SOCIETÁ PER L'ELETTRONICA s.r.l.

EXPERT 1K-FA

COMMUNICATION PROTOCOL SPECIFICATIONS

Rev. 1.0

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Foreword.

This document describes in detailed form the communication protocol of the EXPERT 1K-FA Linear Amplifier produced by SPE srl.

With the term "communication protocol" we intend the "set of rules" that can be used to remotely control the functionality of the Linear Amplifier itself using all the features provided by its embedded firmware.

By following the syntax description of the available command and response types hereafter depicted, a medium-skill computer programmer can build his own customized remote control application (special programs, logs, etc.).

The sample Windows application "EXPERT_Console.exe" freely downloadable from our web site wants to be only a simple programming example that duplicates (with some little improvements) the EXPERT's front panel "touch and feel" and it's not intended to be an "on demand customizable software".

In other terms SPE srl:

- is not involved in any communication software development concerning the EXPERT 1K-FA Linear Amplifier
- doesn't operate any form of consulting activity concerning software development
- doesn't take any responsibility about communication software developed by third party

All the technical information included in this document can be used without any limit by a user who wants to build, for any use, his own communication application.

EXPERT 1K-FA: the communication protocol.

The communication protocol of the EXPERT Linear Amplifier is implemented via a RS-232 serial link available on the rear panel of the device itself and enables any computer provided with the proper serial interface to easily implement a sort of "remote control" that can behave either as a "second front panel" or, for example, as a "reduced command-set" interface tailored for the customer's purpose: it all depends on the skill and imagination of the programmer (and on the power of the computer hardware involved).

The protocol's nature is "general purpose" (it is not bound to any particular or proprietary hardware architecture) and is very efficient because all the information needed is packed together in a very short data record that is sent by the Linear Amplifier in a time of about 40 ms.

The serial communication is asynchronous and the setup parameters are:
  9600 Baud
  8 Bit/char
  1 Stop bit
  No parity control

The interface cable equipped with the amplifier is a simple "straight-through" serial cable having the following connections:

P.C side   EXPERT side
DB-9/F connector   DB-9/M connector

```
  2|   TX  -->                                                    |2
---+----------------------------------------------------+---
  3|   RX  <--                                                    |3
---+----------------------------------------------------+---
  4|   DTR -->                                                    |4
---+----------------------------------------------------+---
  5|   GND                                                        |5
---+----------------------------------------------------+---
   |                                                     |
```

Although, according to EIA specifications, the maximum RS-232 cable length should not be over 50 feet (15 meters), in our laboratory we successfully tested a connection longer than 200 feet (60 meters) made with an inexpensive two pair telephone cable wired following the above connection assignments.

It can be noted that, in addition to the "classic" TX RX ad GND interfacing lines, the "control" DTR line is also connected. It is used to turn the Linear Amplifier on by driving it high with a short "ignition pulse" (200 ms. is enough) after what it can be reset to its low state.

If the DTR line is put to its high state (a voltage level greater than +5 V) and left unchanged for more than 500 ms, it takes the power control of the Linear Amplifier and, as a result, you will not be able to turn it off using the "OFF" key of the front panel of the Linear Amplifier itself unless you put the DTR line in its low state (a voltage of 0 V or below) or remove the connection cable.

In any case, once initiated, the Linear Amplifier internal firmware doesn't send any message through the serial line; to make this possible (and to gain control of the device) it must be sent a proper sequence of bytes that compose the various commands accepted by the Linear Amplifier.

The commands supported are the equivalent of the front panel keys that compose the keyboard plus three "special functions" that enable/disable the Remote Console Update mode and provide a further CAT control mode.

The COMMAND/DATA packets.

The command/data packets supported by the firmware of the Linear Amplifier have the following format:

SYMBOL	MEANING
SYN	Synchronization characters: their individual value is
SYN	•(*)0x55 for the host (PC)
SYN	•(*)0xAA for the Linear Amplifier
CNT	Is the amount of command/data bytes (checksum excluded) expected to be sent/received.
DATA_1	
…	The total amount of command/data bytes contained in the packet.
DATA_N	
CHK	The checksum computed by adding modulo-256 the data bytes DATA_1.. DATA_N.

(*)Note: the numeric notation 0xNN indicates an 8-bit value expressed using hexadecimal format.

The response to a well-formed (valid) command can be an Acknowledge (ACK) or a Status_Info (STATUS) packet.
The response to a command in which an error has been detected will be a Not_Acknowledge (NAK) packet.
If the command is not recognized the response will be an Unknown_Command (UNK) packet.

If, for example, we want to put the Linear Amplifier in OPERATE mode while in STANDBY mode, we have to send this sequence of bytes:

BYTE	MEANING
0x55	
0x55	Three synchronization characters preceding the data and sent by the PC
0x55	
0x02	Two bytes of data follow.
0x10	KEY_PRESSED command.
0x1C	OPERATE key code.
0x2C	Resulting checksum (0x10 + 0x1C = 0x2C).

The Linear Amplifier will respond with a STATUS packet (we'll see it later) or with an ACK packet that indicates that the command has been recognized; the ACK packet is depicted in the following table:

BYTE	MEANING
0xAA	
0xAA	Three synchronization characters preceding the data and sent by the Linear Amplifier.
0xAA	
0x01	One byte of data follows.
0x06	ACK byte
0x06	Resulting checksum

If, for example, we try to send the previous command affected by a checksum error, we'll see the following:

BYTE	MEANING
0x55	
0x55	Three synchronization characters preceding the data and sent by the PC
0x55	
0x02	Two bytes of data follow.
0x10	KEY_PRESSED command.
0x1C	OPERATE key code.
0x3C	Resulting wrong checksum (0x10 + 0x1C = 0x3C).

The Linear Amplifier will respond with a NAK packet indicating that the command is affected by an error (or has a total amount of bytes different from the expected total):

BYTE	MEANING
0xAA	
0xAA	Three synchronization characters preceding the data and sent by the Linear Amplifier.
0xAA	
0x01	One byte of data follows.
0x15	NAK byte
0x15	Resulting checksum

If, for example, we try to send an unknown command (an unexistent op-code):

BYTE	MEANING
0x55	
0x55	Three synchronization characters preceding the data and sent by the PC
0x55	
0x01	Two bytes of data follow.
0x20	Unknown command.
0x20	Resulting checksum.

The Linear Amplifier will respond with UNK packet that indicates that the command has not been recognized::

BYTE	MEANING
0xAA	
0xAA	Three synchronization characters preceding the data and sent by the Linear Amplifier.
0xAA	
0x01	One byte of data follows.
0xFF	UNK byte
0xFF	Resulting checksum

COMMAND SET.

The following table shows all the user commands supported by the current firmware release (Rel. 06_11_06_x and further).
They are divided into three categories:

- Keystroke commands

- Remote Console Update commands

- Remote tuning driven by RS-232 CAT.

COMMAND	CODE	DATA	MEANING	NOTE
KEY_ON	0x10	0x30	Key "L-"	These codes are the equivalent of the left-side keyboard keystrokes.
		0x31	Key "L+"	
		0x32	Key "C-"	
		0x33	Key "L+"	
		0x34	Key "TUNE"	
		0x28	Key "IN"	These codes are the equivalent of the center-side keyboard keystrokes.
		0x29	Key "BAND-"	
		0x2A	Key "BAND+"	
		0x2B	Key "ANT"	
		0X2C	Key "CAT"	
		0x2D	Key "<-- "	
		0x2E	Key "-->"	
		0x2F	Key "SET"	
		0x18	Key "OFF"	These codes are the equivalent of the right-side keyboard keystrokes.
		0x1A	Key "MODE"	
		0x1B	Key "DISPLAY"	
		0x1C	Key "OPERATE"	
RCU_ON	0X80	---	Remote Console Update ON	Enables the Remote Console Update
RCU_OFF	0X81	---	Remote Console Update OFF	Disables the Remote Console Update
CAT_232	0X82	Freq_Lo	Low byte of frequency value expressed in KHz.	This command allows the Linear Amplifier to be tuned by RS-232 CAT.
		Freq_Hi	High byte of frequency value expressed in KHz.	

Let's see them in more detail:

- The KEY_ON command requires a subcode (DATA field) that specifies the keystroke we want to emulate: in the previous paragraph, for example, we took as an example the "OPERATE" keystroke to be sent, so the correct bytes sequence of the whole command was [0x10, 0x1C]. If we want, for example, to turn the Linear amplifier off the command we need to send is [0x10, 0x18] that forms, with all the other requested control characters, the sequence [0x55, 0x55, 0x55, 0x02, 0x10, 0x18, 0x28].

- The RCU_ON command sets the Remote Console Update that allows the connected host to be "informed" about all the activities of the Linear Amplifier itself. In a nutshell, the LCD display mounted on the front panel of the Linear Amplifier is updated from 5 to 8 times a second with the "living information" bound to the internal activities of the amplifier itself. When we enable the Remote Console Update we can get, in a coded form, almost all the information managed by the LCD display; this way we are in a position to build our "special remote panel" using a suitable programming tool equipped, for example, with proper graphic development tools, libraries an so on. When the linear amplifier is turned on it is (by default) reset to RCU_OFF state so, if we want to put it to RCU_ON state, we have to send it the proper [0x55, 0x55, 0x55, 0x01, 0x80, 0x80] bytes sequence.

- The RCU_OFF command is the counterpart of the above described RCU_ON command and disables the timed host update; its activation sequence is [0x55, 0x55, 0x55, 0x01, 0x81, 0x81].

- The CAT_232 command allows the Linear Amplifier internal tuner to be managed by a suitable application running on the connected host computer: in this case we have to enable in advance the proper CAT interface (RS-232) using either the provided CAT menu on the EXPERT front panel or the equivalent remote console commands.

Note: as the most frequent type of commands are the ones that emulate the keystrokes (KEY_ON series) it is important to consider the kinds of feedback response; which depends on whether the Remote Console Update is enabled or not:

•if the RCU is on we have an ACK packet as a response and it can be discarded because its meaning is only a key-code validation. Following this kind of response (and when the updating timeout expires) a STATUS packet containing the data related to the current context will be sent. The updating info streaming will continue until we send a RCU_OFF command or we turn the amplifier off.

•if the RCU is off we have as a response a STATUS packet that contains all the information available at the time the key-code is sent; if we want to pick information at a rate timed by the application running on the host, we can send the "catch-all" RCU_OFF sequence [0x55, 0x55, 0x55, 0x01, 0x81, 0x81] that effects no action and return the STATUS packet as a response. It is advisable, in this case, not to overload the unit with data requests. Remember that, for satisfactory working of the Linear Amplifier, a right serial line activity must not go over the 8 requests per second (the refreshing rate of the LCD display), otherwise the global performance could be dramatically slowed.

The STATUS data packet.

This is the context-sensitive data response sent back by the Linear Amplifier either by a proper opcode transmitted by the host while in RCU_OFF mode or at a scheduled timing while in RCU_ON mode.

It is a 30 bytes data packet (plus 5 byte of framing and checksum control) that is detailed in the following table:

	[Offset]	BYTE	MEANING
HEADER	[00]	SYN	Three synchronization bytes (0xAA) that indicates a data packet coming from the Linear Amplifier.
	[01]	SYN	
	[02]	SYN	
	[03]	CNT	The total amount of bytes (0x1E) that follow.
CONTEXT INFO	[04]	STATUS_CODE	Identification code (0x80) of the STATUS_INFO record.
	[05]	FLAGS	Flags byte.
	[06]	DISPLAY_CTX	Display contextual status byte.
	[07]	SETUP_0	This is an array of 11 info bytes that carry out some useful information related to the IDX_DISPLAY field.
	[08]	SETUP_1	
	[09]	SETUP_2	
	[10]	SETUP_3	
	[11]	SETUP_4	
	[12]	SETUP_5	
	[13]	SETUP_6	
	[14]	SETUP_7	
	[15]	SETUP_8	
	[16]	SETUP_9	
	[17]	SETUP_10	
MEASURE INFO	[18]	BAND | INPUT	Selected input and related selected band.
	[19]	SUB_BAND	Selected sub-band related to INPUT.
	[20]	FREQ_LO	Frequency info expressed in KHz in the form Low_Byte/High_Byte.
	[21]	FREQ_HI	
	[22]	ANTENNA | CAT	Selected CAT and Antenna info related to INPUT.
	[23]	SWR_LO / GAIN_LO	SWR info (STANDBY mode) or GAIN info (OPERATE mode) expressed in the form Low_Byte/High_Byte.
	[24]	SWR_HI / GAIN_HI	
	[25]	TEMPERATURE	Internal temperature info expressed in Celsius degrees.
	[26]	PA_OUT_LO	Exciter output power (STANDBY mode) or Power Amplifier output power (OPERATE mode) expressed in the form Low_Byte/High_Byte.
	[27]	PA_OUT_HI	
	[28]	PR_LO	Reverse power measured in OPERATE MODE and expressed in the form Low_Byte/High_Byte.
	[29]	PR_HI	
	[30]	VA_LO	Internal power supply voltage measured in OPERATE MODE and expressed in the form Low_Byte/High_Byte.
	[31]	VA_HI	
	[32]	IA_LO	Internal power supply current measured in OPERATE MODE and expressed in the form Low_Byte/High_Byte.
	[33]	IA_HI	
FOOTER	[34]	CHECKSUM	Checksum byte: it is the sum modulo-256 of all the data bytes ([04]..[33]).

All the details regarding the implemented data coding will be described In the following pages

[00] SYN Byte

1	0	1	0	1	0	1	0
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Resulting code: 0xAA

[01] SYN Byte

1	0	1	0	1	0	1	0
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Resulting code: 0xAA

[02] SYN Byte

1	0	1	0	1	0	1	0
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Resulting code: 0xAA

[03] CNT Byte

0	0	0	1	1	1	1	0
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Resulting code: 0x1E

[04] STATUS_CODE Byte

1	0	0	0	0	0	0	0
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Resulting code: 0x80

[05] FLAGS Byte

PA_PROT	BEEP	CONTEST	MODE	ALARM	TX	OP/STBY	TUNE
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7   **PA_PROT**: Amplifier internal protection intervention.
           1 : Protection ON
           0 : Protection OFF

Bit 6   **BEEP:** Keyboard acoustic feedback status bit.
           1 : Keyboard beep ON
           0 : Keyboard beep OFF

Bit 5   **CONTEST**: CONTEST mode status bit.
           1 : CONTEST mode ON
           0 : CONTEST mode OFF

Bit 4   **MODE**: Output power mode status bit.
           1 : FULL mode selected
           0 : HALF mode selected

Bit 3   **ALARM**: Alarm status bit.
           1 : Alarm in progress
           0 : Normal operation

Bit 2   **TX**: Transmission status bit.
           1 : The connected transceiver is in TX mode
           0 : The connected transceiver is in RX mode

Bit 1   **OP/STBY**: OPERATE/STANDBY status bit.
           1 : OPERATE mode selected
           0 : STANDBY mode selected

Bit 0   **TUNE**: TUNE operation status bit.
           1 : Automatic TUNING operation in progress
           0 : Normal operation

[06] DISPLAY_CTX Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

This byte of information reflects the current status of the LCD screen with the following meanings:

	CODE	MEANING
OP_STATUS	0x00	The LOGO image is displayed (STANDBY mode).
	0x01	The PA_OUT and I_PA level bars are displayed (OPERATE mode).
	0x02	The PW_REV and V_PA level bars are displayed (OPERATE mode).
INFO_STATUS	0x03	CAT info displayed.
	0x04	Used for debugging purpose (it must be ignored).
	0x05	Antennas vs. Bands info displayed.
	0x06	"DATA STORED" message displayed.
SETUP_STATUS	0x07	"SETUP OPTIONS" menu displayed.
	0x08	"SET ANTENNA" menu displayed.
	0x09	"SET CAT" menu displayed.
	0x0A	"SET YAESU" menu displayed.
	0x0B	"SET ICOM" menu displayed.
	0x0C	"SET BAUDRATE" menu displayed.
	0x0D	"MANUAL TUNE" setup displayed.
	0x0E	"BACKLIGHT" setup displayed.
WARNING_STATUS	0x0F	WARNING message raised when attempting to enter into OPERATE mode and the power supply voltage is < 26 V (HALF mode).
	0x10	WARNING message raised when attempting to enter into OPERATE mode and the power supply voltage is < 40 V (FULL mode).
	0x11	WARNING message raised when, into OPERATE mode, the power supply voltage drops below 20 V (HALF mode).
	0x12	WARNING message raised when, into OPERATE mode, the power supply voltage drops below 26 V (FULL mode).
	0x13	WARNING message raised when, into OPERATE mode, the power supply voltage raises above 38 V (HALF mode).
	0x14	WARNING message raised when, into OPERATE mode, the power supply voltage raises above 50 V (FULL mode).
	0x15	WARNING message raised when, into OPERATE mode, the power supply current raises above 40 A (HALF mode).
	0x16	WARNING message raised when, into OPERATE mode, the power supply current raises above 50 A (FULL mode).
	0x17	WARNING message raised when, into OPERATE mode, the internal temperature measurement raises above 90 °C (194 °F) .
	0x18	WARNING message raised when, into OPERATE mode, the input power coming from the transceiver rises above 50 W pep.
	0x19	WARNING message raised when attempting to transmit in OPERATE mode in the 12 m band (US version only).
	0x1A	WARNING message raised when attempting to transmit in OPERATE mode in the 10 m band (US version only).
	0x1B	WARNING message raised when, into OPERATE mode, the reverse power rises above 300 Wpep.
	0x1C	WARNING message raised when, into OPERATE mode, there is an intervention of the internal diagnostics related to the Power Amplifier protection.
ALARM_HISTORY	0x1D	The "ALARM HISTORY" report is being displayed
SHUTDOWN	0x1E	The "SHUTDOWN" message is being displayed and the amplifier is turning off.
WAIT_OPERATE	0x1F	The "WAIT" message is being displayed and the amplifier is switching to OPERATE mode.

This is a very important info byte since it reflects the current status of the Linear Amplifier and allows the user to decide which command to send to enable the Linear Amplifier itself to perform the same actions as in the manual mode (through the front panel keyboard).
While most of the time the code itself documents the current display status (for example as in the WARNING_STATUS codes), there are certain cases (for example the SETUP_STATUS codes) in which the DISPLAY_CTX code is not enough; in these cases the "auxiliary bytes" SETUP_0..SETUP_10 work as parameters for it.
The following pages will detail all the involved cases.

[06] DISPLAY_CTX == 0x03: CAT info displayed.

[07] SETUP_0

0	0	0	0	CAT #1 Info			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 3-0   **CAT #1 Info**: Selected CAT interface for input #1 (all values are in binary format)
        0000:   SPE
        0001:   ICOM
        0010:   KENWOOD
        0011:   YAESU
        0100:   RS-232
        0101:   NONE

[08] SETUP_1

0	0	0	0	CAT #1 Model			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 3-0   **CAT #1 Model**: Model definition for selected CAT interface for input #1 (all values are in binary format)
- If SETUP_0 == ICOM
  - 0000:   CI-V interface
  - 0001:   VOLTAGE_BAND analog interface

- If SETUP_0 == YAESU
  - 0000:   FT 100
  - 0001:   FT 757 GX2
  - 0010:   FT 817
  - 0011:   FT 840
  - 0100:   FT 847
  - 0101:   FT 890
  - 0110:   FT 897
  - 0111:   FT 900
  - 1000:   FT 920
  - 1001:   FT 990
  - 1010:   FT 1000
  - 1011:   FT 1000 MP1
  - 1100:   FT 1000 MP2
  - 1101:   FT 1000 MP3
  - 1110:   BAND_DATA BCD interface

- Otherwise
  - 0000:   Null value

[09] SETUP_2

0	0	0	0	0	0	BAUD-RATE #1	
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 1-0   **BAUD-RATE #1**: Baud-rate setting for CAT #1 (all values are in binary format)
        00:     1200 Baud
        01:     2400 Baud
        10:     4800 Baud
        11:     9600 Baud

[06] DISPLAY_CTX == 0x03: CAT info displayed. (continued)

[10] SETUP_3

0	0	0	0	CAT #2 Info			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 3-0   **CAT #2 Info**: Selected CAT interface for input #2 (all values are in binary format)
      0000:   SPE
      0001:   ICOM
      0010:   KENWOOD
      0011:   YAESU
      0100:   RS-232
      0101:   NONE

[11] SETUP_4

0	0	0	0	CAT #2 Model			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 3-0   **CAT #2 Model**: Model definition for selected CAT interface for input #2 (all values are in binary format)
- If SETUP_0 == ICOM
  - 0000:   CI-V interface
  - 0001:   VOLTAGE_BAND analog interface

- If SETUP_0 == YAESU
  - 0000:   FT 100
  - 0001:   FT 757 GX2
  - 0010:   FT 817
  - 0011:   FT 840
  - 0100:   FT 847
  - 0101:   FT 890
  - 0110:   FT 897
  - 0111:   FT 900
  - 1000:   FT 920
  - 1001:   FT 990
  - 1010:   FT 1000
  - 1011:   FT 1000 MP1
  - 1100:   FT 1000 MP2
  - 1101:   FT 1000 MP3
  - 1110:   BAND_DATA BCD interface

- Otherwise
  - 0000:   Null value

[12] SETUP_5

0	0	0	0	0	0	BAUD-RATE #2	
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 1-0   **BAUD-RATE #2**: Baud-rate setting for CAT #2 (all values are in binary format)
      00:      1200 Baud
      01:      2400 Baud
      10:      4800 Baud
      11:      9600 Baud

[06] DISPLAY_CTX == 0x03: CAT info displayed. (continued)

[13] SETUP_6

RELEASE_SERIAL_1				RELEASE_SERIAL_2			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-4   **RELEASE_SERIAL_1**: Decimal packed BCD serial number info (digit 1)
Bit 3-0   **RELEASE_SERIAL_2**: Decimal packed BCD serial number info (digit 2)

[14] SETUP_7

RELEASE_SERIAL_3				RELEASE_SERIAL_4			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-4   **RELEASE_SERIAL_3**: Decimal packed BCD serial number info (digit 3)
Bit 3-0   **RELEASE_SERIAL_4**: Decimal packed BCD serial number info (digit 4)

[15] SETUP_8

RELEASE_SERIAL_5				RELEASE_SERIAL_6			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-4   **RELEASE_SERIAL_5**: Decimal packed BCD serial number info (digit 5)
Bit 3-0   **RELEASE_SERIAL_6**: Decimal packed BCD serial number info (digit 6)

[16] SETUP_9

SERIAL_LITERAL							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **RELEASE_LITERAL**: An ASCII uppercase character [A..Z] that terminates the release serial number.

[17] SETUP_10

0	0	0	0	0	0	0	0
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Note: The Release Serial Info indicates the firmware creation date and is structured according to the form DD_MM_YY_X where:

- DD is the DAY   component of the creation date.
- MM is the MONTH   component of the creation date.
- YY is the YEAR component of the creation date.
- X is an uppercase alpha character [A..Z] that represents the stable deployed release.

So, for example, the release version "**29_11_06_B**" indicates "**November 29th 2006**" (stable version **B**) as its creation date.

[06] DISPLAY_CTX == 0x05: Antennas vs. Bands info displayed.

[07] SETUP_0

ANTENNAS_VS_BANDS info							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Resulting code: 0x00

[08] SETUP_1

ANTENNA				BAND			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[09] SETUP_2

ANTENNA				BAND			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[10] SETUP_3

ANTENNA				BAND			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[11] SETUP_4

ANTENNA				BAND			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[12] SETUP_5

ANTENNA				BAND			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[13] SETUP_6

ANTENNA				BAND			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[14] SETUP_7

ANTENNA				BAND			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[15] SETUP_8

ANTENNA				BAND			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[16] SETUP_9

ANTENNA				BAND			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[17] SETUP_10

ANTENNA				BAND			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

The 10-bytes formed by SETUP_1..SETUP_10 stores the relationship (coupling) existing between the available antennas versus the available bands.

The upper half of each byte is relative to the referenced antenna, while the lower half of each byte is relative to the coupled band.

This report is relative to the used input while coding is made using the binary format and the meaning is as follows:

[06] DISPLAY_CTX == 0x05: Antennas vs. Bands info displayed. (continued)

Bit 7-4   **ANTENNA**
       0000:   Antenna #1
       0001:   Antenna #2
       0010:   Antenna #3
       0011:   Antenna #4
       0100:   No antenna

Bit 3-0   **BAND**
       0000:   160 m band
       0001:   80 m band
       0010:   40 m band
       0011:   30 m band
       0100:   20 m band
       0101:   17 m band
       0110:   15 m band
       0111:   12 m band
       1000:   10 m band
       1001:   6 m band

[06] DISPLAY_CTX == 0x05: Antennas vs. Bands info displayed. (continued)

[07] SETUP_0

BANDS_VS_ANTENNAS info							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Resulting code: 0x01

[08] SETUP_1

BAND				ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[09] SETUP_2

BAND				ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[10] SETUP_3

BAND				ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[11] SETUP_4

BAND				ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[12] SETUP_5

BAND				ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[13] SETUP_6

BAND				ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[14] SETUP_7

BAND				ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[15] SETUP_8

BAND				ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[16] SETUP_9

BAND				ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[17] SETUP_10

BAND				ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

The 10-bytes formed by SETUP_1..SETUP_10 stores the relationship (coupling) existing between the available bands versus the available antennas.

The upper half of each byte is relative to the referenced band, while the lower half of each byte is relative to the coupled antenna.

This report is relative to the used input while coding is made using the binary format and the meaning is as follows:

[06] DISPLAY_CTX == 0x05: Antennas vs. Bands info displayed. (continued)

Bit 7-4 **BAND**
    0000:   160 m band
    0001:   80 m band
    0010:   40 m band
    0011:   30 m band
    0100:   20 m band
    0101:   17 m band
    0110:   15 m band
    0111:   12 m band
    1000:   10 m band
    1001:   6 m band

Bit 3-0 **ANTENNA**
    0000:   Antenna #1
    0001:   Antenna #2
    0010:   Antenna #3
    0011:   Antenna #4
    0100:   No antenna

[06] DISPLAY_CTX == 0x07: "SETUP OPTIONS" menu displayed.

[08] SETUP_1

0	0	0	0	0	SELECTED_ITEM		
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 3-0   **SELECTED_ITEM**: The "SETUP OPTIONS" menu selected item code (all values are in binary format).
      000:   "ANTENNA"   item selected
      001:   "CAT"   item selected
      010:   "MANUAL TUNE" item selected
      011:   "BACKLIGHT"   item selected
      100:   "CONTEST"   item selected
      101:   "BEEP"   item selected
      110:   "QUIT"   item selected

[06] DISPLAY_CTX == 0x08: "SET ANTENNA" menu displayed.

[08] SETUP_1

0	0	0	0	SELECTED_ITEM			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 4-0   **SELECTED_ITEM**: The "SET ANTENNA" menu selected item code (all values are in binary format).
      0000:   "160 m" item selected
      0001:   " 80 m" item selected
      0010:   " 40 m" item selected
      0011:   " 30 m" item selected
      0100:   " 20 m" item selected
      0101:   " 17 m" item selected
      0110:   " 15 m" item selected
      0111:   " 12 m" item selected
      1000:   " 10 m" item selected
      1001:   " 6 m" item selected
      1010:   "SAVE" item selected

[09] SETUP_2

160 m ANTENNA				80 m ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[10] SETUP_3

40 m ANTENNA				30 m ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[11] SETUP_4

20 m ANTENNA				17 m ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[12] SETUP_5

15 m ANTENNA				12 m ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[13] SETUP_6

10 m ANTENNA				6 m ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-4
Bit 3-0   **XXX m ANTENNA**: The Selected Antenna binary code referred to XXX m band (and to STATUS.INPUT).
      0000:   Antenna #1
      0001:   Antenna #2
      0010:   Antenna #3
      0011:   Antenna #4
      0100:   No antenna

[06] DISPLAY_CTX == 0x09: "SET CAT" menu displayed.

[08] SETUP_1

0	0	0	0	SELECTED_ITEM			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 3-0   **SELECTED_ITEM**: The "SET CAT" menu selected item code (all values are in binary format).
  0000:   SPE
  0001:   ICOM
  0010:   KENWOOD
  0011:   YAESU
  0100:   RS-232
  0101:   NONE

Note: This menu selection is relative to the **STATUS.INPUT** setup.

[06] DISPLAY_CTX == 0x0A: "SET YAESU" menu displayed.

[08] SETUP_1

0	0	0	0	SELECTED_ITEM			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 3-0   **SELECTED_ITEM**: The "SET YAESU" menu selected item code (all values are in binary format).
  •0000:   FT 100
  •0001:   FT 757 GX2
  •0010:   FT 817
  •0011:   FT 840
  •0100:   FT 847
  •0101:   FT 890
  •0110:   FT 897
  •0111:   FT 900
  •1000:   FT 920
  •1001:   FT 990
  •1010:   FT 1000
  •1011:   FT 1000 MP1
  •1100:   FT 1000 MP2
  •1101:   FT 1000 MP3
  •1110:   BAND_DATA BCD interface

Note: This menu selection is relative to the **STATUS.INPUT** setup.

[06] DISPLAY_CTX == 0x0B: "SET ICOM" menu displayed.

[08] SETUP_1

0	0	0	0	SELECTED_ITEM			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 3-0   **SELECTED_ITEM**: The "SET ICOM" menu selected item code (all values are in binary format).
  •0000:   CI-V interface
  •0001:   VOLTAGE_BAND analog interface

Note: This menu selection is relative to the **STATUS.INPUT** setup.

[06] DISPLAY_CTX == 0x0C: "SET BAUDRATE" menu displayed.

[08] SETUP_1

0	0	0	0	SELECTED_ITEM			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 3-0   **SELECTED_ITEM**: The "SET BAUDRATE" menu selected item code (all values are in binary format).
- 0000:   1200 Baud
- 0001:   2400 Baud
- 0010:   4800 Baud
- 0011:   9600 Baud

Note: This menu selection is relative to the **STATUS.INPUT** setup.

[06] DISPLAY_CTX == 0x0D: "MANUAL TUNE" menu displayed.

[08] SETUP_1

0	L_OUT						
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **L_OUT**: A 7 bit binary coding of the tuner's Lout parameter relative to the current sub-band setup of the STATUS.INPUT selected. The resulting values are the Lout uH (microHenry) multiplied by 10 (i.e. read 63 for a Lout of 6.3 uH and so on). The total values extension is within the range [0.0 .. 12.7 uH].

[09] SETUP_2

C_OUT_LO							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **C_OUT_LO**: Low byte of the word (10 bits) representing the value of the tuner's Cout parameter relative to the current sub-band setup of the **STATUS.INPUT** selected.

[10] SETUP_3

0	0	0	0	0	0	C_OUT_HI	
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **C_OUT_HI**: High byte of the word (10 bits) representing the value of the tuner's Cout parameter relative to the current sub-band setup of the **STATUS.INPUT** selected.

Note: The correct interpretation of the Cout resulting value has to be done taking into account, for every weighted bit, the assigned values of the following list:
Bit 0:   3.6 pF
Bit 1:   6.4 pF
Bit 2:   12.1 pF
Bit 3:   18.9 pF
Bit 4:   40.8 pF
Bit 5:   81.5 pF
Bit 6: 158.0 pF
Bit 7: 321.5 pF
Bit 8: 641.6 pF
Bit 9: 1250.0 pF

So, for example, a 10-bit binary value of 0001001101 has to be read as 192.6 pF.

[06] DISPLAY_CTX == 0x0E: "BACKLIGHT" setup displayed.

[08] SETUP_1

BACKLIGHT_SETUP							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **BACKLIGHT_SETUP**: An 8-bit binary coding of the "slider" representing the current backlight setting of the LCD display; its values range varies from 0 (about 30% of maximum light intensity) to 255 (the maximum light intensity allowed).

[06] DISPLAY_CTX == 0x1D: "ALARM HISTORY" report displayed.

[07] SETUP_0

WRN_IDX				WRN_NO			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-4   **WRN_IDX**: The "visual index" (from 10 to 1) of the displayed alarm messages on the LCD display (max. four at a time and in reverse order as in a stack fashion).

Bit 3-0   **WRN_NO**: The total amount of the stored alarm codes.
         0000: Alarm buffer is empty.
         0001: One alarm code stored.
         …
         1010: Ten alarm codes stored.

[08] SETUP_1

IDX_IN	WARNING_CODE_1						
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[09] SETUP_2

IDX_IN	WARNING_CODE_2						
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[10] SETUP_3

IDX_IN	WARNING_CODE_3						
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[11] SETUP_4

IDX_IN	WARNING_CODE_4						
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[12] SETUP_5

IDX_IN	WARNING_CODE_5						
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[13] SETUP_6

IDX_IN	WARNING_CODE_6						
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[14] SETUP_7

IDX_IN	WARNING_CODE_7						
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[15] SETUP_8

IDX_IN	WARNING_CODE_8						
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[16] SETUP_9

IDX_IN	WARNING_CODE_9						
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

[06] DISPLAY_CTX == 0x1D: "ALARM HISTORY" report displayed. (continued)

[17] SETUP_10

IDX_IN	WARNING_CODE_10						
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

In this case the SETUP_1..SETUP_10 bytes are used to contain the warning codes and the related input (the one that was alarmed); remember that the alarm buffer is managed as a stack (the first stored is the last displayed) so, for example, WARNING_CODE_10 as to be intended as more recent with respect to WARNING_CODE_9.

Bit 7　　**IDX_IN**: An 1-bit code of the alarmed input
　　　　　0:　　　　Input #1.
　　　　　1:　　　　Input #2.

Bit 6-0　**WARNING_CODE_x**: A 7-bit code reflecting the **DISPLAY_CTX.WARNING_STATUS** code that caused the alarm.

[18] BAND | INPUT Byte

BAND				INPUT			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-4   **BAND**: Selected band for tuner setup (all values are in binary format).
          0000:   160 m band
          0001:   80 m band
          0010:   40 m band
          0011:   30 m band
          0100:   20 m band
          0101:   17 m band
          0110:   15 m band
          0111:   12 m band
          1000:   10 m band
          1001:   6 m band

Bit 3-0   **INPUT**: Selected input for tuner setup (all values are in binary format).
          0000:   IN 1 selected
          0001:   IN 2 selected

[19] SUB_BAND Byte

0	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 6-0   **SUB_BAND**: Selected sub-band for tuner setup according to the following list (all values are in decimal format).
          [000..023]: Values range belonging to 160 m band.
          [024..052]: Values range belonging to   80 m band.
          [053..068]: Values range belonging to   40 m band.
          [069..071]: Values range belonging to   30 m band.
          [072..080]: Values range belonging to   20 m band.
          [081..083]: Values range belonging to   17 m band.
          [084..094]: Values range belonging to   15 m band.
          [095..097]: Values range belonging to   12 m band.
          [098..116]: Values range belonging to   10 m band.
          [117..126]: Values range belonging to   6 m band.

[20] FREQ_LO Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **FREQ_LO**: Low byte of the word (16 bit) representing the frequency value coming from the transceiver.

[21] FREQ_HI Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **FREQ_HI**: High byte of the word (16 bit) representing the frequency value coming from the transceiver.

Note: the frequency value is expressed in KHz and its extension is included in the range [0..55000].
        It has to be interpreted according to the following:

           oWhen the **FLAGS.TX** bit is 1 it represent the transceiver tx frequency.

           oWhen the **FLAGS.TX** bit is 0 it represent the frequency value coming from the CAT interface (if enabled and working), otherwise its value is 0.

[22] ANTENNA | CAT Byte

CAT				ANTENNA			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-4   **CAT**: Selected CAT interface for tuner setup (all values are in binary format)
   0000:   SPE
   0001:   ICOM
   0010:   KENWOOD
   0011:   YAESU
   0100:   RS-232
   0101:   NONE

Bit 3-0   **ANTENNA**: Selected antenna for tuner setup (all values are in binary format).
   0000:   Antenna #1 selected.
   0001:   Antenna #2 selected.
   0010:   Antenna #3 selected.
   0011:   Antenna #4 selected.
   0100:   No antenna selected.

[23] SWR_LO/GAIN_LO Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **SWR_LO/GAIN_LO**: Low byte of the word (16 bit) representing either the SWR value or the PA_GAIN value.

[24] SWR_LO/GAIN_HI Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **SWR_LO/GAIN_HI**: High byte of the word (16 bit) representing either the SWR value or the PA_GAIN value.

Note: The interpretation of this word has to be done according to the following:

   o If the **FLAGS.OP/STBY** bit is reset to 0 (STANDBY mode) the word represents the SWR value multiplied by 100 (i.e. read 123 for SWR == 1.23 and so on); there are two special values indicating "out of range" conditions:
      ▪ 0000:   No TX signal to evaluate.
      ▪ 9999   SWR value toward infinite.

   o If the **FLAGS.OP/STBY** bit is set to 1 (OPERATE mode) the word represents the Power Amplifier Gain expressed in dB multiplied by 10 (i.e. read 167 for PA_GAIN == 16.7 dB and so on). Remember that the whole treated range can vary from 10.0 dB to 20.0 dB, so a reading of 99 means "PA_GAIN < 10.0 dB" while a reading of 201 means "PA_GAIN > 20.0 dB".

[25] TEMPERATURE Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **TEMPERATURE**: Internal temperature value expressed in Celsius degrees (i.e. read 45 for a heatsink temperature of 45 °C and so on). The values range can vary from 0 to 90 (90 °C); over this limit value there is the internal hardware protections intervention.

[26] PA_OUT_LO Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **PA_OUT_LO**: Low byte of the word (16 bit) representing the output power emitted by the Linear Amplifier.

[27] PA_OUT_HI Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **PA_OUT_HI**: High byte of the word (16 bit) representing the output power emitted by the Linear Amplifier.

Note: The interpretation of this word has to be done according to the following:

•In STANDBY mode it represents the Exciter's driving power that is directly bypassed to the selected antenna connector.

•In OPERATE mode it represents the Linear Amplifier's output power that is redirected to the selected antenna connector.

In any case, the resulting value represents the Wpep multiplied by 10 (i.e read 10245 for a PA_OUT of 1024.5 Wpep) and its range is [0..1200.0] Wpep in FULL mode and [0..600.0] Wpep in HALF mode.

[28] PR_LO Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **PR_LO**: Low byte of the word (16 bit) representing the amount of the reverse power during transmission.

[29] PR_HI Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **PR_HI**: High byte of the word (16 bit) representing the amount of the reverse power during transmission.
The resulting value represents the Wpep multiplied by 10 (i.e read 1234 for a PR of 123.4 Wpep) and its range is [0..200.0] Wpep.

[30] VA_LO Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **VA_LO**: Low byte of the word (16 bit) representing the internal power supply voltage measured when in OPERATE mode.

[31] VA_HI Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **VA_HI**: High byte of the word (16 bit) representing the internal power supply voltage measured when in OPERATE mode.

The resulting value represents the DC Volts multiplied by 10 (i.e read 432 for a VA of 43.2 Volts) and its range is [0..60.0] Volts.

[32] IA_LO Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **IA_LO**: Low byte of the word (16 bit) representing the internal power supply current measured when in OPERATE mode.

[33] IA_HI Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **IA_HI**: High byte of the word (16 bit) representing the internal power supply current measured when in OPERATE mode.

The resulting value represents the DC Amps multiplied by 10 (i.e read 384 for an IA of 38.4 Amps) and its range is [0..50.0] Amps.

[34] CHECKSUM Byte

0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7-0   **CHECKSUM**: This is the sum modulo-256 (i.e. truncated to one byte) of all the data bytes comprised in the range [04]..[33] (the bytes from **STATUS_CODE** to **IA_HI**); this information is provided to make a received data final check possible in order to estabilish if the acquired **STATUS** data packet has to be considered valid or not.

Note: this checking practice should be applied also in the case of an "easy" response to be examined (for instance an ACK response). The method is fairly simple: during reception the communication program should compute an incremental checksum on the incoming data bytes (whose total is stated by the value of **CNT**) and, at the end of the stream, compare the obtained result with the last (**CHECKSUM**) incoming byte; if there is a match, the acquisition can be considered good and the significant data bytes can be processed.

All the features described in this document are used by the EXPERT_Console PC software (available, for now, only for the Windows platform) so, in order to have a "living example" of all above mentioned, we suggest you load and run it (it is freely dowloadable from our web site).

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