

# Application Note

10/29/2015



## Installation and Testing procedures for **DIRECTV MFH2** with the XR-3™ Satellite Meter

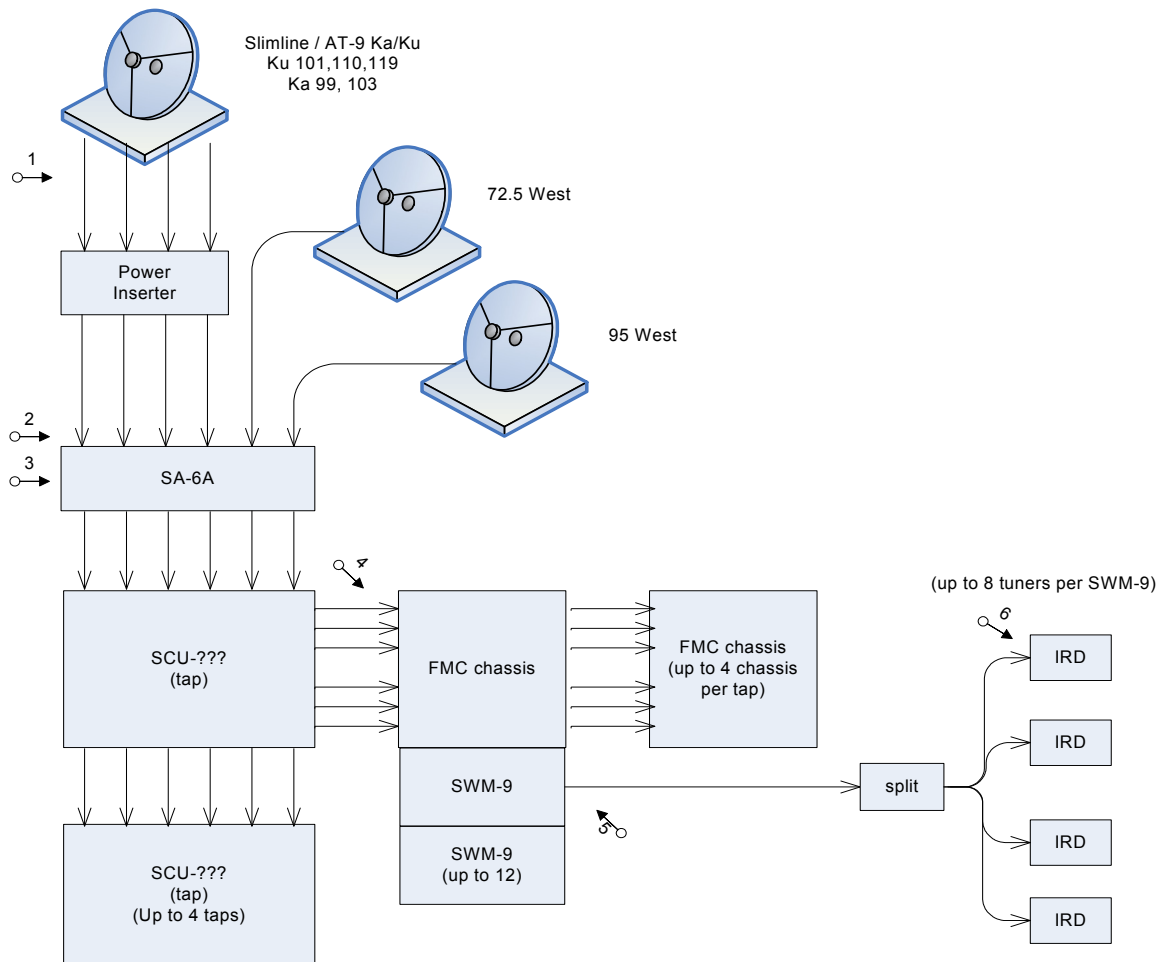
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The DIRECTV MFH2 Distribution System utilizes three dishes, a riser system, and a single cable home run distribution system.

The three dishes are:

- Slimline for 101, 110, 119 West DBS and 99, 103 West Ka satellites (“SlimLine”)
- DBS dish for 72.5 West satellite (“Single Sat 72.5”)
- FSS dish for 95 West satellite (“International 95”)

The distribution system looks something like this:



## General Procedure

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Testing the system should include the following steps. The test locations are denoted by numbers on the diagram above.

- 1) Install and point the antennas. Use the Proof of Performance test to record the performance of each dish. Note the signal quality or C/N measurement; you will want to verify that this quality is maintained as the signal is distributed through the system.
- 2) Verify the signal levels and quality at the input to the SA-6A. The levels must be in the correct range for the SA-6A to work properly. The signal levels from the Slimline are frequently too high and must be padded down before the SA-6A or before the power inserter. Verify that the correct satellite feed is present on each cable input to the SA-6A.
- 3) Adjust the SA-6A to ensure the correct levels reach the SCU-??? tap units. Follow the DIRECTV approved procedure.
- 4) Verify the input levels and signal quality at the input to each FMC chassis. Compare the signal quality (or C/N) to the values obtained directly from the dish. If degradation has occurred, backtrack and determine where the degradation was introduced. Overdriving the components is a common way of degrading the C/N.
- 5) Verify the output of each SWM module. When the SWM module is first powered up, it goes into a test mode where certain transponders are transmitted on all 8 output frequencies. Compare the signal quality (C/N) for each of these to the quality of the signal input to the FMC chassis.
- 6) Verify each customer drop. With the SWM module still in the power-up test mode, repeat the test at each drop to be sure the signal quality is maintained and signal level is adequate for the receivers.

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## Proof of Performance Test

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The XR-3's "Proof of Performance" function may be used to record the measurements of all transponders for future transfer to a PC where they may be printed or archived. The general procedure for using the Proof of Performance (PoP Scan) is:

- Verify that a signal lock is obtained.
- Press ID to verify the correct satellite has been obtained.
- Press MENU and select PoP Scan to start collecting data.

The meter will now scan through all the transponders and collect the data for each. When it finishes a summary screen will show the minimum and maximum level and signal quality.

- Press NEXT
- Enter the location
- Enter your name
- Enter any notes
- Press NEXT
- Enter the name you wish to save the file as
- Press SAVE

The meter will save the file in flash storage.

Use the SatTransfer program to transfer the files to a PC for viewing, printing and archival. This program is described in the Operation Manual.

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## DIRECTV SL5 KaKu Slimline Antenna Pointing

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**Connections:** Coax cable connected from LNB output port to XR-3 satellite meter module's ODU/LNB port

### Meter set-up

Push the **SYST** System soft-key to select the following:

- REGION                    your geographic region
- SERVICE                    **DIRECTV**
- SYSTEM                    **SL5 LNB**
- LNB MODEL                defaults to **SL5 LNB** (but user may change to other menu options for LNB model if going through a 6x8 multi-switch and/or if using a wing dish aimed at the 95 satellite)
- SWITCH TYPE              defaults to **22 kHz** (may default to DTV6x8 if user has indicated that he is passing signal through 6x8 multi-switch before entering meter)

*To make selections, arrow up or down to the item to change and press **Enter**, then arrow up or down to the desired option and press **Enter**. Press **EXIT** or **DONE** to return to Run Mode*

### Azimuth/Elevation Lookup:

Push the **AZ/EL** soft key (lower left corner of main run screen), use the numeric keypad to enter the Postal Code for your current location, and press the **ENTER** key. Press **EXIT** to return to Run Mode

### Antenna Pointing

Install the mast (pole) plumb, preset the antenna reflector's vertical angle (elevation setting) and Skew setting, mount antenna reflector to mast, and grossly align azimuth (using magnetic compass according to 'Magnetic' coordinates shown in AZ/EL screen on meter). You may want to use the AZ/EL look-up feature to obtain rough antenna reflector settings based on your zip code or latitude and longitude.

### Run Mode

- Connect a coax jumper cable from the ODU/LNB port of your XR-3 meter to the LNBF output port.
- Press **LNB** soft-key (located on middle right side of LCD screen) once to power LNB1 (101°W). The satellite orbital position will be displayed in upper left corner of LCD screen.
- Adjust antenna reflector azimuth (left or right) and elevation (up or down) to obtain maximum signal level (left bar graph), signal quality (right bar graph), and LOCK status.
- Press the **ID** soft-key (located on middle left side of LCD screen) to verify that you're aligned to the 101°W satellite. "ID VERIFIED" means you are pointed correctly.
- If "ID FAILED" is displayed, press **SCAN** soft-key and the XR-3 will find which satellite you are aimed at.
- If desired, you may also use Up/Down arrow keys to scroll through other transponders to check for proper RF signal level and quality.
- Press **LNB** power soft-key to toggle to LNB2 (110°W and 119°W). Fine tune azimuth, elevation and skew of dish to maximize signal level and signal quality, and achieve LOCK.
- Press the **ID** soft-key (located on middle left side of LCD screen) to verify that you're aligned to the 110°W and 119°W satellites. "ID VERIFIED" means you are pointed correctly.
- If "ID FAILED" is displayed, press **SCAN** soft-key and the XR-3 will find which satellite you are aimed at.
- If desired, you may also use Up/Down arrow keys to scroll through other transponders to check for proper RF signal level and quality. Transponders 8, 10, and 12 come from the 110°W satellite; and transponders 22 through 32 come from the 119°W satellite.
- Complete the dithering/fine tuning process, adjusting the azimuth and elevation of the dish while looking at the 101°W satellite, as directed by DIRECTV. This will ensure good signal

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reception from all five satellites (99°W, 101°W, 103°W, 110°W, and 119°W) if your mast/pole is plumb.

DIRECTV has strictly stated that they do NOT want the technicians modifying the alignment of the dish while looking only at the Ka signal level (dBm) because if they improve signal reception from the 103°W satellite, they will likely be hurting the alignment on the 99°W satellite at the same time. DIRECTV recommends adjusting the azimuth and elevation of the dish while looking at the 101°W satellite and then performing their fine-tuning/dithering process while looking at the 101°W satellite. Please refer to DIRECTV's official instructions regarding their dithering/fine-tuning process for more information.

- Press **LNB** power soft-key to toggle to LNB3 (99°W) A-Band transponders. The XR-3 will display a signal quality on the right bar graph; however, the lock is not supported by DirecTV.
- If desired, you may also use Up/Down arrow keys to scroll through other transponders to check for proper RF signal level and quality.
- Press **LNB** power soft-key to toggle to LNB4 (99°W) B-Band transponders. The XR-3 will display a signal quality on the right bar graph; however, the lock is not supported by DirecTV.
- If desired, you may also use Up/Down arrow keys to scroll through other transponders to check for proper RF signal level and quality.
- Press **LNB** power soft-key to toggle to LNB5 (103°W) A-Band transponders. The XR-3 will display a signal quality on the right bar graph; however, the lock is not supported by DirecTV.
- If desired, you may also use Up/Down arrow keys to scroll through other transponders to check for proper RF signal level and quality.
- Press **LNB** power soft-key to toggle to LNB6 (103°W) B-Band transponders. The XR-3 will display a signal quality on the right bar graph; however, the lock is not supported by DirecTV.
- If desired, you may also use Up/Down arrow keys to scroll through other transponders to check for proper RF signal level and quality.

***You may choose to use the PoP Scan function of the meter to record the measurements.***

Please refer to the operations manual for more info and instructions related to the Proof of Performance scan feature.

**Notes:**

- It is NOT recommended to keep the XR-3 meter in line while checking receiver status due to attenuation from our circuitry.
- Please ensure that you have the latest versions of North American Field Guide, Software, Dish Limits, and Postal Codes loaded into your meter. If your meter has older versions loaded, please use the FlashUpdate program to update your meter, as described in the Operations Manual.

## Single Sat 72.5 Antenna Pointing

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**Connections:** Coax cable connected from LNB output port to XR-3 satellite meter module's ODU/LNB port

### Meter set-up

Press the **SYST** System soft-key (located near top left corner of LCD screen) to enter the System Setup menu. Then select the following:

- REGION                    your geographic region
- SERVICE                 **DIRECTV**
- SYSTEM                 **Single Sats**
- LNB MODEL             **Single Sat 72.5**
- SWITCH TYPE         defaults to **None**

*To make selections, arrow up or down to the item to change and press **Enter**, then arrow up or down to the desired option and press **Enter**. Press **EXIT** or **DONE** to return to Run Mode*

### Azimuth/Elevation Lookup:

Push the **AZ/EL** soft key (lower left corner of main run screen), use the numeric keypad to enter the Postal Code for your current location, and press the **ENTER** key. Press **EXIT** to return to Run Mode.

### Antenna Pointing

Install the mast (pole) plumb, preset the antenna reflector's vertical angle (elevation setting) and Skew setting, mount antenna reflector to mast, and grossly align azimuth (using magnetic compass according to 'Magnetic' coordinates shown in AZ/EL screen on meter). You may want to use the AZ/EL look-up feature to obtain rough antenna reflector settings based on your zip code or latitude and longitude.

### Run Mode

- Connect a coax jumper cable from the ODU/LNB port of your XR-3 meter to the LNBF output port.
- Press **LNB** soft-key (located on middle right side of LCD screen) to power the LNB. The satellite orbital position will be displayed in upper left corner of LCD screen.
- Adjust antenna reflector azimuth (left or right) and elevation (up or down) to obtain maximum signal level (left bar graph), signal quality (right bar graph), and LOCK status.
- Press the **ID** soft-key (located on middle left side of LCD screen) to verify that you're aligned to the correct satellite. "ID VERIFIED" means you are pointed correctly.
- If "ID FAILED" is displayed, press **SCAN** soft-key and the XR-3 will find which satellite you are aimed at.
  - If desired, you may also use Up/Down arrow keys to scroll through other transponders to check for proper RF signal level and quality.

***You may also choose to use the PoP Scan function of the meter to record the measurements.*** Please refer to the operations manual for more information and instructions related to the Proof of Performance scan feature.

### Notes:

- It is NOT recommended to keep the XR-3 meter in line while checking receiver status due to attenuation from our circuitry.
- Please ensure that you have the latest versions of North American Field Guide, Software, Dish Limits, and Postal Codes loaded into your meter. If your meter has older versions loaded, please use the FlashUpdate program to update your meter, as described in the Operations Manual.

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## International 95 Antenna Pointing

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**Connections:** Coax cable connected from LNB output port to XR-3 satellite meter module's ODU/LNB port

### Meter set-up

Press the **SYST** System soft-key (located near top left corner of LCD screen) to enter the System Setup menu. Then select the following:

- REGION                your geographic region
- SERVICE              **DIRECTV**
- SYSTEM               **Single Sats**
- LNB MODEL          **Intl 95**
- SWITCH TYPE        defaults to **None**

*To make selections, arrow up or down to the item to change and press **Enter**, then arrow up or down to the desired option and press **Enter**. Press **EXIT** or **DONE** to return to Run Mode*

### Azimuth/Elevation Lookup:

Push the **AZ/EL** soft key (lower left corner of main run screen), use the numeric keypad to enter the Postal Code for your current location, and press the **ENTER** key. Press **EXIT** to return to Run Mode.

### Antenna Pointing

Install the mast (pole) plumb, preset the antenna reflector's vertical angle (elevation setting) and Skew setting, mount antenna reflector to mast, and grossly align azimuth (using magnetic compass according to 'Magnetic' coordinates shown in AZ/EL screen on meter). You may want to use the AZ/EL look-up feature to obtain rough antenna reflector settings based on your zip code or latitude and longitude.

### Run Mode

- Connect a coax jumper cable from the ODU/LNB port of your XR-3 meter to the LNBF output port.
- Press **LNB** soft-key (located on middle right side of LCD screen) to power the LNB. The satellite orbital position will be displayed in upper left corner of LCD screen.
- Adjust antenna reflector azimuth (left or right) and elevation (up or down) to obtain maximum signal level (left bar graph), signal quality (right bar graph), and LOCK status.
- Press the **ID** soft-key (located on middle left side of LCD screen) to verify that you're aligned to the correct satellite. "ID VERIFIED" means you are pointed correctly.
- If "ID FAILED" is displayed, press **SCAN** soft-key and the XR-3 will find which satellite you are aimed at.
  - If desired, you may also use Up/Down arrow keys to scroll through other transponders to check for proper RF signal level and quality.

***You may also choose to use the PoP Scan function of the meter to record the measurements.*** Please refer to the operations manual for more information and instructions related to the Proof of Performance scan feature.

### Notes:

- It is NOT recommended to keep the XR-3 meter in line while checking receiver status due to attenuation from our circuitry.
- Please ensure that you have the latest versions of North American Field Guide, Software, Dish Limits, and Postal Codes loaded into your meter. If your meter has older versions loaded, please use the FlashUpdate program to update your meter, as described in the Operations Manual.

## Riser / Trunk Verification

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When the antennas are properly aligned, verify and document the quality of the signals at the input to the riser system and distribution chassis using the procedure below.

This test is performed at the input to the riser system components, specifically at the end of the cables that connect to the SA-6A amplifier and to the FMC distribution chassis.

### **Equipment Setup:**

- Disconnect one input cable at a time and connect it to the XR-3's "Signal In" ODU/LNB port.

### **Meter Set-Up:**

Push the **SYST** System soft-key to select the following:

- REGION                    your geographic region
- SERVICE                    **DIRECTV**
- SYSTEM                    **MFH-2 Riser**
- LNB MODEL                choose the appropriate port (**Port 1 – 101 even, Port 1 – 99A even, Port 2 – 101 odd, Port 2 – 99A odd, Port 3 – 119 even, Port 3 – 103A even, Port 4 – 119 odd, Port 4 – 103A odd, Port 5 – 72.5W, or Port 6 – 95W**)
- SWITCH TYPE            **none**

To make selections, arrow up or down to the item to change and press **Enter**, then arrow up or down to the desired option and press **Enter**.

Press **EXIT** or **DONE** to return to Run Mode

### **Verify Port 1**

- Disconnect the cable from the device Port 1 and connect it to the XR-3 "Signal In".
- Press the **LNB** soft key once to select the 101°W satellite. This will set the XR-3 to see the even transponders from the 101°W satellite (labelled Tr 2 through Tr 32) which should be present on this cable.
- Verify that a signal lock is obtained.
- Press **ID** to verify the correct satellite has been obtained.
- Check some transponder levels and C/N to be sure the signal integrity has been maintained.
- Press **MENU** and use the PoP Scan to collect and record the data.
- Press the **LNB** soft key to toggle to LNB2 (99°W) A-Band even transponders (labelled Tr 2 through Tr 6).
- Verify that the signal levels are in the proper range. For transponders on the 99°W and 103°W satellites, the XR-3 can give an estimated signal quality but the lock is not supported by DirecTV. The meter will not be able to ID verify these two satellites.
- Check some transponder levels and C/N to be sure the signal integrity has been maintained.
- Press **MENU** and use the PoP Scan to collect and record the data.
- Press the **LNB** soft key to toggle to LNB3 (99°W) B-Band even transponders (labelled Tr 2 through Tr 24).
- Verify that the signal levels are in the proper range.
- Press **MENU** and use the PoP Scan to collect and record the data.

**Verify Other Ports**

Using this same method, verify that the signals on all ports are valid and good.

Device Port	Meter Setting	Satellite	Transponders	ID	C/N Quality
1	101 even	101	even	yes	yes
1	99A even	99	even	no	yes*
2	101 odd	101	odd	yes	yes
2	99A odd	99	odd	no	yes*
3	119 even	110,119	even	yes	yes
3	103A even	103	even	no	yes*
4	119 odd	119	odd	yes	yes
4	103A odd	103	odd	no	yes*
5	72.5W	72.5	even	yes	yes
6	95W	95	even/odd	yes	yes

\* The XR-3 will give an estimated signal quality (right bar graph) for these transponders. It will show "Lock Not Supported" and will be unable to ID verify the satellite.



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## Customer Drop / SWM Verification

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This test is performed at the customer drop location, or at points in the single-wire portion of the distribution system between the SWM and the receivers.

The SWM module allocates one channel or frequency to each receiver that is connected to it. The receiver requests a specific transponder and the SWM switches that transponder onto the allocated channel. Therefore, only the transponders actually being used are on the output cable and they are not at the normal frequencies.

When a SWM is active, some channels may be in use, others vacant, depending on how many receivers are active on the line. To test this system, it is best to use the SWM diagnostic mode which is enabled when the SWM is powered up. In this mode, the SWM outputs a signal on all channels which the meter can measure to assess the resulting signal quality.

### **Equipment Setup:**

- Power the SWM in question off and then on to put it into the test mode.
- No other receivers should be active at this time.
- Connect a cable from the SWM module to the XR-3 satellite meter module's ODU/LNB port. Splitters may be located between the SWM and the XR-3.

### **Meter Set-Up:**

Push the **SYST** System soft-key to select the following:

- REGION                      your geographic region
- SERVICE                     **DIRECTV**
- SYSTEM                     **MFH-2 SWM**
- LNB MODEL                **SWM-5, SWM-8, SWM-16, or SWM 32**
- SWITCH TYPE              **none**

### **Verify Signal**

- Scroll through the 9 channels (5 channels for SWM-5) and compare the signal level and signal quality (C/N) to the values previously measured at the input to the FMC chassis.
- If the signal level is below -65 dBm or the C/N has dropped by more than 1 dB, there is likely a problem upstream from the test point. If you are measuring directly at the output from the SWM, the problem is probably in the SWM module itself.
- If the level and C/N looks good, you may document the performance with the PoP Scan.

### Notes:

- It is NOT recommended to keep the XR-3 meter in line while checking receiver status due to attenuation from our circuitry.
- Please ensure that you have the latest versions of North American Field Guide, Software, Dish Limits, and Postal Codes loaded into your meter. If your meter has older versions loaded, please use the FlashUpdate program to update your meter, as described in the Operations Manual.

