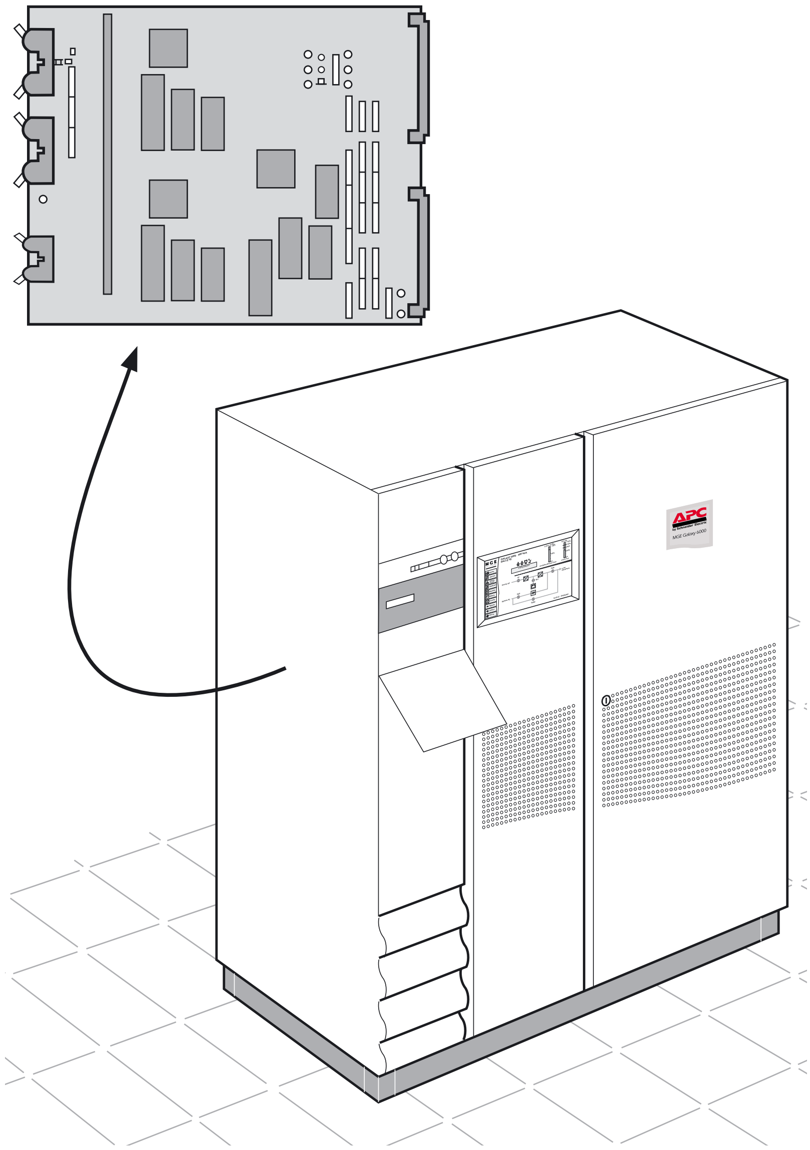
MGE™ Galaxy™ 6000

50, 60 Hz

250 - 600 kVA



"GTC link" communication interface

User manual

Contents

Presentation

Introduction

The "GTC link" communication interface is designed to transmit **MGE**™ **Galaxy**™ **6000** UPS operating information and remote "on/off" commands (if available) to an external computer.

The JBUS hexadecimal communication protocol is used (the **JBUS** ASCII mode is not used in this application).

The "GTC link" features two symmetrical communication channels, both with a simplified V24 (RXD and TXD only) and an RS485 interface.

It consists of a "GTCZ" communication board (central unit) and a "RAUZ 1" (communication network management and interconnection board).
In option, two additional communication ports can be added: "GT2Z" board (central unit) and "RAUZ 2" board (communication network management and interconnection board).
Refer to the "communication options connection manual" of **MGE**™ **Galaxy**™ **6000** nr 6739388XU, for all informations about connections.

"GTCZ" and "GT2Z" boards features

The "GTCZ" and "GT2Z" boards are functionally divided into two main modules:

The ACQ module

- performs data acquisition;
- monitors the status bus of the monitor/control boards;
- computes physical quantities and battery backup time;
- processes alarms;
- sends commands to monitor/ control boards;
- stores configurable parameters and communicates with the "Soft Tunor" software, used by APC by Schneider Electric after-sales service;
- transfers data using the on-board communication channels.

The COM module

The COM communication module is designed for external devices (e.g. "AMUZ" type board of a "Monitor" or "Tele-Monitor") to:
- retrieve information and parameters processed by the ACQ;
- send commands to monitor/ control boards;
- be integrated into other systems (remote indications and supervision).

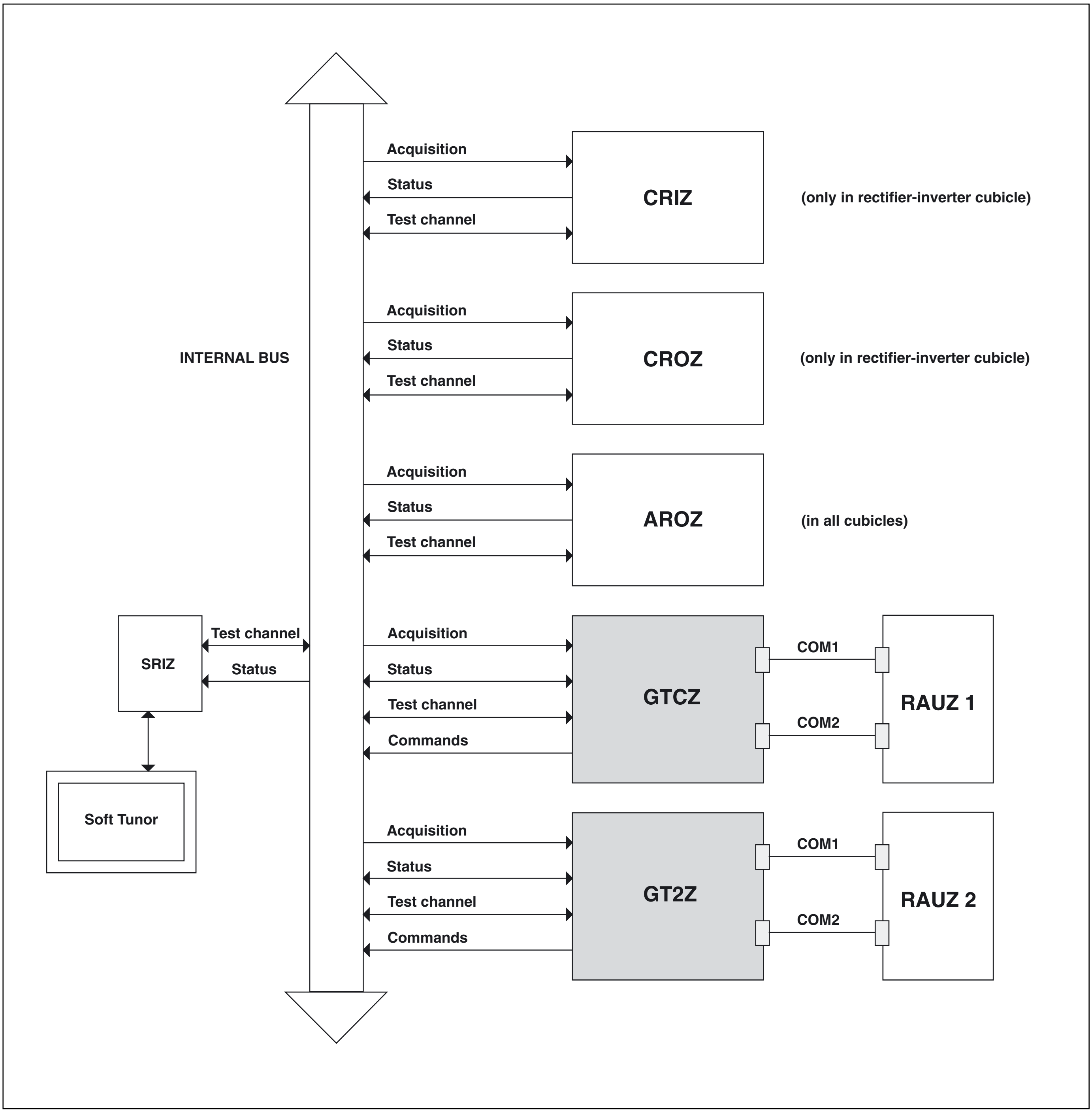
Each "GTCZ" or "GT2Z" board is equipped with two symmetrical communication ports, COM1 and COM2:
- on the "GTCZ" board:
  - COM1 for a "display devices" network consisting of "AMUZ" boards in a unitary or parallel connected UPS configurations,
  - COM2 for a supervisory system;
- on the "GT2Z" board:
  - COM1 and COM2 for a supervisory system.

The "GTCZ" and "GT2Z" boards are configured with the APC by Schneider Electric after-sales customization software called "Soft Tunor".
The computer link is via the test connector located on the front panel of the cubicles and performs:
- configuration, calibration and control of the ACQ module;
- configuration of COM1 and COM2 ports.

The COM1 and COM2 communication ports can be configured as follows:

- **data rate:** 1200, 2400, 4800, 9600 Baud;
- **data bits:** 8 (always);
- **parity:** none, odd, even;
- **stop bits:** 1 or 2;
- **slave address:** 20H to F8H in increments of 8H;
- **interface:**
  - 0 = RS232 simplified,
  - 1 = RS232 complete (not implemented),
  - 2 = RS485;
- **command masks**;
- **other parameters** (modem type, telephone number, handshaking, modem protocol, password) reserved for later use.

Location of the "GTCZ" and "GT2Z" boards in the cubicle electronics

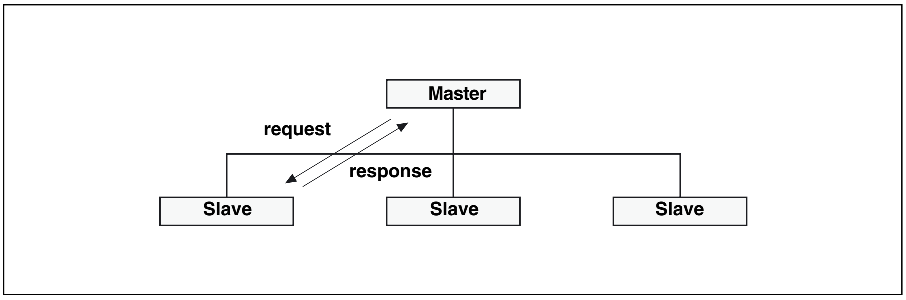


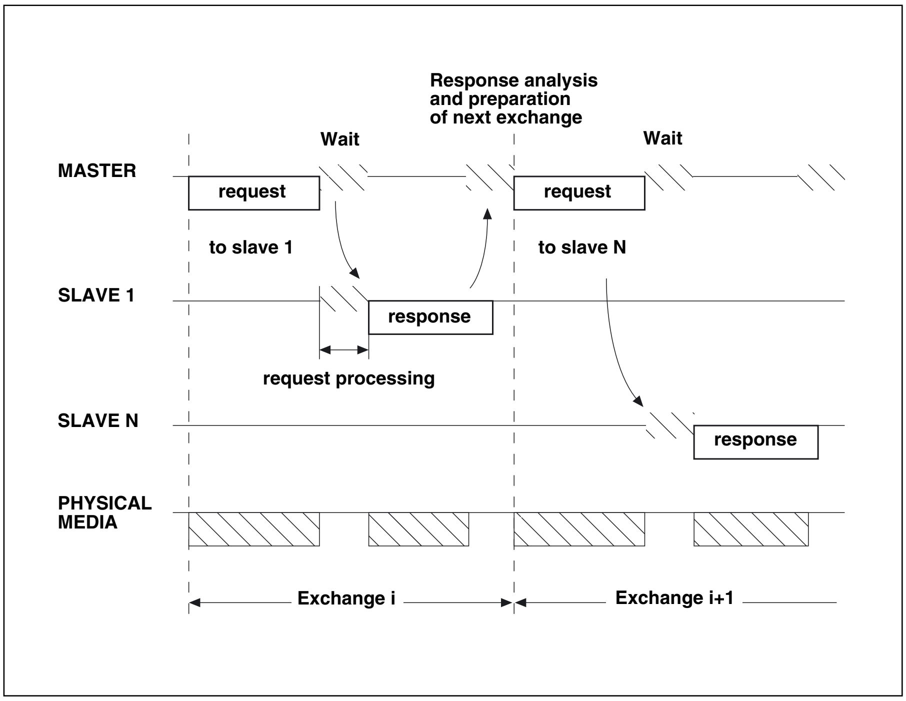
Introduction

JBUS protocol can be used to read or write one or more bits or words. In the interest of simplicity, this document describes only the procedures necessary for operation and monitoring of the APC by Schneider Electric unit.

Communications are initiated by the master and include a request from the master and a response from the slave.

Master requests must be addressed to one specific slave (identified by its address in the first byte of the request frame) as shown in the diagram opposite:





Principle

A full understanding of the protocol is only required if the master is a computer that must be programmed.

All communications include 2 messages: a request from the master and a response from the slave.

Each message or frame containes 4 types of information:

- **slave address** (1 byte)

The slave address specifies the destination station (see address list):

- unitary rectifier-inverter cubicle,
- parallel rectifier-inverter cubicle,
- Static Switch cubicle.

If zero, the request addresses all slaves and there is no response message (in which case it is a broadcast message, a function not used in this application);

- **function code** (1 byte)

Selects a command (e.g. read or write a bit or a word) and checks that the response is correct.
The JBUS protocol comprises 10 functions of which 3 may be used in this application: function 3 (read n output or internal words), or function 4 (read n input words), or function 16 (write n words);

- **information field** (n bytes)

The information field contains the parameters related to the functions: bit address, word address, bit value, word value, number of bits, number of words;

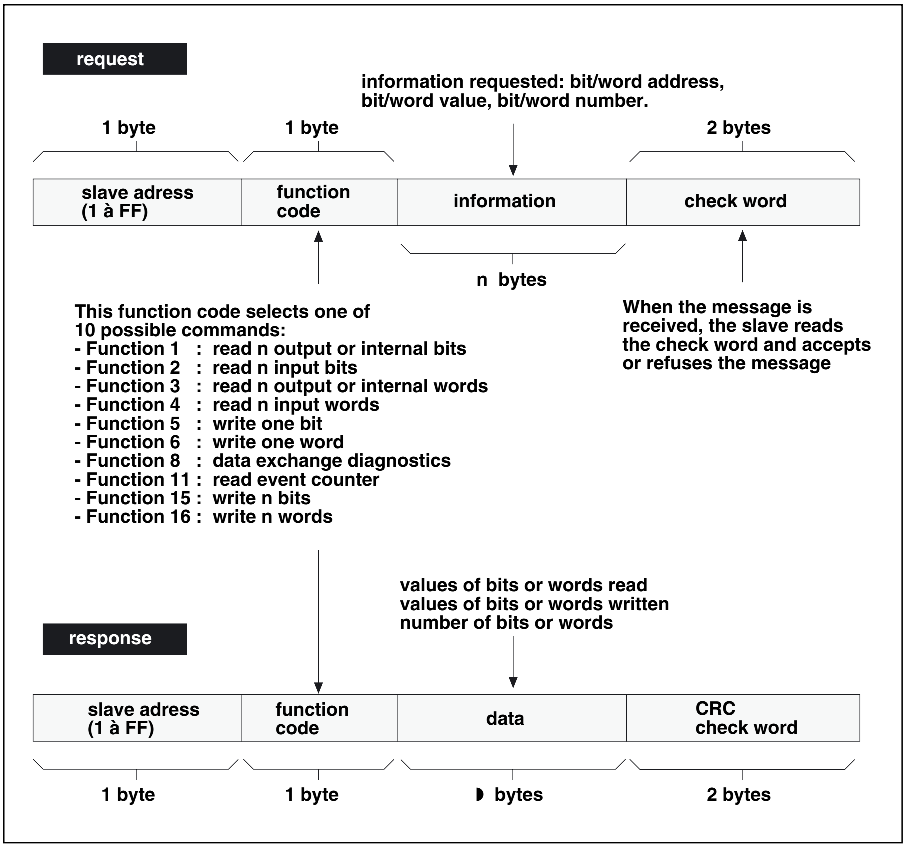
- **check word** (2 bytes)

A word used to detect transmission errors.

Synchronizing data exchanges

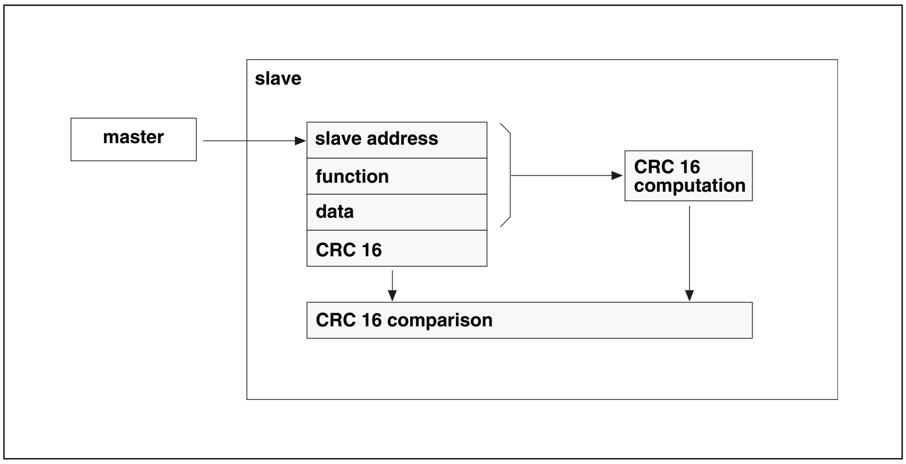
Any character received after 3 or more character lengths of silence is interpreted as the start of a frame. Therefore, a minimum silence of 3 character lengths between frames must be respected.

Description of request and response frames

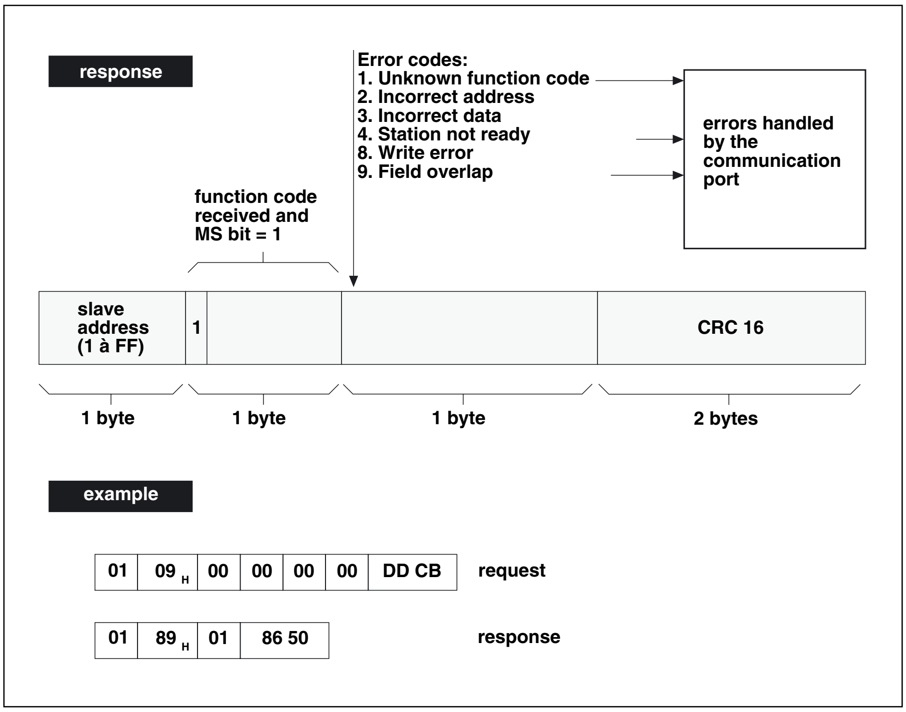


Checking received messages on the slave side

After the master sends a request containing the slave address, the function code and data, it computes the CRC and sends it as the check word (CRC 16).
When the slave receives the request, it stores the message in memory and calculates the CRC 16 to compare it to the received CRC 16.



If the message is incorrect (unequal CRC 16 values), **the slave does not respond**.
If the message received is correct but the slave is unable to process it (incorrect address, incorrect data, etc.), the slave returns an error message with the following contents (see opposite):



Functions

Function 1 and 2: read N bits

- function 1: read output or internal bits;
- function 4: read input bits.

The number of bits must be less than or equal to the bit field size (see memory board).

request

slave address	1 or 2	address of first bit MSB LSB	number of bits to read	CRC 16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

response

slave address	1 or 2	number of bytes read	first byte read		last byte read	CRC 16
1 byte	1 byte	1 byte	✷ bytes			2 bytes

byte detail:

last bit transmitted **first bit transmitted**

Unused bits are set to zero

example

Reading bits at location 404 to 411 of slave at address 20H (charger signals)

request:

20	01	0404	0E	66 FE

response:

20	01	02	10101001	00101110	FB B7

40B ← 404 411 ← 40C (binary values)

Function 3 and 4: read N words

The number of words must be less than or equal to the word field size (see memory board).

- function 3: read output or internal words;
- function 4: read input words.

request

slave address	3 or 4	adress of first bit MSB / LSB	number of words MSB / LSB	CRC 16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

response

slave address	3 or 4	number of bytes read	first word PF / pf	...	last word PF / pf	CRC 16
1 byte	1 byte	1 byte	2 bytes		2 bytes	2 bytes

example

Reading words at location 146 to 14B of slave at address 28H (voltage fields)

request:

28	03	0146	06	A7 E0

response:

28	03	0C	XXXX	...	YYYY	CRC 16
			word 0146		word 014B	

Function 5: writing a bit

request

slave address	5	bit address	bit value	0	CRC 16
1 byte	1 byte	2 bytes	1 byte	1 byte	2 bytes

bit set to 0 → write 0
bit set to 1 → write FF

response

slave address	5	bit address	bit value	0	CRC 16

In function 5 the response and request frames are identical.

example

Setting bit location C05 to 1 of slave at address 40H (inverter on)

request:

40	05	0C05	FF	00	90 7A

Function 6: writing a word

request

slave address	6	word address	word	CRC 16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

response

slave address	6	word address	word	CRC 16

The response is echoed acknowledging that the word sent has been received.

example

Writing the value 1000 into the word location 810H of slave at address 50H

50	06	08 10	10 00	8A 2E

Function 8: reading error diagnosis counters

Each slave manages a set of nine 16 bit counters for error diagnosis (see opposite):

- request / response:

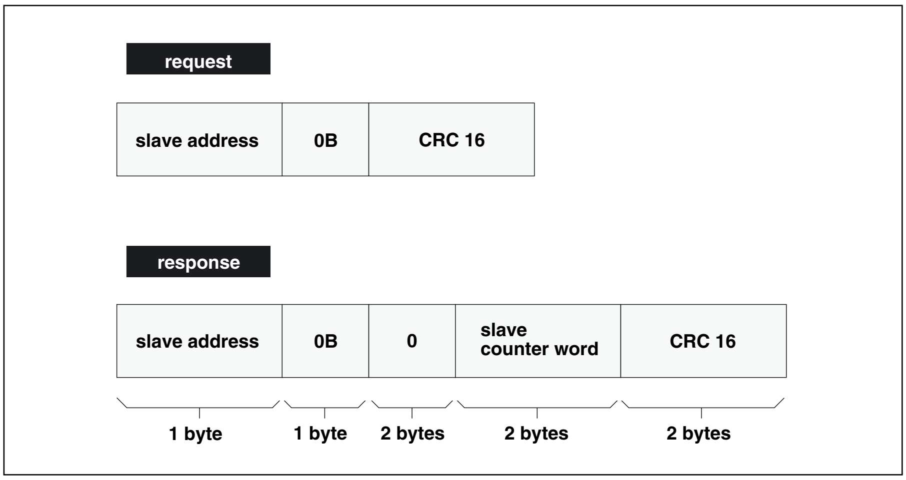
slave address	8	sub-function code	data	CRC 16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

	sub-function code	data	
- the slave must echo the request	00	XYZT	X, Y, Z, T are user defined (transmission parameters)
- reset error diagnosis counter	0A	0000	
- read the total number of:			
received frames with CRC error (CNT 1)	0B	XXXX	requests: XXXX equals 0000 response: XXXX is the counter value
received frames with CRC error (CNT 2)	0C	XXXX	
number of exception responses (CNT 3)	0D	XXXX	
frames addressed to the station (CNT 4) (not including broadcast)	0E	XXXX	
broadcast requests received (CNT 5)	0F	XXXX	
number of NACK responses (CNT 6)	10	XXXX	
unit not ready responses (CNT 7)	11	XXXX	
illegal characters (CNT 8)	12	XXXX	

Function 11: reading event counters

The master and each slave have one event counter.
This counter is incremented each time a frame is received and interpreted correctly by the slave (except for function 11 itself).
A correctly transmitted message increments the counter. If the slave sends an exception response, the counter is not incremented.

The master can read the counter to determine whether or not the slave correctly interpreted the command (incremented the counter or not).

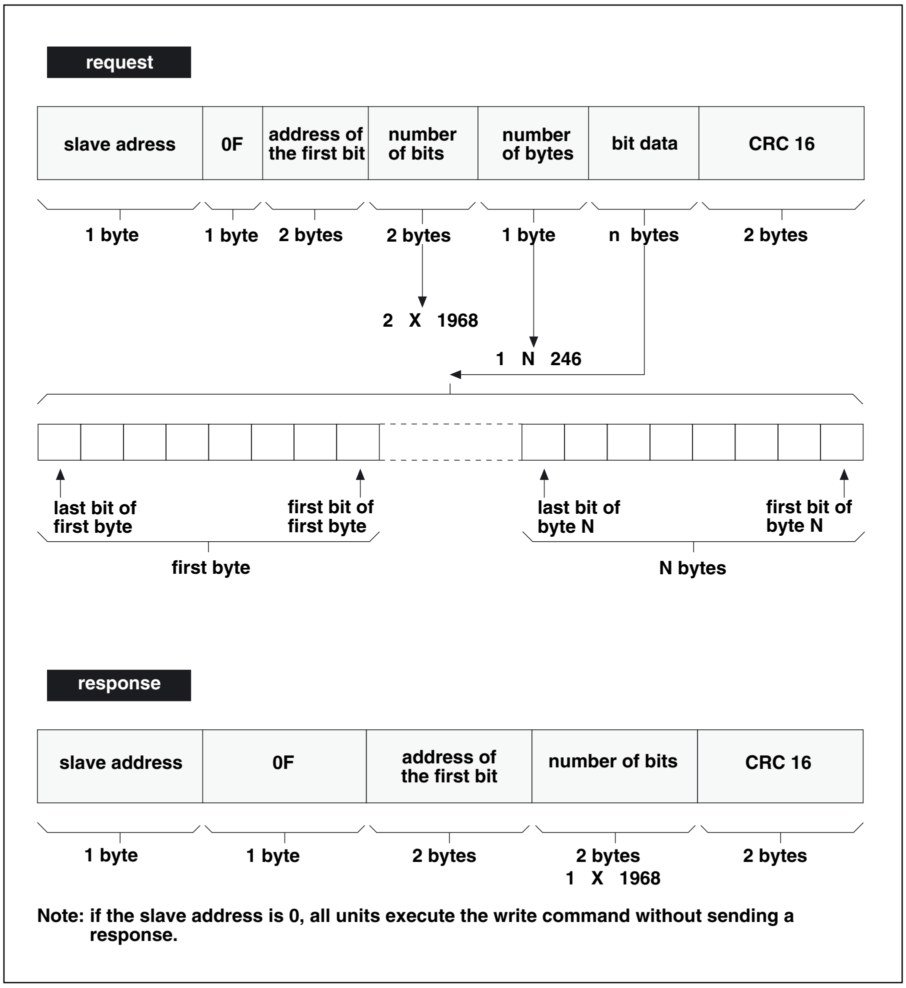


These functions can be used to diagnose the data exchange taking place between master and slaves.

If the master counter equals the slave counter, the slave executed the command sent by the master.

If the master counter is one higher than the slave counter, the slave did not execute the command sent by the master.

Function 15: writing n consecutive bits



Function 16: writing n consecutive words

request

slave address	10 (*)	address of first word	number of words	number of bytes N	data bytes	CRC 16
1 byte	1 byte	2 bytes	2 bytes	1 byte	n bytes	2 bytes

2 X 123

4 N 246

MSB	LSB	MSB	LSB	MSB		MSB	LSB
first word						last word	

response

slave address	10 (*)	address of first word	number of words written	CRC 16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Note: if the slave address is 0, all units execute the write command without sending a response

example

Writing words 00 and 01 of slave at address 20 (synchronization counter)
(00) = 0000
(01) = 0000

request

20	10 (*)	0000	0002	04	0000 0000 0000 0000	5C 93

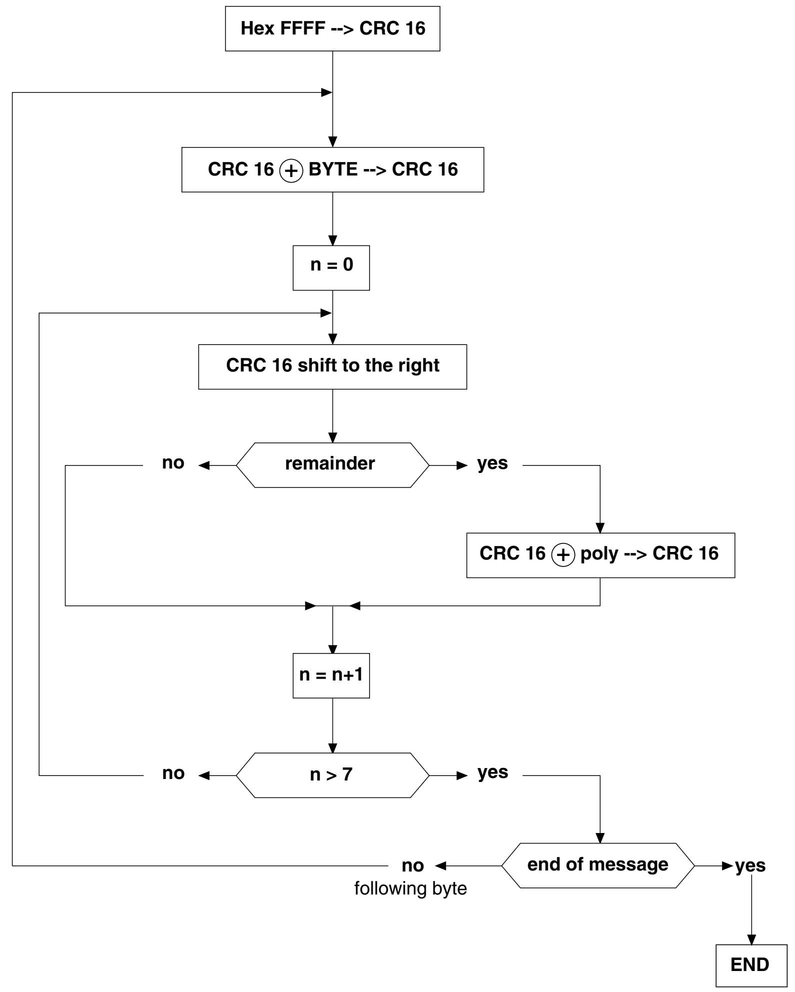
response

20	10 (*)	0000	0002	47 79

) * (

CRC 16 algorithm

If the CRC 16 is calculated using the above algorithm, the least significant byte is transmitted first.



⊕ = exclusive or
n = number of data bits
poly = CRC 16 polynomial = $2^{15} + 2^{13} + 2^{0}$ = $ A001

Example of CRC computation

CRC register initialization	Shift 1	1111	1111	1111	1111	
⊕ of 1st character				0000	0010	
		1111	1111	1111	1101	
	Shift 1	0111	1111	1111	1110	1
Set flag to 1, ⊕ polynomial		1010	0000	0000	0001	
		1101	1111	1111	1111	
	Shift 2	0110	1111	1111	1111	1
Set flag to 1, ⊕ polynomial		1010			0001	
		1100	1111	1111	1110	
	Shift 3	0110	0111	1111	1111	0
Set flag to 0	Shift 4	0011	0011	1111	1111	1
		101			1	
		1001	0011	1111	1110	
	Shift 5	0100	1001	1111	1111	0
	Shift 6	0010	0100	1111	1111	1
		101			1	
		1000	0100	1111	1110	
	Shift 7	0100	0010	0111	1111	0
	Shift 8	0010	0001	0011	1111	1
		101			1	
		1000	0001	0011	1110	
⊕ 2nd character				0000	0111	
		1000	0001	0011	1001	
	Shift 1	0100	0000	1001	1101	1
		101			1	
		1110	0000	1001	1101	
	Shift 2	0111	0000	0100	1110	1
		101			1	
		1101	0000	0100	1111	
	Shift 3	0110	1000	0010	0111	1
		101			1	
		1100	1000	0010	0110	
	Shift 4	0110	0100	0001	0011	0
	Shift 5	0011	0010	0000	1001	1
		101			1	
		1001	0010	0000	1000	
	Shift 6	0100	1001	0000	0100	0
	Shift 7	0010	0100	1000	0010	0
	Shift 8	0001	0010	0100	0001	0
		byte		byte		

Example of CRC 16 computation in "C" using table lookup

```
#define CPH 0 /* most significant bytes */
#define CPL 1 /* least significant bytes */


/* TABLE OF MOST SIGNIFICANT BYTES FOR CRC16 COMPUTATION */

char tbcrch [ ] =
{
0,193,129,64,1,192,128,65,1,192,128,65,0,193,129,64,
1,192,128,65,0,193,129,64,0,193,129,64,1,192,128,65,
1,192,128,65,0,193,129,64,0,193,129,64,1,192,128,65,
0,193,129,64,1,192,128,65,1,192,128,65,0,193,129,64,
1,192,128,65,0,193,129,64,0,193,129,64,1,192,128,65,
0,193,129,64,1,192,128,65,1,192,128,65,0,193,129,64,
0,193,129,64,1,192,128,65,1,192,128,65,0,193,129,64,
1,192,128,65,0,193,129,64,0,193,129,64,1,192,128,65,
1,192,128,65,0,193,129,64,0,193,129,64,1,192,128,65,
0,193,129,64,1,192,128,65,1,192,128,65,0,193,129,64,
0,193,129,64,1,192,128,65,1,192,128,65,0,193,129,64,
1,192,128,65,0,193,129,64,0,193,129,64,1,192,128,65,
0,193,129,64,1,192,128,65,1,192,128,65,0,193,129,64,
1,192,128,65,0,193,129,64,0,193,129,64,1,192,128,65,
1,192,128,65,0,193,129,64,0,193,129,64,1,192,128,65,
0,193,129,64,1,192,128,65,1,192,128,65,0,193,129,64,
};


/* TABLE OF LEAST SIGNIFICANT BYTES FOR CRC16 COMPUTATION */

char tbcrcl [ ] =
{
0,192,193,1,195,3,2,194,198,6,7,199,5,197,196,4,
204,12,13,205,15,207,206,14,10,202,203,11,201,9,8,200,
216,24,25,217,27,219,218,26,30,222,223,31,221,29,28,220,
20,212,213,21,215,23,22,214,210,18,19,211,17,209,208,16,
240,48,49,241,51,243,242,50,54,246,247,55,245,53,52,244,
60,252,253,61,255,63,62,254,250,58,59,251,57,249,248,56,
40,232,233,41,235,43,42,234,238,46,47,239,45,237,236,44,
228,36,37,229,39,231,230,38,34,226,227,35,225,33,32,224,
160,96,97,161,99,163,162,98,102,166,167,103,165,101,100,164,
108,172,173,109,175,111,110,174,170,106,107,171,105,169,168,104,
120,184,185,121,187,123,122,186,190,126,127,191,125,189,188,124,
180,116,117,181,119,183,182,118,114,178,179,115,177,113,112,176,
80,144,145,81,147,83,82,146,150,86,87,151,85,149,148,84,
156,92,93,157,95,159,158,94,90,154,155,91,153,89,88,152,
136,72,73,137,75,139,138,74,78,142,143,79,141,77,76,140,
68,132,133,69,135,71,70,134,130,66,67,131,65,129,128,64,
};
```

```
/**************************************************************************************************** */
/*              FUNCTION CALL:  crc = crc16 (message, length);                                        */
/*              with char *message; message = address of message                                      */
/*                                                                                                    */
/*              int length; length of received message (including CRC)                               */
/*                              expressed in number of bytes                                          */
/*              int crc; = CRC16 calculated from the "address", "code" and                            */
/*              "information" fields.                                                                 */
/*                                                                                                    */
/*              RETURN VALUE:  calculated crc 16 (int crc)                                            */
/*****************************************************************************************************/

int crc16 (message, length)
unsigned char message [ ];      /*  buffer containing message                            */
                                /*  for which the crc16 is to be calculated.             */
int length;                     /*  length of message to be checked                      */
                                /*  (including crc16)                                    */
{                               /*  beginning of the function                            */
int  i ;                        /*  loop variable                                        */
int  j ;                        /*  calculation and displacement variable                */
union  {                        /*  calculated crc16:                                    */
int  ival ;                     /*  - whole                                              */
unsigned char cval [ 2 ];       /*  - table of 2 characters                              */
                                /*  unsigned is important since otherwise the sign       */
                                /*  extension causes negative displacements with         */
                                /*  respect to the beginning of the table                */
        }  crcal;
                                /*$  initialization of calculated crc                    */
crcal.ival = 0XFFFF;
i = 0;
                                /*$  correction of the length to be checked: remove the  */
                                /*$  received crc16 from the length to be checked        */
length = length - 2;
                                /*$  WHILE there are bytes to be checked DO              */
while ( i < length )
        {
                                /*$  calculate the table index                           */
        j = (int) ( message [ i ] ^ crcal.cval [ CPH ] );
                                /*$   most significant byte                              */
        crcal.cval [ CPH ] = tbcrch [ j ] ^ crcal.cval [ CPL ];
                                /*$  least significant byte                              */
        crcal.cval [ CPL ] = tbcrcl [ j ];
                                /*$  next byte                                           */
        i++;
        };                      /*$  END WHILE there are bytes to be checked             */
                                /*$  return the calculated crc                           */
return ( crcal.ival );
}                               /*  end of function                                      */
```

Note: if the CRC16 is computed using table lookup, the most significant byte is transmitted first.

UPS theory of operation

Unitary UPS

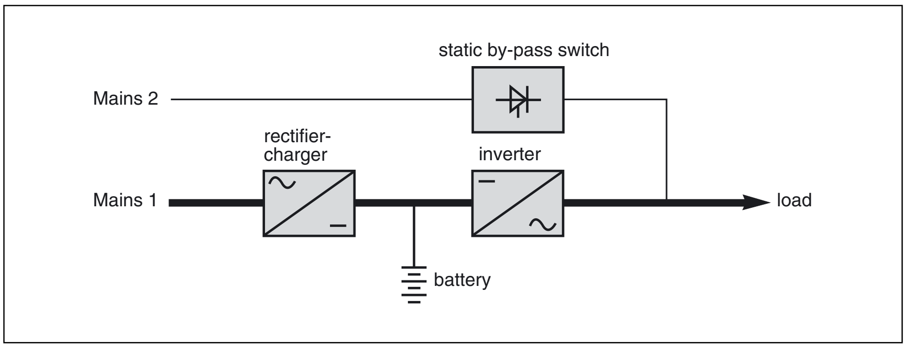
The unitary **MGE**™ **Galaxy**™ **6000** UPSs are made up of five modular sub-assemblies:

- rectifier-charger;
- battery;
- three-phase inverter;
- static switch;
- maintenance bypass.

The load and Mains 2 operate at 50 or 60 Hz.

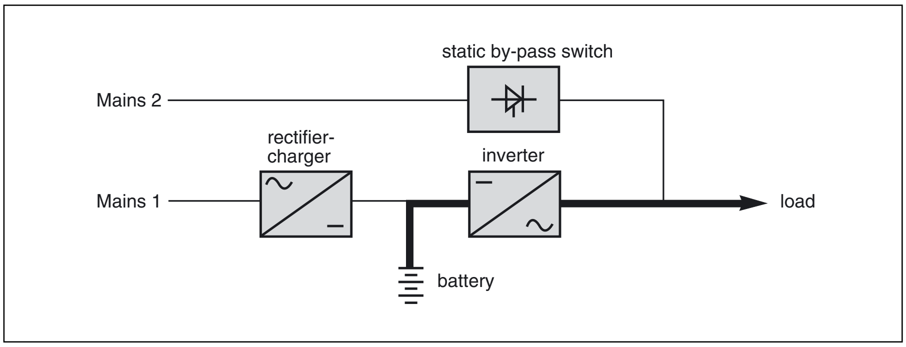
Mains 1 power up

- the inverter receives power from the rectifier-charger and supplies power to the load. There is no direct connection between Mains and load;
- the battery is charged or the charge maintained.



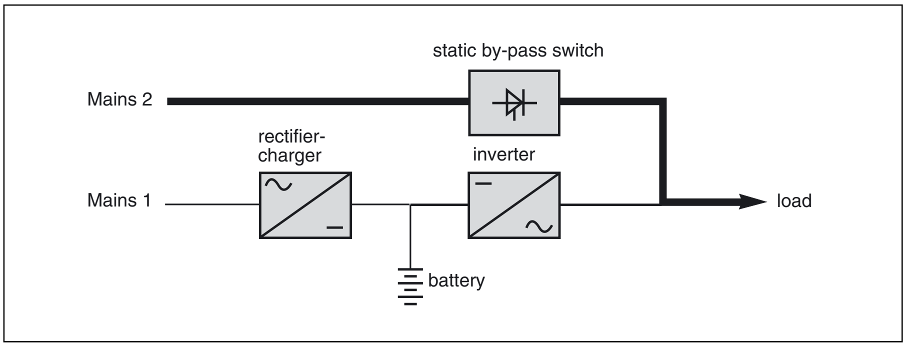
Mains 1 power down

- the inverter receives power from the battery and supplies power to the load;
- the battery discharges.



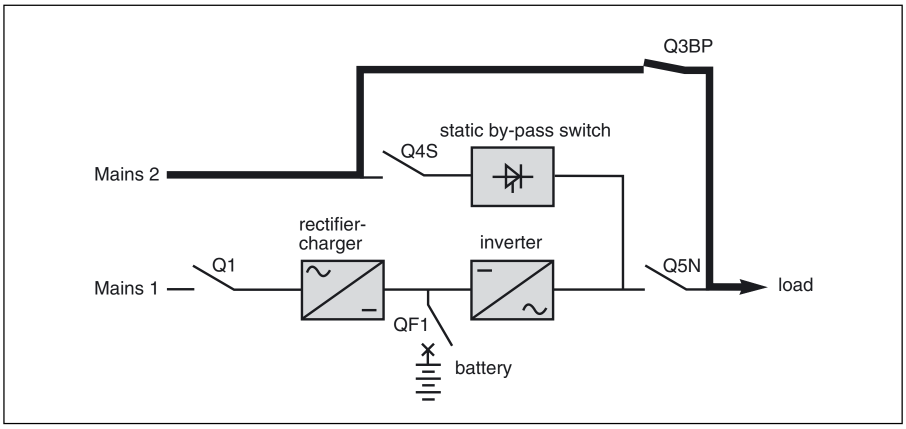
Major overload

- Mains 2 supplies power to the load via the static switch;
- the inverter is shut down;
- the inverter starts-up automatically as soon as overload is removed;
- power is transferred without affecting the load.



Maintenance

- Mains 2 supplies power to the load via the maintenance bypass;
- the rectifier-charger and inverter are shut down and disconnected from all sources of power.

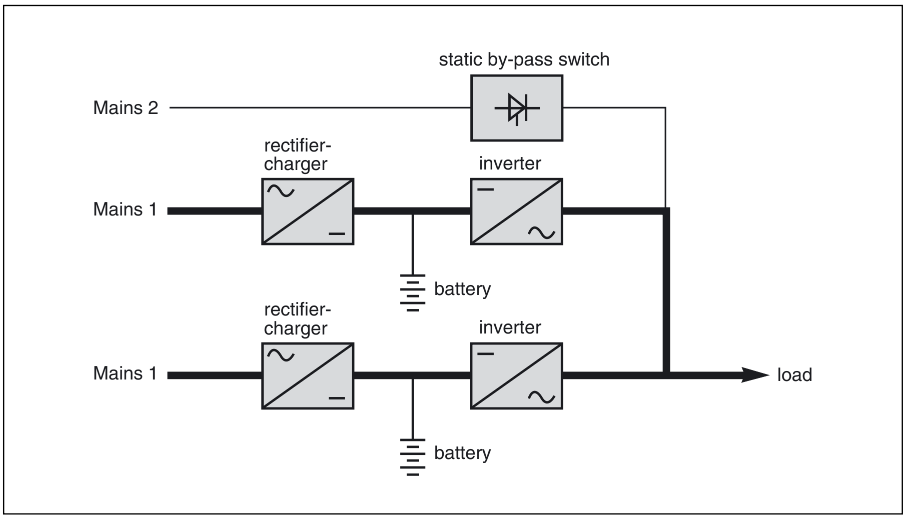


Parallel connected UPS with "Static Switch" cubicle

Up to six parallel connected rectifier-inverter cubicles can be combined with one "Static Switch" cubicle to form a system that operates like a unitary UPS system. Each parallel connected rectifier-inverter cubicle houses a:
- rectifier-charger;
- battery;
- three-phase inverter.

The "Static Switch" cubicle contains:
- static by-pass switch;
- maintenance bypass.

The units have separate batteries:



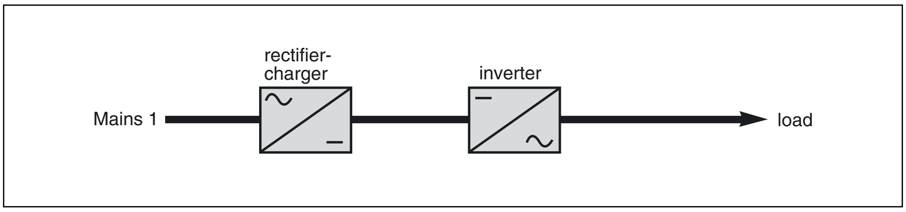
UPS without Mains 2

All UPSs without Mains 2 contain the same sub-assemblies:
- rectifier-charger;
- battery (option);
- three-phase inverter.

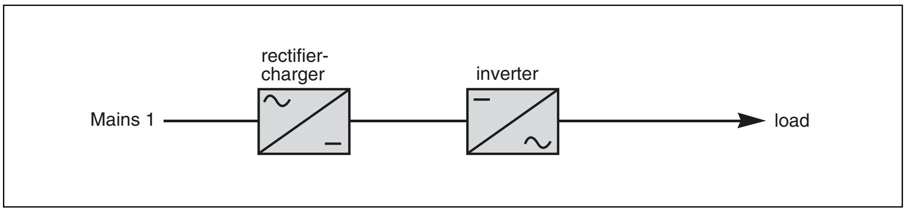
They may or may not be parallel connected depending on type and may or may not contain a battery. The output voltage has a frequency of 50 or 60 Hz.

Operation without battery

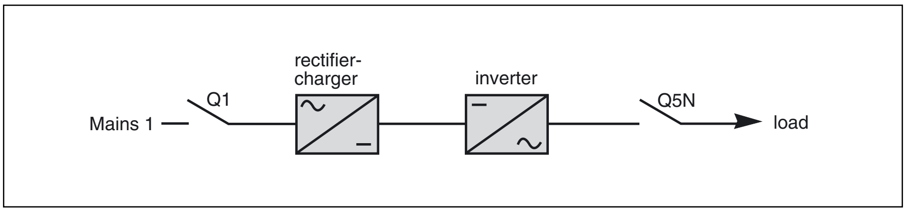
Mains 1 power up:
- the inverter receives power from the rectifier-charger and supplies power to the load. There is no direct connection between Mains 1 and the load.



Mains 1 power down:
- no power to the load.

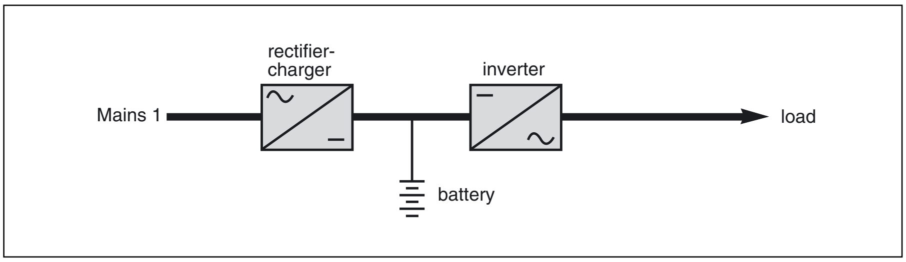


Maintenance position (disconnected):
- no power to the load (except in parallel connected systems, where other units supply power).

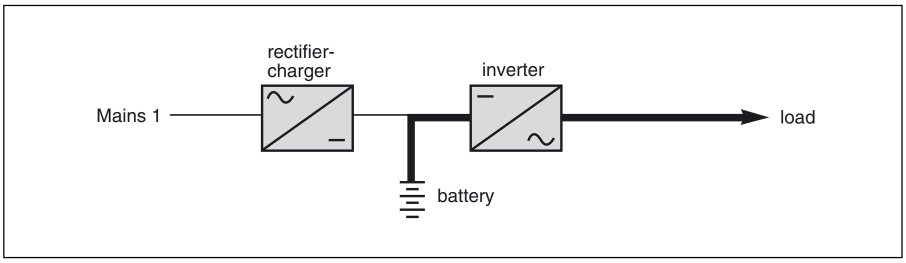


Operation with battery

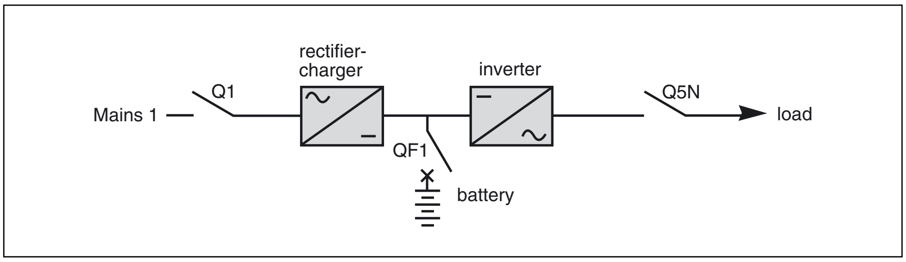
Mains 1 power up:
◗ the inverter receives power from the rectifier-charger and supplies power to the load. There is no direct connection between Mains 1 and the load.



Mains 1 power down:
◗ the inverter runs on battery power and supplies power to the load;
◗ the battery discharges.
Maintenance position

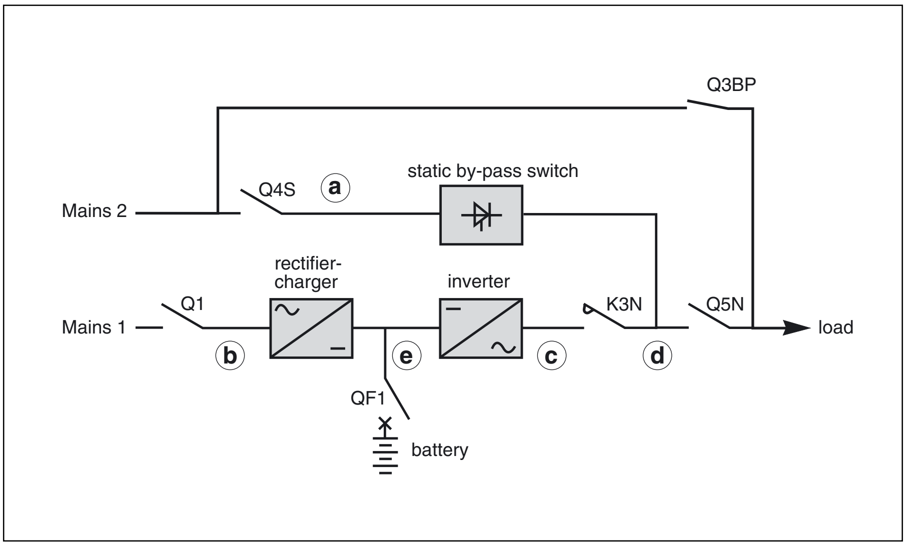


(disconnected):
◗ no power to the load (except in parallel connected systems, where other units supply power).



This chapter presents the specific operating aspects and system data provided by the "GTCZ" and "GT2Z" boards in unitary UPSs. For more detailed information, please refer to the **"system information**" section.

Block diagram



Measured quantities

a	**F Mains 2**	<1A2>	**U Mains 2** **I Mains 2**	<149 to 14E> <109 to 10B>
b	**F Mains 1**	<1A0>	**U Mains 1** **I Mains 1**	<140 to 142> <100 to 102>
c	**F inverter**	<1A1>	**U inverter** **I inverter**	<143 to 148> <106 to 108>
d	**F load**	<1A3>	**U load** **I load**	<14F to 154> <10C to 10E>
e	**Apparent and active power**	<180 to 187>		
	I battery or I dc **Battery backup time**	<115 or 1C1> <1C2>	**U battery or U dc** **Battery temperature**	<155 or 1C0> <1C3>

The numbers enclosed by <> are the addresses in the data array.

Main status bits (UPS operating information)

Normal	**:**	**inverter powers load and full backup time available**	**bit 4C4 = 1**
Danger	**:**	**inverter does not power load**	**bit 4C6 = 1**
Downgraded	**:**	**malfunction or environment fault**	**bit 4C5 = 1**
Load on battery	**:**	**fonctionnement en autonomie**	**bit 4C7 = 1**

Operating modes

The following section describes the different states of a **MGE**™ **Galaxy**™ **6000** UPS and the addresses of the bits in the system data array.

Normal operation

Normal:	bit 4C4 = 1
Danger:	bit 4C6 = 0
Downgraded:	bit 4C5 = malfunction dependent
Load on battery:	bit 4C7 = 0
Q1 closed:	bit 40E = 1
Rectifier/charger on:	bit 408 = 1
QF1 closed:	bit 400 = 1
Inverter connected:	bit 484 = 1
Q5N closed:	bit 498 = 1
Q3BP open:	bit 497 = 0
Q4S closed:	bit 496 = 1
SS open:	bit 499 = 0
K2S open (if available):	bit 494 = 0

Load on battery

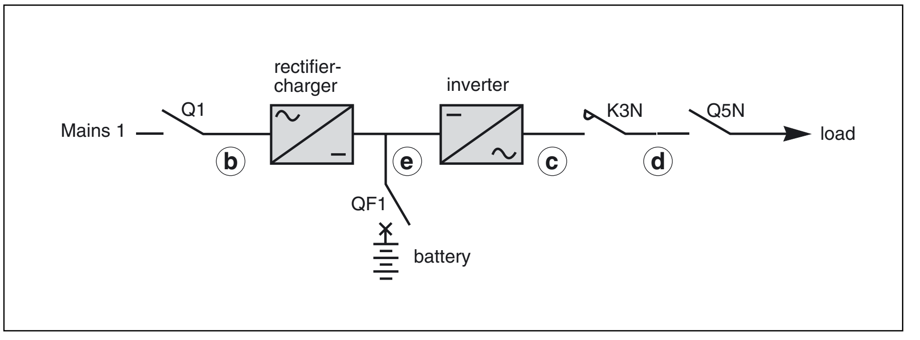
Normal:	bit 4C4 = 1
Danger:	bit 4C6 = 0
Downgraded:	bit 4C5 = malfunction dependent
Load on battery:	bit 4C7 = 1
Q1 indifferent:	bit 40E = X (N/A)
Rectifier/charger off:	bit 408 = 0
QF1 closed:	bit 400 = 1
Inverter connected:	bit 484 = 1
Q5N closed:	bit 498 = 1
Q3BP open:	bit 497 = 0
Q4S closed:	bit 496 = 1
SS open:	bit 499 = 0
K2S open (if available):	bit 494 = 0

Load on Mains 2	Normal:	bit 4C4 = 0
	Danger:	bit 4C6 = 1
	Downgraded:	bit 4C5 = X (N/A)
	Load on battery:	bit 4C7 = X (N/A)
	Q1 indifferent:	bit 40E = X (N/A)
	Rectifier/charger indifferent:	bit 408 = X (N/A)
	QF1 indifferent:	bit 400 = X (N/A)
	Inverter disconnected:	bit 484 = 0
	Q5N closed:	bit 498 = 1
	Q3BP open:	bit 497 = 0
	Q4S closed:	bit 496 = 1
	SS closed:	bit 499 = 1
	K2S closed (if available):	bit 494 = 1
Load on bypass	Normal:	bit 4C4 = 0
	Danger:	bit 4C6 = 1
	Downgraded:	bit 4C5 = X (N/A)
	Load on battery:	bit 4C7 = X (N/A)
	Q1 indifferent:	bit 40E = X (N/A)
	Rectifier/charger indifferent:	bit 408 = X (N/A)
	QF1 indifferent:	bit 400 = X (N/A)
	Inverter connected indifferent:	bit 484 = X (N/A)
	Q5N open:	bit 498 = 0
	Q3BP closed:	bit 497 = 1
	Q4S indifferent:	bit 496 = X (N/A)
	SS indifferent:	bit 499 = X (N/A)
	K2S indifferent:	bit 494 = X (N/A)

Parallel connected UPS

This chapter presents the specific operating aspects and system data provided by the "GTCZ" and "GT2Z" boards in parallel connected UPSs.
For more detailed information, please refer to the **"system information"** section.

Block diagram



Measured quantities

b	**F Mains 1**	<1A0>	**U Mains 1** **I Mains 1**	<140 to 142> <100 to 102>
c	**F inverter**	<1A1>	**U inverter** **I inverter**	<143 to 148> <106 to 108>
d	**F load**	<1A3>	**U load** **I load**	<14F to 154> <10C to 10E>
	Apparent and active power	<180 to 187>		
e	**I battery or I dc** **Battery backup time**	<115 or 1C1> <1C2>	**U battery or U dc** **Battery temperature**	<155 or 1C0> <1C3>

The numbers enclosed by <> are the addresses in the data array.

Main status bits of system operations

Normal	**:**	**inverter powers load and maximum backup time available**	**bit 4C4 = 1**
Danger	**:**	**inverter does not power load**	**bit 4C6 = 1**
Downgraded	**:**	**malfunction or environment fault**	**bit 4C5 = 1**
Load on battery	**:**	**load on battery power**	**bit 4C7 = 1**

Operating modes

The following section describes the different states of a **MGE**™ **Galaxy**™ **6000** UPS and the addresses of the bits in the system data array.

Normal operation

Normal:	bit 4C4 = 1
Danger:	bit 4C6 = 0
Downgraded:	bit 4C5 = malfunction dependent
Load on battery:	bit 4C7 = 0
Q1 closed:	bit 40E = 1
Rectifier/charger on:	bit 408 = 1
QF1 closed:	bit 400 = 1
Inverter connected:	bit 484 = 1
Q5N closed:	bit 498 = 1

Load on battery

Normal:	bit 4C4 = 1
Danger:	bit 4C6 = 0
Downgraded:	bit 4C5 = malfunction dependent
Load on battery:	bit 4C7 = 1
Q1 indifferent:	bit 40E = X (N/A)
Rectifier/charger off:	bit 408 = 0
QF1 closed:	bit 400 = 1
Inverter connected:	bit 484 = 1
Q5N closed:	bit 498 = 1

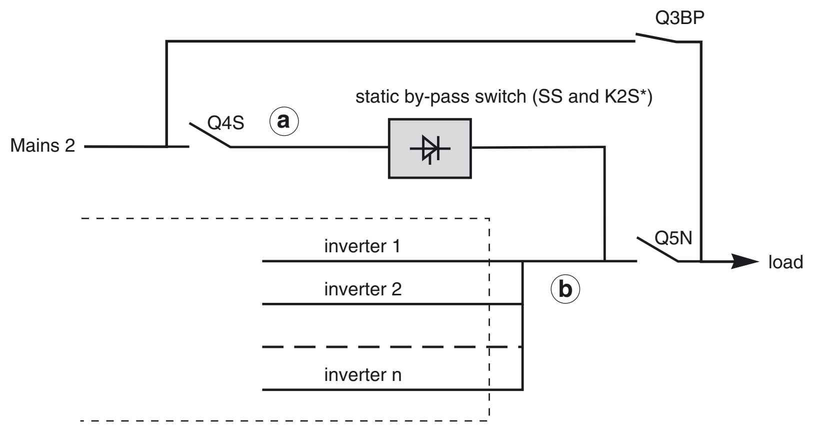
Disconnected

Normal:	bit 4C4 = 0
Danger:	bit 4C6 = 1
Downgraded:	bit 4C5 = X (N/A)
Load on battery:	bit 4C7 = X (N/A)
Q1 indifferent:	bit 40E = X (N/A)
Rectifier/charger indifferent:	bit 408 = X (N/A)
QF1 indifferent:	bit 400 = X (N/A)
Inverter not connected:	bit 484 = X (N/A)
Q5N open:	bit 498 = 0

Static Switch cubicle

This chapter presents the specific operating aspects and system data provided by the "GTCZ" and "GT2Z" boards for **MGE**™ **Galaxy**™ **6000** "Static Switch" cubicles.
For more detailed information, please refer to the **"system information"** section.

Block diagram



* : K2S is the contactor that is parallel-mounted with the static switch on devices with an output greater than 800 kVA.

Measured quantities

a	**F Mains 2**	<1A2>	**U Mains 2** **I Mains 2**	<149 to 14E> <109 to 10B>
b	**F load**	<1A3>	**U load** **I load**	<14F to 154> <10C to 10E>
	Apparent and active power	<180 to 187>		

The numbers enclosed by <> are the addresses in the data array.

Main indicators of system operations

Normal	**:**	**charge alimentée par l'onduleur**	**bit 4C4 = 1**
Danger	**:**	**charge non alimentée par l'onduleur**	**bit 4C6 = 1**
Downgraded	**:**	**anomalie de fonctionnement ou défaut d'environnement**	**bit 4C5 = 1**

Operating modes

The following section describes the different states of a Static Switch cubicle and the addresses of the bits in the system data array.

Normal operation

Normal:	bit 4C4 = 1
Danger:	bit 4C6 = 0
Downgraded:	bit 4C5 = malfunction dependent
Q5N closed:	bit 498 = 1
Q3BP open:	bit 497 = 0
Q4S closed:	bit 496 = 1
SS open:	bit 499 = 0
K2S open (if available):	bit 494 = 0
Inverters connected to load:	bit 4AE = 1

Load on Mains 2

Normal:	bit 4C4 = 0
Danger:	bit 4C6 = 1
Downgraded:	bit 4C5 = X (N/A)
Q5N closed:	bit 498 = 1
Q3BP open:	bit 497 = 0
Q4S closed:	bit 496 = 1
SS closed (if K2S not available):	bit 499 = 1
K2S closed (if available):	bit 494 = 1
Inverters not connected to load:	bit 4AE = 0

Load on bypass

Normal:	bit 4C4 = 0
Danger:	bit 4C6 = 1
Downgraded:	bit 4C5 = X (N/A)
Q5N open:	bit 498 = 0
Q3BP closed:	bit 497 = 1
Q4S indifferent:	bit 496 = X (N/A)
CS indifférent:	bit 499 = X (N/A)
SS indifferent:	bit 494 = X (N/A)
Inverter connected indifferent:	bit 4AE = X (N/A)

Message format

This section describes the messages exchanged between the "GTC link" communication interface and the external computer based on the JBUS protocol.
The length of time after which a message must be interpreted as "not understood" depends on the type of command sent.
The table opposite lists maximum response times:

Data rate	1200 Baud	2400 Baud	4800 Baud	9600 Baud
status information only	0,5 s	0,25 s	0,12 s	0,06 s
all measurements	2 s	1 s	0,5 s	0,25 s

Response time of event (independent of data rate)		
- inverter start-up and connect	:	30 s
- rectifier-charger startup	:	30 s
- rectifier-charger or inverter stop	:	30 s

Example of read data array commands sent by the terminal

(address: 20H)

For the "responses", refer to the "JBUS protocol" section function 1 and 3.

request	station	function code	data address	length	CRC 16
read voltage array (21 values)	20	03	0140	0015	82 9C
read current array (15 values)	20	03	0100	000F	28 03
read global state bits (11 bits)	20	01	04C0	000B	7A 70

Sample commands

command	station	function code	bit address	data	not used	CRC 16
charger on	20	05	0C00	FF	00	89 DB
charger off	20	05	0C01	FF	00	D8 1B
inverter on	20	05	0C04	FF	00	C8 1A
inverter off	20	05	0C05	FF	00	99 DA

List of variable fields

(same for all cubicle types)

The binary data and binary commands can be accessed bit or word-wise.
The word address and position of the bit in the word can be determined from the bit address:

- hundreds and tens digit of bit address = word address;
- least significant digit of bit address = bit position.

JBUS fields	address in hexadecimal		access
	start	end	
signaling	0	5	read / write
signaling	6	F	read
binary data	40	BF	read
commands	C0	DF	read / write
counters	E0	FF	read
currents	100	13	read
voltages	140	17	read
powers	180	19F	read
frequencies	1A0	1BF	read
battery	1C0	1DF	read
adjustments	200	2FF	read
maintenance	300	3FF	read

General definitions

object	0	1
switch	open	closed
unit	off	on
fault	no fault	fault
control device	not activated	activated

Signaling field

(same for all cubicle types)

signaling	units	data		JBUS address hex. word
synchronisation counter (MSB)				0
synchronisation counter (LSB)	ms	0	4294967295	1
binary times		N/A		2
binary times		N/A		3
binary times		N/A		4
binary times		N/A		5
manufacturer's ID	without	1		MSB 6
model ID (MSB)	without	102		LSB 6
model ID (LSB)	without	54380		7
configuration 1	without	N/A inverter type, same as 200		MSB 8 LSB 8
configuration 2	without	hardware version software version		MSB 9 LSB 9
not used				A
not used				B
state of equipment	without	same as 4E		C
state of processing	without	same as 4C		D
not used				E
not used				F

Tables of measured data

Current fields

Legend:

- yes: available in this cubicle;
- bat: available in this cubicle if battery installed;
- no entry: not available.

measured current	units	JBUS address hex. word	type unitary	type parallel	type Static Switch
I1 (I phase 1) Mains 1	A	100	yes	yes	
I2 (I phase 2) Mains 1	A	101	yes	yes	
I3 (I phase 3) Mains 1	A	102	yes	yes	
I1 (I phase 1) inverter	A	106	yes	yes	
I2 (I phase 2) inverter	A	107	yes	yes	
I3 (I phase 3) inverter	A	108	yes	yes	
I1 (I phase 1) Mains 2	A	109	yes		yes
I2 (I phase 2) Mains 2	A	10A	yes		yes
I3 (I phase 3) Mains 2	A	10B	yes		yes
I1 (I phase 1) load	A	10C	yes	yes	yes
I2 (I phase 2) load	A	10D	yes	yes	yes
I3 (I phase 3) load	A	10E	yes	yes	yes
I battery	A	115	bat	bat	
% load	-	120	yes	yes	yes
% peak load (Ph1)	-	121	yes	yes	yes
% peak load (Ph2)	-	122	yes	yes	yes
% peak load (Ph3)	-	123	yes	yes	yes

Voltage fields

Legend:
- yes: available in this cubicle;
- no entry: not available.

measured voltage	units	JBUS address hex. word	type unitary	parallel	SS
U12 Mains 1	V	140	yes	yes	
U23 Mains 1	V	141	yes	yes	
U31 Mains 1	V	142	yes	yes	
U1N inverter	V	143	yes	yes	
U2N inverter	V	144	yes	yes	
U3N inverter	V	145	yes	yes	
U12 inverter	V	146	yes	yes	
U23 inverter	V	147	yes	yes	
U31 inverter	V	148	yes	yes	
U1N Mains 2	V	149	yes		yes
U2N Mains 2	V	14A	yes		yes
U3N Mains 2	V	14B	yes		yes
U12 Mains 2	V	14C	yes		yes
U23 Mains 2	V	14D	yes		yes
U31 Mains 2	V	14E	yes		yes
U1N load	V	14F	yes	yes	yes
U2N load	V	150	yes	yes	yes
U3N load	V	151	yes	yes	yes
U12 load	V	152	yes	yes	yes
U23 load	V	153	yes	yes	yes
U31 load	V	154	yes	yes	yes
U battery	V	155	yes	yes	

Power fields

power measurements	units	JBUS address hex. word	type unitary	parallel	SS
P1 (load active power)	kW	180	yes	yes	yes
P2 (load active power)	kW	181	yes	yes	yes
P3 (load active power)	kW	182	yes	yes	yes
S1 (load apparent power)	kVA	183	yes	yes	yes
S2 (load apparent power)	kVA	184	yes	yes	yes
S3 (load apparent power)	kVA	185	yes	yes	yes
P (load active power)	kW	186	yes	yes	yes
S1 (load apparent power)	kVA	187	yes	yes	yes
% inverter load	-	188	yes	yes	yes
power factor	-	189	yes	yes	yes

Frequency fields

Legend:
- yes: available in this cubicle;
- no entry: not available.

frequencies measurements	units	JBUS address hex. word	type unitary	parallel	SS
F Mains 1	dHz	1A0	yes	yes	
F inverter	dHz	1A1	yes	yes	
FMains 2	dHz	1A2	yes		yes
F load	dHz	1A3	yes	yes	yes

Battery and adjustments fields

Legend:
- no entry: not available;
- yes: available in this cubicle;
- bat: available in this cubicle if battery installed;
- bat/opt: available if option installed.

Inverter type:
- 0: unitary;
- 1: parallel without static switch;
- 2: parallel with static switch;
- 3: Static Switch cubicle.

Battery installed:
- 0 = no;
- 1 = yes.

Sensor installed:
- 0 = no;
- 1 = yes.

battery measurements	units	JBUS address	type		
		hex. word	unitary	parallel	SS
U battery	V	1C0	yes	yes	
I battery	A	1C1	bat	bat	
battery backup time	mn	1C2	bat/opt	bat/opt	
battery room temperature	°C	1C3	bat/opt	bat/opt	

battery adjustments	units	JBUS address	type		
		hex. word	unitary	parallel	SS
inverter type	-	200	yes	yes	yes
battery installed	-	201	yes	yes	
battery temperat. sensor	-	202	yes	yes	
In (I rated load)	A	208	yes	yes	yes
Pn (P rated load)	kW	209	yes	yes	yes

Tables of binary data

Rectifier-charger

Legend:
- no entry: not available;
- yes: available in this cubicle;
- bat: available in this cubicle if battery installed.

rectifier-charger information	bit meaning		JBUS address hex.		type		
	bit=0	bit=1	bit	word	unit.	para.	SS
B_Etat_QF1	open	closed	400	40	bat	bat	
B_Etat_Dech_Bat	not discharging	discharging	401		bat	bat	
B_Etat_Ubat_Min	not reached	min. volt. fault	402		bat	bat	
B_Etat_Ubat_Aut	not reached	warning	403		bat	bat	
B_Etat_Tempe_Ht	normal	outside toleran.	404		bat	bat	
B_Etat_Res1_Ht	not reached	outside toleran.	405		bat	bat	
B_Etat_Vent_Bat	no fault	fault	406		yes	yes	
B_Etat_Cha_Bat	not charging	charging	407		bat	bat	
B_Etat_Pont	off	on	408		bat	bat	
B_Etat_Def_Maj_Cha	no fault	fault	409		yes	yes	
B_Etat_Q1	open	closed	40E		yes	yes	
B_Etat_Arr_Urg	not activated	activated	411	41	yes	yes	
B_Etat_U_Res1	normal	outside toleran.	412		yes	yes	
B_Etat_F_Res1	normal	outside toleran.	413		yes	yes	
B_Etat_Arr_Prog	not activated	activated	417		bat	bat	
B_Etat_Lim_Groupe	not activated	activated	419		bat	bat	
B_Etat_IBat_Aux	not activated	activated	41A		bat	bat	
B_Etat_Egal_Bat	not active	active	41B		bat	bat	
B_Etat_Groupe	not activated	activated	41E		yes	yes	

System information (continued)

Inverter

Legend:
- no entry: not available;
- yes: available in this cubicle.

inverter information	bit meaning		JBUS address hex.		type		
	bit=0	bit=1	bit	word	unit.	para.	SS
B_Etat_Su_Mut	no overload	overload	440	44	yes	yes	
B_Etat_Def_Maj_Ond	no fault	fault	441		yes	yes	
B_Etat_Lim_Ond	no limitation	limitation	445		yes	yes	
B_Etat_Suth_Mut	no overload	overload	446		yes	yes	
B_Etat_Aux_Libre	not activated	activated	44C		yes	yes	
B_Etat_Arr_Urg	not activated	activated	44D		yes	yes	
B_Etat_Arr_Forc_Cext	not activated	activated	454	46	yes	yes	
B_Etat_Inv_Fréq	not activated	activated	465		yes	yes	
B_Etat_Arr_Prot_Cext	not activated	activated	467		yes	yes	

Connectivity

Legend:
- no entry: not available;
- yes: available in this cubicle;
- >800k: on static switch cubicles higher than 800 kVA.

connectivity information	bit meaning		JBUS address hex.		type		
	bit=0	bit=1	bit	word	unit.	par.	SS
B_Etat_Su_Ond	no overload	overload	480	48	yes	yes	yes
B_Etat_Vent	no fault	ventilation fault	482		yes	yes	yes
B_Etat_Ond_Coup	not connected	connected	484		yes	yes	yes
B_Etat_Arr_Inter	enable	disable	485		yes	yes	yes
B_Etat_Cde_Pilote	not synchro.	synchro.	486		yes	yes	yes
B_Etat_Def_Coup	no fault	fault	487		yes	yes	yes
B_Etat_Res2_Ht	normal	outside toleran.	48A		yes		yes
B_Etat_Arr_Urg	not activated	activated	48D		yes	yes	yes
B_Etat_K2S	open	closed	494	49			>800k
B_Etat_Q4S	open	closed	496		yes		yes
B_Etat_Q3BP	open	closed	497		yes		yes
B_Etat_Q5N	open	closed	498		yes	yes	yes
B_Etat_Cde_Cs_Res2	open	closed	499		yes		yes
B_Etat_F_Res2	normal	outside toleran.	49C		yes		yes
B_Etat_U_Res2	normal	outside toleran.	49D		yes		yes
B_Etat_Freq_Auto	not activated	activated	49F		yes		yes
B_Etat_Su_Res2	no overload	overload	4A0	4A	yes		yes
B_Etat_Suth_Res2	no overload	overload	4A1		yes		yes
B_Etat_Suth_Ond	no overload	overload	4A2		yes	yes	yes
B_Etat_Arm_Aux	no fault	fault	4A3		yes	yes	yes
B_Etat_Sans_Trou	not activated	activated	4A4		yes		yes
B_Etat_Ver_Sec	not activated	activated	4A5		yes		yes
B_Etat_Nb_Ond_Suff	insufficient	sufficient	4AF				yes

Global information

Legend:
- no entry: not available;
- yes: available in this cubicle;

global information	bit meaning		JBUS address hex.		type		
	bit=0	bit=1	bit	word	unit.	par.	SS
B_Etat_Arr_Acq	no fault	fault	4C0	4C	yes	yes	yes
B_Etat_Cde_Batt_Fin	no fault	backup time end	4C1		yes	yes	
B_Etat_Fin_Vie_Batt	no fault	battery obsolete	4C2		yes	yes	
B_Etat_Cde_Sys_Nor	no fault	normal	4C4		yes	yes	yes
B_Etat_Cde_Sys_Deg	not downgraded	downgraded	4C5		yes	yes	yes
B_Etat_Cde_Sys_Dan	safe	unsafe	4C6		yes	yes	yes
B_Etat_Cde_Bat_Deg	not on batteries	on batteries	4C7		yes	yes	yes
B_Etat_Arr_Urg	not activated	activated	4C8		yes	yes	yes
B_Etat_CS_K2S	open	closed	4C9		yes	yes	yes
B_Etat_Coup_ASI	disconnected	connected	4CA		yes	yes	yes
B_Etat_Vent_US	no fault	fault	4DD		yes	yes	yes
B_Num_Test_Com	no error	error	4E9	4E	yes	yes	yes
B_Reg_Autres	not configurated	configurated	4EA		yes	yes	yes
B_Reg_Voie	not configurated	configurated	4EB		yes	yes	yes
B_Mes_Invalides	valid	invalid	4EC		yes	yes	yes
B_Etat_Modifié	no change	change	4EF		yes	yes	yes

Table of control devices

Legend:
- no entry: not available;
- yes: available in this cubicle.

commands	bit meaning		JBUS address hex.		type		
	bit=0	bit=1	bit	word	unit.	par.	SS
B_Ope_Mar_Cha	not activated	activated	C00	C0	yes	yes	
B_Ope_Arr_Cha	not activated	activated	C01		yes	yes	
B_Ope_Arr_Ond	not activated	activated	C04		yes	yes	
B_Ope_Mar_Ond	not activated	activated	C05		yes	yes	

Telemonitoring information

Legend:
- no entry: not available;
- yes: available in this cubicle.

information	bit meaning		JBUS address hexadecimal		type		
	bit=0	bit=1	bit	word	unit.	par.	SS
reason for call (high transitions)	no transition	transition	(same structure as word 4C)	50	yes	yes	yes
reason for call (low transitions)	no transition	transition	(same structure as word 4C)	51	yes	yes	yes
main number invalid	valid	invalid	520	52	yes	yes	yes
secondary number invalid	valid	invalid	528		yes	yes	yes

Glossary of information descriptors

(data words at address 40 to 4E)
Every bit is listed according to the following format:
bit address: description
(bit = 0 / bit = 1).

Word address: 40

400: battery circuit breaker (0=open/1=closed)
Battery protection circuit breaker "QF1" is located near the battery and is "on" (closed) during normal operation. When it either trips or is turned "off" (open) the load is no longer protected since battery power is no longer available if Mains 1 fails.

401: battery discharging (0=not discharging/1=discharging)
The inverter powers the load. Mains 1 is either not available or outside tolerances and the inverter is battery powered.

402: minimum battery voltage (0=not reached/1=min. volt. fault)
A fault indicates that the minimum battery voltage has been reached during Load on battery and the inverters it supplies are stopped. If Mains 2 is not available, which is generally the case, the load not longer receives power.

403: low battery shutdown warning (0=not reached/ 1=warning)
The warning indicates that the end of backup time is imminent. It is only applicable when the inverters operate on battery power.

404: battery temperature (0=normal/1=outside tolerances)
This information only exists if the system is equipped with the "Temperature Monitor" option. It tells the user that the temperature of the battery is outside the allowable range. The rectifier-charger circuit is switched so that the battery charging current becomes zero. The battery is no longer being recharged (battery protection).

405 : Mains 1 voltage (0=normal/ 1=outside tolerances)
Indicates that the Mains 1 power supply voltage is outside tolerances and the inverter on battery power.

406 : battery room ventilation (0=no fault/1=fault)
Informs the user of a battery room ventilation fault. The rectifier-charger circuit is switched so that the battery charging current becomes zero. The battery is no longer being recharged. It prevents vented led-acid batteries from giving off hydrogen gas The user must remedy the ventilation problem.

407: battery charging (0=not charging/1=charging)
Informs the user whether the battery is currently being recharged (only valid for vented lead-acid batteries).

408: rectifier-charger status (0=off/1=on)
Gives the status of the rectifier-charger circuit. It stops every time Mains 1 power fails. In this case the load is battery powered via the inverter.

409: major rectifier-charger fault (0=no fault/1=fault)
Informs the user of a major rectifier-charger fault requiring after-sales servicing.

40E: Mains 1 input switch (0=open/1=closed)
"Q1" Mains 1 input switch which powers the rectifier-charger. Normally the switch is closed or "on". The switch can be opened to disconnect the unit from Mains 1 for servicing.

Word address: 41

411: emergency off switch (0=not activated/1=activated)
Normally-closed switch connected to the units. When activated, the rectifier-charger circuits and the inverters stop operating. The "QF1" battery circuit breaker is also opened.
If the "emergency off" also tripped the protection devices to disconnect the units from Mains 1 and Mains 2, the load no longer receives power and the units are completely disconnected.

412: rectifier-charger input voltage (0=normal/1=outside tolerances)
The rectifier-charger stops operating when the Mains 1 phase-to-phase voltage is outside tolerances.

413: rectifier-charger input frequency (0=normal/1=outside tolerances)
The rectifier-charger stops operating when the Mains 1 frequency is outside tolerances.

417: gradual rectifier-charger shutdown (0=not activated/ 1=activated)
Indicates that the rectifier-charger received an external command to gradually stop operating (e.g. gradual load-shedding when using power from engine generator sets).

419: engine generator set current limiting (0=not activated/ 1=activated)
Informs the user that the rectifier-charger has received an external command to limit the current drawn from Mains 1. The additional power required by the inverter is supplied by the battery (which discharges).
Example: operating from a generator that delivers insufficient power.

41A: battery current limiting (0=not activated/1=activated)
The rectifier-charger received an external command to limit the current that charges the battery. Normal battery charging is resumed when Mains 1 returns.
Example: operating from a generator that delivers insufficient power to supply load and charge batteries.
Note: the current limit is programmable.

41B: battery equalization (0=not active/1=active)
The rectifier-charger has been manually switched to equalization mode, to equalize battery cell voltages. This action stops all inverters powered by the battery (if they were not already stopped).

41E: operation on engine-generator set (0=not activated / 1=activated)
Indicates that the rectifier-charger is supplied by an engine-generator set and not by the normal Mains 1 power supply.

Word address: 44

440: inverter stack overload (0=no/1=overload)
Indicates an overload condition due to a load power factor exceeding 0.9.

441: major inverter fault (0=no/ 1=fault)
Informs the user of an inverter fault requiring after-sales servicing.

445: inverter output current limiting (0=no/1=active)
Informs the user that an overload exceeding 1.6 In has occurred at the output: the inverter stops operating.

446: inverter thermal overload (0=no/1=overload)
Informs the user that the output is overloaded by a factor between 1 and 1.6 In: the inverter stops operating.

44C: outside contact (0=not activated/1=activated)
Normally open switch. Initiates the actions that have been configured using the after-sales "Soft Tunor" computer software. Possible actions when activated:

- no action;
- inverter off;
- forced inverter shutdown;
- conditional inverter shutdown;
- frequency change (when powering on the unit) with respect to the frequency configured by the after-sales "Soft Tunor" computer software (i.e. 50Hz to 60Hz or vice versa).

44D: emergency off switch (0=not activated/1=activated)
Normally-closed switch connected to the units. When activated, the rectifier-charger circuits and the inverters stop operating. The "QF1" battery circuit breaker is also opened. If the "emergency off" also trips the protection devices to disconnect the units from Mains 1 and Mains 2, the load no longer receives power and the units are completely disconnected.

Word address: 46

464: forced inverter shutdown (0=not activated / 1=activated)
Indicates to the user that a shutdown of the inverter will result in transfer of the load to Mains 2 with the risk of a 0.8 second interruption in the supply of power to the load.

465: frequency conversion (0=not activated / 1=activated)
Indicates that the **MGE**™ **Galaxy**™ **6000** UPS is operating as a frequency converter between the input and the output (50 Hz / 60 Hz).

466: conditional inverter shutdown (0=not activated / 1=activated)
Indicates to the user that a shutdown of the inverter will take place only if the load transfer conditions to Mains 2 are correct to avoid an interruption in the supply of power to the load.

Word address: 48

480: inverter overload (0=no/ 1=overload)
Informs the user that the load is drawing more than the rated UPS output.

482: ventilation of the battery cabinets (0=no fault / 1=fault)
Indicates to the user that ventilation in a battery cabinet is incorrect due to a fan fault or shutdown. This fault does not result in UPS shutdown. This information is available only on European versions of the **MGE**™ **Galaxy**™ **6000** UPS.

484: inverter connected to the load (0=not connected/ 1=connected)
The inverter is operating and powers the load.

485: inverter off disable (0=enabled/1=disabled)
The inverter off command is disabled.

486: synch with Mains 2 (0=not synch/1=synch)
The inverter may operate without its frequency synchronized to that of Mains 2 (i.e. free-running operation); in this case, it operates at an accurate (within 0.05 Hz) fixed frequency. Alternatively, the inverter may be operated with its frequency synchronized to that of Mains 2.

487: transfer fault (0=no fault/ 1=fault)
Informs the user of a fault on the static switch, used to transfer the load between Mains 2 and inverter output. After-sales servicing is required.

48A: Mains 2 voltage outside tolerances (0=normal / 1=outside tolerances)
Indicates to the user that the Mains 2 backup power supply voltage is outside tolerances. A transfer of the load to the Mains 2 backup power supply will result in a 0.8 second interruption in the supply of power to the load or may not take place.

48D: emergency off switch (0=not activated/1=activated)
Normally-closed switch connected to the units. When activated, the rectifier-charger circuits and the inverters stop operating. The "QF1" battery circuit breaker is also opened.
If the "emergency off" also tripped the protection devices to disconnect the units from Mains 1 and Mains 2, the load no longer receives power and the units are completely disconnected.

Word address: 49

494: contactor K2S (0=open/ 1=closed)
Indicates the position of contactor K2S . Contactor K2S is connected in parallel with the static switch on the Mains 2 line on certain high output units. It is installed in static-switch cubicles with power ratings over 400 kVA.

496: Mains 2 input switch (0=open/1=closed)
Switch "Q4S" is located on the Mains 2 phases at the input of the static switch (on the bypass line). The switch is normally closed.

497: maintenance bypass switch (0=open/1=closed)
Switch "Q3BP" bypasses the static switch and connects Mains 2 directly to the load. This switch is normally open. When closed (with "Q4S" and "Q5N" open), the load can continue to be powered while the UPS is isolated for servicing.

498: inverter output switch (0=open/1=closed)
Switch "Q5N" is located at the output of the inverter and is used to disconnect the load from the inverter (or from the output busbars when several units are connected in parallel).
This switch is normally closed.

499: static switch status (0=open/1=closed)
The static switch on Mains 2 is normally open (inverter powers the load). The load is transferred to Mains 2 by closing the static switch when the inverters are no longer capable of delivering the required power (overload, end of backup time or internal error).

49C: Mains 2 frequency (0=normal/1=outside tolerances)
When the frequency of Mains 2 is outside tolerances, load transfer from inverter to Mains 2 will include an interruption of 0.8 s or will not take place.

49D: Mains 2 voltage (0=normal/ 1=outside tolerances)
When the phase-to-phase Mains 2 input voltage is outside tolerances, load transfer from inverter to Mains 2 will include an interruption of 0.8 second.

49F: free-running frequency request (0=not activated/ 1=activated)
Indicates that the inverter received an external command to desynchronize its output frequency from the frequency of Mains 2.

Word address: 4A

4A0: static bypass (Mains 2) overload (0=no/1=overload)
The load, supplied via the static bypass line (Mains 2), is drawing more than the rated current but continues to be supplied by Mains 2.

4A1: static bypass (Mains 2) thermal overload (0=no/ 1=overload)
Informs the user that the load is no longer powered by Mains 2 due to an extended overload condition.

4A2: inverter thermal overload (0=no/1=overload)
Informs the user that the load is overloaded by a factor between 1 and 1.6 In: the inverter stops operating.

4A3: auxiliary cubicle fault (0=no fault / 1=fault)
Indicates to the user that the fault auxiliary contact connected to the cubicle has been activated. This information is available only on U.S. versions of the **MGE**™ **Galaxy**™ **6000** UPS.

4A4: transfer to Mains 2 with interrupt prohibited (0=not activated/1=activated)
An auxiliary command prohibits transfer to Mains 2 with power interruption.

4A5: transfer lockout (0=not activated/1=activated)
The inverter received an auxiliary command prohibiting transfer to Mains 2. The load is totally dependent on inverter power. If the inverter stops (internal fault), the load will no longer receive power.

4AF: inverter quantity (0=insufficient/1=sufficient)
This only concerns systems with parallel connected inverters and a static switch cubicle. It informs the user that the number of inverters to be connected to the load is insufficient to supply the necessary power. Additional inverter(s) must be turned on so that the inverters can start supplying the power to the load. If this is not the case, Mains 2 continues to supply the power.

Word address: 4C
(summary of operating information)

4C0: acquisition fault (0=no fault / 1=fault)
Indicates an acquisition fault for the internal analogue or logic values of the "GTCZ" or "GT2Z" communication board.

4C1: battery backup time (0=no fault/1=backup time end)
The computed "remaining backup time" is less than the amount configured in the unit.

4C2: end of battery life (0=no fault / 1=end of battery life)
Indicates that the battery has reached its maximum service life and should be replaced.

4C4: system normal, load protected (0=not normal/ 1=normal)
Indicates that the inverter powers the load and that the full battery backup time is available if Mains 1 fail. The unit is operating normally.
Note: for parallel connected inverter cubicles, this only refers to the output power supplied by that specific unit. The load may be unprotected if more than one inverter is required to supply the load power. All required inverters in the system or the static switch cubicle if it exists must therefore be checked.

4C5: system downgraded due to malfunction (0=not downgraded/ 1=downgraded)
Indicates a malfunction or environment fault; nevertheless the inverter can still power the load.

- malfunctions:
  - static switch cubicle ventilation fault,
  - static switch control fault,
  - environment faults:
  - battery temperature outside tolerances,
  - overload exceeding 5%,
  - Mains 2 voltage, frequency or phase outside tolerances with respect to inverter.

4C6: unsafe operation, load unprotected (0=safe/1=unsafe)
Indicates that:
- Mains 2 powers the load due to inverter shutdown (manual or due to an overload or internal fault) or due to opening "Q5N" at the inverter output;
- not able to rely on battery backup because circuit breaker "QF1" is open.

Note: for parallel connected inverters this only refers to the specific unit. The load may still be protected because more than one inverter is supplying power.

4C7: operating on battery power (0=no/1=on battery power)
Indicates that the unit is operating on battery power because:
- Mains 1 voltage failure or dip;
- insufficient Mains 1 power (e.g. engine generator set) with extra energy required supplied by the battery.

4C8: emergency off switch (0=not activated/1=activated)
Normally-closed switch connected to the units. When activated, the rectifier-charger circuits and the inverters stop operating. The "QF1" battery circuit breaker is also opened.
If the "emergency stop" also tripped the protection devices to disconnect the units from Mains 1 and Mains 2, the load no longer receives power and the units are completely disconnected.

4C9: power supplied via SS or K2S (0=open/1=closed)
Indicates that the static switch or the mechanical switch on the Mains 2 backup line is closed. The load is supplied by Mains 2.

4CA: inverter connected (0=disconnected/1=connected)
Indicates that the inverter is in operation and supplying the load.

Word address: 4D

4DD: cubicle ventilation (0=no fault / 1=fault)
Indicates to the user that ventilation in a cubicle is incorrect due to a fan fault or shutdown. This fault does not result in UPS shutdown. This information is available only on U.S. versions of the **MGE™ Galaxy™ 6000** UPS.

Word address: 4E (summary of communication interface information)

4E9: communication interface test error (0=no error/1=error)
Error free communications can no longer be guaranteed.

4EA: unit in configuration mode (0=no config./1=config)
The after-sales "Soft Tunor" computer software is connected to the cubicle, blocking all remote commands.

4EB: remote setting (0=no setting / 1=setting)
Indicates to the user that the Soft Tunor after-sales-support computer tool has been connected to the communication channel.

4EC: invalid measurements (0=valid/1=invalid)
The communication interface receives invalid measurement data and status information from the cubicle.

4EF: change in status (0=no change / 1=change)
Indicates a change in status of at least one indicator between two reads of logical data. This information can be reset by the device connected to the communication channel.

Glossary of telemonitoring information descriptors

(data words at address 50 to D4)

Word address: 50

The causes of high transition alarms followed by a call from the UPS site to the central monitoring site are logged in this word.
Word structure is similar to that of word 4C.

Word address: 51

The causes of low transition alarms followed by a call from the UPS site to the central monitoring site are logged in this word.
Word structure is similar to that of word 4C.

Word address: 52

520: invalid telephone number for main telemonitoring site (0=valid / 1=invalid)
Indicates that calls from the UPS site to the central telemonitoring site consistently fail. The number of the telemonitoring site is therefore declared invalid and no longer used. A second set of calls is then undertaken using the backup number.
The telephone number is reinstated:
- on reception of a new communication configuration using the Soft Tunor after-sales-support computer tool,
- when the "GTCZ" or "GT2Z" communication board is de-energised.

528: invalid telephone number for secondary telemonitoring site (0=valid / 1=invalid)
Indicates that calls from the UPS site to the secondary telemonitoring site consistently fail. The number of the telemonitoring site is therefore declared invalid and no longer used.

The telephone number is reinstated:

- on reception of a new communication configuration using the Soft Tunor after-sales-support computer tool,
- when the "GTCZ" or "GT2Z" communication board is de-energised.

Word address: C1

C10: call reset (0= not activated / 1=activated)

Call reset command issued by the central telemonitoring site. The information bits that provoked the call to the central telemonitoring site are reset.

C11: return call (0= not activated / 1=activated)

Return call command issued by the central telemonitoring site. The UPS site recalls the central telemonitoring site following a time delay of approximately 30 seconds.

C14: status change reset (0= not activated / 1=activated)

Indicates that the central telemonitoring site issues a reset command for the status change bit at address 4EF.
