



Setting up a Mini-BUC using serial commands

APPLICATION NOTE

This Application Note describes how to set up a Mini-BUC using serial commands via an FSK interface on the IF input to the Mini-BUC.

Codan accessories that provide an FSK interface include:

- the 7550 LAN Interface, which converts FSK data to provide direct serial USB and Telnet access to the M&C serial command set of the Mini-BUC
- the 7552 FSK to USB Interface, which converts FSK data to provide direct serial USB access to the M&C serial command set of the Mini-BUC via a USB port of the PC

For information on serial commands for the Mini-BUC see *Application Note: Serial interface commands for the Mini-BUC*, 17-60133. For information on serial commands for the 7550 see *Application Note: Serial interface commands for the 7550*, 17-60135.

All documents referred to in this Application Note are available for download from the Technical Information section of the Codan Satcom web site (www.codansatcom.com).

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LED indicators on the Mini-BUC

During setup and testing, it is useful to observe the LED indicator on the Mini-BUC to determine its current status. Use the information in [Table 1](#) as a guide.

Table 1: Tri-colour LED indicator on the Mini-BUC

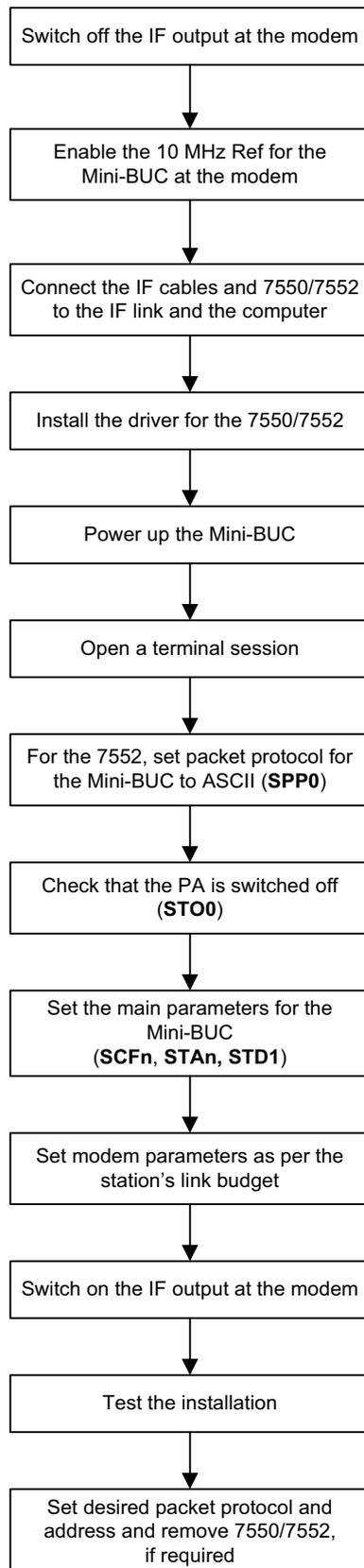
State	Indicates...
Green	Power is supplied to the Mini-BUC and the PA is off
Green and red, or orange	Power is supplied to the Mini-BUC and the PA is on
Flashing red	One or more of the following hardware faults have been detected in the Mini-BUC: <ul style="list-style-type: none"> • overtemperature fault (> 85°C) • PA fault • LO fault • hardware/firmware incompatibility

Installation process

Please refer to *Application Note: Serial interface commands for the Mini-BUC*, 17-60133 when setting up the Mini-BUC.

The flowchart in [Figure 1](#) shows the typical process that should be followed when setting up a Mini-BUC.

Figure 1: Installation process



Connecting the Mini-BUC to the computer

WARNING Switch off the IF output in the modem to prevent RF output radiation until the setup is completed.

To set up the Mini-BUC to accept serial commands:

- Do one of the following:
 - To connect a 7550 or 7552 to the outdoor Mini-BUC see below, [Connecting a 7550 or 7552 to the Mini-BUC](#).
 - To connect a 7550 or 7552 to the indoor modem see [page 5, Connecting a 7550 or 7552 to the modem](#).

Connecting a 7550 or 7552 to the Mini-BUC

CAUTION The sealing rating of the 7550 and 7552 is IP30. They may only be used outdoor temporarily and in dry conditions.

To connect a 7550 or 7552 to the Mini-BUC:

- Disconnect the coaxial cable from the **IF INPUT** connector on the Mini-BUC.
- Connect this coaxial cable to the **MODEM** connector on the 7550 or 7552.
- Connect a short length of coaxial cable between the **IF INPUT** connector on the Mini-BUC and the **BUC** connector on the 7550 or 7552.

CAUTION Do not connect the computer to the USB connection on the 7550 or 7552 until after the driver is installed.

- Install the driver for the USB connection and set up a terminal session in which to use the serial commands (see *Application Note: Installing the USB driver for the 7550 or 7552*, 17-60139).

Connecting a 7550 or 7552 to the modem

To connect a 7550 or 7552 to the modem:

- Disconnect the coaxial cable from the IF output of the modem.
- Connect this coaxial cable to the **BUC** connector on the 7550 or 7552.
- Connect a short length of coaxial cable between the IF output connector on the modem and the **MODEM** connector on the 7550 or 7552.

CAUTION Do not connect the computer to the USB connection on the 7550 or 7552 until after the driver is installed.

- Install the driver for the USB connection and set up a terminal session in which to use the serial commands (see *Application Note: Installing the USB driver for the 7550 or 7552*, 17-60139).

Starting communication with a Mini-BUC

The 7552 FSK to USB Interface provides direct communication with the connected BUC. Therefore any serial commands that you enter are performed by the Mini-BUC. The 7550 LAN Interface provides communication with the Mini-BUC, but it also has its own web server, so the 7550 responds to certain serial commands. If a 7550 is in place and you want to view this information for the 7550, follow the command with a 7550 suffix. If you do not include the 7550 qualifier, you will view the information for the connected Mini-BUC. Examples of this are provided below.

To communicate with the Mini-BUC:

- Power up the system.

The Mini-BUC starts up in ND Satcom protocol by default.

The 7550 automatically sends a command to the Mini-BUC to set it to ASCII protocol so that it can communicate with the 7550.

- ❑ If you are using a 7552 for communication with the Mini-BUC, type **spp0**, then press **Enter**.

The Mini-BUC switches to ASCII protocol and the terminal displays:

Connected to 7550...

```
7550
Starting...

7550 LAN Interface
-----
Version   : v1.00
Build Date : Dec 16 2010
>
```

Connected to 7552...

```
MINIBUC
-----
Version : v1.02
Build Date : Jul 21 2010
>
```

NOTE During setup, ignore any fault LEDs on the Mini-BUC.

- ❑ Type **hlp**, then press **Enter**.

A list of the categories of help for the serial commands is shown.

- ❑ Type **vid 7550** or **vid**, then press **Enter**.

The identity and configuration data for the 7550 or BUC is displayed on the terminal.

For the 7550:

```
>vid 7550
-----ID Data-----
Model No      7550          Serial No      AC40368A0002
Firmware P/No 90-20689-001      Firmware Version v1.00
>
```

For the Mini-BUC:

```
>vid
-----ID Data-----
Model No      4908-W/E-DC/EX-CE-NI  Serial No      A640339A0013
Firmware P/No 90-20685-001      Firmware Version v1.02
>
```

- ❑ Type **vss**, then press **Enter**.

The system status for the Mini-BUC is displayed on the terminal.

```
>vss
-----System Status-----
PA Status      On          Tx Atten      0.0
Tx On          On          Tx Default    On
Pkt Protocol   ND Satcom (4) Pkt Addr      1
IF Comp Freq   0          RF Comp Freq  0
LO Freq        12800      Temp          31.0
>
```

NOTE The system status always indicates ND Satcom packet protocol and address 1, even though ASCII mode is selected.

- ❑ If the PA Status is On, type **sto0**, then press **Enter** to switch off the PA to avoid RF transmissions during setup.
- ❑ Type **vfs**, then press **Enter** to view the fault status of the Mini-BUC.

```
>vfs
-----Fault Status-----
          Current   Latched
PA          OK       OK
BUC Temp    OK       OK
10 MHz Ref  OK       OK
Internal    OK       OK
>
```

Setting up a Mini-BUC

WARNING Switch off the IF output at the modem.

WARNING Ensure that the PA is switched off (**STO0**).

Viewing the local oscillator frequency

NOTE The LO frequency in a Mini-BUC is fixed and cannot be changed.

The LO frequency is selected in consideration with the RF band to be covered, and the frequency range of the modem.

Non-inverting C-Band Mini-BUCs use an LO frequency of 4900 MHz for Standard and Extended bands. Non-inverting Ku-Band Mini-BUCs use LO frequencies of 13 050 MHz for Standard band, and 12 800 MHz for Extended band.

To view the LO frequency and the corresponding IF and RF frequency bands:

Type **vld**, then press **Enter** to view the limit data for the Mini-BUC.

```
>vld
-----Limit Data-----
Min Tx IF Freq  950      Max Tx IF Freq  1700
Min Tx RF Freq 13750    Max Tx RF Freq  14500
LO Freq         12800
>
```

NOTE For more information on LO frequencies see [Table 3 on page 14](#) and [Table 4 on page 14](#).

Setting up the temperature compensation frequency for the Mini-BUC

The L-Band Mini-BUC has a wide-band input so the RF output variation over temperature can vary over different values at different RF frequencies. The internal temperature compensation of the Mini-BUC is set around the desired carrier frequency. The actual carrier frequency is set in the modem (Tx IF Freq). If the temperature compensation frequency is not set, the RF output can vary by up to ± 3.0 dB. The accuracy of the temperature compensation is improved to ± 1.20 dB if the transmit RF frequency is set using the **SCF** command. If operation is limited to a single transponder, set the transmit frequency to the centre frequency of the transponder for better temperature compensation.

To set up the temperature compensation frequency:

- Type **scf**<n>, then press **Enter** to set the internal temperature compensation of the Mini-BUC for the desired carrier frequency.

<n> is the IF or RF frequency. The Mini-BUC automatically determines if the value entered is IF or RF.

Setting up the transmit attenuation

Maximum gain is at an attenuation setting of 0 dB. To minimise the possible effects of interference it is preferable to have a high transmit attenuation and a high IF level from the modem. Therefore, the Mini-BUC attenuator should be set as high as possible, consistent with the required Mini-BUC output power, transmit IF cable loss and maximum IF output level capability of the modem. The maximum cable loss is set by the maximum output power normally provided by modems and the maximum gain of the Mini-BUC. Determine the loss of the cable from its length and the operating frequency (see [Table 2 on page 11](#)).

The transmit attenuation of the Mini-BUC must be set according to the link budget. The gain settings and output power level of the Mini-BUC should be adjusted with the modem's Tx IF level. The transmit attenuation of the Mini-BUC should only be adjusted if the output power required cannot be achieved with the modem. The default value is 0 dB.

To set up the transmit attenuation:

- Type **sta<n>**, then press **Enter** to set the transmit attenuation in accordance with the link budget and the modem's Tx IF level.

n = 0 to 10.0 dB in 0.5 dB steps.

WARNING Always observe the required OPBO (output backoff) for the power rating of the Mini-BUC, the modulation scheme, and the number of simultaneous carriers radiated. Failure to observe these rules causes interference to other users and may damage the output FETs of the Mini-BUC.

- Type **vss**, then press **Enter** to view the transmit attenuation setting.

Setting up the default transmit status

To set up the default transmit status at power-up:

- Do one of the following:
 - To set the power-up status to transmit off, type **std0**, then press **Enter**.
 - To set the power-up status to the last-used state, type **std1**, then press **Enter**.

Setting up the Mini-BUC power to the link budget of the station

To set up the Mini-BUC power for the station:

- Obtain the required RF output power for the station (in watts, typically) from the satellite operator.
- Check that this power includes the OPBO required for the type of modulation and carriers.
- Convert the power in watts to dBm.

NOTE The gain for a Codan Mini-BUC is 70 dB, specified at 0 dB attenuation setting.

- Type **ota**, then press **Enter** to view the current internal attenuation setting of the Mini-BUC.

The factory default setting is 0 dB.

- ❑ Calculate the IF cable loss of the site using the information in [Table 2](#).

Table 2: Cable lengths resulting in a 20 dB loss

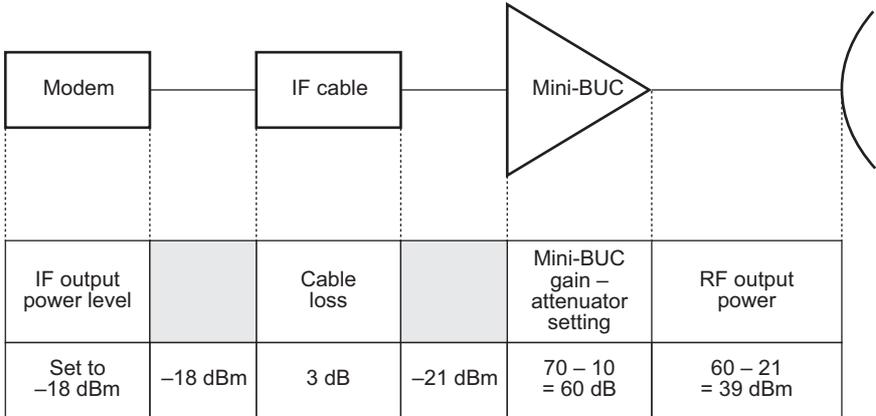
Frequency (MHz)	RG223 (m (ft))	Belden 9914 (m (ft))	Belden 9913F (m (ft))	Times Microwave LMR-400 (m (ft))
950	43 (141)	104 (341)	125 (410)	150 (492)
1450	34 (111)	81 (266)	99 (325)	120 (394)
1700	31 (102)	74 (243)	91 (299)	111 (364)
1750	31 (102)	73 (240)	89 (292)	109 (358)

NOTE [Table 2](#) shows the lengths of commonly used 50 Ω cables that give a loss of 20 dB. The cable lengths are shown in metres and feet.

- ❑ Use the block diagram in [Figure 2](#) or [Figure 3](#) and the formula below to set your modem IF output power level.

$$\begin{array}{rcl}
 \text{Modem IF} & & \\
 \text{output} & & \\
 \text{power} & = & \text{Mini-BUC} \\
 \text{level} & & \text{output} \\
 \text{(dBm)} & & \text{power} \\
 & & \text{(dBm)} \\
 & & - \\
 & & \text{Mini-BUC} \\
 & & \text{gain} \\
 & & \text{(dB)} \\
 & & + \\
 & & \text{Mini-BUC} \\
 & & \text{attenuation} \\
 & & \text{(dB)} \\
 & & + \\
 & & \text{IF cable loss} \\
 & & \text{(dB)}
 \end{array}$$

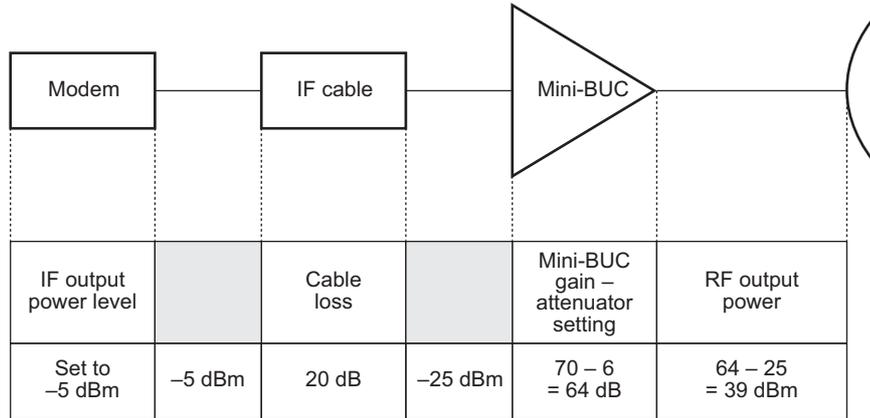
Figure 2: IF levels required for a loss in a short cable of 3 dB to achieve a P1dB of 39 dBm for an 8 W Mini-BUC



Refer to the relevant specifications sheets for the RF output power and gain specifications for your Mini-BUC

CAUTION The OPBO has not been considered in these levels.

Figure 3: IF levels required for a loss in a long cable of 20 dB to achieve a P1dB of 39 dBm for an 8 W Mini-BUC



Refer to the relevant specifications sheets for the RF output power and gain specifications for your Mini-BUC

CAUTION The OPBO has not been considered in these levels.

Setting up a modem

For a modem to operate with the Mini-BUC:

- set the internal reference source for the modem to 10 MHz
- set the reference frequency for the Mini-BUC to 10 MHz via the ODU menu list
- switch on the power supply for the Mini-BUC via the ODU menu list (for IF-powered BUCs only)
- enable the FSK output (if fitted)
- set the FSK address (default address is 1)
- set the modulator parameters
- set the Tx IF frequency (see [page 13, *Setting the Tx IF frequency*](#))
- set the Tx IF output level as per the station link budget
- enable the Tx IF output

WARNING The site will radiate power if the PA of the Mini-BUC is switched on, and the IF output at the modem is enabled.

Setting the Tx IF frequency

For non-inverting Mini-BUCs, the required setting for the IF frequency on your modem is calculated using the following equation:

$$f_{\text{IF}} = f_{\text{RF}} - f_{\text{LO}}$$

For example, if an RF output frequency of 14050 MHz is required from a non-inverting Mini-BUC that has an LO frequency of 12800 MHz, you must set the IF frequency on your modem to 1250 MHz.

Table 3: RF output frequencies for C-Band Mini-BUCs

Modem type	IF frequency from modem (MHz)	RF output frequency (MHz)	
		Standard band (fixed LO 4900 MHz)	Extended band (fixed LO 4900 MHz)
Standard	950 to 1525	5850 to 6425	
Extended	950 to 1525 to 1825	5850 to 6425	5850 to 6725

Table 4: RF output frequencies for Ku-Band Mini-BUCs

Modem type	IF frequency from modem (MHz)	RF output frequency (MHz)	
		Standard band (fixed LO 13050 MHz)	Extended band (fixed LO 12800 MHz)
Standard	950 to 1450	14000 to 14500	
Extended	950 to 1450 to 1700	14000 to 14500	13750 to 14500

Preparing the installation for system testing

Prior to on-air system testing, please check the following:

- The IF output at the modem is switched off.
- The 10 MHz reference to the Mini-BUC is enabled at the modem.

NOTE The 7550 or 7552 should remain connected in the installation for changing the packet protocol back to ND Satcom after testing is complete.

There should be no faults on the terminal display and all LED fault indications should have cleared on the Mini-BUC. Clear any latched faults using the **RLF** command.

Testing the Mini-BUC

On-air tests may be conducted as per the procedure provided by your satellite service provider.

Recording the operating conditions for the Mini-BUC

To view the operating conditions for the Mini-BUC:

- Connect a terminal session to the Mini-BUC through a 7550 or 7552.
- Type **rst**, then press **Enter**.
- Type **vid**, then press **Enter**.
- Type **vss**, then press **Enter**.
- Type **vfs**, then press **Enter**.
- Copy, paste and save the output of these commands to a Word[®] document for future reference. Also include the name/ID of the station, the IF/RF frequency, the modem IF level, the modulation scheme, and date of record.

Preparing the system for operation

Setting up the packet address

The packet address applies to the ND Satcom serial protocol.

To set up the packet address:

- Type **sad<n>**, then press **Enter**.

$1 \leq n \leq 15$, ND Satcom protocol

NOTE The default packet address for the ND Satcom protocol is 1.

Setting up the packet protocol

The ND Satcom packet protocol is commonly used by modem manufacturers and is the only packet protocol available over FSK on the Mini-BUC.

To set up the packet protocol:

- Type **spp4**, then press **Enter**.

This sets the ND Satcom protocol.

Removing a 7550 or 7552 from the installation

NOTE The station traffic is disrupted when the cables are removed as the IFL link is temporarily disabled.

To remove a 7550 or 7552 from the installation:

- Disconnect the cables between the 7550 or 7552 and either the modem or the Mini-BUC.
- Restore any connections (see [page 4, *Connecting a 7550 or 7552 to the Mini-BUC*](#) or [page 5, *Connecting a 7550 or 7552 to the modem*](#)).
- Seal the connections as required.

NOTE For more information see *Application Note: Sealing N-type and MS connectors in satellite equipment installations*, 17-60094.