

***Spectrum One Serial Access  
Bridge (SAB) II***  
*User's Guide*

70-13150-01  
Software Version 3.01  
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# ***About This Manual***

The Spectrum One Serial Access Bridge (SAB) II User's Guide contains information for installing and operating the SAB on the Spectrum One network. The target audience for this manual is the system administrator. It provides installation and configuration information.

## ***Related Documents***

For more information relating to the SAB and the Spectrum One network, refer to the following manuals:

<b>Title</b>	<b>Document Control Number</b>
SAB Programmer's Reference Manual	70-13150-01
3850 Transceiver Quick Reference Guide	58299-04-82
Series 3000 System Software Manual	59045-00-94
Series 3000 Programmer's Reference Manual	59045-00-93
Series 3000 Application Programmer's Guide	59045-00-92
Series 3000 STEP Application Programmer's Guide	59932-00-92

Some documents listed are provided with network hardware. Others may be ordered through a Symbol sales representative. Refer also to the manuals that are included with the network control unit, terminals, and cradle documentation.

# Conventions

Keystrokes are indicated with the angle brackets as follows:

- ENTER identifies a key.
- ALT+X identifies a simultaneous key combination.
- BKSP, SHIFT, ON identifies a key sequence.

Typeface conventions used include.

- [brackets] indicates available command line parameters options or in INI files as separators for configuration options.
- Italics* indicates first time a new term is used, a book title, information that must be replaced by an actual value, and menu titles.
- Screen indicates monitor or terminal screen dialog. Also indicates user input.

## Notes, Cautions and Warnings

This manual uses notes, cautions and warnings for certain conditions or types of information.

**Note:** Indicates tips or special requirements.

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### CAUTION

Indicates conditions that can cause equipment damage or data loss.

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**Warning:** *Warnings indicate procedures that are potentially dangerous and should therefore be performed only by Symbol-authorized repair personnel.*

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### Software Development

## *System Overview*

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The Serial Access Bridge (SAB) and the *Spectrum One* network provide your facility with wireless data collection abilities. Data collected from wireless terminals can be processed by a host computer connected to the SAB. *Symbol Customer Support Services* provides remote support for network management, software updates, and system diagnostics.

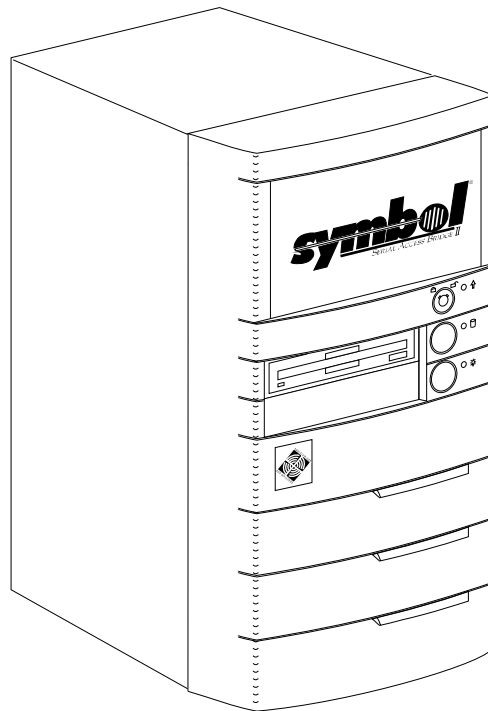


Figure 1 - 1. Serial Access Bridge II

This environment allows host application development for managing data from terminals. Host applications are developed using our productivity programming tools or developing your own custom tools. For more information on programming the SAB, refer to the *SAB Programmer's Reference Manual*.

## **Remote Maintenance**

The SAB modem connection allows remote systems to perform network maintenance and diagnostics routines. The remote viewing system connects to the SAB modem through telephone lines or *null-modem*.

## **Spectrum One Network**

The Spectrum One network provides rapid response communication between a host and many remote terminals over a large area.

The Spectrum One network uses *spread-spectrum* radio technology. This technology was originally developed for military communication and is highly resistant to interception. Spread-spectrum allows radios to spread multiple signals across a Federal Communication Commission (FCC) approved range for commercial users. The result is that no FCC licenses are required.

Radios used in terminals and transceivers are direct sequence spread-spectrum and operate within the approved bandwidth (902MHz to 928MHz). The Spectrum One network uses 49-frequencies (channels) within the spread-spectrum bandwidth. Radio channels are software selectable and each channel uses an approximate 1MHz at -20dB bandwidth.

Physical devices in the Spectrum One network include:

- one SAB
- 1 to 16 transceivers
- 1 to 40 radio terminals (LRT 3800, PRC 3310, VRC 3910, PDT 3110, APS 3395)
- 1 to 24 terminal cradle slots (Models 3860 and 3866)
- optional printers.

## ***Serial Access Bridge***

Upon power up, the SAB operates without operator intervention as a gateway to the Spectrum One network. The SAB provides the connection between the Spectrum One network and the *host* through a *serial link*.

The host is any mainframe computer, mini-computer, workstation, or PC supporting the Symbol serial packet protocol and communicating via the SAB. The SAB controls all input and output between the host and the Spectrum One network. The host recognizes each terminal logically with a unique number.

The SAB software manages the Spectrum One network and maintains a logical connection with each network device. Terminals communicate with the SAB through a radio link with a connected transceiver or a serial-linked cradle. This allows terminals to communicate with the host and use host applications. The SAB requires a set of host applications to facilitate data interchange. Terminal applications typically involve data entry and queries to the host. Host applications provide responsive access for terminals.

The SAB supports remote system administration, an optional service for SAB maintenance and diagnostic functions. System administration is achieved through an enabler on the host side or through Symbol Customer Support Services. Contact a Symbol service representative for more information.



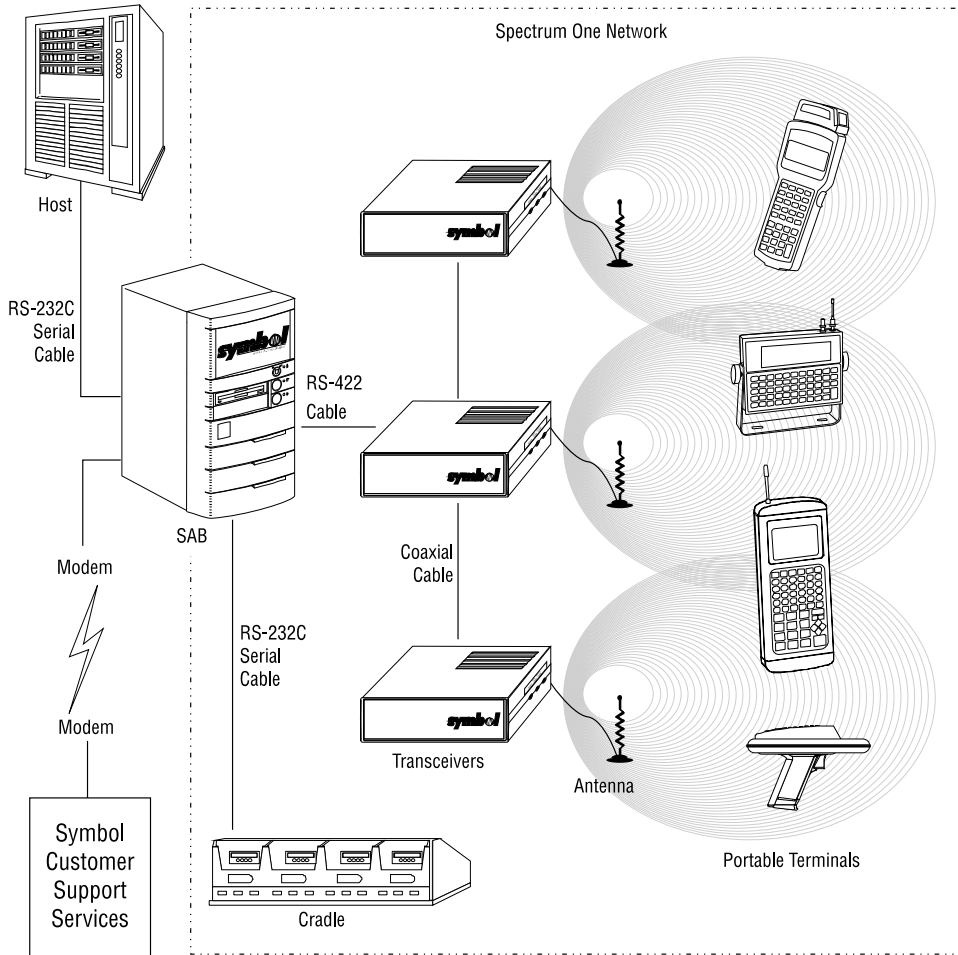


Figure 1 - 2. Serial Link and Spectrum One Network

## Hardware

SAB components are:

<i>One RS-422 serial port</i>	connects to primary transceivers. Refer to 3850 Transceiver Quick Reference Guide.
<i>Two RS-232-C serial ports</i>	connects to cradle and the host. Verify that the host has a compatible serial interface.
<i>One RJ-11 modem phone jack</i>	for remote communication or local null-modem operation.
<i>3-1/2", 1.44Mb floppy disk drive</i>	SAB software diskette <i>version 3.01</i> is always installed in drive during normal operation.

## Software

The SAB software:

- provides the functional interface between the host and Spectrum One network
- manages Spectrum One topology. Refer to the *SAB Programmer's Reference Guide*.
- boots up and initializes SAB
- performs orderly system shutdown and restart
- downloads applications from host into terminals
- routes application data to and from terminals
- supports transceivers and cradles
- optionally routes internal messages to host through *bridge access routines (BARs)*.

The SAB software is supplied on the 3-1/2" floppy disk included with the system.

**Note:** Make a backup copy of the SAB software diskette before installation. Use the backup copy of the SAB software for configuration and operation.

The main files are:

<b>SSP.EXE</b>	SAB server program (SSP).
<b>SSP.INI</b>	SSP configuration information.

Spectrum One configuration information is managed and stored according to the availability of File Access BARS:

<i>File Access BARS enabled</i>	from SPEC1.CFG, a binary file created from SSP.INI information, on the host in a directory where the host looks for files.
<i>File Access BARS disabled</i>	frequency sets and chipping seed are retrieved from SSP.INI. Unit ID for terminals is maintained by the primary transceiver <i>non-volatile memory (NVM)</i> .

**Note:** SPEC1.CFG takes precedence over information in SSP.INI.

## ***Radio Terminal***

A terminal collects data in the Spectrum One network and communicates with transceivers through radio unit. An application running on the terminal is a client to the host application. Terminals also contain a serial communication port to interface with a cradle or for communication to a printer.

## ***Transceiver***

The transceiver has an interface to a coaxial bus for transceiver-to-transceiver communication and a serial interface for communication with the SAB. Transceivers have radios for routing data received from terminals. Transceivers send data to the SAB and pass responses from the SAB back to the terminals. As terminals migrate through different areas, they are handed-off between transceivers. This allows the terminal freedom to move over the entire network area.

## ***Cradle***

The cradle provides:

- direct serial communication
- battery charging
- file transfer and initial program download
- new terminal configuration.

The cradle connects to the SAB through a full-duplex serial link which passes data between the SAB and terminals in the cradle. Direct serial communication is provided via the optical interface between terminal and cradle. Cradles can be daisy chained on a single channel.

## ***Printers***

Spectrum One devices support various printers. For more information, refer to the *Series 3000 System Software Manual* and the *Series 3000 STEP Application Programmer's Guide*.

## ***Chipping Seed***

The user-defined chipping seed generates a pseudo-random chipping sequence. The transmitter and receiver have the same chipping sequence. Superimposing data with the chipping sequence causes information to spread over the frequency band. Data sent over the airwaves is only intelligible to the receiver. The signal has high noise immunity.

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# ***Installation and Configuration***

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Before installation take certain safety precautions:

- Keep SAB and the SAB diskette away from strong magnetic fields and liquids.
- Ground yourself before handling SAB or Spectrum One components.
- Check cables for cracks or loose connectors. Replace them as necessary.
- Designate a separate system to edit SSP.INI. You can use the host if the host is a DOS-based system.

## ***Host Connectivity Requirements***

The serial link between the SAB and the host has the following characteristics:

- Serial cable RS-232-C length is less than 50 feet.
- Cable runs are routed away from electrical noise sources, such as electric motors and high current AC power cables.
- To guarantee error-free data if using a short distance modem:
  - use a modem protocol
  - use a full-duplex connection
  - verify communication delays are virtually nonexistent.
- Serial host connection has hardware buffering capability (16550 UART or better).
- Serial line driver software can efficiently receive and transmit data without losing any characters.

## ***Installation Outline***

Follow the order of the procedures closely:

1. Conduct a site survey.
2. Edit SSP.INI to configure SAB and components.
3. Connect cradle, host, and primary transceiver.
4. Power up Spectrum One network and boot SAB with SAB software.
5. Connect additional transceivers to network. *Refer to 3850 Transceiver Quick Reference Guide.*

## ***Site Survey***

Prior to hardware installation conduct a site survey to test radio reception, field intensity, and measure interference. Information gathered determines the optimum hardware placement and calculates the proper type, quantity and lengths of cables. The site survey determines the quietest radio channels within the spectrum allowed by the FCC. Channel numbers, frequencies, and the chipping seed are stored in the host SPEC1.CFG or SAB SSP.INI. Contact a Symbol service representative for details.

## ***SAB Configuration***

To configure the host serial port to match various standard serial formats:

- use an ASCII text editor on a separate system to edit SSP.INI
- make configurations on the copy of the original SAB software diskette
- capitalizing options is not required
- spaces before and after the equal sign are optional
- a *carriage return* (\013) and *line feed* (\010) character follows each entry.

The default SSP.INI does not include viable entries for the *ChipSeed*, *Channels*, or Net-*BIOS* application and host specifications. Edit these according to your network environment.

The default SSP.INI contains:

```
[HostComm] ; Host-SAB serial connection communications parameters
BaudRate  = 9600; Baudrate in bits/second
DataBits  = 8   ; Number of data bits/character
Parity    = none; Type of parity detection
StopBits  = 1   ; Number of stop bits/character
FlowCtrl  = none; Type of flow control protocol
SysDelay  = 0   ; Send delay in seconds (ignored if FlowCtrl !=
rts)
SysTimeout = 2  ; System timeout in seconds
DSRWait   = yes ; Wait for DSR if 'yes'

[BARs]    ; Bridge Access Routines to be used
Admin     = no
FileServer = no

[Spec1]   ; Spectrum One NCU parameters
ChipSeed  = 623401310
Channels  = 2,10,18,26,34,42
BaseLoad  = no
NCBBuf    = 1024
MaxTerms  = 40

[NetBIOS] ; NetBIOS host connection parameters
Entry     = TESTS,HOSTS,S,20
Entry     = TESTD,HOSTD,D,20

[Log]     ; Logging Control
Spectrum1 = yes
Host      = yes
LogSize   = 64
Logging   = no
```

Modify SSP.INI according to the following tables. Asterisks (\*) indicate default settings.



**Table 2-1. SAB-to-Host Data Link Configuration Directives Under [HostComm]**

<i>BaudRate</i>	300, 600, 1200, 2400, 4800, *9600, 19200, or 38400	communication baud rate for link to host
<i>DataBits</i>	7 or *8	number of data bits
<i>Parity</i>	even, odd or *none	data parity
<i>StopBits</i>	*1 or 2	number of stop bits
<i>FlowCtrl</i>	*none	no flow control available
	xon	XOn/XOff
	rts	RTS/CTS
	hp	HP-3000 (send packet on receipt of linefeed only)
<i>SysDelay</i>	*0 to 10000	integer delay value in milliseconds from when a CTS is detected to when the SAB sends data. Applicable only if FlowCtrl = rts.
<i>SysTimeout</i>	0 to 99, *2	integer time out value in seconds of the gap between two consecutive incoming characters. A packet with a gap larger than SysTimeout value is disregarded.
<i>DSRWait</i>	*yes or no	allow SAB to wait for Data Set Ready (DSR) from the host during startup before becoming active. If the host drops its Data Terminal Ready (DTR) after establishing communication, the SAB reboots. The SAB reloads, raises its DSR, and waits for DTR from the host. The host can reset the SAB by dropping and raising its DSR.

**Table 2-2. BAR Configuration Directives Under [BARs]**

<i>Admin</i>	yes or *no	make administrative BARs available
<i>FileServer</i>	yes or *no	make file service BARs available

**Table 2-3. Spectrum One Network Directives Under [Spec1]**

<i>ChipSeed</i>	10000 to 999999999	inclusive decimal integer chipping seed. Randomly generated.
<i>Channels</i>	from 02 to 50	radio channel numbers, 2-digit values separated by commas. The first channel is the primary channel. Defaults from site survey. SSP.INI specifies up to six channels for transceiver-to-terminal communication. The first channel on the list is the primary channel.
<i>BaseLoad</i>	yes or *no	distribute remote terminal assignments evenly among all transceivers in the network to improve performance
<i>NCBBuf</i>	256, 512, or *1024	maximum size in bytes needed for NetBIOS NCB buffers
<i>MaxTerms</i>	1 to *40	maximum number of terminals to support

**Table 2-4. NetBIOS Configuration Directives Under [NetBIOS]**

<i>Entry</i>	specifies a NetBIOS entry. Multiple entries are specified by adding Entry lines. Each entry has four parameters separated by commas and with no spaces as follows: <code>app,host,m,n</code>	
	where:	
	<i>app</i>	16-character user-assigned host application identifier not used by the SAB.
	<i>host</i>	16-character name of host to which the SAB is connected.
	<i>m</i>	S for session mode, D for datagram mode.
<i>n</i>	number of terminals. Range is from 1 to 40.	

Configuration directives listed under [Log] are for diagnostic or Spectrum One network maintenance. Do not modify the values. Contact a Symbol service representative for more information.

## ***Component Configuration***

The SAB software performs component configuration automatically. The SAB software allocates unique *unit numbers* for transceivers and terminals to communicate with the host. SSP sends unit numbers, the chipping sequence and frequencies to these devices.

If an uninitialized terminal generates an error when activated, place the terminal in the cradle for unit number assignment. The terminal receives the chipping sequence and assigned frequencies.

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### **CAUTION**

Before installing hardware components, verify SAB power switch is off.

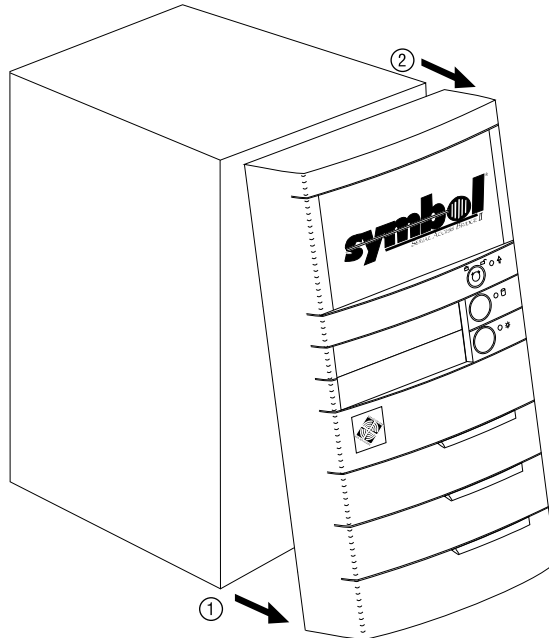
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## Hardware Installation

Refer to the label on the back of the front bezel to connect components. To remove front bezel:

1. Firmly pull bottom of front bezel to unsnap connecting joint from chassis.
2. Gently pull top of front bezel to unsnap connecting joint.



3. Continue connecting the cradle, host, and primary transceiver.

## ***Cradle Connection***

Install the cradle for program downloading capabilities from the SAB.

1. Attach DB-25 connector at one end of cradle null modem cable to CRADLE at rear of SAB.

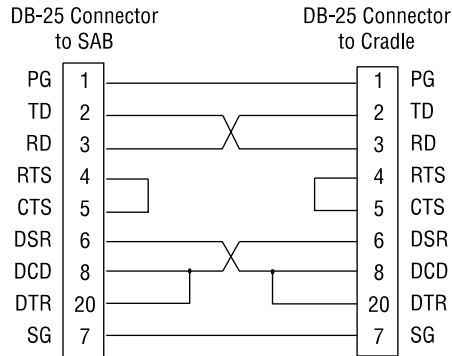


Figure 2 - 1. Cradle Cable Wiring

2. Attach DB-25 connector at other end of cable to serial port on left side of cradle. The cable part numbers are: for Model 3860 (59846-00) and for Model 3866 (58946-01).

**Note:** Different cradle models have varied connection schemes. To connect additional cradles, refer to the quick reference guide for the specific cradle model.

## Host Connection

3. Attach the DB-9 connector on a Symbol null modem cable (59846-02) to HOST at the rear of the SAB.

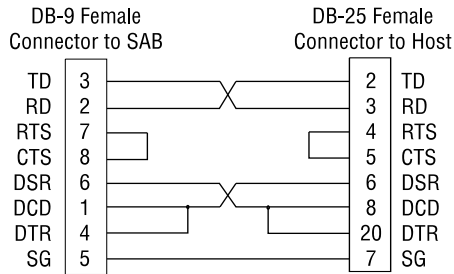


Figure 2 - 2. SAB-to-Host Cable Wiring

4. Attach the DB-25 connector at the other end of the cable to the host serial port.

If the host-to-SAB interface uses *Request To Send (RTS)* and *Clear To Send (CTS)* signals to control flow control, use a Symbol null-modem cable (61383-01) rather than the cable listed above. Set the *FlowCtrl* parameter in SSP.INI to *rts* and the *SysDelay* parameter to at least 100.

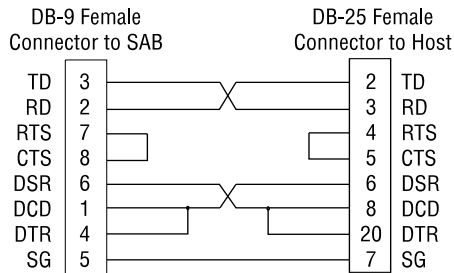


Figure 2 - 3. SAB-to-Host Cable Wiring with RTS/CTS

When using RTS and CTS signals, modify the *FlowCtrl* in SSP.INI as follows:

```
[HostComm]
.
.
.
FlowCtrl=rts
```

## Primary Transceiver Connection

Transceivers NVM must be clear before installing them into the Spectrum One network. Refer to the *3850 Transceiver Quick Reference Guide*.

When the SAB initializes, it resets the topology and automatically configures transceivers with the proper frequency and chipping sequence. If the File Access BARs option is enabled in SSP.INI and SPEC1.CFG exists on the host, the network uses the host SPEC1.CFG frequency and chipping sequence information. Otherwise, the network uses the SSP.INI configuration information.

A 50-foot cable (61047-00) can be ordered for demonstration and generic installation. The RS-422 cable has a female DB-25 connector for SAB connection and a male DB-25 connector for transceiver connection.

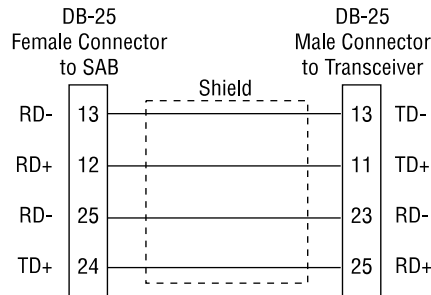


Figure 2 - 4. Transceiver Cable Wiring

1. Attach DB-25 connector at one end of RS-422 cable to TRANSCEIVER at rear of SAB. Attach DB-25 at other end of cable to primary transceiver serial port.
2. Connect power cord to transceiver external power supply and plug power cord into AC outlet.
3. Terminate COAX with 50-ohm terminator.
4. Attach antenna to ANTENNA connection.

## ***Power Up***

Before powering up, replace the front bezel.

1. Plug power cable into power connector at rear of the SAB. Plug other end of to the wall receptacle. Verify all power and serial connections.
2. If using remote administration functions, connect the modem to the dedicated telephone outlet with a phone line.
3. Insert the modified SAB diskette into the floppy drive.
4. Power on system to load and activate SAB. Primary transceiver configures automatically. SAB initialization provides unattended configuration and acquires configuration data. SSP.INI on the SAB diskette and SPEC1.CFG on the host are DOS files.
5. Power on cradle.

**Note:** The powered up SAB will not initialize unless the host application is running if DSRWait is enabled.

## ***Audible Status Indicators***

System beeps from the SAB internal speaker indicate system status.

<i>Single beep</i>	cradle is ready
<i>Repeating beep every 3 seconds</i>	SAB is waiting for DSR



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# Software Development

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After installation, a host programmer must develop host applications that interface with the SAB and the terminals. Symbol has development tools for designing host applications.

Development tools include:

<i>host dependant enablers</i>	C routine library for interfacing the host with the Spectrum One network. The SAB currently supports the DOS Serial Enabler, the PC UNIX Serial Enabler, the RS/6000 with AIX Serial Enabler, the SPARC with Sun Serial Enabler, HP9000 with HP-UX Serial Enabler, OS/2 Serial Enabler, and the VAX/VMS Serial Enabler.
<i>Symbol Terminal Enabler Program (STEP)</i>	radio terminal program which interprets routines from the enablers. Also manages the scanner and printers attached to the terminal.

To develop terminal applications, programmers can also use information found in:

- *Series 3000 System Software Manual*
- *Series 3000 Programmer's Reference Manual*
- *Series 3000 Application Programmer's Guide.*

For more information on programming in the SAB interface, refer to the *SAB Programmer's Reference Guide*.

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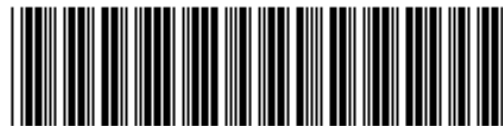
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