



TYPE 7415-3 R.F. COUPLER AND HIGH PASS FILTER



There are those who disagree with the r.f. conducted susceptibility test setup of Method CS02 of MIL-STD-462. Homemade rigs have sprouted to comply with the coupling capacitor requirement, each with its own disadvantage. Our little **Type 7415-3 R.F. Coupler** is the answer. A neat little box with BNC connectors and a pair of binding posts, it is rated at 270 V.A.C. at the LINE terminals and 20 volts PMS into the GEN port. Looks good and does a fine job.

The test setup diagram of the specification will result in power frequency voltages at the voltmeter terminals. If an untuned voltmeter is used, it is difficult to measure a one volt r.f. signal in the presence of the a.c. line voltage. It is not practical to use an EMI meter for this, unless the **Type 7415-3** is placed in series with it. Otherwise, the power frequency voltage can damage the input circuit of the EMI meter.

The **Type 7415-3** contains a high pass filter in series with the detector circuit to eliminate power frequency voltages and allow r.f. signals from 50 KHz to 400 MHz to pass to the EMI meter as required. The high pass filter consists of three stages of an R-C network using series capacitors and shunt resistors. Using resistors instead of inductors enables the unit to cover a wide frequency range, with a 40 dB insertion loss in the pass band. This makes it necessary to multiply the detected voltage by a factor of 100 for the measurement of the injected voltage.

The series capacitor in the **Type 7415-3** consists of several styles of capacitors in parallel. Mica, ceramic and wrapped capacitors exhibit different characteristics versus frequency and the combination eliminates the need to change the

value of the capacitor as frequency changes from 50 KHz to 400 MHz.

A tuned voltmeter such as an EMI meter is recommended as the detector for further isolation of unwanted frequencies, such as harmonics of the signal generator. If the generator waveform is "clean." An untuned meter can be used if it is terminated in 50 ohms and preserves a 50 ohm coaxial circuit throughout the frequency range.

The reactance of the built-in series capacitor from the generator to the power line terminal presents very little loss at 50 KHz. At 400 Hz its reactance is about 362 ohms. Therefore, it represents a path by which 400 Hz power voltages can be fed back to damage the output circuit of the signal generator.

To avoid this, one suggestion is to use an isolating transformer at the output of a low impedance signal source. Figure 1 shows the use of the **Model 6552-1A Audio Amplifier** and the **Type 7033-1 Impedance Matching Transformer**. This arrangement can be used for injection levels up to 20 volts r.m.s. from 50 KHz to 500 KHz with satisfactory results.

At frequencies above 500 KHz, we recommend that a 50 ohm signal generator be used as indicated in Figure 2 except that a small capacitor must be connected in series between the generator and the **Type 7415-3 R.F. Coupler**.

Solar **Type 7525-1** is 0.1 microfarad, fitted with BNC connectors.

The reactance of this series capacitor reduces the power frequency voltage to a safe limit so that the output circuit of the generator will not be damaged. At 500 KHz, the r.f. signal is not greatly attenuated.

At frequencies above 20 or 30 MHz, the connections from the banana jacks to the test sample will create discontinuities that cannot be removed from the setup. It is recommended that the wires from the banana jacks be less than one inch long to minimize VSWR anomalies.

DIMENSIONS

2.0" (51 mm) X 2.5" (63.5 mm) plus mounting flanges x 1.25" (31.25 mm) high.

TYPE 9132-1 R.F. COUPLER AND HIGH PASS FILTER

This unit is a high voltage version of the **Type 7415-3**. It is electrically similar, but in a larger case and with a rating of 500 VAC at the LINE terminals and 20 volts rms into the GEN. Port.

Dimensions: 2.88" (73 mm) x 3.06" (78 mm) plus mounting flanges x 2.0" (51 mm) high.

TYPE 9407-1 A THREE PHASE R.F. COUPLING NETWORK

MIL-STD-462 notice 5, method CS02 requires simultaneous coupling of the r.f. susceptibility



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TYPE 7415-3 R.F. COUPLER AND HIGH PASS FILTER (continued)

signal into all three wires of a three phase power system. The **Type 9407-1** network provides this capability in a neat little box. The unit includes a high pass filter for the elimination of power frequency voltages. Rating of 270 VAC at the LINE terminals and 20 volts rms into the GEN. Port.

Dimensions: 2.88" (73 mm) x 3.06" (78 mm) plus mounting flanges x 2.0" (51 mm) high.

Test Method CS02 requires injection of the signal from a 50 ohm generator capable of seven volts output. This is equivalent to a one watt source. There are two conditions which could inhibit the injection of one volt r.f. into the Equipment Under Test:

- 1) If the r.f. impedance looking into the power terminals of the Equipment Under Test is considerably lower than 50 ohms at the injection frequency, the injected signal will be shunted and it may not be possible to achieve the required injection voltage with a one watt source.
- 2) If the connections to the power source are heavily by-passed as in the case of screen room testing, this will also shunt the injection voltage so that the required level cannot be reached. This can be prevented by inserting an inductor in the power line as indicated in Figure 1 and Figure 2. The secondary of the **Solar Type 6220-1A Transformer** can be used as this inductor.

Therefore, the test setup must be carefully monitored to keep the signal source from exceeding the required seven volts. If the Equipment Under Test does not malfunction with a seven volt signal from a 50 ohm source,

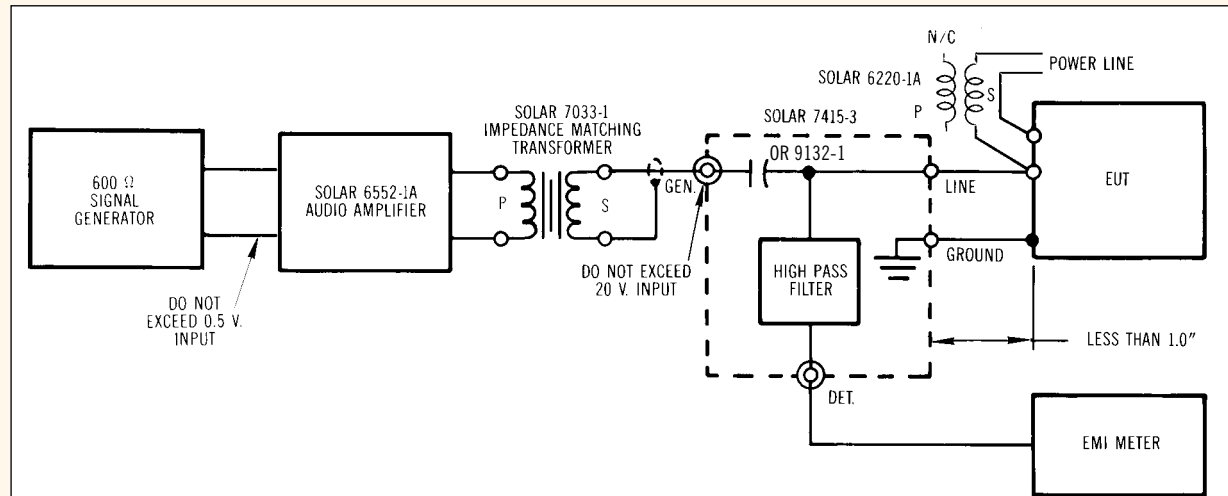


FIG. 1 TEST SETUP FOR FREQUENCIES FROM 50 KHz - 500 KHz

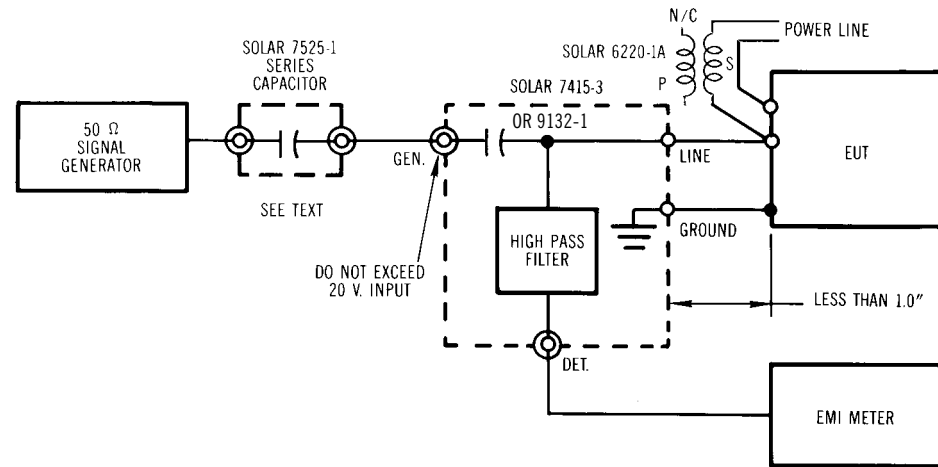


FIG. 2 TEST SETUP FOR FREQUENCIES FROM 500 KHz - 400 MHz

it is deemed to have passed the test. Even though the signal input port of the **Type 7415-3** is rated at 20 volts, it is not

recommended that the power of the signal source be increased beyond one watt in an effort to reach a one volt injection level.

