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XCP Compliance Document For Powerware 9355 230V Model

2006-11-13 Revision M6

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Table of Content

1. About this document

1.1. Foreword

This document describes the implementation of XCP communication protocol in Powerware 9355 UPSes with DSP firmware part number 1023711.

This document is divided into three chapters:

1. Chapter 1, about this document, terms used, and general behavior
2. Chapter 2, describes XCP in a stand-alone three phase UPS (EU model)

The XCP specification itself is not content of this document. The reader should refer to the protocol description for more information about the operation and requirements of the XCP protocol.

1.2. Document history

Revision M6, 2006-11-13

Stephan Köhler

New Alarm #34: Charger failure

Revision L, 2006-02-28

Stephan Köhler

Added 40kVA data.
Removed alarm 233, and 243 from system level XCP for legacy XCP.
New Alarm #157: Check Output Switchgear

Revision K1, 2005-11-30

Stephan Köhler

Added command for data provider (0x50).

9355 2-phase 120V model is in an extra document now.

Revision K, 2005-10-10

Stephan Köhler
Unified XCP for single unit, parallel system, and sub unit into one table for each command.

Revision I, 2005-07-11

Stephan Köhler
Addendums for XCP in 9355, 3 Phase, 230/400 Vac:
Added High Efficiency Mode to document.
Modified high alert strategy behaviour.
Scheduled XCP on/off (0x91, 0x93) are NACKed busy, if delayed restart timer (0x8A) is set.
New CPU #8 in ID block: parallel hot sync card (X-slot) version number.
New alarms for parallel calibration: 38, 41, and 219

Revision E7, 2005-june, 17

Pasi Taimela
The document describes the XCP implemented in 9355 LV 3 phase UPS, release E7.
Fixed few discrepancies based on XCP test.

Revision E6, 2005-02-11

Stephan Köhler

The document describes the XCP implemented in 9355 1, and 3 phase input, release E6.
Set configuration field #10: Battery Cells Per String to read only. False setting can damage the UPS, or batteries.

Revision E4, 2005-01-04

Stephan Köhler
The document describes the XCP implemented in 9355, release E4.
Raised revision number from D to E4 to reflect the DSP release version.
Added meter #92 line event counter. Fixed notation errors.

Revision D, 2004-11-08

This revision documents the features of Powerware 9355 firmware revision D.
This document's revision number also starts with D.

1.3. Terminology

To clarify the terminology used in this document, here are some explanations.

1.3.1. Numbers and values

Unless marked otherwise, all decimal (10 base) numbers are printed normally (decimal ninety-nine = 99). All hexadecimal (16 base) numbers are printed with leading "0x" (decimal ninety-nine = 0x63). All bits, or flags, are printed in single-quotes: '0' or '1':

Number type / term	Description
NN	A decimal (10-base) value NN
0xNN	A hexadecimal (16-base) value, 8-bit byte
0xNNNN	A hexadecimal (16-base) value, 16-bit word
0xNNNNNNNN	A hexadecimal (16-base) value, 32-bit
'N'	A bit, or a flag. N is 0 or 1
'NN...'	A string of bits. N is 0 or 1
Hex	A hexadecimal (16-base) value
Dec	A decimal (10-base) value
Bin	A binary (2-base) value

1.3.2. UPS model Terminology

This document uses various terms describing a model, or a group of models, of Powerware 9355. The table below clarifies this terminology:

Term	Description
50Hz unit	The units which have the frequency set (user settable) to 50Hz
60Hz unit	The units which have the frequency set (user settable) to 60Hz
40kVA unit	40 000VA output power unit
30kVA unit	30 000VA output power unit
15kVA unit	15 000VA output power unit
10kVA unit	10 000VA output power unit

1.3.3. Communication Terminology

Term	Description
Bps	Communication speed unit: bits per second
Baud	This term is used incorrectly (but commonly) as a synonym for "bps"

UPScode	A communication protocol
XCP	A company standard communication protocol

1.3.4. Parallel System Terminology

XCP in 9355 has three different XCP sources: Parallel System, Parallel Sub Unit, and Single Unit. In a parallel system XCP communication starts at system level, i.e. you see the total system's status, meters etc. You use the Select Sub Unit command (0xCE) to switch to a certain sub unit. The local sub unit is the sub unit in a parallel system you are directly connected to with your serial cable. A remote sub unit is a unit in a parallel system you are communicating over CAN with.

1.4. Communication

1.4.1. Speed and timing

Parameter	Value(s)
Speed	1200bps, 2400bps, 9600bps, or 19200bps
Data bits	8
Parity	None
Stop bits	1

The communication lines are able to communicate using XCP, which implementation is defined in this document, and service terminal commands, which implementation is defined elsewhere.

XCP sets the following timing constraints for communication. These timings are independent of the communication speed.

Timing parameter	Value
Delay before UPS begins to send response	0.0 ... 2.0 seconds
Inter-character delay	0.0 ... 0.25 seconds
Inter-sequence delay	0.0 ... 0.5 seconds
Command authorization valid time	16 seconds, or when any command is received

1.4.2. XCP block format

Command block from host

Octet	Description
AB	SFD (Start Frame Delimiter): 10101011 = 0xAB
NN	(Size): number of payload data octet s
CN	Command number, is also first payload data octet
…	Optional parameter octets
PN	Last payload octet
CS	Two's complement 8-bit checksum of preceding bytes, including the SFD and Size bytes.

Response block from UPS

Octet	Description
AB	SFD (Start Frame Delimiter): 10101011 = 0xAB
RB	Response block number: 0x09, for control commands; command number – 0x30, for others.
NN	Number of payload octets in this sequence
XX	Sequence number, starting with 1. The last sequence number of the block is ORed with 0x80.
D0	First payload data octet
…	
DN	Last payload data octet
CS	Two's complement 8-bit checksum of preceding octets, includes the SFD through payload data bytes

1.5. Parallel XCP implementation

40kVA Units do not support parallel operation.

A Unit in parallel system provides two different XCP servers: A system- and a sub unit server. A host shall treat them like independent UPS types, since responses for e.g. alarms, or meters are different.

The system server shows the parallel system as a single big UPS. The sub unit server shows the sub unit's status. A more detailed explanation of the parallel XCP implementation is at the end of this document.

1.6. Deviations from XCP requirements

1.6.1. No PnP response implemented

The Powerware 9355 does not respond to plug and play events. You can see the serial port baud rates from the display. The factory default is 19200 bps.

1.6.2. Port multiplexer of X-Slot 2 and service port

The service port shares the same physical serial port with X-Slot 2. Hence there are following limitations:

The serial port listens to X-Slot 2 by default. If there is data on the service port's Rx line, the multiplexer switches to the service port, *ignoring then* the traffic over X-Slot 2. The very first byte received over service port is always lost due to hardware switch delay.

If you start a session over the service port send the first command twice!

The multiplexer switches back to X-Slot 2 after a delay when there was no traffic over service port. The delay depends on the protocol.

For other protocols e.g. terminal, it is 15 minutes.

For the XCP protocol there are these timeouts:

- If the last command over service port was 0xA0, set requested-only mode, and the UPS was in test mode, the timeout is 10 seconds.
- If the last command was 0xFF, exit XCP, the timeout is 0 seconds.
- If the last command was 0xFF + parameter, set test mode, the timeout is 15 minutes.
- For all other commands it is 40 seconds after the last command.

1.6.3. Powerware 9355 high alert power strategy

You can select high efficiency mode only in single units.

If XCP-high-alert power strategy is set, the UPS never switches into high efficiency mode, but stays in normal operation mode. High alert mode lasts until another power strategy is set, the UPS was turned off completely, or for maximum 24 hours.

1.6.4. Power up behavior

- If you switch off the UPS locally, over display or EPO, you cannot switch on the UPS with XCP commands. You only can switch on the UPS over display.
- If you switch off the UPS over display, so that load is not powered any more, the UPS is in standby mode. To turn the UPS completely off (rectifier off, too), push the off button again. If the UPS was switched off this way over display (i.e. rectifier off), X-Slots are not powered Hence you loose XCP communication.
- If the UPS was switched off because of a failure, X-Slots are not powered during the time of DC-rail discharge. Hence you loose XCP communication for about. 1-2 minutes. After rail-discharge the X-Slots are powered again. You cannot power up the UPS over XCP.

- If the UPS is already on, pushing the LCD-on button has no effect.
- If the UPS is already off, pushing the LCD-off button has no effect. If the UPS is in a parallel system, LCD-off only shuts down the UPS' outputs. A second push of LCD-off, will power down the UPS completely.

2. XCP in 9355, 3 Phase, 230/400 Vac

This chapter describes XCP communication of a Powerware 9355 UPS –15…40kVA / 230Vac model.

2.1. List of commands

Command	In System (S), Sub Unit (U), or/and Single Unit (I)	Code	LEN	Auth req.?	Response block #	Disable with front panel?
ID block request	S,U,I	0x31	1	No	0x01	No
Status request	S,U,I	0x33	1-2	No	0x03	No
Meters block request	S,U,I	0x34	1	No	0x04	No
Current alarms & events request	S,U,I	0x35	1	No	0x05	No
Configuration block request	S,U,I	0x36	1	No	0x06	No
Battery test data request	S,U,I	0x3B	1	No	0x0B	No
Extended limits block request	S,U,I	0x3C	1	No	0x0C	No
System test data request	S,U,I	0x3F	1	No	0x0F	No
Command list request	S,U,I	0x40	1	No	0x10	No
Communications capabilities request	S,U,I	0x42	2	No	0x12	No
UPS topology data request	S,U,I	0x43	1	No	0x13	No
Scratchpad data request	S,I	0x45	2	No	0x15	No
Read Configuration Field	U,I	0x46	3	No	0x09	No
Data Provider Command	S,U,I	0x50	>3	No	0x09	No
Go to bypass command	S,I	0x88	1 or 3	Yes	0x09	Yes
UPS on command	S,I	0x89	1	Yes	0x09	Yes
Delayed load power off & restart command	S,I	0x8A	2-3	Yes	0x09	Yes
UPS off command	S,I	0x8B	1	Yes	0x09	Yes
Set time & date command	S,U,I	0x90	9	Yes	0x09	Yes
Scheduled UPS on in "n" minutes command	S,I	0x91	3	Yes	0x09	Yes
Scheduled UPS off in "n" minutes command	S,I	0x93	3	Yes	0x09	Yes
Set configuration command	U,I	0x95	4	Yes	0x09	Yes
Write Configuration Field	U,I	0x96	>3	Yes	0x09	Yes
Set communication parameter command	S,U,I	0x98	5	Yes	0x09	Yes
Set Scratchpad Sector	S,I	0x99	5	Yes	0x09	Yes
Set Power Strategy command	S,I	0x9A	2	Yes	0x09	Yes
Set requested-only mode command	S,U,I	0xA0	1	No	0x01	No
Initiate battery test command	S,U,I	0xB1	3	Yes	0x09	No
Request system test command	S,U,I	0xB2	3	Yes	0x09	No
Select sub-module command	S,U	0xCE	2-3	No	0x09	No
Authorization code	S,U,I	0xCF				
Exit XCP	S,U,I	0xFF	1-4	No	0x09	No

2.2. ID block request

Purpose

The ID command provides basic identification and capabilities information for the parallel 9355 system.

Command

To request the ID block, send:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	31	23

Response

The response block consists of four sequences:

Byte# **Field**	**Description**
AB	Start of frame delimiter
01	Block (0x31 – 0x30)
2B	Length of this sequence is 43
01	Sequence: first
0	
08	Number of CPUs in this list
1-2	
00 00	Unused placeholder
3-4	
MMmm	DSP firmware revision MM is the major revision level; mm is the minor revision level (sent first). Each revision number consists of two two-digit BCD values. For example: MMmm = 0x0317 is revision 3.17
5-6	
00 00	Unused placeholder
7-8	
00 00	Unused placeholder
9-10	
MMmm	LCD firmware revision (local unit)
11-12	
MMmm	PLDs firmware revision (local unit)
13-14	
MMmm	Bootloader firmware revision (local unit)
15-16	
MMmm	Parallel Hot Sync card (Bridge card) firmware revision (local unit)
17	
00	00 means next two (2) bytes give the VA rating

<table>
<tr><th>Byte#
Field</th><th>Description</th></tr>
<tr><td>18-19</td><td></td></tr>
<tr><td>XXXX</td><td>Extended VA rating (low byte sent first). This is the actual VA rating divided by 50:
<table><tr><th>Unit</th><th>VAs</th><th>VA rating</th></tr><tr><td>8kVA</td><td>8000</td><td>0x00A0</td></tr><tr><td>10kVA</td><td>10000</td><td>0x00C8</td></tr><tr><td>12kVA</td><td>12000</td><td>0x00F0</td></tr><tr><td>15kVA</td><td>15000</td><td>0x012C</td></tr><tr><td>30kVA</td><td>30000</td><td>0x0258</td></tr><tr><td>40kVA</td><td>40000</td><td>0x0320</td></tr></table>Parallel systems show the total of units' kVAs, one unit's kVAs less, if system is redundant.</td></tr>
<tr><td>20</td><td></td></tr>
<tr><td>03</td><td>Three output phases</td></tr>
<tr><td>21</td><td></td></tr>
<tr><td>78</td><td>Phase angle 120°</td></tr>
<tr><td>22</td><td></td></tr>
<tr><td>14</td><td>20 bytes for following descriptive message</td></tr>
<tr><td>23-42</td><td></td></tr>
<tr><td>XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX</td><td>Descriptive message: "Powerware 9355"</td></tr>
<tr><td>XX</td><td>Checksum of first sequence</td></tr>
</table>

Byte#			Description
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
AB	**AB**	**AB**	Start of frame delimiter
01	**01**	**01**	Block (0x31 – 0x30)
5D	**5D**	**5D**	Length of this sequence is 93
02	**02**	**02**	Sequence: second
43	*43*	*43*	
5C	**5C**	**5C**	Meter map length is 92. The following 92 octets tell the data format for these 92 meters: **0xFX:** Meter is an integer, X are the number of *bits* used for post-decimal digits. E.g. 0xF8 is 000.00, 0xF0 = 00000. **0xE2:** Meter is a time in seconds: 00000sec. **0xE1:** Meter is a time: HHMMSSCC E.g. 0x0F062663 is 03:06:38:99PM. **0xE0:** Meter is a Date: CCYYMMDD E.g. 0x14050717 is July, 23rd, 2005. **0x00:** Unused meter. Meter is not present in meters block (0x34). **0xWR:** All other format numbers are 32-bit IEEE-754 floating-point meters. W is the *total* number of places including '.'. R is the number of post decimal digits. E.g. 0x51 is 000.0: 5 places, 1 post decimal, 0x42 is 0.00 and so on.
44-61	*44-61*	*44-61*	
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	**00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00**	**00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00**	Meter #1-18: not used.
62-64	*62-64*	*62-64*	
51 51 51	**51 51 51**	**51 51 51**	Meter #19-21: Input current, phase L1-L3
65	*65*	*65*	
51	**51**	**51**	Meter #22: Output Watts
66	*66*	*66*	
00	**00**	**00**	Meter #23: Not used
67	*67*	*67*	
51	**00**	**00**	Meter #24: Output VA (not in parallel system)
68	*68*	*68*	
00	**00**	**00**	Meter #25: not used
69	*69*	*69*	
42	**00**	**00**	Meter #26: Output power factor (not in parallel system)
70	*70*	*70*	
00	**00**	**00**	Meter #27: not used
71	*71*	*71*	
41	**41**	**41**	Meter #28: Output frequency
72	*72*	*72*	
41	**41**	**41**	Meter #29: Input frequency
73	*73*	*73*	

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
41	**41**	**41**	Meter #30: Inverter frequency
74	*74*	*74*	
41	**41**	**41**	Meter #31: Bypass frequency
75	*75*	*75*	
00	**00**	**00**	Meter #32: not used
76	*76*	*76*	
51	**51**	**51**	Meter #33: Battery current
77	*77*	*77*	
51	**51**	**51**	Meter #34: Battery voltage
78	*78*	*78*	
51	**51**	**51**	Meter #35: Battery percent left
79	*79*	*79*	
E2	**E2**	**E2**	Meter #36: Battery time remaining
80-84	*80-84*	*80-84*	
00 00 00 00 00	**00 00 00 00 00**	**00 00 00 00 00**	Meter #37-41: not used
85	*85*	*85*	
51	**51**	**51**	Meter #42: Battery DC under voltage alarm level
86	*86*	*86*	
51	**51**	**51**	Meter #43: Input current 100% reference
87	*87*	*87*	
51	**51**	**51**	Meter #44: Low battery warning level voltage
88	*88*	*88*	
00	**00**	**00**	Meter #45: Not used
89	*89*	*89*	
51	**51**	**51**	Meter #46: Battery charge current 100% reference
90	*90*	*90*	
51	**51**	**51**	Meter #47: Battery discharge current 100% reference
91-96	*91-96*	*91-96*	
00 00 00 00 00 00	**00 00 00 00 00 00**	**00 00 00 00 00 00**	Meter #48-53: not used
97-99	*97-99*	*97-99*	
51 51 51	**51 51 51**	**51 51 51**	Meter #54-56: Bypass volts, phase L1-L3 (L-N)
100-102	*100-102*	*100-102*	
51 51 51	**51 51 51**	**51 51 51**	Meter #57-59: Input volts, phase L1-L3 (L-N)
103-105	*103-105*	*103-105*	
00 00 00	**00 00 00**	**00 00 00**	Meter #60-62: not used
106	*106*	*106*	
41	**41**	**41**	Meter #63: Ambient temperature
107-108	*107-108*	*107-108*	
00 00	**00 00**	**00 00**	Meter #64-65: not used
109-111	*109-111*	*109-111*	
51 51 51	**51 51 51**	**51 51 51**	Meter #66-68: Load current phase L1-L3
112-114	*112-114*	*112-114*	
51 51 51	**51 51 51**	**51 51 51**	Meter #69-71: Load current 100% reference phase L1-L3
115	*115*	*115*	
51	**00**	**00**	Meter #72: Output VA 100% reference (not in parallel system)

Byte#			Description
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
116	*116*	*116*	
E0	**E0**	**E0**	Meter #73: Date
117	*117*	*117*	
E1	**E1**	**E1**	Meter #74: Time
118-121	*118-121*	*118-121*	
00 00 00 00	**00 00 00 00**	**00 00 00 00**	Meter #75-78: not used
122-124	*122-124*	*122-124*	
51 51 51	**51 51 51**	**51 51 51**	Meter #79-81: Output volts phase L1-L3 (L-N)
125	*125*	*125*	
00	**00**	**00**	Meter #82: not used
126-128	*126-128*	*126-128*	
51 51 51	**51 51 51**	**51 51 51**	Meter #83-85: Output watts phase L1-L3
129	*129*	*129*	
51	**51**	**51**	Meter #86: Output watts per phase 100% reference
130-134	*130-134*	*130-134*	
00 00 00 00 00	**00 00 00 00 00**	**00 00 00 00 00**	Meter #87-91: not used.
135	*135*	*135*	
F0	**F0**	**F0**	Meter #92: Line event counter
XX	**XX**	**XX**	Checksum of second sequence

Byte#			Description
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
AB	**AB**	**AB**	Start of frame delimiter
01	**01**	**01**	Block (0x31 – 0x30)
22	**22**	**22**	Length of this sequence is 34
03	**03**	**03**	Sequence: third
136	*136*	*136*	
21	**21**	**21**	Alarm map length is 33. The following 33 octets are a bitfiled the size of all known alarm numbers. For every present alarm number the bit is set.
137	*137*	*137*	
FF	**FF**	**FF**	Byte #1: Bit0 Alarm #000 Inverter AC over voltage Bit1 Alarm #001 Inverter AC under voltage Bit2 Alarm #002 Inverter under over frequency Bit3 Alarm #003 Bypass AC over voltage Bit4 Alarm #004 Bypass AC under voltage Bit5 Alarm #005 Bypass under over frequency Bit6 Alarm #006 Input AC over voltage Bit7 Alarm #007 Input AC under voltage
138	*138*	*138*	
DF	**DF**	**DF**	Byte #2: Bit0 Alarm #008 Input under over frequency Bit1 Alarm #009 Output AC over voltage Bit2 Alarm #010 Output AC under voltage Bit3 Alarm #011 Output under over frequency Bit4 Alarm #012 Remote emergency power off Bit6 Alarm #014 Building alarm 6 Bit7 Alarm #015 Building alarm 5
139	*139*	*139*	
2F	**2F**	**2F**	Byte #3: Bit0 Alarm #016 Building alarm 4 Bit1 Alarm #017 Building alarm 3 Bit2 Alarm #018 Building alarm 2 Bit3 Alarm #019 Building alarm 1 Bit5 Alarm #021 Charger over temperature
140	*140*	*140*	
FF	**FF**	**FF**	Byte #4: Bit0 Alarm #024 Inverter over temperature Bit1 Alarm #025 Output overload Bit2 Alarm #026 Rectifier input over current Bit3 Alarm #027 Inverter output over current Bit4 Alarm #028 DC link over voltage Bit5 Alarm #029 DC link under voltage Bit6 Alarm #030 Rectifier failed Bit7 Alarm #031 Inverter fault
141	*141*	*141*	
47	**47**	**47**	Byte #5: Bit0 Alarm #032 Battery contactor fail Bit1 Alarm #033 Bypass breaker fail Bit2 Alarm #034 Charger failure Bit6 Alarm #038 Bypass uncalibrated
142	*142*	*142*	

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
87	**87**	**87**	Byte #6: Bit0 Alarm #040 Output uncalibrated Bit1 Alarm #041 Inverter uncalibrated Bit2 Alarm #042 DC voltage uncalibrated Bit7 Alarm #047 Battery current limit
143	*143*	*143*	
A1	**A1**	**A1**	Byte #7: Bit0 Alarm #048 Inverter startup failure Bit5 Alarm #053 Non-volatile ram failure Bit7 Alarm #055 Shutdown imminent
144	*144*	*144*	
0B	**0B**	**0B**	Byte #8: Bit0 Alarm #056 Battery low Bit1 Alarm #057 Utility fail Bit3 Alarm #059 Utility not present
145	*145*	*145*	
D0	**D0**	**D0**	Byte #9: Bit4 Alarm #068 Battery DC over voltage Bit6 Alarm #070 Power supply failure Bit7 Alarm #071 Power supply 5 volt fault
146	*146*	*146*	
4D	**4D**	**4D**	Byte #10: Bit0 Alarm #072 Power supply 12 volt fault Bit2 Alarm #074 Heatsink temp. sensor failed Bit3 Alarm #075 Rectifier current over 125percent Bit6 Alarm #078 Inverter program stack error
147	*147*	*147*	
00	**00**	**00**	Byte #11: No alarms
148	*148*	*148*	
50	**50**	**50**	Byte #12: Bit4 Alarm #092 Inverter off command Bit6 Alarm #094 To bypass command
149	*149*	*149*	
C0	**C0**	**C0**	Byte #13: Bit6 Alarm #102 Phase A current limit Bit7 Alarm #103 Phase B current limit
150	*150*	*150*	
0F	**0F**	**0F**	Byte #14: Bit0 Alarm #104 Phase C current limit Bit1 Alarm #105 Bypass not available Bit2 Alarm #106 Rectifier breaker open Bit3 Alarm #107 Battery contactor open
151	*151*	*151*	
C0	**C0**	**C0**	Byte #15: Bit6 Alarm #118 Rectifier phase rotation Bit7 Alarm #119 Bypass phase rotation
152	*152*	*152*	
02	**02**	**02**	Byte #16: Bit1 Alarm #121 Parallel board failure
153	*153*	*153*	
10	**10**	**10**	Byte #17: Bit4 Alarm #132 Loss of redundancy

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
154	*154*	*154*	
00	**00**	**00**	Byte #18: No alarms
155	*155*	*155*	
24	**24**	**24**	Byte #19: Bit2 Alarm #146 CPU isr error Bit5 Alarm #149 Battery needs service
156	*156*	*156*	
A0	**A0**	**A0**	Byte #20: Bit5 Alarm #157 Check Output Switchgear Bit7 Alarm #159 Level 2 overload phase A
157	*157*	*157*	
FF	**FF**	**FF**	Byte #21: Bit0 Alarm #160 Level 2 overload phase B Bit1 Alarm #161 Level 2 overload phase C Bit2 Alarm #162 Level 3 overload phase A Bit3 Alarm #163 Level 3 overload phase B Bit4 Alarm #164 Level 3 overload phase C Bit5 Alarm #165 Level 4 overload phase A Bit6 Alarm #166 Level 4 overload phase B Bit7 Alarm #167 Level 4 overload phase C
158	*158*	*158*	
43	**43**	**43**	Byte #22: Bit0 Alarm #168 Ups on battery Bit1 Alarm #169 Ups on bypass Bit6 Alarm #174 Low battery shutdown
159	*159*	*159*	
01	**01**	**01**	Byte #23: Bit0 Alarm #176 Software incompatibility detected
160	*160*	*160*	
90	**90**	**90**	Byte #24: Bit4 Alarm #188 Bypass failure Bit7 Alarm #191 Battery test failed
161	*161*	*161*	
85	**85**	**85**	Byte #25: Bit0 Alarm #192 Fuse failure Bit2 Alarm #194 Site wiring fault Bit7 Alarm #199 Batteries disconnected
162	*162*	*162*	
4E	**4E**	**4E**	Byte #26: Bit1 Alarm #201 Transformer overtemperature Bit2 Alarm #202 Ambient undertemperature Bit3 Alarm #203 Ambient overtemperature Bit6 Alarm #206 Automatic shutdown pending
163	*163*	*163*	
09	**09**	**09**	Byte #27: Bit0 Alarm #208 Unable to charge batteries Bit3 Alarm #211 Modem failed

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
164	*164*	*164*	
F9	**F9**	**F9**	Byte #28: Bit0 Alarm #216 Modem call completion failed Bit3 Alarm #219 Autocalibration failed Bit4 Alarm #220 Selective trip of module Bit5 Alarm #221 Inverter output failure Bit6 Alarm #222 Abn. output voltage at startup Bit7 Alarm #223 Rectifier overtemperature
165	*165*	*165*	
03	**03**	**03**	Byte #29: Bit0 Alarm #224 Configuration error Bit1 Alarm #225 Redundancy loss due to overload
166-168	*166-168*	*166-168*	
00 00 00	**00 00 00**	**00 00 00**	Byte #30-32: No alarms
169	*169*	*169*	
40	**40**	**40**	Byte #33: Bit6 Alarm #262 Not Enough Units available
XX	**XX**	**XX**	Checksum of third sequence

Byte#			Description
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
AB	**AB**	**AB**	Start of frame delimiter
01	**01**	**01**	Block (0x31 – 0x30)
10	**10**	**10**	Length of this sequence is 16
84	**84**	**84**	Sequence: fourth and last
170-171	*170-171*	*170-171*	
0050	**0050**	**0050**	Config block length is 80 (low byte sent first). See Configuration block request [0x36].
172	*172*	*172*	
00	**00**	**00**	No statistics map
173-174	*173-174*	*173-174*	
0000	**0000**	**0000**	No alarm history log
175-176	*175-176*	*175-176*	
0000	**0000**	**0000**	No custom events log
177-178	*177-178*	*177-178*	
0003	**0003**	**0003**	UPS topology block length is 3 (low byte first). See UPS topology data request [0x43].
179	*179*	*179*	
3D	**3D**	**3D**	Maximum command length that can be received is 61, including header and checksum
180-181	*180-181*	*180-181*	
0021	**001A**	**0021**	Size of command list block is 33 for single unit and parallel system, and 26 for parallel sub unit. This refers to the Command list request [0x40]
182-183	*182-183*	*182-183*	
0000	**0000**	**0000**	No outlet monitoring block
184-185	*184-185*	*184-185*	
0060	**0060**	**0060**	Alarm block length is 96 (low byte first) for single unit and parallel sub unit, and for parallel system. See Active Alarms Block request [0x35].
XX	**XX**	**XX**	Checksum of fourth sequence

2.3. Status request

Purpose

The Status block shows the status of the unit, include overall UPS or System status, breaker status, topology-related status, and status of pending shutdown and delays. The Status block format is the same for single unit-, parallel system-, and subunit XCP. The data tell the status of this UPS in single-, sub unit mode, or the status of the whole system in system level mode.

Command

To request the status, send:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	33	21

or

SFD [hex]	Length [hex]	Cmd [hex]	Parameter [hex]	Checksum [hex]
AB	01	33	00	21

Response

The response block consists of one sequence:

<table>
<tr><th>Byte#
Field</th><th>Description</th></tr>
<tr><td>AB</td><td>Start of frame delimiter</td></tr>
<tr><td>03</td><td>Block (0x33 – 0x30)</td></tr>
<tr><td>13</td><td>Length of this sequence is 19</td></tr>
<tr><td>81</td><td>Sequence: first and only one</td></tr>
<tr><td>0</td><td></td></tr>
<tr><td>XX</td><td>Overall UPS or System status as one of the following byte code:
<table>
<tr><td>0xF0</td><td>On battery</td><td>UPS or System is drawing all its power from battery</td></tr>
<tr><td>0x60</td><td>On bypass</td><td>The UPS or System is supplying load from its bypass</td></tr>
<tr><td>0x50</td><td>System normal</td><td>The UPS or System is in its normal state, on inverter, with no alarms</td></tr>
<tr><td>0x40</td><td>UPS or System supporting load</td><td>A degraded form of system normal, when there is some alarm condition, that does not immediately affect load</td></tr>
<tr><td>0x10</td><td>UPS or System is off</td><td>Most of the UPS or System is powered down; UPS communications are still active, and may be used to turn the UPS or System on</td></tr>
</table></td></tr>
<tr><td>1</td><td></td></tr>
<tr><td>XX</td><td>Topology status as one of the following bit map:
Bit 7: '1' if utility present
Bit 6: '1' if rectifier on
Bit 5: '1' if low battery warning on
Bit 4: '1' if inverter on
Bit 3: '1' if on battery
Bit 2: '1' if on bypass
Bit 1: '1' always (no output breaker)
Bit 0: '1' always (bypass installed)</td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>XX</td><td>Sub module ID:
00: The UPS is a stand-alone unit or Host is talking on sys-</td></tr>
</table>

Byte# **Field**	**Description**
	tem level in a parallel system. greater than 00: Host is talking to this sub-module parallel system.
3	
XX	Breaker status as one of the following bit map: Bit 7: '1' always : no utility input relay Bit 6: Bypass contactor K1: '0' = open / '1' = closed Bit 5: Static switch: '0' = open / '1' = closed Bit 4: Battery contactor K3: '0' = open / '1' = closed Bit 3: '1' always : no output contactor Bit 2: '1' always Bit 1: '0' Bit 0: '0'
4	
YY	On/off delays status as one of the following bit map: Bit 7: always '0' Bit 6: UPS on delay: '0'=minutes / '1'=seconds Bit 5: UPS off delay: '0'=minutes / '1'=seconds Bit 4: '1', if delayed load off [0x8A] pending Bit 3: '1', if delayed UPS on pending Bit 2: '1', time is count down in minutes or seconds Bit 1: '1', if delayed UPS off pending Bit 0: '1', time is count down in minutes or seconds
5-6	
NNNN	UPS on delay in min or sec depending on Bit #6 of field YY above (low byte first)
7-10	
00 00 00 00	4 placeholders
11-12	
SSSS	UPS off delay in min or sec depending on Bit #5 of field YY above (low byte first)
13-16	
00 00 00 00	4 placeholders
17-18	
LLLL	UPS load power off (low byte sent first)
XX	Checksum

2.4. Meters block request

Purpose

The Meters block contains the measured values of the unit, defined in the ID block request, so voltages, currents, frequencies, temperature, etc.

Meter Sources in a Parallel System

Input- and output voltages, frequencies, and temperatures come from the local unit's meters. They are supposed to be equal across all units in the system.

Battery voltage, and capacity show the lowest of all units' meters.

Input currents, battery currents, and powers are the sum of all units' meters.

Output currents, and powers are the sum of all units' meters in a parallel capacitive system, one less in a redundant system. See topology block for system type

100%-references are calculated out of the local unit's settings.

Date and Time come from the local unit. There is no synchronization between the units in a parallel system, unless you set the time.

Command

To request meter readings, send:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	34	20

Response

The response block consists of three sequences:

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
AB	**AB**	**AB**	Start of frame delimiter
04	**04**	**04**	Block (0x34 – 0x30)
40	**40**	**40**	Length of this sequence is 64 octets, i.e. 16 meters
01	**01**	**01**	Sequence: first
0-3	*0-3*	*0-3*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #19 Input Current Phase L1 in Amperes
4-7	*4-7*	*4-7*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #20 Input Current Phase L2 in Amperes
8-11	*8-11*	*8-11*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #21 Input Current Phase L3 in Amperes
12-15	*12-15*	*12-15*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #22 Output Watts
16-19	*16-19*	*16-19*	
XXXXXXXX			Meter #24 Single unit: Output VA
20-23			
XXXXXXXX			Meter #26 Single unit: Output Power Factor
24-27			
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #28 Output Frequency
28-31	*20-23*	*20-23*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #29 Input Frequency

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
32-35	*24-27*	*24-27*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #30 Inverter Frequency in Hertz
36-39	*28-31*	*28-31*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #31 Bypass Frequency
40-43	*32-35*	*32-35*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #33 Battery Current in Amperes
44-47	*36-39*	*36-39*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #34 Battery Voltage in Volts
48-51	*40-43*	*40-43*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #35 %Battery Left
52-55	*44-47*	*44-47*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #36 Battery Time Remaining in seconds
56-59	*48-51*	*48-51*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #42 Battery DCUV 100% reference
60-63	*52-55*	*52-55*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #43 Input Current 100% reference
	56-59	*56-59*	
	XXXXXXXX	**XXXXXXXX**	Meter #44 Sub unit, System: Low Battery Warning Voltage 100% reference
	60-63	*60-63*	
	XXXXXXXX	**XXXXXXXX**	Meter #46 Sub unit, System: Battery Charge Current 100% reference
XX	**XX**	**XX**	Checksum of first sequence
Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
AB	**AB**	**AB**	Start of frame delimiter
04	**04**	**04**	Block (0x34 – 0x30)
40	**40**	**40**	Length of this sequence is 64 octets, i.e. 16 meters
02	**02**	**02**	Sequence: second
64-67	*64-67*	*64-67*	
XXXXXXXX			Meter #44 Single unit: Low Battery Warning Voltage 100% reference
68-71			
XXXXXXXX			Meter #46 Single unit: Battery Charge Current 100% reference
72-75			
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #47 Battery Discharge Current 100% reference
76-79	*68-71*	*68-71*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #54 Bypass Volts Phase L1-N in Volts
80-83	*72-75*	*72-75*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #55 Bypass Volts Phase L2-N in Volts
84-87	*76-79*	*76-79*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #56 Bypass Volts Phase L3-N in Volts
88-91	*80-83*	*80-83*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #57 Input Volts Phase L1-N in Volts
92-95	*84-87*	*84-87*	

Byte#			Description
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #58 Input Volts Phase L2-N in Volts
96-99	*88-91*	*88-91*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #59 Input Volts Phase L3-N in Volts
100-103	*92-95*	*92-95*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #63 Ambient Temperature in ºC
104-107	*96-99*	*96-99*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #66 Load Current Phase L1 in Amperes
108-111	*100-103*	*100-103*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #67 Load Current Phase L2 in Amperes
112-115	*104-107*	*104-107*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #68 Load Current Phase L3 in Amperes
116-119	*108-111*	*108-111*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #69 Load Current Phase L1 100% reference in Amperes
120-123	*112-115*	*112-115*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #70 Load Current Phase L2 100% reference in Amperes
124-127	*116-119*	*116-119*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #71 Load Current Phase L3 100% reference in Amperes
	120-123	*120-123*	
	XXXXXXXX	**XXXXXXXX**	Meter #73 Sub unit, System: Date
	124-127	*124-127*	
	XXXXXXXX	**XXXXXXXX**	Meter #74 Sub unit, System: Time
XX	**XX**	**XX**	Checksum of second sequence
Byte#			Description
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
AB	**AB**	**AB**	Start of frame delimiter
04	**04**	**04**	Block (0x34 – 0x30)
2C	**20**	**20**	Length of this sequence is 44 for single unit, 32 for sub unit, and parallel system
83	**83**	**83**	Sequence: third and last
128-131	*128-131*	*128-131*	
XXXXXXXX			Meter #72 Single Unit: Output VA 100% reference
132-135			
XXXXXXXX			Meter #73 Single Unit: Date
136-139			
XXXXXXXX			Meter #74 Single Unit: Time
140-143			
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #79 Output Volts L1-N in Volts
144-147	*132-135*	*132-135*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #80 Output Volts L2-N in Volts
148-151	*136-139*	*136-139*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #81 Output Volts L3-N in Volts
152-155	*140-143*	*140-143*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #83 Output watts Phase L1
156-159	*144-147*	*144-147*	

Byte#			Description
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #84 Output watts Phase L2
160-163	*148-151*	*148-151*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #85 Output watts Phase L3
164-167	*152-155*	*152-155*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #86 Output watts 100% reference
168-171	*156-159*	*156-159*	
XXXXXXXX	**XXXXXXXX**	**XXXXXXXX**	Meter #92 Line Event Counter (see ID block for explanation)
XX	**XX**	**XX**	Checksum of third sequence

2.5. Active Alarms block request

Purpose

Get the Active Alarms of the UPS. The Active Alarms Block contains a byte for each alarm defined in the ID block request. An Alarm is active, if it's value is different from 0.

Alarm Sources in a Parallel System

You see all alarms from any unit on system level.

Command

To request active alarms, send:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	35	1F

Response

The response block consists of one sequence:

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
AB	**AB**	**AB**	Start of frame delimiter
05	**05**	**05**	Block (0x35 – 0x30)
60	**60**	**60**	Length of this sequence is 96 for single/sub unit, and for parallel system
01	**01**	**01**	Sequence: first
0	*0*	*0*	
XX	**XX**	**XX**	Alarm #0: inverter AC over voltage XX can be: 0: no alarm greater than 0: alarm active
1	*1*	*1*	
XX	**XX**	**XX**	Alarm #1: inverter AC under voltage
2	*2*	*2*	
XX	**XX**	**XX**	Alarm #2: inverter under over frequency
3	*3*	*3*	
XX	**XX**	**XX**	Alarm #3: bypass AC over voltage
4	*4*	*4*	
XX	**XX**	**XX**	Alarm #4: bypass AC under voltage
5	*5*	*5*	
XX	**XX**	**XX**	Alarm #5: bypass under over frequency
6	*6*	*6*	
XX	**XX**	**XX**	Alarm #6: input AC over voltage
7	*7*	*7*	
XX	**XX**	**XX**	Alarm #7: input AC under voltage
8	*8*	*8*	
XX	**XX**	**XX**	Alarm #8: input under-over frequency
9	*9*	*9*	
XX	**XX**	**XX**	Alarm #9: output AC over voltage
10	*10*	*10*	
XX	**XX**	**XX**	Alarm #10: output AC under voltage
11	*11*	*11*	
XX	**XX**	**XX**	Alarm #11: output under-over frequency

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
12	*12*	*12*	
XX	**XX**	**XX**	Alarm #12: remote emergency power off
13	*13*	*13*	
XX	**XX**	**XX**	Alarm #14: building alarm 6
14	*14*	*14*	
XX	**XX**	**XX**	Alarm #15: building alarm 5
15	*15*	*15*	
XX	**XX**	**XX**	Alarm #16: building alarm 4
16	*16*	*16*	
XX	**XX**	**XX**	Alarm #17: building alarm 3
17	*17*	*17*	
XX	**XX**	**XX**	Alarm #18: building alarm 2
18	*18*	*18*	
XX	**XX**	**XX**	Alarm #19: building alarm 1
19	*19*	*19*	
XX	**XX**	**XX**	Alarm #21: charger over temperature
20	*20*	*20*	
XX	**XX**	**XX**	Alarm #24: inverter over temperature
21	*21*	*21*	
XX	**XX**	**XX**	Alarm #25: output overload
22	*22*	*22*	
XX	**XX**	**XX**	Alarm #26: rectifier input over current
23	*23*	*23*	
XX	**XX**	**XX**	Alarm #27: inverter output over current
24	*24*	*24*	
XX	**XX**	**XX**	Alarm #28: DC link over voltage
25	*25*	*25*	
XX	**XX**	**XX**	Alarm #29: DC link under voltage
26	*26*	*26*	
XX	**XX**	**XX**	Alarm #30: rectifier failed
27	*27*	*27*	
XX	**XX**	**XX**	Alarm #31: inverter fault
28	*28*	*28*	
XX	**XX**	**XX**	Alarm #32: battery contactor failed
29	*29*	*29*	
XX	**XX**	**XX**	Alarm #33: bypass breaker failed
30	*30*	*30*	
XX	**XX**	**XX**	Alarm #34: charger failure
31	*31*	*31*	
XX	**XX**	**XX**	Alarm #38: Bypass uncalibrated
32	*32*	*32*	
XX	**XX**	**XX**	Alarm #40: output uncalibrated
33	*33*	*33*	
XX	**XX**	**XX**	Alarm #41: Inverter uncalibrated
34	*34*	*34*	
XX	**XX**	**XX**	Alarm #42: DC voltage uncalibrated
35	*35*	*35*	
XX	**XX**	**XX**	Alarm #47: battery Current Limit
36	*36*	*36*	
XX	**XX**	**XX**	Alarm #48: inverter Startup Failure
37	*37*	*37*	
XX	**XX**	**XX**	Alarm #53: Non-Volatile RAM failure

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
38	*38*	*38*	
XX	**XX**	**XX**	Alarm #55: shutdown Imminent
39	*39*	*39*	
XX	**XX**	**XX**	Alarm #56: battery low
40	*40*	*40*	
XX	**XX**	**XX**	Alarm #57: utility fail
41	*41*	*41*	
XX	**XX**	**XX**	Alarm #59: Utility not present
42	*42*	*42*	
XX	**XX**	**XX**	Alarm #68: battery dc over voltage
43	*43*	*43*	
XX	**XX**	**XX**	Alarm #70: power supply failure
44	*44*	*44*	
XX	**XX**	**XX**	Alarm #71: power supply 5 volt fault
45	*45*	*45*	
XX	**XX**	**XX**	Alarm #72: power supply 12 volt fault
46	*46*	*46*	
XX	**XX**	**XX**	Alarm #74: heatsink temperature sensor failed
47	*47*	*47*	
XX	**XX**	**XX**	Alarm #75: rectifier current over 125 %
48	*48*	*48*	
XX	**XX**	**XX**	Alarm #78: Inverter program stack error
49	*49*	*49*	
XX	**XX**	**XX**	Alarm #92: inverter off command
50	*50*	*50*	
XX	**XX**	**XX**	Alarm #94: to bypass command
51	*51*	*51*	
XX	**XX**	**XX**	Alarm #102: phase A current limit
52	*52*	*52*	
XX	**XX**	**XX**	Alarm #103: phase B current limit
53	*53*	*53*	
XX	**XX**	**XX**	Alarm #104: phase C current limit
54	*54*	*54*	
XX	**XX**	**XX**	Alarm #105: bypass not available
55	*55*	*55*	
XX	**XX**	**XX**	Alarm #106: rectifier breaker open
56	*56*	*56*	
XX	**XX**	**XX**	Alarm #107: battery contactor open
57	*57*	*57*	
XX	**XX**	**XX**	Alarm #118: rectifier phase rotation
58	*58*	*58*	
XX	**XX**	**XX**	Alarm #119: bypass phase rotation
59	*59*	*59*	
XX	**XX**	**XX**	Alarm #121: Parallel board failure
60	*60*	*60*	
XX	**XX**	**XX**	Alarm #132: Loss of redundancy
61	*61*	*61*	
XX	**XX**	**XX**	Alarm #146: CPU ISR Error
62	*62*	*62*	
XX	**XX**	**XX**	Alarm #149: battery needs service
63	*63*	*63*	
XX	**XX**	**XX**	Alarm #157 Check Output Switchgear

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
64	*64*	*64*	
XX	**XX**	**XX**	Alarm #159: level 2 overload phase A
65	*65*	*65*	
XX	**XX**	**XX**	Alarm #160: level 2 overload phase B
66	*66*	*66*	
XX	**XX**	**XX**	Alarm #161: level 2 overload phase C
67	*67*	*67*	
XX	**XX**	**XX**	Alarm #162: level 3 overload phase A
68	*68*	*68*	
XX	**XX**	**XX**	Alarm #163: level 3 overload phase B
69	*69*	*69*	
XX	**XX**	**XX**	Alarm #164: level 3 overload phase C
70	*70*	*70*	
XX	**XX**	**XX**	Alarm #165: level 4 overload phase A
71	*71*	*71*	
XX	**XX**	**XX**	Alarm #166: level 4 overload phase B
72	*72*	*72*	
XX	**XX**	**XX**	Alarm #167: level 4 overload phase C
73	*73*	*73*	
XX	**XX**	**XX**	Alarm #168: ups on battery
74	*74*	*74*	
XX	**XX**	**XX**	Alarm #169: ups on bypass
75	*75*	*75*	
XX	**XX**	**XX**	Alarm #174: low battery shutdown
76	*76*	*76*	
XX	**XX**	**XX**	Alarm #176: Software incompatibility detected
77	*77*	*77*	
XX	**XX**	**XX**	Alarm #188: Bypass failure
78	*78*	*78*	
XX	**XX**	**XX**	Alarm #191: battery test failed
79	*79*	*79*	
XX	**XX**	**XX**	Alarm #192: Fuse Failed
80	*80*	*80*	
XX	**XX**	**XX**	Alarm #194: site wiring fault
81	*81*	*81*	
XX	**XX**	**XX**	Alarm #199: batteries disconnected
82	*82*	*82*	
XX	**XX**	**XX**	Alarm #201: Transformer Over Temperature
83	*83*	*83*	
XX	**XX**	**XX**	Alarm #202: Ambient Under Temperature
84	*84*	*84*	
XX	**XX**	**XX**	Alarm #203: Ambient Over Temperature
85	*85*	*85*	
XX	**XX**	**XX**	Alarm #206: Automatic Shutdown Pending
86	*86*	*86*	
XX	**XX**	**XX**	Alarm #208: Unable to Charge Batteries
87	*87*	*87*	
XX	**XX**	**XX**	Alarm #211: Modem failed
88	*88*	*88*	
XX	**XX**	**XX**	Alarm #216: Modem Call Completion Failed
89	*89*	*89*	
XX	**XX**	**XX**	Alarm #219: Auto Calibration failed

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
90	*90*	*90*	
XX	**XX**	**XX**	Alarm #220: Selective Trip of Module
91	*91*	*91*	
XX	**XX**	**XX**	Alarm #221: Inverter Output Failure
92	*92*	*92*	
XX	**XX**	**XX**	Alarm #222: Abnormal Output Voltage at Startup
93	*93*	*93*	
XX	**XX**	**XX**	Alarm #223: rectifier over temperature
94	*94*	*94*	
XX	**XX**	**XX**	Alarm #224: Configuration error
95	*95*	*95*	
XX	**XX**	**XX**	Alarm #225: redundancy loss due to overload
XX	**XX**	**XX**	Checksum

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
AB	**AB**	**AB**	Start of frame delimiter
05	**05**	**05**	Block (0x35 – 0x30)
01	**01**	**01**	Length of this sequence is 1 for single/sub unit, and for parallel system
82	**82**	**82**	Sequence: second and last
96	*96*	*96*	
XX	**XX**	**XX**	Single, Sub Unit, Alarm #262: Not enough units to support load
XX	**XX**	**XX**	Checksum

2.6. Configuration block request

Purpose

The Configuration block contains the setup and type information about the UPS. See also: Extended limits block request. The Configuration block format is the same for single unit-, parallel system-, and subunit XCP. The data tell the configuration of this UPS in single-, sub unit mode, or the configuration of the whole system in system level mode.

Command

To request configuration, send:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	36	1E

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
06	Block (0x36 – 0x30)
50	Length of this sequence is 80
81	Sequence: first and only one
0-1	
0191	Machine code: 401 decimal
2-3	
248B	Model number = 9355. 3/5/9 power protection number in marketing literature.
4-5	
0000	Model configuration word is unused
6-7	
XXXX	Input frequency deviation (1/100Hz, low byte first). Example: ±1.0Hz is 0x0064
8-9	
XXXX	Nominal voltage (low byte sent first). User settable:
10-11	
XXXX	Nominal frequency (low byte sent first). User settable:
12-13	
0078	Output phase angle: 120°
14-15	
0000	Hardware modules installed, bytes 1 & 2 are unused
16-17	
XX XX	Hardware modules installed: validity of Status request [0x33]

UPS model	User setting	Nominal voltage value
high voltage	220V	0x00DC
	230V	0x00E6
	240V	0x00F0

User setting	Nominal frequency value
50Hz	0x0032
60Hz	0x003C

<table>
<tr><th>Byte#
Field</th><th>Description</th></tr>
<tr><td></td><td>response data
<table>
<tr><th>Byte</th><th>Description</th><th>bitfield</th></tr>
<tr><td>16</td><td>0xFD: validity of status block byte 2</td><td>11111101</td></tr>
<tr><td>17</td><td>0x70: validity of status block byte 4</td><td>01110000</td></tr>
</table></td></tr>
<tr><td>18-21</td><td></td></tr>
<tr><td>00 00 00 00</td><td>Hardware modules installed: reserved data</td></tr>
<tr><td>22-27</td><td></td></tr>
<tr><td>00 00 XX XX 0X XX</td><td>Battery data:
<table>
<tr><th>Byte</th><th>Value</th><th></th></tr>
<tr><td>1-2</td><td>0x0000</td><td>reserved</td></tr>
<tr><td>3-4</td><td>0xXXXX</td><td>User settable, default 0x00AF = 175, battery shut down level 1.75V/cell</td></tr>
<tr><td>5</td><td>0x01</td><td>Total number, internal and external, of battery strings. Default: 1 string</td></tr>
<tr><td>6</td><td>0xXX</td><td>reserved</td></tr>
</table></td></tr>
<tr><td>28-29</td><td></td></tr>
<tr><td>00 00</td><td>2-byte placeholder</td></tr>
<tr><td>30</td><td></td></tr>
<tr><td>04</td><td>This com port set up: 8N1, no handshaking</td></tr>
<tr><td>31</td><td></td></tr>
<tr><td>XX</td><td>Communication speed of this port:
<table>
<tr><th>User setting</th><th>bps rate value</th></tr>
<tr><td>1200 bps</td><td>0x05</td></tr>
<tr><td>9600 bps</td><td>0x08</td></tr>
<tr><td>19200 bps</td><td>0x09 (default)</td></tr>
</table></td></tr>
<tr><td>32-33</td><td></td></tr>
<tr><td>00 00</td><td>2-byte placeholder</td></tr>
<tr><td>34-35</td><td></td></tr>
<tr><td>0000</td><td>Output voltage adjustment settings – always 0x0000</td></tr>
<tr><td>36-37</td><td></td></tr>
<tr><td>00 00</td><td>Unused placeholder</td></tr>
<tr><td>38-39</td><td></td></tr>
<tr><td>MMmm</td><td>The revision of DSP firmware. BCD. Same format as in ID block request [0x31] response.</td></tr>
<tr><td>40-41</td><td></td></tr>
<tr><td>00 00</td><td>Unused placeholder</td></tr>
<tr><td>42-43</td><td></td></tr>
<tr><td>00 00</td><td>Unused placeholder</td></tr>
<tr><td>44-45</td><td></td></tr>
<tr><td>MMmm</td><td>The revision of Front Panel Display firmware. Same format as above.</td></tr>
<tr><td>46</td><td></td></tr>
<tr><td>00</td><td>OEM type: 00 = Powerware</td></tr>
<tr><td>47</td><td></td></tr>
<tr><td>1F</td><td>Length of Extended limits block request [0x3C] response is 31</td></tr>
<tr><td>48-63</td><td></td></tr>
<tr><td>XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX</td><td>16-byte part number. The number is written at the beginning of this field. The end of the field is filled spaces (0x20).</td></tr>
</table>

Byte# **Field**	**Description**
64-79	
XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX	16-byte serial number. The number is written at the beginning of this field. The end of the field is filled spaces (0x20).
XX	Checksum

2.7. Battery test data request

Purpose

The Battery test result block contains the results of the last Initiate battery test command and ABM status. The Battery test result block format is the same for single unit-, parallel system-, and subunit XCP. The data tell the battery status of this UPS in single-, sub unit mode, or the battery status of the whole system in system level mode.

Command

To request Battery test result, send:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	3B	19

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
0B	Block (0x3C – 0x30)
15	Length of this sequence is 21
81	Sequence: first and only one
0	
XX	Battery status as one of the following byte code: **Battery status** / **Status XX** Test in progress / 0x01 Test passed / 0x02 Test abort (can't be performed) / 0x03 Test failed: Battery alarms active at test response / 0x04
1-4	
00000000	Not implemented (32-bit floating point battery voltage after start delay seconds (ST) of last Initiate battery test command [0xB1], or, zero (0x00000000) if the test is not yet performed or was interrupted before the start delay passed).
5-8	
00000000	Not implemented (32-bit floating point battery voltage after duration seconds (DU) of last Initiate battery test command [0xB1], or, zero (0x00000000) if the test is not yet performed or was interrupted before the start delay passed).
9	
00	Not implemented (Test duration seconds (DU) of last Initiate battery test command [0xB1]).
10-13	
00000000	Not implemented (32-bit floating point Input Voltage measured before starting Battery test).
14-17	
00000000	Not implemented (32-bit floating point Input Current measured before starting Battery test).
18	
00	No external battery cabinets reporting their status.
19	
01	Number of ABM statuses: 1 cabinet.

<table>
<tr><th>Byte#
Field</th><th>Description</th></tr>
<tr><td>20</td><td></td></tr>
<tr><td>XX</td><td>ABM status as one of the following byte code:
<table><tr><th>ABM status</th><th>Status XX</th></tr><tr><td>Charging</td><td>0x01</td></tr><tr><td>Discharging</td><td>0x02</td></tr><tr><td>Floating</td><td>0x03</td></tr><tr><td>Resting</td><td>0x04</td></tr><tr><td>Unknown</td><td>0x05</td></tr></table></td></tr>
<tr><td>XX</td><td>Checksum</td></tr>
</table>

2.8. Extended limits block request

Purpose

The Extended limits block contains configuration information in addition to configuration command. See also Configuration block request. The Extended limit block format is the same for single unit-, parallel system-, and subunit XCP. The data tell the limits of this UPS in single-, sub unit mode, or the limits of the whole system in system level mode.

Command

To request extended limits, send:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	3C	18

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
0C	Block (0x3C – 0x30)
1F	Length of this sequence is 31
81	Sequence: first and only one
0-1	
XXXX	Nominal utility voltage (low byte sent first), EEPROM settable, default: 230V = 0x00E6
2-3	
XXXX	Nominal utility frequency (low byte sent first), EEPROM settable, default 55Hz = 0x0037 i.e. accepts 50 and 60 Hz input
4-5	
XXXX	True power rating (low byte sent first). Watts/50: Product of nominal output KVA and output power factor. Typical values: **Unit** / **Wattage** / **True Power Rating** 40kVA / 36kW / 0x02D0 30kVA / 27kW / 0x021C 24kVA / 21.6kW / 0x01B0 15kVA / 13.5kW / 0x010E 12kVA / 10.8kW / 0x00D8 10kVA / 9kW / 0x00B4 8kVA / 7.2kW / 0x0090 Parallel System power rating is the total of the units' power rating, for redundant systems one unit's power rating less.
6-7	
43 30	XCP spec. supported: 0x43 0x30 indicates Version "C0".
8-9	
XXXX	Bypass/utility frequency limits (in Hz / 100, low byte sent first) Parameter settable: 0.5…3Hz, default: 2Hz = 0x00C8
10-11	
XXXX	Bypass low limit, Parameter settable: nom. Output voltage –(1%…20%), default: 230V –15% = 195V = 0x00C3
12-13	
XXXX	Bypass high limit, Parameter settable: nom. Output voltage +(1%…20%), default: 230V +10% = 253V = 0x00FD

Byte# **Field**	**Description**
14-15	
XXXX	Bypass phase deviation limit (low byte sent first) ROM default: 3 degrees = 0x0003
16	
01	Low battery warning (in minutes)
17	
XX	Horn status: disabled = 0x00, enabled = 0x01, muted = 0x02 default: enabled
18-19	
XXXX	Minimum supported line voltage (low byte sent first) EEPROM settable: nom. Output voltage –(1%…21%), default: 230V –21% = 181V = 0x00B5
20-21	
XXXX	Maximum supported line voltage (low byte sent first) EEPROM settable: nom. Output voltage +(1%…21%), default: 230V +21% = 278V = 0x0116
22-23	
XXXX	Line return stabilization delay. (30 seconds + Parameter settable 0…32768 seconds), or 0 = no automatic restart, default 30 seconds = 0x001E.
24	
00	Minimum battery capacity for return – always 0x00
25	
00	Ambient temperature low alarm limit – always 0x00
26	
XX	Ambient temperature upper alarm limit: EEPROM settable, default 75°C = 0x4B for 8-10 kVA, 95°C = 0x5F for 12-15 kVA, 65-70°C for 24-30 kVA, and 70°C for 40 kVA
27-28	
00 00	Miscellaneous configuration flags and mask not used, always 0
29	
00	Percent load for sleep, not used, always 0
30	
00	Minutes delay for sleep, not used, always 0
XX	Checksum

2.9. System test data request

Purpose

The System test result block contains the results of the last Request system test command (0xB2). The System test result block format is the same for single unit-, parallel system-, and subunit XCP. The data tell the test result of this UPS in single-, sub unit mode, or the test result of the whole system in system level mode.

Command

To request System test result, send:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	3F	15

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
0B	Block (0x3C – 0x30)
04	Length of this sequence is 4
81	Sequence: first and only one
0	
01	The Number of Modules reporting results of Systems Tests is 1.
1	
02	Two bytes reported below for test results
2	
XX	Test Results Status of the Last Test run for each module: **0:** No test has been requested since control power on **1:** Systems test IN PROGRESS - data is NOT valid **2:** Systems test PASSED **3:** Test ABORTED - test could not be performed at this time (e.g., because UPS is On Battery) **4:** Systems Test FAILED
3	
XX	Number of Last Test: **0:** No test has been requested since control power on **1:** General Systems Test **2:** Schedule Battery Commissioning Test **3:** Test Alternate AC Input **4:** Flash the Lights Test
XX	Checksum

2.10. Command list request

Purpose

The Command list block lists all the commands available for this UPS or system.

Command

To request the command list, send:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	40	14

Response

The response block consists of one sequence:

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
AB	**AB**	**AB**	Start of frame delimiter
10	**10**	**10**	Block (0x40 – 0x30)
21	**1A**	**21**	Length of this sequence is for single: 33, for sub unit: 26, and for system 33.
81	**81**	**81**	Sequence: first
0	*0*	*0*	
1E	**17**	**1E**	Number of commands listed: 30, for sub unit: 23, and for system 30.
1	*1*	*1*	
01	**01**	**01**	Number of octets for each command (1)
2	*2*	*2*	
31	**31**	**31**	Send ID Block
3	*3*	*3*	
33	**33**	**33**	Send Status Block
4	*4*	*4*	
34	**34**	**34**	Send Meters Block
5	*5*	*5*	
35	**35**	**35**	Send Alarms Block
6	*6*	*6*	
36	**36**	**36**	Send Configuration Block
7	*7*	*7*	
3B	**3B**	**3B**	Send Battery Tests Results
8	*8*	*8*	
3C	**3C**	**3C**	Send Extended Limits Block
9	*9*	*9*	
3F	**3F**	**3F**	Send Test Results Block
10	*10*	*10*	
40	**40**	**40**	Send Command List Block
11	*11*	*11*	
42	**42**	**42**	Send Comm Capabilities Block
12	*12*	*12*	
43	**43**	**43**	Send UPS Topology Data Block
13	*13*	*13*	
45	**45**	**45**	Send Scratchpad Data Block
14	*14*	*14*	

Byte#			Description
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
46	**46**	**46**	Read Configuration Field
15	*15*	*15*	
50	**50**	**50**	Data Provider Command
16	*16*	*16*	
88		**88**	Go To Bypass
17		*17*	
89		**89**	Immediate UPS On
18		*18*	
8A		**8A**	Delayed Load Power Off & Restart
19		*19*	
8B		**8B**	UPS Off/Load Power Off
20		*20*	
90	**90**	**90**	Set Time & Date
21	*17*	*21*	
91		**91**	Delayed UPS On in "n" minutes
22		*22*	
93		**93**	Delayed UPS Off in "n" minutes
23		*23*	
95	**95**	**95**	Set Config Parameter
24	*18*	*24*	
96	**96**		Write Configuration Field
25	*19*		
98	**98**	**98**	Set Communication Parameter
26	*20*	*25*	
99		**99**	Set Scratchpad Data
27		*26*	
9A		**9A**	Set Power Strategy
28		*27*	
A0	**A0**	**A0**	Send Only Requested Blocks
29	*21*	*28*	
B1	**B1**	**B1**	Initiate Battery Test
30	*22*	*29*	
B2	**B2**	**B2**	Initiate Systems Test
31	*23*	*30*	
	CE	**CE**	Select Sub Module
	24	*31*	
CF	**CF**	**CF**	Authorization Code
32	*25*	*32*	
FF	**FF**	**FF**	Exit XCP Mode
XX	**XX**	**XX**	Checksum

2.11. Communications capabilities request

Purpose

The communications capabilities command tells the host the number of the serial ports, the supported communication speeds, the maximum size of a command block, and the maximum response block size. See also: Set communication parameter command. The communications capabilities block format is the same for single unit-, parallel system-, and subunit XCP. The data always tell the communications capabilities of the local UPS.

Command

There are two possibilities to request Communications capabilities. Either port number 1:

SFD [hex]	Length [hex]	Cmd [hex]	Parameter [hex]	Checksum [hex]
AB	01	42	01	10

or

SFD [hex]	Length [hex]	Cmd [hex]	Parameter [hex]	Checksum [hex]
AB	01	42	00	11

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
12	Block (0x42 – 0x30)
0D	Length of this sequence is 13
81	Sequence: first and only one
0	
01	Number of the communication port
1	
04	Number of supported bps rates is 4
2-3	
04B0	1200 bps supported (low byte sent first)
4-5	
0960	2400 bps supported (low byte sent first)
6-7	
2580	9600 bps supported (low byte sent first)
8-9	
4B00	19200 bps supported (low byte sent first)
10	
3D	Maximum length command that can be received in the UPS input buffer, including header and checksum, is 61.
11-12	
00C8	Largest block response that the UPS can send at once is 200 bytes = 0x00C8
XX	Checksum

2.12. UPS topology data request

Purpose

UPS topology block tells, what kind of UPS this is. The topology block format is the same for single unit-, parallel system-, and subunit XCP. The data tell the topology of this UPS in single-, sub unit mode, or the topology of the whole system in systen level mode.

Command

To request topology block from the UPS the host should send:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	43	11

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
13	Block (0x43 – 0x30)
03	Length of this sequence is 3
81	Sequence: first and only one
0-1	
00X3	Overall topology (low byte send first): **0x0042:** Standalone On-Line UPS, 3 Output Phases and 3 Input Phases **0x0052:** Parallel redundant On-Line UPS, 3 Output Phases and 3 Input Phases **0x0062:** Parallel capacitive On-Line UPS, 3 Output Phases and 3 Input Phases
2	
00	Size of elements in the UPS Element table: 0x00 indicates none
XX	Checksum

2.13. Scratch pad data request

This command exists only for ingle unit-,and parallel system XCP.

Purpose

The scratch pad data block provides the contents of the specified sector of 16 bytes of non-volatile memory. This data is set by the Set scratch pad sector command. These sectors must be fetched one at a time; there is no bulk request for “all sectors”. scratch pad data itself has no meaning to the UPS; it contains whatever monitoring software wants to put in it. See also command 0x99, Set scratch pad Sector. The scratch pad data block format is the same for single unit-,and parallel system XCP. Parallel sub unit does not support scratch pad. The scratch pad data always comes from the locally connected UPS.

Command

To request scratch pad data block, send:

SFD [hex]	Length [hex]	Cmd [hex]	Sector [hex]	Checksum [hex]
AB	02	45	01...0C	XX

This UPS has 12 scratch pad sectors. Hence Sector is a number from 1 to 0x0D.

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
15	Block (0x45 – 0x30)
11	Length of this sequence is 17
81	Sequence: first and only one
0	
XX	Sector number: 0x01…0x0C
1-16	
XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX	16 bytes of data from this scratch pad sector
XX	Checksum

2.14. Read Configuration Field

This command exists only for single unit-,and parallel sub unit XCP.

Purpose

Get new type configuration field data from UPS. The configuration field block format is the same for single unit-,and parallel sub unit XCP. Parallel system XCP does not support configuration fields. The configuration fields always come from the locally connected UPS.

2.14.1. List readable fields

Command

To request the list of readable configuration fields, send:

SFD [hex]	Length [hex]	Cmd [hex]	Field Number [hex]	Checksum [hex]
AB	03	46	FFFF	0E

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
40	Length of this sequence is 64 octets: 30 configuration fields
81	Sequence: first and only one
00	
31	Command Accepted
01	
46	Echo command
02-03	
FFFF	Echo command
04-05	
0001	Field #1: Audible Alarms, Type: U8_T
06-07	
0002	Field #2: Nominal Output Voltage, Type: U16_T
08-09	
0003	Field #3: Bypass Voltage Maximum, Type: S8_T
10-11	
0004	Field #4: Bypass Voltage Minimum, Type: S8_T
12-13	
0005	Field #5: Nominal Output Frequency, Type: U16_T
14-15	
0006	Field #6: Synchronization Window, Type: U8_T
16-17	
0007	Field #7: Output Frequency Max Slew Rate, Type: U16_T
18-19	
0008	Field #8: Number Of Battery Strings, Type: U16_T
20-21	
0009	Field #9: Battery Watts Per Cell, Type: U16_T
22-23	
000A	Field #10: Battery Cells Per String, Type: U16_T
24-25	

Byte# **Field**	**Description**
000B	Field #11: Constant Float Voltage, Type: U16_T
26-27	
000C	Field #12: Low Battery Warning Level, Type: U16_T
28-29	
000D	Field #13: On Battery Alarm Delay, Type: U16_T
30-31	
000E	Field #14: Maximum Charge Current, Type: U16_T
32-33	
000F	Field #15: Automatic On Delay, Type: S16_T
24-35	
0010	Field #16: Automatic Off Delay, Type: S16_T
36-37	
0011	Field #17: Hardware Remote Off Delay, Type: U16_T
38-39	
0012	Field #18: X-slot shutdown signal activation delay, Type: U16_T
40-41	
0013	Field #19: Rectifier Current Limit, Type: U16_T
42-43	
0014	Field #20: Modem Communication, Type: U8_T
44-45	
0015	Field #21: Modem Call Number, Type: SSTRING_T, Format: 1
46-47	
0016	Field #22: Modem Initialization String, Type: SSTRING_T, Format: 1
48-49	
0018	Field #24: Unit Telephone Number, Type: SSTRING_T, Format: 1
50-51	
0019	Field #25: CTO Number, Type: SSTRING_T, Format: 1
52-53	
001A	Field #26: Serial Number, Type: SSTRING_T, Format: 1
54-55	
001B	Field #27: Part Number, Type: SSTRING_T, Format: 1
56-57	
001C	Field #28: UPS Family Name, Type: SSTRING_T, Format: 1
58-59	
001D	Field #29: Reset Parameters, Type: BMASK_16_T
60-61	
001E	Field #30: Battery Handling, Type: BMASK_16_T
62-63	
001F	Field #31: Operation Settings, Type: BMASK_16_T
XX	Checksum

2.14.2. Read a Configuration field

Command

To read a configuration field, send:

SFD [hex]	Length [hex]	Cmd [hex]	Field Number [hex]	Checksum [hex]
AB	02	46	XXXX	XX

Response

The response is the standard Acknowledge (0x09) block, where the data follows the command echo:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
XX	Length of this sequence
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled or EEPROM unreadable **0x36:** Field not implemented or authorization level too low
01	
46	Echo command
02-03	
XXXX	Echo field number
04-	
DDDD	Data
…	
…	Data…
XX	Checksum

Data DDDD is the Configuration Field's data.

If Data_Type is a string, the UPS firmware sends all bytes from the storage reserved for the string. This way the software knows the maximum string length in the UPS implementation. (The second byte of DDDD gives the currently used string LENGTH, followed by the string. After the bytes of the used string LENGTH, the firmware sends unspecified bytes until the length of DDDD is the maximum implemented length for this field.

2.15. Data Provider Command

Purpose of this command is to send data from a host into the UPS, e.g. external temperature sensor values, or signal inputs. The communication happens in two states:

State 1: The host sends the list of available data items. The UPS replies with ACK and a modified list of the data items it wants to receive.

State 2: The host sends data updates periodically, or whenever data changes. If the UPS responds with NACK BUSY the host goes back to state 1 and starts sending the list of available data items unless the UPS reponds ACK.

The UPS supports folowing data items provided from the host:

Number	Data Item	Format	Range	Description
1	EMP Temperature	Integer	-100 - +100 ºC	Temperature measured by the first or default EMP module. Normally is Ambient Temperature.
2	EMP Humidity	Integer	0 - 100	Humidity measured by the first or default EMP module. Normally is Ambient Humidity.
3	EMP Contacts	TBD	--	Provides the state of the EMP Contact Inputs.

2.15.1. Send List of Available Data Items

Command

To send the list to the UPS send:

SFD [hex]	Length [hex]	Cmd [hex]	Op. [hex]	List of Available Data Items [hex]	Checksum [hex]
AB	XX	50	FF	LLMMPP…	XX

LLMMPP… are numbers (bytes) of the available data types.

Response

The response is the standard Acknowledge (0x09) block, where the data follows the command echo:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
XX	Length of this sequence
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** UPS not ready to receive data **0x36:** Parameter invalid or missing or too many parameters
01	
50	Echo Command
02	
FF	Echo Operator
03…	
LLPP…	Echo the kind of data, the UPS wants to receive
XX	

2.15.2. Send Data Update

Command

To send the list to the UPS send:

SFD [hex]	Length [hex]	Cmd [hex]	Op. [hex]	Data Type [hex]	Data Value [hex]	
AB	XX	50	01	LL	XXXX	…

	Data Type [hex]	Data Value [hex]	CS [hex]
…	PP	XXXX	XX

Response

The response is shorter than the standard Acknowledge (0x09) block command echo:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
03	Length of this sequence is 3 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** UPS not ready to receive data
01	
50	Echo Command
02	
01	Echo Operator
XX	

2.16. Go to bypass command

This command exists only for single unit-,and parallel system XCP.

Purpose

Switch the UPS in Bypass mode. You can switch the UPS back into inverter mode with the commands: 0x89 UPS on command, and 0x91 Scheduled UPS on in "n" minutes command. The relationship to other shutdown commands explains Appendix A. Parallel sub unit XCP does not support this command.

2.16.1. Immediate go to bypass

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	88	CC

Response

The response is the standard Acknowledge (0x09) block, where the data follows the command echo:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
02	Length of this sequence is 2 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
88	Echo command
XX	Checksum

2.16.2. Delayed go to bypass

Only available in standalone units.

Command

Before the command, send authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

Then, for the delay 0 - 65535 seconds, send:

SFD [hex]	Length [hex]	Cmd [hex]	Delay [hex]	Checksum [hex]
AB	03	88	DDDD	XX

Note: The delay is stored only in the local unit.

Response

The response is the standard Acknowledge (0x09) block, where the data follows the command echo:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
04	Length of this sequence is 4 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
88	Echo command
02	
DD	Echo delay seconds, low octet
03	
DD	Echo delay seconds, high octet
XX	Checksum

2.17. UPS on command

This command exists only for single unit-,and parallel system XCP.

Purpose

The UPS on command turns on the UPS output. The relationship to other shutdown commands explains Appendix A. Parallel sub unit XCP does not support this command.

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	89	CB

Response

The response is the standard Acknowledge (0x09) block, where the data follows the command echo:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
02	Length of this sequence is 2 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
89	Echo command
XX	Checksum

2.18. Delayed load power off & restart command

This command exists only for single unit-,and parallel system XCP.

Purpose

The Delayed load power off & restart command will turn off the load power after the delay period specified in the parameter. If/when the utility input line is ok, the load power is turned back on.

When the UPS is already counting down the delay of previous delayed load power off & restart command, a new command, with a delay that is

- longer than the current count down value, is accepted and the count down continues from the new value.
- shorter than the current count down value, does nothing but responds with ACK 0x37 “Accepted with parameter adjusted”.

The relationship to other shutdown commands explains Appendix A. Parallel sub unit XCP does not support this command.

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

Then, one of the two choices: For the delay 0 - 255 seconds, send:

SFD [hex]	Length [hex]	Cmd [hex]	Delay [hex]	Checksum [hex]
AB	02	8A	DD	XX

or 0 - 65535 seconds:

SFD [hex]	Length [hex]	Cmd [hex]	Delay [hex]	Checksum [hex]
AB	03	8A	DDDD	CB

Note: The delay is stored only in the local unit. The local unit sends UPS Off, and On commands to the other units when the delay has expired.

Response

The response is the standard Acknowledge (0x09) block, where the data follows the command echo:

Byte# Field	Description
AB	Start of frame delimiter
09	Block code for all control commands
03 or 04	Length of this sequence is 3 or 4 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
89	Echo command
02	
DD	Echo delay first (low) octet
03	*Optional*
DD	Echo optional delay second (high) octet
XX	Checksum

2.19. UPS off command

This command exists only for single unit-,and parallel system XCP.

Purpose

The UPS off command turns off the UPS' or System's load power immediately. The relationship to other shutdown commands explains Appendix A. Parallel sub unit XCP does not support this command.

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	8B	C9

Response

The response is the standard Acknowledge (0x09) block, where the data follows the command echo:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
02	Length of this sequence is 2 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
8B	Echo command
XX	Checksum

2.20. Set time & date command

Purpose

Sets the clock in the UPS. Date and time are meter 73,and 74 in meters block.
Note: Only the local unit's clock is set.

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then:

SFD [hex]	Length [hex]	Cmd [hex]	Date [hex]	Time [hex]	Checksum [hex]
AB	09	90	1 YY YY MM DD	HH MM SS CC	XX

The date and time are in packed BCD format.

Date: Year is given century first YY YY={0x2000...0x2399}, Month MM={0x01...0x12}, day DD={0x01...0x31}.

Time: hr HH={0x00...0x23}, min MM={0x00...0x59}, sec SS={0x00...0x59}, hundred of second CC={0x00...0x99}. MSB of the year is '1' (1YY).

For example 2001 Feb 03, 14:13:11:85 is A0 01 02 03 14 13 11 85.

Response

The response is the standard Acknowledge (0x09) block, where the data follows the command echo:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
10	Length of this sequence is 10 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
90	Echo command
02-05	
1YY YY MM DD	Echo Date
06-09	
HH MM SS CC XX	Echo Time
XX	Checksum

2.21. Scheduled UPS on in "n" minutes command

This command exists only for single unit-,and parallel system XCP.

Purpose

The Scheduled UPS on in "n" minutes command set the schedule to turn on the output power after the minutes specified in the parameter.

If the UPS is already counting down the delay of previous Scheduled UPS on in "n" minutes command, the delay of the new command overwrites the current count down value. If the delay of the new command is zero, the countdown is cancelled and cleared.

The relationship to other shutdown commands explains Appendix A. Parallel sub unit XCP does not support this command.

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, for delay in 0...65535 minutes, low byte first:

SFD [hex]	Length [hex]	Cmd [hex]	Delay [hex]	Checksum [hex]
AB	03	91	DDDD	XX

Note: The delay is only stored in the local unit. The local unit sends a UPS On to all other units when the delay has expired.

Response

The response is the standard Acknowledge (0x09) block, where the data follows the command echo:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
04	Length of this sequence is 4 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
91	Echo command
02	
DD	Echo delay minutes, low octet
03	
DD	Echo delay minutes, high octet
XX	Checksum

2.22. Scheduled UPS off in "n" minutes command

This command exists only for single unit-,and parallel system XCP.

Purpose

The Scheduled UPS off in "n" minutes command set the schedule to turn off the output power after the minutes specified in the parameter.

If the UPS is already counting down the delay of previous Scheduled UPS off in "n" minutes command, the delay of the new command overwrites the current value. If the delay of the new command is zero, the countdown is cancelled and cleared.

The relationship to other shutdown commands explains Appendix A. Parallel sub unit XCP does not support this command.

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, for delay in 0...65535 minutes, low byte first:

SFD [hex]	Length [hex]	Cmd [hex]	Delay [hex]	Checksum [hex]
AB	03	93	DDDD	XX

Note: The delay is only stored in the local unit. The local unit sends a UPS Off to all other units when the delay has expired.

Response

The response is the standard Acknowledge (0x09) block, where the data follows the command echo:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
04	Length of this sequence is 4 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
93	Echo command
02	
DD	Echo delay minutes, low octet
03	
DD	Echo delay minutes, high octet
XX	Checksum

2.23. Set configuration command

Purpose

Set configuration command provides a way of altering the UPS configurations. Use this command to mute the buzzer: parameter 06. This commad affects only the local unit.

2.23.1. List supported parameters

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, request the list of supported configuration parameters:

SFD [hex]	Length [hex]	Cmd [hex]	Par. [hex]	Value[hex]	Checksum [hex]
AB	04	95	FF	0000	BD

Response

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
04	Length of this sequence is 4 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
95	Echo command
02	
FF	Echo parameter
03	
06	1st and only supported parameter: 06, Horn Status
XX	Checksum

2.23.2. Change configuration parameter value

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, parameter and value, low byte first:

SFD [hex]	Length [hex]	Cmd [hex]	Par. [hex]	Value[hex]	Checksum [hex]
AB	04	95	PP	VVVV	XX

The supported parameter ID's and the valid values are:

Par. id	Description	Value
0x06	Horn status	0x0001 to enable; 0x0002 to mute alarm
0xFF	Send available attr. ID's	Always 0x0000, see List supported parameters above.

Response

The response is the standard Acknowledge (0x09) block, where the data follows the command echo:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
05	Length of this sequence is 5 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
95	Echo command
02	
PP	Echo parameter
03-04	
VVVV	Echo new value
XX	Checksum

2.24. Write Configuration Field

This command exists only for single unit-,and parallel sub unit XCP.

Purpose

Set new type configuration field data from UPS.
The configuration field block format is the same for single unit-,and parallel sub unit XCP.
Parallel system XCP does not support configuration fields.
The configuration fields always come from the locally connected UPS.

2.24.1. List writable fields

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to request the list of writable configuration fields, send:

SFD [hex]	Length [hex]	Cmd [hex]	Field Number [hex]	Checksum [hex]
AB	02	96	FFFF	0E

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
3A	Length of this sequence is 58 = 27 configuration fields
81	Sequence: first and only one
00	
31	Command Accepted
01	
96	Echo command
02-03	
FFFF	Echo command
04-05	
0001	Field #1: Audible Alarms, Type: U8_T
06-07	
0002	Field #2: Nominal Output Voltage, Type: U16_T
08-09	
0003	Field #3: Bypass Voltage Maximum, Type: S8_T
10-11	
0004	Field #4: Bypass Voltage Minimum, Type: S8_T
12-13	
0005	Field #5: Nominal Output Frequency, Type: U16_T
14-15	
0006	Field #6: Synchronization Window, Type: U8_T
16-17	
0007	Field #7: Output Frequency Max Slew Rate, Type: U16_T
18-19	
0008	Field #8: Number Of Battery Strings, Type: U16_T
20-21	

Byte# **Field**	**Description**
0009	Field #9: Battery Watts Per Cell, Type: U16_T
22-23	
000B	Field #11: Constant Float Voltage, Type: U16_T
24-25	
000C	Field #12: Low Battery Warning Level, Type: U16_T
26-27	
000D	Field #13: On Battery Alarm Delay, Type: U16_T
28-29	
000E	Field #14: Maximum Charge Current, Type: U16_T
30-31	
000F	Field #15: Automatic On Delay, Type: S16_T
32-33	
0010	Field #16: Automatic Off Delay, Type: S16_T
34-35	
0011	Field #17: Hardware Remote Off Delay, Type: U16_T
36-37	
0012	Field #18: X-slot shutdown signal activation delay, Type: U16_T
38-39	
0013	Field #19: Rectifier Current Limit, Type: U16_T
40-41	
0014	Field #20: Modem Communication, Type: U8_T
42-43	
0015	Field #21: Modem Call Number, Type: SSTRING_T, Format: 1
44-45	
0016	Field #22: Modem Initialization String, Type: SSTRING_T, Format: 1
46-47	
0017	Field #23: Modem Communication Password, Type: SSTRING_T, Format: 1
48-49	
0018	Field #24: Unit Telephone Number, Type: SSTRING_T, Format: 1
50-51	
001D	Field #29: Reset, Type: BMASK_16_T
52-53	
001E	Field #30: Battery Handling, Type: BMASK_16_T
54-55	
001F	Field #31: Operation Settings, Type: BMASK_16_T
56-57	
FFFE	Field #0xFFFE: Access Level Passwords, Type: SSTRING_T, Format: 1
XX	Checksum

2.24.2. Write a Configuration field

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to write to a configuration field, send:

SFD [hex]	Length [hex]	Cmd [hex]	Field Number [hex]	Data [hex]	Checksum [hex]
AB	02	96	NNNN	DDDD...	XX

- NNNN, the Field number, is the 16-bit unsigned number (0001 – 65534, LSB first) of the Field to be written.
- DDDD, 1 – 130 data bytes is the value or the string to be written.
- The User Configuration application learns the type of the variable from the Configuration Field Description file
- Values and bitmaps must be written with predefined number of bytes, LSB first.
- Bit fields contain an array of bits followed by an equal-sized array of bit mask bits. E.g. BMASK_16_T means 8 bit data followed by 8 bit mask.
- Structured Strings are two octets longer and must be written in the form FORMAT + LENGTH + DATA.
- The Used Length must be equal to or less than the maximum Implemented length.

Response

The response is the standard Acknowledge (0x09) block, where the data follows the command echo:

Byte# Field	Description
AB	Start of frame delimiter
09	Block code for all control commands
XX	Length of this sequence
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: 0X31: Command accepted 0x33: Command disabled or EEPROM unreadable 0x36: Field not implemented or authorization level too low
01	
96	Echo command
02-03	
NNNN	Echo field number
04-	
DDDD	Data
…	
…	Data…
XX	Checksum

2.25. Set communication parameter command

Purpose

Set communication parameter is for changing the communication speed for the UPS serial port. See also command 0x42, Communications capabilities request.

2.25.1. List communication parameters

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, request the list of supported communication parameters:

SFD [hex]	Length [hex]	Cmd [hex]	Port [hex]	Par. [hex]	Value[hex]	Checksum [hex]
AB	05	98	00	FF	0000	B9

Response

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
05	Length of this sequence is 5 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
98	Echo command
02	
01	List serial ports: Host sees always only it's own port
03	
FF	Echo parameter
04	
01	1st and only supported parameter: 01, Baud Rate
XX	Checksum

2.25.2. Change communication parameter value

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, parameter and value, low byte first:

SFD [hex]	Length [hex]	Cmd [hex]	Port [hex]	Par. [hex]	Value[hex]	Checksum [hex]
AB	04	98	00	01	VVVV	XX

The supported parameter ID's and the valid values are:

Par. id	Description	Value
0x01	Baud rate	1200, 2400, 9600,or 19200

Response

The response is the standard Acknowledge (0x09) block, where the data follows the command echo:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
06	Length of this sequence is 6 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
98	Echo command
02	
00	Echo Port
03	
01	Echo parameter
04-05	
VVVV	Echo new value
XX	Checksum

2.26. Set Scratchpad Sector

This command exists only for ingle unit-,and parallel system XCP.

Purpose

Command to write 16 bytes of data to Scratchpad sector in the UPS, or to inquire as to how many scratchpad sectors are available in the UPS. Scratchpad data has no meaning to the UPS; it contains whatever monitoring software wants to put in it. See also command 0x99, Scratchpad data request. sThe scratch pad data block format is the same for single unit-,and parallel system XCP. Parallel sub unit does not support scratch pad. The scratch pad data always comes from the locally connected UPS.

2.26.1. Scratchpad Capabilities Request

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to inquire as to how many scratchpad sectors are available in the UPS, send:

SFD [hex]	Length [hex]	Cmd [hex]	Sector [hex]	Value [hex]	Checksum [hex]
AB	03	99	FF	00	BA

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
04	Length of this sequence is 4 octets
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
99	Echo command
02	
FF	Echo sector
03	
0C	UPS supports 12 scratch pad sectors of 16 bytes
XX	Checksum

2.26.2. Write to Scratchpad

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to write data to the scratchpad, send:

SFD [hex]	Length [hex]	Cmd [hex]	Sector [hex]	16 data bytes [hex]	Checksum [hex]
AB	12	99	SS	YY YY YY YY YY YY YY YY YY YY YY YY YY YY YY YY	XX

Sector is a number from 1...12.

Response

The response block consists of one sequence:

Byte# Field	Description
AB	Start of frame delimiter
09	Block code for all control commands
13	Length of this sequence is 19
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x35:** Length incorrect or value not acceptable **0x36:** Parameter invalid or missing or too many parameters
01	
99	Echo command
02	
SS	Echo sector
03-18	
YY YY YY YY **YY YY YY YY** **YY YY YY YY** **YY YY YY YY**	Echo written data
XX	Checksum

2.27. Set Power Strategy command

This command exists only for single unit-,and parallel system XCP.

Purpose

This command is used to select the power strategy for the UPS, choosing among high alert, normal, or the high efficiency strategies. This allows the user to selectively trade off levels of power protection with energy savings. The power strategy block format is the same for single unit-,and parallel system XCP. Parallel sub unit does not support power strategy command. The power strategy data always comes from the locally connected UPS.

2.27.1. List supported strategies

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to request the list of supported strategies, send:

SFD [hex]	Length [hex]	Cmd [hex]	Strat. [hex]	Checksum [hex]
AB	02	9A	FF	BA

Response

The response block consists of one sequence:

Byte#			**Description**
Single unit Field [hex]	**Parallel System**		
	Sub unit Field [hex]	**System Lvl. Field [hex]**	
AB	N/A	**AB**	Start of frame delimiter
09		**09**	Block code for all control commands
07		**06**	Length of this sequence is 7 octets for single unit, and 6 octets for parallel system
81		**81**	Sequence: first and only one
00		*00*	
31		**31**	Command accepted
01-02		*01-02*	
9A FF		**9A FF**	Echo command
03		*03*	
00		**00**	List of available Strategies: Read Back
04		*04*	
01		**01**	List of available Strategies: High Alert
05		*05*	
02		**02**	List of available Strategies: Standard
06			
03			Not in 30kVA and 40kVA: List of available Strategies: Enable High Efficiency
XX		**XX**	Checksum

2.27.2. Read back Power Strategy

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to get the current power strategy, send:

SFD [hex]	Length [hex]	Cmd [hex]	Strat. [hex]	Checksum [hex]
AB	02	9A	00	B9

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
04	Length of this sequence is 4
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01-02	
9A FF	Echo command
03	
PP	Current power strategy
XX	Checksum

2.27.3. Set Power Strategy

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to set power strategy, send:

SFD [hex]	Length [hex]	Cmd [hex]	Strat. [hex]	Checksum [hex]
AB	02	9A	PP	XX

Strategy	Description	Motivation for this Strategy
0x01	High Alert	The UPS shall optimize its operating state to maximize its power-protection levels. To maximize power protection, in the presence of unfavorable incoming utility conditions In Powerware 9355 High Alert does not differ from standard.
0x02	Standard	Balanced, normal power protection strategy. UPS Default strategy
0x03	Enable High Efficiency	Not in 30, and 40 kVA: The UPS is enabled to enter HE operating mode to optimize its operating state to maximize its efficiency, when conditions permit. Mainly the UPS goes to bypass and sets rectifier and inverter to a low power consumption mode. Only single unit supports this strategy

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
03	Length of this sequence is 3
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
9A	Echo command
02	
PP	Echo new power strategy
XX	Checksum

2.28. Set requested-only mode command

Purpose

Powerware 9355 does not implement the "unrequested mode" in XCP communication. Thus this command does nothing but responds.

Command

To set requested-only mode, send:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	A0	B4

Response

In a stand-alone UPS the response is the same as the response for the ID block request [0x31] command. If the UPS was in test mode, the UPS leaves the test mode after this command. In a parallel system, XCP switches back to system level, if it was in sub unit level. Exception: XCP is set to sub unit level in user settings (display).

2.29. Initiate battery test command

Purpose

Currently this command only responds "command accepted", but does nothing.

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to schedule a battery test, send:

SFD [hex]	Length [hex]	Cmd [hex]	Delay [hex]	Duration [hex]	Checksum [hex]
AB	03	B1	ST	DU	XX

Start delay seconds ST (1..255, 0 for default value) is the time to delay after going on battery mode before the UPS takes the first battery voltage reading. Duration seconds DU (1..255, 0 for default value) is the interval between the first and the second readings.

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
04	Length of this sequence is 4
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
B1	Echo command
02	
ST	Echo delay seconds
03	
DU	Echo duration seconds
XX	Checksum

2.30. Request system test command

Purpose

The Request a Systems Test command is used to request specific tests of the UPS. Only the UPS the host is directly connected to, exectues these tests.

2.30.1. Report Systems Test Capabilities

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to request test capabilities, send:

SFD [hex]	Length [hex]	Cmd [hex]	Test [hex]	Checksum [hex]
AB	02	B2	FF	A2

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
07	Length of this sequence is 7 octets
81	Sequence: first and only one
00	
31	Command accepted
01-02	
B2 FF	Echo command
03	
01	Initiate General Systems Test
04	
02	Schedule Battery Commissioning Test
05	
03	Test Bypass Input
06	
04	Flash the Lights Test: LED test screen
XX	Checksum

2.30.2. Initiate General Systems Test

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to start general systems test, send:

SFD [hex]	Length [hex]	Cmd [hex]	Test [hex]	Checksum [hex]
AB	02	B2	01	A0

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
03	Length of this sequence is 3
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01-02	
B2 01	Echo command
XX	Checksum

Test Result

The result of the test in the response to 0x3F, System test data request. If there was any alarm active at the time of test, the test fails. Else the test is passed.

2.30.3. Schedule Battery Commissioning Test

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to schedule battery test, send:

SFD [hex]	Length [hex]	Cmd [hex]	Test [hex]	Checksum [hex]
AB	02	B2	02	9F

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
03	Length of this sequence is 3
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01-02	
B2 02	Echo command
XX	Checksum

Test Results

The result of the test in the response to 0x3F, System test data request. The test is always passed. There is no manual battery test in this UPS yet.

2.30.4. Test Bypass Input

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to test bypass input, send:

SFD [hex]	Length [hex]	Cmd [hex]	Test [hex]	Checksum [hex]
AB	02	B2	03	9F

Response

The response block consists of one sequence:

Byte# Field	Description
AB	Start of frame delimiter
09	Block code for all control commands
03	Length of this sequence is 3
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01-02	
B2 03	Echo command
XX	Checksum

Test Results

The result of the test in the response to 0x3F, System test data request. If there was any of the alarms:

- Bypass failure
- Bypass phase rotation
- Bypass not available
- Bypass under or over frequency
- Bypass AC under voltage
- Bypass AC over voltage
- Bypass breaker fail

active at the time of test, the test fails. Else the test is passed.

2.30.5. Flash the Lights Test

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to flash the lights, send:

SFD [hex]	Length [hex]	Cmd [hex]	Test [hex]	Seconds [hex]	Checksum [hex]
AB	02	B2	04	YY	XX

The test is executed only, if there is no alarm or notice. The command switches the UPS display to the LED test menu screen and activates the horn. The user can leave the LED test screen manually, or the UPS switches back to the last screen after given seconds.

Response

The response block consists of one sequence:

Byte# **Field**	**Description**
AB	Start of frame delimiter
09	Block code for all control commands
04	Length of this sequence is 4
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01-02	
B2 04	Echo command
03	
YY	Echo test duration seconds
XX	Checksum

Test Results

The result of the test in the response to 0x3F, System test data request. If there was any alarm active at the time of test, the test fails. Else the test is passed.

2.31. Select sub-module command

Not present in standalone units.

Purpose

This command allows communication software to address individual sub-units within a parallel UPS system. The subunit selection is in effect until a subsequent "Select sub-module" block command is received. See also Set requested-only mode command [0xA0].

NOTE: You can tie XCP to sub unit level in the LCD unser menu, parallel options. The UPS responds 0x33, NACK busy, if it cannot go to system level, then.

NOTE: ID-, Meters-, Alarm-, Configuration-blocks etc. are different for System- and Sub unit level. Update your data after this command to get changed blocks.

2.31.1. List supported sub-units

Command

To request the list of supported sub-units the host should send:

SFD [hex]	Length [hex]	Cmd [hex]	Subunit [hex]	Checksum [hex]
AB	02	CE	FF	86

Response

The response block consists of one sequence:

Byte#		**Description**
Parallel System		
Sub unit Field [hex]	**System Lvl. Field [hex]**	
AB	**AB**	Start of frame delimiter
09	**09**	Block (0x43 – 0x30)
03	**XX**	Length of this sequence is 3 + , if system level, number of units in parallel system
81	**81**	Sequence: first and only one
0	*0*	
31	**31**	Acknowledge byte: Command accepted
2-3	*2-3*	
CE FF	**CE FF**	Echo command
4...	*4...*	
	00 01 ...	System: List supported sub-units
00 01 ...		Sub unit: Automatically switched back to system. Then System response sent: List supported sub-units
XX	**XX**	Checksum

2.31.2. Select default module (select system level)

Command

To select default sub unit = system level:

SFD [hex]	Length [hex]	Cmd [hex]	Subunit [hex]	Checksum [hex]
AB	02	CE	FE	87

or:

SFD [hex]	Length [hex]	Cmd [hex]	Subunit [hex]	Checksum [hex]
AB	02	CE	00	87

Response

The response block consists of one sequence:

Byte# **Parallel System and Sub unit Field [hex]**	**Description**
AB	Start of frame delimiter
09	Block (0x43 – 0x30)
03	Length of this sequence is 3
81	Sequence: first and only one
0	
31	Acknowledge byte: Command accepted
2-3	
CE FE	Echo command
XX	Checksum

or:

Byte# **Parallel System and Sub unit Field [hex]**	**Description**
AB	Start of frame delimiter
09	Block (0x43 – 0x30)
03	Length of this sequence is 3
81	Sequence: first and only one
0	
31	Acknowledge byte: Command accepted
2-3	
CE 00	Echo command
XX	Checksum

2.31.3. Select a sub-unit

Command

With this command the sub-unit SU is selected as the target for the communication. After this command the following XCP commands respond the data of the sub-unit SU. See also Set requested-only mode command [0xA0]:

SFD [hex]	Length [hex]	Cmd [hex]	Subunit [hex]	Checksum [hex]
AB	02	CE	SU	CSUM

Response

The response block consists of one sequence:

Byte# **Parallel System and Sub unit Field [hex]**	**Description**
AB	Start of frame delimiter
09	Block (0x43 – 0x30)
03	Length of this sequence is 3
81	Sequence: first and only one
0	
31	Acknowledge byte: Command accepted
2-3	
CE SU	Echo command
XX	Checksum

NOTE: If there is such sub-unit SU, but the sub-unit is inaccessible, then the current target selection stays unchanged and the response is NACKed with 0x33 "busy": 0xAB 0x09 0x03 0x81 0x33 0xCE SU CSUM.

NOTE: If no such sub-unit exist (X > number of sub-units), then the current target selection stays unchanged and the response is NACKed with 0x36 "Parameter invalid": 0xAB 0x09 0x03 0x81 0x36 0xCE SU CSUM.

2.32. Exit XCP

Purpose

End communication in a defined way, or continue communitacion over a different protocol, e.g. terminal, UPScode.

2.32.1. Exit XCP to Unspecified Mode

Command

Before the command, send the authorization code:

SFD [hex]	Length [hex]	Authorization code [hex]				Checksum [hex]
AB	04	CF	69	E8	D5	5C

then, to exit XCP, send:

SFD [hex]	Length [hex]	Cmd [hex]	Checksum [hex]
AB	01	FF	55

Response

The response block consists of one sequence:

Byte# Field	Description
AB	Start of frame delimiter
09	Block code for all control commands
02	Length of this sequence is 2
81	Sequence: first and only one
00	
XX	Acknowledge byte as one of the following byte code: **0x31:** Command accepted **0x33:** Command disabled by the front panel function **0x36:** Parameter invalid or missing or too many parameters
01	
FF	Echo command
XX	Checksum

If received over the service port or X-Slot 2, the command causes an immediate test of the port multiplexer of X-Slot 2 and service port. If there is no Rx data at the service port, the multiplexer switches back to X-Slot 2 (default input). This command should be sent as last command of a communication session over the service port. This avoids extra delay until UPS accepts data on X-Slot 2 again. If the UPS was in test mode, the UPS leaves the test mode after this command

Appendix A Shutdown and restart Hierarchy

Powerware 9355 has three timers, one for 0x8A, Delayed Load Power Off & Restart, one for 0x91, Scheduled UPS On in “n” Minutes, and one for 0x93, Scheduled Load Power off in “n” minutes. If “Automatic Off” EEPROM value is > -1, the 0x8A timer is started with the EEPROM value, when the UPS goes on battery.

Powerware 9355 XCP has one extra, local timer for 0x88, Go to Bypass with delay.

Only a single unit, and parallel XCP system level support these commands.

The XCP commands 0x89, UPS On Command is 0x91 with parameter 0. The 0x8B, UPS Off/Load Power Off Command is 0x93 with parameter 0. The difference is that commands 0x89 and 0x8B DO turn on and off the UPS. The commands 0x91 and 0x93 with parameter 0 simply cancel and clear these timers.

A.1 UPS ON AND OFF button

The UPS does not execute remote ON or OFF commands, unless it was turned on with the ON button. If you turn off the UPS with the OFF button, all running on/off timers are cleared All load control commands are accepted any time. See below for exceptions.

A.2 If 0x8A, Delayed Load Power Off & Restart timer is running

The commands 0x88 without delay, 0x89, and 0x8B are NACK’d busy and not executed.

The second command 0x8A is only accepted, if the new delay is longer than the current delay.

If a 0x88, 0x91, or 0x93 timer is running and turns to zero, nothing happens. The UPS does not turn on or off.

The commands 0x88, 0x91, or 0x93 are NACK’d busy and not executed.

If the UPS’ On- or Off-button is pushed, the 0x8A-timer is cleared and canceled. This happens immediately. You don’t need to wait until the UPS turns off or on.

If the UPS was waiting for “utility good” to turn on, it will not turn on until the 0x8A timer expired, plus restart delay.

An active EPO cancels all timers.

A.3 If 0x91, Scheduled UPS On in “n” Minutes timer is running

The commands: 0x89, 0x8A, 0x8B, 0x91, and 0x93, are accepted and executed.

A new 0x91 command resets the timer to the new parameter value. If the 0x91 parameter is 0, the timer is cleared and cancelled.

A 0x89 command sets the timer to zero and immediately turns on the UPS.

A 0x8A command sets the rules in 3.30.1 into power.

If the UPS’ On- or Off-button is pushed, the 0x91-timer is cleared and canceled. This happens immediately. You don’t need to wait until the UPS turns off or on.

An active EPO cancels all timers.

A.4 If 0x93, Scheduled Load Power off in “n” minutes timer is running

The XCP commands: 0x89, 0x8A, 0x8B, 0x91, and 0x93, are accepted and executed.

A 0x93 command resets the timer to the new parameter value. If the 0x93 parameter is 0, the timer is cleared and cancelled.

A 0x8B command sets the timer to zero and immediately turns off the UPS.

A 0x8A command sets the rules in 3.30.1 into power.

If the UPS' On- or Off-button is pushed, the 0x91-timer is cleared and canceled. This happens immediately. You don't need to wait until the UPS turns off or on.

An active EPO cancels all timers.

A.5 If 0x88, Go to bypass command timer is running

The XCP commands: 0x89, 0x8A, 0x8B, 0x91, and 0x93, are accepted and executed.

A 0x88 command with new delay resets the timer to the new parameter value. If the 0x88 parameter is 0, the timer is cleared and cancelled.

A 0x88 command without delay sets the timer to zero and immediately commands the UPS to bypass.

A 0x8A command sets the rules in 3.30.1 into power.

If the UPS' On- or Off-button is pushed, the 0x88-timer is cleared and canceled. This happens immediately. You don't need to wait until the UPS turns off or on.

An active EPO cancels all timers.

Appendix B Parallel XCP implementation

B.1 Sub-unit level XCP

- The Select sub-module command [0xCE] is implemented. When a unit is installed into a parallel system, this command becomes available.
- The on/off commands with a delay (Delayed load power off & restart command [0x8A], Scheduled UPS on in "n" minutes command [0x91], Scheduled UPS off in "n" minutes command [0x93]) are disabled in the sub-unit level XCP to keep all units in the system in a consistent state, and prevent unexpected losses of load.
- You cannot select any other sub unit, except the one you are connected to.

B.2 System level XCP

- The Select sub-module command [0xCE] is implemented. When a unit is installed into a parallel system, this command becomes available.
- The output power meters show the total power of the system.
- In the response of Status request [0x33], the byte 1 shows prioritized summary if the sub-units' status (1 = highest priority):
    - Overload (0xE0). At least one of the sub-units reports 0xE0.
    - On bypass (0x60). All of the sub-units in the system are bypassed always simultaneously.
    - On battery (0xF0). If not neither 0xE0 nor 0x60, and at least one of the sub-units reports 0xF0.
    - System normal (0x50).
    - UPS supporting load (0x40). If not 0xF0, 0xE0, nor 0x60, and at least one sub-unit reports 0x40.
    - UPS off (0x10). The whole system is off
- In the response of Status request [0x33], bytes 2 and 4 are logical OR of the corresponding bytes reported by the sub-units.
- In the response of Meters block request [0x34], these meters are summed from the meters of the sub-units:
    - Output power (#22),
    - Output current ILx (#66-68), and
    - Output current ILx bar chart (#69-71) - minus one unit, if parallel redundant,
    - Output power PLx (#83-85), and
    - Output watts bar chart (#86), - minus one unit, if parallel redundant,
- In the response of Meters block request [0x34], these meters are taken from the sub-unit where the host is connected:
    - Output voltage Uxx (#1-3),
    - Input voltage Uxx (#4-6),
    - Bypass voltage Uxx (#10-12),
    - Output frequency (#28),
    - Input frequency (#29),
    - Bypass frequency (#31),
    - Bypass voltage ULx (#54-56),
    - Input voltage ULx (#57-59),
    - Date (#73),
    - Time (#74),
    - Output voltage ULx (#79-81).
- In the response of Meters block request [0x34], these meters show the minimum of all units in the system:
    - Battery voltage (#34),
    - Battery time remaining (#36),

- The battery status in the response of Battery test data request [0x3B] is prioritized as follows:
  - Test failure (0x04). If any of the sub-units report 0x04.
  - Test in progress (0x01). If not 0x04, and at least one sub-unit reports 0x01.
  - Test passed (0x02).
- The ABM status in the response of Battery test data request [0x3B] is prioritized as follows:
  1. Discharging (0x02). If any of the sub-units report 0x02.
  2. Charging (0x01). If not 0x02, and at least one sub-unit reports 0x01.
  3. Floating (0x03). If not neither 0x01 nor 0x02, and at least one sub-unit reports 0x03.
  4. Resting (0x04).
- Unknown (0x05), if none of the states are sent from none of the units.
- The Set time & date command [0x90] sets the time in all of the sub-units.
- The Set configuration command [0x95] is not implemented in the system level XCP. The parameters, which can be set equally on all units at the same time, are still under consideration.
- Alarms in the response of Current alarms & events request [0x35] are logical OR of the sub-unit alarms. If any of the sub-units alarms a fail, then the system alarms the fail also.

B.3 Communication target selection

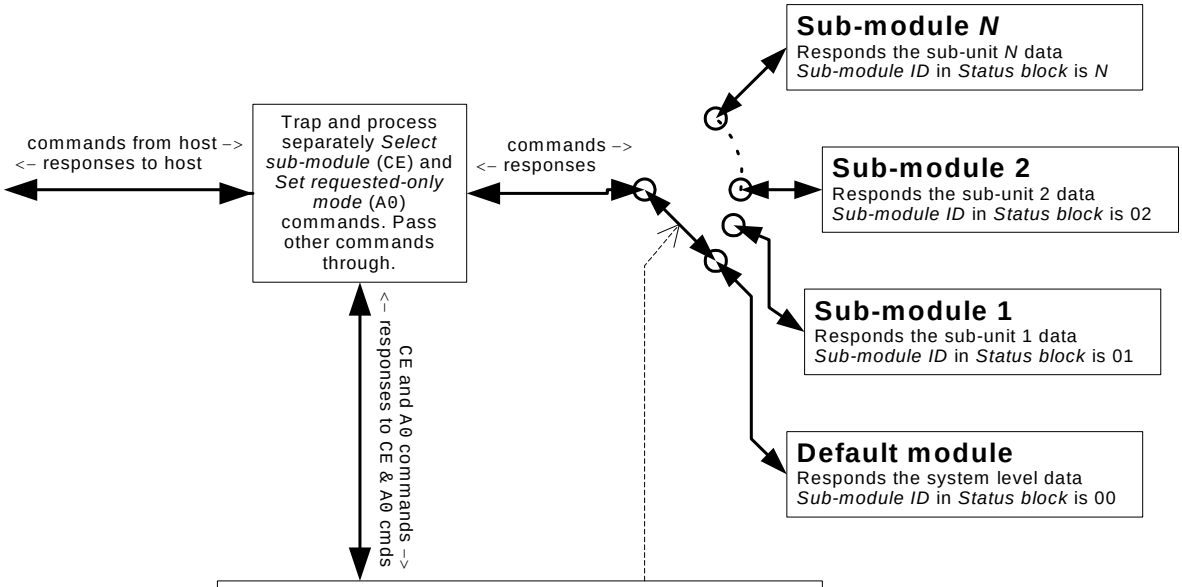
By default the XCP communication starts at system level. Exception: Sub unit is selected over LCD user settings, parallel settings.

To switch to sub unit level (only the sub unit, you are connected to) use the 0xCE, Select sub module command. Future releases will also allow to switch to other sub units in the system.

The command 0xA0, Set requested mode only switches back to system level XCP. Exception: Sub unit is selected over LCD user settings, parallel settings.

Figure 1 shows the *target selector* at each communication port in each of the sub-units. It passes the commands and the responses in-between the host and the selected target. The selector is controlled by logic, which traps and executes separately all commands that affect the target selection, but other commands are passed through. The commands that change the target selection are [0xCE] and [0xA0].

Figure 2 shows the program flow of the communication target selection.



command	response	sets target selection to
A0	send system-level ID	default sub-module
CE FF	lists sub-units 01,02,...,N	default sub-module
CE 01 FF	sends an empty list	sub-module 01
CE *N*[1] FF	sends an empty list	sub-module *N*
CE *M*[2] FF	"parameter invalid"	not changed
CE FE	"command accepted"	default sub-module
CE 01	"command accepted"	sub-module 01
CE *N*[1]	"command accepted"	sub-module *N*
CE *M*[2]	"parameter invalid"	not changed

1) $N \in \{1, 2, ..., \text{(number of sub-units in the system)}\}$.
2) $M \notin \{1, 2, ..., \text{(number of sub-units in the system)}\}$.

Figure 1. Communication target selection.

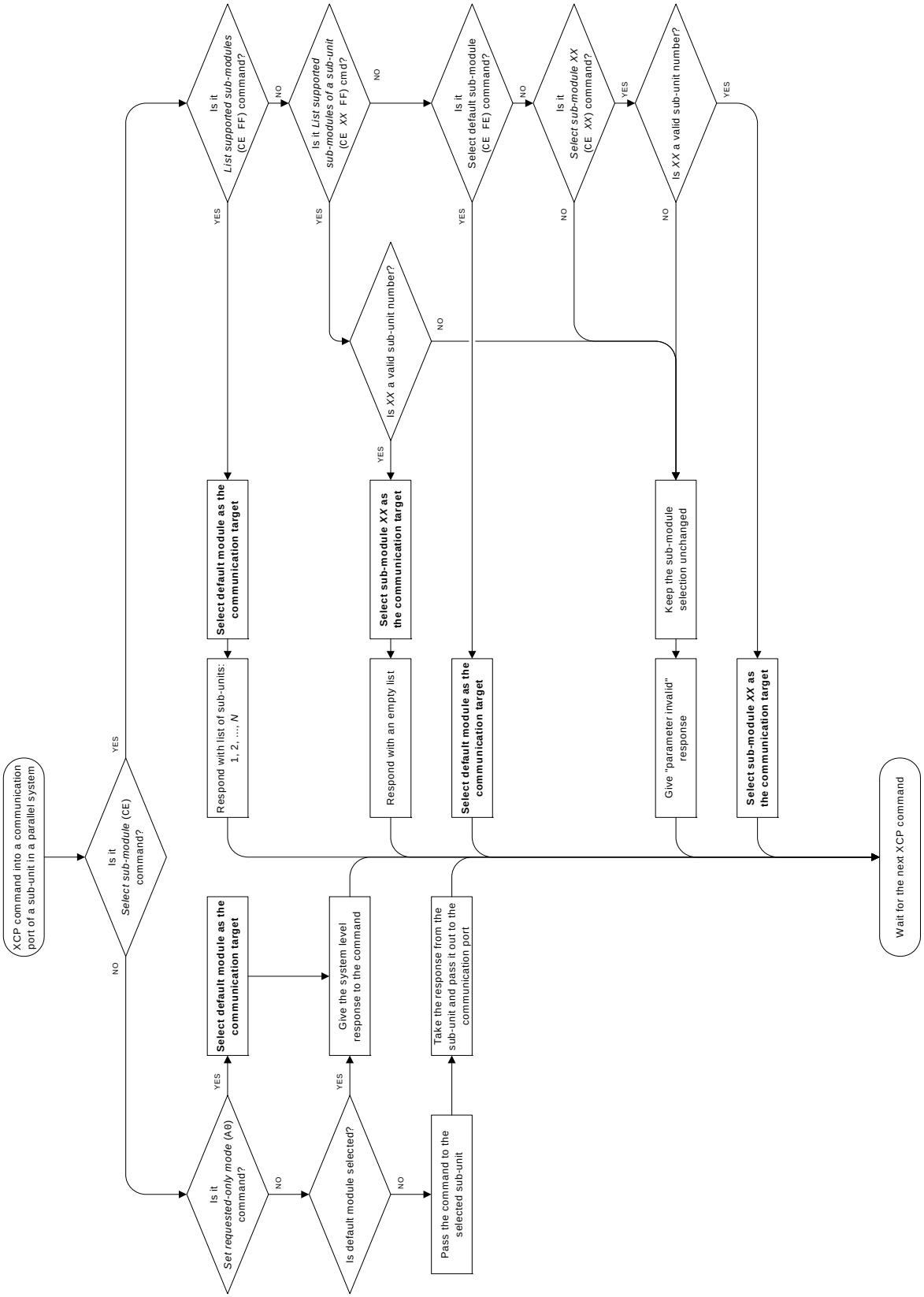


Figure 2. Communication target selection program flow.

B.4 Response generation

The CAN bus is used for both
1. transmitting data for system level data generation, and
2. transmitting commands and responses between the sub-units.

B.4.1 System level XCP

Each sub-unit periodically broadcasts its status and meters over the CAN bus. Also, each sub-unit collects this data, and builds and stores the system level data. When the system level data is requested, it is ready for the response in the memory. Thus the system level responses are generated by the sub-unit's *XCP server/system* (Figure 3) where the host is connected.

Status:

The status is broadcasted periodically.

Meters:

Meters are broadcasted periodically over parallel CAN. A unit calculates the system value for a meter from the meter values of all sub-units, and moves it into the system meters block. If a unit stops communicating, the system level meters are immediately set to 0 in the whole system.

Control Commands:

The control commands are broadcasted immediately over the CAN bus.

B.4.2 Sub-unit level XCP

When a sub-unit is selected, the response is immediately generated internally in the sub-unit's *XCP server/sub-unit* (Figure 3).

Future releases will support remote sub units, too. Communication is then like this:
If the target is another sub unit, the commands and responses go over the parallel CAN bus. The delay is normally less than 10ms. As the CAN protocol does not guarantee maximum response time the delay may be sometimes significantly longer or the response is even lost.

Figure 3 shows how communication data is generated, and how commands and responses are passed in-between the sub-units in a parallel 9340 system. Remote sub units will be supported in future releases.

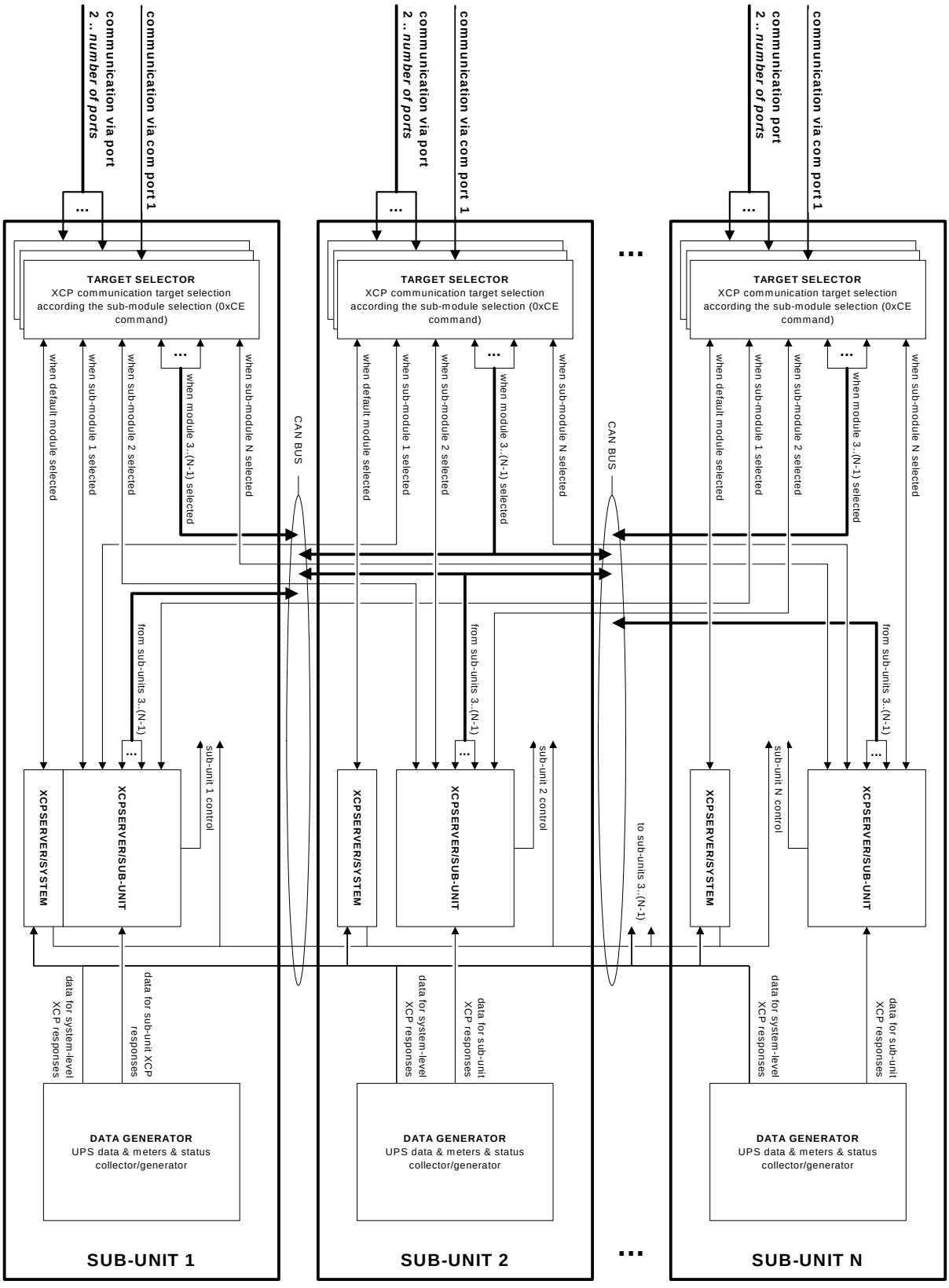


Figure 3. Communication flow in a parallel system.