

NTP Client

Interface for Synchronizing to an NTP Server

Supplement to the “Functional Description and Specifications Module IE”

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A1 Revision History

No.	Date	Subject
0.n	May 06, 2008	Preliminary documents, changes without notice.
1.0	June 09, 2008	First released document.
1.1	June 16, 2008	The NTP Client configuration page now shows the IP address of the reference.
1.2	September 25, 2008	Two NTP-Server possible. Additional description in "Configuration" and "Status". Added section "Synchronization".
2.0	February 25, 2011	IE hardware version 2. Revised.

A2 Copyright

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A3 General Remarks

This manual is a supplement to the "Functional Description & Specifications Module IE" manual. It describes a special feature of the IE module realized by an optional firmware and an additional hardware.

1 NTP Client

1.1 Description

The "Network Time Protocol" (NTP) is used for time synchronization within networks. The NTP servers are queried by NTP clients, which then can synchronize their internal clocks accordingly.

The IE module with option "C" (which stands for NTP client) can connect to such a server and synchronize to it. In case of a successful synchronization, it provides a reference signal on the "REF OUT" port which can be used by connected RUBIDIUM modules (e.g. GT, GL, GI, AI + option D) for synchronizing purposes (see chapter "2.1 Output of Time & Date Reference Signals").

The IE module with option "C" thus gives a RUBIDIUM system the possibility to synchronize to an NTP server over Ethernet.

1.2 Hints

The IE module sends time requests every 64 seconds to the selected server.

If you choose an Internet time server please choose a server which is closest to the client – in a network sense.

In general the organization which operates the time server does not guarantee a permanent, uninterrupted operation free of disturbances.

The accuracy achieved is in the range 2 – 50 ms, and it is dependent on the symmetry and speed of the Internet path between server and client.

It is strongly recommended not to run other tasks of the IE module during normal operation, because that might disturb the output of the reference signals. This concerns for example the configuration of other RUBIDIUM modules or the usage of the status monitor.

IE Option "C" NTP Client

1.3 Configuration

Click on the red dot beside Configuration or on the tiny blue IE button or – in case of IE version 2 – on the large blue IE button to access the IE module.

Now click on "NTP Client" to open the configuration page of the NTP Client.

Rubidium Series IE Frame: Single Frame

Configuration GPS 10 MHz GB SV IE

4: IE - IE

Add User
Modify User
Delete User
Version
NTP Client

NTP Client

Remote Hosts

	Primary	Secondary
IP	<input type="text" value="192.168.0.29"/>	<input type="text"/>
Stratum	1	n/a
Reference	NVAL	n/a
Poll Count	6	0
Failed Polls	0	0
Last Poll	09:05:08 2011-02-24 UTC	n/a
Active Host	Primary	
Automatic Changeover	<input checked="" type="checkbox"/>	
Last Auto Changeover	n/a	
Manual Changeover	<input type="button" value="Changeover"/>	
Changeover Count	0	

Client

Output Protocol:

Current Date/Time: 09:05:12 2011-02-24 UTC

Drift Correction: 4 ppm

Sync: yes

Lock: yes

Last Sync: 09:05:08 2011-02-24 UTC

Every time you change the configuration click on the Save To Module button afterwards. This makes the new set-up effective and will store it to a non-volatile memory on the IE module.

You can set the IP addresses of up to two NTP servers ("Primary" and "Secondary"). If you need just one server, put its address in "Primary" and set "Secondary" to "0.0.0.0".

Use the button "Changeover" to switch between the servers manually. Note that this will interrupt the second pulse and may cause irregularities in the attached modules.

If you wish an automatic changeover, activate the appropriate checkbox. See section 1.4 for more information. This setting is the default and recommended.

UTC time & date will be sent every second via serial interface. You can select the data protocol out of the "Output Protocol" dropdown list.

Remarks

- Every change in the set-up causes the seconds pulse to be interrupted and a new synchronization is started. Avoid frequent changes during normal operation.
- Don't use DNS names (e.g. time.nist.gov), since they can not be resolved.
- No NTP queries will be sent to IP addresses that end with a "0" (Network addresses) or with a "255" (Broadcast addresses).
- To ensure an accurate time base, use only reliable time servers. Some public servers can differ from real time within several seconds.

1.4 Synchronization

The NTP Client checks the entered ip address and starts synchronizing with the associated server.

Upon the first synchronization, two requests are sent within a short time. If this leads to a successful synchronization, the "sync" and "lock" status are set to "yes". If in sync, the seconds pulse is send via the "REF" port.

During normal operation, a request is send every 64 seconds.

If the currently active server is not reachable and "Automatic Changeover" is active, the NTP Client switches to the other server, if it has a valid address. Now synchronization is done with the second server as described above.

In case of the second server getting unreachable, a changeover to the first one takes place and so on.

After five minutes of not being synced, the status "lock" is set to "no" and delivered via the "REF" port to the connected module.

1.5 Status

On the same page where you did the configuration, you can also get information about the synchronization status of your NTP client.

Here is a short description of the elements:

Element	Description	Examples
Stratum	Presents the stratum value that was received from the configured server. This value tells the distance of the server to a reference clock. A server that is directly connected to a reference device (e.g. an atomic clock or a GPS clock or a radio clock) would have stratum 1. Any server that synchronizes to a stratum 1 server has stratum 2 and so on. If the stratum field indicates "n/a", no value has been received yet. Please refer to chapter "1.6 Troubleshooting" for help on this topic.	1 2 3 ... 15
Reference	If the configured server has a stratum of 2 or more, it is synced to another server with a stratum that is lower by 1 (e.g. a stratum-3 server is synced to a stratum-2 server). The IP address of that "lower stratum" server is shown here. If the stratum of the configured server is 1 or 0, the reference field shows an up to 4 character ASCII string. This string describes the reference as shown in the examples column on the right. If the reference field indicates "n/a", no value has been received yet. Please refer to chapter "1.6 Troubleshooting" for help on this topic.	ACTS, GPS, PTB, 192.168.0.1

Poll Count	The number of queries that have already been sent to the server.	4869
Failed Polls	The number of queries that could not be sent or have not been answered. Generally this is due to an unreachable server (refer to chapter "1.6 Troubleshooting").	0
Last Poll	The time and date (UTC, 24h) of the last query that was sent to the server. If there wasn't any query yet, "n/a" is shown. This time changes about every 64 seconds (the display does not update automatically – use the button "Reload From Module" to check for changes).	13:09:11 2008-05-26 UTC
Active Host	Shows the host that is currently used for synchronization.	Primary, Secondary
Last Auto Changeover	The time and date of the last automatically initiated changeover; "n/a" if no changeover took place yet. Reset upon change of the host addresses.	13:09:11 2008-05-26 UTC
Changeover Count	Number of automatic changeovers. Reset upon change of the host addresses.	0
Current Date/Time	Current date and time when the page was loaded. Matches the time provided as a serial data output.	13:09:11 2008-05-26 UTC
Drift Correction	Some external factors like temperature cause the internal oscillator's frequency to differ from a nominal value. These differences are measured and corrected by the value that is displayed here.	66 ppm
Sync	This element shows "yes" if a valid time could be retrieved at least once. While this is "no", no output is made on the "REF" port.	yes / no
Lock	Shows whether the internal time is locked to the NTP time	yes / no
Last Sync	Time and date of the last successful synchronization. Shouldn't be older than approx. 64 seconds during normal operation. Shows "n/a" if no sync was conducted.	13:09:11 2008-05-26 UTC

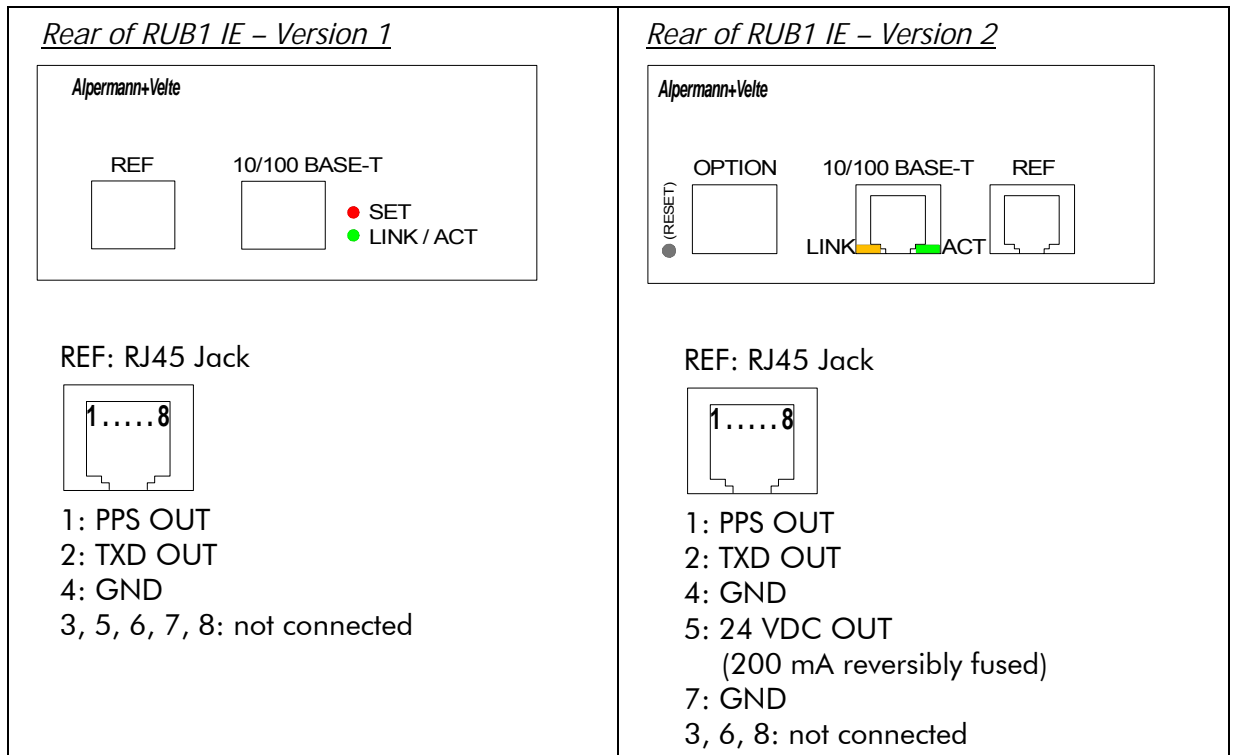
1.6 Troubleshooting

Problem	Solution
The stratum or reference field shows "n/a", although the configured server is valid.	Be sure that the configured server can be reached by the IE module. Is there any firewall that could potentially affect network traffic?

2 Application

2.1 Output of Time & Date Reference Signals

Connections at the rear panel of the IE module with option "C"



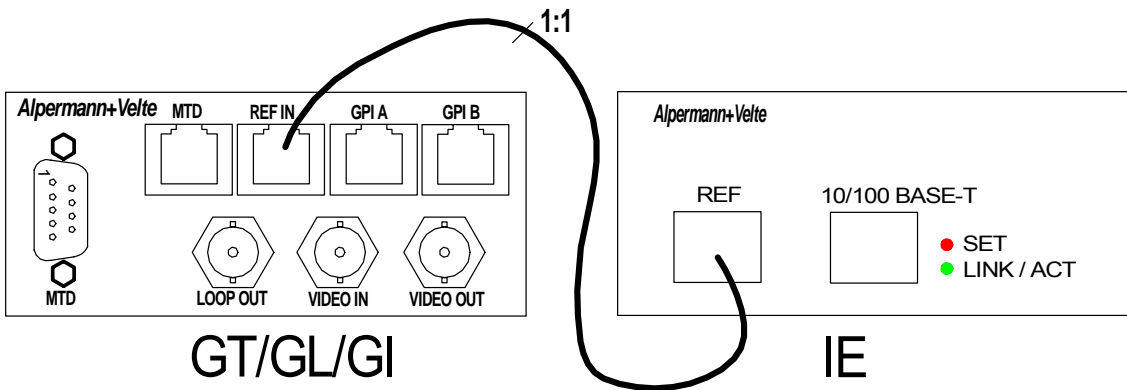
Signal descriptions

GND	Signal ground.
PPS OUT	Pulse Per Second output. Positive going pulse, pulse width ≈ 250 ms. Reference mark = positive (leading) edge. Signal level: 3.3 V no load; 3.1 V at 600 Ω Slew rate (rising edge): ≈ 2 V/ μ s
TXD	RS232 signal TxD = transmit line, unbalanced data output. Serial data string, output of time & date, time zone = UTC. Data protocol selectable: "Meinberg Standard" format, 2400/7e2, NMEA \$GPRMC 4800/8n1 + PPS. Signal level: -5.5 V to +6.0 V (11.5 V _{pp}) no load -5.0 V to +5.5 V (10.5 V _{pp}) at 600 Ω

2.2 Time Reference of the RUBIDIUM System

2.2.1 GT/GL/GI System: Reference of Time Code Generators

GT/GL/GI Connection



GT/GL/GI Configuration

Setting at the "Reference" function:

The screenshot shows the 'Reference' configuration window. The 'Reference' section has 'Source' set to 'Serial' and 'Format' set to 'Meinberg Std 2400/7e2 + PPS'. The 'Time Zone and DST Mode' section has 'Reference Input' set to 'UTC' and 'GT Time Zone' set to 'Auto + Reference Check'. The 'Mode of GT Time Zone Synchronisation' section is set to 'Periodically' with a mode of 'Every Day', occurring on 'Monday' at '03:00'. Under 'At Special Events', the 'Reference Lock within 20min' checkbox is checked.

Setting at the "Time Zone" function:

The screenshot shows the 'Time Zone' configuration window. The 'Reference Input' section has 'Offset from UTC' set to '+00:00' and 'DST Bias' set to '00:00'. The 'Preset' dropdown is set to 'UTC'. There is a 'Load' button at the bottom right.

Setting at the "Generate" function:

Regarding the phase synchronization of the LTC output of a GT/GL module it is recommended to use a video/black-burst signal if you are working with television signals (select "Sync = Video"), otherwise use the internal oscillator (select "Sync = Internal"). This avoids any frame discontinuities of the time code during the day due to an unstable PPS signal. The time synchronization at 3 o'clock at night (according to the setting at "Reference") will correct the time addresses of the time code, this may result in generating a frame discontinuity at this particular moment.

2.2.2 AI/DI/HI/XI System: Reference of Time & Date Video Inserters

Please refer to "Daytime Inserter – Time & Date Video Windows Inserter for a RUBIDIUM Module (AI, DI, HI, XI) with Option D" manual for a detailed description.

