SIEMENS
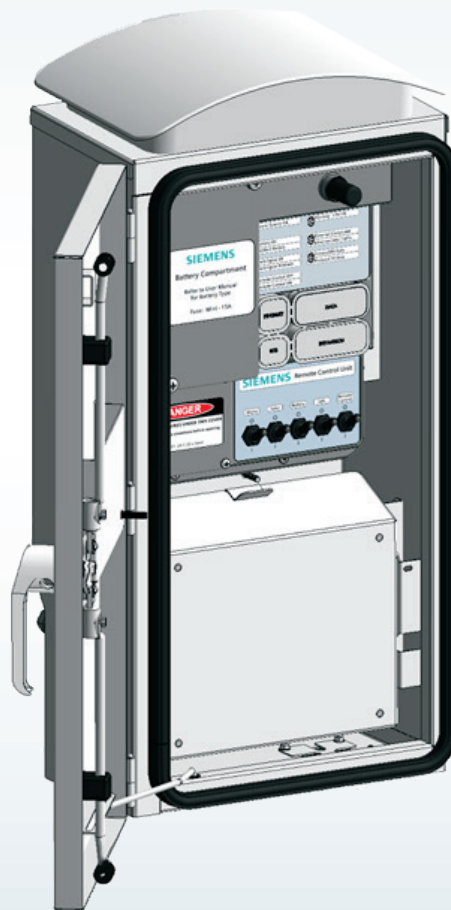
Instruction manual

Type 3AD8 remote control unit (RCU) DNP3 protocol instructions

Installation operation maintenance IC1000-F320-A200-X-4A00

Answers for infrastructure and cities.

	Hazardous voltages.
	Will cause death, serious injury or property damage.
	Always de-energize and ground the equipment before maintenance. Read and understand this instruction manual before using equipment. Maintenance should be performed only by qualified personnel. The use of unauthorized parts in the repair of the equipment or tampering by unqualified personnel will result in dangerous conditions which will cause death, severe injury or equipment damage. Follow all safety instructions contained herein.

Important

The information contained herein is general in nature and not intended for specific application purposes. It does not relieve the user of responsibility to use sound practices in application, installation, operation and maintenance of the equipment purchased. Siemens reserves the right to make changes in the specifications shown herein or to make improvements at any time without notice or obligation. Should a conflict arise between the general information contained in this publication and the contents of drawings or supplementary material or both, the latter shall take precedence.

Qualified person

For the purpose of this manual a **qualified person** is one who is familiar with the installation, construction or operation of the equipment and the hazards involved. In addition, this person has the following qualifications:

- **Is trained and authorized** to de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.

- **Is trained** in the proper care and use of protective equipment, such as: rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.

- **Is trained** in rendering first aid.

Further, a qualified person shall also be familiar with the proper use of special precautionary techniques, personal protective equipment, insulation and shielding materials, and insulated tools and test equipment. Such persons are permitted to work within limited approach of exposed live parts operating at 50 volts or more, and shall, at a minimum, be additionally trained in all of the following:

- The skills and techniques necessary to distinguish exposed energized parts from other parts of electric equipment

- The skills and techniques necessary to determine the nominal voltage of exposed live parts

- The approach distances specified in NFPA 70E® and the corresponding voltages to which the qualified person will be exposed

- The decision-making process necessary to determine the degree and extent of the hazard and the personal protective equipment and job planning necessary to perform the task safely.

Note:

These instructions do not purport to cover all details or variations in equipment, or to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens sales office.

The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens Industry, Inc. The warranty contained in the contract between the parties is the sole warranty of Siemens Industry, Inc. Any statements contained herein do not create new warranties or modify the existing warranty.

Table of contents

Abbreviations

DNP3	Distributed network protocol
PC	Personal computer
PID	Point identity (analog PID or digital PID)
PTT	Push-to-talk
RCU	Remote control unit
SCADA	Supervisory control and data acquisition
UTC	Universal time coordinated

Introduction

Introduction

The purpose of the remote control unit (RCU) is to provide remote SCADA system access to monitor and control Siemens Fusesavers installed on power lines. The RCU maintains an internal database, which holds information on the Fusesaver line being monitored and on the RCU itself. It is this data that is available to the SCADA system. The internal database is detailed in this manual, refer to RCU internal database and controls section beginning on page 15. It is usual for a utility to retrieve only a subset of the data available in the database; this is called point mapping.

The SCADA system accesses the RCU internal database with a SCADA protocol and a long-range radio or modem. Different SCADA protocols have different capabilities and methodologies. This manual deals with the DNP3 protocol over the RCU serial data connection.

The RCU implements the slave DNP3 protocol using industry standard libraries provided by Triangle Microworks, Inc.

A subset level of the DNP3 protocol is supported, which is defined in the DNP3 profile document RCU_DNP3_Profile_Rxx.xml and is provided separately to this manual. The profile is a formatted document determined by the DNP3 committee.

This manual provides additional information so the user can fully understand the implementation of the DNP3 protocol on this equipment, how the RCU internal database is mapped into the serial DNP3 protocol, and the configuration options available to the user.

The manual also deals with the settings for the radio power supply and radio serial data interface. The target reader of this manual is already familiar with DNP3 and the user's SCADA system.

Format and aim of the operating instructions

These operating instructions apply for the Siemens RCU.

The purpose of this instruction manual is to assist the user in configuring the DNP3 protocol to work with the user's SCADA system.

In written or verbal communications, please provide the complete description from the operating instructions, quote the serial number, and use only the designations and key numbers for sub-parts used in these locations.

Contact the nearest Siemens representative if any additional information is desired.

Safety instructions

The RCU, together with the accessories and special tools also supplied, is in conformity with the statutory laws, rules, and standards applicable at the time of delivery, especially those regulations concerning health and safety.

Signal words

The signal words "danger," "warning" and "caution" used in this manual indicate the degree of hazard that may be encountered by the user. These words are defined as:

Danger - Indicates an imminently hazardous situation that, if not avoided, **will** result in death or serious injury.

Warning - Indicates a potentially hazardous situation that, if not avoided, **could** result in death or serious injury.

Caution - Indicates a potentially hazardous situation that, if not avoided, **may** result in minor or moderate injury.

Notice - Indicates a potentially hazardous situation that, if not avoided, **may** result in property damage.

Field service operation and warranty issues

Siemens can provide competent, well-trained field service representatives to provide technical guidance and advisory assistance for the installation, overhaul, repair and maintenance of Siemens equipment, processes and systems. Contact regional service centers, sales offices or the factory for details, or telephone Siemens field service at +1 (800) 347-6659 or +1 (919) 365-2200 outside the U.S.

Designated usage

The RCU is used to connect the Fusesaver pole-mounted circuit breaker into a utility SCADA system. Any other use is forbidden, unless the consent of Siemens has been obtained.

NOTICE

Changes to any part of the Remote Control Unit or its accessories, that are carried out by the user or others, and not previously agreed by Siemens, will void the warranty of the whole product.

Compatibility

This version of the DNP3 protocol manual is compatible with the following firmware and software versions:

Application	Applicable versions
RCU Firmware	100
Fusesaver Firmware	330-60
Communications module Firmware	1537-75

Table 1: Compatibility

DNP3 points and controls

Point mapping

RCU database digital and analog inputs can be configured to suit the SCADA master needs in a number of ways:

- RCU database points can be mapped to specific DNP3 point indices.

- RCU database points can be unmapped, in which case they will not appear in the DNP3 point indices and will not be available to the SCADA system.

- For mapped points, the DNP3 class can be set as described below.

Point mapping is especially useful when trying to reduce the bandwidth requirements over the SCADA network by removing points that are deemed unnecessary. This can be achieved by mapping all required points to contiguous DNP3 indices starting at index 0. Unwanted points can then be left unmapped (i.e., not mapped to any class), in which case they will not be returned by integrity poll or individual poll or will they generate unsolicited messages.

Note that all point configuration is carried out with the RCU Connect PC utility.

Class assignment

For all mapped points, the user can assign DNP3 class 0, 1, 2, 3 or "None."

Points with class "None" will not be returned in an integrity poll. However, these points can still be read by polling the specific data type/point index for that point.

The advantage of setting class "None" is that a point can still be scanned if required but will not cause use of bandwidth in integrity polls. The disadvantage is the potential fragmentation of integrity polls.

Contiguous DNP3 indices

A DNP3 integrity poll will return all DNP3 points that have been mapped to the RCU internal database and that have been assigned to class 0, 1, 2 or 3. If the DNP3 mapping has gaps in the sequence of indices caused either by an unmapped DNP3 index or by a mapped point being set to class "None," it will result in multiple DNP3 fragments being sent across the SCADA network. This problem can be avoided by mapping the class "None" points to the end of the DNP3 index.

Point mapping example 1

This is a typical DNP3 mapping for the RCU analog input points to reduce bandwidth requirements by excluding some points and keeping the DNP3 indices contiguous so that an integrity poll will return DNP3 indexes 0 to 13 in a single message. The points in grey are not mapped and cannot be read.

Figure 1: Point mapping example 1

Point mapping example 2

A similar mapping to above, but with unwanted points mapped and assigned to class "None" at the end of the DNP3 point index. The unwanted points will not generate events and will not be returned in a status poll, but can still be read by issuing a command to read that point or data type directly. This mapping will reduce the bandwidth requirements by the same amount as the previous example, but the unwanted points can still be read if necessary.

Figure 2: Point mapping example 2

Digital input point implementation

Digital points are DNP3 binary inputs (object group 1) and binary input events (object group 2).

Refer to the section on RCU internal database and controls beginning on page 15 to understand how the status, events and qualifiers for each point are generated.

Default input point mapping is DNP3 index = RCU digital PID.

Analog input point implementation

Analog points are DNP3 analog inputs (object group 30) and analog input events (object group 32) for points that generate events.

Refer to the section beginning on page 15 about RCU internal database and controls to understand how the status, events and qualifiers for each point are generated.

Default input point mapping is DNP3 index = RCU analog PID.

Object flags

DNP3 object flags are generated as shown in Table 2. Some object flags correspond to the internal data qualifiers set out in the section on RCU internal database and controls beginning on page 15.

Database object flags	
DNP3 object flag	Maps to
ONLINE	RCU qualifier online
RESTART	RCU qualifier restart
COMMS_LOST	RCU qualifier communications lost
REMOTE_FORCED	Always clear
LOCAL_FORCED	RCU qualifier overridden
CHATTER_FILTER	Always clear
ROLLOVER	Always clear
OVERRANGE	Always clear
DISCONTINUITY	Always clear
REFERENCE_ERROR	Always clear

Table 2: Object flags

DNP3 device attributes

Device attributes (object group 0) come from the RCU database string points defined in the RCU operating instructions (IC1000-F320-A198-X-XXXX).

Note that RCU string points are not supported in DNP3 in any other way.

DNP3 device attributes are mapped into RCU string points as given in Table 3.

DNP3 device attributes		
DNP3 device attribute	Mapping in RCU internal database	
	S_PID	Name
252: device manufacturer's name	0	RCU manufacturer's Name
250: device manufacturer's product name and model	1	RCU product name and model
246: user assigned ID code/number	2	Utility asset number (configurable)
245: user assigned location name	3	Name/location (configurable)
242: device manufacturer's software version	4	RCU software version

Table 3: DNP3 device attributes

Controls

Controls are provided for all the control points listed in the RCU operating instructions (IC1000-F320-A198-X-XXXX) as shown in the supported control options Table 4. No protocol mapping of controls is available, RCU control points (C_PIDs) map directly to DNP3 control point indices.

Pulse times are ignored on all controls.

Time set is mapped to object group 50.

Supported control options

The following options are supported for the RCU and Fusesaver controls.

No controls can be cancelled when running.

No event class is assigned to the controls.

Refer to RCU Operating Instructions (IC1000-F320-A198-X-XXXX) for full description of the control.

When supported, trip, pulse off and latch off commands may be used interchangeably to perform the same control.

When supported, close, pulse on and latch on commands may be used interchangeably to perform the same control.

Table 4: Supported control options

DNP3 point index	RCU control point (C_PID)	Control name	Supported control options								
			Select/ operate	Direct operate	Direct operate - no ack	Pulse on	Pulse off	Close	Trip	Latch on	Latch off
0	0	Clear protocol counters	Yes	Yes	Yes	Yes		Yes		Yes	
1	1	Trip/close ganged	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	2	Trip/close any	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	3	Phase A trip/close	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	4	Phase B trip/close	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	5	Phase C trip/close	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	6	RCU dummy control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	7	Fusesaver dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	8	RCU clear flags	Yes	Yes	Yes	Yes		Yes		Yes	
9	9	Set protection mode - normal	Yes	Yes	Yes	Yes		Yes		Yes	
10	10	Set protection mode - single shot	Yes	Yes	Yes	Yes		Yes		Yes	
11	11	Set protection mode - off	Yes	Yes	Yes	Yes		Yes		Yes	
12	12	Set remote mode - no reclose	Yes	Yes	Yes	Yes		Yes		Yes	
13	13	RCU reboot	Yes	Yes	Yes	Yes		Yes		Yes	
14	14	Set remote mode - fast	Yes	Yes	Yes	Yes		Yes		Yes	
15	15	Set/clear "protection off"	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
16	16	Set/clear "instantaneous protection" bit	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
17	17	Set/clear "no reclose protection bit"	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
18	18	RCU primary test mode	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Control response codes

Available response codes are given in Table 5, which shows which codes are supported and where appropriate details the RCU internal database response code utilized. Otherwise the response code is as per the DNP3 specification in IEEE Std. 1815-2012. Where the table shows that the response code is not supported, it means that this code is never returned to the master station.

Table 5: DNP3 control response codes

DNP3 control response codes		
DNP3 response code	Supported	Relevant RCU internal response code
SUCCESS	Yes	SUCCESS
TIMEOUT	Yes	
NO_SELECT	Yes	
FORMAT_ERROR	Yes	
NOT_SUPPORTED	Yes	
ALREADY_ACTIVE	Yes	ALREADY_ACTIVE
HARDWARE_ERROR	Yes	COMMS_LOST or NOT_CONFIGURED
LOCAL	Yes	REMOTE_CONTROL_OFF or IN_SESSION or LEVER_DOWN
TOO_MANY_OBJS	Yes	
NOT_AUTHORIZED	No	
AUTOMATION_INHIBIT	No	
PROCESSING_LIMITED	No	
OUT_OF_RANGE	No	
RESERVED	No	
NON_PARTICIPATING	Yes	
UNDEFINED	Yes	

DNP3 internal indicator bits

DNP3 internal indicator bits are set as follows:

- Config_corrupt is set by the RCU Configuration Error point D_PID 5

- Local_control is set by the RCU Remote Control Enabled point D_PID 101

- Device_trouble never gets set by RCU.

SCADA interface configuration

Configuration settings fall into three classes:

- Site-specific data that need to be changed on a per-site basis such as the DNP3 slave address.

- Those that must be set for correct operation, but which remain constant across all sites. An example might be the radio power supply voltage.

- Those that should be left as the default settings unless there is a need to change them. Examples are the more involved DNP3 library settings.

Standard RCU configurations for a utility are held in a configuration template file that Siemens will set up according to the user requirements defined in their RCU configuration specification form (KMS-3100).

The process to develop the template is as follows:

1. The user completes an RCU configuration specification form and returns to Siemens. This form contains all configuration settings required for the RCU and the communications protocol. The form also details which settings will be visible to the field user and which settings can be changed by the field user. Since most settings are fixed for a utility, they will usually be hidden from the field user.

2. Siemens creates the utility specific RCU configuration file and returns it to the user.

3. Using the RCU Connect utility, the user configures the protocol mapping (which points are to be sent to the SCADA system) and workshop tests the SCADA protocol with the RCU Probe PC utility to be certain that the RCU is working as expected with the SCADA system.

The user now has a "template" configuration file for the population of RCUs. Using this template makes site commissioning easier by minimizing the amount of site-specific data required.

This manual lists all the configuration settings that relate to the SCADA interface, including the radio power supply, the radio data interface and the DNP3 protocol. Other settings that relate to the Fusesaver site are detailed in the RCU operating instructions (IC1000-F320-A198-X-XXXX).

Table 6: Radio power supply settings

Radio power supply settings				
Name	Range/choice	Unit	Default	Description/comment
Radio/modem power supply	Off Battery Controlled supply		Off	Sets the power source for the radio or modem. Off - no power supply. Battery - power supply from the battery via a relay. Controlled supply - a voltage controlled supply is provided.
Radio supply voltage	3,000-9,000	mV	6,000 mV	Voltage when using controlled supply.
Radio average current	10-1,000	mA	100 mA	Enter the average current the installed radio will consume. This is required for reliable battery management when running from auxiliary power supply. This value is an estimate of: the receive current plus the transmit current x transmit duty cycle. Required accuracy is +/- 50%.
Radio reset time	1-255	10 minutes	2,550 minutes	This is a time-out setting in multiples of 10 minutes. If a protocol message has not been received for this time, then the radio will be powered off for 10 seconds and then powered on again. The purpose is to restart the radio periodically if there is no SCADA activity just in case the radio is the problem. Range is 1 to 255 giving 10 to 2,550 minutes.

Table 7: Radio/modem serial interface settings

Radio/modem serial interface settings				
Name	Range/choice	Unit	Default	Description/comment
Radio data interface type	RS232 signals Logic level signal (3-9 V)		RS232	Signals can be RS232 or logic level when logic level, voltage and Tx/Rx signal polarity can be configured.
Radio signal voltage	3,000-9,000	mV	5,000	This sets the radio signal voltage when using logic-level serial interface.
PTT enabled	On/off		Off	To enable PTT with pre-transmit and post-transmit times as below.
PTT pre-transmit time	0-100	100 ms	0	PTT output will be turned on for this time period before transmitting.
PTT post-transmit time	0-100	100 ms	0	PTT output will remain on for this time period after transmitting has stopped.
TTL Tx polarity	Normal/inverted		Normal	Normal TTL Tx polarity will have a logic high when idle. Start, stop and data bits will have standard polarity. Inverted TTL Tx polarity will have a logic low when idle. Start, stop and data bits will be inverted also.
TTL Rx polarity	Normal/inverted		Normal	Normal TTL Rx polarity will have a logic high when idle. Start, stop and data bits will have standard polarity. Inverted TTL Rx polarity will have a logic low when idle. Start, stop and data bits will be inverted also.
Data rate	1,200, 2,400, 4,800, 9.600, 19,200, 38,400, 57,600, 115,200	bps	115,200	
CTS handshaking support	Enabled/disabled		Disabled	When enabled, RCU serial transmission will only occur when the CTS input pin is asserted. When disabled, the CTS input pin is ignored.
RTS handshaking support	Enabled/disabled		Disabled	When enabled, the RCU RTS output pin will be de-asserted in request to stop receiving serial data (buffer full, unable to process more incoming data). When disabled, the RTS output pin is de-asserted.
Data bits	8 bits	Bits	8 bits	
Stop bits	1 or 2	Bits	1	
Parity enabled	Enabled/disabled		Disabled	
Parity	Odd or even		Odd	

Table 8: SCADA operation settings

SCADA operation settings				
Name	Range/choice	Unit	Default	Description/comment
SCADA protocol type	Serial DNP3		Serial DNP3	Select this option for serial DNP3.
Automatically clear fault flags	Yes No		Yes	There are several fault flags in the database (e.g., DPID 20, 21, 22 which indicate a cleared fault has occurred on the line). These flags can be cleared by the SCADA system operator with a reset control (CPID 8) and/or after a time-out. This setting determines if the fault flags will be cleared after a time-out: ▪ Yes, flags will be cleared by time-out. ▪ No, flags will not be cleared by time-out.
Automatically clear fault flags time-out	0-3,600	s	120	See above.
Always allow trip	True False		False	When this setting is false, SCADA controls to Fusesaver are rejected if the RCU remote control switch is off or a Fusesaver external lever is down. This setting allows a modification of this behavior so that SCADA trip controls can always be sent to Fusesavers. ▪ True: The RCU will issue the trip command to the Fusesaver to trip regardless of RCU remote control switch position and regardless of Fusesaver external lever position. The Fusesaver will trip regardless of policy file setting for manual inhibit (see Fusesaver operating instructions IC1000-F320-A170-XX-XXXX). ▪ False: If the RCU Remote Control switch is off or if the external lever of the Fusesaver is down, then the RCU will reject the trip command from the SCADA system. **Note:** This setting only modifies the handling of SCADA Fusesaver trip commands.

Table 9: Protocol point configuration

Protocol point configuration				
Name	Range/choice	Unit	Default	Description/comment
Line current deadband	1-100	0.1 A	20	This setting defines an amount by which the line current changes an event will be created and sent through the protocol to the SCADA control center.
Digital point mapping and class assignment			Default mapping is protocol database index = DNP3 index with all points assigned to class 1	The mapping and class assignment can be configured using the RCU Connect utility.
Analog point mapping and class assignment			Default mapping is protocol database index = DNP3 index with all points assigned to class 2	The mapping and class assignment can be configured using the RCU Connect utility.

Table 10: DNP3 configuration

DNP3 configuration				
Name	Range/choice	Unit	Default	Description/comment
RCU data link address	0-65,519	DNP3 address	1	RCU DNP3 address. This will normally be set on a per-site basis.
Master data link address	0-65,519	DNP3 address	2	Master station DNP3 address. This will normally be constant for a utility.
Disable group 32 variation 3	Yes No		Enabled	Disable if not supported by master.
Disable group 32 variation 4	Yes No		Enabled	Disable if not supported by master.
Self-address support enable	Yes No		No	Refer DNP3 specification in IEEE Std. 1815-2012.
Maximum data link retries	0-100		3	Refer DNP3 specification in IEEE Std. 1815-2012.
Application layer confirm time-out	1-7,200	s	30	Refer DNP3 specification in IEEE Std. 1815-2012.
Support unsolicited responses	Yes No		Yes	Refer DNP3 specification in IEEE Std. 1815-2012.
Enable unsolicited responses at start-up	Yes No		No	Refer DNP3 specification in IEEE Std. 1815-2012.
Unsolicited response confirmation time-out	100-65,535	ms	10,000	Refer DNP3 specification in IEEE Std. 1815-2012.
Number of unsolicited retries	0-65,535		3	Refer DNP3 specification in IEEE Std. 1815-2012.
Enable infinite unsolicited retries	Yes No		No	Refer DNP3 specification in IEEE Std. 1815-2012.
Enable class 1 event unsolicited responses at start-up	Yes No		No	Refer DNP3 specification in IEEE Std. 1815-2012.
Enable class 2 event unsolicited responses at start-up	Yes No		No	Refer DNP3 specification in IEEE Std. 1815-2012.
Enable class 3 event unsolicited response at start-up	Yes No		No	Refer DNP3 specification in IEEE Std. 1815-2012.
Class 1 events unsolicited response trigger	1-10		1	Refer DNP3 specification in IEEE Std. 1815-2012.
Class 2 events unsolicited response trigger	1-10		1	Refer DNP3 specification in IEEE Std. 1815-2012.
Class 3 events unsolicited response trigger	1-10		1	Refer DNP3 specification in IEEE Std. 1815-2012.
Class 1 event hold time	0-65,535	ms	60,000	Refer DNP3 specification in IEEE Std. 1815-2012.
Class 2 event hold time	0-65,535	ms	60,000	Refer DNP3 specification in IEEE Std. 1815-2012.
Class 3 event hold time	0-65,535	ms	60,000	Refer DNP3 specification in IEEE Std. 1815-2012.
Max time between select and operate	1-60	s	10	Refer DNP3 specification in IEEE Std. 1815-2012.

RCU internal database and controls

This section details the data and controls available in the RCU internal database.

Fusesaver data
Status data
Each Fusesaver has internal electronics executing protection, controlling the tripping and closing, measuring line current and so on. The Fusesaver electronics send Fusesaver status data every second to the RCU over a short-range radio using a communications module fitted to the underside of the Fusesaver. This data is called the live-data stream. The RCU uses this live data to update the RCU internal database so that this status data can be then sent to a SCADA master station.

Fusesaver time-tagged events
In addition to the live data, the Fusesaver generates time-tagged events such as "protection trip" or "line current on." These events are also sent over the short-range radio to the RCU and can be passed on to the SCADA master station as time-tagged events. In this case, the event time provided to the SCADA system is the time given by the Fusesaver (in other words the time which would be seen in the Fusesaver event log).

When retrieving time-tagged events from a Fusesaver, the RCU will discard events that:

- Occurred before the communications between Fusesaver and RCU were established, or

- Occur while communications between Fusesaver and RCU have failed.

RCU data
In addition to the data from the Fusesaver, the RCU itself generates status points in the database, such as door open or battery end of life. These points can also generate events available to the protocol to be sent to the SCADA system. In this case, the events will have a time tag from the RCU internal clock.

Data qualifiers
Data available in the RCU database may have one of the qualifiers described below. Refer to page 8 Table 2: Object flags for details of how the qualifiers are used by the DNP3 protocol. Changes to qualifiers will generate events which are tagged by RCU clock time.

Database qualifiers		
Item	Item	Description
1	Online	This qualifier indicates if a point has meaning for this site. When supported, this qualifier will be set: ■ True when the data point is configured to be active. ■ False when the data point is configured to be inactive (i.e., that phase is not configured) and therefore unable to obtain valid data. When not supported, this qualifier will be set true. Changes to this qualifier generate events tagged with RCU time.
2	Restart	This qualifier indicates if a point's data is not yet updated after a restart. When supported, this qualifier will be set: ■ True on restart. ■ False when data is updated. When not supported, this qualifier will be set false. Changes to this qualifier generate events tagged with Fusesaver or RCU time as detailed for that point.
3	Communications lost	This qualifier indicates if a point's data cannot be retrieved from a Fusesaver. When supported, this qualifier will be set: ■ True when no data is being received for this point due to a failure in communications (e.g., failed to communicate with Fusesaver). ■ False if data is being received for this point. ■ False on restart and only set to true if there is a failure to establish communications to the Fusesaver. When not supported, this qualifier will be set false. Changes to this qualifier generate events tagged with RCU time.
4	Overridden	This qualifier indicates that the data for the point has been overridden by a user and is not true data. Normally this will only occur during protocol testing. When supported, this qualifier will be set: ■ False on restart. ■ True when data is overridden. When not supported, this qualifier will be set false. Once a point has been overridden, the overridden qualifier will remain true until the RCU is restarted. Changes to this qualifier generate events tagged with RCU time.

Events are also generated by changes to point data; the time tag for data changes is detailed in the point list below.

When qualifier events are generated simultaneously with point data, they are merged as a single event with time tag set by point-data event.

Example of points from Fusesaver
A configured point that comes from a Fusesaver will have online set true and on restart of the RCU will have restart set true. When the RCU opens communications to the Fusesaver and gets data, the restart qualifier will be set to false and will stay false until a future restart. If after a restart the RCU cannot establish communications to the Fusesaver or if communications fails, then the communications lost qualifier will be set.

A point that comes from the Fusesaver but is not configured in this particular installation, such as a phase-B point in a single-phase installation that only has phase A, will have online set to false and restart set true and communications lost set false.

Example of point from RCU
A point such as "door open," which is always configured and always up-to-date, will always have online set true and restart set false and communications lost set false.

Digital point description

The list below defines the digital-input points in the RCU.

Digital points are identified by Digital_Point IDentity or D_PID.

The following data is given for each point.

- D_PID: the identifier for this point including a phase identifier if valid.
- Source: the source of the data, namely the RCU or the Fusesaver.
- The valid states, such as open/close
- The source of the event time tag (if the point generates events), which may be the RCU itself or the Fusesaver.
- How the status is determined.
- How events are determined.
- How the status is set on restart of the RCU.
- Data qualifiers which are supported for that point.

Some digital points behave like protection relay flags; they are set by a particular protection event.

These flag points can be cleared by the SCADA operator sending "Clear Flags" control.

They can also be set to be cleared automatically after the passing of a set time period, for example, one hour.

These points are:

Protection flags	
Digital point D_PID	Use
17, 18, 19	Indicates permanent fault on the line, which the Fusesaver could not clear
20, 21, 22	Indicates transient fault on the line, which was cleared by the Fusesaver
23, 24, 25	Indicates a fault current was detected but ended before the Fusesaver tripped. For example, a downstream transformer fuse may have cleared the fault.
54, 55, 56	Indicates a very short-lived current surge -possibly due to lightning activity.

Table 11: Protection flags

See Table 15: RCU database digital points list for a full list of all digital points available in pages 20-29.

Analog point description

The list below defines the analog-input points in the RCU.

Analog points are identified by Analog_Point Identity or A_PID.

The following data is given for each point:

- A_PID: the identifier for this point including nominating the relevant phase if valid.
- Source: the source of the data, namely the RCU or the Fusesaver.
- The engineering units, range and resolution.
- The source of the event time tag (if the point generates events), which may be the RCU itself or the Fusesaver.
- A description of the data.
- What happens on restart of the RCU.
- Data qualifiers, which are supported for that point.

See Table 16: RCU database analog points list for a full list of all analog points available in pages 30-32.

Events and deadbands

Some analog points generate events on change of value controlled by their deadband. Other points do not generate events on change of value, refer to Table 16: RCU database analog points list for Analog points on page 30.

As an example, DNP3 points can be configured to belong for class 1, 2 or 3, which will mean they will generate DNP3 protocol events if they have that capability or alternatively they may be set to class 0, which do not generate DNP3 protocol events.

Deadbands are fixed for most points (a deadband is the value by which a point must change in order for it to generate an event). However, the deadband can be configured for some points so that the utility can control the bandwidth used.

Fault current recording

Analog points 12-17 act as a record of the measured value of fault currents. For example, a fault might have been measured as 480 A peak on phase A. In this case A_PID 12 will be set to that value. These values are overwritten each time there is a new fault on that phase and will generate a new event. They are volatile and are cleared on RCU restart.

String point description

The RCU can return string data to a SCADA system if supported by the protocol. String data is usually data about the site, such as site name.

String points are identified by String_Point IDentity or S_PID. The following data is given for each point:

- S_PID: the identifier for this point including nominating the relevant phase if valid.

- Source: the source of the data, namely the RCU or the switchgear and how it is set up.

- A description of the data.

- What happens on restart of the RCU.

- Data qualifiers which are supported for that point.

Controls description

Controls are commands that can be sent by a protocol to operate Fusesavers or to affect the RCU (for example, to reset fault flags). The full list of available controls are listed in Table 12: Internal response codes.

Control points are identified by Control_Point IDentity or C_PID. The following data is given for each point:

- C_PID: The control point identifier.

- Target: This specifies what is controlled.

- Control type: This specifies what type of control is sent to the target.

When a control is received, it is accepted or rejected by the RCU. Table 12 describes the internal control response codes that may be associated with each control. One of these codes will be returned by the RCU as a response to a control request from the SCADA system, refer to Table 5: DNP3 control response codes on page 10.

Where multiple responses apply, the lowest numbered one will be reported.

Trip/close controls for Fusesaver are passed to the Fusesaver and take time to have an effect, at least 60 seconds and up to 120 seconds.

Some protocols may only be able to support limited types of control.

Controls to RCU, such as clear flags or counters, are always accepted. Controls to Fusesaver may be rejected depending on other conditions, such as communications to Fusesaver lost or remote control disabled.

Table 12: Internal response codes

	Code	Description
	Internal control response codes	
1	SUCCESS	Command request has been accepted and command has been initiated.
2	NOT_CONFIGURED	Request not accepted because the control target has not been configured (e.g., C phase not configured).
3	COMMS_LOST	Request not accepted because either the RCU is starting up and has not yet fully verified the Fusesaver, or at some later date has lost communications to the Fusesaver.
4	ALREADY_ACTIVE	Request not accepted because the control queue is full or the control is already active.
5	REMOTE_CONTROL_OFF	Request not accepted because remote switch is off.
6	IN_SESSION	Request not accepted because a Siemens Connect session is in progress and has control of the Fusesaver.
7	LEVER_DOWN	Request not accepted because the a Fusesaver external lever is in the down position.

Protection mode bits

A Fusesaver can be in one of five protection modes. Refer Fusesaver operations manual (IC1000-F320-X170-X-XXXX).

Controlling the protection in the Fusesaver are three bits, which are available in the database as digital points in Table 13.

Protection is operating normally when all the bits are clear.

When there is a change of protection mode (e.g., the mode is changed from Normal to Fast Single), the protection bits are changed as shown in Table 14.

In the database and controls available to the SCADA system, the RCU provides indication and control of both protection modes and protection bits.

In other words, when setting up the SCADA system the engineer can choose to control the protection bits directly (CPID 15, 16, 17) or by control of modes (CPID 9, 10, 11, 12, 14).

The choice between these two methods is wholly up to the user. Both methods give equivalent control of the Fusesaver protection; however, each may have its own advantages to the utility.

Control of protection modes is simple to implement and allows the user to easily restrict the choice for the operator to the two or three modes that are going to be used operationally (it is unlikely that a utility will want to use all the five available modes). Also, to change between modes, such as protection normal and protection fast single, requires only one command in mode control, but two commands in bit control (to change the auto-reclose bit and the instantaneous bit). Consequently, there is more room for operator error in controlling bits.

On the other hand, if the SCADA and other operators in the utility are familiar with changing protection on a bit-by-bit basis, then control of bits may be a better fit with existing practices compared to control of modes.

Protection mode bits			
Bit	DPID	State	Functionality in Fusesaver
Protection OFF	119, 120, 121	Set	Protection tripping inhibited
		Clear	Will trip on protection
Auto-reclose OFF	125, 126, 127	Set	Auto-reclose inhibited
		Clear	Will auto-reclose
Instantaneous trip	122, 123, 124	Set	Protection will trip at as soon as the pick-up current is exceeded
		Clear	Protection will trip as configured

Table 13: Protection mode bits

Protection mode/protection control bit relationship				
New mode		Protection OFF bit	Auto-reclose OFF bit	Instantaneous bit
Name	Indication DPID			
Protection OFF	80, 81, 82	Set	Not changed	Not changed
Normal	74, 75, 76	Clear	Clear	Clear
Normal single	98, 99, 100	Clear	Set	Clear
Fast	116, 117, 118	Clear	Clear	Set
Fast single	77, 78, 79	Clear	Set	Set

Table 14: Protection mode/protection control bit relationship

Finally, there is a further set of bits in the database, which show the remote set status of all the protection mode and protection bits. These are the points that are kept by the Fusesaver when the external lever is pulled down and will be re-instated when the external lever is returned up. These points may be of little interest to the SCADA operator for operational purposes, but they do indicate the protection that will be in force when the Fusesaver external lever is returned to the up position. The remote protection mode bits are DPID 65 to 73, 95 to 97, 113 to 115. It is recommended that these bits are not mapped unless they are of specific interest.

Digital points

Table 15: RCU database digital points list

D_PID	Phase	Name/states/source	Status/events/restart/qualifiers
		RCU database digital points list	
0		**RCU - Door open** **Source:** Remote control unit (RCU) **States:** Open/closed **Event time tag:** RCU time	**State:** Set when the door is open. Cleared when the door is closed. **Events:** Events generated by change of state above. **On restart:** Volatile - state updated on restart. No event generated when state is updated on restart. **Data qualifiers:** Override.
1		**RCU - Remote control on/off** **Source:** RCU **States:** On/off **Event time tag:** RCU time	**State:** Set when remote control switch on front panel is on. Cleared when remote control switch on front panel is off. **Events:** Events generated by change of state above. **On restart:** Volatile - state updated on restart. No event generated when state is updated on restart. **Data qualifiers:** Override.
2		**RCU - Battery needs to be replaced** **Source:** RCU **States:** Needs to be replaced/OK **Event time tag:** RCU time	**State:** Set when RCU battery needs to be replaced. Cleared when RCU battery is replaced. **Events:** Events generated by change of state above. **On restart:** Non-volatile - This state is non-volatile and is carried through a restart. **Data qualifiers:** Override.
3		**RCU - Source power on** **Source:** RCU **States:** Has power source/no power source **Event time tag:** RCU time	**State:** Set when RCU has a power source (auxiliary supply or solar). Cleared when the RCU has no power source. **Events:** Events generated by change of state above. **On restart:** Volatile - state updated on restart. **Data qualifiers:** Override.
4		**RCU - Solar panel problem** **Source:** RCU **States:** Solar panel OK/solar panel problem **Event time tag:** RCU time	**State:** Set when RCU is configured for solar operation and detects that the solar panel has not been supplying any voltage or has not been able to fully recharge the battery over a period of several days. Cleared when the solar panel does recharge battery or on RCU restart. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override.
5		**RCU - Configuration error** **Source:** Fusesavers all phases **States:** OK/configuration error **Event time tag:** RCU time	**State:** Set when there is a configuration error, which means there is a discrepancy between the configuration loaded into the RCU and Fusesaver on the line. Cleared when a valid configuration is detected. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, restart.
6		**Fusesaver unaccessible** **Source:** Fusesavers all phases **States:** Unaccessible/accessible **Event time tag:** RCU time	**State:** Set when the RCU is unable to access Fusesavers due to a Siemens Connect user on site having established an operating session with the Fusesavers. In this case, the RCU can report data but cannot make controls or retrieve events. This means that events will be delayed for the duration of the Siemens Connect session (but will still have the correct time tag when they are retrieved). Cleared when Siemens Connect session finishes. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override.

RCU database digital points list			
D_PID	Phase	Name/states/source	Status/events/restart/qualifiers
7		**RCU - Need time** **Source:** Remote control unit (RCU) **States:** Time OK/need time **Event time tag:** No events	**State:** Set on start-up and periodically every 24 hours thereafter. Cleared when time updated by SCADA protocol. **Events:** No events generated for this point. **On restart:** Volatile - state set on restart. **Data qualifiers:** Override.
8 9 10	A B C	**Communications module - Communications OK** **Source:** RCU **States:** OK/fail **Event time tag:** RCU time	**State:** Set when communications are ok to the Fusesaver. Cleared when communications are not ok to the Fusesaver. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart.
11 12 13	A B C	**Communications module - Battery low** **Source:** Fusesaver **States:** OK/low **Event time tag:** RCU time	**State:** Set when communications module battery has failed a battery test or is nearing exhaustion. Cleared when the communications module battery is ok. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
14 15 16	A B C	**Line - Current on** **Source:** Fusesaver **States:** Line current on/line current off **Event time tag:** Fusesaver	**State:** Set when Fusesaver line current is on. Cleared when Fusesaver current is off. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by Fusesaver line current on event. Cleared event generated by line current off event, protection trip event, manual trip event or three-phase lockout event. These events come from the Fusesaver event record. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
17 18 19	A B C	**Line - Permanent fault occurred** **Source:** Fusesaver **States:** –/permanent fault **Event time tag:** ■ Ongoing event Fusesaver ■ Off-going event RCU	**State:** Set when permanent fault event has been generated by the Fusesaver. Cleared by protection flag reset timer or by operator control. **Events:** Set event generated when a permanent fault event has been generated by the Fusesaver. Cleared event generated when state is cleared as above. Note that only the ongoing event is significant, the cleared event should be discarded by the SCADA system. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, communications lost.
20 21 22	A B C	**Line - Cleared fault occurred** **Source:** Fusesaver **States:** –/cleared fault **Event time tag:** ■ Ongoing event Fusesaver ■ Off-going event RCU	**State:** Set when cleared fault event has been generated by the Fusesaver. Cleared by protection flag reset timer or by operator control. **Events:** Set event generated when a cleared fault event has been generated by the Fusesaver. Cleared event generated when state is cleared as above. Note that only the ongoing event is significant, the cleared event should be discarded by the SCADA system. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, communications lost.
23 24 25	A B C	**Line - Detected fault occurred** **Source:** Fusesaver **States:** –/detected fault **Event time tag:** ■ Ongoing event Fusesaver ■ Off-going event RCU	**State:** Set when detected fault event has been generated by the Fusesaver. Cleared by protection flag reset timer or by operator control. **Events:** Set event generated when a detected fault event has been generated by the Fusesaver. Cleared event generated when state is cleared as above. Note that only the ongoing event is significant, the cleared event should be discarded by the SCADA system. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, communications lost.

RCU database digital points list			
D_PID	Phase	Name/states/source	Status/events/restart/qualifiers
26 27 28	A B C	**Fusesaver - Closed** **Source:** Fusesaver **States:** Open/closed **Event time tag:** Fusesaver	**State:** Set when Fusesaver is in closed state. Cleared when Fusesaver is open (tripped) state. This status data comes from the Fusesaver live-data stream. **Events:** Set event generated for Fusesaver auto-close event or manual-close event. Cleared event generated on Fusesaver protection-trip event, manual-trip event, or three-phase lockout event. These events come from the Fusesaver event record. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
29 30 31	A B C	**Fusesaver - Lever down** **Source:** Fusesaver **States:** Lever up/lever down **Event time tag:** Fusesaver	**State:** Set when Fusesaver's external lever is down. Cleared when Fusesaver's lever is up. This status data comes from the Fusesaver live-data stream. **Events:** Set event generated for Fusesaver external lever down event. Cleared event generated by Fusesaver external lever up event. No event generated on start-up/restart. These events come from the Fusesaver event record. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
32		**Fusesaver - Tribal fault** **Source:** Fusesavers **States:** Tribal fault/no tribal fault **Event time tag:** RCU time	**State:** Set when there is a problem with the communications among the Fusesavers, which is preventing them from forming a tribe so they can cooperate. The likely cause is one of the communications modules is faulty or removed from its Fusesaver. Cleared when there is no problem with the tribe. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost (set when communications is lost to all configured Fusesavers).
33 34 35	A B C	**Fusesaver - Protection trip** **Source:** Fusesaver **States:** –/protection trip occurred **Event time tag:** ■ Ongoing event Fusesaver ■ Off-going event RCU	**State:** Set when a protection trip event has been generated by the Fusesaver. Cleared by Fusesaver entering the closed state or automatic-close event or operator-close event. **Events:** Set event generated when a protection trip event has been generated by the Fusesaver. Cleared event generated when state is cleared as above. Note that only the ongoing event is significant, the cleared event should be discarded by the SCADA system. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, communications lost.
36 37 38	A B C	**Fusesaver - Three-phase lockout trip** **Source:** Fusesavers **States:** –/three-phase lockout occurred **Event time tag:** ■ Ongoing event Fusesaver ■ Off-going event RCU	**State:** Set when a three-phase lockout event has been generated by the Fusesaver. Cleared when Fusesaver enters the closed state or automatic-close event or operator-close event. **Events:** Set event generated when a three-phase lockout event has been generated by the Fusesaver. Cleared event generated when state is cleared as above. Note that only the ongoing event is significant, the cleared event should be discarded by the SCADA system. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, communications lost.
39 40 41	A B C	**Fusesaver - Operator trip** **Source:** Fusesaver **States:** –/operator trip occurred **Event time tag:** ■ Ongoing event Fusesaver ■ Off-going event RCU	**State:** Set when an operator trip event has been generated by the Fusesaver. Cleared by Fusesaver entering the closed state or automatic-close event or operator-close event. **Events:** Set event generated when an operator trip event has been generated by the Fusesaver. Cleared event generated when state is cleared as above. Note that only the ongoing event is significant, the cleared event should be discarded by the SCADA system. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, communications lost.

RCU database digital points list			
D_PID	Phase	Name/states/source	Status/events/restart/qualifiers
42 43 44	A B C	**Fusesaver - Automatic close** **Source:** Fusesaver **States:** –/automatic close occurred **Event time tag:** ■ Ongoing event Fusesaver ■ Off-going event Fusesaver	**State:** Set when an auto-close event has been generated by the Fusesaver. Cleared by Fusesaver entering the open state or operator trip event, protection trip event, three-phase lockout event, or backfeed block trip event. **Events:** Set event generated when auto-close event has been generated by the Fusesaver. Cleared event generated when state is cleared as above. Note the ongoing event is significant, the cleared event should be discarded by the SCADA system. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, communications lost.
45 46 47	A B C	**Fusesaver - Operator close** **Source:** Fusesaver **States:** –/operator close occurred **Event time tag:** ■ Ongoing event Fusesaver ■ Off-going event Fusesaver	**State:** Set when an operator close event has been generated by the Fusesaver. Cleared by Fusesaver entering the open state or operator trip event, protection trip event, three-phase lockout event, or backfeed block trip event. **Events:** Set event generated when operator-close event has been generated by the Fusesaver. Cleared event generated when state is cleared as above. Note the ongoing event is significant, the cleared event should be discarded by the SCADA system. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, communications lost.
48 49 50	A B C	**Fusesaver - VI worn out** **Source:** Fusesaver **States:** Ok/worn out **Event time tag:** RCU time	**State:** Set when Fusesaver VI life is worn out. For a particular Fusesaver, this can only happen once and will never be reset. When the Fusesaver is replaced, the bit will be cleared. This status data comes from the Fusesaver live-data stream. **Events:** Ongoing event generated from change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
51 52 53	A B C	**Fusesaver - Mechanism fault** **Source:** Fusesaver **States:** Ok/faulty **Event time tag:** Fusesaver	**State:** Set when Fusesaver has failed to trip or close properly (i.e., a mechanism fault). Cleared when Fusesaver does trip or close properly. This status data comes from the Fusesaver live-data stream. **Events:** Set event generated by Fusesaver failure to operate event. Cleared event generated by Fusesaver actuator ok event. These events come from the Fusesaver event record. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
54 55 56	A B C	**Fusesaver - Surge detected** **Source:** Fusesaver **States:** –/surge detected occurred **Event time tag:** ■ Ongoing event Fusesaver ■ Off-going event RCU	**State:** Set when a surge-detected event has been registered by the Fusesaver. Cleared by protection flag reset timer or by operator control. **Events:** Set event generated when a surge-detected event has been generated by the Fusesaver. Cleared event generated when state is cleared as above. Note that only the ongoing event is significant, the cleared event should be discarded by the SCADA system. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, communications lost.
57		**RCU - Dummy point** **Source:** Remote control unit (RCU) **States:** On/off **Event time tag:** RCU time	**State:** This is a dummy point controlled by the RCU dummy control (C_PID 6) and is used for test purposes. The point is set and cleared by the RCU dummy control. No physical control takes place. **Events:** Events generated by change of state above. **On restart:** Clear on restart. **Data qualifiers:** Override.

RCU database digital points list			
D_PID	Phase	Name/states/source	Status/events/restart/qualifiers
58 59 60	A B C	**Fusesaver - Dummy point** **Source:** Fusesaver **States:** Set/clear **Event time tag:** RCU time	**State:** This is a dummy point controlled by the Fusesaver dummy control (C_PID 7) and is used for test purposes. The point is set and cleared by the Fusesaver dummy control on all configured phases. The control is received by the remote control unit (RCU) and relayed to the Fusesavers. Once received, the Fusesaver changes the dummy point. No physical control takes place. **Events:** Set event generated by Fusesaver dummy point set event. Cleared event generated by Fusesaver dummy point clear event. These events come from the Fusesaver event record. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
61 62 63	A B C	**Fusesaver - Protection running** **Source:** Fusesaver **States:** Protection not running/protection running **Event time tag:** RCU time **Note:** these points are essentially internal Fusesaver operation and do not normally need to be used by SCADA system for operational purposes.	**State:** Set when Fusesaver protection running, which means that it will trip on faults. Cleared when Fusesaver protection is not running (i.e., because the capacitors are charging or the external lever is down). This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
64		**RCU - Battery on** **Source:** RCU **States:** Battery off/battery on **Event time tag:** RCU time	**State:** This point indicates that the battery is detected. For this to be true, the battery must be connected and the battery switch will be on. **Events:** Events generated by change of state above. **On restart:** Volatile - state updated on restart. **Data qualifiers:** Override.
65 66 67	A B C	**Fusesaver - Remote protection mode - normal** **Source:** Fusesaver **States:** –/remote protection mode normal **Event time tag:** RCU time	**State:** Set when Fusesaver remote protection mode is set to normal. Cleared when Fusesaver protection mode is set to normal single, fast, fast single or off. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
68 69 70	A B C	**Fusesaver - Remote protection mode - fast single** **Source:** Fusesaver **States:** –/remote protection mode fast single **Event time tag:** RCU time	**State:** Set when Fusesaver remote protection mode is set to fast single. Cleared when Fusesaver protection mode is set to normal, normal single, fast or off. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
71 72 73	A B C	**Fusesaver - Remote protection mode - off** **Source:** Fusesaver **States:** –/remote protection mode off **Event time tag:** RCU time	**State:** Set when Fusesaver remote protection mode is set to off. Cleared when Fusesaver protection mode is set to normal, normal single, fast or fast single. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
74 75 76	A B C	**Fusesaver - In force protection mode - normal** **Source:** Fusesaver **States:** –/in force protection mode in force **Event time tag:** RCU time	**State:** Set when Fusesaver in force protection mode is set to normal. Cleared when Fusesaver in force protection mode is set to off, normal single, fast or fast single. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.

RCU database digital points list			
D_PID	Phase	Name/states/source	Status/events/restart/qualifiers
77 78 79	A B C	**Fusesaver - In force protection mode - fast single** **Source:** Fusesaver **States:** –/protection mode in force fast single **Event time tag:** Remote control unit (RCU) time	**State:** Set when Fusesaver in force protection mode is set to fast single. Cleared when Fusesaver in force protection mode is set to normal, normal single, fast or off. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
80 81 82	A B C	**Fusesaver - In force protection mode - off** **Source:** Fusesaver **States:** –/protection mode in force off **Event time tag:** RCU time	**State:** Set when Fusesaver in force protection mode is set to off. Cleared when Fusesaver in force protection mode is set to normal, normal single, fast or fast single. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
83 84 85	A B C	**Fusesaver - Tribe running** **Source:** Fusesaver **States:** Tribe not running/tribe running **Event time tag:** Events not generated. **Note:** These points are essentially internal Fusesaver operation and do not normally need to be used by SCADA system for operational purpose.	**State:** Set when Fusesaver tribe is running. Cleared when Fusesaver tribe is not running. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
86 87 88	A B C	**Fusesaver - Charged capacitors** **Source:** Fusesaver **States:** Capacitors not charged/capacitors charged **Event time tag:** Events not generated. **Note:** These points are essentially internal Fusesaver operation and do not normally need to be used by SCADA system for operational purpose.	**State:** Set when the Fusesaver capacitors are charged. Cleared when Fusesaver capacitors are not charged. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
89 90 91	A B C	**Fusesaver - Trip pending** **Source:** Fusesaver **States:** Trip not pending/trip pending **Event time tag:** RCU time	**State:** Set when the Fusesaver has a trip control pending. Cleared when the Fusesaver has no trip control pending. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
92 93 94	A B C	**Fusesaver - Close pending** **Source:** Fusesaver **States:** Close not pending/close pending **Event time tag:** RCU time	**State:** Set when the Fusesaver has a close control pending. Cleared when the Fusesaver has no close control pending. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
95 96 97	A B C	**Fusesaver - Remote protection mode - normal single** **Source:** Fusesaver **States:** –/remote protection mode normal single **Event time tag:** RCU time	**State:** Set when Fusesaver remote protection mode is set to normal single. Cleared when Fusesaver remote protection mode is set to normal, fast, fast single or off. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.

RCU database digital points list			
D_PID	Phase	Name/states/source	Status/events/restart/qualifiers
98 99 100	A B C	**Fusesaver - In force protection mode - normal single** **Source:** Fusesaver **States:** –/protection mode in force normal single **Event time tag:** Remote control unit (RCU) time	**State:** Set when Fusesaver in force protection mode is set to normal single. Cleared when Fusesaver in force protection mode is set to normal, fast, fast single or off. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
101		**RCU - Remote control enabled** **Source:** RCU **States:** Disabled/enabled **Event time tag:** RCU time	**State:** Set when remote controls to the Fusesavers are enabled. Cleared when remote controls to the Fusesavers are disabled. Remote controls are disabled if the remote control switch is off, if any Fusesaver has its lever down, if Siemens Connect is in session with any Fusesaver or if the RCU is updating new time to the Fusesavers. **Events:** Events generated by change of state above. **On restart:** Volatile - state updated on restart. **Data qualifiers:** Override.
102		**RCU - Remote control panel on** **Source:** RCU **States:** On/off **Event time tag:** RCU time	**State:** Set when the Fusesaver control panel is on. Cleared when the Fusesaver control panel is off. The Fusesaver control panel may be switched on by pressing the on/off switch, it may be switched off with the on/off switch or by closing the RCU door. **Events:** Events generated by change of state above. **On restart:** Volatile - state updated on restart. **Data qualifiers:** Override, online.
103 104 105	A B C	**RCU - Sending phase control** **Source:** RCU **States:** Sending control/not sending control **Event time tag:** RCU time	**State:** Set when the RCU is in the process of sending a control to a specific phase Fusesaver. Cleared when the RCU is not sending a control to a specific phase Fusesaver. **Events:** Events generated by change of state above. **On restart:** Volatile - state updated on restart. **Data qualifiers:** Override, online.
106		**RCU - Sending line control** **Source:** RCU **States:** Control in progress/control not in progress **Event time tag:** RCU time	**State:** Set when the RCU is in the process of sending a control to all the Fusesaver phases configured in the line. Cleared when the RCU is not sending a control to all Fusesaver phases configured in the line. **Events:** Events generated by change of state above. **On restart:** Volatile - state updated on restart. **Data qualifiers:** Override, online.
107 108 109	A B C	**RCU - Fusesaver control panel controls enabled** **Source:** RCU **States:** Fusesaver control panel controls enabled/Fusesaver control panel controls disabled **Event time tag:** RCU time	**State:** Set when the Fusesaver control panel controls are enabled for a specific phase in a line. Cleared when the Fusesaver control panel controls are not enabled for a specific phase in a line. Phase controls are enabled when Fusesaver control panel controls are allowed (refer to item 111 on page 27) and the enable control button has been pressed (if present). The phase controls can be disabled by pressing the enable control button, by time-out or when Fusesaver control panel controls are not allowed (refer to item 111 on page 27). If the panel type is one which does not have enable controls button, then the button is assumed to be on. **Events:** Events generated by change of state above. **On restart:** Volatile - state updated on restart. **Data qualifiers:** Override, online.

RCU database digital points list			
D_PID	Phase	Name/states/source	Status/events/restart/qualifiers
110		**RCU - Fusesaver control panel line controls enabled** **Source:** Remote control unit (RCU) **States:** Fusesaver control panel line controls enabled/Fusesaver control panel line controls disabled **Event time tag:** RCU time	**State:** Set when the Fusesaver control panel controls are enabled for a line. Cleared when the Fusesaver control panel controls are not enabled for a line. Line controls are enabled when Fusesaver control panel controls are allowed (refer to item 111 below) and the enable control button has been pressed (if present). The line controls can be disabled by pressing the enable control button, by time-out or when Fusesaver control panel controls are not allowed (refer to item 111 below). If the panel type is one which does not have enable controls button, then the button is assumed to be on. **Events:** Events generated by change of state above. **On restart:** Volatile - state updated on restart. **Data qualifiers:** Override, online.
111		**RCU - Fusesaver control panel controls allowed** **Source:** RCU **States:** Fusesaver control panel line controls allowed/Fusesaver control panel line controls not allowed **Event time tag:** RCU time	**State:** Set when the Fusesaver control panel controls are allowed for a line. Cleared when the Fusesaver control panel controls are not allowed for a line. Fusesaver control panel controls are allowed if Fusesaver external levers and the RCU switch are in the correct position, the Fusesavers are not being controlled by Siemens Connect and the RCU is not in the process of updated the Fusesaver time. **Events:** Events generated by change of state above. **On restart:** Volatile - state updated on restart. **Data qualifiers:** Override, online.
112		**RCU - Fusesaver control panel present** **Source:** RCU **States:** Fusesaver control panel present/ Fusesaver control panel not present **Event time tag:** RCU time	**State:** Set when the RCU detects that a known Fusesaver control panel is connected. Cleared when the RCU cannot detect a known Fusesaver control panel. **Events:** Events generated by change of state above. **On restart:** Volatile - state updated on restart. **Data qualifiers:** Override, online.
113 114 115	A B C	**Fusesaver - Remote protection mode - fast** **Source:** Fusesaver **States:** –/remote protection mode fast **Event time tag:** RCU time	**State:** Set when Fusesaver remote protection mode is set to fast. Cleared when Fusesaver remote protection mode is set to normal, normal single, fast single or off. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
116 117 118	A B C	**Fusesaver - In force protection mode - fast** **Source:** Fusesaver **States:** –/protection mode in force fast **Event time tag:** RCU time	**State:** Set when Fusesaver in force protection mode is set to fast. Cleared when Fusesaver in force protection mode is set to normal, normal single, fast single or off. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
119 120 121	A B C	**Fusesaver - Remote protection bit - protection off** **Source:** Fusesaver **States:** –/remote protection bit protection off **Event time tag:** RCU time	**State:** Set when Fusesaver remote protection bit protection off mode is set. Cleared when Fusesaver remote protection bit protection off is cleared. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.

RCU database digital points list			
D_PID	Phase	Name/states/source	Status/events/restart/qualifiers
122 123 124	A B C	**Fusesaver - Remote protection bit - instantaneous** **Source:** Fusesaver **States:** –/remote protection bit instantaneous **Event time tag:** Remote control unit (RCU) time	**State:** Set when Fusesaver remote protection bit instantaneous mode is set. Cleared when Fusesaver remote protection bit instantaneous is cleared. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
125 126 127	A B C	**Fusesaver - Remote protection bit - no reclose** **Source:** Fusesaver **States:** –/remote protection bit no reclose **Event time tag:** RCU time	**State:** Set when Fusesaver remote protection bit no reclose mode is set. Cleared when Fusesaver remote protection bit no reclose is cleared. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state set on restart. **Data qualifiers:** Override, online, restart, communications lost.
128 129 130	A B C	**Fusesaver - In force protection bit - protection off** **Source:** Fusesaver **States:** –/protection bit in force protection off **Event time tag:** RCU time	**State:** Set when Fusesaver in force protection bits have protection off set. Cleared when Fusesaver in force protection bits have protection off cleared. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state set on restart. **Data qualifiers:** Override, online, restart, communications lost.
131 132 133	A B C	**Fusesaver - In force protection bit - instantaneous** **Source:** Fusesaver **States:** –/protection bit in force instantaneous **Event time tag:** RCU time	**State:** Set when Fusesaver in force protection bits have instantaneous set. Cleared when Fusesaver in force protection bits have instantaneous cleared. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state set on restart. **Data qualifiers:** Override, online, restart, communications lost.
134 135 136	A B C	**Fusesaver - In force protection bit - no reclose** **Source:** Fusesaver **States:** –/protection bit in force no reclose **Event time tag:** RCU time	**State:** Set when Fusesaver in force protection bits have no reclose set. Cleared when Fusesaver in force protection bits have no reclose cleared. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state set on restart. **Data qualifiers:** Override, online, restart, communications lost.
137		**RCU - Excessive cleared faults** **Source:** RCU **States:** Cleared faults excessive/clear faults not excessive **Event time tag:** RCU time	**State:** Set when the RCU processes a specified number of cleared fault events within a specified sliding time window. State is cleared by protection flag reset timer or by operator control. **Events:** Set event generated when a specified number of cleared fault events have been generated by the Fusesaver within the specified sliding time window. Cleared event generated when state is cleared as above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override.
138		**RCU - Primary test mode** **Source:** RCU **States:** In/out **Event time tag:** RCU time	**State:** Controlled by C_PID 18 which can set or clear the point. When set, the RCU primary test mode is in. When clear, the RCU primary test mode is out. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override.

RCU database digital points list			
D_PID	Phase	Name/states/source	Status/events/restart/qualifiers
139 140 141	A B C	**Fusesaver - Remote forced protection armed** **Source:** Fusesaver **States:** Remote forced protection armed/ remote forced protection not armed **Event time tag:** Fusesaver	**State:** Set when Fusesaver forced protection arming is on due to a control from an remote control unit (RCU). Cleared when Fusesaver forced protection arming has been turned off by a control from an RCU or when the forced protection arming time-out has elapsed. This status data comes from the Fusesaver live-data stream. **Events:** Set event generated by Fusesaver remote forced protection arming on event. Cleared event generated by Fusesaver remote forced protection arming off event. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.
142 143 144	A B C	**Fusesaver - Backfeed block trip** **Source:** Fusesaver **States:** –/Backfeed block trip occurred **Event time tag:** ■ Ongoing event Fusesaver ■ Off-going event RCU	**State:** Set when backfeed block trip event has been generated by the Fusesaver. Cleared by Fusesaver entering the closed state or automatic close event or operator close event. **Events:** Set event generated when a backfeed block trip event has been generated by the Fusesaver. Cleared event generated when state is cleared as above. Note that only the on-going event is significant, the cleared event should be discarded by the SCADA system. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, communications lost.
145 146 147	A B C	**Fusesaver - Forced protection armed** **Source:** Fusesaver **States:** Forced protection armed/forced protection not armed **Event time tag:** RCU	**State:** Set when Fusesaver forced protection arming is on due to the Fusesaver external lever being down or when remote forced protection has been armed. Cleared when Fusesaver forced protection arming is not armed and forced protection arming is not on due to external lever being down. This status data comes from the Fusesaver live-data stream. **Events:** Events generated by change of state above. **On restart:** Volatile - state clear on restart. **Data qualifiers:** Override, online, restart, communications lost.

Analog points

Table 16: RCU database analog points list

RCU database analog points list		
A_PID	Phase	Name/source/engineering units/ resolution/time tag	Value/events/restart/qualifiers
0		**RCU - Battery life remaining** **Source:** Remote control unit (RCU) **Engineering unit:** Days **Range:** 0-4,000 **Resolution:** 1 **Event time tag:** RCU time	**Value:** Battery life remaining in days until it needs to be replaced. **Events and deadbands:** Deadband of 1 day. **On restart:** Non-volatile data, carried through restart. **Data qualifiers:** Override.
1		**RCU - Protocol messages received without error** **Source:** RCU **Engineering unit:** Numerical count **Range:** 0-65,535 **Resolution:** 1 **Event time tag:** No events	**Value:** Current number of protocol messages received without error. **Events and deadbands:** No events generated (and therefore no deadbands). **On restart:** Restart to 0 on a restart. **Data qualifiers:** Override.
2		**RCU - Protocol messages received with errors** **Source:** RCU **Engineering unit:** Numerical count **Range:** 0-65,535 **Resolution:** 1 **Event time tag:** No events	**Value:** Current number of protocol messages received with error. **Events and deadbands:** No events generated (and therefore no deadbands). **On restart:** Restart to 0 on a restart. **Data qualifiers:** Override.
3		**RCU - Protocol messages sent** **Source:** RCU **Engineering unit:** Numerical count **Range:** 0-65,535 **Resolution:** 1 **Event time tag:** No events	**Value:** Current number of protocol messages sent. **Events and deadbands:** No events generated (and therefore no deadbands). **On restart:** Restart to 0 on a restart. **Data qualifiers:** Override.
4		**RCU - Restart count** **Source:** RCU **Engineering unit:** Numerical count **Range:** 0-65,535 **Resolution:** 1 **Event time tag:** No events	**Value:** Increments each time RCU microprocessor restarts. **Events and deadbands:** No events generated (and therefore no deadbands). **On restart:** Non-volatile data, carried through restart. **Data qualifiers:** Override.
5 6 7	A B C	**Communications module - Battery life remaining** **Source:** Communications module **Engineering unit:** Percentage **Range:** 0-100% **Resolution:** 1% **Event time tag:** RCU time	**Value:** Last record of battery life remaining reported by the communications module. **Events and deadbands:** Deadband of 1%. **On restart:** Point is set to 0. **Data qualifiers:** Override, online, restart, communications lost.

RCU database analog points list			
A_PID	Phase	Name/source/engineering units/ resolution/time tag	Value/events/restart/qualifiers
8 9 10	A B C	**Line - RMS current** **Source:** Fusesaver **Engineering unit:** A rms **Range:** 0-204.7 A rms **Resolution:** 0.1 A rms **Event time tag:** RCU time **Scaling:** x10	**Value:** Last line current reported by the Fusesaver. **Events and deadbands:** Deadbands can be configured. **On restart:** Point is set to 0. **Data qualifiers:** Override, online, restart, communications lost.
11 12 13	A B C	**Line - Fault current peak** **Source:** Fusesaver **Engineering unit:** A peak **Range:** 0-10,000 A peak **Resolution:** 1 A **Event time tag:** Fusesaver	**Value:** Peak value fault current from last Fusesaver fault. **Events and deadbands:** Event generated when there has been a detected fault or a protection trip event, which returned fault current data from the Fusesaver. Event contains fault current reported by Fusesaver. Deadband 1 A. **On restart:** Point is set to 0. **Data qualifiers:** Override, online, communications lost.
14 15 16	A B C	**Line - Fault current rms** **Source:** Fusesaver **Engineering unit:** A rms **Range:** 0-7,000 A rms **Resolution:** 1 A **Event time tag:** Fusesaver	**Value:** Return rms value fault current from last Fusesaver fault. Note that this is the peak current divided by 1.41. **Events and deadbands:** Event generated when there has been a detected fault or a protection trip event, which returned fault current data from the Fusesaver. Event contains rms fault current reported by Fusesaver. Deadband 1 A. **On restart:** Point is set to 0. **Data qualifiers:** Override, online, restart, communications lost.
17 18 19	A B C	**Line - Load current before fault** **Source:** Fusesaver **Engineering unit:** A rms **Range:** 0-204.7 A rms **Resolution:** 0.1 A **Event time tag:** Fusesaver **Scaling:** x10	**Value:** Rms value load current recorded by the Fusesaver prior to its last protection trip. **Events and deadbands:** Event generated when there has been a protection trip event, which returned load current data from the Fusesaver. Event contains load current reported by Fusesaver. Deadband 0.1 A. **On restart:** Point is set to 0. **Data qualifiers:** Override, online, communications lost.
20 21 22	A B C	**Fusesaver - VI life remaining** **Source:** Fusesaver **Engineering unit:** Percentage **Range:** 0-100% **Resolution:** 1% **Event time tag:** RCU time	**Value:** Last VI life remaining reported by Fusesaver. **Events and deadbands:** Deadband 1%. **On restart:** Point is set to 0. **Data qualifiers:** Override, online, communications lost.
23 24 25	A B C	**Fusesaver - Availability** **Source:** Fusesaver **Engineering unit:** Percentage **Range:** 0-100% **Resolution:** 0.01% **Event time tag:** RCU time	**Value:** Fusesaver availability is the percentage of time the Fusesaver has had line current on during the preceding 24 hours. The rolling algorithm updates every 2.4 hours. If communicates are lost to the Fusesaver, the algorithm is paused and restarts when communicates have returned. **Events and deadbands:** Deadband 0.1%. **On restart:** Point is set to 100.0%. **Data qualifiers:** Override, online, communications lost.

RCU database analog points list			
A_PID	Phase	Name/source/engineering units/ resolution/time tag	Value/events/restart/qualifiers
26 27 28	A B C	**Primary operations count** **Source:** Remote control unit (RCU) **Engineering unit:** Numerical count **Range:** 0-65,535 **Resolution:** 1 **Event time tag:** No events	**Value:** When D_PID 138 is clear (primary test mode is out) the value is incremental for the relevant phase when any of the following events are received from the Fusesaver: ■ Protection trip ■ Three-phase lockout trip ■ Operator trip. When D_PID 138 is set (primary test mode is in) or communications is lost between the Fusesaver and RCU, the values are not incremental. **Events and deadbands:** Deadband of 1. **On restart:** Non-volatile, carried through restart. These points are zeroed by the reset RCU configuration procedure (refer to RCU operating instructions IC1000-F320-A198-X-XXXX). This might be needed if an RCU is re-deployed. **Data qualifiers:** Override.
29 30 31	A B C	**Fusesaver forced protection arming hours remaining** **Source:** Fusesaver **Engineering unit:** Hours **Range:** 0-24 **Resolution:** 1 **Event time tag:** RCU time	**Value:** Number of hours remaining until forced protection arming will automatically be turned off. Value will be 0 when forced protection arming is off. **Events and deadbands:** Deadband of 1. **On restart:** Point is set to 0. **Data qualifiers:** Override, online, restart, communications lost.
32 33 34	A B C	**Fusesaver mechanism trip count** **Source:** Fusesaver **Engineering unit:** Numerical count **Range:** 0-2,000 **Resolution:** 1 **Event time tag:** RCU time	**Value:** Count of the number of times the Fusesaver mechanism has been tripped/opened since manufacture. **Events and deadbands:** Deadband of 1. **On restart:** Point is set to 0. **Data qualifiers:** Override, online, restart, communications lost.
35 36 37	A B C	**Line - Fault detection** **Source:** Fusesaver **Engineering unit:** 200 µs **Range:** 0-65,535 **Resolution:** 1 **Event time tag:** Fusesaver	**Value:** Returns fault duration of last Fusesaver fault. Not the returned value is in 200 µs increments. **Events and deadbands:** Events generated when there has been a detected fault or a protection trip event, which returned fault duration data from the Fusesaver. Event contains fault duration reported by Fusesaver. Deadband of 1. **On restart:** Point is set to 0. **Data qualifiers:** Override, online, restart, communications lost.

Strings

Table 17: RCU database strings

S_PID	Phase	Use/source/size	Description/events/restart/qualifiers
0		**RCU manufacturer's name** **Source:** RCU **Maximum length:** 64 characters	**Description:** A non-configurable string containing the same manufacturer of this device. In this case, Siemens. **Events:** No events generated. **On restart:** String valid on restart (non-volatile). **Data qualifiers:** None.
1		**RCU product name and model** **Source:** RCU **Maximum length:** 32 characters	**Description:** A non-configurable string containing the product name and model. In this case, remote control unit 3AD8. **Events:** No events generated. **On restart:** String valid on restart (non-volatile). **Data qualifiers:** None.
2		**Utility asset number** **Source:** User configured **Maximum length:** 32 characters	**Description:** A user configurable string, which is the utility asset number for this device/site. **Events:** No events generated. **On restart:** String valid on restart (non-volatile). **Data qualifiers:** None.
3		**Name/location** **Source:** RCU **Maximum length:** 128 characters	**Description:** Name of the Fusesaver line being monitored by the RCU. This will either be the line named in the configuration or the name of the line found by the RCU after searching. **Events:** No events generated. **On restart:** Blank if no line name in configuration, otherwise the line name given in the configuration. **Data qualifiers:** None.
4		**RCU software version** **Source:** Remote control unit (RCU) **Data type:** String **Maximum length:** 32 characters	**Description:** A non-configurable string containing the software version in the RCU. **Events:** No events generated. **On restart:** String valid on restart (non-volatile). **Data qualifiers:** None.
5 6 7	A B C	**Fusesaver serial number** **Source:** Fusesaver **Data type:** String **Maximum length:** 16 characters	**Description:** A string with the serial number of the Fusesaver fitted to that phase. **Events:** No events generated. **On restart:** String set to null. **Data qualifiers:** None.

Controls

Table 18: RCU database controls

C_PID	Name/target/control type/controls	Description
0	**Clear protocol counters** **Target:** Remote control unit (RCU) **Control type:** Unary control **Controls:** Clear counters	This control will reset all protocol counters in the RCU to 0.
1	**Trip/close ganged** **Target:** Line (Fusesaver all phases) **Control type:** Binary control **Controls:** Trip/close	**Trip** command will issue a trip command to all the Fusesavers (all phases) on the line but only if communications are normal to each and every Fusesaver. If communications have failed to any Fusesaver, no trip will be sent to any Fusesaver. **Close** command will issue to a close command to all the Fusesaver (all phases) on the line but only if communications are normal to each and every Fusesaver. If communications have failed to any Fusesaver, no trip will be sent to any Fusesaver. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then the control will be rejected with the relevant control response control.
2	**Trip/close any** **Target:** Line (Fusesaver all phases) **Control type:** Binary control **Controls:** Trip/close	**Trip** command will issue a trip command to any Fusesavers which are configured and to which communications are normal. **Close** command will issue to a close command to any Fusesavers which are configured and to which communications are normal. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then the control will be rejected with the relevant control response control.
3	**Phase A trip/close** **Target:** Fusesaver phase A **Control type:** Binary control **Controls:** Trip/close	**Trip** command will issue a trip command to the A-phase Fusesaver if configured. **Close** command will issue to a close command to the A-phase Fusesaver if configured. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then the control will be rejected with the relevant control response control.
4	**Phase B trip/close** **Target:** Fusesaver phase B **Control type:** Binary control **Controls:** Trip/close	**Trip** command will issue a trip command to the B-phase Fusesaver if configured. **Close** command will issue to a close command to the B-phase Fusesaver if configured. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then the control will be rejected with the relevant control response control.
5	**Phase C trip/close** **Target:** Fusesaver phase C **Control type:** Binary control **Controls:** Trip/close	**Trip** command will issue a trip command to the C-phase Fusesaver if configured. **Close** command will issue to a close command to the C-phase Fusesaver if configured. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then the control will be rejected with the relevant control response control.
6	**RCU dummy control** **Target:** RCU **Control type:** Binary control **Controls:** Trip/close	This is a dummy control point, which can be used for test purposes. It controls the RCU dummy input point (D_PID 57). **Trip** command will clear the dummy input point on the RCU. **Close** command will set the dummy input point on the RCU.
7	**Fusesaver dummy control** **Target:** Fusesaver all phases **Control type:** Binary control **Controls:** Trip/close	This is a dummy control point, which can be used for test purposes. It controls the Fusesaver dummy input points (D_PID 58, 59, 60). **Trip** command will clear the dummy input points on all Fusesavers that are in communication. **Close** command will set the dummy input points on all Fusesavers that are in communication. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then the control will be rejected with the relevant control response control.

RCU database controls		
C_PID	Name/target/control type/controls	Description
8	**RCU clear flags** **Target:** Line (Fusesaver all phases) **Control type:** Unary control **Controls:** Clear flags	This control clears the protection flags in the RCU (remote control unit).
9	**Set protection mode - Normal** **Target:** Line (Fusesaver all phases) **Control type:** Unary control **Controls:** Set protection mode	This control issues commands to all phases to set their remote protection mode to normal but only if communications are normal to each and every Fusesaver and no Fusesaver has its external lever down. If communications have failed to any Fusesaver or any Fusesaver has its lever down, then no command will be sent to any Fusesaver. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then control will be rejected with the relevant control response code.
10	**Set protection mode - Fast single** **Target:** Line (Fusesaver all phases) **Control type:** Unary control **Controls:** Set protection mode	This control issues commands to all phases to set their remote protection mode to fast single but only if communications are normal to each and every Fusesaver and no Fusesaver has its external lever down. If communications have failed to any Fusesaver or any Fusesaver has its lever down, then no command will be sent to any Fusesaver. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then control will be rejected with the relevant control response code.
11	**Set protection mode - Off** **Target:** Line (Fusesaver all phases) **Control type:** Unary control **Controls:** Set protection mode	This control issues commands to all phases to set their remote protection mode to off but only if communications are normal to each and every Fusesaver and no Fusesaver has its external lever down. If communications have failed to any Fusesaver or any Fusesaver has its lever down, then no command will be sent to any Fusesaver. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then control will be rejected with the relevant control response code.
12	**Set protection mode - Normal single** **Target:** Line (Fusesaver all phases) **Control type:** Unary control **Controls:** Set protection mode	This control issues commands to all phases to set their remote protection mode to normal single but only if communications are normal to each and every Fusesaver and no Fusesaver has its external lever down. If communications have failed to any Fusesaver or any Fusesaver has its lever down, then no command will be sent to any Fusesaver. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then control will be rejected with the relevant control response code.
13	**RCU - Reboot** **Target:** RCU **Control type:** Unary control **Controls:** Reboot	This control issues a reboot command to the RCU.
14	**Set protection mode - Fast** **Target:** Line (Fusesavers all phases) **Control type:** Unary control **Controls:** Set protection mode	This control issues commands to all phases to set their remote protection mode to fast but only if communications are normal to each and every Fusesaver and no Fusesaver has its external lever down. If communications have failed to any Fusesaver or any Fusesaver has its lever down, then no command will be sent to any Fusesaver. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then control will be rejected with the relevant control response code.
15	**Set/clear protection off bit** **Target:** Line (Fusesavers all phases) **Control type:** Binary control **Controls:** Set/clear protection bit	This control issues commands to all phases to set/clear their remote protection off bit but only if communications are normal to each and every Fusesaver and no Fusesaver has its external lever down. If communications have failed to any Fusesaver or any Fusesaver has its lever down, then no command will be sent to any Fusesaver. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then control will be rejected with the relevant control response code.
16	**Set/clear instantaneous protection bit** **Target:** Line (Fusesavers all phases) **Control type:** Binary control **Controls:** Set/clear protection bit	This control issues commands to all phases to set/clear their instantaneous protection off bit but only if communications are normal to each and every Fusesaver and no Fusesaver has its external lever down. If communications have failed to any Fusesaver or any Fusesaver has its lever down, then no command will be sent to any Fusesaver. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then control will be rejected with the relevant control response code.

RCU database controls		
C_PID	Name/target/control type/controls	Description
17	**Set/clear no reclose protection bit** **Target:** Line (Fusesaver all phases) **Control type:** Binary control **Controls:** Set/clear protection bit	This control issues commands to all phases to set/clear their no-reclose protection off bit but only if communications are normal to each and every Fusesaver and no Fusesaver has its external lever down. If communications have failed to any Fusesaver or any Fusesaver has its lever down, then no command will be sent to any Fusesaver. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then control will be rejected with the relevant control response code.
18	**Set/clear RCU primary test mode** **Target:** Line (Fusesaver all phases) **Control type:** Binary control **Controls:** Set/clear	This control sets and clears DPID_138, primary test mode. Control will always be accepted irrespective of D_PID 101 (remote control enabled). When primary test mode is set, in-service switching operations counting is disabled (refer A_PID 26-28 operations counter), (e.g., to exclude operations that have been carried out by testing staff during installation).
19	**Set/clear remote forced protection arming** **Target:** Line (Fusesaver all phases) **Control type:** Binary control **Controls:** Set/clear	This control turns on/off the Fusesaver forced protection mode. Set command will issue a command to turn the Fusesaver forced protection mode on. Clear command will issue a command to turn the Fusesaver forced protection mode off. Controls will be sent to any Fusesavers, which are configured and to which communications are normal. Controls will only be accepted if D_PID 101 (remote control enabled) is set. If not, then control will be rejected with the relevant control response code. When turned on, forced protection arming will automatically turn off after a configurable period defined in the Fusesaver to reduce battery drain.