

MCRPC-GPS ISA/PCI BUS INTERFACE PROTOCOL  
Version 1.1.0

Multiple Byte Download (reserve 0x90 through 0x9F for multiple byte download). All of these commands are followed by a value from 0xE0 to 0xFF for the specific nibble of information to retrieve. Retrieved data nibble returned as 0xC? for even nibble count and 0xD? for odd nibble count

Command: 0x90  
Name: Get Time and Date  
Response: 0x90  
Function: Requests time, date and leap second count from card  
Type: Request

Command: 0x91  
Name: Get Fix and Number of Satellites  
Response: 0x91  
Function: Requests fix quality, fix type, number of satellites in view and number of satellites in use  
Type: Request

Command: 0x92  
Name: Get Receiver status  
Response: 0x92  
Function: Requests receiver diagnostic status and temperature  
Type: Request

Command: 0x93  
Name: Get Latitude  
Response: 0x93  
Function: Requests latitude and hemisphere  
Type: Request

Command: 0x94  
Name: Get Longitude  
Response: 0x94  
Function: Requests longitude and hemisphere  
Type: Request

Command: 0x95  
Name: Get Antenna Location  
Response: 0x95  
Function: Requests speed, course and altitude. NOTE: Altitude is the height of the antenna above sea level  
Type: Request

Command: 0x96  
Name: Get Group 1 Signal-to-noise ratio  
Response: 0x96  
Function: Requests the first six satellite PRN (sat. ID) and signal-to-noise ratio in dB  
Type: Request  
Command: 0x97

Name: Get Group 2 Signal-to-noise ratio  
Response: 0x97  
Function: Requests the second six satellite PRN (sat. ID) and signal-to-noise ratio in dB  
Type: Request

Command: 0x9D  
Name: Signature  
Response: 0x9D  
Function: Requests for the signature string from the card  
Type: Request

Command: 0x9E  
Name: Firmware Version Information  
Response: 0x9E  
Function: Requests the Firmware Version information from the card  
Type: Request

Multiple Byte Upload (reserve 0xA0 through 0xBF for multiple byte download). All of these commands are followed by a value from 0x20 to 0x2F for the specific nibble of information to send. Count returned in the range from 0x00 to 0x1F

Command: 0xA0  
Name: Reset Load Time  
Response: 0xA0  
Function: Resets the internal loaded decode time nibble counter to zero. This command is always sent prior to uploading a new time so that the state of the operation is always known. This command should only be used when the GPS is not present. See Time Reference command (0x80) for obtaining this information.  
Type: Request

Command: 0xA1  
Name: Validate Time and Date  
Response: 0xA1  
Function: Indicates the PC is finished uploading time/date information. See the section "Controlling Decoded Time" for a full explanation  
Type: Request

#### Upload Carrier Nibble

Command: 0x2?  
Name: Load Time/Date carrier nibble  
Response: 0x00 – 0x1F on successful reception, the order in the load time code sequence for the time code nibble just sent  
Function: See the section "Controlling Decoded Time" for full explanation of loading time  
Type: Request

## Single Byte Request/Response Commands (reserve 0x80 through 0x8F)

Command: 0x80  
Name: Time Reference  
Response: 0xC?  
Function: Request current time reference. The low nibble indicates the active reference as follows:  
0x1100 0001           GPS is the active reference  
0x1100 0010           Real time clock is the active reference  
0x1100 0100           - reserved –  
0x1100 1000           - reserved –

Type: Request

Command: 0x81  
Name: Request Interrupt Status  
Response: 0x6?  
Description: Returns the current interrupt mask. The interrupt mask is a logical OR of any active interrupts. The low nibble indicates which of the following interrupts are enabled:

0110 0001   Once per second on active time reference PPS  
0110 0010   Once per minute on active time reference PPS  
0110 0100   - reserved -  
0110 1000   Simulated Interrupt

Type: Request

Command: 0x82  
Name: Interrupt on response enable  
Response: 0x82 + immediate interrupt  
Description: Enable interrupt on command response. When enabled, every command response will be accompanied by an interrupt.

Type: Request

Command: 0x83  
Name: Interrupt on response disable.  
Response: 0x83  
Description: Disable interrupt on command response. When disabled, NO command response will be accompanied by an interrupt.

Type: Request

Command: 0x84  
Name: Get Board Equipment List.  
Response: 0x7?  
Description: Get the currently installed equipment on the card.

0111 0001   GPS Receiver  
0111 0010   Real Time Clock  
0111 0100   - reserved for future expansion -  
0111 1000   - reserved for future expansion -

Type: Request

Command: 0x8F  
Name: Dummy Command  
Response: 0x8F  
Function: No Operation. This command can be used to clear the response of the previous command from the I/O port  
Type: NO OP

#### Error Codes (reserve 0x40 through 0x4F)

Code: 0x40  
Definition: Unrecognized command  
Description: This error code is returned when an unrecognized command is sent to the card.

Code: 0x41  
Definition: Checksum failure  
Description: This error code is returned when the checksum sent to the card and the checksum calculated by the card do not match

Code: 0x42  
Definition: RTC Time Reference Unavailable  
Description: This error code is returned when the GPS is the active time reference and an Upload Time command (0xA0, 0xA1) is issued.

Code: 0x43  
Definition: No Time Reference Available  
Description: This error code is returned when neither the GPS nor the RTC is the active time reference and a time reference request (0x80) is made.

#### Mask Interrupts (reserve 0x60 through 0x6F)

Command: 0x6?  
Name: Update Interrupt Mask  
Response: 0x6?  
Function: Change the interrupt mask. See the section entitled "GPSISA Interrupts" for more information. The low nibble indicates the active reference as follows:  
0x0110 0001 Once per second on active time reference PPS  
0x0110 0010 Once per minute on active time reference PPS  
0x0110 0100 - reserved -  
0x0110 1000 Simulated interrupt – immediate response

Type: Request  
Note: This bit is immediately cleared upon servicing.

Code: 0x5?  
Name: Current Active Interrupt  
Description: Return value indicates which interrupt was triggered. The low nibble indicates which of the following interrupts are enabled:  
0101 0001 Once per second on active time reference PPS  
0101 0010 Once per minute at s=30 on active time reference PPS  
0101 0100 - reserved -  
0101 1000 Simulated interrupt  
Type: Card initiated response

## Controlling Decoded Time

### Time/Date sequence:

Offset	Definition
0x00	Seconds Ones
0x01	Seconds Tens
0x02	Minutes Ones
0x03	Minutes Tens
0x04	Hours Ones
0x05	Hours Tens
0x06	Leap Second Ones – download only
0x07	Leap Second Tens – download only
0x08	Day Ones
0x09	Day Tens
0x0A	Month Ones
0x0B	Month Tens
0x0C	Year Ones
0x0D	Year Tens
0x0E	Checksum = Logical XOR of all bytes

### Fix and Number of Satellites:

Offset	Definition
0x00	Fix Type: 0 = none 1 = 2-D 2 = 3-D
0x01	Fix Quality: 0=none 1=Non-differential 2=Differential 6=Estimated
0x02	Sats in view ones
0x03	Sats in view tens
0x04	Sats in use ones
0x05	Sats in use tens
0x06	Checksum = Logical XOR of all bytes

### Receiver Status:

Offset	Definition
0x00	Status low nibble – See chart for specifics
0x01	Status high nibble
0x02	Temperature ones
0x03	Temperature tens
0x04	Temperature sign
0x05	Checksum = Logical XOR of all bytes

### Latitude:

Offset	Definition
0x00	Minute decimal ten thousandths
0x01	Minute decimal thousandths
0x02	Minute decimal hundredths
0x03	Minute decimal tenths
0x04	Minute ones
0x05	Minute tens
0x06	Degree ones
0x07	Degree tens
0x08	Hemisphere: 1 = North, 2 = South, ? = unknown
0x09	Checksum = Logical XOR of all bytes

Longitude:

Offset	Definition
0x00	Minute decimal ten thousandths
0x01	Minute decimal thousandths
0x02	Minute decimal hundredths
0x03	Minute decimal tenths
0x04	Minute ones
0x05	Minute tens
0x06	Degree ones
0x07	Degree tens
0x08	Degree hundreds
0x09	Hemisphere: 1 = East, 2 = West, F = unknown
0x0A	Checksum = Logical XOR of all bytes

Antenna Location:

Offset	Definition
0x00	Altitude tenths
0x01	Altitude ones
0x02	Altitude tens
0x03	Altitude hundreds
0x04	Altitude thousands
0x05	Altitude ten thousands
0x06	Altitude sign: 0 = Positive Altitude, 1 = Negative Altitude
0x07	Speed ones
0x08	Speed tens
0x09	Speed hundreds
0x0A	Speed thousands
0x0B	Course ones
0x0C	Course tens
0x0D	Course hundreds
0x0E	Checksum = Logical XOR of all bytes

Card Signature:

Offset	ISA Card	PCI Card	Definition
0x00	0xC4	0xC4	High nibble of 'G'
0x01	0xD7	0xD7	Low nibble of 'G'
0x02	0xC5	0xC5	High nibble of 'P'
0x03	0xD0	0xD0	Low nibble of 'P'
0x04	0xC5	0xC5	High nibble of 'S'
0x05	0xD3	0xD3	Low nibble of 'S'
0x06	0xC4	0xC5	High nibble of 'I' or 'P'
0x07	0xD9	0xD0	Low nibble of 'I' or 'P'
0x08	0xC5	0xC4	High nibble of 'S' or 'C'
0x09	0xD3	0xD3	Low nibble of 'S' or 'C'
0x0A	0xC4	0xC4	High nibble of 'A' or 'I'
0x0B	0xD1	0xD9	Low nibble of 'A' or 'I'
0x0C	0xCE	0xCF	Checksum

Signal-to-noise ration Group 1 or Group 2:

Offset	Definition
0x00	1st Satellite PRN low nibble
0x01	1st Satellite PRN high nibble
0x02	1st Satellite SNR low nibble
0x03	1st Satellite SNR high nibble
0x04	2nd Satellite PRN low nibble
0x05	2nd Satellite PRN high nibble
0x06	2nd Satellite SNR low nibble
0x07	2nd Satellite SNR high nibble
0x08	3rd Satellite PRN low nibble
0x09	3rd Satellite PRN high nibble
0x0A	3rd Satellite SNR low nibble
0x0B	3rd Satellite SNR high nibble
0x0C	4th Satellite PRN low nibble
0x0D	4th Satellite PRN high nibble
0x0E	4th Satellite SNR low nibble
0x0F	4th Satellite SNR high nibble
0x10	5th Satellite PRN low nibble
0x11	5th Satellite PRN high nibble
0x12	5th Satellite SNR low nibble
0x13	5th Satellite SNR high nibble
0x14	6th Satellite PRN low nibble
0x15	6th Satellite PRN high nibble
0x16	6th Satellite SNR low nibble
0x17	6th Satellite SNR high nibble
0x18	Checksum = Logical XOR of all bytes

Firmware Version:

Offset	Definition
0x00	Major Version
0x01	Minor Version
0x02	Checksum = Logical XOR of all bytes

Status definition:

Garmin status flags – pass = 1, fail = 0

Bit	Definition		
0	Garmin ROM pass/fail	0 = fail,	1 = pass
1	Receiver pass/fail	0 = fail,	1 = pass
2	Data retained/lost	0 = lost,	1 = retained
3	Real time clock retained/lost	0 = lost,	1 = retained
4	Oscillator drift pass/fail	0 = fail,	1 = pass
5	Data collection	0 = collecting,	1 = not collecting
6	Board configuration retained/lost	0 = lost,	1 = retained
7	- reserved –		

Example 1:

Uploading time and date – Current time is 13:31:53 10/22/2000. Update time is 04:11:26 02/18/2000: Note only two digit year is uploaded

1. Send 0xA0; wait for response 0xA0
2. Send 0x26; wait for response 0x00
3. Send 0x22; wait for response 0x01
4. Send 0x21; wait for response 0x02
5. Send 0x21; wait for response 0x03
6. Send 0x24; wait for response 0x04
7. Send 0x20; wait for response 0x05
8. Send 0x28; wait for response 0x06
9. Send 0x21; wait for response 0x07
10. Send 0x22; wait for response 0x08
11. Send 0x20; wait for response 0x09
12. Send 0x20; wait for response 0x0A
13. Send 0x20; wait for response 0x0B
14. Send 0x2b; wait for response 0x0C
15. Send 0xA1; wait for response 0xA1 if checksum valid, 0x41 if checksum invalid

Example 2:

Download control information: Longitude contains 090 degree 30.1166 minutes

1. Send 0x94; wait for response 0x94
2. Send 0xE0; wait for response 0xC6
3. Send 0xE1, wait for response 0xD6
4. Send 0xE2, wait for response 0xC1
5. Send 0xE3, wait for response 0xD1
6. Send 0xE4; wait for response 0xC0
7. Send 0xE5; wait for response 0xD3
8. Send 0xE6; wait for response 0xC0
9. Send 0xE7; wait for response 0xD9
10. Send 0xE8; wait for response of 0xC0
11. Send 0xE9; wait for response of 0xDA
12. Send 0xEA; wait for response – checksum if correct, error code if bad

### Example 3:

Downloading card signature to identify bus type of currently selected card: A GPSISA and a GPSPCI card are installed in the same system. The following sequence indicates an ISA card.

1. Send 0x9E; wait for response 0x9E
2. Send 0xE0; wait for response 0xC4 'G'
3. Send 0xE1; wait for response 0xD7
4. Send 0xE2; wait for response 0xC5 'P'
5. Send 0xE3; wait for response 0xD0
6. Send 0xE4; wait for response 0xC5 'S'
7. Send 0xE5; wait for response 0xD3
8. Send 0xE6; wait for response 0xC4 'I'
9. Send 0xE7; wait for response 0xD9
10. Send 0xE8; wait for response 0xC5 'S'
11. Send 0xE9; wait for response 0xD3
12. Send 0xEA; wait for response 0xC4 'A'
13. Send 0xEB; wait for response 0xD1
14. Send 0xEC; wait for response 0xCE XOR of 'GPSISA' nibbles

The following sequence indicates a PCI card

1. Send 0x9E; wait for response 0x9E
2. Send 0xE0; wait for response 0xC4 'G'
3. Send 0xE1; wait for response 0xD7
4. Send 0xE2; wait for response 0xC5 'P'
5. Send 0xE3; wait for response 0xD0
6. Send 0xE4; wait for response 0xC5 'S'
7. Send 0xE5; wait for response 0xD3
8. Send 0xE6; wait for response 0xC5 'P'
9. Send 0xE7; wait for response 0xD0
10. Send 0xE8; wait for response 0xC4 'C'
11. Send 0xE9; wait for response 0xD3
12. Send 0xEA; wait for response 0xC4 'I'
13. Send 0xEB; wait for response 0xD9
14. Send 0xEC; wait for response 0xCF XOR of 'GPSPCI' nibbles

### Command Range:

- 0x00 – 0x1F – Multiple byte upload buffer offset counter
- 0x20 – 0x2F – Multiple byte upload carrier nibble
- 0x30 – 0x3F – Free for later expansion
- 0x40 – 0x4F – Error codes
- 0x50 – 0x5F – Card Initiated Interrupt Response
- 0x60 – 0x6F – Mask Interrupts/Mask Response
- 0x70 – 0x7F – Free for later expansion
- 0x80 – 0x8F – Single byte return/Special commands
- 0x90 – 0x9F – Multiple byte download commands
- 0xA0 – 0xBF – Multiple byte upload commands
- 0xC0 – 0xDF – Multiple byte download carrier nibble
- 0xE0 – 0xFF – Multiple byte download buffer offset/address