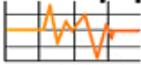




RSVP²

**Test Equipment
Depot**

1-800-517-8431

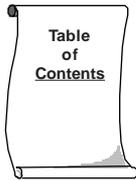
99 Washington Street
Melrose, MA 02176
Fax 781-665-0780
TestEquipmentDepot.com

OPERATION MANUAL



TRILITHIC

The Best Thing on Cable



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GENERAL INFORMATION



Introduction

Congratulations! You now own Trilithic's reverse path tester for installers, the **Guardian RSVP²**. This return path testing instrument is designed specifically for the needs of the CATV installer.

Many return path problems begin in the subscriber's home. Errors in installation, defective cabling, improper installation or loose hardware can disrupt the return path communications or allow ingress to enter your system. The best way to avoid such problems is to test the quality of the path during every installation.

The RSVP² works with Trilithic's **9580 SST Sweep and Ingress Analyzer** mounted in the headend of your system. At the push of a button, the RSVP²:

- Verifies that the output level from the set top converter can be set at the proper level to reach the headend at your desired nominal level.
- Verifies that the carrier to (ingress + noise) ratio of return signals is within limits that you can set.
- Makes it easy to select the right value of pad if the installer is using Reverse Step Attenuators (RFPs) to balance forward and reverse attenuation levels.
- Has the capability to generate a return path signal that can be used to verify the shielding integrity of a drop. This feature can be used in conjunction with a ferrite loop antenna and reverse leakage receiver to insure that a house will be ingress free after the installation.
- Enables you to troubleshoot an installation using the RSVP² in SOURCE Mode in combination with a Signal Level Meter.

The RSVP² presents the results as a PASS or FAIL. You can also call up the actual measurement data in order to troubleshoot the installation.

Your RSVP² enables you to determine, at the time of installation, if the subscriber is able to access any of your system's premium services which rely on the return path.

Up to one hundred Guardian RSVP²s and five 9580 SSR field sweep units can operate together with a single 9580 SST.

Features: RSVP² Versus RSVP

The RSVP² differs from the earlier RSVP in several ways:

- The RSVP² is equipped with a LOCK OUT Mode which prevents an operator from changing the level or frequency settings in SOURCE Mode. This removes the possibility of accidentally setting the RSVP²'s output to an occupied frequency, or to a level large enough to compress the upstream laser at the node.
- The range over which the RSVP² can test return levels has been expanded by 10dB. This allows the Installer to test the return "launch level" through a wider range of tap and splitter values without using an external pad. The RSVP² has sufficient range to be connected directly to taps as low as 7dB; even in systems operating at reduced return levels or to services with as much as 35dB isolation, operating at normal levels.

The RSVP² can be used interchangeably anywhere that the extra operating range is not required.



RSVP²

WALKTHROUGH



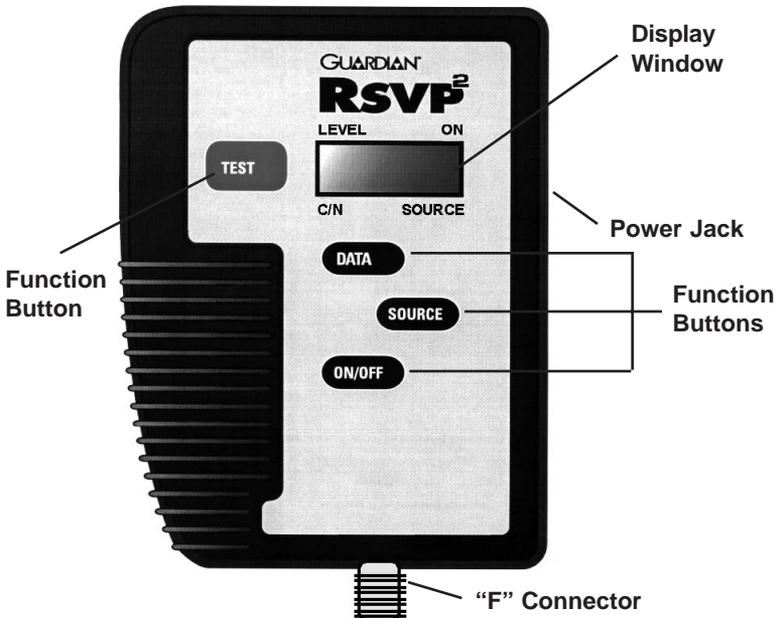
Introduction

Now that you have your RSVP² out of its box, take a few moments to look it over so that you become familiar with its controls.

NOTE: Display representations throughout this manual are samples only. Display numbers (i.e. channels and frequencies) in your actual Meter may be different.

Identify Components

The Guardian RSVP²'s function buttons and display window are on the front panel. An "F" connector is located on the bottom and a power and communications jack is on the side of the unit.



TRILITHIC

Guardian RSVP² Operating Manual
RSVP² Walkthrough – 5

- **ON/OFF** button – powers unit ON and OFF.
- **TEST** button – begins the headend level test.
- **DATA** button – displays numeric results of headend level test.
- **SOURCE** button – activates source mode.
- **Display Window** – 4-digit LED readout and 4 function annunciator LED dots in the corners.
- **Power Jack** – serves the dual function of input for charging the unit and programming connector.
- **“F” Connector** – connects unit to cable inside the subscriber’s house or to the ground block outside the residence.

Basic Operation Overview

The Guardian RSVP² contains a signal source which can be programmed to output at any one of eight test frequencies assigned by the 9580 SST. The frequency coverage matches the 9580 SST’s 5 – 42 MHz range.

In TEST Mode, the RSVP² verifies operation of the return path by stepping its output level automatically from 20 – 55 dBmV. The output is increased in small steps until the desired return signal level is reached at the headend or until a user-set maximum output is reached. The RSVP² will determine the optimum injection level which can vary from installation to installation. Since the RSVP² always starts at a low level; it eliminates the possibility of overloading the system by injecting an unnecessarily strong signal.

In SOURCE Mode, the output is set via the setup operation to a constant value from 20 – 55 dBmV. This mode is useful for troubleshooting the wiring of a subscriber’s home with the aid of a signal level meter or, more importantly, in order to test the house wiring for leakage in the return path.



RSVP² OPERATION



Introduction

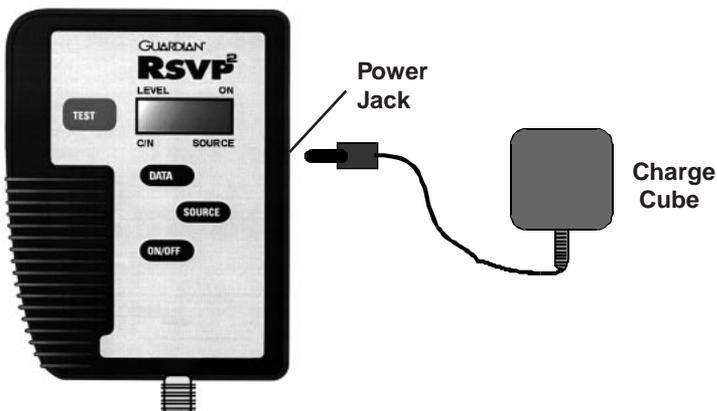
The operation of the Guardian RSVP² is straightforward. A simple push of the **ON/OFF** button turns the unit ON. Before you even go into the field you should set up the unit for the test. Then, in the field, all you need to do is connect the RSVP² to the subscriber's cable via the "F" connector on the bottom of the unit. Press the **TEST** button and the unit will give you a reading of either PASS or FAIL. That's all there is to it.

HOT TIP

For a quick reference to the various RSVP² operations, refer to MESSAGE DISPLAYS on page 24 so that you can see a listing of the RSVP²'s various display messages.

Charge Unit

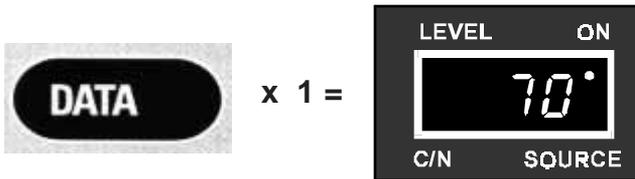
When you first take your RSVP² out of it's box, we recommend that you charge it overnight or for 14 hours before using. Simply plug the connector of the charge cube into the power jack on the side of the RSVP².



Then plug the charge cube into an outlet. The display will show “chr9” and the power indicator annunciator will be on.



To check the status or progress of the charging, remove the charge cube from the RSVP². Press the **ON/OFF** button to turn the unit ON. Then press the **DATA** button once and the RSVP² will indicate how much charge it has. For example, in the display below, you can see that unit is charged to 70%.



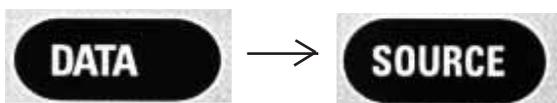
To exit the BATTERY CHECK Mode, press the **DATA** button again.

NOTE: The RSVP² has a 5 minute automatic shutdown feature to save battery life. After 5 minutes of inactivity (except in SOURCE Mode), the unit will power itself off automatically. When the battery gets low, the **ON** LED begins to *flash*.

Set Up RSVP²

You can set up the RSVP² with the function buttons or by using Trilithic's **ConfigR** software which is designed specifically for the RSVP². If you are using ConfigR, refer to the operation manual which came with the software.

To enter the SETUP Mode from the RSVP², press the **ON/OFF** button to turn the unit ON. Then, press the **DATA** button, at which point the battery life percentage is displayed, and then the **SOURCE** button.



The first display shows the RSVP²'s battery Voltage. The Voltage comes from two NiCad cells in series and will range from 2.7 Volts for a fully charged battery to 2.0 Volts for a very weak battery.

Press **DATA** again to get into the SETUP Mode so that you can set the unit's parameters. Use the **TEST** button as an UP arrow to increment values and the **SOURCE** button as a DOWN arrow to decrement values.



UP



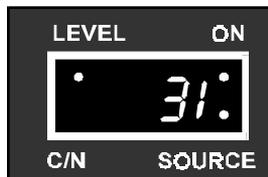
DOWN

The settings in the SETUP Mode appear in the following order:

- Source Level
- Source Frequency
- Source Mode
- Test Carrier Select
- Maximum Test Output
- Link Frequency
- C/N Bandwidth
- C/N Threshold

SOURCE LEVEL SETUP

When you first enter the SETUP Mode, the SOURCE and LEVEL annunciators light. Your RSVP² displays the calibrated output level (in dBmV) that it will generate when it is in SOURCE Mode. This mode is very useful for troubleshooting the wiring in the subscriber's home or, more importantly, checking the home wiring for leakage. For most leakage applications, a setting between +35dBmV and +40dBmV is sufficient.



Adjust the level in 1 dB steps by pressing either the **TEST** button (increment) or the **SOURCE** button (decrement).

NOTE: If SOURCE Mode changes are LOCKED OUT, you will be unable to change these values. If you wish to change the settings, you will need to use ConfigR to unlock the SOURCE Mode so that you can make the desired changes.

Once the desired output level is set, press the **DATA** button. The unit advances to the SOURCE FREQUENCY setup.

SOURCE FREQUENCY SETUP

When you enter the SOURCE FREQUENCY SETUP Mode, the SOURCE annunciator lights and the LEDs show the frequency (in MHz) of the signal which will be generated when in SOURCE Mode. If you will be using the RSVP² to test for leakage, this frequency must match your reverse leakage receiver's frequency.



Adjust the Source frequency by pressing the **TEST** button (increment) or the **SOURCE** button (decrement).

NOTE: If SOURCE Mode changes are LOCKED OUT, you will be unable to change these values. If you wish to change the settings, you will need to use ConfigR to unlock the SOURCE Mode so that you can make the desired changes.

Once the desired Source frequency is set, press the **DATA** button. The unit advances to the SOURCE MODE setup.

SOURCE MODE SETUP

Use the SOURCE MODE SETUP Mode to determine whether the source mode output signal will be Continuous Wave (CW), Tagged, or Pulsed. When set to CW, the output signal is unmodulated. In Pulsed Mode, the output signal is ON/OFF modulated. In Tagged Mode, the output signal is AM modulated at 20 Hz for detection by a Trilithic **Super** style leakage detector. (For more information, see the SOURCE MODE section on page 19). Use the **SOURCE** or **TEST** buttons to cycle between the three choices.

NOTE: If SOURCE Mode changes are LOCKED OUT, you will be unable to change these values.



Once the desired Source Mode is set, press the **DATA** button. The unit advances to the TEST CARRIER selection.

REMINDER: If you wish to enable the LOCK OUT Mode to prevent setting SOURCE Mode's parameter's manually, you **MUST** use ConfigR to do so.

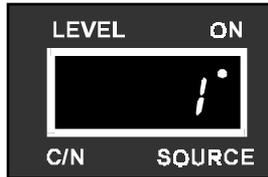
TEST CARRIER SELECT

When communicating with 9580 SST Headend Unit, the RSVP² uses the ID allocated to the unit "F" SSR Field Unit. The TEST CARRIER SELECT Mode enables you to select which of the 8 unit "F" test frequencies you wish to use for the reverse level test.

NOTE: The SST-9580 supports multiple SSR Field Units by the Unit ID assignment. Each unit transmits sweep carriers which are approximately 90kHz apart. The unit "A" frequencies are set at the SST. Then each field unit determines where it should transmit by offsetting from unit "A" frequencies. For example, with frequency 1 set to 5.0 MHz at the SST, unit "A" SSR transmits at 5.00 MHz, unit "B" at 5.09... and unit "F" at 5.47 MHz. Since the RSVP² always acts like a unit "F" SSR, its frequencies will be offset from those entered at the SST by 470kHz.

CAUTION: When an SSR Field unit is designated unit "F", it will continuously tie up the SST so that the RSVP² will not be able to communicate with the headend and will display the "buSY" indicator. Therefore, make sure that you are not using any SSRs with the unit "F" designation at the same time you are using your RSVP².

When you set up the RX Frequencies on your SST-9580, you will want to select one or more of the eight test frequencies to be close to the active return frequencies which will be used by your system. In this case, set the RSVP² to the frequency (1 – 8) which is closest to the active frequency. Refer to your SST-9580 manual for more information regarding exact placement of these frequencies.



Use the **TEST** and **SOURCE** buttons to cycle through the test selection choices 1 - 8.

NOTE: If you will be using a large number of RSVP²s on a single SST, set some of the units above and some them below your active frequency.

Once you have selected the desired test carrier, press the **DATA** button. The unit advances to the MAXIMUM OUTPUT setup.

MAXIMUM TEST OUTPUT SETUP

The MAXIMUM TEST OUTPUT SETUP Mode shows the maximum level (in dBmV) which the RSVP² will output in TEST Mode.



The maximum test output level is usually set a few dB below the maximum output available from the set top converter.

NOTE: The maximum limit is + 55 dBmV.

Once you have selected the desired test level, press the **DATA** button. The unit advances to the LINK FREQUENCY setup.

LINK FREQUENCY SETUP

When you enter the LINK FREQUENCY SETUP Mode, the display shows the data carrier frequency in MHz.

This frequency must match the output frequency at the SST with which the RSVP² will communicate.



Use the **SOURCE** or **TEST** buttons to adjust the Link Frequency in 50 kHz steps.

Once the desired Link Frequency is set, press the **DATA** button. The unit advances to the C/N BANDWIDTH setup.

C/N BANDWIDTH SETUP

When you enter the C/N BANDWIDTH SETUP Mode, the display shows the C/N Bandwidth in MHz. The C/N Bandwidth should be set to match the bandwidth of the carrier output from the cable modem or set top converter.



Use the **SOURCE** or **TEST** buttons to adjust the C/N Bandwidth from 0.1 MHz to 6.0 MHz in 100 kHz steps.

NOTE: The measurement bandwidth for the noise calculation is 375 kHz. Noise calculations for other bandwidths are made using the following formula:

$$10 \times \log \left(\frac{BW_{\text{user}}}{BW_{\text{RSVP}}} \right)$$

Once the desired C/N Bandwidth is set, press the **DATA** button. The unit advances to the C/N THRESHOLD setup.

C/N THRESHOLD

When you enter the C/N THRESHOLD setup, the unit shows the C/N threshold in dB.

The C/N threshold should be set to the recommended minimum carrier-to-noise ratio given by the modem's manufacturer. (You may want to add a few dB of margin to the manufacturer's recommended minimum level.)



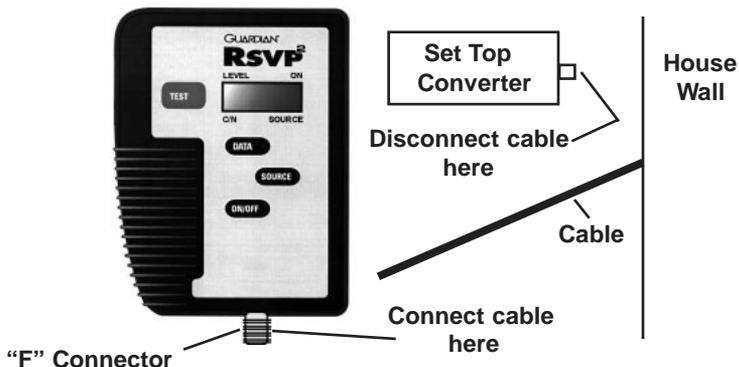
Once you have set the C/N threshold, press the **DATA** button. The RSVP² returns to the REST STATE (the mode it was in when you first turned the unit ON).

NOTE: If you turn the unit OFF during any of the setup menu procedures, any changes you have made to the current set up parameter will be aborted.

TEST Mode

When the RSVP² is in the TEST Mode, the **SOURCE** and **SETUP** functions are disabled.

Before running your test, disconnect the cable from the subscriber's set top converter and connect it to the "F" connector on the bottom of your RSVP².



To enter TEST Mode, press the **TEST** button when the unit is in the ON ready state.

NOTE: When you press the **ON/OFF** button, the unit powers up into the ON ready state. The ON LED is lit, indicating that the unit is ON.

When you press the **TEST** button, “tEst” appears briefly in the display.

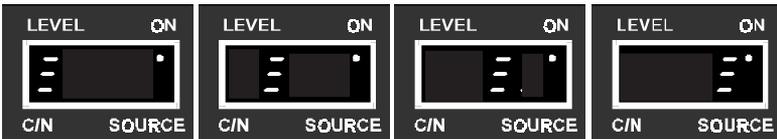


The TEST Mode enables the RSVP² to observe sweep information generated by the SST Headend unit.

The RSVP² first tunes to the link frequency which was programmed in the SETUP Mode (see LINK FREQUENCY SETUP page 13) and then receives data transmitted by the SST.

If reliable data is being received, the RSVP² observes the data for the test frequency assigned in the SETUP Menu. If the data indicates that no other test signals are present, the RSVP² begins testing.

The RSVP² displays a moving bar which indicates that the test is progressing.



During the test, the RSVP² transmits its test carrier in synchronization with the SST in the headend. It starts with a low level (20dBmV) and then increments in steps of up to 8dBmV until:

- it is received at precisely the proper level by the SST
- or
- the RSVP has reached the maximum test output entered in the SETUP Menu.

If the level is correct the RSVP² computes C/N and compares it to the C/N threshold. If C/N is greater than the threshold, the RSVP² displays "PASS". That's all there is to it!



If you wish to see the actual test data, press the **DATA** button to advance the display to show the output level (in dBmV) required to reach nominal at the headend. You can then press **DATA** again to show the C/N ratio at the headend using the noise bandwidth which was entered in the SETUP Mode. Press **DATA** a third time to return the RSVP² to the ON ready state.

NOTE: To return to the ON ready state and terminate the reverse path test at any time from the TEST Menu, press the **TEST** button.

If the output level required to reach the headend at nominal level is greater than the maximum limit programmed into the RSVP² or less than +20dBmV (refer to *MAXIMUM TEST OUTPUT SETUP* page 12), the RSVP² displays "FAIL" and will illuminate the **LEVEL** annunciator.



If the output level is okay, the RSVP² then checks the C/N threshold. If the C/N threshold is not met, the RSVP² displays "FAIL" and illuminates the **C/N** annunciator.



If you wish to see the level and the C/N, press the **DATA** button after a failed test, the RSVP² will provide the same information as it does after a passed test. This information can be used to troubleshoot. For example, you might try a different technique to find a problem if the reverse path was 2dB low as opposed to 20dB low. For detailed information regarding several of these techniques, refer to *TROUBLESHOOTING THE DROP* on page 21.

NOTE: C/N is not computed if the test fails due to level since this data is meaningless without having a known carrier level reference.

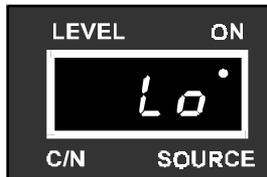
Once you are done with the testing process, press **TEST** to return the RSVP² to the base ON state or the **ON/OFF** button to turn the unit OFF.

PROBLEM INDICATORS

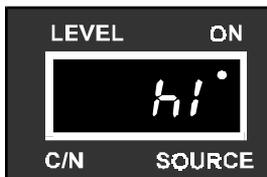
Some factors may affect the RSVP² TEST Mode. This section describes some of the more common occurrences.

Data Carrier Levels Out of Bounds

If the unit finds that the data carrier level is too low for reliable data reception (below -15dBmV) while it is tuned to the link frequency, it will display "Lo".



If the carrier level is too high for reliable data reception (above $+20\text{dBmV}$), it will display "hi".



If the data is corrupted (e.g. by interference), it will display “no” and “dAtA” *blinking* in sequence.



In these events, you will need to troubleshoot the forward carrier problems before you can continue with the reverse path test.

Busy Signal

If an active SSR with the unit “F” designation is communicating with the SST, it will continuously tie up the frequency slot needed by the RSVP².

In this case, the RSVP² will not be able to sense a “clear” channel and will display “bUSy” until the channel becomes available or you press the **TEST** button to exit TEST Mode.

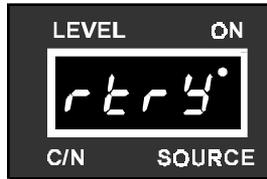


Therefore, make sure that you are not using any SSRs with the unit “F” designation when you are also using the RSVP².

Retry Command

RSVP²s are normally kept from interfering with each other by the “listen for clear channel before transmitting” feature. Since the typical test duration is only 3 – 4 seconds, it is unusual for there to be a conflict between one or more RSVP² units. However, if two tests are initiated within the same 0.75 second interval, this feature may not be effective. In this case, a collision detection algorithm determines that multiple RSVP²s collided.

The units will display a “rtry” message to prompt you to repeat the test.



Source Mode

The RSVP² enables you to detect leakage in an installation by using SOURCE Mode in conjunction with a signal level meter.

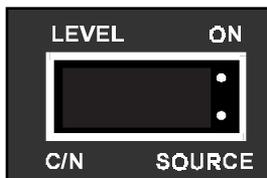
When the RSVP² is in the SOURCE Mode, it generates a special reverse frequency test signal which you can inject into the house cabling. By using Trilithic's **IsoMeter** with the RSVP², you can then track down any points in the cabling where the test signal is radiating from the subscriber's drop. See the Operation Manual for the **IsoMeter** for more information on locating leaks.

Before you use the SOURCE Mode, you need to program the desired source frequency, output level and mode via the SETUP Mode (refer to page 9).

To enter SOURCE Mode, turn the unit ON. Then, press the **SOURCE** button.



The RSVP² displays “Src?”. Press the **SOURCE** button a second time and the unit enters SOURCE Mode.



NOTE: If you press a different button, the RSVP² will go to that function instead. For example, you press **SOURCE**. Then, instead of pressing **SOURCE** a second time, you press the **TEST** button. The unit starts TEST Mode.

REMINDER: If you wish to lock out the ability to change SOURCE Mode's parameters manually, you must set up the function in ConfigR.

The SOURCE Mode is stored in the RSVP²'s memory during setup. It has three available modes:

- CW (Continuous wave)
- Pulsed
- Tagged

When the unit is in CW Mode, the output signal is unmodulated.

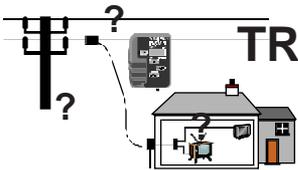
In PULSED Mode, the output signal is ON/OFF modulated; alternating between 250 Hz and 500 Hz every 0.75 seconds. This produces a recognizable audio pattern when detected with a Signal Level Meter. Additionally, the ON/OFF modulation provides a power savings of about 20% as compared to CW or TAGGED Modes.

NOTE: You can use the CW and PULSED Modes to locate faults in the wiring.

When the RSVP² is in TAGGED Mode, the output signal is AM modulated at 20 Hz for detection by a Trilithic **Super** style leakage detector.

Once you have checked the subscriber's cabling for reverse frequency leaks, you can exit the SOURCE Mode by pressing the **SOURCE** button again. This returns you to the ready ON state.

5 TROUBLESHOOTING THE DROP

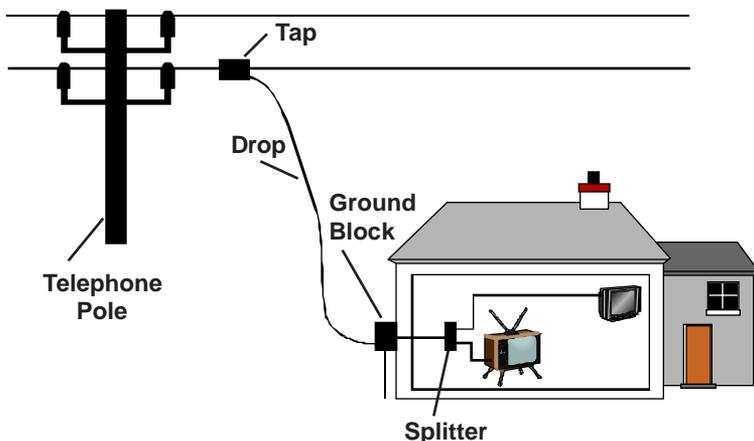


Introduction

The RSVP² enables you to perform several techniques for trouble-shooting your cable system at the subscriber's location via both TEST Mode and SOURCE Mode. Both methods of troubleshooting help you to “divide and conquer” the problem. That is, you can check each section of cable in order to pinpoint the trouble.

Troubleshooting in TEST Mode

In the event that the RSVP² indicates a “FAIL” when it is in TEST Mode, you can keep the RSVP² in that mode and try to find the source of the problem by testing at the splitter, the ground block and the tap to see if the RSVP² can communicate with the headend.



First, you can connect the RSVP² to the tap and run the TEST. If the level and C/N are good, that means that the RSVP and the headend are communicating so the problem is likely in the subscriber's cabling. If the level and C/N are bad, the problem is probably somewhere else in the system and not with this installation.

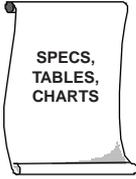
Next, connect the RSVP² at the ground block and run the TEST Mode again. If the level and C/N are bad, that probably means that the drop cable is bad. You can check it by replacing it with another one and seeing if that “cures” the problem. If the C/N level is good at the ground block, that means that the problem is somewhere along the cabling in the subscriber’s house.

You will need to check each section of cable in the home by isolating and checking each one. Start at the splitter and just work along each section until you have isolated the problem.

Troubleshooting in SOURCE Mode

If you discover that the RSVP² does communicate with the headend from the tap, which indicates that the trouble is somewhere in the subscriber’s cabling, you may be able to locate it by checking the continuity of the system. By using the RSVP² in SOURCE Mode in conjunction with a signal level meter, you can check for continuity of the house system. Just as you did in TEST Mode, you will need to follow a strategy of “divide and conquer” by dividing the installation into pieces so that you can isolate the faulty element.

To use the RSVP² with a signal level meter to check the installation, put the unit into SOURCE Mode (selecting CW or PULSE). Set the RSVP² to a known level (such as +40) and plug it into the ground block. Go to each outlet and use the SLM to measure the level. If the signal loss is greater than the anticipated cable and splitter loss, you have located the discontinuity. If not, you will need to continue the process along each section of cable and connections.



ADDITIONAL INFORMATION



Specifications

The specifications for your Guardian RSVP² are as follows:

RF Output Frequency	5 – 42MHz
RF Output Level	+20 to +55dBmV (1dB steps)
RF Output Level Accuracy	±1.5dB; -18 to +55°C
Spectral Purity	All unwanted 5 – 42MHz: -40dBc 54 – 750 MHz: -45dBc
Receive Frequencies	50 – 53.75MHz 73.75 – 75.75MHz 80.5 – 92MHz (w/hdwr mod.)
Receive Sensitivity	- 15 to +20dBmV
Display	4 digit LED with 4 dot annunciators.

Message Displays

The following list shows the various messages and the displays of the RSVP².

Display	Message
BUSY	The RSVP ² attempted to perform a return path test and the channel was occupied. This is usually due to an SSR-9580 set up as a unit "F" which is operating at the same time.
CHRG	The RSVP ² detected a charge cube inserted into its external port.
CONT	Continuous Wave (CW) source mode signal.
(NO) DATA	NO DATA appear together and indicate that the RSVP ² found signal power at the Link Frequency which was specified in the SETUP Menu but is unable to decode data. This could indicate possible problems in the data link as well as interference at that frequency.
FAIL	This is displayed if the return path test fails due to either bad carrier to noise ratio or inability to reach the headend at the proper level.
HI	This indicates that the data carrier signal is too HIGH from the SST.
LO	This indicates that the data carrier is too LOW or not present from the SST.
NA	This indicates the RSVP ² is unable to get within 16dBmV of the Nominal Level.
OFF	This indicates that the SST-9580 is offline. It could be in ZOOM or FAST Mode.
PASS	This is displayed if the return path test passed for both carrier-to-noise ratio and carrier level.
PORT	The RSVP ² detected an RS-232 data cable inserted into its external port or a charge cube that wasn't inserted into the wall socket.

PULS	Pulsed (ON/OFF) source mode signal.
RTRY	This indicates that a collision may have occurred during the return path test and that the operator should repeat the test.
TAG	A 20 Hz AM modulated source mode signal for use with the Guardian IsoMeter .
TEST	A return path test was initiated. Three solid bars will move from left to right across the display as the test is conducted and while the RSVP ² communicates with the SST-9580.
SRC?	Displayed after the FIRST press of the SOURCE button. To enter SOURCE Mode, press the button a second time.