ProTalk SPX

PLC Voice Alarm Annunciator

User's Manual

Model B1275

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BARNETT ENGINEERING LTD.

Table of Contents

Chapter 1 Specifications

Chapter 2 Overview

Chapter 3 Installation

Chapter 4 Operation

Chapter 5 Configuration

Chapter 6 Appendices

Chapter 7 Warranty

Chapter 1 Specifications

1. General

Alarm Capacity	Up to 110 alarms with 5 minutes of voice storage. The basic unit, with 2.5 minutes of storage, can accept up to 55 alarms.
Alarm Types	Alarms can be taken from status points or analog values. High and low setpoints can be used with the analog values.
Telephone Connection	RJ11 - tone or pulse dialling
Voice Programming Connection	RJ11 - using standard tone telephone set
Power & Audio Connection	DB15 with DC power and radio or PA interface - RX audio, TX audio, PTT and COS
Data Programming Connection	DB9 - RS232, 4800 baud
PLC/Serial Connection	DB9 - RS232, 300 - 9600 baud. Serial protocols such as MODBUS supported with the SPX operating as either a master or slave device.
Printer Connection	DB9 - RS232, serial, 300 - 9600 baud
Channel Busy (COS)	0 to 7.5 V input level, 10 kÙ impedance, adjustable by potentiometer
Transmit Enable (PTT)	Open collector driver, 25 V, 500 mA max
Power Fail Input	Ground closure to indicate power failure (or any external condition)
Voice Quality	Digitized, toll quality, 32 kbps ADPCM

Power	+11.5 to +25 VDC, 150 mA
Environment	0^{o}C to +60^{o}C
Physical	8.75" wide, 6.75" high, 2.25" deep. Can be either surface mounted or flush mounted in a panel cutout
Programming	PC programmable using software supplied with the unit
Front Panel	2 x 16 character LCD display showing alarms, operating status and diagnostics. 8 LEDs show the current status of the telephone line, the radio interface and the serial communications port. Switches provide local acknowledge, menu selection and function control. Internal speaker with adjustable volume for monitoring operation.

2. Programmable Features

Voice Messaging	Unit ID, Group ID and Alarm ID. Analog parameters use permanent stored vocabulary to announce units such as "degrees".
Alarm Handling	Status points can be interpreted as normally on, normally off or latched.
Alarm Groups	Alarms can be assigned into one of 8 groups. All alarms in a group will use the same directory when calling out.
Shifts	Up to 4 shifts can be used. The currently active shift instructs a group to use one of the 6 available directories.
Alarm Tags	Each alarm point can be assigned a transmit DTMF code (1 to 7 digits).
Alarm Name	16-character description of the point; used for display, printing and alpha-numeric paging

Interval Timer	2 stage timer which uses short interval "A" times before switching to long interval. Short and long intervals are adjustable from 1 to 255 minutes; "A" times can be from 0 to 9.
Acknowledge Code	Stops the transmission cycle when received. 1 to 7 DTMF digits with individual codes allowed for each of the groups
Interrogate Code	Forces annunciation of all active alarms. 1 to 7 DTMF digits with individual codes allowed for each group
Remote Control Code	Enables the control section, allowing the caller to modify values in the PLC; 1 to 4 DTMF digits

3. Telephone

Directory Structure	Up to 20 numbers in each of the 6 directories, each directory can hold up to 256 digits. The directory structure contains both radio and telephone instructions.
Number of Rings	From 1 to 8 rings before answering - can also be set to never answer
Access	Multiple levels of security are available to restrict access to the SPX.
Alpha-numeric Paging	Transmits site, group and alarm description to an alpha-numeric paging terminal

4. Radio

Signalling	The radio transmission can consist of any combination of 2 or 5 tone paging, DTMF, alert tone or delays in addition to the voice message.

Squelch Polarity	Either high or low level for busy

5. Options

Memory expansion - increases voice storage time

Software maintenance agreement

Extended warranty

NEMA 4 enclosure

Battery backup power supply

Chapter 2 Overview

The purpose of this chapter is to give you an overview of the capabilities of the ProTalk SPX. To assist you in planning, the chapter is formatted to address the various components that make up your system. Each section points out the parameters which must be configured in order to make selected features work. Read the guide completely before programming your SPX. For more details on the configuration screens and specific parameters, refer to the Configuration chapter.

1. What kind of a system do you have?

The first step in configuring the ProTalk SPX is to define what type of system you have. The SPX works with various types of PLCs, including Modicon and Allen-Bradley. If not inherent in the communications protocol, you must also define whether the SPX is to be configured as a master or slave. The baud rate for communications between the SPX and the PLC may be set between 300 and 9600 baud. You may also set other communication parameters, such as the number of bits per character, number of stop bits, parity, type of error checking, interval between polls, and the number of times the SPX will retry a poll if it does not receive a valid answer.

The SPX is programmed with a site voice identifier which is announced before any of the alarms. In addition, you may program a 16 character alpha-numeric site name which is used by the printer and for identification on the LCD.

When defining your system, be sure to address all of the following parameters on the General Configuration screen:

- Site Name - 16 character alpha-numeric
- PLC Comms - use button to select this window
  - Poll Interval - in msec
  - Poll Timeout - in msec
  - Poll Retries - 0 to 9
  - Slave Address - (if a slave)
  - PLC Baud Rate - 300 to 9600 baud
  - Stop Bits
  - Parity
  - Bits per Character
  - Error Check - CRC or BCC

SPX Mode - use button to select this window
Modicon Master
Modicon Slave
Allen-Bradley SLC-500
Allen-Bradley PLC-5

Use the Program screen to program the site voice identifier after the configuration has been programmed.

2. What constitutes an alarm?

The next step in configuring the SPX is to define what constitutes an alarm. Alarm points may be of several types: Internal, Digital, Analog, Totalizer, Comms Watch, or External.

A digital point has two states, normal and alarm. The SPX looks for a zero or a one in the PLC register associated with that point. The voice message for a digital point is normally programmed to announce the alarm condition when it is activated, e.g. "Intrusion Alarm".

An alarm may be configured as momentary or latched. A momentary alarm changes state and stays that way until the condition returns to normal. For a latched point, a pulse registers as an alarm. Once acknowledged, it is considered to have returned to normal. The next occurrence of the pulse is a new alarm.

Note that the first two alarm points in the SPX are dedicated, one to a power failure and the other to a communications failure with the PLC. Power fail contacts are wired into the DB15 Power/Radio connector, the only hardware alarm on the ProTalk SPX. Additional Comms Watch points may be configured if more than one PLC is being polled.

For an analog point, the SPX reads an actual value from the register in the PLC. The SPX recognizes an alarm when a high or low setpoint is exceeded. Hysteresis allows you to specify when the alarm is considered to have reset. When an alarm occurs, the SPX announces the name of the point followed by the word "High" or "Low". The numerical value of the analog, complete with decimal places and units, is announced when you interrogate the SPX. Note that it may take from 5 to 10 seconds to poll all 110 points, so values are not necessarily in real time.

You must specify the maximum and minimum decimal and binary values, high and low setpoints, plus the engineering units in which analog values arereported. You must also specify hysteresis, so that the unit can calculate when an analog alarm is reset.

Totalizers are a subset of analogs. These points never alarm as they do not have setpoints. However, the accumulated total will be announced whenever the unit is interrogated.

A Comms Watch point is used when more than one PLC is monitored. The point specifies the maximum number of consecutive communications failures which may occur with that address before an alarm is announced.

In addition to a voice identifier, each alarm point should be programmed with a 16 character alpha-numeric name. This name will be displayed when scrolling through alarms on the front panel of the SPX, when programming the voice message, or when alarms are printed. Points may be completely configured, but temporarily disabled.

When defining your alarms, be sure to address all of the following items on the Point screen (for Digital, Analog, Totalizer, Comms Watch and External):

Alarm Type	Use Change buttons to select a different type
Alarm Name	16 character alpha-numeric
PLC Address	(or node number for Allen-Bradley)
PLC Register	(or logical address for Allen-Bradley)
Active	enabled or disabled

for Digital Points

Alarm When	zero or one
Alarm State	momentary or latched

for Analog Points

Minimum Decimal	engineering units minimum value
Maximum Decimal	engineering units maximum value
Minimum Binary	PLC register minimum value
Maximum Binary	PLC register maximum value
Binary Values	signed or unsigned
Low Setpoint	alarm if below this value
High Setpoint	alarm if above this value
Hysteresis	percent of full scale
Units	use button to select Spoken Units screen; specify prefix, units and suffix
Alarm State	momentary or latched

for Totalizer Points

Units	use button to select Spoken Unitscreen; specify prefix, units and suffix

Decimal Place	where decimal point is placed in the total
for Comms Watch	
Setpoint	maximum number of consecutive communications failures allowed

Use the Program screen to program the voice identifiers for each point after the configuration has been entered.

Alarms points may be divided into different groups which report in different ways. For more information on grouping, refer to section 8.

3. What do you want the SPX to do when it receives an alarm?

The third step in configuring the SPX is to decide how you want it to respond when it receives an alarm. The SPX goes through a series of instructions called a directory. You may configure the SPX to

- make voice announcements over a radio or public address system
- dial through a list of telephone numbers until it receives the correct acknowledgement
- activate a radio pager by dialling up a paging terminal or sending paging frequencies over the radio
- activate another device by sending DTMF codes

or any combination of the above. The only limitations are that the contents of one directory must not exceed 256 characters or 20 lines. Six unique directories are allowed, which may be used by different groups of alarms or different shifts. Refer to the Configuration chapter for more information on programming directories.

Following are some basic programming examples. The instructions shown may be combined into more elaborate sets which will completely customize the SPX to your application.

3.1 Announcements over Radio

One way of reporting alarms is over a radio or public address system. When the directory specifies a radio transmission, the Push-to-Talk is asserted for a preprogrammed warm-up period. Then, if the next instruction is for a voice announcement, the Site ID, Group ID and Alarm IDs for the individual alarms active in the group will be announced. Optionally, the phrase "Enter Acknowledge Code" will be spoken after the announcement.

The SPX normally waits five seconds for an Acknowledge Code, then proceeds to the next instruction in the directory. An additional delay may be configured to allow longer for the acknowledgement.

Announcement over a public address system is identical to announcement over a radio, with the voice connections made to the PA input. If it is not possible to acknowledge the alarm, the "Enter Acknowledge Code" prompt may be deleted and the SPX configured to automatically acknowledge itself. Refer to section 5 for more details on acknowledging alarms.

The Directory Editor is used to configure the instructions in a directory. Instructions for announcing the alarms over radio are typically of the following format:

```
1    [RADIO] [VOICE] [VOICE]
2    [WAIT]60
3    [RADIO] [VOICE] [VOICE]
```

where [RADIO] is the command to turn on the radio, [VOICE] is the command to announce the voice message, and [WAIT] followed by digits specifies a pause in seconds. In the above example, the SPX announces the alarm twice over radio, waits one minute for an acknowledgement, then announces the alarm twice again.

The [PATCH] command is a special type of radio command, used for radio patches to the telephone system. Once the patch is activated by the specified DTMF tones, announcement proceeds as per a standard [DIAL] command (see section 3.2). A line starting with the [PATCH] command must end with a [DTMF] command to disconnect the patch.

If using the radio, the following parameters must be programmed in the General Configuration screen:

Squelch Polarity - radio busy indicated by high or low signal
Radio Warmup Time - in msec

3.2 Announcements over Telephone

The most common way of reporting alarms is over the telephone. The SPX may be configured to use tone or pulse dialling. It will either monitor for call progress tones, or simply announce the voice message after dialling. The voice message consists of the Site ID, Group ID, the list of alarms present and the phrase "Enter Acknowledge Code". The entire message is repeated three times, with a pause of five seconds after each to wait for an Acknowledge Code.

A series of telephone numbers may be programmed into the directory. If an acknowledgement is not received after calling the first number, the SPX will continue to dial through the directory until it reaches a number where it is acknowledged. If an acknowledgement is not received by the time it reaches the end of the directory, it will continue dialling from the top.

Instructions for announcing alarms over the telephone will generally be of the following format:

```
1    [DIAL]2559544 [VOICE]
2    [DIAL]2592343 [VOICE]
3    [DIAL]2385832 [VOICE]
```

where [DIAL] is the dial command, the digits represent the telephone number, and [VOICE] is the command to announce the alarm.

Note that all DTMF digits are valid as part of a [DIAL] command, including A, B, C, D and the asterisk (*) and octothorpe (#). The ! (exclamation mark) has a special meaning. Each ! in a telephone number inserts a two-second delay. This may be necessary when you are dialling from a PABX to an outside line, for example, or dialling long distance.

If using the telephone, the following parameters must be addressed in the General Configuration screen:

Call Progress - enable or disable
Tone Dialling - enable or disable

Instructions for announcing alarms over radio and telephone may be combined within a directory. For example, a common application is to first announce the alarm over the radio, then if there is no acknowledgement, begin to dial out over the telephone.

Following is a summary of the basic directory commands which will send alarm messages over telephone or radio:

[RADIO]	Keys the radio for the programmed warm-up time, and keeps it keyed until the last instruction in that line is executed.
[DIAL]	Takes the telephone line off-hook; waits 500 msec (or monitors for dial tone), then dials the telephone number specified by the digits which follow.
[WAIT]	Causes the SPX to delay for the interval which follows, programmed in seconds (maximum = 255); may be on a line of its own, or may be included as part of a [RADIO], [PATCH] or [DIAL] line.

[PATCH] Keys the radio, activates the telephone patch with a DTMF code, then sends the voice announcement as per a [DIAL] command.

[VOICE] Transmits the voice messages associated with points in the alarm condition.

There are several other commands in the directory editor which may be used to transmit special signalling, such as radio paging tones or DTMF alarm tags. Refer to section 4 for more details.

3.3 Shift Changes

A common application is for the SPX to be used to reach personnel who are on call after hours when a site is unattended. The same people are not always on call; they will normally take turns or alternate. However, it is not necessary to reprogram the directory every time the shift changes. The SPX may be configured with up to four shifts, each dialling from a different directory. When the shift changes, the directory can be changed easily using one DTMF code, or the buttons on the front panel of the SPX. Alternatively, the shift may be programmed to change automatically by means of a seven day, twenty-four hour clock.

The Shift Change Code may be issued over radio or telephone. Receiving the Shift Change Code causes the SPX to advance to the next shift. The SPX will announce "Report Using Shift x", where x is a number between 1 and 4. The Shift Change Code may be repeatedly exercised until the SPX is reporting for the desired shift. For instructions on changing the shift from the front panel, refer to the chapter on Operation. Note that the Shift Change applies to the SPX as a whole; all groups of alarms will be affected when the shift advances.

A one- to seven-digit DTMF Shift Change Code, or a Shift Timeclock, must be specified in the General Configuration screen. In addition, for each group of alarms, you must specify which directory is to be used for each shift in the Group Configuration screen.

4. Do you want to send signalling as well as or instead of the voice messages?

Other commands may be used in the directories to insert special signalling along with the voice alarm announcements.

4.1 Alert Tone

One of the most common signals sent with an alarm announcement is an Alert Tone. It may be inserted anywhere in a Radio or Telephone string, but its

most common application is to draw people's attention to an alarm condition before a voice announcement over the radio. A typical line in the directory would be:

1 [RADIO] [ALERT] [VOICE] [VOICE]

4.2 DTMF Tones

Another type of signalling which may be sent is DTMF. One application is for DTMF overdialling when communicating with a device such as a paging terminal. Following are two examples:

1 [DIAL]2559544 [WAIT]4 [DTMF]1234 [WAIT]2 [DTMF]2381832

In the above example, the SPX dials the paging terminal at 255-9544, waits four seconds, dials the pager number 1234, waits two seconds, then dials the number 238-1832 which will be displayed in the pager LCD as the number to call back (the SPX telephone number). Note that an alternative in this case would be to enter the number as one long [DIAL] command with exclamation marks (!) inserted for the delays, i.e.

1 [DIAL]2559544!!1234!2381832

2 [DIAL]2559544 [ANSWER] [DTMF]1234 [ANSWER] [VOICE]

In the second example above, the SPX dials the paging terminal at 255-9544, waits for an answer (e.g. voice prompt), dials the pager number 1234, waits again for an answer, then announces the voice message.

Another application for DTMF tones is to signal other devices to activate. Each alarm may have a DTMF tag assigned. The DTMF code may be sent before, after, or without the voice message, using the directory commands [VOICE-], [VOICE+], or [SIGNAL] respectively. If you wish to send the voice message without the DTMF tag, use the [VOICE] command.

In the following example, when an alarm occurs, the voice message is sent over radio, followed by a DTMF code which activates an annunciator panel at the master station.

3 [RADIO] [VOICE+]

To use this feature, you must specify a one- to seven-digit DTMF Tag for each alarm in the Point screen. Note that all DTMF digits are valid, including A, B, C, D and the asterisk (*) and octothorpe (#).

4.3 Radio Paging

If equipped with the paging option, the SPX will also generate paging tones for transmission over radio. Two-tone paging codes are specified in Hz.

```
1       [RADIO] [2 TONE]617.4/349.0 [WAIT]2 [VOICE]
```

In the above example, the SPX sends the tones 617.4 and 349.0 Hz (corresponding to filter numbers 152 and 111, or Cap Code G721) out over the radio, waits two seconds for the pager to activate and generate its alert tone, then sends the voice message.

Five-tone paging frequencies are interpreted directly from the pager code. In the following example, the SPX sends the tones associated with pager code 45123, waits two seconds for the pager to activate and generate its alert tone, then sends the voice message.

```
2       [RADIO] [5 TONE]45123 [WAIT]2 [VOICE]
```

Following is a summary of the directory commands which will send special signalling along with the voice alarm messages:

[ALERT]	Transmits an Alert tone
[DTMF]	Transmits the DTMF tones which follow the command; may be used over telephone or radio
[ANSWER]	Causes the SPX to monitor for call progress indication
[VOICE+]	Transmits the voice message associated with a point in the alarm condition, followed by the DTMF tag
[VOICE-]	Transmits the DTMF tag associated with a point in the alarm condition, followed by the voice message
[SIGNAL]	Transmits the DTMF tag associated with a point in the alarm condition, without the voice message
[2 TONE]	Transmits the 2-tone paging frequencies specified over radio only; must be part of a line beginning with the [RADIO] command
[5 TONE]	Transmits the 5-tone paging code specified over radio only; must be part of a line beginning with the [RADIO] command

4.4 Alpha-numeric Paging

The SPX will also generate alpha-numeric pages using the TAP protocol over a phone line.

```
1       [DIAL] 2559545 [TAP]97531
```

In the above example, the SPX dials the paging terminal at 255-9545, then activates the modem to send the page data and perform handshaking with the

terminal. The SPX automatically inserts the paging code and the password, if required, then sends the individual pager code as specified in the directory, in this case 97531. The alpha-numeric message consists of the Site ID, Group ID and Alarm ID associated with the alarming point, and indicates the presence of any additional alarms.

The following parameter must be specified in the General Configuration screen in order to send alpha-numeric pages:

TAP Paging - Paging terminal type and password

5. How do you want to respond to an alarm?

Next you must decide how you want the called party to respond to the alarm. In most cases, it is desirable that the alarm be acknowledged. Therefore, in its default state, the SPX prompts the called party to "Enter Acknowledge Code" after the alarms have been announced. The SPX waits five seconds to receive the code, then proceeds to its next message repetition or directory instruction.

The SPX is normally acknowledged by sending the Acknowledge Code, a one- to seven-digit DTMF code, over the radio or telephone. The SPX may also be acknowledged by pressing the ACK button on the front of the unit, or the remote ACK switch if one has been installed.

If you enter the Acknowledge Code followed by an octothorpe (#), the SPX acknowledges the alarms for a programmed period of time. When the time expires, the SPX checks the points again, and if the same alarms are present it reinitiates the reporting sequence. This feature is used to halt the voice announcements, particularly over radio, while workers attend to the alarm. However, if the condition is not remedied within a certain period of time, the alarm will be reported again.

In some cases, it will not be possible to acknowledge an alarm, such as when it is announced over a public address system. In that case you may disable the request to "Enter Acknowledge Code" and have the SPX automatically acknowledge itself after the alarms have been announced.

Each group of alarms has its own Acknowledge Code. The following parameters must be set in the Group Configuration screen:

Auto Ack - enable or disable
Ack Request - enable or disable
Acknowledge - 1 to 7 digit DTMF code

If you wish to acknowledge for a fixed period of time, the following parameter must be set in the General Configuration screen:

Temp Ack Time - in minutes

Using the [AUTO ACK] command in a directory will cause the SPX to automatically acknowledge its alarms. Note that Auto Ack **must be enabled in the Group Configuration screen** in order for the [AUTO ACK] command to be recognized in the directory, as different groups of points may employ the same directory. [AUTO ACK] must appear on its own line in the directory, as in the following example of an announcement over a public address system:

```
1    [RADIO] [VOICE] [VOICE]
2    [AUTO ACK]
```

6. What if the alarm is not acknowledged?

If the SPX goes all the way through a directory without receiving an acknowledgement, it starts again from the beginning. The timing of the repetitions is controlled by two timers. The SPX repeats the directory instructions a number of times controlled by a short cycle timer, and then reverts to a longer timer. On a radio system, if no one acknowledges the alarms right away, you may not want to take up excessive air time with further announcements.

Timing is controlled on an individual basis for each group of alarms. The following parameters must be set in the Group Configuration screen:

Short Timer - 0 to 255 minutes
Short Cycles - 0 to 9 times
Long Timer - 0 to 255 minutes

7. What do you want the SPX to do when you call it up?

In addition to dialling out to report alarms, the SPX will also answer the telephone line when you dial it up. This allows you to acknowledge alarms, interrogate the unit, change the shift, or perform remote control functions by writing a value to a PLC register. You can control whether or not the SPX answers the phone, and if so, after how many rings (useful if the phone line is shared with another device). You may also control the level of security, by determining whether callers require a password to access the registers.

With the lowest level of security, Level 1, the SPX will answer the phone and announce the Site ID, any groups which are alarming, and prompt the caller to

"Enter Command". No Access Code is required. With the next level of security, Level 2, the SPX will announce only the Site ID when it answers the phone. The caller must then enter a password before being given access to alarms or other functions. With the highest level of security, Level 3, the SPX will answer the phone but will not say anything; it will wait ten seconds for the proper Access Code, then hang up.

The SPX may be interrogated over the radio or telephone. Each group of alarms has its own Interrogate Code. When the code is entered, the status of the points in the group is annunciated. For digital points, the SPX announces the name of the point only if it is alarming. For analog points, the SPX announces the name of the point, its status ("High", "Low" or "Normal"), followed by its reading, complete with units. For totalizers, the name of the point is announced followed by the accumulated quantity.

Points must be enabled in order for them to be interrogated. If you want to interrogate points but not have them alarm, assign them to a separate group and disable the group. Refer to the next section for more information on groups.

For any point where you are allowing the register to be written to externally, you must set Remote Control to "On" in the Point screen.

The following parameters in the General Configuration screen must be addressed in order to determine how the SPX responds when telephoned:

Security - Level 1, 2 or 3
Answer Rings - 1 to 8, or never answer
Access Code - 1 to 7 DTMF digits
Control Code - 1 to 4 DTMF digits

In addition, if you wish to interrogate the SPX, you must enter a one- to seven-digit Interrogate Code in the Group Configuration screen.

8. Do you want all alarms handled the same way, or do you want alarms grouped?

In many applications, there is a requirement for different types of alarms to alert different people. This is handled in the SPX by assigning alarms to different groups. The maximum 110 alarms may be assigned to eight different groups. There is no limitation on the size of a group.

If the alarm announcement or call-out sequences are distinct for the different groups, they may be assigned individual directories. Six unique directories are allowed. In addition, each group of alarms may be instructed to dial from a

different directory when the shift changes. In this way, if on-call personnel change, it is possible to change the directory with one command without reprogramming the SPX.

In addition to a voice identifier, each group should be programmed with a 16 character alpha-numeric group ID. This name will be displayed when scrolling through alarms on the front panel of the SPX, when programming the voice identifiers, or when an alarm group is printed. Groups may be completely configured, but temporarily disabled using either the programming screen or the switches on the front panel of the SPX. Disabled groups may be interrogated.

If using more than one alarm group, be sure to set the following parameters unique to each group in the Group Configuration screen:

Group - enable or disable
Auto Ack - enable or disable
Ack Request - enable or disable
Group tag - 16 character alpha-numeric string
Acknowledge - 1 to 7 digit DTMF code
Interrogate - 1 to 7 digit DTMF code
Short Timer - 0 to 255 minutes
Short Cycles - 0 to 9 times
Long Timer - 0 to 255 minutes
Directory to use for each shift

Finally, for each individual point, you must specify which group the alarm belongs to in the Point screen.

Use the Program screen to program the group voice identifier.

Note: *If alarms occur in different groups at the same time, the SPX will report the alarms one group at a time until they are acknowledged. Be aware that adding extended Waits in one directory might delay the reporting of alarms in another group.*

9. Do you want to use a printer to log SPX activity?

The activity of the ProTalk SPX may be logged on a serial printer. If you want to use the printer, set the following parameters in the General Configuration screen:

Printer - enable or disable
Printer Baud Rate - 300 to 9600 baud

Chapter 3 Installation

The following instructions assume that a configuration has been created for the SPX and stored to a file. The file is then downloaded with a laptop computer to the SPX once it has been installed. Alternatively, the SPX may be configured in the shop and then installed in the field. It has an internal battery which retains the contents of memory when power is removed.

1. Mounting

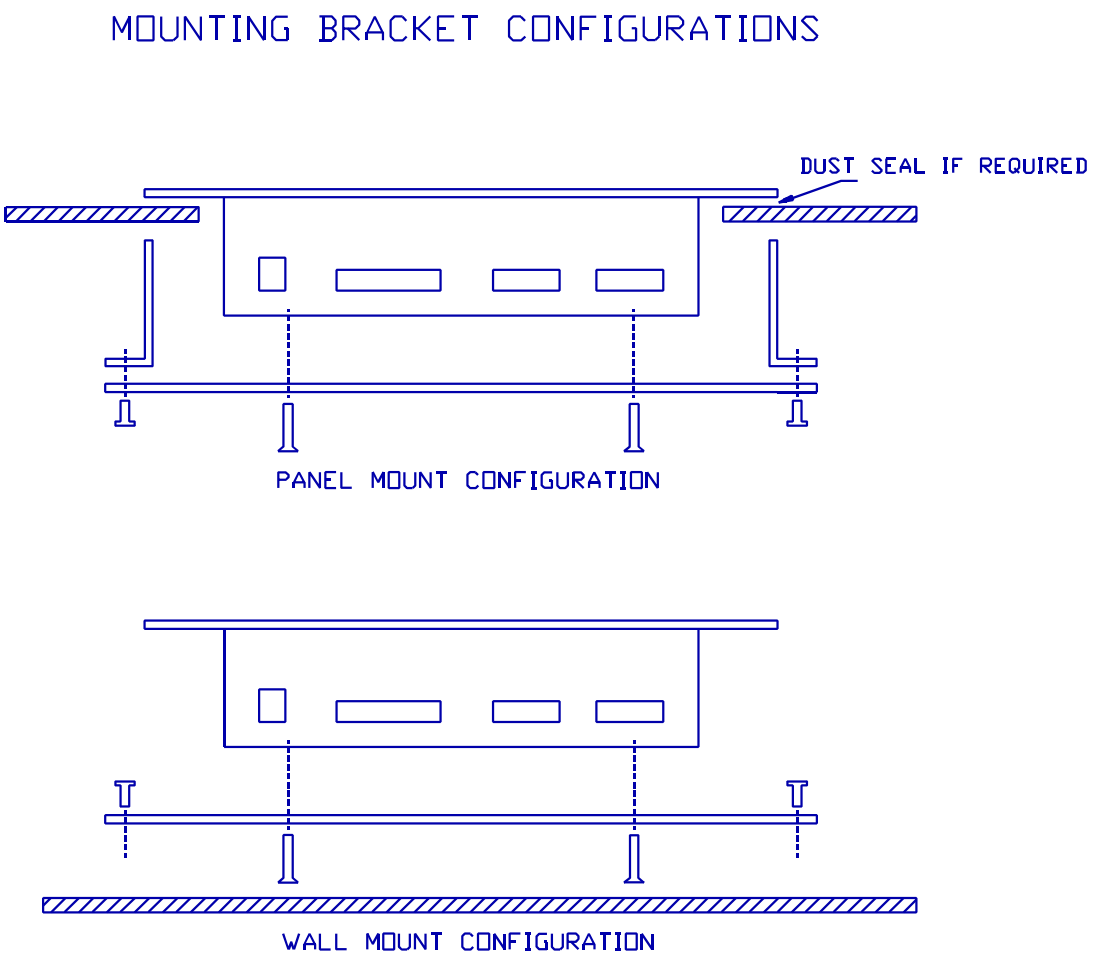


Figure 2 SPX Mounting Options

Install the ProTalk SPX in a clean, dry place suitable for electronic equipment. The unit will operate from 0°C to +60°C.

Figure 1 shows the mounting options for the ProTalk SPX. The SPX may be flush-mounted in a panel cutout, or surface-mounted to a back panel or rail.

2. Connections

Figure 2 is a drawing of the front panel of the SPX, showing where connections are made.

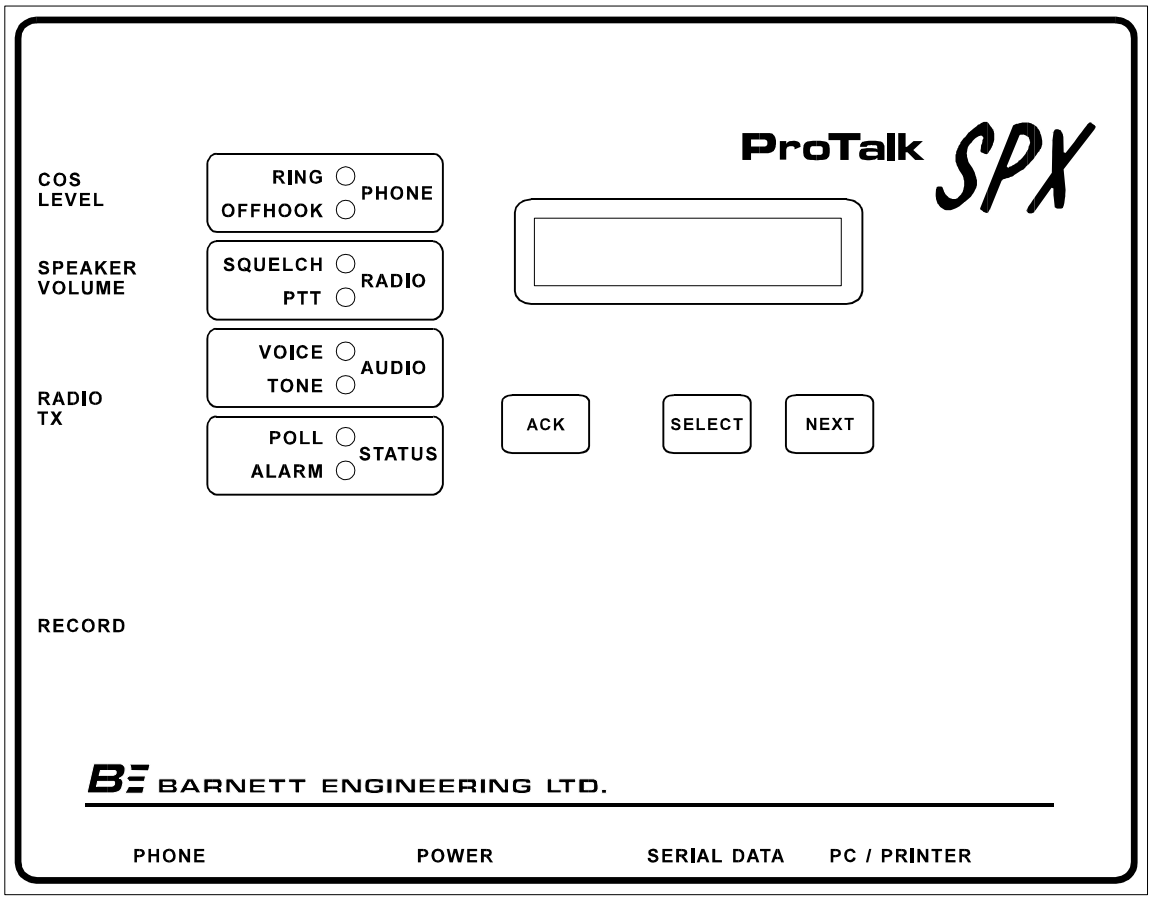


Figure 3 ProTalk SPX Front Panel

The main external connections are made to the power connector. If Option 505 is ordered, a mating DB15 plug with wire tails is provided. The pinout of the connector is shown in Figure 3.

Option 505 Cable		
DB15 PIN NUMBER	FUNCTION	WIRE COLOUR
1	External ACK SW (input)	
2	GND	BLK (PVC)
3	unused	
4	+12 VDC	
5	GND	
6	GND	BLK (PWR)
7	Radio RX Audio (input)	BRN (PVC)
8	Radio COS (input)	GRN (PVC)
9	External Power Fail (input)	
10	GND	
11	+12 VDC	RED (PWR)
12	unused	
13	GND	
14	Radio PTT (output)	RED (PVC)
15	Radio TX Audio (output)	WHT (PVC)

Figure 3 SPX Power Connector

2.1 Power

The ProTalk SPX will operate from a supply of +11.5 VDC to +25 VDC. The current requirement is 150 mA.

Connect power to pin 4 or pin 11, and ground to pin 5 or 13. All of the grounds are common; those on pins 2, 6 and 10 are provided for use with the ACK switch, radio and Power Fail indicator respectively.

2.2 Radio

If the alarms are to be announced over radio, connect Radio TX Audio (pin 15) to the transmit audio of the radio, and Radio RX Audio (pin 7) to the receive audio. The received audio source in the radio should be from a squelched point that does not have white noise present when there is no carrier.

The Radio PTT Output (pin 14) provides a ground closure through an open collector to signal the radio to transmit. Connect this point to the radio's push-to-talk circuit. The maximum rating is 500 mA, 25 V.

The Radio COS Input (pin 8) is used to indicate to the SPX whether the radio channel is busy. Connect this point to the output of the radio's carrier-operated switch or relay (COS or COR). In its default condition, the SPX looks for a high signal to indicate the channel is clear and a low signal when the channel is busy. The input is internally pulled up to work with open collector outputs. The SPX may be programmed to recognize the reverse polarity (see the Configuration chapter).

2.3 Local Acknowledge

This input allows you to connect an external switch which will function identically to the ACK switch on the front panel of the SPX. The switch may be located some distance from the SPX. Connect the ACK SW Input (pin 1) to a normally open contact which will be grounded to acknowledge the alarm.

Note: The action of the acknowledge switch depends on what function the LCD is displaying at the time; the exact effect of its operation may be unknown if it is located remotely from the SPX.

2.4 Serial Connections

To program the SPX, connect a cable between the DB9P PC/Printer port and the PC. Figure 4 details the cable requirements.

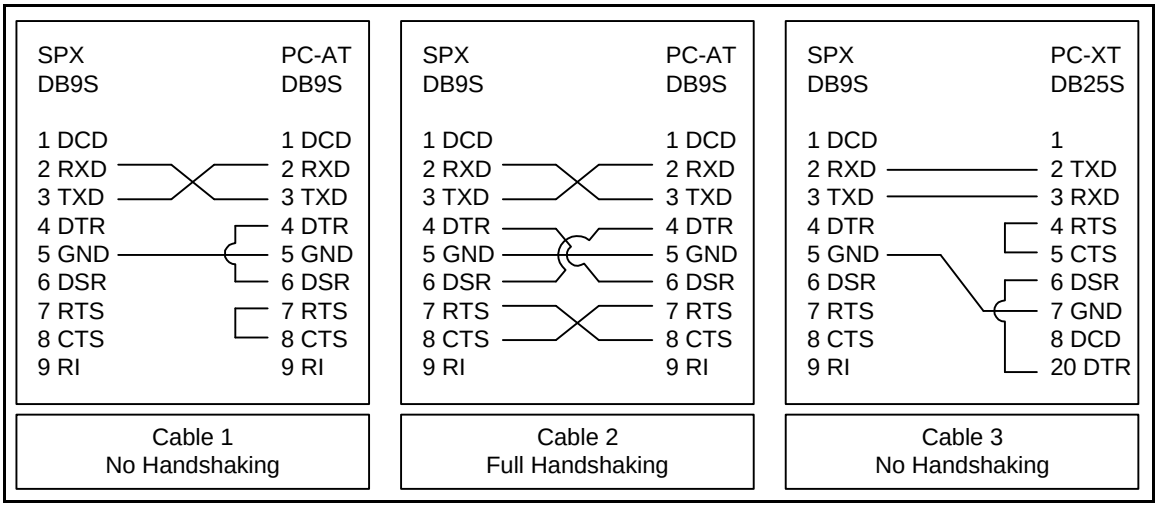


Figure 4 PC Serial Connections

Once the SPX has been programmed, this same port may be connected to a serial printer for activity logging.

3. Downloading the Configuration

The following instructions deal only with downloading the configuration from a PC to the SPX. For detailed instructions on programming the configuration, refer to the following chapters:

- Overview - summary of the operation and capabilities of the ProTalk SPX; gives you an outline of what parameters must be programmed in order to implement the features you want

- Configuration - a detailed item-by-item description of the programming windows

3.1 Connect the PC/Printer port (P6) of the ProTalk SPX to the COM1 or COM2 port of a personal computer having the following minimum characteristics:

- 386 processor
- Windows 95
- 8M RAM
- SVGA screen
- serial COM port

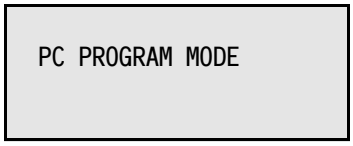
3.2 To start the program, double-click on the SPX icon, or run SPX.exe from the directory where the program is installed. Click on the menu selections with the mouse. Each item has one letter underlined. If you don't have a mouse, press the <ALT> key in conjunction with that letter to activate the function. Within open menus or windows, use just the highlighted letter. You can also navigate the screen with the tab and arrow keys, and press the Enter key to make your selections.

3.3 Open the file where the SPX database is stored. If you know the complete file name, type it into the name field in the Open File window. Otherwise, browse to the proper drive and directory, then select a filename from the window. SPX configuration files must have a .DAT extension.

3.4 From the ProTalk SPX Programmer desktop, select the Program menu.

3.5 In the Serial Port box, click on COM1 or COM2 to select the correct port for communications with the SPX.

3.6 In the Configuration box, click on Write to SPX. The LCD in the SPX will display the following message:



You will receive a message back at the PC stating either that the database was successfully stored, or that the SPX was busy or there was a communications error.

4. Programming Voice Messages

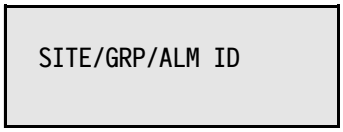
The SPX must have a valid database before you program the voices, in order for it to identify which points require voice messages.

4.1 If you are programming voices for the first time, click on Clear Voices to make sure the memory is empty.

4.2 Click on Record Voices.

When you click on this selection, control of the programming is transferred from the PC to the front panel of the SPX. Once you have entered this mode, pressing keys on your PC keyboard will have no effect. Control can only be returned by the appropriate command from the SPX.

When the SPX receives the Record Voices command from the PC, the following menu is displayed in the LCD:

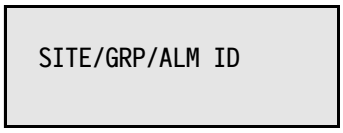


The top line displays the alpha-numeric Site ID programmed into the database. As you scroll through, it will display the group names and then the names of the alarm points which are enabled. The second line shows the functions of the ACK, SELECT, and NEXT keys in this mode:

- ACK (QUIT) - returns program control to the PC
- SELECT - selects the currently displayed point and advances you to the recording mode
- NEXT - used to scroll through the site, group and alarm names

4.3 Use the NEXT key to scroll through the site, group and alarm IDs. When the display is showing the point for which you wish to record a voice message, press the SELECT key.

When you press SELECT, the menu in the LCD changes to the following:



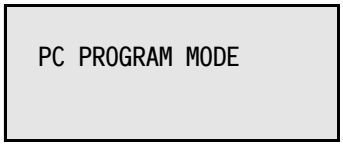
The top line displays the selected site, group or alarm ID. The second line shows the functions of the ACK, SELECT and NEXT keys in this mode:

- ACK (EXIT) - returns you to the previous menu
- SELECT (REC) - records a voice message
- NEXT (PLY) - replays the voice message associated with the selected point

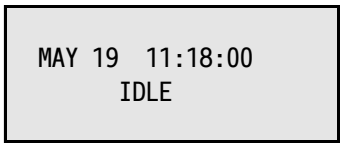
The line also displays the percent of memory still available for recording voices.

4.4 To record voice messages, plug a telephone into the RECORD jack on the side of the SPX. Speak the phrase into the handset while holding down the SELECT (REC) button. When you release the SELECT (REC) button, the message just recorded will automatically be played back. To hear the message again, press NEXT (PLY). You may re-record the message as many times as necessary. Once it is satisfactory, press ACK (EXIT) to return to the previous menu. Then scroll to the next point and record its voice message. The amount of voice storage available is displayed when you enter the record mode.

4.5 Once all of the voice messages have been recorded, press ACK (QUIT) to return program control to the PC. The LCD will display the following message:



4.6 Click on the Cancel button or the Close icon to exit from the programming screen. The SPX will begin polling and its LCD will display the date, time and status:



5. PLC Connections

Connect the PLC to the SPX via the DB9P Serial Data connector. Figure 4 details the cable requirements.

Note: The Allen-Bradley SLC-500 is configured similar to a PC-AT so cables 1 or 2 may be used.

6. Telephone Line

Connect the telephone line to the RJ11 jack labelled PHONE. The line should be using the inner (red/green) pair. Audio levels to the telephone line are fixed internally in conformance with FCC regulations.

Caution: DO NOT plug the telephone line into the RECORD jack, as damage could result to the SPX.

7. Radio Levels

7.1 Radio Setup

Radio Setup commands have been built into the SPX to facilitate testing of an SPX reporting over radio. Three choices are available to exercise the radio. The Push-to-Talk may be asserted by itself, with a DTMF tone, or with voice.

Start with the SPX LCD displaying its default date, time and status. Press the NEXT button to advance through all of the Groups and the Shift, until the LCD displays the following:

```
ENTER
MAINTENANCE MODE
```

Press SELECT.

Press NEXT to advance through Alarm Reporting, Printer, Communications, Monitor Points, and Time, until the LCD displays the following:

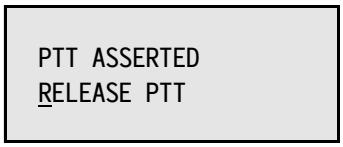
```
RADIO SETUP
```

Press SELECT to enter the radio setup mode.

7.1.1 Asserting the PTT

The first selection displayed is:

Press SELECT to activate the Push-to-Talk signal to the radio. The PTT indicator will light and the following message will be displayed:



Press SELECT to release the PTT. The following message will be displayed:

Press NEXT to stay within the Radio Setup mode, or SELECT to exit.

7.1.2 Sending a DTMF Tone

Use the NEXT key to scroll through the choices in the Radio Setup menu. The second choice displayed is:

Press SELECT to assert the PTT and send a DTMF tone. The PTT indicator will light, the tone will be heard via the local speaker, and the LCD will display the following message:

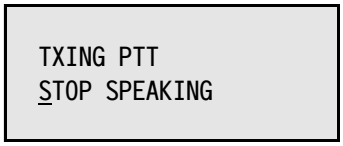
Press SELECT to stop sending the DTMF tone and release the PTT. The following message will be displayed:

Press NEXT to stay within the Radio Setup mode, or SELECT to exit.

7.1.3 Sending a Voice Message

Use the NEXT key to scroll through the choices in the Radio Setup menu. The third choice displayed is:

Press SELECT to assert the PTT and send a voice message. The PTT indicator will light, the voice message "No Alarms" will be heard in the local speaker, and the LCD will display the following message:



Press SELECT to stop sending the voice message and release the PTT. The following message will be displayed:

Press NEXT to scroll through the choices again. To leave the Radio Setup mode, press SELECT. The following message will be displayed:

Press NEXT to continue to scroll through the Maintenance mode, SELECT to advance the display back to the beginning (default status line).

For more information on the front panel menus, refer to chapter 4, Operation.

7.2 Transmit Levels

Use the Radio Setup menus to generate a PTT to the radio along with a tone or voice. Adjust the level of the transmitted audio to between -20 and 0 dBm, using the Radio TX level pot on the side of the SPX.

7.3 Receive Levels

Adjust audio received from the radio to a level between -20 and 0 dBm.

7.4 COS Level

This single-turn pot adjusts the level presented by the radio's carrier-operated switch (COS) to indicate a busy channel. In its default condition, the radio expects a high signal when the channel is clear and a low when the channel is busy. The SPX may be reconfigured in software to recognize a low when the channel is clear and a high when the channel is busy.

7.4.1 Adjust the COS pot so that the SQUELCH LED on the front panel lights when the radio is receiving carrier, and goes out when the channel is clear.

To test the COS operation, perform the following steps. Note that an easy way to simulate an alarm is to unplug the cable to the PLC, which will generate a Communications Failure alarm.

7.4.2 With the radio not receiving carrier, generate an alarm and check that the associated message is transmitted over the radio. If the unit does not transmit, adjust the COS pot until the SQUELCH LED follows the operation of the radio.

7.4.3 Key another radio in the system so that the channel is busy (receiving carrier). Create an alarm. The SPX should wait for a clear channel, or else time out after one minute and then transmit. If it does not wait, adjust the COS pot until the SQUELCH LED follows the operation of the radio.

8. Speaker Volume

Adjust the level of the voice and tones at the local speaker using the Speaker Volume pot on the side of the SPX.

9. Testing

9.1 Power Fail

Check power fail alarm by simulating a power failure at the supply. Ground the power fail input or disconnect AC power.

9.2 Communications Fail

Check communications fail alarm by disconnecting the PLC from the SPX.

9.3 PLC Communications

9.3.1 Communications Errors

Check the integrity of the PLC communications by monitoring the LCD of the SPX. Use the NEXT and SELECT switches to enter the maintenance mode as described above. The communications display is the following:

```
COMM    Good=123
Tx=130   Bad=007
```

In this display, the polls are monitored, and the number of successful and unsuccessful communication attempts recorded. Once the count reaches 999, it rolls over and starts again at 0. To reset the count at any time, press SELECT while this message is displayed.

If the number of bad responses does not equal zero, check the PLC addressing and polling parameters. Possible sources of error include incorrect configuration of the SPX with either the PLC address or communication format.

Press NEXT to monitor individual nodes and their parameters.

9.3.2 Auto Sense Communications

The LCD displays the following message:

```
AUTO SENSE
COMMUNICATIONS
```

If there are no communication errors, press NEXT to monitor individual points. Press SELECT to run the Auto Sense Communications test.

Initially the CTS line is tested (RTS is always asserted). If the LCD displays an error message, i.e.

```
NODE 000  MODBUS
ERROR - NO CTS
```

check for the following:

- serial cable is attached

- serial cable has correct pin-out
- PLC supports RTS/CTS handshaking

If the PLC supports RTS/CTS handshaking and the serial cable is properly connected, the LCD will display the following message:

```
NODE 000  MODBUS
CTS ASSERTED
```

The display shows the address of the node or PLC being examined, and the communication protocol configured in the **SPX** database (MODBUS or Allen-Bradley).

Press NEXT to advance the node number (maximum 255) and start the test. The SPX automatically queries the PLC serial port using all possible combinations of communications parameters (300 to 19200 baud; even/odd/no parity; 1 or 2 stop bits), pausing approximately one second between requests to wait for a reply. The LCD displays the status as the test progresses, e.g.

```
NODE 001  MODBUS
TEST     300,8N1
```

The message in the lower right represents baud rate, bits per character (8), parity, and stop bits respectively. The test runs continuously until the SPX receives a valid response or another key is pressed. If a message is received, the LCD displays the successful communication parameters as follows:

```
NODE 001  MODBUS
OK      9600,8E1
```

In this example, node 001 is communicating at 9600 baud, with 8 data bits, even parity and 1 stop bit. Check that these match the communications parameters programmed into the SPX in the General Configuration window (Chapter 5).

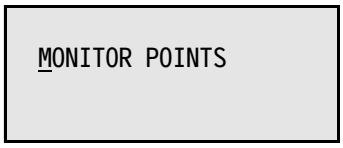
If the test keeps repeating and does not stop, it indicates that that node is not present. Press NEXT to test the next address. Advancing through the nodes in this manner until communications are successful allows you to confirm the addressing of the PLC or nodes. Check that these match the addresses programmed into the SPX in the Point Summary (Chapter 5).

Press SELECT to return to Auto Sense Communications in the maintenance menu. Press NEXT to monitor individual points.

9.4 Monitor Points

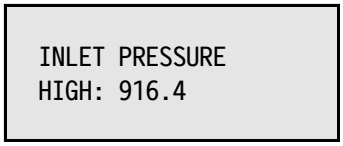
Use the LCD to verify the PLC addressing. Check that the SPX is accurately monitoring the contents of individual PLC registers.

In this mode the LCD displays the following message:



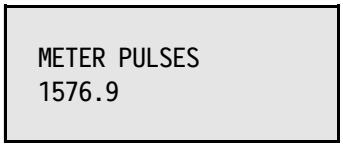
Use the SELECT key to select this function. Then use the NEXT key to scroll through all of the enabled alarm points. Scrolling is continuous if you hold the NEXT key down. The name of the point (ASCII tag) will be displayed along with its value. Digital status points will display the message Alarming, Acknowledged or Idle.

Analog points will display the message Lo, Hi, Ack or Idle, followed by the most recently reported value for that point.

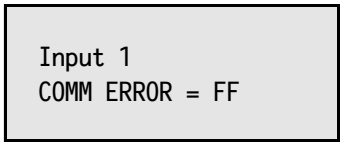


Individual alarm points may be acknowledged by pressing the ACK button while that point is displayed.

Totalizers are a subset of analogs. They do not have setpoints and therefore do not alarm. However, the totals can be read on the display or by interrogating the SPX.



If the SPX is unable to read a particular point, it will display an error message of the following format:



The hexadecimal codes correspond to error messages common to the type of PLC being monitored. The codes are listed in Appendix A.

To stop scrolling through the points, press the SELECT button to return to the main menu (Monitor Points). Pressing the NEXT button advances the LCD to the Time display. Press NEXT until the following message is displayed:

Press SELECT to advance the display back to the beginning (default status line).

9.5 Directories

Check the reporting sequence of each directory by simulating an alarm in a group which will activate that directory. Advance through each of the four shifts and repeat the test.

9.6 Control Codes

Check that Access, Acknowledge, Interrogate, Shift Change and Remote Control Codes are decoded properly over radio and telephone.

9.7 Printer

Check that activity is printed out on the serial printer.

Chapter 4 Operation

1. Description of Operation

1.1 General

The ProTalk SPX continuously polls, or is written to by, the registers of a PLC. When an alarm condition is detected, the SPX announces a user-programmed voice message for that point. Points monitored are of several varieties: digital, analog, totalizer, Comm Watch, or external. For a status point, the SPX recognizes a zero-to-one or one-to-zero transition in the PLC register as an alarm condition. For analog points, exceeding high or low setpoints is recognized as an alarm. Comm Watch points alarm after a preset number of communications failures is exceeded. Totalizer points do not alarm but announce an accumulated total when interrogated. External points are for remote control.

Alarms are announced in a manner determined by the programming of the SPX directories. The directories are series of instructions which may include lists of telephone numbers, announcements to the radio, paging tones, delays, requests for acknowledgement, and others. There are six directories, A through F, and four shifts. Alarm points may be divided into eight different groups. Each shift for each group can dial from a separate directory.

Note that alarms may not necessarily be reported in "real time". A complete polling or reporting cycle of 110 points may take up to ten seconds, depending on how the points are grouped. Alarms are latched at the time they are received, meaning further changes will not be registered until the SPX has reported the initial alarms. When you receive an alarm report, use the Interrogate Code to determine the most recent value of a point.

1.2 Announcing Alarms over Radio or Public Address System

When a directory specifies a radio transmission, the Push-to-Talk is asserted for a preprogrammed warm-up period. Then, if the next instruction is for a voice announcement, the Site ID, Group ID and Alarm IDs for the individual alarms active in the group are announced. Optionally, the phrase "Enter Acknowledge Code" will be spoken after the announcement.

The SPX waits five seconds for an Acknowledge Code, then proceeds to the next instruction in the directory. An additional delay may be programmed to allow a longer time interval for the acknowledgement.

Other options are available for signalling over the radio. Special DTMF codes may be programmed for each point. Alarms may be transmitted with the DTMF code before the voice announcement, after the voice announcement, or without the voice announcement. Delays, number of repetitions of the voice message, and the interval between repetitions may be programmed. If the SPX is equipped with the paging option, codes may be included to activate two-tone or five-tone pagers over the radio.

The SPX may also activate a radio patch to the telephone.

1.3 Announcing Alarms over Telephone

When the directory specifies telephone dialling, and call progress monitoring is enabled, the SPX goes off hook for 500 msec and listens for dial tone. If dial tone is not present, the SPX hangs up and tries again. After three unsuccessful attempts to detect dial tone, the SPX concludes there is a problem with the line and stops dialling. When this occurs, the unit displays "Dial Error" in the LCD and the printer logs the error. With the progress tone detect function off, the SPX proceeds with the dialling sequence without checking for dial tone on the line.

If dial tone is detected, and the next characters in the directory are a series of numbers, these numbers are dialled using tone or pulse dialling, as specified in the configuration. A pause may be programmed, or the unit may be instructed to wait for an answer from the called device, e.g. a paging terminal. If more DTMF digits are encountered, they will be dialled also.

If busy, no answer or re-order tones are encountered from the phone line, the SPX proceeds to the next instruction.

1.3.1 Voice Messages

If the telephone is answered, and the next instruction is for a voice message, it announces the Site ID, Group ID, and the list of any alarms present. Digital alarms are announced exactly as the message has been programmed. For analog alarms, the point name is announced followed by "High" or "Low", depending on which setpoint has been exceeded. The SPX then prompts the user to "Enter Acknowledge Code". It repeats the entire message up to three times, pausing five seconds after each announcement to wait for an acknowledgement. When the Acknowledge Code is detected, the SPX announces the group name, then "Alarms Acknowledged; Enter Command

Code". At this point you may enter another command, such as Interrogate, Change Shift, or Remote Control. If no further DTMF codes are received, the SPX hangs up after five seconds.

If the SPX does not receive the Acknowledge Code, it hangs up the telephone line after the third announcement, then proceeds to the next line in the directory. If the SPX dials all the way through the directory without being acknowledged, it waits for the interval specified by the Short Timer, then starts reporting again from the top of the directory. After the number of tries specified for the Short Cycle, the SPX retries the list at intervals specified by the Long Timer. The SPX continues in this cycle until it is acknowledged.

All of the timers and intervals referred to above are adjustable. Call progress may be disabled and the SPX will simply dial out and announce its alarms without monitoring the telephone line. In addition, the SPX may be programmed to announce the alarm a number of times over radio, or public address system, before it starts dialling on the telephone.

1.3.2 Alpha-Numeric Paging

If the telephone is answered and the next instruction is for TAP paging, the SPX activates its modem and establishes communications and handshaking with the paging terminal. The pager code is transmitted, then an alpha-numeric message which consists of the Site ID, Group ID and Alarm ID. If additional alarms are present, the message will indicate their number. Once the paging terminal acknowledges that it has received the message, or after three unsuccessful retries, the SPX hangs up the telephone line. The unit waits five seconds, then proceeds to the next instruction in the directory.

1.4 Acknowledging an Alarm

When the SPX calls you on the telephone, it may take up to five seconds before it starts speaking. After it announces the alarms, it prompts you to "Enter Acknowledge Code". You have five seconds to begin entering the digits. After the SPX has detected the Acknowledge Code, it speaks the group name, then the phrase "Alarms Acknowledged; Enter Command Code". If no further DTMF digits are received, it hangs up the phone.

Note that when the SPX reports an alarm for an analog point, it announces the point name followed by "High" or "Low", but not the actual level. To obtain the current reading, you must interrogate the unit. Enter the Interrogate Code for that group of alarms, and the most recently reported value for each point will be announced. You have five seconds to interrogate the SPX after the "Alarms Acknowledged" announcement before it hangs up. Alternatively, you may redial the SPX and enter the Interrogate Code.

There is a special code which allows you to acknowledge the alarm for a set period of time only (default is fifteen minutes). After the timer expires, the SPX checks the registers again, and if the same alarm is still present, it begins the reporting cycle just as if it was a new alarm. To acknowledge for this interval, enter the Acknowledge Code followed immediately by an octothorpe or pound sign (#).

To acknowledge the SPX locally, press the ACK switch on the unit, or activate the external acknowledge switch if one has been wired in remotely.

1.5 Telephoning the SPX

With Level 1 (minimum) security programmed, when you call the SPX on the telephone, it answers after the programmed number of rings and announces its Site ID, Group ID and any alarms which are present. After this announcement, the SPX prompts you to "Enter Command Code". It then waits ten seconds for you to enter a DTMF code. This could be an Interrogate Code, Shift Change Code, Acknowledge Code or Remote Control Code. The SPX will hang up whenever it has waited for more than ten seconds without receiving a DTMF digit.

If a higher level of security has been programmed, you will have to enter a DTMF Access Code (password) before the ProTalk SPX gives you access to the registers. With Level 2 security, the SPX announces its Site ID, and then you must enter the password. With Level 3 security, the SPX makes no announcement when it answers the phone. You must enter the Access Code within ten seconds or the SPX will hang up.

2. Front Panel Indicators (LEDs)

Figure 1 shows the front panel of the ProTalk SPX. The following indicators are provided for monitoring the status of the unit:

Ring	yellow LED lights when ringing voltage detected on the telephone line
Off Hook	yellow LED lights when the SPX is off hook to dial a number or receive an incoming call
Squelch	yellow LED lights when squelched condition detected from radio (i.e. radio busy)
PTT	yellow LED lights when the SPX is generating a Push-to-Talk signal to the radio

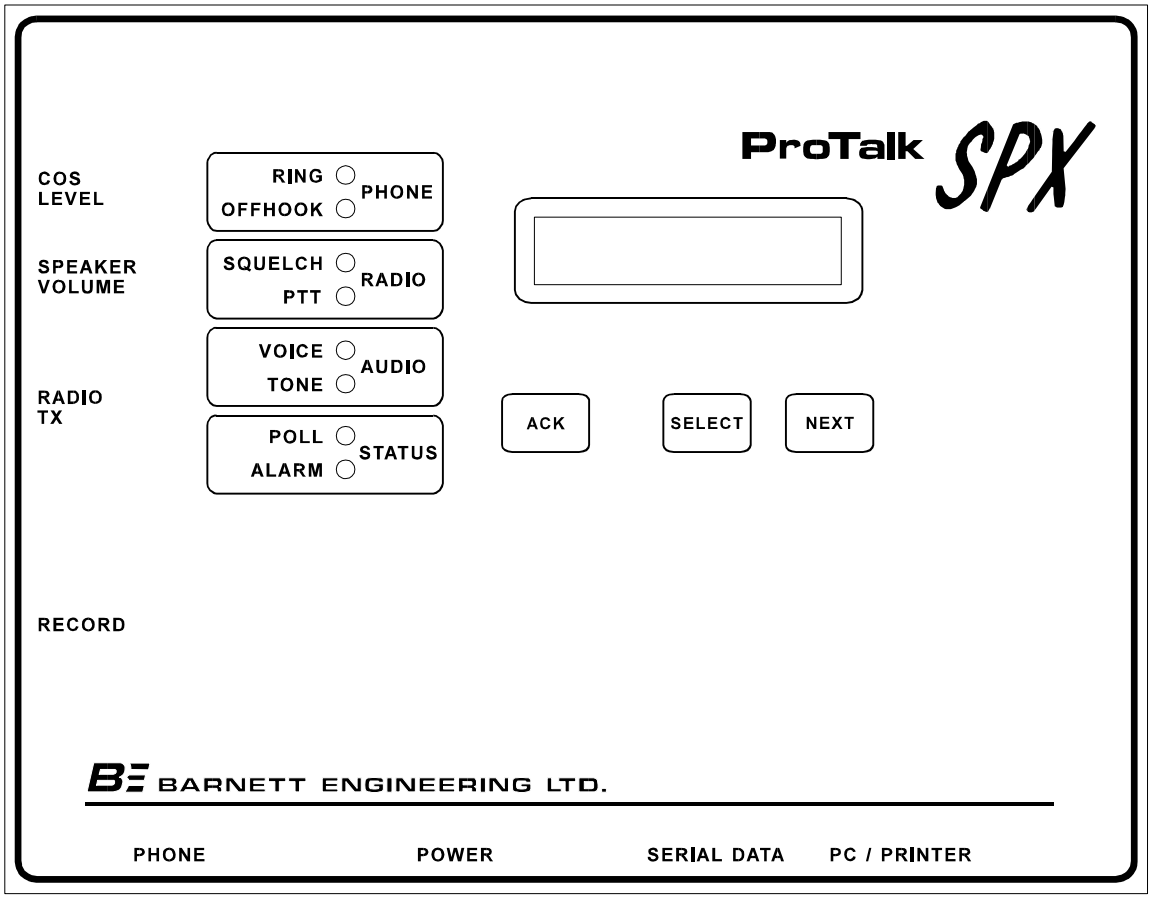


Figure 5 ProTalk SPX Front Panel

Voice green LED lights when the SPX is talking

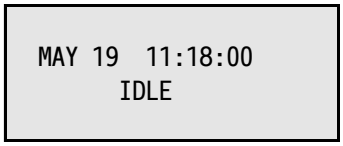
Tone green LED lights when the SPX detects incoming DTMF tone (flashes once per digit), or when the SPX is generating outgoing paging or DTMF tones

Poll green LED flashes when the SPX is polling the PLC, or when the PLC writes to the SPX; off if there are no communications

Alarm red LED lights when an alarm condition is present (flashing for unacknowledged, steady for acknowledged)

3. LCD Status Messages

The two-line, 16-character LCD displays the following basic status message:



The first line always shows the date and time. The second line displays the present status of the ProTalk SPX, or specifically what activity it is currently performing. Following is a list of messages which may be displayed in this line:

IDLE
COMMAND RECEIVED
INTERROGATE
SHIFT = X
ANSWER CALL
WAIT
AUTO ACKNOWLEDGE
RADIO TX
DTMF SIGNALLING
ALERT SIGNAL
ANNOUNCE ALARMS
TONE SIGNALLING
TONES + VOICES
VOICES + TONES
TWO TONE SIGNAL
FIVE TONE SIGNAL
DELAY
DIAL OUT
REDIAL OUT
DIAL ERROR
ANNOUNCE ALARMS
TERMINATE CALL
WAIT FOR ACK

If no key on the front panel has been pressed for more than four minutes, the SPX always reverts to the default display. In this mode, hitting the ACK button acknowledges all alarms regardless of which group they belong to.

4. Front Panel Operation

Figure 2 is a flow chart which outlines how to step through the functions which are controlled from the front panel of the ProTalk SPX. The following sections describe the front panel operation in more detail.

4.1 Acknowledging All Alarms

When the display is in its default state, displaying the time and a status message, push the ACK button to acknowledge all alarms. The alarm LED will switch from flashing to on steady.

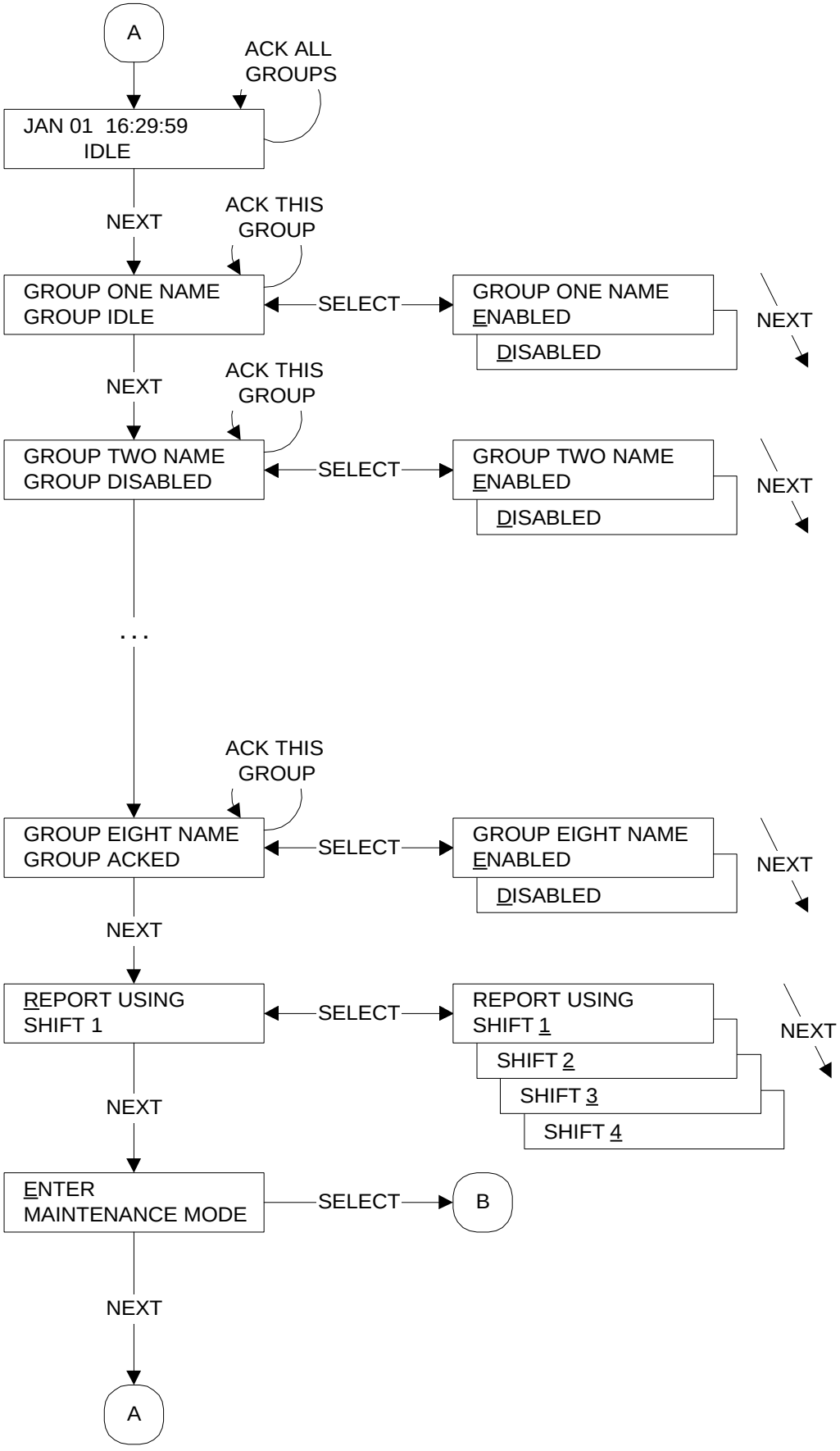


Figure 6a Front Panel Operation - Flowchart

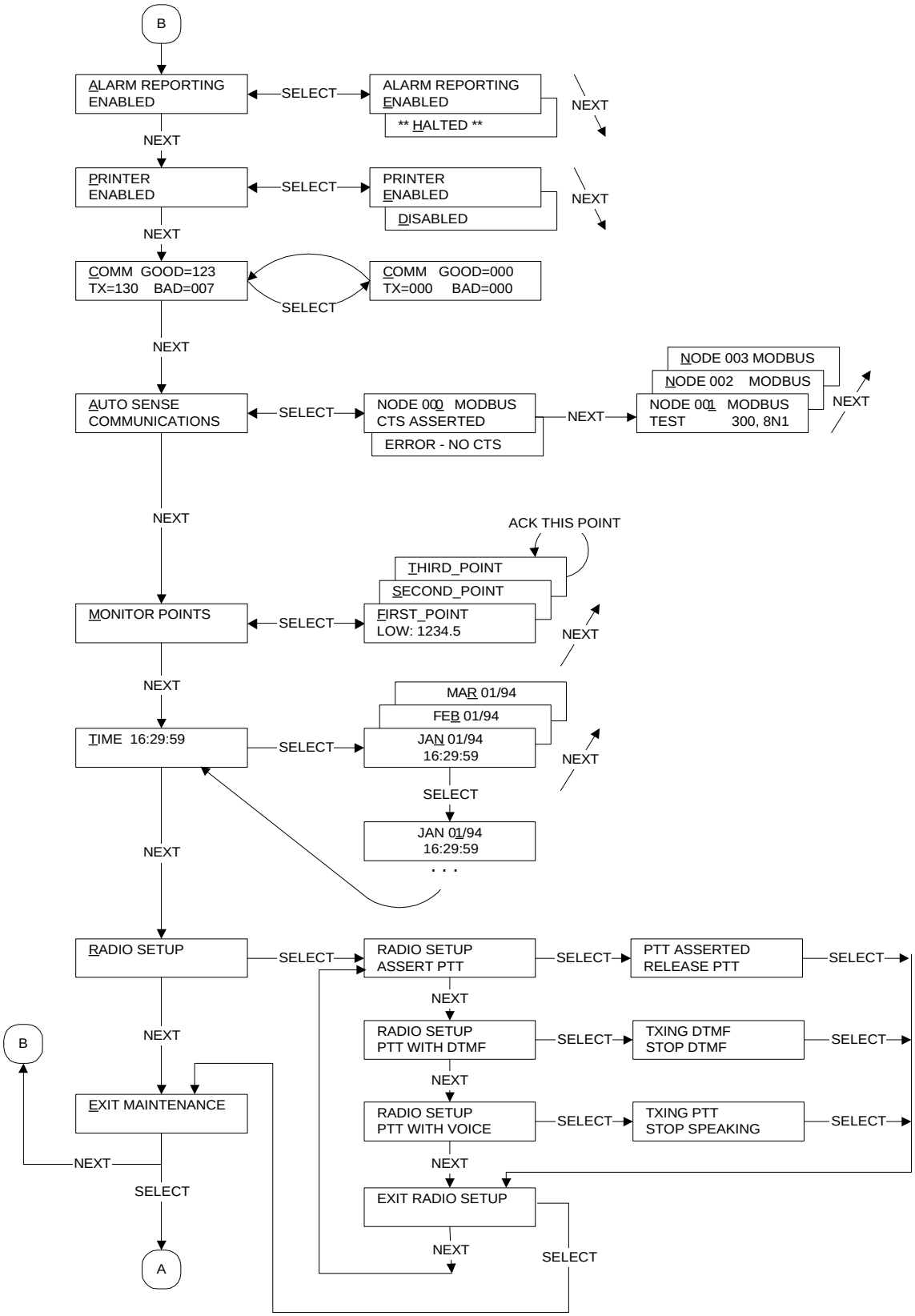
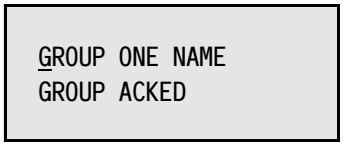


Figure 7b Maintenance Mode - Flowchart

Note that an external ACK switch may be wired in through the power/radio connector. It functions identically to the local ACK button.

4.2 Acknowledging a Group of Alarms

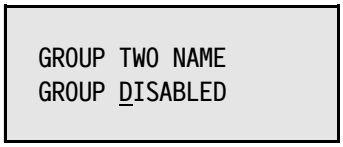
To examine individual groups of alarms, press the NEXT button. The LCD displays the group name followed by a status message, e.g. Group Alarming, Acked, Idle, Disabled. The cursor flashes on the first letter of the name. Press the NEXT button to advance the display to the next group. (Note that if an unused group has not been assigned an alpha-numeric name when the SPX is configured, a row of blank squares will be displayed.)



When the display is in this mode, with the cursor on the group number, press the ACK button to acknowledge all alarms in the group. The display in the status line will change from Group Alarming to Group Acked.

4.3 Enabling/Disabling a Group of Alarms

To enable or disable a group of alarms, press the SELECT button when that alarm group is displayed with the cursor flashing on the group name. The cursor will advance to flash on the status line.

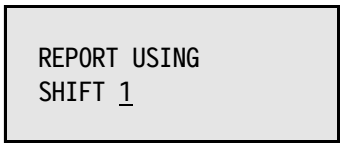


Press the NEXT button to toggle between the choices. If a group is disabled, the status line will show Disabled. If a group is enabled, the status line will read Idle, Alarming or Acked. When the desired condition is displayed, hit the SELECT button to register that choice. The display will return to the cursor flashing on the group name. Use the NEXT button to advance to the next group.

4.4 Changing Shifts

To change the shift, use the NEXT button to advance through all of the alarm groups. The next item displayed will be the Change Shift function. The message displayed says Report Using Shift x, with the cursor flashing under

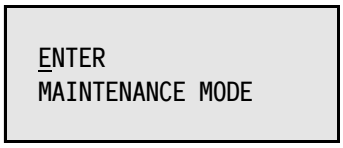
the first line of the display. Press the SELECT key to select this function. The cursor will then flash under the shift number.



Use the NEXT key to cycle through the choices, shifts 1 through 4. Hit the SELECT key when the desired choice is displayed. The cursor will move back to the first line.

Note: If the SPX has been configured to change shifts automatically according to a time clock, the front panel switches will have no effect.

Hitting the NEXT key will advance the LCD to the Maintenance Mode.



4.5 Halting Alarm Reporting

Hit NEXT to return to the default display, SELECT to enter the Maintenance Mode. The first item displayed will be Alarm Reporting.

If for any reason you want to halt alarm reporting, for example for maintenance purposes or to reprogram the SPX, hit SELECT to choose this function. The cursor will move from the first line to the second. Press NEXT to toggle between Enabled or Halted. Press SELECT when your choice is displayed. The cursor will move back to the first line. Press NEXT to advance to the printer function.

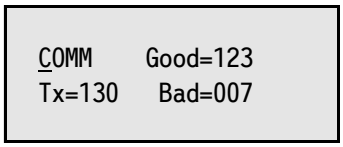
4.6 Enabling/Disabling the Printer

The next item displayed will be the printer, with the cursor flashing under the first line of the display.

Press the SELECT button to select this function. The cursor will flash under the second line. Then use the NEXT button to toggle between Enabled and Disabled. When the desired condition is displayed, hit the SELECT button. The cursor will move back to the first line. Hitting the NEXT button will advance the display to the Communications function.

4.7 Monitoring Communications

In this display, the polls are monitored, and the number of successful and unsuccessful communication attempts recorded.

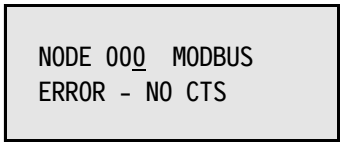


Once the count reaches 999, it rolls over and starts again at 0. To reset the count at any time, press SELECT while this message is displayed. Press NEXT to automatically sense communications at PLC nodes.

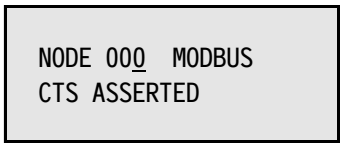
4.8 Automatically Sensing Communications

In this mode, individual nodes may be monitored and tested to determine their required communications parameters. This feature is useful when setting up the SPX to confirm if a node is present and what communications format it uses. The LCD displays the following message:

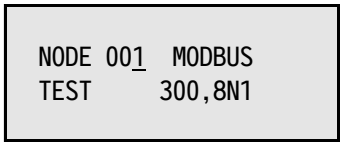
Press SELECT to start the test. Initially the CTS line is tested (RTS is always asserted). If no serial cable is attached, if the serial cable has the wrong pin-out, or if the PLC port does not support RTS/CTS handshaking, the LCD displays an error message:



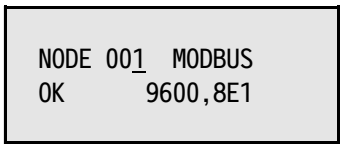
The display shows the number of the node being examined, and the communication protocol configured in the SPX database (MODBUS or Allen-Bradley). If the SPX detects CTS, the LCD displays the following:



Press NEXT to advance the node number (maximum 247 for A-B, 255 for MODBUS) and start the test. The SPX automatically queries the PLC serial port using all possible combinations of communications parameters (300 to 19200 baud; even/odd/no parity; 1 or 2 stop bits), pausing approximately one second between requests to wait for a reply. The LCD displays the status as the test progresses, e.g.



The message in the lower right represents baud rate, bits per character (8), parity, and stop bits respectively. The test runs continuously until another key is pressed or the SPX receives a valid response. If a message is received, the LCD displays the successful communication parameters as follows:

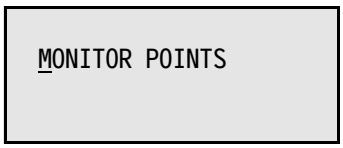


Press NEXT to test the next node, or SELECT to return to Auto Sense Communications in the Maintenance menu.

From the Maintenance menu, press NEXT to monitor individual points.

4.9 Monitoring PLC Registers

In this mode the LCD displays the following message:

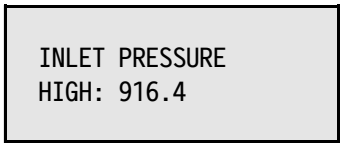


Use the SELECT key to select this function.

Caution: In this mode, the SPX will poll only the displayed point. Monitoring of other points will be halted.

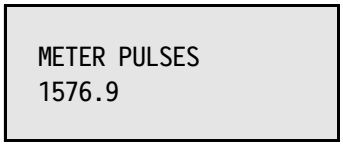
Then use the NEXT key to scroll through all of the enabled alarm points. Scrolling is continuous if you hold the NEXT key down. The name of the point (ASCII tag) will be displayed along with its value. Digital status points will display the message Alarming, Acknowledged or Idle.

Analog points will display the message Lo, Hi, Ack or Idle, followed by the most recently reported value for that point.

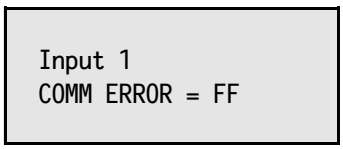


Individual alarm points may be acknowledged by pressing the ACK button while that point is displayed.

Totalizers are a subset of analogs. They do not have setpoints and therefore do not alarm. However, the totals can be read on the display or by interrogating the SPX.



If the SPX is unable to read a particular point, it will display an error message of the following format:

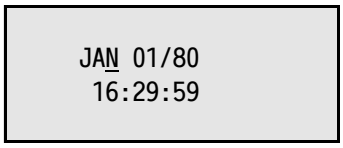


The hexadecimal codes correspond to error messages common to the type of PLC being monitored. The codes are listed in Appendix A.

To stop scrolling through the points, press the SELECT button to return to the main menu (Monitor Points). Pressing the NEXT button advances the LCD to the Time display.

4.10 Setting Time and Date

To change the time and date, press the SELECT button when the cursor is flashing under the word Time.



The display will advance to show the date and time, with the cursor flashing under the month.

Press NEXT to scroll through the months. Scrolling is continuous if you hold the NEXT key down. Once the month is correct, press SELECT to advance the cursor to the day. If you wish to change the day, press NEXT until the correct setting is displayed, then press SELECT. Use the NEXT and SELECT keys to advance through all fields of the time and date. Once the seconds are set, press SELECT. The LCD will go back to displaying the Time. Press NEXT to advance the display to the radio setup.

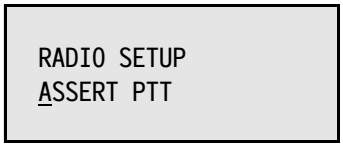
4.11 Setting Up the Radio

The radio setup commands are used for testing or setting up the radio. Press SELECT to enter this mode.

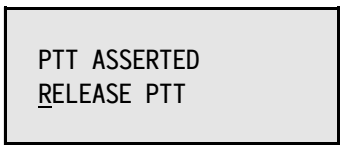
Three choices are available to exercise the radio. The Push-to-Talk may be asserted by itself, with a DTMF tone, or with voice.

4.11.1 Asserting the PTT

The first selection displayed is:



Press SELECT to activate the Push-to-Talk signal to the radio. The PTT indicator will light and the following message will be displayed:



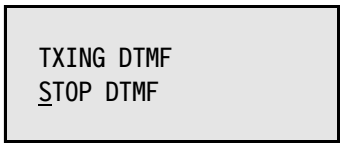
Press SELECT to release the PTT. The following message will be displayed:

Press NEXT to stay within the Radio Setup mode, or SELECT to exit.

4.11.2 Sending a DTMF Tone

Use the NEXT key to scroll through the choices in the Radio Setup menu. The second choice displayed is:

Press SELECT to assert the PTT and send a DTMF tone. The PTT indicator will light, the tone will be heard via the local speaker, and the LCD will display the following message:



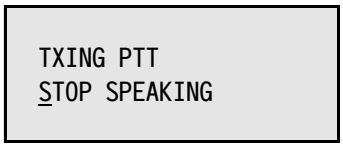
Press SELECT to stop sending the DTMF tone and release the PTT. The following message will be displayed:

Press NEXT to stay within the Radio Setup mode, or SELECT to exit.

4.11.3 Sending a Voice Message

Use the NEXT key to scroll through the choices in the Radio Setup menu. The third choice displayed is:

Press SELECT to assert the PTT and send a voice message. The PTT indicator will light, the voice will be heard in the local speaker, and the LCD will display the following message:



Press SELECT to stop sending the voice message and release the PTT. The following message will be displayed:

Press NEXT to scroll through the choices again. To leave the Radio Setup mode, press SELECT. The following message will be displayed:

Press NEXT to continue to scroll through the Maintenance mode, SELECT to advance the display back to the beginning (default status line).

5. Remote Operation with DTMF Codes (phone or radio)

Some functions of the ProTalk SPX may be controlled remotely by using DTMF tones. Codes may be entered from the keypad of your telephone when you dial up the SPX, or when the SPX has dialled you to report an alarm.

Codes may also be entered with a DTMF encoder over the radio. Unless the SPX is talking on the telephone line, the radio is monitored constantly, so a code may be entered at any time.

5.1 Acknowledging a Group of Alarms

Each group of alarms is programmed with its own individual DTMF Acknowledge Code. When alarms are announced, the message consists of the Site ID, Group ID and individual alarm points, after which the SPX prompts you to "Enter Acknowledge Code". At this point enter the ACK code for the group which is alarming. The SPX will announce "Alarms Acknowledged".

Remote DTMF codes can only be used to acknowledge groups of alarms. If more than one group is alarming, the Acknowledge Code for each group must be entered. Individual alarms may be acknowledged using the front panel switches.

5.2 Interrogating a Group of Alarms

Each group of alarms is programmed with a one- to seven-digit DTMF Interrogate Code. This code may be entered at any time over the radio. It may also be entered over the phone when you have dialled the SPX and it prompts you to "Enter Command Code", or when the SPX calls you to announce its alarms. If the SPX is programmed for Level 2 or Level 3 security, you must enter an Access Code (password) before you can interrogate the unit.

If the SPX has dialled you, it will prompt you to "Enter Acknowledge Code". You may enter the Interrogate Code at this point, or you may enter the Acknowledge Code. The unit will announce "Alarms Acknowledged; Enter Command Code". You have ten seconds to enter another command before the SPX hangs up. If you interrogate first, the SPX will announce the status of all the points, then prompt you again to "Enter Acknowledge Code".

When you enter the Interrogate Code, the SPX comes back with an announcement of the status of all points in that group. Digital or status alarms will be announced with the point name if they are alarming. Analog points will have the point name; "High", "Low" or "Normal"; and the actual value of the point in the engineering units specified. Totalizers will announce the point name and the quantity.

Note that when an analog alarm is detected, the SPX announces only the point name followed by "High" or "Low", depending on which setpoint has been exceeded. To obtain the actual reading, you must interrogate the unit.

5.3 Changing Shifts

Each group of alarms may be programmed for up to four shifts. Each shift allows the same group of alarms to report using a different directory. This function is most commonly used when different personnel go on call. Rather than reprogramming the directory with new telephone numbers, the Change Shift function is used.

The shift may be programmed to change automatically with a time clock, or manually by means of a one- to seven-digit DTMF Shift Change Code. When the code is entered, the SPX announces "Report Using Shift x", where x is a number between one and four. Each operation of the Shift Change Code advances the shift by one. Keep entering the Shift Change Code until the desired shift is selected.

Note: If the shift has been programmed to change according to the time, entering the Shift Change Code will cause the reporting shift to be announced, but it will not change.

5.4 Sending Remote Control Commands

All points except Internal and Comms Watch points may be programmed for remote control. This means that a value may be written to the PLC register from the SPX using DTMF tones. Each point must be individually configured to allow for external control.

5.4.1 Standard (Interactive) Remote Control

The Remote Control Code is a one- to four-digit DTMF code. It is followed by the point number, up to three digits (leading zeroes are permitted).

When the Remote Control Code and point number are entered, the SPX responds by announcing the Alarm ID, its value, and the prompt "Enter Change". If it is a digital point, the value in the register will be "0" or "1". For an analog point, the value will be announced in engineering units. If the Remote Control Code is incorrect, or the point has not been enabled for external operation, the SPX will remain silent.

To change the value, enter one to four DTMF digits, followed by an *Enter* code of two asterisks (**). Enter the value in engineering units without a decimal point. The position of the decimal point in the new value will be the same as that in the previously announced value (right justified). The SPX will echo back the new value to the operator with the "Enter Change" prompt. If the value is correct, press ** to accept the most recently spoken value and write it

to the PLC register. The SPX responds with "Change" and the point name along with the new value as read from the PLC register.

Negative numbers are entered starting with the octothorpe (#) character as the negative sign, with up to an additional four digits plus the Enter code. For digital points, enter "0" to change from a "1". If the value is already "0", entering any other DTMF digit will change it to "1".

Press **##** to abort the current session without writing to the PLC. The SPX will announce "Error" along with the point name and the old value obtained by reading the PLC register. If the SPX waits more than 15 seconds without receiving a DTMF digit, it will automatically abort the session.

5.4.2 Single String DTMF Control

A shortcut is available to control a point by entering a single DTMF string of a maximum eight digits. The string is built up as follows:

{Remote Control Code} + {three-digit point number} + {value}

The Remote Control Code is a zero- to four-digit DTMF code. Note that an empty Remote Control Code, i.e. no control code, is valid when using the single string method of external control, but not the standard (interactive) method. If Level 2 or Level 3 security has been programmed in the SPX, the password must still be entered to gain telephone access to the unit before sending a single string DTMF control.

The point number must be three digits long; leading zeroes are mandatory. As with the standard method, each point must be individually configured to permit remote control.

After entering the Remote Control Code and the three-digit point number, you have two seconds to enter a value before the SPX enters the interactive mode. Only a "0" or a "1" may be entered in the value field; any other digits invalidate the string. As such, the shortcut is useful for changing digital values or resetting totalizers. Analog values should be modified using the interactive method.

When the single string DTMF control has been successfully executed, the SPX announces "Change" followed by the point name and the new value as read from the PLC register.

6. Printer Operation

To obtain a hard-copy record of the activity of the ProTalk SPX, connect the PC/Printer port to a serial printer. The SPX will provide a time-stamped record of any SPX activity. (Specific individual alarms will not be printed.) Printer messages will be of the following format:

JAN 01/94 16:29:19 GROUP NUMBER ONE RADIO TRANSMISSION
JAN 01/94 16:29:21 GROUP NUMBER ONE PAUSE
JAN 01/94 16:29:22 GROUP NUMBER ONE AUTO ACKNOWLEDGE
JAN 01/94 16:29:23 GROUP NUMBER ONE START CYCLE TIMER
JAN 01/94 16:29:24 GROUP NUMBER ONE TIMED ACKNOWLEDGE
JAN 01/94 16:29:25 GROUP NUMBER ONE ACKNOWLEDGED
JAN 01/94 16:29:26 GROUP NUMBER ONE ENABLED
JAN 01/94 16:29:27 GROUP NUMBER ONE DISABLED
JAN 01/94 16:29:26 PROGRAM RESTART
JAN 01/94 16:29:26 RETRY DIAL OUT
JAN 01/94 16:29:26 TELEPHONE ACCESS ERROR
JAN 01/94 16:29:26 PRINTER ENABLED
JAN 01/94 16:29:27 PRINTER DISABLED
JAN 01/94 16:29:28 ADVANCE TO SHIFT 1
JAN 01/94 16:29:28 ADVANCE TO SHIFT 2
JAN 01/94 16:29:28 ADVANCE TO SHIFT 3
JAN 01/94 16:29:28 ADVANCE TO SHIFT 4
JAN 01/94 16:29:29 TIME CHANGE
FEB 10/94 12:29:00 TIME SET
FEB 10/94 12:29:01 ANSWER INCOMING CALL
FEB 10/94 12:29:02 TERMINATE INCOMING CALL

7. Internal Speaker

The ProTalk SPX is equipped with an internal speaker to allow you to monitor its operation. Whenever the SPX is making a voice announcement, it will be heard at the local speaker. At other times it monitors the radio traffic. Adjust the volume with the level-control pot on the side of the unit.

Chapter 5 Configuration

1. Loading the Program

1.1 PC Requirements

The ProTalk SPX must be programmed with a personal computer having the following minimum characteristics:

- 386 processor
- Windows 95
- 8M RAM
- SVGA screen
- serial COM port

1.2 Starting Up the Program

The program diskettes supplied with the SPX contain the configuration software and the software installation utility. Place disk 1 into the floppy drive and select the program SETUP.EXE using Run in the Windows Start menu. Follow the instructions and the installation program will automatically install the configuration program onto the hard drive.

To start the program, click on the SPX icon that appears in the installed location. The program will load and search for the default start-up files:

SPX.dat - the configuration database
SPX.cfg - the serial port setting

If these files are not found, default files will be created and a warning posted.

2. Menu and Window Operations

The configuration software is a Windows 95-based application used to present the data fields and selection boxes for entering the program parameters. Depending on the screen that is currently active, there are different ways to select the data field to be altered or to bring up a different window. The most direct way is to use a mouse and click on the desired function. If the computer is not equipped with a mouse, the keyboard can be used to navigate through the menu screens.

At the top of the desktop are a menubar and a toolbar that launch the various operations in the program. The toolbar buttons duplicate the operations found in the menu.

To activate on-line help, press F1 or select the Help menu at the top of the desktop. Context help for the controls is available when dialogue boxes are open. Press the Help question mark in the upper right of the dialogue box, place the cursor with the question mark over the control, then click the left mouse button.

When the configuration for the SPX is completed, it should be stored to a file in order to maintain a permanent record of the unit's configuration. Configuration information can be read from an operating SPX and modified or stored.

2.1 Types of Data

There are five types of data display areas used in the various dialogue boxes:

2.1.1 Button

The buttons have a raised appearance with a shadow. Click on the button with the mouse to select the function shown, or press Enter when the button is highlighted.

2.1.2 Input Line

Input lines are single line text editors that display the text string and allow it to be changed. The usual text editor functions such as delete, backspace and the arrow keys are operational. If you are using a mouse, you can select a number of characters by holding the left mouse button while moving over the characters with the cursor.

2.1.3 Option Button

When there is a parameter that requires a single choice from a number of entries, the option button box is used (also known as a radio button). It displays circles with the choices to the right. The active selection will have a dot in the circle. Use either the mouse or the directional arrow keys to make your choice. Only one can be selected at a time. A typical option button box looks like this:

◯ Low
◉ Medium
◯ High

2.1.4 Check Box

Check boxes are used when there is an on / off choice for a number of parameters. Each parameter is selected independently of the others; any combination of selections is allowed. When the selection is on, the box beside the choice will have an X or a check mark in it; otherwise it will be blank. Use either the mouse or the spacebar to toggle between on and off. Check boxes look like this:

- ☐ Printer
- ☒ Alarms
- ☒ Tone Dialling

2.1.5 Drop-down Menu

A text box with an arrow on the right side indicates a menu. Click on the arrow and the choices for that parameter drop down. Use the directional arrow keys when the item is highlighted to cycle through the selections, or click on the desired choice with the mouse.

2.2 Operating the Keyboard

Users with a mouse will perform most of the selection operations without using the keyboard commands. If there is no mouse on the programming computer, the various data areas can be modified by using the keyboard.

2.2.1 Alternate Key

The pull-down menus at the top of the screen are activated by pressing the Alternate key at the same time as the underlined letter in the menu bar. For example, press Alt-F to bring down the file operations menu. Each pull-down menu also displays selections with an underlined letter. The active selection is highlighted with a blue background, or, on a monochrome monitor, a darker shade of grey. Press Enter to execute the active selection.

2.2.2 Up and Down Arrows

The up and down arrows move the selection over the available choices in the menubar or any other box selection area. In other windows, the arrows move the selection through the available choices.

2.2.3 Right and Left Arrows

The right and left arrows move the selection across the menubar and move the cursor in text editing lines.

2.2.4 Tab Key

When a dialogue box is open, press the Tab key to advance the item that is selected (highlighted). Each time the key is pressed, the highlight moves to the next data area in the box. All of the data areas are accessible including check boxes, option buttons, input lines, buttons and drop-down menus. These data entry types are described in Section 2.1.

2.2.5 Space Bar

When a selection is highlighted in a check box, press the space bar to alternately turn the selection on and off.

2.3 Viewing and Modifying Data

The menu bar at the top of the screen shows these selections: File, General, Groups, Points, Directory, Program, and Help. To pull down the menu for one of these functions, either move the mouse cursor over the desired title and press the left mouse button, or select the function by holding the alternate key down and then pressing the underlined letter in the title. For example, press Alt-F to bring down the file operations menu to show these available selections:

Open...	
Save	
Save As...	
Exit	Alt+F4
Summary	
New Database	

One menu item will be highlighted. This is the function that will be activated when you press the Enter key. Use the arrow keys to highlight different selections. Alternatively, press the underlined letter for the command, e.g. A for Save As... (The Alternate key is not required with hot keys inside the menu.)

3. Menu and Dialogue Box Description

Each heading in the menu is also accessible from the toolbar. Once a window is opened up from the desktop, it must be closed before another window is selected.

3.1 File

Click on File in the menubar to bring up the following selections.

3.1.1 Open

Click on Open to display the Open File window. As a short-cut, click on the button shown at left in the toolbar.

The current directory is displayed at the top of the window. Use this field to browse for the current directory.

To open a file, double-click on a filename or select a file and then press Open. Alternatively, you may type the filename into the name field, complete with the path information if it is not in the current directory.

The SPX configuration software recognizes only files with a .DAT extension.

3.1.2 Save

To save the SPX configuration you have currently defined, select File Save. As a short-cut, click on the button shown at left in the toolbar. The default filename is SPX.DAT.

3.1.3 Save As

To save the SPX configuration under a new file name, click on Save As. As a short-cut, click on the button shown at left in the toolbar.

Enter the filename in the name field if it is a new file, or pick an existing one from the selection shown. The program will automatically assign a .DAT extension. Alternatively, you may double-click on an existing filename or select a file and then press Save.

3.1.4 Exit

Exit terminates the program and returns to the Windows '95 desktop. The program will warn you to save the current file if you do not want to lose the data.

3.1.5 Summary

This window displays a summary of the values currently assigned to the parameters in the SPX configuration. Menu commands include:

- Exit - return to SPX desktop
- Print - standard Windows screen for printing the summary
- Setup - standard Windows screen for formatting the page(s) to be printed
- More - includes selections for a summary of general configuration, group, point, directory information, or all of the above
- Warnings - The SPX analyzes the configuration of the SPX and points out any potential problems with the operation. These notes are warnings only; they will not inhibit execution of the parameters as programmed.
- Last Page - The summary data is presented in pages. Use the Last Page command to scroll backwards through the information.
- Next Page - The summary data is presented in pages. Use the Next Page command to scroll forwards through the information.

```
SPX Alarm Reporting Unit  ---  Barnett Engineering Ltd.

General Summary

   Name: AJAX PLANT 1            Temporary Acknowledge Time: 15 min
   Security Level: 1             Access Code: 789
   Radio Warmup: 100 msec.       Radio busy when COS low.
   Rings before answer: 2        Dial tone detect enabled.
   Tone dialling enabled.        Control Code: (None)
   The printer is enabled.       Printer baud rate: 9600
   TAP Password: PG1             Shift Change Code: 933

   Shift 1 starts at 08:00 on Monday, Tuesday, Wednesday, Thursday
      and Friday.
   Shift 2 starts at 17:00 on Monday, Tuesday, Wednesday and
      Thursday.
   Shift 3 starts at 17:00 on Friday.


   PLC Configuration:

   PLC Type: AB SLC-500 Master
   Baud rate: 9600
   1 stop bit, odd parity, 8 data bits
   Polling interval: 250 msec.
   Retry interval: 250 msec.
```

Figure 1 - File Summary

A sample of the summary information is shown in Figure 1.

3.1.6 New Database

Click on New Database to create a new file. You will be offered two choices:

- Create a new file that has nothing in the database but the PLC type.
- Open an example configuration for a specified PLC type. The file will have some groups, points and directories programmed that may then be modified.

3.2 General

The General Configuration determines the operations of the SPX relating to the PLC, radio, telephone and printer.

3.2.1 General Configuration

Click on General in the menubar to display the General Configuration screen shown, or click on the button shown at left in the toolbar.

SITE NAME - name displayed on the SPX front panel LCD or printer; 16 alphanumeric characters (default is empty)

TEMPORARY ACK TIME - interval in minutes for which the SPX will be temporarily acknowledged after receiving the Ack Code immediately followed by an octothorpe [#]; maximum 250 minutes (default 15 minutes). When the timer expires, the SPX resumes alarm reporting at the interval specified by the Short Timer.

SECURITY - controls the level of security when you call the SPX on the telephone (default is Level 1)

Level 1 - no Access Code required; the SPX announces Site ID, any groups that are alarming, and prompts the caller to "Enter Command"

Level 2 - SPX announces only the Site ID when it answers the phone; the caller must enter a password (Access Code) for further access to the unit

Level 3 - the SPX answers the phone but makes no announcement; the caller must enter an Access Code within ten seconds

Access Code - password; 1 to 7 DTMF digits (default is empty)

Shifts

Click on this button to bring up the shift change parameters. The shift may be changed manually by entering a DTMF code or using the front panel controls, or it may be set to change automatically with a time clock. If the timed method is chosen, exercising the Shift Change Code (DTMF code or front panel switches) will act as an interrogation. The reporting shift will be announced or displayed, but will not change.

DTMF Code - code to advance the SPX to the next reporting shift; 1 to 7 DTMF digits (default is empty)

Time Clock - day and time when shift advances (**both** must be specified); Monday to Sunday, 24 hour clock. Once any day of week check box is selected, the timed method is enabled and the DTMF code is overridden.

Note: Make sure the SPX clock is programmed correctly. Refer to Chapter 4, section 4.9, for information on setting the time and date.

TAP PASSWORD

Enter the paging type (default is PG1) immediately followed by the password, if required, in the field provided (up to 11 alpha-numeric characters in total).

RADIO SETTINGS

Squelch Polarity - radio busy indicated by high or low signal (default is busy when low)

Radio Warmup Time - time the radio is keyed before transmitting, in msec (default is 100 msec)

TELEPHONE SETTINGS

Rings Before Answer - number of rings before SPX answers the telephone; 1 through 8, or never answer (default is answer after 2 rings)

Dial Tone Detect - enables checking for dial tone, ringing, busy, and other call progress tones (default condition). If disabled, the SPX will come off hook and dial without monitoring for dial tone. It will start the voice announcement immediately after dialling, without testing to see if the line has been answered. Call progress monitoring is sometimes disabled if the telephone line condition is poor and the progress detector falses on the line noise.

Tone Dialling - enables DTMF dialling (default condition). The SPX will use pulse dialling if tone dialling is disabled.

PRINTER

Enable - enables printer (default condition)

Printer Baud Rate - baud rate for communications between the SPX and the printer; 300 to 9600 baud (default is 9600)

CONTROL CODE - code that enables remote control, allowing the caller to modify registers in the PLC; 1 to 4 DTMF digits (default is empty)

Note: An empty Control Code is valid if you are using single string DTMF control. If you are using standard (interactive) remote control, or both methods, a Control Code should be specified. See Chapter 4, section 5.4, for details.

PLC COMMS

Click on this button to bring up the window displaying the PLC communications parameters. Details of the serial communications between the PLC and the SPX are determined by the settings in this window. The appearance of the communications screen is dependent on the type of PLC being used.

SPX Mode (PLC Type)

Press this button to bring up the window used to select the type of PLC communications that will be used by the SPX.

If you change the type of PLC, some of the configuration data will be lost and the program comes up with a warning message.

STOP BITS - 1 or 2 stop bits (default is 1)

PARITY - odd, even or none (default is even)

BITS PER CHAR - the number of data bits in the character (default is 8)

PLC BAUD RATE - baud rate for communications between the SPX and the PLC; 300 to 9600 baud (default is 9600)

POLL INTERVAL (master only) - interval between successive polls, in msec (default is 250 msec)

POLL TIMEOUT (master only) - interval for which the SPX will wait for a poll response before timing out (default is 250 msec)

POLL RETRIES (master only) - number of times a poll will be retried if a valid answer is not received; 0 through 9 (default is 5)

SLAVE ADDRESS (slave only) - address of the SPX when communicating in PLC slave mode; 1 to 8 digits (default is empty). When the slave mode is selected, some parameters that are relevant only in the master mode do not appear in the window.

ERROR CHECK (Allen-Bradley only) - type of error checking used, CRC or BCC (default is CRC)

Click the OK button once all these parameters are set.

3.3 Groups

Click on Group to bring up the group menu. Select a group to bring up the Group Configuration screen.

Alarms may be divided into up to eight reporting groups. Each group must be configured separately. As a short-cut to any group, click on its button in the toolbar, shown at left.

3.3.1 Group Configuration

ENABLE

This Group - enables or disables the group (default is disabled)

Auto ACK - enables a group to respond to an AutoAck command in a directory (default is disabled)

ACK Request - enables the voice prompt "Enter Acknowledge Code" after announcement of the alarms (default is enabled; should be disabled if the AutoAck function is used, for example over a public address system)

GROUP NAME - group name displayed on the SPX front panel LCD or printed out when an alarm occurs in the group; 1 to 16 alpha-numeric characters (default is empty)

ACKNOWLEDGE CODE - code used to acknowledge receipt of an alarm from the SPX (halts alarm transmission); 1 to 7 DTMF digits (default is empty)

INTERROGATE CODE - code used to make the SPX announce the condition of all alarm points in the group; 1 to 7 DTMF digits (default is empty)

SHORT TIMER - interval after which the SPX retries a directory if no alarm acknowledgement has been received; 0 to 255 minutes (default is 0)

SHORT CYCLES - number of times the SPX retries the directory at the interval specified by the short timer; 0 to 9 times (default is 0)

LONG TIMER - interval at which the SPX retries a directory after the short cycle timer has expired; 0 to 255 minutes (default is 0)

SHIFT 1 - determines which directory the alarms in the group use when the SPX is set for Shift 1 (default is directory A)

SHIFT 2 to SHIFT 4 - as per SHIFT 1

3.4 Points

Click on Points in the menubar to bring up the Point Summary, or click on the button for Points in the toolbar, shown at left.

The database contains space for up to 110 alarm points. Use the scroll bar to view all points. To program an individual point, double click on that line, or highlight the line and press Enter.

Five different types of points can be specified: Internal, Digital, Analog, Totalizer, and Comm Watch. Remote control is allowed on Digital, Analog and Totalizer points. Points 1 and 2 are designated as internal and cannot be changed. They monitor the power supply and communications between the SPX and the PLC. All other points can be set as desired but cannot be changed to internal. Comm Watch is a special case that allows more than one communications monitor point to be created. It is used where the SPX is polling more than one PLC in a network and it is required that each PLC have its own communications failure watch.

To report an alarm in more than one way, or to configure several setpoints, program multiple points to access a particular register.

Each point has its own window where different parameters may be set. The point number and type are shown at the top of the window. The following elements are common to each window:

CANCEL - exits the POINT screen without saving the current point data

OK - exits the POINTS screen and saves the current point data

ALARM NAME - alarm name displayed on the front panel LCD or when the alarm is printed; 1 to 16 alpha-numeric characters (default is empty)

PLC ADDRESS (Modicon) or NODE NUMBER (Allen-Bradley) - address of the PLC. For internal points the address is shown as internal; for all others it should be set to the correct value. If the SPX is configured as a slave, you will not be able to change the address on the screen.

PLC REGISTER (Modicon) or LOGICAL ADDRESS (Allen-Bradley) - register location of the data in the PLC for this point. For points one and two this is shown as internal; for all others it should be set to the correct value. If the SPX is configured as a slave, you will not be able to change the register number on the screen.

Refer to Figures 2 through 4 for details of PLC addressing.

DTMF TAG - 1 to 7 digit DTMF string transmitted along with the voice message when an alarm occurs. Leave this location empty to send only voice messages when alarming (default is empty).

ENABLED - point will generate an alarm annunciation if enabled (default is disabled)

Note: A point can be interrogated only if it is enabled. If you want to interrogate a point but never have it alarm, assign it to a separate group and disable alarming for that group.

USING GROUP - 1 of 8 groups to which the alarm point is assigned (default is Group 1)

3.4.1 Internal Point

There are two alarm points that are internal to the SPX. The alarm addressing is fixed. The alarm names default as described in the following, but may be changed should you wish to assign them to other fixed points. The first is a power failure alarm. The point is a ground closure input that may be reprogrammed to monitor any external input.

The second is a PLC communications failure alarm. It is recommended that you not use this point when multiple PLCs are being accessed, as the alarm will set and clear depending on the present polling result.

Modicon Modbus Slave (RTU mode only)

PLC Address

Function:	user assigned address of the slave device on a network	
Range:	1 to 255	

PLC Register

Function:	address of register within slave to receive data	
Range:	digital = 00003 to 00110 or	*remote control allowed
	analog = 40003 to 40110 or combination	*remote control allowed
	last three digits correspond to point number	

Modicon Modbus Master (RTU mode only)

PLC Address

Function:	address of a remote device containing requested data	
Range:	1 to 255	

PLC Register

Function:	address of data location within remote PLC	
Range:	output coil = 00001 to 09999	*remote control allowed
	discrete input = 10001 to 19999	
	input register = 30001 to 39999	
	output register = 40001 to 49999	*remote control allowed

Figure 2 - PLC Addressing

These are the only two hardware alarms on the SPX. In addition to the common ones described above, the following parameter should be programmed:

ALARM STATE - momentary or latched (default is momentary). If an alarm is latched, the SPX recognizes a pulse as an alarm and the point is considered to be in the alarm condition until it is acknowledged (cleared). Next occurrence of the pulse is treated as a new alarm. Momentary alarms register as an alarm for as long as they are present; alarms may be acknowledged, but are not considered to be cleared until the point returns to its normal state.

Allen-Bradley DF1 to SLC-500

Node Number

Function: network address of a remote device containing requested data
Range: 0 to 255

Logical Address

Function: file address of data within remote PLC
Format: digital = Tf:e/b
analog = Tf:e
(T = file type, f = file number, e = element, b = bit)
Range: digital - O:e/b
f = implied 0
e = 0 or 1
b = 00 to 15
digital - I:e/b
f = implied 1
e = 0 or 1
b = 0 to 15
digital - Bf:e/b *remote control allowed
f = 3 or 9 to 255
e = 0 to 255
b = 0 to 15
digital - Nf:e/b *remote control allowed
f = 7 or 9 to 255
e = 0 to 255
b = 0 to 15
analog - Nf:e *remote control allowed
f = 7 or 9 to 255
e = 0 to 255

Figure 3 - PLC Addressing

3.4.2 Digital Point

The second type of point is a digital or ON/OFF alarm. In addition to the common parameters, program the following for each digital point:

ALARM WHEN - specifies whether zero or one is the alarm condition (default is one)

ALARM STATE - momentary or latched (default is momentary). If an alarm is latched, the SPX recognizes a pulse as an alarm and the point is considered to be in the alarm condition until it is acknowledged (cleared). Next occurrence

Allen-Bradley DF1 to PLC-5

Node Number

Function: network address of a remote device containing requested data
Range: 0 to 255

Logical Address

Function: file address of data within remote plc
Format: digital = Tf:e.s/b
analog = Tf:e
(T = file type, f = file number, e = element, s = sub-element, b = bit)
Range: digital - O:e.s/b
f = implied 0
e = 000 to 277 octal
s = 0 to 377 octal
b = 00 to 17 octal
digital - I:e.s/b
f = implied 1
e = 000 to 277 octal
s = 0 to 377 octal
b = 00 to 17 octal
digital - Bf:e/b *remote control allowed
f = 3 or 9 to 9999
e = 0 to 65535
b = 0 to 15
digital - Nf:e/b *remote control allowed
f = 7 or 9 to 9999
e = 0 to 65535
b = 0 to 15
analog - Nf:e *remote control allowed
f = 7 or 9 to 9999
e = 0 to 65535

Figure 4 - PLC Addressing

of the pulse is treated as a new alarm. Momentary alarms register as an alarm for as long as they are present; alarms may be acknowledged, but are not considered to be cleared until the point returns to its normal state.

REMOTE CONTROL - off or on. If Remote Control is on, a value may be written to the register externally. Figures 2 through 4 specify the types of points for which remote control is allowed.

Caution: *The SPX uses a Read-Modify-Write algorithm to change the register in an Allen-Bradley PLC. Take precautions to ensure that the SPX and the PLC can not overwrite each other's data in the same word.*

3.4.3 Analog Point

In the default database, all points are defined as digital. To specify an analog point, click on the Point Type drop-down menu and select Analog. The program will prompt you that some information for the point will be erased. If the point type is indeed going to be changed, click YES and proceed; otherwise, click NO to return without change.

For this type of point, the SPX reads an analog value from the PLC register. A "High" or "Low" alarm is announced whenever the value exceeds a specified setpoint. When the reading is announced, the units of measure are spoken as well.

CALIBRATION SETTINGS

Conversion of the binary instrument reading from the PLC into English units is determined by the values entered into the Calibration section. To set these values, click on Calibrate and program the following information:

Minimum Binary - binary number that represents the minimum analog value that will be read from the register (0 to 65535 for unsigned, -32768 to +32767 for signed; default is 0)

Maximum Binary - binary number that represents the maximum analog value that will be read from the register (0 to 65535 for unsigned, -32768 to +32767 for signed; default is 4096)

Binary Values - signed or unsigned (default is unsigned)

Minimum Decimal - number that represents the lowest decimal value of the analog (x.xxx to xxx.x). Numbers between -999.9 and +999.9 can be entered (default is 0). If the desired value is outside this range, use the multipliers in the Units section to scale the value when it is annunciated.

Maximum Decimal - number that represents the highest decimal value of the analog (x.xxx to xxx.x). Numbers between -999.9 and +999.9 can be entered (default is 999.9). If the desired value is outside this range, use the multipliers in the Units section to scale the value when it is annunciated.

Low Setpoint - decimal value below which an alarm will be reported (default is 250)

High Setpoint - decimal value above which an alarm will be reported (default is 750)

Hysteresis

The High and Low Reset points will be calculated automatically by specifying the hysteresis. Once an analog has alarmed, it must recover to a preset level before it will return to the normal state. For example, if a high setpoint is specified at 750, and hysteresis is 1%, the alarm will not reset until the value of the analog drops below 742.5.

Click on the Hysteresis button and select the percent hysteresis from the drop-down menu (default is 10%).

UNITS

For an analog point, you should specify the engineering units in which the value will be announced. Click on the Units button to bring up the window containing units of measure.

Units are defined by three sections:

Units - the measure that is being announced
Prefix - the multiplier for the units
Suffix - used where the measurement is a rate, per hour for example

Specify None (default) wherever a prefix, units or a suffix is not required.

3.4.4 Totalizer Point

To specify a totalizer point, click on the Point Type drop-down menu and select Totalizer. Totalizers are a subset of analog points. The SPX reads the register as an integer value but treats it as an absolute number instead of converting it to a reading. It is an accumulated total from a register within the PLC. This type of point does not alarm. However, the value of the totalizer, complete with units and decimal places, will be announced when you interrogate the group.

Except for the decimal place, the other parameters are described in the analog point section.

DECIMAL PLACE - where to insert the decimal point when announcing the value in the totalizer (default is at the end)

3.4.5 Communications Watch Point

Communications Watch is used in applications where the SPX is polling more than one PLC in a network environment. If individual communication failure alarms are required for each PLC that is being polled, the watch alarm is used. An alarm is triggered when the failure count exceeds the setting of the setpoint. The counter is reset every time communications are successful. In addition to the common data entries, the setpoint must be entered.

SETPOINT - failure count to trigger alarm; maximum 10,000 (default is 1000)

3.5 Directory

A directory is a sequence of reporting instructions that the SPX follows when it detects an alarm condition. Unless an automatic acknowledgement is programmed, the SPX will proceed through the instructions until an acknowledgement is received. If the SPX reaches the end of the directory without receiving an acknowledgement, it will start again from the beginning (after an interval specified by the timers in the Group Configuration screen).

Click on Directory to pull down the menu, then select one of six unique directories, A through F. As a short-cut to any directory, click on its button in the toolbar.

Different directories may be used by different groups of alarms, or by different shifts responding to the same alarms.

3.5.1 Directory Summary

Click on one of the directory selections to bring up the Directory Summary. In this screen, the directory number is shown in the top line of the display. Contents of the directory are listed line by line. Each line is a series of instructions relating to one call-out cycle.

Use the Up and Down arrows or mouse to highlight a line. Press Enter to edit that line, or Insert to insert a new line at that point.

LINE EDITOR

The Line Editor is used to specify the exact sequence of instructions in each call-out cycle. Each line may contain a maximum of 120 characters from among the following selections. Click on the position in the line, then click on

a selection from the commands. The pointer will advance to the next available position by default. You will not be allowed to leave vacant lines. You may overwrite a position, or use the Delete command to erase it.

Some examples of programming directories are given in Chapter 2 - Overview.

[DIAL] Takes the telephone line off-hook, and keeps it off-hook until the last instruction in the line is executed. The SPX then dials the number specified by the digits (maximum 39) that come after. (If Call Progress is enabled, it will monitor for dial tone first.) Note that all DTMF digits are valid, including A, B, C, D and the asterisk (*) and octothorpe (#). The ! (exclamation mark) has a special meaning. Each ! in a telephone number inserts a two-second delay. This may be necessary when you are dialling from a PABX to an outside line, for example, or dialling long distance.

The [VOICE] message that follows is announced up to three times. Each announcement is followed by the prompt "Enter Acknowledge Code", and the SPX pauses five seconds to listen for an acknowledgement. If an ACK Code is received, the SPX announces "Alarms Acknowledged; Enter Command Code" and allows you to enter further commands. If no ACK Code is received after the third announcement, the SPX hangs up and proceeds to the next line in the directory.

[RADIO] Keys the radio for the programmed warm-up time, and keeps it keyed until the last instruction in that line is executed. If enabled for that group, the prompt "Enter Acknowledge Code" will be inserted after the last command in the line.

[WAIT] Causes the SPX to delay for the interval that follows, programmed in seconds (maximum = 255); may begin a line, or may be included as part of a line beginning with [RADIO], [PATCH] or [DIAL] command. Note that a [WAIT] inserted in a [RADIO] or [DIAL] line will occur with the radio keyed or the telephone off-hook.

[PATCH] Activates a radio patch to the telephone system; command must be followed by a DTMF string (1 - 39 digits). Alarm announcement is as per a [DIAL] command, i.e. up to three voice announcements with a pause of five seconds in between to listen for an acknowledgement. The last command in the line must be [DTMF] to turn off the patch.

[AUTO ACK] If enabled for that group, this command causes the SPX to automatically acknowledge its alarms, without receipt of an ACK code. There will be no further repetitions of the alarm. Typically it is used where acknowledgement is not possible, such as after announcement over a public address system. The [AUTO ACK] command should be the last item in a directory, and must be entered on its own line.

[TAP] Transmits the TAP pager code (up to 8 digits) to the paging terminal; must be preceded by a [DIAL] command containing the telephone number of the terminal. Use of this command activates the SPX modem to transmit the page data in the necessary format. The pager service code and password, if required, are automatically inserted. The alpha-numeric message that follows consists of the Site ID, Group ID and Alarm ID associated with the alarming point. The pager does not have room to display additional alarm messages; if more are present, their number will be indicated.

The SPX and paging terminal automatically handle all hand-shaking; therefore, it is not necessary to use the [ANSWER] command. Once the information has been exchanged, the SPX and paging terminal hang up. Only one [TAP] code can be included per line. If additional pagers must be alerted, they should go in a new line, preceded by the [DIAL] command.

[VOICE] Transmits the voice messages associated with points in the alarm condition, including the Site and Group IDs.

[VOICE+] Transmits the voice message associated with a point in the alarm condition, followed by the DTMF tag; may be included as part of a line beginning with a [RADIO], [PATCH] or [DIAL] command.

[VOICE-] Transmits the DTMF tag associated with a point in the alarm condition, followed by the voice message; may be included as part of a line beginning with a [RADIO], [PATCH] or [DIAL] command.

[DTMF] Transmits the DTMF tones (maximum 39) that follow the command; may be used over telephone or radio.

[SIGNAL] Transmits the DTMF tag associated with a point in the alarm condition, without the voice message; may be included as part of a line beginning with a [RADIO], [PATCH] or [DIAL] command.

[ANSWER] Causes the SPX to monitor for an answer, typically a voice response, before proceeding; for example, if the SPX is calling a voice or numeric paging terminal with an automated attendant, it can be programmed to wait after it dials the terminal for a voice prompt before it continues dialling the pager number (not required for TAP paging).

[ALERT] Transmits an Alert tone, typically used to alert the called party that a voice message is to follow (1000 Hz tone, about the same volume as speech, 100 msec on, 100 msec off, repeated 8 times); may be included as part of a line beginning with the [RADIO], [PATCH] or [DIAL] command.

[5 TONE] Transmits the 5-tone paging code specified over radio only; format is y.zzzzz or .zzzzz, where y is the preamble, if required, and zzzzz is the 5-digit cap code. If a series of pagers are addressed, only the first code needs the preamble. To activate call two of a dual address-equipped pager, add the letter U after the cap code. Must be part of a line beginning with the [RADIO] command.

[2 TONE] Transmits the 2-tone paging frequencies specified over radio only; format is xxxx.x/yyyy.y (valid frequencies are 100.1 through 2499.9 Hz). For a group call, specify the same frequency for both tones. Must be part of a line beginning with the [RADIO] command.

[DELETE] Removes the selected line entry.

Following are some restrictions on the use of directory commands:

1) Lines must begin with a [DIAL], [RADIO], [WAIT], [PATCH], or [AUTO ACK] command.
2) [WAIT] may be used on a line by itself, or included as part of a line starting with the [RADIO], [PATCH] or [DIAL] command.
3) [AUTO ACK] must be on a line of its own.
4) The [2 TONE] or [5 TONE] commands must be used in a line beginning with the [RADIO] command.
5) [VOICE] should be used only once in a line beginning with the [DIAL] command, and should be the last command entered.
6) The [VOICE] command inserted in a [DIAL] line automatically triggers multiple repetitions of the voice message and the "Enter Acknowledge Code" prompt. The [VOICE+] and [VOICE-] commands cause only a single transmission of the voice message and the associated DTMF tag.

7) [ANSWER] can only be used in a line starting with the [DIAL] or [PATCH] command.

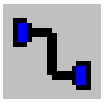
8) [TAP] can only be used in a line starting with the [DIAL] command. No other commands should be entered in the same line.

3.5.2 Copy Directory

A directory may be copied to another directory and modified, to avoid having to enter all the information again. Click on the Copy command in the Directory menu to bring up the window.

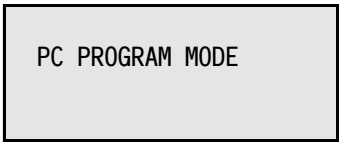
Click on the directory numbers in the Copy From and Copy To fields, then click the OK button. The Directory Editor may then be used to modify the new directory.

3.6 Program



To program voice or configuration data to the SPX, click on Program in the menubar, or click on the Program button in the toolbar, shown at left.

This dialogue box communicates directly with the SPX. Click on the Com Port button to select either COM1 or COM2. The LCD in the SPX will display the following message:



Note that the SPX will not resume normal operation until you have exited the Program menu.

3.6.1 Programming Voice Messages

The SPX must contain a valid configuration before you program the voices, in order for it to identify which points require voice messages.

1) If you are programming voices for the first time, click on Clear Voices in SPX to make sure the memory is empty.

2) Click on Record Voices.

When you click on this selection, control of the programming is transferred from the PC to the front panel of the SPX. Once you have entered this mode, pressing keys on your PC keyboard will have no effect. Control can only be returned by the appropriate command from the SPX.

When the SPX receives the Record Voices command from the PC, the following menu is displayed in the LCD:

```
SITE/GRP/ALM ID
QUIT SELECT NEXT
```

The top line displays the alpha-numeric Site ID programmed into the database. As you scroll through, it will display the group names and then the names of the alarm points that are enabled. The second line shows the functions of the ACK, SELECT, and NEXT keys in this mode:

- ACK (QUIT) - returns program control to the PC
- SELECT - selects the currently displayed point and advances you to the recording mode
- NEXT - used to scroll through the site, group and alarm names

3) Use the NEXT key to scroll through the site, group and alarm IDs. When the display is showing the point for which you wish to record a voice message, press the SELECT key.

Note: The Power Supply and PLC Comms voice messages may be overwritten by a user phrase if required.

When you press SELECT, the menu in the LCD changes to the following:

```
SITE/GRP/ALM ID
EXIT xx% REC PLY
```

The top line displays the selected site, group or alarm ID. The second line shows the functions of the ACK, SELECT and NEXT keys in this mode:

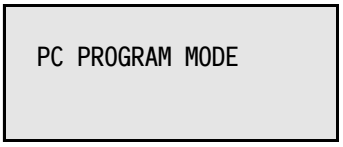
- ACK (EXIT) - returns you to the previous menu
- SELECT (REC) - records a voice message
- NEXT (PLY) - replays the voice message associated with the selected point

The line also displays the percent of memory still available for recording voices.

4) To record voice messages, plug a telephone handset into the RECORD jack on the side of the SPX. Speak the phrase into the handset while holding down the SELECT (REC) button. When you release the SELECT (REC)

button, the message just recorded will automatically be played back. To hear The message again, press NEXT (PLY). You may rerecord the message as many times as necessary. Once it is satisfactory, press ACK (EXIT) to return to the previous menu. Then scroll to the next point and record its voice message. The amount of voice storage available is displayed when you enter the record mode.

5) Once all of the voice messages have been recorded, press ACK (QUIT) to return program control to the PC. The LCD will display the following message:



6) Click on the Cancel button or the Close icon to exit from the programming screen. The SPX will begin polling and its LCD will display the date, time and status:

3.6.2 Clearing Voices in the SPX

Click on Clear Voices to erase all of the voice information currently stored. This operation should be performed before storing a new set of voice messages in the SPX.

3.6.3 Retrieving Recorded Voices from the SPX to a File

If you wish to keep a file record of the voice messages recorded in the SPX, click on Read Voices in the Program window. The PC will prompt you for the name of the file where the voice information is to be stored. Enter the filename complete with path, then click the OK button to upload. A full voice database may take several minutes to upload; status of the transfer is shown on a progress bar.

3.6.4 Storing a Voice File to the SPX

An alternative to recording voice messages is to download a voice file from the PC. Click on Store Voices in SPX in the Program window. The PC will prompt

you for the name of the file in which the voice information is stored. Enter the filename complete with path, then click the OK button to download.

A full voice database may take several minutes to download; status of the transfer is shown on a progress bar.

3.6.5 Retrieving the SPX Configuration

To retrieve the database currently stored in the SPX, click on Read from SPX. You will receive a message at the PC stating either that the SPX is working, that the database was successfully transferred, or that there was a communications error.

3.6.6 Storing the SPX Configuration

To store the current configuration to the SPX, click on Write to SPX. You will receive a message at the PC stating either that the SPX is working, that the database was successfully stored, or that there was a communications error.

Chapter 6 Appendices

A. Communication Error Codes

Modicon Error Codes	
00	success
01	illegal function
02	illegal data address
03	illegal data value
04	failure in associated device
05	acknowledge long command
06	"busy, rejected message"
07	NAK - negative acknowledge
08	memory parity error
FD	not enough characters
FE	CRC error
FF	no response

Data Highway and DH-485 Error Codes	
00	success
x2	cannot guarantee delivery, link layer
x3	duplicate token holder detected
x4	local port is disconnected
x5	application layer timed out waiting for a response
x6	duplicate node detected
x7	station is off-line
x8	hardware fault
1x	illegal command or format
2x	host has a problem and will not communicate
3x	remote node host is missing, disconnected, or shut down
4x	host could not complete function due to hardware fault
5x	addressing problem or memory protected rungs
6x	function disallowed due to command protection selection
7x	processor is in program mode
8x	compatibility mode file missing or communication zone problem
9x	remote node cannot buffer command
Bx	remote node problem due to download
Cx	cannot execute command due to active IPBs
D1	a field has an illegal value
D2	less levels specified in address than minimum for any address
D3	more levels specified in address than system supports
D4	symbol not found
D5	symbol is of improper format
D6	address doesn't point to something
D7	file wrong size
D8	cannot complete request, situation has changed since the start of the command
D9	data or file is too large
DA	transaction size plus word address is too large
DB	access denied, improper privilege
DC	condition cannot be generated - resource is not available
DD	condition already exists - resource is already available
DE	command cannot be executed
DF	histogram overflow
E0	no access

E1	illegal data type
E2	invalid parameter or invalid data
E3	address reference exists to deleted area
E4	command execution failure for unknown reason
E5	data conversion error
E6	scanner not able to communicate with 1771 rack adapter
E7	adapter cannot communicate with module
E8	1771 module response was not valid
E9	duplicated label
EA	file is open; another node owns it
EB	another node is the program owner
FD	not enough characters
FE	CRC error
FF	no response

Chapter 7 Warranty

1. Warranty Statement

Barnett Engineering Ltd. warrants that all equipment supplied shall be free from defects in material or workmanship at the time of delivery. Such warranty shall extend from the time of delivery for a period of one year. Buyer must provide written notice to Barnett Engineering Ltd. within this prescribed warranty period of any defect. If the defect is not the result of improper usage, service, maintenance, or installation and equipment has not been otherwise damaged or modified after delivery, Barnett Engineering shall either replace or repair the defective part or parts of equipment or replace the equipment or refund the purchase price at Barnett Engineering Ltd.'s option after return of such equipment by buyer to Barnett Engineering Ltd. Shipment to Barnett Engineering Ltd.'s facility shall be borne on account of buyer.

1.1 Consequential Damages

Barnett Engineering Ltd. shall not be liable for any incidental or consequential damages incurred as a result of any defect in any equipment sold hereunder and Barnett Engineering Ltd.'s liability is specifically limited to its obligation described herein to repair or replace a defective part or parts covered by this warranty.

1.2 Exclusive Warranty

The warranty set forth herein is the only warranty, oral or written, made by Barnett Engineering Ltd. and is in lieu of and replaces all other warranties, expressed or implied, including the warranty of merchantability and the warranty of fitness for particular purpose.