement	Days
Units	Days
Values Range	0 .. 65,534
Invalid Value	65,535 (0xFFFF)
Data Item 2	etm_hour
Measurement	Hours
Units	Hours
Values Range	0 .. 23
Invalid Value	N/A
Data Item 3	etm_minute
Measurement	Minutes
Units	Minutes
Values Range	0 .. 59
Invalid Value	N/A
Data Item 4	etm_second
Measurement	Seconds
Units	Seconds
Values Range	0 .. 59
Invalid Value	N/A
Data Item 5	etm_millisecond
Measurement	Milliseconds
Units	Milliseconds
Values Range	0 .. 999
Invalid Value	N/A
SNVT_elec_kwh	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Electrical energy
Units	Kilowatt-hours
Values Range	0 .. 65,535
Invalid Value	N/A
SNVT_elec_kwh_I	
Data Length	1
Suggested Data Array Formats	Sint32
Data Item 1	
Measurement	Electricity
Units	Kilowatt-hour
Values Range	-214,748,364.8 .. 214,748,364.6
Invalid Value	-214,748,364.7 (0x7FFFFFFF)
SNVT_elec_whr	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Electric energy
Units	Watt-hours
Values Range	0 .. 6,553.5
Invalid Value	N/A

SNVT_elec_whr_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Electric Energy
Units	Watt-hour
Values Range	0 .. 3.40282E38
Invalid Value	N/A
SNVT_enthalpy	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Enthalpy
Units	KiloJoules per Kilogram kJ/kg
Values Range	-327.68 .. 327.66
Invalid Value	Raw: 32,767 (0x7FFF) Type: 327.67
SNVT_evap_state	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	evap_t
Units	N/A
Values Range	0 .. 2
Invalid Value	255 (0xFF)(EVAP_NUL)
SNVT_ex_control	
Data Length	10
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	ex_ctrl_status
Measurement	ex_control_t
Units	N/A
Values Range	0 .. 2
Invalid Value	255 (0xFF)(EX_CONTROL_NUL)
Data Item 2-7	ex_ctrl_domid_0, ..ex_ctrl_domid_5
Measurement	Domain ID
Units	Byte
Values Range	0 .. 255
Invalid Value	N/A
Data Item 8	ex_ctrl_domid_len
Measurement	Domain length
Units	Number of bytes
Values Range	0 .. 6
Invalid Value	N/A
Data Item 9	ex_ctrl_subnet
Measurement	Subnet
Units	Subnet number
Values Range	1 .. 255
Invalid Value	N/A
Data Item 10	ex_ctrl_node
Measurement	Node
Units	Node number
Values Range	1 .. 127
Invalid Value	N/A

SNVT_file_pos	
Data Length	2
Suggested Data Array Formats	Uint32
Data Item 1	ops_rw_ptr
Measurement	Read/Write Pointer
Units	File Byte Address
Values Range	0 .. 2,147,483,647
Invalid Value	N/A
Data Item 2	ops_rw_len
Measurement	Read/Write Length
Units	Number of Bytes
Values Range	0 .. 65,535
Invalid Value	N/A
SNVT_file_req (only raw data supported)	
Data Length	12
Suggested Data Array Formats	Byte
SNVT_file_status (only raw data supported)	
Data Length	27
Suggested Data Array Formats	Byte
SNVT_fire_test	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	fire_test_t
Units	N/A
Values Range	0 .. 3
Invalid Value	255 (0xFF)(FT_NUL)
SNVT_flow	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Flow volume
Units	Liters/Second
Values Range	0 .. 65,534
Invalid Value	65,535 (0xFFFF)
SNVT_flow_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Flow Volume
Units	Liters/Second
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A
SNVT_flow_mil	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Flow volume
Units	Milliliters/Second (ml/s)
Values Range	0 .. 65,535
Invalid Value	N/A

SNVT_flow_p	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Flow volume
Units	Cubic metres per hour
Values Range	0 .. 655.34
Invalid Value	Raw: 65,535 (0xFFFF) Type: 655.35
SNVT_freq_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Frequency
Units	Hertz
Values Range	0 .. 3.40282E38
Invalid Value	N/A
SNVT_freq_hz	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Frequency
Units	Hertz
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_freq_kilohz	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Frequency
Units	Kilohertz
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_freq_milhz	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Frequency
Units	Hertz
Values Range	0 .. 6.5535
Invalid Value	N/A
SNVT_fire_init	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	fire_initiator_t
Units	N/A
Values Range	0 .. 16
Invalid Value	255 (0xFF)(FI_NUL)

SNVT_fire_indcte	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	fire_indicator_t
Units	N/A
Values Range	0 .. 8
Invalid Value	255 (0xFF)(FN_NUL)
SNVT_gfci_status	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	gfci_status_t
Units	N/A
Values Range	0 .. 5
Invalid Value	255 (0xFF)(GFCI_NUL)
SNVT_grammage	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Grammage
Units	Grams/Square-meter
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_grammage_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Grammage
Units	Grams/Square-meter
Values Range	0 .. 3.40282E38
Invalid Value	N/A
SNVT_hvac_emerg	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	emerg_t
Units	N/A
Values Range	0 .. 5
Invalid Value	255 (0xFF)(EMERG_NUL)
SNVT_hvac_mode	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	Hvac_t
Units	N/A
Values Range	0 .. 17
Invalid Value	255 (0xFF)(HVAC_NUL)

SNVT_hvac_overid	
Data Length	3
Suggested Data Array Formats	Float
Data Item 1	hvac_ord_state
Measurement	hvac_overid_t
Units	N/A
Values Range	0 .. 48
Invalid Value	255 (0xFF)(HVO_NUL)
Data Item 2	hvac_ord_percent
Measurement	Percent
Units	Percent of Full Scale
Values Range	-163.840 .. 163.830
Invalid Value	Type: 163.835 Raw: 32,767 (0x7FFF)
Data Item 3	hvac_ord_flow
Measurement	Flow
Units	Liters per Second
Values Range	0 .. 65,534
Invalid Value	65,535 (0xFFF)

SNVT_hvac_status	
Data Length	7
Suggested Data Array Formats	Float
Data Item 1	hvac_sts_mode
Measurement	hvac_t
Units	N/A
Values Range	0 .. 17
Invalid Value	255 (0xFF)(HV_NUL)
Data Item 2	hvac_heat_out_pri
Measurement	Primary Heat Output
Units	Percent of Full Scale
Values Range	-163.840 .. 163.830
Invalid Value	Type: 163.835 Raw: 32,767 (0x7FFF)
Data Item 3	hvac_heat_out_sec
Measurement	Secondary Heat Output
Units	Percent of Full Scale
Values Range	-163.840 .. 163.830
Invalid Value	Type: 163.835 Raw: 32,767 (0x7FFF)
Data Item 4	hvac_cool_out
Measurement	Cooling Output
Units	Percent of Full Scale
Values Range	-163.840 .. 163.830
Invalid Value	Type: 163.835 Raw: 32,767 (0x7FFF)
Data Item 5	hvac_econ_out
Measurement	Economizer Output
Units	Percent of Full Scale
Values Range	-163.840 .. 163.830
Invalid Value	Type: 163.835 Raw: 32,767 (0x7FFF)
Data Item 6	hvac_fan_out
Measurement	Fan Output
Units	Percent of Full Scale
Values Range	-163.840 .. 163.830
Invalid Value	Type: 163.835 Raw: 32,767 (0x7FFF)
Data Item 7	hvac_in_alarm
Measurement	In Alarm State
Units	Alarm value
Values Range	0 .. 1
Invalid Value	N/A
SNVT_hvac_type	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	Hvac_hvt_t
Units	N/A
Values Range	0 .. 9
Invalid Value	255 (0xFF)(HVT_NUL)

SNVT_length	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Length
Units	Meters (m)
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_length_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Length
Units	Meters
Values Range	0 .. 3.40282E38
Invalid Value	N/A
SNVT_length_kilo	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Length
Units	Kilometers (km)
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_length_micr	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Length
Units	Micrometers, Microns
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_length_mil	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Length
Units	Millimeters (mm)
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_lev_cont	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Continuous Level
Units	Percent of Full Level
Values Range	0 .. 100.0
Invalid Value	N/A

SNVT_lev_cont_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Continuous Level
Units	Percent of Full Scale
Values Range	0 .. 100
Invalid Value	N/A
SNVT_lev_disc	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	Discrete_levels_t
Units	N/A
Values Range	0 .. 4
Invalid Value	255 (0xFF)(ST_NUL)
SNVT_lev_percent	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Percentage Level
Units	Percent of Full Scale, or Parts-per Million (ppm)
Values Range	-163.840 .. 163.830
Invalid Value	Type: 163.835 Raw: 32,767 (0x7FFF)
SNVT_lux	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Illumination
Units	Lux
Values Range	0 .. 65,535
Invalid Value	N/A
SNVT_magcard (only raw data supported)	
Data Length	20
Suggested Data Array Formats	Byte
SNVT_mass	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Mass
Units	Grams
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_mass_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Mass
Units	Grams
Values Range	0 .. 3.40282E38
Invalid Value	N/A

SNVT_mass_kilo	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Mass
Units	Kilograms (kg)
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_mass_mega	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Mass
Units	Metric Tons; Tonne
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_mass_mil	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Mass
Units	Milligrams (mg)
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_motor_state	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	motor_state_t
Units	N/A
Values Range	0 .. 7
Invalid Value	255 (0xFF)(MOTOR_NUL)
SNVT_muldiv	
Data Length	2
Suggested Data Array Formats	Uint16, Float
Data Item 1	Multiplier
Measurement	Multiplier
Units	N/A
Values Range	0 .. 65,535
Invalid Value	N/A
Data Item 2	Divisor
Measurement	Divisor
Units	N/A
Values Range	1 .. 65,535
Invalid Value	0
SNVT_multiplier	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Multiplier
Units	N/A
Values Range	0 .. 32.7675
Invalid Value	N/A

SNVT_nv_type	
Data Length	15
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1-8	nv_type_pid0, ..nv_type_pid7
Measurement	Program ID
Units	N/A
Values Range	0 .. 255
Invalid Value	N/A
Data Item 9	nv_type_scope
Measurement	Scope
Units	N/A
Values Range	0 .. 6
Invalid Value	N/A
Data Item 10	nv_type_index
Measurement	Type index
Units	N/A
Values Range	1 .. 65,535
Invalid Value	0
Data Item 11	nv_type_cat
Measurement	nv_type_category_t
Units	N/A
Values Range	1 .. 14
Invalid Value	255 (0xFF)(NVT_CAT_NUL)
Data Item 12	nv_type_length
Measurement	Type length
Units	Bytes
Values Range	1 .. 31
Invalid Value	0
Data Item 13	nv_type_scale_a
Measurement	Scaling multiplier
Units	N/A
Values Range	-32,768 .. 32,766
Invalid Value	32,767
Data Item 14	nv_type_scale_b
Measurement	Scaling exponent
Units	N/A
Values Range	-32,768 .. 32,766
Invalid Value	32,767
Data Item 15	nv_type_scale_c
Measurement	Scaling offset
Units	N/A
Values Range	-32,768 .. 32,766
Invalid Value	32,767

SNVT_obj_request	
Data Length	2
Suggested Data Array Formats	Uint16, Float
Data Item 1	obj_request_id
Measurement	Object ID
Units	object index
Values Range	0 .. 65,535
Invalid Value	N/A
Data Item 2	obj_request
Measurement	object_request_t
Units	N/A
Values Range	0 .. 17
Invalid Value	255 (0xFF)(RQ_NUL)
SNVT_obj_status	
Data Length	2
Suggested Data Array Formats	Uint32
Data Item 1	obj_status_id
Measurement	Functional Block ID
Units	N/A
Values Range	0 .. 65,535
Invalid Value	N/A
Data Item 2	obj_status_bits
Measurement	object_status_bits
Units	Bits
Values Range	0 .. 4,294,967,295
Invalid Value	N/A
SNVT_occupancy	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	Occup_t
Units	N/A
Values Range	0 .. 3
Invalid Value	255 (0xFF)(OC_NUL)
SNVT_override	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	override_t
Units	N/A
Values Range	0 .. 2
Invalid Value	255 (0xFF)(OV_NUL)
SNVT_ph	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Acidity
Units	pH
Values Range	-32.768 .. 32.767
Invalid Value	N/A

SNVT_ph_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Acidity
Units	pH
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A

SNVT_pos_ctrl	
Data Length	9
Suggested Data Array Formats	Float
Data Item 1	pos_ctrl_rcvr_id
Measurement	Receiver ID
Units	ID number
Values Range	1 .. 65,535
Invalid Value	0
Data Item 2	pos_ctrl_cntrl_id
Measurement	Controller ID
Units	ID number
Values Range	1 .. 65,534
Invalid Value	65,535 (0xFFFF)
Data Item 3	pos_ctrl_cntrl_prio
Measurement	Controller priority
Units	Priority value
Values Range	0 .. 200
Invalid Value	N/A
Data Item 4	pos_ctrl_function
Measurement	cam_func_t
Units	N/A
Values Range	0 .. 2
Invalid Value	255 (0xFF)(CMF_NUL)
Data Item 5	pos_ctrl_action
Measurement	cam_act_t
Units	N/A
Values Range	0 .. 2
Invalid Value	255 (0xFF)(CMA_NUL)
Data Item 6	pos_ctrl_number
Measurement	Action number
Units	Action number
Values Range	1 .. 255
Invalid Value	0
Data Item 7	pos_ctrl_pan
Measurement	Pan position
Units	Degrees
Values Range	-359.98 .. 360.00
Invalid Value	Raw: 32,767 (0x7FFF) Type: 655.34
Data Item 8	pos_ctrl_tilt
Measurement	Tilt position
Units	Degrees
Values Range	-359.98 .. 360.00
Invalid Value	Raw: 32,767 (0x7FFF) Type: 655.34
Data Item 9	pos_ctrl_zoom
Measurement	Zoom position
Units	Percent of full-scale or ppm
Values Range	-163.840 .. 163.830
Invalid Value	Raw: 32,767 (0x7FFF) Type: 163.835

SNVT_power	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Power
Units	Watts (W)
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_power_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Power
Units	Watts
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A
SNVT_power_kilo	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Power
Units	KiloWatts
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_ppm	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Concentration
Units	Parts per Million (ppm)
Values Range	0 .. 65,535
Invalid Value	N/A
SNVT_ppm_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Concentration
Units	Parts per Million
Values Range	0 .. 3.40282E38
Invalid Value	N/A

SNVT_preset	
Data Length	11
Suggested Data Array Formats	Uint16, Float
Data Item 1	preset_learn
Measurement	learn_mode_t
Units	N/A
Values Range	0 .. 3
Invalid Value	255 (0xFF)(LN_NUL)
Data Item 2	preset_selector
Measurement	Selector
Units	N/A
Values Range	0 .. 65,535
Invalid Value	N/A
Data Item 3-6	preset_value00, ..preset_value03
Measurement	Value
Units	Specific to SNVT
Values Range	0 .. 255
Invalid Value	N/A
Data Item 7	preset_day
Measurement	Days
Units	Days
Values Range	0 .. 65,534
Invalid Value	65,535 (0xFFFF)
Data Item 8	preset_hour
Measurement	Hours
Units	Hour
Values Range	0 .. 23
Invalid Value	N/A
Data Item 9	preset_minute
Measurement	Minutes
Units	Minutes
Values Range	0 .. 59
Invalid Value	N/A
Data Item 10	preset_second
Measurement	Seconds
Units	Seconds
Values Range	0 .. 59
Invalid Value	N/A
Data Item 11	preset_millisecond
Measurement	Milliseconds
Units	Milliseconds
Values Range	0 .. 999
Invalid Value	N/A
SNVT_press	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Pressure (gauge)
Units	KiloPascals
Values Range	-3,276.8 .. 3,276.6
Invalid Value	Type: 3,276.7 Raw: 32,767 (0x7FFF)

SNVT_press_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Pressure (gauge)
Units	Pascals
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A
SNVT_press_p	
Data Length	1
Suggested Data Array Formats	Sint16, Float
Data Item 1	
Measurement	Pressure (gauge)
Units	Pascals
Values Range	-32,768 .. 32,766
Invalid Value	32,767 (0x7FFF)
SNVT_privacyzone	
Data Length	3
Suggested Data Array Formats	Uint16, Float
Data Item 1	priv_zn_action
Measurement	privacyzone_t
Units	N/A
Values Range	0 .. 5
Invalid Value	255 (0xFF)(PZ_NUL)
Data Item 2	priv_zn_number
Measurement	Zone number
Units	Privacy zone number
Values Range	1 .. 255
Invalid Value	0
Data Item 3	priv_zn_camera_id
Measurement	Camera ID
Units	ID number
Values Range	1 .. 65,535
Invalid Value	0

SNVT_ptz	
Data Length	6
Suggested Data Array Formats	Float
Data Item 1	ptz_pan_dir
Measurement	pan_dir_t
Units	N/A
Values Range	0 .. 2
Invalid Value	255 (0xFF)(PAN_NUL)
Data Item 2	ptz_pan_speed
Measurement	Pan speed
Units	Percent of full level
Values Range	0.0 .. 100.0
Invalid Value	N/A
Data Item 3	ptz_tilt_dir
Measurement	tilt_dir_t
Units	N/A
Values Range	0 .. 2
Invalid Value	255 (0xFF)(TILT_NUL)
Data Item 4	ptz_tilt_speed
Measurement	Tilt speed
Units	Percent of full level
Values Range	0.0 .. 100.0
Invalid Value	N/A
Data Item 5	ptz_zoom
Measurement	zoom_t
Units	N/A
Values Range	0 .. 2
Invalid Value	255 (0xFF)(ZOOM_NUL)
Data Item 6	ptz_zoom_speed
Measurement	Zoom speed
Units	Percent of full level
Values Range	0.0 .. 100.0
Invalid Value	N/A
SNVT_pump_sensor	
Data Length	13
Suggested Data Array Formats	Float
Data Item 1	pump_sn_rot_speed
Measurement	Frequency
Units	Hertz
Values Range	0 .. 6,553.4
Invalid Value	N/A
Data Item 2	pump_sn_body_temp
Measurement	Body temperature
Units	Degrees celcius
Values Range	-274.0 .. 6,279.4
Invalid Value	N/A
Data Item 3	pump_sn_mot_ext_temp
Measurement	Motor external temperature
Units	Degrees celcius
Values Range	-274.0 .. 6,279.4
Invalid Value	N/A
Data Item 4	pump_sn_mot_int_temp
Measurement	Motor internal temperature

Units	Degrees celcius
Values Range	-274.0 .. 6,279.4
Invalid Value	N/A
Data Item 5	pump_sn_mot_overload
Measurement	Boolean
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 6	pump_sn_oil_low
Measurement	Boolean
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 7	pump_sn_ph_imbal
Measurement	Boolean
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 8	pump_sn_curr_use
Measurement	Electric current usage
Units	Ampere
Values Range	-3,276.8 .. 3,276.6
Invalid Value	N/A
Data Item 9	pump_sn_pwr_usage
Measurement	Power usage
Units	Kilowatts
Values Range	0 .. 6,553.4
Invalid Value	N/A
Data Item 10	pump_sn_temp_ctrl
Measurement	unit_temp_t
Units	N/A
Values Range	0 .. 3
Invalid Value	255 (0xFF)(TEMP_NUL)
Data Item 11	pump_sn_em_brake_act
Measurement	Boolean
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 12	pump_sn_fric_brk_act
Measurement	Boolean
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 13	pump_sn_gas_brk_act
Measurement	Boolean
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)

SNVT_pumpset_mn	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	pset_main_pump
Measurement	motor_state_t
Units	N/A
Values Range	0 .. 7
Invalid Value	255 (0xFF)(MOTOR_NUL)
Data Item 2	pset_booster_pump
Measurement	motor_state_t
Units	N/A
Values Range	0 .. 7
Invalid Value	255 (0xFF)(MOTOR_NUL)
Data Item 3	pset_prio_level
Measurement	priority_level_t
Units	N/A
Values Range	0 .. 11
Invalid Value	255 (0xFF)(PR_NUL)
Data Item 4	pset_process_ready
Measurement	oolean_t
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 5	pset_emerg_stop
Measurement	oolean_t
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 6	pset_main_pumpd_ena
Measurement	oolean_t
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 7	pset_boost_pumpd_ena
Measurement	oolean_t
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 8	pset_maint_req
Measurement	oolean_t
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)

SNVT_pumpset_sn	
Data Length	14
Suggested Data Array Formats	Float
Data Item 1	pset_sn_dil_flow
Measurement	Total Dilution Flow Volume
Units	Milliliters per second
Values Range	0 .. 65,534
Invalid Value	N/A
Data Item 2	pset_sn_exh_temp
Measurement	Exhaust Temperature
Units	Degrees Celcius
Values Range	-274.0 .. 6,279.4
Invalid Value	N/A
Data Item 3	pset_sn_exh_press
Measurement	Exhaust Pressure
Units	Kilo-pascals
Values Range	-3,276.8 .. 3,276.6
Invalid Value	N/A
Data Item 4	pset_sn_seal_press
Measurement	Shaft seal purge pressure
Units	Kilo-pascals
Values Range	-3,276.8 .. 3,276.6
Invalid Value	N/A
Data Item 5	pset_sn_inlet_vacuum
Measurement	Inlet vacuum pressure
Units	Kilo-pascals
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A
Data Item 6	pset_sn_supply_volts
Measurement	Supply voltage
Units	Volts
Values Range	-3,276.8 .. 3,276.6
Invalid Value	N/A
Data Item 7	pset_sn_cool_flow
Measurement	Total coolant flow
Units	Milliliters per second
Values Range	0 .. 65,534
Invalid Value	N/A
Data Item 8	pset_sn_cool_fl_low
Measurement	Boolean
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 9	pset_sn_dil_active
Measurement	Boolean
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 10	pset_sn_bal_dil_act
Measurement	Boolean
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)

Data Item 11	pset_sn_inl_p_dil_act
Measurement	Boolean
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 12	pset_sn_exh_dil_act
Measurement	Boolean
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 13	pset_sn_dil_fl_oor
Measurement	Boolean
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
Data Item 14	pset_sn_pwr_sup_on
Measurement	Boolean
Units	Bit
Values Range	0, 1
Invalid Value	255 (0xFF)(BOOL_NUL)
SNVT_pwr_fact	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Power Factor
Units	Multiplier
Values Range	-1.00000 .. 1.00000
Invalid Value	N/A
SNVT_pwr_fact_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Power Factor
Units	N/A
Values Range	-1 .. 1
Invalid Value	N/A

SNVT_reg_val	
Data Length	3
Suggested Data Array Formats	Sint32
Data Item 1	reg_val_value
Measurement	Raw value
Units	Defined by unit field
Values Range	-2,147,483,638 .. 2,147,483,647
Invalid Value	N/A
Data Item 2	reg_val_unit
Measurement	reg_val_unit_t
Units	N/A
Values Range	0 .. 43
Invalid Value	255 (0xFF)(RVU_NUL)
Data Item 3	reg_val_decimals
Measurement	Decimal Place
Units	Digits to Right of Decimal Point
Values Range	0 ..7
Invalid Value	N/A

SNVT_reg_val_ts	
Data Length	9
Suggested Data Array Formats	Sint32
Data Item 1	reg_val_ts_raw
Measurement	Raw Value
Units	
Values Range	-2,147,483,648 .. 2,147,483,647
Invalid Value	N/A
Data Item 2	reg_val_ts_unit
Measurement	reg_val_unit_t
Units	N/A
Values Range	0 .. 43
Invalid Value	255 (0xFF)(RVU_NUL)
Data Item 3	reg_val_ts_bits
Measurement	See SNVT tables
Units	See SNVT tables
Values Range	0 .. 255
Invalid Value	N/A
Data Item 4	reg_val_ts_year
Measurement	Year
Units	Year
Values Range	0 .. 300
Invalid Value	N/A
Data Item 5	reg_val_ts_month
Measurement	Month
Units	Month of Year
Values Range	0 .. 12
Invalid Value	N/A
Data Item 6	reg_val_ts_day
Measurement	Day
Units	Day of Month
Values Range	0 .. 31
Invalid Value	N/A
Data Item 7	reg_val_ts_hour
Measurement	Hour
Units	Hour of day
Values Range	0 .. 23
Invalid Value	N/A
Data Item 8	reg_val_ts_min
Measurement	Minutes
Units	Minute of Hour
Values Range	0 .. 59
Invalid Value	N/A
Data Item 9	reg_val_ts_secs
Measurement	Second
Units	Second of minute
Values Range	0 .. 59
Invalid Value	N/A

SNVT_res	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Electrical Resistance
Units	Ohms
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_res_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Electrical Resistance
Units	Ohms
Values Range	0 .. 3.40282E38
Invalid Value	N/A
SNVT_res_kilo	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Electrical Resistance
Units	KiloOhms
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_rpm	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Angular Velocity
Units	Revolutions per Minute (RPM)
Values Range	0 .. 65,534
Invalid Value	65,535 (0xFFFF)
SNVT_scene	
Data Length	2
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	Function
Measurement	Scene_t
Units	N/A
Values Range	0 .. 23
Invalid Value	255 (0xFF)(SC_NUL)
Data Item 2	Scene_Number
Measurement	Scene Number
Units	Scene Number
Values Range	1 .. 255
Invalid Value	N/A

SNVT_scene_cfg	
Data Length	7
Suggested Data Array Formats	Float
Data Item 1	scn_cfg_func
Measurement	scene_config_t
Units	N/A
Values Range	0 .. 4
Invalid Value	255 (0xFF)(SCF_NUL)
Data Item 2	scn_cfg_scene
Measurement	Scene Number
Units	Scene Number
Values Range	1 .. 255
Invalid Value	N/A
Data Item 3	scn_cfg_setting
Measurement	Scene Setting Level
Units	Percent of Full Level
Values Range	0 .. 100.0
Invalid Value	N/A
Data Item 4	scn_cfg_rotation
Measurement	Scene Rotation Angle
Units	Degrees
Values Range	-359.98 .. 360.00
Invalid Value	Raw: 32,767 (0x7FFF) Type: 655.34
Data Item 5	scn_cfg_fade_tim
Measurement	Scene Fade Time
Units	Seconds
Values Range	0.0 to 6,553.4
Invalid Value	Raw: 65,535 (0xFFFF) Type: 6553.5
Data Item 6	scn_cfg_dly_tim
Measurement	Scene Delay Time
Units	Seconds
Values Range	0.0 to 6,553.4
Invalid Value	Raw: 65,535 (0xFFFF) Type: 6553.5
Data Item 7	scn_cfg_scn_proi
Measurement	Scene Priority
Units	Priority Value
Values Range	0 .. 255
Invalid Value	N/A

SNVT_setting	
Data Length	3
Suggested Data Array Formats	Float
Data Item 1	setting_function
Measurement	setting_t
Units	N/A
Values Range	0 .. 5
Invalid Value	255 (0xFF)(SET_NUL)
Data Item 2	setting_setting
Measurement	Scene Setting Level
Units	Percent of Full Level
Values Range	0 .. 100.0
Invalid Value	N/A
Data Item 3	setting_rotation
Measurement	Rotation Angle
Units	Degrees
Values Range	-359.98 .. 360.00
Invalid Value	Raw: (0x7FFF) 32,767 Type: 655.34
SNVT_smo_obscur	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Smoke Obscuration
Units	Percent Obscuration
Values Range	0.000 .. 5.000
Invalid Value	N/A
SNVT_sound_db	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Sound Level
Units	Decibels
Values Range	-327.68 .. 327.67
Invalid Value	N/A
SNVT_sound_db_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Sound Level
Units	Decibels from Sound Pressure Level
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A
SNVT_speed	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Linear Velocity
Units	Meters per Second
Values Range	0 .. 6,553.5
Invalid Value	N/A

SNVT_speed_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Speed
Units	Meters per Second
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A
SNVT_speed_mil	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Linear Velocity
Units	Millimeters per Second
Values Range	0 .. 65.535
Invalid Value	N/A
SNVT_state	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	16 state bits
Units	Bits
Values Range	0 .. 65,535
Invalid Value	N/A
SNVT_state_64	
Data Length	4
Suggested Data Array Formats	Packed_Bit, Uint16, Float
Data Item 1	state_64_word0
Measurement	Boolean
Units	Bit
Values Range	0, 1 per bit (16 bits in word)
Invalid Value	N/A
Data Item 2	state_64_word1
Measurement	Boolean
Units	Bit
Values Range	0, 1 per bit (16 bits in word)
Invalid Value	N/A
Data Item 3	state_64_word2
Measurement	Boolean
Units	Bit
Values Range	0, 1 per bit (16 bits in word)
Invalid Value	N/A
Data Item 4	state_64_word3
Measurement	Boolean
Units	Bit
Values Range	0, 1 per bit (16 bits in word)
Invalid Value	N/A

SNVT_str_asc	
Data Length	31
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1 – 31	ascii00, ascii01, .. ascii30
Measurement	Character String
Units	N/A
Values Range	0 .. 255
Invalid Value	N/A
SNVT_str_int	
Data Length	16
Suggested Data Array Formats	Uint16, Float
Data Item 1	char_set
Measurement	Locale Code
Units	N/A
Values Range	0 .. 255
Invalid Value	N/A
Data Item 2-16	wide_char00, .. wide_char14
Measurement	Wide-character string with NULL terminator
Units	N/A
Values Range	0 .. 65,535
Invalid Value	N/A
SNVT_switch	
Data Length	2
Suggested Data Array Formats	Float
Data Item 1	Value
Measurement	Value
Units	Percentage of full scale
Values Range	0 .. 100.0
Invalid Value	N/A
Data Item 2	State
Measurement	State
Units	N/A
Values Range	0 .. 1
Invalid Value	-1
SNVT_telcom	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	telcom_states_t
Units	N/A
Values Range	0 .. 20
Invalid Value	255 (0xFF)(TEL_NUL)
SNVT_temp	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Temperature
Units	Degrees Celsius
Values Range	-274.0 .. 6,279.5
Invalid Value	N/A

SNVT_temp_diff_p	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Temperature difference
Units	Degrees Celcius
Values Range	-327.68 .. 327.66
Invalid Value	Raw: 32,767 (0x7FFF) Type: 327.67
SNVT_temp_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Incremental Count
Units	Degrees Celcius
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A
SNVT_temp_p	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Temperature
Units	Degrees celsius
Values Range	-273.17 .. 327.66
Invalid Value	Type: 327.67 Raw: 32,767 (0x7FFF)
SNVT_temp_ror	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Temperature Rate of Change/Rise
Units	Degrees Celsius per Minute (°C/min)
Values Range	-16,384.0 .. 16,383.0
Invalid Value	Raw: 32,767 (0x7FFF) Type: 16,383.5

SNVT_temp_setpt	
Data Length	6
Suggested Data Array Formats	Float
Data Item 1	Occupied_cool
Measurement	Occupied Cooling Setpoint
Units	Degrees Celsius
Values Range	-273.17 .. 327.66
Invalid Value	Type: 327.67 Raw: 32,767 (0x7FFF)
Data Item 2	Standby_cool
Measurement	Standby Cooling Setpoint
Units	Degrees Celsius
Values Range	-273.17 .. 327.66
Invalid Value	Type: 327.67 Raw: 32,767 (0x7FFF)
Data Item 3	Unoccupied_cool
Measurement	Unoccupied Cooling Setpoint
Units	Degrees Celsius
Values Range	-273.17 .. 327.66
Invalid Value	Type: 327.67 Raw: 32,767 (0x7FFF)
Data Item 4	Occupied_heat
Measurement	Occupied Heating Setpoint
Units	Degrees Celsius
Values Range	-273.17 .. 327.66
Invalid Value	Type: 327.67 Raw: 32,767 (0x7FFF)
Data Item 5	Standby_heat
Measurement	Standby Heating Setpoint
Units	Degrees Celsius
Values Range	-273.17 .. 327.66
Invalid Value	Type: 327.67 Raw: 32,767 (0x7FFF)
Data Item 6	Unoccupied_heat
Measurement	Unoccupied Heating Setpoint
Units	Degrees Celsius
Values Range	-273.17 .. 327.66
Invalid Value	Type: 327.67 Raw: 32,767 (0x7FFF)
SNVT_therm_mode	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	therm_mode_t
Units	N/A
Values Range	0 .. 2
Invalid Value	255 (0xFF)(THERM_NUL)
SNVT_time_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Elapsed Time
Units	Seconds
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A

SNVT_time_hour	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Elapsed Time
Units	Hours
Values Range	0 .. 65,535
Invalid Value	N/A
SNVT_time_min	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Elapsed Time
Units	Minutes
Values Range	0 .. 65,535
Invalid Value	N/A
SNVT_time_sec	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Elapsed time
Units	Seconds
Values Range	0 .. 6,553.4
Invalid Value	65,535 (0xFFFF)

SNVT_time_stamp	
Data Length	6
Suggested Data Array Formats	Uint16, Float
Data Item 1	ts_year
Measurement	Year
Units	Year
Values Range	0 .. 3000
Invalid Value	65,535 (0xFFFF)
Data Item 2	ts_month
Measurement	Month
Units	Month of Year
Values Range	0 .. 12
Invalid Value	N/A
Data Item 3	ts_day
Measurement	Day
Units	Day of Month
Values Range	0 .. 31
Invalid Value	N/A
Data Item 4	ts_hour
Measurement	Hours
Units	Hours of Day
Values Range	0 .. 23
Invalid Value	N/A
Data Item 5	ts_minute
Measurement	Minutes
Units	Minute of Hour
Values Range	0 .. 59
Invalid Value	N/A
Data Item 6	ts_second
Measurement	Second
Units	Second of Minute
Values Range	0 .. 59
Invalid Value	N/A
SNVT_time_zone (only raw data supported)	
Data Length	15
Suggested Data Array Formats	Byte

SNVT_tod_event	
Data Length	3
Suggested Data Array Formats	Uint16, Float
Data Item 1	tod_cur_state
Measurement	occup_t
Units	N/A
Values Range	0 .. 3
Invalid Value	255 (0xFF)(OC_NUL)
Data Item 2	tod_nxt_state
Measurement	occup_t
Units	N/A
Values Range	0 .. 3
Invalid Value	255 (0xFF)(OC_NUL)
Data Item 3	tod_tm_to_nxt
Measurement	Time to Next State
Units	Minute of Hour
Values Range	0 .. 65,535
Invalid Value	N/A
SNVT_trans_table	
Data Length	8
Suggested Data Array Formats	Float
Data Item 1-7	tr_point00, ..tr_point06
Measurement	Axis-points Array
Units	N/A
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A
Data Item 8	interp_methods
Measurement	interp_t
Units	N/A
Values Range	0 .. 65,535
Invalid Value	N/A
SNVT_turbidity	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Turbidity
Units	Nephelometric Turbidity Units (NTU)
Values Range	0 .. 65.534
Invalid Value	65,535 (0xFFFF)
SNVT_turbidity_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Turbidity
Units	Nephelometric Turbidity Units (NTU)
Values Range	0 .. 3.40282E38
Invalid Value	N/A

SNVT_valve_mode	
Data Length	1
Suggested Data Array Formats	Byte, Uint16, Float
Data Item 1	
Measurement	valve_mode_t
Units	N/A
Values Range	0 .. 7
Invalid Value	255 (0xFF)(VALVE_NUL)
SNVT_vol	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Volume
Units	Liters
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_vol_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Volume
Units	Liters
Values Range	0 .. 3.40282E38
Invalid Value	N/A
SNVT_vol_kilo	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Volume
Units	Kiloliters (kl)
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_vol_mil	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Volume
Units	Milliliters
Values Range	0 .. 6,553.5
Invalid Value	N/A
SNVT_volt	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Electric Voltage
Units	Volts
Values Range	-3,276.8 ... 3,276.7
Invalid Value	N/A

SNVT_volt_ac	
Data Length	1
Suggested Data Array Formats	Uint16, Float
Data Item 1	
Measurement	Electric Voltage
Units	Volts, Alternating Current (VAC)
Values Range	0 .. 65,534
Invalid Value	65,535 (0xFFFF)
SNVT_volt_dbmv	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Electric Voltage
Units	Decibels-milliVolts, Direct Current
Values Range	-3,276.8 .. 3,276.7
Invalid Value	N/A
SNVT_volt_f	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Electric Voltage
Units	Volts
Values Range	-3.40282E38 .. 3.40282E38
Invalid Value	N/A
SNVT_volt_kilo	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Electric Voltage
Units	Kilovolts
Values Range	-3,276.8 .. 3,276.7
Invalid Value	N/A
SNVT_volt_mil	
Data Length	1
Suggested Data Array Formats	Float
Data Item 1	
Measurement	Electric Voltage
Units	Millivolts
Values Range	-3,276.8 .. 3,276.7
Invalid Value	N/A
SNVT_zerospan	
Data Length	2
Suggested Data Array Formats	Float
Data Item 1	zero
Measurement	Zero-term
Units	Percent (%) or Parts-per-Million (ppm)
Values Range	-163.840 .. 163.835
Invalid Value	N/A
Data Item 2	span
Measurement	Span-factor
Units	Percent (%) or Parts-per-Million (ppm)
Values Range	0 .. 32.7675
Invalid Value	N/A

Appendix A.4. Using UNVTs

UNVT's are User-defined Network Variable Types and are defined in the configuration file by filling the SNVT_Type field with "UNVT_FST" or "Not SNVT". The UNVT's size in bytes should also be added to the UNVT_Byte_Length field and the UNVT's type number in the UNVT_ID field. Valid UNVT_IDs range from 146 to 255 and 0. The UNVT_ID value will be substituted with the default value of 0 if the field is left empty.

Appendix A.5. Using NV_Min_Value, NV_Max_Value Fields

The NV_Min_Value, NV_Max_Value functionality were added to stop the propagation of 'out of bounds' network variables across a LonWorks network. NV values higher than assigned by the NV_Max_Value field or lower than assigned by NV_Min_Value field will not be sent out on the network or copied to their relevant Data Arrays. If one or both of these fields are not assigned values, limit checking will not be performed on that particular field. This functionality applies only to SNVT's of either Floating point or Integer formats.

One or both of these fields can be linked to a configuration network variable update input in order to create an interoperable configuration property. For further information refer to Appendix A.13

Appendix A.6. Sending Network Variable Updates in Throttling Mode

When the Lon_Function field specifies a Throttling Mode Client Map Descriptor the NV_Delta_Value, Min_Scan_Time and Max_Scan_Time fields *all* need to be assigned values.

When operating in Throttling Mode, a Network Variable's value will be sampled at the Min_Scan_Time period. If the value differs by an amount greater than or equal to that specified by the NV_Delta_Value field from the previously transmitted value, the NV update will be transmitted. Otherwise an NV update will be only sent if the time since the last update is greater than or equal to the Max_Scan_Time field value.

This functionality applies only to SNVT's of either Floating point or Integer formats.

Appendix A.7. Using SNVT_Index

The SNVT_Index field must be specified for all explicitly addressed Client Map Descriptors. Explicitly addressed Client Map Descriptors use this field to index their relevant Map Descriptors on the Server side. For implicitly addressed Client Map Descriptors and all Server side Map Descriptors the driver will assign an index to each one, starting from 0 and incrementing to 4095, in the order they appear in the configuration file.

Appendix A.8. Domain Table Setup

To be able to communicate with other nodes on the LonWorks network, the FieldServer must have its domain, subnet and node IDs set. The FieldServer has the option of writing its domain table at start-up or leaving it for management by network management tools. In

other words, the user is able to set the FieldServer's domain, subnet and node id without the help of a network management tool. This feature is enabled in the configuration file by filling out the Title and System_Address fields of the FieldServer parameters as follows:

FieldServer	
System_Station_Address,	Title
[node_id],	“:D[domain_id]:S[subnet_id]:[Title continued...]”

The Title field must start with “:D”, followed by the domain_id in hexadecimal notation, followed by “:S”, followed by the subnet_id in hexadecimal notation and enclosed by “:”. The domain length is automatically determined by the number of digits in the [domain_id] field. With 2 hexadecimal digits constituting 1 byte, “:D123456:” for example would have a length of 3.

Once the domain table has been set, the “:Dxx:Sxx:” part of the Title field will be removed. Now the Title field will be left with [Title continued...] which may be the Node self-documentation string or any title.

Appendix A.9. Using LonMaker to commission the FieldServer

- Ensure that the correct firmware and latest configuration is loaded on the FieldServer (Each change in the FieldServer requires re-commissioning of the FieldServer in LonMaker)
- Ensure that the FieldServer and the LonMaker machine are on the same network.
- Open the existing Network in LonMaker, or create a new Network
- Click on “Create New Network” and follow the network wizard, making the following selections:
 - Network Interface: Choose Network Attached
 - Management Mode: Choose Onnet unless you are working offline
 - Register Plug-ins required. None
- Once Visio is open with the Network showing, drag a new device onto the drawing from the toolbox.
- Follow the Device Network, making the following selections
 - Enter Device Name: Choose commission device
 - Specify Device Template: Choose upload from device
 - Specify Device Channel: Choose Auto Detect
 - Specify Device Properties: Leave as is (Ping is optional)
 - Identify Device: Choose service pin
 - Device Application Image: Leave unchecked
 - Initial State: Leave as is
- Press the service pin on the FieldServer when asked to do so, and the FieldServer will be commissioned.
- Drag a new function block onto the drawing from the toolbox. Give the function block a name and ensure that it is allocated to the FieldServer device.
- Once the function block is on the drawing, you can drag input and output variables onto the function block. When you do this, LonMaker will show you the variables available for binding. Click on the variables you require (or use the select all option), and they will be commissioned onto the function block.
- You are now ready to connect these variables to other devices by dragging connections from the toolbox and connecting the variables.

Appendix A.10. Note for Trane Rover Users.

Use Trane Rover Service Pack 4 when commissioning the FieldServer. This does not ship from Trane by default and may have to be requested from the local Trane representative.

When using Pre-Service Pack 4 software, you will be able to see the FieldServer in Rover, but none of the FieldServer variables will be available for binding even though they are present. Service Pack 4 has been tested to ensure that the variables show and the bindings work well.

Appendix A.11. Configuring a Network without LonMaker Binding (Explicit Addressing)

All the Servers and their Clients need to be on the same domain to be able to communicate. See Appendix A.8 for further information.

If LonWorks device's Node ID is not known, it may be read using a utility program like NodeUtil or using a LonWorks Analyzer. All the Client Node CSV files need to have their Subnet_ID and Node_ID parameters set to point to their respective Server Subnet and Node ID values (see Node_ID in section 4.4).

Once the FieldServers are restarted the network should function correctly.

Appendix A.12. External Interface File (XIF) generation

After start-up the FieldServer creates a XIF (version 4.0) according to the configuration loaded. This file is called fServer.xif and can be uploaded from the FieldServer using the RuiNet utility.

The FieldServer's XIF file is internally generated by the LonWorks driver using the information contained in the FieldServer's configuration file (CONFIG.CSV). It is not possible to download an externally created XIF file using NodeUtil or LonMaker®. It is also not possible to download any type of externally created network variables default values file. The FieldServer's configuration can be changed by uploading and editing the CONFIG.CSV file, and therefore the XIF file must be obtained by uploading it from the FieldServer. Remember that this XIF file will change whenever the configuration file has been changed, downloaded and the FieldServer restarted.

Appendix A.13. Linking Configuration Properties with Configuration Network Variables

Configuration properties are implemented on the FieldServer using configuration network variables. Configuration network variables take the form of update inputs in order to be updated as well as read by a network management tool. Each configuration network variable will have its own Map Descriptor. Since the data carried by a network variable is intended as a configuration property for other already declared non-configuration network variable(s), no Data Array needs to be assigned to its Map Descriptor.

Configuration properties can be declared to belong to the entire node, to an object(s) or to a network variable(s). This declaration defines the *scope* of the configuration property. Configuration properties that belong to an object shall be declared as a part of the object and not declared as a part of the node. Similarly a configuration property that is associated with a specific network variable(s) shall be declared as belonging to the network variable(s) and not the object or the node.

A configuration property's type and responsible Map Descriptor(s) are declared by the configuration network variable's self-documentation string as follows:

For linking to the entire node:

"&0,,0\x80,[SCPT Index]"

Example: "&0,,0\x80,20"

For linking to object(s):

"&1,[Object Index(s)],0\x80,[SCPT Index]"

Example: "&1,0.2.3,0\x80,23"

For linking to network variable(s):

"&2,[NV Index(s)],0\x80,[SCPT Index]"

Example: "&2,0.1.2.4.7,0\x80,20"

Where [SCPT Index] must be substituted by the relevant SCPT Index value from the following table. [Object Index(s)] is a list of LonMark object index(s) separated by points, while [NV Index(s)] is a list of network variable(s) separated by points.

CONFIGURATION PROPERTY	STANDARD CONFIGURATION PARAMETER (SCPT'S)	TYPE	EQUIVALENT SNVT	SCPT INDEX
RANGE, MAXIMUM	SCPTMAXRNGE		SNVT_XXX	20
RANGE, MINIMUM	SCPTMINRNGE		SNVT_XXX	23

Further examples of configuration network variables are presented in Appendix A.14

Appendix A.14. Creating a LonMark Object

For more information on filling out the Node Self-Documentation String as well as the relevant Network Variable Self-Documentation Strings in order to create a LonMark Object please consult the following documentation from the LonMark Interoperability Association at www.lonmark.org

Understanding LonMark Self-Documentation
 LonMark Application Layer Interoperability Guidelines

The two examples given below will show how LonMark Objects can be assigned in FieldServer configuration files:

The first example uses the standard Open Loop Sensor Object (Type 1) to create a Water Temperature Sensor that will send out its current status via Network Variable Updates. A typical recipient of these updates is given by example #2 which uses the LonMark Open Loop Actuator Object (Type 3) to create a Water Heating Element object that will interpret the Network Variable it receives and adjust power to its heating element accordingly.

LonMark Config file Example #1 – Open Loop “Water Temperature” Sensor:

```
// Client Side Map Descriptors
```

Map_Descriptors	Map_Descriptor_Name,	Data_Array_Name,	Data_Array_Offset,	Lon_Function,	Function,	Node_Name,	SNVT_Index,	SNVT_Type,	Nv_Min_Value,	Nv_Max_Value,	Nv_Selfdoc_text
nvoTemp,	DA_FI_01,	0,	NVUOIMC,	WRBC,	LON_1,	-,	SNVT_Temp_f,	-,	-,	-,	"@01;WaterTemp"
NviTempMin,	-,	-,	CFG_NVUI,	Server,	LON_1,	-,	SNVT_Temp_f,	10,	-,	-,	"&2,0,0\x80,23"
NviTempMax,	-,	-,	CFG_NVUI,	Server,	LON_1,	-,	SNVT_Temp_f,	-,	300,	-,	"&2,0,0\x80,20"

The Node Self-Documentation String defines one LonMark object of type 1 – Open Loop Sensor.

These two configuration network variables will be linked to the first Map Descriptor declared. The NV_Min_Value and NV_Max_Value fields define the defaults for these CP's. These defaults are loaded by the FieldServer after a restart only when re-commissioning is required.

The object index is 0 and this Map Descriptor defines the 1st Network Variable of the object.

LonMark Config file Example #2 – “Water Heating Element” Actuator:

```
// Client Side Map Descriptors
```

Map_Descriptors	Map_Descriptor_Name,	Data_Array_Name,	Data_Array_Offset,	Lon_Function,	Function,	Node_Name,	SNVT_Index,	SNVT_Type,	Nv_Min_Value,	Nv_Max_Value,	Nv_Selfdoc_text
nvoTemp,	DA_FI_01,	0,	NVUOIMC,	WRBC,	LON_1,	-,	SNVT_Temp_f,	-,	-,	-,	"@01;WaterTemp"
NviTempMin,	-,	-,	CFG_NVUI,	Server,	LON_1,	-,	SNVT_Temp_f,	10,	-,	-,	"&2,0,0\x80,23"
NviTempMax,	-,	-,	CFG_NVUI,	Server,	LON_1,	-,	SNVT_Temp_f,	-,	300,	-,	"&2,0,0\x80,20"

The Node Self-Documentation String defines one LonMark object of type 3 – Open Loop Actuator.

These two configuration network variables will be linked to the first Map Descriptor declared. The NV_Min_Value and NV_Max_Value fields define the defaults for these CP's. These defaults are loaded by the FieldServer after a restart only when re-commissioning is required.

The object index is 0 and this Map Descriptor defines the 1st Network Variable of the object.

Appendix A.15. Combining explicitly addressed and bound network variables

To ensure undisturbed communication between the network management tool and the FieldServer during the commissioning, binding or monitoring processes, the timeouts of the explicitly addressed variables (Map Descriptors) might need to be set to values lower than the message timeouts used by the network management tool (LonMaker for Windows).

LonWorks FieldServer Performance

No	Description	Min	Typ	Max	Units
1	FieldServer startup time with 4096 network variables	-	6.5	-	Minutes
2	Time to commission FieldServer with 4096 network variables	-	-	40	Minutes
3	Time to complete a network variable updFieldServersbetween two FieldServers (acknowledged service)	-	40	-	Milli-seconds
4	Time to complete a networkFieldServersoll message between two FieldServers (request/response service)	-	125	-	Milli-seconds
5	Time to complete a network manageFieldServers variable fetch message between two FieldServers (request/response service)	-	125	-	Milli-seconds

Appendix A.16. Node Status Operation

When binding network variables on the FieldServer, the node status will be on-line before binding as well as after un-binding network variables. A node will go off-line only when a bound network variable of that node goes off-line (e.g. is disconnected).

Appendix A.17. Network Management Fetch Function

Normally one would use a NVPIEXC to perform the polling (RDBC) function if required, but it has the limitation that data can only move in one direction (Server to Client). The added functionality of a Write-through was added to the network management fetch command (NMFETCHC) to provide movement of data back to the polled node. This means that should the data in the Data Array linked to a NMFETCHC Map Descriptor change by another process, that the data will be propagated to the polled node by means of a network variable update.

Another useful feature of the NMFETCHC function is that it can perform reads to any other type of node function (NVUI, CFG_NVUI, NVUOEXX, NVPIIMC, etc.) This means that even Client Map Descriptors can be read this way.

Network management fetch requests received on polled nodes are handled differently from normal NV Poll requests. The response to a NV Poll will contain valid data. Data is valid if the node that is the source of the data is online and if this data is not too old. The data in the response to a network management fetch will not be checked for validity, however, it will simply respond with the current data in the Data Array.

Appendix A.18. Service types currently supported for network variable messages

Currently the service type for network variable update messages is fixed to acknowledged service. Request-response service is used for network variable poll and network management fetch messages.

Appendix A.19. Spaces in Network Variable Names

Due to the difficulties encountered with spaces and other 'illegal' characters used in network variable names (Map Descriptor names), the driver will automatically replace all spaces and illegal characters in names with underscores at startup. Illegal characters differ according to the Network Management Software being used. The correct rule set for illegal characters will be selected by the connection_type connection parameter.

The following characters are illegal for the stated Connection_Types:

- **LonMaker®**, LonWatcher, None - Whitespace
- Circon_SI – Whitespace, %, -

In addition, the maximum number of Network Variables under Circon_SI is limited to 255 per node.

Appendix A.20. SNVT_Option Field

This field can be used to isolate a specific record within a complex SNVT. Appendix A.21 and Appendix A.3 show which SNVTs are currently attributed with SNVT_Option capabilities.

Appendix A.21. SNVT_Units Field

The measurement units of a SNVT is fixed as far as it is transported across the LonWorks network, but by the setting of the SNVT_Units field it is possible to specify how the data is made available in Data Arrays. For example SNVT_temp_f is always transported across the LonWorks network as degrees Celsius, but by setting the SNVT_Units field to Deg_F the measurement units of the Map Descriptor's data will be set to degrees Fahrenheit. The following table shows which SNVT's currently have SNVT_Units capabilities.

Note: In the table below **bold** marks the default setting except for ***bold italics***, which take precedence as the default if the point is mapped to a floating point Data Array.

SNVT_Type	SNVT_Option	SNVT_Units	Length	Measurement Units
SNVT_press_f	N/A	Inch_H2O	1	Inches of water
SNVT_press_p	N/A	Inch_H2O	1	Inches of water
SNVT_temp	N/A	Raw	1	Raw, unadjusted data
		Deg_C	1	Degrees Celsius (°C)
		Deg_F	1	Degrees Fahrenheit (°F)
SNVT_temp_f	N/A	Deg_C	1	Degrees Celsius (°C)
		Deg_F	1	Degrees Fahrenheit (°F)
SNVT_temp_p	N/A	Raw	1	Raw, unadjusted data
		Deg_C	1	Degrees Celsius (°C)
		Deg_F	1	Degrees Fahrenheit (°F)
SNVT_switch	All	Raw	2	Raw, unadjusted data
	Value	Raw	1	Raw, unadjusted data
		Percent	1	Percent (%)
	State	Raw	1	Raw, unadjusted data
SNVT_temp_setpt	All	Raw	12	Raw, unadjusted data
		Deg_C	6	Degrees Celsius (°C)
		Deg_F	6	Degrees Fahrenheit (°F)
	Occupied_cool	Raw	1	Raw, unadjusted data
		Deg_C	1	Degrees Celsius (°C)
		Deg_F	1	Degrees Fahrenheit (°F)
	Standby_cool	Raw	1	Raw, unadjusted data
		Deg_C	1	Degrees Celsius (°C)
		Deg_F	1	Degrees Fahrenheit (°F)
	Unoccupied_cool	Raw	1	Raw, unadjusted data
		Deg_C	1	Degrees Celsius (°C)
		Deg_F	1	Degrees Fahrenheit (°F)
	Occupied_heat	Raw	1	Raw, unadjusted data
		Deg_C	1	Degrees Celsius (°C)
		Deg_F	1	Degrees Fahrenheit (°F)
	Standby_heat	Raw	1	Raw, unadjusted data
		Deg_C	1	Degrees Celsius (°C)
		Deg_F	1	Degrees Fahrenheit (°F)
	Unoccupied_heat	Raw	1	Raw, unadjusted data
		Deg_C	1	Degrees Celsius (°C)
		Deg_F	1	Degrees Fahrenheit (°F)

Appendix B. Troubleshooting Tips

Appendix B.1. Debugging a LonWorks connection: Hints and tips

- To test connections, put your configuration tool into a mode that will display service requests, and then push the button on the FieldServer. A request should appear.
- In order for variables to appear as outputs, they need to be declared as write variables in the FieldServer. Declaring the Map Descriptor functions as WRBC, or WRBX can do this. See Appendix A.1 for more information.
- If the domain and Subnet ID are defined in the configuration file of the FieldServer, these values will be used when power is cycled to the FieldServer. If the values set here are different to what the Network Manager has set up for the FieldServer for clients using implicit addressing, the FieldServer will stop communicating. In this case either change these settings or remove them from the configuration file completely and recommission the FieldServer.

Appendix B.2. Error Message Lonlive.c 121

If the following error message is returned:

```
DRIVER-> LON : Error, timeout while waiting for Lon I/F to reset!----- Configuration Error -----
```

It is possible that the FieldServer hardware in use may not support LonWorks, or the firmware loaded contains LonWorks but is the wrong firmware for the application. Remove LonWorks from the configuration or get new firmware/hardware.
