ProTalk FLX

ALARM REPORTING UNIT

OPERATOR'S MANUAL

Rev. 1.04
February 2004

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Chapter 1 Overview

The purpose of this chapter is to give you an overview of the capabilities of the ProTalk FLX. 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 FLX. For more details on the configuration screens and specific parameters, refer to Chapter 6 - Configuration.

1. What kind of a system do you have?

The B1280 FLX uses various input signal modules to obtain readings and conditions. Programming of the system should begin with the configuration of the installed I/O modules; this is done in the Hardware section. The pull-down Hardware menu provides a choice of main and expander chassis. In most cases the main chassis will be the only one installed.

Throughout this description there are references to inputs and points. Inputs are related to the hardware module and are usually the signal on a particular pin, although they can also be registers derived from the input pins as in the case of the VSWR readings on the RF power module. Points are the alarms that are set up to operate from the information obtained with an input. They may also be defined as control outputs. The FLX is capable of handling 240 points; each can be set to work from any available input or output.

There are two stages involved in the setup of the system: configuration of the installed hardware modules and then setup of the alarm points. The hardware section is done first because there are several parameters that are specific to the inputs. In the point configuration it is possible to have several points operate from a single hardware input. An example would be where major and minor alarm level alarms are required on an analog point. Since multiple points can access one input, it is not possible to allow any hardware changes in a point setup because this would affect other points using the same input.

Each digital input board monitors 16 points, which may be configured as standard digitals, watchdog timers, interval timers or totalizers. The following parameters must be specified: normally open or normally closed input, debounce time, type of transition for watchdog timers and totalizers, resolution for an interval timer, and time-out interval for a watchdog. There are two types of

digital input boards: D1 which operates from ground closures, and D2 which may be configured to operate from AC or DC voltages as well as ground closures.

Analog input boards monitor eight 0-5 or 0-10 volt inputs, plus dedicated points for positive voltage, current, and negative voltage. Input voltage and the use of enable inputs to qualify the readings must be specified.

RF input boards monitor eight external directional couplers for forward or reflected power. Sensor type and the use of PTT inputs to qualify the readings must be specified. VSWR readings may be derived from forward and reflected power readings.

In addition, the main processor board automatically monitors the power supply voltage and the temperature. Alarm points may be derived from these inputs. The board also includes a microphone which can be enabled for remote monitoring of audio at the site via radio or telephone.

There are two types of control output boards available, the C1 which provides 16 open-collector drivers, and the C2 which provides four form C relay contacts and four form A or form B relay contacts. You must specify in the hardware section whether each output operates from on / off codes, or, if timed, the interval for which it is to operate.

The FLX 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, for identification on the LCD, and in alpha-numeric pages. This parameter is set in the General Configuration window.

Use the Program window to program the site voice identifier after the configuration has been entered.

If you have purchased the M2 version, the ProTalk FLX may also be monitored and controlled via a data port using the Modbus protocol. For more information on digital operation, refer to Chapter 3, section 3. Communication parameters for the data port are specified in the General Configuration window.

2. What constitutes an alarm?

The next step in configuring the FLX is to define what constitutes an alarm. Inputs may be of several types: Digital, Watchdog Timer, Interval Timer, Totalizer, Analog, RF Power, VSWR, and internal analogs such as Power Supply voltage and current, and temperature.

A digital point has two states, normal and alarm. The FLX looks for an on or off condition at the input 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.

Totalizers and Interval timers, although they originate from the digital input module, are a treated as analog points. These points never alarm as they do not have setpoints. However, their accumulated values will be announced whenever the unit is interrogated.

A Watchdog timer produces an alarm when its input is not changed during the programmed time interval. The result is the same as a digital alarm.

Note that some inputs in the FLX are dedicated, e.g. the Power Supply and temperature inputs on the processor board, +/- V and current on each analog board, and the VSWR readings on the RF input boards.

For an analog point, the FLX reads a voltage from the instrument, and converts it in the analog input card to an 8-bit digital reading. The FLX 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 FLX 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 FLX.

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

In addition to a voice identifier, each point should be programmed with a 16 character alpha-numeric name. This name will be displayed when scrolling through points on the front panel of the FLX, when programming the voice message, or when alarms or control operations 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 all Points

Alarm Name	16 character alpha-numeric
Alarm State	momentary or latched
Active	enabled or disabled

for Analog Points

Minimum Decimal	engineering units minimum value
Maximum Decimal	engineering units maximum value
Minimum Binary	input card minimum value
Maximum Binary	input card maximum value
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

for Totalizer Points

Decimal Place	where decimal point is placed in the total

for RF Points

Sensor Range	range of external directional coupler

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 FLX to do when it receives an alarm?

The third step in configuring the FLX is to decide how you want it to respond when it receives an alarm. The FLX goes through a series of instructions called a directory. You may configure the FLX 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 a paging terminal or sending paging frequencies over the radio
- activate another device by sending DTMF codes

or any combination of the above. Up to 20 sequences of activities can be entered into each directory. Six unique directories are allowed, which may be used by different groups of alarms or different shifts. Refer to chapter 6 - Configuration 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 FLX 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 FLX 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 FLX 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 FLX 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 FLX 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 FLX 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]2381234 [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:

Dial Tone Detect - 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. Announces the voice message three times, each time followed by a five second wait for the Acknowledge Code.

[WAIT] Causes the FLX 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.

[ANSWER] Causes the FLX to monitor for call progress indication.

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 FLX 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 FLX 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 FLX. Alternatively, the shift may be programmed to change automatically by means of a seven day, twenty-four hour clock. The shift may also be changed with a Modbus write command to the data port.

The Shift Change Code may be issued over radio or telephone. Receiving the Shift Change Code causes the FLX to advance to the next shift. The FLX 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 FLX 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 FLX 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 Time Clock, 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 FLX 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 FLX 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 FLX 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

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

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

In the above example, the FLX dials the paging terminal at 255-9545, then activates the modem to send the page data and perform handshaking with the terminal. The FLX automatically inserts the paging service 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 paging service code and password must be specified in the General Configuration screen to use this feature.

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

5.1 Acknowledging Alarms

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 FLX prompts the called party to "Enter Acknowledge Code" after the alarms have been announced. The FLX waits five seconds to receive the code, then proceeds to its next message repetition or directory instruction.

The FLX is normally acknowledged by sending the Acknowledge Code, a one- to seven-digit DTMF code, over the radio or telephone. (The FLX may also be acknowledged from the front panel, or with a Modbus write to the data port.)

If you enter the Acknowledge Code followed by an octothorpe (#), the FLX acknowledges the alarms for a programmed interval of time. When the time expires, the FLX 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 FLX 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 FLX 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]
```

5.2 Sending Remote Control Commands

You may also respond to an alarm condition by operating control outputs at the site. The FLX will operate relays or open collector drivers by decoding commands received over radio or telephone. If you have the M2 option, they may also be controlled with Modbus write commands to the data port. Outputs are specified in the hardware section to operate from on/off codes or for timed intervals. The remote control code is a seven-digit DTMF code consisting of the three-digit Control Code, a three-digit point number, plus a "1" for On or a "0" for Off.

Remote control commands may be sent over radio anytime the FLX is not reporting alarms. Whenever a control is operated, the FLX provides verbal confirmation by announcing the name of the output followed by the word "On" or "Off".

Commands may be sent over telephone either when the FLX calls you to report an alarm or when you dial it. When the FLX calls you, it will prompt you to "Enter Acknowledge Code". At this point you have five seconds to enter a command, such as a Remote Control code (or Acknowledge, Interrogate or Change Shift). The unit responds with the status of the output, then prompts you to enter another command. If no further digits are received, the FLX hangs up. Similarly, when you call up the FLX and enter the appropriate access code, it will prompt you to enter a command.

Specify a three-digit DTMF Control Code in the General Configuration screen if you wish to send remote control commands. Individual points must be specified as outputs and enabled.

6. What if the alarm is not acknowledged?

If the FLX 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 FLX 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 FLX to do when you call it up?

In addition to dialling out to report alarms, the FLX will also answer the telephone line when you dial it up. This allows you to acknowledge alarms, interrogate the unit, change the shift, operate control outputs or monitor audio at the site. You can control whether or not the FLX 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 FLX 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 FLX 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 FLX will answer the phone but will not say anything; it will wait ten seconds for the proper Access Code, then hang up.

The FLX 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 FLX announces the name of the point only if it is alarming. For interval timers and totalizers, the name of the

point is announced followed by the accumulated quantity. For analog points, the FLX announces the name of the point, its status ("High", "Low" or "Normal"), followed by its reading, complete with units. The FLX also announces the status of the control outputs, speaking the name of the point followed by "On" or "Off".

Points must be enabled in order for them to be interrogated. To monitor audio at the site over radio or telephone, assign a point to the Audio Monitor output on the processor board. 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.

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

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

In addition, if you wish to interrogate or acknowledge the FLX, you must enter one- to seven-digit Interrogate and / or Acknowledge Codes in the Group Configuration screen. To allow remote control, enter a three-digit Control Code in the General Configuration screen.

If you have the M2 version, raw data in the FLX registers may also be interrogated by sending Modbus read commands over the data port.

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 FLX by assigning alarms to different groups. The maximum 240 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 FLX.

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 FLX, 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 FLX. 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 FLX 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 FLX activity?

The activity of the ProTalk FLX 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 2 Specifications

The ProTalk FLX monitors and reports alarm conditions of all types: digital, analog, RF power, totalizers and loss of event. Alarms are reported as voice announcements over the telephone line or a radio port. The FLX may also be interrogated to announce the actual value of all monitored points in engineering units. Output modules for remote control are available.

If you have purchased the M2 version, the FLX may also be monitored and controlled as a Modbus slave using an RS232 serial port.

The FLX is configured using Windows 95 software supplied with the unit. All programmable settings can be saved to disk as a permanent record.

1. Chassis

Holds one control module and five I/O modules; two expander chassis may be added, each with five module slots.

Dimensions	19" rack mount, 3.5" high, 6" deep
Power	11 to 28 VDC or 120 VAC Integral battery charger

2. Control Module

B1280M1 - basic voice alarm reporting unit
B1280M2 - enhanced unit with Modbus capability

Provides the reporting interface that transmits alarm and measurement information.

Display	2x16 LCD and status indicator LEDs
Controls	Selector pushbuttons with menu access
Telco Port	RJ11 with modem
Data Port	DB9, RS232 serial
Program Port	DB9, RS232 serial - also used to print out activities
Alarms	Ambient temperature -40°C to +60°C, announced in either Celsius or Fahrenheit degrees, high and low alarm setpoints DC power supply voltage, announced in volts, high and low setpoints

Voice Storage	Flash memory, 5 minute capacity
Radio Port	RX audio, TX audio, PTT and COS 2 and 5 tone paging
Speaker	Internal with volume control
Microphone	Internal with built-in compression amplifier, for remote monitoring of site audio

3. Digital Module

B1280D1 - ground closure
B1280D2 - ground closure, AC or DC voltage

Each of the 16 inputs can be individually configured for one of the following functions:

Alarm Conventional alarm detection
- Normally open or normally closed inputs
- Latched or momentary
- 10 msec to 18.2 hr debounce in 10 msec or 1 sec steps

Totalizer Counting from devices such as flow meters
- Maximum count of 65535 before rolling over to zero

Interval Time measurements (duration)
- Maximum interval 655.35 sec or 655.35 min

Watchdog Monitoring for a loss of a periodic function such as tower strobe lights
- 10 msec to 18.2 hr timeout in 10 msec or 1 sec steps

4. Analog Module

B1280A1

Provides 11 analog points that can have high, low or both alarm setpoints.

Analog Inputs 8 general purpose, 0 to 5 VDC or 0 to 10 VDC
- Positive power supply 0 to +20 VDC
- Negative power supply -30 VDC to -60 VDC
- Positive current, range dependent on external shunt

Enable Inputs 2 ground closure inputs that can be used to qualify an analog reading only when the input is active

5. RF Power Module

B1280R1

Provides 8 RF inputs which can be programmed as forward power, reflected power or VSWR monitors.

RF Inputs 8 RF power sensors for connection to external directional couplers; either diode (0.7 volt) or square-law (5 volt) type couplers can be used.

PTT Inputs 8 PTT sense inputs for detecting transmitter activity - for use with forward and reflected power measurements.

Supported power sensors are:

Decibel 350W and 1000W
Zetron 100W and 400W
Celwave 500W
Sinclair 990W with expanded 20W scale

6. Output Module

B1280C1

Provides 16 open collector outputs that can be remotely operated by DTMF codes (or Modbus commands with the M2 control module).

Outputs 16 open collector drivers
0.5 A at 50 VDC
Programmable for latched or timed operation

B1280C2

Provides 8 control relay outputs that can be remotely operated by DTMF codes (or Modbus commands with the M2 control module).

Outputs 4 form C relay contacts, 4 form A or B relay contacts
0.5 A at 30 VDC
Programmable for latched or timed operation
Programmable for reset on power-up

Chapter 3 Device Operation

1. Hardware

1.1 Main Board

1.1.1 B1280M Module Description

The B1280M is a plug-in module for use with the FLX chassis. It provides the processing and communications interface between the installed I/O modules and the various ports used to transmit the alarm conditions or analog readings. The board contains the voice components which allow the FLX to annunciate the alarms and values over the telephone system or on a mobile radio system. DTMF, 2 tone, 5 tone and alpha-numeric paging signals are generated from this module. It also includes ports for connection to telephone line or radio, connector for voice programming, a connection for PC programming which doubles as a printer port, and an RS232 serial port for transmission of Modbus data. The latter is enabled only if the M2 version of firmware is purchased. Refer to Figure 3-1 for the front panel layout.

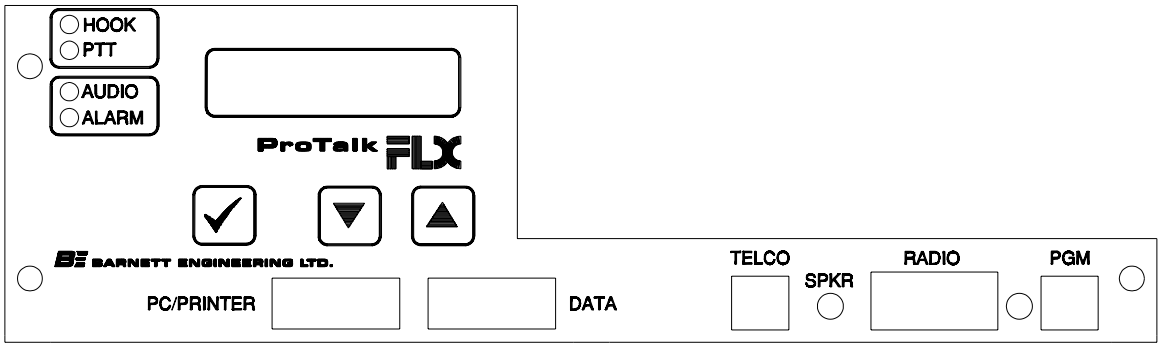


Figure 3-1 B1280M Front Panel

The front panel has an LCD display and switches that allow the system to be monitored and controlled through a menu selection process.

Communications with the I/O boards are carried through a 10-pin connector that mates with the motherboard.

FEATURES

- operates from input DC power sources between +12 and +25 VDC

- operates from an AC adapter
- on-board battery charger for use with an external battery
- programmed using Windows 95/98 software supplied with the unit
- built-in battery monitor including readings of the voltage
- built-in ambient temperature monitor
- built-in microphone for remote monitoring of audio
- telco port for dial-up reporting or call-in queries
- serial printer port
- serial data port
- 240 programmable alarm points; each can be assigned to any of the available inputs or outputs
- electronically adjustable level settings
- radio port
- built-in speaker

1.2 Input Boards

1.2.1 Digital Inputs

B1280D1 MODULE DESCRIPTION

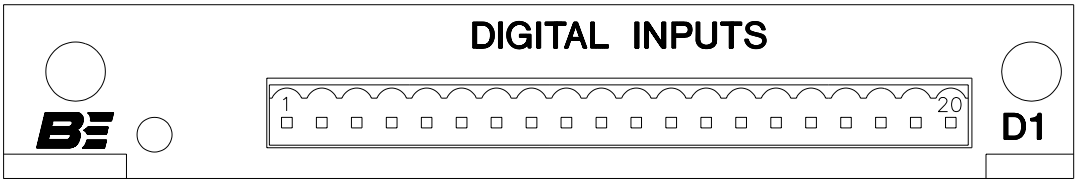


Figure 3-2 B1280D1 Front Panel

The B1280D1 is a plug-in module for use with the FLX chassis. It provides 16 programmable digital inputs that can be alternately configured as totalizers, interval timers and event watchdog timers. Connections to the module are made through the plug-in terminal block located on the front panel. Refer to Figure 3-2 for the layout. There are 16 optically coupled inputs, two ground return pins and the drive voltage for the isolators. The isolators can be powered either by the internal 5 volt supply or from an external voltage source. If an external source is used, it should not be any greater than +12 VDC.

The front panel run LED indicator flashes continuously when the module is operating.

Power and communications with the processor board are carried through the 10-pin connector that mates with the motherboard. Each card slot in the chassis has a unique connector code which is read by the installed module for communications addressing.

FUNCTIONALITY

Each of the 16 inputs can be individually programmed for one of the following types of operation:

Standard Digital Input

- used as an on / off type of alarm by the processor
- debounce interval: 0 to 18.2 hours in 10 msec or 1 sec steps
- normally open or normally closed alarm source

Totalizer

- used as an analog type of input by the processor with the current count available for viewing or annunciation. Inputs 15 and 16 have the capability of being externally reset by inputs 13 and 14 respectively. There is no alarm setpoint with this type of input.
- debounce interval: 0 to 18.2 hours in 10 msec or 1 sec steps
- choice of count modes
  - low to high changes
  - high to low changes
  - both

Interval Timer

- used as an analog type of input by the processor with the last recorded interval available for viewing or annunciation. There is no alarm setpoint with this type of input.
- debounce interval: 0 to 18.2 hours in 10 msec or 1 sec steps
- normally open or normally closed count source
- resolution 0.01 sec or 0.01 min

Watchdog Timer

- used as an on / off type of alarm by the processor. Each time that a reset occurs on the input, the watchdog interval timer is reloaded. If the reset signal does not occur within the watchdog interval, the alarm is set. A subsequent reset signal will clear the alarm indication in the B1280D module. If this event is to be latched when it occurs, select the latch option in the point programming.
- debounce interval: 0 to 18.2 hours in 10 msec or 1 sec steps
- choice of reset modes
  - low to high changes
  - high to low changes
  - both
- watchdog interval: 0 to 18.2 hours in 10 msec or 1 sec steps

B1280D2 MODULE DESCRIPTION

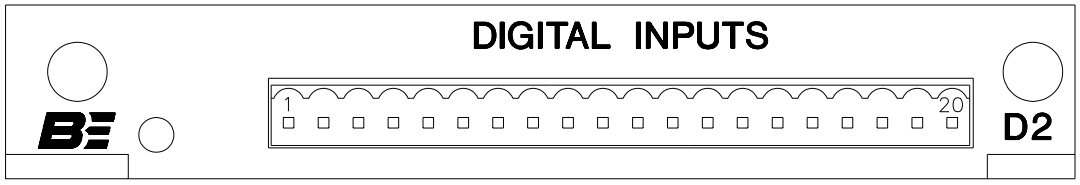


Figure 3-3 B1280D2 Front Panel

The B1280D2 is a plug-in module for use with the FLX chassis. It provides 16 programmable digital inputs that can be alternately configured as totalizers, interval timers and event watchdog timers. Connections to the module are made through the plug-in terminal block located on the front panel. Refer to Figure 3-3 for the layout. There are 16 optically coupled inputs, which may operate from DC voltages, AC voltages, or ground closures. The voltage range (specified at the time of order) may be 24 volts, 120 volts or 240 volts. The inputs are divided into four sections, each with its own optical power input. Depending on how the power input is wired, the inputs can operate in different ways:

- as ground closures if the power input is attached to a positive DC voltage
- as DC voltage inputs if the power is attached to ground
- as AC voltage inputs if the power input is attached to common

Each of the four input sections can operate independently; however, all inputs must comply with the voltage range for the module.

The front panel run LED indicator flashes continuously when the module is operating.

FUNCTIONALITY

Each of the 16 inputs can be individually programmed as a standard digital input, totalizer, interval timer, or watchdog timer. Programming criteria are identical to those for a D1 board.

1.2.2 Analog Inputs

B1280A MODULE DESCRIPTION

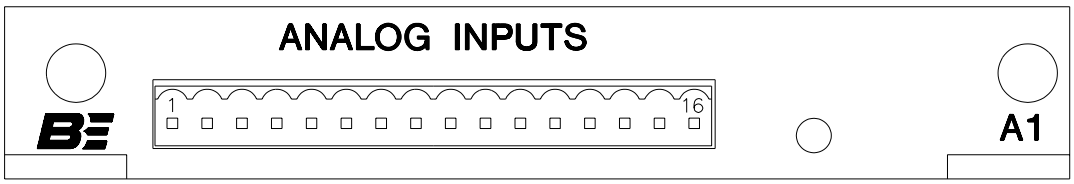


Figure 3-4 B1280A Front Panel

The B1280A is a plug-in module for use with the FLX chassis. It provides 11 programmable analog inputs. Connections to the module are made through the plug-in terminal block located on the front panel. There are eight general purpose inputs with individual range settings of 0 to 5 VDC or 0 to 10 VDC. One input is available for voltage monitoring with a range of 0 to 20 VDC. With an external shunt resistor, the supply connected to the voltage input can also be monitored for current flow. The range of the current sensor is dependent on the value of the shunt resistor. Negative voltages in the range of -30 VDC to -60 VDC can be monitored on the last input. Refer to Figure 3-4 for the front panel layout.

The front panel run LED indicator flashes continuously when the module is operating.

Power and communications with the processor board are carried through the 10-pin connector that mates with the motherboard. Each card slot in the chassis has a unique connector code which is read by the installed module for communications addressing.

FUNCTIONALITY

Each of the inputs can be conditioned with either of the two enable inputs. By selecting this option, the recorded value will be valid only for the time that the enable is active. When the enable is removed, the module retains the last reading.

1.2.3 RF Inputs

B1280R MODULE DESCRIPTION

The B1280R is a plug-in module for use with the FLX chassis. It provides eight programmable RF power sensor inputs. Connections to the module are made through the phono connectors and the plug-in terminal block located on the front panel. Each of the eight inputs can be programmed as either forward or reflected power monitors. In addition to the eight basic power inputs there are four internal points that can be selected as VSWR monitors. When these points are

used, they are set to use input pairs 1 and 5, 2 and 6, 3 and 7 and 4 and 8 as forward and reflected power sensors respectively. There are eight PTT inputs that can be used in conjunction with the power readings. When the PTT conditioning is enabled, power readings are taken only when the transmitter is active. The last reading is stored until it is updated by a new reading. Refer to Figure 3-5 for the front panel layout.

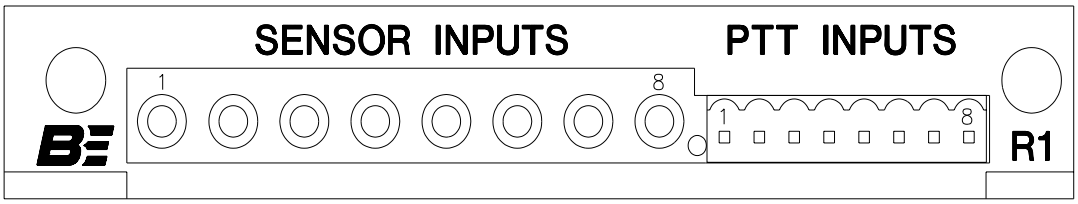


Figure 3-5 B1280R Front Panel

The front panel run LED indicator flashes continuously when the module is operating.

Power and communications with the processor board are carried through the 10-pin connector that mates with the motherboard. Each card slot in the chassis has a unique connector code which is read by the installed module for communications addressing.

When the RF inputs are sampled, eight consecutive measurements are made and the average of these measurements is considered the current value. Each forward or reflected power input may be qualified with a PTT input, such that the RF input will be sampled only if the PTT input is asserted. It is recommended that PTT qualifiers always be used with forward power measurements; otherwise, transmitter power will be sampled at timed intervals without regard for whether the radio is keyed.

Each VSWR RF input is qualified with a minimum forward power level. Different types and ranges of RF sensors may be selected. The forward input is measured periodically and if it is above the threshold, the reflected input is measured and the VSWR calculation done. The inputs are sampled continuously whenever a PTT is activated. The power readings must be consistent for eight consecutive readings before the VSWR reading is updated, to account for fluctuations during power-up and power-down. The last valid VSWR calculation and power readings are saved until a change is detected.

FUNCTIONALITY

Each input can be programmed to accept sensor signals from Decibel, Celwave, Zetron and Sinclair directional couplers. Power ranges up to 1000 watts are available.

1.3 Output Boards

1.3.1 Remote Control

B1280C1 MODULE DESCRIPTION

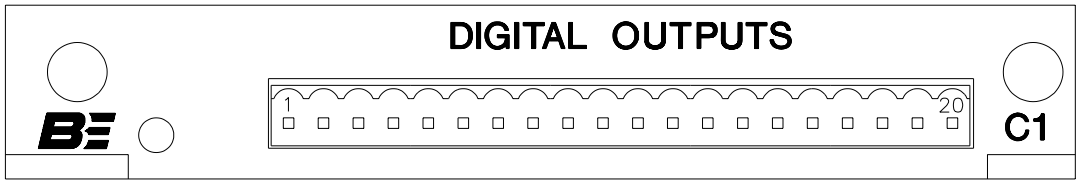


Figure 3-6 B1280C1 Front Panel

The B1280C1 is a plug-in module for use with the FLX chassis. It provides 16 programmable digital outputs. Connections to the module are made through the plug-in terminal block located on the front panel. Refer to Figure 3-6 for the front panel layout. There are 16 open collector drivers which will sink 0.5 A at 50 VDC. Flyback protection diodes may be enabled in the output drivers if the module is used with inductive loads.

The front panel run LED indicator flashes continuously when the module is operating.

Power and communications with the processor board are carried through the 10-pin connector that mates with the motherboard. Each card slot in the chassis has a unique connector code which is read by the installed module for communications addressing.

FUNCTIONALITY

Each of the outputs can be programmed for latched or timed operation. Timed operation may be from 0 to 18.2 hours in 10 msec or 1 sec steps.

B1280C2 MODULE DESCRIPTION

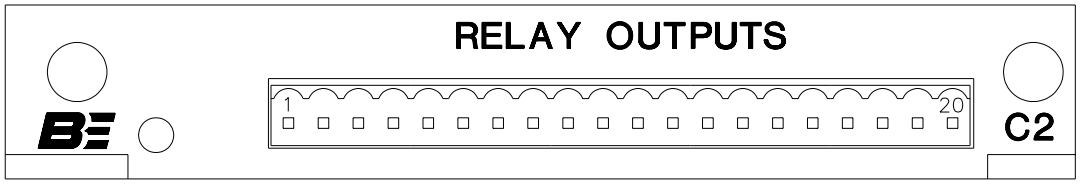


Figure 3-7 B1280C2 Front Panel

The B1280C2 is a plug-in module for use with the FLX chassis. It provides eight programmable relay outputs. Connections to the module are made through the plug-in terminal block located on the front panel. Refer to Figure 3-7 for the front panel layout. Relays 1 through 4 are available at the connector as form C outputs. Relays 5 through 8 can be configured as either normally open or normally closed outputs.

The front panel run LED indicator flashes continuously when the module is operating.

Power and communications with the processor board are carried through the 10-pin connector that mates with the motherboard. Each card slot in the chassis has a unique connector code which is read by the installed module for communications addressing.

FUNCTIONALITY

Each of the outputs can be programmed for latched or timed operation. Timed operation may be from 0 to 18.2 hours in 10 msec or 1 sec steps.

2. Voice Operation

The ProTalk FLX continuously monitors its input cards, which can be digital, analog or RF. When an alarm condition is detected, the FLX announces a user-programmed voice message for that point. Points monitored are of several varieties: digital, analog, totalizer, interval timer, watchdog timer, or RF. For a status point, the FLX recognizes an on-to-off or off-to-on transition in the input as an alarm condition. For analog points, exceeding high or low setpoints is recognized as an alarm. Totalizer points do not alarm but announce an accumulated total when interrogated.

Alarms are announced in a manner determined by the programming of the FLX 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.

The ProTalk FLX also decodes commands, so that the user may acknowledge or interrogate the unit, or operate controls at the remote site.

Note that alarms are latched at the time they are received, meaning further changes will not be registered until the FLX has reported the initial alarms. When you receive an alarm report, use the Interrogate Code to determine the most recent value of a point.

2.1 Reporting Alarms

Alarms are reported according to a sequence of instructions programmed by the user. Announcements may consist of voice messages, paging or alert tones, DTMF codes, or a combination. Alarms can be formatted to repeat at intervals until they are acknowledged, or they may repeat a fixed number of times and then stop (automatic acknowledgement).

At the end of any voice message, the ProTalk FLX announces "Enter Acknowledge Code". At the end of a sequence, it waits for a programmed interval, then repeats the message. Between sequences, it checks to see if any DTMF codes have been detected. If the acknowledge code has been received, it acknowledges the alarms and stops the reporting sequence. If an interrogate code has been received, it announces the status of any digital points in the alarm condition, plus the value of all analogs. The FLX inhibits alarm reporting while the unit is responding to an interrogation. If a relay code is received, the FLX opens or closes the relay as instructed and then continues with the alarm reporting sequence.

If the unit has been programmed to report only new alarms then only unacknowledged alarms will be spoken. Otherwise all alarms that are not in the normal state will be spoken.

2.1.1 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 FLX 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. Codes may be included to activate two-tone or five-tone pagers over the radio.

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

When reporting an alarm, the FLX asserts the PTT and waits for the programmed warm-up time before transmitting. PTT is held on until the message is complete.

Voice, DTMF and paging tones each have their own, independently adjustable audio level.

2.1.2 Announcing Alarms over Telephone

When the directory specifies telephone dialling, and call progress monitoring is enabled, the FLX goes off hook for 500 msec and listens for dial tone. If dial tone is not present, the FLX hangs up and tries again. After three unsuccessful attempts to detect dial tone, the FLX 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 FLX 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 FLX proceeds to the next instruction. 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 FLX 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 FLX 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 FLX hangs up after five seconds.

If the FLX 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 FLX 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 FLX retries the list at intervals specified by the Long Timer. The FLX 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 FLX will simply dial out and announce its alarms without monitoring the telephone line. In addition, the FLX may be programmed to announce the alarm a number of times over radio, or public address system, before it starts dialling on the telephone.

2.2 Acknowledging Alarms

The ProTalk FLX will continue announcing the presence of alarms until it is acknowledged. Each group of alarms has its own Acknowledge Code. If points are alarming simultaneously in more than one group, the FLX will report the alarms one group at a time until they are acknowledged. Alarms may be acknowledged by several methods.

2.2.1 DTMF Acknowledge over Radio or Telephone

The most common method of acknowledging alarms is to send a DTMF code over radio or telephone to the site.

When the FLX 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 FLX 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 FLX 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 measured value for each point will be announced. You have five seconds to interrogate the FLX after the "Alarms Acknowledged" announcement before it hangs up. Alternatively, you may redial the FLX and enter the Interrogate Code.

ACKNOWLEDGE CODE

The acknowledge code may be from 1 to 7 DTMF digits. When the FLX decodes these digits, it halts the alarm-reporting sequence for that group. The code is assigned using the Group Configuration screen described in Chapter 6, section 3.4.

TIMED ACKNOWLEDGE

The FLX may also be temporarily acknowledged by sending the acknowledge code followed by the # sign. Receipt of this code will halt the reporting of alarms for the time interval programmed in the General Configuration screen. If alarms are still present after the expiry of this timer, the FLX will resume the normal alarm-reporting sequence.

2.2.2 Front Panel Acknowledge

If you are present at the site, alarms may be acknowledged from the front panel.

ACKNOWLEDGE ALL ALARMS

In its default mode, the LCD displays the time and local operation. Press the Select switch (✔) while this message is displayed to acknowledge all alarms which are present. Refer to section 4.0 for a detailed description of the front panel operation.

ACKNOWLEDGE GROUPS OF ALARMS

Pressing the ▼ switch on the front panel enables you to scroll through the groups on the FLX. An individual group may be acknowledged by pressing the ✔ switch when the group name and status (ALARMING) are displayed.

2.2.3 Auto Acknowledge

The FLX may be programmed to announce its alarms and then automatically acknowledge itself. Refer to Chapter 6, section 3.6, for instructions on how to program an alarm-reporting sequence with the "Auto Ack" code at the end. Where required, "Auto Ack" must be enabled in the Group Configuration screen for each group using that directory.

2.3 Interrogating the FLX

2.3.1 Interrogating over Radio

The FLX may be interrogated by sending a 1 to 7 digit DTMF code over radio. Each group of alarms and relays has its own individual Interrogate Code, set in the Group Configuration screen. When the unit detects this code, it announces the site ID, the group ID, the name of all digital points in the alarm condition, the value of all analog points, and the status of any relays used in that group. To interrogate other points in the FLX, enter the Interrogate Code for their unique group.

2.3.2 Telephoning the FLX

With Level 1 (minimum) security programmed, when you call the FLX 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 FLX 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 Control Code. The FLX 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 FLX gives you access to the data. With Level 2 security, the FLX announces its Site ID, and then you must

enter the password. With Level 3 security, the FLX makes no announcement when it answers the phone. You must enter the Access Code within ten seconds or the FLX will hang up.

2.4 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.

2.4.1 Shift Change over Radio or Telephone

The shift may be changed by sending a one- to seven-digit DTMF Shift Change Code over radio or telephone. If connected to a radio, the ProTalk FLX monitors the channel constantly, so the code may be entered anytime when the FLX is not making a voice announcement. Over telephone, the code may be entered when you call the FLX, after you hear the "Enter Command Code" prompt. You may also enter the Shift Change Code when the FLX has telephoned you to report an alarm. When the code is entered, the FLX 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.

The Shift Change Code is assigned in the General Configuration window, described in Chapter 6, section 3.3.

2.4.2 Automatic Shift Change

The ProTalk FLX may also be configured to change the reporting shift automatically according to a time clock. Refer to Chapter 6, section 3.3, for information on setting the times for shift changes. Refer to Chapter 4, section 4.6, for information on setting the correct time and date from the front panel.

2.4.3 Front Panel Shift Change

If you are present at the site, the shift may be changed from the front panel of the FLX.

In its default mode, the LCD displays the time and local operation. Press the down arrow (▼) on the front panel to scroll through the groups on the FLX.

After the status of the last group, the LCD displays the message "Report using Shift x". Press the Select switch (✔) while this message is displayed to cycle through the shifts. Press the ▲ or ▼ arrow once the correct selection is displayed. Refer to section 4.0 for a detailed description of the front panel operation.

2.5 Remote Control

The ProTalk FLX is capable of providing control outputs in a variety of hardware configurations. Each output may be programmed to operate with an "On" and an "Off" code, or for a timed interval.

2.5.1 Remote Control Command

Remote control commands are seven DTMF digits in length and are derived as follows. The first three digits are the Control Code as defined in the General Configuration screen. The next three digits are the number of the point as defined in the Point Summary (with leading zeroes if required). The last digit is a "1" for On or a "0" for Off. When the ProTalk FLX receives this code, it operates the associated output and provides verbal confirmation by announcing the voice message programmed for that point, followed by the word "On" or "Off", e.g. "Pump Control On". When the FLX is interrogated, it also announces the status of the outputs.

2.5.2 Operating Outputs over Radio or Telephone

The ProTalk FLX monitors the radio channel at all times except when it is announcing alarms, so remote control codes may be entered at any time over the radio.

Remote control codes may be sent over the telephone either by dialling up the unit, or when it calls you to report an alarm. When you call the FLX, after you have entered the necessary access code, the unit will prompt you to "Enter Command Code". You have five seconds to begin entering DTMF digits. When the FLX calls you, it prompts you to "Enter Acknowledge Code". Once acknowledged, it prompts you to "Enter Command Code". The remote control code will actually be decoded after either prompt. It will announce the group name and the point name, followed by "On" or "Off", then prompt you again to enter a command or acknowledge code. If no further DTMF digits are received, it hangs up the phone.

2.5.3 Remote Monitoring of Audio

The Audio Monitor operates as a specialized remote control command. The processor board of the FLX is equipped with a microphone, which may be used to monitor audio at the site over radio or telephone. If assigned to a point, the

microphone may be turned on for a fixed interval, as with any other timed output. The command is derived from the Control Code in the General Configuration screen, and the number assigned to the point.

Unless it is making a voice announcement, the FLX monitors the radio channel constantly, so the Monitor Audio command may be entered at any time. When it receives the command, the FLX keys the push-to-talk, announces "Audio Monitor On" (or other user-programmed message), and activates the microphone for the interval specified by the hardware timer. During this time, any audio activity detectable at the site will be broadcast over the radio channel. Once the timer has expired, the FLX turns off the microphone and releases the radio push-to-talk. In a full duplex radio system, the FLX may detect a command to turn the Audio Monitor off, but will not act on it until the timer has expired.

Over telephone, the Monitor Audio command may be sent at the same times any other Remote Control command would be accepted, either when the FLX calls you to announce an alarm, or when you call it. When it detects this command, the FLX announces "Audio Monitor On" (or other user-programmed message), then turns on the microphone at the site for the interval specified by the hardware timer. The telephone line is held off hook for as long as the microphone is turned on. During this time, you will hear any audio activity detectable at the site. Once the timer has expired, the FLX prompts you to enter another command or acknowledge code. You may circumvent the operation of the timer by sending the corresponding "Off" command. The FLX announces "Audio Monitor Off" (or other user-programmed message), then prompts you to enter another command or acknowledge code. If no further DTMF digits are received, it hangs up the phone.

3. Modbus Operation

If you have the M2 version of the control module, the ProTalk FLX may also be monitored and controlled via a data port. All of the hardware I/O and voice alarm reporting features operate as previously described.

For data operation, the FLX is configured as a Modbus slave. When it scans its internal registers for the changes which represent alarms, the inputs may come from the installed hardware modules or they may be virtual inputs written to by Modbus. Raw data for any point may also be read over the Modbus port. Hardware outputs may be operated by DTMF commands over radio or telephone, or they may be operated by Modbus write commands to the associated point register. Special registers are available that allow you to detect an alarm condition, acknowledge groups, or change shifts.

The FLX accepts the following Modbus commands:

01	Read Coil Status	00001 to 00240

03	Read Holding Registers	40001 to 40244
05	Force Single Coil	00001 to 00240
06	Preset Single Register	40001 to 40241 and 40244
07	Read Exception Status	always returns 0
08	Loopback Diagnostic Test	echos transmitted command
15	Force Multiple Coils	00001 to 00240, maximum 240 coils
16	Preset Multiple Registers	40001 to 40241 and 40244, maximum 120 registers
17	Report Slave ID	always returns 255

Coils / registers ?0001 to ?0240 are associated with points 1 to 240. To interrogate a point, send a coil or register read command with the point address (address 1 to 240). A point must be enabled in order to be interrogated. A returned digital value is 0 or 1; a returned analog is 16 bits. The standard reading from an analog input card is 0 to 255 (only the least significant 8 bits contain data), although some derived points, such as totalizers, interval timers and RF power points, return a full 16-bit word. Note that these are unscaled binary readings. Refer to the calibration window for any analog point to determine the decimal range represented.

A write to any register (point) will attempt to modify the value of that point. If the point has been configured as a Modbus register, the data will be accepted. If the point has been configured to monitor a hardware input, the Modbus write will not be allowed. Note that an analog input from a Modbus register differs from a hardware analog input in that it has 16 bits and is signed; a hardware analog has only 8 significant bits and is unsigned.

An output can be modified with a Modbus write command to perform a remote control function. Any write that modifies an output point will trigger a voice announcement and a print-out of the change.

In addition to the 240 points, the FLX has four special registers which allow you to detect an alarm condition, acknowledge groups, or change shifts.

Registers 241, 242, and 243 values contain group weighted bits, i.e.

bit 01h = group 1 (lsb)
bit 02h = group 2
bit 04h = group 3
bit 08h = group 4
bit 10h = group 5
bit 20h = group 6
bit 40h = group 7
bit 80h = group 8 (msb)

group 8 MSB	group 7	group 6	group 5	group 4	group 3	group 2	group 1 LSB

Register 40241 is the Acknowledge register. You may read or write a value from 0 to 255 in this register. A read command will detect whether alarming groups have been acknowledged; a write command may be used to acknowledge alarms. Modbus acknowledge writes are interpreted the same as DTMF acknowledge commands and are logged on the printer as well as spoken.

Register 40242 is the Alarming register. It is a read only register. Returned values from 0 to 255 will indicate which of the eight groups has unacknowledged alarms present.

Register 40243 is the Group Enable register. It is a read only register. Returned values from 0 to 255 will indicate which of the eight groups are enabled.

Register 40244 is the Shift register. You may read or write a value from 0 (Shift 1) to 3 (Shift 4) in this register. A read command will detect which shift the FLX is using; a write command may be used to change the shift. Modbus shift change writes are interpreted the same as DTMF shift change commands and are logged on the printer as well as spoken.

4. Front Panel Indicators (LEDs)

Figure 3-1 shows the front panel of the ProTalk FLX. The following indicators are provided for monitoring the status of the unit:

Off Hook yellow LED lights when the FLX is off hook to dial a number or receive an incoming call

PTT yellow LED lights when the FLX is generating a Push-to-Talk signal to the radio

Audio green LED lights when the FLX is talking or receiving DTMF digits

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

In addition, each I/O module has a red Run LED which lights to indicate it is in communication with the main control module.

5. Printing a Log

To obtain a hard-copy or serial data record of the activity of the ProTalk FLX, connect the PC / Printer port to a serial printer or other device. The FLX will provide a time-stamped record of all FLX activity. Printer messages will be of the following format:

```
"MMM dd, yyyy", space, "hh:mm:ss", space, space, "16 char tag", space, "message"
```

where:

"MMM dd, yyyy = month, date, year
(month in capital letters, always a two digit date)
"hh:mm:ss" = time in 24 hr format
"16 char tag" = unit, group or point name
"message" = variable length message (see below)

The printed message will either be a system message with the unit tag printed, a group message with the group name printed, or an individual point message with the point name printed.

5.1 System Messages

Following is a list of the system messages which may be printed:

```
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "using shift 1"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "using shift 2"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "using shift 3"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "using shift 4"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "front panel change to shift 1"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "front panel change to shift 2"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "front panel change to shift 3"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "front panel change to shift 4"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "time change to shift 1"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "time change to shift 2"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "time change to shift 3"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "time change to shift 4"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "dtmf advance to shift 1"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "dtmf advance to shift 2"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "dtmf advance to shift 3"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "dtmf advance to shift 4"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "FLX RUN MODE HALTED!!!"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "FLX RUN MODE ENABLED"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "printer disabled"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "printer enabled"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "time change"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "time set"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "***** PROGRAM RESTART *****"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "answer incoming call"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "terminate incoming call"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "telephone access error"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "retry dial"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "dial failure"
"MMM dd, yyyy" "hh:mm:ss"  "16 char unit tag" "program mode"
```

5.2 Group Messages

Following is a list of the group messages which may be printed:

```
"MMM dd, yyyy" "hh:mm:ss"  "16 char group tag" "DISABLED"
"MMM dd, yyyy" "hh:mm:ss"  "16 char group tag" "ENABLED"
"MMM dd, yyyy" "hh:mm:ss"  "16 char group tag" "acknowledged"
"MMM dd, yyyy" "hh:mm:ss"  "16 char group tag" "timed acknowledge"
"MMM dd, yyyy" "hh:mm:ss"  "16 char group tag" "wait"
"MMM dd, yyyy" "hh:mm:ss"  "16 char group tag" "auto acknowledge"
"MMM dd, yyyy" "hh:mm:ss"  "16 char group tag" "radio transmission"
"MMM dd, yyyy" "hh:mm:ss"  "16 char group tag" "dial ###"
"MMM dd, yyyy" "hh:mm:ss"  "16 char group tag" "phone patch ###"
```

Note: "###" in the dial and phone patch message will be replaced by the actual digits programmed in the directory.

5.3 Point Messages

Following is a list of the point messages which may be printed:

```
"MMM dd, yyyy" "hh:mm:ss"  "16 char point tag" "remote change"
"MMM dd, yyyy" "hh:mm:ss"  "16 char point tag" "HIGH ALARM"
"MMM dd, yyyy" "hh:mm:ss"  "16 char point tag" "LOW ALARM"
"MMM dd, yyyy" "hh:mm:ss"  "16 char point tag" "ALARM"
"MMM dd, yyyy" "hh:mm:ss"  "16 char point tag" "normal"
```

6. Keeping Time

The ProTalk FLX has an internal clock used to time-stamp activities reported on the printer. Time is shown in the top line whenever the FLX is displaying its default mode. Set the clock from the Maintenance menu using the front panel switches (refer to Chapter 4).

Chapter 4 Panel Operation

The front panel of the FLX is shown in Figure 4-1. The panel contains a 2-line by 16-character liquid crystal display (LCD) and a 3-switch keypad. The switches, labelled ✔, ▼ and ▲ (OK, DN and UP), are used to control the menus on the LCD. If no keys are pressed for one minute, the display blanks and the menu is restarted from the beginning.

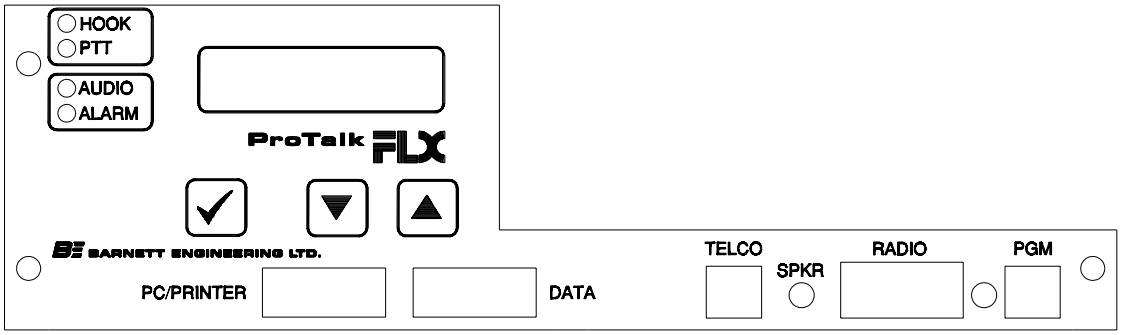


Figure 4-1 FLX Front Panel

Figures 4-2 and 4-3 are flowcharts showing operation of the front panel switches and menus. Menu categories are:

Time and Local Operation
Group Status
Shift
Maintenance Mode
- change run mode
- change printer mode
- change group enable
- monitor points
- adjust radio audio output level
- set date and time

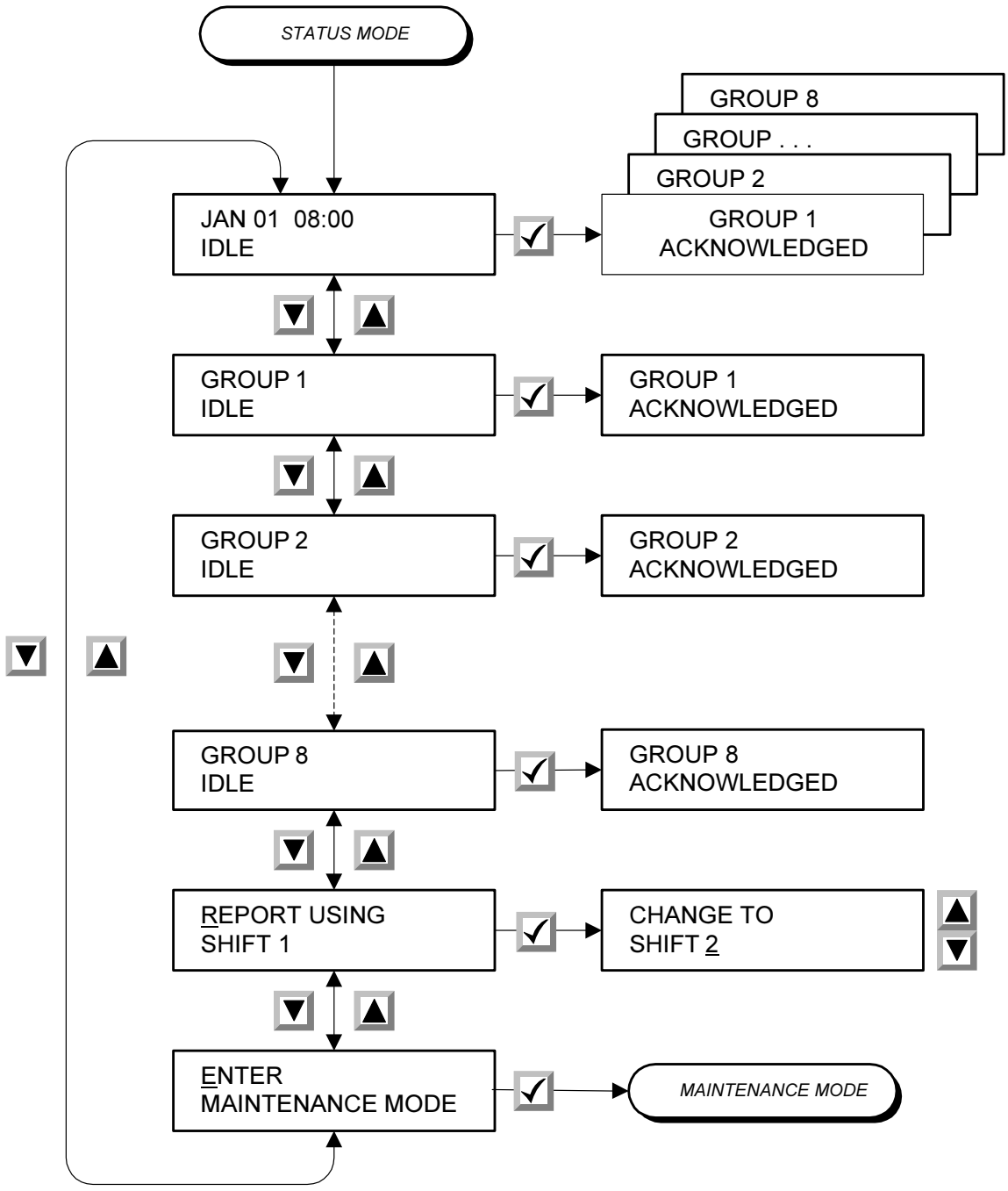


Figure 4-1 User Interface Status Menu

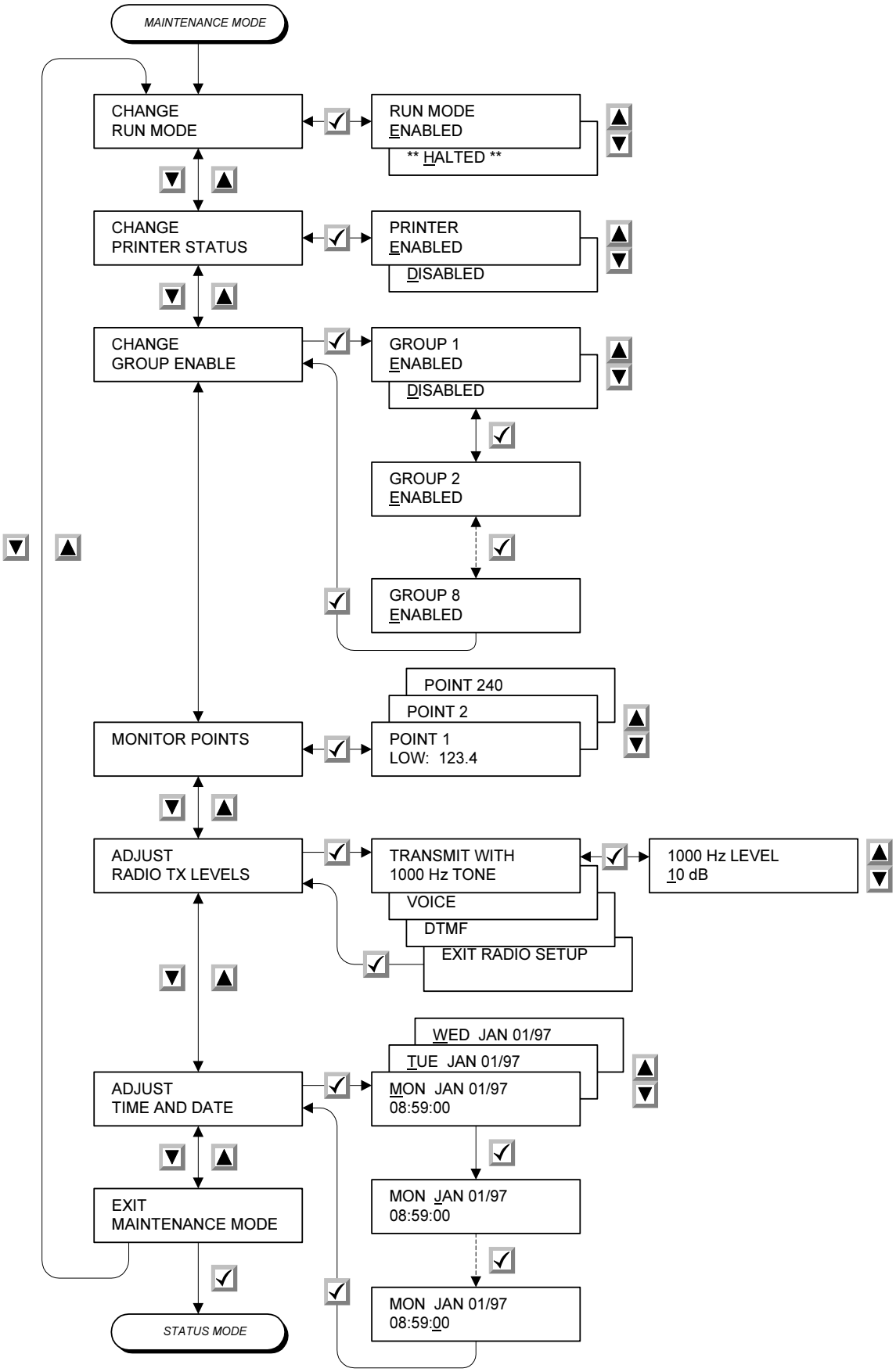
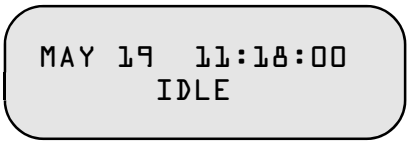


Figure 4-2 User Interface Maintenance Menu

In programming mode, the LCD and keys are used for voice recording. The LCD shows redefinitions for the three keys in the order of ✔, ▼ and ▲ (OK, DN, UP). The menus are [QUIT, NEXT, SELECT] for choosing voices and [EXIT, PLAY, RECORD] for recording voices.

1. Time and Local Operation

In its default mode the LCD displays time and local operation, as follows:



If no activity is taking place, the status line displays IDLE.

If the FLX is reporting an alarm, the status line displays the activity currently taking place, as per the following examples:

```
      IDLE
  ** HALTED **
RADIO TX
TX PHONE PATCH
WAIT
DTMF SIGNALLING
ALERT SIGNAL
TWO TONE SIGNAL
FIVE TONE SIGNAL
DELAY
ANNOUNCE ALARMS
REQUEST ACK
WAIT FOR ACK
AUTO ACKNOWLEDGE
COMMAND RECEIVED
INTERROGATE
ACKNOWLEDGE
TIMED ACKN
```

Each activity is displayed as it is carried out. When the FLX is waiting between sequences, it displays IDLE.

If the FLX receives a DTMF command, it displays Command Received, indicating the command was decoded. Then it displays the commanded action, e.g. Acknowledge, Interrogate, etc.

When the default line is displayed, press ✔ to acknowledge all groups. Press ▼ to advance the display to individual groups.

2. Group Status

The FLX shows the status of each of the input groups, displaying the alpha-numeric name of the group in the first line, and the status in the second line. Groups display the message Idle, Alarming, Acknowledged or Disabled.

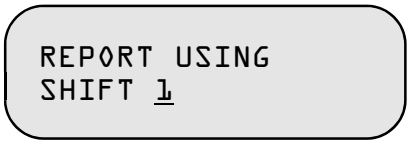
Individual groups may be acknowledged by pressing ✔ when the status of that group is displayed.

Scroll through the groups using the ▲ and ▼ buttons. When the last group is displayed, pressing ▼ advances you to the Change Shifts mode.

3. Change Shifts

.

The next menu item is the Change Shift function. The displayed message says "Report Using Shift x", with the cursor flashing under the first line of the display. Press ✔ to select this function. The cursor will then flash under the shift number, as shown:



Use the ▲ and ▼ keys to cycle through the choices, shifts 1 through 4. Press ✔ when the desired choice is displayed. The cursor will move back to the first line.

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

Hitting ▼ advances the LCD to the Maintenance Mode.

4. Maintenance Mode

When the following message is displayed, press ✔ to enter the Maintenance Mode. Press ▼ to return to the default display, or ▲ to go back to the Shift Change function.

Within the Maintenance Mode, press ▲ to select the previous parameter, ▼ to advance to the next parameter, and ✔ to edit the parameter displayed. The first item displayed is the Run Mode.

4.1 Run Mode

If the FLX is running, the LCD displays the following:

Press ✔ if you wish to change this parameter. The cursor will move to the second line. Use the UP / DN arrows to toggle between Enabled or Halted. Press ✔ when the desired setting is displayed, e.g.

Note: It is sometimes helpful to halt alarm reporting for testing or maintenance.

Press the ▼ arrow to advance to the Printer Mode.

4.2 Printer Mode

In Printer Mode, the LCD displays the following:

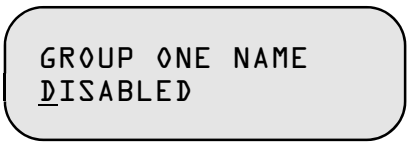
Press ✔ if you wish to change this parameter. The cursor will move to the second line. Use the UP / DN arrows to toggle between Enabled or Disabled. Press ✔ when the desired setting is displayed.

Press ▼ to advance to Group Enable mode.

4.3 Enable Groups

In Group Enable mode, the LCD displays the following:

Press ✔ to change which groups are enabled or disabled. {Press ▲ to return to the printer status, or ▼ to advance to Monitor Points.} The LCD will display the following:



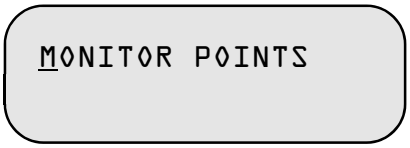
Use the ▲ or ▼ key to toggle between enabling or disabling the group. Press ✔ when the desired choice is displayed. The menu will automatically advance to the next group.

Once you have viewed the eighth group, pressing ✔ will return you to the original "Change Group Enable" message.

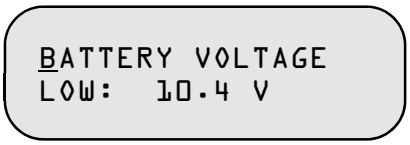
Press ▼ to advance to Monitor Points.

4.4 Monitor Points

When the LCD is displaying the following message, press ✔ to monitor individual points, ▲ to return to Group Enable mode, or ▼ to advance to Radio TX Level adjustment.



The FLX shows the status of each of the enabled input points, displaying the alpha-numeric name of the point in the first line, and the value in the second line. Digital status points display the message Alarming, Acknowledged or Normal. Analog points display the message Lo, Hi, Acked or Normal, followed by the most recently reported value for that point, e.g.



Press ✔ to acknowledge an individual alarm when the status of that point is displayed.

Scroll through all enabled points using the ▲ and ▼ keys. When you are finished, press ✔ to go back to the "Monitor Points" message. Press ▼ to advance to Radio TX Level adjustment.

4.5 Radio TX Levels

The output level to the radio may be adjusted from -48 to +4 dBm in 2 dB increments, or to MUTE. Transmit levels for paging tones, voice and DTMF are adjustable independently. The LCD displays the following:

Press ✔ to select this function.

4.5.1 Tone

The first message displayed is the following:

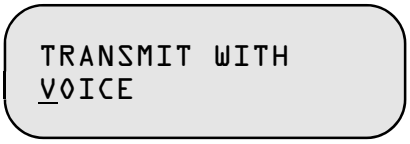
Press ▲ or ▼ to select voice or a DTMF tone. Press ✔ to transmit a 1000 Hz tone. The FLX will assert the PTT output and generate a continuous 1 kHz tone. The LCD displays the following:

Press the ▲ or ▼ switches to adjust the output level of the tone.

Press ✔ to stop sending the tone. The PTT will be released and the LCD will return to the "Transmit with 1000 Hz Tone" display. Press ▼ to adjust the level of the transmitted voice.

4.5.2 Voice

The next message displayed is the following:



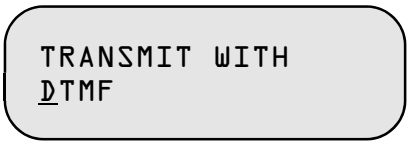
Press ✔ to transmit a voice message. The FLX will assert the PTT output and repeat the phrase "No Alarms" over and over. The LCD displays the following:

Press the UP / DN switches to adjust the output level.

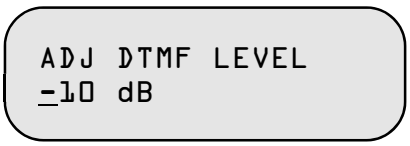
Press ✔ to stop sending the voice message. The PTT will be released and the LCD will return to the "Transmit with Voice" display. Press ▼ to adjust the level of the transmitted DTMF.

4.5.3 DTMF

The next message displayed is the following:



Press ✔ to transmit. The LCD will display the following:



The unit will assert the PTT output and generate a continuous DTMF tone.

Press the ▲ and ▼ switches to adjust the output level of the tone.

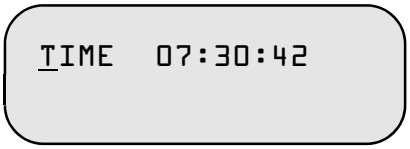
Press ✔ to stop sending the tone. The PTT will be released and the LCD will return to the "Transmit with DTMF" display. Press ▼ to display the following message:

Press ✔ to return to the initial display:

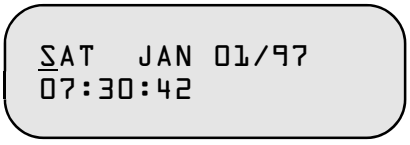
Once complete, press ▼ to advance to the time and date.

4.6 Date and Time

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

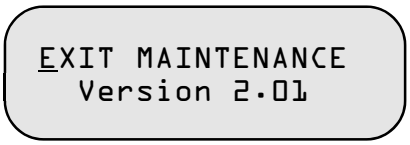


The display will advance to show the date and time, with the cursor flashing under the day of the week.



Press the ▲ and ▼ keys to scroll through the days of the week. Once the day is correct, press ✔ to advance the cursor to the month. If you wish to change the month, press the ▲ or ▼ switch until the correct setting is displayed, then press ✔. Use the ▲, ▼ and ✔ keys to advance through all fields of the time and date. Once the seconds are set, press ✔. The LCD will return to displaying the Time.

Press ▼ to advance the display to Exit Maintenance.



Press ▲ to go back to Time and Date, or ▼ to return to the Run Mode.

Press ✔ to exit the Maintenance Mode. The LCD will return to its default time and local operation display.

Chapter 5 Installation

The following instructions assume that a configuration has been created for the FLX and stored to a file. The file is then downloaded with a PC or laptop computer to the FLX once it has been installed. Alternatively, the FLX may be configured in the shop and then installed in the field. Flash memory retains the data and an internal battery runs the clock when power is removed.

1. Mounting

The FLX is designed for mounting in a 19" rack. Install the ProTalk FLX in a clean, dry place suitable for electronic equipment. The unit will operate over the temperature range from -20°C to +60°C.

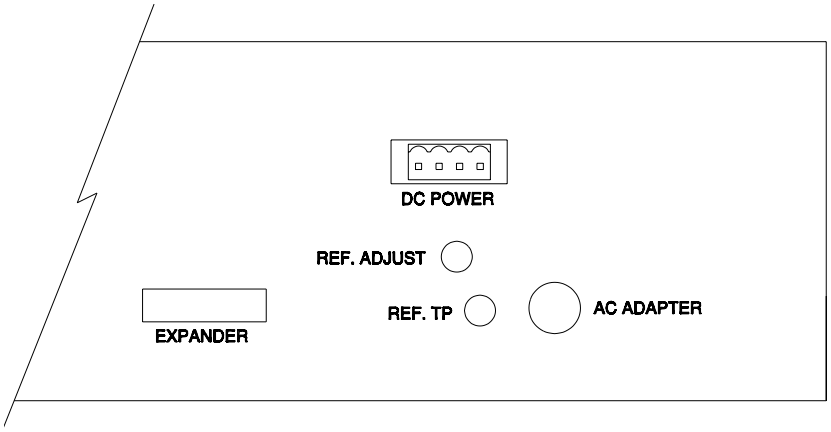


Figure 5-1 FLX Chassis Rear View

2. Connections

2.1 Rear Panel

The rear of the FLX is shown in Figure 5-1. If DC power is to be used, connect to the DC Power terminal block as shown in Figure 5-2. If an AC adapter is used, connect it to the AC Adapter plug. The adapter must supply 15 volts and have a centre ground connector. When the AC adapter is used, an external battery can be connected to the DC terminal block to provide backup power in the event of an AC failure. When all of the modules have been installed, adjust the reference voltage to read 5.00 volts at the test point. If expanders are being used, install the expander cable between the main chassis and the expander before power is applied.

1	+V 12 to 28 VDC
2	GND
3	+ BATTERY
4	- BATTERY

Figure 5-2
DC Power Connections

2.2 Control Board

The control module is present in all systems. The hardware is common to all models, but the board will have different versions of firmware installed depending on what is purchased.

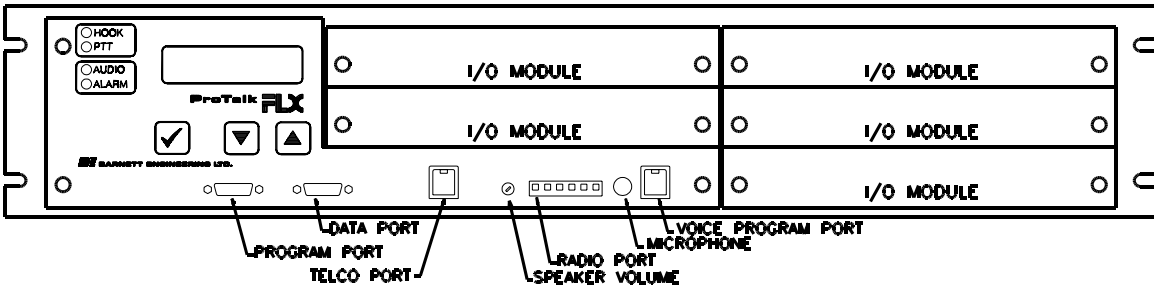


Figure 5-3 FLX Front Panel

2.2.1 Program Port DB9P

The program port is an RS232 serial interface that is used to transfer the configuration of the FLX to and from the programming PC. When it is not being used for programming, it operates as a serial printer output. Figure 5-4 shows the pinout of the Program and Data connectors.

2	RXD (to FLX)
3	TXD (from FLX)
4	DTR
5	GND
6	DSR
7	RTS
8	CTS

Figure 5-4
Serial Port Connections

2.2.2 Data Port DB9P

The data port is an RS232 serial interface used to provide communications with a Modbus system. The port is only operational if you have purchased the M2 version of the board.

2.2.3 Telco Port RJ11

This is the telephone line interface that is connected to the telco line at the site. The line should use 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 FLX.

2.2.4 Radio Port Terminal Block

The processor module has a radio port for connection to a mobile radio or other audio system such as public address. Connections for a mobile radio are shown in Figure 5-5.

1	COS
2	GND
3	PTT
4	RX AUDIO
5	TX AUDIO
6	N/C

Figure 5-5
Radio Port Connections

Connect the TX Audio line to the transmit audio of the radio, and RX Audio line to the receive audio in the radio. 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 PTT output 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 100 mA, 30 V.

The COS input is used to indicate to the FLX whether the radio channel is busy. It may also be used to inhibit transmission over a busy channel. Connect this point to the output of the radio's carrier-operated switch or relay (COS or COR). In its default condition, the FLX 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 FLX may be programmed to recognize the reverse polarity (see Chapter 6, section 3.3).

2.2.5 Voice Program Port RJ11

This port is used to program the voices into the FLX. A standard DTMF telephone set is used.

2.3 Digital Input Modules

2.3.1 B1280D1

Refer to Figure 5-6 for the connections to the digital module. Connect inputs to the first 16 terminals; pins 17 and 18 are ground, 19 is +5 volts and 20 is the opto-isolator supply. In most applications, pins 19 and 20 are connected together to operate the isolators from the internal supply. If the inputs are to be completely isolated from the FLX, apply an external power source, not exceeding 12 volts, to pin 20, and leave the 5 volt output at pin 19 unconnected.

Note that inputs 13 and 14 may be wired as external resets for totalizer inputs on pins 15 and 16 respectively.

TB		TB		TB		TB		TB	
1	I/P 1	5	I/P 5	9	I/P 9	13	I/P 13	17	GND
2	I/P 2	6	I/P 6	10	I/P 10	14	I/P 14	18	GND
3	I/P 3	7	I/P 7	11	I/P 11	15	I/P 15	19	5
4	I/P 4	8	I/P 8	12	I/P 12	16	I/P 16	20	OPTO

Figure 5-6 D1 Module Connections

Inputs to the module are ground closures with either dry contacts or open-collector transistors as the signal source. Do not connect alarm signals with a voltage present to the module inputs.

2.3.2 B1280D2

Refer to Figure 5-7 for the connections to the digital module. The voltage range for the module is specified at the time of order as 24 volts, 120 volts, or 240 volts. The 24 volt module will accept a range of from 5 to 50 volts. Inputs can operate in different ways depending on how the input power is wired to the common. Pin 17 is the common for inputs 1 through 4, pin 18 is the common for inputs 5 through 8, pin 19 is the common for inputs 9 through 12, and pin 20 is the common for inputs 13 through 16.

TB		TB		TB		TB		TB	
1	I/P 1	5	I/P 5	9	I/P 9	13	I/P 13	17	COM 1-4
2	I/P 2	6	I/P 6	10	I/P 10	14	I/P 14	18	COM 5-8
3	I/P 3	7	I/P 7	11	I/P 11	15	I/P 15	19	COM 9-12
4	I/P 4	8	I/P 8	12	I/P 12	16	I/P 16	20	COM 13-16

Figure 5-7 D2 Module Connections

GROUND CLOSURE INPUTS

Attach the common to a positive DC voltage.

DC VOLTAGE INPUTS

Attach the common to ground.

AC VOLTAGE INPUTS

Attach the common to neutral.

Connect inputs to the first 16 terminals. Each of the four input sections can operate independently; however, each group must conform to the voltage range for the module.

2.4 Analog Input Module B1280A1

Connections to the analog module are as shown in Figure 5-8.

TB		TB		TB		TB	
1	I/P 1	5	I/P 5	9	GND	13	N/C
2	I/P 2	6	I/P 6	10	+V IN	14	-V IN
3	I/P 3	7	I/P 7	11	+ I OUT	15	EN 1
4	I/P 4	8	I/P 8	12	GND	16	EN 2

Figure 5-8 Analog Module Connections

The first eight inputs are for general purpose analog signals and have a range of either 0-5 volts or 0-10 volts depending on the programming. The +V input is used to monitor DC voltages in the range of 0 to 20 VDC. The positive side of the current input shares the +V input and returns on the +I OUT line. Current measurements are valid as long as the voltage at +V remains above 8 volts. The reading obtained from the current port is determined by the value of the external shunt resistor that is connected between the +V and +I pins. The value of the shunt is determined by the formula:

$$R_{shunt} = 0.05 / I_{max}$$

This gives values such as:

0.005 Ω for 10 A full scale
0.025 Ω for 5 A full scale
0.05 Ω for 1 A full scale

Negative DC voltages between -30 volts and -60 volts can be attached to the -V input.

Each of the analog inputs can be conditioned with one of the two enable inputs. This allows a reading to be taken only when the enable input is valid (low). When the unit is interrogated, the last valid reading will be reported for inputs using the enable lines.

2.5 RF Input Module 1280R1

Connections to the RF input module ae shown in Figure 5-9.

J		J		TB		TB	
1	I/P 1	5	I/P 5	1	PTT 1	5	PTT 5
2	I/P 2	6	I/P 6	2	PTT 2	6	PTT 6
3	I/P 3	7	I/P 7	3	PTT 3	7	PTT 7
4	I/P 4	8	I/P 8	4	PTT 4	8	PTT 8

Figure 5-9 R1 Module Connections

2.5.1 RF Couplers

The RF module monitors up to eight directional couplers that are attached to the RCA jacks. These inputs can calculate forward and reflected power directly, and VSWR calculations can be performed using pairs of inputs. Refer to Chapter 6, section 3.2, for details. Connect RF inputs from the external directional couplers to the RCA jacks using shielded audio cable. Ensure that the type and range of each RF sensor has been correctly programmed into the FLX configuration. When calculating VSWR, the forward and reflected power sensors must be of the same type.

2.5.2 PTT Monitor

Radio PTTs should be monitored in order to qualify the conditions under which forward power measurements are taken. Each coupler input that is monitoring forward power should have a PTT signal from the transmitter connected to the associated PTT sense input. The eight PTT inputs correspond directly to the eight RF inputs so that a forward alarm monitor on input 4 should have a PTT from that transmitter connected to sense input 4. The sense inputs are ground closures sinking 1 mA, normally open, low for PTT active.

2.6 Control Output Modules

2.6.1 B1280C1

The C1 output module provides 16 open collector drivers. The connections are shown in Figure 5-10.

Connect outputs to the first 16 terminals. Pins 17, 18 and 19 are ground. If the module is used with inductive loads, connect pin 20 to the positive voltage to enable the flyback protection diodes in the output drivers.

TB		TB		TB		TB		TB	
1	O/P 1	5	O/P 5	9	O/P 9	13	O/P 13	17	GND
2	O/P 2	6	O/P 6	10	O/P 10	14	O/P 14	18	GND
3	O/P 3	7	O/P 7	11	O/P 11	15	O/P 15	19	GND
4	O/P 4	8	O/P 8	12	O/P 12	16	O/P 16	20	DIODE

Figure 5-10 C1 Module Connections

2.6.2 B1280C2

The C2 output module provides four form C relay outputs and four outputs which may be either form A or form B. For outputs 5 through 8, insert jumpers in the top of the board to select either normally open or normally closed contacts. External connections to the module are shown in Figure 5-11.

TB		TB		TB		TB	
1	RLY 1 NO	6	RLY 2 NC	11	RLY 4 C	16	RLY 6 C
2	RLY 1 C	7	RLY 3 NO	12	RLY 4 NC	17	RLY 7 NO/NC
3	RLY 1 NC	8	RLY 3 C	12	RLY 5 NO/NC	18	RLY 7 C
4	RLY 2 NO	9	RLY 3 NC	14	RLY 5 C	19	RLY 8 NO/NC
5	RLY 2 C	10	RLY 4 NO	15	RLY 6 NO/NC	20	RLY 8 C

Figure 5-11 C2 Module Connections

3. Startup

On applying power, the LCD displays the following message if the FLX has already been configured:

```
ProTalk FLX Ver0.01
Reloading Database
```

or the following message prompting you to enter a configuration:

```
ProTalk FLX Ver0.01
Create New Database
```

4. Programming

Refer to Chapter 6 for complete instructions on how to run the configuration software.

4.1 Downloading the Configuration

To download the FLX configuration, connect a cable between the Program port and the PC. Figure 5-12 details the cable requirements.

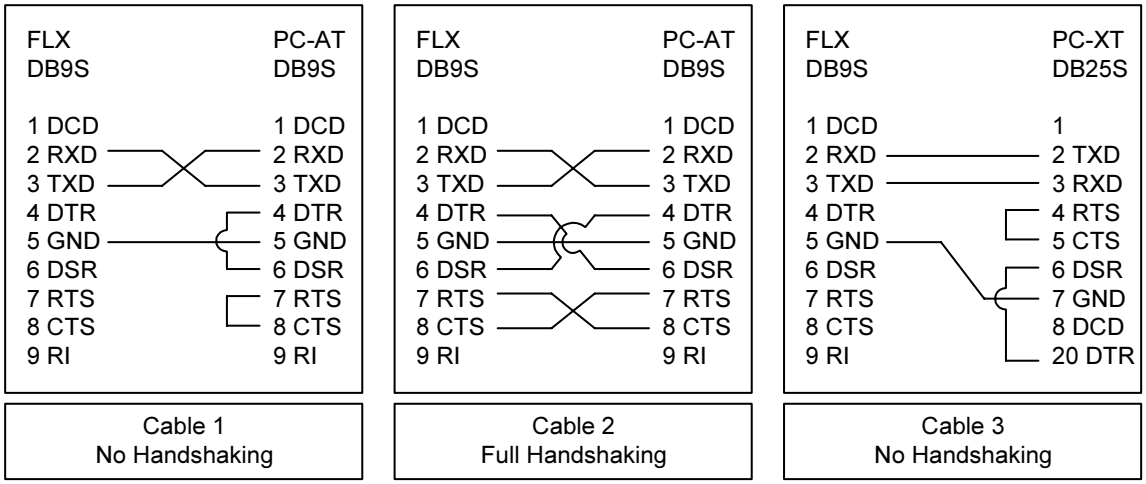


Figure 5-12 Programming Cables

In the FLX configuration software on the PC, click the Program menu selection. Ensure that the COM port selected matches that to which you have attached the serial cable. The LCD in the FLX will display the following message:

Note that the FLX will not resume normal operation until you have exited the Program menu on the PC.

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

4.2 Recording Voice Messages

To record voice messages, plug a telephone handset into the Voice Program RJ11 jack on the front of the FLX. The FLX 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 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 FLX. 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 FLX.

   When the FLX 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 and control points which are enabled. The second line shows the functions of the ✔, ▼ and ▲ keys in this mode:

   - ✔ (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 point names

3) Use the ▲ 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 ▼ key.

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

The top line displays the selected site, group or point ID. The second line shows the functions of the ✔, ▼ and ▲ keys in this mode:

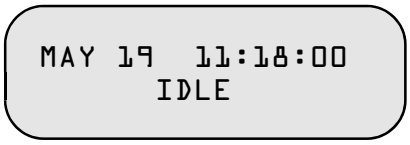
- ✔ (EXIT) - returns you to the previous menu
- ▼ (REC) - records a voice message
- ▲ (PLY) - replays the voice message associated with the selected point

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 FLX. Speak the phrase into the handset while holding down the ▼ (REC) button. When you release the ▼ (REC) button, the message just recorded will automatically be played back. To hear the message again, press ▲ (PLY). You may rerecord the message as many times as necessary. Once it is satisfactory, press ✔ (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 ✔ (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 FLX will begin polling and its LCD will display the date, time and status:



5. Radio Level Adjustments

Radio set-up commands have been built into the FLX to facilitate testing. Refer to complete instructions for the Maintenance Mode in the description of the front panel operation, Chapter 4.

5.1 Transmit

Three choices are available to exercise the radio. The Push-to-Talk may be asserted with voice, with a DTMF tone, or with a 1 kHz tone. Levels may be independently set, so that a sequence which includes voice messages and tones may transmit each at a different level, if desired.

STEP PROCEDURE

1 Enter the Maintenance Mode from the FLX front panel.

2 Select Radio TX level.

3 Assert the PTT with each of voice, DTMF and a 1 kHz tone.

4 Use the ▼ or ▲ keys to adjust the levels between 0 and -48 dBm, or MUTE.

5.2 Receive

Adjust the receive audio on the radio to a level between -20 and 0 dBm.

6. Testing

6.1 Monitor Points

Use the LCD to verify the FLX programming. Check that the FLX is accurately monitoring the desired inputs.

To scroll through the programmed points, enter the Maintenance Mode, press the ▼ switch until the FLX displays the Monitor Points message, then press ✔. 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.

6.2 Directories

Check the reporting sequence by simulating alarms. The progress through the directory is displayed on the LCD. Voice messages may be monitored by connecting a local telephone set into the Voice Program RJ11 jack.

6.3 Control Codes

Check that the Acknowledge, Interrogate, Shift Change and Relay Output codes for each group are decoded properly over radio and telephone.

6.4 Printer

Check that activity is printed out on the serial printer.

Chapter 6 Configuration

1. Loading the Program

1.1 PC Requirements

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

- 386 or better
- Windows 95
- 8M RAM
- SVGA monitor
- serial COM port

1.2 Starting Up the Program

The program diskettes supplied with the FLX 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 FLX icon that appears in the installed location. The program will load and search for the default start-up files:

FLX.dat - the configuration database
FLX.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 95/98-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 FLX 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 FLX 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 space bar 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 highlighted 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, Hardware, 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 highlighted 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.)

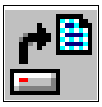
3. Menu and Dialogue Box Description

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



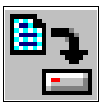
Click on Open to display the Open File window. As a short-cut, click on the button shown at left in the toolbar.

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 FLX configuration software recognizes only files with a .DAT extension.

3.1.2 Save



To save the FLX 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 FLX.DAT.

3.1.3 Save As

To save the FLX 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 95/98 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 FLX configuration. Menu commands include:

- Exit - return to FLX 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 hardware, general configuration, group, point, directory information, or all of the above
- Warnings - The software analyses the configuration of the FLX 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.

3.1.6 New Database

Click on New Database to create a new file. The program will prompt you that all current information will be erased.

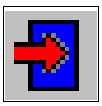
3.2 Hardware

The B1280 FLX uses various input signal modules to obtain readings and conditions. Programming of the system should begin with the configuration of the installed I/O modules; this is done in the Hardware section. The pull-down Hardware menu provides a choice of main and expander chassis. In most cases the main chassis will be the only one installed.

Throughout this description there are references to inputs and points. Inputs are related to the hardware module and are usually the signal on a particular pin, although they can also be registers derived from the input pins as in the case of the VSWR readings on the RF power module. Points are the alarms that are set up to operate from the information obtained with an input. Points may also be Modbus registers. The FLX is capable of handling 240 points; each can be set to work from any available input.

There are two stages involved in the setup of the system: configuration of the installed hardware modules and then setup of the alarm points. The hardware section is done first because there are several parameters that are specific to the inputs. In the point configuration it is possible to have several points operate from a single hardware input. An example would be where major and minor alarm level alarms are required on an analog point. Since multiple points can access one input, it is not possible to allow any hardware changes in a point set-up because this would affect other points using the same input.

3.2.1 Main Unit



Click on Hardware in the menubar, then Main Unit, to configure the hardware modules in the FLX Main Chassis. As a short-cut, click on the button shown at left in the toolbar.

The first step is to set the appropriate module types into the correct slots. The configuration of the hardware must match exactly with the modules installed in the FLX chassis.

If the unit has not previously been programmed, all slots will be empty. To select or change the type of module in any slot, click on the drop-down arrow to the right of the box, then click on one of the following choices:

- digital input
- analog input
- RF input
- open collector output
- relay output

The desired module will be displayed in the slot selected. To view the current parameters for that module, click on the Summary button beside the slot name.

PROCESSOR BOARD

To view the summary of inputs and outputs on the main processor board, click on the button labelled Processor.

Two inputs and one output are available on the processor board. The first is a reading of the power supply voltage, between 0 and +20 VDC. The second is a reading of the ambient temperature, between -40 and +60°C, or -40 and +144°F. The parameters for these inputs are fixed. If you wish to use them as alarm inputs, program them in the Points section.

The processor board is also equipped with a microphone that enables you to monitor audio at the remote site. The microphone is turned on, as with a standard timed output, by a remote control "On" command. The microphone keys the radio push-to-talk, or holds the telephone line off hook, until the timer expires. Over telephone, receipt of a remote control "Off" command defeats the timer.

Enter a value between 1 and 255 seconds in the Audio Timer field. If you wish to use the microphone feature, assign a point to the Audio Monitor output in the Points section.

DIGITAL INPUT BOARD

To view a summary of the digital inputs, click on the Summary button beside a slot containing a digital input board.

Each digital card has 16 inputs that may be programmed as standard digital, watchdog, interval timer or totalizer inputs. If the card has not been previously programmed, all of the inputs will default to a standard digital.

To configure an input, double click on it, highlight it and press Enter, or click on Edit Line in the menu. Alternatively, right-click the mouse over any line. The line will be highlighted and an Edit Line button displayed. Highlight this button, then click to configure the input.

Standard Digital

To set the parameters for a standard digital, select any input labelled digital.

Common elements which must be programmed are as follows:

Debounce - length of time the input must be present before it registers as a change; programmable from 0 to 18.2 hours in 10 msec or 1 sec increments (default is 1000 msec)

Input - default is Normally Open, with a closure representing an alarm. To reverse, click on Normally Closed.

Change Input Type - To change the input to another type, select from this drop-down menu. Changing the input type deletes the existing settings.

Watchdog Timer

A Watchdog Timer reloads the watchdog interval timer each time the input is reset. If no reset occurs within the watchdog interval, the alarm is set.

In addition to the **Debounce**, the following parameters must be set:

Input - Click the appropriate option button to select whether the timer is reset on low-to-high transitions, high-to-low transitions, or both.

Watchdog Timer - interval without a reset pulse after which an alarm will be set; 0 to 18.2 hours in 10 msec or 1 sec steps (default is 500 msec)

Interval Timer

An interval timer is used to register the elapsed time between events. There is no alarm setpoint for this type of input. The last recorded interval is reported when you interrogate the group.

Debounce time and **Input** type are set as for other digitals.

Totalizer

A totalizer is used to count pulses. It may be programmed to register low-to-high transitions, high-to-low transitions, or both. The accumulated total is announced when the group is interrogated. If used on inputs 15 or 16, the totalizers may be externally reset by inputs 13 and 14 respectively. Otherwise the counts will simply roll over.

Debounce time and **Count Changes** are set as for other digitals.

ANALOG INPUT BOARD

To view a summary of the analog inputs, click on the Summary button beside a slot containing an analog input board.

Eleven inputs are available on one analog input card: eight general purpose analogs, one positive voltage, one current and one negative voltage. The input functions are fixed; it not possible to change their type as with a digital input card. The analog inputs can be read continuously, or they may be conditioned to be read only when one or the other of two enable inputs to the board goes low. The FLX stores the last valid reading when the enable input disappears.

To configure an input, double click on it, select it and press Enter, or use the Edit Line command.

Standard Analog

The following parameters must be configured:

> **Input Range** - Click on the appropriate option button for a 0 - 5 VDC input or a 0 - 10 VDC input.
>
> **Enable** - Select the Enable Input which will be used to qualify the analog reading. If you choose Always On (default), the reading will always be valid.

Positive Voltage

Input 9 on the analog card monitors a voltage with a range between 0 and 20 VDC.

Set the **Enable** inputs as for a standard analog.

Current

With the use of an external shunt resistor, Input 10 can be used to measure the current flow for the same supply connected to the voltage input.

Set the **Enable** inputs as for a standard analog.

Negative Voltage

Input 11 may be used to monitor a voltage in the range of -30 to -60 VDC.

Set the **Enable** inputs as for a standard analog.

RF INPUT BOARD

To view a summary of the RF inputs, click on the Summary button beside a slot containing an RF input board.

Twelve inputs are available on one RF input card: the first eight are RF power readings and the last four are VSWR readings. The RF power inputs monitor either forward or reflected power. The VSWR readings, inputs 9 through 12, are derived from forward and reflected pairings 1/5, 2/6, 3/7 and 4/8 respectively. The input functions are fixed; RF power may be specified as a forward or reflected reading in the Points menu. The RF inputs can be read continuously, or they may be conditioned to be read only when the transmitters are active, indicated by the corresponding Push-to-Talk inputs going low. If the enable is used, the FLX stores the last valid reading when the PTT disappears.

To configure an input, double click on it, select it and press Enter, or use the Edit Line command.

RF Power

The following parameters must be specified:

Sensor Type - Click the option buttons to specify whether the external directional coupler is Celwave (default), Sinclair or Decibel.

PTT Control - Click the option button to specify whether the power should be measured continually, or only when the transmitter is active as indicated by the associated PTT signal (default).

VSWR

The box for this input describes the source of the signals for the VSWR calculation. Note that there are no parameters to set.

OPEN COLLECTOR OUTPUT CARD (C1)

To view a summary of the outputs, click on the Summary button beside a slot containing an open collector output board.

Each C1 card has 16 outputs which may be programmed as standard outputs, i.e. output is set by one DTMF code and reset by another, or as timed outputs, i.e. output is activated for a set time interval, then automatically reset. If the card has not been previously programmed, all of the outputs will default to standard.

To configure an output, double click on it, select it and press Enter, or use the Edit Line command. Ensure that the configuration matches the installed hardware.

Standard Outputs

No parameters need be defined for a standard output. On / Off codes are determined by the Control Code in the General Configuration screen, and the point number assigned to the output. To configure a timed output, select Timed Output from the drop-down menu labelled Change Output Type.

Timed Outputs

A timed output may be set to operate for from 10 msec to 18.2 hours (default is 500 msec). Enter the time in the input line, then click the desired units in the Range option. If seconds are chosen, the time is incremented in 1 sec steps; if milliseconds are used, the time is incremented in 10 msec steps.

CONTROL OUTPUT CARD (C2)

To view a summary of the outputs, click on the Summary button beside a slot containing a relay output board.

Each C2 card has four form C relay outputs (outputs 1-4) and four outputs which may be programmed with either form A or form B contacts (outputs 5-8). The outputs may be programmed as standard outputs, i.e. output is set by one DTMF code and reset by another, or as timed outputs, i.e. output is activated for a set time interval, then automatically reset. If the card has not been previously programmed, all of the outputs will default to standard, with relays 5 through 8 having normally open contacts.

At power-up, the standard relay outputs can be forced to the reset condition. If a reset is not specified, the relay will remain in the same state that it was in when power was removed. Timed relays are always reset on power-up.

To configure an output, double click on it, select it and press Enter, or use the Edit Line command. Ensure that the configuration matches the installed hardware.

Form C Relays 1-4

Standard Output

Click the check box if you want the relay to reset to its normal condition when power is applied. If you do not click this box, the relay will maintain the same position it was in when power was removed. To configure a timed output, select Timed Output from the drop-down menu labelled Change Output Type.

Timed Output

A timed output may be set to operate for from 10 msec to 18.2 hours. Enter the time in the input line, then click the desired units in the Range option. If seconds are chosen, the time is incremented in 1 sec steps; if milliseconds are used, the time is incremented in 10 msec steps. Select On / Off Output from the drop-down menu labelled Change Output Type to change to a standard output.

Form A/B Relays 5-8

Standard Output

Relays 5 through 8 are programmed the same as relays 1 through 4 for standard operation, except that you must specify whether the normal (off) position of the relay is open or closed, as you have only one set of contacts available (default is normally open).

Timed Output

Relays 5 through 8 are programmed for timed operation the same as relays 1 through 4, except that you must specify whether the normal (off) position of the relay is open or closed, as you have only one set of contacts available.

3.2.2 Expander Modules

To program any expander modules in the system, click on Expander 1 or 2 in the Hardware menu.

Next set the appropriate module types into the correct slots. The configuration of the hardware must match exactly with the modules installed in the expander chassis. The module types are the same as those which plug into the main unit.

3.3 General

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

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

The following parameters must be specified:

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

TEMPORARY ACK TIME - interval in minutes for which the FLX will be temporarily acknowledged after receiving the Ack Code immediately followed by an octothorpe [#]; maximum 255 minutes (default 60 minutes). When the timer expires, the FLX resumes alarm reporting at the interval specified by the Short Timer.

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

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

Level 2 - FLX 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 FLX 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, writing a Modbus command to the data port, 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, Modbus write or front panel switches) will act as an interrogation. The reporting shift will be announced or displayed, but will not change.

Shift Code - code to advance the FLX 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 FLX clock is programmed correctly. Refer to Chapter 4, section 4.6, for information on setting the time and date.

DATA PORT

For data operation, the FLX is configured as a Modbus slave. Click on this button to set the serial communication parameters.

Slave Address - address of the FLX when communicating in Modbus slave mode; 1 to 8 digits (default is 1)

Bits per Char - the number of data bits in the character (default is 8)

Baud Rate - baud rate for communications with the FLX via the data port; 300 to 9600 baud (default is 9600)

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

Stop Bits - 1 or 2 stop bits (default is 1)

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 25 msec increments; maximum is 6375 msec, default is 125 msec

TELEPHONE SETTINGS

Rings Before Answer - number of rings before FLX 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 FLX 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 FLX will use pulse dialling if tone dialling is disabled.

PRINTER

Enable - enables printer (default is disabled)

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

ANNOUNCE NEW ALARMS ONLY - Reports only unacknowledged alarms, otherwise alarms that are not in the normal state are spoken. (default is off)

CONTROL CODE - code which enables remote control, allowing the caller to operate relay or open collector outputs on the FLX; 3 DTMF digits (default is 111)

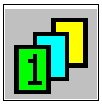
TAP PASSWORD

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.)

Click OK to register your changes to the General Configuration. If you click Cancel, then a warning message will be displayed.

3.4 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.

3.4.1 Group Configuration

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

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

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

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)

TIMERS

Short Timer - interval after which the FLX retries a directory if no alarm acknowledgement has been received; 0 to 255 minutes (default is 4 min)

Short Cycles - number of times the FLX retries the directory at the interval specified by the short timer; 0 to 9 times (default is 5)

Long Timer - interval at which the FLX retries a directory after the short cycle timer has expired; 0 to 255 minutes (default is 30 min)

SHIFT SELECTION

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

Shift 2 to Shift 4 - as per Shift 1

Click OK to register your changes to the Group Configuration. If you click Cancel, then a warning message will be displayed.

3.5 Points

Once inputs and outputs have been configured in the Hardware section (3.2), they must be assigned to points in order to provide alarm and control capabilities. To report an alarm in more than one way, or to configure several setpoints, program multiple points to access a particular input.

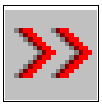
Three different types of input points can be specified: Digital, Analog, and RF. Digital inputs may be standard digitals, Watchdog Timers, Interval Timers or Totalizers. Analog points monitor customer programmable 0 - 5 VDC or 0 - 10 VDC analog inputs. There are also dedicated analog inputs for monitoring positive and negative supply voltages and current inputs on each analog input card, or power supply and temperature inputs on the processor board. RF inputs may be used to monitor forward or reflected RF power, and used to calculate VSWR.

Outputs must also be assigned to a point in order to be used for remote control. Most characteristics of outputs, such as open collector or relay, standard on / off

or timed operation, form of contacts, and reset on power-up, are set in the Hardware section. Assigning them to a point allows them to have an on and off code, also a point name which is announced when the control is operated. The Audio Monitor is a special output on the processor board which must also be assigned to a point in order to be usable.

If you have purchased the M2 version of firmware, the FLX can also monitor internal registers that are written to over the data port using Modbus protocol. Three different types of points are available. The first is a Modbus Digital, an on/off reading which corresponds to a Modbus coil. The second is a Modbus Analog, similar to a hardware analog in that a Modbus register reading is scaled and alarms generated when setpoints are exceeded. The third is a Modbus Totalizer, again similar to a hardware totalizer in that a Modbus register is read and the raw value reported when the FLX is interrogated.

3.5.1 Point Summary



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 window displays the number of the point, on/off status, name, type of point, hardware slot and port or Modbus address, group to which it is assigned, and some detail for that point. When this window is first opened, all of the points will show as unused. There are 240 available points. Use the scroll bar to view all points.

To configure a point, double click on it, highlight it and press Enter, or click on Edit Line or Change Line in the menu.

When you program an empty point, the first screen that comes up is the Card Selection. This window displays the types of modules installed in each slot of the FLX, as programmed in the Hardware section, plus an option for a Modbus register. From the drop-down menu, select the card location or register that corresponds to the type of point you wish to program, then click OK. The next screen presented is the Port Selection for the selected card, or Register Type for Modbus. From the drop-down menu, select the desired port or register type, then click OK. The next window that comes up allows you to program information for the individual point.

If a point has already been programmed, use the Change Line command in the menu to assign it to a different card or port, or Edit Line just to change information about the point. Alternatively, right-click the mouse over any line. The line will be highlighted and an Edit Line/Change Line menu displayed. Highlight the desired choice, then click to configure the point.

3.5.2 Digital Points

Depending on the type of input you select, a number of different parameters must be programmed.

STANDARD DIGITAL

The first type of point is a standard digital or ON / OFF alarm.

The point address and type are shown in the top line of the display. Program the following for each digital point:

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)

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.

Alarm State - momentary or latched (default is momentary). If an alarm is latched, the FLX 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.

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

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).

Cancel - exits the Point screen without saving the current point data

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

WATCHDOG TIMER

The second type of digital point is a Watchdog Timer.

Program the parameters as for a standard digital point.

INTERVAL TIMER

The third type of digital point is an Interval Timer.

This type of point does not alarm. However, the value of the interval, in seconds or milliseconds, will be announced when you interrogate the group. Program the parameters as for a standard digital point.

TOTALIZER POINT

The last type of digital point is a totalizer.

The FLX accumulates the total number of pulses at the input. It reads the input register as an integer value but treats it as an absolute number instead of converting it to a reading. This type of point does not alarm. However, the value of the totalizer, complete with units and decimal place, will be announced when you interrogate the group.

In addition to the common digital parameters, you must program the following:

Decimal Place - where to insert the decimal point when announcing the value of the totalizer (default is at the end)

Spoken Units

For a totalizer point, you must specify the engineering units in which the value will be announced. Click on the Units button to bring up the Spoken Units window. 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.

3.5.3 Analog Points

STANDARD ANALOG

For this type of point, the FLX reads an analog value from the input 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.

Program the following for each analog point:

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)

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.

Alarm State - momentary or latched (default is momentary). If an alarm is latched, the FLX 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.

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

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).

Cancel - exits the Point screen without saving the current point data

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

In addition, you must specify the following:

Calibration Settings

Conversion of the binary instrument reading into English units is determined by the values entered into the Calibration section. To set these values, click on Calibrate and the Analog Calibration window will appear.

Program the following information:

BINARY VALUES

Minimum Binary - binary number which represents the minimum analog value that will be read from the register (0 to 255 is the possible range when a B1280A1 module is installed)

Maximum Binary - binary number which represents the maximum analog value that will be read from the register (maximum is 255)

Show as volts - click this button to show the analog inputs as voltages (0 - 5 VDC or 0 - 10 VDC as programmed in the Hardware section) instead of binary readings

DECIMAL VALUES

Minimum Decimal - number which 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 (prefix) in the Units section to scale the value when it is annunciated.

Maximum Decimal - number which 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 100). If the desired value is outside this range, use the multipliers (prefix) in the Units section to scale the value when it is annunciated.

Low Setpoint - value below which an alarm will be reported

High Setpoint - value above which an alarm will be reported

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.

From the drop-down menu, specify a percent hysteresis between 1 and 25 (default is 10%.)

Spoken Units

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

SPECIAL ANALOG POINTS

Positive Voltage

Parameters for a positive voltage point are programmed the same as for other analog points. As it monitors a fixed input with a range of 0 to 20 VDC, point 9 on the analog card, calibration is limited to setting the level at which you wish it to alarm, i.e. low and high setpoints and hysteresis.

Negative Voltage

Parameters for a negative voltage point are programmed the same as for other analog points. As it monitors a fixed input with a range of -30 to -60 VDC, point 11 on the analog card, calibration is limited to setting the level at which you wish it to alarm.

Current

One current input is available on the FLX analog card, input 10, which, through the use of an external shunt resistor, may be used to measure the current associated with the positive voltage, input 9.

In addition to the usual parameters, program the following in the Calibration screen:

MAXIMUM DECIMAL - top limit of the current measurement. This range determines the value of the shunt resistor, as per the following formula:

$$R_{shunt} = 0.05 / I_{max}$$

3.5.4 RF Points

RF FORWARD POWER

Program the following for each RF point:

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)

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.

Alarm State - momentary or latched (default is momentary). If an alarm is latched, the FLX 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.

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

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).

Cancel - exits the Point screen without saving the current point data

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

In addition, you must specify the following calibration settings:

Maximum Decimal - maximum power rating of the RF sensor (up to 999.9 W for Sinclair and Decibel sensors, 500 W for Celwave)

Low Setpoint - value below which an alarm will be reported

Hysteresis - from the drop-down menu, specify a percent hysteresis between 1 and 25 (default is 10%)

RF REFLECTED POWER

To change to a reflected power point, click on the Change to Reflected button in the RF point window. The Low Setpoint in the Calibration window will change to a High Setpoint.

VSWR

Program the common parameters for a VSWR point as for other types of RF points. In addition, you must program the following in the Calibration section:

High Setpoint - value above which a High VSWR alarm will be reported (range is 1 to 3.5)

Hysteresis - from the drop-down menu, specify a percent hysteresis between 1 and 25 (default is 10%)

3.5.5 Processor Points

POWER SUPPLY

This type of point is identical to a positive voltage point, except that it measures the voltage (0 to 20 VDC) of the supply rather than an externally connected source.

TEMPERATURE

To configure a temperature alarm, select the temperature input and set the parameters as for any other point. Click Calibrate to set High or Low setpoints, between -40°C and +60°C. Click on Change to Celsius (or Fahrenheit) to change the scale.

3.5.6 Control Points

To program a point for remote control, select either a Driver Out (C1) or a Relay Out (C2) from the card selection menu. For a C1 card, select one of 16 open collector ports programmed as either standard or timed outputs. For a C2 card, select one of four form C outputs (1 - 4) or one of four form A or B outputs (5 - 8) programmed as standard or timed.

Program the following for each control point:

Alarm Name - point name displayed on the front panel LCD or printed when the control is activated; 1 to 16 alpha-numeric characters (default is empty)

Enabled - control point can be operated only if enabled (default is disabled)

Using Group - 1 of 8 groups to which the control point is assigned (default is Group 1)

Cancel - exits the Point screen without saving the current point data

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

ON/OFF CODES

The FLX operates a control point when the DTMF remote control code is received over radio or telephone. The remote control code is generated automatically; it is not defined in the point screen. For example, where the On Code is 4560101, the Control Code "456" is specified in the General Configuration screen. The next three digits, "010", refer to the number of the point as listed in the Point Summary. The last digit is "1" for On or "0" for Off.

When an output is operated, the FLX provides audio confirmation by announcing the name of the point followed by the word "On" or "Off." When the group is interrogated, the unit will respond with the state of the outputs in addition to the status of the input points.

Note: Timed outputs are programmed in the Hardware section to turn off after a set interval. A timed control point will respond to an Off Code if it is received before the expiration of the associated timer.

3.5.7 Modbus Points

DIGITAL REGISTER

The first type of Modbus point is a standard digital or ON / OFF alarm.

The point address and type are shown in the top line of the display. Program the following for each Modbus digital register:

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)

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.

Alarm State - momentary or latched (default is momentary). If an alarm is latched, the FLX 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.

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

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).

ANALOG REGISTER

For this type of point, the FLX reads an analog value from the Modbus 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.

Note: A Modbus analog register has 16-bit resolution and is signed, unlike the hardware analog input which is 8-bit and unsigned.

Program the following for each Modbus analog register:

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)

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.

Alarm State - momentary or latched (default is momentary). If an alarm is latched, the FLX 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.

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

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).

Cancel - exits the Point screen without saving the current point data

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

In addition, you must specify the following:

Calibration Settings

Conversion of the binary Modbus register reading into English units is determined by the values entered into the Calibration section. To set these values, click on Calibrate and the Analog Calibration window will appear.

Program the following information:

BINARY VALUES

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 255)

Sign - default is unsigned

DECIMAL VALUES

Minimum Decimal - number which 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 (prefix) in the Units section to scale the value when it is annunciated.

Maximum Decimal - number which 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 100). If the desired value is outside this range, use the multipliers (prefix) in the Units section to scale the value when it is annunciated.

Low Setpoint - value below which an alarm will be reported (default is 2.50)

High Setpoint - value above which an alarm will be reported (default is 7.50)

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.

From the drop-down menu, specify a percent hysteresis between 1 and 25 (default is 10%.)

Spoken Units

For a Modbus analog point, you must specify the engineering units in which the value will be announced. Click on the Units button to bring up the Spoken Units window. 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.

TOTALIZER REGISTER

The third type of Modbus register is a totalizer. Totalizers are a subset of Modbus analogs. The FLX 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 place, is announced when you interrogate the group.

Program the following parameters for a Modbus totalizer:

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

Enabled - point can be interrogated only if enabled (default is disabled)

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

Decimal Place - where to insert the decimal point when announcing the value of the totalizer (default is at the end)

Spoken Units

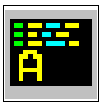
For a totalizer point, you must specify the engineering units in which the value will be announced. Click on the Units button to bring up the Spoken Units window. Units are defined by three sections:

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.

3.6 Directory

A directory is a sequence of reporting instructions which the FLX follows when it detects an alarm condition. Unless an automatic acknowledgement is programmed, the FLX will proceed through the instructions until an acknowledgement is received. If the FLX 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 tool bar, shown at left.

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

3.6.1 Directory A through F

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 click on Edit Line or Insert Line in the menu. You may also change any line by double-clicking on it. A third alternative is to right-click the mouse over any line. The line will be highlighted and a menu displayed which duplicates the selections in the top line.

LINE EDITOR

The Line Editor is used to specify the exact sequence of instructions in each call-out cycle. Each directory will hold a maximum of 20 lines; a line may contain up to 120 characters from among the following selections. Note that each function is represented by a single character so that the data consists of these single characters plus the data that may follow some types of entries. 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. The top line of the Directory Summary shows what percent of the directory you have filled.

Some examples of programming directories are given in Chapter 1 - Overview.

[DIAL] Takes the telephone line off-hook, and keeps it off-hook until the last instruction in the line is executed. The FLX then dials the number specified by the digits (maximum 39) which 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 which follows is announced up to three times. Each announcement is followed by the prompt "Enter Acknowledge Code", and the FLX pauses five seconds to listen for an acknowledgement. If an ACK Code is received, the FLX announces "Alarms Acknowledged; Enter Command Code" and allows you to enter further commands. If no ACK Code is received after the third announcement, the FLX 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 FLX to delay for the interval which 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 FLX 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 FLX 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 which 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 FLX 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 paging terminal hangs 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) which 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 FLX to monitor for an answer, typically a voice response, before proceeding; for example, if the FLX 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] If the FLX is equipped for paging, 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] If the FLX is equipped for paging, 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:

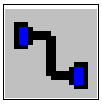
1) Lines must begin with a [DIAL], [RADIO], [WAIT], [PATCH], or [AUTO ACK] command.
2) [WAIT] may be used on a line by itself, or included as part of a line starting with the [RADIO], [PATCH] or [DIAL] command.
3) [AUTO ACK] must be on a line of its own.
4) The [2 TONE] or [5 TONE] commands must be used 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.
9) Directories may contain a maximum of 256 characters. The top line indicates the percent of available memory space that has been used. Directories may contain no more than 20 lines; the maximum length of any one line is 120 characters.

3.6.2 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.

3.7 Program



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

The window that comes up is used to communicate directly with the FLX. At this time the serial port of your computer must be connected to the Program port of the FLX (see Chapter 5, section 3, for details of the cable.) Click on COM1 or COM2 to select the communications port being used by your computer. The LCD in the FLX will display the following message:

```
PC PROGRAM MODE
```

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

3.7.1 Recording Voice Messages

The FLX 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 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 FLX. 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 FLX.

   When the FLX 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 and control points which are enabled. The second line shows the functions of the ✔, ▼ and ▲ keys in this mode:

- ✔ (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 point names

3) Use the ▲ 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 ▼ key.

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

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

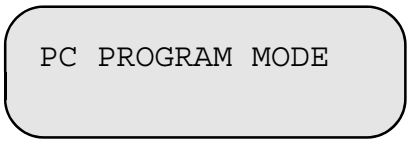
The top line displays the selected site, group or point ID. The second line shows the functions of the ✔, ▼ and ▲ keys in this mode:

- ✔ (EXIT) - returns you to the previous menu
- ▼ (REC) - records a voice message
- ▲ (PLY) - replays the voice message associated with the selected point

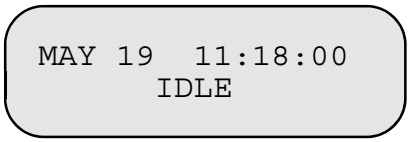
The line also displays the percent of memory still available for recording voices.

4) To record voice messages, plug a telephone handset into the RECORD jack on the side of the FLX. Speak the phrase into the handset while holding down the ▼ (REC) button. When you release the ▼ (REC) button, the message just recorded will automatically be played back. To hear the message again, press ▲ (PLY). You may rerecord the message as many times as necessary. Once it is satisfactory, press ✔ (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 ✔ (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 FLX will begin polling and its LCD will display the date, time and status:



3.7.2 Clearing Voices in the FLX

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 FLX.

3.7.3 Retrieving Recorded Voices from the FLX to a File

If you wish to keep a file record of the voice messages recorded in the FLX, 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.

3.7.4 Storing a Voice File to the FLX

An alternative to recording voice messages is to download a voice file from the PC. Click on Write Voices 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.

3.7.5 Retrieving the FLX Configuration

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

3.7.6 Storing the FLX Configuration

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

Chapter 7 Warranty

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 Ltd. 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)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.

(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.