

# MDC-900 MDC-2100



## OWNER'S GUIDE



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## INTRODUCTION

The OSCOR Microwave Downconverter option (MDC-2100) expands the OSCOR 's frequency range limit to 21GHz. *The MDC-900 extends the OSCOR 's range to 9GHz.*

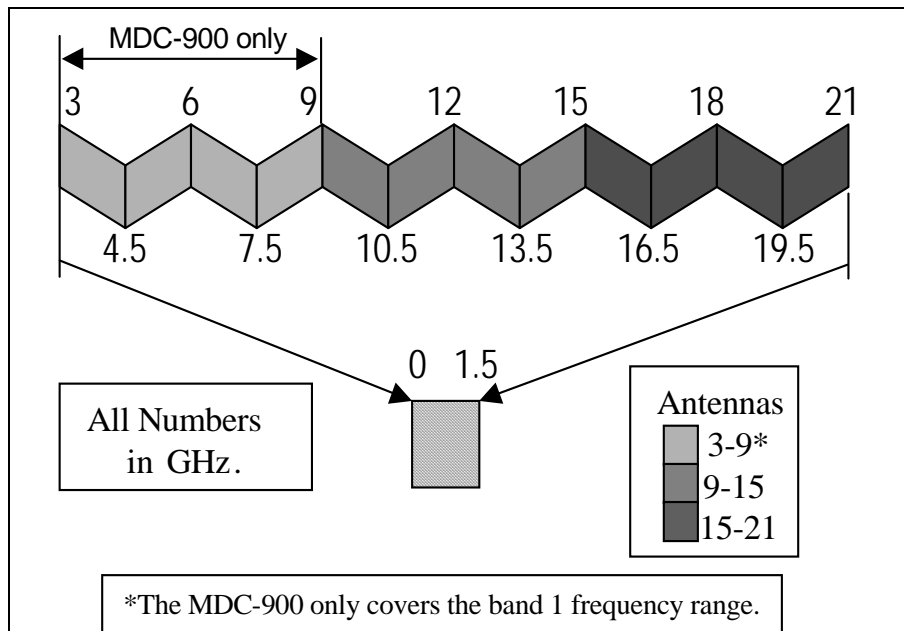
**Note:** General descriptions of the MDC-2100 in this guide may not always include exceptions for the MDC-900, which does not cover the 9 to 21GHz spans.

Microwave signals tend to be directional; therefore, the MDC-2100 features an array of high gain directional antennas. The MDC is compatible with the OPC interface and the OTL locator options. It can function in the sweep, analyze and correlation modes and includes a tripod, which provides the stability needed to securely point the antennas and a swivel neck for easy positioning.



**Figure 1: MDC-2100 MICROWAVE DOWNCONVERTER**

The span of frequencies from 3 to 21GHz is so broad the OSCOR cannot display them all in a single window; therefore, a special folding process is implemented. This process folds the entire spectrum from 3 to 21GHz into twelve 1.5GHz windows. Six windows may be viewed simultaneously when using OSCOR 5.0 software. **Figure 2** illustrates the down-conversion process.



**Figure 2: ILLUSTRATION OF THE MDC-2100 DOWNCONVERSION PROCESS**

The OSCOR (version 5.0) displays up to six 1.5GHz (1500MHz) windows simultaneously, or the spectrum may be separated into three antenna frequency bands: 3 to 9GHz, 9 to 15GHz, or 15 to 21GHz with two 1.5GHz windows displayed simultaneously.

**Note:** The MDC-900 has a single antenna and covers the band from 3 to 9GHz.

Built-in microwave filters can reduce the display even further. These filters are referred to as Filter A and Filter B. The Identify function allows for the determination of the frequency. Below is a chart representing the display of the frequencies in response to the selected antenna and microwave filter. Understanding **Figure 3** is critical to understanding the OSCOR operations using the MDC-2100 and MDC-900.

**Note:** The OSCOR always super-imposes the various 1.5GHz windows.

ANTENNA BAND	Filter A	Filter B	Filter A & B (Not applicable for OSCOR 5.0)	
<b>3 – 9GHz</b>	4.5 -- 6	3 -- 4.5	4.5 -- 6	3 -- 4.5
	6 -- 7.5	7.5 -- 9	6 -- 7.5	7.5 -- 9
<b>9 – 15GHz (MDC-2100 only)</b>	10.5 -- 12	9 -- 10.5	10.5 -- 12	9 -- 10.5
	12 -- 13.5	13.5 -- 15	12 -- 13.5	13.5 -- 15
<b>15 – 21GHz (MDC-2100 only)</b>	16.5 -- 18	15 -- 16.5	16.5 -- 18	15 -- 16.5
	18 -- 19.5	19.5 -- 21	18 -- 19.5	19.5 -- 21

**Figure 3: OPERATIONAL FREQUENCY BANDS**

## Installing the MDC-2100/MDC-900

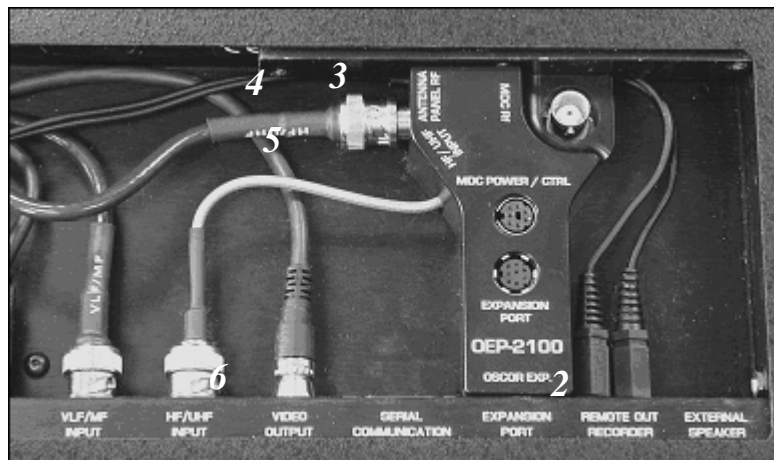
In order to use the MDC with the OSCOR, a special connector (the OEP-2100) must be installed in the connector tray of the OSCOR. This connector should be installed permanently into the connector tray and provides for easy connection of the MDC while not affecting the OSCOR normal operation. Note the step numbers on **Figure 4** below to assist in the installation.

*To install the OEP-2100:*

1. Turn the OSCOR off and wait at least 30 seconds before proceeding.
2. Remove the OEP from the packaging and insert the mini-din connector (OSCOP EXP.) into the EXPANSION PORT of the OSCOR as shown in **Figure 4**. (You may have to unplug the two tape recorder cables labeled REMOTE OUT RECORDER).
3. Insert the metal support bar into the connector tray. Align the depression at the center of the bar with the screw head at the top of the OEP. (The cables that provide connection to the tape recorder controls must be placed under the metal support.)
4. Use the hex wrench to tighten the two hex screws. (This holds the OEP in place.)
5. Unplug the HF/UHF BNC connector from the OSCOR and plug it into the OEP at the ANTENNA PANEL RF jack.
6. Connect the OEP BNC cable (HF/UHF INPUT) to the OSCOR HF/UHF INPUT.

*To install the MDC-2100 or MDC-900:*

1. Plug the MDC BNC connector into OEP BNC jack (MDC RF).
2. Plug MDC mini-din connector into the MDC POWER/CTRL jack.
3. Utilize the OSCOR keypad to control the MDC.



**Figure 4: INSTALLATION OF THE OEP**

The MDC can be used in a stationary position sitting on the provided tripod or it can be moved around the environment to provide a thorough sweep of the area. For best operation, the MDC should be located at least three feet away from the OSCOR. Position the metal housing towards the OSCOR.

## Operational Control of the MDC-2100/MDC-900

### OSCOR Version 4.0

Operational control of the MDC-2100 is provided by the OSCOR keypad using the normal OSCOR functional control. For example, in the OSCOR SWEEP or ANALYZE modes, pressing the **F1** button will toggle through all of the OSCOR inputs including the MDC-2100 frequency bands. Furthermore, in the SWEEP mode, pressing the **RECALL** button will display the OSCOR available inputs including the MDC inputs. Some of the other normal OSCOR functions that are impacted by the MDC-2100 are described below.

- Press, **F1** "INPUT" and repeat until "3-9GHz" is displayed in the lower left.
- Press, "SHIFT" (DATA FUNCTIONS area) and then "EXPAND" (CONTROL area).
- Press, **F1** "Show All" once to select "Show All". Use the Control wheel to move the arrow to any signal you wish to analyze.
- Press, "Narrow" (CONTROL area) 2 or 3 times.
- Press, "Sweep/Analyze" (CONTROL area) to select "Analyze".
- Reposition the arrow over the signal and press, "Narrow" to center the signal.
- Press, **F4** "MDC Anlz". See **Figure 6A**.
- Press, **F2** "3-9GHz" as often as needed to select the band with your signal.
- Press, **F3** "Filtr A & B" to select Filter A or Filter B. Select the Filter with your signal.
- Press, **F4** "Identify" once to identify the frequency. Observe which way your signal moved. The possible frequencies are displayed at top left. Press, **F4** again to return.
- Press, **MENU** "EXIT" to return to the normal menu.

### OSCOR Version 5.0

Operational control of the MDC is provided by the OSCOR keypad using the normal OSCOR functional controls. For example, in the OSCOR SWEEP or ANALYZE modes, pressing the **F1** button will toggle through all of the OSCOR inputs including the MDC frequency bands. Furthermore, in the SWEEP mode, pressing the **RECALL** button will display the OSCOR available inputs including the MDC inputs. Some of the other normal OSCOR functions that are impacted by the MDC are described below.

#### Signal identification Process:

Viewing the entire spectrum from 3 to 21GHz:

- Select **MDCA-all**, as illustrated in **Figure 5**. There are 4 methods you may use.
  - o Method 1. Press **RECALL** (DATA FUNCTIONS area), scroll to "MDC-2100... Filter A" and press **RECALL** (or **MENU/VIEW SPAN** then **MENU/MANUAL MODE**).
  - o Method 2. Press **AUTO/MANUAL** (MODE area - lower left by power light) then **F2**, then **F1**, etc. This method picks from the same menu as above.
  - o Method 3. Press **F1/INPUT** and repeat until you see **MDCA-all** displayed.
  - o Method 4. Enter a frequency found in an MDCA window. You must start from an OSCOR RF band (not INFRARED or AC VLF).
  - o Spans are recalled with the settings last used no matter which method is used. **MDCA-all** may not initially display. If **MDCA-1**, **MDCA-2** or **MDCA-3** displays, press **F4/MDC Anlz**, then **F1/Show All**.

- o You can choose to begin with **MDCB-all** if you wish. You must view both **MDCA-all** and **MDCB-all** to see the entire spectrum.
- Set the span to 1.5GHz, if necessary. If a smaller span initially displays, press **SWEEP/ANALYZE** (CONTROL area) to select **SWEEP**. Press **SHIFT** (DATA FUNCTIONS area) and **EXPAND** (CONTROL area).
- Notice any signals displayed.
- Select **MDCB-all**. Use the same options discussed above.
- Set the span to 1.5GHz.
- Notice any signals displayed.

#### Viewing Bands 1, 2 and 3:

- You can view bands in any order but be sure to view all six spans.
- Press **F4/MDC Anlz**.
- Press **F2** to toggle through each band. Note all signals.

Viewing smaller spans: After all bands have been viewed, cycle through each one again. Analyze all unknown signals.

- Position the display arrow over any signal with the rotary control (CONTROL area).
- Press **NARROW** (CONTROL area) if you wish.
- Press **SWEEP/ANALYZE**.
- Press **NARROW** if you wish.

#### Identifying signals:

- Press **F4/Identify** see **Figure 6B**.
  - o Observe whether the signal moved left or right, see **Figure 7**.
  - o The possible frequencies will be displayed at the top left. If the signal moved left it is one frequency, if it moved right it is the other.
- Press **F4/RETURN** to return to the previous menu to identify all other signals.
- Press **MENU/EXIT** to return to the normal menu.

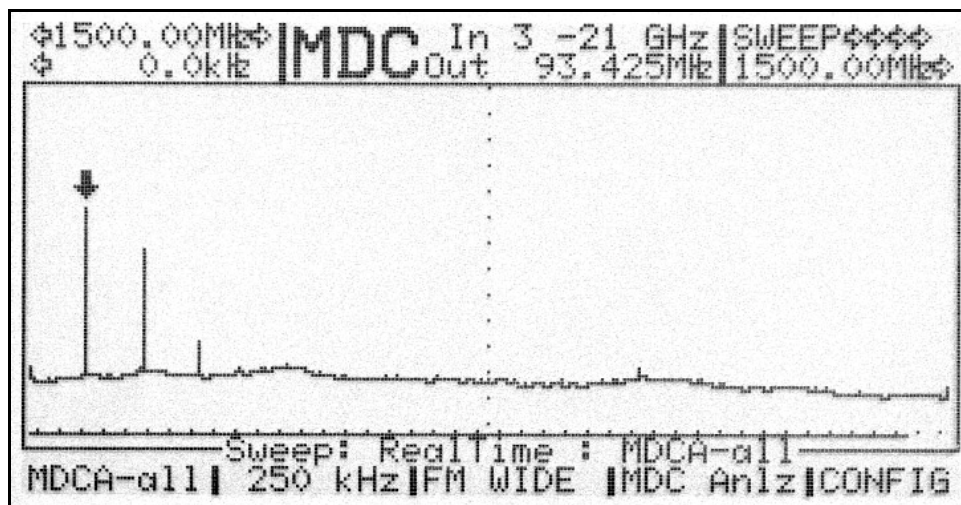


Figure 5: MDCA-ALL (OSCOR 5.0)

```

┌ANALYZE: RF SIGNAL┐ 08:04:08 ┌DEVIATION┐
└Show All┘ 9-15GHz┘Filter B┘Identify┘EXIT

```

Figure 6A: ANALYZING AN MDC SIGNAL (OSCOR 4.0)

```

┌ANALYZE: RF SIGNAL┐ 08:06:46 ┌DEVIATION┐
└Show All┘MDCB-2 ┘Filter B┘Identify┘EXIT

```

Figure 6B: ANALYZING AN MDC SIGNAL (OSCOR 5.0)

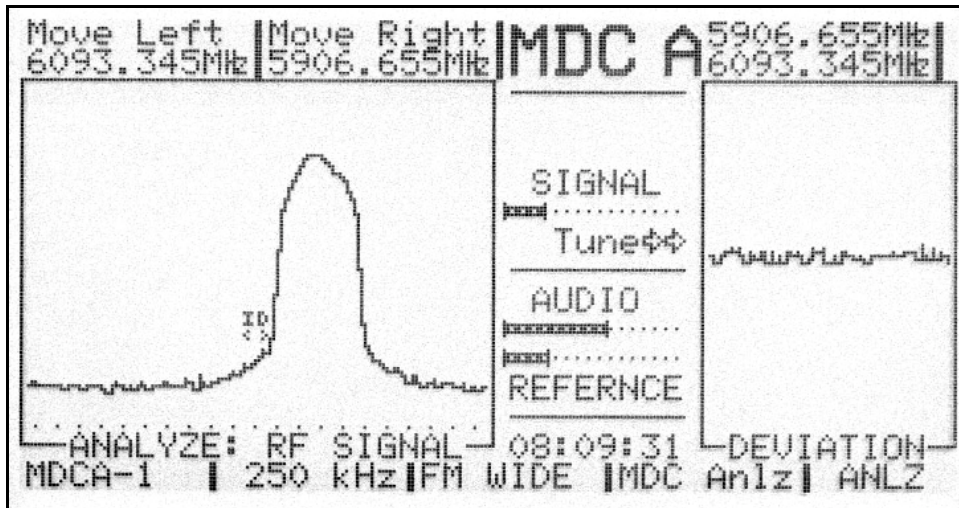


FIGURE 7: USING "IDENTIFY" TO VERIFY A SIGNAL (OSCOR 5.0)

### OSCOR Sweep and Analyze Modes with the MDC

In the Sweep mode, the cursor frequency is no longer representative of a single frequency because of the folding principle described in the introduction of this manual. Therefore, when the entire frequency spectrum is displayed from 3 to 21GHz (MDC-2100) or 3 to 9GHz (MDC-900), only the local frequency is displayed for the cursor frequency. In this display, it is important to note that the OSCOR is in the MDC mode and not to confuse this display with the normal RF/WhipH frequency display. Furthermore, when selecting a single antenna band as described by **Figure 3**, the cursor frequency represents four different possible frequencies (two if using OSCOR 5.0), and when a specific filter is selected (A or B) then the cursor frequency represents two different possible frequencies. From the sweep mode, it is impossible to tell the exact frequency of the transmitted signal. Follow the sequence described in the previous paragraph to determine the exact transmitted frequency.

Furthermore, when rolling the cursor rotary dial back and forth, half of the numbers representing potential signal frequencies will be increasing while others will be decreasing. This again is due to the down-conversion process. Furthermore, often signals will have an odd shape due to the down conversion. In **Figure 8**, a signal is selected using the OSCOR NARROW button and the OSCOR rotary dial. This signal has a rather strange shape because of the folding process of the down-conversion, but it provides an excellent indicator for the proper signal down conversion. Hence, by pressing

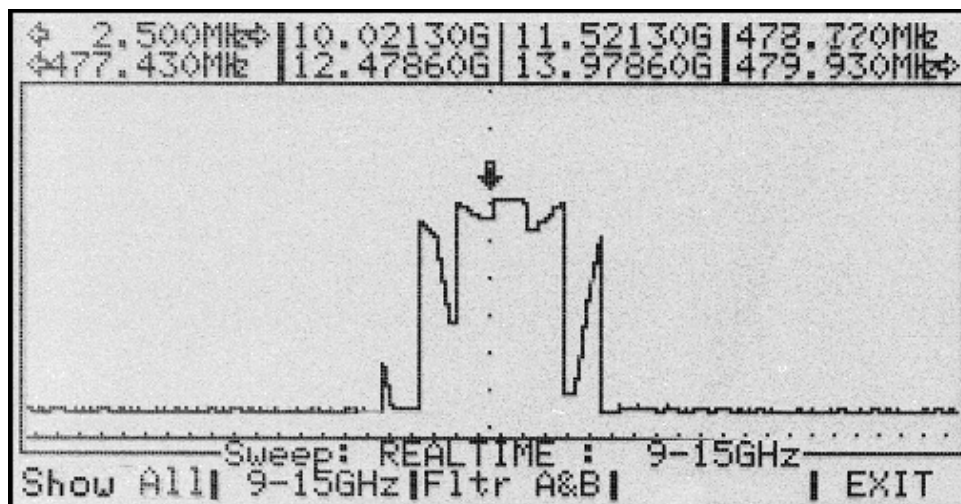


the F4 button to further analyze the signal, it is possible to analyze which antenna and filter that is actually receiving the signal. **Figure 9** shows the proper antenna selected and the proper filter selected which corrects the signal shape. Furthermore, the unusual signal shape of **Figure 8** indicates that this signal should be a Filter B signal.

**Note:** The OSCOR 5.0 software will not allow this type signal to be displayed.

The frequency span limits are always between 0 and 3GHz. This is because the OSCOR is a spectrum analyzer that covers the frequency range up to 3GHz, but the input frequencies of the down-converter cover 3 to 21GHz (MDC-2100) or 3 to 9 GHz (MDC-900). Therefore, the cursor frequencies provide the possible signal frequencies while the span numbers (indicated at the top right and left of the display) provide the frequency span the OSCOR is actually viewing after the down-conversion process.

**Technical Note:** It is possible to have a very slight shift in frequency in the down-conversion process. In the example below, the signal shifted about 50KHz; this is a minimal shift considering the signal is at 10GHz.



**Figure 8: SELECTING A SIGNAL WITH THE MDC (OSCOR 4.0)**

**Technical Note:** You may see false signals at 8.5 and 9GHz. These are produced by an interaction of the MDC and the OSCOR. You may minimize this by moving the MDC a few feet from the OSCOR and orientating the MDC metal housing towards the OSCOR.

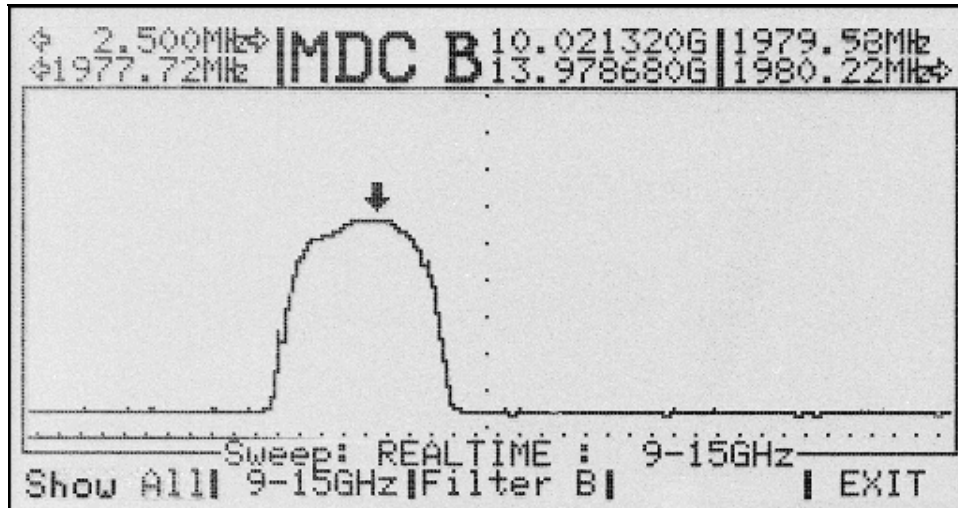


Figure 9: SELECTING THE PROPER MDC BAND AND FILTER (OSCOR 4.0)

### Storing a Sweep Span with the MDC

Since the MDC down-conversion process displays multiple frequency bands at once, the easiest way to quickly view a specific frequency span is to type in a desired center frequency and then use the EXPAND and NARROW keys to adjust the span.

To store a specific frequency span:

1. Ensure that the OSCOR is in the SWEEP mode and the MDC is connected.
2. Type in the desired center frequency between 3 and 21 GHz (or 3 and 9GHz for the MDC-900).
3. Adjust the frequency span using the EXPAND and NARROW keys. (The number in the top left corner of the OSCOR display shows the span.)
4. Press the **STORE** button.
5. To review the stored spans, simply press the **RECALL** button from the SWEEP mode.

**Note:** Further details can be found in the OSCOR Owner's Guide.

There are some important aspects of storing spans that should be understood:

- If you store a specific frequency band in the MDC range (for example 5.6 to 5.8GHz), the MDC will also simultaneously search a parallel frequency band (in the example it will also search from 6.2 to 6.4GHz).
- You cannot store frequency spans that cross the 1.5GHz crossover points. See **Figures 2** and **3** for the 1.5GHz bands. Therefore, to search specifically from 4 to 6GHz as an example, you may choose to search the 3 to 9GHz antenna band with the Group A filter to cover the range from 4.5 to 6GHz (See **Figure 3**). And then, store a range centered at 4.25GHz with a 500MHz span to cover from 4 to 4.5GHz. If using OSCOR 4.0, the fastest and simplest method would be to simply cover the entire span from 3 to 9GHz with Filter A & B selected.
- When storing a span in memory, the actual frequency limits are not displayed in the frequency span list. However, pressing the RECALL button will recall the span showing the stored frequency span.
- To summarize these effects:

*If you desire to cover a frequency span that is greater than 1.5GHz or crosses the antenna bands, the best approach is always to cover the entire antenna band that*

includes the desired frequency span. The table below provides some examples and recommended search span for speed and accuracy.

Example of a Desired Frequency Span:	Recommended Implementation:
4 – 6GHz	3 – 9GHz (MDCA-1 & MDCB-1/OSCOR 5.0)
6 – 8GHz	3 – 9GHz (MDCA-1 & MDCB-1/OSCOR 5.0)
5.7 – 5.9GHz	5.8 GHz, 250MHz span
8 – 10GHz	3 – 21GHz (MDCA-all & MDCB-all/OSCOR 5.0)
13 – 16GHz	3 – 21GHz (MDCA-all & MDCB-all/OSCOR 5.0)

Figure 10; EXAMPLES OF STORING SPANS

### Storing a Signal in the MDC Frequency Range

When a signal is stored in the OSCOR signal database, only the signal frequency is stored in OSCOR memory. However, when the OSCOR tunes to a specific signal in the MDC frequency band (3 - 21GHz) then the OSCOR automatically directs the MDC to the proper antenna band and filter group to maximize the signal to noise ratio and maximize the system performance. An example signal is shown below, **Figure 11**.

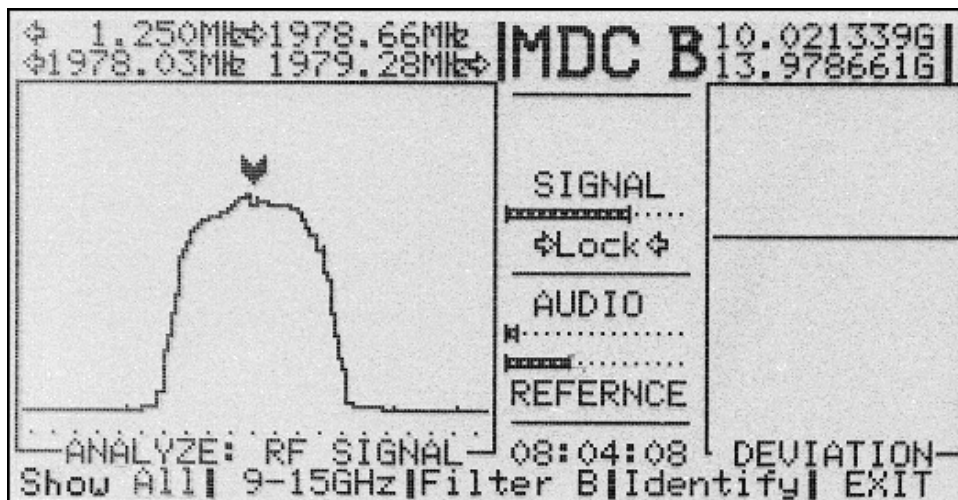


Figure 11: ANALYZE MODE USING THE MDC (OSCOR 4.0)

To store a specific frequency:

1. Ensure that the OSCOR is in the ANALYZE mode.
2. Type in the desired center frequency between 3 and 21 GHz (or 3 and 9GHz for the MDC-900).
3. Press the **STORE** button.
4. To review the stored frequencies, simply press the **RECALL** button from ANALYZE mode. Alternatively, you may select AUTO/MANUAL, then MANAGE DATA, then SIGNALS, then EDIT MENU and pick from that list.

**Note:** Frequencies are stored in a 2.5MHz wide window (span). If a different span is desired the frequency should be stored as a span. See previous instructions. Further details can be found in the OSCOR Owner's Guide.

## Microwave Transmission Considerations for the MDC

There are important principles and considerations to understand when dealing with microwave frequency radiators.

- As the frequency increases, the penetration of RF signals through building materials, foliage, etc. decreases rapidly. Therefore, microwave signals are considered to be a line-of-sight (LOS) communication link. If you locate a microwave surveillance device, the receiving station will be in the direction of the transmission antenna.
- Directional properties of microwave transmissions may be leveraged by the use of high gain, directional antennas to create an efficient point-to-point RF link. In addition, the short wavelengths of microwave frequencies allow for decreased dimensions of such antennas. These techniques result in a signal that is beamed from one location to another with very little energy wasted in unintended directions, and in turn makes the RF energy more elusive in its detection.
- Reflections from metal structures in a building can greatly complicate the location and detection process. Furthermore, these reflections tend to de-polarize the transmitted signals rather quickly. The MDC antennas are linearly polarized, and some customers have had concerns that the polarization effect of the MDC antennas could cause the user to overlook a transmitter due to an incorrect polarization effect. Rotating the antenna 90 degrees along the LOS axis can minimize this effect. However, our experience and testing indicate that this is not a problem because of the reflective nature of the metal structures in a normal building environment.

Sweep operations: The facility you are trying to protect should be considered in relationship with its surroundings. Any window, or external opening should be considered a possible LOS portal for microwave radiation. Nearby buildings are potential locations for receivers.

- Begin any sweep for microwave radiators outside the facility.
- Align the MDC in a LOS path between surrounding buildings and windows or openings.
- Direct the MDC antennas towards your facility.
- Operate the OSCOR in peak display mode (traces) for a specific time.
- If devices/signals are detected, note the area of the facility where the signals originated. Signal strength will be greatest when directional MDC antennas are aligned along an LOS path and the antenna's polarity matches the transmitter.
- If devices/signals are detected and determined to not be continuous wave signals, run traces again and again for shorter and shorter times. In this way you can determine the time between transmissions. This methodology is crucial for detecting devices using burst or packet transmitters.
- Sweep inside the facility in the areas where signals originated.
- Once an area of a room is determined to be the transmission source, the MDC may be used as a probe to locate the transmitter.

Because of the principles above, it is important to understand that to properly use the MDC, it is necessary to point the MDC in all directions of possible concern. It is advisable to move the MDC to different locations in the room. *It has been suggested that because of the microwave reflections, it may be possible to completely cover a room by pointing the MDC directly at the ceiling.* The concept is that due to the metal in most ceiling structures, there would be enough reflective effect to detect a transmitter from any location in the room. This method has some merits, but it is impossible to predict how reliable that it would be in all situations. Therefore, this method should only be used when

it is absolutely necessary in order to save time. *A good rule of thumb is to assume that the MDC has an antenna pattern that is about 100 degrees wide.* In other words, it is necessary to point the MDC in at least 4 different directions around the room to cover the perimeter. Also, the MDC should be pointed up and possibly moved around the room to cover the ceiling, and down to cover the floor. Furthermore, if you expect a very sophisticated threat, it is recommended to point the MDC into ducting, above ceiling tiles, and in any enclosed spaces in which it would be possible to place a transmitter with a high gain antenna. It is highly recommended that the "Show All" mode of operation for the MDC-2100 be utilized (MDCA-all and MDCB-all if using OSCOR 5.0). When a signal is detected, the user can then manually select the different antenna bands and filters to further investigate the signal. Or, the user can simply go to the analyze mode and allow the MDC to determine the operational frequency of the transmitter. Also, it is not recommended to use the MDC with the OSCOR *automatic mode* unless the MDC directional characteristics are taken into consideration. If running the OSCOR and MDC in the *automatic mode*, take care to enable the appropriate MDC spans. To maximize usage of the MDC, include MDC 3-21GHz Filter A and MDC 3-21GHz Filter B in your span list (*For OSCOR 4.0 users, set span to All Bands A&B*).

## Using the MTU-2100 Microwave Test Unit

The MTU-2100 is designed to provide a simple test to verify that the MDC is working properly. When the button is pressed on the MTU, low power signals are generated at about 5.9, 11.8, and 17.7GHz for 3 minutes. Each transmitted signal contains a modulated tone between 900Hz and 1KHz to verify that the signal is radiating from the MTU-2100. It is important to note that the frequency transmissions from the MTU may drift slightly. It should also be noted that the MTU test transmitter and the MDC down-converter both have polarized antennas. When using the MDC in a room environment, the polarization is often not of great concern because of the depolarizing effect that occurs from reflections from the room structure. However, when verifying proper operation of the MDC using the MTU at a close proximity, the polarization of the antennas is important. To achieve the proper polarization with the high gain antennas of the MDC, the following positioning should be utilized.

- 3 – 9GHz band: MTU and MDC should be both horizontally oriented.
- 9 – 15GHz band: MTU and MDC should be perpendicularly oriented.
- 15 –21GHz band: MTU and MDC should be perpendicularly oriented.



**Figure 12: PROPER MTU ORIENTATION FOR TESTING BAND 1 (3- 9GHZ) OR MDC- 900**



**Figure 13: PROPER MTU ORIENTATION FOR TESTING BAND 2&3 (9- 21GHZ) FOR MDC- 2100 ONLY**

Since the MDC is a very sensitive receiving device, it is very possible for the MDC to detect sub-harmonics from the MTU. In other words, when using the MTU, additional signals may appear at frequencies other than the main signals of 5.9, 11.8, and 17.7 GHz. The best way to determine if a signal is being radiated from the MTU is to move the MTU away from the MDC and see if the signal disappears or go the analyze mode in the OSCOR and listen for the modulated tone from the MTU. All signals from the MTU will contain the modulated tone. The main MTU signals should all be found using Filter A.

## MDC-2100/MDC-900 SPECIFICATIONS

<b>Specifications</b>	<b>MDC-2100</b>	<b>MDC-900</b>
Frequency Range:	3-21GHz	3-9GHz
Conversion output:	5MHz to 3005MHz	5MHz to 3005MHz
Frequency Bands of Operation:	Band 1: 3-9GHz Band 2: 9-15GHz Band 3: 15-21GHz Show All: 3-21GHz	Band 1: 3-9GHz
Antenna Gain:	Band 1: 10 dB Band 2: 9 dB Band 3: 9 dB	Band 1: 10 dB
MDS - Minimum Detectable Signal including receiver sensitivity, antenna gain, and filtering losses:	Band 1: -110 dBm Band 2: -110 dBm Band 3: -110 dBm	Band 1: -110 dBm
Input Power:	300 milliamps at 12 volts	150 milliamps at 12 volts

### All models

Weight:	1.4 lb	.635 Kg
Dim:	11.4 x 3.1 x 1.4in	29 x 8 x 3.5 cm
Tripod:		
Weight:	.77 lb	.35 Kg
Dim:	8.75 x 2.5 x 1.5 in	22.2 x 6.4 x 3.8 cm
Usage Height:	5.5 in	14 cm
Case Dimensions:		
Size (H x W x D):	6.25 x 18.5 x 14.5 in	47 x 36.8 x 15.9 cm



## Technical Bulletin

24 April 2002

For the MDC-900 and MDC-2100

This bulletin describes a calibration process to ensure the maximum technical performance for the MDC unit.

### Technical Background:

Most Down-converter products contain a local oscillator (LO) reference signal that is utilized in the down-conversion process. While this LO frequency is vital to the down-conversion process, it also creates a blind spot in the frequency spectrum that cannot be analyzed. However, the MDC and OSCOR design addresses this technical problem. In order to ensure that there is not a blind spot at the LO frequency or any of its harmonics (6GHz, 12GHz, 18GHz), the OSCOR automatically shifts the LO frequency as it is sweeping through the frequency range near the LO frequency. The ability to automatically shift the MDC LO frequency as commanded by the OSCOR is one of the primary reasons that the MDC units were designed only for use with the OSCOR. Other spectrum analyzers do not contain the intelligent functions to control this function and remove blind spots created by the LO. In order for this shifting process to be optimized, it is necessary to calibrate the OSCOR shift command with the physical characteristics of the MDC frequency shifting process. However, even if the calibration process is not performed, the probability for a random signal of 200KHz bandwidth to actually be located in a blind spot assuming a uniform random signal distribution is only 0.000167.

### Calibration Process:

Follow these steps to calibrate the MDC to the particular OSCOR utilized with it. There is no need to connect the MDC to the OSCOR for calibration.

To calibrate an OSCOR to a specific MDC unit;

1. Press SHIFT and the numbers 786.
2. Enter the number \_\_\_\_\_. This calibrates for 6GHz. *This number is unique to each MDC unit and must be obtained from REI.* The above calibration number is to be used with MDC-900/MDC-2100 serial number \_\_\_\_\_. To calibrate for 12GHZ enter \_\_\_\_\_. To calibrate for 18GHz enter \_\_\_\_\_.
3. Press Shift and the numbers 788 to permanently store the calibration data in the OSCOR.

Note: This calibration data is permanently stored in the OSCOR Kernel. It will never need to be repeated even if the OSCOR program key is replaced. The calibration process can be repeated as often as desired. Also, if the MDC is used with another OSCOR, the calibration process must be repeated to ensure that the MDC and OSCOR are calibrated for use together. *The OSCOR will store only one calibration number at a time.*



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