Section II. DL-1 DUMMY LOAD

E-5. Description

The DL-1 (fig. E-3) is a 100-watt resistor load for use with any 100-watt transmitter or transceiver such as the 32S-1, 32S-3, or KWM-2. Use of this dummy load allows alignment or adjustment of transmitter circuits without sustained radiation of an interfering carrier. The DL-1 consists of four 50-ohm Globar resistors in a series-parallel arrangement to provide a 50-ohm resistive load. The DL-1 may be switched locally or remotely to select antenna or dummy load for connection to transmitter output. Jacks are provided for 6.3-volt ac, 50- to 60-Hz relay coil supply, remote switching, and transmitter and antenna connections. The unit can be set on a table or desk or mounted on any chassis or rack frame. As an alternate mounting, the four rubber feet can be removed and the unit mounted on a flat plate with four 6-32 screws.

E-6. Installation

No installation procedures are required if the unit is to be used on the operating desk or table. If the DL-1 is to be mounted on a rack frame or chassis, remove the four rubber feet, and mount with four 6-32 screws. Refer to figure E-4. Ground the case of the unit with the screw shown. Make connections to transmitter (fig. E-5), station control unit, and antenna as shown in figure E-6.

E-7. Operation.

If the DL-1 is to be operated by remote switching, set the REMOTE SWITCH-DUMMY LOAD control to REMOTE SWITCH. If the DL-1 is to be operated within reach using local control, the REMOTE SWITCH-DUMMY LOAD control and the relay will transfer the transmitter output from the antenna to the resistive load.

E-8. Circuit Description. (fig. E-6)

When S1, or the remote switch in parallel with it, is open, the relay coil is not energized, and the normally closed contacts 4 and 5 of relay K1 connect the transmitter output to the antenna. When S1 or the remote switch is closed, the coil of K1 is energized from the 6.3-volt ac heater voltage source of the transmitter, and the antenna is connected to ground through contacts 2 and 3. With K1 energized, the transmitter output is connected through contacts 5 and 6 to the resistive load. This load consists of four Globar 50-ohm resistors in a series-parallel arrangement. The DL-1 will dissipate considerably more power than 100 watts without burning out the resistors, but it is recommended that higher loading be confined to very short periods of time.

CAUTION

If the DL-1 is used as a dummy load for higher power transmitters such as the 30S-1, switch the transmitter to TUNE, and do not apply power to the DL-1 for more than 30 seconds at a time.

E-9. Specifications.

Relay coil input voltage	6.3 volts ac, 50 to 60 Hz.
Rf power dissipation rating	100 watts continuous. 1000 watts for 30 sec on. 5 min off.
Weight	2 Pounds, 14 ounces.
Dimensions	3-1/8 x 5-11/16 x 7-5/16 inches.

Section III. ELECTRICAL DUMMY LOAD DA-412A/U

E-10. General Description

a. Dummy Load DA-412A/U, figure E-11, is a portable, general purpose 50-ohm coaxial transmission line termination. This self-contained unit is suitable for use on either ship or shore installations operating in a horizontal plane without the need for outside power sources or additional equipment. This termination load resistor provides an accurate, dependable, and practically nonreflective dummy antenna for adjustment, standby, and testing of transmitters under nonradiating conditions from dc to 3000 MHz.

b. The DA-412A/U is rectangular in shape with transverse cooling fins spaced evenly along its entire length. The front and rear fins are made extra thick and bent outward 90° to form mounting flanges. These flanges act as supports for free standing use or mounting brackets for optional fixed installation. For this purpose, mounting holes are provided. (See Section II.)

c. The rf input connector, located on the front face of the unit, is a female N similar to UG-58A/U, but is a special "quick-change" design permitting rapid and easy interchange with other AN type connectors. Also provided is a UG-57B/U male to male (N type) adapter to permit cables with jacks such as UG-20E/U to be attached to the dummy load. The adapter is fastened to the front of the radiator by means of a spring holder.

E-11. Reference Data

Frequency range	Dc to 3000 MHz.
Vswr	1.2:1 dc - 3000 MHz.
Input impedance	50 ohms nominal.
Load power rating	600 watts continuous 900 watts for a 15-min interval (see text).
Ambient temperature range	−54°C to +64°C.

Weight	19.6 pounds.
Operating position	Horizontal only.

a. Equipment Supplied.

Qty per equip	Name
1	Dummy Load, Electrical
1	Adapter
2	Instruction Book

b. Equipment Required but not Supplied.

Qty	Name
1	Resistance Bridge

E-13. Site Selection

Locate Dummy Load DA-412A/U to provide at least 6 inches of free space around and above the unit. Place to permit the shortest possible cable length between the dummy load and the transmitting equipment.

E-14. Installation Requirements

Operate the DA-412A/U in a horizontal position only (handle on top). The dummy load may be used free-standing on any convenient flat surface. If it is desired to fasten the load by its mounting brackets, use ¼" machine screws and nuts or #12 wood screws. The four 5/16" holes in the mounting brackets are on a base rectangle of 14-5/8 by 4-1/8 inches.

E-15. Functional Operation

a. Dummy Load DA-412A/U consists essentially of a metallic film-type resistor immersed in a dielectric coolant. The resistor, individually selected for its accuracy, is enclosed in a special tapered housing which provides a linear reduction in surge impedance directly proportional to the distance along the resistor. This produces the uniform, practically reflectionless line termination over the stated frequencies of the DA-412A/U.

b. The dielectric coolant is chosen for its desirable dielectric properties and thermal characteristics. Cooling of the dummy load is accomplished by natural fluid and air convention. The dielectric coolant carries the electrically generated heat from the resistor to the walls of the cylindrical cooling tank. This tank is encased in a set of radiating fins constructed of heavy gage metal, which are firmly pressed on the cylinder. The heat from the dielectric oil is transferred to the surrounding air by the radiating fins.

c. Expansion of the coolant with the rise in temperature is allowed for by means of a synthetic rubber diaphragm (not visible) in the rear dome of the load. The breather holes in the dome are visible.

E-12. Equipment Supplied and Equipment Required but Not Supplied with DA-412A / U

Not applicable.

Nomenclature	Dimensions
DA-412A/U	16-13/16"lg x 5-15/16"w x 8-1/2"h
UG-57B/U	1-5/8" lg x 13/16" dia

Nomenclature	Required use
ZM-4/U	Troubleshooting procedures

E-16. Operating Procedure

Connect the DA-412A/U to the transmitting equipment under test with 50-ohm coaxial cable such as RG-212/U or equal and a plug (UG-18E/U or equal) which mates with the rf input connector of the load. A Cable-type jack such as UG-20E/U which will mate with the UG-57B/U adapter may also be employed for the connection. After the transmitter has been connected to the dummy load, proceed according to the instructions pertaining to the specific equipment involved.

CAUTION

DO NOT operate this equipment over the rated 600 watts continuously or over 900 watts for more than 15-minute intervals. Allow unit to cool to ambient temperature (approximately +25°C) before reusing at the 900-watt power level. Operate in a horizontal position only (handle on top).

E-17. Operator's Maintenance

a. The principal maintenance required by the operator will be the cleaning of the rf input connector and adapter. If the connector or adapter should become dirty or grimy, clean carefully with trichlorethylene on a cotton swab stick. Keep the radiator of the DA-412A/U wiped clean and free of dust.

WARNING

Prolonged breathing of dry cleaning solvents is dangerous. Make certain adequate ventilation is provided.

b. If any portions of the radiator are corroded or rusted, clean the area carefully with a fine sandpaper and touch up with gray enamel.

E-18. Periodic Inspection

With the rugged and simple construction of the DA-412A/U dummy load, periodic inspection will be necessary at only about 6-month intervals. The inspection procedure should include the items listed below:

a. Oil Leakage. Make sure there is no indication of coolant oil seepage around the radiator tank, and particularly at the front and back around the underside of the clamping band. See paragraph E-19, Troubleshooting Chart, if leakage is observed. Check tightness of the clamping band screw and the fasteners around the front cylinder.

b. Dc Resistance. Accurate measurement of the dc resistance between the inner and outer conductors of the rf input connector will provide a good check on the condition of the load resistor. For this measurement, use a test set with an accuracy of 1 percent at 50 ohms such as ZM-4/U. The resistance measured should be a nominal 50 ohms, ± 2 ohms.

c. Inspect the DA-412A/U for completeness and general condition of the equipment.

E-19. Troubleshooting

a. Use of Troubleshooting Chart. The troubleshooting chart in *b* below lists the symptoms of the commonly encountered troubles, causes, and suggested corrective measures. The repairman should use this chart as a guide in analyzing symptoms.

b. Troubleshooting Chart.

Symptoms	*Causes*	*Remedy*
Leakage of coolant oil around clamping bands or radiator housing.	Clamping bands not tight	Tighten slightly with a screwdriver
	Faulty O-ring (front)	Replace per paragraph E-24.
	Faulty diaphragm (rear)	Replace per paragraph E-23.
Excessive overheating of the radiator.	Transmitter power too high	Reduce transmitter power.
	Coolant oil level too low	Add more coolant oil to the radiator per paragraph E-23.
High or low dc resistance values per paragraph E-18.	Faulty rf section assy	Replace per paragraph E-24.
	Faulty rf input connector	Replace per paragraph E-22.
	Loose rf input connector	Tighten with a screwdriver.
	Faulty rf section assy	Replace per paragraph E-24.
	Coolant oil level too low	Add more coolant oil to the radiator per paragraph E-23.

E-20. Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, reduce downtime, and to assure that the equipment is serviceable. The periodic inspection checks (para E-18) will serve as a good guide to preventive maintenance.

E-21. Tools Required for Repairs and Replacement

There are no special techniques required for the repair or replacement of components in Dummy Load DA-412A/U. A screwdriver will be the only tool needed. Paragraphs E-22 and E-23 below outline component removal and replacement.

E-22. Rf Input Connector Removal and Replacement

a. Connector removal.

(1) Remove the four #8-32 x 5/16" roundhead machine screws (fig. D-11) from the corners of the rf connector.

(2) Pull the connector straight out of its socket.

b. Connector Replacement.

(1) Make sure that the projecting center contact pin on the connector is carefully engaged and properly aligned with the mating socket of the load resistor input.

(2) Replace the four #8-32 x 5/16" roundhead machine screws in the corners of the rf connector.

E-23. Diaphragm and Coolant Oil Removal and Replacement

To replace or examine the coolant oil, the diaphragm must first be removed. Removal and replacement of the diaphragm and coolant oil are listed in *a* and *b* below:

a. Removal of Diaphragm and Coolant Oil.

(1) Stand the dummy load vertically, with the band end (diaphragm end) up.

(2) Loosen the clamp screw (fig. D-11) until the clamping band is released.

(3) Remove the diaphragm cover and lift the diaphragm from the back end of the radiator tank.

(4) The coolant oil level should be about 1 inch below the top of the radiator cylinder. If the oil appears to be contaminated, replace.

b. Replacement of Diaphragm and Coolant Oil.

(1) Fill the dummy load with the proper coolant oil (Appendix D) to 1 inch below the top of the radiator cylinder.

(2) Replace the diaphragm on the back end of the radiator tank and replace the diaphragm cover.

(3) Replace the clamping band and tighten the clamping screw.

E-24. Rf Section Assembly Removal and Replacement

If it should become necessary to remove the load resistor assembly, first remove the diaphragm (para E-23) and coolant oil and then proceed with the steps in *a* below.

a. Rf Section Assembly Removal.

(1) Pour the coolant oil into a CLEAN container.

(2) Set the dummy load on its mounting feet.

(3) Loosen and remove the four 8-32 x 5/16" oval head machine screws (fig. D-11) from around the cylinder (rf input connector end).

(4) With one hand, hold the load assembly by the rf input connector; using the other hand, push the assembly (from inside the radiator housing) out of the radiator.

(5) Inspect the O-ring seal (fig. D-11) which is located just inside the mounting flange of the resistor assembly. *Do not* reuse the O-ring if there is any sign of deterioration.

b. Rf Section Assembly Replacement.

(1) If O-ring seal is good or has been replaced, place the load assembly back in the radiator.

(2) Replace and tighten the four 8-32 x 5/16" oval head machine screws from around the cylinder.

(3) Replace the coolant oil (para E-23).

Section IV. ELECTRICAL DUMMY LOAD DA-75/U

E-25. Coverage of Instruction

The function, description, and operation of the Bird Model 82A Termaline Coaxial Resistor (dummy load) are covered in this appendix. In addition, procedures are provided for operating and maintaining the dummy load. These procedures include operating instructions, maintenance instructions, and instructions for testing and recalibrating the voltage standing wave ratio (vswr) characteristic for the dummy load.

E-26. Function of Dummy Load

The dummy load is a carbon film coaxial load resistor that simulates the properties of normal loads in applications involving electrical energy from the dc to the microwave range. The dummy load may be substituted for an antenna to permit tuning radiofrequency generating equipment during maintenance and routine tests, at the same time minimizing the production of radio interference.

E-27. Additional Function

The dummy load, used with a suitable indicating device, may be substituted for any normal circuit loading element in order to measure the power output of any electrical power source.

E-28. Description of Dummy Load (fig. D-12)

The dummy load is rated for a maximum power dissipation of 500 watts. The instrument may be operated at full rated power over a temperature range of −60° to +45°C without adverse effects. The dummy load is useful for frequencies in the range from direct current to 2500 MHz and has an input impedance of 51.5 ohms ± 5%. The voltage standing wave ratio (vswr) of the dummy load is 1.1 for frequencies up to 1000 MHz and less than 1.25 for frequencies from 1000 MHz to 2500 MHz. The instrument is cooled by a liquid coolant and an air convection system that removes heat radiated by external fins. The official nomenclature for the instrument is Dummy Load, Electrical DA-75A/U. The common name, dummy load, is used throughout this appendix.

E-29. Physical Description.

The dummy load is a portable instrument housed in a box-like frame having external cooling fins. Brackets for mounting the instrument are attached at each end. The resistor assembly protrudes from the housing at one end of the instrument, making the input coaxial connector and oil filler plug easily accessible. Accessories supplied with the dummy load are Cord CP-17, an RG-17/U cable and Cord CP-19, and an RG-19/U cable. Both are 5-foot coaxial cables with a wattmeter connector on one end. Technical data supplied with each individual dummy load includes a factory prepared frequency versus vswr chart and the precise dc resistance value of the load stamped on the dummy load housing.

E-30. Operating Methods

Operating procedures to be performed in the course of normal use of the dummy load are detailed in this section. Three basic operating methods are detailed here including procedures for using the instrument as a dummy load with rf transmitters as a dummy antenna, to measure transmission line losses, and to measure power losses produced by insertion devices.

NOTE

The dummy load has no operating controls and requires no preliminary adjustment prior to using.

E-31. Procedure for Using Dummy Load with Rf Transmitters

The procedure outlined below should be followed when using the instrument as a dummy load when working with transmitters.

CAUTION

There should be at least 6 inches of clearance from surrounding obstructions to allow unrestricted transfer of heat from the dummy load to the surrounding air. This requirement is necessary where consistently high rf power values are involved to prevent early coaxial resistor failure.

a. Shut down rf power source under test and disconnect transmission line from antenna.