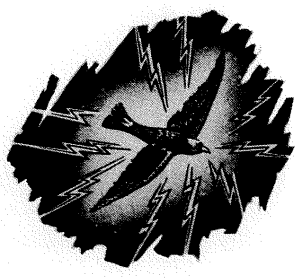
# INSTRUCTION MANUAL

# DUMMY LOAD
# Coaxial Load Resistor

## MODEL 8138

### General Dynamics Drawing No. A16071



BIRD ELECTRONIC CORP.
CLEVELAND, OHIO

LITHO IN U.S.A.

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Figure 1-1. Model 8138 Dummy Load

# SECTION I
# INTRODUCTION AND DESCRIPTION

1-1. SCOPE

1-2. This technical manual provides a description, installation and maintenance instructions, suggested uses, and other pertinent information for the Model 8138 Dummy Load, manufactured by Bird Electronic Corporation, Cleveland (Solon), Ohio, for General Dynamics, their drawing number A16071. (See figure 1-1.) This manual is intended for use by the technicians who are responsible for the operation and maintenance of this equipment.

1-3. PURPOSE

1-4. The Model 8138 dummy load is a resistor designed to match 50-ohm coaxial lines. It is used primarily for transmitter loading, conveniently dissipating transmitter power to replace an antenna during transmitter tuning. In this application it provides an almost purely resistive load, independent of frequency. It is also used for insertion loss measurement of connectors, cables, filters, and similar components. It is used as aerospace ground equipment in support of the F-111A/B.

1-5. LEADING PARTICULARS

1-6. Leading Particulars for the Model 8138 Dummy Load are given in Table I.

1-7. DESCRIPTION

1-8. The Model 8138 Dummy Load is a metallic film on Pyrex glass cylindrical resistor which is immersed in a dielectric coolant. The resistor and coolant are confined in a conical internal housing which provides proper characteristics for good coaxial line termination.

Table I. Leading Particulars

| | |
|---|---|
| Wattage Rating (Continuous) | 120 watts |
| Characteristic Impedance | 50 ohms |
| Type | Oil-cooled metallic film on glass |
| Rated Frequency Range | 225 - 400 megacycles/sec. |
| VSWR (Voltage Standing Wave Ratio) | 1.1:1 |
| Line Connectors | |
| Standard | Female "N" type |
| Optional | Any common RF type |
| Ambient Temperature Ranges | |
| Operating | 0 to +55°C (+32 to +131° F) |
| Non-Operating | -62 to +85°C (-80 to +185° F) |
| Altitude Range | |
| Operating | Sea Level to 6,000 ft |
| Non-Operating | Sea Level to 50,000 ft |
| Relative Humidity Range | |
| Operating (max.) | 95 percent at 0 to +55°C |
| Non-Operating (max.) | 100 percent at -62 to +85°C |
| Coolant | |
| Type | GE Type 10C Transil Dielectric Oil |
| Volume | 4/5 pt |
| Basic Overall Dimensions | |
| Width | 3-15/16 in. |
| Height (handle retracted) | 6-11/32 in. |
| Depth | 9-31/64 in. |
| Weight | 6 lbs |

Cooling fins are provided on the housing to help dissipate resistor heat to the surrounding atmosphere. A synthetic rubber bellows is mounted on the back to compensate for changes in oil volume caused by temperature changes of the coolant. A vented metal cap protects the bellows from damage.

**CAUTION**

Do not probe the vent hole of the diaphragm cap with a sharp-pointed instrument or the diaphragm may be damaged.

1-9. A screw-type coaxial cable connector is provided at the front of the dummy load to facilitate making line connections. The standard model is equipped with a Female "N" type connector. This mates with the Male "N" type plug of RG-8A/U and RG-9B/U type cables. If another type of connector is required, substution can be made by removing the four No. 8-32 round-head machine screws that secure the connector flange to the face of the load resistor. Pull straight out on the connector to remove it. A new connector can be installed by reversing the removal procedure. Alternate quick-change connectors are available from Bird Electronic Corporation.

1-10. The load rests on four rubber bumper feet. These feet can be removed to provide threaded holes for rigid mounting of the unit.

1-11. THEORY OF OPERATION

1-12. The dummy load consists of a metallic film on Pyrex glass cylindrical resistor mounted in an oil-filled housing. The resistor is terminated with a coaxial connector which extends from the housing. Within the housing the resistor is mounted in a conical internal housing which helps to provide the proper electrical characteristics for coaxial line termination.

1-13. When a load is applied to the resistor, the resistor converts the electrical input into heat which must be dissipated to prevent the parts from overheating. The heat generated in the resistor is absorbed by the dielectric oil which surrounds the resistor. The specific gravity of the heated oil is less than that of the cool oil, and the heated oil rises, causing convection currents to flow within the housing. The tapered end of the conical housing has three slots top and bottom, and the wide end has one round hole top and bottom to facilitate oil circulation through the conical housing and around the resistor. As the convection currents flow through the outside housing, the hot oil contacts the metallic housing, transferring the heat to the housing to cool the oil. The external housing has cooling fins which help dissipate the heat to the atmosphere. This system operates as long as the load continues to be dissipated into the resistor.

1-14. When the oil heats, it expands and requires a greater volume. This expansion is compensated for by a synthetic rubber diaphragm installed at the rear of the load, which accommodates the extra volume. The diaphragm is protected by a spun metal cover. The cover at the rear of the load and the resistor assembly at the front of the load are retained by circular V-clamps.

# SECTION II
# PREPARATION FOR USE

2-1. GENERAL

2-2. Model 8138 Dummy Load as received is ready for operation. It has been factory filled to the required coolant level with approximately 4/5 pint of GE Type 10C Transil Dielectric Oil at room temperature. Upon receipt, check for oil loss. A few drops of oil loss will not impair the efficiency of the equipment, but losses greater than 10 percent may impair the operation, since cooling characteristics are important to maintaining proper RF impedance and power rating.

2-3. INSTALLATION

2-4. The following considerations should be made when installing the Model 8138 Dummy Load.

a. The unit has been designed to be operated with the carrying handle positioned on the top. If the dummy load is laid on either side, the termination properties will not be impaired, but the load power capacity will be reduced by a considerable amount. This is due to the restricted circulation of coolant when it is tipped.

b. Mount the dummy load on any convenient flat surface. Make sure there is several inches of free air space around and above the unit to enable free air circulation necessary for cooling. The dummy load will rest on its four rubber feet.

c. If fixed mounting is desired, remove the four rubber bumper feet to provide mounting holes for mounting. Refer to figure 2-1 for mounting dimensions.

**CAUTION**

Do not operate the dummy load with the input connector pointing up. This will prevent coolant from reaching the input section of the dummy load and will greatly disturb the RF impedance.

d. If the particular installation requires a different type of coaxial connector, the connector is easily replaced with a different type by removing the four machine screws that secure the connector to the dummy load and pulling straight out to remove it. Install the correct connector by reversing the removal procedure. Connect the coaxial cable to the dummy load. Alternate connectors are available from the manufacturer.

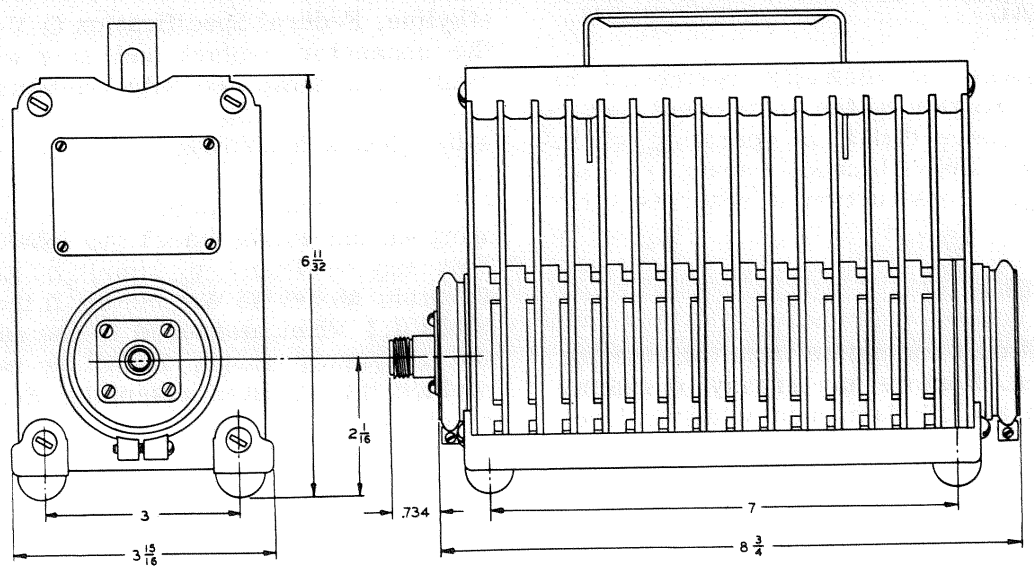



Figure 2-1. Mounting Dimensions

# SECTION III
# OPERATING INSTRUCTIONS

3-1. GENERAL

3-2. The dummy load has no switches, controls, or indicators which the operator must manipulate or watch. It must be used only in the manner for which it was intended. Make sure it is used only on 50-ohm RF lines within the power limits for which it is rated. Some of the most frequently used applications are given below.

**CAUTION**

When the dummy load is operated at close to its rated capacity for an extended period, the exterior housing will become hot enough to cause burns. Take care not to touch the metal under these conditions.

3-3. TRANSMITTER LOADING

3-4. In this application, it is necessary only to connect the load to the transmitter line. It will provide a standardized load resistance within its rating, dissipating the power in the form of heat.

3-5. LOSS MEASUREMENT AND VSWR MEASUREMENT OF INSERTION COMPONENTS

3-6. Loss measurements and VSWR measurements of insertion components such as connectors, filters, and cables can be made by comparing measurements with and without the component installed in a line terminated by the dummy load. Highly accurate measurements of this type can be made when a Bird Model 43 Thruline Wattmeter is used in conjunction with the dummy load.

# SECTION IV
# MAINTENANCE INSTRUCTIONS

4-1. GENERAL

4-2. Maintenance is normally restricted to cleaning the exterior of the instrument and to checking to assure that it is operating within the required VSWR limits. Because of its simple, rugged construction it requires little care.

4-3. CLEANING

4-4. Wipe all dust and grime from the exterior of the housing. Remove any greasy or gummy deposits with a cloth dampened with trichloroethyline, Federal Specification O-Y-236a. Clean the connector contact and face with a cotton swab stick dampened with trichloroethylene.

4-5. CHECKING VSWR

4-6. To determine if the dummy load is operating satisfactorily, check the VSWR of the unit. This can be done very simply by use of a Bird Thruline Model 43 Wattmeter. If the VSWR exceeds 1.1 when measured in the rated wattage and frequency range, it will be necessary to replace the resistor assembly. Refer to paragraph 6-4.

# SECTION V
# TROUBLESHOOTING

5-1. TROUBLESHOOTING CHART

5-2. Table II provides a list of the most probable troubles which might occur in the load. For each trouble there is a list of probable causes and remedies.

Table II. Troubleshooting Chart

| TROUBLE | PROBABLE CAUSE | REMEDY |
|---|---|---|
| VSWR EXCEEDS 1.1 | Poor connections. | Clean connectors. Tighten securely. |
| | Defective resistive element. | Replace resistive element. |
| UNIT LEAKS OIL | Defective O-ring. | Disassemble and replace O-ring. |
| | Punctured diaphragm. | Disassemble and replace diaphragm. |
| UNIT OVERHEATS | Excessive load. | Remove excessive load. |
| | Unit not in upright position. | Set in upright position with handle on top. |
| | Insufficient coolant. | Add dielectric oil to required level. |
| | Resistor assembly not properly oriented in housing. | Disassemble and position resistor assembly so that coolant slots are at top and bottom. |

# SECTION VI
# REPAIR INSTRUCTIONS

6-1. GENERAL

6-2. Repair is normally limited to parts replacement. Do not disassemble unless troubleshooting indicates the necessity of parts replacement. To replace parts, disassemble and reassemble only to the extent required as directed below.

6-3. DISASSEMBLY

6-4. Disassemble the dummy load as follows:

a. Remove the four machine screws (2, figure 6-1) that secure the connector (3) to the RF load resistor assembly (4); pull straight out to remove the connector.

b. Position the dummy load so that the nameplate end is up. Loosen the screw on the clamping band (1) that secures the RF load resistor assembly (4) to the housing (6); remove the band and pull straight up to remove the load resistor assembly. The coolant will drip into the housing as the assembly is removed. Remove the O-ring (5) from the resistor.

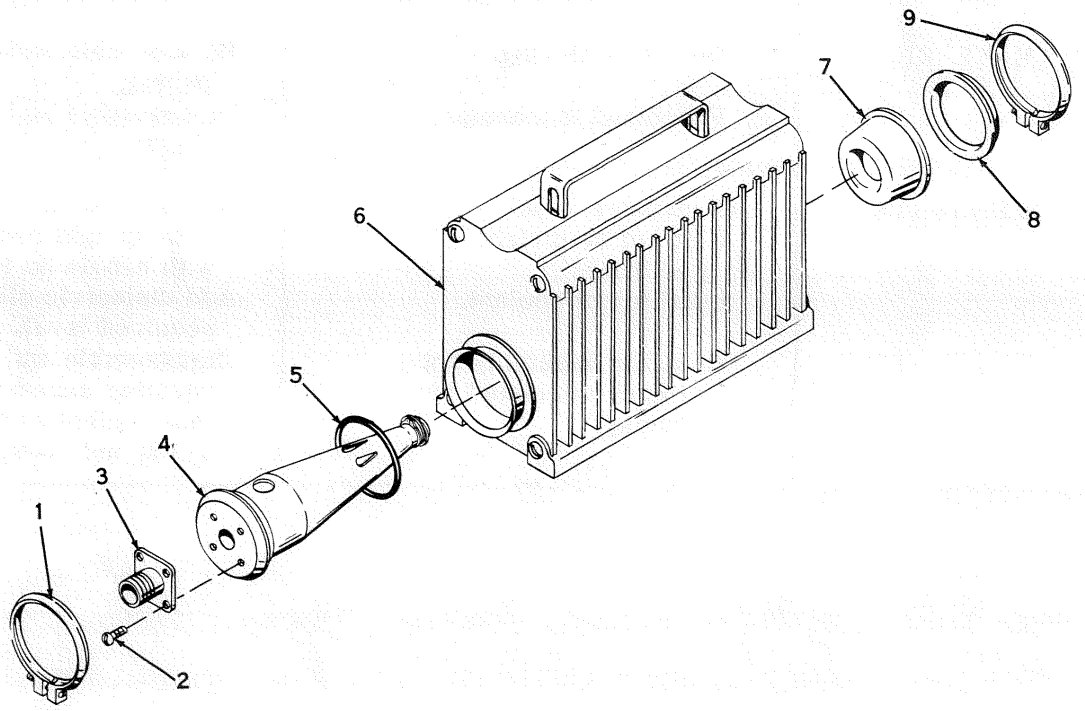
c. If both the load resistor assembly (4) and diaphragm (7) are to be removed, pour the coolant oil from the housing.

d. Loosen the clamping band (9) that secures the diaphragm cap (8) and diaphragm (7) to the housing (6); remove the clamping band, cap, and diaphragm.

6-5. CLEANING AND INSPECTION

6-6. Clean and inspect the disassembled parts of the dummy load as follows:

a. Wipe the outside of the RF load resistor assembly with a clean, dry, lint-free cloth.




1. Clamping Band
2. Machine Screw
3. Connector
4. RF Load Resistor Assembly
5. O-ring
6. Housing
7. Rubber Diaphragm
8. Diaphragm Cap
9. Clamping Band

Figure 6-1. Dummy Load, Exploded View

b. Wipe the O-ring and diaphragm with a cloth.

c. Clean all remaining metallic parts with trichloroethylene, Federal Specification O-Y-236a. Dry thoroughly, taking care to remove all traces of solvent from the inside of the housing.

d. Inspect the O-ring and diaphragm for cracks, scoring, deterioration, and other damage; replace damaged parts.

e. If predisassembly troubleshooting indicated that the RF load resistor assembly was not performing within required limits, replace it.

f. Inspect the housing for cracks, broken cooling fins, damaged clamping band seats, and other damage; replace a damaged housing.

g. Replace other parts that are cracked, distorted, or otherwise damaged.

6-7. REASSEMBLY

6-8. Reassemble the dummy load as follows:

a. Position the rubber diaphragm (7, figure 6-1) on the housing (6) so that the projecting end enters the housing. Position the diaphragm cap (8) on the housing and secure the parts with the clamping band (9).

b. Position the housing so that the nameplate end is up. Fill the housing to the required level with GE Type 10C Transil Dielectric Oil (approximately 4/5 pint at room temperature).

c. Install the O-ring (5) on the RF load resistor assembly (4). Position the load resistor assembly so that it is fully seated in the housing. Make sure that the slotted holes on the tapered end of the conical housing and the round holes at the wide end of the conical housing are positioned top and bottom.

**CAUTION**

Failure to orient the RF load resistor assembly correctly in the housing will result in obstructed coolant flow and may affect the power rating and RF impedance.

d. Secure the RF load resistor assembly (4) to the housing with the clamping band (1). Tighten the screw on the clamping band.

e. Position the connector (3) on the front of the RF load resistor assembly (4); secure with four machine screws (2).

f. After reassembly, check the dummy load for coolant leaks. If coolant is leaking from around the clamping bands, tighten the band screw and check if the leaking stops. If it does not, replace the O-ring (5) or the diaphragm (7).

g. Check the VSWR of the dummy load by connecting it, along with a Bird Model 43 Thruline Wattmeter, to a properly rated 50-ohm transmission line. VSWR must not exceed 1.1.

# SECTION VII
# REPLACEMENT PARTS LIST

7-1. PARTS LIST

7-2. A list of replaceable parts for the dummy load is given below. Use the exploded view of figure 6-1 for parts identification.

| Index No. Fig. 6-1 | Bird Part No. | Nomenclature | Qty Reqd |
|---|---|---|---|
| 1 | 750254 | BAND ASSEMBLY, Clamping . . . . . | 1 |
| 2 | COML | SCREW, Machine, Rd hd, No. 8-32 x 1/4 in., brs, sil pl . . | 4 |
| 3 | 424062 | CONNECTOR, Female N type . . . . . | 1 |
| 4 | 813002 | RESISTOR ASSEMBLY, RF load . . . . . | 1 |
| 5 | 5229 | O-RING . . . . . | 1 |
| 6 | NSS* | HOUSING . . . . . | 1 |
| 7 | 24015 | DIAPHRAGM . . . . . | 1 |
| 8 | 24050 | CAP, Diaphragm . . . . . | 1 |
| 9 | 750254 | BAND ASSEMBLY, Clamping . . . . . | 1 |
| N.I.⁄ | 5030 | OIL, GE Type 10C Transil Dielectric . . . . . | 1 pt |

* Not Sold Separately
⁄ Not Illustrated