



ALTRONIC RESEARCH, INC.

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altronic.com

**MODEL 6400 SERIES
COAXIAL LOAD RESISTOR**



ALTRONIC RESEARCH, INC.
P.O. BOX 249
YELLVILLE, ARKANSAS 72687, U.S.A.

DECLARATION OF CONFORMITY

The RF Coaxial Load Model 6400 Series conforms to the following standards:

Low-Voltage Directive (2014/35/EU)

Electromagnetic Compatibility Directive (2014/30/EU)

Machinery Directive (2009/127/EC)

Restriction of Hazardous Substances Directive (EU)2017/2102)
Safety Requirements for Radio Transmitting Equipment
(IEC 215 / EN 60215)

As of the date of manufacture on the specifications page.

ATTEST:

John L. Dyess,
President



6410/6412/6415



6401L



6403/6405



640105



6401

MODEL 6400 SERIES RF COAXIAL AIR COOLED LOADS

LIMITED WARRANTY

We take pride in manufacturing products of the highest quality and we warrant them to the original purchaser to be free from defects in material and workmanship for the period of one year from date of invoice. Additionally, products of our manufacture repaired by us are warranted against defects in material and workmanship for a period of 90 days from date of invoice, with the provisions described herein.

Should a product, or a portion of a product of our manufacture prove faulty, in material or workmanship, during the life of this warranty, we hereby obligate ourselves, at our own discretion, to repair or replace such portions of the product as required to remedy such defect. If, in our judgment, such repair or replacement fails to be a satisfactory solution, our limit of obligation shall be no more than full refund of the purchase price.

This warranty is limited to products of our own manufacture. Equipment and components originating from other manufacturers are warranted only to the limits of that manufacturer's warranty to us. Furthermore, we shall not be liable for any injury, loss or damage, direct or consequential, arising out of the use, or misuse (by operation above rated capacities, repairs not made by us, or any misapplication) of the equipment. Before using, the user shall determine the suitability of the product for the intended use; and the user assumes all risk and liability whatsoever in connection therewith.

The foregoing is the only warranty of Altronic Research Incorporated and is in lieu of all other warranties expressed or implied.

Warranty returns shall first be authorized by the Customer Service Department and shall be shipped prepaid. **Warranty does not cover freight charges.**

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OPERATING TEMPERATURE WARNING

**CARE SHOULD BE TAKEN TO OPERATE UNIT BELOW STATED
MAXIMUM AMBIENT OPERATING TEMPERATURE.**

**OPERATION ABOVE RATED AMBIENT
TEMPERATURE MAY CAUSE MOTOR THERMAL
PROTECTION TO SHUT OFF FAN, WHICH MAY
CAUSE DAMAGE TO UNIT.**

**PROVISIONS ARE MADE TO TRIP THE INTERLOCK
IN THE EVENT OF OVERHEAT, BUT THE INTERLOCK
MUST BE PROPERLY CONNECTED TO THE RF SOURCE FOR THIS
FUNCTION TO OPERATE.**

**NEVER OPERATE WITH INTERLOCK
BYPASSED OR MALFUNCTIONING.
TO DO SO WILL VOID THE WARRANTY.**

PRECAUTIONS



WARNING



This equipment can start automatically. Do not attempt any service or parts replacement without first disconnecting all AC power and RF power. Failure to do so may result in serious or *fatal electrical shock or physical injury.*

CAUTION

Do not block air grills or restrict airflow when ducting inlet and discharge air. Restrictions in airflow limit the load's ability to dissipate RF power and could damage and/or cause the unit to fail.

CAUTION

Do not connect the unit to an RF power source without first ensuring that the load is connected to the proper line voltage and that the interlock circuit is properly attached to the transmitter. Do not apply more than rated power to unit. Damage will occur before thermal protectors can activate interlock circuit if large overloads are applied.

☠CAUTION☠

When using any cleaning solvents or solutions, assure that there is adequate ventilation to protect personnel from breathing any irritable or possibly toxic fumes.

INTRODUCTION

This handbook was prepared for technical personnel as an aid in understanding and performing installation, service and maintenance procedures for the Model 6400 Series Air-Cooled Coaxial Loads. Personnel are considered to be skilled if they have the necessary knowledge and practical experience of electrical and radio engineering to appreciate the various hazards that can arise from working on radio transmitters, and to take appropriate precautions to ensure the safety of personnel.

HAZARD ANALYSIS

1. The 6400 Series Coaxial Loads are provided for indoor operation.
2. The hazards presented by these loads include:
 - Electrical hazards envisioned by the Low Voltage Directive;
 - Mechanical hazards envisioned by the Machinery Directive;
 - High voltage shock/burn hazard presented by the radio frequency energy that the load is designed to dissipate. This hazard is not directly addressed by any standard, but we have chosen to comply with the requirements of IEC 215/EN60215.
3. The electrical hazards arise from the connection of the equipment to 115/230 volts AC. The following measures were incorporated into the design to minimize the exposure of personnel to the AC Voltage.
 - All AC power enters through a low voltage IEC female receptacle on the front of the load.
 - There is no low voltage to the load unless a 115/230-volt male power connector is plugged into the AC receptacle. By disconnecting the male power connection a worker is assured that low voltage is not present during maintenance.
 - The AC power entering the load is immediately connected to guarded terminal blocks.
 - AC power is routed to a minimum of locations.
 - All control voltages are 28 volts AC or less.
 - Exposed terminals which carry voltages greater than 28 volts AC are protected from accidental contact.
 - Users are not required to remove any panels for normal operation or maintenance.
4. The mechanical hazard arises from the operation of the fan and fan motor. The following measures were incorporated into the design to minimize exposure of personnel to these hazards:
 - Power to the fan and motor can be removed by disconnecting the power supply from the front of the load.
 - The panels that protect personnel from contact with the rotating elements are not removable except with tools.
 - There are no operating controls or routine adjustments required inside the load.
 - Air inlet and outlet panels will not allow access for workers' fingers.
5. The high voltage shock/burn hazards arise from the connection of the load to the transmitter. The following measures were incorporated into the design to minimize exposure of personnel to these hazards:
 - The panels, which protect personnel from contact with the high voltage elements, are not removable except with tools.
 - There are no operating controls or routine adjustments required within the high voltage compartment of the load.

- The interlock connections are located on the front of the load and are easily removed thereby opening the interlock circuit.
- Warning labels on the load instruct personnel to first remove AC and RF connections before performing any maintenance.

AIR FLOW VS TEMPERATURE ANALYSIS

The Model 6400 Series Coaxial Loads were designed to cut off RF transmission when temperature in the load reaches 140°F. This allows for cooling of the load while keeping the outlet air temperature cool enough to prevent burning if personnel come in contact with the air flow.

ELECTROMAGNETIC COMPATIBILITY (EMC) ANALYSIS

This device is a finished apparatus available on the commercial market and is subject to conformity with the Electromagnetic Compatibility Directive (2014/30/EU). The compliance of this apparatus with The Directive has been established in accordance with Annex II thereof.

This apparatus has been determined to be immune to electromagnetic energy which is radiated or *conducted by the associated transmitting apparatus. It will accept without malfunction the entire* output of the transmitter for which it is designed.

The design of the control circuitry and the components thereof has been optimized for immunity from electromagnetic disturbances and will accept disturbances on the AC Mains without malfunction. This apparatus may introduce disturbances upon the AC Mains during starting and stopping events. These disturbances are not expected to last longer than 25 cycles (1/2 second) and are of a normal nature for motor-driven machinery. No special measures have been taken to reduce or to mitigate these effects.

SECTION I

DESCRIPTION AND LEADING PARTICULARS

- 1-1. Purpose and Application of Equipment.** The Model 6400 Series Coaxial Loads are designed to safely dissipate their rated power of electrical energy over a frequency range of DC to 240 MHz.
- 1-2. Equipment Supplied.** The Model 6400 Series Coaxial Load is supplied with standard RF connectors. Their designations are:

FLANGE SELECTION								
	N Female	7/8"	E1	F1	R1	E3	E3	E3
6401L	√							
6401	√	√	√	√	√			
6403	√	√	√	√	√			
6405	√	√	√	√	√			
640105	√				√			
6410			√	√	√	√	√	√
6412			√	√	√	√	√	√
6415			√	√	√	√	√	√

The standard power supply voltages and their designators after the Model # are:

-110: 110-120VAC, single phase, 50/60 Hz

-230: 208-230VAC, single phase, 50/60 Hz

- 1-3. Equipment Required But Not Supplied.** The Model 6400 Series Coaxial Load is complete as supplied, but the user must furnish AC Mains input, RF input, interlock control cable and ground cable appropriate to each installation.
- 1-4. General Description.** The Model 6400 Series Coaxial Load is enclosed in a single aluminum case which is painted with a durable acrylic finish. Power connection is made through an IEC connector on the front panel of the fan enclosure. This panel also contains a 2-screw barrier terminal strip for connection of the interlock circuit. The RF connector is located on the front of the load.
- 1-5. Electrical Description.** The Model 6400 Series contains a 50-ohm non-reactive resistor assembly capable of dissipating its rated value of applied electrical energy at sea level at frequencies between DC and 240 MHz with a maximum VSWR of 1.15 to 1. No provisions are made for tuning the resistor assembly and all operating controls relate to the operation of the fan assembly. The fan control circuit consists of two switches wired in parallel to control the fan motor contactor. Power is supplied to this contactor and to the

"Fan On" lamp whenever the equipment is attached to the correct power supply and the main power switch is "ON" or when the fan thermostats sense a temperature equal to or greater than 120° ($\pm 7^\circ$) F. The transmitter interlock circuit consists of one thermal switch wired to the interlock terminal board on the front panel of the fan enclosure. This switch closes whenever it senses a temperature equal to or greater than 140°F ($\pm 7^\circ$).

1-6. Mechanical Description. The Model 6400 Series RF Coaxial Load is a 50-ohm non-reactive resistor assembly, which is cooled by forced ambient air. The Model 6400 Series Coaxial Load fan assemblies consists of one or two fans depending on the power dissipation capacity of the load. Air flows from the base of the load through the resistor assembly and discharges out the top of the load.

1-7. General Principle of Operation. After ascertaining that the Model 6400 Series is connected to the correct power supply, connect the transmitter interlock circuit and RF source. Turn the main power switch ON to start the fan and enable transmitter. Operate transmitter as desired. To stop operation, it is necessary to first turn off the transmitter, then the main power switch on the Model 6400 Series Coaxial Load. The fan may continue to run for some time. This depends upon the power level at which the load was operating and upon the ambient air temperature. This feature is necessary to prevent damage to the load. The Model 6400 Series Coaxial Load can be operated in a "Standby" or "Reject" mode with the blower off. Current draw in this mode is 60 mill amperes. To operate in this mode, connect the unit as before and leave the main power switch on the front panel on "Standby".

1-8. Operating and Adjustment Controls. The only operating control is the main power switch. No field adjustments are necessary or possible.

1-9. Operator Training. The operator of this equipment must have the following skills/knowledge:

- An understanding of the purpose of the equipment;
- An understanding of the principles of operation of the equipment;
- An understanding of the normal operating procedures for the equipment;
- An understanding of the normal and abnormal indications which may be presented at the control point;
- The proper procedures for starting, using and stopping the equipment under normal conditions;
- The proper procedure for stopping the equipment under abnormal or emergency conditions;
- The proper procedure to lock out and mark controls prior to allowing or commencing maintenance on the equipment;
- The proper procedure to obtain clearance to remove lockouts and out-of-service marks and return the equipment to normal service.

SECTION II

TEST EQUIPMENT AND SPECIAL TOOLS

2-1. Test Equipment Required. No test equipment is required for routine maintenance. In some circumstances it may be desirable to determine the temperature differential (outlet air minus inlet air) and ambient air temperature which the equipment is experiencing. We recommend the Fluke Model 52 or equivalent instrument for this function.

2-2. Special Tools Required. Although no non-standard tools are required for routine maintenance, we recommend the technician have the following specialized tools available:

1 Torx T-20 driver

1 Tee handle hex key, 1/8" bit

1 Power screwdriver with 1/8" hex key & torx T-20 bit

SECTION III

PREPARATION FOR USE AND RESHIPMENT

3-1. Unpacking Equipment. The units should be handled and unpacked with care. Inspect outer cartons for evidence of damage during shipment. *Claims for damage in shipment must be filed promptly with the transportation company involved.* No internal packaging or bracing is used for shipments and the units should not rattle when being unpacked.

3-2. Pre-installation Inspection. Conduct a thorough inspection of the units, paying particular attention to the following items:

- Screws in place and tight.
- All panels and grills free of dents and scratches.
- AC input receptacle visually OK.
- Interlock terminal strip visually OK.
- RF connector visually OK.

While inspecting RF connector, measure DC resistance of the unit by reading from the center conductor to the outer conductor. Compare this reading to that on the specification sheet at the end of this manual. Reading should be ± 1 ohm. If not, consult factory.

3-3. Pre-installation Tests. Prior to installation, connect the load to AC Mains power for the following tests:

- a. Read data plate on fan enclosure and connect to a suitable source of AC power.
- b. Turn power switch on and check for quiet fan operation.

3-4. Installation. The Model 6400 Series Coaxial Load must be installed in a location convenient for servicing. Consideration should be given to adequate accessibility for maintenance and unit replacement. No attempt is made in this handbook to present complete installation instructions, since physical differences in plant will determine the installation procedure. General guidelines are outlined in subsequent paragraphs.

3-5. Location. The location selected for the Model 6400 Series Coaxial Load should be dry, free of excessive dust and have an ambient temperature below 104°F (40°C). The room should be well ventilated to prevent excessive temperature rise and consequent derating of the unit. The power dissipated by each load is shown in the table below.

Model	6401L	6401	6403	6405	640105/WFAN	6410	6412	6415
POWER/watts	1,000	1,000	3,000	5,000	6,000	10,000	12,000	15,000

- 3-6. Mounting.** The Model 6400 Series Coaxial Load is designed to be floor, wall or bench mounted and should be securely attached to the mounting surface. The enclosure rests on two fixed aluminum feet. These are drilled for 3/8-16 machine screws.

CAUTION!

THE UNIT MUST BE ATTACHED TO THE PROPER AC POWER SUPPLY WITH INTERLOCK CONNECTED WHENEVER THE RF CONNECTOR IS ATTACHED TO THE SOURCE. INADVERTENT APPLICATION OF RF POWER TO THE UNIT WITHOUT AC POWER MAY DAMAGE OR DESTROY THE RESISTOR ASSEMBLY.

- 3-7. Connections.** There are three connectors on the Model 6400 Series Coaxial Loads: the RF connector, the AC power supply and the transmitter interlock.
1. The RF connector is on the front panel of the unit. Connect to the appropriate RF line from the transmitter.
 2. The AC power supply connector is an IEC 320 power connector located on the front panel of the enclosure.
 3. The transmitter interlock is attached to the 2-position terminal strip located on the front panel of the fan enclosure.
- 3-8. Adjustments.** No field adjustments are necessary or possible.
- 3-9. Preparation for Reshipment.** No special measures are required to prepare the Model 6400 Series Coaxial Loads for reshipment. Care must be taken to protect the RF connector and to immobilize the swivel flange. Packaging should provide protection against abrasion and impact.

SECTION IV

THEORY OF OPERATION

- 4-1. **General.** The Model 6400 Series Coaxial Load contains a 50-ohm non-reactive resistor assembly which is cooled by forced air supplied by one or two fans in a fan assembly. Control of the fan/fans and of the transmitter interlock circuit is accomplished with a single rocker switch and two thermal switches.

Model	Resistor Assembly Ω
6401L	3 @ 150
6401	4 @ 200
6403	4 @ 200
6405	6 @ 300
640105	3@150 6@300
6410	8 @ 400
6412	10 @ 500
6415	10 @ 500

- 4-2. **Control Circuits.** There are 2 control circuits in the Model 6400 Series Coaxial Loads. One circuit controls the fan/fans, and the other controls the transmitter interlock circuit. Control power for the Blower Assembly derives power from the Control Transformer, which is fed from a 3 ampere circuit breaker. This breaker also supplies Line Power to the Blower Assembly. One thermal switch and one rocker switch are connected to AC Control Line. The thermal switch is Single Pole, Normally Open and connects in parallel with the Double Pole, Single Throw rocker switch. The fan indicator lamp is connected in parallel with the fan motor. The transmitter interlock circuit consists of one thermal switch connected to TB1-1 and TB1-2. This terminal pair is Normally Closed and opens at 140°F \pm 7°F. The Model 6401 interlock circuit is without an interlock terminal block. The red wires exiting the bottom of the resistor housing are used for the interlock circuit.

SECTION V

MAINTENANCE



***PERSONNEL WORKING ON THIS LOAD MUST BE
CONSIDERED SKILLED AS DEFINED BY
EN60215 SECTION 3.1 AND APPENDIX D***

BEFORE PERFORMING ANY MAINTENANCE:

- 1. DISCONNECT POWER AND ALLOW MOTOR TO COME TO A FULL STOP.**
- 2. DISCONNECT RF CONNECTOR ASSEMBLY AND LOCK OUT TRANSMITTER OPERATING CONTROLS.**
- 3. DISCONNECT TRANSMITTER INTERLOCK LINE.**

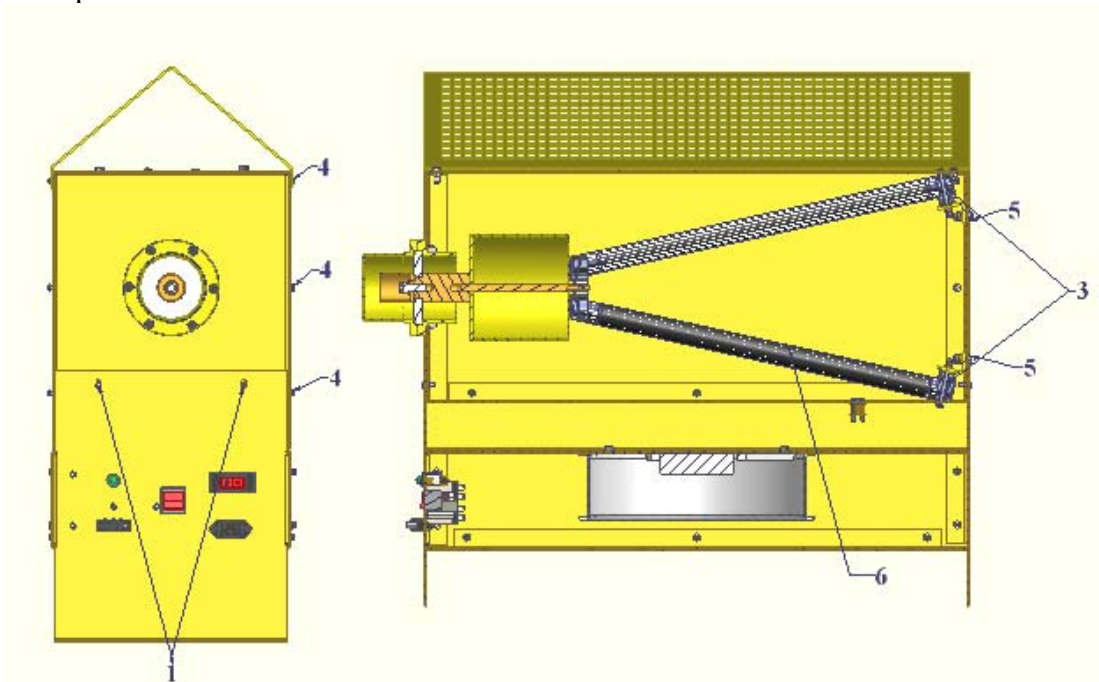


***FAILURE TO FOLLOW THESE DIRECTIONS
MAY CAUSE FATAL ELECTRICAL SHOCK!***

- 5-1. Cleaning.** The enclosure of the Model 6400 Series Coaxial Load is finished with an acrylic finish or other durable coating system. It should be cleaned with a neutral plastic and glass cleaner such as Windex or Glass Plus. The RF connector should be cleaned with a non-residue contact cleaner. Remove dirt accumulations from the fan and motor by vacuuming. Do not use solvents or an air jet, as these can damage the motor. Remove dirt and dust accumulations from the grills and resistor assembly with an air jet and a soft brush.
- 5-2. RF Circuit.** The RF Load Resistor does not require any periodic maintenance and the only repairs possible are the replacement of parts in the connector, quick-step or support portions of the resistor assembly or the replacement of the resistors.

To remove resistors it is first necessary to separate the fan housing from the load.

1. Remove the four 8-32 screws from the RF and back panels that hold the fan assembly to the load.
2. Lift the load from the fan assembly while allowing the wiring to slide out of the fan housing. Remember when reassembling to slide the wires back into the fan housing. Loose wiring will get into the fan and cause damage to the load.
3. Next remove the four 10-32 x 2" Grounding Screws from the top and bottom of the load.
4. Remove all 8 – 32 Torx from the shroud and remove the shroud from the resistor assembly.
5. Remove the four bolts securing the resistor brackets to the resistor assembly housing. When replacing these bolts leave them loose until the grounding screws are tightened. Failure to tighten the grounding screws before the resistor bracket screws will cause the VSWR to be out of the acceptable range.
6. Replace resistors as necessary.
7. Assembly is the reverse procedure. The resistor bracket with the thermal switch goes to the top of the load.



CAUTION!

Take care when tightening the $\frac{1}{4}$ -20 x 2" screws securing the lower resistor bracket to the flex panel. Overtightening can fracture the resistors. The resistors are hard, brittle ceramic material. Avoid impact and excessive force when installing or removing them.

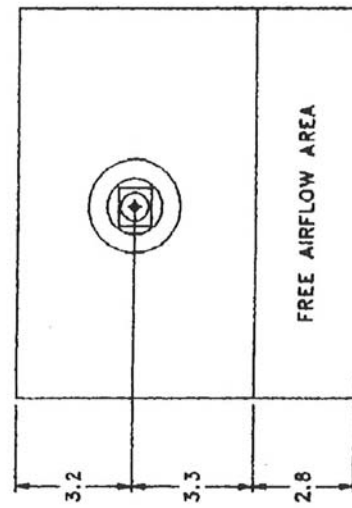
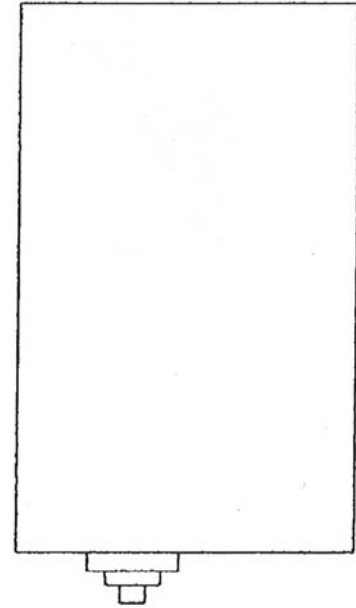
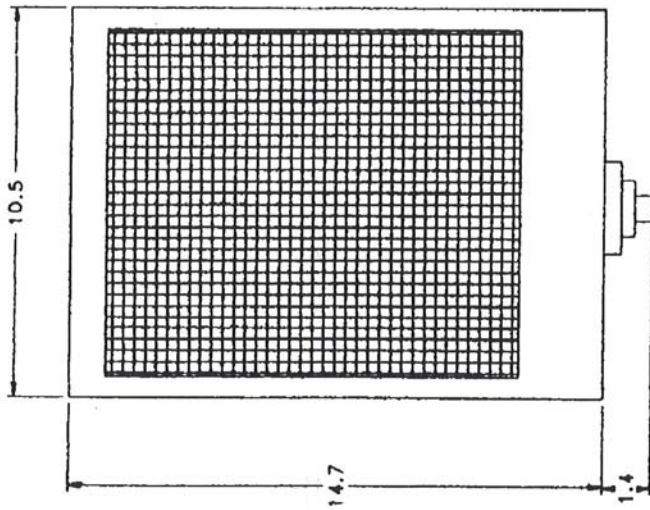
SECTION VI

6-1 OUTLINE AND DIMENSIONS

6401

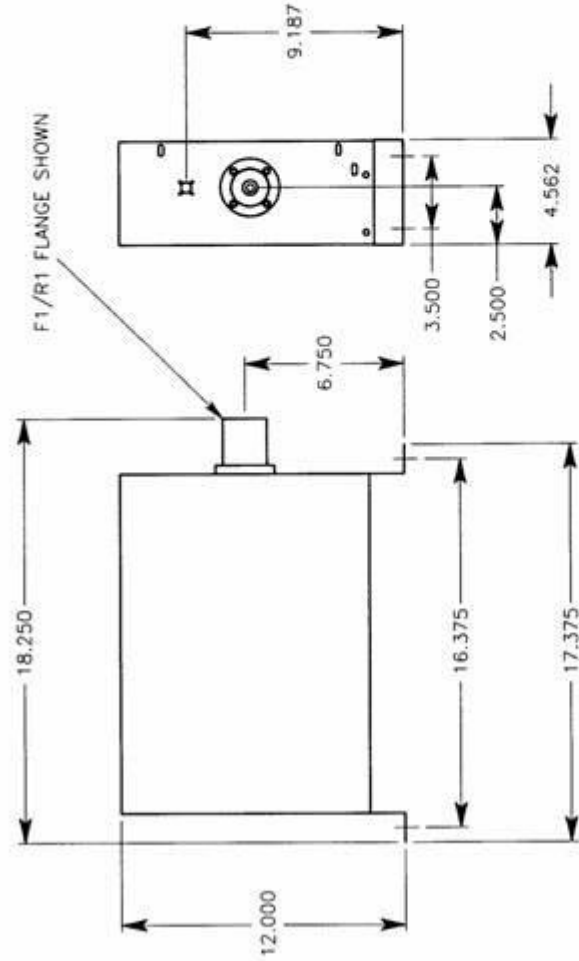
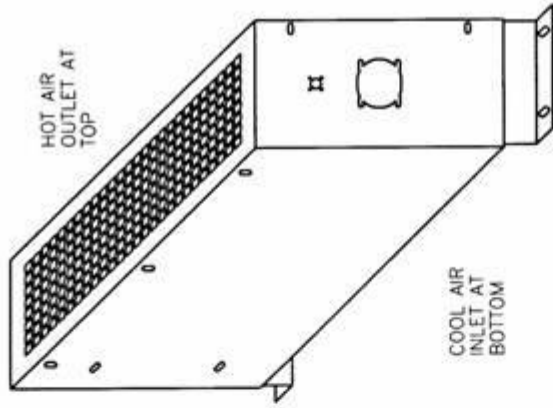
NOTES:

1. SURFACE FINISH BEIGE SPLATTER
2. TYPE MALE RF CONNECTOR STANDARD
3. CONVECTION COOLED. KEEP AIRFLOW PATH CLEAR.



REVISIONS		
REV	DESCRIPTION	DATE

REV	DESCRIPTION	DATE	REV. BY:



ISOMETRIC VIEW SHOWN WITHOUT FLANGE ASSEMBLY

NOTE:
 1. OTHER FLANGES AVAILABLE UPON REQUEST.
 CONSULT FACTORY FOR DETAILS.
 2. ALL DIMENSIONS NOMINAL.



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 Yellville, Arkansas 72687, U.S.A.

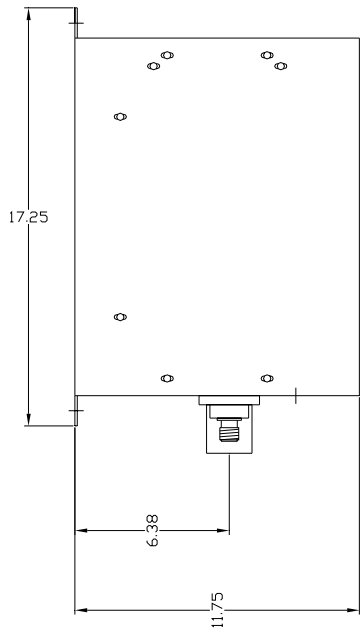
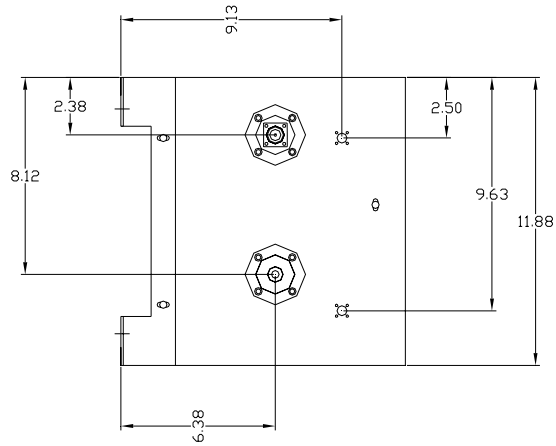
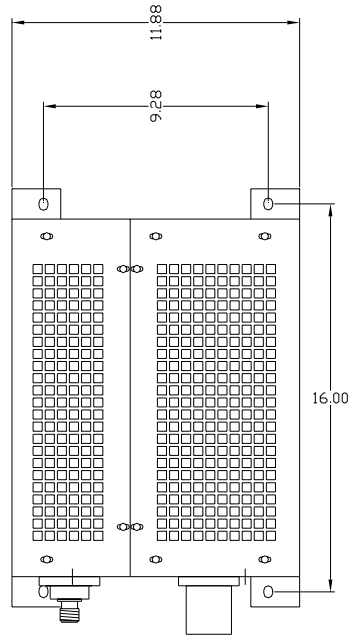
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MODEL NO.: L6401

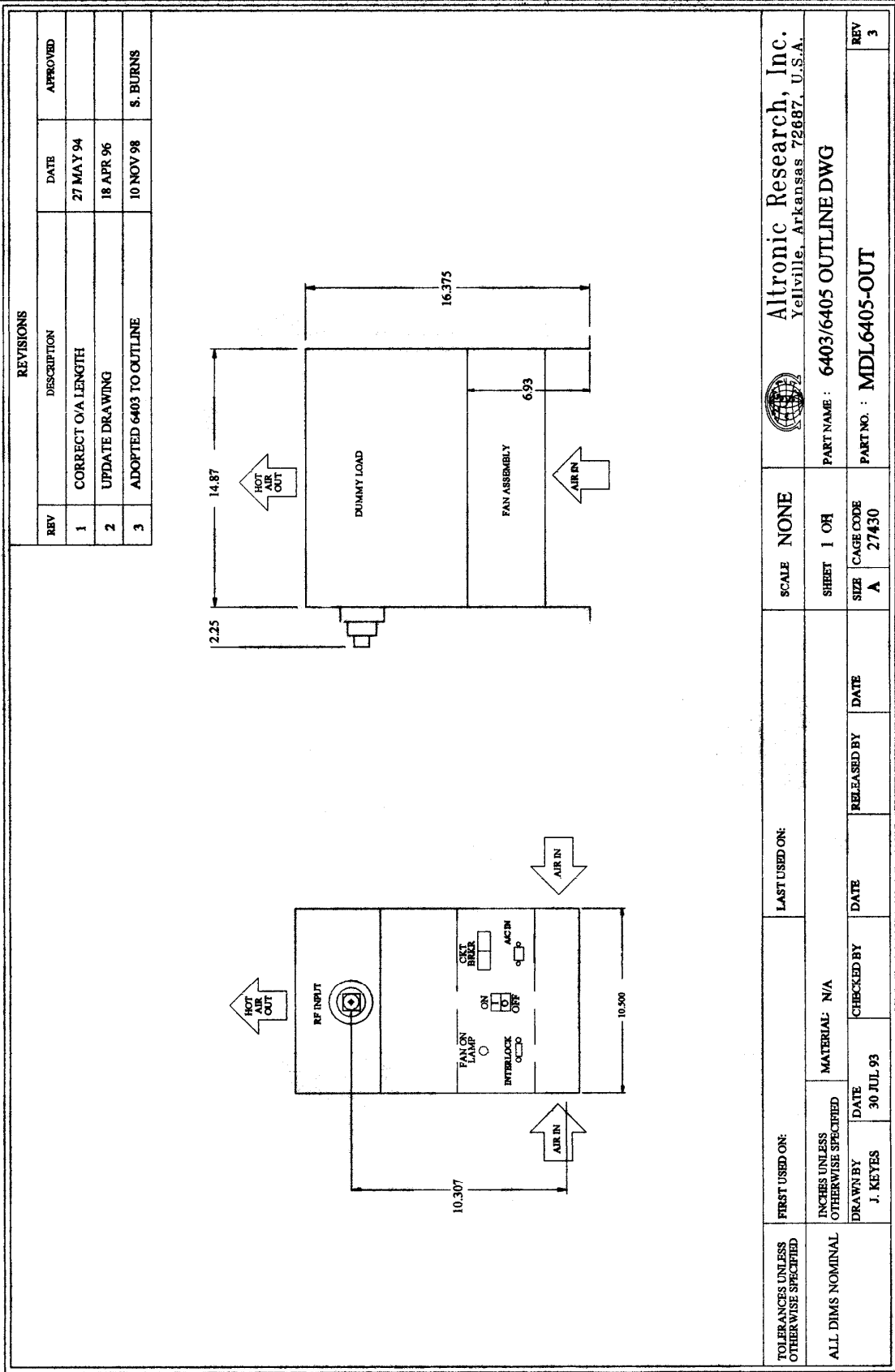
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SCALE	DRAWN BY:	DATE:	CHECKED BY:	REV
NONE	S. BURNS	09 APR 03		

REVISIONS			
REV.	DESCRIPTION	DATE	REV. BY:

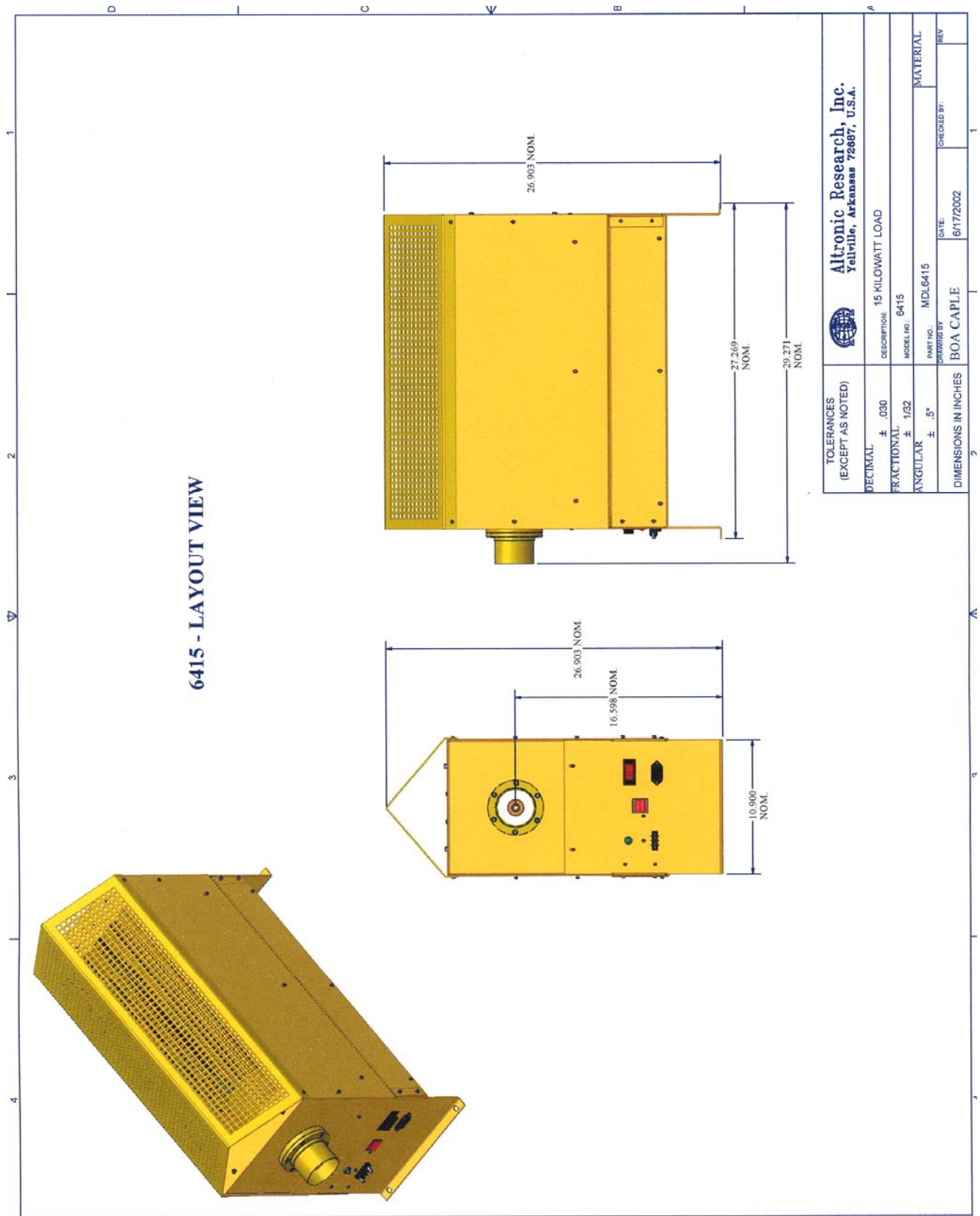


TOLERANCES (EXCEPT AS NOTED)		 Altronic Research, Inc. Yellville, Arkansas 72687, U.S.A.	
DECIMAL	NDM.		
FRACTION	NDM.		
ANGULAR	NDM.		
DIMENSIONS IN INCHES	NDM.		
DESCRIPTION: OUTLINE DRAWING			
MODEL NO.: 640105B			
PART NO.: MDL_640105B-DUT			
SCALE	DRAWN BY: S.BURNS	DATE: 09 FEB 99	CHECKED BY:



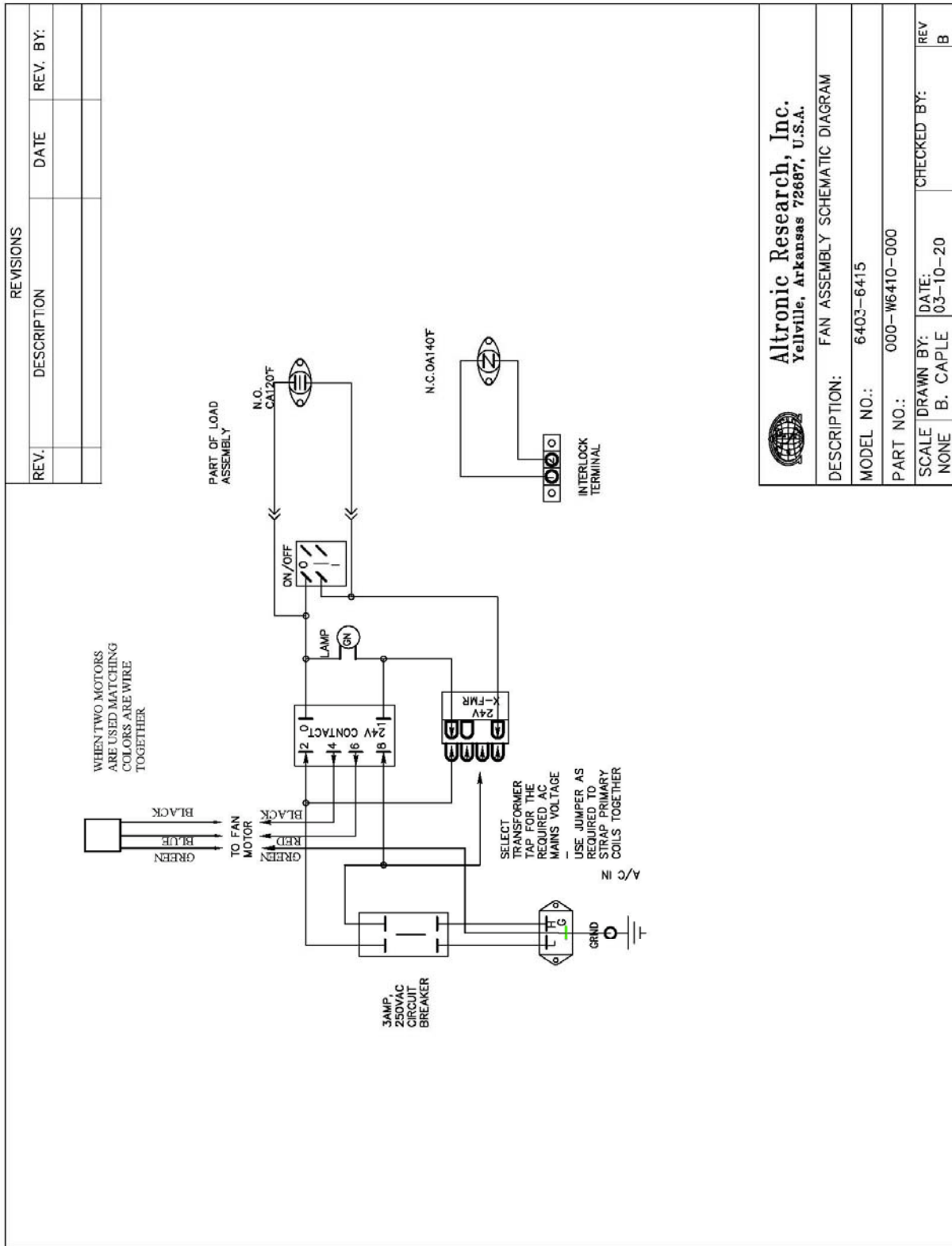
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1	CORRECT OVA LENGTH	27 MAY 94	
2	UPDATE DRAWING	18 APR 96	
3	ADOPTED 6403 TO OUTLINE	10 NOV 98	S. BURNS

TOLERANCES UNLESS OTHERWISE SPECIFIED		FIRST USED ON:		LAST USED ON:		SCALE NONE		Altronic Research, Inc. Yellville, Arkansas 72887, U.S.A.	
ALL DIMS NOMINAL		INCHES UNLESS OTHERWISE SPECIFIED		MATERIAL: N/A		SHEET 1 OF 1		PART NAME: 6403/6405 OUTLINE DWG	
DRAWN BY J. KEYES		DATE 30 JUL-93		CHECKED BY		SIZE A		PART NO.: MDL6405-OUT	
		DATE		RELEASED BY		CAGE CODE 27430		REV 3	



Models 6410/6412/6415 Layout View

6-2 SCHEMATIC DIAGRAM Models 6410/6412/6415



Altronic Research, Inc.
Yellville, Arkansas 72687, U.S.A.

DESCRIPTION: FAN ASSEMBLY SCHEMATIC DIAGRAM

MODEL NO.: 6403-6415

PART NO.: 000-W6410-000

SCALE: NONE

DRAWN BY: B. CAPLE

DATE: 03-10-20

CHECKED BY:

REV. B

REVISIONS		
REV.	DESCRIPTION	DATE

6-3 REPLACEMENT PARTS LIST

**(CONSULT FACTORY)
CALL 870-449-4093**

When consulting the factory for replacement parts, please have the model and the serial number of loads requiring service.

SPECIFICATIONS

Model 6400 Series Coaxial Loads

Impedance----- 50 ohms nominal

VSWR @ DC to 110MHz ----- 1.10:1 max.

VSWR @ 120MHz to 240MHz----- 1.15:1 max.

Connectors:

- Model 6400 SeriesN ----- N - Female
- Model 6400 SeriesE7/8----- 7/8" fan EIA swivel flange
- Model 6400 SeriesE1 ----- 1-5/8" fan EIA swivel flange
- Model 6400 SeriesF1 ----- 1-5/8" fan unflanged flush
- Model 6400 SeriesR1 ----- 1-5/8" fan unflanged recessed
- Model 6400 SeriesE3 ----- 3-1/8" fan EIA swivel flange
- Model 6400 SeriesF3 ----- 3-1/8" fan unflanged flush
- Model 6400 SeriesR3 ----- 3-1/8" fan unflanged recessed

Power Rating @ Sea Level----- 1 to 15 KW

Frequency Range ----- DC to 240 MHz

Cooling Method ----- Forced Air

Ambient Temperature ----- -30°C to +43°C

Fan Assembly----- Axial Fan/Fans

AC Power Requirements:

- 6401 ----- Static Air
- 6401 ----- Static Air
- 6403/6405 ----- 115 VAC,50/60Hz, 1 Amp
- 6403/6405 ----- 230 VAC,50/60Hz, 1 Amp
- 640105/WFan ----- 115-130 VAC,60Hz, 2 Amp
- 640105/WFan ----- 220-240VAC,50/60Hz,1Amp
- 6410/6412/6415 ----- 115 VAC, 50/60Hz, 3/5 Amp
- 6410/6412/6415 ----- 230 VAC, 50/60Hz, 3 Amp

Finish > Beige Splatter

Serial No. _____ Frequency _____ Resistance _____ dBA@3ft < 80dBA

Model _____ Inspected by _____ Date _____



CRAFTED WITH PRIDE IN ARKANSAS, U.S.A.