



# CT-4 Setup Using OneExpert CATV

Date 3/25/2020

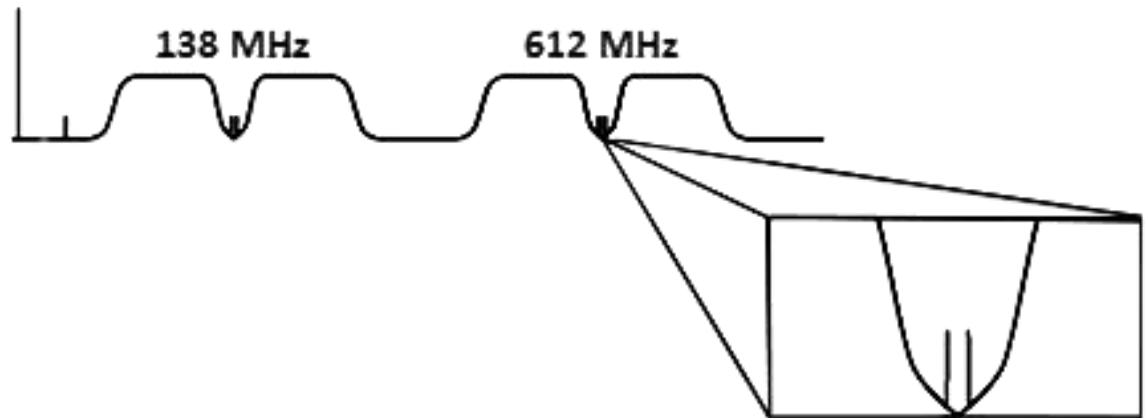


# Purpose

## Measure and properly set CT-4 Levels in the headend

**Procedure is to be done in the headend with the CT-4 in LOW RES VIEW**

- Precise measurements done in the headend allows the ISP tech to setup a -30 dBc relationship between the Viavi dual CW's and the adjacent QAM carriers at two different frequencies

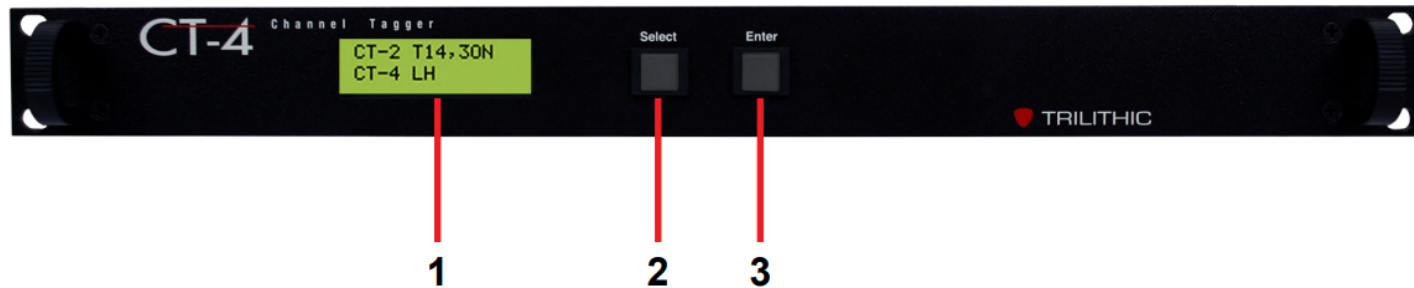


# Procedure

- Measure adjacent QAM Channels on either side of 612 MHz and 138 MHz
  - Ch. 88 or 89, and 16 or 17 respectively
  - Log channel power levels for each
- Beginning with 612 MHz measure the peak value of one carrier of the dual CW's
  - This can only be done in CT-4 “LOW RES VIEW” on most headend analyzers
    - LOW RES VIEW “ON” spreads the CW's out to 25 kHz
    - Analyzer must have at least 10 kHz RBW or better
  - Ch 88 or 89 channel power -30 dB = target level for CW's
  - Adjust CT-4 “Level” to setup -30 dBc relationship to adjacent QAM
    - Using “Select” and “Enter” buttons on CT-4 to adjust “level” appropriately
    - Ideal setup is -29.5 to -30 dBc to adjacent QAM carrier
- Repeat steps above for the low frequency setup, typically 138 MHz but can vary per system
  - The Low band level adjustments are made using the Low Band Offset settings in the CT-4.
    - Using the “select” and “enter” buttons to adjust the low band carrier level by entering the offset value to compensate for cable loss from CT-4 to system injection point
    - This is typically a small amount +/- 0 to 4 dB
- Once the levels are set properly, turn LOW RES VIEW on the CT-4 to “OFF”
  - This returns the dual CW's to their proper spacing for leakage detection

**Graphical step by step process to follow**

# CT- User Interface (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

# CT-4 Connections (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.

# CT-4 Mounting Considerations

## 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.



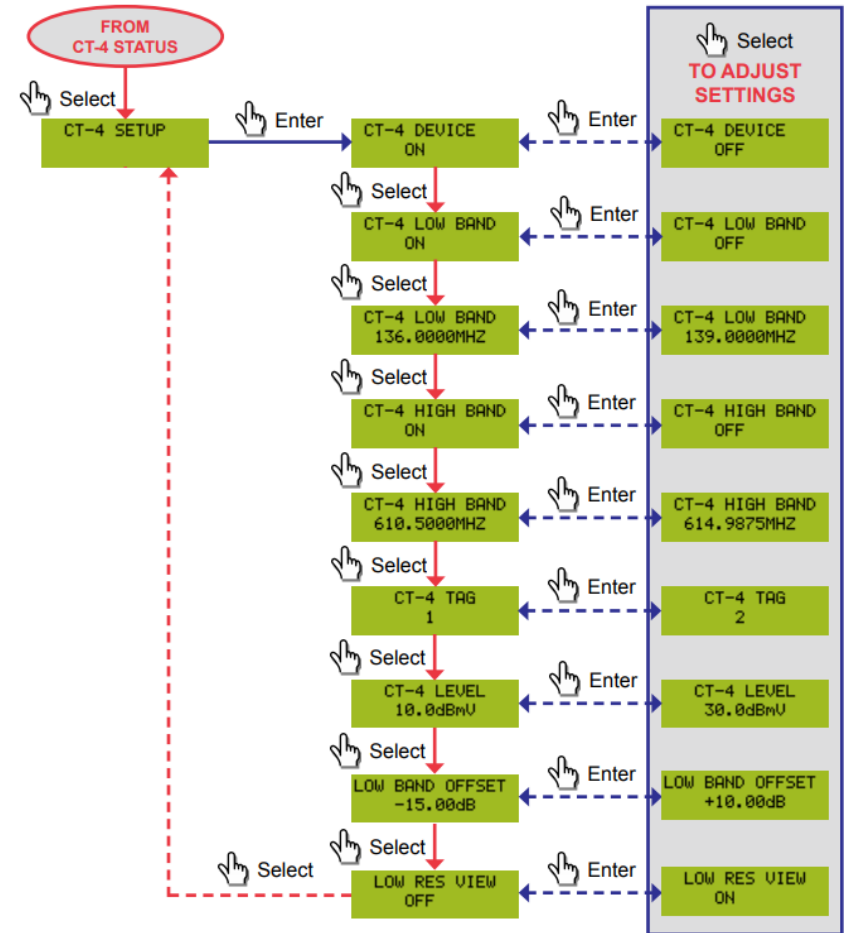
See next slide for pre-connection settings

# CT-4 Initial Setup

## Prior to connecting to live plant

### Initial settings

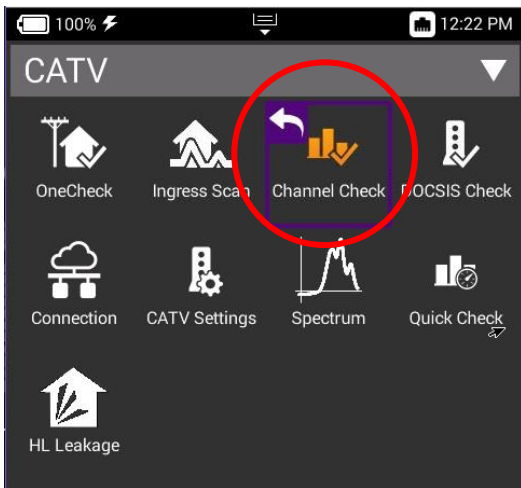
- Set CT-4 Level to 10 dBmV to eliminate the chance of injecting too hot once connected to plant (default level = 10 dBmV)
  - You will adjust this level after you measure the adjacent QAM's and Dual CW's in plant to set up a -30 dBc relationship between adjacent QAM and Dual CW's
- Set appropriate High Band and Low Band frequencies (Typical US 138.0 & 612.0 MHz)
- Set desired TAG, Typically 2 or 8
- Turn LOW RES VIEW "ON" to aid in the setup
  - Must be turned "OFF" once setup is completed
- Navigate the menu to the right with the Select and Enter buttons on the CT-4 front panel
  - Select:** takes you down to the next menu item
  - Enter:** into the menu item to adjust settings
    - When editing, the setting will flash
    - Once the selection is saved, it will no longer be flashing
    - "Enter" will take you into the menu that allows you to "select" your new setting and save the settings when completed
- Connect CT-4 output to plant near the combiner to insert the Dual CW carriers to live plant



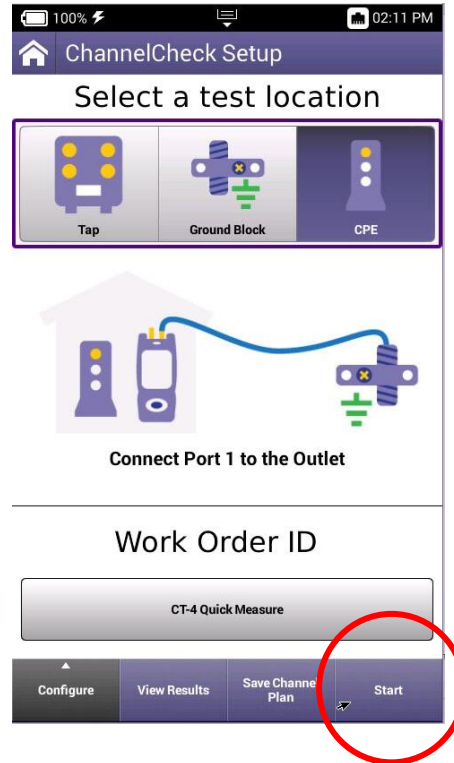
# Procedure

With an ONX meter measure Adjacent QAM Channel Power

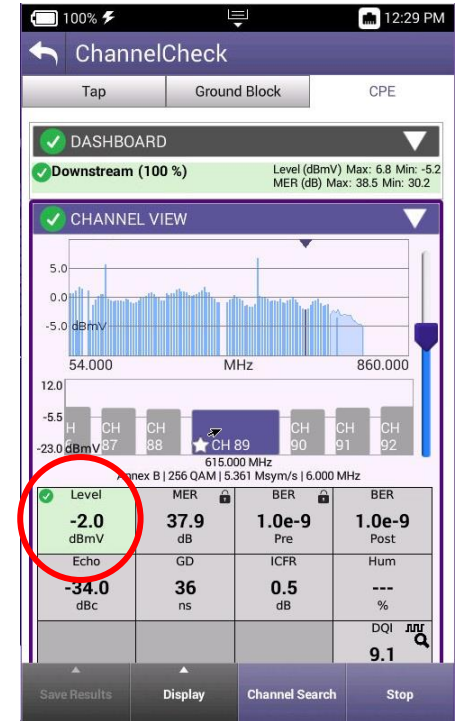
Select a test point with combined signal to port 1 of the ONX



CATV Home Screen  
select  
“Channel Check”



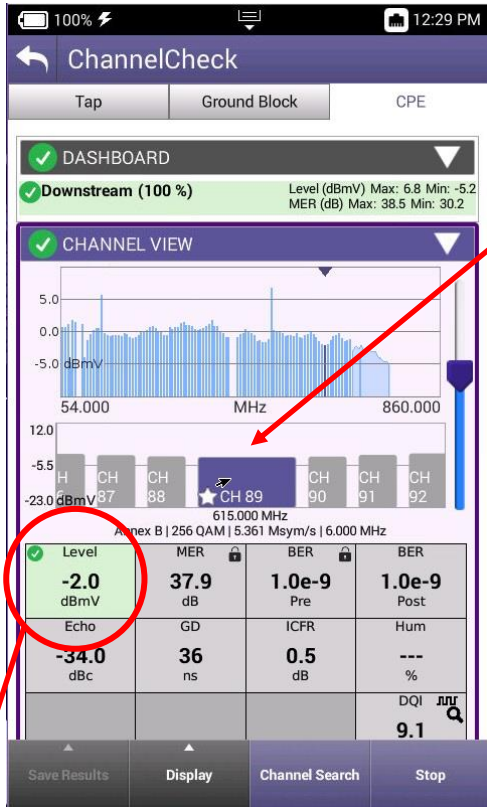
Channel Check Setup  
select  
“Start”



ONX builds channel plan  
provides measurement for  
all channels in the plan

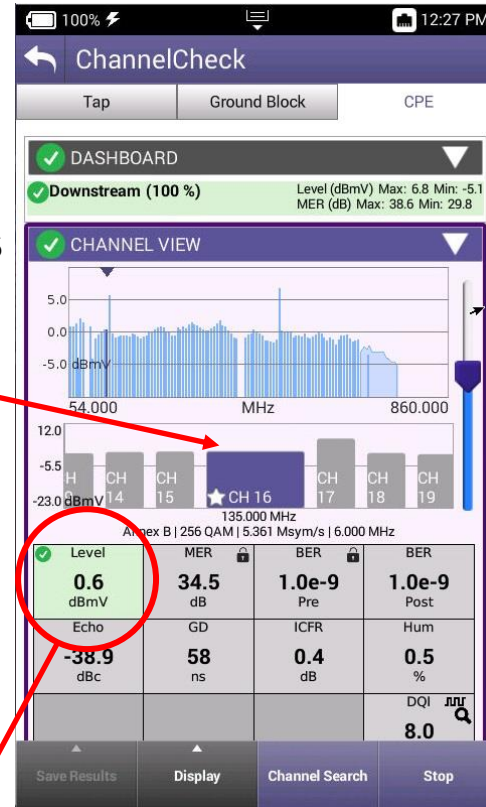


# Procedure



## Select Channels

Ch 88 or Ch 89  
and  
Ch 16 or Ch 17  
Log Levels



$$-2.0 \text{ dBmV} - 30 \text{ dB} = \underline{-32 \text{ dBmV}}$$

$$0.6 \text{ dBmV} - 30 \text{ dB} = \underline{-29.4 \text{ dBmV}}$$

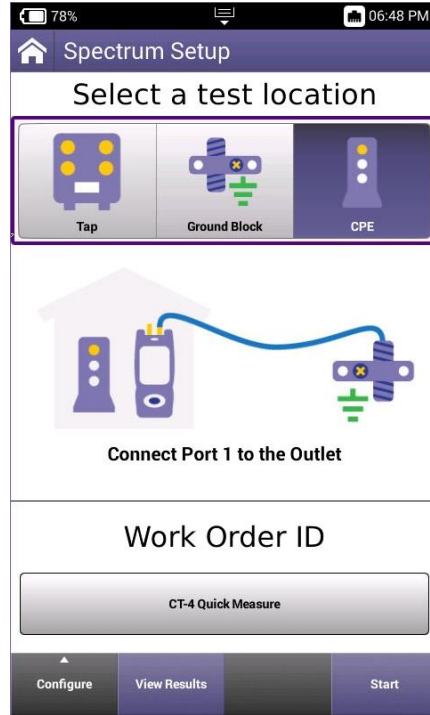
Target Levels for CT-4 Dual CW's  
(Typically set within ½ dB high at setup)

# Downstream Spectrum Setup

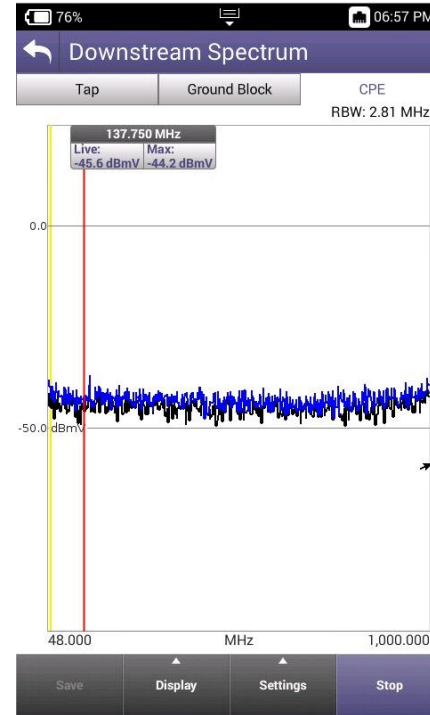
## (612 MHz)



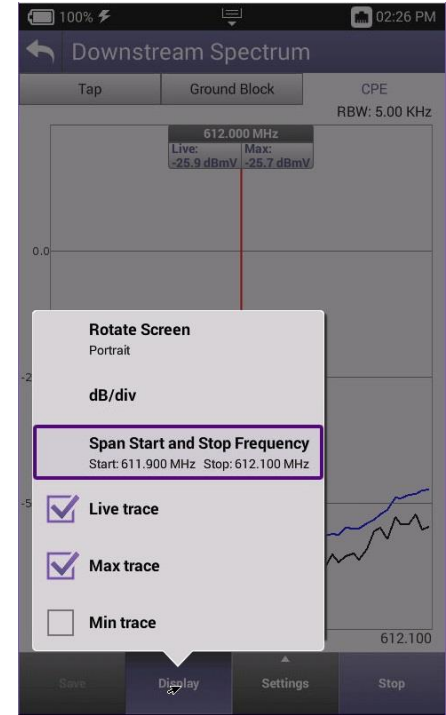
CATV Home Screen  
select  
“Spectrum”



Spectrum Setup  
select  
“Start”



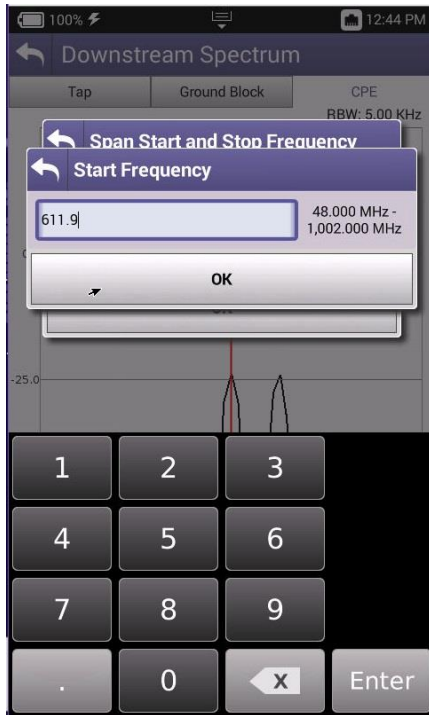
Spectrum  
select  
“Display”



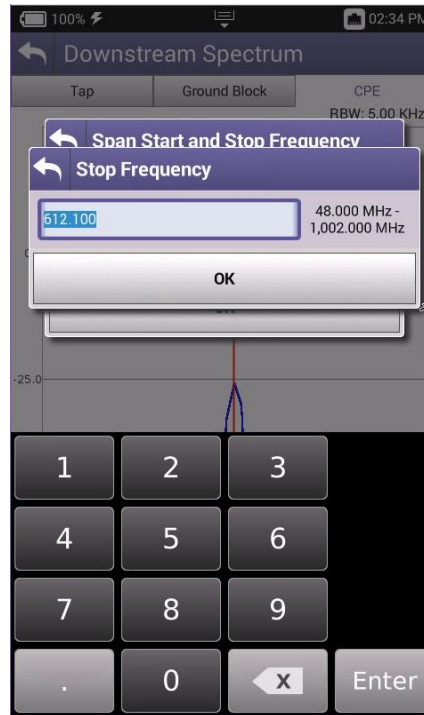
Enter  
**Start** and **Stop**  
Frequencies as  
seen above

# Downstream Spectrum Setup

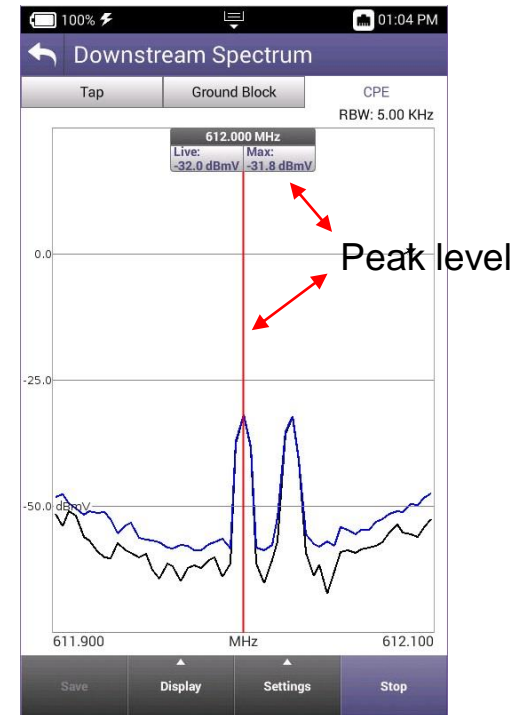
(612 MHz)



Enter Start Freq  
611.9 MHz



Enter Stop Freq  
612.1 MHz

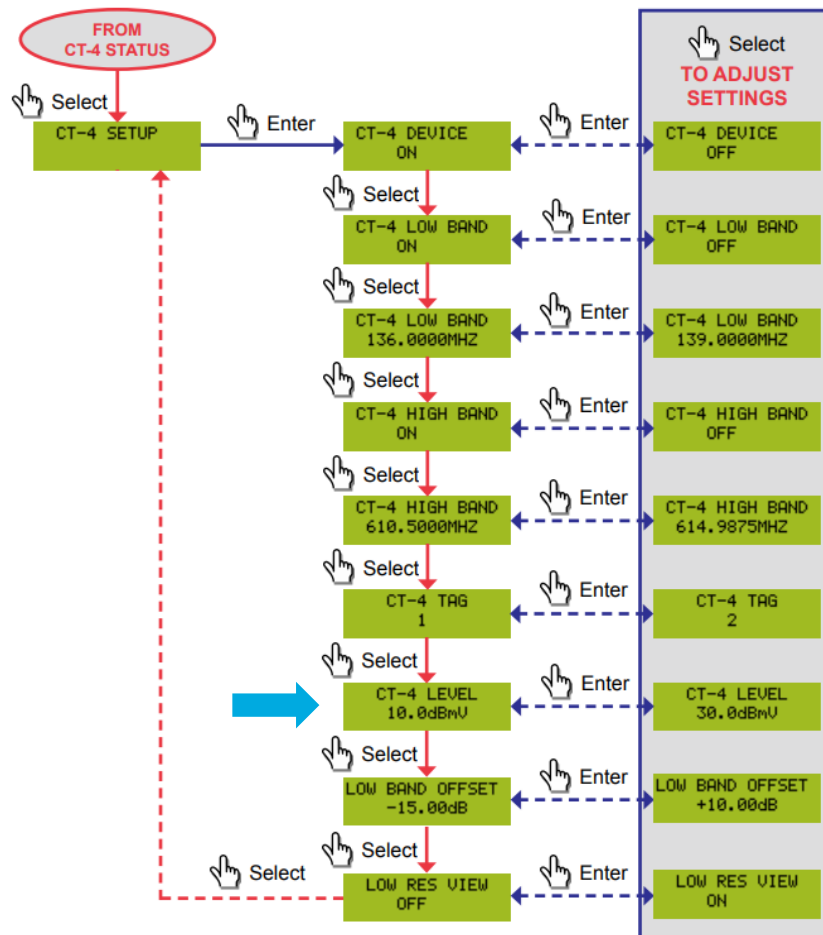


Move Marker  
to  
Peak Level

**Note: Must see both CW carriers to properly measure peak value**

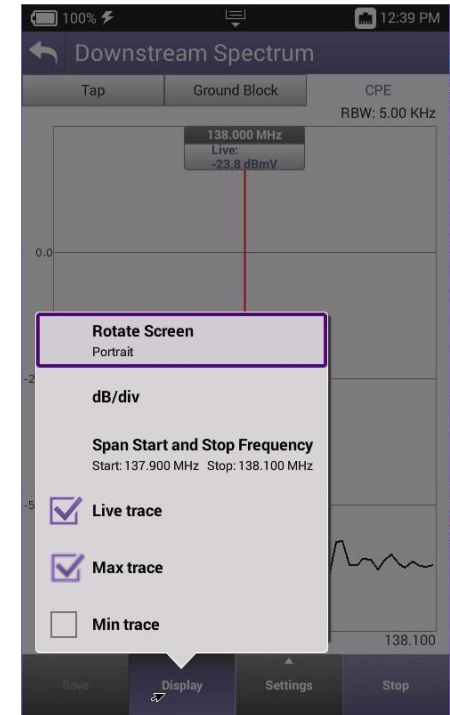
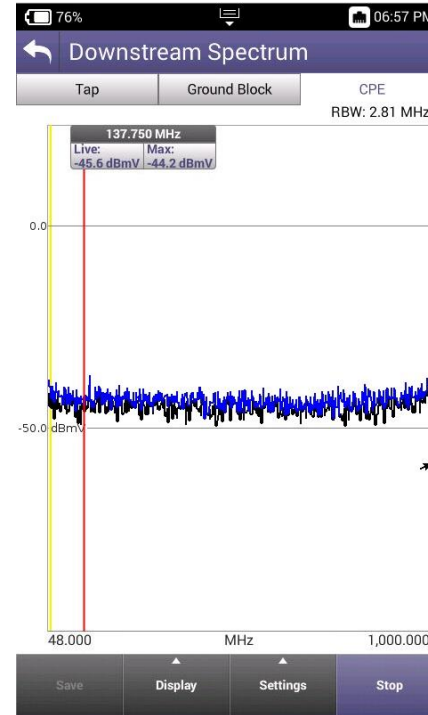
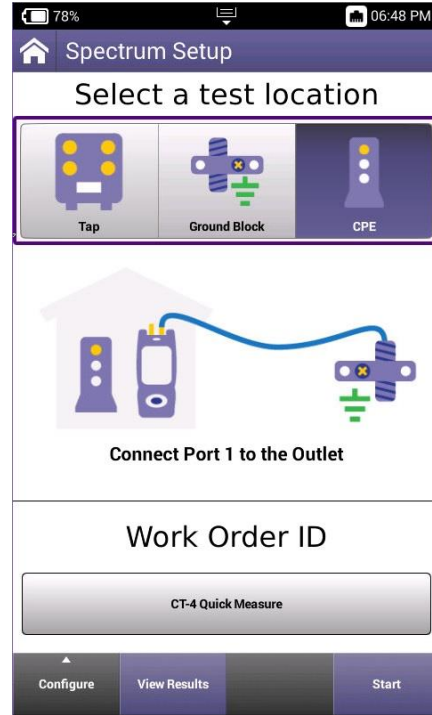
# CT-4 Level Adjust for 612 MHz

- Navigate to the CT-4 LEVEL and adjust the appropriate amount to setup a -30 dBc relationship to the adjacent QAM on either side of 612 MHz
  - Example: QAM Ch 89 = -2 dBmV
    - Math:  $-2 \text{ dBmV} - 30 \text{ dBmV} = \underline{-32 \text{ dBmV}}$
    - In this case, the target level for a -30dBc relationship = -32 dBmV
    - Let's say you measure the dual CW's = -34 dBmV
    - If the CT-4 level output is currently 10.0 dBmV, you need to add 2 dB which = 12.0 dBmV on the CT-4 output.
    - After making that adjustment, measure the dual CW at 612 MHz again to verify that it is within  $\frac{1}{2}$  dB on the high side of -32 dBmV (range -31.5 to -32.0 dBmV).
    - Re-measure and make further adjustments if needed.



# Downstream Spectrum Setup

(138 MHz)



CATV Home Screen  
select  
“Spectrum”

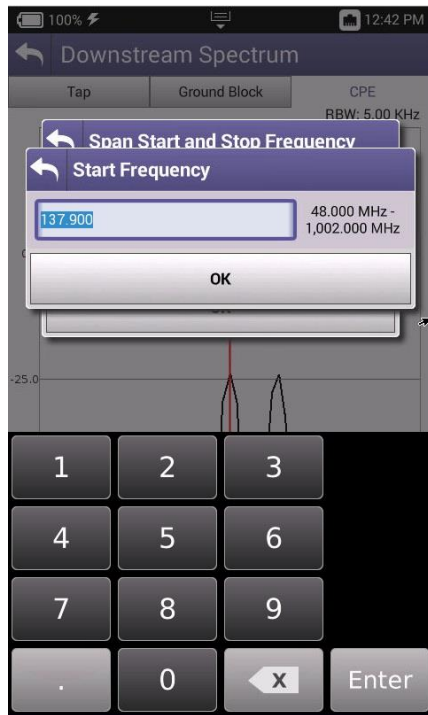
Spectrum Setup  
select  
“Start”

Spectrum  
select  
“Display”

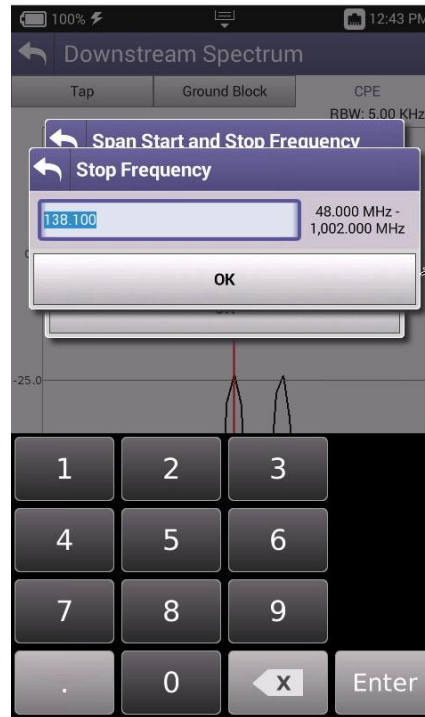
Enter  
**Start** and **Stop**  
Frequencies as  
seen above

# Downstream Spectrum Setup

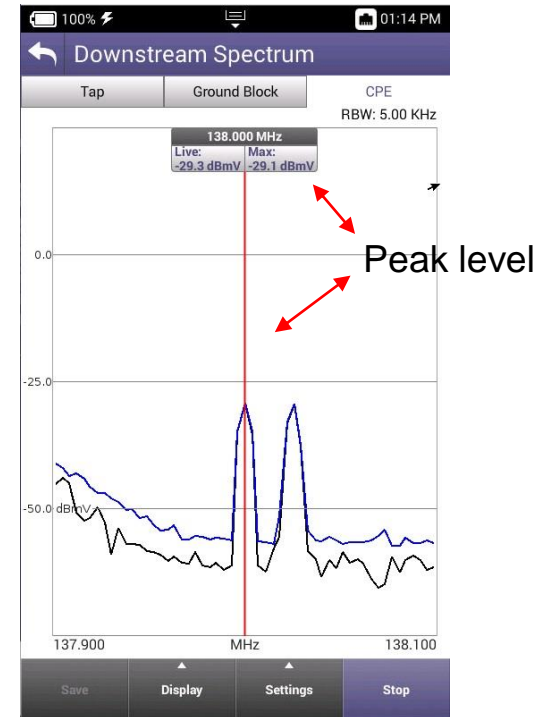
(138 MHz)



Enter Start Freq  
137.9 MHz



Enter Stop Freq  
138.1 MHz



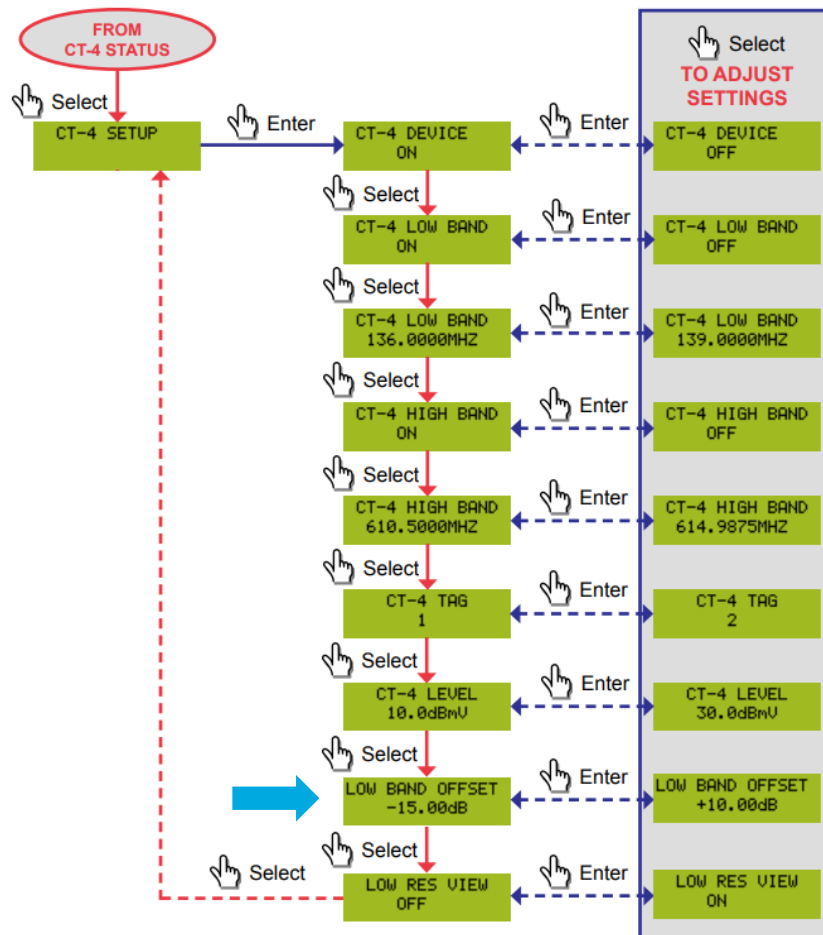
Move Marker  
to  
Peak Level

**Note: Must see both CW carriers to properly measure peak value**

# CT-4 Level Adjust for 138 MHz

- Navigate to the CT-4 LOW BAND OFFSET and adjust the appropriate amount to setup a -30 dBc relationship to the adjacent QAM on either side of 138 MHz

- Example: QAM Ch 17 = .6 dBmV
  - Math:  $.6 \text{ dBmV} - 30 \text{ dBmV} = \underline{-28.9 \text{ dBmV}}$
  - In this case, the target level for a -30dBc relationship = -28.9 dBmV
  - Let's say you measure the dual CW's = -34 dBmV
  - If the CT-4 LOW BAND OFFSET is currently +00.00 dB, you need to add 4.6 dB. Since the LOW BAND OFFSET is adjustable in .25dB increments, enter +4.75 dB.
  - After making that adjustment, measure the dual CW at 138 MHz again to verify that it is within  $\frac{1}{2}$  dB on the high side of -28.9 dBmV (range -29.4 to -28.9 dBmV).
  - Re-measure and make further adjustments if needed.



# Measurement Results

Target Levels from Slide 3

High Band Target Range

$$-2.0 \text{ dBmV} - 29.5 \text{ dB} = \underline{-31.5 \text{ dBmV}}$$

$$-2.0 \text{ dBmV} - 30 \text{ dB} = \underline{-32 \text{ dBmV}}$$



This looks good

Low Band Target Range

$$0.6 \text{ dBmV} - 29.5 \text{ dB} = \underline{-28.9 \text{ dBmV}}$$

$$0.6 \text{ dBmV} - 30 \text{ dB} = \underline{-29.4 \text{ dBmV}}$$



This looks good

Once desired levels are achieved, turn LOW RES VIEW off on the CT-4

**Note:** The target relationship of the dual CW's to Adjacent QAM channel power is -30 dBc  
"Ideally, error slightly on the high side as measurements indicate above"



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