Westronic

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WS2000 WACP

994-T025 Rev C
August, 2001

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.

Tel: 972-235-5292 | **Fax:** 972-235-5299 | **Order Fax:** 972-235-8058
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Westronic Systems, Inc.
a Mediation Technology company

1850 N. Greenville Ave., Suite 184 | Richardson, TX 75081 USA

Revision History

Rev Level	Issue Date	Reason for Reissue
	March, 1993	First Release
A	May, 1996	Word Format Changes
B	January, 2000	Convert to FrameMaker, Format Changes, Correct Document Errors
C	August, 2001	Convert from FrameMaker to Word, Logo Update

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1 Product Description

1.1 Overview

The WS2000 with Westronic Asynchronous Control Protocol (WACP), shown in Figure 1-1, collects alarm and status information from Network Elements (NEs) and equipment equipped with Telemetry Byte-Oriented Serial (TBOS) protocols and discrete telemetry interfaces. The WS2000 then reports the information to the Operations System (OS) using WACP protocol when polled by the host over a direct or modem connection.

Figure 1-1 WS2000 WACP

The TBOS interfaces can be equipped with internal and external 202T modems, allowing distances greater than 4,000 feet between the WS2000 and the monitored NEs or between the WS2000 and its host. Because of its ability to combine multiple TBOS serial ports and discrete I/O logic into one WACP serial output, the WS2000:

- Provides low-cost monitoring and control features at customer premises or controlled environment vault sites
- Conserves the number of serial ports used on main data collection units
- Extends the range of network coverage

The WS2000 provides a compact mechanical package for rack mounting using a metal enclosure for shielding and support.

A power supply/watchdog monitor circuit aids power up/power down situations and provides automatic reset/restart capability. Also, the monitor circuit has a microprocessor unit LED indication (**MPU RUN**) along with a relay output contact, and presents event Change-of-State (COS) conditions through the **COS** LED and a relay output that can be fed to an external alarm panel. A **COS RESET** front-panel pushbutton provides local reset for COS, which can also be reset externally through a rear-panel connection.

Nominal –24 Vdc or –48 Vdc sources supply power for the WS2000, which has its own integral power supply to meet onboard logic supply requirements.

Terminal block access for site input battery power connections, 4-wire modem lines, and MPU RUN and COS output contacts is available at

the rear of the shelf. Port access for 10 serial channels is available on 8-pin connectors at the rear of the unit. Discrete input/output logic point access is available on 2 rear-accessible, 50-position, Delta-type connectors.

Besides the WACP host channel, the WS2000 (Figure 1-2) is equipped with 8 TBOS serial collection channels, 32 discrete inputs, and 8 control outputs. Each expansion daughter board allows an additional 32 discrete inputs and 8 control outputs.

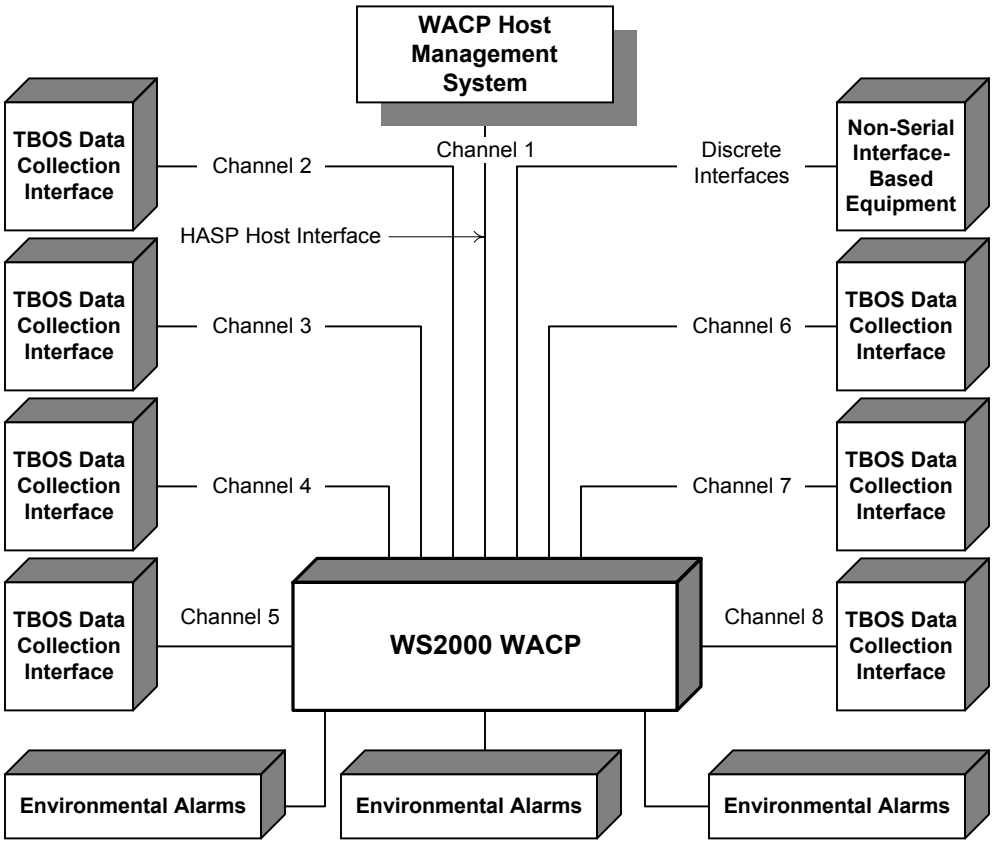


Figure 1-2 Overview of WS2000 Capabilities

The serial interfaces include Channel 0 for Craft maintenance and configuration and Channel 1 for reporting WACP data to the host. Serial Channels 2 – 5 are configured for TBOS data collection using RS-232, RS-422, or RS-485 interfaces. Optional Channels 6 – 9, activated with the addition of an internally mounted daughter board, are only capable of TBOS data collection using RS-422 interfaces.

Other daughter board options add the following combinations:

- 32 alarm/status inputs and 8 control outputs
- 202T modem (2/4-wire voice frequency) interface for Channel 1 reporting

1.2 WS2000 Configurations

Table 1-1 lists part numbers for ordering the WS2000 WACP, accessories, and spares.

Table 1-1 WS2000 WACP Equipment Part Numbers

WS2000

Part No	Plugin	Description	Serial Ports	Discrete I/O		Modem Type
				Input	Output	
590-T098	500-T119	WACP	4 TBOS	32	8	–
590-T099	500-T126	WACP	4 TBOS	32	8	202T
590-T260	500-T127	WACP	4 TBOS	64	16	–
590-T261	500-T228	WACP	4 TBOS	64	16	202T
590-T268	500-T129	WACP	8 TBOS	32	8	–
590-T269	500-T130	WACP	8 TBOS	32	8	202T
590-T270	500-T131	WACP	8 TBOS	64	16	–
590-T271	500-T132	WACP	8 TBOS	64	16	202T
Accessories						
590-0106	500-2006	Discrete Expander		32	8	–
590-0074	500-2004	Discrete Expander		64	16	–
519-0300	–	Portable Wesmaint		–	–	–
519-T001	–	Rack-Mount Wesmaint		–	–	–
567-T007	–	PC Wesmaint Software		–	–	–
533-T030	–	19-inch Telzon Wire-Wrap Block		64	16	–
533-T011	–	23-inch Telzon Wire-Wrap Block		64	16	–
533-T032	–	Front-Access Wire-Wrap Interface Assy		64	16	–
585-T034	–	Rear-Access Wire-Wrap Interface Assy		64	16	–
520-T001	–	Rack-Mount 202T Modem		–	–	202T
520-T007	–	Audible/Visual Alarm Panel (Monitors one RTU)		–	–	–
520-T025	–	Universal External Alarm Panel (Monitors 8 RTUs)		–	–	–
620-0077	–	8-Pin Serial Connector (10 are included in 585-0005)		–	–	–
620-0078	–	50-Pin Delta Connector		–	–	–
990-0150	–	Serial Insertion Tool (One is included in 585-0005)		–	–	–
977-T042	–	JB3 Termination Plug		–	–	–
585-0005	–	Serial Connector Kit (Includes 12 connectors, one tool)		–	–	–

Table 1-1 WS2000 WACP Equipment Part Numbers

WS2000

Part No	Plugin	Description	Serial Ports	Discrete I/O		Modem Type
				Input	Output	
500-2000	_	19-inch Shelf Assembly		_	_	_
585-T055	_	23-inch Rack Adapter Kit		_	_	_
994-T025	_	WS2000 TABS Technical Manual		_	_	_

1.3 Other Products From Westronic

The following provides information about 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, Inc. products.

1.3.1 WS1000

The WS1000 product line complements many operations and network management systems by providing an economical, flexible means of converting varying quantities of discrete (dry-contact) alarm, status, and control data to a simple, easy-to-handle TABS or TBOS interface.

Available configurations provide the flexibility to select the unit best suited for various applications. Choose 64/128 discrete inputs with 8/16 discrete outputs.

Small size and flexible mounting requirements allow placement of the unit close to the source of discrete interfaces. WS1000 can mount in an equipment bay or on a distribution frame as the application demands. This flexibility results in considerable reduction in the amount of required wiring. The basic structure of a front-facing wire-wrap block, commonly found on distribution frames, provides a sturdy housing for the Terminator. Located on the easily removable module contained within the housing are all the active components. WS1000 is the ideal way to collect discrete alarms throughout a site or service area with feedback to a WS2000 or WS3000 hub.

1.3.2 C1000

The C1000 complements many operation support systems by providing an economical and flexible means of collecting small to large quantities (32 – 256 points) of discrete alarm and status data and converting them to simple, easy-to-handle TABS or TBOS interface.

Different versions of the C1000 allow communications with either a TABS or TBOS host. The C1000 can pass-through polls for other addresses, permitting daisy-chains of C1000 units in larger configurations and permitting the C1000 and local NE telemetry data to combine into a single channel. In some cases, data can combine through a single modem.

The C1000 requires only one vertical space (1.75 inch) in either a 19-inch or 23-inch equipment rack, allowing location as close as possible to the source of discrete interfaces. The result is a large reduction in the amount of wiring required to pick up alarm and status data. The reduction in wiring eliminates the possibility of losing data through unknown disconnected, moved, or cut wiring. Serial and discrete interfaces are through standard 9-pin subminiature and 50-pin connectors, making installation and replacement exceptionally fast and simple.

The C1000 is equipped with two serial ports:

- The first, a host port, serves as a TABS or TBOS host communications interface that can be equipped with an optional 1200-bps Bell 202T-compatible internal modem, allowing the C1000 to be located beyond the range of standard RS-422/RS-485 interfaces.
- The second, an expansion port, serves as a TABS or TBOS data collection interface.

The housing can accommodate a maximum of eight 50-pin discrete interface connectors. All the different configurations use this same housing.

1.3.3 WS3000

The WS3000 is a powerful telemetry unit that combines a high-speed processor and large database capacity with the most useful functions of discrete and serial alarm collection, mediation, and access. The WS3000 is the ideal bridge between today's telemetry networks and the advanced protocols now appearing. 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 and discrete dry contacts
- 5 serial ports supporting user-selectable RS-232/RS-422/RS-485 interfaces from 1200 – 9600 bps
- 4 serial ports supporting RS-422 interfaces from 1200 – 9600 bps
- 32 – 512 discrete alarm/status inputs and 8 – 128 discrete control outputs with capability to support a maximum of 30,000 alarm points (about 2,000 SIDs)
- Remote database configuration and software upgrade through exchanging PCMCIA cards or downloading through a Trivial File Transfer Protocol (TFTP) server or X-modem
- Switched Network Software (SNS, also referred to as String TABS) to control network access devices, such as PADs, terminal servers, and modems, for monitoring network elements and remotes
- Fault-Tolerant Monitor (FTM, also referred to as TABS2) software to provide redundant 2-way monitoring of long-distance network elements
- Custom protocols are available on a special assembly basis

2 Hardware Description

2.1 Front-Panel Indicators and Controls

Figure 2-1 is an illustration of the WS2000 front panel, showing the location of the front-panel indicators and controls.

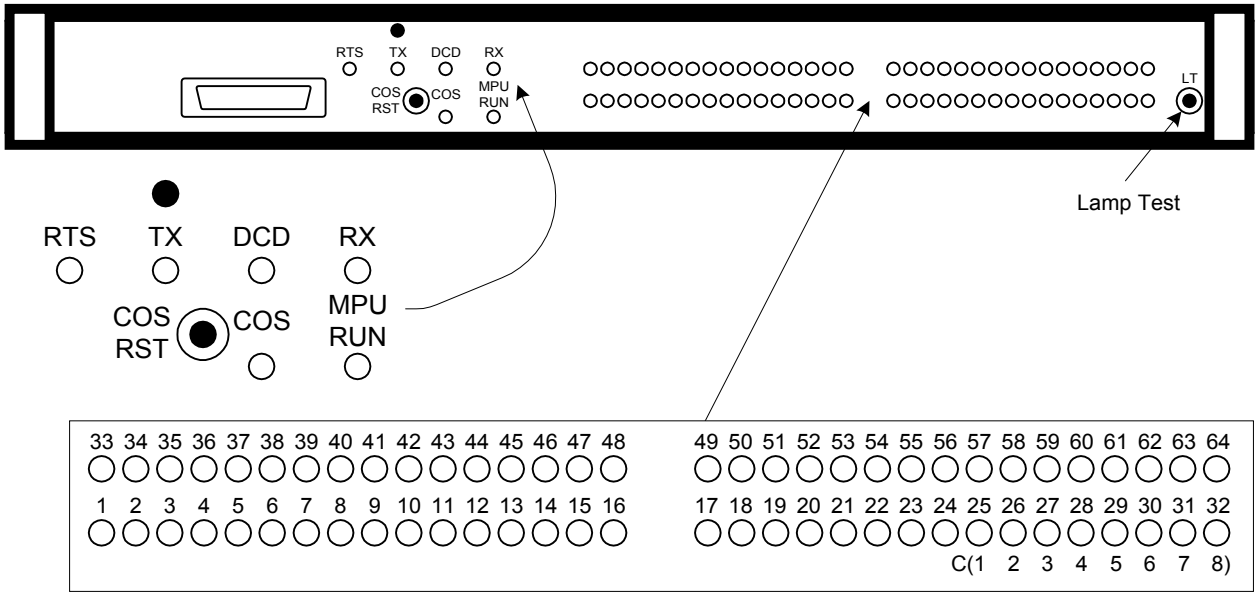


Figure 2-1 WS2000 Front Panel

2.1.1 Indicators

The following are the WS2000 front-panel indicators:

RTS: Request-to-Send – Carrier Output

TX: Transmit – Transmit data indication

DCD: Data Carrier Detect – Carrier frequency received

RX: Receive – Receive data indication

The **RTS**, **TX**, **DCD**, and **RX** indicators display line conditions on the host port. When not equipped with an internal 202T modem, WS2000 has an annunciator board instead to display line conditions. The WS2000 host port then uses a standard external RS-232 modem.

COS: Change-of-State LED – Indicates serial/discrete input change-of-state (alarm) for inputs to the WS2000. The **COS** LED mirrors the state of the COS relay: lit when the relay is activated and extinguished when the relay is deactivated.

MPU RUN: Microprocessor Run LED – Indicates proper initialization and operation of microcomputer and real-time operating system software. Failure indicated if Off.

Status/Alarm LED (**1 – 32**)**:** Input Indications – Alarms present on Points 1 – 32. LEDs 25 – 32 indicate for control outputs 1 – 8 when backplane jumper Z7 is installed.

Status/Alarm LED (**33 – 64**)**:** Input Indications – Alarms present on Points 33 – 64. LEDs 57 – 64 indicate for control outputs 9 – 16 when backplane jumper Z9 is installed.

2.1.2 Pushbuttons

WS2000 has the following front-panel pushbuttons:

COS RST – Change-of-State Reset – Resets the COS relay and extinguishes the **COS** LED to acknowledge an alarm condition on serial/discrete inputs to the WS2000.

LT – Lamp Test – Lights all Status/Alarm LEDs.

When the WS2000 detects a new alarm, it lights the front-panel LED for the associated alarmed input (1 – 64) and activates the COS relay, which lights the **COS** LED. The front-panel alarm LED, the **COS** LED, and the COS relay remain active until the alarm clears. At this point, this is an unacknowledged alarm.

However, you can acknowledge the new alarm or multiple unacknowledged alarms by pressing the **COS RST** pushbutton or an external pushbutton that temporarily grounds the COS Reset terminal on TB1. The COS relay then deactivates and extinguishes the **COS** LED, but the front-panel LED for the alarmed inputs (1 – 64) remains lit until the alarms clear. If the COS relay outputs on TB1 drive an external audible device, the device sounds while alarms are active and becomes silent when the alarms clear or are acknowledged through the **COS RST** pushbutton.

Any new alarm detected after you release the **COS RST** pushbutton reactivates the COS relay, **COS** LED, and the external audible device, if connected. If multiple alarms exist and an acknowledged alarm clears, then reoccurs, the WS2000 considers the alarm as unacknowledged and reactivates the COS relay and LED. When all unacknowledged alarms have cleared, the COS relay and LED deactivate.

Important! Do not use the **COS RST** pushbutton to acknowledge alarms when an optional external alarm annunciator connects to the WS2000 unit. The external alarm annunciator derives its alarming input from the COS relay and provides its own ACO pushbutton for alarm acknowledgment.

2.1.3 Modem Output Level Adjustment Control

When the WS2000 is equipped with the optional internal 202T/V.23 modem, the transmit output level is adjustable. This adjustment is done by adjusting a potentiometer, accessable through the front-panel. The adjusting screw is at the top of the front panel above the **TX** LED (see Figure 2-1). Turn the adjusting screw clockwise to increase the output level and counter-clockwise to decrease it.

2.2 Interfaces

2.2.1 Discrete Interfaces

Each of the WS2000 WACP and discrete expander units handle 32 status/alarm inputs, with maximum on-board expansion capabilities of 64 inputs each. Each provides 8 relay control outputs with maximum expansion capability of 16 outputs each. LEDs indicate on the status/alarm inputs and control outputs.

Discrete logic inputs, whose inputs require *wetting* current to operate, must reference either positive or negative battery, as desired. WS2000s and discrete expanders derive their wetting current from the input power.

The discrete logic outputs (control points) use magnetically latched Form C (SPDT) or Form A (SPST) relay contacts and individually can operate in momentary or latched modes. In latched mode, the last output is magnetically held to ensure that the output remains during power outages. Backplane jumper connections (see Figure 3-11) determine the control output type (Form A or C). Form A outputs are normally open contacts, whereas Form C outputs are both normally open and normally closed. The wiper of each Form C relay connects to a common control voltage. Figure 2-2 shows the Form A and Form C configurations.

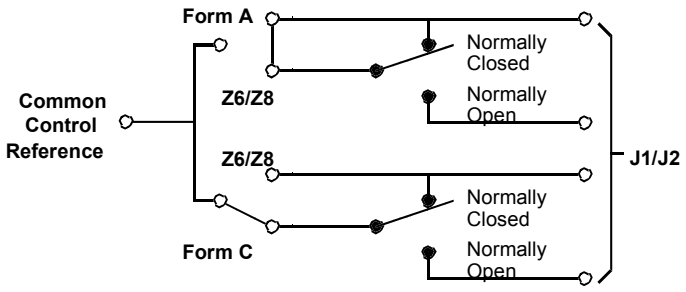


Figure 2-2 Form A and Form C Control Output Configuration

Through jumper strap option selections, groups of 8 relay control outputs can be directly strapped as status inputs to allow status monitoring of control outputs. Backplane jumper Z7 routes control outputs 1 – 8 to status input points 25 – 32 and jumper Z9 routes outputs 9 – 16 to inputs 57 – 64. Routing the control outputs in this manner reduces the number of discrete input points from 32 to 24 inputs or from 64 to 56 or 48 inputs.

2.2.2 Serial Interfaces

A fully loaded WS2000 comes equipped with 10 serial ports:

- Channel 1 supports WACP host communications using an RS-232, RS-422, or RS-485 interface.

  As an option, Channel 1 can also have an internal-mount Bell 202T/CCITT V.23 modem to provide the host communications interface. Through jumper strap option selections, the internal modem provides a two- or four-wire voice-frequency interface. Front-panel LEDs (see *Indicators* on Page 2-1) indicate transmit data, receive data, request-to-send, and carrier detection activity. An access hole in the front panel enables transmit output level adjustments.
- Channels 2 – 5 (Ports 1 – 4, respectively) collect TBOS data using an RS-232, RS-422, or RS-485 interface.
- Channels 6 – 9 (Ports 5 – 8, respectively) collect TBOS data using an RS-422 interface only. These channels are optional.
- Channel 0 is an RS-232, 9600-bps Craft interface port.

Any of the TBOS collection ports (Channels 2 – 9) can serve as an interface to a WS2000 slave unit.

2.3 Configuration and Diagnostics

The Craft port, which allows configuration and diagnostics, is accessible through connectors on the front and rear panels of the WS2000. Data input to the unit and data reported to the host are viewable from either of these connectors. The following major functions are accessible at these connectors:

- Configure custom or standard display point process lists
- Assign process lists to the available data collection inputs (discrete or serial ports)
- Configure and map the data collection displays into the displays available on the WACP host communications port

Optional four-digit hexadecimal password control can be set into the WS2000. The password resides in the 1K EEPROM located on the WS2000 shelf; thus, the password remains even if the plugin unit is removed or replaced.

2.4 Optional External Accessories

2.4.1 External Discrete Expanders

Each WS2000 can control a maximum of seven (7) WS2000 discrete expanders over a parallel Westronic Peripheral Interface Bus (WPIB) as shown in Figure 2-3. The WS2000 discrete expander has a minimum of 32 discrete alarm status inputs and 8 discrete control outputs. Through a daughter board, the discrete expander provides further expansion with an additional 32 inputs/8 control outputs. Thus, maximum expansion includes 64 discrete inputs and 16 discrete control outputs for each expander.

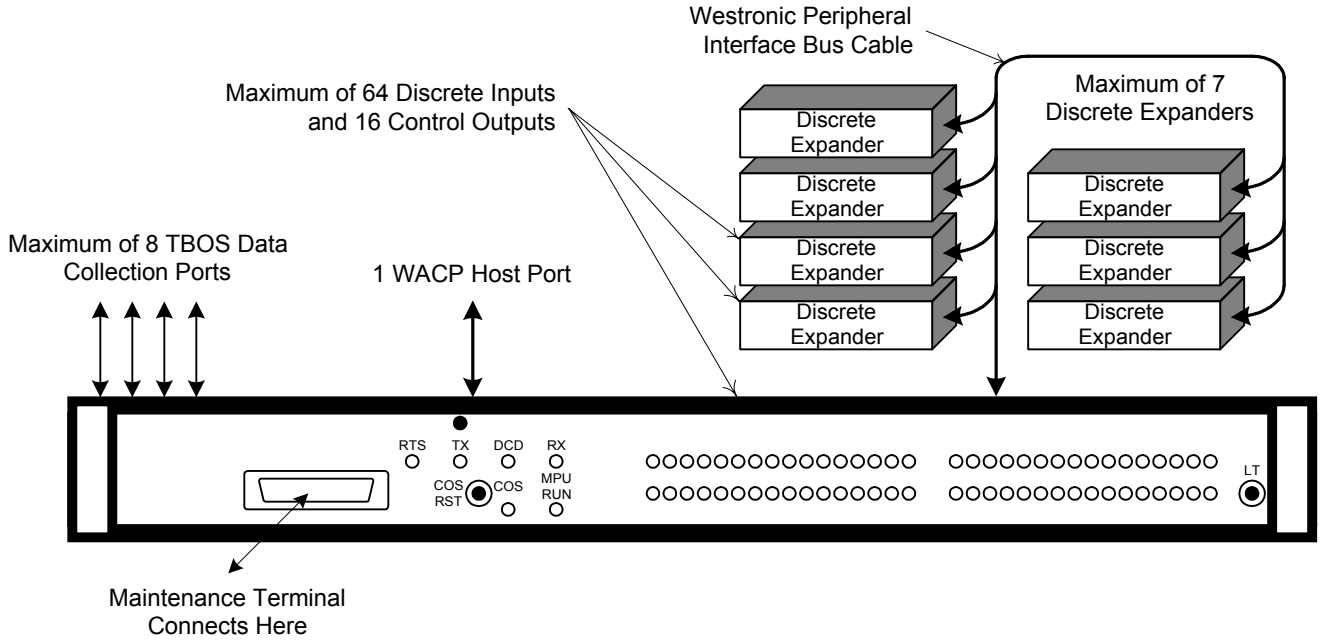


Figure 2-3 Expansion Using Discrete Expanders

2.4.2 Rack-Mount Modem

Rack-mount modem panels allow a WS2000 data collection serial channel to operate on a 2- or 4-wire Frequency Shift Keying (FSK) circuit. The WS2000 uses the following modem types: 202T/CCITT V.23 modem (PN 540-0300) and the Voice-Frequency Continuous Tone (VFCT) modem (PN 540-T001).

Each modem requires only one vertical space (1.75 inches) in a standard 19-inch equipment rack. Rack-mount adapters are available for mounting in a 23-inch rack.

The front panel has four LED indicators to indicate RTS, TX, DCD, and RXD activity. In addition, strap settings select continuous carrier or normal RTS. See **Rack-Mount Modem** on Page 3-30.

2.4.3 External Alarm Panel

The Westronic external alarm panel connects to the COS relay outputs located on TB1 to provide audible and visual standing alarm summary indications. The external alarm panel has an audible annunciator, an audible alarm disable toggle switch, an **ACO** button, and an alarm summary LED.

Whenever the WS2000 detects a new alarm, it activates the COS relay, which in turn activates the audible annunciator. As long as the WS2000 has one or more active alarms, the COS relay remains energized and the alarm summary LED on the external panel stays lit. The audible annunciator remains active until you press the **ACO** button (***not*** the **COS RST** pushbutton on the WS2000) or all active alarms have cleared. The WS2000 momentarily opens, then closes, the COS relay to indicate a new alarm to the alarm panel, reactivating the audible annunciator.

Because the external alarm panel derives its alarm input from the COS relay, it is of utmost importance to ***not use*** the **COS RST** pushbutton located on the WS2000 front panel. To do so defeats the purpose of having the external alarm panel.

2.4.4 Universal Annunciator Panel

The Universal Annunciator Panel performs the same function and connects in the same manner as the external alarm panel, except that it provides alarm annunciation for a maximum of eight different remote terminal units.

2.4.5 Telzon Interface Assembly

The Telzon interface assembly is a standard Type-89 termination block. The panel provides front-panel wire-wrap access to all discrete and serial connections. A maximum of two blocks can mount on the same mounting bar. Interconnecting cables accommodate all wire-wrap interfaces. **Telzon Termination Panel** on Page 3-36 has more detailed information on the Telzon interface assemblies.

The Telzon interface assembly is ideal for central office installations where four vertical rack spaces (7 inches) are available for the WS2000

unit and interface assembly. The Telzon interface assembly provides wire-wrap connections for the following maximums:

- 64 discrete alarm inputs (status input and status input return)
- 16 discrete control outputs (Form A only)
- 8 serial data collection ports
- Host communications port

2.4.6 Front-Access Wire-Wrap Assembly

The front-access wire-wrap interface assembly is suitable for Controlled Environment Vault (CEV) installations where front access to all connections is required because of rack space limitations (see Figure 3-29). The front-access interface assembly, which requires two rack increments (3.5 inches) – one increment for itself and one increment for the WS2000, provides wire-wrap access to all discrete, serial, and power connections on the WS2000. Interconnecting cables are available with the unit to accommodate the wire-wrap interfaces. The front-access interface assembly has the following features:

- 64 discrete alarm inputs (status input and status input return)
- 16 discrete control outputs (Form A)
- 8 serial data collection ports
- 1 serial host port
- Power input
- Frame ground
- Local MPU RUN relay and audible alarm relay
- External COS reset input

2.4.7 Rear-Access Wire-Wrap Assembly

The rear-access interface assembly is ideal for installations having only one vertical rack space (1.75 inches) available for all alarm equipment. The rear-access interface assembly, which preserves the one-increment vertical space for each WS2000 unit, consists of three plug adapters that mount on the discrete and serial WS2000 backplane connectors (see Figure 3-30). The assembly provides wire-wrap connections for the following:

- 64 discrete alarm inputs
- 16 discrete control outputs (Form A or C)
- 8 serial data collection ports, 1 WACP host port, and 1 Craft port.

2.5 Specifications

This section provides detailed information on the electrical, environmental, and mechanical specifications of the WS2000 product line. Also included are detailed data for the parallel, serial, and host ports, and auxiliary interfaces.

2.5.1 Electrical

The following are typical power and electrical requirements:

- Input voltage range: –20 Vdc to –60 Vdc
- Power requirements:
  - 5.0 Watts (No input sense currents)
  - 24.0 Watts (64 inputs sense currents)
- Fusing of WS2000 units: See Table 3-34.
- External switching power available from the WS2000 unit
- WS2000 supply outputs:
  - + 5.0 Vdc ± 5% at 1.5 Amps (maximum)
  - +12.0 Vdc ± 10% at 400 mA each (maximum)
  - 12.0 Watts total output power

2.5.2 Environmental

- Operating ambient temperature range: 0°C to 55°C
- Humidity: < 95% noncondensing

2.5.3 Mechanical

The following lists WS2000 mechanical characteristics:

Dimensions

- Height: 1.75 inches (4.4 cm)
- Width: 17.4 inches (44.1 cm)
- Depth: 8.0 inches (20.3 cm)

Mounting

- 19-inch (48.3 cm) rack mounting
- 23-inch (58.4 cm) rack mounting with optional adapters

Weight

- 5.3 lbs (2.4 kg) maximum unpackaged; 8 lbs (3.6 kg) packaged

Connectors

- Power, analog, and auxiliary connections: TB1
  14-pin, dual-level compression terminal block that accepts #14 to #24 AWG wire
- Serial and digital host port connections: P1 – P6, P8 – P13
  8-position header terminal connectors. Mating connectors manufactured by:
  - Methode: PN 1300-108-424 or PN 130F-108-424
  - Westronic: PN 620-0077 or PN 690-T006/690-T007
- WPIB connection: P7
  34-position (2 x 17) ribbon cable header. Mating connector manufactured by:
  - Amp: PN 746094-8
  - Robinson Nugent: PN IDS-C34PK-SR-TR
  - Assman: PN AWP 34-7241
- Discrete and control output connections: J1, J2
  50-position, female, Delta-type connectors. Mating connector manufactured by:
  - TRW: PN 97-12500-180 or PN 97-12500-181
  - Westronic: PN 620-0078

2.5.4 Interfaces

This section provides detailed data on each of the WS2000 interfaces.

2.5.4.1 Parallel Interface

- WPIB (Westronic Peripheral Interface Bus)
- Eight WPIB addresses: one for the WS2000 and one for each discrete expander (maximum of seven)

2.5.4.2 Serial Ports

Host Port

- WACP protocol
  - Asynchronous
  - 7 data-bit characters
  - Even parity

- One start and one stop bit
- 1200; 2400; 4800; or 9600 bps

- RS-232/RS-422/RS-485 selectable
- Optional Westronic 202T/V.23 modem:
  - 1200 bps
  - Bell 202T/CCITT V.23 compliant
  - FSK
  - TX output: +1 dBm (maximum)
  - RX sensitivity: –6 dBm to –42 dBm (selectable, see ***Internal 202T Modem*** *(Optional)* on Page 3-9)
  - 2- or 4-wire modem
- Connectors: P6, P12, or TB1 (see **Host Port** on Page 3-19)

Serial Data Collection Channels 2 – 5

- TBOS:
  - Asynchronous
  - Eight data-bit characters
  - Odd parity
  - Two stop bits
  - 1200 or 2400 bps
- RS-232/RS-422/RS-485 selectable
- Connectors:
  - P3 (Channel 4)
  - P4 (Channel 2)
  - P10 (Channel 5)
  - P11 (Channel 3)

Serial Data Collection Channels 6 – 9

- TBOS:
  - Asynchronous
  - Eight data-bit characters
  - Odd parity
  - Two stop bit
  - 1200 or 2400 bps
- RS-422 only

- Connectors:
  - P1 (Channel 7)
  - P2 (Channel 9)
  - P8 (Channel 6)
  - P9 (Channel 8)

Wesmaint (Craft) Channel 0

- Asynchronous, 7 data-bit characters, even parity, one stop bit, 9600 bps
- RS-232
- +5 Vdc, ±12 Vdc
- Prog En (Program Enable/EEPROM Write Enable)
- Connectors: P5 (rear), JB3 (front-access DB25)

2.5.4.3 Status/Alarm Inputs

- 32 or 64 opto-coupled inputs arranged in groups of 8 with a single common for all inputs
- Input voltage: –48/–24 Vdc Battery, (+) Battery Return
- Input current: 3 – 5 mA for each point
- Logic levels:

Input Power	Logic Level	Voltage
–24 Vdc	0 (Off)	Input open or –18 Vdc to –30 Vdc
	1 (On)	Input greater than –8.0 Vdc
–48 Vdc	0 (Off)	Input open or –40 Vdc to –60 Vdc
	1 (On)	Input greater than –12.0 Vdc

- Logic level sensing can be inverted through maintenance port configuration setup

2.5.4.4 Control Outputs

- 8 or 16 relay control outputs
- Momentary/latched operation set through the Craft port or by WACP host
- Contact arrangement (selectable for each output):
  - SPST Normally Open (Form A), or
  - SPDT (Form C) with common voltage applied to contact wiper
- Contact Ratings:
  - 2 Amps at 30 Vdc
  - 0.6 Amps at 110 Vdc
  - 60 Watts maximum switching power

2.5.4.5 Auxiliary

- MPU RUN Relay Output: SPDT (Form C)
- COS Relay Output: SPDT (Form C)
- Output Contact Ratings: 1 Amp at 60 Vdc
- COS RESET input: + Battery pulse

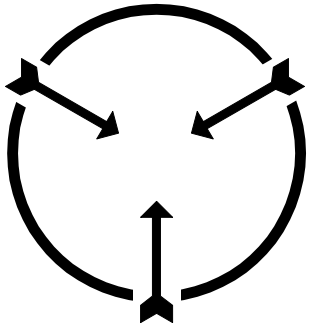
3 Installation

3.1 Overview

This section contains detailed installation instructions, tables, and diagrams that define all hardware configuration options, special material handling considerations, and precautions. Included are descriptions of the physical layout of the unit and optional equipment. Not all hardware, connections, wiring, and strapping are applicable to all WS2000 versions or applications.

3.2 Handling Considerations and Precautions

WS2000 modules contain Complementary Metal-Oxide Semiconductor (CMOS) and N-Channel Metal Oxide Semiconductor (NMOS) integrated circuits to maximize noise immunity and promote low power consumption. These components are Electro-Static Discharge (ESD) sensitive and can be damaged if subjected to high static voltage levels. Therefore, ensure familiarization with the ESD procedures that follow. Packaging containing CMOS and NMOS components have a label as shown in Figure 3-1.



Static Sensitive
Maintain Antistatic Protection

Figure 3-1 Electrostatic Discharge (ESD) Label

CMOS and NMOS devices are equipped with protection diodes, but 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.

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 modules, always verify they are not carrying static charges. Always wear a personal grounding device, such as an ESD heel or wrist strap.
- When extracting a module, always place it in an antistatic bag or covering for transportation/storage.
- Perform repair work on 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 touch the pins and always place components in antistatic foam for storage and transportation.
- Ensure that desoldering tools have static reduction. Some desoldering tools can actually generate large static voltages that damage CMOS and NMOS devices.

3.3 Module Substitution

The following are general procedures that must be followed when replacing or substituting WS2000 modules:

CAUTION: TheWS2000 front-panel DB25 connector (JB3) connects to the portable Wesmaint unit or to a termination plug when the rack-mount Wesmaint, which connects to rear-panel connector P5, is used. **Remove** the portable Wesmaint unit connection or the termination plug from connector JB3 **before applying or removing power from the WS2000**.

- Turn power off when removing or inserting modules. The boards are designed to withstand removal and insertion with power on, but a highly recommended practice is to remove the system power when substituting modules.
- Make sure the substitute board is of the same type (part number) and contains the same options.
- Substitute modules only with modules that contain identical jumper connections. Observe the jumper and mini-jumper arrangements on the original board and ensure they are identical on the replacement module. Failure to do so can cause module failure, point displacement because of incorrect board addresses, communication failure with the host, and other related failures.
- Make sure an EEPROM with current firmware is installed on the replacement board. Always make sure that substitute or replacement EEPROMs are properly seated in the socket with correct pin alignment. Verify that all pins insert into the socket and none are bent inward/outward.

- Make sure replacement modules mate properly with the connectors at the rear of the bin. Never force a board into position because this can damage rear connectors. In case of insertion problems, determine why the module does not easily plug into position and take appropriate action. To plug a module into position, push firmly with the thumbs on the lower portion of the front. Remove a module by gently rocking it while drawing it from the bin until it is free of the connectors at the rear.

Only qualified electronics service personnel who are familiar with microcomputers and Input/Ouput (I/O) interfacing should carry out actual module repair. Attendance by such personnel in a WS2000 training course to learn special circuit concepts and applications is highly recommended. When returning a faulty module, describe the suspected problem, fault, or symptom on the documentation that accompanies the module.

3.4 Installation Procedures

The following describes how to install the WS2000 and ancillary products into a permanent location. Refer to the check list at the end of this section for a step-by-step WS2000 installation guide. Upon completion all all the installation steps, the WS2000 unit will be ready for software configuration. Refer to Sections 4 and 5 for these procedures.

3.4.1 Inspecting the WS2000

Before applying power, remove the WS2000 main board assembly from its housing and confirm that the plug-in expansion boards are seated properly. Strap options are preset in the factory; however, they can be changed according to user requirements.

3.4.2 Installing the WS2000

The WS2000 requires one vertical space (1.75 inches) in a 19-inch standard telecommunications rack. Rack adapters are included with the unit for mounting in 23-inch wide racks. Figure 3-2 shows the various dimensions for the WS2000, which are the same for discrete expander units.

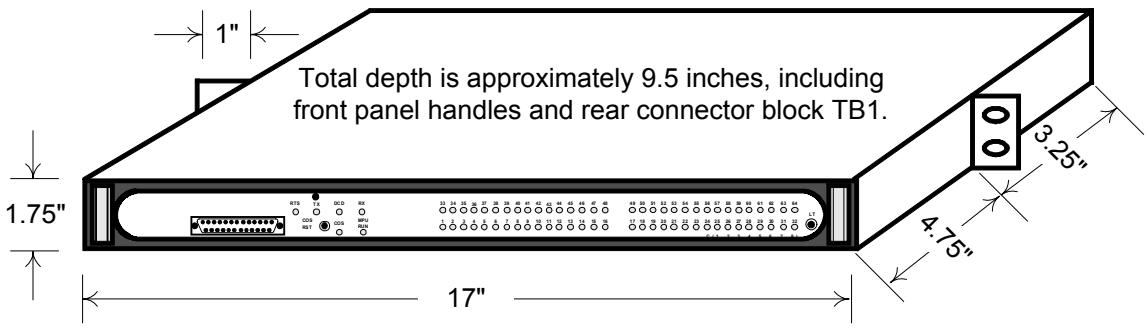


Figure 3-2 WS2000 WACP

3.4.3 Configuring the WS2000

The following presents strap options for the main board, internal modem boards, and the back plane. Option straps on the main board determine the following:

- Source of Channel 1 RTS and Tx signals
- Memory size (8K or 32K) and type (EPROM, EEPROM, or RAM), Write Enable for EEPROM, and address range for RAM
- Device size (28/32 pins)
- Watchdog enabled/disabled
- Memory bank switching

Option straps in the internal modems determine the modem mode and receiver sensitivity or transmit/receive impedance, receiver sensitivity, and duplex mode.

The backplane option straps establish the contact form for control outputs, the parallel expansion bus address, and serial port receive side terminations when operating RS-422 or RS-485.

3.4.3.1 Main Board

Four main boards (referred to as Type 1, Type 2, Type 3, and Type 4) are available. Compare the board in the unit with Figure 3-3 through Figure 3-6 to determine the type installed. Use the appropriate table, Table 3-1 through Table 3-4, to configure the main board.

Note: All strap options are preset at the factory.

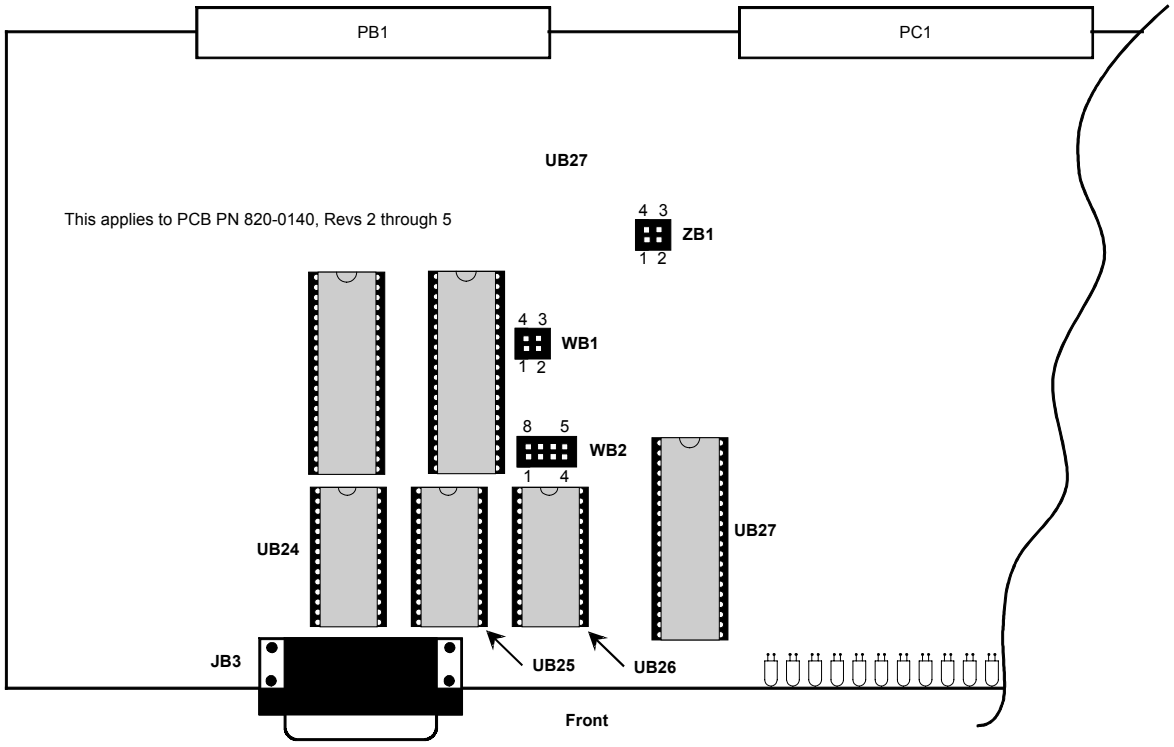


Figure 3-3 Strap Arrangements for Type 1 main Board

Table 3-1 Strap Arrangements for Type 1 Main Board

Block	Pin	Function
WB1	1 – 2	Channel 1 RTS (modem) from Main board. Remove when daughter board provides source.
	3 – 4	Channel 1 Tx (modem) from Main board. Remove when daughter board provides source.
WB2	1 – 2, 7 – 8	UB25 is 32K EPROM (27C256)
	2 – 7, 3 – 6	UB25 is 32K EEPROM (28C256)
	3 – 6	Write En if UB25 is 8K EEPROM (28C64) or 32K EEPROM (28C56).
	4 – 5	UB24 is 32K RAM (65256); Not installed when UB24 is 8K RAM (62640)
ZB1	1 – 2	I/O Reset Enable (Reset Control Output Latches During Power Up/Down, Auto Restart)
	3 – 4	Watch Dog Enable (Auto Restart)

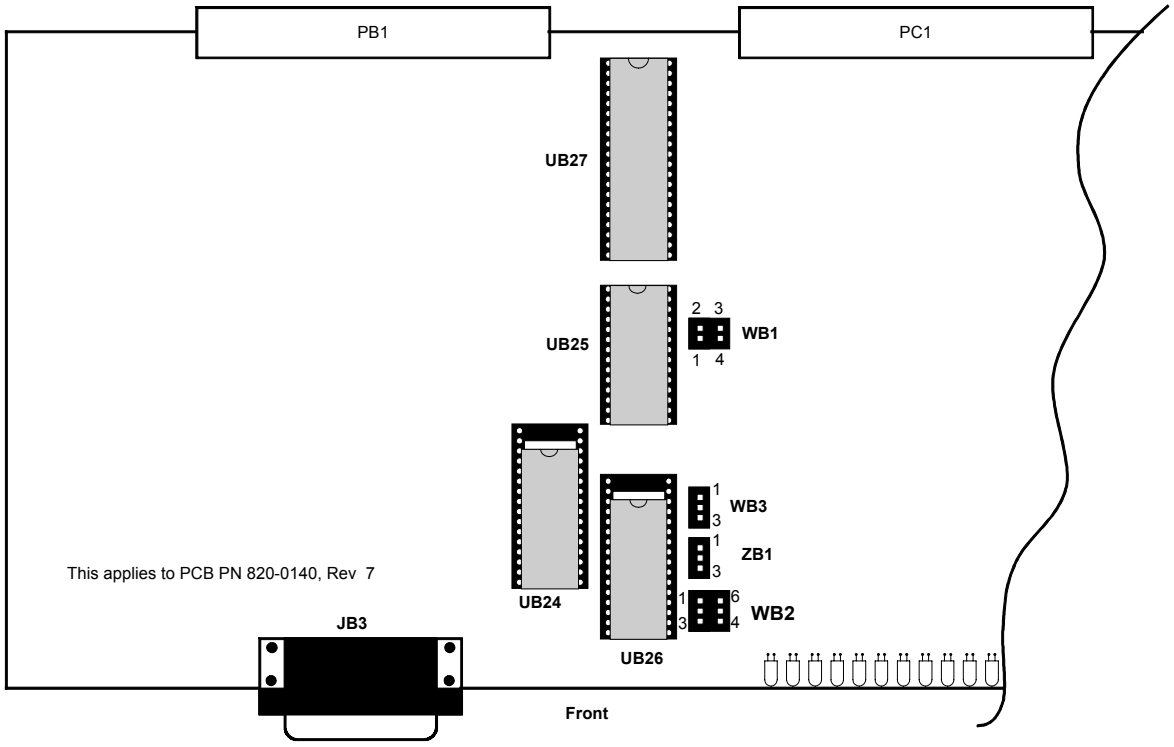


Figure 3-4 Strap Arrangements for Type 2 main Board

Table 3-2 Strap Arrangements for Type 2 Main Board

Block	Pin	Function
WB1	1 – 4	Channel 1 RTS (modem) from Main board. Remove when daughter board provides source.
	2 – 3	Channel 1 Tx (modem) from Main board. Remove when daughter board provides source.
WB2	1 – 6	**Do Not Install**. UB24 RAM address range
	2 – 5	**Do Not Install**. UB24 RAM address range
	3 – 4	Write enable when UB25 is EEPROM
WB3	1 – 2	UB26 is 32-pin device.
	2 – 3	UB26 is 28-pin device; Default (Note).
ZB1	1 – 2	Watch Dog Enable (Auto Restart); Default
	2 – 3	Watch Dog Disable

Note: When UB26 is a 28-pin device, insert it in the pins closest to the front of the board.

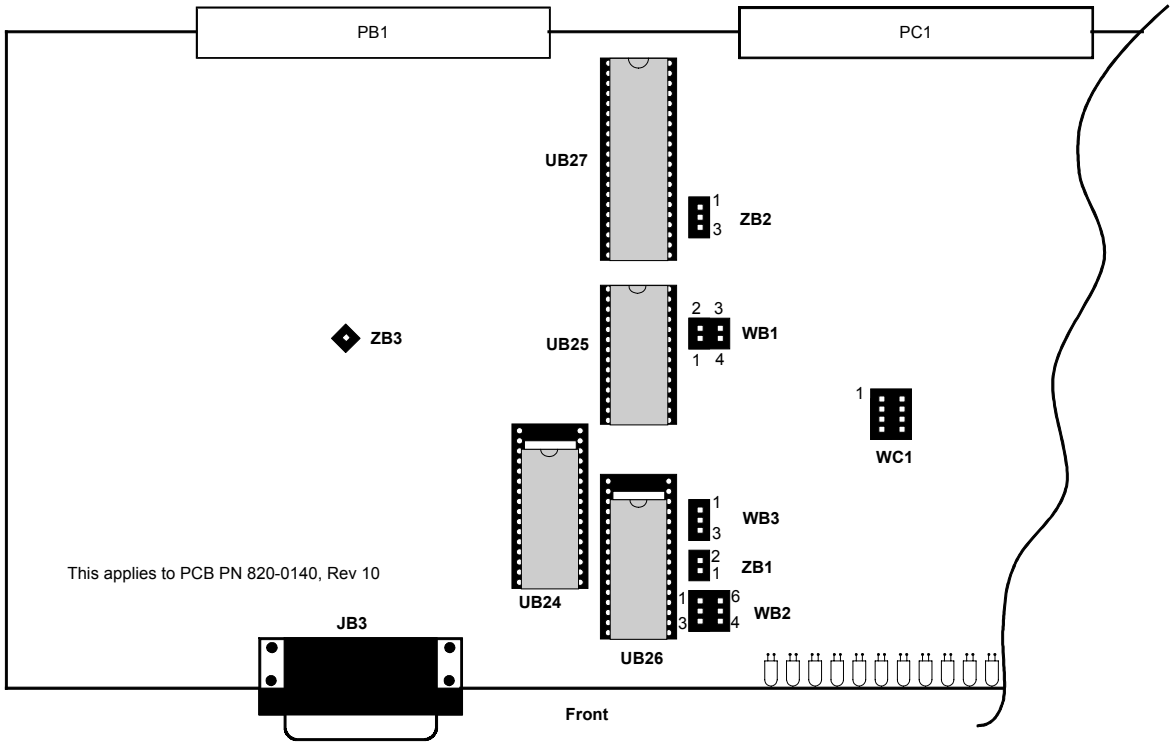


Figure 3-5 Strap Arrangements for Type 3 main Board

Table 3-3 Strap Arrangements for Type 3 Main Board

Block	Pin	Function
WB1	1 – 4	Channel 1 RTS (modem) from Main board. Remove when daughter board provides source.
	2 – 3	Channel 1 Tx (modem) from Main board. Remove when daughter board provides source.
WB2	1 – 6	**Do Not Install**. UB24 RAM address range
	2 – 5	**Do Not Install**. UB24 RAM address range
	3 – 4	Write enable when UB25 is EEPROM
WB3	1 – 2	UB26 is 32-pin device.
	2 – 3	UB26 is 28-pin device; Default (Note).
WC1	Not Used	Board ID
ZB1	None	Watch Dog Enabled (Auto Restart)
	1 – 2	Watch Dog Disabled
ZB2	None	For Testing Purposes, Not Applicable
ZB3	None	For Testing Purposes

Table 3-3 Strap Arrangements for Type 3 Main Board

Block	Pin	Function
Note: When UB26 is a 28-pin device, insert it in the pins closest to the front of the board.		

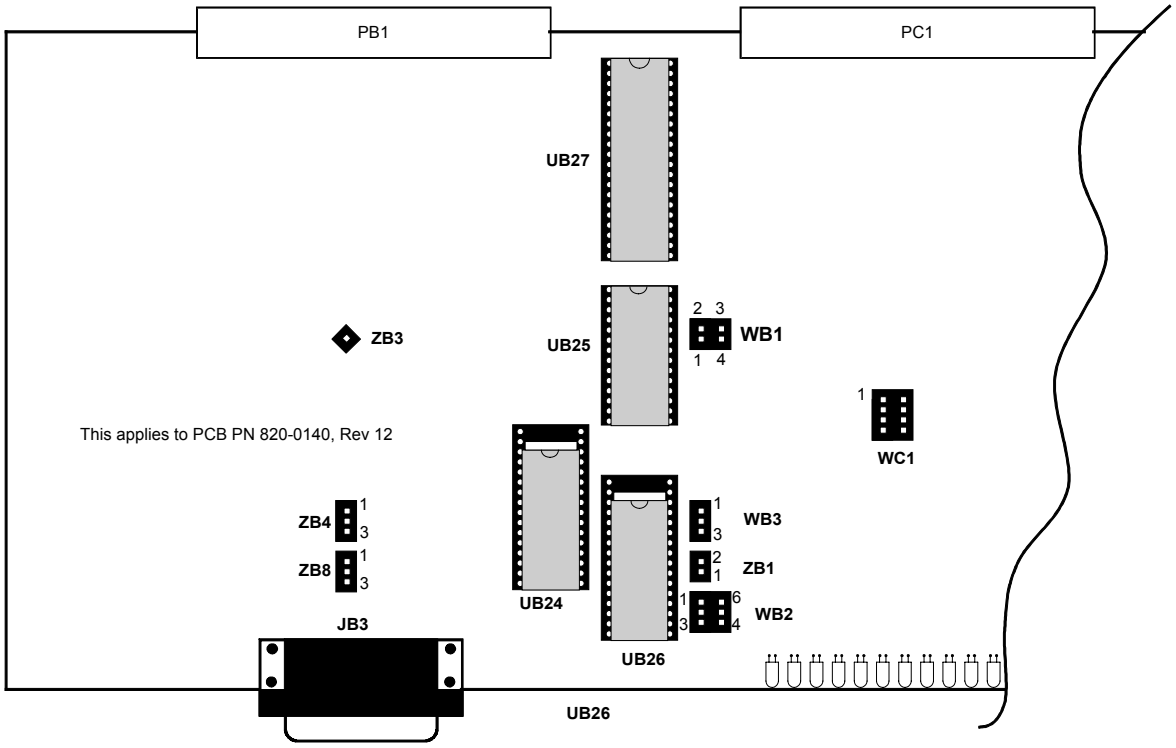


Figure 3-6 Strap Arrangements for Type 4 main Board

Table 3-4 Strap Arrangements for Type 4 Main Board

Block	Pin	Function
WB1	1 – 4	Channel 1 RTS (modem) from Main board. Remove when daughter board provides source.
	2 – 3	Channel 1 Tx (modem) from Main board. Remove when daughter board provides source.
WB2	1 – 6	**Do Not Install**. UB24 RAM address range
	2 – 5	**Do Not Install**. UB24 RAM address range
	3 – 4	Write enable when UB25 is EEPROM
WB3	1 – 2	UB26 is 32-pin device.
	2 – 3	UB26 is 28-pin device; Default (Note).
WC1	Not Used	Board ID

Table 3-4 Strap Arrangements for Type 4 Main Board

Block	Pin	Function
ZB1	None	Watch Dog Enabled (Auto Restart)
	1 – 2	Watch Dog Disabled
ZB4, ZB8	1 – 2	Not Applicable
	2 – 3	UB25/UB26 bank switchable; Default
ZB3	None	For Testing Purposes

Note: When UB26 is a 28-pin device, insert it in the pins closest to the front of the board.

3.4.3.2 Internal 202T Modem (Optional)

The 202T modem board has user-selectable option straps. Z5 is factory installed to bypass a timing circuit used in other applications. The board comes supplied with default strap settings. Figure 3-7 illustrates the jumper block locations.

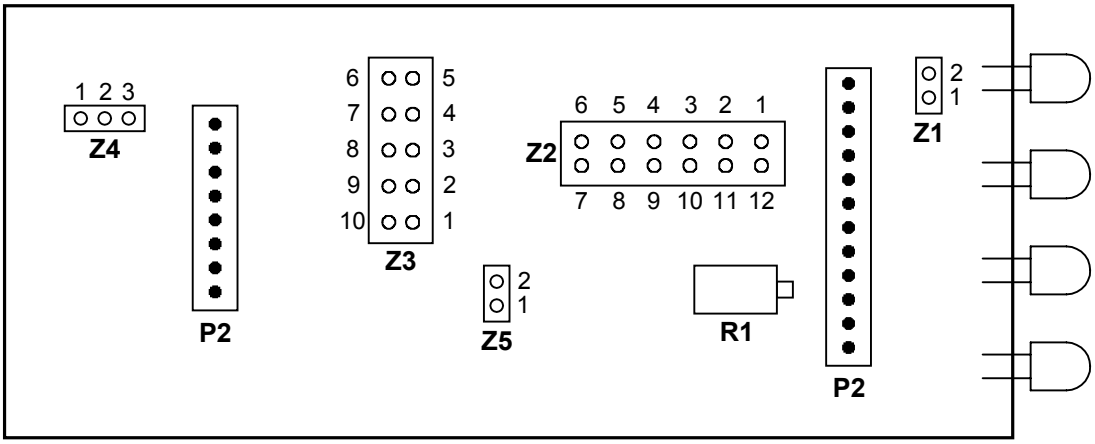


Figure 3-7 202T Modem Card

Table 3-5 through Table 3-7 describe the modem strapping options shown in Figure 3-7.

Table 3-5 202T Modem Card Jumper Blocks and Functions

Item	Function
Z1	Jumper block Z1 does not apply to WS2000 applications.
Z2	Jumper block Z2 performs two functions: ■ Pins 1 – 12 provide receiver squelch on the Request To Send (RTS) line. Install when modem runs 2-wire half-duplex mode. ■ Pins 2 through 11 establish the modem mode operation type. See Table 3-6 for Z2 strap arrangements. Factory default is 4W/202.
Z3	Jumper block Z3 sets the modem receive signal sensitivity. See Table 3-7 for receiver sensitivity Z3 strap arrangements. The setting should be set 5 – 10 dBm lower than the actual receive level. Default is –36 dBm.
Z4	Jumper block Z4 selects between 2-wire and 4-wire operating modes. Strap Pins 1 – 2 for 2-wire operation or strap Pins 2 – 3 for 4-wire operation. Default is 4-wire.
Z5	Jumper block Z5 provides a timing circuit for another product line/application. Z5 must be strapped when used in the WS2000 to bypass the timing circuit. Default is installed.
R1	Trim pot R1 adjusts the modem transmit output level. Clockwise rotation increases output level (+3 dBm maximum output). Default is –10 dBm.

Table 3-6 202T Modem Mode Operation Type (Z2 Jumper Block)

Mode	Z2 Pin Straps				
	2–11	3–10	4–9	5–8	6–7
2W/202	In	Out	In	In	In
2W/202/EQ	Out	Out	In	In	In
2W/V.23	In	Out	Out	In	In
2W/V.23/EQ	Out	Out	Out	In	In
4W/202; Default	In	Out	In	In	Out
4W/202/EQ	Out	Out	In	In	Out
4W/V.23	In	Out	Out	In	Out
4W/V.23/EQ	Out	Out	Out	In	Out

Table 3-7 202T Modem Receive Signal Sensitivity (Z3 Jumper Block)

Rx Level	Z3 Pin Straps				
	1–10	2–9	3–8	4–7	5–6
–6 dBm	In	In	In	In	In
–12 dBm	Out	Out	Out	Out	In
–18 dBm	Out	Out	Out	In	Out
–24 dBm	Out	Out	In	Out	Out
–30 dBm	Out	In	Out	Out	Out
–36 dBm; Default	In	Out	Out	Out	Out
–42 dBm	Out	Out	Out	Out	Out

3.4.3.3 VFCT Modem Board (Optional)

The VFCT modem is plug compatible with the 202T modem. Operating in the 4 kHz to 8 kHz frequency band, the VFCT modem uses Frequency Shift Keying (FSK) for modulation with a mark frequency of 5.2 kHz and a space frequency of 6.2 kHz. The modem operates at 1200 bps and is jumper configurable for full-/half-duplex mode, input sensitivity, and 600/75 Ohm transmit/receive line impedance. The transmit/receive lines are 2 separate tip/ring pair interfaces (that is, a four-wire configuration). Figure 3-8 displays the jumper block locations. Table 3-8 summarizes the jumper settings for the VFCT modem card.

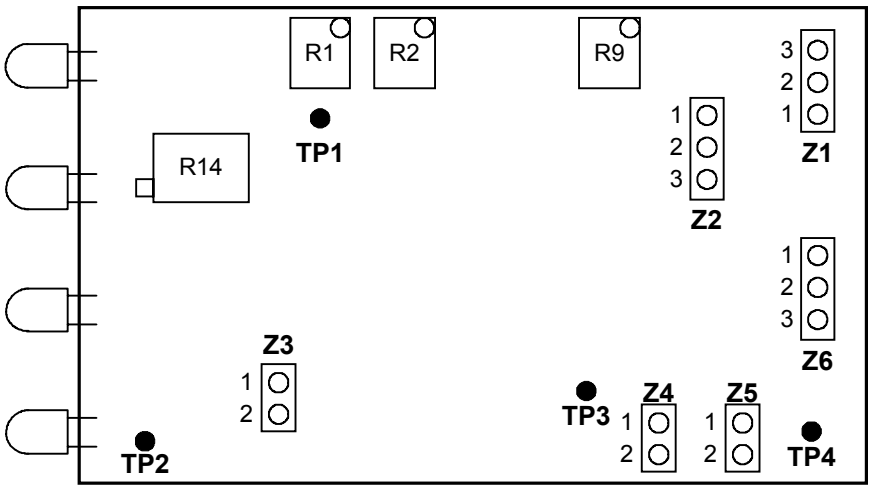


Figure 3-8 VFCT 4- Through 8-kHz Modem Board

Digital communication with the VFCT modem is through an RS-232C interface at P1. All analog signals route through connector P2.

Table 3-8 VFCT Modem Card Jumper Setting Summary

Function	Jumper	Pin Straps	Strap Function
Transmit Impedance	Z1	1 – 2* 2 – 3	75 Ohm 600 Ohm
	Z5	1 – 2 None*	75 Ohm 600 Ohm
Receive Impedance	Z4	1 – 2* None	75 Ohm 600 Ohm
	Z6	1 – 2* 2 – 3	75 Ohm 600 Ohm
Receive Input Sensitivity	Z2	1 – 2* 2 – 3 None	0 dBm to –20 dBm –20 dBm to –30 dBm –30 dBm to –60 dBm
Duplex Mode	Z3	1 – 2* None	Half Duplex Full Duplex
* Default settings			

Table 3-9 and Table 3-10 show adjustments and test points for the VFCT modem card.

Table 3-9 Adjustments for VFCT Modem Card

Adjustment	Function
R14	Transmit adjust +10 dBm to –50 dBm (default is –10 dBm)
R1	High-frequency adjust (6,200 Hz factory set)
R2	Low-frequency adjust (5,200 Hz factory set)
R9	Receive center frequency (5,700 Hz factory set)

Table 3-10 Test Points for VFCT Modem Card

Test Point	Function
TP1	Buffered RTS signal test point
TP2	CTS signal test point
TP3	Pre-driven receive signal test point
TP4	Transmit signal into transformer

3.4.3.4 Backplane

Figure 3-9 shows the location of the discrete input/output point connectors (J1/J2), the Westronic Peripheral Interface Bus (WPIB) port (P7), the serial port connectors (P1 – P6, P8 – P13), and option jumper blocks Z1 – Z9.

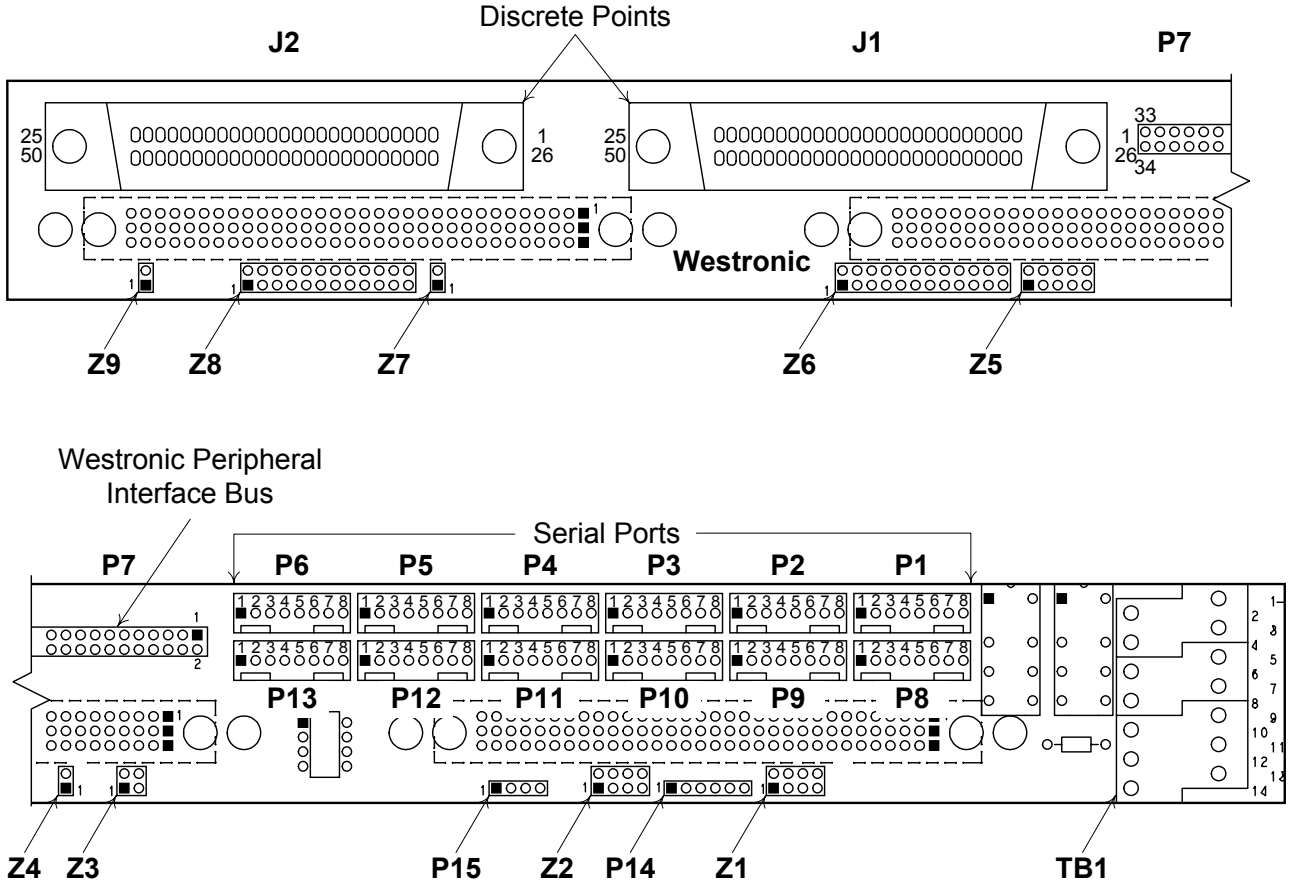


Figure 3-9 WS2000 Backplane Showing Rear Connectors and Jumper Block Locations

3.4.3.4.1 Discrete Control Outputs (Form A/Form C)

The discrete logic outputs (control points) use magnetically latched contacts. Magnetic latching of the last output ensures that it does not change during power outages. Discrete logic configurations can be a normally open SPST contact (Form A) or a normally closed/normally open SPDT contact (Form C), with the wiper of each control output connected to a common control voltage. Relay output contact configurations are jumper selectable for each point. One common return is available and the site battery voltage serves as the input source.

The factory default is Form C. These interconnections to the network require selecting the appropriate Form A/C operation. Jumper block Z6 sets the form operation for the first eight control outputs. Jumper block

Z8 sets the form operation for the second set of control outputs, Points 9 through 16. Figure 3-10 illustrates the strapping options on Z6 and Z8 using Control Points 1, 2, 9, and 10 as examples.

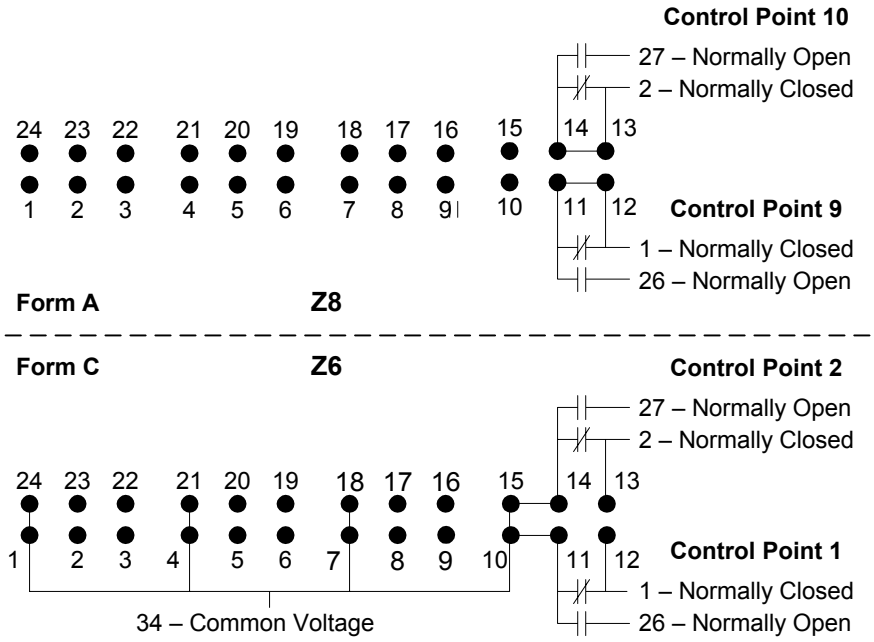


Figure 3-10 Functional View of Z6 and Z8 Strapping

When configured as Form A, each control point provides one isolated pair (normally open).

When configured as Form C, each control point provides one Normally Open (NO) contact and one Normally Closed (NC) contact. Each contact provides a connection to a common voltage pin provided for each set of eight points. Figure 3-11 shows the strapping options for all 16 control points at Z6 and Z8.

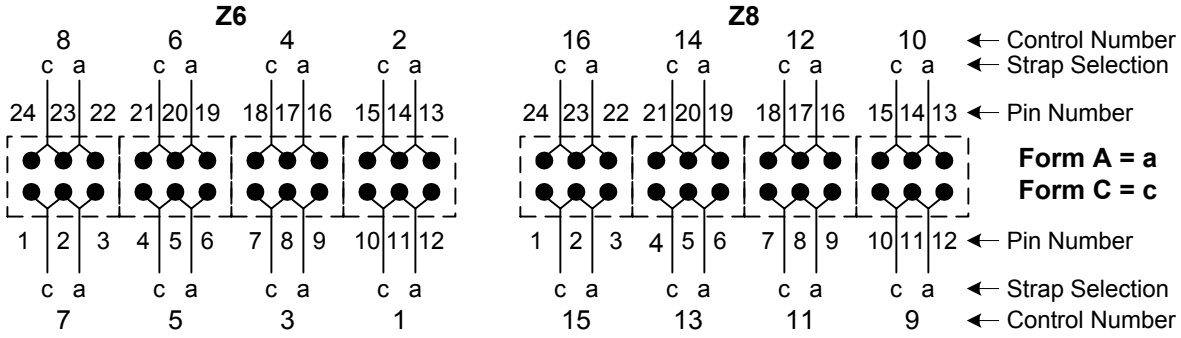


Figure 3-11 Z6/Z8 Form A/Form C Jumper Strap Arrangements

3.4.3.4.2 WPIB Addresses

Local discrete alarm capacity can increase from a maximum of 64 alarms and 16 control relay outputs on a single WS2000 to a total of 512 alarms and 128 control relays by using Westronic discrete expanders. A single WS2000 can handle a maximum of 7 discrete expanders.

The WS2000 and all discrete expanders use identical bin and backplanes. Z5 of each discrete expander requires the strap settings shown in Table 3-11 when they are used with the WS2000 remote. The WS2000 has no straps on its jumper block Z5, indicating it is the master or main unit.

Table 3-11 Z5 WPIB Address Jumper Strap Settings

Expander	WPIB Address	Z5 Pins
0 (WS2000)	00	None
1	08	**5 – 6**
2	10	**4 – 7**
3	18	**4** – **7**, **5** – **6**
4	20	**3 – 8**
5	28	**3** – **8**, **5** – **6**
6	30	**3** – **8**, **4** – **7**
7	38	**3** – **8**, **4** – **7**, **5** – **6**

3.4.3.4.3 Serial Port Terminations

Applications using RS-232 interface operation require no straps on jumper blocks Z1 – Z3. However, if a connected port uses RS-422 or RS-485 interface operation, the port interface requires termination resistors on the receive side. Install the appropriate jumper straps on blocks Z1 – Z3 to provide termination resistors for Channels 1 – 9. Table 3-12 lists the jumper strap arrangements for blocks Z1 – Z3.

Recommendation: Install terminating resistors on the receiver terminal of all RS-422 circuits and on the furthest receiver terminal of an RS-485 circuit.

Table 3-12 Z1, Z2, Z3 Jumper Strap Arrangements for RS-422/RS-485 Receiver Termination

Pins	Function		
	Z1	**Z2**	**Z3** (Note)
1 – 8	Chan 9 Rx	Chan 2 Rx	Chan 1 CTS
2 – 7	Chan 8 Rx	Chan 3 Rx	Chan 1 Rx
3 – 6	Chan 7 Rx	Chan 4 Rx	Chan 1 RxC
4 – 5	Chan 6 Rx	Chan 5 Rx	Chan 1 TxC
1 – 4	N/A	N/A	Chan 1 CTS
2 – 3	N/A	N/A	Chan 1 Rx

Note: Backplanes from Revision B onward have a 4-pin Z3 block.

3.4.4 Cabling the WS2000

Figure 3-9, a rear view of the WS2000 unit, shows how the connections are grouped on the WS2000 backplane. Figure 3-12 Illustrates the various connection options described in this section. This section provides connection details for cabling the WS2000 to the network and office equipment in the following order (the order is not critical; vary according to your needs/optional equipment):

- Make all RS-232/RS-422/RS-485 serial connections using eight-pin connectors P1 through P6 and P8 through P13.
- Connect all discrete inputs through 50-pin connectors J1 and J2.
- Connect discrete expanders through connector P7 using the WPIB.
- Make power, local annunciator (the external alarm panel or the universal alarm panel), and internal host modem connections at TB1.
- Connect optional accessory interface equipment, such as the Telzon termination panel, the front-access wire-wrap kit, or the rear-access wire-wrap kit.

  Note: The front-access wire-wrap kit handles serial port, discrete input/control output, and TB1 connections. The rear-access wire-wrap kit and the Telzon termination block handle serial port and discrete input/control output connections.

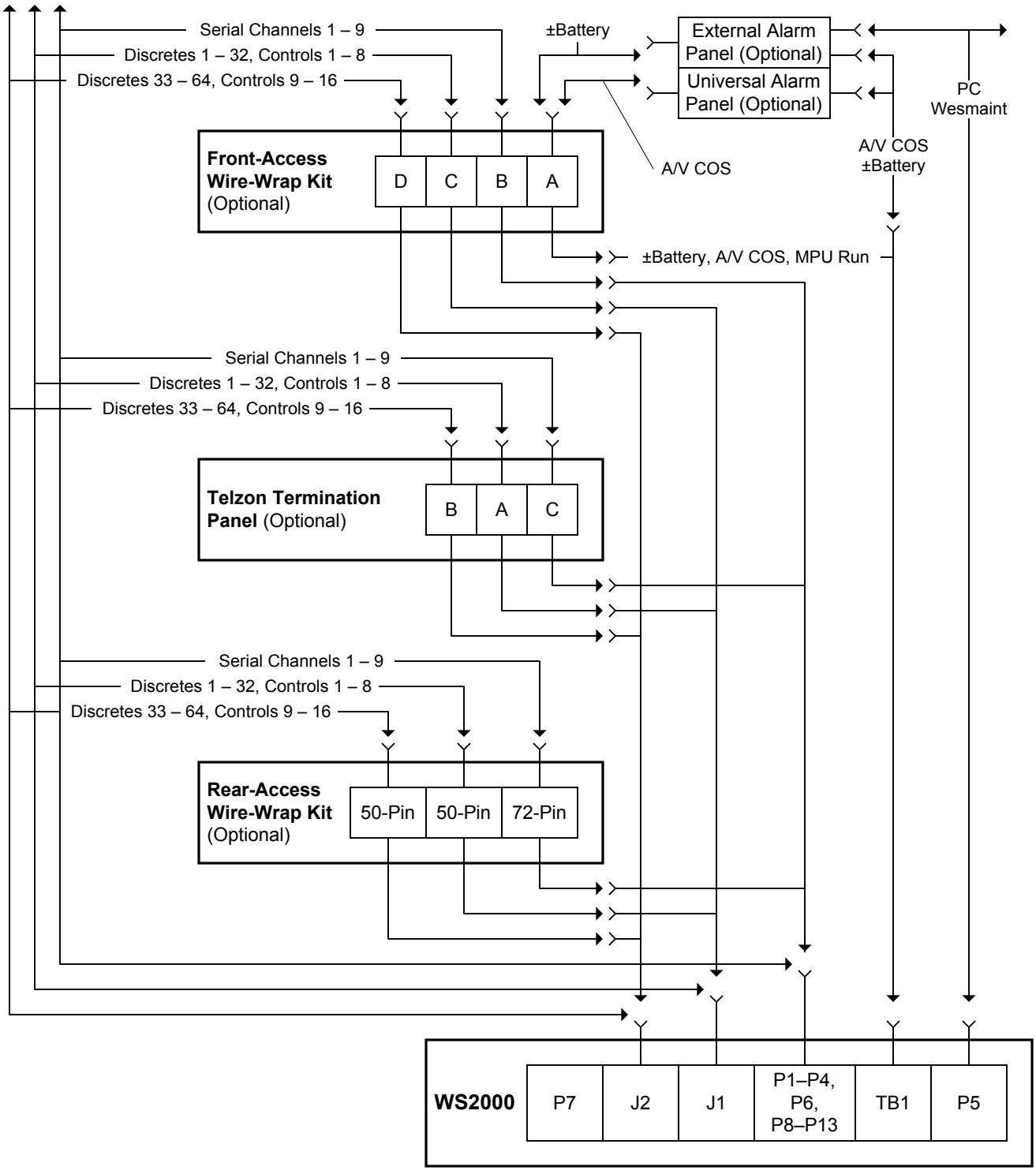


Figure 3-12 Overview of WS2000 System Connections

3.4.4.1 Front-Panel Craft Port

Pinout information and pin layout for the front-panel DB25 Craft port connector (JB3) appears in Figure 3-13. Table 3-13 includes pinout details for Craft port connector P5 (Methode).

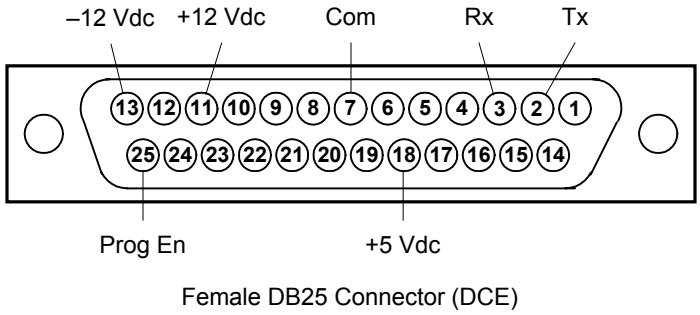


Figure 3-13 Front-Panel Connector JB3

3.4.4.2 Wesmaint Connections

Connection of a PC to the WS2000 WACP requires the PC-Wesmaint cable included with the software package. Connect the cable to the PC COM1 or COM2 port. If the PC uses a 25-pin COM port, use a DE9 to DB25 adapter to adapt the cable to the COM port. If the application requires an extension cable, use a standard RS-232 cable to connect the Wesmaint cable to the WS2000. Additional considerations about connecting the Craft port to any of the available hardware Wesmaint configurations is in *Cabling* on Page 5-1.

3.4.4.3 Serial Port Connections

Serial port cable assemblies require Methode connectors (PN1300-108-424 or 30F-108-424 or Westronic PN 620-0077). Methode hand insertion tool, JT-11-100-ST (Westronic PN 990-0150), is required to build these cables.

Each serial cable must be fitted with a ferrite Electromagnetic Interference (EMI) filter (provided with the W2000) during installation. The cable must wrap a minimum of two times around the ferrite and snap securely shut.

CAUTION: These connectors are designed for #24 AWG solid wiring. Use of smaller or larger diameter wiring, multiple terminations in the same contact, or stranded wire can result in intermittent connections.

Figure 3-14 illustrates the portion of the backplane containing the serial port connectors. The figure shows the port locations, their channel associations, the pin designations, and the type of serial interface.

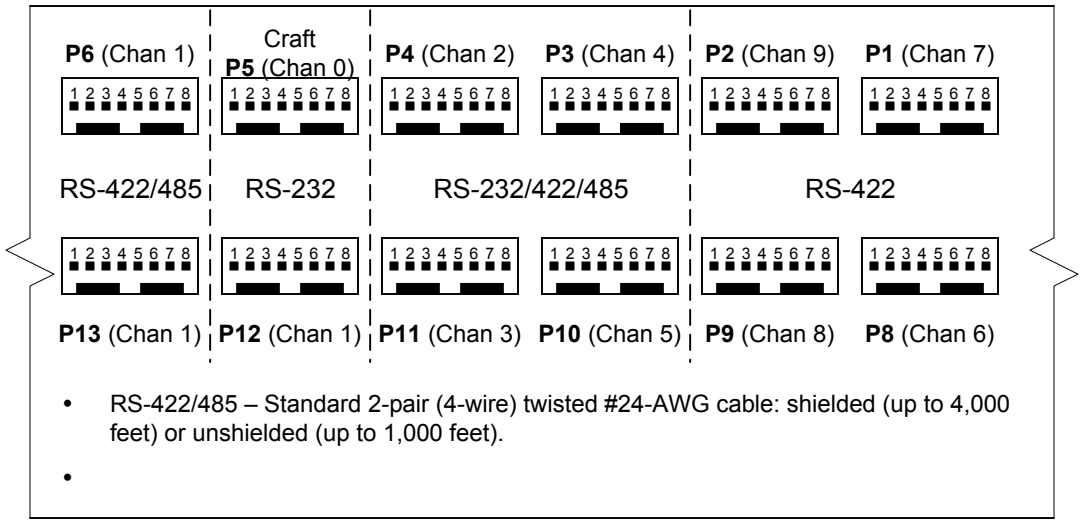


Figure 3-14 Rear View of WS2000 Serial Port Connectors (Methode)

3.4.4.3.1 Host Port

Channel 1 (host port) uses P6 if configured for an RS-422 or RS-485 interface and P12 if configured for an RS-232 interface. When the host port uses an external modem connected to P12, use the pinout information shown in Figure 3-15. When WS2000 has an internal 202T modem, make the host port connections at TB1 (Figure 3-19).

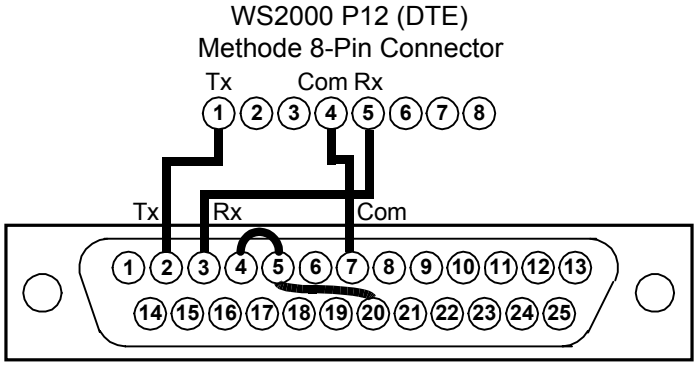


Figure 3-15 Host Port RS-232 Modem Connections

3.4.4.3.2 Serial Data Collection Ports/Craft Port

The serial data collection ports use different pinouts, depending on the chosen interface type.

Table 3-13 lists the cable interface data for the serial inputs and outputs, and the rear port for Craft maintenance (P5). Figure 3-16 diagrams the serial port interface connections for direct connection or connection through external modems.

Table 3-13 Cabling Interface Data for Serial Input/Output

Conn	Chan	Intfc RS-	Methode Pin Number							
			1	2	3	4	5	6	7	8
P1	7	422	–	–	–	Com	Rx–	Rx+	Tx–	Tx+
P2	9	422	–	–	–	Com	Rx–	Rx+	Tx–	Tx+
P3	4	232	Tx	RTS	CTS	Com	Rx	DCD	–	–
		422	–	–	–		Rx–	Rx+	Tx–	Tx+
		485	–	–	–		Rx–	Rx+	Tx–	Tx+
P4	2	232	Tx	RTS	CTS	Com	Rx	DCD	–	–
		422	–	–	–		Rx–	Rx+	Tx–	Tx+
		485	–	–	–		Rx–	Rx+	Tx–	Tx+
P5	Craft	232	Tx	Rx	Prog En	Com	–12 Vdc	+5 Vdc	+12 Vdc	–
P6	1	422	–	–	–	Com	Rx–	Rx+	Tx–	Tx+
		485	RTS–	RTS+	–	Com	Rx–	Rx+	Tx–	Tx+
P8	6	422	–	–	–	Com	Rx–	Rx+	Tx–	Tx+
P9	8	422	–	–	–	Com	Rx–	Rx+	Tx–	Tx+
P10	5	232	Tx	RTS	CTS	Com	Rx	DCD	–	–
		422	–	–	–		Rx–	Rx+	Tx–	Tx+
		485	–	–	–		Rx–	Rx+	Tx–	Tx+
P11	3	232	Tx	RTS	CTS	Com	Rx	DCD	–	–
		422	–	–	–		Rx–	Rx+	Tx–	Tx+
		485	–	–	–		Rx–	Rx+	Tx–	Tx+
P12	1	232	Tx	RTS	CTS	Com	Rx	DCD	–	–

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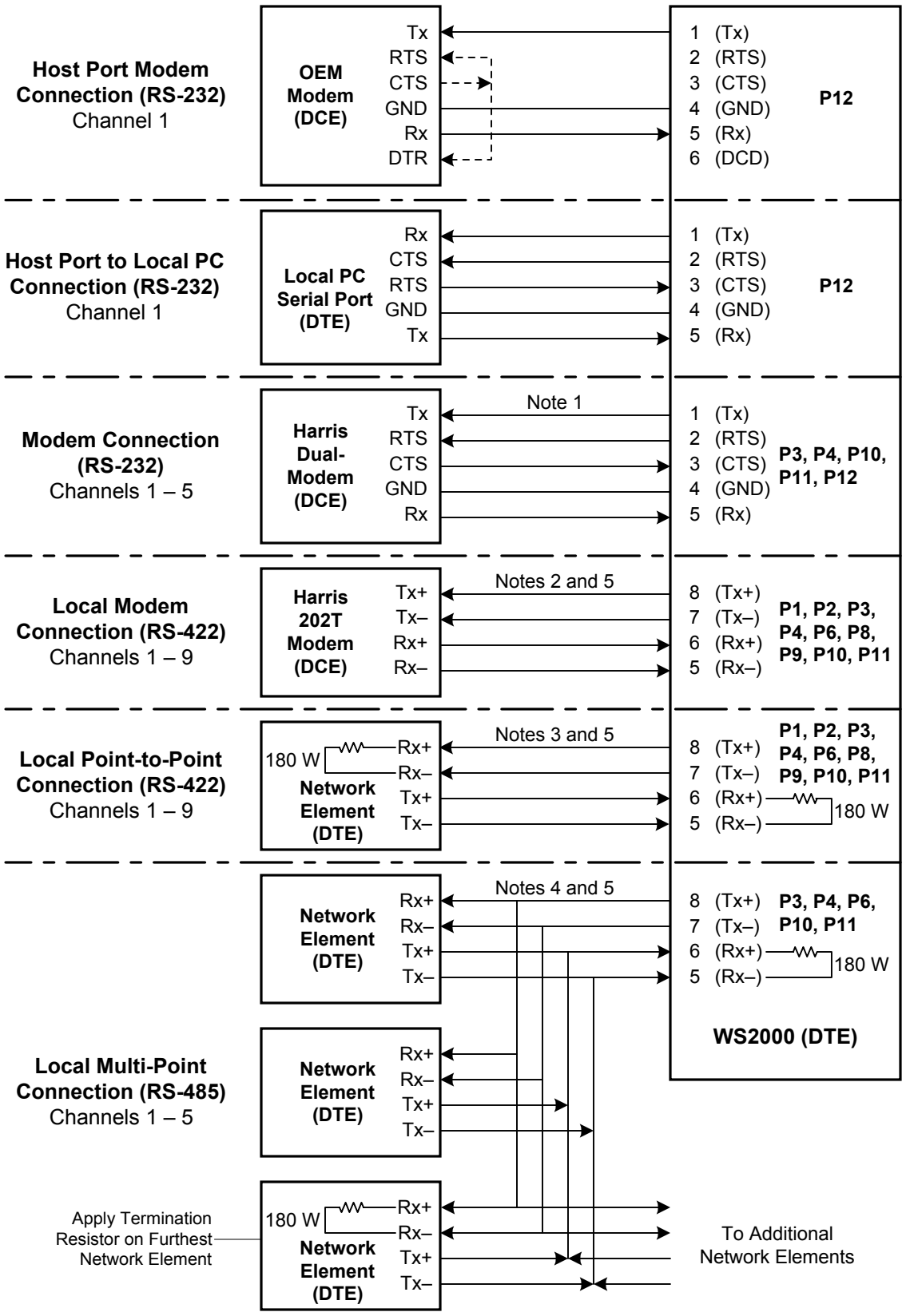


Figure 3-16 Serial Port Interface Connections for WS2000

The following notes are to *Figure 3-16 Serial Port Interface Connections for WS2000*.

1. The host port (Channel 1) and four of the serial data collection ports (Channels 2 – 5) can interconnect to networks using RS-232. This connection is suitable for use with external clear-channel modems, such as the 202T. If the modem to be connected is DCE, the WS2000 transmit signal lines terminate into the modem transmit inputs and the WS2000 receive signal lines terminate into the modem receive outputs (that is, straight-through connection) because the WS2000 is considered DTE equipment.
2. The host port (Channel 1) and all eight serial data collection ports (Channels 2 – 9) can interconnect to networks using RS-422. This connection is suitable for use with 202T modems. If the modem to be connected is DCE, the WS2000 transmit signal lines terminate into the modem transmit inputs and the WS2000 receive signal lines terminate into the modem receive outputs (that is, straight-through connection).
3. Any of the WS2000 serial data collection ports and the host port can interconnect to NEs using RS-422. The WS2000 is considered Data Terminal Equipment (DTE). If the NE to be connected is DTE, the WS2000 transmit signal lines terminate into the NE receive inputs and the WS2000 receive signal lines terminate into the NE transmit outputs (that is, transmit-receive crossover connection).
4. Five of the WS2000 serial data ports (Channels 1 – 5) can interconnect to NEs using RS-485. Connections are the same as for the RS-422 interface. Observe that for a multi-drop RS-485 interface, the end network element should have terminating resistors installed for the channel receiver. Intermediate units do not require channel termination.
5. Common terminology for balanced line connections are plus (+) and minus (–). Other naming conventions are as follows:
   - Plus = tip (T) = A = true (T)
   - Minus = ring (R) = B = false (F) = invert

3.4.4.4 Discrete and Analog Connections

WS2000 backplane connectors J1 and J2 handle the cable connections for discrete inputs and control outputs. Set each control output as Form A or Form C contact closure. See Figure 3-11 for connector pin layouts. As discussed in *Backplane* on Page 3-13, jumper block Z6 determines contact configurations for control outputs 1 through 8 and jumper block Z8 determines contact configurations for control outputs 9 through 16. Pin 34 on connectors J1 and J2 provides Form C control common voltage. Also see discussion of Form A and Form C in *Discrete Interfaces* on Page 2-3.

Figure 3-17 shows a rear view of the WS2000 with the connector layouts.

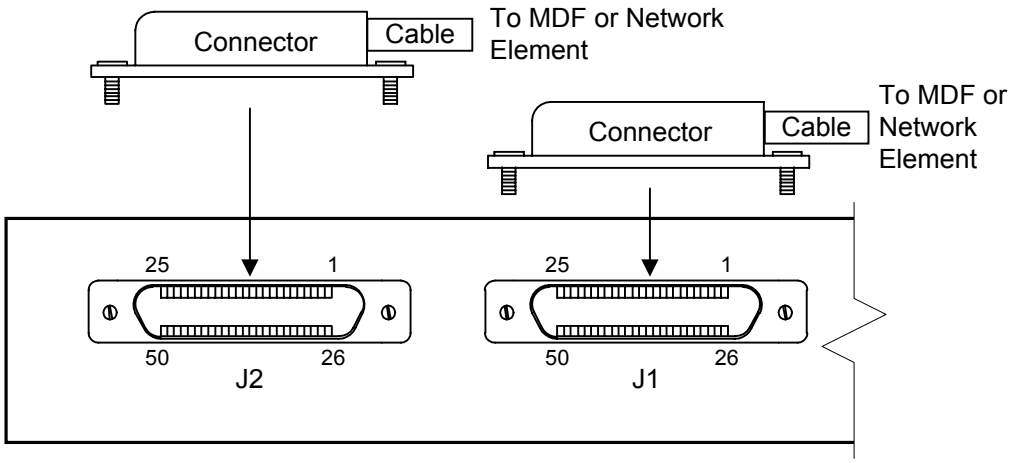


Figure 3-17 Rear View of the WS2000 Discrete Connectors

Connector

Delta 50-pin male connector. Use either of the following connector assemblies:

- Westronic 50-pin connector assembly: PN 620-0078
- Cinch: PN 97-12500-180 or 97-12500-181

Cable

Standard 25-pair (50 wires) unshielded telephone cable; #24 AWG single-strand wire

Table 3-14 and Table 3-15 list the designations for the discrete interfaces in the rear terminations.

Table 3-14 Pinouts for WS2000 Discrete Interface Connector J1

Function	Pin		Function
Control Output 1, Form C – NC	1	26	Control Output 1, Form A or C – NO
Control Output 2, Form C – NC	2	27	Control Output 2, Form A or C – NO
Control Output 3, Form C – NC	3	28	Control Output 3, Form A or C – NO
Control Output 4, Form C – NC	4	29	Control Output 4, Form A or C – NO
Control Output 5, Form C – NC	5	30	Control Output 5, Form A or C – NO
Control Output 6, Form C – NC	6	31	Control Output 6, Form A or C – NO
Control Output 7, Form C – NC	7	32	Control Output 7, Form A or C – NO
Control Output 8, Form C – NC	8	33	Control Output 8, Form A or C – NO
Ground	9	34	Control Output Common Voltage
Status/Alarm Input 1	10	35	Status/Alarm Input 2
Status/Alarm Input 3	11	36	Status/Alarm Input 4
Status/Alarm Input 5	12	37	Status/Alarm Input 6
Status/Alarm Input	13	38	Status/Alarm Input 8
Status/Alarm Input 9	14	39	Status/Alarm Input 10
Status/Alarm Input 11	15	40	Status/Alarm Input 12
Status/Alarm Input 13	16	41	Status/Alarm Input 14
Status/Alarm Input 15	17	42	Status/Alarm Input 16
Status/Alarm Input 17	18	43	Status/Alarm Input 18
Status/Alarm Input 19	19	44	Status/Alarm Input 20
Status/Alarm Input 21	20	45	Status/Alarm Input 22
Status/Alarm Input 23	21	46	Status/Alarm Input 24
Status/Alarm Input 25	22	47	Status/Alarm Input 26
Status/Alarm Input 27	23	48	Status/Alarm Input 28
Status/Alarm Input 29	24	49	Status/Alarm Input 30
Status/Alarm Input 31	25	50	Status/Alarm Input 32

Table 3-15 Pinouts for WS2000 Discrete Interface Connector J2

Function	Pin		Function
Control Output 9, Form C – NC	1	26	Control Output 9, Form A or C – NO
Control Output 10, Form C – NC	2	27	Control Output 10, Form A or C – NO
Control Output 11, Form C – NC	3	28	Control Output 11, Form A or C – NO
Control Output 12, Form C – NC	4	29	Control Output 12, Form A or C – NO
Control Output 13, Form C – NC	5	30	Control Output 13, Form A or C – NO
Control Output 14, Form C – NC	6	31	Control Output 14, Form A or C – NO
Control Output 15, Form C – NC	7	32	Control Output 15, Form A or C – NO
Control Output 16, Form C – NC	8	33	Control Output 16, Form A or C – NO
Ground	9	34	Control Output Common Voltage
Status/Alarm Input 33	10	35	Status/Alarm Input 34
Status/Alarm Input 35	11	36	Status/Alarm Input 36
Status/Alarm Input 37	12	37	Status/Alarm Input 38
Status/Alarm Input 39	13	38	Status/Alarm Input 40
Status/Alarm Input 41	14	39	Status/Alarm Input 42
Status/Alarm Input 43	15	40	Status/Alarm Input 44
Status/Alarm Input 45	16	41	Status/Alarm Input 46
Status/Alarm Input 47	17	42	Status/Alarm Input 48
Status/Alarm Input 49	18	43	Status/Alarm Input 50
Status/Alarm Input 51	19	44	Status/Alarm Input 52
Status/Alarm Input 53	20	45	Status/Alarm Input 54
Status/Alarm Input 55	21	46	Status/Alarm Input 56
Status/Alarm Input 57	22	47	Status/Alarm Input 58
Status/Alarm Input 59	23	48	Status/Alarm Input 60
Status/Alarm Input 61	24	49	Status/Alarm Input 62
Status/Alarm Input 63	25	50	Status/Alarm Input 64

3.4.4.5 Discrete Expander Cabling

Figure 3-18 shows the parallel interface and expansion bus of a WS2000 to discrete expanders through connector P7. The WS2000 can control a maximum of 7 discrete expanders through a 34-conductor ribbon cable used for the connection. One end of the cable connects to P7 of the WS2000 unit while the next connector in line connects to P7 of a discrete expander. If the cable has additional unused connectors,

the remaining cable can be rolled up and later unrolled to connect added discrete expanders.

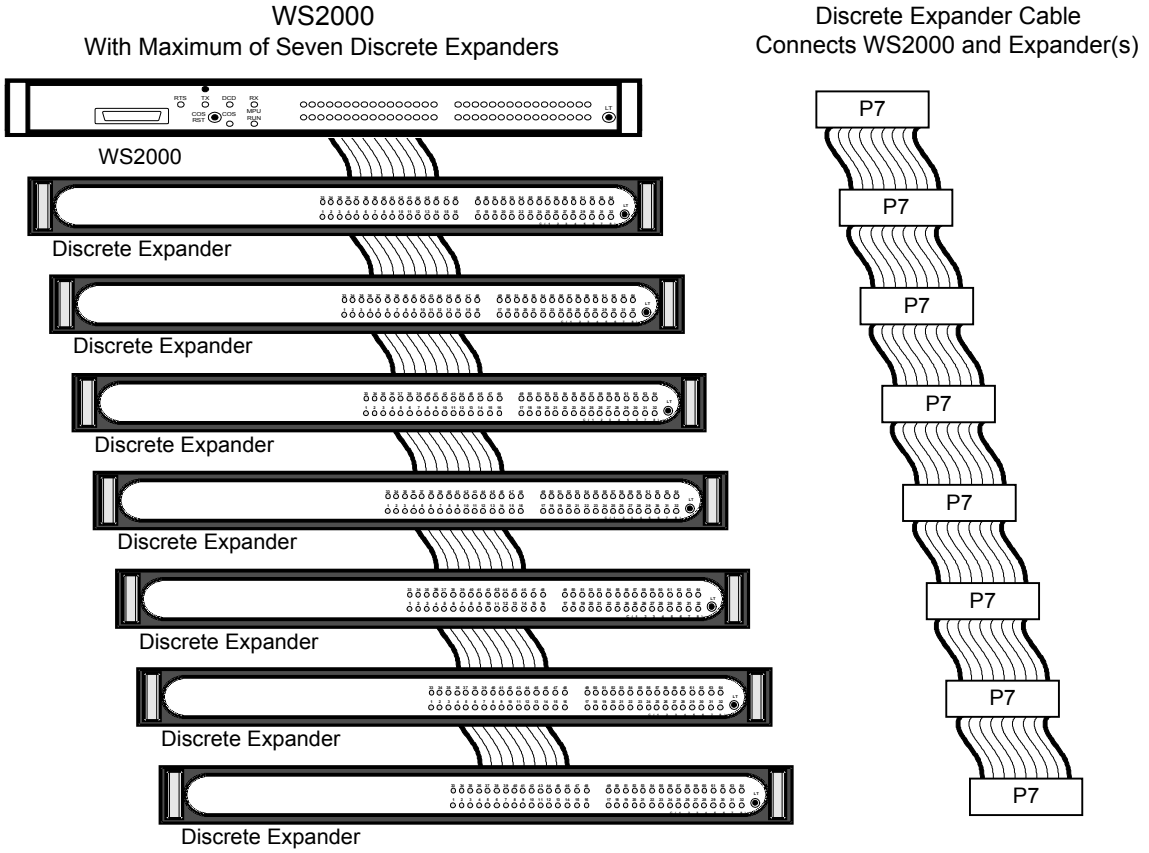


Figure 3-18 WS2000 to Discrete Expander Interface Connections

Table 3-16 lists cables having 2 through 8 connectors. Order from Westronic using the listed order number. Table 3-17 lists the pinout information for the ribbon cable.

Table 3-16 Westronic Peripheral Interface Bus (WPIB) Cable Part Numbers

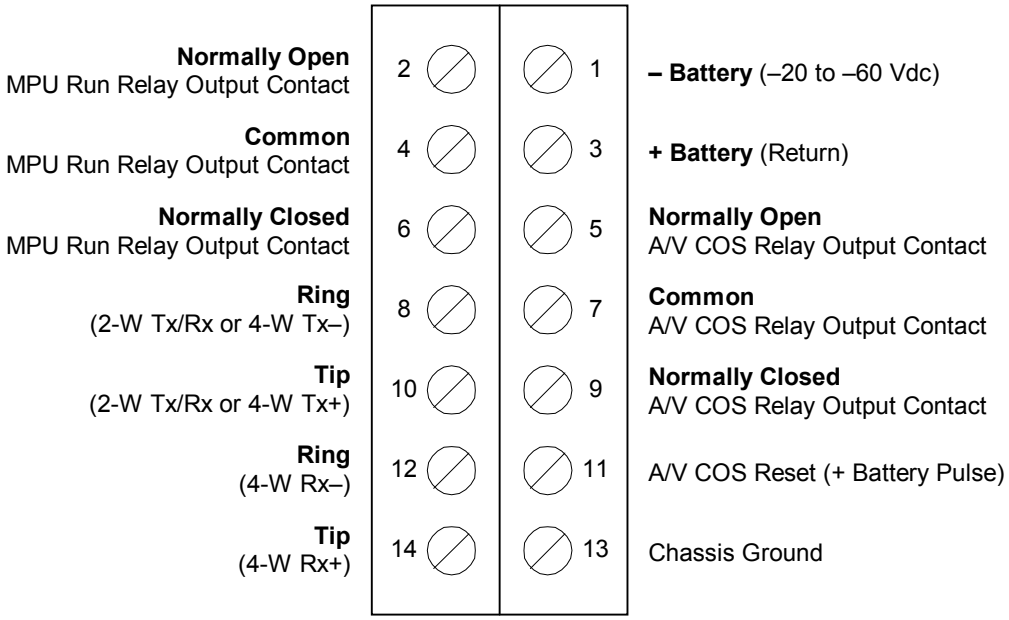
PN	Description
963-0003	WPIB cable, 2 connectors: 1 expander
963-0004	WPIB cable, 3 connectors: 2 expanders
963-0005	WPIB cable, 4 connectors: 3 expanders
963-0006	WPIB cable, 5 connectors: 4 expanders
963-0007	WPIB cable, 6 connectors: 5 expanders
963-0012	WPIB cable, 7 connectors: 6 expanders
963-0013	WPIB cable, 8 connectors: 7 expanders

Table 3-17 Pinout Information for the Westronic Peripheral Interface Bus (WPIB) P7

Function	Pin		Function
–12 Vdc	1	18	AO0
+12 Vdc	2	19	0 Vdc
+5 Vdc	3	20	AO4
+V1 (Control Relay Coil Voltage)	4	21	AO3
I/O RST	5	22	AO2
ID	6	23	AO7
STB	7	24	AO6
DI1	8	25	AO5
DI0	9	26	DO1
–	10	27	DO0
DI4	11	28	0 Vdc
DI3	12	29	DO4
DI2	13	30	DO3
DI7	14	31	DO2
DI6	15	32	DO7
DI5	16	33	DO6
AO1	17	34	DO5

3.4.4.6 Terminal Board TB1 Connections

Figure 3-19 shows connections to TB1.



Use #14 – #24 AWG Solid Wire for All TB1 Connections

A/V	Audio/Visual
AWG	American Wire Gauge
COS	Change of State
MPU	Microprocessor Unit

Figure 3-19 WS2000 Rear Connector TB1

3.4.4.7 Optional Devices

The following discusses configuration and connection for the following optional, ancillary equipment:

- Rack-mount modem
- External audible/visual alarm panel
- Universal alarm panel
- Telzon termination panel
- Front-access wire-wrap kit
- Rear-access wire-wrap kit

3.4.4.7.1 Rack-Mount Modem

The optional rack-mount modem (Figure 3-20), used on the data collection channels, is equipped with the 202T/CCITT V.23 modem expansion card [see *Internal 202T Modem (Optional)* on Page 3-9]. The modem is a standard one-increment 19-inch rack- mount panel with the following dimensions: 19.0 inches (w) by 1.75 inches (h) by 2.0 inches (d). The assembly includes 23-inch rack-mount adapters.

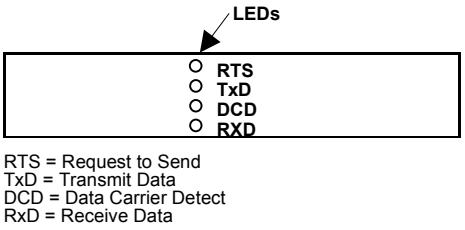


Figure 3-20 Front View of the Rack-Mount Modem

Main Board Configuration

The rack-mount modem main board (PN 540-0090), shown in Figure 3-21, has the factory-set strap options specified in Table 3-18.

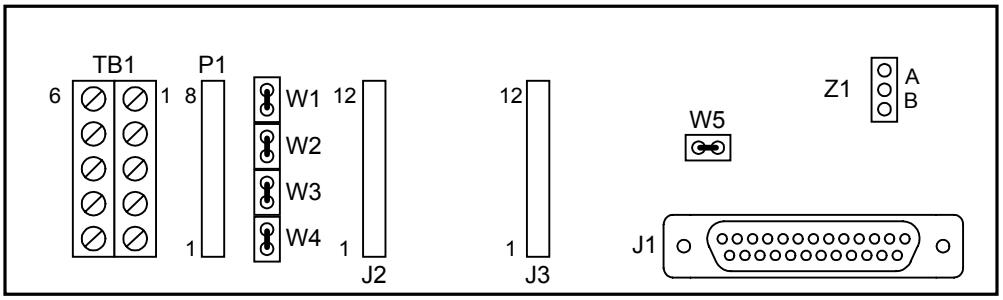


Figure 3-21 Rack-Mount Modem Main Board

Table 3-18 Factory Strap Options for Rack-Mount Modem Main Board

Jumper	Strapping	Function
Z1	No strap	Normal RTS operation
	A	Continuous carrier when DTE equipment is connected and DTR present
	B	Continuous carrier
W1 – W5	Artwork circuitry	Not applicable to WS2000 applications

Figure 3-22 shows terminal block TB1 pinouts on the rack-mount modem assembly. The 4-wire 202T connection uses Pins 1, 2, 3, and 4; the 2-wire connection uses Pins 1 and 2. Use #14 – #24 AWG wire for the power connection.

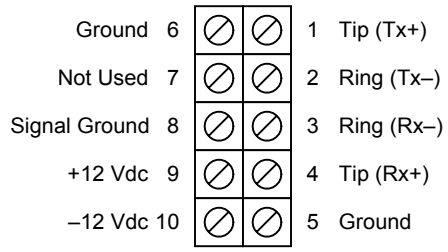


Figure 3-22 Rack-Mount Modem TB1 Pinouts

Cable Connections

A special cable (PN 977-0032) provides power and digital signals for the rack-mount modem from the WS2000. One end of this cable fans out into two Methode connectors: J4 and J5. Older versions of this cable labeled these two connectors as J1 and J2, respectively. The other end of the cable has a single male DB25 connector (P1). (If a rack-mount modem is used along with a rack-mount hardware Wesmaint, another cable, PN 977-T055, is available that provides power and data for both devices.)

Cable connector J5 (J2 of the older version cable) connects to WS2000 P5 to provide ±12 Vdc power to the modem.

Cable connector J4 (J1) connects to the selected WS2000 data collection channel (Channel 2 – Channel 5) Methode connector (P3, P4, P10, or P11). This connection establishes the RS-232 signal channel between the WS2000 and the modem module.

Cable connector P1, the male DB25 connector, connects to J1 on the rack-mount modem (see Figure 3-21). Table 3-19 provides pinout information for the DB25 connector at J1 of the rack-mount modem.

Table 3-19 Connector J1 DB25 Pinouts

Pin	Function
2	Transmit In
3	Receive Out
4	Request to Send (RTS)
5	Clear to Send (CTS)
6	Data Set Ready (DSR)
7	Common
8	Data Carrier Detect (DCD)
9	+12 Vdc
10	–12 Vdc
11	+12 Vdc
13	–12 Vdc
20	Data Terminal Ready (DTR)
22	Ring Indicator (RI)

Table 3-20 shows the point-to-point wiring from TB1 on the rack-mount modem to a remote site (downstream) WS2000 unit. This cable connection, shown in the lower part of Figure 3-23, allows incoming information to transfer from a remote site to the WS2000 system over a 4-wire voice-frequency (VF) circuit.

Table 3-20 Connection Between Rack-Mount Modem and WS2000 Units

From Rack-Mount Modem		To WS2000	
TB1-1	Tx+ (Tip)	TB1-14	Rx+ (Tip)
TB1-2	Tx– (Ring)	TB1-12	Rx– (Ring)
TB1-3	Rx– (Ring)	TB1-8	Tx– (Ring)
TB1-4	Rx+ (Tip)	TB1-10	Tx+ (Tip)

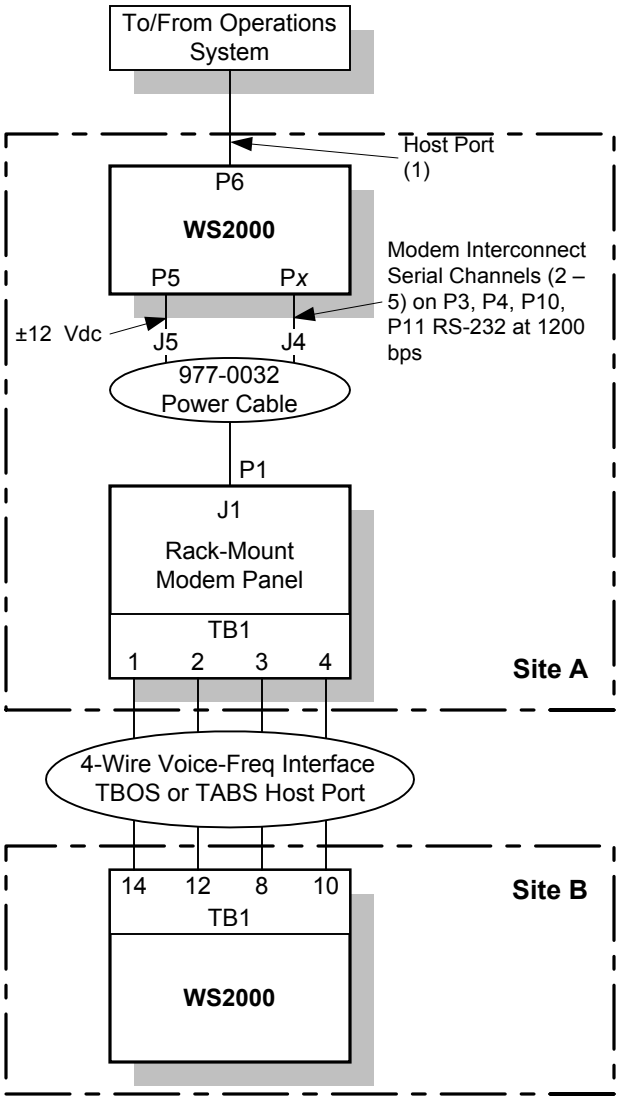


Figure 3-23 WS2000 and Rack-Mount Modem Interconnections

3.4.4.7.2 External Audible/Visual Alarm Panel

The Westronic external audible/visual alarm panel connects to the COS (Change of State) relay outputs located on WS2000 TB1 to provide both audible and visual standing summary alarm indications. The external alarm panel is equipped with an audible annunciator, an audible alarm disable toggle switch, an **ACO** button, and an alarm summary LED. **P5 IN** receives power from WS2000 P5. **P5 OUT** passes the information on for use by other equipment, such as a PC Wesmaint. Figure 3-24 shows the front and rear panels while Table 3-21 details the TB1 and P5 pinouts.

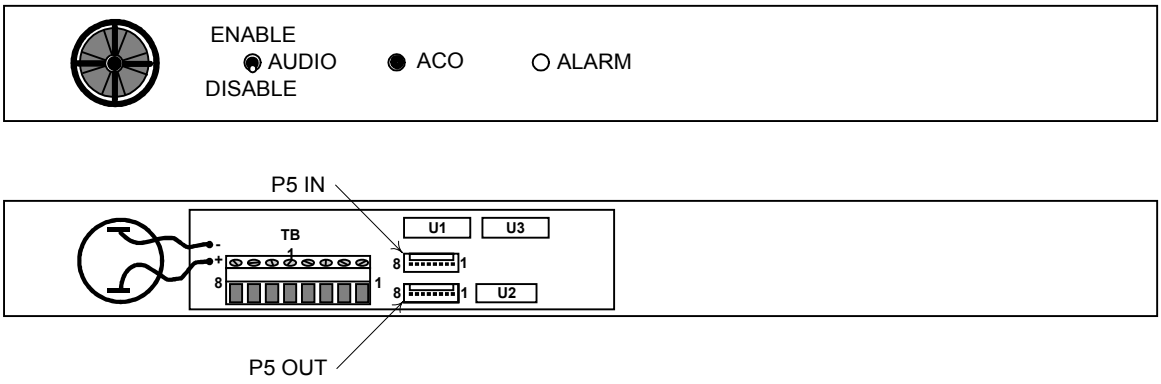


Figure 3-24 External Audible/Visual Alarm panel

Table 3-21 Audible/Visual Alarm Panel Pinouts for TB1 and P5 IN/OUT

TB1		P5 IN/P5 OUT	
Pin	**Function**	**Pin**	**Function**
1	Audio Common	**1**	Tx
2	Audio Normally Closed	**2**	Rx
3	Audio Normally Open	**3**	Prog En
4	LED Common	**4**	Common
5	LED Normally Closed	**5**	–12 Vdc
6	LED Normally Open	**6**	+5 Vdc
7	COS Common	**7**	+12 Vdc
8	COS Normally Open	**8**	–

3.4.4.7.3 Universal Annunciator Panel

The Universal Annunciator Panel provides simultaneous audible and visual notification of alarms reported by a combination of up to eight Westronic remote telemetry units, such as WS1000, C1000, WS2000, and WS3000. The panel is equipped with an audible annunciator, power LED, audible alarm disable toggle switch, lamp test button, **ACO** button and eight individual alarm summary LEDs. Figure 3-25 shows the position of all front-panel controls and indicators, and rear-panel connectors.

Mounting

You can mount the 1-VU Universal Annunciator Panel in a standard 19- or 23-inch communications rack using the included adapters. You can also mount it flush with the rack or with a front extension by positioning the mounting ears toward the front or rear.

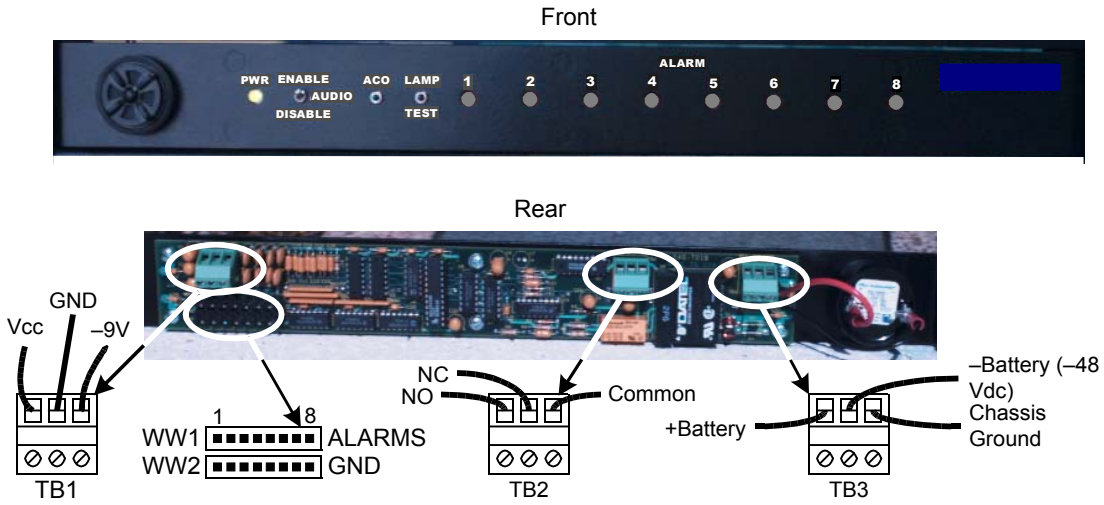


Figure 3-25 Universal Annunciator Panel, Front and Rear Panels

Electrical Connections

The panel connects to the COS relay terminals located on WS2000 rear-panel TB1 to provide both audible and visual standing alarm summary indications. The alarm output is enabled when the COS Normally Open contact (TB1-5) closes.

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 summary alarm 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. Fuse with a 0.5 Amp slow-blow fuse.

Make alarm input connections at connectors **WW1** (**ALARMS**) and **WW2** (**GND**). Table 3-22 shows the input connections. For example, to make the WS2000 indicate on Alarm 7, connection is as follows:

From WS2000	To UAP Alarm 7 LED
TB1-5 (COS Normally Open)	WW1-7 (**ALARMS**)
TB1-7 (COS Return)	WW2-7 (**GND**)

Table 3-22 Alarm Summary Input Connections

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

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 WS2000, 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 **TB2** 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**.

3.4.4.7.4 Telzon Termination Panel

The Telzon termination panel (Figure 3-26) provides front-panel wire-wrap access to all discrete and serial connections available on the WS2000 backplane.

The Telzon block comes in two configurations: 19 inches and 23 inches. The kits include cables and appropriate size mounting bars.

Table 3-23 lists part numbers for parts associated with the Telzon panels.

Connections and Cabling

Each Telzon termination panel has three connectors: two access the wire-wrap terminations for the discrete I/O and one accesses the wire-wrap terminations for serial and digital-host port communications. All three connectors are standard Delta-style female 50-pin connectors.

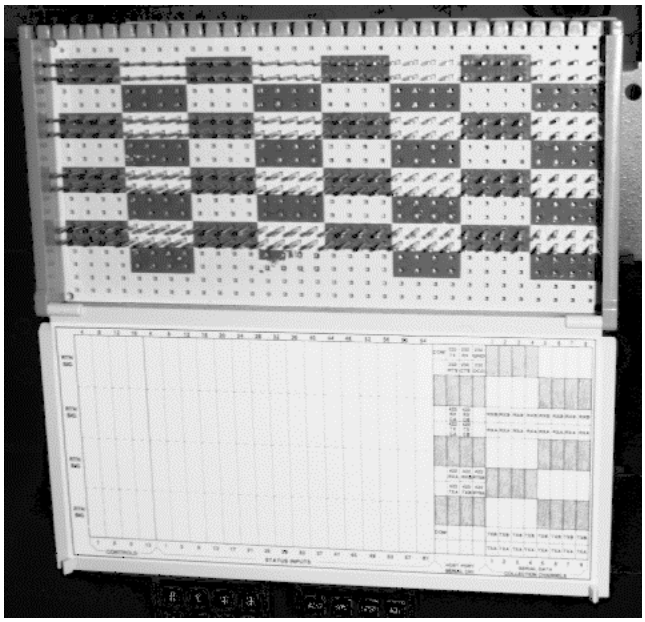


Figure 3-26 Telzon Block

Table 3-23 Telzon Block Component Part Numbers

Item	Qty	Part No	Description
–	1	533-T030 533-T011	19-inch Telzon Panel 23-inch Telzon Panel
1	1	640-T002	Telzon Wire-Wrap Block
2	2	977-T003	3-foot Discrete I/O Cable (for connectors A and B)
3	1	977-T070	3-foot Serial I/O Cable (for connector C)
4	1	953-T003	23-inch Mounting Bar
5	1	953-T091	19-inch Mounting Bar

The panel connects through three 3-foot cables that are included with the Telzon panel. Two of the cables, which are used for discrete I/O connections, terminate with one male and one female, standard Delta-style, 50-pin, right-angle connectors. Each cable supports 32 discrete alarm/status inputs and eight discrete control outputs or analog inputs. Both cables are required, regardless of the number of discretes actually used. The third cable has one end that terminates with a standard female, Delta-style, 50-pin, right-angle connector and the other end "fans" out into 11 female, 8-pin, Methode connectors, which handle RS-232 and RS-422/485 connections for the serial collection ports and the RS-422/TTL accumulator inputs (see Figure 3-27).

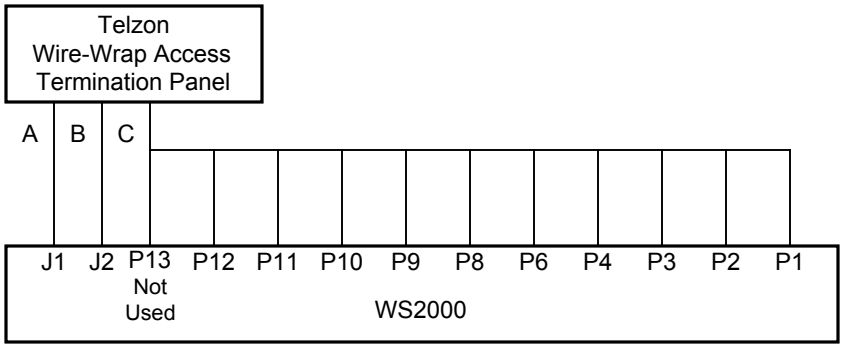


Figure 3-27 Remote and Telzon Termination Block Interconnection

Table 3-24 shows the wire color-pair combinations identifying which serial connection from the Telzon cable terminates to the mating WS2000 unit "P" plug.

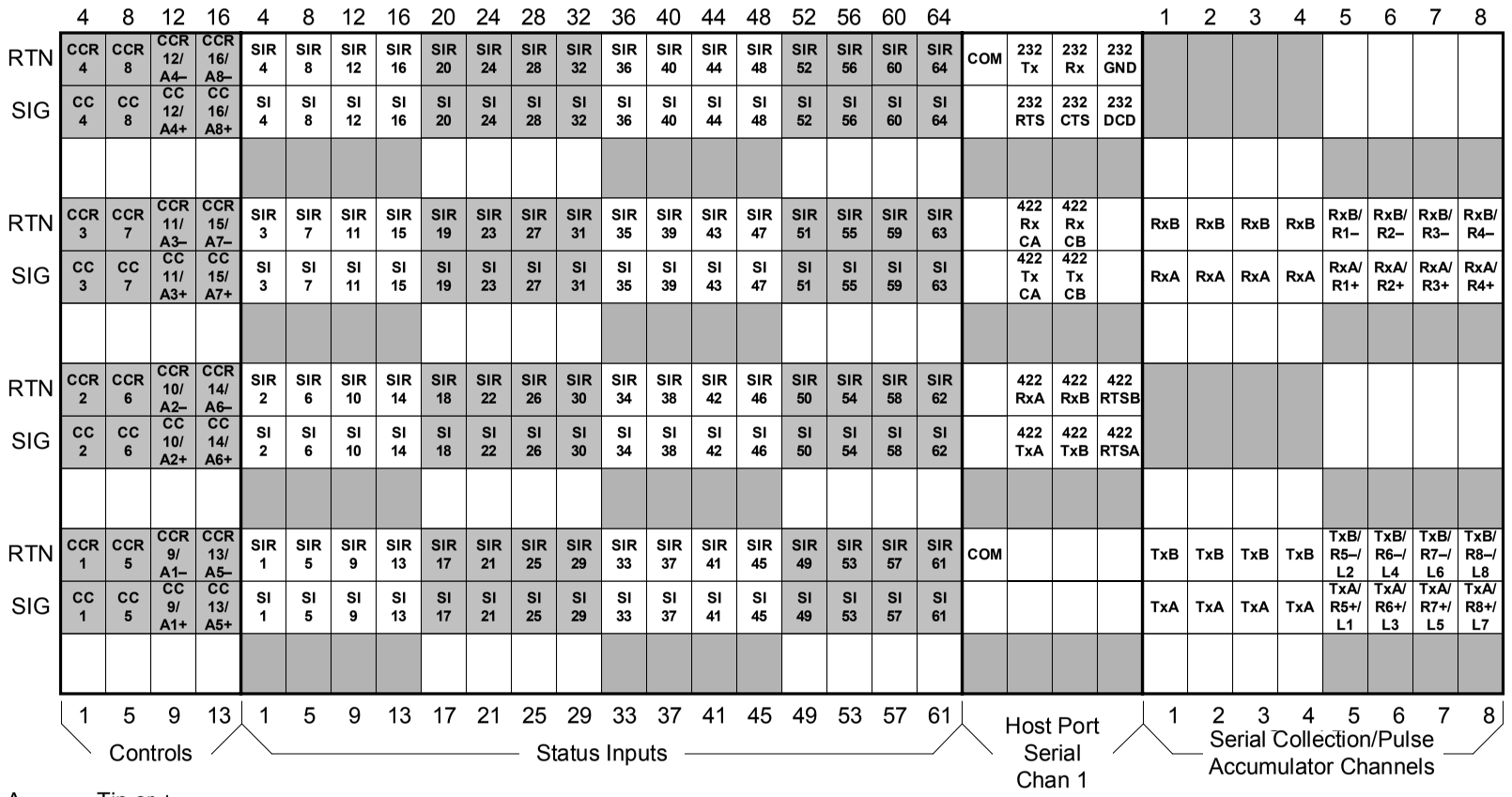
Table 3-24 Telzon Serial Connector Identification and Wire Colors

WS2000 Plug	Serial Channel/Interface Type	Telzon Cable Wire
P1	7 RS-422 (TBOS)	Orange/Yellow, Orange/Red
P2	9 RS-422 (TBOS)	Brown/Yellow, Brown/Red
P3	4 RS-232/422/485 (TBOS)	Green/Black, Green/White
P4	2 RS-232/422/485 (TBOS)	Blue/Black, Blue/White
P6	1 RS-422 (WACP)	Slate/Black, Slate/White, Slate/Red
P8	6 RS-422 (TBOS)	Blue/Yellow, Blue/Red
P9	8 RS-422 (TBOS)	Green/Yellow, Green/Red
P10	5 RS-232/422/485 (TBOS)	Brown/Black, Brown/White
P11	3 RS-232/422/485 (TBOS)	Orange/Black, Orange/White
P12	1 RS-232 (WACP)	Green/Violet, Brown/Violet, Slate/Violet
P13	1 RS-485 (Not Used)	Slate/Yellow, Slate/Violet

Configuration

The Telzon panel can route signals in applications using a maximum of 64 discrete alarm/status inputs, 16 discrete control outputs, and eight serial data collection ports. Digital host communications can also route through the Telzon panel. Figure 3-28 details the pinouts.

Figure 3-28 Telzon Pinouts and Functions



A Tip or +
B Ring or –
CTS Clear to Send
DCD Data Carrier Detect
RTS Request to Send
232 RS-232
422 RS-422/RS-485
– Return

A1 – A8 Analog 1 through 8
L1 – L8 TTL Pulse Accumulator 1 through 8
R1 – R8 RS-422 Pulse Accumulator 1 through 8

1 Channel 2 (P4)
2 Channel 3 (P11)
3 Channel 4 (P3)
4 Channel 5 (P10)
5 Channel 6 (P8)
6 Channel 7 (P1)
7 Channel 8 (P9)
8 Channel 9 (P2)

Telzon Termination Panel Wire-Wrap Features

Each discrete input on the Telzon termination panel is a dry contact input with two wire-wrap pins for connection. One pin is the dry contact input while the other is a return. Each group of 32 returns buss together and terminate onto a common (COM) wire-wrap pin. Each discrete control output is a relay closure to two isolated contacts.

Four standard serial collection ports (Channels 2 – 5) can connect as RS-232 or RS-422/RS-485. RS-422/RS-485 connections have four wire-wrap pins: Transmit and Receive Tip/Ring. The digital host communications port generally connects as RS-232 or RS-422. The RS-232 connection uses six wire-wrap pins:

- Transmit (Tx)
- Receive (Rx)
- Ground (Gnd)
- Request to Send (RTS)
- Clear to Send (CTS)
- Data Carrier Detect (DCD)

The four optional collection ports (Channels 6 – 9) must connect using the RS-422 interface.

3.4.4.7.5 Front-Access Wire-Wrap Kit

The front-access wire-wrap kit is intended for any WS2000 application requiring front access to the unit. The wire-wrap panel uses one rack space in addition to the WS2000 main unit, as shown in Figure 3-29. This kit is ideal for Controlled Environment Vault (CEV) or installations with restricted rear access. The kit has a heavy-duty, clear-plastic cover (not shown) to prevent accidental contact with the wire-wrap pins.

Figure 3-29 Front-Access Wire-Wrap Kit (Cover Removed)

The front-access wire-wrap kit consists of the parts shown in Table 3-25.

Table 3-25 Front-Access Wire-Wrap Kit (PN 533-T032) Components

Part Number	Qty	Description
510-T001	1	Wire-Wrap Panel
977-T046	1	TB1 Cable (A)
977-T047	1	Serial Cable (B)
977-T048	2	Discrete Cables (C and D)
953-1001	2	23-inch Rack Adapters
900-0008	4	Rack Adapter Screws

The cables provided in this kit connect directly to the WS2000 as shown in Figure 3-30. Table 3-26 through Table 3-29 describe the front wire-wrap connections.

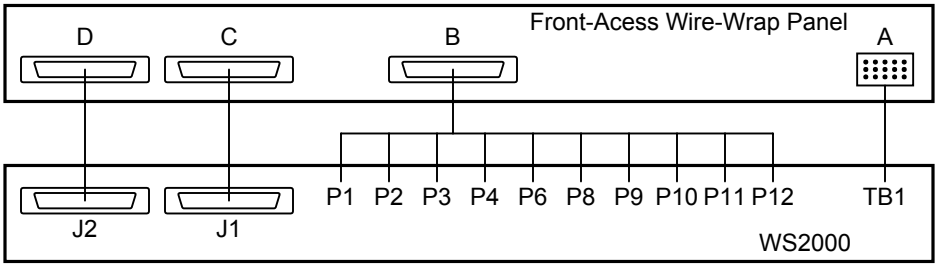


Figure 3-30 Front-Access Wire-Wrap Panel Connections

Table 3-26 Power/Auxiliary Host Port Connections Between WS2000 and Front-Access Wire-Wrap Panel Connector A

From Conn A Pin No	To WS2000 TB1 Pin No	Wire Color	Function
1	TB1-3	Red	(+) Battery Ground
2	TB1-1	Black	(–) Battery Input
3	TB1-13	Green	Frame Ground
A1	TB1-10	Orange	Internal 202T Modem Tip (Tx+)
A2	TB1-8	White	Internal 202T Modem Ring (Tx–)
A3	TB1-2	White/Black	MPU Run Relay NO
A4	TB1-4	Red/Black	MPU Run Relay Common
A5	TB1-6	Green/Black	MPU Run Relay NC
A6	No Connection		

Table 3-26 Power/Auxiliary Host Port Connections Between WS2000 and Front-Access Wire-Wrap Panel Connector A

From Conn A Pin No	To WS2000 TB1 Pin No	Wire Color	Function
D1	TB1-14	Blue/White	Internal 202T Modem Tip (Rx+)
D2	TB1-12	Blue	Internal 202T Modem Ring (Rx–)
D3	TB1-5	Black/White	COS Run Relay NO
D4	TB1-7	Red/White	COS Run Relay Common
D5	TB1-9	Green/White	COS Run Relay NC
D6	TB1-11	Blue/Black	External COS Reset

Table 3-27 Serial Port Connections for Front Wire-Wrap Panel Connector B

Function	Pin		Function	Function	Pin		Function
Ch 2 Tx– (RS-422)	**A7**	**B7**	Ch 2 Tx+ (RS-422)	Ch 6 Tx– (RS-422)	**C7**	**D7**	Ch 6 Tx+ (RS-422)
Ch 2 Rx– (RS-422)	**A8**	**B8**	Ch 2 Rx+ (RS-422)	Ch 6 Rx– (RS-422)	**C8**	**D8**	Ch 6 Rx+ (RS-422)
Ch 2 Shld Gnd	**A9**	**B9**	Ch 3 Shld Gnd	Ch 7 Shld Gnd	**C9**	**D9**	Ch 6 Shld Gnd
Ch 3 Tx– (RS-422)	**A10**	**B10**	Ch 3 Tx+ (RS-422)	Ch 7 Tx– (RS-422)	**C10**	**D10**	Ch 7 Tx+ (RS-422)
Ch 3 Rx– (RS-422)	**A11**	**B11**	Ch 3 Rx+ (RS-422)	Ch 7 Rx– (RS-422)	**C11**	**D11**	Ch 7 Rx+ (RS-422)
Ch 4 Tx– (RS-422)	**A12**	**B12**	Ch 4 Tx+ (RS-422)	Ch 8 Tx– (RS-422)	**C12**	**D12**	Ch 8 Tx+ (RS-422)
Ch 4 Rx– (RS-422)	**A13**	**B13**	Ch 4 Rx+ (RS-422)	Ch 8 Rx– (RS-422)	**C13**	**D13**	Ch 8 Rx+ (RS-422)
Ch 4 Shld Gnd	**A14**	**B14**	Ch 5 Shld Gnd	Ch 9 Shld Gnd	**C14**	**D14**	Ch 8 Shld Gnd
Ch 5 Tx– (RS-422)	**A15**	**B15**	Ch 5 Tx+ (RS-422)	Ch 9 Tx– (RS-422)	**C15**	**D15**	Ch 9 Tx+ (RS-422)
Ch 5 Rx– (RS-422)	**A16**	**B16**	Ch 5 Rx+ (RS-422)	Ch 9 Rx– (RS-422)	**C16**	**D16**	Ch 9 Rx+ (RS-422)
Ch 1 Tx– (RS-422)	**A17**	**B17**	Ch 1 Tx+ (RS-422)	Ch 1 Tx (RS-232)	**C17**	**D17**	Ch 1 RTS (RS-232)
Ch 1 Rx– (RS-422)	**A18**	**B18**	Ch 1 Rx+ (RS-422)	Ch 1 CTS (RS-232)	**C18**	**D18**	Ch 1 Sig Gnd (RS-232)
Ch 1 Shld Gnd	**A19**	**B19**	No Connection	Ch 1 Rx (RS-232)	**C19**	**D19**	Ch 1 DCD (RS-232)

Table 3-28 J1 Discrete Input/Output Connections from Front Wire-Wrap Panel Connector C

Function	Pin		Function	Function	Pin		Function
Control Output 1	**A20**	**B20**	Control Output 1 Return	Control Output 2	**C20**	**D20**	Control Output 2 Return
Control Output 3	**A21**	**B21**	Control Output 3 Return	Control Output 4	**C21**	**D21**	Control Output 4 Return
Control Output 5	**A22**	**B22**	Control Output 5 Return	Control Output 6	**C22**	**D22**	Control Output 6 Return
Control Output 7	**A23**	**B23**	Control Output 7 Return	Control Output 8	**C23**	**D23**	Control Output 8 Return
Status/Alarm Input 1	**A24**	**B24**	Status/Alarm Input 1 Return	Status/Alarm Input 2	**C24**	**D24**	Status/Alarm Input 2 Return
Status/Alarm Input 3	**A25**	**B25**	Status/Alarm Input 3 Return	Status/Alarm Input 4	**C25**	**D25**	Status/Alarm Input 4 return
Status/Alarm Input 5	**A26**	**B26**	Status/Alarm Input 5 Return	Status/Alarm Input 6	**C26**	**D26**	Status/Alarm Input 6 Return
Status/Alarm Input 7	**A27**	**B27**	Status/Alarm Input 7 Return	Status/Alarm Input 8	**C27**	**D27**	Status/Alarm Input 8 Return
Status/Alarm Input 9	**A28**	**B28**	Status/Alarm Input 9 Return	Status/Alarm Input 10	**C28**	**D28**	Status/Alarm Input 10 Return
Status/Alarm Input 11	**A29**	**B29**	Status/Alarm Input 11 Return	Status/Alarm Input 12	**C29**	**D29**	Status/Alarm Input 12 Return
Status/Alarm Input 13	**A30**	**B30**	Status/Alarm Input 13 Return	Status/Alarm Input 14	**C30**	**D30**	Status/Alarm Input 14 Return
Status/Alarm Input 15	**A31**	**B31**	Status/Alarm Input 15 Return	Status/Alarm Input 16	**C31**	**D31**	Status/Alarm Input 16 Return
Status/Alarm Input 17	**A32**	**B32**	Status/Alarm Input 17 Return	Status/Alarm Input 18	**C32**	**D32**	Status/Alarm Input 18 Return
Status/Alarm Input 19	**A33**	**B33**	Status/Alarm Input 19 Return	Status/Alarm Input 20	**C33**	**D33**	Status/Alarm Input 20 Return
Status/Alarm Input 21	**A34**	**B34**	Status/Alarm Input 21 Return	Status/Alarm Input 22	**C34**	**D34**	Status/Alarm Input 22 Return
Status/Alarm Input 23	**A35**	**B35**	Status/Alarm Input 23 Return	Status/Alarm Input 24	**C35**	**D35**	Status/Alarm Input 24 Return
Status/Alarm Input 25	**A36**	**B36**	Status/Alarm Input 25 Return	Status/Alarm Input 26	**C36**	**D36**	Status/Alarm Input 26 Return
Status/Alarm Input 27	**A37**	**B37**	Status/Alarm Input 27 Return	Status/Alarm Input 28	**C37**	**D37**	Status/Alarm Input 28 Return
Status/Alarm Input 29	**A38**	**B38**	Status/Alarm Input 29 Return	Status/Alarm Input 30	**C38**	**D38**	Status/Alarm Input 30 Return
Status/Alarm Input 31	**A39**	**B39**	Status/Alarm Input 31 Return	Status/Alarm Input 32	**C39**	**D39**	Status/Alarm Input 32 Return

Table 3-29 J2 Discrete Input/Output Connections from Front Wire-Wrap Panel Connector D

Function	Pin		Function	Function	Pin		Function
Control Output 9	**A40**	**B40**	Cntrl Out 9 Return	Control Output 10	**C40**	**D40**	Cntrl Out 10 Return
Control Output 11	**A41**	**B41**	Cntrl Out 11 Return	Control Output 12	**C41**	**D41**	Cntrl Out 12 Return
Control Output 13	**A42**	**B42**	Cntrl Out 13 Return	Control Output 14	**C42**	**D42**	Cntrl Out 14 Return
Control Output 15	**A43**	**B43**	Cntrl Out 15 Return	Control Output 16	**C43**	**D43**	Cntrl Out 16 Return
Status/Alarm Input 33	**A44**	**B44**	Status/Alarm Input 33 Return	Status/Alarm Input 34	**C44**	**D44**	Status/Alarm Input 34 Return
Status/Alarm Input 35	**A45**	**B45**	Status/Alarm Input 35 Return	Status/Alarm Input 36	**C45**	**D45**	Status/Alarm Input 36 Return
Status/Alarm Input 37	**A46**	**B46**	Status/Alarm Input 37 Return	Status/Alarm Input 38	**C46**	**D46**	Status/Alarm Input 38 Return
Status/Alarm Input 39	**A47**	**B47**	Status/Alarm Input 39 Return	Status/Alarm Input 40	**C47**	**D47**	Status/Alarm Input 40 Return
Status/Alarm Input 41	**A48**	**B48**	Status/Alarm Input 41 Return	Status/Alarm Input 42	**C48**	**D48**	Status/Alarm Input 42 Return
Status/Alarm Input 43	**A49**	**B49**	Status/Alarm Input 43 Return	Status/Alarm Input 44	**C49**	**D49**	Status/Alarm Input 44 Return
Status/Alarm Input 45	**A50**	**B50**	Status/Alarm Input 45 Return	Status/Alarm Input 46	**C50**	**D50**	Status/Alarm Input 46 Return
Status/Alarm Input 47	**A51**	**B51**	Status/Alarm Input 47 Return	Status/Alarm Input 48	**C51**	**D51**	Status/Alarm Input 48 Return
Status/Alarm Input 49	**A52**	**B52**	Status/Alarm Inputn 49 Return	Status/Alarm Input 50	**C52**	**D52**	Status/Alarm Input 50 Return
Status/Alarm Input 51	**A53**	**B53**	Status/Alarm Input 51 Return	Status/Alarm Input 52	**C53**	**D53**	Status/Alarm Input 52 Return
Status/Alarm Input 53	**A54**	**B54**	Status/Alarm Input 53 Rtrn	Status/Alarm Input 54	**C54**	**D54**	Status/Alarm Input 54 Rtrn
Status/Alarm Input 55	**A55**	**B55**	Status/Alarm Input 55 Rtrn	Status/Alarm Input 56	**C55**	**D55**	Status/Alarm Input 56 Rtrn
Status/Alarm Input 57	**A56**	**B56**	Status/Alarm Input 57 Rtrn	Status/Alarm Input 58	**C56**	**D56**	Status/Alarm Input 58 Rtrn
Status/Alarm Input 59	**A57**	**B57**	Status/Alarm Input 59 Rtrn	Status/Alarm Input 60	**C57**	**D57**	Status/Alarm Input 60 Rtrn
Status/Alarm Input 61	**A58**	**B58**	Status/Alarm Input 61 Rtrn	Status/Alarm Input 62	**C58**	**D58**	Status/Alarm Input 62 Rtrn
Status/Alarm Input 63	**A59**	**B59**	Status/Alarm Input 63 Rtrn	Status/Alarm Input 64	**C59**	**D59**	Status/Alarm Input 64 Rtrn

3.4.4.7.6 Rear-Access Wire-Wrap Kit

The rear-access wire-wrap kit (Figure 3-31) is ideal for any WS2000 application where rear access to the unit is available. The wire-wrap kit consists of connectors that snap onto the connectors on the rear of the WS2000.

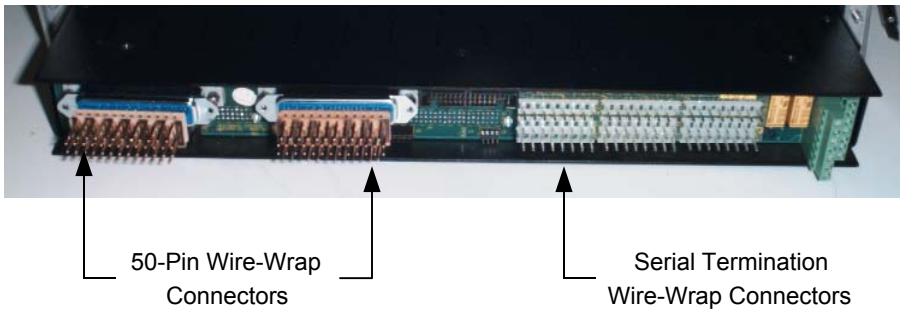


Figure 3-31 WS2000 with Rear-Access Wire-Wrap kit

The wire-wrap kit preserves the one rack-space footprint of the WS2000 unit, making this kit ideal for Customer Premises Equipment (CPE) or cabinet installations. The J1 and J2 wire-wrap connectors provide alarm input pins and a single ground return pin. Control pins are available for Form A or Form C contacts. The serial port pins provide all serial input/output signals on the WS2000. The rear-access wire-wrap kit consists of the components listed in Table 3-30.

Table 3-30 Rear-Access Wire-Wrap Kit (PN 585-T034) Components

Part Number	Quantity	Description
620-T030	2	50-Pin Wire-Wrap Connectors (for J1/J2)
517-T003	1	Serial Termination Wire-Wrap Connector

Figure 3-32 and Figure 3-33 and Table 3-31 through Table 3-33 list the pinouts for the various rear-access wire-wrap connectors.

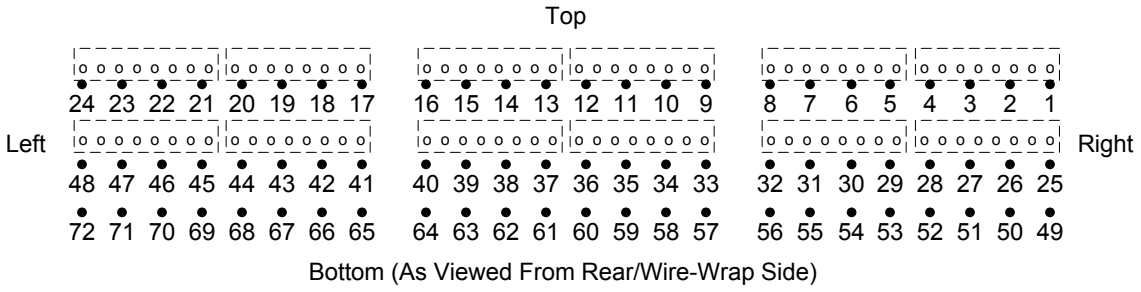


Figure 3-32 Rear-Access Serial Termination Wire-Wrap Connector Pinouts

Table 3-31 Serial Port Connections for the Rear-Access Wire-Wrap Assembly

Pin	Channel/Function	Pin	Channel/Function	Pin	Channel/Function
1	4 RS-422 Tx +	25	7 RS-422 Tx +	49	6 RS-422 Tx +
2	4 RS-422 Tx –	26	7 RS-422 Tx –	50	6 RS-422 Tx –
3	4 RS-422 Rx +	27	7 RS-422 Rx +	51	6 RS-422 Rx +
4	4 RS-422 Rx –/RS-232 Rx	28	7 RS-422 Rx –	52	6 RS-422 Rx –
5	4 Ground	29	9 RS-422 Tx +	53	8 RS-422 Tx +
6	4 RS-232 CTS	30	9 RS-422 Tx –	54	8 RS-422 Tx –
7	4 RS-232 RTS	31	9 RS-422 Rx +	55	8 RS-422 Rx +
8	4 RS-232 Tx	32	9 RS-422 Rx –	56	8 RS-422 Rx –
9	2 RS-422 Tx +	33	3 RS-422 Tx +	57	5 RS-422 Tx +
10	2 RS-422 Tx –	34	3 RS-422 Tx –	58	5 RS-422 Tx –
11	2 RS-422 Rx +	35	3 RS-422 Rx +	59	5 RS-422 Rx +
12	2 RS-422 Rx –/RS-232 Rx	36	3 RS-422 Rx –/RS-232 Rx	60	5 RS-422 Rx –/RS-232 Rx
13	2 Ground	37	3 Ground	61	5 Ground
14	2 RS-232 CTS	38	3 RS-232 CTS	62	5 RS-232 CTS
15	2 RS-232 RTS	39	3 RS-232 RTS	63	5 RS-232 RTS
16	2 RS-232 Tx	40	3 RS-232 Tx	64	5 RS-232 Tx
17	Craft Time In	41	1 RS-422 Tx Clock +	65	1 RS-422 Tx Clock –
18	Craft +12 Vdc	42	1 RS-422 Rx Clock +	66	1 RS-422 Rx Clock –
19	Craft +5 Vdc	43	1 RS-422 Tx +	67	1 RS-232 DCD
20	Craft –12 Vdc	44	1 RS-422 Tx –	68	1 RS-422 Rx –/RS-232 Rx
21	Craft Ground	45	1 RS-422 Rx +	69	1 Ground
22	Craft Prog En	46	1 RS-422 Rx –	70	1 RS-232 CTS
23	Craft RS-232 Rx	47	1 RS-422 RTS +	71	1 RS-232 RTS
24	Craft RS-232 Tx	48	1 RS-422 RTS –	72	1 RS-232 Tx

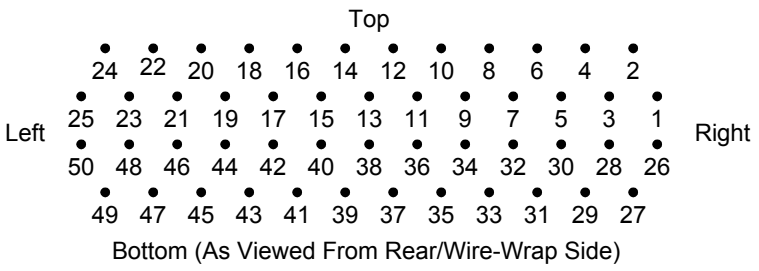


Figure 3-33 Rear-Access 50-Pin Wire-Wrap Connector on J1/J2

Table 3-32 J1 Discrete I/O Connections for the Rear-Access Wire-Wrap Assembly

Function	Pin		Function
Control Relay 1 Form C – NC	1	26	Control Relay 1 Form A or C – NO
Control Relay 2 Form C – NC	2	27	Control Relay 2 Form A or C – NO
Control Relay 3 Form C – NC	3	28	Control Relay 3 Form A or C – NO
Control Relay 4 Form C – NC	4	29	Control Relay 4 Form A or C – NO
Control Relay 5 Form C – NC	5	30	Control Relay 5 Form A or C – NO
Control Relay 6 Form C – NC	6	31	Control Relay 6 Form A or C – NO
Control Relay 7 Form C – NC	7	32	Control Relay 7 Form A or C – NO
Control Relay 8 Form C – NC	8	33	Control Relay 8 Form A or C – NO
Ground	9	34	Control Relay Common Voltage
Status/Alarm Input 1	10	35	Status/Alarm Input 2
Status/Alarm Input 3	11	36	Status/Alarm Input 4
Status/Alarm Input 5	12	37	Status/Alarm Input 6
Status/Alarm Input 7	13	38	Status/Alarm Input 8
Status/Alarm Input 9	14	39	Status/Alarm Input 10
Status/Alarm Input 11	15	40	Status/Alarm Input 12
Status/Alarm Input 13	16	41	Status/Alarm Input 14
Status/Alarm Input 15	17	42	Status/Alarm Input 16
Status/Alarm Input 17	18	43	Status/Alarm Input 18
Status/Alarm Input 19	19	44	Status/Alarm Input 20
Status/Alarm Input 21	20	45	Status/Alarm Input 22
Status/Alarm Input 23	21	46	Status/Alarm Input 24
Status/Alarm Input 25	22	47	Status/Alarm Input 26
Status/Alarm Input 27	23	48	Status/Alarm Input 28
Status/Alarm Input 29	24	49	Status/Alarm Input 30
Status/Alarm Input 31	25	50	Status/Alarm Input 32

Table 3-33 J2 Discrete I/O Connections for the Rear-Access Wire-Wrap Assembly

Function	Pin		Function
Control Output 9, Form C – NC	1	26	Control Output 9, Form A or C – NO
Control Output 10, Form C – NC	2	27	Control Output 10, Form A or C – NO
Control Output 11, Form C – NC	3	28	Control Output 11, Form A or C – NO
Control Output 12, Form C – NC	4	29	Control Output 12, Form A or C – NO
Control Output 13, Form C – NC	5	30	Control Output 13, Form A or C – NO
Control Output 14, Form C – NC	6	31	Control Output 14, Form A or C – NO
Control Output 15, Form C – NC	7	32	Control Output 15, Form A or C – NO
Control Output 16, Form C – NC	8	33	Control Output 16, Form A or C – NO
Ground	9	34	Control Relay Common Voltage
Status/Alarm Input 33	10	35	Status/Alarm Input 34
Status/Alarm Input 35	11	36	Status/Alarm Input 36
Status/Alarm Input 37	12	37	Status/Alarm Input 38
Status/Alarm Input 39	13	38	Status/Alarm Input 40
Status/Alarm Input 41	14	39	Status/Alarm Input 42
Status/Alarm Input 43	15	40	Status/Alarm Input 44
Status/Alarm Input 45	16	41	Status/Alarm Input 46
Status/Alarm Input 47	17	42	Status/Alarm Input 48
Status/Alarm Input 49	18	43	Status/Alarm Input 50
Status/Alarm Input 51	19	44	Status/Alarm Input 52
Status/Alarm Input 53	20	45	Status/Alarm Input 54
Status/Alarm Input 55	21	46	Status/Alarm Input 56
Status/Alarm Input 57	22	47	Status/Alarm Input 58
Status/Alarm Input 59	23	48	Status/Alarm Input 60
Status/Alarm Input 61	24	49	Status/Alarm Input 62
Status/Alarm Input 63	25	50	Status/Alarm Input 64

3.4.5 Powering the WS2000

The procedure to apply power to the WS2000 can vary, depending on the equipment installed. The following describes how to apply power to a WS2000 equipped with/without discrete expanders.

Using #14 – #24 AWG power wire, connect input power to WS2000 TB1 through a fused source. Table 3-34 provides fuse requirements. The input voltage ranges from –20 Vdc to –60 Vdc. Verify that the

plug-in board assembly is installed and that the power input leads are terminated before inserting the fuse.

Table 3-34 WS2000 Fusing Requirements

No of Discrete Expanders	–48 Vdc		–24 Vdc	
	GMT	Type 70	GMT	Type 70
0	0.75 A	0.75 A	1.3 A	1.3
1	1.3 A	1.3 A	2.0 A	2.0 A
2	2.0 A	2.0 A	2.5 A	2.0 A
3	2.5 A	2.0 A	3.0 A	3.0 A
4	3.0 A	3.0 A	3.5 A	5.0 A
5	3.5 A	5.0 A	4.0 A	5.0 A
6	4.0 A	5.0 A	5.0 A	5.0 A
7	5.0 A	5.0 A	5.0 A	5.0 A

Each WS2000 unit pulls a maximum load of 24 Watts, assuming all discrete inputs are active and the WS2000 application includes a rack-mount modem.

3.4.5.1 Without Discrete Expanders

1. Install the appropriate fuse at the power distribution panel to power the WS2000 up. The front-panel **MPU RUN** LED lights and remains lit.
2. Connect a PC or portable Wesmaint unit to the DB25 connector (JB3) on the WS2000 front panel or connect a rack-mount Wesmaint unit to P5 on the WS2000 rear panel.

   Important! When Wesmaint connects to P5 on the rear of the WS2000, you must insert a jumper plug in the front-panel DB25 connector for configuration changes to take effect. (Refer to *Cabling* on Page 5-1.) ***Disconnect the jumper plug before powering down the WS2000.*** You do not need the jumper plug if you are viewing the unit configuration or running diagnostic menus. *You can power the unit down with the rack-mount Wesmaint unit connected.*

   CAUTION: Do not power down the WS2000 without first disconnecting the PC or portable Wesmaint unit connected to the front DB25 connector.
3. If no display is present, press **DSPY**.

4. WS2000 has no password control at initial installation and turnup time. Refer to Procedure 5-14 if the installed unit requires a password.

3.4.5.2 With Discrete Expanders

WS2000 Turnup

5. **A.** When the discrete expander units have separate fusing from the WS2000, remove the WPIB cable connector (P7) from the WS2000 backplane. The discrete expander plug-ins do not require removal from the shelf backplane.

   B. When WS2000 and any connected discrete expander units share the same fuse:

   - Remove the WPIB cable connector (P7) from the WS2000 backplane
   - Pull all discrete expander plug-ins out about 1 inch from the shelf backplane

6. Install the appropriate fuse at the power distribution panel to power up the WS2000. The front panel **MPU RUN** LED lights and remains lit.

Discrete Expander Turnup

7. Power the WS2000 down and reconnect the WPIB cable to the P7 connector on the WS2000.
8. Verify each discrete expander unit address (each discrete expander has a unique address).
9. Install the discrete expander plug-ins into their shelves.
10. Physically inspect the WPIB cable assembly to verify that the P7 connections on all interconnected shelves are seated correctly over the proper pins.
11. Perform the powerup procedure discussed in *Without Discrete Expanders* on Page 3-49.
12. Verify that the discrete expander units are communicating properly with the WS2000 by connecting the Wesmaint to the WS2000 and perform the following steps:
    - Configure the WS2000 (refer to *WS2000 Step-by-Step Configuration* on Page 4-9.)
    - Configure the discrete points of each discrete expander to a chosen host output display number. See *Configuring Output Displays* on Page 4-13 to make display assignments for the discrete expanders.

- Put the WS2000 unit in Normal Mode. See *Wesmaint Mode* on Page 5-17.
- Activate several latching controls on each discrete expander (*Latching Control* on Page 5-13). Exerce several control points on each discrete expander to verify proper communication between the WS2000 and the discrete expander units.

  You should hear an audible relay closure within the unit.

  If the unit status loopback straps (Z7 and Z9) are inserted on the backplane, the control point LED should turn on or off in conjunction with the relay closure.

3.5 Installation Check List

Use the following check list when installing the WS2000 hardware:

A. Mount the unit.

B. Verify strap options for the following boards:
- Main (Figures 3-3 – 3-6; Tables 3-1 – 3-4)
- Modem (Figure 3-7; Tables 3-5 – 3-7)

C. Verify backplane strap options (Figure 3-9) for the following:
- Serial RS-422 receive side terminations (Z1 – Z3, Table 3-12)
- Control output configuration (Z6 and Z8, Figure 3-11)
- WPIB addresses (Z5, Table 3-11)

D. Cable the unit
- Verify serial port connections (DTE/DCE or DTE/DTE):
  - Figures 3-12, 3-14, and 3-16, Table 3-13
  - Figures 3-27 and 3-28, Table 3-24 (Telzon panel)
  - Figure 3-30, Table 3-27 (front-access panel)
  - Figure 3-32, Table 3-31 (rear-access panel)
- Verify discrete connections:
  - Figure 3-17, Tables 3-14 and 3-15
  - Figures 3-27 and 3-28 (Telzon)
  - Figure 3-30, Tables 3-28 and 3-29 (front-access panel)
  - Figure 3-33, Tables 3-32 and 3-33 (rear-access panel)
- Verify analog connections (Tables 3-13, 3-27, and 3-31)
- Verify power connections (Figure 3-19, Table 3-26)

The unit is now ready for software configuration. See Section 4 for configuration information and Section 5 for Wesmaint reference material.

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4 Software Configuration

4.1 Introduction

Section 3 described the WS2000 hardware configuration. This section, which describes software configuration, consists of three primary parts:

- An overview of configuration and the configuration process
- A methodology for organizing configuration parameters
- A detailed set of instructions for configuring a WS2000

4.2 Configuration Overview

This overview briefly describes the elements that make up an operations system and introduces various monitoring concepts. An understanding of these elements and concepts is helpful when configuring the WS2000.

A monitoring system is a hierarchical organization of units designed to report and control digital transmission equipment. A centralized Operations System (OS) or control center occupies the top of the hierarchy. The OS collects data from Remote Telemetry Units (RTUs) on a polled basis.

The RTUs form the second level of the hierarchy. The WS2000 is an RTU that processes information from monitored equipment and discrete inputs on a polled basis. The monitored equipment and discrete inputs are at the base of the hierarchy.

4.2.1 Scan Points

The basic unit of information that WS2000 processes is a binary signal called a scan point. The monitored equipment provides a scan point to indicate some aspect of its condition. The manufacturer of the monitored equipment defines the scan points, which are active high or low. The invert attribute allows inversion of the scan point status before processing. Thus, an RTU can process the status regardless of the electronic output of the monitored equipment.

4.2.2 Process Lists

WS2000 processes the scan point data according to various attributes defined in a process list before reporting it to the OS. A process list is a set of attribute definitions for each of the 64 scan points in a display.

Each display that WS2000 processes must have an associated process list.

The WS2000 comes from the factory with a default configuration, such as that shown in Appendix A. The default WS2000 configuration database supplies several predefined process lists. You can customize, delete, or copy any of the predefined process lists. You can also create a new process list from scratch or generate a new list by copying and modifying an existing process list.

4.2.2.1 Alarm/Status Points

The process list classifies a scan point as an alarm point or a status point. Scan points with an alarm point classification indicate a Change of State (COS) when the scan point status changes from a low to a high state. The COS results in local WS2000 alarm annunciation through the change-of-state LED (**COS**).

A bipolar alarm point provides COS indications when scan point status changes in either direction, such as from high to low or from low to high.

Status points, on the other hand, are information only and never indicate a change of state.

4.2.2.2 Status Inversion

Scan points can be active when they are high or low. The invert attribute allows scan point status to be inverted before processing. That is, when the scan point status is low, it processes as though it were high and, likewise, it processes as though low when it is high.

4.2.2.3 Memory Attributes

A process list can define a memory attribute for each scan point. If a scan point has memory (sometimes referred to as stretch), WS2000 holds any changes in scan point status until they are reported to the OS.

4.2.3 Control Points

The monitored equipment provides control points to affect some operational aspect. Such typical uses of control points are to silence alarm indications or to restart microprocessor-based equipment. As in the case of scan points, the manufacturer of the monitored equipment also defines the actual meanings of control points.

Some control points are bipolar and require a latching command (On or Off) while other control points require only a momentary command (pulse).

Each WS2000 provides a maximum of one display (64 points) of discrete input data. The first 16 points of each discrete display can operate as latching or momentary control points.

4.2.4 Serial Interfaces

Communications among the monitored equipment, the WS2000, and the operations center occur over a serial interface. A serial interface is a physical connection that transports information. The rules that govern information transport are called a protocol.

Each serial interface communicates at a configurable speed of 1200 or 2400 bps. The WACP host interface is also capable of 4800 and 9600 bps. Communications between WS2000 and the monitored equipment usually use the RS-422 physical layer interface with a channel speed of 2400 bps.

Each WS2000 is equipped with 10 serial channels, four of which are optional. Channel 1 is a WACP channel reporting to the host. Channels 2 through 9 are TBOS. Channel 0/10, the Craft maintenance port, interfaces with the Wesmaint/PC-Wesmaint for configuration and local monitoring of the WS2000. Configuration parameters for Channel 0/10 are fixed and cannot be altered.

Section 5 describes Wesmaint functions in detail. Also see Section 2 for specific information on channel interface parameters.

4.2.4.1 Physical Connections

The WS2000 supports three types of physical connections for serial interfaces: RS-232/RS-422 (point-to-point interfaces) and RS-485 (multi-point interfaces). Serial Channels 1 through 5 support all three types of physical level interfaces. Channels 6 through 9 support RS-422 only. Channel 0/10 is RS-232 only.

Refer to Section 2 for more information on the interface characteristics of each channel.

4.2.4.2 Handshaking

WS2000 serial Channels 1 through 5 provide the Request to Send (RTS) handshaking signal when operating in RS-232 mode. When Channels 2 through 5 operate in RS-232 mode, RTS is asserted 10 – 20 milliseconds before data transmission begins and is deasserted after data transmission ends.

Serial Channel 1 also provides an RS-422 RTS signal. When operating in RS-422 mode, the RTS signal is asserted on powerup and remains asserted. Although some channels provide the Clear to Send (CTS) and

Data Carrier Detect (DCD) handshake signals, WS2000 does not use these signals.

Refer to Section 2 for detailed information on the interface parameters of each channel.

4.2.4.3 Serial Communications

4.2.4.3.1 TBOS Protocol Organization

Telemetry Byte Oriented Serial (TBOS) protocol is a master/slave protocol. WS2000 serves as master while the monitored equipment serves as a slave. When communicating with Network Elements (NEs), the WS2000 is the host and the NE is the slave. Under TBOS protocol rules, the master issues a poll or command character to the slave and waits a maximum of 200 milliseconds for the slave (NE) to respond. Further information regarding TBOS is available in AT&T Compatibility Bulletin 149 (CB149).

Displays

WS2000 scans the monitored equipment for scan point data and commands the monitored equipment to operate control points. The fundamental unit of information in the TBOS protocol is the display, which is a set of 64 scan points and 64 control points. Each set of scan points has a corresponding set of defined control points.

Monitored equipment contain one or more displays, depending on the number of defined scan points and control points. TBOS protocol supports a maximum of eight displays (512 points) for each serial port.

Characters

Display organization consists of characters – sets of eight scan points each. Because a display contains 64 scan points, each display contains eight characters. The character is the smallest unit of information transferred by TBOS protocol.

Scan List

WS2000 uses a scan list to control display character polling. When all scan points in a display are active, the scan list polls all eight characters. If one or more display characters are not active, the scan list can be set to never poll inactive characters. In polling only the active display characters, WS2000 processes a display more efficiently.

A scan list can be set to disable processing on scan characters for newly installed, but untested, equipment.

Note: To insure proper operation, TBOS protocol requires polling on at least two characters of a given TBOS serial channel.

TBOS Commands and Responses

A master sends two TBOS message types: scan requests and command requests. A TBOS scan request identifies the display and character for which the master is polling and the slave returns the requested character. A TBOS command request identifies the display and control point that the master wants to control and specifies the type of control (latch, unlatch, or momentary).

WACP Protocol Organization

Westronic Asynchronous Control Protocol (WACP) is an asynchronous ASCII-based master/slave protocol that provides communications between a WACP host and WACP remote units. A WACP host can be a master station, a terminal, or a serial printer. WS2000 WACP, a WACP remote, collects status/alarm data from and orders control output operations to local discrete interfaces and other remote units. Data collection and control between the WS2000 WACP and other remote units occurs through TBOS interfaces. After it collects data, the WS2000 WACP reports the data over the WACP protocol interface to the host. Appendix B provides an overview, protocol definition, and the language set syntax for command and response messages.

4.2.5 Display Mapping

In the role of a mediator, the WS2000 reports alarm/status information to the operations center and accepts control commands on a maximum 72 displays associated with monitored equipment connected to the WS2000 using TBOS or discrete interfaces. To enable the operations center to understand and address the monitored equipment displays, the WS2000 WACP automatically maps (translates) the displays connected to it. That is, correspondence exists between the operations center displays and the monitored equipment or network element displays. See Figure 4-1.

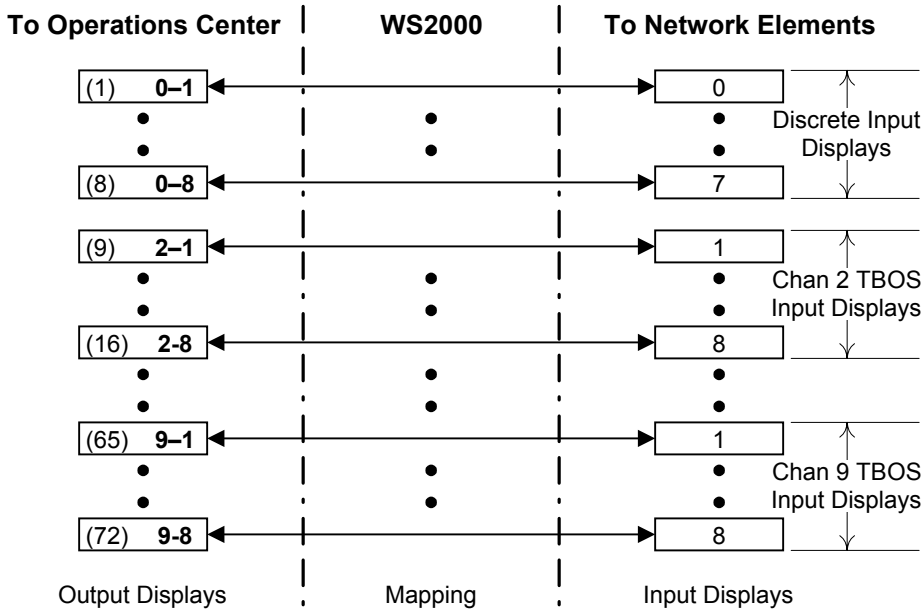

Figure 4-1 Scan (Alarm/Status) and Control Point Mapping

Output/Input Displays

Display numbers that the operations center understands are referred to as *output displays* while display numbers corresponding to the monitored equipment are referred to as *input displays*.

When mapping occurs on an output display, the WS2000 WACP assigns a display to:

- A specific input display on one of the serial channels
- A specific group of 64 discrete inputs on the main board or on one of the expander units

A serial TBOS port can support a maximum of eight displays of information (1 – 8).

When mapping occurs on an input display, the scan points and control points associated with that display have identical mapping. That is, to map the scan points for a particular display separately from the control points is not possible.

4.3 Configuration Templates

By converting serial and discrete information into an understandable format, WS2000 allows operation centers to monitor and control diverse groups of transmission and switching equipment. However, before WS2000 can perform this conversion, it must have information on equipment characteristics and parameters, such as the following:

- Physical characteristics (RS-232, RS-422, or RS-485) and communication rate of each serial interface
- Mapping information on alarms and controls from the remote equipment to the format used by the operations center
- Other attributes that affect how alarm/status information reports to the operations center

Planning the configuration setup before actually configuring a WS2000 is useful. The various configuration templates provide a method of defining serial channel characteristics, customizing process lists, and verifying input-to-output display mappings. Copy the templates and use them to organize and document your configuration. After completing the configuration templates, you can use them as a guide during WS2000 installation and programming. WS2000 provides the following three configuration templates:

- Serial Channel Configuration
- Output Display Configuration
- Process List Configuration

Note: Appendix A shows these configuration templates and the attributes of the predefined process lists.

4.3.1 Serial Channel Configuration Template

You must define the following information when configuring a WS2000 Dialout serial channel:

- The interface type: RS-232/RS-422 (point-to-point) or RS-485 (multi-point)
- The communications rate of the channel: 1200 or 2400 bps

The Serial Channel Configuration template provides a row for each configurable serial channel in the WS2000. Each row has a column in which to define the interface type and communications rate.

4.3.2 Display Configuration Template

WS2000 WACP automatically maps the data source and input display number for you. However, for each WS2000 display, you must define the following information:

- The identifier for the process list that defines the desired attributes for the data points within the display
- A list of the display characters to be scanned and reported

  For example, scan characters 1 and 2 in Display 5 scan or report only on Scan Points 1 through 16 in Display 5.

The Output Display Configuration template provides a row for each output display reported by WS2000. Each row has a column to define the information described in the previous list.

Note: When a TBOS port fails to retrieve data for any of its assigned displays, the first 63 scan points of the display become 0 while Point 64 becomes a 1.

Recommendation: On any display assigned to a serial port, classify Point 64 as a bipolar alarm to aid the operations center in failure detection.

4.3.3 Process List Configuration Template

You must select a list number and assign some combination of data point attributes to each data point in the display when configuring a WS2000 process list. The following includes possible data point attributes:

- Bipolar — A data point classified as a bipolar alarm causes the point to report as a change when it goes from high-to-low or from low-to-high state. The Change-of-State (COS) indicator illuminates on both transitions. Bipolar has no meaning for points that are not also classified as alarms.
- Alarm — A data point classified as an alarm point causes the point to report as a change when it goes from low-to-high state. The front-panel COS indicator also illuminates when the data point goes from low-to-high state.
- Memory — Any change of state latches until it is reported.
- Invert — The data state inverts before processing.
- Status — A data point that is not classified as an alarm point reflects status and does not report in response to a change request.

The Process List Configuration template has a row to provide the proposed Process List number and a space for each display point. Fill out each entry in the Process List Configuration template to indicate which attributes apply to a corresponding point.

Use the first letter of each attribute to specify the attribute for each point. Use a blank space to represent Status. Also list the attributes in the order in which they appear on the Wesmaint display to improve entry and configuration verification. Wesmaint always lists the process list attributes in the following order:

B A M I:

- B = Bipolar
- M = Memory
- A = Alarm
- I = Inverted

The list attribute BAMI indicates that the corresponding point is a bipolar alarm with memory and the state inverts before processing.

4.4 WS2000 Step-by-Step Configuration

This section details the step-by-step procedures for configuring a WS2000 WACP using the Wesmaint terminal. Follow the procedures in the given order because the end of one procedure sets the context for the following procedure. The same procedure in Section 5 assumes you have just entered the procedure. This section assumes that the reader is familiar with the material presented in *Configuration Overview* and *Configuration Templates*.

4.4.1 Configuring Serial Channels

Configuring the serial channels begins with defining the physical characteristics and data rates. During configuration, verify that the RS-422/RS-485 termination straps (Z1 – Z3) located on the rear of the WS2000, are in correct position. Refer to Section 3 for details on the serial port strapping and cabling options.

Use Procedure 4-1 to configure the serial channels.

Procedure 4-1 Configuring the Serial Channels

Step	Procedure

1. Press **CMD** until the window displays **`WESMAINT MODE`** and press **SEL**.

2. **A.** If the window displays **`CONFIG MODE`**, go to Step 4.

   B. If the window displays **`NORMAL MODE`**, press ⇑.
   *The window displays **`CONFIG MODE?`**.*

3. Press **YES**.
   *The window momentarily displays **`STOPPING TASKS`**, then displays **`CONFIG MODE`**.*

4. Press **CMD**.
   *The window displays **`WESMAINT MODE`**.*

5. Press ⇑ three times.
   The window displays ***SERIAL CH. INTFC***.

6. Press **SEL**.
   The window displays ***CH1=RS232/485*** *or* ***CH1=RS422***.

7. Press **DATA** and, using **NO** and **YES**, select the desired physical interface.

8. Press ⇑.
   The window displays ***CH1=1200 BAUD***, ***CH1=2400 BAUD***, ***CH1=4800 BAUD***, *or* ***CH1=9600 BAUD***.

9. Press **DATA** and select the desired data rate using **YES** and **NO**.

10. Press ⇑.
    The window displays ***CH2=RS422*** *or* ***CH2=RS232/485***.

11. Press **DATA** and select the desired physical interface using **YES** and **NO**.

12. Press ⇑.
    The window displays ***CH2=1200 BAUD*** *or* ***CH2=2400 BAUD***.

13. Press **DATA** and select the desired baud rate using **YES** and **NO**.

14. Press ⇑ and perform Steps 10 – 13 for the remaining serial channels.

    Note: Channels 6 – 9 are RS-422 only and cannot be changed. Data rate choices for channels 2 – 9 are 1200 and 2400 bps only.

15. Press **CMD**.
    The window displays ***WESMAINT MODE***.

4.4.2 Configuring Process Lists

The WS2000 comes with many predefined process lists, as shown in Appendix A. If none of the predefined lists provides a set of scan point attributes that match requirements for reported displays, build a new list from scratch or modify an existing list. Refer to *Process List Configuration Template* on Page 4-8 for attribute definitions (BAMI).

In this configuration function, several choices appear: View List, Modify List, Create List, Duplicate List, and Delete List. Select **CREATE LIST** to generate a new process list. If the new list is similar to an existing list, a quicker method is to use the **DUPLICATE LIST** function, then

edit the newly generated list using the **MODIFY LIST** function. When you select **MODIFY LIST?**, Wesmaint offers the Auto Propagate function, which copies the attributes assigned to the first scan point and applies them to each of the remaining scan points in the process list.

Use Procedure 4-2 to configure a process list.

Procedure 4-2 Configuring a Process List

Step	Procedure

1. Press ⇓ once.
   *The window displays **CONFIG LISTS**.*

2. Press **SEL**.
   *The window displays **VIEW LIST?**.*

3. Use **NO** to reach the desired function: **VIEW LIST**, **MODIFY LIST**, **CREATE LIST**, **DUPLICATE LIST**, or **DELETE LIST**. When the desired function appears, press **YES**.
   *The Wesmaint window prompts for a list identifier **LIST NUMBR=^**.*

4. **A.** If you select **MODIFY LIST**, go to Step 5.

   B. If you select **CREATE LIST**, go to Step 11.

   C. If you select **DUPLICATE LIST**, go to Step 12.
   *When you select **DUPLICATE LIST**, the Wesmaint window displays **DUP FROM=^**.*

Modifying a Process List

5. Enter the four-digit list identifier using the hex keypad and press **ENTR**.
   *The window prompts **AUTO PROPAGATE?**.*

6. Press **YES** to enable the Auto Propagate function or **NO** to disable it.

   Note: If you select the Auto Propagate function, any changes you make to the attributes of one point affect the attributes of all subsequent (higher) points in the list.

7. Use ⇑ and ⇓ to view the point attributes in the list.

8. Use **RUN**, **STOP**, **ON**, **OFF**, **YES**, **NO**, **DATA**, and **CLR** to modify the attributes of the point displayed in the window as follows:

Attribute (Note)	Press	
	To Select	To Deselect
Bipolar	**RUN**	**STOP**
Alarm	**ON**	**OFF**
Memory	**YES**	**NO**
Invert	**DATA** (Toggles Invert On/Off)	
Note: Press **CLR** to remove all attributes.		

9. Press **ENTR** to store the modified attributes in WS2000 non-volatile memory.
The Wesmaint window prompts ***STORE LIST?***.

10. Press **YES** to store the list or **NO** to continue with modifications.

Note: Pressing **PT**, **SEL**, **DSPY**, or **CMD** before you store a modified list causes WS2000 to ignore all modifications.

Creating a Process List

11. Enter the four-digit list identifier using the hex keypad and press **ENTR**.
A. *If the entered list number does not already exist, WS2000 creates a new list and automatically invokes the Modify List function.*

Go to Step 5 and continue the procedure.

B. *If the entered list number already exists, the window briefly displays the message* ***LIST EXISTS NOW****, followed by the prompt* ***MODIFY LIST?***.

Press **YES** to modify the existing list and go to Step 5 or **NO** to select another operation.

C. *If the window displays* ***NO SPACE LEFT****, you must delete an existing list to make room for the new list. Press* **CMD** *and* ⇑ *twice, then press* **SEL**. *Go to Step 3 and select* ***DELETE LIST***. *The Wesmaint window prompts* ***DELETE LIST?***

Press **YES**, enter the four-digit list identifier using the hex key-pad, and press **ENTR**.

Note: The WS2000 EEPROM has space for 100 process lists.

12. Enter the four-digit list identifier using the hex keypad and press **ENTR**.
If the specified list does not exist, the window briefly displays ***NO SUCH LIST***.

13. Repeat Step 12.
After you select the From list, the window prompts ***DUP TO=^***.

14. Enter the list identifier to be assigned to the new list using the hex keypad and press **ENTR**.
A. *If the specified list already exists, the window diplays* ***LIST EXISTS NOW****, followed by the prompt* ***OVERWRITE?***.

    Press **YES** to overwrite the existing list or **NO** to repeat Step 12.

    B. *If the specified list does not exist already, WS2000 creates the list using the attributes from the list specified in Step* 12.
    The window prompts ***MODIFY LIST?***.

    Press **YES** to enter the Modify mode or **NO** to select another operation.

    C. *If the window displays* ***NO SPACE LEFT****, you must delete an existing list to make room for the new list. Press* **CMD** *and* ⇑ *twice, then press* **SEL**. *Go to Step 3 and select* ***DELETE LIST***.
    The Wesmaint window prompts ***DELETE LIST?***

    Press **YES**, enter the four-digit list identifier using the hex keypad, and press **ENTR**.

15. Press **CMD**.
The window displays ***WESMAINT MODE***.

4.4.3 Configuring Output Displays

The WS2000 scans monitored equipment for scan point data and commands the monitored equipment to operate control points. WS2000 processes data in terms of a display, which is a set of 64 scan points and 64 control points. Each point can report alarm/status and address a control point.

A WS2000 WACP has eight TBOS data collection channels (2 – 9) with each data collection channel collecting data on eight displays. Thus, WS2000 collects a maximum 64 displays over the TBOS interfaces. WS2000 collects an additional eight displays through the internal discrete expander (64 scan points and 16 control points) and a maximum 7 external discrete expanders (64 scan points and 16 control

points each). Ultimately, WS2000 handles a maximum 72 displays (64 TBOS displays and 8 local discrete displays). Observe the following:

- Maximum number of scan points is 4,608 (72 displays x 64 scan points)
- Maximum number of control points is 4,224: 4,096 (64 displays x 64 control points) + 128 (8 expanders of 16 control points each)

Now that you have prepared the serial ports and process lists, you are ready to configure the output displays. By definition, output displays report to the operations center over the host port (Channel 1). You must assign a process list and define a character scan list to the output displays, which WS2000 automatically maps to the input displays (Figure 4-1).

Use Procedure 4-3 to configure the output displays.

Procedure 4-3 Configuring the Output Displays

Step	Procedure

1. Press ⇓ once.
   The display reads ***CONFIG DISPLAYS***.

2. Press **SEL**.
   The window displays an output display screen, such as ***0 – 1 DISC ON/OFF***.

   Note: At this point, you have two choices: press **PT.** and enter a specific display number or press ⇑ or ⇓ until you reach the desired display number.

   Each display definition consists of three screens:

   - The first screen identifies the data source:
     - The data source is a discrete input:
       0 – *Y* DISC ON/OFF
       – 0 = discrete interface channel
       – Y = Displays 1 – 8 (1 is the WS2000 internal discrete expander; 2 – 8 are the 7 external discrete expanders)
       – DISC = discrete
       – ON = enabled
       – OFF = disabled
     - The data source is a serial input port:
       ***X* – *Y* TBOS ON/OFF**
       – X = TBOS channels 2 – 9

- Y = Displays 1 – 8
- TBOS = TBOS serial interface
- ON = enabled
- OFF = disabled

- The second screen shows the process list identifier:
  ***X – Y* LIST XXXX**
- The third screen shows the character scan list:
  ***X – Y* SCAN 12345678**

3. Select each output display for configuration using ⇑ or **PT**.

4. **A.** To enable/disable the data source, press **ON** or **OFF**, respectively, while in the first screen.
   OFF *changes to* ***ON*** *or* ***ON*** *changes to* ***OFF***.

   B. To assign a process list, press **Data** while in the second screen.
   The window displays ***LIST=^***.

   C. To define the scan list, press **Data** while in the third screen.
   The window displays ***SCAN=^***.

5. Enter the list identifier (four digits) or the characters to be scanned (1 – 8) using the hex keypad and press **ENTR**.
   The window displays the new process list identifier or the characters to be scanned, such as 12568.

6. Repeat Steps 3 through 5 for each display.

7. Press **CMD**.
   The window displays ***WESMAINT MODE***.

4.4.4 Configuring the WACP Location Name

You must assign the WACP location name to identify the WS2000 remote to the host. This enables discrimination of this particular WS2000 from others that could connect to the same host serial port.

Use Procedure 4-4 to configure the WACP location name.

Procedure 4-4 Configuring the WS2000 WACP Location Name

Step	Procedure

1. Press ⇑ four times.
   The window displays ***WACP LOCATION NM***.

2. Press **SEL**.
   The window displays ***LN= XXXXXXX***.

3. Press **DATA** to enter a location Name.
   The Wesmaint window prompts with ***LN= A*** .

4. Enter the desired name, one letter at a time, pressing ⇑ or ⇓ until the desire letter (A – Z) or number (0 – 9) appears. When the letter/number is correct, press **YES**.
   The Wesmaint window displays the entered letter/number and advances one position to the right for you to continue.

5. After developing the location name using Step 4, press **ENTR**.
   The window displays the location name you have entered.

6. Press **CMD**.
   The window displays ***WESMAINT MODE***.

4.4.5 Verifying the New Configuration

Use Procedure 4-5 to verify the new configuration.

Procedure 4-5 Verifying a New Configuration

Step	Procedure

1. Press **CMD** until the window displays **WESMAINT MODE** and press **SEL**.

2. **A.** If the window displays **NORMAL MODE**, go to Step 4.

   B. If the window displays **CONFIG MODE**, press ⇑.
   The window displays ***NORMAL MODE?***.

3. Press **YES**.
   The window momentarily displays ***INITIALIZING…, then WESMAINT READY***.

4. Press **CMD**.
   The window displays ***WESMAINT MODE***.

5. Select the Serial Channel Interface function (press ⇑ three times).

6. Select each configured serial channel and verify the following:
   - Interface type (RS-232/RS-422/RS-485)

Note: Channels 1 – 5 can be any of the three interface types; Channels 6 – 9 are RS-422 only.

- Baud rate (1200 or 2400 for Channels 2 – 9; or 1200; 2400; 4800; or 9600 bps for Channel 1)

7. Press **CMD** and select the Configure Lists function (press ⇑ twice).

8. Select each configured process list and, using the View List function, verify the process list attributes.

9. Press **CMD** and select the Configure Displays function (press ⇑ once).

10. Select each output display using ⇑ or ⇓ or **PT.**.

11. **A.** If the data source is a discrete input, verify the following:
    - Expander (display) number
    - Process list number
    - Character scan list numbers

    B. If the data source is a TBOS input display, verify the following:
    - Serial channel number (2 – 9)
    - Input display number (1 – 8)
    - Process list number
    - Character scan list numbers

12. Press **CMD** and select the WACP Location Name function (press ⇑ five times).

13. Verify that the location name is correct.

4.5 Configuration Check List

Use the following check list when configuring the WS2000:

A. Enter Config mode

B. Configure WS2000 TABS address (Procedures 4-1 and 4-2)

C. Configure serial channel interfaces (Procedure 4-1)

D. Configure process lists (Procedure 4-2)

E. Configure displays (Procedure 4-3)

F. Configure analogs (if applicable) (Procedure 4-4)

G. Configure accumulators (if applicable) (Procedure 4-5)

H. Enter Normal mode

I. Test with operations center/operations system

5 Maintenance Interface

5.1 Interface Hardware

The WS2000 maintenance unit, Wesmaint, is a multi-functional local display that provides a user interface to the WS2000 and is available in either a rack-mount or portable version. The front panel consists of 16 hexadecimal keys, 16 function keys, and a 16-character LED display. The serial cable that connects to JB3 or P5 on the WS2000 supplies power for the Wesmaint unit.

Besides the rack-mount and portable Wesmaint versions, Westronic offers several PC Wesmaint software packages that provide a Wesmaint interface using a PC as the "Wesmaint" unit. Besides the Wesmaint function, one of the PC Wesmaint software versions retrieves, views, and downloads WS2000 configuration information. In lieu of a Wesmaint or PC Wesmaint, you can accomplish configuration through a VT100 terminal using equivalent ASCII characters.

5.2 Cabling

If you are using a PC Wesmaint version, refer to the PC Wesmaint manual:

- 994-T010 for DOS
- 994-T055 or SPEC 0167 for Windows 95

If you are using a rack-mount Wesmaint, connect it to P5 on the rear of the WS2000 and install a termination plug on JB3, jumpering Pins 18 and 25. The termination plug (PN 977-T042) is available from Westronic. Table 5-1 shows pinout information for connector JB3.

Note: Only install the termination plug ***after*** applying power and remove it ***before*** removing power.

Table 5-1 Front-Panel Wesmaint Connector JB3

Pin	Function
2	Transmit
3	Receive
7	Common
11	+12 Vdc
13	–12 Vdc
18	+5 Vdc
25	Program Write Enable

If you are using the portable Wesmaint unit or a VT100 terminal, connect it to the DB25 connector (JB3) on the front of the WS2000. You can also connect a VT100 terminal to P5. Use the terminations shown in Table 5-2.

Table 5-2 VT100 Maintenance Connections

VT100 (9-Pin DTE)	**JB3** (25-Pin DCE)	**P5** (8-Pin DTE)
Pin 2 (Rx)	Pin 3 (Rx)	Pin 1 (Tx)
Pin 3 (Tx)	Pin 2 (Tx)	Pin 2 (Rx)
Pin 5 (Com)	Pin 7 (Com)	Pin 4 (Com)
Jumper 7 to 8, 4 to 6 (PC only)	Jumper Pin 18 to 25	No Jumper Required

The Wesmaint unit or VT100 displays menu choices when you press **CMD** (Command) or **DSPY** (Display) – (@ or A, respectively, for the VT100). This indicates that the WS2000 is operating properly and is ready for configuration according to site requirements. If nothing appears on the screen or the message **EEPROM CORRUPT** appears, a memory problem has occurred.

5.3 Wesmaint Functions

When you use a rack-mount Wesmaint unit, the initial display reads **WESMAINT READY**. When you use a portable or PC Wesmaint, the initial display is blank. If you press **CMD**, the display reads **WESMAINT MODE**. If you press **DSPY**, the display reads **VERSION NUMBER**. The Wesmaint software can then accept keypad entries. Two types of Wesmaint functions are available:

- Display – to view data
- Command – to program data

Press **DSPY** (@ on VT100) to access the menu of display functions or **CMD** (A on VT100) to access the menu of command functions. Both keys are active at all times.

When you press **DSPY** or **CMD** (@ or A), the first function title in that menu displays. You can view the list of function titles by pressing ⇑ (H) or ⇓ (L) (see Figure 5-2 or Figure 5-3). The same menus appear whether Wesmaint is in Normal or Configuration mode; however, as shown in these two figures, depending on the Wesmaint mode, some menu functions become invalid or view only when you seek to access them.

To access a function, press **DSPY** if the function is in the **Display** menu or **CMD** if the function is in the **Command** menu. Press ⇑ or ⇓ until the function title displays, then press **SEL** (Select) – (C on VT100). You can exit or abort a function at any time by pressing **DSPY** or **CMD** again.

5.3.1 Wesmaint Unit Key Layout

Figure 5-1 illustrates the Wesmaint panel and its key pads.

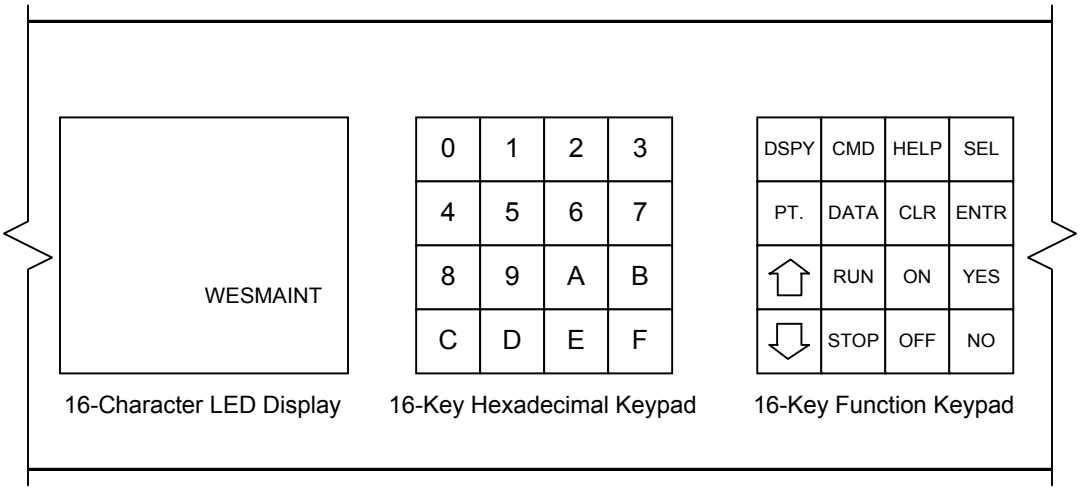

Figure 5-1 WS2000 Wesmaint Maintenance Unit

5.3.2 ASCII Terminal Key Layout

Table 5-3 provides an ASCII cross-reference of Wesmaint function keys if you use a VT100 terminal instead of a Wesmaint.

Table 5-3 Wesmaint-ASCII Terminal Functional Equivalence

Wesmaint Key	ASCII Character	Wesmaint Key	ASCII Character
0	0	DSPY	@
1	1	CMD	A
2	2	HELP	B
3	3	SEL	C
4	4	PT	D
5	5	DATA	E
6	6	CLR	F
7	7	ENTR	G
8	8	⇑	H
9	9	RUN	I
A	:	ON	J
B	;	YES	K
C	<	⇓	L
D	=	STOP	M
E	>	OFF	N
F	?	NO	O

The Craft firmware driver in the WS2000 issues a Carriage Return (CR) character after each line.

WS2000 Characters

The WS2000 Tx/Rx characters consist of one start bit, 7 data bits, even parity, and one stop bit at a data rate of 9600 bps.

If you are using a PC, the arrow key can cause a "?" prompt to appear on the screen, at which point the WS2000 appears to lock up. The question mark prompt is a WS2000 mode that allows a PC ASCII file to load into the EEPROM.

To get out of the "lock up" question mark prompt, perform the following steps.

- Enter @
- Press Carriage Return (ENTER)
- Enter @

These steps should bring back the Version Number or the Wesmaint Mode function.

5.3.3 Operator Prompts

While using Wesmaint or a VT100 to program a WS2000, the software prompts for user information. The following explains these operator prompts.

5.3.3.1 Question Mark (?)

Certain functions are questions followed by a question mark (?). These questions require a Yes or No response. Press **YES** or **NO**, as appropriate.

5.3.3.2 Numerical Input Prompt (^)

Certain functions require you to input numerical data. When the numerical input prompt (^) displays, key in the appropriate data using the hex keypad. After keying in the data, press **ENTR** (G) to signal the end of data entry. If you make a mistake while entering data and notice this before pressing **ENTR**, press **CLR** (F) to erase the data and start over. Pressing **ENTR** without entering any data is equivalent to entering the value 0.

5.3.4 Function Menus

The following sections (*Display Functions* on Page 5-5 and *Command Functions* on Page 5-15) contain detailed descriptions of all Wesmaint menu functions. The descriptions outline the formats of the displayed data, indicate which keys are active, and provide step-by-step operating procedures.

For a discussion of how to use the various Wesmaint functions to configure a WS2000, refer to Section 4. *Configuration Overview* on Page 4-1 includes more information about WS2000 configuration elements, such as process lists, displays, and channels.

Some Wesmaint functions are valid only in Normal mode, some only in Config mode, and some functions are valid in either mode. See *Wesmaint Mode* on Page 5-15 for a discussion of Normal versus Config mode.

5.4 Display Functions

Figure 5-2 shows the Display functions and the function purpose.

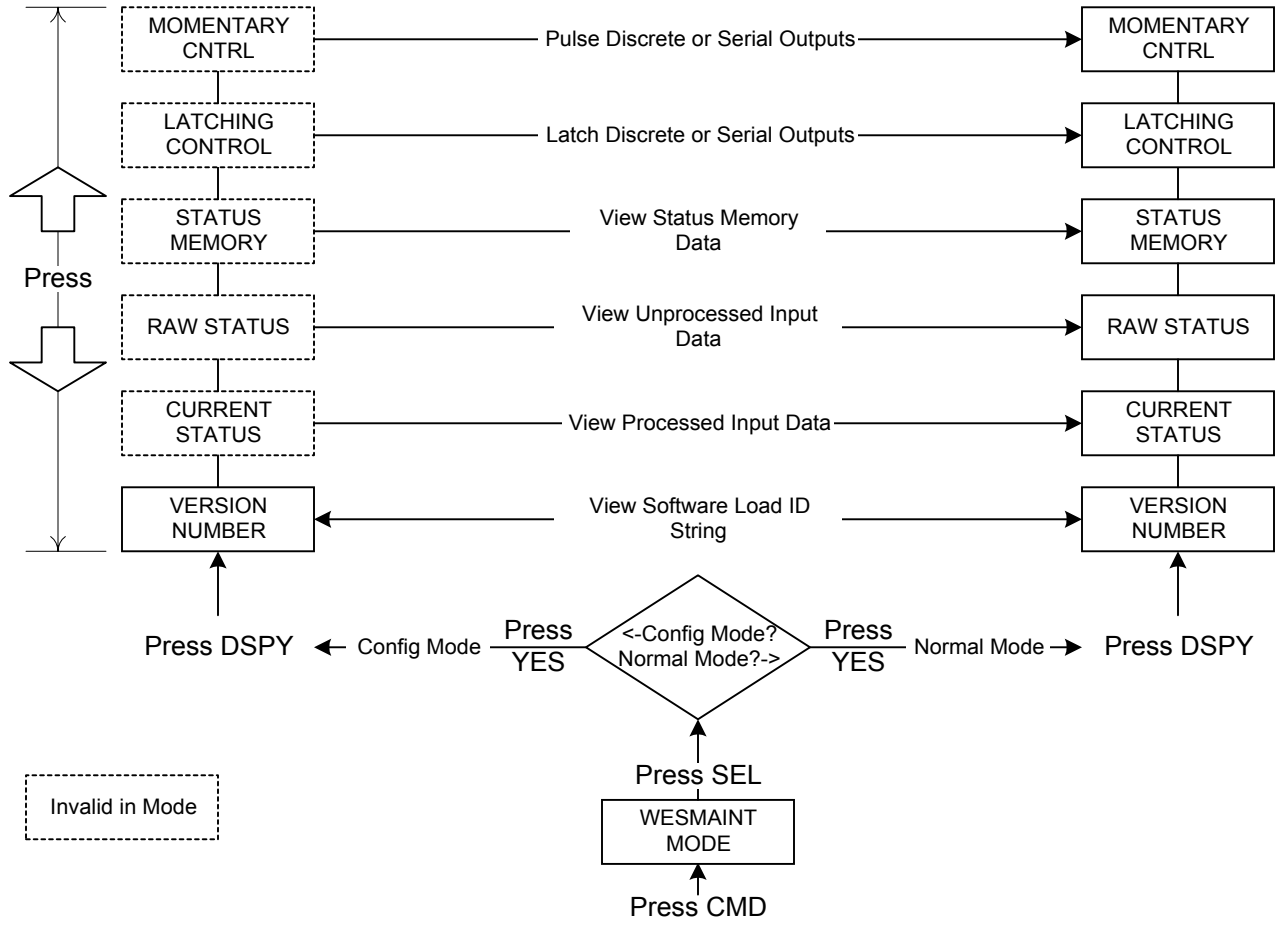

Figure 5-2 Display Function Commands

5.4.1 Version Number

The following describes how to use Wesmaint to view the current WS2000 software version.

Menu: DSPY

Purpose: To identify the software load stored in the EPROM. Use this identification to report any problems with WS2000 firmware.

Screen Format: After you select the function, the stored software load identity scrolls through the display window.

Keys Used: The following keys are active during this function:

- ⇑**:** Scroll foward to view software load identity
- ⇓**:** Scroll backward to view software load identity

- **STOP:** Stop scrolling software load identity
- **RUN:** Start scrolling software load identity

Valid Modes: Normal, Config

Operation: Perform Procedure 5-1 to view the WS2000 software revision.

Procedure 5-1 Viewing the WS2000 Software Load Version

Step	Procedure
	Selecting the Function
1.	Press **DSPY** until the window displays **`VERSION NUMBER`**.
2.	Press **SEL**. *The software version information scrolls across the window.*
	Exiting the Function
3.	Press **DSPY** or **CMD**. *The window displays* ***`VERSION NUMBER`*** *or* ***`WESMAINT MODE`****, respectively.*

5.4.2 Current Status

The following describes how to view the current status of the WS2000 input data.

Menu: DSPY

Purpose: To view the input data status as seen by the master station. Data processes according to the point attributes defined in the related process lists. Refer to *Process Lists* on Page 4-2 for a discussion of process lists.

Screen Format: The following is the screen format for this function:

`p - d - c zzzzzzzz C`

`p`	Port (Channel: 0 = Discrete Expanders; 2 – 9 = TBOS Collection Ports)
`d`	Display Number (1 – 8)
`c`	Character Number (1 – 8)
`zzzzzzzz`	Data Bit Status
`C`	Current Status Menu

Note: The data bits appear with the Least Significant Bit (LSB) on the left and the Most Significant Bit (MSB) on the right: Bits 1, 2, 3, 4, 5, 6, 7, 8.

A flashing asterisk (*) signifies that one or more points with alarm attributes have the status memory bit On. That is, a change not yet reported to the master station has occurred on a data point. When any data point has alarm and memory attributes, the state shown may/may not be the current state of the input. After the alarm reports to the master station, the asterisk (*) disappears.

Keys Used: The following keys are active during this function:

- ⇑**:** Advance to the next character in the current output display or to the first character in the next output display
- ⇓**:** Back to the previous character in the current output display or to the last character in the previous output display
- **PT** (POINT)**:** Select a particular output display number and character for viewing
- **CLR** (CLEAR)**:** Clear the status memory bits for the onscreen character

Note: The **CLR** key affects the data that reports to the master station. The primary use for this key is when WS2000 is in an offline diagnostic mode. Use this command key with discretion when WS2000 is in an online mode.

Valid Modes: Normal mode only

Operation: Perform Procedure 5-2 to view the current status of the WS2000 input data.

Procedure 5-2 Viewing the Current Status of WS2000 Input Data

Step	Procedure
	Selecting the Function
1.	Press **DSPY** until the window displays **`VERSION NUMBER`**.
2.	Press ⇑ once. *The window displays* ***`CURRENT STATUS`***.
3.	Press **SEL**.
	Selecting a Display/Character
4. A.	Press ⇑ to view the next character of the current output display or the first character of the next output display.

B. Press ⇓ to view the previous character of the current output display or the last character in the previous output display.

C. Press **PT** to select a specific output display number and character for viewing.
The window prompts with ***CHANNEL=^***.

- Enter the desired channel number (0, 2 – 9) using the hex keypad and press **ENTR**.
  The window prompts with ***DISPLAY***=^.
- Enter the desired output display number (1 – 8) using the hex keypad and press **ENTR**.
  The window prompts with ***CHARACTER***=^.
- Enter the desired character number (1 – 8) using the hex keypad and press **ENTR**.

Clearing Status Memory Bits

5. Press **CLR** to clear the status memory bits for the current output display and character.

Exiting the Function

6. Press **DSPY** or **CMD**.
The window displays ***VERSION NUMBER*** *or* ***WESMAINT MODE****, respectively.*

5.4.3 Raw Status

The following describes how to view the input data before WS2000 processes the information.

Menu: DSPY

Purpose: To view the status of raw input data before it processes according to the point attributes defined in the related process lists. Refer to *Process Lists* on Page 4-2 for a discussion on process lists.

Screen Format: The following is the screen format for this function:

```
p – d – c zzzzzzzz R
```

p	Port (Channel: 0 = Discrete Expanders; 2 – 9 = TBOS Collection Ports)
d	Display Number (1 – 8)
c	Character Number (1 – 8)
zzzzzzzz	Data Bit Status
R	Raw Status Menu

Note: The data bits appear with LSB (1) on the left and MSB (8) on the right.

Keys Used: The following keys are active during this function:

- ⇑**:** Advance to the next character in the current output display or to the first character in the next output display
- ⇓**:** Back to the previous character in the current output display or to the last character in the previous output display
- **PT** (POINT)**:** Select a particular output display number and character for viewing

Valid Modes: Normal mode only

Operation: Use Procedure 5-3 to view the raw status of the WS2000 input data.

Procedure 5-3 Viewing the Raw Status of WS2000 Input Data

Step	Procedure
	Selecting the Function
1.	Press **DSPY** until the window displays **VERSION NUMBER**.
2.	Press ⇑ until the window displays **RAW STATUS**.
3.	Press **SEL**.
	Selecting a Display/Character
4. A.	Press ⇑ to view the next character of the current output display or the first character of the next output display.

B. Press ⇓ to view the previous character of the current output display or the last character in the previous output display.

C. Press **PT** to select a specific output display number and character for viewing.
The window prompts with ***CHANNEL=^***.

- Enter the desired channel number (0, 2 – 9) using the hex keypad and press **ENTR**.
  The window prompts with ***DISPLAY***=^.
- Enter the desired output display number (1 – 8) using the hex keypad and press **ENTR**.
  The window prompts with ***CHARACTER=^***.
- Enter the desired character number (1 – 8) using the hex keypad and press **ENTR**.

Exiting the Function

5. Press **DSPY** or **CMD**.
The window displays ***VERSION NUMBER*** *or* ***WESMAINT MODE****, respectively.*

5.4.4 Status Memory

The following describes how to view an unreported change-of-state for a data point.

Menu: DSPY

Purpose: To view data points that have the status memory bit On, which indicates that the data point has experienced an unreported change of state.

Screen Format: The following is the screen format for this function:

p – d – c *zzzzzzzz* M

p	Port (Channel: 0 = Discrete Expanders; 2 – 9 = TBOS Collection Ports)
d	Display Number (1 – 8)
c	Character Number (1 – 8)
zzzzzzzz	Data Bit Status
M	Status Memory Menu

Note: The data bits appear with LSB (1) on the left and MSB (8) on the right.

Keys Used: The following keys are active during this function:

- ⇑**:** Advance to the next character in the current output display or to the first character in the next output display
- ⇓**:** Back to the previous character in the current output display or to the last character in the previous output display
- **PT** (POINT)**:** Select a particular output display number and character for viewing

Valid Modes: Normal mode only

Operation: Use Procedure 5-4 to view the memory status of the WS2000 input data.

Procedure 5-4 Viewing the Status Memory

Step	Procedure

Selecting the Function

1. Press **DSPY** until the window displays **`VERSION NUMBER`**.
2. Press ⇑ until the window displays **`STATUS MEMORY`**.
3. Press **SEL**.

Selecting a Display/Character

4. **A.** Press ⇑ to view the next character of the current output display or the first character of the next output display.

   B. Press ⇓ to view the previous character of the current output display or the last character in the previous output display.

   C. Press **PT** to select a specific output display number and character for viewing.
   The window prompts with ***`CHANNEL=^`***.
   - Enter the desired channel number (0, 2 – 9) using the hex keypad and press **ENTR**.

   The window prompts with ***`DISPLAY=^`***.
   - Enter the desired output display number (1 – 8) using the hex keypad and press **ENTR**.

   The window prompts with ***`CHARACTER=^`***.
   - Enter the desired character number (1 – 8) using the hex keypad and press **ENTR**.

Exiting the Function

5. Press **DSPY** or **CMD**.
   The window displays ***VERSION NUMBER*** *or* ***WESMAINT MODE****, respectively.*

5.4.5 Latching Control

The following describes how to operate latching commands for discrete control outputs on the WS2000.

Menu: DSPY

Purpose: To operate the discrete control outputs in latching mode or to send a latching control command over a data collection port to monitored equipment.

The WS2000 local discrete status inputs and control outputs map simultaneously. Status inputs are on points 1 – 32 or 1 – 64, depending on hardware. Control outputs are on points 1 – 8 or 1 – 16, depending on hardware.

Through option-strap settings on WS2000, 16 status input points can read the state of the 16 control outputs. When this strapping option is applied, status inputs 25 – 32 read the state of control points 1 – 8 and status inputs 57 – 64 read the state of control points 9 – 16.

Screen Format: The following is the screen format for this function:

L CTL:p – d – *yy*

L CTL	Latching Control
p	Port (Channel: 0 = Discrete Expanders; 2 – 9 = TBOS Collection Ports)
d	Display Number (1 – 8)
yy	Point Number (01 – 64)

Keys Used: The following keys are active during this function:

- ⇑**:** Advance to the next control point
- ⇓**:** Back to the previous control point
- **PT** (POINT)**:** Select a specific control point number
- **ON:** Energize the currently selected control point
- **OFF:** De-energize the currently selected control point
- **HELP:** Display a brief help message

Valid Modes: Normal mode only

Operation: Use Procedure 5-5 to latch selected discrete control points on the WS2000.

Procedure 5-5 Latching Control Outputs

Step	Procedure
	Selecting the Function
1.	Press **DSPY** until the window displays **`VERSION NUMBER`**.
2.	Press ⇑ until the window displays **`LATCHING CONTROL`**.
3.	Press **SEL**.
	Selecting a Control Point
4. A.	Press ⇑ to select the next control point or press ⇓ to go to the previous control point.
B.	Press **PT** to select a specific control point. *The window prompts with* ***`CHANNEL=`***^. ▪ Enter the desired channel number (0, 2 – 9) using the hex keypad and press **ENTR**. *The window prompts with* ***`DISPLAY`***=^. ▪ Enter the desired display number (1 – 8) using the hex keypad and press **ENTR**. *The window prompts with* ***`POINT=^`***. ▪ Enter the desired control point number (1 – 64) using the hex keypad and press **ENTR**.
	Operating the Selected Control Point
5.	Press **ON** to energize the selected control point or press **OFF** to de-energize the control point.
	Exiting the Function
6.	Press **DSPY** or **CMD**. *The window displays* ***`VERSION NUMBER`*** *or* ***`WESMAINT MODE`****, respectively.*

5.4.6 Momentary Control

This section describes how to operate a momentary command for discrete control outputs on the WS2000.

Menu: DSPY

Purpose: To operate the discrete control outputs in momentary mode or to send a momentary control command over a data collection port to monitored equipment.

The WS2000 local discrete status inputs and control outputs map simultaneously. Status inputs are on points 1 – 32 or 1 – 64, depending on hardware. Control outputs are on points 1 – 8 or 1 – 16, depending on hardware.

Through option-strap settings on WS2000, 16 input points can read the state of the 16 control outputs. When this strapping option is applied, status inputs 25 – 32 read the state of control points 1 – 8 and status inputs 57 – 64 read the state of control points 9 – 16.

Screen Format: The following is the screen format for this function:

`M CTL:p – d – yy`

`L CTL`	Latching Control
`p`	Port (Channel: 0 = Discrete Expanders; 2 – 9 = TBOS Collection Ports)
`d`	Display Number (1 – 8)
`yy`	Point Number (01 – 64)

Note: The operating indicator is normally blank (Off).

Keys Used: The following keys are active during this function:

- ⇑**:** Advance to the next screen for the current display or the first point in the next display
- ⇓**:** Back to the previous point in the current display or the last point in the previous display
- **PT** (POINT)**:** Select a specific display/point number
- **ON:** Operate the currently selected point and briefly turn the operating indicator On

Valid Modes: Normal mode only

Operation: Use Procedure 5-6 to initiate momentary control commands on selected control points.

Procedure 5-6 Initiating Momentary Control Commands

Step	Procedure

Selecting the Function

1. Press **DSPY** until the window displays **`VERSION NUMBER`**.
2. Press ⇑ until the window displays **`MOMENTARY CNTRL`**.
3. Press **SEL**.

Selecting a Control Point

4. **A.** Press ⇑ to select the next control point or press ⇓ to go to the previous control point.

   B. Press **PT** to select a specific control point.
   The window prompts with ***`CHANNEL=^`***.
   - Enter the desired channel number (0, 2 – 9) using the hex keypad and press **ENTR**.
     The window prompts with ***`DISPLAY`***=^.
   - Enter the desired display number (1 – 8) using the hex keypad and press **ENTR**.
     The window prompts with ***`POINT=`***^.
   - Enter the desired control point number (1 – 64) using the hex keypad and press **ENTR**.

Operating the Selected Control Point

5. Press **ON** to momentarily energize the selected control point.

Exiting the Function

6. Press **DSPY** or **CMD**.
   The window displays ***`VERSION NUMBER`*** *or* ***`WESMAINT MODE`****, respectively.*

5.5 Command Functions

Figure 5-3 shows the Command functions and the function purpose.

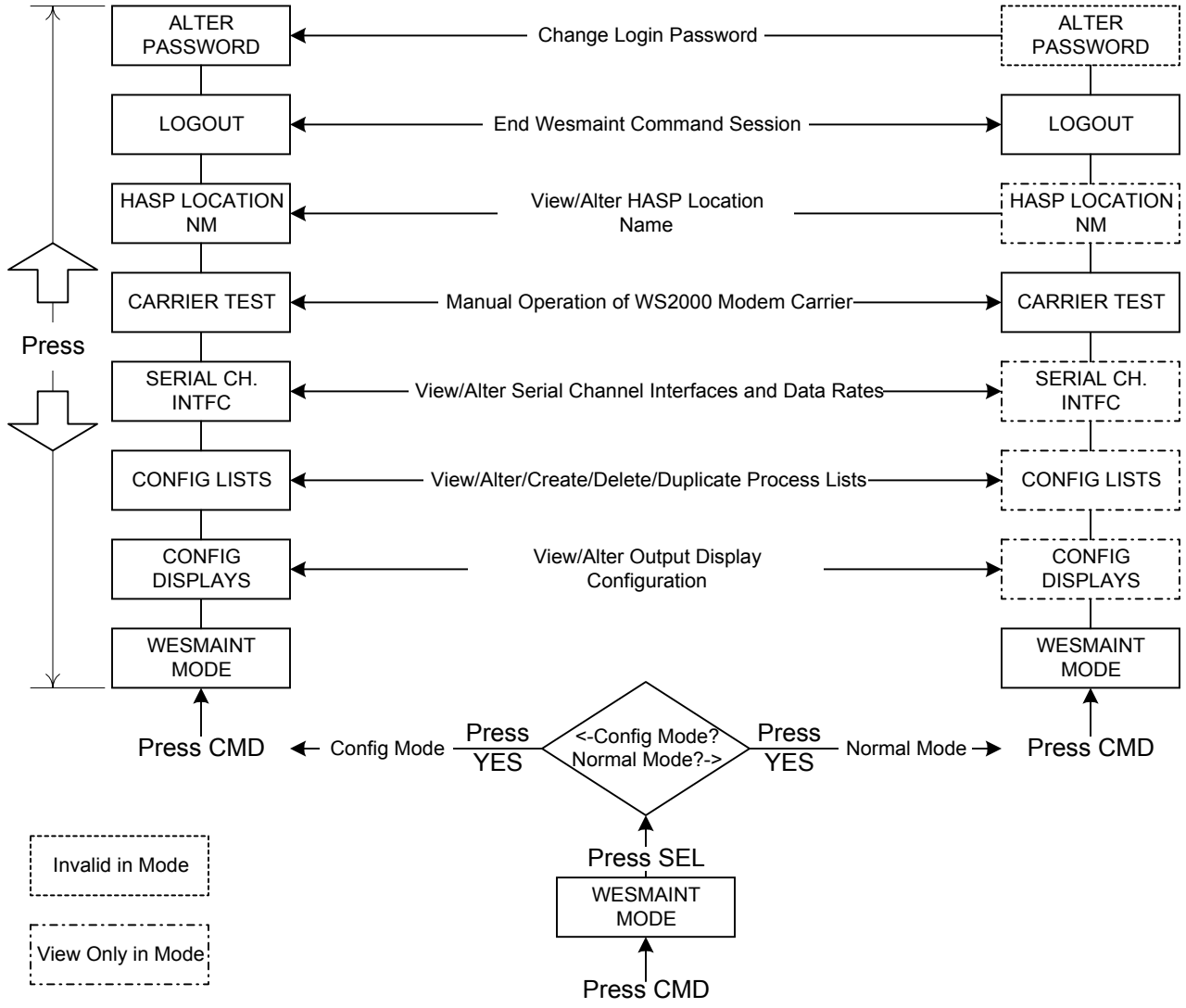

Figure 5-3 Wesmaint-ASCII Terminal Function Equivalence

5.5.1 Wesmaint Mode

The following describes how to change the WS2000 from the configuration mode, used to change data, to the normal operation mode for processing information.

Menu: CMD

Purpose: To confirm or change the Wesmaint operating mode.

Note: Some command functions can operate in both Normal and Config mode while other command functions can operate in only one of the two operating modes. Each function description has a section labeled *Valid Modes* that identifies the valid mode or modes for that function.

Screen Format: Depending on the current operating mode, either of two prompts appears: **`NORMAL MODE?`** or **`CONFIG MODE?`**.

Keys Used: The following keys are active during this function:

- ⇑**:** Display the alternate operating mode
- ⇓**:** Return to the current operating mode
- **YES:** Select the alternate operating mode

Valid Modes: Normal, Config

Operation: Use Procedure 5-7 to alter the WS2000 operating mode.

Procedure 5-7 Changing Wesmaint Modes

Step	Procedure

Selecting the Function

1. Press **CMD** until the window displays **`WESMAINT MODE`**.

2. Press **SEL**.
   The window displays the current operating mode.

Changing to the Alternate Operating Mode

3. Press ⇑ to display the alternate operating mode. Observe the following:
   A. *If already in the Normal mode, the window prompts* ***`CONFIG MODE?`***.
   - Press **YES** to enter Config mode.
     The window briefly displays ***`STOPPING TASKS`****… to indicate that normal WS2000 functions are shutting down in preparation for the Config mode. Then,* ***`CONFIG MODE`*** *appears.*

   B. *If already in the Config mode, the window prompts* ***`NORMAL MODE?`***.
   - Press **YES** to restart the WS2000 and resume normal operation.
     The window displays ***`INITIALIZING`*** *to indicate that normal WS2000 functions are restarting in preparation for normal operation. Then* ***`WESMAINT READY`*** *appears.*

Exiting the Function

4. Press **DSPY** or **CMD**.
   The window displays ***`VERSION NUMBER`*** *or* ***`WESMAINT MODE`****, respectively.*

5.5.2 Configure Displays

The following describes how to configure the WS2000 output displays.

Menu: CMD

Purpose: To view or modify the output displays configuration.

Screen Format: Each display has three configurable components:

- Data Source
- Process List
- Scan List

WS2000 uses three separate screens to show this information.

Data Source

Data sources can be discretes or serial.

Discretes

For output displays where data originates from discrete inputs, the source screen shows the discrete input expander address:

p **–** ***d*** **DISC YY**

p	Port (Channel 0 = Discrete Expanders)
d	Display Number/Expander Address (1 – 8); 1 = Internal Discrete Expander; 2 – 8 = External Expanders 1 – 7
DISC	Discrete Input
YY	On = Collection Port Installed and Enabled Off = Collection Port Installed but Disabled

Serial

For output displays where data originates from a serial port, the source screen shows the following:

p – d TBOS YY

p	Port (Channel: 2 – 9 = TBOS Collection Ports)
d	Display Number (1 – 8)
TBOS	Serial Collection Input
YY	On = Collection Port Installed and Enabled Off = Collection Port Installed but Disabled

See *Serial Port Connections* on Page 3-11 for the physical location of Channels 2 – 9.

Process List

The process list screen shows the selected process list number for the output display:

p – d* LIST *yyyy

p	Port (Channel: 0 = Discrete Expanders; 2 – 9 = TBOS Collection Ports)
d	Display Number (1 – 8)
LIST	Process List
yyyy	Process List Identifier Number

Note: Process list identifier 0000 indicates that no process list attributes have been selected and that the display points process as *status without memory*.

Scan List

The scan list screen indicates the valid characters in each display. WS2000 does not scan invalid characters, whose data bits are constantly held at 0. The scan list screen shows the numbers of the valid characters:

p – d* SCAN *zzzzzzzz

p	Port (Channel: 0 = Discrete Expanders; 2 – 9 = TBOS Collection Ports)
d	Display Number (1 – 8)
SCAN	Scan List
zzzzzzzz	Valid Character Numbers (1 – 8): 1 2 3 4 5 6 7 8

Keys Used: The following keys are active during this function:

- ⇑**:** Advance to next screen for current output display or first screen of next output display
- ⇓**:** Back to previous screen for current output display or last screen of previous output display
- **PT** (POINT)**:** Select a specific output display
- **DATA:** Enter data entry mode

Valid Modes:

■ View Output Display	Normal mode, Config mode
■ Modify Output Display	Config mode only

Operation: Use Procedure 5-8 to configure an output display.

Procedure 5-8 Configuring an Output Display

Step	Procedure

Selecting the Function

1. Press **CMD** until the window displays **WESMAINT MODE**.
2. Press ⇑ until the window displays **CONFIG DISPLAYS**.
3. Press **SEL**.

Selecting a Screen or a Specific Output Display

4. **A.** Press ⇑ to advance to the next screen on the current output display or to the last screen on the previous output display.

   B. Press ⇓ to go to the previous screen on the current output display or to the last screen on the previous output display.

   C. Press **PT** to select a specific output display.
   The window prompts with ***CHANNEL=^***.
   - Enter the desired channel number (0, 2 – 9) using the hex keypad and press **ENTR**.

The window prompts with ***DISPLAY***=^.

- Enter the desired display number (1 – 8) using the hex keypad and press **ENTR**.

Enabling/Disabling the Data Source for a Display

5. Select the desired output display using Step 4.

6. Press **ON** to enable a disabled source or **OFF** to disable an enabled source.

Changing the Process List

7. Use Step 4 to select the desired output display, then press ⇑ once to access the list screen (**`p – d LIST yyyy`**).

8. Press **DATA**.
   The window prompts with ***LIST=^***.

9. Enter the process list identifier code using the hex keypad and press **ENTR**.
   If the WS2000 configuration does not contain the selected process list, the window briefly displays the message ***NO SUCH LIST*** *and prompts again for a list number.*

   Note: To view, alter, create, duplicate, and delete process lists, use the Configure Lists function.

Changing the Scan List

10. Use Step 4 to select the desired output display, then press ⇑ twice to select the scan screen (**`p – d SCAN zzzzzzzz`**).

11. Press **DATA**.
    The window prompts with ***SCAN=^***.

12. **A.** Enter the numbers for the characters to be scanned using the hex keypad and press **ENTR**. For example, to scan characters 1, 2, and 8, enter 128.

    B. To disable **scanning** of all display characters, press **ENTR** only.

Exiting the Function

13. Press **DSPY** or **CMD**.

The window displays ***VERSION NUMBER*** *or* ***WESMAINT MODE****, respectively.*

5.5.3 Configure Process Attribute Lists

This section describes how to view, modify, create, duplicate, or delete WS2000 configuration Process Lists.

Menu: CMD

Purpose: To view or modify process list attributes. This function also allows you to create, delete, and duplicate process lists.

Screen Format: The following is the screen format for this function:

LST ***xxxx yy aaaa***

LST	Process List
xxxx	Process List Identifier Number
yy	Point Number (1 – 64)
aaaa	Point Attributes

Point Attributes

Each point in a process list can have four attributes:

- **B** = bipolar alarm enable
- **A** = alarm enable
- **M** = change of state memory enable
- **I** = invert state

You can individually enable/disable these attributes for each point. If all attributes are disabled, the point processes as *status without memory* and displays as a blank space.

Keys Used: The following keys are active during this function:

- ⇑**:** Advance to the next point in the current list
- ⇓**:** Back to the previous point in the current list
- **PT** (POINT)**:** Select a list to view or modify

The following keys are active during the Modify function only:

- **RUN:** Enable bipolar attribute
- **STOP:** Disable bipolar attribute
- **ON:** Enable alarm attribute
- **OFF:** Disable alarm attribute
- **YES:** Enable memory attribute
- **NO:** Disable memory attribute

- **DATA:** Toggle invert attribute
- **CLR:** Clear all attributes
- **ENTR:** Store modified process list

Valid Modes:

■ View Process List	Normal mode, Config mode
■ Modify Process List	Config mode only
■ Create Process List	Config mode only
■ Duplicate Process List	Config mode only
■ Delete Process List	Config mode only

Operation: Use Procedure 5-9 to view, modify, create, duplicate, or delete a Process List identifier code.

Procedure 5-9 Configuring Process Attribute Lists

Step	Procedure

Selecting the Function

1. Press **CMD** until the window displays **`WESMAINT MODE`**.
2. Press ⇑ until the window displays **`CONFIG LISTS`**.
3. Press **SEL**.
   *The window displays **`VIEW LIST?`**.*
4. Press **NO** to cycle through the list options (**`VIEW LIST?`**, **`MODIFY LIST?`**, **`CREATE LIST?`**, **`DUPLICATE LIST?`**, **`DELETE LIST?`**) and press **YES** at the one you want to use.
   *The window prompts with **`LIST NUMBR=^`**.*
   *When you select the **`DUPLICATE LIST?`** option, the window prompts with **`DUP FROM=^.`***
5. **A.** If you selected **`VIEW LIST?`**, go to Step 6.
   B. If you selected **`MODIFY LIST?`**, go to Step 9.
   C. If you selected **`CREATE LIST?`**, go to Step 15.
   D. If you selected **`DUPLICATE LIST?`**, go to Step 16.
   E. If you selected **`DELETE LIST?`**, go to Step 18.

Viewing Process List Attributes

6. Enter the four-digit list identifier using the hex keypad and press **ENTR**.

7. Use ⇑ and ⇓ to view the point attributes in the list.

8. Press **PT** to select a different list for viewing and continue from Step 6.

Modifying List Attributes

9. Enter the four-digit list identifier using the hex keypad and press **ENTR**.
   The window prompts with ***AUTO PROPAGATE?****.*

10. Press **YES** to enable the Auto Propagate function or **NO** to disable it.

    Note: If you select the Auto Propagate function, any changes you make to the attributes of one point affect the attributes of all subsequent (higher) points in the list.

11. Use ⇑ and ⇓ to view the point attributes in the list.

12. Use **RUN**, **STOP**, **ON**, **OFF**, **YES**, **NO**, **DATA**, and **CLR** to modify the attributes of the point displayed in the window as follows:

Attribute (Note)	Press	
	To Select	To Deselect
Bipolar	**RUN**	**STOP**
Alarm	**ON**	**OFF**
Memory	**YES**	**NO**
Invert	**DATA** (Toggles Invert On/Off)	
Note: Press **CLR** to remove all attributes.		

13. Press **ENTR** to store the modified attributes in WS2000 non-volatile memory.
    The window prompts with ***STORE LIST?****.*

14. Press **YES** to store the list or **NO** to continue with modifications.

    Note: Pressing **PT**, **SEL**, **DSPY**, or **CMD** before you store a modified list causes WS2000 to ignore all modifications.

Creating a New Process List

15. Enter the four-digit list identifier using the hex keypad and press **ENTR**.
A. If the entered list number does not already exist, WS2000 creates a new list and automatically invokes the Modify List function.
- Go to Step 9 and continue the procedure.

B. If the entered list number already exists, the window briefly displays the message ***LIST EXISTS NOW****, followed by the prompt* ***MODIFY LIST?****.*
- Press **YES** to modify the existing list and go to Step 9 or **NO** to select another operation.

C. If the window displays ***NO SPACE LEFT****, you must delete an existing list to make room for the new list. Go to Step 18 to delete an existing list. The window prompts with* ***DELETE LIST?****.*

Note: The WS2000 EEPROM has space for 100 process lists.

Duplicating a List

16. Enter the four-digit list identifier using the hex keypad and press **ENTR**.
The window prompts with ***DUP TO=^****. If the specified list does not exist, the window briefly displays* ***NO SUCH LIST****.*

17. Enter the list identifier to be assigned to the new list using the hex keypad and press **ENTR**.
A. If the specified list already exists, the window diplays ***LIST EXISTS NOW****, followed by the prompt* ***OVERWRITE?****.*
- Press **YES** to overwrite the existing list or **NO** to repeat Step 16.

B. If the specified list does not exist already, WS2000 creates the list using attributes from the list specified in Step 16*.*
The window prompts with ***MODIFY LIST?****.*
- Press **YES** to modify the existing list and go to Step 9 or **NO** to select another operation.

C. If the window displays ***NO SPACE LEFT****, you must delete a list.*
- Press **CMD**.
- The window prompts with `View List?`.
- Press **NO** until the window prompts `DELETE LIST?`, then select **YES**.
- The window prompts with `LIST NUMBR=^`.
- Go to Step 18.
- Deleting a Process List

18. Enter the four-digit list identifier using the hex keypad and press **ENTR**.
A. If the entered list number exists, the window briefly displays ***LIST DELETED****, followed by the prompt* ***VIEW LIST?****.*

B. If the specified list does not exist, the window briefly displays ***NO SUCH LIST****, then displays* ***LIST NUMBR=^****.*
- Repeat Step 18.

Exiting the Function

19. Press **DSPY** or **CMD**.
The window displays ***VERSION NUMBER*** *or* ***WESMAINT MODE****, respectively.*

5.5.4 Serial Channel Interface

This section describes how to set the electrical interface type and the data rate for the WS2000 serial ports.

Menu: CMD

Purpose: To view or modify data collection protocols, the electrical interface specification (RS-232/RS-485 or RS-422), or the data rate (1200 bps or 2400 bps) for the serial channels.

Screen Format: Each serial channel has two configurable components:

- Electrical Interface
- Data Rate

Electrical Interface

The following is the electrical interface screen format:

CH*x* = RS*eeee*

CH	Channel
x	Channel Number (1 – 9)
RS	Recommended Standard
eeee	232/485 or 422

Data Rate

The following is the data rate screen format:

CH*x* = *yyyy* BAUD

CH	Channel
x	Channel Number (1 – 9)
yyyy	1200 or 2400 bps (Channels 2 – 9) or 1200; 2400; 4800; or 9600 bps (Channel 1)
BAUD	Baud

Keys Used: The following keys are active during this function:

- ⇑**:** Advance to interface type or baud rate of current channel or to protocol type of next channel
- ⇓: Back to baud rate of previous channel or to previous display for this channel
- **PT** (POINT): Select a new channel
- **DATA**: Enter data entry mode

Valid Modes:

- View Serial Channel Interface — Normal mode, Config mode
- Modify Serial Channel Interface — Config mode only

Operation: Use Procedure 5-10 to view or modify the serial channel interface and data rate for the WS2000 serial ports.

Procedure 5-10 Configuring the Serial Channel Interface

Step	Procedure
	Selecting the Function
1.	Press **CMD** until the window displays **WESMAINT MODE**.
2.	Press ⇑ until the window displays **SERIAL CH INTFC**.

3. Press **SEL**.
   *After you press **SEL**, the window displays Channel 1 electrical interface type (**CH1 – RS232/422**).*

Viewing Serial Channel Configuration Data

4. **A.** Press ⇑ to display the current channel baud rate.
   - Press ⇑ again to make the next channel the current channel and display its interface type.

     Observe that the channel numbers automatically *wrap* from 9 to 1. ⇓ works similarly to ⇑. When you press ⇓, you access the previous display for the current channel or the last display (Baud rate) for the previous channel. When you are at Channel 1 and press ⇓ , the display wraps around to Channel 9. Similarly, when you are at Channel 9 and press ⇑ , the display wraps to Channel 1.
   - Press ⇑ again to display the new current channel baud rate.
   - Repeat Step A to display the interface type and data rate parameters for the other channels.

   B. Press **PT** to select a specific channel.
   *The window prompts with **CHANNEL=^**.*
   - Enter the desired channel number (1 – 9) using the hex keypad and press **ENTR**. Continue pressing ⇑ to view the selected channel data rate.

Changing Interface Type

5. Select the desired channel using Step 4. Verify that the interface type displays.

6. Press **DATA**.
   *The window prompts with **RS-232/485?**.*

7. Press **YES** to select the RS-232/RS-485 interface. Otherwise, press **NO**.
   *The window prompts with **RS-422?**.*

8. Press **YES** to select the RS-422 interface or **NO** to redisplay the RS-232/485 prompt.

   Note: You cannot change Channels 6 – 9 to the RS-232/485 interface. These channels are RS-422 only.

Changing the Baud Rate

9. Select the desired channel using Step 4. Verify that the data rate displays.

10. Press **DATA**.
The window prompts with ***1200 BAUD?****.*

11. **A.** Press **YES** to select 1200 Baud. Otherwise, press **NO**.
The window prompts ***2400 BAUD?****.*

    B. Press **YES** to **select** 2400 Baud or **NO** to display the ***1200 BAUD*** prompt.

    Note: Channel 1 allows 4800 and 9600 Baud. The procedure to select a data rate is the same as 11A/11B.

Exiting the Function,

12. Press **DSPY** or **CMD**.
The window displays ***VERSION NUMBER*** *or* ***WESMAINT MODE****, respectively.*

5.5.5 Carrier Test

This section describes how to perform a carrier test on the WS2000 host port.

Menu: CMD

Purpose: To manually operate the WS2000 carrier signal for testing purposes.

Screen Format: This function has two screen formats: **CARRIER ON** or **CARRIER OFF**.

Keys Used: The following keys are active during this function:

- **ON:** Manually turn carrier on
- **OFF:** Return to normal operation

Valid Modes: Normal, Config

Operation: Use Procedure 5-11 to perform the Carrier Test function on the WS2000 host port.

Procedure 5-11 Performing the Carrier Test

Step	Procedure

Selecting the Function

1. Press **CMD** until the window displays **`WESMAINT MODE`**.
2. Press ⇑ until the window displays **`CARRIER TEST`**.
3. Press **SEL**.
   The window displays ***`CARRIER OFF`*** *or* ***`CARRIER ON`****.*

Modifying the Carrier Status

4. **A.** Press **ON** to force the carrier On.

   B. Press **OFF** to force the carrier Off (return to normal operation).

Exiting the Function

5. Press **DSPY** or **CMD**.
   The window displays ***`VERSION NUMBER`*** *or* ***`WESMAINT MODE`****, respectively.*

5.5.6 WACP Location Name

The following describes how to view or change the location name for the WS2000.

Menu: CMD

Purpose: To establish the WS2000 location name that identifies which WS2000 is reporting alarm/status to the host and enables a specific WS2000 to be addressed to accept commands from the host.

Screen Format: The following is the screen format for this function:

```
LN = XXXXXXXXXX
```

`LN`	Location Name
`XXXXXXXXXX`	Assigned Name (Alphanumeric)

Keys Used: The following keys are active during this function:

- ⇑**:** Advance to next character
- ⇓**:** Back to previous character
- **DATA:** Change the WACP location name
- **YES:** Accept the displayed character

- **NO:** Do not accept the displayed character
- **ENTR** (ENTER)**:** Accept the displayed name

Valid Modes: Normal, Config

Operation: Use Procedure 5-12 to view/change the WS2000 location name.

Procedure 5-12 Viewing/Changing the Location Name

Step	Procedure

Selecting the Function

1. Press **CMD** until the window displays **`WESMAINT MODE`**.
2. Press ⇑ until the window displays **`WACP LOCATION NM`**.
3. Press **SEL**.
   The window displays ***`LN = LOCATION NAME`***.

Changing the Location Name

4. Press **ENTR**.
   The window prompts with ***`LN=A`*** .
5. Press ⇑ or ⇓ until the desired letter/number (A – Z, 0 – 9) appears and then press **YES**.
   The desired letter/number remains in the current position and the "cursor" advances one position to the right.
6. Repeat Step 5 until the desired name appears in the window.
7. Press **ENTR** to accept the name.
   The window displays the name you entered.

Exiting the Function

8. Press **DSPY** or **CMD**.
   The window displays ***`VERSION NUMBER`*** *or* ***`WESMAINT MODE`****, respectively.*

5.5.7 Logout

This section describes how to log out of WS2000 when a password is used to log in. When security is required, you must use the Logout command. After you select this function, WS2000 automatically performs Logout.

Note: WS2000 does not execute an automatic logout if you unplug the Wesmaint unit or hang up the phone when connected through a modem.

Menu: CMD

Purpose: To end a command session. You cannot select any new commands until you supply a password. Also see *Alter Password* on Page 5-30.

Screen Format: When you select this function, the Wesmaint window displays the following message: **`LOGOUT COMPLETE`**.

Keys Used: No keys are active when you select this function because WS2000 automatically performs Logout.

Valid Modes: Normal, Config

Operation: Use Procedure 5-13 to log out of WS2000 when a password is used to log in.

Procedure 5-13 Logging Out

Step	Procedure
	Selecting the Function
1.	Press **CMD** until the window displays **`WESMAINT MODE`**.
2.	Press ⇑ until the window displays **`LOGOUT`**.
3.	Press **SEL**. *The window displays **`LOGGING OUT`**, then **`LOGOUT COMPLETE`**.*
	Selecting Another Command
4.	Press **DSP** or **CMD**. *The window displays **`VERSION NUMBER`** or **`WESMAINT MODE`**, respectively.*

5.5.8 Alter Password

The following explains how to enable, disable, and change a password on the WS2000.

Notes:

1. When passwords are enabled and WS2000 goes through a reset sequence, such as cycling unit power Off/On, WS2000 requires you to log in.
2. When passwords are enabled, WS2000 does not allow commands to execute until the password is entered. Password prompting occurs automatically after a Logout command executes.
3. Password 0000 disables the password function. Any other password value enables the password function. While the password function is disabled, WS2000 does not request a password when powered up; thus, the LOGOFF command has no effect.

Menu: CMD

Purpose: To change the password stored in the serial EEPROM. This function also disables or enables the password function.

Screen Format: When you select this function, the screen displays: **`PASSWORD=^`**.

Keys Used: Use any of the keys in the hex keypad to enter a four-digit password and press **ENTR** to store a new password. If you make a mistake while keying in the password, press **CLR**.

Valid Modes: Config only

Operation: Use Procedure 5-14 to alter the WS2000 password. Enter Wesmaint using the old password, then change the password.

Procedure 5-14 Altering the Password

Step	Procedure
	Selecting the Function
1.	Press **CMD** until the window displays **`WESMAINT MODE`**.
2.	Press ⇑ until the window displays **`ALTER PASSWORD`**.
3.	Press **SEL**. *The window prompts* ***`PASSWORD=^`***.
4.	Respond to the prompt with a four-digit number using the hex keypad (**0** – **9**, **A**– **E**).

5. Reenter the same four-digit number after the **CONFIRM** prompt appears.
   If the two passwords are different, the window displays ***NOT CHANGED!****. This message indicates that the old password remains in effect.*
   If the two passwords match, the window displays ***CHANGED!****. This message indicates that WS2000 has stored the password in the serial EEPROM. After a brief pause, the window displays* ***ALTER PASSWORD****.*

6. To change the password, repeat Steps 3 through 5 using the new password.

Exiting the Function

7. Press **DSPY** or **CMD**.
   The window displays ***VERSION NUMBER*** *or* ***WESMAINT MODE****, respectively.*

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Appendix A Default Data/Configuration Templates

This appendix includes default configuration data and configuration templates as follows:

- Default Serial Channel Information (Table A-1)
- Serial Channel Configuration Template (Table A-2)
- Output Display Configuration Template (Table A-3)
- Predefined Process Lists (Table A-4)
- Process List Configuration Template (Table A-5)

  Copy this table as often as needed to develop your process lists.

Table A-1 Default Serial Channel Information

Channel	Protocol	Interface Type	Data Rate (BPS)
1	WACP Host	RS-232/RS-485*, RS-422	1200, 2400*, 4800, 9600
2	TBOS	RS-232/RS-485, RS-422*	1200, 2400*
3	TBOS	RS-232/RS-485, RS-422*	1200, 2400*
4	TBOS	RS-232/RS-485, RS-422*	1200, 2400*
5	TBOS	RS-232/RS-485, RS-422*	1200, 2400*
6	TBOS	RS-422	1200, 2400*
7	TBOS	RS-422	1200, 2400*
8	TBOS	RS-422	1200, 2400*
9	TBOS	RS-422	1200, 2400*

* Default value

Table A-2 Serial Channel Configuration Template

Channel	Protocol	Interface Type	Data Rate (BPS)
1	WACP		
2	TBOS		
3	TBOS		
4	TBOS		
5	TBOS		
6	TBOS	RS-422	
7	TBOS	RS-422	
8	TBOS	RS-422	
9	TBOS	RS-422	

All input displays automatically map as shown Table A-3 and default to Process List #0001. All characters are scanned.

A serial TBOS port supports a maximum of eight displays of information (1 – 8). Each discrete expander supports a maximum of one display.

When mapping occurs on an input display, the scan points and control points associated with that display have identical mapping. That is, to map the scan points for a particular display separately from the control points is not possible.

Table A-3 Output Display Configuration Template

Output Display	Input Display Data Source (Note)		Process List (Default 0001)	Scanned Characters
	Chan No	In Display		
0–1	0	0 (WS2000)		1 2 3 4 5 6 7 8
0–2	0	1		1 2 3 4 5 6 7 8
0–3	0	2		1 2 3 4 5 6 7 8
0–4	0	3		1 2 3 4 5 6 7 8
0–5	0	4		1 2 3 4 5 6 7 8
0–6	0	5		1 2 3 4 5 6 7 8
0–7	0	6		1 2 3 4 5 6 7 8
0–8	0	7		1 2 3 4 5 6 7 8

Table A-3 Output Display Configuration Template

Output Display	Input Display Data Source (Note)		Process List (Default 0001)	Scanned Characters
	Chan No	In Display		
2–1	2	1		1 2 3 4 5 6 7 8
2–2	2	2		1 2 3 4 5 6 7 8
2–3	2	3		1 2 3 4 5 6 7 8
2–4	2	4		1 2 3 4 5 6 7 8
2–5	2	5		1 2 3 4 5 6 7 8
2–6	2	6		1 2 3 4 5 6 7 8
2–7	2	7		1 2 3 4 5 6 7 8
2–8	2	8		1 2 3 4 5 6 7 8
3–1	3	1		1 2 3 4 5 6 7 8
3–2	3	2		1 2 3 4 5 6 7 8
3–3	3	3		1 2 3 4 5 6 7 8
3–4	3	4		1 2 3 4 5 6 7 8
3–5	3	5		1 2 3 4 5 6 7 8
3–6	3	6		1 2 3 4 5 6 7 8
3–7	3	7		1 2 3 4 5 6 7 8
3–8	3	8		1 2 3 4 5 6 7 8
4–1	4	1		1 2 3 4 5 6 7 8
4–2	4	2		1 2 3 4 5 6 7 8
4–3	4	3		1 2 3 4 5 6 7 8
4–4	4	4		1 2 3 4 5 6 7 8
4–5	4	5		1 2 3 4 5 6 7 8
4–6	4	6		1 2 3 4 5 6 7 8
4–7	4	7		1 2 3 4 5 6 7 8
4–8	4	8		1 2 3 4 5 6 7 8
5–1	5	1		1 2 3 4 5 6 7 8
5–2	5	2		1 2 3 4 5 6 7 8
5–3	5	3		1 2 3 4 5 6 7 8
5–4	5	4		1 2 3 4 5 6 7 8

Table A-3 Output Display Configuration Template

Output Display	Input Display Data Source (Note)		Process List (Default 0001)	Scanned Characters
	Chan No	In Display		
5–5	5	5		1 2 3 4 5 6 7 8
5–6	5	6		1 2 3 4 5 6 7 8
5–7	5	7		1 2 3 4 5 6 7 8
5–8	5	8		1 2 3 4 5 6 7 8
6–1	6	1		1 2 3 4 5 6 7 8
6–2	6	2		1 2 3 4 5 6 7 8
6–3	6	3		1 2 3 4 5 6 7 8
6–4	6	4		1 2 3 4 5 6 7 8
6–5	6	5		1 2 3 4 5 6 7 8
6–6	6	6		1 2 3 4 5 6 7 8
6–7	6	7		1 2 3 4 5 6 7 8
6–8	6	8		1 2 3 4 5 6 7 8
7–1	7	1		1 2 3 4 5 6 7 8
7–2	7	2		1 2 3 4 5 6 7 8
7–3	7	3		1 2 3 4 5 6 7 8
7–4	7	4		1 2 3 4 5 6 7 8
7–5	7	5		1 2 3 4 5 6 7 8
7–6	7	6		1 2 3 4 5 6 7 8
7–7	7	7		1 2 3 4 5 6 7 8
7–8	7	8		1 2 3 4 5 6 7 8
8–1	8	1		1 2 3 4 5 6 7 8
8–2	8	2		1 2 3 4 5 6 7 8
8–3	8	3		1 2 3 4 5 6 7 8
8–4	8	4		1 2 3 4 5 6 7 8
8–5	8	5		1 2 3 4 5 6 7 8
8–6	8	6		1 2 3 4 5 6 7 8
8–7	8	7		1 2 3 4 5 6 7 8
8–8	8	8		1 2 3 4 5 6 7 8

Table A-3 Output Display Configuration Template

Output Display	Input Display Data Source (Note)		Process List (Default 0001)	Scanned Characters
	Chan No	In Display		
9–1	9	1		1 2 3 4 5 6 7 8
9–2	9	2		1 2 3 4 5 6 7 8
9–3	9	3		1 2 3 4 5 6 7 8
9–4	9	4		1 2 3 4 5 6 7 8
9–5	9	5		1 2 3 4 5 6 7 8
9–6	9	6		1 2 3 4 5 6 7 8
9–7	9	7		1 2 3 4 5 6 7 8
9–8	9	8		1 2 3 4 5 6 7 8

Note: Channel Number 0 = discrete inputs (Input Display 0 = WS2000; 1 – 7 are the external discrete expanders; Channel Numbers 2 – 9 = TBOS Channels 2 – 9.

Table A-4 Predefined Process Lists

List	Points	Attributes
0001	1 – 64	BAM
0002	1 – 48	BAI
	49 – 64	BA
118A	1 – 64	AM
120A	1 – 32	AM
	33 – 64	A
121A	1 – 16	AM
	17 – 64	A
122A	1 – 64	A
123A	1 – 48	AM
124A	1 – 36	AM
	37 – 48	A
125A	1 – 24	AM
	25 – 48	A
126A	1 – 12	AM
	13 – 48	A
127A	1 – 48	A
128A	1 – 32	AM
129A	1 – 24	AM
	25 – 32	A
130A	1 – 16	AM
	17 – 32	A
131A	1 – 8	AM
	9 – 32	A

List	Points	Attributes
139A	1 – 16	BA
140A	1 – 32	BA
141A	1 – 48	BA
0118	1 – 63	AM
	64	BA
0119	1 – 48	AM
	49 – 63	A
	64	BA
0120	1 - 32	AM
	33 – 63	A
	64	BA
0121	1 – 16	AM
	17 – 63	A
	64	BA
0122	1 – 63	A
	64	BA
0123	1 – 48	AM
	64	BA
0124	1 – 36	AM
	37 – 48	A
	64	BA
0125	1 – 24	AM
	25 – 48	A
	64	BA

List	Points	Attributes
0130	1 – 16	AM
	17 – 32	A
	64	BA
0131	1 – 8	AM
	9 – 32	A
	64	BA
0132	1 – 32	A
	64	BA
0133	1 – 16	AM
	64	BA
0134	1 – 12	AM
	13 – 16	A
	64	BA
0135	1 – 8	AM
	9 – 16	A
	64	BA
0136	1 – 4	AM
	5 – 16	A
	64	BA
0137	1 – 16	A
	64	BA
0138	64	BA
0139	1 – 16, 64	BA
0140	1 – 32, 64	BA

132A	1 – 32	A
133A	1 – 16	AM
134A	1 – 12	AM
	13 – 16	A
135A	1 – 8	AM
	9 – 16	A
136A	1 – 4	AM
	5 – 16	A
137A	1 – 16	A
138A	1 – 64	STATUS

0126	1 – 12	AM
	13 – 48	A
	64	BA
0127	1 – 48	A
	64	BA
0128	1 – 32	AM
	64	BA
0129	1 – 24	AM
	25 – 32	A
	64	BA

0141	1 – 48, 64	BA
9999	9 – 16	M
	17 – 24	AM
	25 – 32	BAM
	33 – 40	I
	41 – 48	IM
	49 – 56	AMI
	57 – 64	BAMI
B = Bipolar, A = Alarm		
M = Memory, I = Invert		

Table A-5 Process List Configuration Template

List _____				List _____			
Point	**Attributes**	**Point**	**Attributes**	**Point**	**Attributes**	**Point**	**Attributes**
1		33		1		33	
2		34		2		34	
3		35		3		35	
4		36		4		36	
5		37		5		37	
6		38		6		38	
7		39		7		39	
8		40		8		40	
9		41		9		41	
10		42		10		42	
11		43		11		43	
12		44		12		44	
13		45		13		45	
14		46		14		46	
15		47		15		47	
16		48		16		48	
17		49		17		49	
18		50		18		50	
19		51		19		51	
20		52		20		52	
21		53		21		53	
22		54		22		54	
23		55		23		55	
24		56		24		56	
25		57		25		57	
26		58		26		58	
27		59		27		59	
28		60		28		60	

Table A-5 Process List Configuration Template

List _____			
Point	**Attributes**	**Point**	**Attributes**
29		**61**	
30		**62**	
31		**63**	
32		**64**	

List _____			
Point	**Attributes**	**Point**	**Attributes**
29		**61**	
30		**62**	
31		**63**	
32		**64**	

B = Bipolar A = Alarm M = Memory I = Invert

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Appendix B WACP Technical Specifications

Overview of WACP Protocol Organization

Westronic Asynchronous Control Protocol (WACP) is an asynchronous ASCII-based master/slave protocol that provides communications between a WACP host and WACP remote units. A WACP host can be a master station, a terminal, or a serial printer. WS2000 WACP, a WACP remote, collects status/alarm data from and orders control output operations to local discrete interfaces and other remote units. Data collection and control between the WS2000 WACP and other remote units occurs through TBOS interfaces. After it collects data, the WS2000 WACP reports the data over the WACP protocol interface to the host.

WACP messages, consisting of printable ASCII characters in the ANSI range 32 – 126, have a maximum length of 64 bytes to minimize overhead on X.25 and other packet networks. A carriage return character (CR) terminates command messages from the host to WACP remote units. Responses from the remotes to the host terminate with a two-character sequence counter, a two-character ASCII checksum, and a carriage return/line feed pair (Figure B-1).

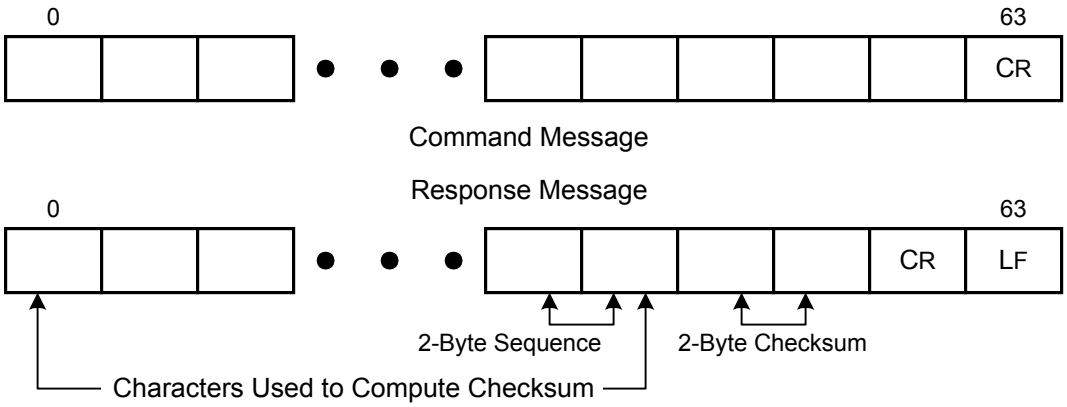

Figure B-1 WACP Command and Response Messages

The sequence counter (00 – 99), which then resets to 00, keeps track of message sequences. Each digit uses its ASCII equivalent. Likewise, an ASCII equivalent represents each nibble of the checksum. For example, if the checksum is 0xEA, the first nibble converts to ASCII character *E* and the second nibble converts to *A*. The checksum computation uses byte 0 through the sequence counter bytes.

WACP transmission characteristics are as follows:

- 1200; 2400; 4800; or 9600 bps
- 7 data bits
- 1 Start and 1 Stop bit
- Even parity

Data flow control between the host and the remote unit uses XON/XOFF and RTS/CTS handshake signals.

Displays

The WS2000 scans monitored equipment for scan point data and commands the monitored equipment to operate control points. WS2000 processes data in terms of a display, which is a set of 64 scan points and 64 control points. Each point can report alarm/status and address a control point.

A WS2000 WACP has eight TBOS data collection channels (2 – 9) with each data collection channel collecting data on eight displays. Thus, WS2000 collects a maximum 64 displays (eight channels times eight displays) over the TBOS interfaces. WS2000 collects an additional eight displays through the internal discrete expander (64 scan points and 16 control points) and a maximum 7 external discrete expanders (64 scan points and 16 control points each). Ultimately, WS2000 handles a maximum 72 displays (64 TBOS displays and 8 local discrete displays). Observe the following:

- Maximum number of scan points is 4,608 (72 displays x 64 scan points)
- Maximum number of control points is 4,224: 4,096 (64 displays x 64 control points) + 128 (8 expanders of 16 control points each)

Characters

Display organization consists of characters – sets of eight scan points each (Figure B-2). Because a display contains 64 scan points, each display contains eight characters. The character is the smallest unit of information transferred in WACP protocol.

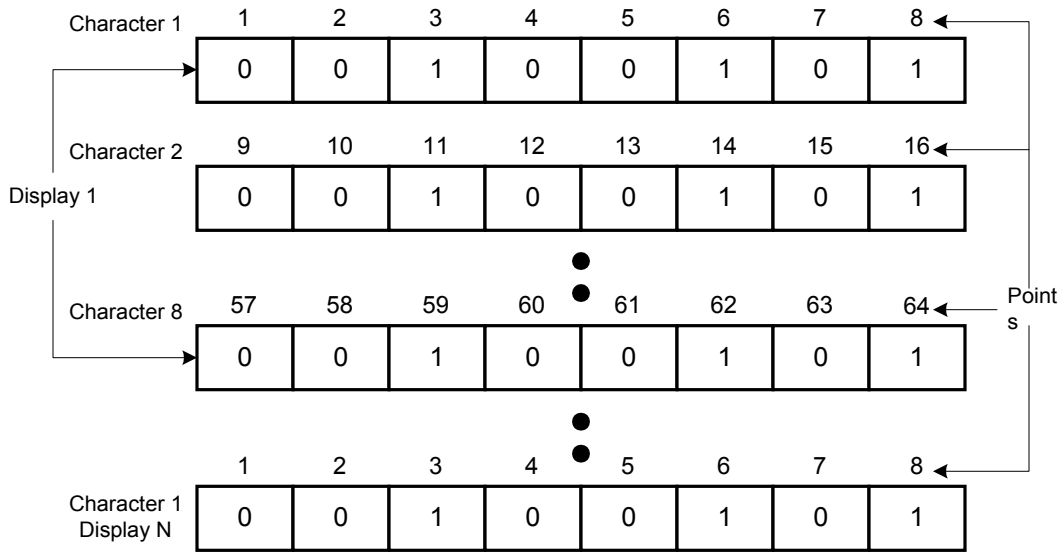

Figure B-2 Displays, Characters, and Points

Scan List

WS2000 uses a scan list to control display character reporting. When all scan points in a display are active, the scan list reports all eight characters. If one or more display characters are not active, the scan list can be set to not report inactive characters.

Data Reporting Methods

Two methods are available for reporting status and alarm data to the host: poll on demand and autonomous data reporting. Poll on demand requires the WACP host to specifically ask for either status or alarm data. Autonomous reporting enables the WACP RTU to report spontaneous alarm occurrences. WS2000 does not autonomously report status data.

Timing and Errors

The WS2000 WACP responds within 2 seconds of receiving an error-free command from the host. The WS2000 validates WACP messages by checking syntax and verifying the checksum (response messages only).

Invalid Commands

If it receives an invalid WACP command or if the command has invalid parameters, such as an out-of-range display number or point number, the WS2000 generates an INVALID response message (see *INVALID* on Page B-16).

Non-Command Requests

WS2000 considers a single carriage return character (CR) from the WACP host as a noncommand request. By using a single CR message, the WACP host can quickly determine which WS2000 remotes are active on a link or can stop a stream of responses. However, if several WS2000 HASPs are on a multidrop link to a WACP host, a single CR results in all the WACP units responding simultaneously, causing receive errors on the response. In this case, the host must include the location name of the WS2000 it wishes to communicate with so that it receives a coherent response. The WS2000 always responds with its location name in the form of a response to a SETLN command (see SETLN command in Language Set section).

Response Interruptions

A request can possibly generate numerous response messages. When the WACP host needs to interrupt the response message flow from a WS2000 for any reason, it can send a single carriage return or another command.

If the command that interrupts the WS2000 response is a single CR, WS2000 sends only the ABORT response (see *ABORT* on Page B-16) and terminates any current responses. However, if the WACP host has sent a command other than a single CR to interrupt a WS2000 during a response stream, the WS2000 sends the ABORT response, terminates any current responses, and then responds accordingly to the command causing the interruption.

Figure B-3 shows a typical response interruption scenario.

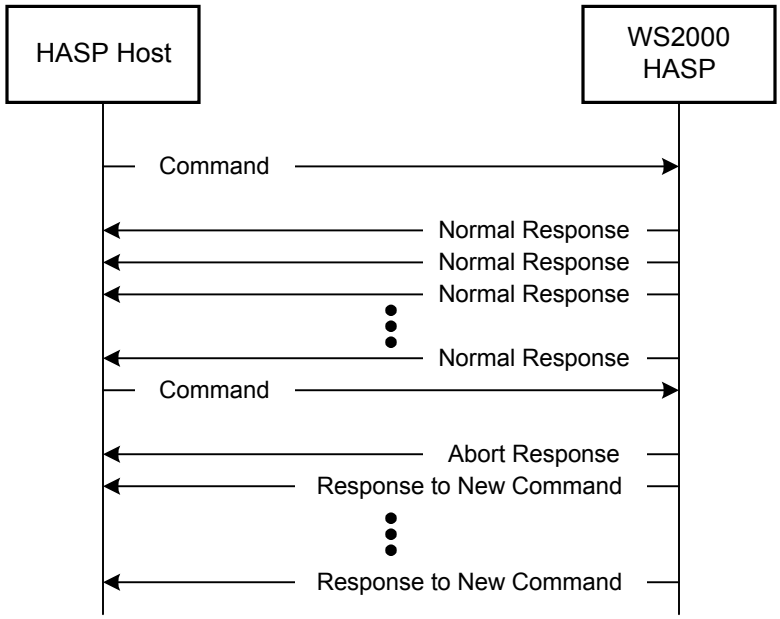

Figure B-3 Response Interruption Scenario

Non-Response

A WS2000 does not respond to requests containg location names not matching that of the remote.

Message Echoing

The WS2000 does not echo command messages or characters to the WACP host.

Start Up and Synchronization

Whenever the WS2000 comes out of a reset condition, it must notify the WACP host that it requires time and date synchronization. Until the host sets the time and date, the characters xx represent their values (that is, time=xx:xx:xx and date=xx-xx-xx). When the host sees xx values for the time and date, it sends a SETDATE command (see *SETDATE*on Page B-11) to the remote.

After WS2000 receives the SETDATE command, it does not require synchronization for another 6 hours. After 6 hours have elapsed and no synchronization has taken place, the WS2000 sends an hourly SYNC_REQUIRED message (see *SYNC_REQ* on Page B-17).

Language Set

The following describes the general syntax structure for command and response messages and the specific messages that WACP supports.

Syntax

The following character set helps define the syntax:

<>	enclose a symbol specifier
[]	enclose an optional symbol
^	space

The following symbol codes specify certain fields in a WACP message and appear throughout the remainder of this document:

cr	ASCII carriage return character (hex 0x0D)
lf	ASCII line feed character (hex 0x0A)
crc	2-byte cyclic redundancy check
seq	2-byte incremental message counter
date	8 bytes
time	8 bytes

Command Message Syntax

Several items prefix a WACP command message:

- A command code
- The location name of the addressed remote (optional)
- Any data parameters necessary to support the command

Therefore, a WACP command message uses the following general format:

<command code>^<[location name]>^<parameter>^…<parameter><cr>

The *command code* is some valid WACP command, the optional *location name* is the name of the addressed remote, and *parameter* is some data dependent on the command code.

Response Message Syntax

Several items prefix a WACP response message:

- The date
- The time
- The location name of the remote (always provided)
- Any data parameters necessary to support the response

Thus, a WACP response message uses the following general format:

<date>^<time>^<location name>^<parameter>^…<parameter>^<seq>^<crc><cr><lf>

The *date* appears in yy:mm:dd format:

- *yy* is the current year (01 indicates the year 2001)
- *mm* is the current month (01 – 12)
- *dd* is the current day (01 – 31).

The *time* appears in hh:mm:ss format:

- *hh* is the current hour based on a 24-hour clock (01 – 24). In the 24-hour clock, hh=12 designates noon and hh=24 designates midnight.
- *mm* is the current minute (00 – 59)
- *ss* is the current second (00 – 59).

The following characters differentiate the *date* and *time* parameters:

: (semicolon) formats the time of day: hh:mm:ss

\- (hyphen) formats the date: yy-mm-dd

The *location name* is the name of the responding remote and *parameter* is some data dependent on the response type.

As a guideline, all WACP messages adhere to the following in message syntax:

16. The ASCII space character (0x20) delimits each WACP message field.
17. All alpha data must be uppercase.
18. Data fields requiring an alphanumeric string cannot include blank spaces embedded between characters in the string.
19. Valid ASCII characters are those in the range of 32 to 126.
20. A carriage return character must mark the end of a command message.

21. A carriage return/line feed character pair must mark the end of a response message.

22. Symbols in a message must appear in the order given by their format specification. A format specification for each command/response message appears in the next section.

Command/Response Messages

All WACP messages have some parameter fields that contain data denoted by a literal label. The literal label defines a particular data item. Table B-1 lists literal labels and their parameter restrictions:

Table B-1 WACP Protocol Literal Labels

Literal	Description	Parameter Restrictions
'LN='	Location Name of WS2000 remote	LN must be uppercase without embedded spaces or tabs and be no more than 12 bytes maximum (for example, LN=REMOTE_SITE1). Valid characters for location name are *A* to *Z* and *1* to *9* to accommodate character display on the Wesmaint unit. The location name in a command message does not require use of blank spaces to make up for names shorter than 12 characters. The location name in a response message has blank character padding to the left if the name is less than 12 characters long.
'CH='	Data collection port channel number	2-byte ASCII field (00 = discrete channel; 02 – 09 = TBOS channels)
'DS='	Display number	2-byte ASCII field (01 – 08)
'PT='	Point number	2-byte ASCII field (01 – 64)
'ST='	Point status value	ST must be one of two codes: 'NO' (normal) or 'AC' (active).
'OP='	Control operation directive	OP must be one of three codes: 'SE' (latch); 'CL' (unlatch); or, 'PL' (latch then unlatch).

Command Messages

ALARM

The ALARM command requests only the standing alarms that have occurred in a WS2000. The host can make two types of alarm data request, identical in format to the Type 1 and Type 2 status requests, from a WS2000. To indicate that the WS2000 has reported all alarm information, the remote sends a COMPLETE message as its last mes

sage. When the response from WS2000 only consists of a COMPLETE message, the host has requested alarms on displays that are not active.

Note: The date and time included in an alarm response message refers to the time the message was reported. Do not use the time/date stamp as an actual sequence-of-event time stamp for when an alarm occurred.

The ALARM command format to request alarm data from all displays on all collection channels is as follows:

Command Format (Type 1)

```
ALARM^LN=[LN=aaaaaaaaaaaa]<cr>
```

The following is an example of an ALARM command and the corresponding response to request alarm data for all points in all displays on all collection channels:

Command Example

```
ALARM^LN=REMOTE_SITE1<cr>
```

Response Example

```
96-01-27^13:23:10^LN=REMOTE_SITE1^CH=01^DS=01^PT=01^
ST=NO^<seq>^<crc><cr><lf>

96-01-27^13:23:12^LN=REMOTE_SITE1^CH=03^DS=01^PT=02^
ST=AC^<seq>^<crc><cr><lf>
```

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```
96-01-27^14:01:10^LN=REMOTE_SITE1^CH=07^DS=01^PT=04^
ST=NO^<seq>^<crc><cr><lf>

96-01-27^14:01:11^LN=REMOTE_SITE1^COMPLETE^<seq>^
<crc><cr><lf>
```
(end of report)

Autonomous alarm reporting uses the response format just shown without an end-of-report message because autonomous messages can occur at any time.

The ALARM command format to request alarm data from all displays on a specific channel is as follows:

Command Format (Type 2)

```
ALARM^[LN=aaaaaaaaaaaa]^CH=bb<cr>
```

- *aa…aa* is the 12-byte location name string.
- *bb* is the channel collecting the data: 00 = discretes or 02 to 09 = TBOS channels.

The corresponding response uses the following format:

Response Format

```
<date>^<time>^LN=aaaaaaaaaaaa^CH=bb^DS=cc^PT=dd^
ST=ee^<seq>^<crc><cr><lf>
```

- *aa…aa* is the 12-byte location name string.
- *bb* is the channel collecting the data: 00 = discretes or 02 to 09 = TBOS channels.
- *cc* specifies the display number: 01– 08.
- *dd* is the point number: 01 – 64.
- *ee* is the state of the point: AC (active) or NO (normal).

The following is an example of an ALARM command and the corresponding response to request alarm data for all points in all displays on a specific collection channel:

Command Example

```
ALARM^LN=REMOTE_SITE1^CH=02<cr>
```

Response Example

```
96-01-27^13:23:10^LN=REMOTE_SITE1^CH=02^DS=01^PT=01^
ST=NO^<seq>^<crc><cr><lf>

96-01-27^13:23:12^LN=REMOTE_SITE1^CH=02^DS=01^PT=02^
ST=AC^<seq>^<crc><cr><lf>

96-01-27^14:01:10^LN=REMOTE_SITE1^COMPLETE^<seq>^
<crc><cr><lf>
```

(end of report)

CONTROL

The CONTROL command requests the WS2000 to operate a control output relay. The request indicates which control to operate by specifying the channel, display, and point number. The operation options are SE (latch), CL (unlatch) or PL (momentary).

The CONTROL command format for an operation control request and its corresponding response is as follows:

Command Format

```
CONTROL^[LN=aaaaaaaaaaaa]^CH=bb^DS=cc^PT=dd^
OP=SE|CL|PL<cr><lf>
```

- *aa…aa* is the 12-byte location name string.
- *bb* is the channel collecting the data: 00 = discretes or 02 to 09 = TBOS channels.
- *cc* is the display (01 – 08).

- *dd* is the point number (01 – 64).

Response Format

```
<date>^<time>^LN=aaaaaaaaaaaa^CH=bb^DS=cc^PT=dd^
OP=SE|CL|PL^<seq>^<crc><cr><lf>
```

The operation parameter, defined by the literal OP, must specify only one of the three possible operational choices. If WS2000 determines that the request is valid and that the point is addressable, WS2000 responds with the same channel, display, point, and operation information that appeared in the request. If the request is an error or WS2000 cannot perform the operation (for example, map information does not exist for the point or display), WS2000 responds with the INVALID message.

The following is an example of the CONTROL command and its response:

Command Example

```
CONTROL^LN=REMOTE_SITE1^CH=02^DS=01^PT=02^OP=SET^
<cr><lf>
```

Response Example

```
96-01-7^13:33:12^LN=REMOTE_SITE1^CH=02^DS=01^PT=02^
OP=SE^<seq>^<crc><cr><lf>
```

SETDATE

The SETDATE command sets the date and time for the WS2000 WACP. When a WACP host is polling more than one remote, it should send the SETDATE command without a location name specified. This enables all remotes on the line to synchronize simultaneously. As mentioned in *Start Up and Synchronization* on Page B-7, a SETDATE command needs to be sent out every 6 hours to assure that the remotes maintain a 1-second timing accuracy.

The following shows the formats for the SETDATE command and its corresponding response:

Command Format

```
SETDATE^<date>^<time><cr>
```

Response Format

```
<date>^<time>^LN=aaaaaaaaaaaa^OK^^^^^^^<seq>^<crc>
<cr><lf>
```

The variable *aa…aa* is the 12-byte location name string.

After receiving the SETDATE command, the WS2000 WACP sets its date to the date in the request message, sets its local time to the new time, and responds with the current time and date and location name.

Command Example

```
SETDATE^<96-01-23>^<13:23:43><cr>
```

Response Example

```
<96-01-23>^<13:23:55>^LN=REMOTE_SITE1^OK^^^^^^^
<seq>^<crc><cr><lf>
```

STATUS

The STATUS command requests the WS2000 to send display point status data. The response only returns status on active displays. The host can make four types of status data requests, going from very general to very specific:

Type 1 Status Request

- All status points in all displays on all data collection channels

Type 2 Status Request

- All status points in all displays on a specific data collection channel

Type 3 Status Request

- All status points in a specific display on a specific channel

Type 4 Status Request

- A single specific point in a specific display on a specific channel

Each request uses a different command message format. To indicate that the WS2000 has reported all status information, the remote sends a COMPLETE message as its last message. When the response from WS2000 only consists of a COMPLETE message, the host has requested status on displays that are not active.

Note: The date and time included in a status response message refers to the time the message was reported. Do not use the time/date stamp as an actual sequence-of-event time stamp for when a status point changed state.

The STATUS command format to request all the displays on all data collection channels is as follows:

Type 1 Status Request Command Format

```
STATUS^[LN=aaaaaaaaaaaa]<cr>
```

The addressed WS2000 response format is as follows:

Response Format

```
<date>^<time>^LN=aaaaaaaaaaaa^CH=bb^DS=cc^PT=dd^
ST=ee^<seq>^<crc><cr><lf>
```

- *aa…aa* is the 12-byte location name string.
- *bb* is the channel collecting the data: 00 = discretes or 02 to 09 = TBOS channels.
- *cc* specifies the display number: 01– 08.
- *dd* is the point number: 01 – 64.
- *ee* is the state of the point: AC (active) or NO (normal).

The WS2000 responds with 64 messages for each active display (64 points in a display) multiplied by the number of defined active displays for each channel multiplied by the number of collection channels.

The following is an example of the STATUS command and the corresponding response to request status for all points in all displays on all data collection channels:

Type 1 Status Request Command Example

```
STATUS^LN=REMOTE_SITE1<cr>
```

Response Example

```
96-01-27^13:23:10^LN=REMOTE_SITE1^CH=00^DS=01^PT=01^
ST=NO^<seq>^<crc><cr><lf>
```

```
96-01-27^13:23:12^LN=REMOTE_SITE1^CH=00^DS=01^PT=02^
ST=AC^<seq>^<crc><cr><lf>
```

-
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-

```
96-01-27^13:23:14^LN=REMOTE_SITE1^CH=05^DS=08^PT=64^
ST=NO^<seq>^<crc><cr><lf>
```

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```
96-01-27^14:01:10^LN=REMOTE_SITE1^CH=08^DS=08^PT=64^
ST=NO^<seq>^<crc><cr><lf>
```

```
96-01-27^14:01:13^LN=REMOTE_SITE1^COMPLETE^<seq>^
<crc><cr><lf>
```
(end of report)

The STATUS command format to request all the displays on a specific data collection channel is as follows:

Type 2 Status Request Command Format

```
STATUS^[LN=aaaaaaaaaaaa]^CH=bb<cr>
```

- *aa…aa* is the 12-byte location name string.
- *bb* is the channel collecting the data: 00 = discretes or 02 to 09 = TBOS channels.

The WS2000 responds with 64 messages for each active display (64 points in a display) multiplied by the number of defined active displays for the specified channel.

The following is an example of a STATUS command and the corresponding response to request status for all points in all displays on a specific collection channel:

Type 2 Status Request Command Example

```
STATUS^LN=REMOTE_SITE1<cr>
```

Response Example

```
96-01-27^13:23:10^LN=REMOTE_SITE1^CH=00^DS=01^PT=01^
ST=NO^<seq>^<crc><cr><lf>
```

```
96-01-27^13:23:12^LN=REMOTE_SITE1^CH=00^DS=01^PT=02^
ST=AC^<seq>^<crc><cr><lf>
```

-
-
-

```
96-01-27^13:23:14^LN=REMOTE_SITE1^CH=00^DS=08^PT=64^
ST=NO^<seq>^<crc><cr><lf>
```

```
96-01-27^13:23:16^LN=REMOTE_SITE1^COMPLETE^<seq>^
<crc><cr><lf>
```
(end of report)

The STATUS command format to request a specific display on a specific data collection channel is as follows:

Type 3 Status Request Command Format

```
STATUS^[LN=aaaaaaaaaaaa]^CH=bb^DS=cc<cr>
```

- *aa…aa* is the 12-byte location name string.
- *bb* is the channel collecting the data: 00 = discretes or 02 to 09 = TBOS channels.
- *cc* is the display (01 – 08).

The WS2000 responds with 64 messages for the specified display (64 points in a display) on the specified channel.

The following is an example of a STATUS command and the corresponding response to request status for all points in a specific display on a specific collection channel:

Type 3 Status Request Command Example

```
STATUS^LN=REMOTE_SITE1^CH=00^DS=02<cr>
```

Response Example

```
96-01-27^13:23:10^LN=REMOTE_SITE1^CH=00^DS=02^PT=01^
ST=NO^<seq>^<crc><cr><lf>

96-01-27^13:23:12^LN=REMOTE_SITE1^CH=00^DS=02^PT=02^
ST=AC^<seq>^<crc><cr><lf>
```

-
-
-

```
96-01-27^13:23:14^LN=REMOTE_SITE1^CH=00^DS=02^PT=64^
ST=NO^<seq>^<crc><cr><lf>

96-01-27^13:23:16^LN=REMOTE_SITE1^COMPLETE^<seq>^
<crc><cr><lf>
```
(end of report)

The STATUS command format to request a specific point in a specific display on a specific data collection channel is as follows:

Type 4 Status Request Command Format

```
STATUS^[LN=aaaaaaaaaaaa]^CH=bb^DS=cc^PT=dd<cr>
```

- *aa…aa* is the 12-byte location name string.
- *bb* is the channel collecting the data: 00 = discretes or 02 to 09 = TBOS channels.
- *cc* is the display (01 – 08).
- *dd* is the point number (01 – 64).

The WS2000 responds with the status if the display is active.

The following is an example of a STATUS command and the corresponding response to a status request on a specific point in a specific display on a specific collection channel:

Type 4 Status Request Command Example

```
STATUS^LN=REMOTE_SITE1^CH=00^DS=02^PT=01<cr>
```

Response Example

```
96-01-27^13:23:10^LN=REMOTE_SITE1^CH=00^DS=02^PT=01^
ST=NO^<seq>^<crc><cr><lf>
96-01-27^13:23:14^LN=REMOTE_SITE1^COMPLETE^<seq>^
<crc><cr><lf> (end of report)
```

Response Messages

ABORT

WS2000 uses the ABORT response message to indicate that it was interrupted while responding to a previous request.

The ABORT response format is as follows:

Response Format

```
<date>^<time>^LN=aaaaaaaaaaaa^ABORT^^^^<seq>^<crc>
<cr><lf>
```

The string *ABORT* consists of eight characters, three of which are blanks.

The following is an example of an ABORT response:

Response Example

```
96-01-27^13:33:12^LN=REMOTE_SITE1^ABORT^^^^<seq>^
<crc><cr><lf>
```

INVALID

WS2000 uses the INVALID response message to indicate that the received request message cannot be carried out because of some error in the message (for example, an incorrect data parameter specification, or the message had incorrect syntax or parity errors).

The INVALID response format is as follows:

Response Format

```
<date>^<time>^LN=aaaaaaaaaaaa^INVALID^^<seq>^<crc>
<cr><lf>
```

The string *INVALID* consists of eight characters, one of which is a blank.

The following is an example of an INVALID response:

Response Example

```
96-01-27^13:33:12^LN=REMOTE_SITE1^INVALID^^<seq>^
<crc><cr><lf>
```

OK

WS2000 responds with OK when the host sends the SETLN or SET-DATE commands (provided they are valid) or a single carriage return.

The OK response format is as follows:

Response Format

```
<date><time>LN=aaaaaaaaaaaa^OK^^^^^^^<seq>^<crc>
<cr><lf>
```

The string *OK* consists of eight characters, six of which are blanks.

The following is an example of an OK response:

Host Command

```
<cr>
```

Response Example

```
96-01-27^13:33:12^LN=REMOTE_SITE1^OK^^^^^^^<seq>^
<crc><cr><lf>
```

SYNC_REQ

WS2000 sends the SYNC_REQ response message to the host whenever the WS2000 has not received a SETDATE command within 6 hours. The WS2000 sends the message every hour on the hour until it receives a SETDATE command.

The SYNC_REQ response format is as follows:

```
<date><time>LN=aaaaaaaaaaaa^SYNC_REQ^<seq>^<crc>
<cr><lf>
```

The following is an example of the SYNC_REQ response:

```
96-01-27^13:33:12^LN=REMOTE_SITE1^SYNC_REQ^<seq>^
<crc><cr><lf>
```

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Westronic

Westronic Systems, Inc.
a Mediation Technology company

1850 N. Greenville Ave., Suite 184 | Richardson, TX 75081 USA
www.westronic.com I 1-800-890-5292 or 1-972-235-5292