Remotely
Controlling and Monitoring
Base Stations

1 July 2000

This technical application note explains how the remote control of base stations works, describes a number of supported system configurations, and provides some information about using the Tait T803 Tone Remote module to enable the remote control of base stations using Tait T800 equipment.

Overview

Base stations are often the core of a two-way communications system. They are located somewhere with good RF propagation, such as the top of a tall building or a mountain peak. However, the despatcher is usually in an office which is remote from the base station, maybe even kilometres away. A system such as that shown in Figure 1 is needed to bring voice to and from the base station and to enable the despatcher to control and monitor the base station.

This system consists of three parts.

- **Despatch Console**. A simple despatch console (also known as a desktop controller) often looks like a telephone. Each button is allocated a function and there is a handpiece that allows the despatcher to key the base station transmitter or to listen to what the base station is receiving.

- **Remote Controller**. The remote controller (also known as a tone panel) is located at the base station. It receives commands from the despatch console and carries them out.

- **Link**. A link (for example a telephone line or a microwave link) that connects the despatch console to the remote controller.

Control Signals

The signalling that the system uses works in the following way:

1.   The despatcher does something, for example presses PTT.

2.   The despatch console encodes the action into one of the available standard signalling tones and sends it over the link to the remote controller.

3.   The remote controller receives the signal, decodes it and activates the correct function, for example keying the transmitter.

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Control signals are of two basic types: DC line signals or tones. DC line signals must have a dedicated wire line from end to end. Tone signals are tones in the same range as voice so that they can be carried by any links (for example microwave or optical fibre) that will carry conversation.
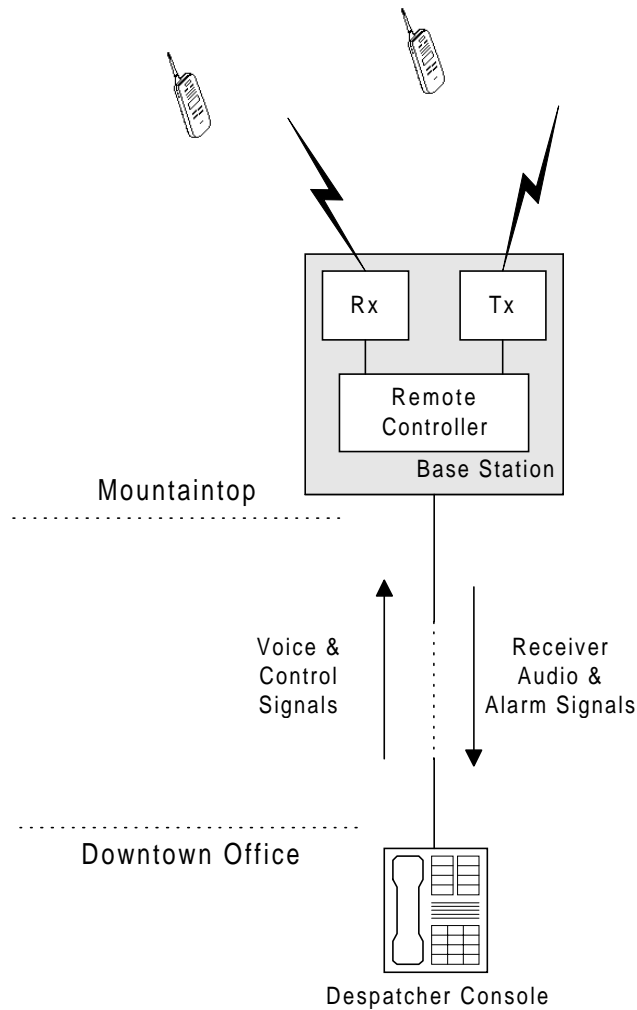

Figure 1   A Remotely Controlled Base Station

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System Configurations

The T803 is suitable for use in the following remotely controlled base station systems.

Basic Despatch System

In a basic despatch system, the despatcher console remotely keys the base station. Typically, there is no DC path so that DC signalling cannot be used. There may also be a requirement for the despatcher to change channels, monitor radio traffic, and change the channel mode from base station to despatcher. The T803 may also need to be configured with tone on idle, so that the despatcher console is unmuted when audio is on the line.
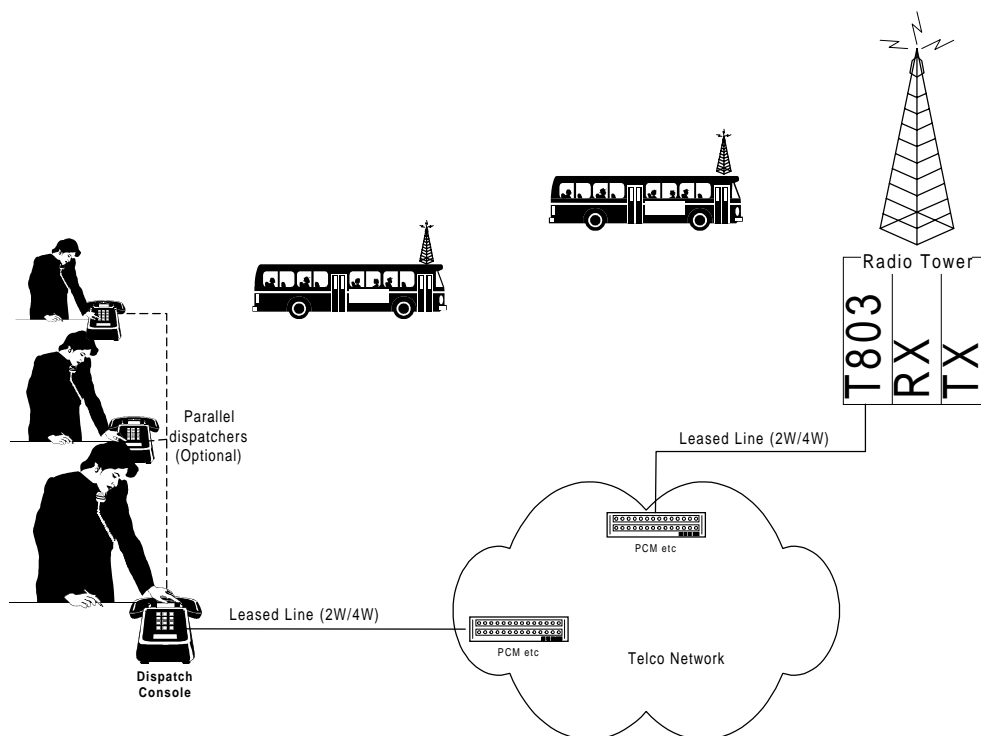

Figure 2   Basic Despatch System

Despatch with High Site Control

A despatch system can be set up so that the despatcher can remotely control equipment at the site, for example to turn tower lighting on or off, to turn on stand-by power systems, provide door entry security, and so on. The T803 has four auxiliary outputs that can be used to open or close relays. Function tones can turn these outputs on or off.
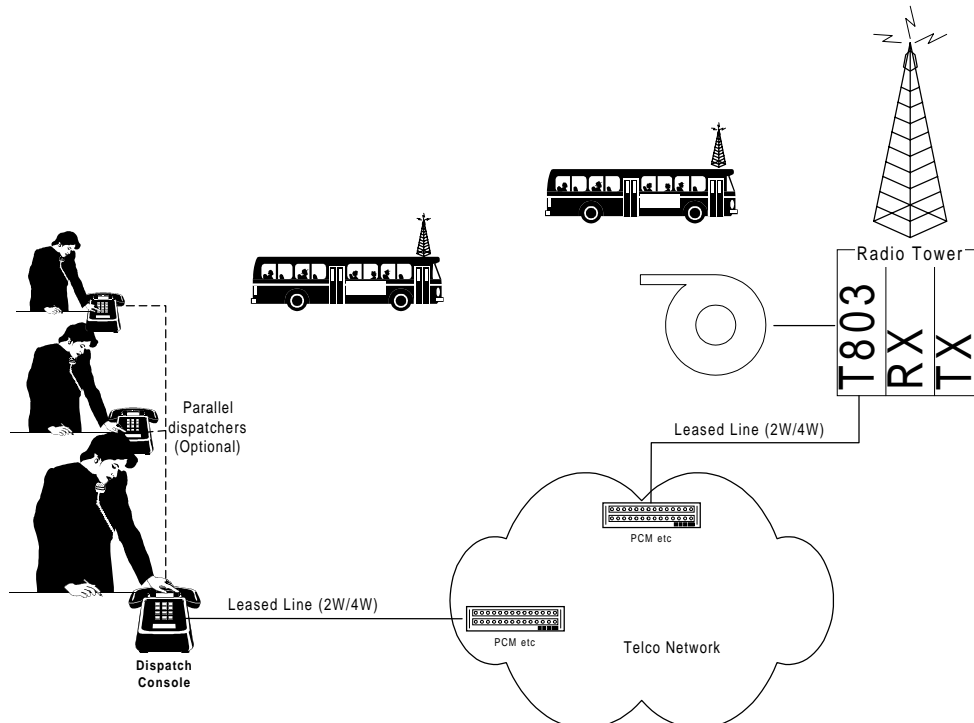

Figure 3   Despatch with Control of Equipment at the High Site

Despatch with Alarm Monitoring

A despatch system can be equipped with alarm monitoring. The T803 can provide alarm signals to the despatcher and/or to the maintenance technician's radio. The T803 can be programmed to provide a Selcall sequence for transmission or sending down the line, to target one or more radios or despatcher consoles. The T803 has four built-in alarm sources for monitoring the status of the channel. In addition, up to four auxiliary inputs can be connected to equipment such as intruder sensors. A function tone is available so that the despatcher can remotely reset the alarms. High site control can be used to turn the sensors on.
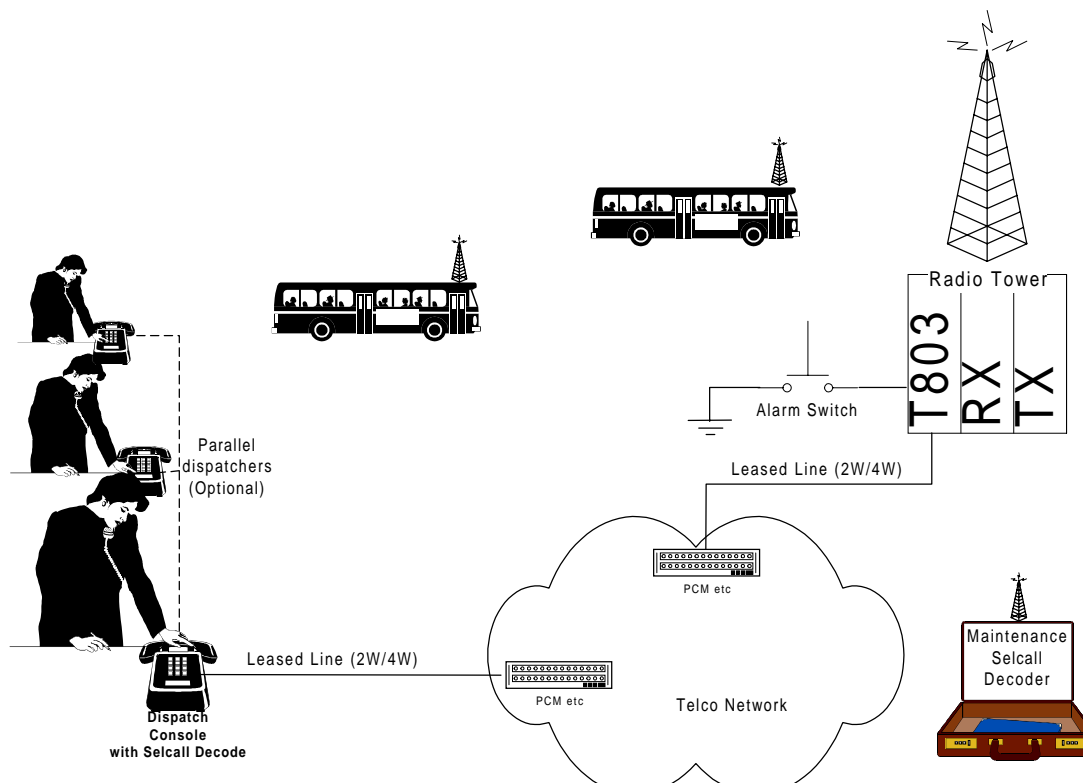

Figure 4   Despatch with Alarm Monitoring

Despatch with Linking

A despatcher console can be linked to the base station using a pair of T800 Series II transmitters/receivers. This is referred to as a relay or linked despatch system. Two T803s are needed: one for the linking repeater and another for the base station itself. The first T803 must be programmed for keytone only operation with notch fltering disabled. This means that it passes all control signalling on unchanged to the base station T803. Note that both T803s can be programmed with other capabilities such as alarm monitoring.
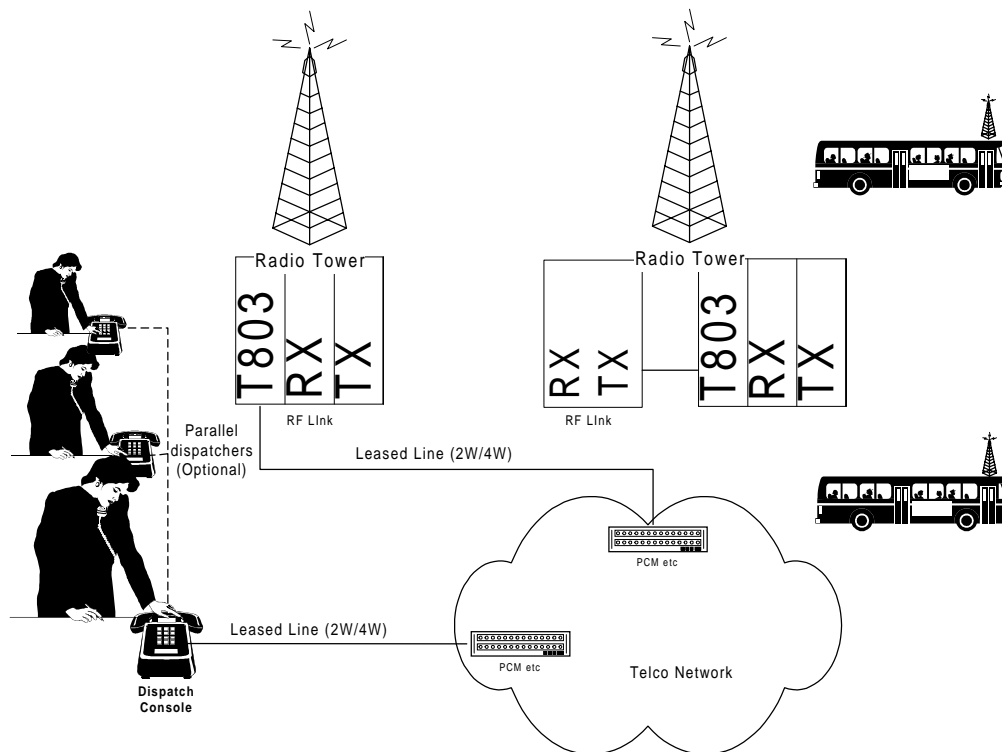

Figure 5   Relay (or Linked) Despatch System

Despatch with Multiple Receivers

A despatch system can have several receivers to cover a geographical area. For each call, the receiver with the best reception must be selected so that it provides audio to the despatcher. Selection works like this. The T803s at each site send a voting tone to the despatch room equipment, which selects the receiver producing the best quality audio.
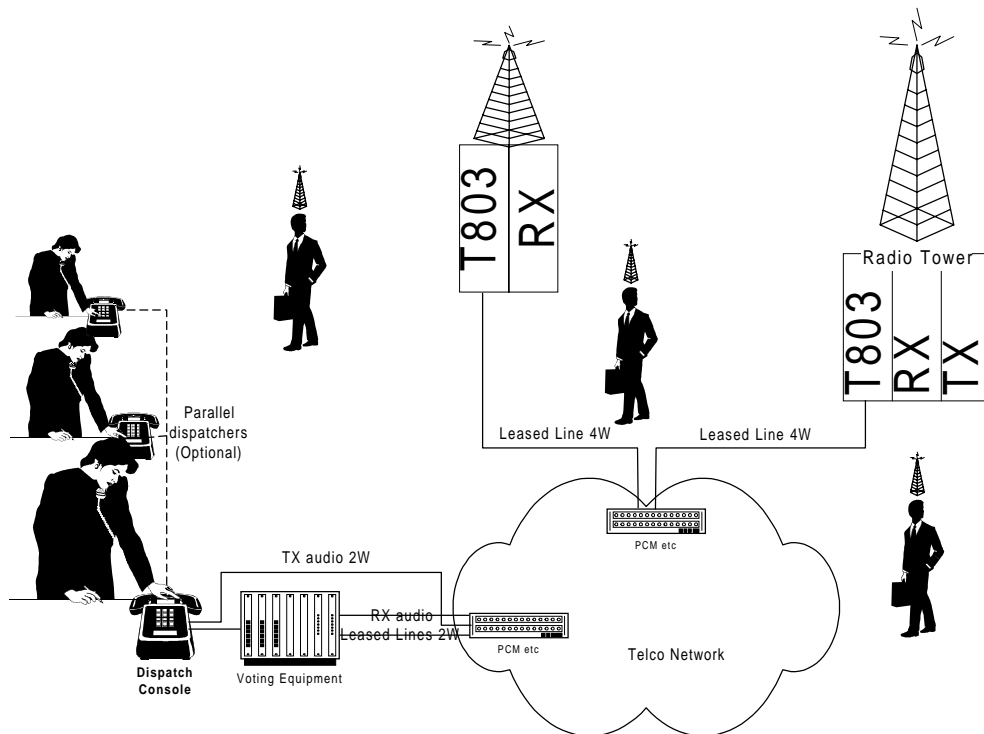

Figure 6   Despatch System with Receiver Voting

Tait T803 Tone Remote Module

Until recently, operators with Tait T800 base stations needed to add equipment from third party vendors to create a remotely controlled base station. Now, with the release of the Tait T803 Tone Remote module, a fully featured and configurable remote controller is available. The T803 is designed to fit into a channel rack frame; because it incorporates a monitoring speaker and a programming port, it can replace the usual speaker panel without requiring any additional space. The T800-27-0x01 single-channel rack frame is available for exciter/power amplifier output up to 100 W and the T800-27-0x00 dual-channel rack frame for transmitter output up to 25 W.

This section explains the different tone control signalling formats that the T803 supports, describes the T803 front panel display, and provides pinout information for the T803's auxiliary control outputs and auxiliary alarm inputs. For more details on the T803's features, technical specifications, and accessories, and for instructions on how to install, set up and test it, see the T803 Service Manual. For information on how to use PGM800Win to programme the T803, see the T800 Programming Application User's Manual or the online Help.

Tone Control Signalling

The T803 supports the following methods of tone control signalling:

Keytone only
A keytone is a signal to the remote controller to key the transmitter on. Generally, the keytone is 2175 Hz, though for example Simoco M81 signalling uses 2970 Hz. When the T803 receives the keytone from the despatcher console, it keys the transmitter on and leaves it on as long as it continues to receive the keytone. The T803 can be programmed to use any one of a number of pre-defined frequencies as the keytone. If required, Tait can add other frequencies.
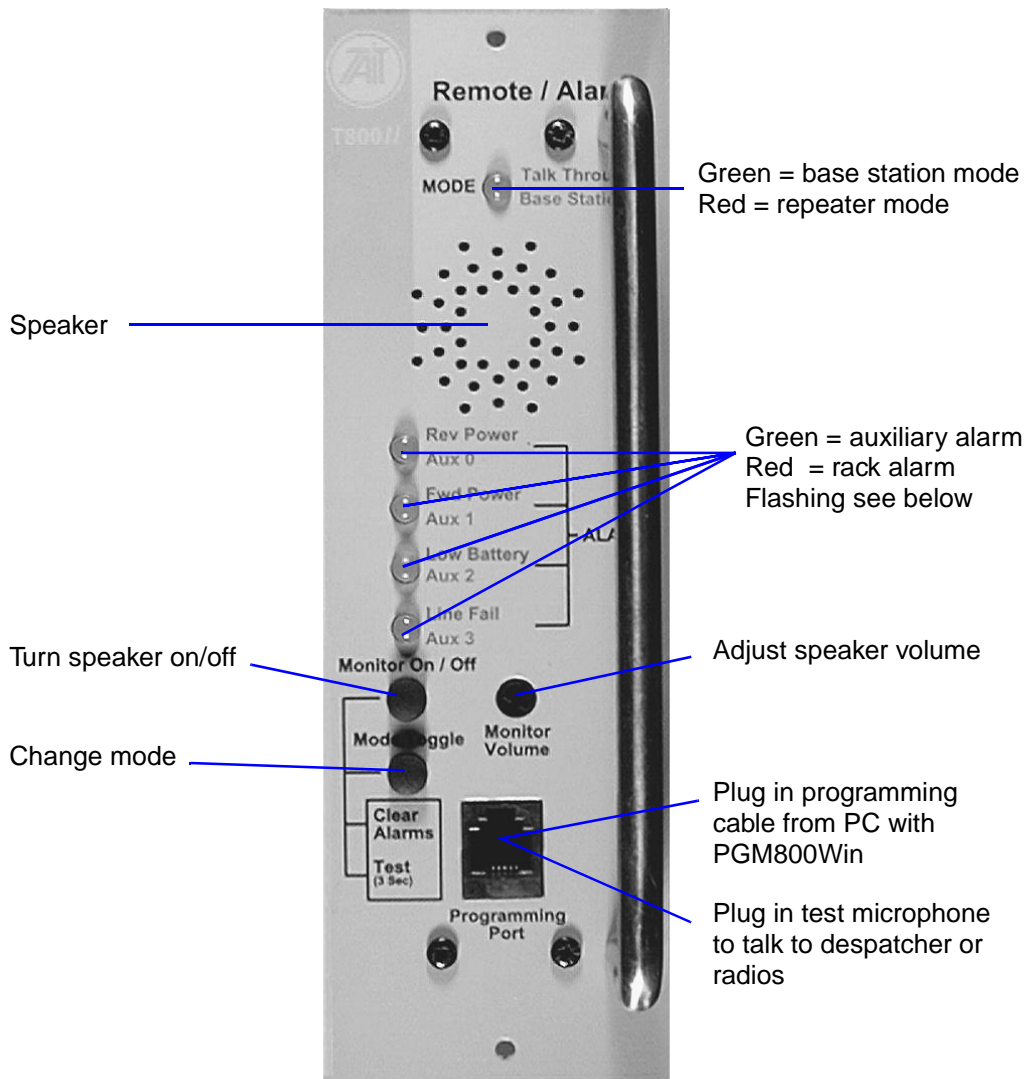
High Level Guard Tone / Function Tone / Low Level Guard Tone
The Motorola Guard-Tone™ and GE Secure-IT™ formats use more complex signalling in order to support a range of commands. When the despatcher presses the PTT, the console sends a high level guard tone (HLGT) followed by one or two function tones, then by a low level guard tone (LLGT). The LLGT acts as a keytone and continues as long as the console PTT is pressed. When the T803 detects the function tone(s), it carries out the function (for example setting the channel), and when it detects the LLGT, it keys the transmitter on and leaves it on until the LLGT signal ceases.

When the despatcher wants to make a change to the base station but does not activate the PTT, the HLGT and the function tone are sent, but the LLGT is omitted.

The frequency used by HLGT and LLGT is the same, usually 2175 Hz. HLGT has a nominal level of +10 dBm and LLGT -20 dBm. The T803 can be programmed for a variety of other frequencies and its automatic level control means that it can accept a wide variety of line levels and attenuation. It sends received audio to the console in accordance with TBR15 and TBR 17.

Front Panel Display

Green = base station mode
Red = repeater mode

Speaker

Green = auxiliary alarm
Red = rack alarm
Flashing see below

Turn speaker on/off

Adjust speaker volume

Change mode

Plug in programming
cable from PC with
PGM800Win

Plug in test microphone
to talk to despatcher or
radios

Front Panel Mode LED

The Mode LED on the front panel flashes in different ways, depending on the condition.

Flash Rate		Condition
— — — —	equal 0.3s on/ 0.3s off	Module is linked with PGM800Win
—— — ——	long flash 1 s on/0.3 s off	Microcontroller has detected an internal communications error
— — — — — —	short off 0.3 s on/0.08 s off	Speaker is ON.

Where two or more conditions occur at the same time, the precedence is in the order shown above (i.e. module linked has the highest priority, followed by microcontroller error, then speaker ON).

Resetting Alarms

Press the Monitor and Mode buttons together to reset any alarms.

Auxiliary Alarm Inputs

The T803 can be provided with up to four auxiliary alarm inputs. You connect them to the T803 using SK8 on the rack frame backplane. They use contact closure to 0 V. The following are the pinouts.

	Input	Adjacent Earth
Alarm0	14	1
Alarm1	15	2
Alarm2	16	3
Alarm3	17	4

Auxiliary Control Outputs

The T803 can provide up to four open collector control outputs. They are connected to SK8 on the rack frame backplane and are rated at a maximum of 50 V and 250 mA. The following are the pinouts.

	Output	Adjacent 13.8 V
Aux 0	25	13
Aux 1	24	12
Aux 2	23	11
Aux 3	22	10

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