Frequency Agile Converter (FAC)

User Manual

PREFACE

This document describes the installation, commissioning and operation of TASC Systems Frequency Agile Converter (FAC).

Hardware and software described in this document is subject to on-going development and improvement. Consequently there may be minor discrepancies between the information in this document and the performance and design of the hardware and software.

Periodically throughout this manual, you will find text such as this, which has been shaded and bolded with a pointing finger to catch your attention. These are special notes and tips to assist you.

Before connecting any equipment to any FAC product, it is important to read the Installation & Adjustments section of this document in its entirety. Application of voltages and signal levels in excess of the built-in protection devices could seriously damage the FAC and the equipment it is being connected to.

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1.0 PRODUCT DESCRIPTION

1.1 GENERAL DESCRIPTION

The Frequency Agile Converter (FAC) is a Radio Frequency (RF) device that takes a CDMA channel as input and then repeats it to one or two other distinct CDMA channels within the same band of frequencies.
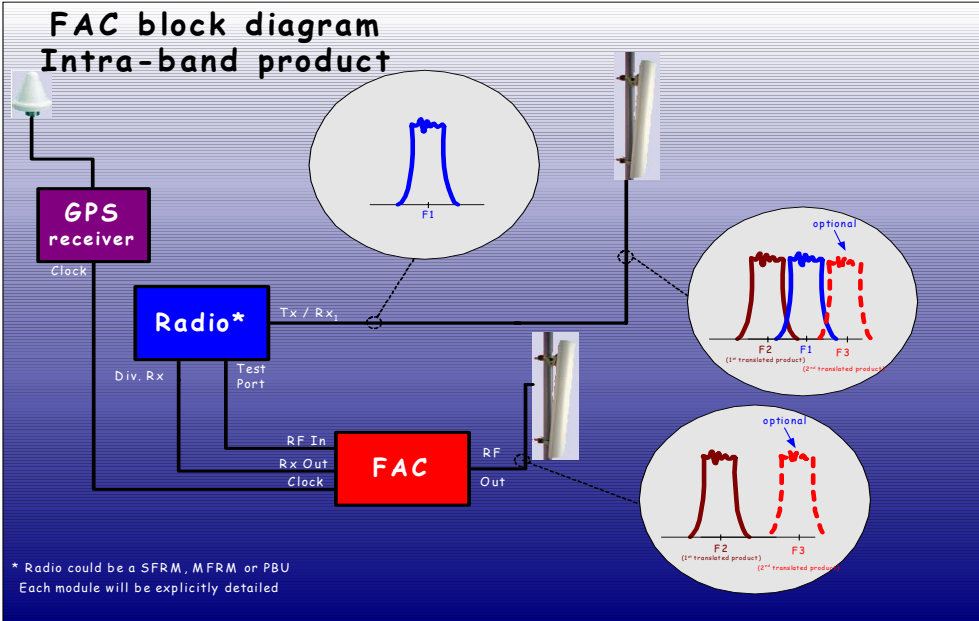
Figure 1 – FAC Block diagram (Intra-band product)

There are two models of FAC. One is for the PCS band and one is for the cellular band. Physically, they appear the same. The FAC is packaged in a 4RU enclosure ready for mounting in a standard 19-inch equipment rack. Installation in a 23 or 26-inch rack requires a 4RU adapter kit (available separately as an accessory).

Configuration of the FAC's input channel, output channels and gain level are accomplished using the *Frequency Agile Converter Configuration Tool (FACT)*. The FACT software runs on a PC and can connect locally to the FAC through the FAC's serial Programming Port.

Alternatively the FACT program can configure the FAC remotely by using a modem to dial into a sitePORTAL unit (either a UARM or a sitePORTAL Lite), which is in turn connected to the FAC's Programming Port. A, (see Section 3.1) detailed user manual for sitePORTAL is available from TASC Systems Inc.

2.0 INSTALLATION & ADJUSTMENTS

2.1 The FAC Front Panel

All of the FAC's connectors and status lights (LEDs) are located on front panel as shown in Figure 2. The left side of the panel has the grill for ventilating the chassis. A grounding lug is located on the back panel.

Figure 2 – FAC Front Panel

There are three light-emitting diodes (LEDs) on the front panel that indicate the status of the unit: Fail, Alarm, and Normal. The FAC's status can also be monitored by the FACT software, which is explained in a later section.

Figure 3 – FAC Front Panel Connectors

The connectors on the front panel are summarized in the table below:

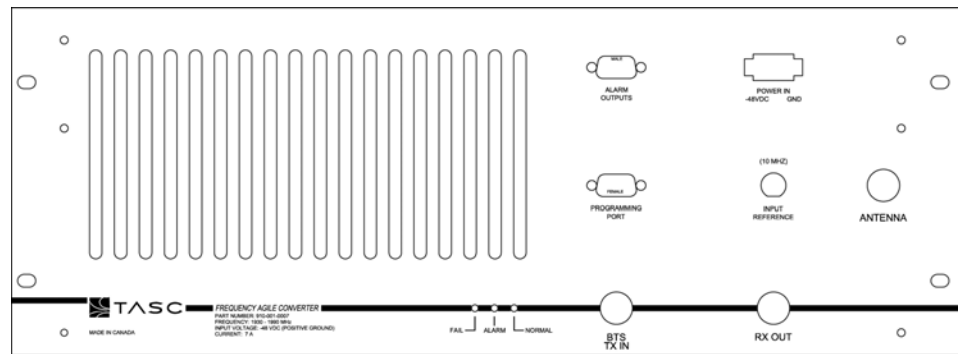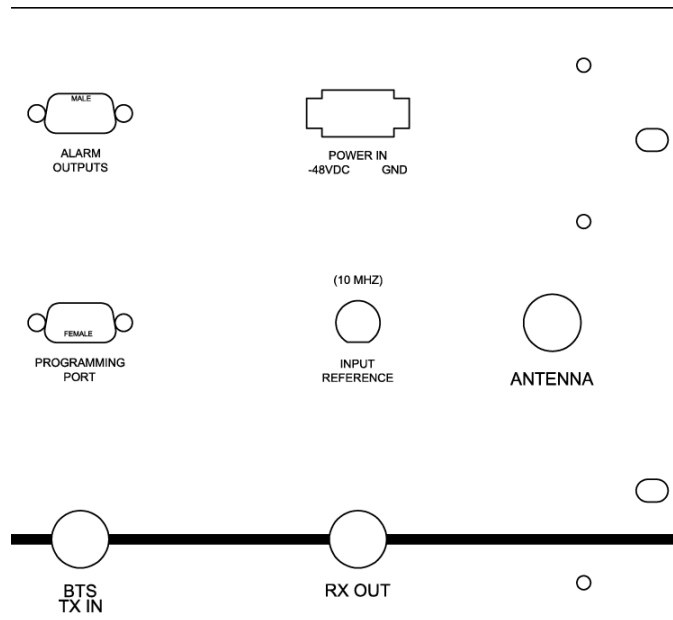| Port	Type	Description
Programming Port	DB-9 female	Serial data connection to configure and monitor the FAC remotely (through a sitePORTAL unit) or locally (RS232).
Alarm Outputs	DB-9 male	FET open drain outputs for wiring to an external alarm panel if desired. Two outputs: Major, Minor.
Power In	Molex 42021	–48 VDC positive-ground power source.
Input Reference	BNC female	User-provided external 10 MHz reference clock (optional).
Antenna	N female	FAC TX and Div. RX connection to antenna.
BTS TX IN	N female	Input RF signal to the FAC.
RX Out	N Female	Output to BTS Diversity RX input

Table 1 – FAC Front Panel Connectors

2.2   Environmental and Mounting Requirements

A standard FAC is shipped with the following components:

- FAC unit
- 4U height, 19, 23 and 26-inch rack-mount adapter kit
- 40' DC cable terminated with a Molex type 42021 at one end
- CD-ROM containing the FACT (FAC Tool) Configuration Software and User Manual

The FAC is designed for use inside an equipment shelter where extreme weather conditions would not be experienced. The FAC will operate within specifications from +10 degrees to +50 degrees Celsius ambient. The cabinet is designed to be rack mounted in a standard 19" (optionally 23" or 26") equipment rack. The FAC uses a front-mount design with clearance holes for attachment to the equipment rack using standard rack hardware. The FAC is 4 rack units (7 inches) in height.

Before powering up the FAC, ensure that the frequency band of the FAC unit matches that of the network it is being installed in and that all RF connections are properly configured. Allow the unit sufficient time to stabilize at the ambient temperature of the equipment room before applying power. The power supply connector may then be plugged in.

The FAC operates from a 48VDC positive-ground source. Operation from an AC source requires an external -48V power supply (available separately as an accessory).

Ensure that there is no obstruction to airflow through the cooling fan vents.

2.3   Power Connections

The DC connection to the FAC must be positive ground at a nominal -48 Volts. An external AC power supply is available as an option. The nominal current draw at -48 VDC is a maximum of 7 Amps. (4 A @ 110 VAC). The user must install proper fusing between the voltage supply and the FAC in accordance with the local electrical code. The DC connection to the FAC is via a Molex type 42021 connector. A forty-foot cable and mating connector are supplied with the unit.

Be sure to observe the correct polarity when connecting the –48VDC power supply to the FAC. Failure to do so could damage the unit.

The rear of the FAC chassis is fitted with a ¼ " NC bolt for grounding the chassis to earth. The –48 volt DC input of the FAC is isolated from the chassis as well as the various output voltages.

2.4   RF Connections

The maximum RF output of the FAC is 35 Watts average CDMA power. The RF output of the FAC must be properly terminated with either an antenna or load of 50 ohms nominal impedance. The high power amplifier is isolated at the output with a circulator and load as a safety measure. The RF output connector is Type N Female. If poor return loss is experienced at the output of the FAC, a VSWR (Reflected Power) alarm will be generated and the FAC will automatically go off the air.

Caution should be observed around the RF OUT port, as it is capable of emitting strong electromagnetic fields if not terminated properly.

The RF input to the FAC is to be connected to the TX output of the CDMA BTS radio or Pilot Beacon Unit through a coaxial cable. One or more channels may be present at the RF input of the FAC. An internal filter will automatically tune to the frequency of the channel chosen in the configuration window of the FACT software (see Section 3).

The composite signal amplitude at the RF IN connector should not exceed -10 dBm.

2.5   Fans

There are two fans mounted in the rear of the FAC cabinet to provide cooling to the high power amplifier mounted inside the FAC cabinet. The airflow created by the fans must remain unimpeded and therefore a minimum of 5 inches of clearance is required at both the front and rear of the FAC. The amplifier will remain sufficiently cool with the loss of one fan. If the FAC should experience a single fan failure, an alarm will be generated, allowing a technician adequate time to schedule a visit to the site. Failure of both fans will generate a more severe alarm and a lock-down of the unit. The FAC will then be out of service until a field visit resolves the problem.

2.6   Clock Source (10 MHz Input Reference)

The accuracy of the clock source will determine the frequency accuracy at the output of the FAC. The internal clock source of the FAC has an accuracy of +/- 2.5 ppm.

The accuracy of the clock reference of a typical GPS receiver is +/- 1.0 ppm. If an external clock source is available, it can be applied to the Input Reference connector on the front panel of the FAC. It is recommended that the most accurate 10 MHz clock source available be used.

The signal from the external clock source must be 10 MHz and should be applied at a level of 0 dBm.

When connecting an optional external clock source to the external clock input of the FAC, ensure that "External" is selected in the Clock Reference of the configuration window of the FACT software (described below). This will disable the internal clock of the FAC and the FAC will then use the external clock as the input reference.

The connector for the external clock is BNC female and has a nominal impedance of 50 Ohms.

2.7 External Alarm Outputs

The FAC alarms may be connected in summary form to an external alarm reporting system via the front panel's DB-9 male connector labeled "Alarm Outputs." A wiring diagram is shown below:

EXTERNAL ALARM OUTPUT
(NORMAL OPERATING CONDITION SHOWN)
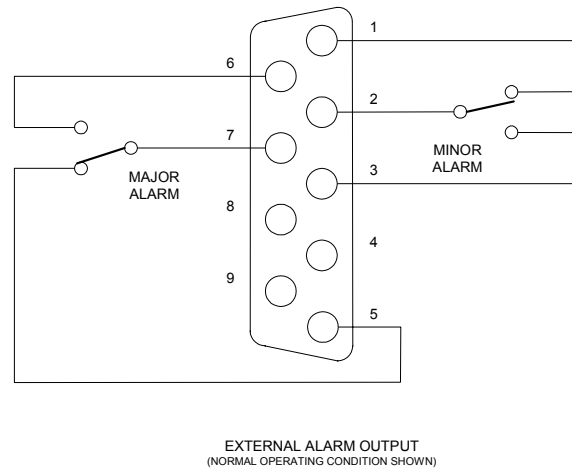
Figure 4 – External Alarm Output Wiring Diagram

Pins 1 and 2 are normally closed Minor Alarm output.
Pins 2 and 3 are normally open Minor Alarm output.
Pins 5 and 7 are normally closed Major Alarm output.
Pins 6 and 7 are normally open Major Alarm output.

☞ **The outputs are isolated Form C Relay contacts.**

When connecting FAC alarm outputs to a UARM (sitePORTAL), it is important to set it up properly for relay contact outputs. Connect the wiring and configure the jumper for the UARM input channel per the instructions in the UARM User Manual. For connection to other equipment, be sure to consult the applicable product manual for connection of the relay contact outputs.

3.0 CONFIGURING AND USING THE FAC

3.1 Connecting to the FAC

On power up, the FAC front panel's green and red LEDs will flash for a few seconds, after which it will automatically go online (on the air) as indicated by the green LED being on solid. The amber LED will indicate any minor alarms (fault). The red LED indicates a major alarm (failure). When a major alarm is present, the RF portion of the FAC will not operate.

On first power up, the FAC will not have channels assigned so it will stay offline and indicate a no PLL lock (major) alarm (red LED on). Upon configuration of the channels, this alarm will clear and the FAC will go online.

☞ **When taking an FAC offline for service or relocation to a new site, it is recommended that both output channels first be disabled (and/or have the power amplifier software-disabled). If this is not done, powering up an FAC at a new site with channels set from a prior site may result in operation on the wrong channels. Be prepared to quickly configure the appropriate channels after power up if this should occur.**

To configure the FAC from a PC, launch the FACT Configuration Utility and select from the menu to make a connection to the FAC (see Figure 4). Select a Local Connection if connecting directly from the PC's serial COM port to the FAC's serial Programming Port via a standard serial cable. Select Remote Connection from the menu if connecting to the FAC through a dialup modem and sitePORTAL unit.
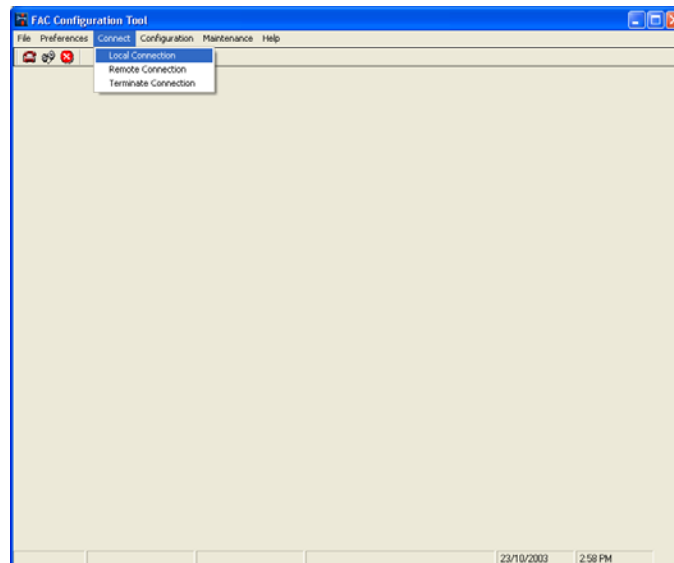
Figure 5 – FACT (FAC Tool) Local Connection

Users who connect directly (locally) to the FAC can skip to Section 3.2 FAC General

3.1.1 sitePORTAL Pass-through Mode

(For remote connections via sitePORTAL - UARM or sitePORTAL Lite)

To connect remotely to the FAC, a connection must first be made remotely through a sitePORTAL device located with the FAC. The sitePORTAL device handles the connection to the FAC by passing on messages to the FAC. The FAC remote connection mode is used to facilitate 'dial up' connections through remote sitePORTAL units. When the remote connection mode is activated on the FAC, the On-line menus are enabled.

In order to connect to the FAC remotely via a sitePORTAL, the sitePORTAL must first be put into Pass-through mode using the UMCS software. Once the sitePORTAL is put into Pass-through mode, the sitePORTAL will then forward the next incoming modem call on to the FAC.

3.1.2 Remote Connection Window

Once the sitePORTAL is set up in Pass-through mode, a connection can then be made from the FACT to the FAC. When connecting in remote mode, FACT prompts with the Remote Connection 'dialer' window. A sample dialer window is shown in Figure 5. To call a site, click on the site of interest and then click the dial/connect button.
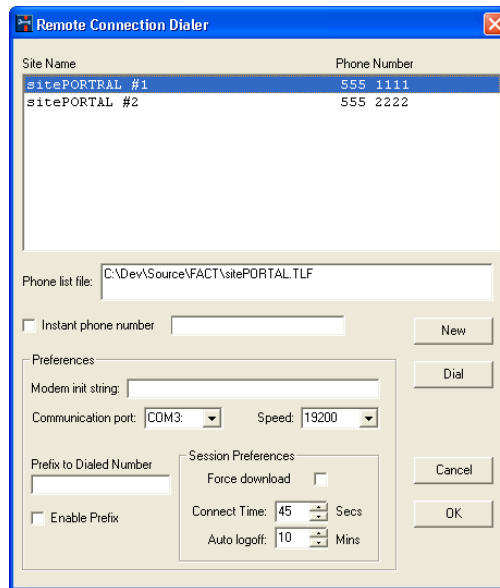
Figure 6 – Dialer Window – sitePORTAL

Like the Connection List File maintenance section discussed later in this document, the dialer window works with as many connection list files as you have created with the Connection List maintenance program. Connection list files can contain a mixture of 'dial up' and TCP/IP connections. FACT always displays the last accessed Connection list file. If you wish to use another file, click on the New button. A file open window is shown. Select the file you wish to use with the dialer.

When you have selected the site of interest, click on the dial button to start the call. The dialer window also allows the user to select an alternative phone number via the 'Instant' phone number box. If you wish to dial a number not listed in the Connection list file, click in the Instant phone number box and enter the number to dial in the adjacent text box. This overrides any selected entry in the list box.

3.1.3 Preferences Panel

The dialer window conveniently replicates the modem preferences information that can also be accessed via the menu item Preferences Modem Connection. The modem preferences panel provides access to the following settings:

Setting	Description
Modem init string	A user-supplied modem specific initialization string
Communication port	The PC's modem port
Speed	The modem's DTE speed (default: 19200 kbs)
Connect time	The time after dialing before FACT must see DCD from the modem or the call is terminated (default: 45 seconds)
Auto logoff	The maximum time that FACT can be idle before the user is logged out and the call terminated (default: 10 minutes)
Prefix	Enables/disables the dialed number prefix which may be added to the telephone database number

Table 2 – Modem Preferences Panel

Once a connection is established with the FAC through the sitePORTAL, the FAC configuration and status page will automatically open (see Figure 5). Closing the FAC configuration and status page does not close the sitePORTAL's connection to the FAC.
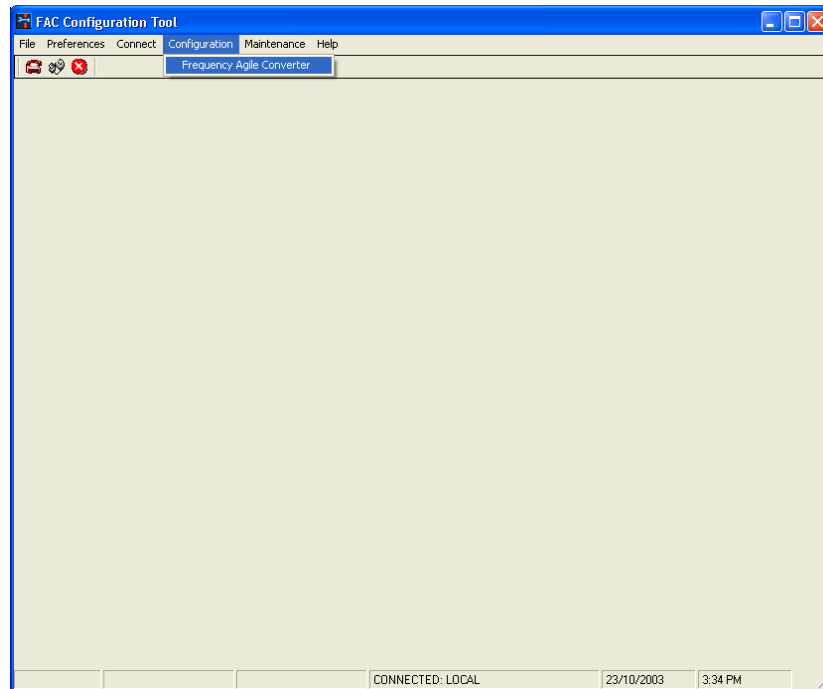
Figure 7 – FACT Configuration Options

The FAC configuration and status page can be opened by selecting the Configuration->Frequency Agile Converter menu option. This menu option is enabled when the FACT is connected to an FAC hardware device. By selecting this menu option, the "Frequency Agile Converter Configuration and Status" window opens (see Figure 7).

3.2   FAC General

The Frequency Agile Converter Tool dialog window (Figure 7) has two tabs, one for configuration and one for status.

The FAC firmware version is indicated in the top right corner of the FAC Configuration window.   This value may be needed when contacting customer support.
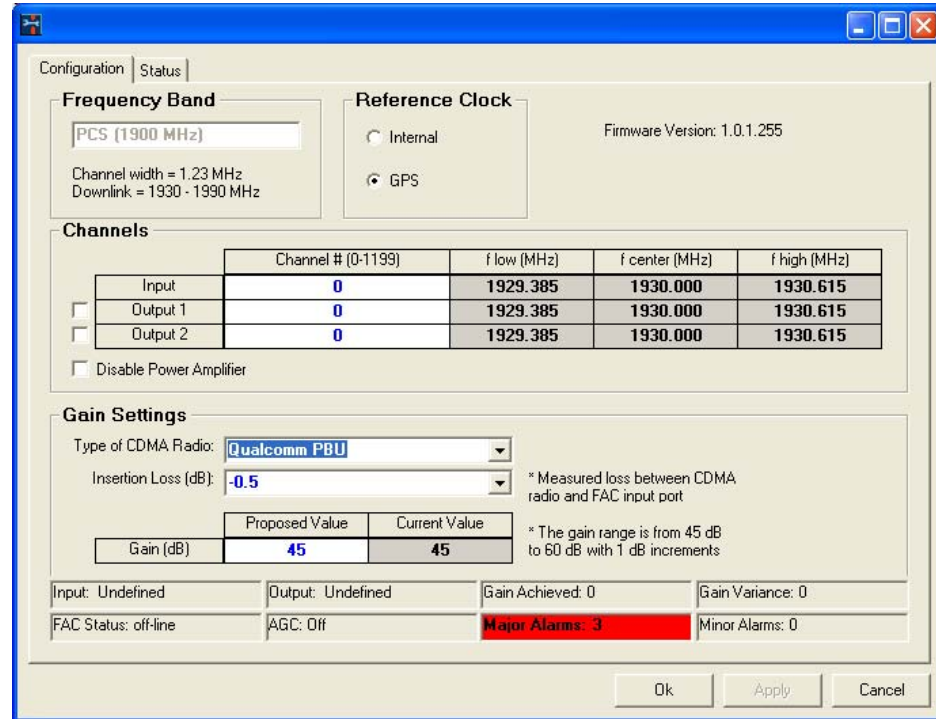
Figure 8 – Frequency Agile Converter Configuration

The FAC Configuration and Status windows have a common status bar at the bottom of the form. This status bar gives a summary of the FAC's current status. It indicates the FAC's input and output signal strengths, whether the FAC is on the air or off the air, whether automatic gain control (AGC) is on or off, and whether or not there are any Major or Minor alarms. The status fields are detailed in the sub-sections to follow.

3.2.1 Input

The Input status field shows the input channel signal strength in dBm (in ½ dB steps).   The input signal strength is channel selective, (i.e. RF signal present on other channels is not included in the input signal measurement). Input signal measurement involves a ten second time-average window, which means that sudden changes in input signal will be smoothed out in the readings.

If there is an error condition, it will show as one of the cases below:

> Under Range: meaning signal is below start of measurable range
>   (approx –40dBm with no attenuation set
>   i.e. gain at 60dB and AGC not active).

> Saturated: meaning signal is beyond measurable range
>   (approx -10 dBm with no attenuation set
>   i.e. gain at 60dB and AGC not active).

> Undefined: meaning other error condition

If any of the above error conditions persist (i.e. not happening briefly as the FAC applies settings and transitions through offline and online states) then there is likely a serious condition present that may also be indicated as an alarm condition.

3.2.2 Output

The Output status field shows the output signal strength in dBm (in ½ dB steps). The output signal strength is composite, (i.e. it will differ by approx 3dB depending on whether one or two output channels is selected). Output signal measurement is nearly instantaneous.

If there is an error condition, it will show as one of the cases below:

> Under Range: meaning signal is below start of measurable range
>   (< 27dBm)

> Saturated: meaning signal is beyond measurable range
>   (>= 48 dBm)

> Undefined: meaning other error condition

If any of the above error conditions persist (i.e. not happening briefly as the FAC applies settings and transitions through offline and online states) then there is likely a serious condition present, which may also be indicated as an alarm condition.

3.2.3 Gain Achieved

The Gain Achieved field shows the system gain achieved. When two output channels are selected, the gain is adjusted to indicate the gain per output channel.

3.2.4 Gain Variance

The Gain Variance field is a simple diagnostics aid which indicates the amount that the gain achieved is in variance from the gain setting, without explanation (such as AGC attenuation). The FAC subtracts 1dB from the variance as a tolerance window.

In most cases, non-zero variances will be transient resulting from sudden fluctuations in the input signal, or as AGC is changing attenuation automatically.

3.2.5 FAC Status

If the FAC is actively transmitting on either of the two output channels, it is then considered to be online (i.e. on the air). If both output channels are disabled or if the FAC has major alarms, then the FAC is considered to be offline (i.e. off the air and not transmitting).

To take the FAC off the air, select the Disable Power Amplifier check box (and/or deselect both output channel check boxes) and press the Apply button or the OK button. Note that the FAC will go off the air automatically if it experiences major alarms or lock down.

With the power amplifier disabled, but with input and output channels selected, the FAC will appear as online, but will not be generating RF output signal. This facilitates setting up channels and verifying the input channel signal before activating the high power RF output.

3.2.6 AGC

The AGC field either indicates AGC as off, or the amount of attenuation the AGC has initiated to keep output power within allowable limits.

3.2.7   Major Alarms

The Major Alarms field indicates the number of major alarms present. The background will be red if any are present.

3.2.8   Minor Alarms

The Minor Alarms field indicates the number of minor alarms present. The background will be yellow if any are present.

3.3 FAC Configuration

Any changes made will not be applied until either the "Apply" button or the "Ok" button is selected. Selecting "Cancel" will close the window without updating any settings.

Parameter Name	Range Of Values	Default Value	Description
Reference Clock	-Internal -GPS	GPS	Reference clock used to determine channel frequencies.
Input Channel Number	Dependent on the FAC Frequency Band*	Lowest Channel Number	Channel number of input channel. The input channel selects the input signal to repeat to output channels 1 and 2.**
Output 1 Channel Number	Dependent on the FAC Frequency Band*	Lowest Channel Number	Channel number of output channel 1.**
Output 1 Enabled	-Checked (ON) -Unchecked (OFF)	Unchecked	If this checkbox is checked, the FAC will repeat the signal coming from the input channel through channel 1. If this checkbox is not checked, no signal will be broadcast through output channel 1.
Output 2 Channel Number	Dependent on the FAC Frequency Band*	Lowest Channel Number	Channel number of output channel 2.**
Output 2 Enabled	-Checked -Unchecked	Unchecked	If this checkbox is checked, the FAC will repeat the signal coming from the input channel through channel 2. If this checkbox is not checked, no signal will be broadcast through output channel 2.
Type of CDMA Radio	-None -Nortel MFRM -Qualcomm PBU	None	The Nortel MFRM radio introduces a loss of 50 dB between its Main output port and the RF sample port. The Qualcomm PBU radio introduces a loss of 37.5 dB between its RF output port and the RF sample port.
Insertion Loss	-10 dB to 20 dB (0.5 dB increments)	0 dB	The loss of the system as measured by the technician installing the FAC. The insertion loss represents the cabling loss measured by the technician between the RF sample.
Proposed Gain	45 to 60 dB (1 dB increments)	60 dB	Calculated as CDMA Radio Loss + Insertion Loss, or entered manually by a user.

Table 3 – User Settable Parameters

See Section 3.3.1 for Channel numbers.

** See Section 3.3.3 for calculation of Channel Frequencies.

3.3.1 Frequency Band

The frequency band that the FAC works in is preset at the factory. The FACT software automatically detects which frequency band that the FAC is working in and then allows the user to select channels based on the frequency band.

For North America there are two possible factory presets for the frequency band as shown here:

Frequency Band	Channel #'s	Channel Width	Downlink
PCS (1900 MHz)	0 - 1199	1.23 MHz	1930 - 1990 MHz
Cellular (850 MHz)	1 - 799, 991-1023	1.23 MHz	869 - 894 MHz

Table 4 – Frequency Bands

3.3.2 Input Reference Clock

The FAC uses a reference clock to synchronize the output frequencies. The FAC can be set to use either its internal built-in clock, or an external clock signal from a GPS receiver for example. If an external input reference is to be used, the user must provide the appropriate clock signal with a 10 MHz reference output at a level of approximately 0 dBm.

Select the appropriate Reference Clock setting as shown in Figure 7.

Note: If the FAC is set to external clock, but none is connected, the FAC will most likely experience PLL loss of lock alarms.

3.3.3 Channels

The input channel and output channels must be valid channel numbers for the frequency band. The number of channels available varies based on the frequency band.

When any of the channel numbers is changed, three values are automatically calculated. These values represent the channel width of the frequency band.

The channel width along with the center frequency (F Center) of a channel gives the low and high band edges of the chosen channel.

The output channels are enabled or disabled by selecting or deselecting the check box located to the left of the output channel.

The PCS (1900 MHz) channel frequencies are calculated as follows:

F Center = 1930 MHz + (0.05 * channel #)

The Cellular (850 MHz) channels frequencies are calculated as follows:

F Center = 870 MHz + (0.03 * channel #) [1 < channel # <799]
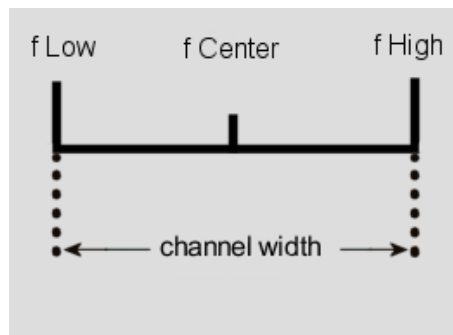F Center = 870 MHz + 0.03 * (channel # - 1023) [991 < channel # < 1023]

Figure 9 – Channel Width

For example, an FAC that is set to use the PCS (1900 MHz) frequency band has available channels 0 to 1199. Each channel has a channel width of 1.23 MHz. If the user were to choose channel 325, the calculated center frequency would be 1946.25 MHz with a low frequency of 1945.635 MHz and a high frequency of 1946.865 MHz.

Changing the input channel value while the output power amplifier is on could cause undesired effects. To disable the output power amplifier, check the "Disable Power Amplifier" checkbox and press the Apply button.   The power amplifier must be manually re-enabled to resume normal FAC operations.

3.3.4 Gain Settings

The two output channels share a common gain setting for amplifying the output signals. The gain setting needs to be adjusted based on the device insertion loss and RF design. By selecting the radio type and by indicating the insertion loss, a proposed gain value is calculated. The proposed gain value is the suggested gain setting. The proposed gain value may be kept or

it may be entered manually. Clicking "Apply" sets the gain. The gain may be set between 45 and 60dB.

The actual gain value is indicated by the "current value".

The gain achieved is the actual gain achieved, which may vary from what the gain is actually set to. The gain variance is difference between the actual gain and what the gain is set to, but it also takes the Automatic Gain Control (AGC) into account.

For example: if three CDMA carriers are presented to the RF input of the FAC, at a composite idle (no activity on any of the three carriers) amplitude of -10 dBm, the calculation would be as follows:

-10 dBm for three carriers = -14.7 dBm per carrier

Desired output at maximum BTS output power:
     2 carriers @ 41.6 dBm each (44.6 dBm composite)

Dynamic range is 7 dB
     (difference between idle and fully utilized channel)

-14.7 dBm + gain value of 49.3 dB = 34.6 dBm
     (one channel idle power at the output)

34.6 dBm + 3 dB for the second channel = 37.6 dBm

Maximum BTS output = 37.6 dBm + 7 dB = 44.6 dBm

Therefore, in this example a gain setting of 49 or 50 dB would be used.

Table 5 – Gain Settings Table

If the output power is too high then AGC (Automatic Gain Control) becomes active. The AGC function automatically controls the gain in order to achieve maximum amplitude of 44.6 dBm for two channels, or 41.6 dBm for one channel, at the output port ("RF OUT") of the FAC.

The AGC implementation in the FAC is in two stages. One stage is implemented in firmware to adapt to fluctuations in the input signal, keeping the output signal within allowable limits. The AGC cycles every ½ a second, monitoring the output level in response to the attenuator setting and input signal, adjusting the attenuator gradually (approx ¼ to ½ dB steps per cycle) to prevent sudden fluctuations in gain.

In the event the FAC reads the output signal as beyond the measurable range, the attenuator is set to maximum and then AGC cycles normally to recover to the nominal operating level from below.

The second stage of AGC is implemented in the hardware of the high power RF power amplifier. It acts quickly to prevent harm to the power amplifier.

3.4 FAC Status and Alarms

By selecting the "Status" tab, a list of possible FAC alarms is displayed, along with the current status of the unit (See Figure 9).
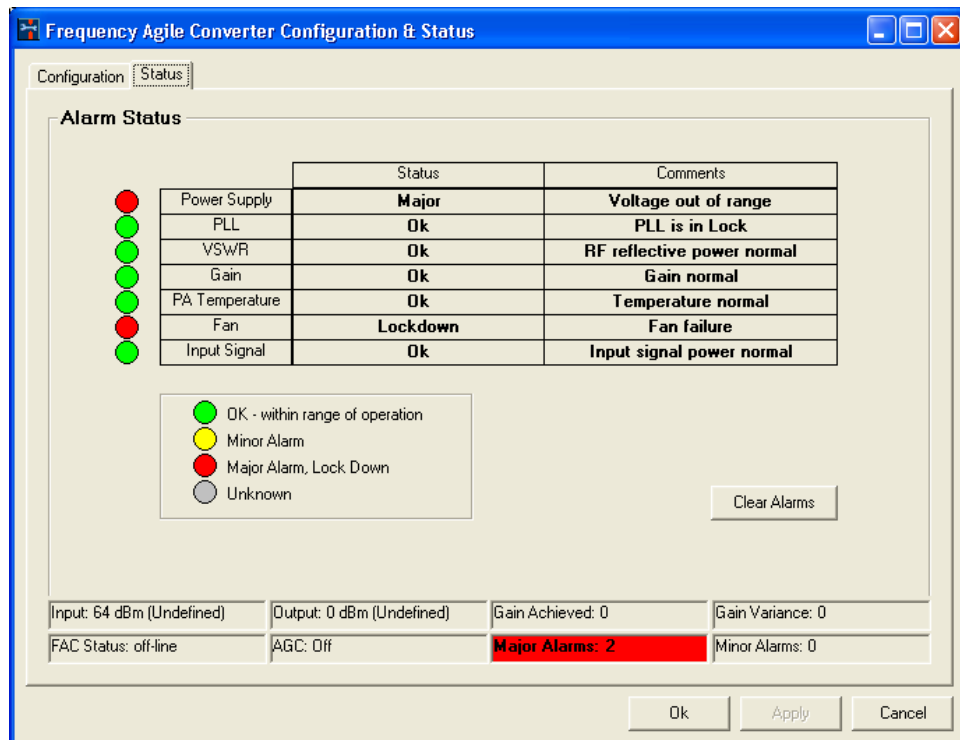

Figure 10 – Frequency Agile Converter Status

3.4.1 Alarm Status

The major components of the FAC are monitored to ensure the unit is functioning properly. Certain conditions can cause the FAC to be in one of five possible states. These states are:

1. Ok – monitored value is within normal operating range
2. Minor – monitored value is outside of the range of operation, but the FAC can still continue to operate on the air

3. Major – monitored value is outside of the range of operation, causing the FAC to go off the air

4. Lock Down – alarm requires a manual reset to clear, even if the alarm condition has already cleared. All other alarm types will automatically clear when the alarm condition ceases, but a locked down alarm requires user intervention to clear the alarm. Alarm lock down is used for the following types of scenarios:

   - The failure condition causing the alarm should never happen and so could indicate that a serious malfunction has occurred in which case a technician should confirm whether or not the system is ok

   - The condition is serious, but the alarm will always clear itself once the system is taken off the air, but if the unit then goes back on the air, the alarm will reoccur

   - Some alarm conditions if they repeat beyond a threshold count or stay on for too long, will result in a lock down

5. Unknown – the current value is unknown because the system is still initializing (wait for system to finish initializing)

3.4.2 Resetting Locked Down Alarms

The user may clear all locked down alarms by pressing the "Clear Alarms" button in the "Alarm Status" panel. If an alarm condition continues to be present, the alarm indicator will reactivate.

3.4.3 Alarms, Severities and Lock Down Criteria

Alarm	Severity	Locks Down
Power Supply	Major	Instantly
PLL	Major	Persistent for 3 minutes or 10 repeats without 2 hours of normal state.
VSWR	Minor	Persistent for 5 minutes or 10 repeats without 2 hours of normal state.
Gain	Minor	Persistent for 10 minutes or 50 repeats without 3 hours of normal state.
Temperature	Major	Persistent for 10 minutes or 10 repeats without 6 hours of normal state.
Fan	Minor	Never if only one fan fails at a time. Instantly if both fans fail simultaneously.
Input Signal	Minor	Never if on-channel input signal level is too low. Instantly if raw input signal is too high. (Composite Input signal level must be < +10 dBm)

Table 6 – Lock Down Criteria

Notes:

1. Lock down of a minor alarm escalates it to a major alarm.
2. Some alarm conditions may not be immediately detected because of the current state of the unit. (e.g. a VSWR triggering fault will not be discovered until the FAC goes on the air).
3. A VSWR alarm will result in the RF output being temporarily disabled. After a short timeout, RF output will be reactivated. If the fault is still present, this retry sequence repeats until corrected (or the unit locks down). This whole sequence is treated as one instance of a VSWR alarm condition with the alarm being turned on at the beginning and off when it clears. The FAC will effectively be off the air even though it may appear to be online. This sequence minimizes RF radiation in the event the output load is disconnected from the FAC while on the air.
4. Some error conditions that prevent the FAC from going online may result in a PLL alarm, (e.g. no output channel selected will result in a PLL alarm).

4.0 MAINTENANCE

4.1   Firmware Upgrade

When it is necessary to upgrade the firmware of the FAC, start the FACT utility and follow the steps below.

Invoke the 'Local Flash Upload" command from the 'Flash Upload" entry of the "Maintenance" menu (as shown n Figure 10 below).
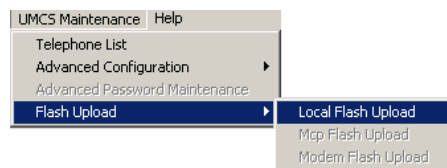

Figure 11 – Invoking the Flash Upload Command

FACT prompts with the Open Flash file window (as shown in Figure 11).
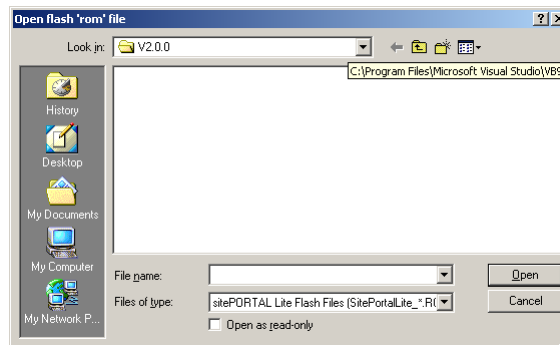

Figure 12 – Open Flash File window

Select the flash load file (.rom extension) and click the Open button. FACT prompts to confirm the flash upload (with the message shown in Figure 12).
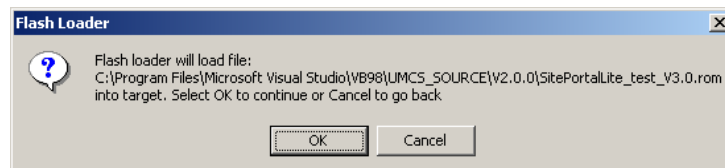

Figure 13 – Flash upload confirm message

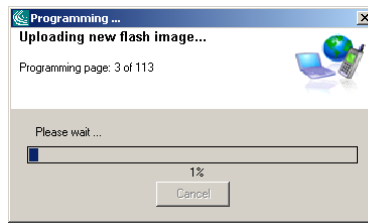Selecting OK will proceed to uploading the flash code. The flash load progress bar will be shown (Figure 13).

Figure 14 – Flash load progress bar

☞ **During flash loading the red and green indicators on the FAC will flash alternately. When the flash load is complete, the FAC is restarted with the new firmware.**

5.0 SPECIFICATIONS

Electrical	
Frequency bands	PCS: 1930-1990 MHz
Absolute group delay	< 5 μs
Gain adjustment range	45 to 60 dB in 1dB increments
Output power (RMS, One CDMA carrier)	+41.6 dBm (PCS)
Output power (RMS, Two CDMA carriers)	+44.6 dBm (PCS composite) / +41.6 dBm (PCS per channel)
Max. Input power	-10 dBm
RF Input	N female
RF Output	N female
External Clock input	BNC female
Clock signal	Internal, or external 10 MHz reference
AC Power Input	Optional
DC Power Input	-36 to -76VDC, -48 VDC nominal Positive ground 7 A. max.
Programming Interface	RS-232, 9600 bps
Alarm Output Interface	Form C Relay. Isolated Contacts.
Indicators	Green LED for normal operation Amber LED for alarm condition Red LED for unit failed condition
Mechanical	
Weight	10.5 kg
Size: H x W x D	7" (4U) x 19" x 17"
Mounting	19" equipment rack mount (includes brackets to fit a 23" rack)
Operating Temperature Range	+10°C to +40°C controlled environment
Storage Temperature Range	-40°C to +60°C

Table 7 – Specifications Table