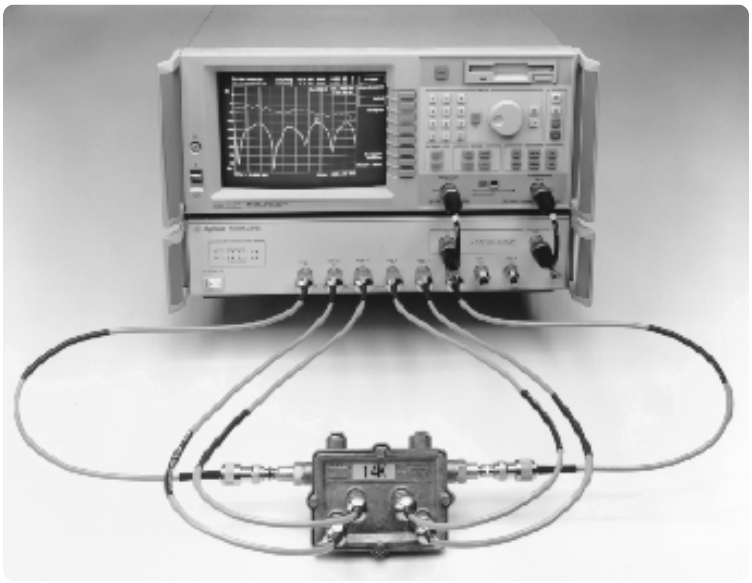
Agilent 87050A/B, 87075A/B
Custom Multiport Test Sets

Product Overview



- **Improve test throughput for multiport devices**
- **50 ohm and 75 ohm versions**
- **Solid-state or mechanical switching**

Easily test multiport devices

Many of today's wireless communications, broadband, and cable-television components have three or more ports. These components require multiple connections for complete characterization with a two-port network analyzer. You can simplify high-volume tuning and testing of these devices by using a multiport test set between the device under test (DUT) and your network analyzer. These test sets are useful for a variety of multiport components such as:

- duplexers
- directional couplers
- circulators
- transmitter combiners
- receiver multicouplers
- distribution amplifiers
- cable-television multitaps and splitters

Improve throughput

Multiport test sets dramatically reduce overall tune and test times because the DUT only needs to be connected once to test multiple signal paths. Minimizing the number of connections also reduces operator fatigue and lowers the chance of connection to the wrong port. In addition, fewer connections means less wear on cables, connectors, fixtures and DUTs.

Wide range of measurement solutions

Agilent Technologies multiport test sets can be customized to your measurement application with any number of ports, and a variety of connector types and switching arrangements. In their simplest configuration, they serve as switch matrices between your multiport device and any two-port network analyzer with an internal or external test set. Alternatively, they can be configured with internal couplers or bridges as well as switches. This allows consolidation of both the signal-splitting and switching functions into one test set for optimal performance. These test sets are available in both 50 ohm and 75 ohm versions, with electromechanical or solid-state switching. Mechanical switches offer the lowest loss and best isolation, while solid-state switching provides fast and highly repeatable measurements. All unused test ports are terminated internally to reduce unwanted reflections.

Agilent Technologies

Innovating the HP Way

Wireless Communications Applications

Fast duplexer tune and test

Duplexers are three-port filters used to separate transmitted and received signals that share a common antenna. When using a duplexer test set with only one internal switch as shown in Figure 1A, you can simultaneously measure the insertion loss from transmitter to antenna ports and antenna to receiver ports. This allows both sides of the duplexer to be tuned and tested at the same time. Path interactions can also easily be observed on the instrument display as shown in Figure 2, eliminating the retest and rework that occurs when only one path at a time is measured. A duplexer test set also allows you to measure return loss of all three ports of the DUT. When limit-line displays are used with multiport test sets, pass-fail testing of return loss, insertion loss, bandwidth, and stopband rejection is fast and repeatable. If you need to test the isolation between the transmit and receive ports of the duplexer, a full three-port test set is required for single-connection measurements.

Full three-port testing

Transmission measurements between all three ports of a device can be accomplished by adding two more switches to a duplexer test set, as shown in Figure 1B. These measurements are often required for three-port components such as directional couplers, and circulators. A full three-port test set also allows you to measure isolation between the transmitter and receiver ports of a duplexer.

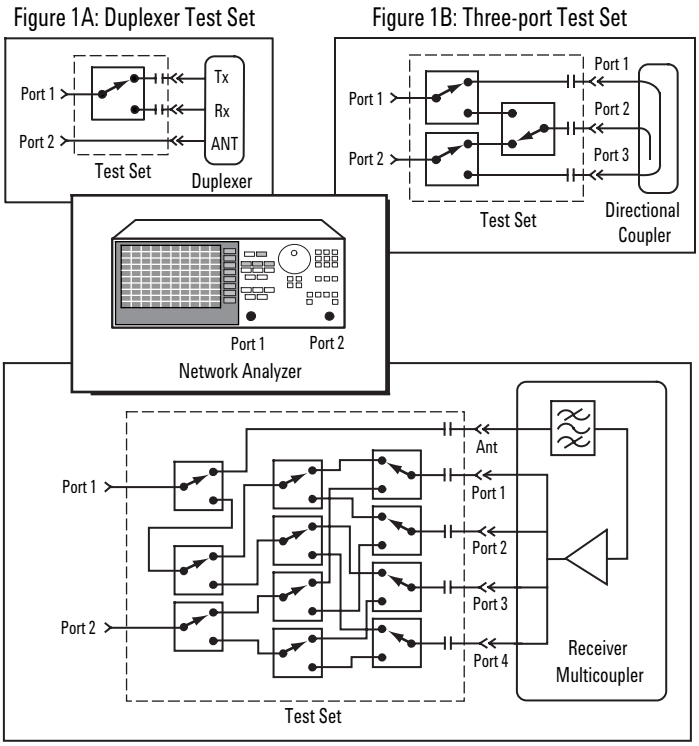


Figure 1C: Multicoupler Test Set

Figure 1. Multiport test sets can be designed to test a variety of multiport devices from simple passives to more complicated devices with active components.

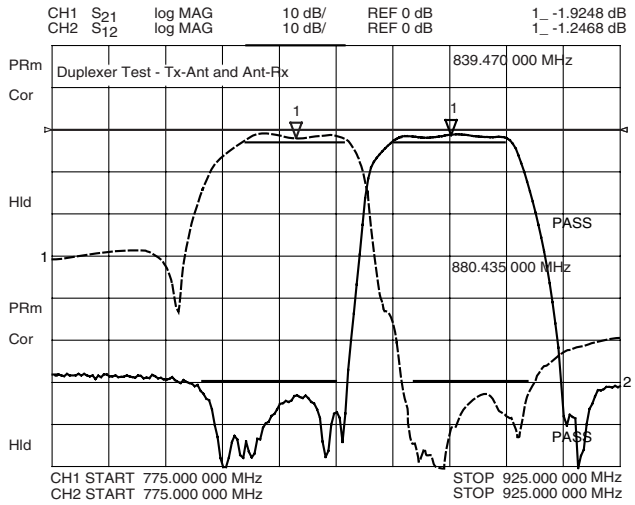


Figure 2. Simultaneous sweeps of the Tx-Ant and Ant-Rx paths improve duplexer tune and test times.

Receiver multicouplers

Multicouplers are used in the receiving system of base stations to amplify the RF signal coming from the antenna and to divide it into multiple outputs. A multiport test set and network analyzer combination (see Figure 1C) allows a single connection for swept-frequency linear transmission and reflection measurements, and for nonlinear measurements such as 1 dB gain compression.

If other nonlinear measurements are needed, the test set can incorporate additional ports to allow connection of other instruments to the DUT. For example, additional sources and a spectrum analyzer could be switched in place of the network analyzer to perform third-order intermodulation measurements (see Figure 3). Another example would be the inclusion of a broadband-noise source for measuring noise figure. In this manner, a multiport test set can greatly improve measurement throughput by providing a true single-connection, multiple-measurement test system.

Broadband and Cable-TV Applications

Distribution amplifiers

Distribution amplifiers have multiple outputs and are used to boost television signals to make up for cable and multitap losses. You can use a multiport test set to measure forward and reverse frequency response and gain, as well as return loss on all the ports. If you need to test isolation between all the amplifier outputs, a full N-port test set is required.

N-port testing of multitaps and splitters

In cable-television distribution systems, multitaps are used to draw off a portion of the feeder-line signal for a subscriber. Splitters are used in drop systems to provide television signals to multiple outlets. These components typically divide the input signal between two and eight outputs. A full N-port test set used in conjunction with a quick-connect fixture allows fast and easy high-volume testing of tap or splitter frequency response, return loss, and isolation between all the ports.

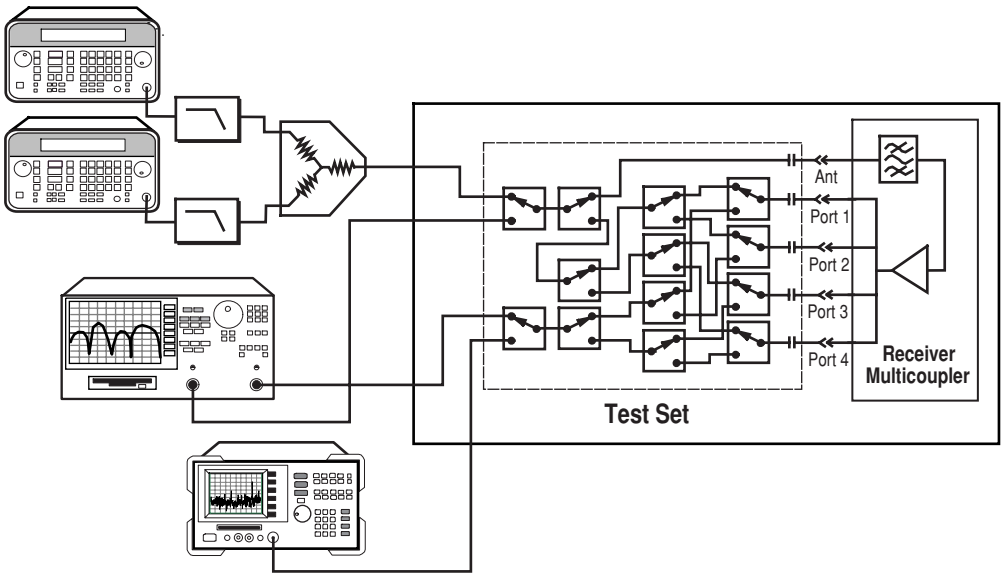


Figure 3. An example of a single-connection multiple-measurement test system for receiver multicouplers

Test Process Improvements

Increase throughput per instrument

A multiport test set is valuable in manufacturing applications where the time required for device connection, handling, and/or configuration is significantly greater than the test time. In these situations, a dual-port test set allows two operators or two part-handlers to share a single network analyzer, which increases the throughput per network analyzer. For example, two duplexers can be connected to the same test set, as shown in Figure 4, allowing testing on one device while an operator connects or disconnects cables on the other device.

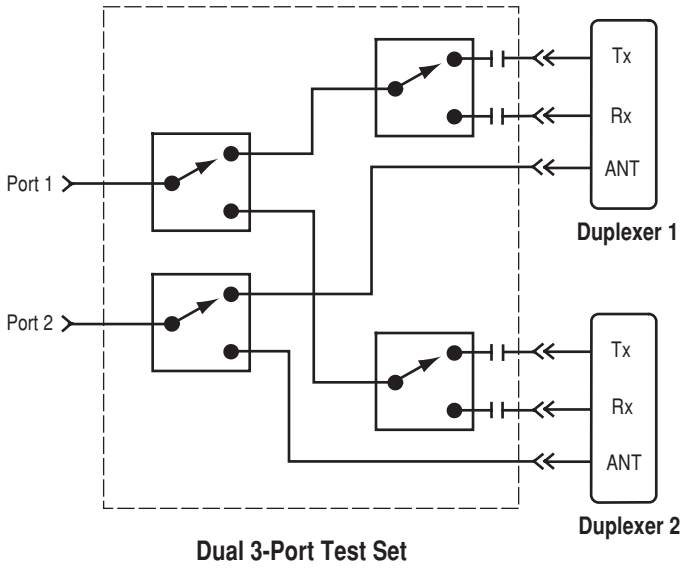


Figure 4. Share one network analyzer between two DUTs by using a dual-port test set.

Make forward and reverse measurements with T/R network analyzers

Network analyzers such as the 8753ET or the 8712ET family that are based on an internal transmission/reflection (T/R) test set are cost-effective instruments that provide the right level of accuracy for many applications. However, T/R test sets are limited to forward measurements only. By adding an external reversing test set, as shown in Figure 5, you get both forward and reverse transmission and reflection measurements with a single connection. This eliminates the need to disconnect the DUT, turn it around, and reconnect it to the network analyzer. This approach is less accurate, but more economical than using an S-parameter network analyzer.

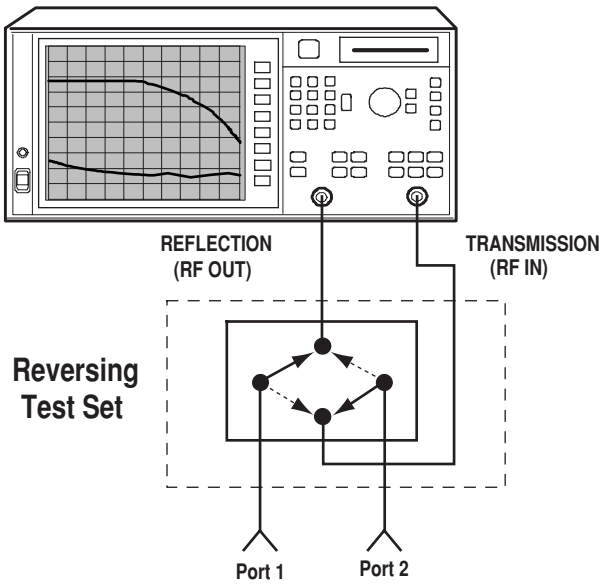


Figure 5. A reversing test set allows a T/R-based network analyzer to make measurements in both the forward and reverse directions.

Remove Cable and Fixture Losses

You can reduce undesirable effects of cables and fixtures on measurement accuracy by calibrating the signal paths for transmission and reflection measurements. Combining a multiport test set with transmission/reflection or S-parameter network analyzer allows for error-corrected measurements on any two ports at a time.

Calibration data for each signal path can be saved in the instrument's internal memory, allowing for easy retrieval when a measurement is made using that path.

System Configuration

Compatibility

Agilent multiport test sets are compatible with the 8712 and 8753 families of RF network analyzers, and with the 85046, and 85047 series of standard external test sets.

Test set control

The test sets can be controlled from the front panel of the network analyzer or by a computer for automated measurements.

Ordering Information

Price, delivery and relevant specifications for multiport test sets are quoted on a custom-basis by Agilent's special handling department. The 87050 series of model numbers cover all 50 ohm test sets, while 75 ohm test sets are covered under the 87075 series. "A" models use electromechanical switches and "B" models provide solid-state switching.

Agilent Technologies also has several existing test-set specials with product numbers that are tied to specific network analyzer or test-set model numbers.

Please consult your local Agilent sales engineer for help in determining the best solution for your multiport test application.

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