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NAVSHIPS 0969-209-3010

TECHNICAL MANUAL

for

ELECTRICAL DUMMY

LOAD, DA-412A/U

**DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND**

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Publication: 11 April 1967

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Section 1
General Information



Figure 1-1. Dummy Load Electrical, DA-412A/U

SECTION 1 GENERAL DESCRIPTION

1-1. SCOPE

This instruction manual covers the description, theory, operation, and maintenance of Dummy Load, Electrical DA-412A/U. Extracts from this publication may be made to facilitate the preparation of other Department of Defense publications.

1-2. GENERAL DESCRIPTION

Dummy Load DA-412A/U, Figure 1-1, 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 non-reflective Dummy Antenna for adjustment, standby, and testing of transmitters under non-radiating conditions from dc to 3000 MHz.

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 2, Installation.

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.

1-3. 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	-54°C to +64°C
Range	
Weight	19.6 pounds
Operating Position	Horizontal only

TABLE 1-1. EQUIPMENT SUPPLIED			
Qty per Equip.	Name	Nomenclature	Dimensions
1	Dummy Load, Electrical	DA-412A/U	16-13/16"lg x 5-15/16"w x 8-1/2"h
1	Adapter	UG-57B/U	1-5/8"lg x 13/16" dia
2	Instruction Book	-	-

TABLE 1-2. EQUIPMENT REQUIRED BUT NOT SUPPLIED			
Qty	Name	Nomenclature	Required Use
1	Resistance Bridge	ZM-4/U	Troubleshooting procedures

SECTION 2

INSTALLATION

2-1. SITE SELECTION

Locate Dummy Load DA-412A/U to provide at least six 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.

2-2. 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 1/4" 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.

SECTION 3

OPERATION

3-1. FUNCTIONAL OPERATION

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.

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 convection. 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 gauge metal, which are firmly pressed on the cylinder. The heat from the dielectric oil is transferred to the surrounding air by the radiating fins.

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.

3-2. 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).

3-3. OPERATOR'S MAINTENANCE

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 a dry cleaning solvent such as trichlorethylene on a cotton swab stick. Keep the radiator of the DA-412A/U wiped clean and free of dust.

CAUTION

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

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

SECTION 4 TROUBLESHOOTING

4-1. PERIODIC INSPECTION

With the rugged and simple construction of the DA-412A/U Dummy Load, periodic inspection will be necessary at only about six 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 under side of the clamping band. See paragraph 4-2 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 one 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.

4-2. TROUBLESHOOTING CHART

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

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 5-2c
	Faulty diaphragm (rear)	Replace per paragraph 5-2b
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 5-2b
	Faulty RF Section Assy.	Replace per paragraph 5-2c
High or low dc resistance values per par. 4-1b.	Faulty RF input connector	Replace per paragraph 5-2a
	Loose RF input connector	Tighten with a screwdriver
	Faulty RF Section Assy.	Replace per paragraph 5-2c
	Coolant oil level too low	Add more coolant oil to the radiator per paragraph 5-2b

Section 5
Maintenance

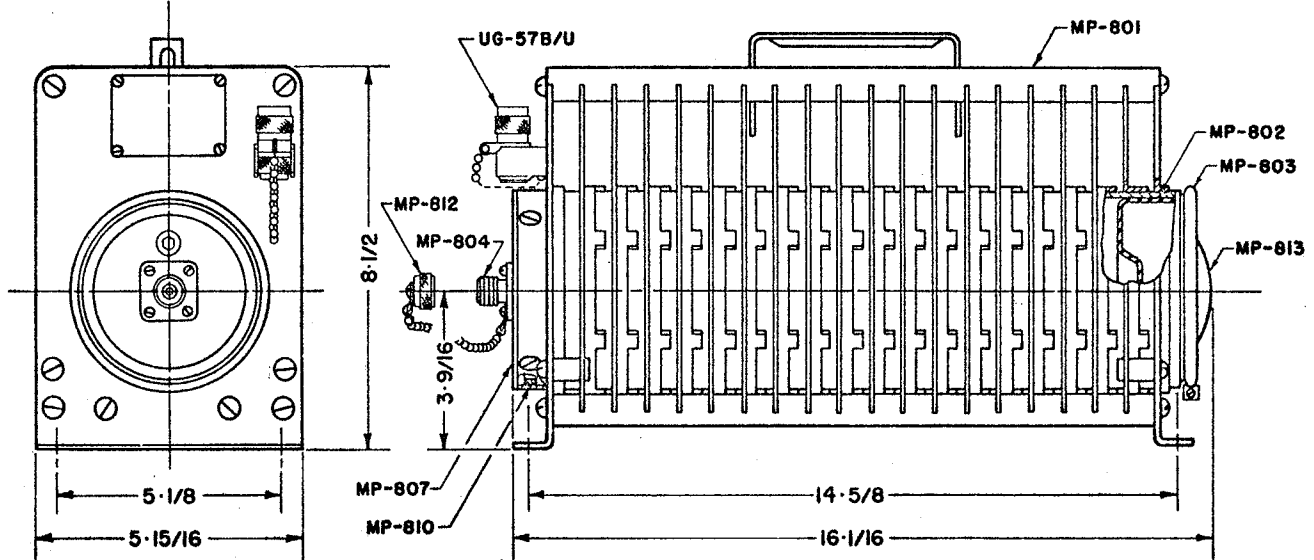


Figure 5-1. Parts Illustration, DA-412A/U

SECTION 5

MAINTENANCE

5-1. PREVENTIVE MAINTENANCE

Preventive Maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, reduce down time, and to assure that the equipment is serviceable. The Periodic Inspection checks of paragraph 4-1 will serve as a good guide to preventive maintenance.

5-2. REPAIRS

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. The paragraphs below outline component removal.

a. RF Input Connector Replacement. The input connector is a special Quick-Change design which permits easy interchange with the use of only a screwdriver. This process does not in any way interfere with the essential coaxial continuity of the load resistor RF input or the coolant oil seal. For replacement, proceed as follows:

- (1) Remove the four #8-32 x 5/16" round head machine screws from the corners of the RF connector.
- (2) Pull the connector straight out of its socket.
- (3) Reverse the above procedure to install new connector. Be 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.

b. Diaphragm and Coolant Oil. To replace or examine the coolant oil, the diaphragm must first be removed. Replacement of the diaphragm and coolant oil are listed in the steps below.

- (1) Stand the Dummy Load vertically, with the back end up.
- (2) Loosen the clamp screw 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 one inch below the top of the radiator cylinder. If the oil appears to be contaminated, replace.
- (5) To reassemble, reverse the above procedure.

c. RF Load Resistor Assembly. If it should become necessary to remove the load resistor assembly, first remove the diaphragm and coolant oil per paragraph b above, and proceed with the steps below.

- (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 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 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.
- (6) To replace the Assembly, reverse the above procedure, guiding the RF Section from inside the radiator.

TABLE 5-1. REPLACEMENT PARTS LIST

Symbol	Name and Description	Locating Function
MP-801	RADIATOR, Cooling: Rectangular shape 15-1/4"lg x 5-15/16"w x 8-1/2"h Transverse vertical fins brazed at 5/8" intervals to central tank. Al alloy, Gray enamel, Bird p/n 2440-001	Houses RF load resistor and dielectric coolant.
MP-807	RF SECTION ASSY: Tapered and slotted coaxial line with 50-ohm load resistor center conductor. 4-1/2" dia x 14-1/4"lg. Copper alloy. Bird p/n 8401-002	Housed in radiator MP-801 non-reflecting terminator for RF Power.
MP-805	COOLANT: Hi-temperature dielectric oil. Bird p/n 5-030	Contained in radiator MP-801.
MP-804	CONNECTOR, RF Input: Female Type N 47/64"lg with 1-1/4" square mounting flange. Four 3/16" mounting holes on 15/16" square. 5/8-24 thread. Brass nickel plate. Bird p/n 4240-062	Female N RF input connector on front face of unit.
MP-803	CLAMP BAND: 4-5/8" OD x 1/4" V-band with two clamping blocks (one threaded) and 10-32 x 1-1/2 Fil HMS. Stainless steel, gray nickel plate Bird p/n 2430-055	Holds diaphragm MP-802 to radiator MP-801.
MP-812	CAP, Dust: 3/4" dia x 9/16"lg overall 5/8-24 threads. Brass, Nickel plate. Bird p/n 5-297	Dust protector for MP-804.
MP-810	O-RING Seal: 3-3/4" x 1/8" nominal. Synthetic rubber. Bird p/n 5-453	Seal for coolant oil.
MP-802	DIAPHRAGM: 4-3/8" x 1-1/2" nominal. Synthetic rubber. Bird p/n 2430-015	Expansion bellows for oil MP-805.
MP-813	COVER, DIAPHRAGM, 4-7/16" x 25/32" nominal. Bird p/n 2430-035	Protective cover for diaphragm, MP-802