Westronic

WS1000 Remote – TABS

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Technical Manual

Technical Manual

Westronic Systems, Inc.
a Mediation Technology company

NOTICE

WESTRONIC makes no warranties about this document. WESTRONIC reserves the right to make hardware and software changes to the product described within this document without prior notice and without obligation to notify any person of such revision or change.

REGULATORY INFORMATION

WARNING: This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the installation manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15, Subpart J of the FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of the equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

CAUTION: Changes or modifications not expressly approved by Westronic could void the user's authority to operate this equipment.

The FCC label can be found on the right side of the shelf assembly. The label includes the following information:

This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

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Revision History

Rev Level	Issue Date	Reason for Reissue
A	January, 1992	First Release
2	May, 1993	–
B	September, 1993	–
C	September, 1996	–
D	March, 1997	–
E	April, 1998	–
F	March, 1999	Remove Manufacturer Discontinued part numbers, clarify summary alarm option
G	June, 1999	Format changes (Word – FrameMaker), Logo Update
H	February, 2001	Format changes (FrameMaker – Word), Logo Update
I	November, 2003	Format changes, Logo Update, Address Update
J	June, 2005	Updated address and fax

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1 Product Description

1.1 Overview

The WS1000 remote provides an economical and flexible means of collecting small/large quantities of discrete alarm and status data, which it converts to a simple, easily handled Telemetry Asynchronous Block Serial (TABS) interface to complement many operation support systems.

WS1000 mounts in an equipment rack or on a Main Distribution Frame (MDF), thus allowing location as close as possible to the source of discrete interfaces. This results in a large reduction in the wiring required to collect alarm and status data. A reduction in wiring eliminates the possibility of losing data through unknown, disconnected, moved, or cut wiring.

WS1000 has two serial ports: Port 1 and Port 2. Port 1 serves as a TABS host communications interface that can be equipped with an optional 1,200-bps Bell 202T-compatible internal modem, which allows locating WS1000 beyond the range of standard RS-422/RS-485 interfaces. Or if required by the application, serial Port 1 can be equipped with an optional RS-422-to-RS-232 conversion board. Serial Port 2 serves as a TABS data collection interface, allowing WS1000 to combine data from other WS1000 TABS remotes or local TABS-based Network Elements (NEs).

The WS1000 TABS units provide a combination of discrete alarm/status inputs and discrete control outputs. The following WS1000 configurations are available:

- 128 inputs/16 outputs, without modem, with/without alarm summary
- 128 inputs/16 outputs, with 202T modem, with/without alarm summary
- 64 inputs/8 outputs, without modem, with/without alarm summary
- 64 inputs/8 outputs, with 202T modem, with/without alarm summary

The WS1000 unit consists of a standard wire-wrap housing and a plug-in module. The same housing accommodates all the different configurations. The plug-in module is accessible from the front of the WS1000 unit.

Using a digital connection or a modem in the first unit, multiple WS1000 units can connect in a daisychain to share a single TABS host interface port. Combining WS1000 units makes it possible to convert a

maximum of 4,096 discrete inputs and 512 control outputs into a single TABS interface.

The WS1000 architecture eases troubleshooting and repair. All WS1000 active components are located on one module. Front-panel LEDs indicate when the unit has power, is functional, and is receiving/ transmitting data on the serial TABS ports.

1.2 Front-Panel Indicators

The following provides information about the WS1000 front-panel LED indicators:

- **MPU RUN:** Microprocessor Run – indicates proper microcomputer initialization and operation. A hardware or software failure has occurred if **MPU RUN** LED is Off after the unit has powered up.
- **Serial Port 1 RX:** Serial Port 1 Receive – LED momentarily lights for each poll byte received from the host.
- **Serial Port 1 TX:** Serial Port 1 Transmit – LED momentarily lights for each response byte transmitted to the host.
- **Serial Port 2 RX:** Serial Port 2 Receive – LED momentarily lights for each response byte received from downstream units reporting to the host.
- **Serial Port 2 TX:** Serial Port 2 Transmit – LED lights for each poll byte relayed to downstream units transmitted.

1.3 Applications

The WS1000 Remote collects discrete alarm/status inputs and generates control outputs. The Port 2 serial interface can combine data reported by other TABS-based remote equipment into a single TABS output.

When WS1000 receives a TABS command from the host on Port 1, it transmits the command on Port 2 to other connected units (NEs). When WS1000 receives a response from an NE on Port 2, it transmits the response over Port 1 to the host or the next unit in the system. Operating in this manner, WS1000 functions as a repeater/concentrator for other TABS remote equipment.

Figure 1-1 illustrates a basic WS1000 TABS remote configuration. When more alarm/controls are required, multiple WS1000s can form a daisychain (RS-485) to allow a maximum of 4,096 discrete inputs and 512 control outputs.

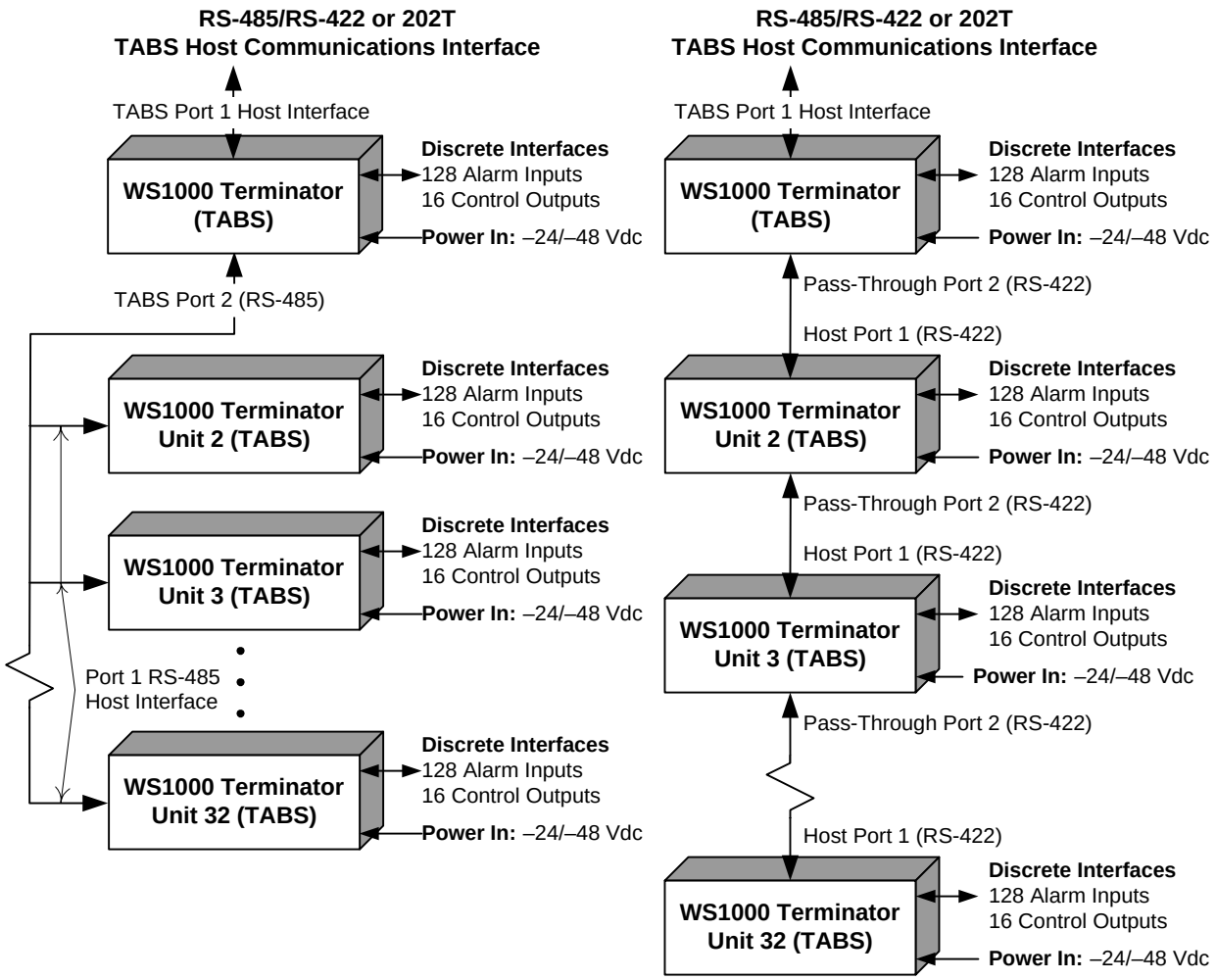

Figure 1-1 WS1000 Discrete Parallel (RS-485) and Serial (RS-422) Expansion

1.4 WS1000 TABS Remote Configurations

The WS1000 supports various numbers of discrete inputs/control outputs and different serial interfaces. Table 1-1 lists the most common WS1000 TABS remote unit configurations available.

Table 1-1 WS1000 Remote Configurations

Top-Level Order No	Plugin Module	Unit Description
–	533-T022	WS1000 Shelf
594-T009	501-T009	1 TABS Host Port/1 TABS Pass-Through Port, 128 Discrete Inputs/16 Control Outputs
594-T010	501-T010	1 TABS Host Port With 202T Modem/1 TABS Pass-Through Port, 128 Discrete Inputs/16 Control Outputs
594-T011	501-T011	1 TABS Host Port/1 TABS Pass-Through Port, 64 Discrete Inputs/8 Control Outputs
594-T012	501-T012	1 TABS Host Port With 202T Modem/1 TABS Pass-Through Port, 64 Discrete Inputs/8 Control Outputs
594-T035	501-T035	1 TABS Host Port With RS-232 Board/1 TABS Pass-Through Port, 64 Discrete Inputs/8 Control Outputs
594-T036	501-T036	1 TABS Host Port With RS-232 Board/1 TABS Pass-Through Port, 128 Discrete Inputs/16 Control Outputs
594-T083	501-T083	1 TABS Host Port/1 TABS Pass-Through Port, 64 Discrete Inputs/8 Control Outputs With External Alarm Summary
594-T084	501-T084	1 TABS Host Port With 202T Modem/1 TABS Pass-Through Port, 64 Discrete Inputs/8 Control Outputs With External Alarm Summary
594-T085	501-T085	1 TABS Host Port/1 TABS Pass-Through Port, 128 Discrete Inputs/16 Control Outputs With External Alarm Summary
594-T086	501-T086	1 TABS Host Port With 202T Modem/1 TABS Pass-Through Port, 128 Discrete Inputs/16 Control Outputs With External Alarm Summary

1.5 Diagnostics and Configuration

WS1000 performs internal diagnostics each time it powers up. The front-panel Port 1 **RX** LED lights during the Programmable Read Only Memory (PROM) test, then the Port 1 **TX** LED lights during the RAM test. The **MPU RUN** LED lights only after all powerup diagnostics have successfully completed.

A DIP switch block on the front panel enables WS1000 configuration:

- DIP switch segment settings enable the unit to respond to any of the 32 available TABS addresses.
- The two serial ports can operate in RS-422 or RS-485 mode at 1,200 or 2,400 bps. When the WS1000 has an internal modem, Port 1 automatically configures to 1,200 bps. When configuring a WS1000 that is in a daisychain to another WS1000 unit equipped with a modem, configure serial port 2 for 1,200 bps.

- Another switch segment changes the last control output to an alarm summary indication if WS1000 is equipped with the alarm summary option (Table 1-1).
- Two additional switch segments select line terminations for each of the serial ports.

Installation contains more information on configuration switch settings.

1.6 Specifications

The following provides electrical, environmental, and mechanical specifications for the WS1000 and various interface specifications.

1.6.1 Power Requirements

A watchdog/power supply monitor circuit expedites powerup/power down situations and provides automatic initialize reset/restart capability. An external –24/–48 Vdc plug-in connection supplies power for the WS1000 Remote, which has its own integral switching power supply for onboard power requirements. The following are WS1000 system electrical specifications:

- Input voltage: –24 Vdc or –48 Vdc (–20 Vdc to –60 Vdc)
- Maximum external fusing: 0.75 Amps (–24 Vdc) or 0.5 Amps (-48 Vdc) Type 70 or GMT
- Idle power dissipation: 2.7 Watts (no input sense currents, no relays on)

The Westronic WS1000 Power Distribution Panel (PDP) can power several WS1000s (12 maximum) at the same location when necessary.

Table 1-2 lists the maximum module power requirements for the available configurations, with values based on all inputs at ground potential.

Table 1-2 Power Ratings for WS1000 TABS Configurations

Equipment Configuration (Max)	Power (Watts)
128 Inputs/16 Outputs	8.9
128 Inputs/16 Outputs/RS-232 Board	8.9
128 Inputs/16 Outputs/202T Modem	9.4
64 Inputs/8 Outputs	5.5
64 Inputs/8 Outputs/RS-232 Board	5.5
64 Inputs/8 Outputs/202T Modem	6.0

1.6.2 Environmental

- Ambient operating ambient temperature range: 0°C to +60°C
- Humidity: < 95% non-condensing.

1.6.3 Mechanical

The WS1000 uses compact mechanical packaging for rack- or MDF-mounting using a metal/plastic enclosure for support.

- Dimensions: 8.0" (20.3 cm) wide x 4.0" (10.2 cm) high x 5.0" (12.7 cm) deep – similar in construction to a traditional front-access wire-wrap distribution block. ***Installation*** has detailed information.
- Mounting: 19.0" (48.3 cm) or 23" (58.4 cm) rack mounting bar that can hold two units side-by-side (units can also flush mount to a board or other solid fixture)
- Weight: 4.8 lbs (2.2 kg) maximum
- Connectors:
  - **Power:** two-position, compression mating plug that accepts #14 AWG through #24 AWG wire (Westronic PN 640-T005, Phoenix Contact PN MSTB-1.5/2-ST-5.08)
  - **Wire wrap:** front-panel wire-wrap for discrete Input/Output (I/O) and TABS serial ports. Wire-wrap pins are 0.050 inches^2 (0.325 cm^2) with 0.190-inch (1.235 cm) spacing between pins. Pins accept #24 AWG or #26 AWG wire.

1.7 Interfaces

This section provides detailed data on each of the WS1000 interfaces. Included are detailed data for the parallel, serial, host port, and auxiliary interfaces.

A 32 x 10 wire-wrap terminal block on the front of WS1000 provides access for all discrete inputs/outputs, serial ports, and modem connections.

1.7.1 Discrete Interfaces

The WS1000 discrete inputs are referenced internally to the negative battery input. Essentially, the inputs are single lines whereby an Off condition exists when the input is open or tied to negative (–) battery. An On condition exists when the input is tied to positive battery (return or ground). If the source is a set of isolated contacts, positive battery (return/ground) connections are available on the WS1000 front for feeding one side of the contacts. Table 1-3 lists the discrete input logic levels.

Table 1-3 Discrete Input Logic Levels

Input Power	Logic Level	Voltage
–24 Vdc	0 (Off)	–15 Vdc through –30 Vdc or Open Circuit
	1 (On)	–8 Vdc through +5 Vdc
–48 Vdc	0 (Off)	–15 Vdc through –60 Vdc or Open Circuit
	1 (On)	–8 Vdc through +5 Vdc

Discrete logic outputs use Form A contacts and operate in momentary or latching mode. The mode is defined within the TABS control command. Each discrete output is a normally open Single-Pole, Single-Throw (SPST) isolated contact with both sides of the connection individually available to the user. To generate a control, the contacts close, presenting a closed loop to the far end. Ground connections are available on the WS1000 front panel as a convenience for applications where one side of the contacts needs a ground. The last control output can also serve as a summary alarm output indication through a front-panel DIP switch selection if the summary alarm option is installed. That is, reception of any alarm input generates a summary alarm output.

The following describes the discrete status/alarm inputs and control outputs.

Discrete Status/Alarm Inputs

- Number of inputs: 64 or 128
- Protection: sustain transient voltages (15 kV maximum)
- Ground: common ground for all inputs
- Current: 1.0 mA for each grounded input

Control Outputs

- Number of outputs: 8 or 16 relay control outputs. In units equipped with the Alarm Summary option (see Table 1-1), the last control output can be configured as an Alarm Summary (DIP switch Segment 6 in On position).
- Contact type: SPST normally open (Form A)
- Operation: momentary (300 ms) or latched (based upon TABS command)
- Contact ratings: 0.5 Amps at 60 Vdc or 0.3 Amps at 110Vdc; 30 Watts (maximum) switching power

1.7.2 Serial Ports

The following describes the serial ports: Port 1 (host port) and Port 2 (pass-through port).

Port 1 (Host Port)

- Protocol: TABS (one start bit, eight data bits, odd parity, one stop bit), 1,200/2,400 bps
- Physical interface/electrical level: RS-232, RS-422, RS-485, or 202T modem
- Protection: sustain transient voltages (15 kV maximum)
- Connection: front wire-wrap terminal block (see Section Installation Procedures)
- Optional internal modem (PN 535-T005, Rev A or B):
  - Type: 202T/CCITT V.23 compliant, 2-wire or 4-wire at 1,200 bps
  - Output amplification: –10 dBm default (+2.0 dBm maximum)
  - Receive sensitivity: –36 dBm default (–6 dBm to –48 dBm in 6-dBm steps)
- Optional internal modem (Part Number 535-T016):
  - Type: 202T/CCITT V.23 compliant, 2-wire or 4-wire at 1,200 bps

- Output amplification: –10 dBm default (+2.0 dBm maximum)
- Receive sensitivity: automatic select (–6 dBm to –48 dBm with input capable of being blocked during transmit using squelch)

■ Optional RS232 Conversion Board (PN 535-T007):

- If required by the application, serial Port 1 can be equipped with an optional RS-422-to-RS-232 conversion board. Serial Port 2 serves as a TABS data collection interface, allowing WS1000 to combine data from other WS1000 TABS remotes or local TABS-based Network Elements (NEs).

Port 2 (Pass-Through Port)

■ Protocol: TABS (one start bit, eight data bits, odd parity, one stop bit), 1,200/2,400 bps

■ Physical interface/electrical level:RS-422 or RS-485

■ Protection:sustain transient voltages (15 kV maximum)

■ Connection:front wire-wrap terminal block (see Section Installation Procedures)

1.8 Other Westronic Products

The following information briefly describes other Westronic products that are available to meet alarm system needs. Call **972-235-5292** to talk with a Westronic representative to learn more about these and other Westronic Systems communications products.

1.8.1 C1000

The C1000 provides an economical, flexible means of collecting small-to-large quantities (32 – 256 points) of discrete alarm and status data, which it converts into a simple, easily handled TABS or TBOS interface to complement many operation support systems.

Different versions of C1000 allow communications with a TABS or TBOS host. C1000 can pass through polls for other addresses, permitting C1000 units to form a daisychain for larger configurations and combining telemetry data from C1000 and local NEs into a single channel. In some cases, data is combined through a single modem.

The C1000 requires only one vertical unit (VU) or 1.75 inches in a 19- or 23-inch equipment rack, allowing location as close as possible to the source of discrete interfaces. This results in a large reduction in the wiring required to collect alarm and status data. A reduction in wiring eliminates the possibility of losing data through unknown disconnected,

moved, or cut wiring. Serial and discrete interfaces appear through standard 9-pin “D” subminiature and 50-pin connectors, making installation and replacement fast and simple.

The C1000 comes equipped with two serial ports: the host and expansion ports. The host port serves as a TABS or TBOS host communications interface that can be equipped with an optional RS-232 board or a 1,200-bps Bell 202T-compatible internal modem to allow locating C1000 beyond the range of standard RS-422/RS-485 interfaces. The expansion port serves as a TABS or TBOS data collection interface. The housing, used with all the different configurations, accommodates a maximum of eight 50-pin discrete interface connectors.

1.8.2 WS2000

The WS2000 product line offers data collection and reporting capabilities necessary to make small remote telemetry units more flexible and efficient. WS2000s combine compact design with power to configure multiple serial and discrete interfaces in virtually any arrangement to best serve the needs of the network. A single-rack-increment high unit fits within 19-inch or 23-inch racks. Other mountings are available.

A WS2000 can have the following equipment combinations:

- 4 or 8 serial ports with user-selectable RS-232, RS-422, and RS-485 interfaces at 1,200 and 2,400 bps
- 32 – 512 discrete alarm/status inputs and 8 – 128 discrete control outputs, expandable to 2,048 inputs and 512 outputs in some configurations
- 8 analog inputs (optional), expandable to 24 analog inputs
- Host port interface at RS-232, RS-422, and RS-485 at 1,200; 2,400; and 9,600 bps (an optional internal modem is available)

To support a broad range of equipment, the SmartScanner can incorporate many interface types:

- Asynchronous and synchronous serial
- Discrete inputs and outputs
- Analog and pulse inputs

Some of the many available serial protocol types include:

- HASP (ASCII)
- E-Telemetry (E2A format)
- MCS-11
- TABS
- TBOS

1.8.3 WS3000

The WS3000 is a powerful telemetry unit that combines the most useful functions of discrete and serial alarm collection, mediation, and access with a high-speed processor and large database capacity. The WS3000 is the ideal bridge between today's telemetry networks and the advanced protocols now appearing. With Ethernet asynchronous connectivity and database capacity of 30,000 data points, the WS3000 is the choice of quality telecommunications carriers. WS3000 features include the following:

- Optional ethernet interface
- Available solutions for remote alarm monitoring over TL1 ASCII TCP/IP ethernet, OSI ethernet, and asynchronous communications
- Data collection using TBOS, TABS, and TELTRAC protocols
- 9 serial ports supporting user-selectable RS-232/RS-422/RS-485 interfaces from 1,200 – 9,600 bps
- 32 – 512 discrete alarm/status inputs and 8 – 128 discrete control outputs with capability to support a maximum of 30,000 alarm points
- Custom protocols are available on a special assembly basis

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2 Installation

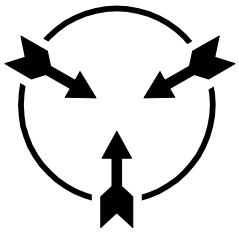
2.1 Overview

This section presents information on how to install, configure, and wire the WS1000 TABS remote. Initial discussion involves considerations/ precautions when handling Complementary Metal-Oxide Semiconductor (CMOS) and N-Channel Metal-Oxide Semiconductor (NMOS) integrated circuits and substituting modules. Following that are installation procedures for mounting the unit, setting straps for the internal modem and discrete Input/Output (I/O) expansion, and configuring the unit using the front-panel DIP switch. Concluding this section is the wiring required for the various configurations and options.

2.2 Handling Considerations and Precautions

WS1000 modules contain CMOS and NMOS integrated circuits, which maximize noise immunity and promote low-power consumption. However, they are also Electro-Static Discharge (ESD) sensitive and, therefore, some possibility exists that they can be damaged because of high static voltage levels. Although CMOS and NMOS devices are equipped with protection diodes, incorrect handling that allows excessive static energy to enter the devices can still cause device failure. These failures are not readily detected and, in time, can lead to premature device failure.

Become familiar with the ESD procedures that follow. Packaging containing CMOS and NMOS components have a label as shown in Figure 2-1.



Static Sensitive
Maintain Antistatic Protection

Figure 2-1 Electrostatic Discharge (ESD) Logo

Caution: Adhering to the following guidelines significantly reduces the possibility of electrostatic damage on CMOS or NMOS components, thus improving system reliability and keeping downtime to a minimum.

- Before removing or inserting WS1000 modules, always verify that they are not carrying static charges. Always wear a personal grounding device, such as an ESD heel or wrist strap.
- When extracting a WS1000 module, always place it in an antistatic bag or covering for transportation/storage.
- Perform repair work on WS1000 modules in an antistatic work station. All personnel performing repair work must be grounded through wrist straps and antistatic matting in the work station.
- Exercise extreme care when handling CMOS/NMOS components. Do not to touch the pins and always place components in antistatic foam for storage and transportation.
- Ensure that desoldering tools have static reduction. Some desoldering devices can actually generate large static voltages that damage CMOS and NMOS devices.

The housing and power ground protect the WS1000 plug-in module against 15-kV transients while it is in the housing.

2.3 Module Substitution

Note: Only qualified electronics service personnel should carry out actual WS1000 module repair. Unauthorized repair may void warranty. When returning a faulty module, describe the suspected problem, fault, or symptom on the documentation that accompanies the module.

The following are general procedures to follow when replacing or substituting WS1000 modules:

- Turn power off or unplug the front power connector when removing or inserting WS1000 modules. The boards are designed to withstand removal and insertion with power on, but a highly recommended practice is to remove the system power supply when substituting/replacing modules.
- Make sure the substitute board is of the same type (part number) and contains the same switch and jumper setting options. Failure to do so can cause module failure, point displacement because of incorrect board addresses, communication failure with the host, or other related failures.
- Make sure replacement modules mate properly with the connectors at the rear of the housing. Never force a board into position because this can damage rear connectors in the housing or on the module. Determine why the module does not easily plug into position and take appropriate action. To plug a module into position, firmly push with the thumbs on the lower portion of the

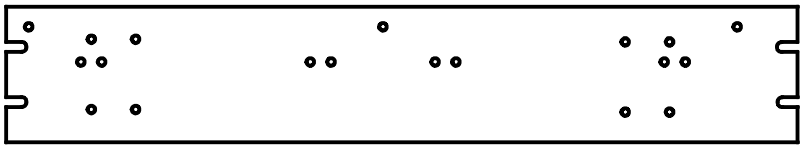
front. To remove a WS1000 module, simply pull forward on the ejection handle until the module snaps free from the housing.

2.4 Installation Procedures

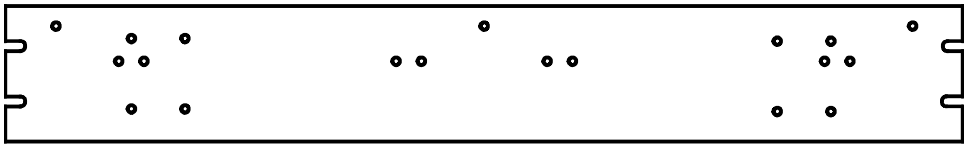
The following describes how to install WS1000 units into a permanent location.

2.4.1 Mounting the Unit

WS1000 mounts into a 19-inch (48.3 cm) or 23-inch (58.4 cm) equipment rack or can mount onto a distribution frame. Each WS1000 unit comes with a mounting bracket suitable for use with a rack-mount adapter panel or distribution frame. You can order the 19-inch and 23-inch rack-mount panels for equipment rack installation. Figure 2-2 is a template of the 19- and 23-inch panels.



A. 19-Inch Mounting Plate



B. 23-Inch Mounting Plate

Figure 2-2 19- and 23-inch Rack-Mount Panels

By design, the back edge of the WS1000 chassis slides down into the metal right-angle mounting bracket and snaps into place, securing it to the bracket.

The WS1000 unit requires a minimum of three rack-increment spaces (5.25 inches or 13.3 cm). Use five rack-increment spaces (8.75 inches or 22.2 cm), however, in situations requiring frequent removal of the WS1000 housing after it has been installed. The two extra rack increments (3.5 inches or 8.9 cm) allow the unit to slide up to disengage from the mounting bracket. A maximum of two units can mount side-by-side on any rack-mount panel.

2.4.2 Unit Inspection

Before powerup, remove the WS1000 plug-in module assembly and confirm that the internal modem or expansion boards (if any) are seated

properly. The factory has preset all option straps. To verify jumper options, refer to the tables and figures that immediately follow in Internal Option Straps.

2.4.3 Internal Option Straps

2.4.3.1 Main Board

Configure the WS1000 main board to meet your engineering specifications using the user-selectable option straps. Figure 2-3 shows the option strap locations on the main plug-in board and Table 2-1 provides the default option strap settings.

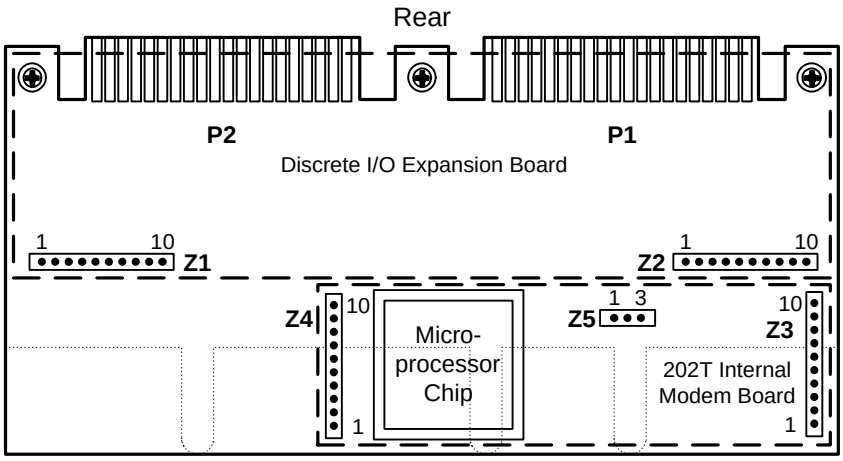


Figure 2-3 Main Board Jumper Block Locations

Table 2-1 Factory Default Strapping for WS1000 Main Board

Jumper	Pins	Function
Z1	1-2	Connect strap if discrete I/O expansion board is not installed. Remove strap before installing expansion board.
Z2	–	No strapping
Z3	1-2	Connect strap if an internal modem is not installed. Remove strap before installing modem board.
Z4	–	No strapping
Z5 (Note)	2-3 1-2	Connect to enable the watch-dog timer. Connect to disable the watch-dog timer.

Note: Z5 is present on printed circuit board Revisions 00 and 01 only.

2.4.3.2 202T Internal Modem PN 535-T005

The 202T internal modem comes in two varieties: PN 535-T005 and PN 535-T016. Figure 2-4 shows the modem board physical layout for Part Number 535-T005, Revisions A and B. Option straps on Revision A and B boards determine the communication type and sensitivity settings for the 202T internal modem. Modem sensitivity is set to –36 dBm at the factory. If your application requires a different sensitivity, set it 5 – 10 dBm below the input power level. For example, if the input power is –17 dBm, set the sensitivity to –24 dBm. Revision A boards have additional option straps to enable/disable analog and digital loopback connections. Table 2-2 shows option jumper settings for Revision A boards; Table 2-3 shows option jumper settings for Revision B boards.

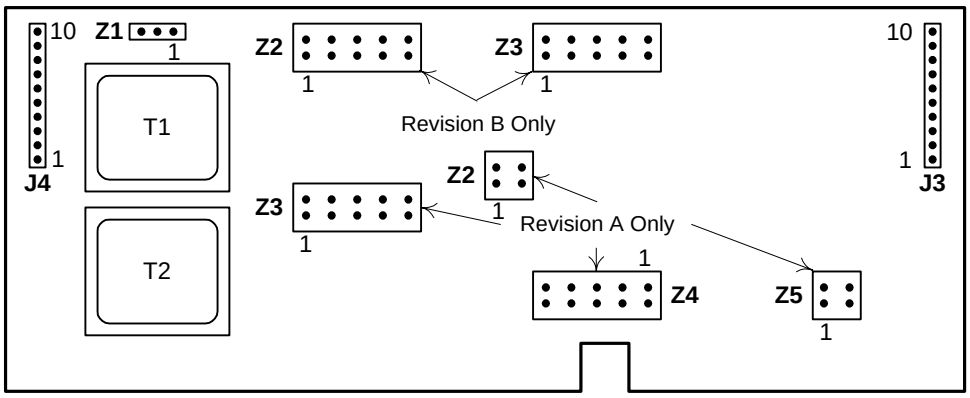


Figure 2-4 202T Internal Modem Board PN 535-T005 Layout

Table 2-2 202T Internal Modem PN 535-T005, Rev A, Strap Settings

Jumper	Strap Pins	Function
Z1	1-2	2-Wire, Half Duplex
	2-3 (Default)	4-Wire, Full Duplex
Z2	1-4, 2-3	Analog Loopback Disabled
	1-2, 3-4	Analog Loopback Enabled
Z3	1-10, 2-9, 3-8, 4-7, 5-6	–6 dBm Receiver Sensitivity
	5-6	–12 dBm Receiver Sensitivity
	4-7	–18 dBm Receiver Sensitivity
	3-8	–24 dBm Receiver Sensitivity
	2-9	–30 dBm Receiver Sensitivity
	1-10 (Default)	–36 dBm Receiver Sensitivity
	None	–42 dBm Receiver Sensitivity
Z4	1-10, 2-9, 3-8, 5-6	2-Wire, 202T
	1-10, 2-9, 3-8	2-Wire, 202T, Equalized
	1-10, 2-9, 5-6	2-Wire, V.23
	1-10, 2-9	2-Wire, V.23, Equalized
	2-9, 3-8, 5-6 (Default)	4-Wire, 202T
	2-9, 3-8	4-Wire, 202T, Equalized
	2-9, 5-6	4-Wire, V.23
	2-9	4-Wire, V.23, Equalized
	1-10, 2-9, 3-8, 4-7, 5-6	103 Orig
	1-10, 2-9, 3-8, 4-7	103 Ans
	1-10, 2-9, 4-7, 5-6	V.21 Orig
	1-10, 2-9, 4-7	V.21 Ans
Z5	1-4, 2-3 (Default)	Digital Loopback Disabled
	1-2, 3-4	Digital Loopback Enabled

Table 2-3 202T Internal Modem PN 535 T005-Rev B, Strap Settings

Jumper	Strap Pins	Function
Z1	1-2	2-Wire, Half Duplex
	2-3 (Default)	4-Wire, Full Duplex
Z2	1-10, 2-9, 3-8, 4-7, 5-6	–6 dBm Receiver Sensitivity
	5-6	–12 dBm Receiver Sensitivity
	4-7	–18 dBm Receiver Sensitivity
	3-8	–24 dBm Receiver Sensitivity
	2-9	–30 dBm Receiver Sensitivity
	1-10 (Default)	–36 dBm Receiver Sensitivity
	None	–42 dBm Receiver Sensitivity
Z3	1-10, 2-9, 3-8, 5-6	2-Wire, 202T
	1-10, 2-9, 3-8	2-Wire, 202T, Equalized
	1-10, 2-9, 5-6	2-Wire, V.23
	1-10, 2-9	2-Wire, V.23, Equalized
	2-9, 3-8, 5-6 (Default)	4-Wire, 202T
	2-9, 3-8	4-Wire, 202T, Equalized
	2-9, 5-6	4-Wire, V.23
	2-9	4-Wire, V.23, Equalized
	1-10, 2-9, 3-8, 4-7, 5-6	103 Orig

2.4.3.3 202T Internal Modem PN 535-T016

Internal modem PN 535-T016 (Figure 2-5) has only two strapping options: selecting 2-wire or 4-wire operating mode (jumper block Z1) and whether to enable squelch (jumper block Z2). This model automatically sets receiver sensitivity. Use Table 2-4, which indicates factory default settings, to configure the modem according to your local engineering requirements.

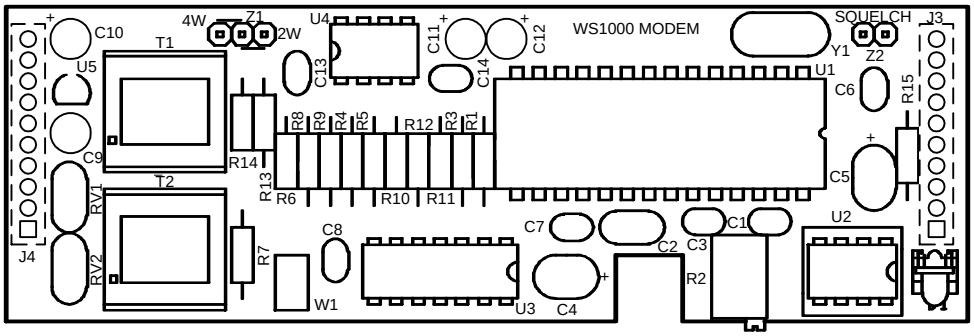


Figure 2-5 202T Internal Modem Board PN 535-T016 Layout

Table 2-4 202T Internal Modem PN 535-T016 Jumper Settings

Jumper	Strap Pins	Function
Z1	1-2 (Default)	4-Wire, Full Duplex
	2-3	2-Wire, Half Duplex
Z2	Installed	Squelch Enabled
	Not Installed (Default)	Squelch Disabled

The squelch jumper, when inserted, disables the receive line while the modem transmits. Install the jumper to enable squelch when operating in 2-wire mode.

In a TABS application, set front-panel DIP switch Segment 7 to Off (Automatic Carrier) when operating in 2-wire mode or when operating in 4-wire mode with squelch enabled.

The **Carrier Detect** LED illuminates whenever the modem detects a carrier. When operating in 2-wire mode, the LED blinks while the modem transmits because the modem detects its own carrier regardless of the squelch jumper (Z2) setting.

2.4.3.4 Internal RS-232 Board Straps

Connect Z1 Pins 1 and 2 together for constant carrier or Pins 2 and 3 together for automatic (switched) carrier.

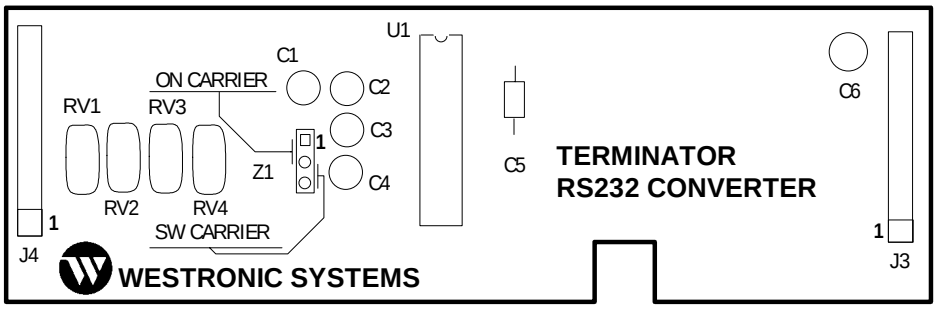


Figure 2-6 RS-232 Host Interface Board PN 535-T007 Layout

2.4.3.5 Discrete I/O Expansion Board Straps

The discrete I/O expansion board has no straps to set.

2.4.4 Installation Wiring

A decal inside the WS1000 front panel shows wiring information and switch settings for the specified WS1000 configuration. Make connections for discrete status inputs, control relay outputs, and serial port I/O on the wire-wrap interfaces. The Ground (GND) pins tie to ground internally. Each pin can hold two wrapped wires.

When connecting more than one WS1000 in RS-485 mode, make the connection through the wire-wrap terminals on the front of each WS1000 block. Designate one WS1000 to receive information from Port 1 of all other WS1000 units. A maximum of 32 WS1000 units can be bussed in this fashion. Refer to Figure 1-1, Figure 2-10, and Figure 2-11.

2.4.4.1 Discrete Status Inputs/Control Outputs

The following figures show the wire-wrap connections for the various WS1000 configurations:

- Figure 2-7 shows the pinouts on a WS1000 configured for 64 inputs and 8 outputs.
- Figure 2-8 shows the pinouts on a WS1000 configured for 128 inputs and 16 outputs.

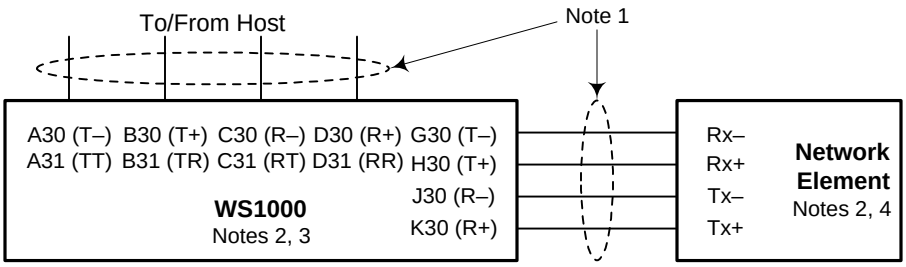
2.4.4.2 Serial Ports 1 and 2 System Interconnections

The following diagrams show the serial port connections for various standard configurations:

- External I/O (Figure 2-9)
- Multi-drop with digital I/O (Figure 2-10)
- Multi-drop with analog I/O to host (Figure 2-11)

Figure 2-7 Front Panel Wire-Wrap Points for 64-Input/8-Output WS1000

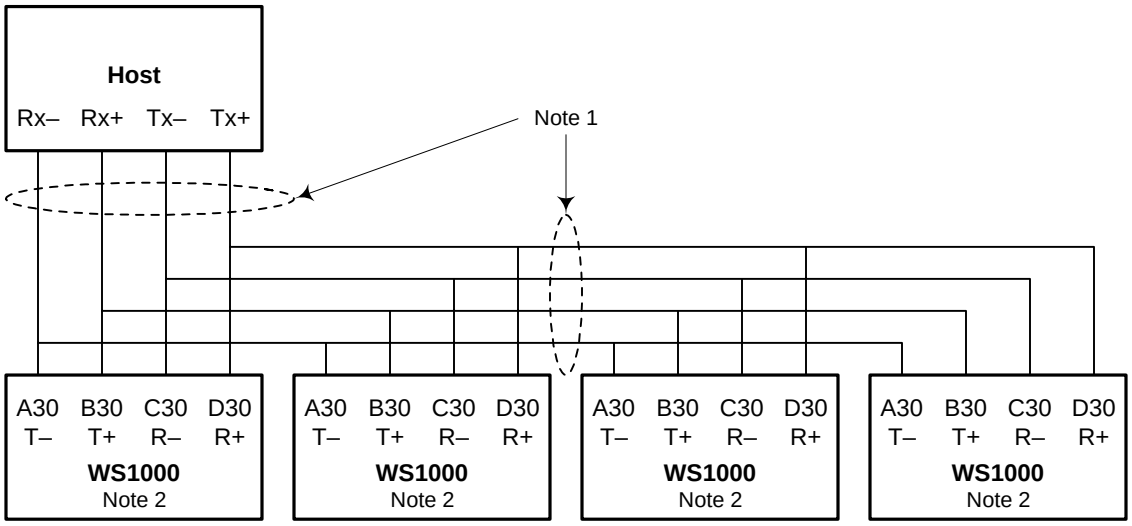
Figure 2-8 Front Panel Wire-Wrap Points for 128-Input/16-Output WS1000



Notes:

1. For digital connections, use standard 24/26 AWG twisted-pair solid wire for wire-wrap connections between WS1000s and TABS host system.
   Maximum distance is 4,000 feet (1,219 meters) shielded cable or 1,000 feet (305 meters) unshielded cable.
   For analog connections, use standard 24/26 AWG quad wire between WS1000 and data line facilities.
2. WS1000 and network elements require different addresses/display numbers.
3. This WS1000 is the initial unit for communicating with a TABS host.
   If the host is collocated with the initial WS1000 (< 4,000 feet or 1,219 meters), use the digital I/O pin assignments: A30, B30, C30, and D30.
   If the host is remotely located from the initial WS1000, use the 202T modem connection and the analog I/O pin assignments: A31, B31, C31, and D31.
4. Alarm and control I/O is accomplished using the network element TABS connection.

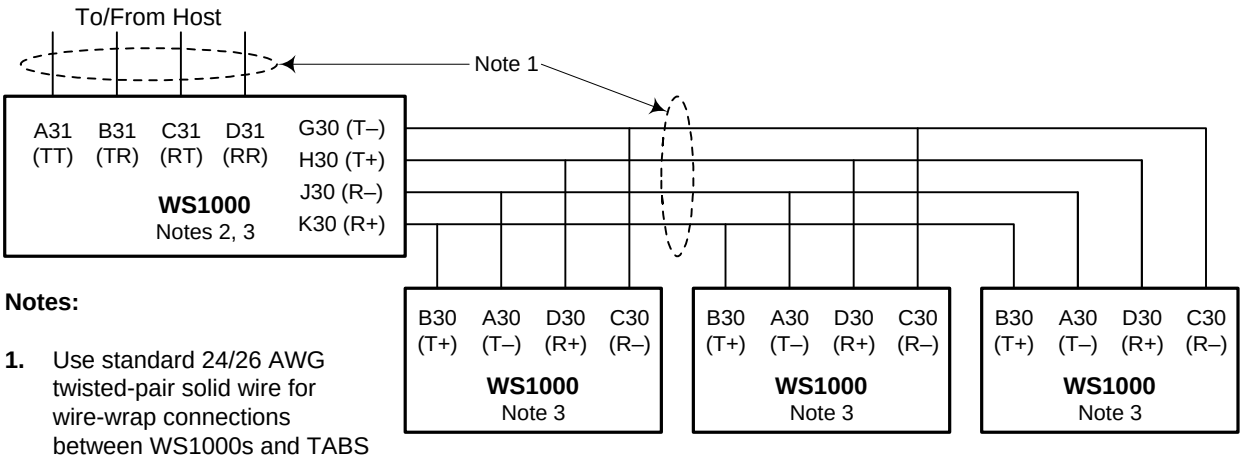
Figure 2-9 External Input/Output



Notes:

1. Use standard 24/26 AWG twisted-pair solid wire for wire-wrap connections between WS1000s and TABS host system. Maximum distance is 4,000 feet (1,219 meters) with shielded cable or 1,000 feet (305 meters) with unshielded cable.
2. A maximum of 32 WS1000s can interconnect together.

Figure 2-10 Multi-Drop With Digital Input/Output



Notes:

1. Use standard 24/26 AWG twisted-pair solid wire for wire-wrap connections between WS1000s and TABS host system.
   Maximum distance is 4,000 feet (1,219 meters) shielded cable or 1,000 feet (305 meters) unshielded cable.
2. This WS1000 is the initial unit for communicating with a TABS host. If the host is collocated with the initial WS1000 (< 4,000 feet or 1,219 meters), use the digital I/O pin assignments: A30, B30, C30, and D30.
   If the host is remotely located from the initial WS1000, use the 202T modem connection and the analog I/O pin assignments: A31, B31, C31, and D31.
3. A maximum of 32 WS1000s can interconnect together. In this instance, only the initial WS1000 is equipped with a modem.

Figure 2-11 Multi-Drop With Analog I/O to Host

2.4.5 Input Power Connections

Provide power from a power distribution panel, such as the Westronic Power Distribution Block (PN 560-T008) shown in Figure 2-12, using #14 – #24 AWG wire for the power and ground leads. The input voltage range is –20 Vdc to –60 Vdc for nominal –24/–48 Vdc operation. Remove the power fuse before inserting or removing the plug-in power connector on the unit front.

The following apply to the Power Distibution Panel (PDP):

- The PDP uses wire-wrap pins laid out in columns. All pins in each column connect together on the back of the PDP.
- If input power is applied on Pin A of any column, for example, the other four pins (B – E) of that column then become outputs. Total power-feed capacity of a single PDP is 12 WS1000s.
- If more than four WS1000s receive power through the panel, use #14 – #22 AWG solid wire to jumper the top row (Pins A) together, observing column polarity as shown in Figure 2-12.
- Fuse the PDP power input. The input voltage and the number of powered WS1000s determine the fuse value. Use GMT or Type 70 fuses of the value shown in Table 2-5:

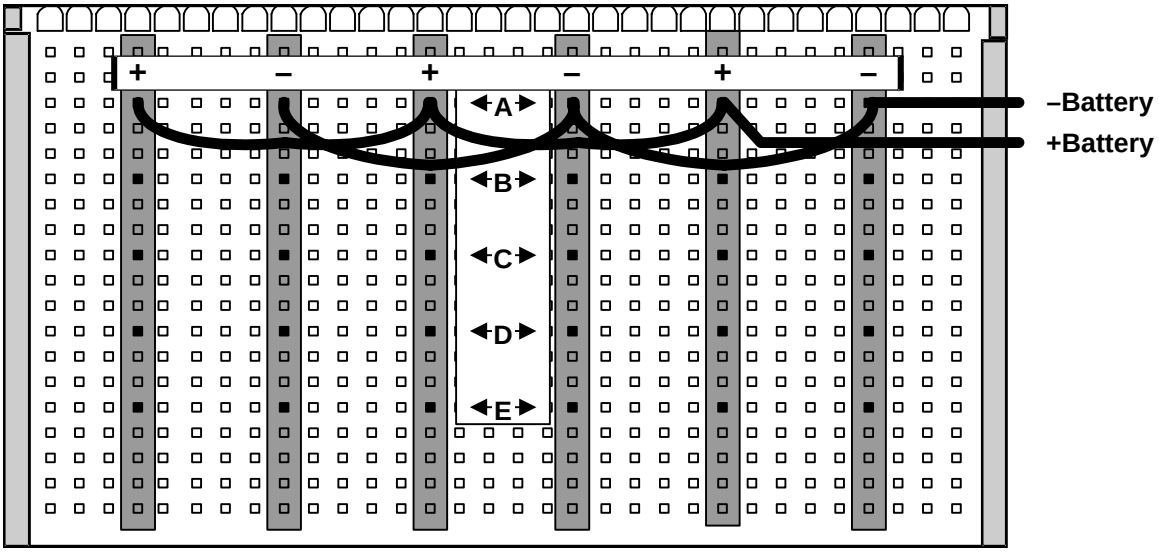


Figure 2-12 Power Distribution Panel I/O

Table 2-5 Power Distribution Panel Fuse Requirements

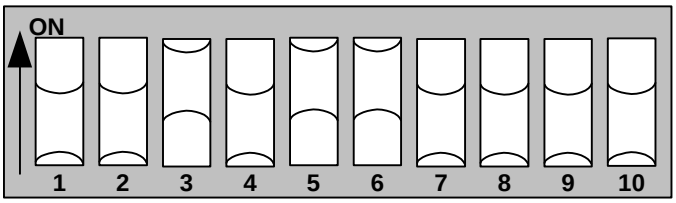
Number of WS1000s	–48 Vdc		–24 Vdc	
	GMT	Type 70	GMT	Type 70
1	0.5 A	0.5 A	0.75 A	0.75 A
2	0.75 A	0.75 A	1.3 A	1.3 A
3	1.0 A	1.0 A	2.0 A	2.0 A
4	1.3 A	1.3 A	2.5 A	2.0 A
5	2.0 A	2.0 A	3.0 A	3.0 A
6	2.0 A	2.0 A	3.5 A	5.0 A
7	2.0 A	2.0 A	4.0 A	5.0 A
8	2.5 A	2.0 A	5.0 A	5.0 A
9	2.5 A	3.0 A	5.0 A	5.0 A
10	3.0 A	3.0 A	5.0 A	6.0 A
11	3.0 A	5.0 A	6.0 A	6.0 A
12	3.5 A	5.0 A	6.0 A	6.0 A

To power WS1000 up, install the appropriate fuse at the panel using Table 2-5 as reference. After power is applied, the front-panel **MPU RUN** LED lights and remains lit.

The WS1000 TABS unit is now ready for configuration according to site requirements.

2.5 WS1000 Unit Configuration

Configure each WS1000 unit using the front-panel DIP switch (see Figure 2-13). WS1000 has just one 10-segment switch block.



1 – 5 TABS Address Number (see Table 2-6)
6 Alarm Summary Interface (If Installed); Otherwise, Serial Port Interface
7 Serial Port Interface (Alarm Summary Installed, No Internal Modem); Carrier Select (No Alarm Summary, Internal Modem Installed); No Effect if Using RS-232
8 Port 1/Port 2 Interface Data Rate (No Internal Modem); No Effect With Internal Modem Installed
9 Port 1 Balanced Line Termination (No Internal Modem Installed)
10 Port 2 Balanced Line Termination

Figure 2-13 DIP Switch Segments 1 Through 10

TABS has the ability to address a particular remote (in this case, WS1000) using a number ranging from 0 through 31. The TABS address scheme, known as the Monitored Equipment Frame Address (MEFA), allows a maximum of 32 WS1000 TABS slaves to connect through a single serial channel to a single master. Because each WS1000 unit has a particular address, the master uses the TABS message address field to identify which WS1000 slave is to accept/ respond to a TABS command. Only the slave addressed in the command transmits a corresponding response message.

Monitored equipment contain one or more displays, depending on the number of defined scan and control points. TABS supports a maximum of 65,535 displays for each TABS address. The TABS input display is known as Monitored Equipment Display Number (MEDN). WS1000 display numbers are fixed and cannot be changed. A WS1000 equipped with fewer than 64 discrete inputs has Display 0 while a WS1000 with more than 64 discretes has Displays 0 and 1.

2.5.1 TABS Address Number (Switch Segments 1 – 5)

The factory default switch settings are all switch segments Off. Setting a segment in the On position enables the secondary function. Switch segments S1 through S5 (Table 2-6) set the TABS address number that the unit responds to on TABS Port 1.

Table 2-6 S1 – S5, DIP Switch Segment Settings for TABS Address Number

Add	S1-1	S1-2	S1-3	S1-4	S1-5	Add	S1-1	S1-2	S1-3	S1-4	S1-5
0	↓	↓	↓	↓	↓	16	↑	↓	↓	↓	↓

Table 2-6 S1 – S5, DIP Switch Segment Settings for TABS Address Number

Add	S1-1	S1-2	S1-3	S1-4	S1-5	Add	S1-1	S1-2	S1-3	S1-4	S1-5
1	↓	↓	↓	↓	↑	17	↑	↓	↓	↓	↑
2	↓	↓	↓	↑	↓	18	↑	↓	↓	↑	↓
3	↓	↓	↓	↑	↑	19	↑	↓	↓	↑	↑
4	↓	↓	↑	↓	↓	20	↑	↓	↑	↓	↓
5	↓	↓	↑	↓	↑	21	↑	↓	↑	↓	↑
6	↓	↓	↑	↑	↓	22	↑	↓	↑	↑	↓
7	↓	↓	↑	↑	↑	23	↑	↓	↑	↑	↑
8	↓	↑	↓	↓	↓	24	↑	↑	↓	↓	↓
9	↓	↑	↓	↓	↑	25	↑	↑	↓	↓	↑
10	↓	↑	↓	↑	↓	26	↑	↑	↓	↑	↓
11	↓	↑	↓	↑	↑	27	↑	↑	↓	↑	↑
12	↓	↑	↑	↓	↓	28	↑	↑	↑	↓	↓
13	↓	↑	↑	↓	↑	29	↑	↑	↑	↓	↑
14	↓	↑	↑	↑	↓	30	↑	↑	↑	↑	↓
15	↓	↑	↑	↑	↑	31	↑	↑	↑	↑	↑

2.5.2 Alarm Summary (Segment 6) and Serial Port (Segment7) Interfaces

The operation of Segments 6 and 7 depend on whether WS1000 has the alarm summary option (TABLE), which is discussed more fully in Universal Annunciator Panel Option.

WS1000 Has the Alarm Summary Option

- Segment 6 On makes the last installed control output serve as an alarm summary output.
- Segment 6 Off does not change the last control output (it remains a standard control output).
- Segment 7, on units without an internal modem, sets the electrical interface for TABS serial Port 1 to either RS-422 or RS-485 operation:
  - On sets Port 1 for RS-485 operation.
  - Off sets Port 1 for RS-422 operation.
- Segment 7, on units equipped with an internal modem, selects the carrier operation:
  - On sets the modem for Constant Carrier.

- Off sets the modem for Auto Carrier.

- Segment 7 has no effect if WS1000 uses an RS-232 interface.

WS1000 Does Not Have the Optional Alarm Summary Option

- Segment 6 On sets Port 1 to RS-485 operation.
- Segment 6 Off sets Port 1 to RS-422 operation.
- Segment 7, on units equipped with an internal modem, selects the carrier operation:
  - On sets the modem for Constant Carrier.
  - Off sets the modem for Auto Carrier.
- Segment 7 has no effect if WS1000 is not equipped with an internal modem or uses an RS-232 interface.

2.5.3 Serial Port Interface Data Rate (Segment 8)

Segment 8 selects the data rate for Port 1 and Port 2 when WS1000 does not use an internal modem:

- Segment 8 On sets the data rate to 1,200 bps.
- Segment 8 Off sets the data rate to 2,400 bps.
- Segment 8 has no effect in WS1000 units equipped with an internal modem.

2.5.4 Port 1 Line Termination (Segment 9)

Segment 9 sets the balanced line termination for TABS serial Port 1 when WS1000 has no internal modem:

- Segment 9 On sets a 180-ohm termination for the following conditions:
  - Serial Port 1 connects in a point-to-point connection link (RS-422).
  - Serial Port 1 connects at the end of a multipoint connection link (RS-485).
- Segment 9 Off sets an open termination if Port 1 connects in the middle of a multipoint connection link (RS-485).

2.5.5 Port 2 Line Termination (Segment 10)

Segment 10 sets the balanced line termination for TABS serial Port 2:

- Segment 10 On sets a 180-ohm termination when serial Port 2 connects using an RS-422 link or terminates one end of an RS-485 bus.
- Segment 10 Off sets an open termination.

2.6 Universal Annunciator Panel Option

The Universal Annunciator Panel provides simultaneous audible and visual notification of alarms reported by a combination of a maximum eight Westronic Remote Telemetry Units (RTUs), such as C1000, WS1000, WS2000, and WS3000. The panel is equipped with an audible annunciator, power LED, audible alarm disable switch, lamp test button, alarm cutoff button, and eight individual alarm LEDs. You can use the panel with the following WS1000 Part Numbers:

- 594-T083
- 594-T084
- 594-T085
- 594-T086

2.6.1 Mounting

The Universal Annunciator Panel is one Vertical Unit (VU) or 1.75 inches high and mounts in a standard 19- or 23-inch (using included adapters) communications rack. The panel mounts flush with the rack or has a front extension by positioning the mounting ears toward the front or rear.

2.6.2 Electrical Connections

The panel connects to the last control relay output (8, 16, 24, or 40) of the WS1000 to provide both audible and visual standing summary alarm indications. Set WS1000 front-panel DIP switch Segment 6 to On to disable the last control output and enable the summary alarm output (see *Alarm Summary (Segment 6) and Serial Port (Segment7) Interfaces* on Page 2-16 for more details on all the DIP switch settings.
Figure 2-14 shows the locations of all front-panel controls and indicators and rear-panel connectors.

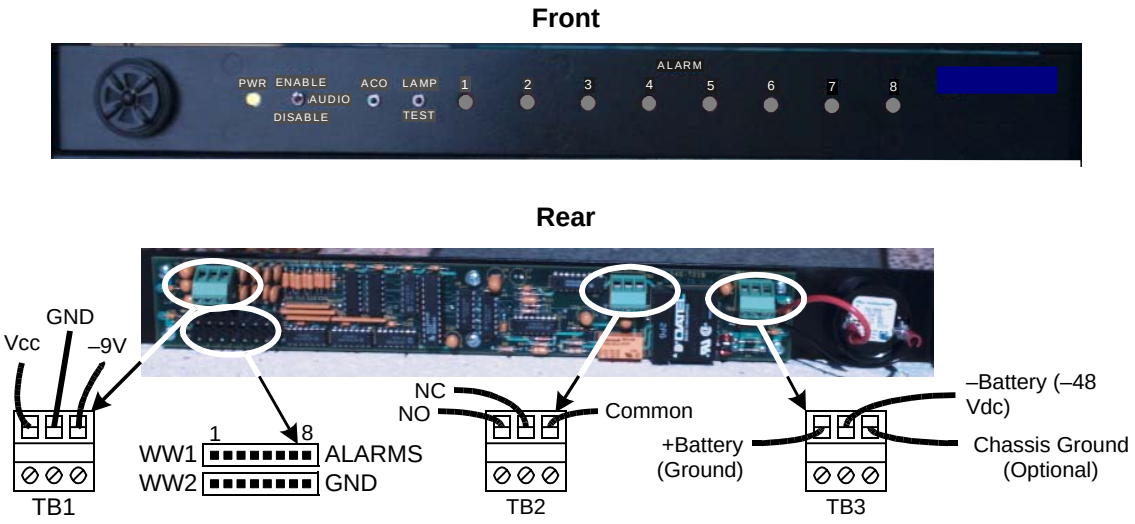


Figure 2-14 Optional Universal Annunciator Panel, Front and Rear Panels

Caution: Exercise caution when making wiring connections to the rear of the annunciator panel. Small bits of wire or other debris can fall into units mounted lower in the equipment rack. Westronic is not responsible for damage caused by debris falling into this or other equipment.

TB1 is reserved for future expansion.

TB2 is an alarm summary output (normally open/normally closed contacts and common) for use with an external unit. **TB2** output, rated at 2 Amps (24 Watts maximum) switching, provides an alarm output any time the audible alarm activates.

Input power (–20 Vdc to –72 Vdc) connects to **TB3**. Pin 1 is +Batt, Pin 2 is –Batt, and Pin 3 is chassis ground.

Make alarm input connections at connectors **WW1** (**ALARMS**) and **WW2** (**GND**). Table 2-7 shows the input connections. For example, a possible connection for a WS1000 with 8 control outputs is as follows:

WS1000 Pin E13 (C8) to alarm panel connector **WW1** Pin 2 (**ALARMS**) to light **ALARM 2** LED

WS1000 Pin F13 (C8R) to alarm panel connector **WW2** Pin 2 (**GND**) to light **ALARM 2** LED

A WS1000 with 16 control outputs can possibly connect as follows:

WS1000 Pin A16 (C16) to alarm panel connector **WW1** Pin 5 (**ALARMS**) to light **ALARM 5** LED

WS1000 Pin B16 (C16R) to alarm panel connector **WW2** Pin 5 (**GND**) to light **ALARM 5** LED

Table 2-7 Summary Alarm Input Connections

Connector	Front Panel ALARM LED							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
WW1 Pin (**ALARMS**)	1	2	3	4	5	6	7	8
WW2 Pin (**GND**)	1	2	3	4	5	6	7	8

2.6.3 Operation

The **PWR** LED lights green when power is properly applied and lights red when the power leads are reversed. Verify that **PWR** is green when applying power. Press the **LAMP TEST** pushbutton to test all LEDs.

When the annunciator panel receives a relay closure (alarm) from the WS1000, the appropriate front panel **ALARM** LED lights red and the audible alarm sounds. The alarm output is available at **TB2** as normally open, normally closed, and common points. You can use the alarm output to indicate an alarm to another unit, such as an end-of-rack indicator. The audible alarm sounds until disabled by the audible alarm timer (available on units delivered after August, 1998), the alarm cutoff (**ACO**) button is pressed, or the alarm input clears. The alarm does not sound again until receipt of another alarm input. The **ALARM** LED remains lit until the alarm input is removed.

Moving the **AUDIO** switch to the down position (**DISABLE**) disables the audible alarm until returned to the up position (**ENABLE**) and has no other effect on panel operation, including the alarm output at **TB2**.

2.7 Installation Check List

Use the following check list when installing WS1000 hardware:

- Mount the unit
- Verify default strapping:
  - Main board
  - Modem board
  - RS-232 board
- Cable the unit:
  - Verify serial port connections (DTE/DCE or DTE/DTE)
  - Verify discrete connections
- Set the front-panel DIP switch segments in accordance with *WS1000 Unit Configuration.*

3 Maintenance

3.1 WS1000 Startup Tests

During WS1000 powerup, WS1000 runs a series of diagnostic tests, such as a Random Access Memory (RAM) test and a Programmable Read Only Memory (PROM) checksum test, to verify microprocessor integrity. While the MPU **RUN** LED is off during startup, the front-panel receive and transmit LEDs for both serial ports help determine failed startup tests. Port 1 **RX** LED indicates testing in progress for the PROM checksum and Port 1 **TX** LED indicates testing in progress for RAM integrity. Initially, the appropriate LED illuminates on each test. If all tests pass, Port 1 **RX** or **TX** LEDs turn off (providing the serial ports are not terminated) and the **MPU RUN** LED on the unit front lights and remains lit as long as WS1000 has power.

3.1.1 PROM Checksum and RAM Failure

Port 1 RX LED remaining lit after the **MPU RUN** LED lights indicates that the actual calculated checksum does not agree with the embedded firmware checksum.

Port 1 TX LED remaining lit after the **MPU RUN** LED lights indicates a fatal RAM failure, which in turn causes the MPU to disable unit operation.

The RAM and PROM reside within the microprocessor chip on the main board and are not repairable in the field. Remove the main board from the housing and make sure that the microprocessor chip is seated securely in its socket. If the chip appears to be securely in place, contact the factory for a Return Material Authorization (RMA) number to begin the repair process.

3.2 WS1000 Serial Port Failures

The unit serial ports communicate using TABS protocol and require 4-wire interconnection for proper RS-422 or RS-485 operation. Each unit serial port has a receive and transmit LED to indicate data activity. Table 3-1 through Table 3-3 refer to possible error indications derived from the LEDs. Each table has an associated figure to illustrate the connection. Table 3-4 describes the notes listed in the **Trouble Notes** columns.

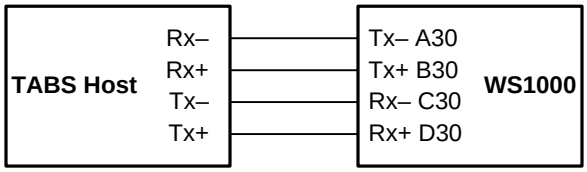


Figure 3-1 Single WS1000 Connection to a TABS Host System (RS-422 or 202T)

Table 3-1 Single WS1000 Connection to a TABS Host System (RS-422 or 202T)

Host Bit 64	MPU Run LED	Port 1 (Host)		Port 2 (Pass-Through)		Trouble Notes (See Table 3-4)
		RX LED	TX LED	RX LED	TX LED	
0	On	Flash	Flash	–	–	1
1	Off	No Flash	No Flash	–	–	2
1	On	No Flash	No Flash	–	–	3, 6, 10, 13, 20
1	On	Flash	No Flash	–	–	3, 6, 10, 13, 20, 21
1	On	Flash	No Flash	–	–	5, 9, 15, 18, 19

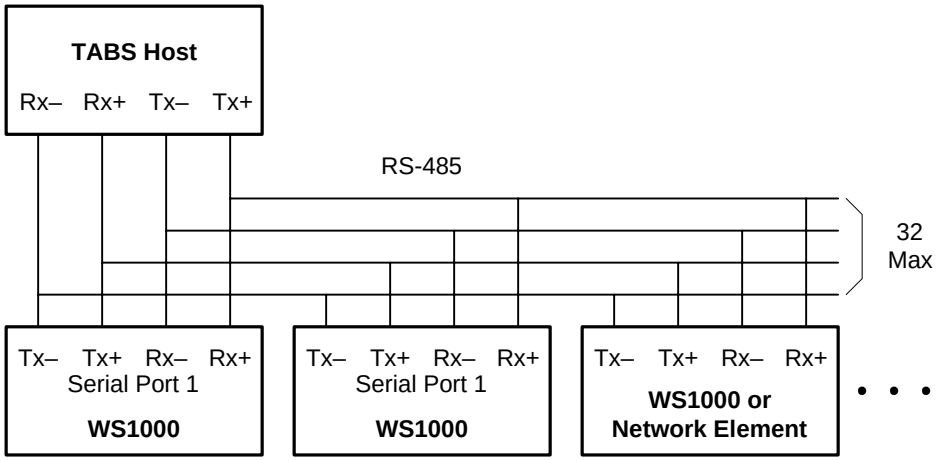


Figure 3-2 Multiple WS1000s With RS-485 Connection to a TABS Host System

Table 3-2 Multiple WS1000s With RS-485 Connection to a TABS Host System

Host Bit 64	MPU Run LED	Port 1 (Host)		Port 2 (Pass-Through)		Trouble Notes (See Table 3-4)
		RX LED	TX LED	RX LED	TX LED	
0	On	Flash	Flash	–	Flash	1
1	Off	No Flash	No Flash	–	–	2
1	On	No Flash	No Flash	–	No Flash	3, 6, 10, 13, 20
1	On	Flash	No Flash	–	Flash	3, 6, 10, 13, 21
1	On	Flash	Flash	–	Flash	5, 9, 15, 16, 18, 19, 21

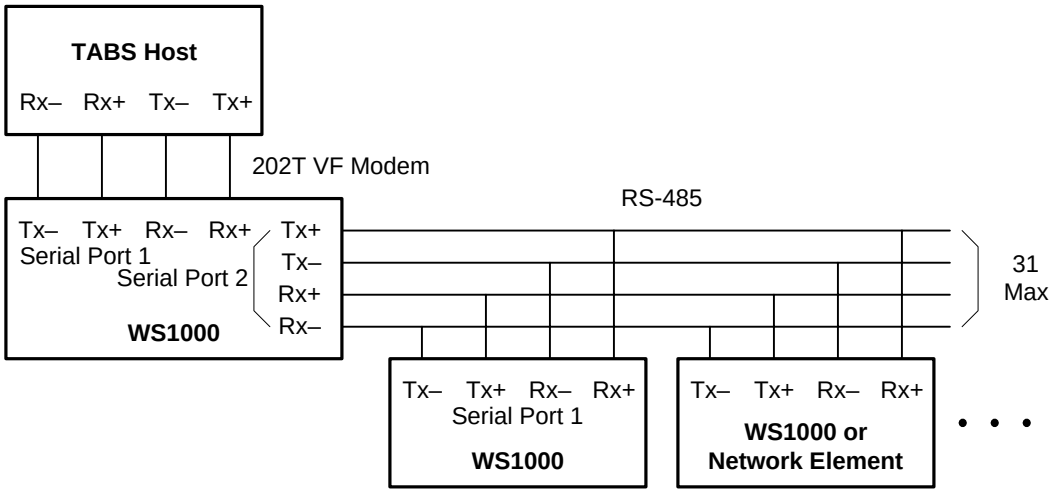


Figure 3-3 Multiple WS1000s/Network Element With RS-485 Connection to a Single WS1000 Having a 202T VF-Modem Connection to the TABS Host System

Table 3-3 Multiple WS1000s/Network Element With RS-485 Connection to a Single WS1000 Having a 202T VF-Modem Connection to the TABS Host System

Host Bit 64	MPU Run LED	Port 1 (Host)		Port 2 (Pass-Through)		Trouble Notes (See Table 3-4)
		RX LED	TX LED	RX LED	TX LED	
0	On	Flash	Flash	Flash	Flash	1
1	Off	No Flash	No Flash	No Flash	No Flash	2
1	On	No Flash	No Flash	No Flash	No Flash	3, 6, 10, 13, 20
1	On	Flash	Flash	No Flash	Flash	4, 5, 9, 15, 18, 19
1	On	Flash	No Flash	Flash	Flash	8, 9, 12, 14, 17
1	On	Flash	No Flash	No Flash	Flash	3, 4, 6, 7, 8, 10, 11, 12, 13, 14, 16, 17, 20, 21
1	On	Flash	Flash	Flash	Flash	5, 8, 9, 12, 14, 16, 17, 18, 19, 21

3.2.1 Trouble Conditions

Table 3-4 provides descriptions and possible causes for failures indicated in the **Trouble Notes** columns of Table 3-1 through Table 3-3.

Table 3-4 WS1000 TABS Probable Trouble Conditions

Note	Description	Check/Fix
1	Normal	N/A
2	MPU RUN LED off, no power	Check for blown or missing fuse, open power wire, or reversed ± conditions

Table 3-4 WS1000 TABS Probable Trouble Conditions

Note	Description	Check/Fix
3	Reversed Serial Port 1 Tx and Rx data lines	Check for crossed connections; swap data lines on serial port if necessary
4	Reversed Serial Port 2 Tx and Rx data lines	Check for crossed connections; swap data lines on serial port if necessary
5	Reversed Serial Port 1 Tx+ and Tx– data lines	Check for crossed connections; swap data lines on serial port Tx pins if necessary
6	Reversed Serial Port 1 Rx+ and Rx– data lines	Check for crossed connections; swap data lines on serial port Rx pins if necessary
7	Reversed Serial Port 2 Tx+ and Tx– data lines	Check for crossed connections; swap data lines on serial port Tx pins if necessary
8	Reversed Serial Port 2 Rx+ and Rx– data lines	Check for crossed connections; swap data lines on serial port Rx pins if necessary
9	Inoperative Serial Port 1 transmit driver	Replace WS1000
10	Inoperative Serial Port 1 receive circuitry	Replace WS1000
11	Inoperative Serial Port 2 transmit driver	Replace WS1000
12	Inoperative Serial Port 2 receive circuitry	Replace WS1000
13	Serial Port 1 receive termination DIP switch segment 9 in wrong position	Set DIP switch segment 9 to opposite setting
14	Serial Port 2 receive termination DIP switch segment 10 in wrong position	Set DIP switch segment 10 to opposite setting
15	Serial Port 1 RS-422/RS-485 DIP switch segment 6 in wrong position	Set DIP switch segment 6 to opposite setting
16	Inoperative receive circuitry on downstream WS1000 or network element	Check downstream WS1000 or network element
17	Inoperative transmit driver on downstream WS1000 or network element	Check downstream WS1000 or network element
18	Inoperative receive circuitry on TABS host system	Check TABS host system for proper operation
19	202T modem transmit level is out of adjustment	Set transmit output of 202T modem to proper level
20	202T modem receive sensitivity is out of adjustment	Set receive input sensitivity to proper level
21	TABS address DIP switches set to wrong address number	Set address DIP switches to correct address number

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