



CT-4
Digital Leakage Tagger
User's Guide



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Chapter 1

General Information

Ordering Information

For additional information about our products and services, contact your local VIAVI representative or visit <https://www.viavisolutions.com/en-us/how-buy>.

Where to Get Technical Support

Phone US: +1-844-GO-VIAVI or +1-844-468-4284

Outside US: +1-855-275-5378

Email: Trilithic.support@viavisolutions.com

Website: <https://support.viavisolutions.com/welcome>

How this Manual is Organized

This manual is divided into the following chapters:

- Chapter 1, “General Information” provides contact information and describes how this operation manual is structured.
- Chapter 2, “Introduction” introduces what the CT-4 is and what it does. This chapter discusses the practical application, connections and controls of the CT-4.
- Chapter 3, “Installation” describes steps needed to install the CT-4.
- Chapter 4, “Setup” describes the steps needed to perform initial configuration of the CT-4 and describes the steps needed to perform periodic calibration of the CT-4.
- Chapter 5, “Appendix” shows the technical specifications of the CT-4.

Conventions Used in this Manual

This manual has several standardized conventions for presenting information:

- Connections, menus, menu options, and user-entered text and commands appear in **bold**.
- Section names, web, and e-mail addresses appear in *italics*.



A **NOTE** is information that will be of assistance to you related to the current step or procedure.



A **CAUTION** alerts you to any condition that could cause a mechanical failure or potential loss of data.



A **WARNING** alerts you to any condition that could cause personal injury.

Precautions



Do not use the CT-4 in any manner not recommended by the manufacturer



The CT-4 may not operate correctly in the presence of a strong electromagnetic field.

Periodic Calibration

The chosen frequency must closely match that of the leakage detector or leaks will not be detected properly. If the CT-4 appears to be out of calibration, the unit must be returned to VIAVI or a VIAVI authorized repair center for re-calibration.

Chapter 2

Introduction

This chapter:

- Describes the purpose of the CT-4
- Gives a feature overview of the CT-4
- Lists the equipment supplied with the CT-4 and optional accessories
- Gives a guided tour of the CT-4 and explains the display screen

What is the CT-4?

The CT-4 is a 1U rack mounted unit that is located in the headend that provides an uncompromising tagging solution for active analog or digital systems.

CT-2/3 Operation

The new CT-4 can act as a traditional CT-2 or CT-3 analog tagger. This feature provides the ability to detect tagged leaks and ignore untagged leaks, saving time from false alarms from signals not originating in your system.

When several CATV systems operate in the same area, it is often difficult to determine which system is the source of a detected leak. The CT-4 is designed to deal with the problem of leakage identification in dual cable or overbuilt situations.

The CT-4 solves the problem of determining which cable is leaking by attaching a low frequency tag to the analog leakage carrier on the cable system.

VIAVI leakage receivers with analog tag detection including the Searcher Plus GT, Super Plus, Seeker Lite², Seeker and Seeker SE can be set to alarm only when the leakage signal has been tagged to insure the leak is from your system. The tagged signal from the CT-4 also causes a distinctive audible response in these leakage receivers.

VIAVI leakage receivers generate an audible tone that varies in pitch depending on the leakage strength. When the CT-4 tags a leak, it causes this audible tone to rise and fall in pitch at a rate of:

- 3 Hz – This is a “warble” tone that is used primarily with the Searcher Plus, Searcher Plus GT, or Super Plus analog leakage detectors. If you do not hear this fluctuating tone, you know that the leak did not originate in your system.
- 10 to 23 Hz (excluding 16 Hz) – This is the tag frequency that is used with the Searcher Plus GT, Super Plus, Seeker Lite², Seeker and Seeker SE leakage detectors.

CT-2/3 Application

Used as a system with a VIAVI leakage receiver, the CT-4 helps to eliminate “false alarm” triggers. The CT-2 and CT-3 provide the following features:

- Tags carrier used for traditional analog leakage measurement for easy identification.
- Provides low frequency modulation (3 Hz) “warble” tone for use with the Searcher Plus, Searcher Plus GT, or Super Plus analog leakage detectors.
- Provides higher frequency modulation (10 to 23 Hz, excluding 16 Hz) tag for use with the Super Plus, Search Lite, Seeker Lite², Seeker and Seeker SE leakage detectors.
- Provides a built-in leakage carrier source and is non interfering because its low frequency modulation is removed easily by the customer’s TV automatic gain control.

CT-4 Operation

The new CT-4™ works in conjunction with the Seeker D and Seeker D Lite Digital Leakage Detectors. The VIAVI Seeker D leakage detector accurately detects and measures signal leakage within the LTE and aeronautical frequency bands and features unsurpassed sensitivity from 2 to 2000 uV/m (20 to 2000 uV/m for Seeker D Lite).

The Seeker D and Seeker D Lite detect the proprietary signals from the CT-4 and scale the leakage value to match the adjacent analog or digital carrier as programmed into the meter. If reference analog is selected in the Seeker D, the readings will closely resemble the readings from an analog Seeker measuring leakage off the adjacent analog carrier.

Whether testing for leaks in both digital and analog systems, or monitoring aeronautical bands or LTE, the Seeker D and Seeker D Lite provide all of the capability to find and fix leaks quickly, accurately, and effectively.

CT-4 Application

Used as a system with the Seeker D and Seeker D Lite Digital Leakage Detectors, the CT-4 detects leaks in the Aeronautical and LTE frequency bands and eliminates all “false alarm” triggers. The CT-4 provides the following features:

- Provides proprietary dual CW carriers to give the Seeker D and Seeker D Lite Leakage Detectors the ability to detect leaks in the Aeronautical Frequency Band (135–139 MHz) and provides immunity to “false alarms”.
- Provides proprietary dual CW carriers to give the Seeker D and Seeker D Lite Leakage Detectors the ability to detect leaks in the LTE Frequency Band (610.5–615 MHz) and provides immunity to “false alarms”.
- The CT-4 eliminates the risk of affecting any adjacent digital channels by injecting an adjustable signal from 10 to 30 dBmV, targeting approximately 30 dB below the chosen digital carriers.

Equipment Supplied with Your CT-4

The CT-4 comes with the following:

- CT-4 Digital Leakage Tagger
- AC U.S. Power Cable
- Operation manual on CD

Accessories & Replacement Parts for Your CT-4

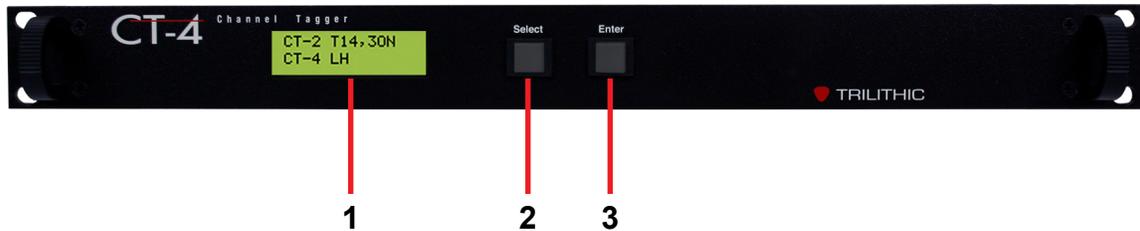
The following replacement parts are available for the CT-4:

Part Number	Description
0190197000	AC U.S. Power Cable 6 Foot Male (NEMA 5-15P) to Female (IEC 320C13)
0190322000	AC Euro Power Cable 2.5 Meter Male (IEC 884/CEE 7/VII) to Female (IEC 320C13)

To place an order, contact your local VIAVI representative, call 1-844-GO-VIAVI, or visit <https://www.viavisolutions.com/en-us/how-buy>.

A Guided Tour of Your CT-4

Front View



- 1. Display Screen** – This LCD is used to display the setup and operational status of the CT-4. The setup information on most screens can be adjusted from the front panel of the device.
- 2. Select** – This button is used to control the CT-4 as follows:
 - Scroll through the main menus
 - Scroll through the setup/display options available within the selected sub-menu
 - Adjust the settings within individual setup options after the Enter button has been selected.
- 3. Enter** – This button is used to control the CT-4 as follows:
 - Enter the menus and sub-menus
 - Select individual setup options to adjust settings

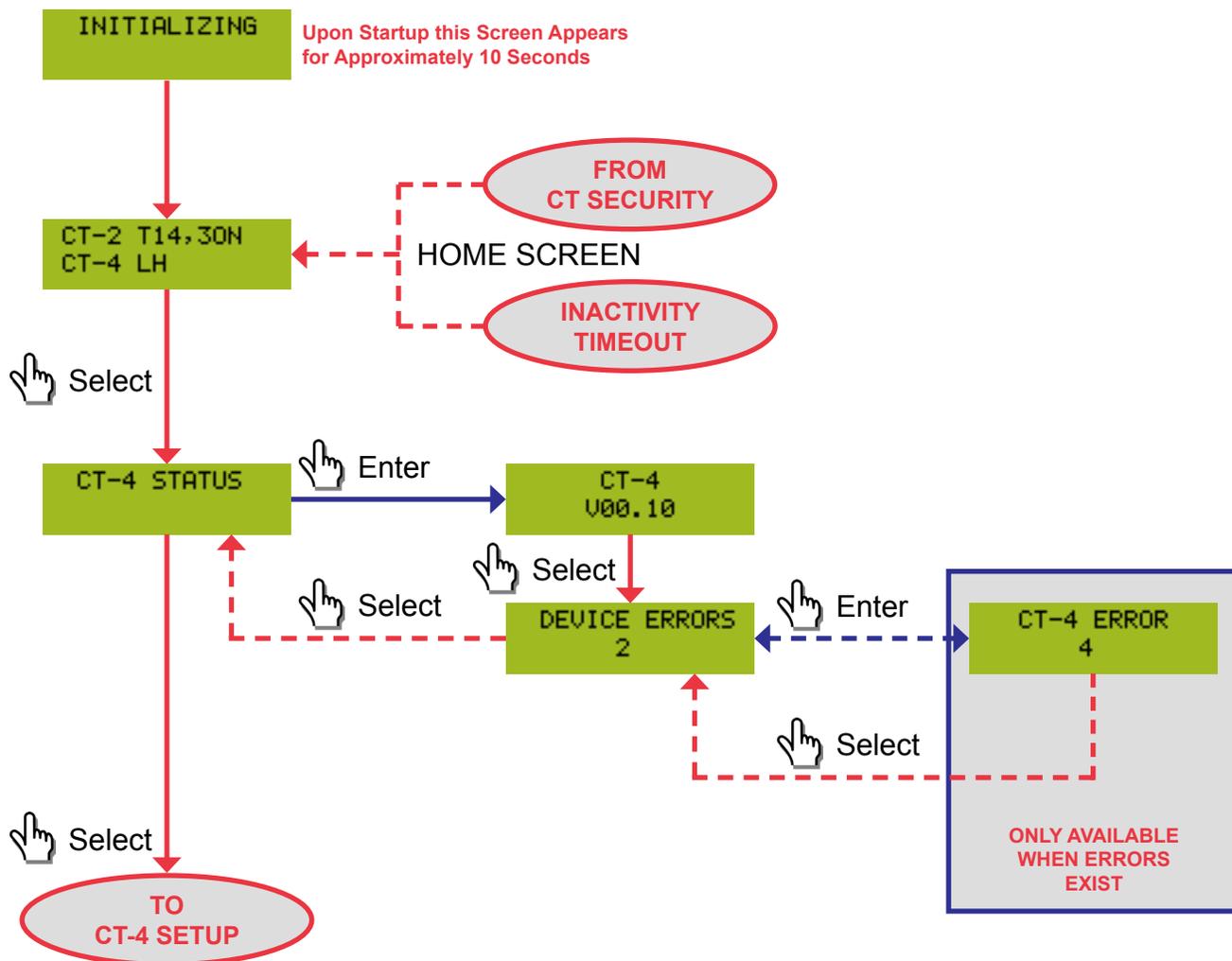
Rear View

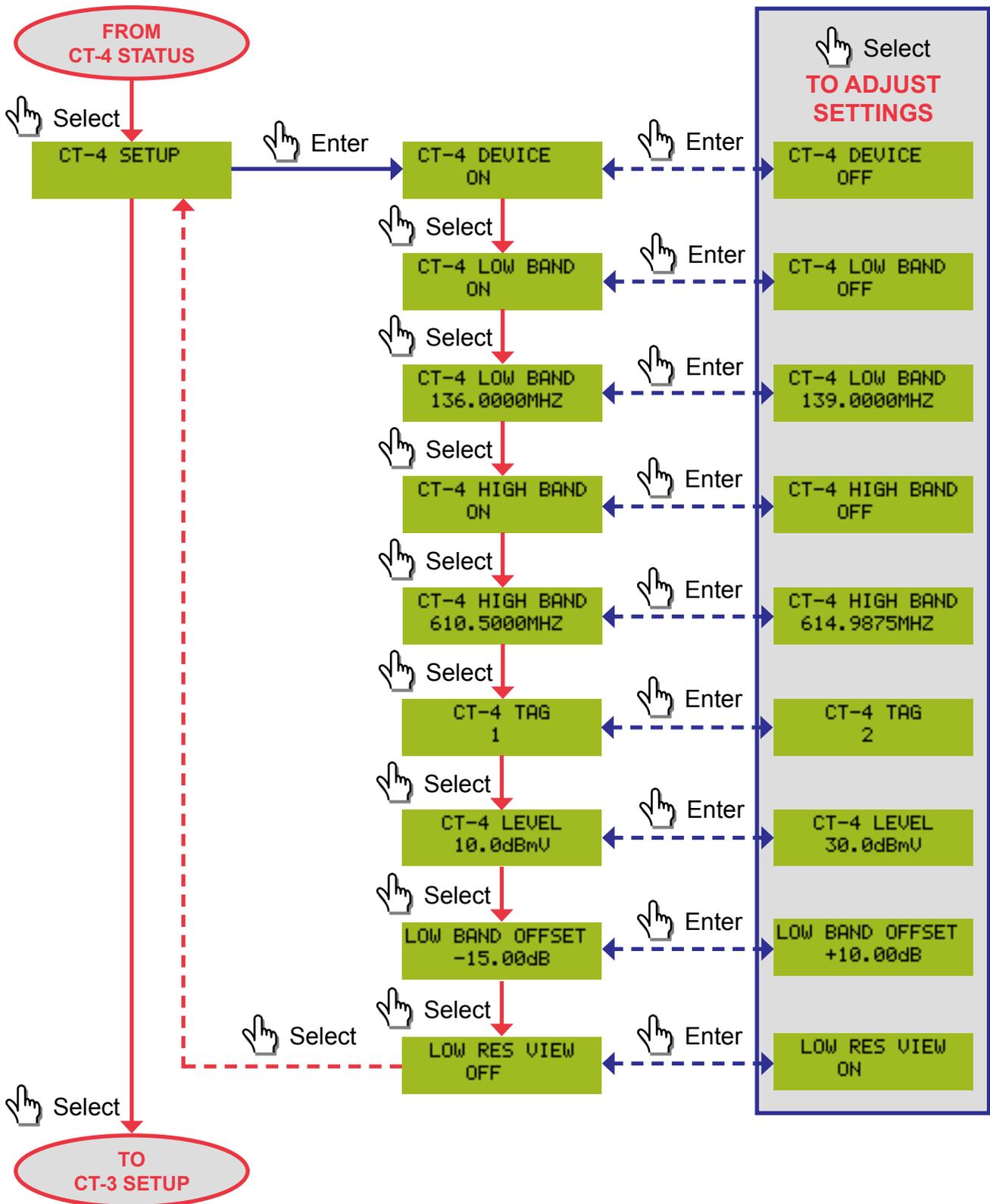


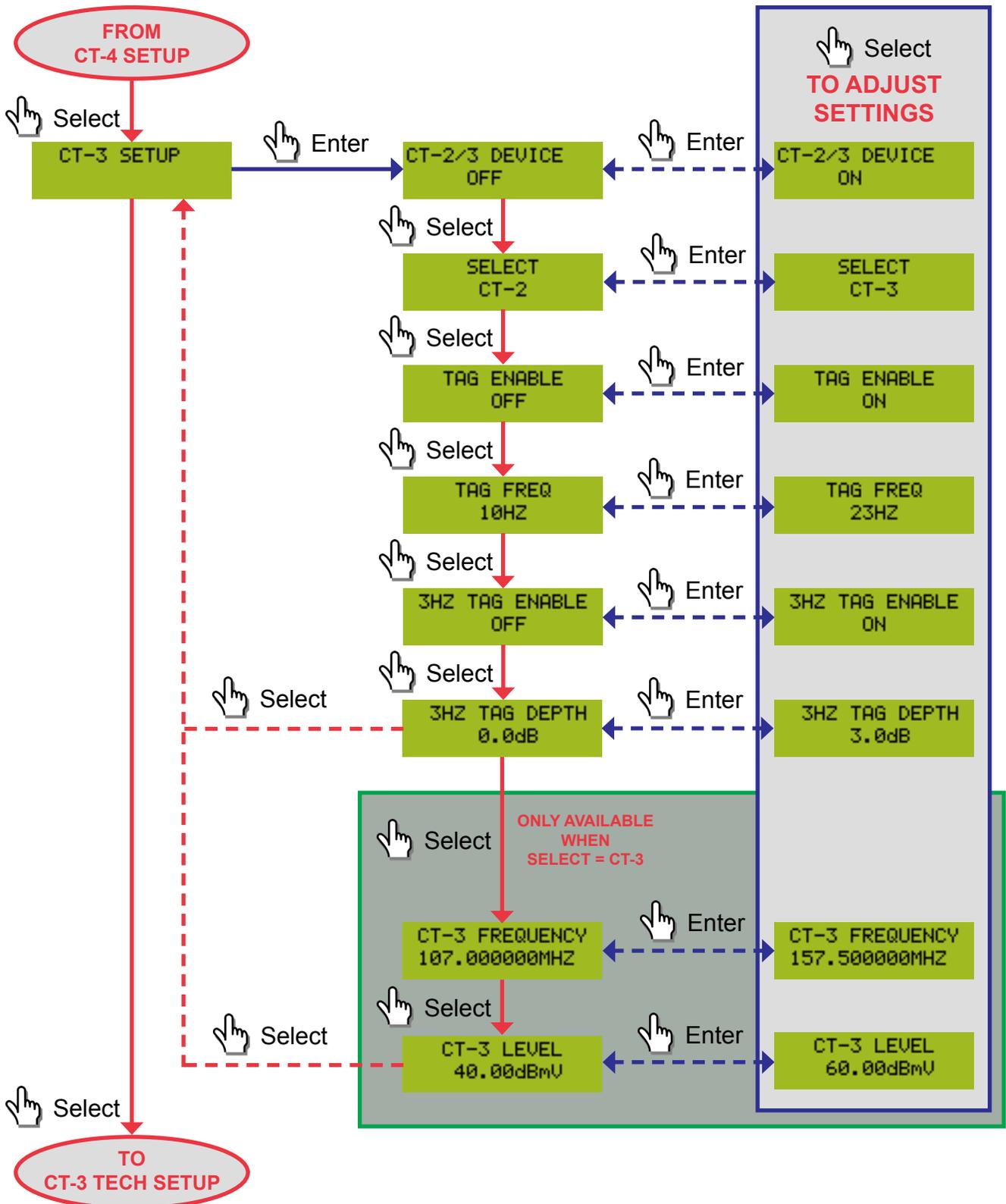
1. **CT-4 Output** – This is the RF output connection for the CT-4 function.
2. **CT-2 Input** – This is the RF input connection for the CT-2 function.
3. **CT-2/3 Output** – This is the RF output connection for the CT-2/3 function.
4. **Ethernet** – This port is for factory use and firmware upgrades.
5. **AC Power Input** – This is a Female (IEC 320C13) port for connection of an AC power cable. This port accepts AC input power from 90 to 370 VAC (47-440 Hz), 0.75 A.

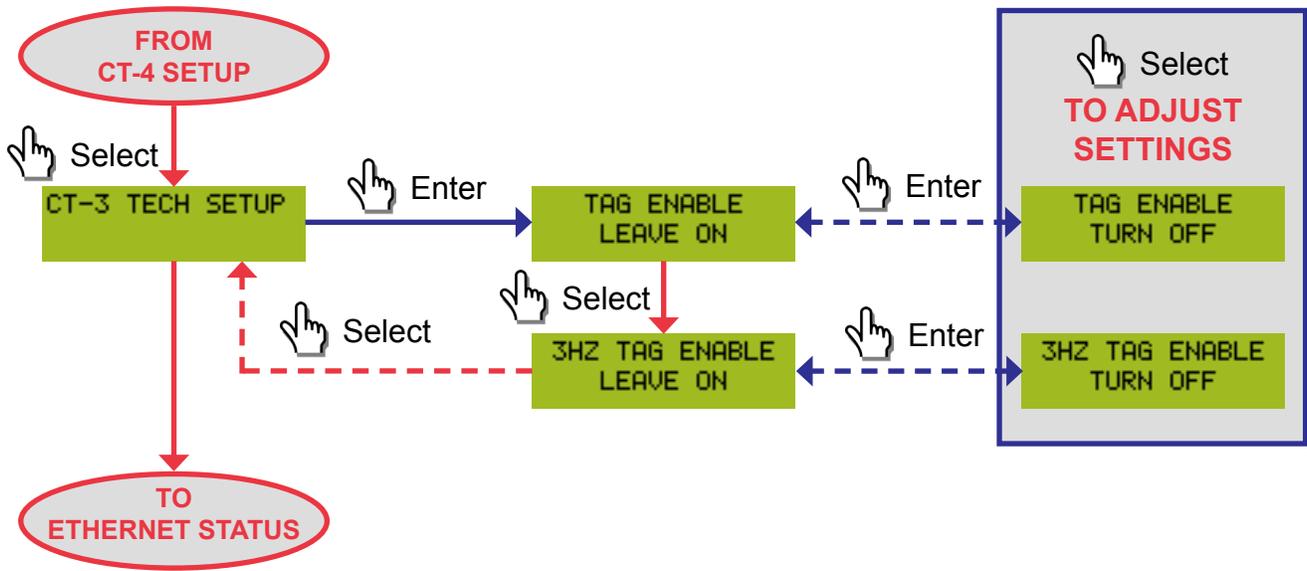
Display Screen Navigation

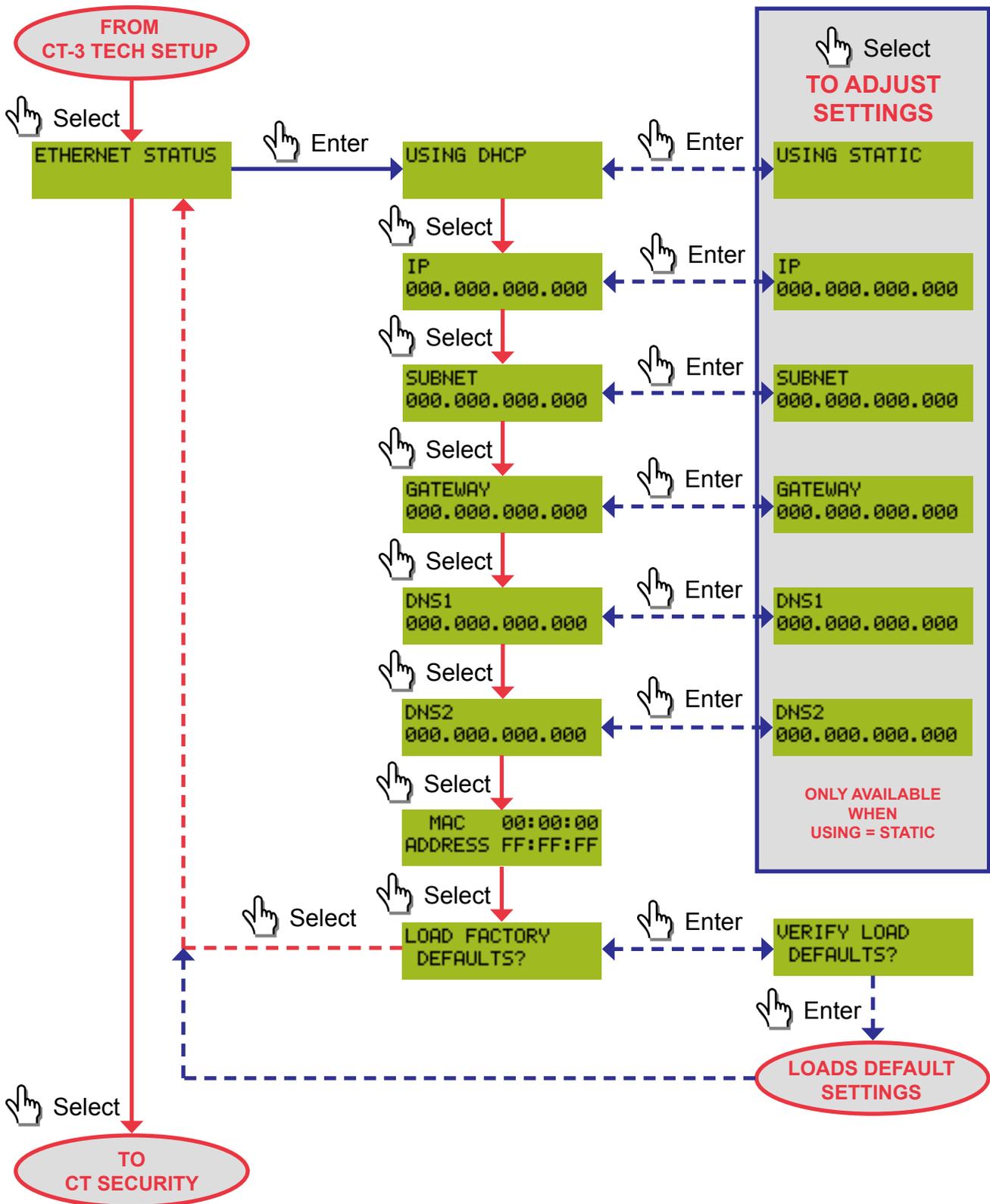
The following images provide an example of the method used to navigate the menus available on the CT-4 display screen.

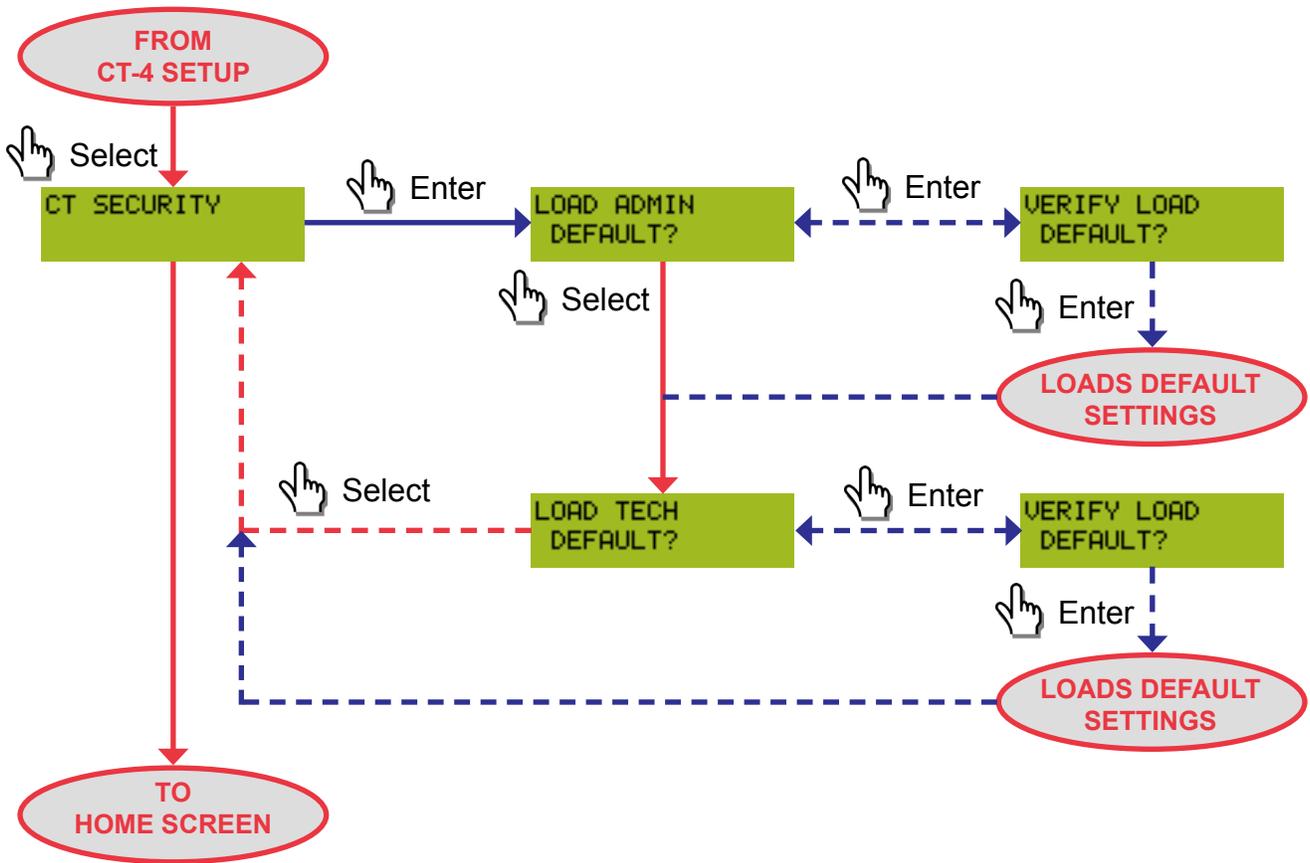










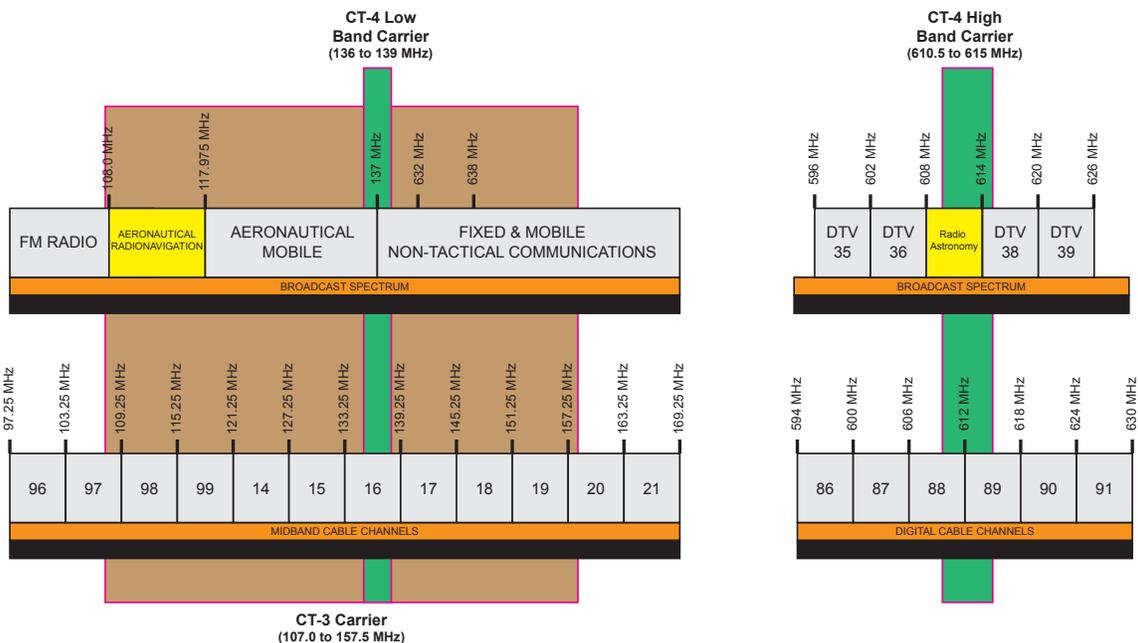


Chapter 3 Installation

Overview

The CT-4 needs to be installed where it can be injected into the system to reach the customer base at the frequency ranges that are specified by the desired mode(s) of operation;

- CT-2 Operation
 - 10 to 23 Hz (excluding 16 Hz) Tag
 - Carrier Source: External Channel Modulator Input
 - Carrier Frequency Band: Determined by External Channel Modulator
- CT-3 Operation
 - 10 to 23 Hz (excluding 16 Hz) Tag
 - Carrier Source: Integrated CW Source Output
 - Carrier Frequency Band: 107–157.5 MHz
- CT-4 Operation
 - Carrier Source: Integrated Proprietary Dual CW Source Output
 - Aeronautical Carrier Frequency Band (Low Band): 135–139 MHz
 - LTE Carrier Frequency Band (High Band): 610.5–615 MHz



Installation Instructions

Typically a CT-4 should be installed at each location that an existing CT-2 or CT-3 is installed and in many cases this may require a CT-4 to be installed in each hub site and/or each head end.

The following section explains the procedure used to install the CT-4. In order to properly setup the CT-4 the following steps must be completed in this order. Do not skip any steps.



CAUTION

Be sure to verify the whether the AC line voltage is correct for the device or damage may occur.

CT-2 Operation

For operation in the CT-2 mode, perform the following installation steps;

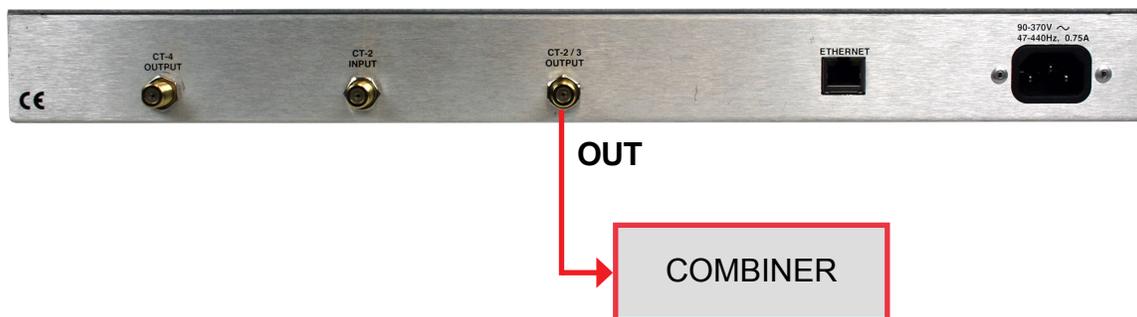
1. Select a suitable rack panel location near the modulator for the desired leakage channel and mount the CT-4 in the rack using four retaining screws.
2. Connect the device between the modulator and combiner as shown in the image below.
3. Connect the device to AC power.



CT-3 Operation

For operation in the CT-3 mode, perform the following installation steps;

1. Select a suitable rack panel location near the combiner where RF signals reside and mount the CT-4 in the rack using four retaining screws.
2. Connect the device to the combiner as shown in the image below.
3. Connect the device to AC power.



CT-4 Operation

For operation in the CT-4 mode, perform the following installation steps;

1. Select a suitable rack panel location near the combiner where RF signals reside and mount the CT-4 in the rack using four retaining screws.
2. Connect the device to the combiner as shown in the image below.
3. Connect the device to AC power.



Setup Guidelines

Leakage Receiver Tag Detection Support

The following VIAVI leakage detectors **DO NOT** include tag detection:

- **Searcher Plus**
 - Single detection frequency of 108 to 157.25 MHz
 - Crystal controlled fixed frequency, set at the factory

The following VIAVI leakage detectors include CT-2 or CT-3 type tag detection in the corresponding frequency ranges:

- **Super Plus & Searcher Plus GT**
 - Single detection frequency of 108 to 157.25 MHz
 - Crystal controlled and set at the factory
 - Default modulation of 20 Hz, internally adjustable & set at the factory
- **Seeker Lite²**
 - Frequency range of 118.5 to 147.25 MHz
 - Default detection frequencies of 121.2625, 127.2625, 133.2625, 139.2500 & 146.2625 MHz, user configurable in 6.25 kHz steps using optional Seeker Setup software
 - Modulation range of 10 to 23 Hz (excluding 16 Hz)
 - Default modulation of 20 Hz, user configurable in 1 Hz steps using optional Seeker Setup software
- **Seeker & Seeker SE**
 - Low band frequency range of 109.25 to 110.5 MHz (models marked “LOW BAND ENABLED”)
 - High band frequency range of 118.5 to 147.25 MHz (all models)
 - Default detection frequencies of 121.2625, 127.2625, 133.2625, 139.2500 & 146.2625 MHz, user configurable in 6.25 kHz steps using optional Seeker Setup software
 - Default modulation of 20 Hz, user configurable in 1 Hz steps using optional Seeker Setup software

The following VIAVI leakage detectors include CT-4 type tag detection:

- **Seeker D & Seeker D Lite**
 - Low band frequency range of 135 to 139 MHz
 - High band frequency range of 610.5 to 615 MHz
 - Low & high bands are user configurable in 12.5 kHz steps using optional Seeker Setup software

Tag Modulation Settings

Use the following modulation settings for the leakage tag depending on the type(s) of VIAVI leakage receivers you will be using in your system:

- **Receivers Without Tag Detection** – Use the 3 Hz setting to enable a “warble” tone to be heard on leakage meters that do not use channel tagging.
- **Receivers With Tag Detection** – Use the 10 to 23 Hz (excluding 16 Hz) setting to match the modulation settings of the leakage receivers in your system.



NOTE

The 3 Hz “warble” tone can be used simultaneously with the 10 to 23 Hz (excluding 16 Hz) for a mix of receivers with and without tag detection. However, the Seeker products will not benefit from the use of the 3 Hz “warble” tone, since they utilize the 10 to 23 Hz (excluding 16 Hz) tag signal.



NOTE

The modulation settings only apply to the use of the CT-2/3 operation mode. The CT-4 operation mode for the Seeker D and Seeker D Lite digital leakage detectors does not use a modulated signal.

CT-2 Operation Mode Setup

In the CT-2 operation mode, an external channel modulator is required to produce a channel that the CT-4 tag will be combined with. The CT-4 will generate a tag with 10 to 23 Hz (excluding 16 Hz) modulation that will be combined internally with the channel provided by the external channel modulator.

Perform the following steps to properly setup the CT-2 operation mode:

1. From the front panel of the CT-4, navigate to the **CT-3 SETUP** menu.
2. From this menu, navigate to the **CT-2/3 DEVICE** menu.
3. From this menu, enable the device by selecting the **ON** option.
4. Navigate to the **SELECT** menu and select the **CT-2** option.

CT-2/3 SETUP

CT-2/3 DEVICE
OFF

CT-2/3 DEVICE
ON

SELECT
CT-2

5. Perform the following actions depending on whether your system includes:

RECEIVERS WITH TAG DETECTION OR RECEIVERS WITH & WITHOUT TAG DETECTION

- Navigate to the **3HZ TAG ENABLE** menu and select the **OFF** option to ensure that this feature doesn't interfere with the channel tag.
- Navigate to the **TAG FREQ** menu and enter the channel tag frequency modulation in MHz that matches the modulation settings of the leakage receivers you will be using in your system.
- Navigate to the **TAG ENABLE** menu and select the **ON** option to enable channel tagging for supported devices.

3HZ TAG ENABLE
OFF

TAG FREQ
10HZ

TAG ENABLE
ON

RECEIVERS WITHOUT TAG DETECTION

- Navigate to the **TAG ENABLE** menu and select the **OFF** option to ensure that this feature doesn't interfere with the "warble" tone.
- Navigate to the **3HZ TAG DEPTH** menu and enter the tag depth in dB that works best within your system. By default, the tag depth is set to 3.0 dB, but in some cases you may desire less than 3 Hz modulation.
- Navigate to the **3HZ TAG ENABLE** menu and select the **ON** option to enable the "warble" tone for supported devices.

TAG ENABLE
OFF

3HZ TAG DEPTH
3.0dB

3HZ TAG ENABLE
ON

6. Once the previous steps are completed the CT-2 tag will be enabled and properly functioning.

CT-3 Operation Mode Setup

In the CT-3 operation mode, the CT-4 injects a tag with 10 to 23 Hz (excluding 16 Hz) modulation into a frequency agile CW carrier from 107 to 157.5 MHz.

Perform the following steps to properly setup the CT-3 operation mode:

1. From the front panel of the CT-4, navigate to the **CT-3 SETUP** menu.
2. From this menu, navigate to the **CT-2/3 DEVICE** menu.
3. From this menu, enable the device by selecting the **ON** option.
4. Navigate to the **SELECT** menu and select the **CT-3** option.

CT-2/3 SETUP

CT-2/3 DEVICE
OFF

CT-2/3 DEVICE
ON

SELECT
CT-3

5. Perform the following actions depending on whether your system includes:

**RECEIVERS WITH TAG DETECTION OR
RECEIVERS WITH & WITHOUT TAG DETECTION**

- Navigate to the **3HZ TAG ENABLE** menu and select the **OFF** option to ensure that this feature doesn't interfere with the channel tag.
- Navigate to the **TAG FREQ** menu and enter the channel tag frequency modulation in MHz that matches the modulation settings of the leakage receivers you will be using in your system.
- Navigate to the **CT-3 FREQUENCY** menu and enter the channel tag carrier frequency in MHz that matches the frequency settings of the leakage receivers you will be using in your system.
- Navigate to the **CT-3 LEVEL** menu and enter the channel tag carrier level in dBmV. Adjust the carrier level to be 1.5 dB below the adjacent video carrier level. This compensates for the video/cw peak detector efficiency of the leakage receiver.
- Navigate to the **TAG ENABLE** menu and select the **ON** option to enable channel tagging for supported devices.

3HZ TAG ENABLE
OFF

TAG FREQ
10HZ

CT-3 FREQUENCY
107.000000MHZ

CT-3 LEVEL
40.00dBmV

TAG ENABLE
ON

RECEIVERS WITHOUT TAG DETECTION

- Navigate to the **TAG ENABLE** menu and select the **OFF** option to ensure that this feature doesn't interfere with the "warble" tone.
- Navigate to the **3HZ TAG DEPTH** menu and enter the tag depth in dB that works best within your system. By default, the tag depth is set to 3.0 dB, but in some cases you may desire less than 3 Hz modulation.
- Navigate to the **3HZ TAG ENABLE** menu and select the **ON** option to enable the "warble" tone for supported devices.

TAG ENABLE
OFF

3HZ TAG DEPTH
3.0dB

3HZ TAG ENABLE
ON

6. Once the previous steps are completed the CT-3 tag will be enabled and properly functioning.

CT-4 Operation Mode Setup

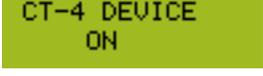
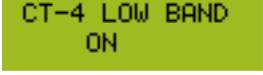
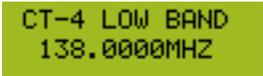
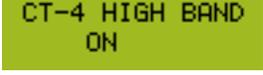
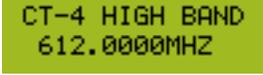
In the CT-4 operation mode, the CT-4 injects proprietary dual CW carrier tags with either 156.25 or 625 Hz spacing between the carriers in the Aeronautical frequency (135 to 139 MHz) and/or LTE frequency (610.5 to 615 MHz) bands.

Each frequency band can be independently enabled which provides the ability to monitor both bands simultaneously or each one individually.

When using a standard SCTE channel lineup, we recommended the two pairs of leakage carriers be injected into the system at 138 MHz and 612 MHz, which is the guard band between QAMs or analog carriers based on which type of channel resides at each frequency.

If you are not using a standard SCTE channel lineup, the two carriers should be injected in the guard band between QAMs or analog carriers based on which type of channel resides at each frequency.

Perform the following steps to properly set up the CT-4 operation mode:

1. Connect a spectrum analyzer to the test port of the combiner that the plant RF and the CT-4 output are connected to.
2. From the front panel of the CT-4, navigate to the **CT-4 SETUP** menu. 
3. From this menu, navigate to the **CT-4 DEVICE** menu. 
4. From this menu, enable the device by selecting the **ON** option. 
5. Navigate to the **CT-4 LOW BAND** menu and select the **ON** option. 
6. Navigate to the **CT-4 LOW BAND** frequency menu and enter the channel tag carrier frequency in MHz that matches the low band frequency settings of the Seeker D and Seeker D Lite leakage detectors you will be using in your system. 
7. Navigate to the **CT-4 HIGH BAND** menu and select the **ON** option. 
8. Navigate to the **CT-4 HIGH BAND** frequency menu and enter the channel tag carrier frequency in MHz that matches the high band frequency settings of the Seeker D and Seeker D Lite leakage detectors you will be using in your system. 

9. Navigate to the **CT-4 TAG** menu and select spacing between each pair of dual carriers that matches the settings of the Seeker D and Seeker D Lite leakage detectors you will be using in your system:

- Select the **1** option to set the spacing between each pair of dual carriers to 156.25 Hz.
- Select the **2** option to set the spacing between each pair of dual carriers to 625 Hz.
- Select the **3** option to set the spacing between each pair of dual carriers to 312.5 Hz.
- Select the **4** option to set the spacing between each pair of dual carriers to 468.75 Hz.
- Select the **5** option to set the spacing between each pair of dual carriers to 781.25 Hz.
- Select the **6** option to set the spacing between each pair of dual carriers to 937.5 Hz.
- Select the **7** option to set the spacing between each pair of dual carriers to 1093.75 Hz.
- Select the **8** option to set the spacing between each pair of dual carriers to 1250 Hz.

CT-4 TAG
1

CT-4 TAG
2

10. Navigate to the **LOW RES VIEW** menu.

- Select the **ON** option to be able to accurately adjust the output level of the CT-4 using a standard spectrum analyzer with a minimum resolution bandwidth of 10 kHz.
- Select the **OFF** option to be able to accurately adjust the output level of the CT-4 using a high-resolution spectrum analyzer with a minimum resolution bandwidth of 30 Hz.

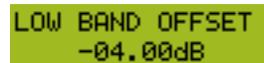
LOW RES VIEW
ON

LOW RES VIEW
OFF

11. Navigate to the **CT-4 LEVEL** menu and enter the high band channel tag carrier level in dBmV. Using the spectrum analyzer, adjust the high band carrier level to be 30 dB down from the total average power of an adjacent QAM carrier or 36 dB down from an adjacent analog video carrier.

CT-4 LEVEL
17.0dBmV

12. Navigate to the **LOW BAND OFFSET** menu and enter the low band offset in dB. Using the spectrum analyzer, adjust the low band carrier level to be 30 dB down from the level of an adjacent QAM carrier or 36 dB down from an adjacent analog carrier.



LOW BAND OFFSET
-04.00dB

13. Navigate to the **LOW RES VIEW** menu and select the **OFF** option to enable normal operation.



LOW RES VIEW
OFF

14. Once the previous steps are completed the CT-4 tags will be enabled and properly functioning.

Example Setup Using a Spectrum Analyzer



NOTE

The signal displays and settings shown in this section are for reference only and performance may vary based on manufacturer/model of analyzer.

Typical Spectrum Analyzers

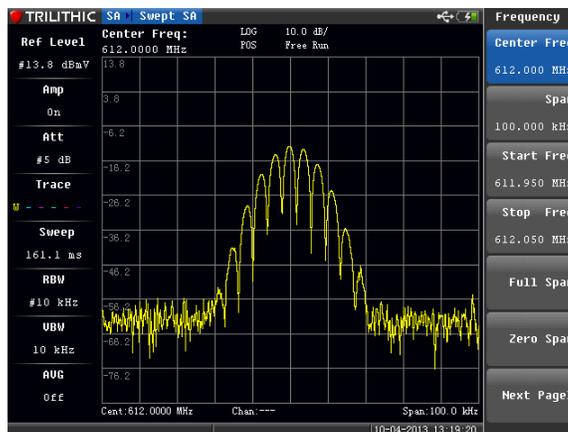
The screens shown in this section represent the view a typical Spectrum Analyzer with a minimum resolution bandwidth of 10 kHz would provide when setting up the CT-4.



NOTE

We recommend using an Advanced Spectrum Analyzer for the initial setup of the CT-4. However, a typical spectrum analyzer can be used for setup as shown below.

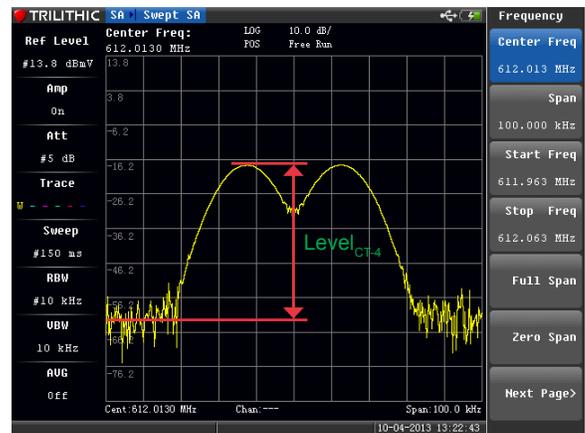
- When the Low Resolution Mode (Setup Mode) of the CT-4 is turned OFF, one of 8 tags is used between the carriers which will not allow you to distinguish between each peak of the CT-4 carrier as shown in the image to the right.



NOTE

If only 2 tags are available, a firmware update is available. Contact us at Trilithic.support@viavisolutions.com or 1-844-GO-VIAVI.

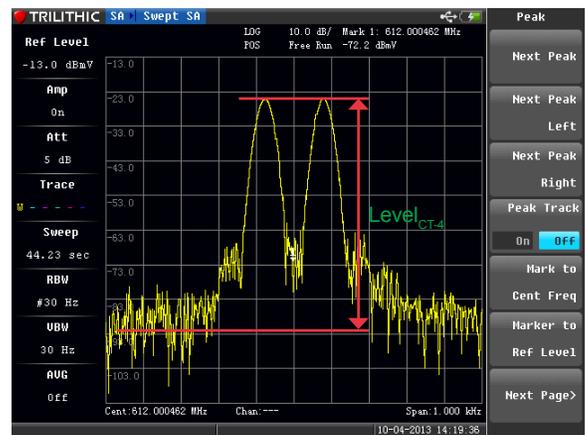
- When the Low Resolution Mode (Setup Mode) of the CT-4 is turned ON, a 25 kHz spacing is used between the carriers. This will allow you to distinguish between each peak of the CT-4 carrier as shown in the image to the right. This is an acceptable spectrum analyzer view for initial setup and provides the minimum accuracy needed for CT-4 carrier level measurement.



Advanced Spectrum Analyzers

With an advanced spectrum analyzer, the Low Resolution Mode (Setup Mode) of the CT-4 should be turned OFF. The screen shown below represents the display of an Advanced Spectrum Analyzer with the following recommended settings:

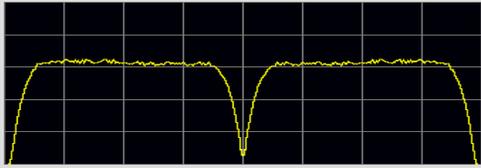
- Resolution Bandwidth (RBW) of 30 Hz.
- Video Bandwidth (VBW) of 30 Hz.
- Frequency Span of 1 kHz.



Example CT-4 Setup Scenarios

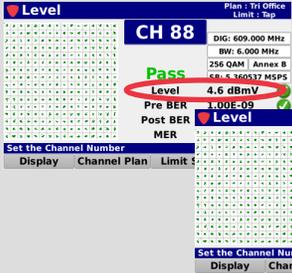
All Analog (Low Band) & All Digital (High Band) Adjacent Carriers

HIGH BAND - 612 MHz

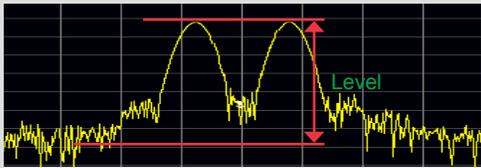


Channel 88 (QAM 64/256) Channel 89 (QAM 64/256)

- Measure & Record the Average Total Power of both Adjacent Carriers
 CH 88 = ____ dBmV CH 89 = ____ dBmV

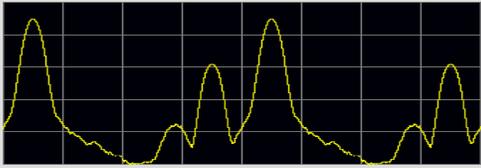



- Use the lowest Average Total Power of the two adjacent carriers to Calculate the Target CT-4 High Band Carrier Level.
 Target CT-4 Level = $P_{MIN} - 30$ dB
 Target CT-4 Level = ____ - 30 dB
 Target CT-4 Level = ____ dBmV
- Measure CT-4 High Band Carrier Level



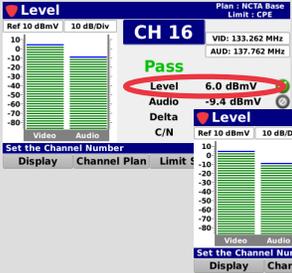
- Adjust the **CT-4 LEVEL** (Front Panel) upward from its minimum value until:
 Actual CT-4 Level = Target CT-4 Level
 Actual CT-4 Level = ____ dBmV
- Record CT-4 Carrier Level (Front Panel)
 CT-4 Level = ____ dBmV

LOW BAND - 138 MHz

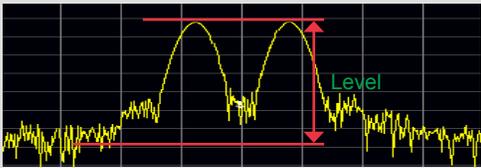


Channel 16 (ANALOG) Channel 17 (ANALOG)

- Measure & Record the Peak Video Level of both Adjacent Carriers
 CH 16 = ____ dBmV CH 17 = ____ dBmV



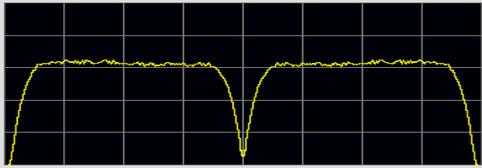

- Use the lowest Video Level of the two adjacent carriers to Calculate the Target CT-4 Low Band Carrier Level.
 Target CT-4 Level = $L_{MIN} - 36$ dB
 Target CT-4 Level = ____ - 36 dB
 Target CT-4 Level = ____ dBmV
- Measure CT-4 Low Band Carrier Level



- Adjust the **LOW BAND OFFSET** (Front Panel) upward from its minimum value until:
 Actual CT-4 Level = Target CT-4 Level
 Actual CT-4 Level = ____ dBmV
- Record Low Band Offset Value (Front Panel)
 LOW BAND OFFSET = ____ dBmV

Mixed (Low Band) & All Digital (High Band) Adjacent Carriers

HIGH BAND - 612 MHz

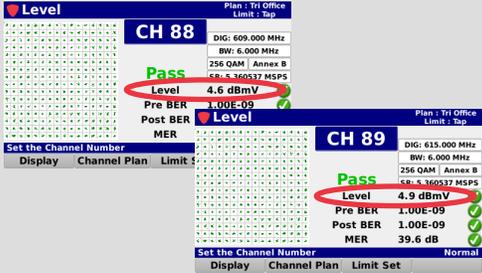


Channel 88
(QAM 64/256)

Channel 89
(QAM 64/256)

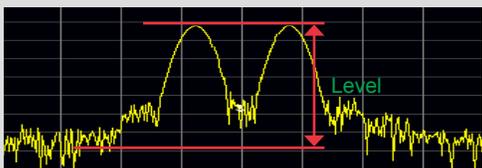
- Measure & Record the Average Total Power of both Adjacent Carriers

CH 88 = _____ dBmV CH 89 = _____ dBmV



- Use the lowest Average Total Power of the two adjacent carriers to Calculate the Target CT-4 High Band Carrier Level.

Target CT-4 Level = $P_{MIN} - 30$ dB
 Target CT-4 Level = _____ - 30 dB
 Target CT-4 Level = _____ dBmV
- Measure CT-4 High Band Carrier Level

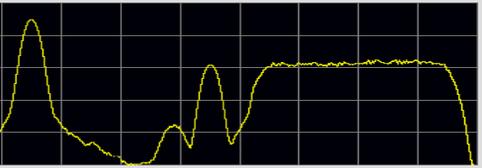


- Adjust the **CT-4 LEVEL** (Front Panel) upward from its minimum value until:

Actual CT-4 Level = Target CT-4 Level
 Actual CT-4 Level = _____ dBmV
- Record CT-4 Carrier Level (Front Panel)

CT-4 Level = _____ dBmV

LOW BAND - 138 MHz

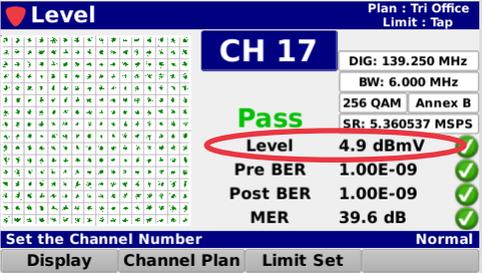


Channel 16
(ANALOG)

Channel 17
(QAM 64/256)

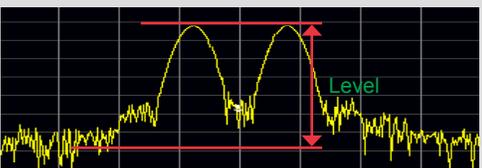
- Measure & Record the Average Total Power of CH 17

CH 17 = _____ dBmV



- Use the Average Total Power of the adjacent Digital Carrier (CH 17) to Calculate the Target CT-4 Low Band Carrier Level.

Target CT-4 Level = $P_{ADJ} - 30$ dB
 Target CT-4 Level = _____ - 30 dB
 Target CT-4 Level = _____ dBmV
- Measure CT-4 Low Band Carrier Level

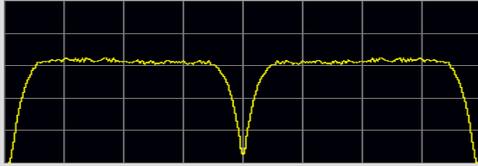


- Adjust the **LOW BAND OFFSET** (Front Panel) upward from its minimum value until:

Actual CT-4 Level = Target CT-4 Level
 Actual CT-4 Level = _____ dBmV
- Record Low Band Offset Value (Front Panel)

LOW BAND OFFSET = _____ dBmV

HIGH BAND - 612 MHz

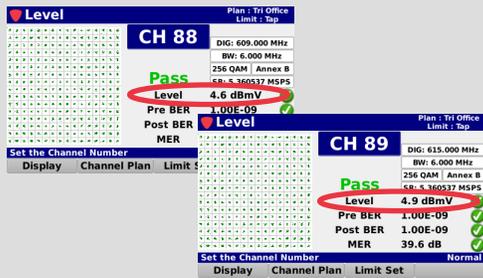


Channel 88
(QAM 64/256)

Channel 89
(QAM 64/256)

1. Measure & Record the Average Total Power of both Adjacent Carriers

CH 88 = ____ dBmV CH 89 = ____ dBmV



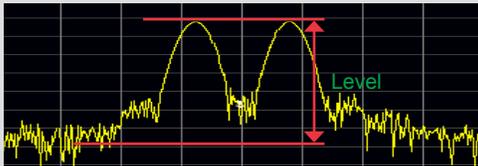
2. Use the lowest Average Total Power of the two adjacent carriers to Calculate the Target CT-4 High Band Carrier Level.

$$\text{Target CT-4 Level} = P_{\text{MIN}} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} \text{ dBmV}$$

3. Measure CT-4 High Band Carrier Level



4. Adjust the **CT-4 LEVEL** (Front Panel) upward from its minimum value until:

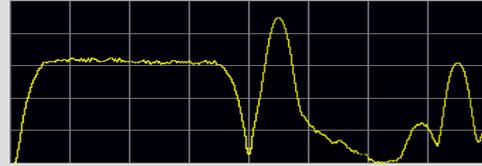
$$\text{Actual CT-4 Level} = \text{Target CT-4 Level}$$

$$\text{Actual CT-4 Level} = \text{____} \text{ dBmV}$$

5. Record CT-4 Carrier Level (Front Panel)

CT-4 Level = ____ dBmV

LOW BAND - 138 MHz

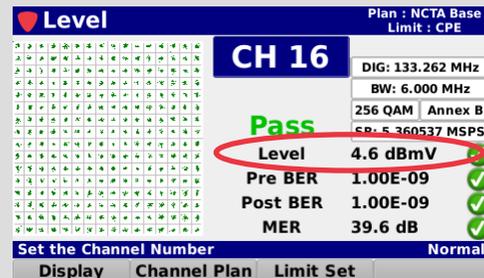


Channel 16
(QAM 64/256)

Channel 17
(ANALOG)

1. Measure & Record the Average Total Power of CH 16

CH 16 = ____ dBmV



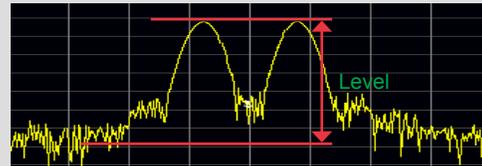
2. Use the Average Total Power of the adjacent Digital Carrier (CH 16) to Calculate the Target CT-4 Low Band Carrier Level.

$$\text{Target CT-4 Level} = P_{\text{ADJ}} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} \text{ dBmV}$$

3. Measure CT-4 Low Band Carrier Level



4. Adjust the **LOW BAND OFFSET** (Front Panel) upward from its minimum value until:

$$\text{Actual CT-4 Level} = \text{Target CT-4 Level}$$

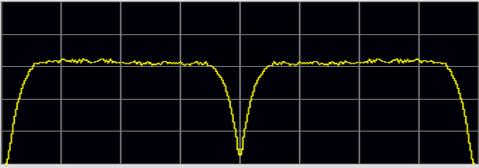
$$\text{Actual CT-4 Level} = \text{____} \text{ dBmV}$$

5. Record Low Band Offset Value (Front Panel)

LOW BAND OFFSET = ____ dBmV

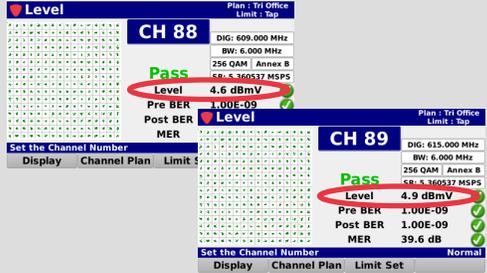
All Digital (Low Band) & All Digital (High Band) Adjacent Carriers

HIGH BAND - 612 MHz



Channel 88
(QAM 64/256) **Channel 89**
(QAM 64/256)

- Measure & Record the Average Total Power of both Adjacent Carriers
 CH 88 = ____ dBmV CH 89 = ____ dBmV

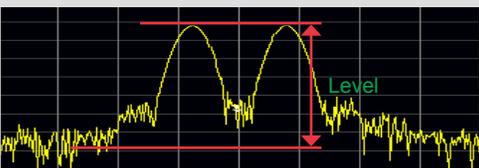


- Use the lowest Average Total Power of the two adjacent carriers to Calculate the Target CT-4 High Band Carrier Level.

$$\text{Target CT-4 Level} = P_{\text{MIN}} - 30 \text{ dB}$$

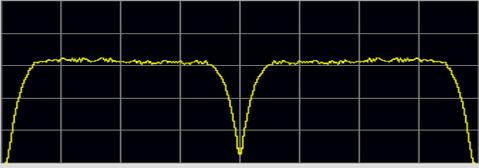
$$\text{Target CT-4 Level} = \text{____} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} \text{ dBmV}$$
- Measure CT-4 High Band Carrier Level



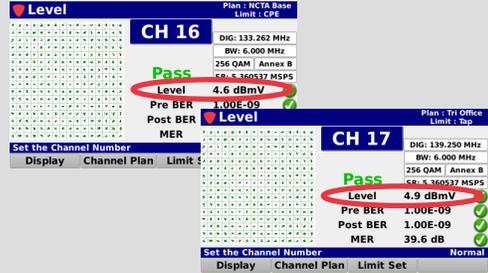
- Adjust the **CT-4 LEVEL** (Front Panel) upward from its minimum value until:
 Actual CT-4 Level = Target CT-4 Level
 Actual CT-4 Level = ____ dBmV
- Record CT-4 Carrier Level (Front Panel)
 CT-4 Level = ____ dBmV

LOW BAND - 138 MHz



Channel 16
(QAM 64/256) **Channel 17**
(QAM 64/256)

- Measure & Record the Average Total Power of both Adjacent Carriers
 CH 16 = ____ dBmV CH 17 = ____ dBmV

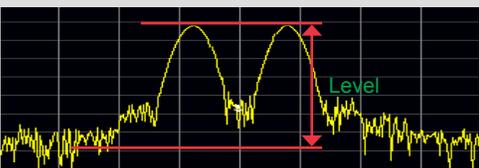


- Use the lowest Average Total Power of the two adjacent carriers to Calculate the Target CT-4 High Band Carrier Level.

$$\text{Target CT-4 Level} = P_{\text{MIN}} - 30 \text{ dB}$$

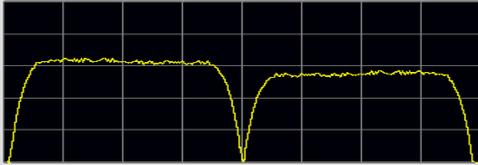
$$\text{Target CT-4 Level} = \text{____} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} \text{ dBmV}$$
- Measure CT-4 Low Band Carrier Level



- Adjust the **LOW BAND OFFSET** (Front Panel) upward from its minimum value until:
 Actual CT-4 Level = Target CT-4 Level
 Actual CT-4 Level = ____ dBmV
- Record Low Band Offset Value (Front Panel)
 LOW BAND OFFSET = ____ dBmV

Mixed Digital (Low & High Band) Adjacent Carriers

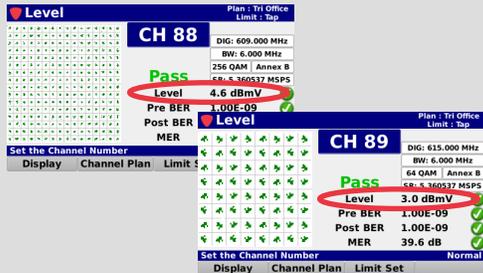


Channel 88
(QAM 256)

Channel 89
(QAM 64)

1. Measure & Record the Average Total Power of both Adjacent Carriers

CH 88 = ____ dBmV CH 89 = ____ dBmV



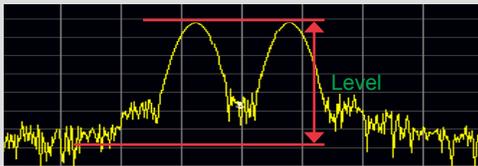
2. Use the lowest Average Total Power of the two adjacent carriers to Calculate the Target CT-4 High Band Carrier Level.

$$\text{Target CT-4 Level} = P_{\text{MIN}} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} \text{ dBmV}$$

3. Measure CT-4 High Band Carrier Level



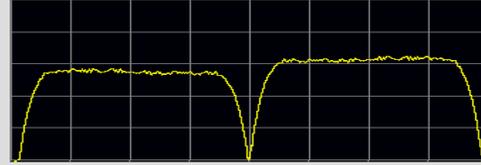
4. Adjust the **CT-4 LEVEL** (Front Panel) upward from its minimum value until:

$$\text{Actual CT-4 Level} = \text{Target CT-4 Level}$$

$$\text{Actual CT-4 Level} = \text{____} \text{ dBmV}$$

5. Record CT-4 Carrier Level (Front Panel)

$$\text{CT-4 Level} = \text{____} \text{ dBmV}$$

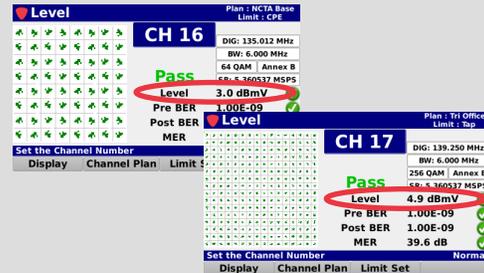


Channel 16
(QAM 64)

Channel 17
(QAM 256)

1. Measure & Record the Average Total Power of both Adjacent Carriers

CH 16 = ____ dBmV CH 17 = ____ dBmV



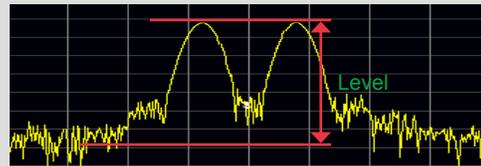
2. Use the lowest Average Total Power of the two adjacent carriers to Calculate the Target CT-4 High Band Carrier Level.

$$\text{Target CT-4 Level} = P_{\text{MIN}} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} \text{ dBmV}$$

3. Measure CT-4 Low Band Carrier Level



4. Adjust the **LOW BAND OFFSET** (Front Panel) upward from its minimum value until:

$$\text{Actual CT-4 Level} = \text{Target CT-4 Level}$$

$$\text{Actual CT-4 Level} = \text{____} \text{ dBmV}$$

5. Record Low Band Offset Value (Front Panel)

$$\text{LOW BAND OFFSET} = \text{____} \text{ dBmV}$$

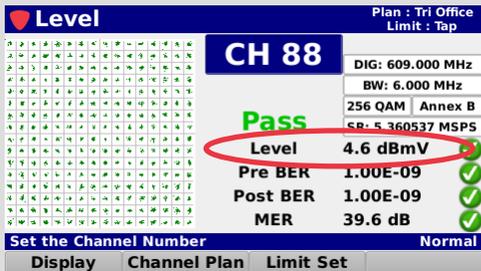
Single Adjacent Carriers



Channel 88
(QAM 64/256) **Channel 89**
(No Carrier)

1. Measure & Record the Average Total Power of the Adjacent Carrier

CH 88 = _____ dBmV



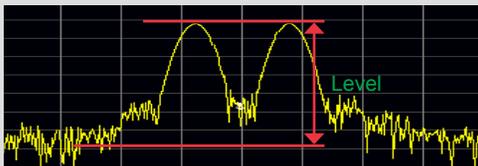
2. Use the Average Total Power of the adjacent carrier to Calculate the Target CT-4 High Band Carrier Level.

$$\text{Target CT-4 Level} = P_{\text{ADJ}} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{_____} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{_____} \text{ dBmV}$$

3. Measure CT-4 High Band Carrier Level



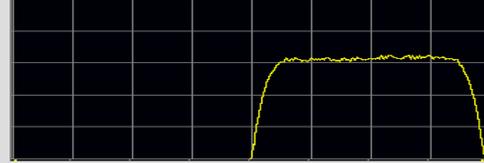
4. Adjust the **CT-4 LEVEL** (Front Panel) upward from its minimum value until:

$$\text{Actual CT-4 Level} = \text{Target CT-4 Level}$$

$$\text{Actual CT-4 Level} = \text{_____} \text{ dBmV}$$

5. Record CT-4 Carrier Level (Front Panel)

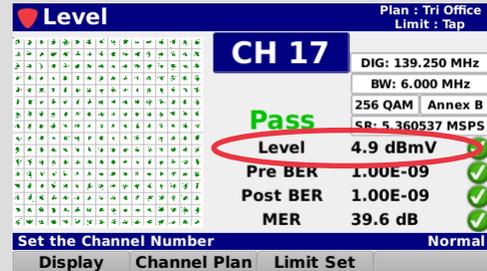
CT-4 Level = _____ dBmV



Channel 16
(No Carrier) **Channel 17**
(QAM 64/256)

1. Measure & Record the Average Total Power of the Adjacent Carrier

CH 17 = _____ dBmV



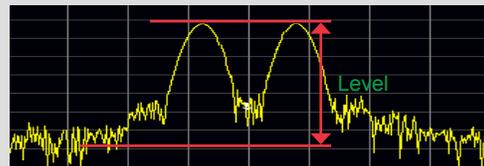
2. Use the Average Total Power of the adjacent carrier to Calculate the Target CT-4 High Band Carrier Level.

$$\text{Target CT-4 Level} = P_{\text{ADJ}} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{_____} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{_____} \text{ dBmV}$$

3. Measure CT-4 Low Band Carrier Level



4. Adjust the **LOW BAND OFFSET** (Front Panel) upward from its minimum value until:

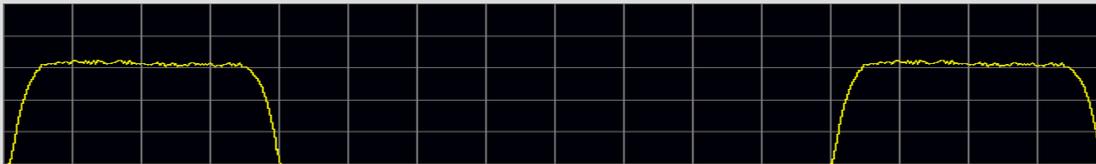
$$\text{Actual CT-4 Level} = \text{Target CT-4 Level}$$

$$\text{Actual CT-4 Level} = \text{_____} \text{ dBmV}$$

5. Record Low Band Offset Value (Front Panel)

LOW BAND OFFSET = _____ dBmV

No Adjacent Carriers



Channel 15 / 87
(QAM 64/256)

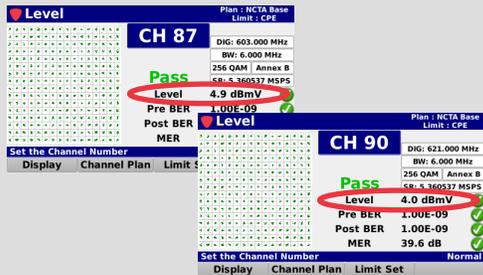
Channel 16 / 88
(No Carrier)

Channel 17 / 89
(No Carrier)

Channel 18 / 90
(QAM 64/256)

1. Measure & Record the Average Total Power of the nearest Adjacent Carriers

CH 87 = ____ dBmV CH 90 = ____ dBmV



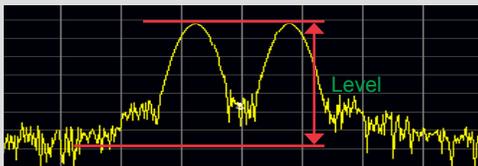
2. Use the lowest Average Total Power of the two adjacent carriers to Calculate the Target CT-4 High Band Carrier Level.

$$\text{Target CT-4 Level} = P_{\text{MIN}} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} \text{ dBmV}$$

3. Measure CT-4 High Band Carrier Level



4. Adjust the **CT-4 LEVEL** (Front Panel) upward from its minimum value until:

$$\text{Actual CT-4 Level} = \text{Target CT-4 Level}$$

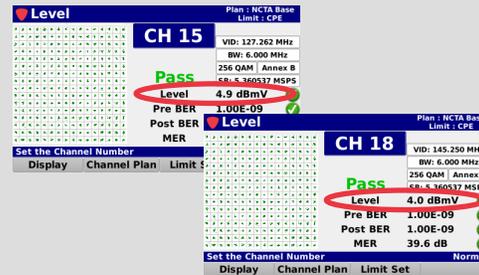
$$\text{Actual CT-4 Level} = \text{____} \text{ dBmV}$$

5. Record CT-4 Carrier Level (Front Panel)

CT-4 Level = ____ dBmV

1. Measure & Record the Average Total Power of the nearest Adjacent Carriers

CH 15 = ____ dBmV CH 18 = ____ dBmV



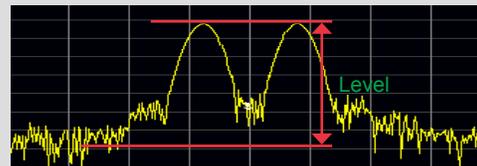
2. Use the lowest Average Total Power of the two adjacent carriers to Calculate the Target CT-4 High Band Carrier Level.

$$\text{Target CT-4 Level} = P_{\text{MIN}} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} - 30 \text{ dB}$$

$$\text{Target CT-4 Level} = \text{____} \text{ dBmV}$$

3. Measure CT-4 Low Band Carrier Level



4. Adjust the **LOW BAND OFFSET** (Front Panel) upward from its minimum value until:

$$\text{Actual CT-4 Level} = \text{Target CT-4 Level}$$

$$\text{Actual CT-4 Level} = \text{____} \text{ dBmV}$$

5. Record Low Band Offset Value (Front Panel)

LOW BAND OFFSET = ____ dBmV

CT-3 Tech Setup

The **CT-3 TECH SETUP** menu is used to set whether users are allowed to enable/disable the tags from the CT-4 web interface. However, the CT-4 web interface is not available at this time. Once it becomes available the settings within this menu will apply to anyone who logs in with a TECH level account.

Perform the following steps to properly setup the CT-3 Tech Setup:

1. Navigate to the **CT-3 TECH SETUP** menu.
2. Navigate to the **TAG ENABLE** menu and select from either of the following options:
 - **TURN ON** – If the tag is off, this will turn on the channel tag for 30 seconds.
 - **LEAVE OFF** – If the tag is off, this will leave the channel tag off.
 - **TURN OFF** – If the tag is on, this will turn off the channel tag for 30 seconds.
 - **LEAVE ON** – If the tag is on, this will leave the channel tag on.

CT-3 TECH SETUP

TAG ENABLE
TURN ON

TAG ENABLE
LEAVE OFF

TAG ENABLE
TURN OFF

TAG ENABLE
LEAVE ON

3. Navigate to the **3HZ TAG ENABLE** menu and select from either of the following options:
 - **TURN ON** – If the 3 Hz tag is off, this will turn on the channel tag for 30 seconds.
 - **LEAVE OFF** – If the 3 Hz tag is off, this will leave the channel tag off.
 - **TURN OFF** – If the 3 Hz tag is on, this will turn off the channel tag for 30 seconds.
 - **LEAVE ON** – If the 3 Hz tag is on, this will leave the channel tag on.

3HZ TAG ENABLE
TURN ON

3HZ TAG ENABLE
LEAVE OFF

3HZ TAG ENABLE
TURN OFF

3HZ TAG ENABLE
LEAVE ON

Ethernet Setup

The **ETHERNET STATUS** menu is used to adjust the Ethernet settings of the CT-4. The Ethernet settings of the CT-4 are used to provide access the CT-4 web interface. However, the CT-4 web interface is not available at this time. Once it becomes available, the settings within this menu will allow the CT-4 to be accessible via a network connection.

Perform the following steps to properly setup the CT-3 Tech Setup:

1. Navigate to the **ETHERNET STATUS** menu.
2. Navigate to the **USING DHCP/STATIC** menu and select from either of the following options:

ETHERNET STATUS

USING DHCP

- **USING DHCP** – This will allow the Ethernet settings of the CT-4 to be automatically set by a DHCP server.
- **USING STATIC** – This will allow the Ethernet settings of the CT-4 to be manually set by the user.

USING STATIC

3. If **USING DHCP** is selected, you can continue navigating through the Ethernet settings screens to view the network information that is assigned by the DHCP server.
4. If **USING STATIC** is selected, you can adjust the following Ethernet settings:

- **IP** – Enter the IP Address from this menu.

IP
000.000.000.000

- **SUBNET** – Enter the Subnet Address from this menu.

SUBNET
000.000.000.000

- **GATEWAY** – Enter the Gateway Address from this menu.

GATEWAY
000.000.000.000

- **DNS1** – Enter the Primary DNS Address from this menu.

DNS1
000.000.000.000

- **DNS2** – Enter the Secondary DNS Address from this menu.

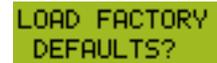
DNS2
000.000.000.000

5. Navigate to the **MAC ADDRESS** screen to view the MAC Address of the CT-4.

MAC ADDRESS 00:00:00
FF:FF:FF

6. Navigate to the **LOAD FACTORY DEFAULTS?** menu to restore the default Ethernet settings of the CT-4.

- From this menu, press the **Select** button to display the **VERIFY LOAD DEFAULTS?** menu.
- To load the default Ethernet settings, press the **Select** button again.

A rectangular button with a light green background and black text that reads "LOAD FACTORY DEFAULTS?".A rectangular button with a light green background and black text that reads "VERIFY LOAD DEFAULTS?".

CT Security Setup

The **CT-3 SECURITY** menu is used to reset the username and password of the TECH and ADMIN user accounts for the CT-4 web interface. However, the CT-4 web interface is not available at this time.

Perform the following steps to reset the user passwords of the CT-4:

1. Navigate to the **CT-3 SECURITY** menu.
2. Navigate to the **LOAD ADMIN DEFAULT?** menu.
 - From this menu, press the **Select** button to display the **VERIFY LOAD DEFAULT?** menu.
 - To load the default Admin password, press the **Select** button again.
 - The default Admin password will be set to “admin”.
3. Navigate to the **LOAD TECH DEFAULT?** menu.
 - From this menu, press the **Select** button to display the **VERIFY LOAD DEFAULT?** menu.
 - To load the default Tech password, press the **Select** button again.
 - The default Tech password will be set to “tech”.

A rectangular button with a light green background and black text that reads "CT SECURITY".

Chapter 5

Appendix

General Specifications

Input / Output Impedance	75 Ω (nominal)
Controls	Front Panel Select & Enter Buttons
Display	Two-Line LCD, 16 Characters per Line
Communication	10/100 Base-T Ethernet (for factory use only)
Power	90 to 370 VAC, 47-440 Hz, 0.75 A
Size	1U (1.75") Rack Enclosure
Operating Temperature	50 to 104 °F (10 to 40 °C)

CT-2 Operation Mode Specifications

Compatibility	Searcher Plus, Searcher Plus GT, Super Plus, Seeker Lite ² , Seeker & Seeker SE Leakage Detectors
Modulation Type	Sine Wave
Tag Modulation Frequency	3 Hz Warble Tone 10 to 20 Hz (excluding 16 Hz)
3 Hz Tag Depth of Modulation	0.0 to 3.0 dB
Input Return Loss	> 15 db from 100 to 160 MHz
Output Return Loss	> 13 db from 100 to 160 MHz

CT-3 Operation Mode Specifications

Compatibility	Searcher Plus GT, Super Plus, Seeker Lite ² , Seeker & Seeker SE Leakage Detectors
Carrier Type	Sine Wave
Tag Modulation Frequency	3 Hz Warble Tone, ± 0.1 Hz 10 to 20 Hz (excluding 16 Hz), ± 0.1 Hz
3 Hz Tag Depth of Modulation	0.0 to 3.0 dB, ± 0.2 dB
Carrier Frequency	107.0000 to 157.5000 MHz, ± 2.5 ppm Adjustable in 3.125 kHz Steps
Carrier Output Level	40.00 to 60.00 dBmV, ± 2 dB
Spurious Outputs	-60 dBc Minimum
Output Return Loss	> 13 db from 100 to 160 MHz

CT-4 Operation Mode Specifications

Compatibility	Seeker D and Seeker D Lite Leakage Detectors
Carrier Type	Proprietary Dual CW for Low & High Bands
Tag Signatures	8 available carrier spacings
Carrier Frequency	Low Band: 135–139 MHz High Band: 610.5 –615 MHz Adjustable in 12.5 kHz Steps
Carrier Output Level	10.00 to 30.00 dBmV, ± 2 dB
Low Band Offset	-15.00 to 10.00 dB from High Band, ± 1 dB
Spurious Outputs	-40 dBc Minimum

CT-4 Error Codes

##	Error Description	Solution
3	Factory calibration is not valid	Return the device to the factory for repair.
4	User parameters are not valid	Set up the parameters on the front panel. If the error persists, return the device to the factory for repair.
5	Invalid flash ID detected	Cycle power on the unit. If the error persists, return the device to the factory for repair.
6	PLL lock	Cycle power on the unit. If the error persists, return the device to the factory for repair.

Limited Warranty

For the latest warranty information, visit

<https://www.viavisolutions.com/literature/viavi-solutions-inc-general-terms-en.pdf>



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English

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