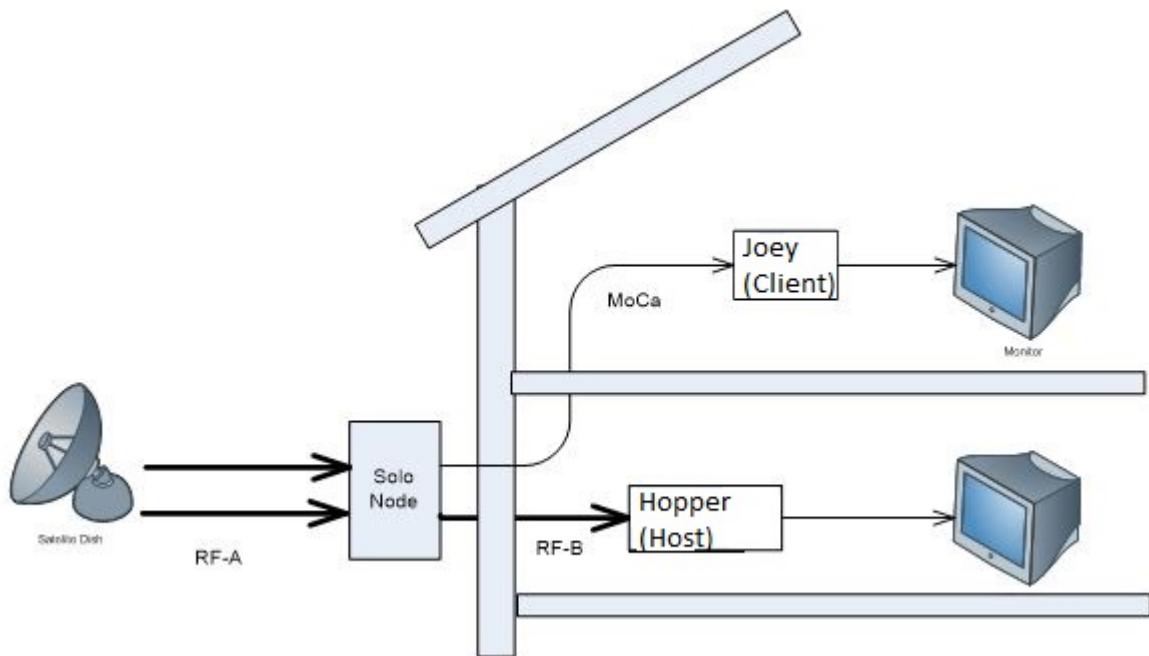# Testing DISH Network Solo Node Hopper 1 and Hopper 2 Systems with XR-3 Satellite Meter

1 Solo Node System Description

With a Solo Node, the system consists of a 1000.2 or 1000.4 dish, a Solo Node, a Dish Network Hopper 1 or Hopper 2 receiver, and some number of Dish Network Joeys to connect HDTVs to the MoCA network. One HDTV may be connected directly to the Hopper.

Two cables from the dish connect to the node input ports 1 and 2. The node's "host" port is connected to the Hopper. The node's "client" port connects to the MoCA network of Joeys.

The satellite transponder signals are only present in the system on the cables shown in dark lines above and labeled RF-A and RF-B. The RF-B portion also carries the MoCA signals in the 650-850 MHz band. The older model Super Buddy satellite meter has no provision for testing this MoCA band. The MoCA portion of the home network does not carry the satellite signals, only the MoCA signals (or possibly cable or off-air signals also). TVs connected to the MoCA network via Joeys receive their video signals from the Hopper receiver transmitted as MoCA signals.

2 Testing

2.1 Point the Dish

The dish can be pointed by connecting the ODU / LNB port of the meter to any one of the cables from the output ports of the LNB. Select the system type that matches the LNB and proceed as you would for any normal installation of that type of dish.

Once the dish is pointed, it might be good to verify that both cables carry proper signals to the point they attach to the node. Transponders in both the lower (950:1450 MHz) band and in the upper (1650:2150 MHz) band should be checked.

Connections: Coax cable connected from an LNBF 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   **Dish Network**
- SYSTEM   depends on your LNB hardware (i.e. EA DPP 1000.4, WA DPP 1000.4, EA DPP 1000.2, or WA DPP 1000.2, etc.). Note: WA = Western Arc, EA = Eastern Arc, DPP = Dish Pro Plus, DPH = Dish Pro Hybrid.
- LNB MODEL   depends on your LNB hardware and whether or not you're using a wing dish
- SWITCH TYPE   will default to most common switch type to control built-in switch in your LNB

*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*

Antenna Pointing

Install the mast plumb, preset the antenna vertical angle, mount to mast and grossly align azimuth. You may want to use the AZ/EL lat/long or postal code look-up feature to obtain rough antenna settings.
- Press the **AZ/EL** soft-key, type in the local postal code or latitude and longitude, and press **ENTER**. Approximate antenna settings will be displayed. Press **EXIT** soft-key to return to the main Run screen.

Run Mode
- Press **LNB** soft-key (located on middle right side of LCD screen) to power the LNB.

After selecting the desired satellite and pressing the **LNB** soft-key to power the LNB:
- Adjust antenna reflector azimuth and elevation to obtain maximum signal level (left bar graph), signal quality (right bar graph), and LOCK status.
- Press the **ID** soft-key to verify the satellite. "ID VERIFIED" means you are pointed correctly.
- If "ID FAILED" is displayed, press **SCAN** soft-key and 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 level and quality.
- Press the LNB soft-key again to toggle to the 2nd feed horn (i.e. 110°W if western arc or 61.5°W if eastern arc) and repeat antenna reflector adjustments to maximize signal level and quality and check for ID verification.
- Adjust the skew of the dish to maximize signal level and quality.
- Press the LNB soft-key again to toggle to the 3rd feed horn (i.e. 129°W if western arc or 77°W if eastern arc) and repeat antenna reflector adjustments to maximize signal level and quality and check for ID verification.
- Adjust the skew of the dish to maximize signal level and quality.

2.2 Connect the Node

Connect the two cables from the LNB to the input ports of the node. Verify that the node is operating as follows:

1) Connect a cable from the XR-3 satellite meter module's ODU / LNB port to the node's HOST port
2) In the system selection menus, select:
- REGION   your geographic region
- SERVICE   **Dish Network**
- SYSTEM   **XiP Hopper**
- LNB MODEL   **SOLO East** or **SOLO West** (depending on eastern or western arc sats)
- SWITCH TYPE   **XiP**

3) On the meter's main Run screen, the bottom left soft-key should indicate a band selection: Band 1, Band 2, or Band 3. This selects the three frequency bands output from the node. The receiver has three tuners and each tuner uses a different band, so all 3 bands should be checked.
    Note: You must use Applied Instruments' Turbo S2 satellite meter module that features high-band tuning (part number XR-TS2-02) to be able to test Band 3 (2500-3000 MHz) with the satellite meter.
4) Leaving Band 1 selected, press the LNB soft-key (located on middle right side of LCD screen) to provide LNB power and select LNB 1. This is the 119°W (or 72.0°W) satellite. Press your up/down arrow keys to verify that both odd and even numbered transponders are being received with good signal level and quality
5) Press the LNB soft-key again to select LNB 2, the 110°W (or 61.5°W) satellite. Again verify that both odd and even transponders are good.
6) Press the LNB soft-key a third time to select LNB 3, the 129°W (or 77°W) satellite. Once again verify that both odd and even transponders are good.
7) Press the LNB soft-key a fourth time to turn the LNB off.
8) Now press the BAND soft-key (located in lower left corner of LCD screen) to select BAND 2. This will select the middle frequency band used by the second tuner in the receiver. Go through all of the LNB selections as above, checking both odd and even transponders. When finished, turn the LNB off again.
9) Now, to check the third band, as mentioned above, you must have Applied Instruments' Turbo S2 satellite meter module with a built-in down-converter (part number XR-TS2-02). If you're aren't sure if you have this version of Turbo S2 module, press MENU soft-key, then select 'Versions' from the Main Menu and refer to the 'Module HW Version' field. If the Module HW version is '1.01', then your meter module has the built-in down-converter to allow you to tune to Band 3 (2500-3000 MHz). This will enable the meter to measure the signals in the 2500-3000 MHz band that would otherwise be out of range of the meter's tuner frequency range.

    Press the BAND soft-key to select BAND 3. Go through all of the LNB selections again checking both odd and even transponders. When finished, turn the LNB power off.

Note: The current draw of the system is significant during this test on the HOST output port of the node, so testing time should be minimized to preserve battery charge. The intent is just to verify that output from the node is good before continuing with the installation to the Hopper receiver. The total current draw of the XiP system and the may exceed the 750 mAmp current limit of the meter when testing through long cable runs. By using a power inserter, the current limitation is not a problem. If a Duo Node is used, it is best to connect the power inserter to one host port of the node and the meter to the other.

Both odd and even transponders should be checked in each band to be sure the node is performing its frequency conversions properly. At this point it should be sufficient to check one odd and one even transponder from each satellite on each band.

2.3 Install the Receiver

Run the coax cable to the receiver's location. At this point, AC power must be available to power the Hopper receiver; that enables you to utilize a power inserter (such as Model DPP44) to power the system and preserve the meter's battery charge.

1) Connect the cable from the node to the power inserter port labeled "to switch"
2) Connect a jumper cable from the meter's ODU / LNB port to the power inserter's "receiver" port.
3) Using the same system selection as above (Service Dish Network, System XiP Hopper, LNB Model Solo East or Solo West), you can now perform more extensive checks including a PoP Scan or Limit Scan.

Be sure to verify the level and quality of the Band 3 signals. Since this is the highest frequency band, it is the most likely to have problems and most prone to signal loss through the cable. The Turbo S2 satellite meter module with hand band (2500-3500 MHz) tuning capability, part number XR-TS2-02, is always needed when testing Band 3.

4) Remove the power inserter and connect the cable from the HOST port of the node to the meter's ODU / LNB port.
5) Connect a coax cable from the Hopper receiver to the meter's IDU / IRD port.
6) Turn the Hopper receiver on. Using the meter's V/I (Volt/Amp) screen, observe the IRD voltage and LNB current draw. To reach the menu's V/I (Volt/Amp) screen from the main Run screen, press the MENU soft-key (located near lower right corner of LCD screen), then press the V/I soft-key or select Volt/Amp from the Main Menu list.

2.4 MoCA Testing

If the testing in the previous section indicates all signals are good up to the Hopper receiver, the RF-A and RF-B portions of the network have been tested, although not in the MoCA frequency range. A quick check of actual video output on one of the TVs attached to the Joey should validate the MoCA portion of the network.

The model XR-3 Modular Test Instrument with the model Turbo S2 satellite meter modules (part numbers XR-TS2-01 & XR-TS2-02), are capable of displaying a spectrum graph showing the MoCA signal. These meters are able to tune to the 750 to 850 MHz frequency range used by the MoCA signal and have a special peak-hold method needed to view the bursted MoCA signal.

To obtain this MoCA spectrum on the XR-3 with Turbo S2 module:
1) Connect the meter's ODU/LNB port to a client or host port of the node,
2) Press MENU soft-key to get to the Main Menu
3) Select 'Spectrum'
4) Select 'MORE' Select 'MoCA view'

The network must be active, so a Hopper should be connected during this test.

Due to the sometimes-on, sometimes-off nature of the MoCA signal, you will have to wait for several scans before a representative level will be shown.

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