



Advanced Return Path Alignment & Maintenance Using the 9581 SST R4

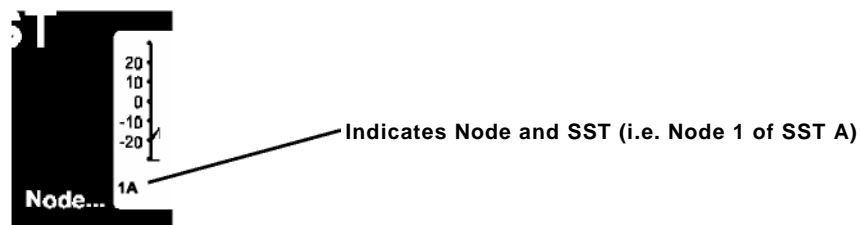
Introduction

The first step in developing a successful alignment and maintenance strategy for the return path depends on understanding what constitutes a properly operating system. If you have not already done so, review your system parameters so that you will have the following information handy:

- Proper levels at the headend.
- Proper injection points for the node and each type of amplifier in the system.
- Proper injection level for each device in the return system including coupling and test probe losses.

You may also wish to review the [9581 SST R4 Operation Manual](#) for the proper installation and basic operation of your 9581SST R4 system as well as the Operation Manuals for your field pieces.

Alignment of the reverse path should begin at the headend. Use the SST to monitor the ingress for each return path that you will be aligning.



REMINDER: When you are reading the ingress, the 9581 SST R4 displays the node and the SST (A or B) it is reading. In the example above, NODE 1 of SST A is being read so **1A** appears next to the word “Node” on the front panel. To cycle through SST A nodes 1 - 8 and then proceed to SST B and its 8 nodes, press the **Node** button.

For the 9581R4 system to achieve sweep accuracies better than ± 1 dB (and your return data system to function properly), ingress must be at least 20 dB below the expected return levels. If the SST is set properly, this will be 30 dB down from full scale on the ingress display. Carefully inspect the spectrum around each test carrier frequency. If ingress is excessive, take one of the following steps to reduce it:

- If you are combining several return paths, try disconnecting some to reduce total ingress.
- If your system has no active carriers, turn down the gain or remove the pads in the reverse amplifiers.
- Temporarily pick a higher operating level for the SST and SSR.
- Find and fix the major ingress problems. Remember, you can use your 9581 SST R4 system to help you troubleshoot the ingress while in the field.

If ingress exceeds -20 dB relative to the desired return level, the 9581 SST R4 sweep display will show an “X” rather than the usual frequency marker (bar). This is another indication that there is an ingress problem, which needs to be tracked down.

<p>For Additional Help Contact Trilithic Applications Engineering 1-800-344-2412 or 317-895-3600 support@trilithic.com or www.trilithic.com</p>

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Adjusting the Fiber Link

Adjustment of the fiber link will require two technicians since the fiber receiver output must be adjusted with the SSR connected to the node (see Figure 5 below).

NOTE: This could be achieved with one technician but it would involve a lot of back and forth runs to the headend and the node.

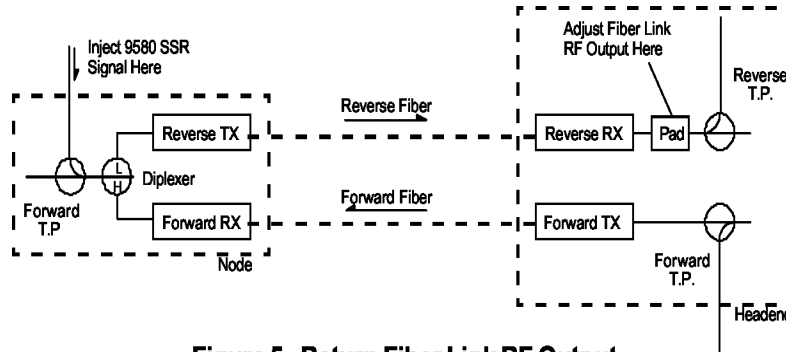


Figure 5. Return Fiber Link RF Output.

To adjust the fiber path properly, consult the manufacturer's data sheets to determine how to set gain in the fiber receiver. You may also want to measure the optical power at the receiver input to make sure that it meets recommended levels prior to starting alignment. Inject the 9581 SST R4 test signals at the system design level into the node test point.

If your fiber receiver uses pads to set the gain, use the **GAIN/TILT** display on the SST to determine the correct pad to use in the fiber receiver. The SST will show a maximum gain error of ± 9.9 dB. If the initial gain is off by more than ± 9.9 dB, it may be necessary to zero in on the correct pad by changing the pad value until the reading is on scale. Then you can select a pad accordingly to set the gain as close as possible to 0.0 dB. When finished, switch to the **SWEEP** display to observe the sweep response.

If your fiber receiver has a screwdriver adjustment, use the **SWEEP** display and adjust the receiver's gain so that the sweep response is positioned on the center graticule of the **SWEEP** display.

HOT TIP

Be sure to select the proper Unit ID on the SST SWEEP display. Remember, this also effects which Field Piece's data is displayed in the GAIN/TILT display.

NOTE: Some fiber nodes have a gain adjustment in the node, which must be set first (i.e. Texscan's FLAMETHROWER™). Consult the manufacturer for the proper procedure for making this adjustment prior to setting the fiber receiver's gain.

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If you cannot get a display, try the following:

- Be sure that the SSR is receiving the data carrier as evidenced by the cursor pointing to **CAR DET** (carrier detect) on the SSR's display.
- Make sure that the injection test point you are using is pointing the correct way (i.e. TOWARD the headend).
- Make sure that the fiber transmitter and receiver are functioning properly and that the proper light level is reaching the headend.
- Increase or decrease the Field Piece's TX level in 5 dB increments until the response is on screen. Note the difference that is necessary for the output setting and adjust the gain accordingly. Now you can return your Field Piece to the proper output level and fine tune the gain setting.

Adjusting Amplifiers

When an amplifier is balanced properly, its gain and tilt will virtually cancel the loss and tilt of everything in the upstream path between the amplifier and the next amplifier upstream (see Figure 6 below).

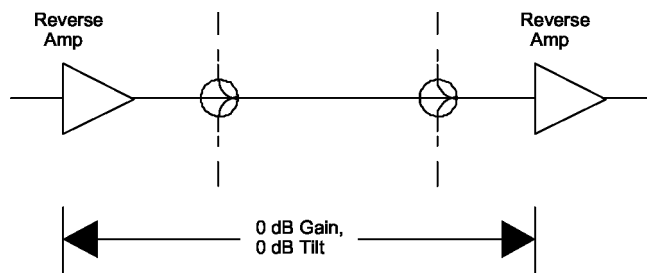


Figure 6. Balanced Amplifier.

With the node adjusted properly, proceed to the first amplifier from the node. Set your Field Piece's TX level to the proper injection level for the amplifier. Connect it to the amplifier's input test point(s).

REMINDER: Don't forget to allow for test point or coupling losses.

For amplifiers with fixed pads and equalizers, use the **GAIN/TILT** display. The 9581 SST R4 will show a maximum gain error of ± 9.9 dB. If the initial gain is off by more than ± 9.9 dB, it may be necessary to zero in on the correct pad by changing the pad value until the reading is on scale. Then you can install the equalizer to compensate for tilt. Once the tilt is corrected, fine tune the pad value to give an overall gain of 0.0 dB. Now, you can switch to the **SWEEP** display to observe the sweep response.

If your amplifier has screw driver gain and tilt adjustments, you need to use the **SWEEP** display and adjust the amplifier's gain controls so that the sweep response is positioned in the display. Adjust the amplifier's tilt for a flat response. Then you can fine tune the gain adjustment to position the sweep response on the center graticule of the display. You can switch to the **GAIN/TILT** display to confirm your settings numerically.

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If you do not get a display, try the following:

- Be sure that the field piece is receiving the data carrier as evidenced by the cursor pointing to **CAR DET** (carrier detect) on the field piece's display.
- Make sure that the injection test point you are using is pointing the correct way (i.e. TOWARD the headend).
- Increase or decrease the field piece's TX level in 5 dB increments until the response is on screen. Note the difference that is necessary for the output setting and adjust the gain accordingly. Now you can return your SSR to the proper output level and fine tune the gain setting.

Proceed to the next amplifier and repeat the process until ALL of your amplifiers are aligned. Make sure that you adjust the field piece's TX level if necessary when you are changing amplifier types.

Ingress

Ingress along the return path can cause serious disruptions to a subscriber's cable service. This makes regular monitoring of ingress an essential part of a sound return maintenance strategy. The 9581 SST R4 was designed to provide you with a simple solution to reverse monitoring.

When you are using the 9581 SST R4 to monitor ingress, there are configuration trade-offs that you need to consider. The most important of these concerns the number of return paths connected to a single input on the SST. Combining your returns may economize on your hardware but it can make it far more difficult to localize on the source of ingress.

If you equip your 9581 SST R4 with Test Point Managers, you will be able to monitor 8 or 16 independent return test points. This can reduce the need to combine returns.

If ingress control is a "must", as it is in the case of telephony or commercial data carrying, consider using more than one SST so that each return can be monitored separately.

You can also automate your ingress monitoring task by using **Viewer II**, the 9581 SST R4's Remote Monitoring Software, with a PC. When ingress problems do occur, you can:

- Determine along which return path the ingress is coming. If necessary, disconnect the combined returns one at a time until you locate the "bad" one.
- Read and record ingress levels at several frequencies.
- Go to the node (first amplifier in an all coax system) and read the ingress at the node's return input using an SLM.

CAUTION: Be careful to choose a test point that is looking downstream and NOT toward the headend (see Figure 7 below).

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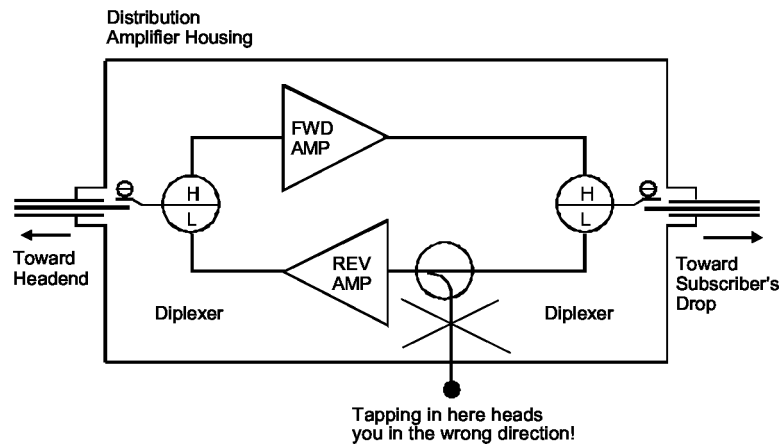


Figure 7. Incorrect Test Point Selection.

Compare this ingress to the levels you saw at the headend. If the levels are still about the same, divide the number of amplifiers in each leg in half and test at that point. Continue to divide the amplifier spans in half until you locate the amplifier farthest from the node that still has the ingress problem.

Once you have localized the ingress, you can troubleshoot the hardware and the drops of the target amplifier. When you think that you may have located the difficulty, connect the field piece to the system and verify that the problem is fixed by observing the ingress pattern.

Many ingress problems are transient in nature. For example, ingress from a CB radio will only be present when the radio is keyed on and the vehicle it is in is physically close to a leaky section of cable plant. These transient events will be on the order of 1 or 2 seconds.

Other events in the subscriber's house, such as electrical transients from turning on motors in appliances, can be much shorter in duration. The SST allows you to capture these transient events by combining the use of FAST Mode and PEAK HOLD Mode.

In FAST Mode, the SST analyzes each node at rates up to 80 Hz. This enables you to capture transients in the millisecond range.

When PEAK HOLD Mode is enabled, these transients stay in the screen until you reset the system.

REMINDER: The sweeping procedure is not supported when the SST is in FAST Mode.

An effective strategy for you may be to balance a node with the SST in NORMAL Mode. After you have obtained a balance, let the SST analyze the node in FAST Mode for a long duration (i.e. 24 hours) to verify that transient ingress is not a problem.

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