

UDP Configuration User Guide

**Revision A November 24, 2004
Document Part Number GC-800-238**

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Grid Connect

1630 W. Diehl Rd.
Naperville, IL 60563
USA
Phone: 630.245.1445

Technical Support

Phone: 630.245.1445
Fax: 630.245.1717
On-line: www.gridconnect.com

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Date	Rev.	Author	Comments
11/24/04	A	GR	Preliminary Release

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1. Network Configuration using UDP

1.1 UDP Datagrams

A device server like the NET232 can also be configured or queried over the network using UDP datagrams. The device server has a UDP listener set for port 30718 (77FE Hex). Responses from the device server are returned to the source port of the UDP packet.

The first three bytes of the UDP data block should be set to zero. The fourth byte selects the function as described in the following table:

Table 1 - UDP Configuration

Byte	Command	Parameters	Notes
03	Node Reset	2 bytes, software type	These 2 bytes are used to prevent accidental reset of the Device Server. (Value for standard NET232 firmware: 58 31 [Hex], X1)
F6	Query for Firmware Version	None	The Device Server responds with the F7 block below.
F7	Firmware Information	First 16 bytes of the firmware image, 4 bytes device information and serial number, 6 bytes of MAC address	The first 16 bytes of the firmware image contain the software type (offset 4,5) and checksum (offset 14,15). The last two bytes of the device information contain the serial number. The last six bytes are the MAC address.
F8	Query for Setup Record	None	The Device Server responds with the F9 block below.
F9	Configuration Readback	120 byte setup record	n/a
FA	Set Configuration	120 byte setup record	The IP address (byte 0-3) will not be overridden using FA. See FD for this functionality.
FB	Configuration Change Acknowledge	None	This block is sent back to the host requesting a configuration change (FB). After sending out this block, the Device Server resets and uses the new configuration sent with the FA command.

Byte	Command	Parameters	Notes
FC	Set IP Address	<p>First 8 bytes must be set to the string IP-SETUP (Hex 49 50 2D 53 45 54 55 50).</p> <p>Next 2 bytes have to be set to 00.</p> <p>Next 2 bytes must contain the last two bytes of the MAC address.</p> <p>Next 4 bytes have to be the new IP address.</p>	<p>This block can be sent as a broadcast, because the serial number is unique. It provides one method to set the IP address of the Device Server if is on the local network and the serial number is known. Remember, broadcasts are only 'heard' on the subnet on which they are generated. No reply is sent by the Device Server, which restarts using the new IP address after the block is received.</p> <p>Example (all in Hex): 49 50 2D 63 45 54 55 50 00 00 2A 12 81 00 01 02 IP address of the node with MAC address xx-xx-xx-xx-2A-12 set to 129.0.1.2</p>
FD	Set Configuration and IP Address	Same as FA, but changes IP address as well (bytes 0-3).	n/a
E0 to EF	Query Configuration	All setup records can be queried.	The second nibble of the command, '0' to 'F', represents the number of the setup record.
D0 to DF	Answer to E0-EF	D1 always returns 00 in the record as this is reserved for security features.	D0 will return the standard setup record (120 bytes).
C0 to CF	Set Configuration	All setup records can be set.	The second nibble of the command, '0' to 'F', represents the number of the setup record. C0 needs 120 bytes as parameter and C1 needs 126 bytes as parameter.
B0 to BF	Answer to C0-CF	No parameter follows.	

1.2 Configuring Multiple Devices

When configuring a number of Device Servers identically, it is useful to create a template setup record. The setup record can then be sent to the “target” Device Servers from a “master” Device Server via “cut and paste” or UDP.

Device Servers use a 120-byte setup record in Intel Hex format. This format facilitates the transfer of binary data using ASCII characters. See Setup Records on page E-7 and The Intel Hex Format on page E-5 for information about setup records and converting them to Intel Hex format.

```
:20000010AC10C81D0000100000000000AC10010B4C0200001127000000000000C000000011
:20002010000000000000000000000000000000000000000000000000000000000000B0
:200040104C0200001227000000000000C0000000000000000000000000000000000049
:1800601000000000000000000000000000000000000000000000000000000078
:00000001FF
```

Figure 1 - Sample Setup Record in Intel Hex Format

1.2.1 Acquiring a Valid Setup Record

There are a number of ways to acquire a valid setup record:

Copy the setup record of a properly configured Device Server via Monitor Mode (easiest method).

Request the setup record of a properly configured Device Server via another Device Server on the network.

Build the setup record in software.

From a host PC, request the setup record of a properly configured Device Server via UDP.

To copy the setup record of a properly configured Device Server:

1. Configure a “master” Device Server with the desired parameters.
2. Enter Monitor Mode on the master Device Server (see Monitor Mode in the user manual)
3. At the prompt, enter GC followed by a carriage return. The Device Server will respond with its setup record in Intel Hex format.
4. Copy the setup record into a text file and save it for future use.

To request the setup record of a properly configured Device Server via another Device Server on the network:

1. Make sure that both units are plugged onto the network properly.
2. Enter Monitor Mode (with network support enabled) on the unit that is not properly configured.
3. Issue the command GC x.x.x.x followed by a carriage return, where x.x.x.x is the IP address of the properly configured device. The properly configured device will respond by sending its setup record to the unit you are currently on. This configuration will be displayed in Intel HEX format.
4. Copy that HEX string, and then issue the command SC. Now paste the copied string.

The unit will not reboot on its own. You must reboot the unit before the settings take effect.

To build the setup record in software:

1. Create a 120-byte setup record.
2. Convert it to an Intel Hex record (see The Intel Hex Format on page 1-5).
3. Copy the setup record into a text file and save it for future use.

To request the setup record of a properly configured Device Server via UDP:

1. Configure a Device Server with the desired parameters and place it on the network.
2. From a host PC, send the F8 datagram to the Device Server . The Device Server responds with the F9 datagram, which includes its setup record.
3. Send a previously saved setup record from a host PC via UDP.

1.2.2 Sending a Setup Record

There are also a number of ways to send a setup record to a Device Server:

Send a previously saved setup record via Monitor Mode (easiest method).

Send the setup record of a properly configured Device Server to another Device Server on the network.

Send a previously saved setup record from a host PC via UDP.

To send a setup record via Monitor Mode:

1. Configure a “master” Device Server with the desired parameters and place it on the network.
2. Place another Device Server (the “target”) on the network.
3. Enter Monitor Mode (with network support enabled) on the master Device Server (see Monitor Mode on page B-1)
4. At the prompt, enter SC x.x.x.x, followed by a carriage return.
5. Send the setup record to the target Device Server.

Note: For example, using Hyperterminal, copy the setup record and select “Paste to Host” to send it to the Device Server. The Device Server reboots with the new configuration.

To send a previously saved setup record to a Device Server via UDP, from a host PC, send the **FA** (or **FD**) datagram to the “target” Device Server.

Note: The Device Server responds with the **FB** datagram. Refer to the table.

1.2.3 The Intel Hex Format

With this format, 8-bit binary data can be sent and received as ASCII text. The transmission is blocked in records, and every record has its own checksum.

The record begins with a colon (:) and consists of a block length (2-character Hex), a 16-bit address (4-character Hex), and a block type (2-character Hex). It is built by adding all binary 8-bit values and taking the complement, so adding all byte values (including length, address, and type) should yield zero.

Example:

00000001FF

End record, type 01, length 00, address 00 00, checksum FF.

01002000805F

Data record consisting of one byte (value 80 Hex) for address 0020 (32 decimal).

For communication with the node, the following block types are defined:

Table 2 - Block Types

Option	Hex
Data block program memory (firmware)	00
End record	01
Data block configuration memory	10

To get and set the node configuration, 120 bytes should be exchanged at once in 32-Byte records. The IP address in the record (bytes 0 to 3) will be ignored (unless the UDP FD command is being used).

1.2.4 Calculating the Checksum

As mentioned in [Table 2 - Block Types](#) above, the last two characters of an Intel Hex setup record represent a checksum of the data in the line. Since the checksum is a two-digit hexadecimal value, it can represent a value from 0 to 255.

The checksum is calculated by summing the value of the data on the line and taking the two's complement of the sum.

Note: Do not include the leading colon or the checksum byte in the sum.

Example:

0300300002337A1E

Record length: 03 (3 bytes of data)

Address: 0030 (the 3 bytes will be stored at 0030, 0031, and 0032)

Record Type: 00 (normal data)

Data: 02, 33, 7A

Checksum: 1E

$03 + 00 + 30 + 00 + 02 + 33 + 7A = E2$

The two's complement of E2 is 1E. See [Calculating the Two's Complement](#) below.

1.2.5 Calculating the Two's Complement

The two's complement of a number is the value that must be added to the number to reach a Hexadecimal value of 100 (256 in decimal). In the example above, $E2 + 1E = 100$.

You can also calculate the two's complement by subtracting the sum from 100. Using the example above again, $100 - E2 = 1E$. It may help to use a scientific calculator.

1.3 Setup Records

A setup record consists of 120 bytes. They are transmitted at once from and to the node. Unused bytes should be initialized as 00. [Table 3 - Setup Record 0](#) Construction defines the structure of setup record 0.

Table 3 - Setup Record 0 Construction

Byte(s)	Function
00-03	IP address of the unit (x.x.x.x)
04	Reserved (0)
05	Flag BYTE Bit 7: Reserved (0) Bit 6: Set 1 for AUI, 0 for 10BASE-T (CoBox-Micro only) Bits 5-0: Reserved (0)
06	Number of host bits for subnetting; if 0, matching standard netmask for Class A, B, C is used.
07	TCP Keepalive. Valid Range: 1-65; FFh = disabled
08-11	Telnet configuration password (0 if not used)
12-15	Gateway IP address (0,0,0,0 if not used)
16-63	48-byte Channel 1 parameters; parameter setup Channel 1 (see Table 4 - Channel Parameters)
64-111	48-byte Channel 2 parameters; parameter setup Channel 2 (see Table 4 - Channel Parameters)
112-119	DHCP device name. First 8 bytes for the DHCP name. Second byte in setup record 3.

1.3.1 Channel Parameters

Use the following table to select setup record 0 parameters for Channel 1:

Table 4 - Channel Parameters

Byte(s) (Channel 1)	Function
16	Interface Mode
17	Line Speed Bits 7-5: Reserved Bits 4-0: Baud Rate
18	Flow Control
19	Reserved
20-21	Own TCP port low-byte, high-byte (Intel)
22-23	Remote TCP port low byte, high-byte (Intel)
24-27	Remote IP address (low/high low/high)
28	Connect Mode
29	Disconnect Mode
30	Disconnect w/ inactivity time-out, minutes (00 if unused)
31	Disconnect w/ inactivity time-out, seconds (00 if unused)
32-33	Characters to trigger send immediately (sendchar)
34	Flush mode
35	Pack Control
36-47	Reserved (0)
48-63	a) Terminal name for Telnet terminal type option (15 characters max), 0-terminated. If set and Bit 6 in Disconnect Mode is set, Telnet connection will be assumed. b) Password for Passworded Socket Connection (Bit 4 in Disconnect Mode Set).

1.3.2 Setup record 1

This record is reserved for security parameters. That means there are some restrictions on reading this setup record. Basically this setup record is “write-only”.

Address	Function
00	Security flags Bit 7 reserved, 0 Bit 6 1=SNMP disabled Bit 5 1=Web Server disabled Bit 4 1=Port 77FEh disabled Bit 3 1=Enhanced password enabled Bit 2 1=Encryption enabled Bit 1 1=TFTP disabled Bit 0 1=Telnet Setup disabled
01...16	Twofish or AES key (16 byte = 128 bit)
17...33	16 byte enhanced password + Null terminator
34...47	SNMP Community 13 byte + Null terminator (since 4.5b8 and XPort 1.2)
48	Additional Security flags Bit 7 1=WEB Setup disabled Bit 6 not used (0) Bit 5 reserved (0) Bit 4 not used (0) Bit 3 not used (0) Bit 2 not used (0) Bit 1 1=Port 77F0h disabled Bit 0 1=Echo enabled
49	Key length (in bytes) for AES. 16, 24 or 32 for 128, 192 or 256 bit keys, respectively
50...65	2 nd part AES key when using 192 or 256 bit keys
66...125	not used
Serial usage	
Query	G1 (ATTENTION: will always return 00h for each setup byte)
Set	S1
Network usage	
Query	E1 (ATTENTION: will always return 00h for each setup byte)
Set	C1

1.3.3 Setup record 2

This setup record is not used but reserved.

Address	Function
00...125	not used
Serial usage	
Query	G2
Set	S2
Network usage	
Query	E2
Set	C2

1.3.4 Setup record 3

This record is used for additional parameters.

Address	Function
00	Hostlist retry counter
01...02	Hostlist retry timeout
03...74	Hostlist, 12 entries each 4 byte IP + 2 byte port number
75	Start character serial channel 1
76	Start character serial channel 2
77...99	not used
100...101	ARP cache timeout
102...109	DHCP name (the second 8 byte of the possible length of 16 byte)
110...111	HTTP port number
112...113	SMTP port number
114...115	Reserved
116	Additional flags
	Bit 7 1=High Performance enabled
	Bit 6 1=Monitor Mode Entry During Startup disabled
	Bit 5 not used (0)
	Bit 4 not used (0)
	Bit 3 not used (0)
	Bit 2 reserved (0)
	Bit 1 1=Auto Increment Source Port for Channel 2 enabled
	Bit 0 1=Auto Increment Source Port for Channel 1 enabled
117...125	not used
Serial usage	
Query	G3
Set	S3
Network usage	
Query	E3
Set	C3

1.3.5 Setup record 4

This setup record is reserved.

Address	Function
00...125	not used
Serial usage	
Query	G4
Set	S4
Network usage	
Query	E4

Set C4

1.3.6 Setup record 5

This record contains specific e-mail notification parameters, used in conjunction with record 6.

Address	Function
00...03	Mail server IP address
04...52	Recipient 1, 49-byte string (must include null terminator)
53...101	Recipient 2, 49-byte string (must include null terminator)
102...125	Unit name, 24-byte string (must include null terminator)
Serial usage	
Query	G5
Set	S5
Network usage	
Query	E5
Set	C5

1.3.7 Setup record 6

This record contains additional e-mail notification parameters, used in conjunction with record 5.

Address	Function
00...23	Domain name, 24-byte string (must include null terminator)
24	Trigger1 Mask, selects the configurable pins (1,2, or 3) to be used in this trigger condition (any combination): Bit 7...3 Reserved, must be 0 Bit 2 1=CP3 used in trigger condition, 0=CP3 not used Bit 1 1=CP2 used in trigger condition, 0=CP2 not used Bit 0 1=CP1 used in trigger condition, 0=CP1 not used
25	Trigger1 Compare, selects the level of the configurable pins on which to trigger (any combination): Bit 7...3 Reserved, must be 0 Bit 2 1=trigger on CP3 Active, 0=trigger on CP3 Inactive Bit 1 1=trigger on CP2 Active, 0=trigger on CP2 Inactive Bit 0 1=trigger on CP1 Active, 0=trigger on CP1 Inactive Note: if none of the configurable pins is to be used in a trigger, that is the trigger Mask=0, then the Compare must be set to 0
26	Trigger1 Serial state: 3=serial compare is off, 0=serial compare is on
27...28	Trigger1 Serial compare, 2-byte sequence
29...52	Trigger1 Message, 24-byte string (must include null terminator)
53	Trigger1 Priority: 3=normal, 1=high
54...55	Trigger1 Minimum interval (seconds): time required between two trigger conditions for a new notification, range: 0-65535
56...57	Trigger1 Maximum interval (seconds): time required for original trigger condition to be present for a re-notification, range: 1-65535; 0=disabled
58	Trigger2 Mask, selects the configurable pins (1,2, or 3) to be used in this trigger condition (any combination): Bit 7...3 Reserved, must be 0 Bit 2 1=CP3 used in trigger condition, 0=CP3 not used Bit 1 1=CP2 used in trigger condition, 0=CP2 not used Bit 0 1=CP1 used in trigger condition, 0=CP1 not used
59	Trigger2 Compare, selects the level of the configurable pins on which to trigger (any combination): Bit 7...3 Reserved, must be 0 Bit 2 1=trigger on CP3 Active, 0=trigger on CP3 Inactive Bit 1 1=trigger on CP2 Active, 0=trigger on CP2 Inactive Bit 0 1=trigger on CP1 Active, 0=trigger on CP1 Inactive Note: if none of the configurable pins is to be used in a trigger, that is the trigger Mask=0, then the Compare must be set to 0
60	Trigger2 Serial state: 3=serial compare is off, 0=serial compare is on
61...62	Trigger2 Serial compare, 2-byte sequence

63...86	Trigger2 Message, 24-byte string (must include null terminator)
87	Trigger2 Priority: 3=normal, 1=high
88...89	Trigger2 Minimum interval (seconds): time required between two trigger conditions for a new notification, range: 0-65535
90...91	Trigger2 Maximum interval (seconds): time required for original trigger condition to be present for a re-notification, range: 1-65535; 0=disabled
92	Trigger3 Mask, selects the configurable pins (1,2, or 3) to be used in this trigger condition (any combination): Bit 7...3 Reserved, must be 0 Bit 2 1=CP3 used in trigger condition, 0=CP3 not used Bit 1 1=CP2 used in trigger condition, 0=CP2 not used Bit 0 1=CP1 used in trigger condition, 0=CP1 not used
93	Trigger3 Compare, selects the level of the configurable pins on which to trigger (any combination): Bit 7...3 Reserved, must be 0 Bit 2 1=trigger on CP3 Active, 0=trigger on CP3 Inactive Bit 1 1=trigger on CP2 Active, 0=trigger on CP2 Inactive Bit 0 1=trigger on CP1 Active, 0=trigger on CP1 Inactive Note: if none of the configurable pins is to be used in a trigger, that is the trigger Mask=0, then the Compare must be set to 0
94	Trigger3 Serial state: 3=serial compare is off, 0=serial compare is on
95...96	Trigger3 Serial compare, 2-byte sequence
97...120	Trigger3 Message, 24-byte string (must include null terminator)
121	Trigger3 Priority: 3=normal, 1=high
122...123	Trigger3 Minimum interval (seconds): time required between two trigger conditions for a new notification, range: 0-65535
124...125	Trigger3 Maximum interval (seconds): time required for original trigger condition to be present for a re-notification, range: 1-65535; 0=disabled

Serial usage

Query	G6
Set	S6

Network usage:

Query	E6
Set	C6

1.3.8 Setup record 7

This record contains configurable pins settings. Two different formats are in use.

1.3.8.1 XPort, XPort-03, XPort-485

Address	Function
00	CP1 option: CTS (0), IN1 (4), OUT1 (5), LED1 (10), RS485_TXEN (12)
01	CP2 option: DCD (2), IN2 (6), OUT2 (7), RS485_TXEN (12)
02	CP3 option: RTS (1), DTR (3), IN3 (8), OUT3 (9), LED3 (11), RS485_TXEN (12)
03	CTS state: Bit 7 1=signal is active, Bit 6...0 reserved
04	RTS state: Bit 7 1=signal is active, Bit 6...0 reserved
05	DCD state: Bit 7 1=signal is active, Bit 6...0 reserved
06	DTR state: Bit 7 1=signal is active, Bit 6...0 reserved
07	IN1 state: Bit 7 1=signal is active, Bit 6...0 reserved
08	OUT1 state: Bit 7 1=signal is active, Bit 6...0 reserved
09	IN2 state: Bit 7 1=signal is active, Bit 6...0 reserved
10	OUT2 state: Bit 7 1=signal is active, Bit 6...0 reserved
11	IN3 state: Bit 7 1=signal is active, Bit 6...0 reserved
12	OUT3 state: Bit 7 1=signal is active, Bit 6...0 reserved
13	LED1 state: Bit 7 1=signal is active, Bit 6...0 reserved
14	LED3 state: Bit 7 1=signal is active, Bit 6...0 reserved
15	RS485_TXEN state: Bit 7 1=signal is active, Bit 6...0 reserved
16...123	not used
124	RS485_TXEN signal level: 1=active high, 0=active low
125	User I/O signal level: 1=active high, 0=active low

1.3.8.2 WiPort

Address	Function
00...10	CP0...CP10
	Bit 0-6 Function selection
	0=General Purpose Input, 1=General Purpose Output, 2=Modem Ctrl Input channel 0, 3=Modem Ctrl Output channel 0, 4=Modem Ctrl Input channel 1, 5=Modem Ctrl Output channel 1, 6=Status LED channel 0, 7=Status LED channel 1, 8=Diagnostics LED, 9=RS485 Selection, 9=RS485 Half Duplex, 10=General Purpose Input and Trigger input, 11=Reset to defaults
	Bit 7 Active level
	0=high active, 1=low active.
Serial usage	
Query	G7
Set	S7
Network usage	
Query	E7
Set	C7

1.3.9 Setup record 8

This record contains specific wireless network interface parameters, used in conjunction with record 9.
(Currently on **WI232** only)

Address	Function	
00	Bit 0	WiFi enable
	Bit 1-3	Power level (not supported on all HW) 0=14dBm, 1=20 dBm, 2=17 dBm, 3=15 dBm, 4=14 dBm, 5=11 dBm, 6=8 dBm, 7=invalid.
	Bit 4-6	Transmission Data rate 0=1 Mbps, 1=2 Mbps, 2=5.5 Mbps, 3=11 Mbps, 4=2, 1 Mbps, 5=5.5, 2, 1 Mbps, 6=11, 5.5, 2, 1 Mbps.
	Bit 7	Power management enable
01	Bit 0	Ad Hoc network creation enable
	Bit 1-3	Ad Hoc network creation country 0=US, 1=FR, 2=JP, 3=Others
	Bit 4-7	Ad Hoc network creation channel Valid: US:1...11, FR: 10...13, JP:1...14. Others: 1...13
02	Bit 0-1	Security style 0=None, 1=WEP, 2=WPA.
	Bit 2-4	Authentication method 0=None, 1=Shared, 2=TLS, 3=TTLS, 4=PEAP, 5-7= Reserved
	Bit 5-7	Encryption method 0=None, 1=WEP64, 2=WEP128, 3-7=Reserved
03...35	SSID	
36...68	BSSID	
69...125	Passphrase part 1	
Serial usage		
Query	G8	
Set	S8	
Network usage		
Query	E8	
Set	C8	

1.3.10 Setup record 9

This record contains specific wireless network interface parameters, used in conjunction with record 8.
(Currently on WI232)

Address	Function
00...06	Passphrase part 2
07...38	Encryption key in hex
39...125	Reserved
Serial usage	
Query	G9
Set	S9
Network usage:	
Query	E9
Set	C9

1.3.11 Setup record 10 to 15

These setup records are not used.