



POWERLOGIC® Satellite Time Synchronization System (STS3000)

Installation Instructions

Retain for future use.

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INTRODUCTION

The Satellite Time Synchronization System (STS3000) provides the ability to synchronize the date and time of Series 4000 and 3000 Circuit Monitors to UTC time with an accuracy better than +/- 1 millisecond. By synchronizing the date and time of circuit monitors across a facility or campus, you can determine the actual sequence in which events occurred.

The STS3000 package contains a CyberSciences STR100 Satellite Time Reference Module, a GPS antenna/receiver, and associated cables (see Table 1). The STR100 provides two DCF-77 time synchronization outputs. Each output provides a time synchronization signal to 16 circuit monitors, in a daisy-chain format, with a maximum cable length of 300 meters (985 feet) when using 18-AWG, shielded, twisted-pair cable.

The STR100 accepts GPS-based time synchronization reference signals from either a Trimble Acutime 2000 antenna (included), or from a modulated IRIG-B source. The antenna and an IRIG-B source can be concurrently connected to the unit to provide redundant time reference inputs. The STR100 will synchronize to the antenna input, since it is the preferred source. It can automatically change to the IRIG-B source if the antenna input is lost.

While the STS3000 system was specifically designed to provide time synchronization signals to Series 4000 and Series 3000 Circuit Monitors as well as Quantum ERT cards, it can be implemented with any slave device that can accept a 24Vdc pulse stream and decode the DCF-77 protocol. For example, the STR100 can provide time synchronization for programmable controllers and other distributed processing units that perform control tasks based on date and time.

Table 1: Contents of the STS3000 Satellite Time Synch System

Item	Model / Type	Part Number
Satellite Time Reference module	Cyber Sciences STR100	STRM
GPS antenna/receiver	Trimble Acutime 2000 Smart Antenna (39091-00)	SAM
Antenna Cable, 200-foot	Multi-pair cable with weather-proof connector to antenna and flying leads to the STR100 input (24017)	SAIF200
RS-232 Null Modem Cable (10-foot)	POWERLOGIC cable (EGWNMC)	3050 EGWNMC
Technical Support Contact Sheet	n/a	n/a

SAFETY PRECAUTIONS

DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only by qualified personnel.
- Turn off all power supplying this equipment and the equipment it is mounted in before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm that power is off.
- Replace all device doors and covers before turning on power to this equipment.
- To avoid personal shock or damage to the electronic components of the satellite time reference, do not connect the power supply to the unit until you have made all connections as described in this bulletin.

Failure to observe these instructions will result in death or serious injury.

CONNECTING THE SYSTEM

Connecting the STS3000 system requires five main steps. Details for completing these steps are provided in the sections that follow.

1. Determine the GPS time sync source to be used – either Trimble Acutime 2000 antenna or an IRIG-B source.
2. If the Trimble Acutime 2000 antenna is selected as the time reference source, it must be installed outside with a clear view of the sky. The antenna cable must then be connected between the antenna and the STR100. If an IRIG-B source is used, connect a 75-ohm coax, with BNC connector on each end, between the IRIG-B generator and the STR100.
3. Connect the DCF-77 output, in a daisy-chain format, to a discrete digital input on each circuit monitor that is to be synchronized.
4. Using the circuit monitor display, configure the selected input's mode to be "Time Sync"
5. Connect the 24Vdc (2A) power supply to the STR100.
6. Configure the STR100 and antenna (if used).

Figure 1 on page 3 illustrates a typical system layout.

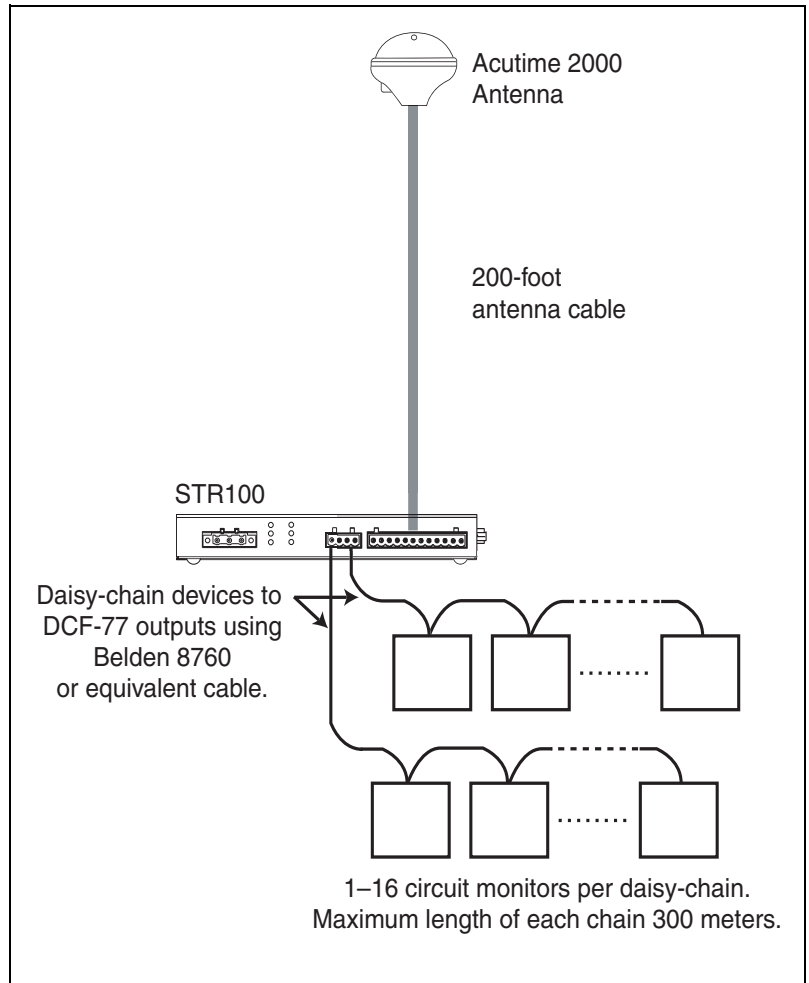


Figure 1: System layout

DETERMINING THE GPS REFERENCE SOURCE

The Trimble Acutime 2000 antenna is the preferred time reference input. If the STR100 is being installed in an area that has an existing, modulated IRIG-B time reference signal, then the IRIG-B source may be used to prevent having to install the antenna.

NOTE: Both inputs can be connected for redundant operation.

INSTALLING THE ANTENNA

The Trimble Acutime 2000 antenna is a pole-mounted GPS receiver and antenna in a single, environmentally-sealed enclosure. Once power is applied (through the antenna cable), the antenna automatically tracks satellites and surveys its position to within meters. It then switches to overdetermined time mode and generates a PPS (pulse-per-second) output synchronized, within 50 nanoseconds, to UTC (Coordinated Universal Time). The communications connection between the antenna and the STR100 is RS-422, allowing significantly longer antenna cables than traditional RF antenna connections.

Mount the antenna outside with a clear, unobstructed, view of the sky. Mount the antenna to a 1" (25.4 mm) outside diameter, 14 threads-per-inch conduit, or to a standard 0.75" (19.05 mm) inside diameter NTP pipe thread. Connect the weather proof DIN connector on the antenna cable to the antenna. Connect the screw terminal connector on the other end of the antenna cable to the "GPS Interface" port on the STR100. The antenna cable can be routed through the mounting conduit/pipe, but a weather head will be required since the antenna cable connector is located to one side of the antenna mount.

CONNECTING THE DCF-77 OUTPUT TO CIRCUIT MONITORS

Each DCF-77 output on the STR100 is a 24Vdc, 500ma (max), pulse-width-modulated signal that provides a complete date and time string once each minute. The DCF-77 output is designed to be connected to a discrete input on a slave device. Multiple slave devices can be connected to a single output by connecting them in a daisy-chain format using Belden 8760 cable (18AWG, shielded, twisted pair cable) or equivalent. The maximum length of the daisy chain depends on the number of devices and the cable type. For sixteen devices, using Belden 8760 cable, the maximum length is 300 meters (985 feet). See Appendix A — Time Sync Output Wiring Limitations for additional information.

While the STR100 was specifically designed to provide time synchronization signals to Schneider Electric Series 4000 and Series 3000 Circuit Monitors as well as Quantum ERT cards, it can be implemented with any slave device that can accept a 24Vdc pulse stream and decode the DCF-77 protocol.

Figure 2 illustrates wiring connections to the STR100 DCF-77 connector.

To connect the STR100's DCF-77 output to a circuit monitor, do the following:

1. Select an input on each circuit monitor to accept the DCF-77 signal. Any of the inputs on the IOC44 I/O card or the 32Vdc input modules on the CM4000 I/O Extender can be configured to accept the time sync input.
2. Connect the twisted-pair cable between meters in a daisy-chain format. Ensure that the 24Vdc positive lead is connected to the circuit monitor positive input terminal and the 24Vdc common lead is connected to the circuit monitor negative input terminal. A maximum of 16 circuit monitors can be connected to a single DCF-77 output. Appendix A describes cable length limitations based on the cable type and number of devices.
3. Configure the mode for the selected input on each circuit monitor to be "Time Sync." See "Configuring Circuit Monitor Inputs for Time Sync" on page 6.
4. Connect the twisted-pair cable to one of the DCF-77 outputs on the STR100 maintaining the cable color code for the positive and negative terminals. The STR100 instruction bulletin, included with the STR100 module, provides detailed instructions on wiring to the DCF-77 outputs.

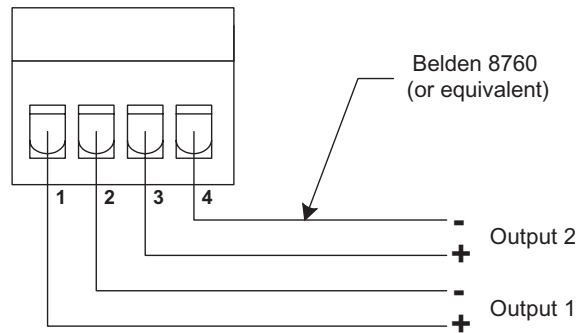


Figure 2: DCF-77 Output Connections

CONNECTING 24 VDC CONTROL POWER TO THE STR100

The STR100 requires a control power source of 24Vdc, +/-10%, with the ability to provide 36 watts of power. The power supply (not included in the STS3000 package) should be a Class 2 rated supply with a minimum of 1500 volts of isolation. Use 18AWG wire (minimum) for control power connections, and limit the control power cable length to less than 10 meters (32.8 feet).

To connect the STR100 to the power supply, do the following:

1. Connect the positive (+) terminal on the STR100 to the 24 Vdc positive on the power supply (see Figure 3).
2. Connect the negative (-) terminal on the STR100 to the common on the power supply.
3. Connect the ground terminal on the STR100 to a true earth ground. Do not connect the common from the 24Vdc power supply to true earth ground unless specified by local electrical codes.

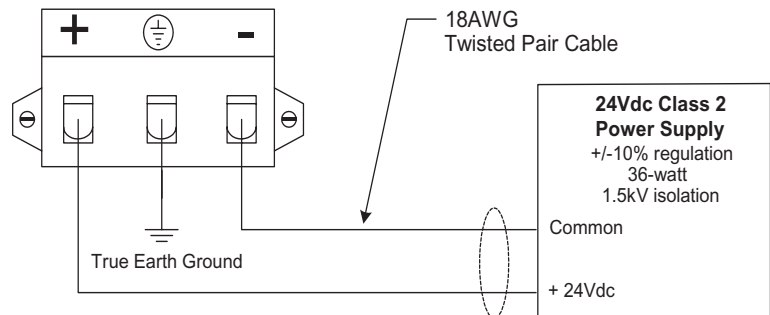


Figure 3: Control Power Connections

CONFIGURING THE STR100 AND ACUTIME 2000 ANTENNA

The STR100 and the Acutime 2000 antenna do not require any setup to provide a UTC time synchronization signal. However, if you prefer that devices be synchronized to local time rather than UTC time, some configuration is required. Refer to the Cyber Sciences "Model STR100 Satellite Time Reference" instruction bulletin provided with the STR100 module for complete details.

CONFIGURING CIRCUIT MONITOR INPUTS FOR TIME SYNCH

Each circuit monitor that receives the time synchronization signal must have a minimum of one digital input point available, and the input's mode must be configured for "Time Sync." To configure a circuit monitor input for Time Sync mode, do the following:

1. Using the circuit monitor display, select the SETUP menu.
2. Provide your password (default = 0) and press Enter.
3. Press the Down Arrow to select the I/O menu. Press Enter to select.
4. Using the Down Arrow, select either the IOC44 or I/O Extender – depending on which input is used to accept the time synchronization signal.
5. Select the desired "Digital In xxx" from the menu and press Enter.
NOTE: "xxx" represents the position of the input being used – for example the first input of an IOC44 in Slot B would be BS1.
6. Using the Down Arrow, select MODE and press Enter.
7. Using the Down Arrow, select TIME SYNCH and press Enter.
8. Press the Menu key to exit the SETUP mode.
9. Using the arrow keys, select YES to save changes, when prompted. Press Enter to complete the process.

OPERATION

After making all connections and completing the configuration of the STR100, the antenna, and the circuit monitor input, the STR100 will continuously provide the time synchronization signal output to circuit monitors without user interaction.

TECHNICAL SUPPORT

Refer to the Technical Support Contacts sheet, included in the STS3000 package, for a listing of technical support contacts by country.

**APPENDIX A — TIME SYNC OUTPUT
WIRING LIMITATIONS**

The table below provides details for selecting a cable that will adequately provide connection between the STR100 time synchronization output and an input on a number of circuit monitors (CMs). Based on data in Table 2, it is recommended that Belden 8760 cable be used for connecting the STR100 output to a circuit monitor input.

Table 2: Time Sync Signal Wiring Recommendations

Cable Length (meters)	Number of CMs per Output	Max Current per Output (mA)	Voltage Drop at GPS (<4.0V)	Recommended Wire
100	16	0.400	1.880	Belden 8761, 22 awg
200	16	0.400	3.759	Belden 8761, 22 awg
300	8	0.240	3.383	Belden 8761, 22 awg
300	16	0.400	3.513	Belden 8760, 18 awg
400	8	0.240	2.810	Belden 8760, 18 awg
500	8	0.240	3.513	Belden 8760, 18 awg

APPENDIX B – ACUTIME 2000 ANTENNA SPECIFICATIONS

Table 3: Trimble Acutime 2000 Antenna Specifications

Physical Characteristics	
Dimensions	6.12" D, 5.0" H (155 mm x 127 mm)
Weight	12.8 oz (363 g)
Connector	12-pin round, waterproof
Mounting	1" (25.4 mm) — 14 straight thread or 3/4" (19.05 mm) pipe thread
Environmental Specifications	
Operating temperature	-40° to +85° C
Storage temperature	-55° to +105° C
Vibration	0.008 g ² /Hz at 5–20 Hz
	0.05 g ² /Hz at 20–100 Hz
	-3 db/octave at 100–900 Hz
Operating humidity	95% RH, non-condensing at 60° C
EMC	CE, FCC Class B
Performance Specifications	
General	L1 frequency, C/A code (SPS) continuous tracking receiver, static overdetermined clock mode (default)
Update Rate	1 Hz
Accuracy in dynamic tracking mode	SPS: Position — 25m CEP, Velocity — 0.25 ms CEP; DGPS: Position — 2m CEP, Velocity — 0.05 ms CEP
Time to first fix (no stored position)	Typical cold start: <120 seconds
Time to first PPS (stationary with stored position, e.g., after power outage)	<60 seconds
Re-acquisition after 60-second signal loss	<2 seconds (90%)
PPS Output	
Physical interface	RS-422/485
Width	10 microseconds (default); user programmable from 10 microseconds to 500 milliseconds
On-time Edge	Rising edge on-time (default); user-programmable rising or falling
Resolution	80 nanoseconds
Accuracy	UTC 50 nanoseconds (statis); UTC 300 nanoseconds (dynamic, TDOP <3)
Antenna Cable Specifications	
Length	200 feet (61 meter)
Weight	Approximately 12 lbs (4.8 kg)
Description	6 twisted pairs, 22 AWG, overall foil shield with drainwire, pvc jacket, 300 volt

Electrical equipment should be serviced only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. This document is not intended as an instruction manual for untrained persons.