

**Model 8145 TimeGuard™
TIME SELECTOR SWITCH
INSTALLATION AND
OPERATION MANUAL**

*95 Methodist Hill Drive
Rochester, NY 14623*

Phone: US +1.585.321.5800

Fax: US +1.585.321.5219



www.spectracomcorp.com

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1 Introduction

The Spectracom Model 8145 TimeGuard is a time selector switch. The TimeGuard accepts time data outputs from two NetClock receivers and performs automatic failure detection and switchover to provide a redundant time source. The TimeGuard outputs the selected NetClock time data signals to synchronized CADs, voice loggers, wall clocks, dispatch consoles, networks, or any device accepting an RS-232, RS-485, IRIG-B or IRIG-E data stream.

1.1 Features

The Spectracom 8145 TimeGuard offers the following features:

- TimeGuard enhances system reliability by permitting redundant time sources.
- TimeGuard may be configured for automatic or manual switching between the primary and backup time sources.
- Front panel lamps provide visual indication of operational status. Alarm relay outputs allow remote status monitoring.
- Compact rack mount design conserves rack space.

1.2 SPECIFICATIONS

This section lists the specifications for Model 8145 TimeGuard.

1.2.1 Inputs

TimeGuard accepts time data signals from a NetClock receiver designated as the Primary Clock and a NetClock receiver designated as the Backup Clock. TimeGuard supports IRIG, Serial Comm, and Remote outputs from the NetClock receivers.

IRIG INPUTS

Source:	NetClock IRIG Output Connector
Connector:	BNC
IRIG Format:	IRIG B or IRIG E, determined by NetClock IRIG format switch setting.
IRIG Signal:	Amplitude modulated or pulse width coded (TTL). Determined by NetClock and TimeGuard IRIG DIP switch setting.
Interconnect Cable:	2 meter BNC cable furnished in the ancillary kit

SERIAL COMM INPUTS

Source:	NetClock Serial Comm Connector
Connector:	DB9 Male
Input Signal:	RS-232
Bit Rate:	300 to 9600 baud, determined by NetClock baud rate switch setting
Data Format:	Data Formats 0, 1, or 2 as determined by NetClock data format switch setting.
Interconnect Cable:	2 meter DB9 cable furnished in the ancillary kit.

REMOTE INPUTS

Source:	NetClock Remote output Connector
Connector:	DB9 Male
Input Signals:	RS-485 and RS-232 once-per-second data stream in Formats 0 or 1 as determined by NetClock data format switch setting. RS-485 time sync status RS-485 on-time pulse +5 VDC enable signal
Interconnect Cable:	2 meter DB9 cable furnished in the ancillary kit.

1.2.2 Outputs

The TimeGuard outputs the selected primary or backup timing signals applied to the input connectors.

IRIG output connector:	BNC
Serial Comm output connector:	DB9 Female
Remote output Connector:	DB9 Female

1.2.3 Alarms

Alarm Classifications:	Major Alarm, Minor Alarm
Alarm Parameters:	The TimeGuard uses the NetClock time sync status and monitors the presence of the applied time data signals to determine alarm status.
Monitored Data Signals:	IRIG, RS-232 and RS-485 time data on Remote inputs. DSR on Serial Comm inputs.
Alarm Assertion:	Table 1-2 lists the cause for alarms and the resulting action TimeGuard exhibits when placed in the automatic switchover mode.
Alarm Relay Outputs:	The TimeGuard provides relay contact closures to allow remote monitoring of Minor Alarms, Major Alarms, and Backup Clock selection.
Contact Rating:	2 Amp, 30 VDC.

PRIMARY			BACKUP			OUTPUTS	
TIME DATA	TIME SYNC	READY LAMP	TIME DATA	TIME SYNC	READY LAMP	CLOCK SELECTED	ALARM STATUS
OK	YES	ON	OK	YES	ON	PRIMARY	NONE
OK	YES	ON	OK	NO	OFF	PRIMARY	MINOR
OK	YES	ON	FAULT	YES	OFF	PRIMARY	MINOR
OK	YES	ON	FAULT	NO	OFF	PRIMARY	MINOR
OK	NO	OFF	OK	YES	ON	BACKUP	MINOR
OK	NO	OFF	OK	NO	OFF	PRIMARY	MAJOR
OK	NO	OFF	FAULT	YES	OFF	PRIMARY	MAJOR
OK	NO	OFF	FAULT	NO	OFF	PRIMARY	MAJOR
FAULT	YES	OFF	OK	YES	ON	BACKUP	MINOR
FAULT	YES	OFF	OK	NO	OFF	BACKUP	MAJOR
FAULT	YES	OFF	FAULT	YES	OFF	PRIMARY	MAJOR
FAULT	YES	OFF	FAULT	NO	OFF	PRIMARY	MAJOR
FAULT	NO	OFF	OK	YES	ON	BACKUP	MINOR
FAULT	NO	OFF	OK	NO	OFF	BACKUP	MAJOR
FAULT	NO	OFF	FAULT	YES	OFF	PRIMARY	MAJOR
FAULT	NO	OFF	FAULT	NO	OFF	PRIMARY	MAJOR

Table 1-1: TimeGuard Operation

1.2.4 Status Indicators and Controls

MAJOR ALARM

The red MAJOR ALARM lamp illuminates whenever a Major Alarm is asserted. A Major Alarm occurs when both READY lamps are off. Under this condition, time accuracy or output time data signal availability may be compromised.

MINOR ALARM

The red MINOR ALARM lamp illuminates whenever a Minor Alarm is asserted. A Minor Alarm occurs when either the Primary or Backup READY lamp is off. Under this condition, the TimeGuard is able to output accurate and reliable time data signals

PRIMARY READY

This green lamp is lit whenever the Primary NetClock is synchronized to WWVB or GPS and all time data signals are detected. This lamp is off whenever this NetClock has lost WWVB or GPS time sync and/or loss of a time data signal.

BACKUP READY

This green lamp is lit whenever the Backup NetClock is synchronized to WWVB or GPS and all time data signals are detected. This lamp is off whenever this NetClock has lost WWVB or GPS time sync and/or loss of a time data signal.

PRIMARY CLOCK

This momentary pushbutton switch with a yellow indicator lamp lights whenever the Primary Clock is selected. In the MANUAL switchover mode, depressing this switch causes the TimeGuard to select the Primary NetClock as the time source.

BACKUP CLOCK

This momentary pushbutton switch with a yellow indicator lamp lights whenever the Backup Clock is selected. In the MANUAL switchover mode, depressing this switch causes the TimeGuard to select the Backup NetClock as the time source.

AUTO

This alternate action pushbutton switch is equipped with a yellow indicator lamp; it selects AUTOMATIC or MANUAL switchover operation. The TimeGuard operates in the AUTOMATIC mode when this switch is depressed (down) and the lamp is on. The TimeGuard operates in the MANUAL mode when the AUTO switch is out and the lamp is off.

1.2.5 1.5.5 User-Configurable Options

The TimeGuard can be configured to suit various installation needs by using the internal DIP switches.

- Switch SW1: This DIP switch is used to select between amplitude modulated or pulse width coded (TTL) IRIG input signals. This switch sets the IRIG sensing circuit to the correct threshold voltage.
- Switch SW2: This ten-position DIP switch is used to configure the TimeGuard to ignore time sync status and unused time data signals.

1.2.6 Power Requirements

- Line Voltage: 115/230 VAC \pm 15%
Line Frequency: 50/60 Hz
Power: 6 Watts
115 VAC Fuse: 1/4 Amp, 250V, Slo-Blo
230 VAC Fuse: 1/8 Amp, 250V, Slo-Blo

1.2.7 Mechanical and Environmental Specifications

- Height: 1 rack units (1.75 inches)
Width: EIA 19" rack
Depth: 10 inches
Weight: 6 lbs.
Temperature: 0 to +50°C operating range

2 Installation

Install and test the Model 8145 as described herein. In all cases, if any problems occur during installation and configuration, please contact Spectracom Technical Support at US +1 585.321.5800.

CAUTION:


Electronic equipment is sensitive to Electrostatic Discharge (ESD). Observe all ESD precautions and safeguards when handling the Model 8145.

NOTE: If equipment is returned to Spectracom, it must be shipped in its original packing material. Save all packaging material for this purpose.

2.1 Inventory

Before installing the 8145, please verify that all material ordered has been received (Table 2-1). If there is a discrepancy, please contact Spectracom Customer Service at US 585.321.5800.

Quantity	Part Number	Description
1	W01000	AC Line Cord
1	F01R25	Spare fuse, 1/4W Slo-Blo
2	CA01006	Coaxial Cable, 2 meters
4	050008	DB9 Interface Cable, 2 meters
1	P13007	7-position terminal block

Table 2-1: Product Inventory

2.2 Inspection

Unpack the equipment and inspect it for damage. If any equipment has been damaged in transit, please contact Spectracom Customer Service at US 585.321.5800.

2.3 Typical Installation

Figure 2-1 illustrates a typical TimeGuard installation. The TimeGuard selects and outputs time data received from the primary or backup time-servers. The selected time data outputs are used to synchronize various devices requiring accurate time.

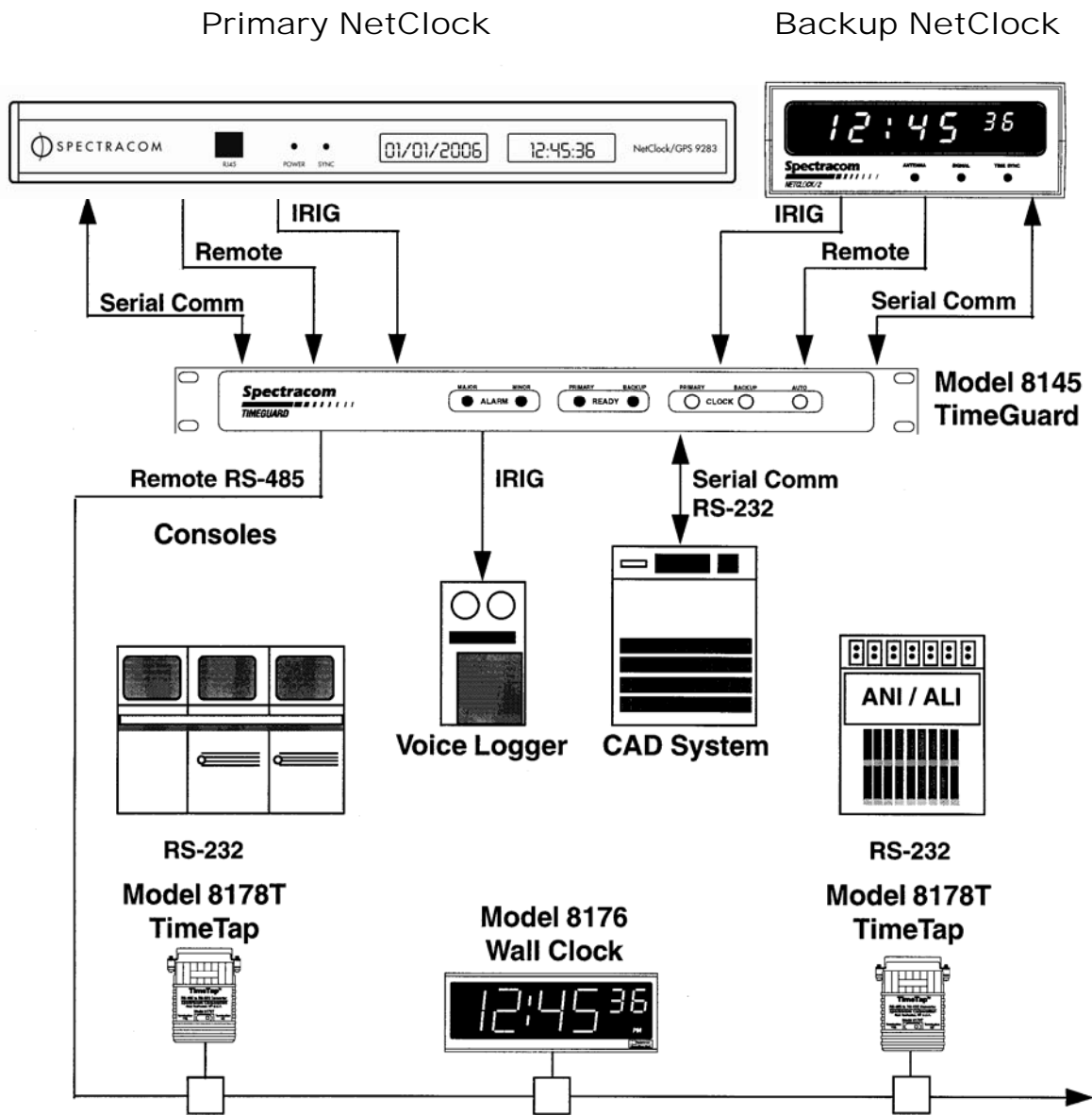


Figure 2-2: Typical TimeGuard Installation

Preparations for Use

This section outlines the set-up procedure for the Model 8145 TimeGuard. The DIP switch functions described in this section are located inside the unit. Refer to Section 3, Operation, for a detailed description of DIP switch functions.

2.3.1 Line Voltage Selection

The TimeGuard is factory set for 115 VAC $\pm 15\%$, 50/60 Hz power line operation. The instrument may also be operated from a 230 VAC $\pm 15\%$, 50/60 Hz power line. For 230 VAC operation, change the voltage selection drum and line fuse as illustrated in Figure 2-2, and as described below:

1. Remove the line cord (if installed) from the line voltage connector.
2. Open the fuse and selector drum cover with a small flat-bladed screwdriver. Insert the screwdriver blade into the cover notch and pry.
3. Pull the voltage selection drum from the power connector assembly. Reinsert the drum so that the desired line voltage appears through the cover cut-out.
4. Pull the fuse block from the power connector assembly. Replace fuse with a 1/8 amp, 250V slow blow fuse for 230 VAC operation.
5. Reinstall the fuse block into the lower fuse compartment. Make certain the arrow on the fuse block is pointing down.
6. Snap cover door closed.

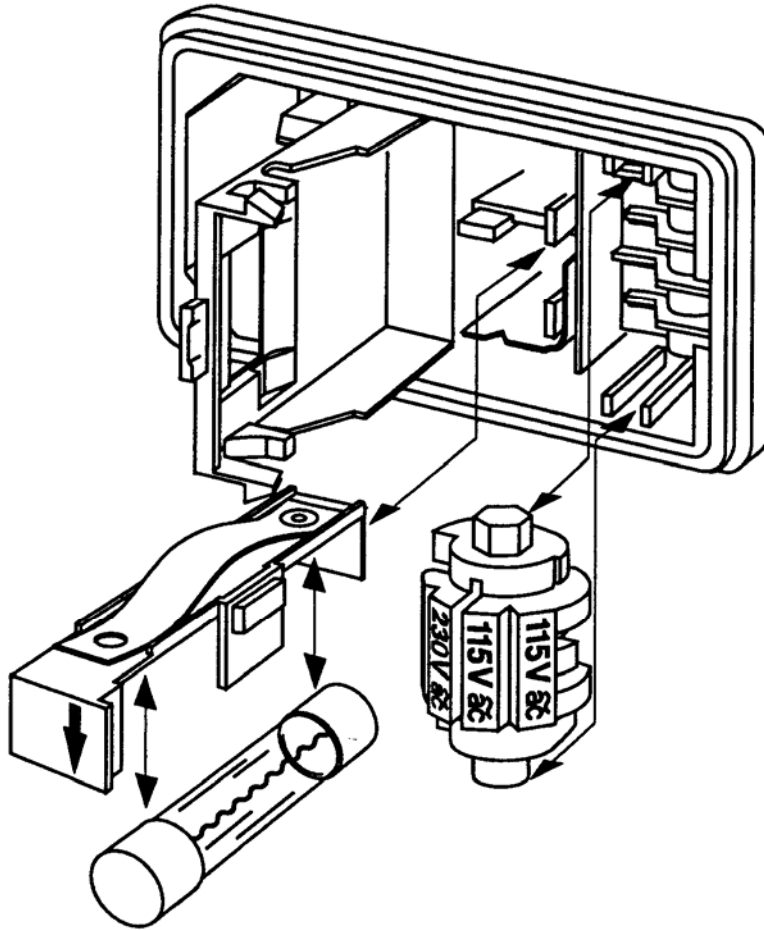


Figure 2-3: Line Voltage Selection/Fuse Replacement

2.3.2 Switchover Mode Selection

The front panel AUTO switch configures the TimeGuard to operate in MANUAL or AUTOMATIC switchover mode. In MANUAL switchover mode, the Primary or Backup Clock may be selected as the time data source by depressing corresponding CLOCK button. The TimeGuard operates in the MANUAL mode when the AUTO switch is in the OUT position and the AUTO switch indicator lamp is off.

Depressing the AUTO switch enables AUTOMATIC failure detection and switchover and causes the AUTO mode indicator lamp to light. The NetClock time synchronization status and the presence of the time data outputs are monitored in the AUTOMATIC mode. A loss of time synchronization to WWVB or GPS or loss of time data signal causes the TimeGuard to select the Backup NetClock. The TimeGuard automatically reselects the Primary NetClock when the fault condition is corrected.

2.3.3 IRIG Signal Select

NetClock receivers equipped with IRIG output can be configured to output an amplitude modulated (AM) or pulse width coded (TTL) IRIG B or IRIG E signal. Set the TimeGuard IRIG detection circuitry to match the type of IRIG signals applied. The TimeGuard is factory set to detect the presence of amplitude modulated IRIG signals.

Applications using pulse width coded (TTL) IRIG signals require a DIP switch setting change. Internal DIP switch SW1 sets the threshold level of the IRIG detection circuitry. Refer to Figure 2-3 to assist in locating DIP switch SW1. To select pulse width coded operation, place switch number 1 and 2 in the TTL (ON) position.

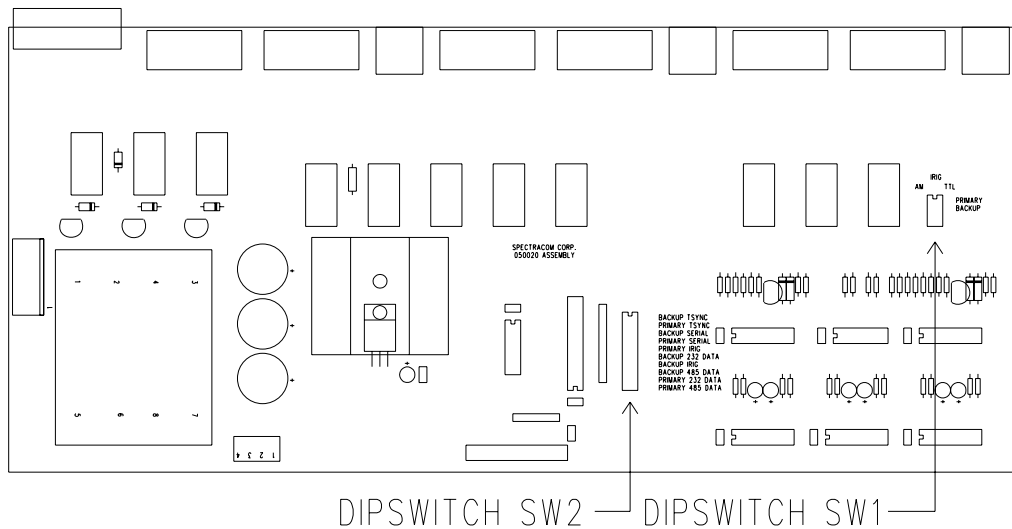


Figure 2-4: DIP Switch Locations

2.3.4 Installations Without IRIG

The TimeGuard is factory set to monitor the presence of the RS-232, RS-485, and the optional IRIG time data outputs from the NetClock. If any of the time data outputs are not detected, the TimeGuard will Minor Alarm and extinguish the READY status lamps.

The TimeGuard must be configured to ignore the IRIG signal in installations where the NetClock receivers are not equipped with IRIG output. To disable the IRIG detection circuits, place Switch numbers 5 and 7 of DIP Switch SW2 in the OFF position. Refer to Figure 2-3 to locate DIP Switch SW2.

2.4 Rack Mounting

The TimeGuard installs into an EIA 19-inch rack. The panel height is one rack unit (1.75 inches). The recommended configuration is to install the TimeGuard and the Primary and Backup NetClock receivers in the same rack. For installations in which minimal rack space is available, Spectracom offers a side-by-side rack mount kit for the Model 8182 NetClock receivers. The side-by-side panel height is 3 rack units (5.25 inches). A single mount rack kit is also available; the panel height is two rack units (3.5 inches).

2.5 Input Connections

The mating cables for IRIG, Serial Comm, Remote and AC inputs are provided in the ancillary kit.

Connect the line cord to the TimeGuard AC input module and a properly grounded outlet. A ground lug is provided for use in installations where electrical codes require an additional safety ground connection.

Connect the input data cables to the corresponding connectors of the Primary and Backup NetClock receivers.

NOTE: Installations in which NetClock receivers are not equipped with IRIG output require a DIP Switch configuration change in the TimeGuard. Refer to Section 2.3.4, *Installations without IRIG*, for more information.

2.5.1 Connecting the TimeGuard to TTS Receivers, 9100 Series NetClocks, and 9200 Series Netclocks

The TimeGuard accepts time data from Spectracom synchronized clocks designated as Primary and Backup time sources. The WWVB synchronized Model 8182 Netclock/2, GPS synchronized Model 8183 NetClock/GPS, Model 91xx NetClock, Model 92xx NetClock, and TTS series receivers are available as time sources. The TimeGuard may utilize the same model clocks or combination of clocks, i.e., NetClock/GPS as primary and NetClock/2 as backup.

The TimeGuard supports IRIG, Remote RS-485, Serial RS-232 interrogation and once-per-second time data signals. Fault detection within the TimeGuard allows automatic switchover between the applied inputs. Unused or unavailable time signals can be disabled within the TimeGuard to match the master clocks available outputs or application requirements. For example, the Model 9189 does not have IRIG or RS-232 once-per-second outputs. These signals must be disabled within the TimeGuard to allow proper operation.

NetClock/2 output connectors match the TimeGuard input connectors. The two products simply connect together using the cables provided in the TimeGuard ancillary kit. Follow the installation guidelines published in the TimeGuard Instruction Manual.

The Model 8183 NetClock/GPS, Model 91xx NetClock, Model 92xx NetClock, and TTS series receivers' output signals and connectors differ from some of the TimeGuard input connectors. This difference requires the use of an adapter and set-up configuration to allow operation with the TimeGuard.

2.5.1.1 Adapter Cable Designations

All required cables and adapters are provided in the TimeGuard ancillary kit. 91xx, 92xx, and TTS receivers require the use of the 8145-0001-5000 cable adapter assembly. Model 8183 units require the use of the 8145-0000-5000 cable adapter assembly. Refer to Figure 2-5 for more information.

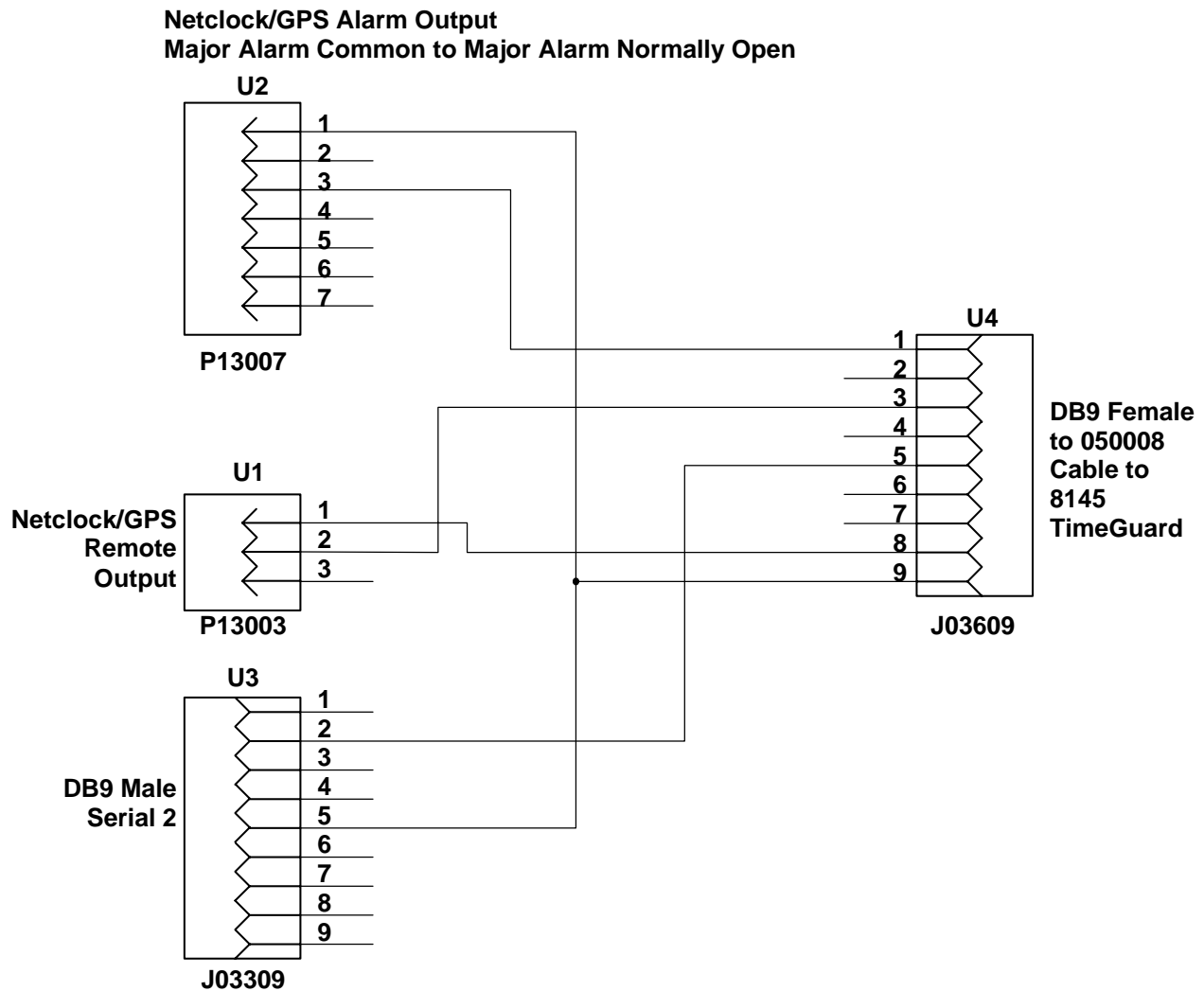


Figure 2-5: TimeGuard Adapter Cable Diagram

2.5.1.2 Serial Comm Connection

Connect one of the supplied DB9 cables between the NetClock/NTP Serial Comm port and the appropriate (Primary or Backup) TimeGuard Serial Comm port.

2.5.1.3 Remote Connection

The TimeGuard utilizes DB9 connectors for the Remote Inputs. The TimeGuard monitors the time synchronization status and the presence of RS-232 and RS-485 once-per-second data streams applied to the Remote Inputs.

The 91xx, 92xx, and TTS receivers provide RS-485 once-per-second data on a 3-position terminal strip. Time Synchronization status is communicated by Relay 1 contact closure that is configured for Major Alarm operation. The connector difference requires the use of an adapter to connect these signals to the TimeGuard Remote Inputs.

Install the 8145-0001-5000 adapters as described below:

- Insert the 10-position terminal strip from the adapter into the 91xx/TTS receiver Timer/Alarm Relays connector.
- Insert the 3-position terminal strip from the adapter into the receiver's RS-485 Remote Port 1 connector.
- Connect one of the supplied DB9 cables between the adapter and the appropriate (Primary or Backup) Remote Input connector.

2.5.1.4 IRIG Connection

IRIG is available from 9183 and 9283 NetClock/GPS units as well as from TTS240 receivers. Connect one of the supplied BNC cables between the receiver and the appropriate (Primary or Backup) TimeGuard IRIG Input port. The TimeGuard can be configured to accept either Amplitude Modulated (AM) or Pulse-Width-Coded (TTL) IRIG formats. Refer to *Installation* in this manual for more information.

If IRIG is not required for the application or if using non-IRIG equipped receivers the TimeGuard must be configured to disable this input signal. Refer to Section 3 for TimeGuard configuration information.

2.5.1.5 TimeGuard Configuration

The 8183, 91xx, 92xx, and TTS series receivers do not provide a RS-232 once-per-second time data stream as found on the NETCLOCK/2 remote port. In addition, some receivers may not be equipped with an IRIG output. To assure proper operation the TimeGuard must be configured to match the available time data streams. Internal DIP-switch SW2 is used to select which time data signals are monitored by the TimeGuard's fault detection circuitry.

DIP switch SW2 is illustrated in Figure 2-6. Table 2-2 provides the recommended DIP-switch configuration for use with 91xx, 92xx, and TTS series receivers.

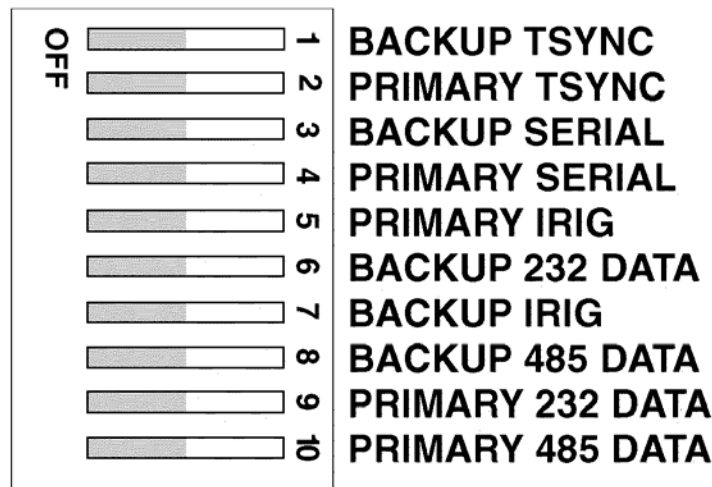


Figure 2-6: DIP Switch SW2

SWITCH #	ON/OFF	FUNCTION
1	ON	Backup Time Synchronization Status
2	ON	Primary Time Synchronization Status
3	ON	Backup RS-232 Serial Communication
4	ON	Primary RS-232 Serial Communication
5	NOTE	Primary IRIG
6	OFF	Backup RS-232 Once-Per-Second
7	NOTE	Backup IRIG
8	ON	Backup RS-485 Once-Per-Second
9	OFF	Primary RS-232 Once-Per-Second
10	ON	Primary RS-485 Once-Per-Second

Table 2-2: TimeGuard Switch Configuration

NOTE: Model 8183, 9183, 9283, and TTS 240 receivers are equipped with IRIG outputs. If IRIG is used in the application place DIP switches 5 and 7 in the ON position. Place these switches in the OFF position if IRIG is not required or when using non-IRIG equipped receivers.

2.5.1.6 Receiver Configuration

Time synchronization status of the receiver is communicated to the TimeGuard using relay contacts. The adapter cable is wired to Relay 1 Common and Normally Open contacts. Relay 1 must be configured for Major Alarm operation.

A Major Alarm is asserted whenever the receiver has a CPU failure or it has lost 3-D fix for a period of 2 hours. At this point the Time Sync status characters in the RS-232 Serial Comm and RS485 outputs ports are changed to a “?” to indicate loss of GPS synchronization. The Major Alarm contact closure shall cause the TimeGuard to automatically switch over.

By default Relay 1 is configured for Major Alarm operation. This can be verified or changed using a web browser connection to the front panel Ethernet port. Refer to the appropriate receiver instruction manual for information on web interface and clock configuration. Figure 3 shows the Relay setup screen.

NOTE: *RELAY 1 MUST BE CONFIGURED FOR MAJOR ALARM OPERATION.* Relay 2 and Relay 3 can be configured for Alarm or Event Timer operation.

2.6 Output Connections

The TimeGuard outputs the time data signals derived from the selected clock source. Relay contact closures are provided for remote Status monitoring. Refer to Section 3 for detailed information in TimeGuard outputs.

IRIG: The IRIG signal is typically used to synchronize voice loggers. The IRIG signal may be driven up to 1,000 feet when using RG-58 coaxial cable.

SERIAL COMM: This is the RS-232 interrogation port. The selected NetClock responds with an RS-232 time data stream when queried by the connected device. This output is typically used to synchronize the Computer Aided Dispatch (CAD) System. Cable runs up to 44 feet from the TimeGuard are possible using standard grade RS-232 cable. The 44-foot cable limitation is derived by subtracting the 6-foot interconnect cable from the RS-232 maximum distance recommendation of 50 feet. Longer cable lengths are possible if shielded low capacitance RS-232 cables are used.

REMOTE OUTPUT: The RS-485 once-per-second time data stream is output on this connector. The RS-485 output may be distributed throughout a facility over a single twisted pair cable in lengths up to 4000 feet.

ALARM OUTPUTS: Relay contact closures communicate Minor and Major Alarm status and selection of the Backup Clock as the time data source. The mating seven-position terminal block is included in the ancillary kit.

2.7 Initial Operation

The Primary and Backup NetClock receivers must be time-synchronized to WWVB or GPS before attempting initial operation and functional verification of the TimeGuard.

NOTE: A continuity tester or ohmmeter is required to verify alarm outputs.

Perform the following steps to verify the Model 8145 TimeGuard operation:

1. With all the input data cables connected between the TimeGuard and the NetClock receivers, both READY lamps are illuminated and no alarms are asserted.
2. Place the TimeGuard in the MANUAL mode by placing the AUTO switch in the OUT position. The lamp inside the AUTO switch is turned off whenever the TimeGuard is placed in the MANUAL mode. Depress the CLOCK push buttons to select between the Primary and Backup clock sources. Observe that the CLOCK switch lamp illuminates when it is depressed. This gives a visual indication as to which clock source is selected. Leave the TimeGuard in MANUAL mode and select the Backup clock.
3. Depress the AUTO button to place the TimeGuard in the AUTOMATIC switchover mode. Observe that the AUTO switch lamp is illuminated and the clock source was switched from the Backup to the Primary source. The TimeGuard gives the Primary clock source priority when operating in the AUTOMATIC switchover mode.
4. Disconnect the Primary Remote input cable from the TimeGuard. The Remote cable contains RS-485 time sync status, time data, on-time pulse, and RS-232 time data. When this cable is removed, the TimeGuard detects the loss of data and time synchronization in the Primary clock source.

Observe that the MINOR ALARM lamp is ON. The Primary READY lamp is OFF, and the TimeGuard has automatically selected the Backup as the clock source. Verify the Minor Alarm relay contact closure by observing continuity between pins 3 and 4 on the rear panel ALARM OUTPUT connector. Verify the Backup selected relay alarm closure by observing continuity between pins 5 and 6 of the ALARM OUTPUT connector.

5. Remove the Backup Remote cable and the Primary Remote cable. Observe that the MAJOR ALARM lamp is ON, the MINOR ALARM lamp is OFF, both READY lamps are OFF, and the Primary Clock has been reselected as the clock source. Verify the Major Alarm relay contact closure by observing continuity between Pins 1 and 2 on the ALARM OUTPUT connector. Verify the Minor and Backup contact closures have opened by observing no continuity between Pins 3 and 4 and Pins 5 and 6.
6. Reapply the Remote input cables and observe that both ALARM lamps are OFF, both READY lamps are ON, and the Primary Clock is selected as the clock source. The TimeGuard is now ready for years of reliable service.

3 Operation

This section describes the front and rear panel functions, internal switch functions, and operation information for the Spectracom Model 8145 TimeGuard.

3.1 Theory of Operation

The Spectracom Model 8145 TimeGuard is a time selector switch intended for use in applications requiring redundant time sources.

3.1.1 Background

The TimeGuard enhances system reliability by accepting and monitoring time data signals from two NetClock receivers. If a failure is detected, the TimeGuard alarms the user and automatically switches to the alternate time source when required.

The TimeGuard may also be configured to operate in the MANUAL mode. In this mode, the AUTOMATIC switchover feature is disabled and the user selects the clock source.

Figure 3-1, TimeGuard Block Diagram, illustrates the signal flow and functions of the Model 8145.

3.1.2 Clock Inputs and Fault Detectors

The TimeGuard monitors the time synchronization status and the presence of the time data signals applied to the IRIG, Remote, and Serial Comm inputs. If any of time data signals is not present, the fault detector signals the switchover and alarm circuitry of this failure.

The signals applied to the IRIG connectors are sensed at thresholds selected by internal DIP Switch SW1. This switch sets the threshold detection voltage for IRIG amplitude modulated (AM) signals or IRIG pulse width coded (TTL) signals. If the applied IRIG signal falls below the selected threshold level, a fault signal is fed to the switchover and alarm circuitry.

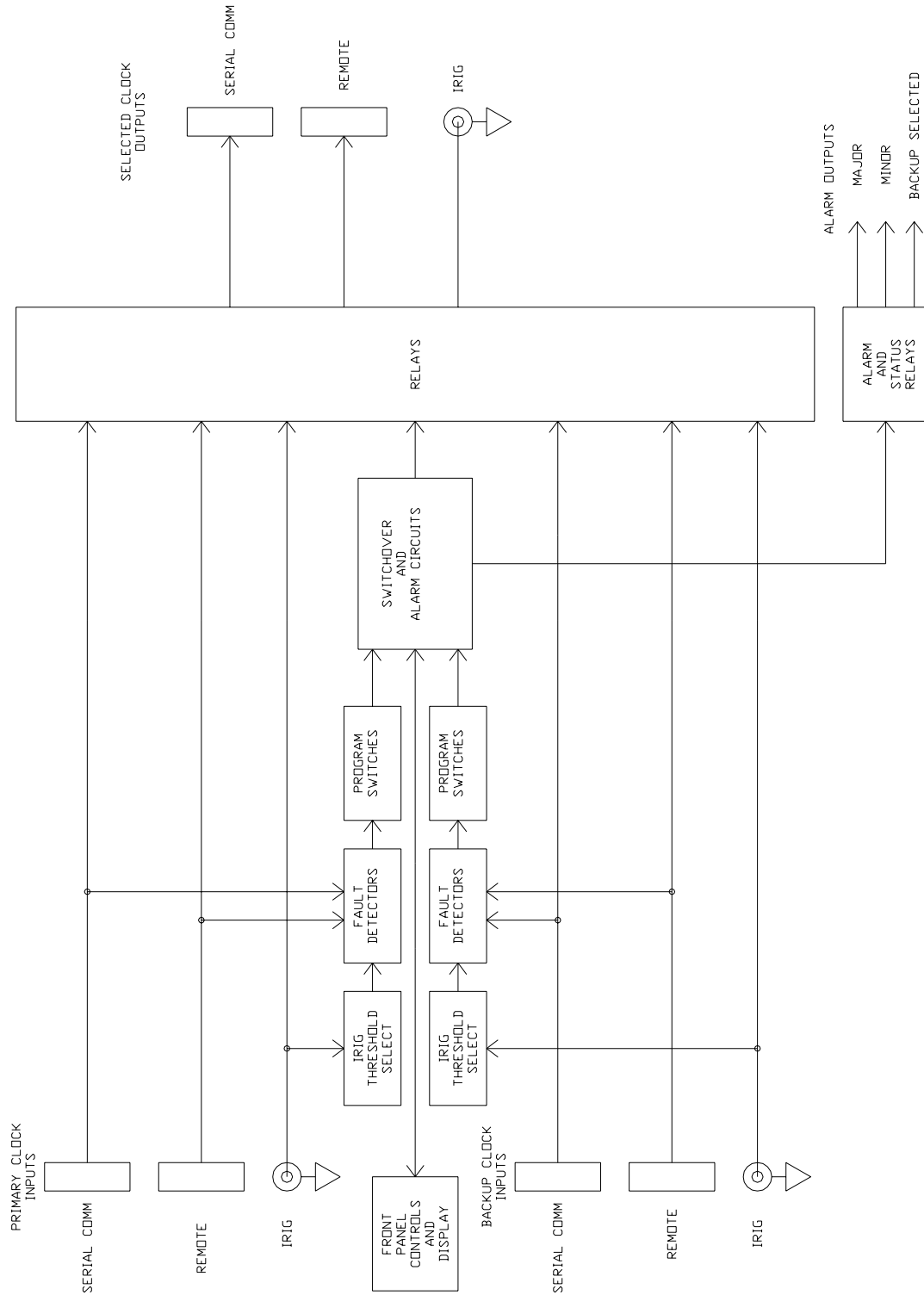


Figure 3-1: TimeGuard Block Diagram

The RS-232 Serial Comm port is active only when the connected device requests the time from the selected clock source. Since this port is idle most of the time, the Serial Comm port is qualified as ready and available by the presence of the NetClock Data Set Ready (DSR Pin 6) signal. If the Serial Comm cable from the connected NetClock receivers is removed, the loss of DSR is detected as a fault.

The NetClock Remote connector outputs time sync status, time data, and the on-time pulse in RS-485 levels and an RS-232 time data signal. The TimeGuard detects the presence of the RS-232 and RS-485 time data signals and monitors the time sync status of the connected NetClock receivers. The switchover and alarm circuitry are alerted whenever a loss of time sync to WWVB or GPS or time data is detected.

The RS-485 on-time pulse is not monitored, but is switched to the output Remote connector.

3.1.3 Switchover and Alarm Circuit

The fault detectors feed the status of the IRIG, Serial Comm, Remote RS-232, Remote RS-485, and Time Sync through the program switches to the switchover and alarm circuits. The program switches break the path of selected fault detectors if that signal is not available or is not used in the application. For example, if the NetClock receivers attached to the TimeGuard do not have the optional IRIG output, it is necessary to block the IRIG fault detector signal. If the IRIG fault signal is not blocked, the TimeGuard remains in an alarm condition. Placing any of the program switches (DIP Switch SW2) in the OFF position blocks the fault detectors from the switchover and alarm circuits.

The front panel ALARM lamps, READY lamps, CLOCK select lamps, and rear panel output signals are driven by the switchover and alarm circuits.

In the AUTOMATIC switchover mode, the TimeGuard responds to time data faults and loss of time synchronization as shown in Table 3-1.

PRIMARY			BACKUP			OUTPUTS	
TIME DATA	TIME SYNC	READY LAMP	TIME DATA	TIME SYNC	READY LAMP	CLOCK SELECTED	ALARM STATUS
OK	YES	ON	OK	YES	ON	PRIMARY	NONE
OK	YES	ON	OK	NO	OFF	PRIMARY	MINOR
OK	YES	ON	FAULT	YES	OFF	PRIMARY	MINOR
OK	YES	ON	FAULT	NO	OFF	PRIMARY	MINOR
OK	NO	OFF	OK	YES	ON	BACKUP	MINOR
OK	NO	OFF	OK	NO	OFF	PRIMARY	MAJOR
OK	NO	OFF	FAULT	YES	OFF	PRIMARY	MAJOR
OK	NO	OFF	FAULT	NO	OFF	PRIMARY	MAJOR
FAULT	YES	OFF	OK	YES	ON	BACKUP	MINOR
FAULT	YES	OFF	OK	NO	OFF	BACKUP	MAJOR
FAULT	YES	OFF	FAULT	YES	OFF	PRIMARY	MAJOR
FAULT	YES	OFF	FAULT	NO	OFF	PRIMARY	MAJOR
FAULT	NO	OFF	OK	YES	ON	BACKUP	MINOR
FAULT	NO	OFF	OK	NO	OFF	BACKUP	MAJOR
FAULT	NO	OFF	FAULT	YES	OFF	PRIMARY	MAJOR
FAULT	NO	OFF	FAULT	NO	OFF	PRIMARY	MAJOR

Table 3-1: TimeGuard Operation

3.2 Front Panel Functions

Refer to Figure 3-2, Model 8145 Front Panel, and the following paragraphs for information on the TimeGuard front panel functions.

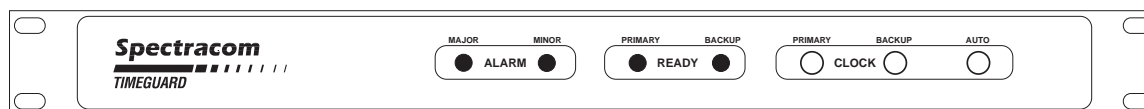


Figure 3-2: TimeGuard Front Panel

3.2.1 Major Alarm Indicator

This lamp is illuminated whenever a Major Alarm is asserted. Any time the accuracy or presence of the TimeGuard output time data is uncertain, a Major Alarm is asserted.

3.2.2 Minor Alarm Indicator

This lamp is illuminated whenever a Minor Alarm is asserted. A Minor Alarm is asserted whenever a fault or faults are detected that do not compromise the accuracy or availability of the output time data signals.

3.2.3 Primary Ready Indicator

This lamp is illuminated when all the Primary time data signals are present and time synchronized to WWVB or GPS. This lamp is turned off if the Primary clock is not time synchronized and/or if any of the time data signals are not detected.

3.2.4 Backup Ready Indicator

This lamp is illuminated when all the Backup time data signals are present and time synchronized to WWVB or GPS. This lamp is off when the Backup Clock is not time synchronized and/or if any of the time data signals are not detected.

3.2.5 Primary Clock Pushbutton / Indicator

Depressing this momentary pushbutton in the MANUAL mode selects the Primary Clock as the time source. Depressing this button while in the AUTOMATIC switchover mode has no effect on the source selection. The indicator lamp is ON whenever the Primary Clock is selected as the time source.

3.2.6 Backup Clock Pushbutton / Indicator

Depressing this momentary pushbutton in the MANUAL mode selects the Backup Clock as the time source. Depressing this button while in the AUTOMATIC switchover mode has no effect on the source selection. The indicator lamp is ON whenever the Backup Clock is selected as the time source.

3.2.7 Auto Pushbutton / Indicator

This alternate action pushbutton selects the method of switchover operation. The TimeGuard operates in the AUTOMATIC switchover mode when the AUTO switch is depressed and the

indicator lamp is ON. The TimeGuard operates in the MANUAL mode when this pushbutton is in the OUT position. The AUTO indicator lamp is OFF when MANUAL switchover is selected.

3.3 Rear Panel Functions

Refer to Figure 3-3, Model 8145 Rear Panel, and the following paragraphs for information on the TimeGuard rear panel functions.

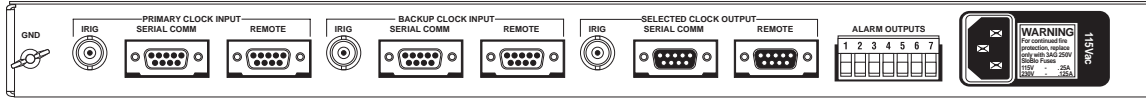


Figure 3-3: TimeGuard Rear Panel

3.3.1 Primary and Backup IRIG Inputs

These BNC connectors accept the IRIG signals from the Primary and Backup NetClock receivers. The IRIG signal may be either in IRIG-B or IRIG-E amplitude modulated (AM) or pulse width coded (TTL) formats. The TimeGuard is factory set to accept amplitude modulated IRIG-B or IRIG-E signals. The TimeGuard can be configured to accept pulse width coded IRIG signals by changing internal DIP Switch settings. These switches set the threshold levels on the IRIG fault detectors the TTL levels. Refer to Section 3.4.1 for additional information on the IRIG AM/TTL selection switches. The TimeGuard ancillary kit contains two meter BNC cables to interconnect the IRIG signals.

NOTE: If the source receivers are not equipped with IRIG output, the TimeGuard IRIG fault detection circuitry must be bypassed. An internal DIP switch is used to bypass the fault detectors. Refer to *Internal Switch Functions* for more information.

3.3.2 Primary and Backup Serial Comm Inputs

These DB9 male connectors accept the Serial Comm signals from the Primary and Backup NetClock receivers. The TimeGuard monitors the presence of the NetClock Data Set Ready (DSR, Pin 6) signals to determine port availability. The cables to interconnect the NetClock receivers to the TimeGuard are provided in the TimeGuard ancillary kit. These cables are two (2) meters long and wired in a one-to-one configuration.

3.3.3 Primary and Backup Remote Inputs

These DB9 male connectors accept the Remote output signals from the Primary and Backup NetClock receivers. The NetClock Remote outputs contain RS-485 time data, time synchronization status, on-time pulse and an RS-232 time data signal. The TimeGuard monitors the time synchronization status and the presence of the RS-485 and RS-232 time data signals. The RS-485 on-time pulse is not monitored for faults, but is passed on to the output Remote connector.

The cables to interconnect the NetClock receivers to the TimeGuard are provided in the TimeGuard ancillary kit. These cables are two (2) meters long and wired in a one-to-one configuration.

3.3.4 Selected Clock IRIG Output

This BNC connector provides the selected clock source IRIG output signal. The IRIG output may be an amplitude modulated sine wave or pulse width coded square wave signal in an IRIG-

B or IRIG-E format. The IRIG signal type and format is determined by the NetClock set-up switches. These switches are located on the bottom cover of the NetClock. The IRIG format rotary switch selects between IRIG-B and IRIG-E when set as shown in Table 3-2.

SWITCH SETTING	IRIG FORMAT
0	IRIG B
1	IRIG B with Signature Control
2	IRIG E
3	IRIG E with Signature Control

Table 3-2: IRIG Formats

Signature control removes the data coding from the IRIG output whenever the NetClock receiver has lost time sync to WWVB or GPS. The signature control feature is not needed when the TimeGuard is used. The TimeGuard automatically selects the alternate clock source when loss of time sync is detected.

The NetClock DIP switch number 3 configures the IRIG output as amplitude modulated (AM) or pulse width coded (TTL). Placing DIP switch number 3 in the ON position selects AM output and TTL when OFF.

Refer to your NetClock's Instruction Manual for more information.

3.3.5 Selected Clock Serial Comm Output

This connector provides access to the selected clock source Serial Comm output. Commands to request the time, manually set the time, and obtain NetClock set-up and performance information are entered here. The baud rate and time data format selections are made using switches located on the bottom cover of the NetClock (or through the NetClock user interface, depending on the model of the receiver). Refer to your NetClock's Instruction Manual for more information.

The Serial Comm connector is a 9-pin series D female. Connector pin numbering is shown in Figure 3-4. The Serial Comm is configured as Data Communication Equipment (DCE). The Serial Comm pin assignments are listed in Table 3-3.

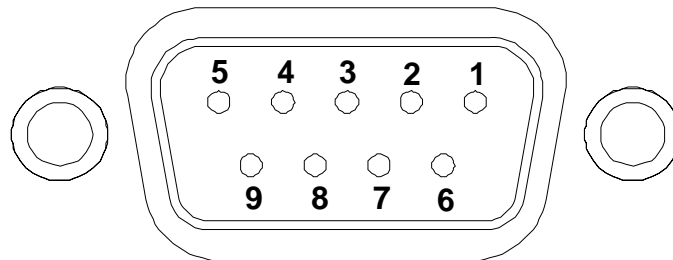


Figure 3-4: Serial Comm Pin Numbering

PIN	SIGNAL	I/O	DESCRIPTION
2	RXD	O	Receive Data
3	TXD	I	Transmit Data
5	GND	-	Signal Common
6	DSR	O	Data Set Ready
7	RTS	*	Request to Send
8	CTS	*	Clear to Send

**Pins 7 and 8 are internally shorted together in NETCLOCK/2 models.*

Table 3-3: Serial Comm Pin Assignments

3.3.6 Selected Clock Remote Output

This connector provides the selected clock Remote output signals. The Remote output contains a once-per-second time data stream in RS-232 and RS-485 levels. The NetClock time sync status and a 1PPS on-time pulse is also output in RS-485 levels. The baud rate and data format selection is made using the switches located on the bottom cover of the NETCLOCK/2 Receiver. Refer to the your NetClock's instruction manual for more information.

The Remote output connector is a 9-pin series D female. Connector pin numbering is illustrated in Figure 3-5. Pin assignments are shown in Table 3-4.

NOTE: The 8183, 91xx, 92xx, and TTS series receivers do not provide a RS-232 once-per-second time data stream as found on the NETCLOCK/2 remote port.

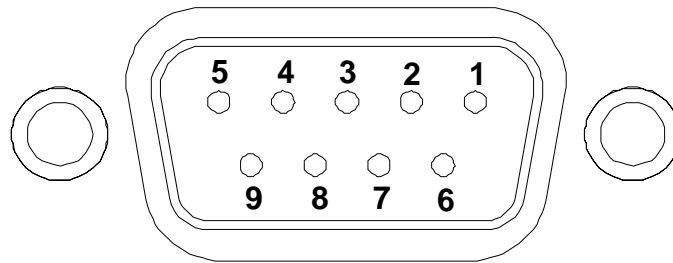


Figure 3-5: Remote Output

PIN	SIGNAL	DESCRIPTION
3	-DATA	RS-485 inverted time data
8	+DATA	RS-485 non-inverted time data
2	-ON-TIME	RS-485 inverted on-time pulse
7	+ON-TIME	RS-485 non-inverted on-time pulse
1	-TSYNC	RS-485 inverted time sync status
6	+TSYNC	RS-485 non-inverted time sync status
4	ENABLE	+5V Enable output
9	GND	Signal Ground
5	DATA	RS-232 time data output (NETCLOCK/2)

Table 3-4: Remote Output Pin Assignments

3.3.7 Alarm Outputs

Operational status of the TimeGuard may be remotely monitored using the relay contact closures located on the ALARM OUTPUT connector. The ALARM OUTPUT connector is shown in Figure 3-6.

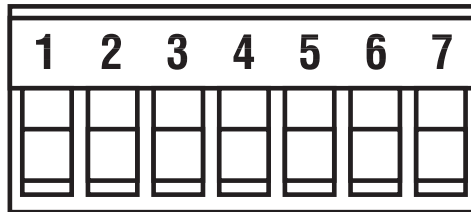


Figure 3-6: Alarm Output Connector

The ALARM OUTPUT connector provides indication of a Major Alarm, Minor Alarm, and Backup Clock selected. A Major Alarm is asserted whenever both clock sources have failures detected that may compromise the time data accuracy. A Minor Alarm is asserted when failures are detected that do not compromise the time data accuracy. Refer to Section 3.1.3 for a complete description of Major and Minor Alarms.

Table 3-5 lists the ALARM OUTPUT connector pin assignments. Whenever a Major Alarm is asserted, the Major Alarm relay is de-energized, causing continuity between Pins 1 and 2. A power failure also appears as a Major Alarm because the Major Alarm relay will be de-energized.

A Minor Alarm energizes the Minor Alarm relay and causes continuity between Pins 3 and 4 of the ALARM OUTPUT connector.

Whenever the Backup clock is selected as the time source, the Backup relay is energized, causing a contact closure between Pins 5 and 6.

The Alarm Relay contacts are rated for 2 Amps at 30 VDC and are isolated from ground. The ALARM OUTPUTS are not latched. The contacts open then the fault condition is corrected.

CONNECTOR PIN	CONTACT CONNECTION
1	Major NC
2	Major C
3	Minor C
4	Minor NO
5	Backup NO
6	Backup C
7	Ground

Table 3-5: Alarm Output Pin Assignments

3.3.8 AC Power

The TimeGuard is supplied with a detachable line cord. This cord plugs into the AC power module. The power module contains RFI filters, line fuse, and a line voltage selector. The TimeGuard may be operated from a 115 VAC or 230 VAC, 50/60 Hz power line. Refer to section 2.1.1 for information on line voltage selection and fuse replacement.

3.3.9 Chassis Ground

The TimeGuard chassis is connected to the power line safety ground. This ground stud allows connection of the TimeGuard to a separate earth ground when required by electrical codes. Connect the chassis ground stud to a good earth ground or ground stake using the largest cable conductor possible.

3.4 Internal Switch Functions

The TimeGuard may be reprogrammed to suit various applications by DIP Switches SW1 and SW2. These internal switches are accessed by removing the top cover, which is secured by 1/4 turn fasteners. Figure 3-7 and the following paragraphs describe the TimeGuard switch functions.

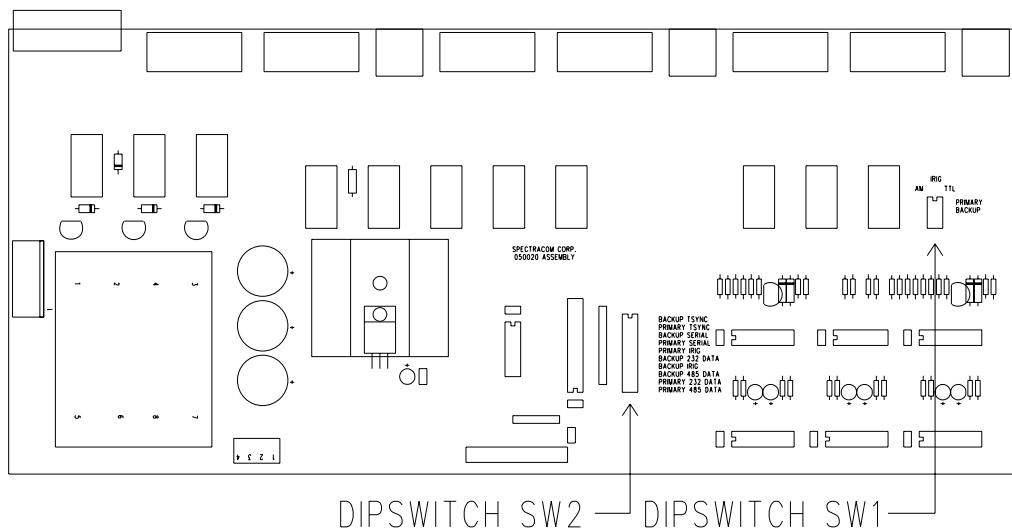


Figure 3-7: TimeGuard Switches

3.4.1 Select IRIG Signal

DIP Switch SW1 configures the TimeGuard to accept an amplitude modulated (AM) or pulse width Coded (TTL) IRIG signal. The DIP Switch selects the threshold level of the IRIG detection circuitry. To ensure proper operation, this switch must match the type of IRIG signal applied. The TimeGuard is factory selected to accept AM IRIG signals. To configure the TimeGuard for IRIG TTL operation, place switch numbers 1 and 2 in the ON position. Figure 3-8 illustrates DIP Switch SW1 operation. Switch numbers 3 and 4 have no connection.

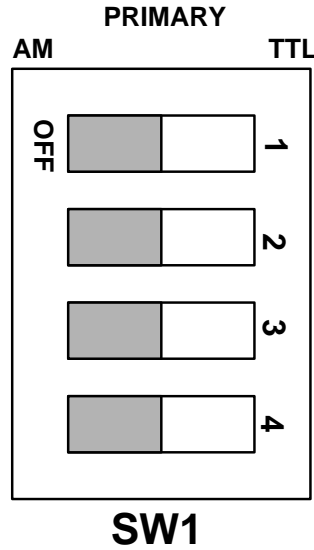


Figure 3-8: DIP Switch SW1

3.4.2 Input and Alarm Configuration

The 10-position DIP Switch SW2 is used to program the alarm and switchover operation. The TimeGuard is factory-set to monitor the presence of all NetClock time data outputs and time sync status to WWVB or GPS. A loss of time sync or any time data signal will cause an alarm and possible switchover.

Installations having NetClock receivers not equipped with the IRIG output option must reprogram the TimeGuard to ignore the missing signal. To operate the TimeGuard without input IRIG signals, place switch numbers 5 and 7 of DIP Switch 2 in the OFF position.

In addition to IRIG, the TimeGuard may be configured to ignore time sync status, Serial Comm port, the Remote RS-232 data, and the Remote RS-485 data signals.

Figure 3-9 and the following paragraphs describe DIP Switch SW2 operation.

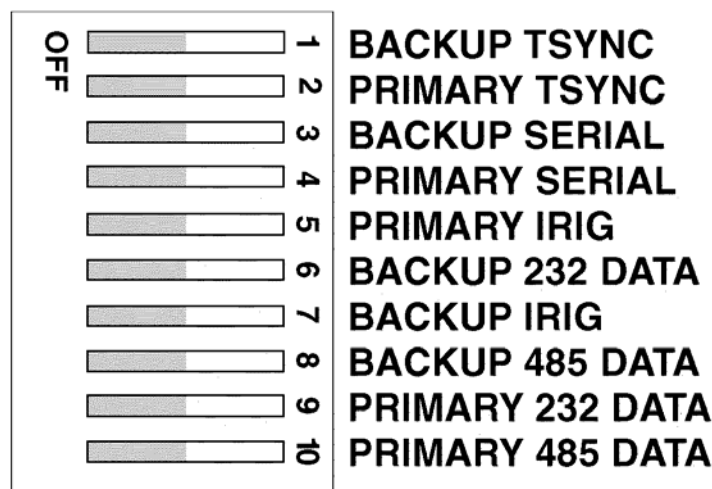


Figure 3-9: DIP Switch SW2

Switch 1 Backup TSYNC**Switch 2 Primary TSYNC**

Placing these switches in the OFF position programs the TimeGuard to ignore the NetClock time sync status to WWVB or GPS. In applications where the NetClock time is derived by its Manual Set function, these switches must be placed in the OFF position.

In most applications, the NetClock receiver is time synchronized to WWVB or GPS, and Switches 1 and 2 must be placed in the ON position.

Switch 3 Backup Serial**Switch 4 Primary Serial**

The switches are used to defeat the fault detectors on Serial Comm input signals. If the application does not require the use of the Serial Comm port, place the switches in the OFF position. In the ON position, the Serial Comm input is qualified as "good" whenever the DSR signal is detected.

Switch 5 Primary IRIG**Switch 7 Backup IRIG**

In applications where the source NetClock receivers are not equipped with IRIG, or if the IRIG signal is not used, place the switches in the OFF position. This prevents the IRIG fault detectors from asserting an alarm indicating the IRIG signal is missing. In the ON position, the TimeGuard monitors the presence of the input IRIG signals.

Switch 6 Backup 232 Data**Switch 9 Primary 232 Data**

Placing these switches in the OFF position programs the TimeGuard to ignore the fault detectors placed on the RS-232 data signals found on the Remote connector. In the ON position, the TimeGuard monitors the RS-232 Remote data signals.

Switch 8 Backup 485 Data**Switch 10 Primary 485 Data**

Placing these switches in the OFF position programs the TimeGuard to ignore the fault detectors placed on the RS-485 data signals found on the Remote connector. In the ON position, the TimeGuard monitors the RS-485 Remote data signals.

Spectracom Corporation

95 Methodist Hill Drive

Rochester, NY 14623

www.spectracomcorp.com

Phone: US +1.585.321.5800

Fax: US +1.585.321.5219