

# **THERMAL**

**ENGINEERING COMPANY**

## **MODEL 12501 DIGITAL HERMETIC ANALYZER**



## **OPERATING INSTRUCTIONS**

**THERMAL ENGINEERING COMPANY**

A Division of Airserco Manufacturing Company LLC

7555 Tyler Boulevard; Mentor, OH 44060 800-473-1754 Fax: 440 946-8188

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# **MODEL 12501 DIGITAL HERMETIC ANALYZER** **OPERATING INSTRUCTIONS**

Model 12501 Digital Hermetic Analyzer tests and runs single-phase compressors up to 5 HP, 120,208,240, or 277 volts. Read these instructions carefully before using the instrument.

The Digital Hermetic Analyzer is a precision electrical test instrument. If treated with reasonable care, it should provide a long life of satisfactory service. Keep the instrument free of dirt, grease and moisture and protect it from excessive shock or vibration.

## **SPECIFICATIONS**

Internal Start Capacitor Values: 100,200,400 MFD

Capacitance: 0-200,0-2000 MFD ranges. Tests at 5 volts.

Compressor Amperage: 0-30A

Start and Run Volts: 0-600VAC

Winding Resistance: 0-200 ohm

Megohmmeter: 0-1000 megohms. Tests at 500 volts

Breaker: 30A

Display Fuse: AGX 3/8 or equivalent

Power: 120,208,240, or 277 VAC 50/60 Hz

Dimensions: 13 1/2" x 10" x 4"

Weight: 5.5 lbs

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## STANDARD ACCESSORIES

**#2136 240 Volt Adaptor Cord:** Standard female receptacle terminating in alligator clips. Adapts instrument plug to 240 volt power source and provides a connection for ground.

**#2186 Capacitor Leads:** White leads with alligator clips terminating into banana plugs. Used to connect run capacitor to instrument

## SAFETY PRECAUTIONS

**This instrument is intended for use only by qualified air conditioning and refrigeration service technicians. Exercise extreme caution while using this unit. Make sure the system being tested is disconnected from power when making connections to the Model 12501.**

**POWER** switch must be in **OFF** position before connecting the Model 12501 to power. Failure to do this could result in dangerous voltages being present at the COMPRESSOR TEST LEADS.

To reduce the possibility of electrical shock, set **POWER** switch to **OFF** and disconnect Digital Analyzer from power before disconnecting **TEST LEADS** from compressor.

*CAUTION:* **POWER SUPPLY** switch must be at proper setting before connecting the Model 12501 to power or damage to the instrument could result.

## PANEL CONTROLS AND CONNECTIONS

**POWER SUPPLY SWITCH:** Controls power supply for the display and test circuits. Set to the proper supply voltage before connecting the Digital Analyzer to power.

**POWER SWITCH:** Selects between test and run functions.

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**READ SWITCH:** Push and hold to read megohms and capacitance (MFD) on digital display when checking compressor insulation (Ground Test) and testing capacitors.

**BREAKER:** 30A circuit breaker. Push to reset.

**DISPLAY FUSE:** 3/8 Amp fuse to protect test circuit and digital display power supply.

**EXTERNAL RUN CAPACITOR JACKS:** Connects to run capacitor when running compressors that use a run capacitor.

**COMPRESSOR SWITCH:** Set to type of compressor being analyzed, split phase or capacitor start Not used with PSC compressors.

**CAPACITOR SWITCH:** Selects value of Digital Analyzer's internal start capacitors.

**REVERSING SWITCH:** Interchanges start and .run winding to try to free a tied up compressor.

**START SWITCH:** Used to start split phase and capacitor start compressors.

**SELECTOR SWITCH:** Selects between various TEST and RUN functions. TEST functions are on the left side and can be performed only when the POWER switch is in the TEST position. RUN functions are on the right side and can be performed only when in the POWER switch is in the RUN position.

**COMPRESSOR TEST LEADS:** RED, WHITE, BLACK, and GREEN leads wired directly to the instrument, which terminate in alligator clips. Used to start and run compressors and test windings and capacitors.

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## **GENERAL NOTES**

When using the Model 12501 with 208 V or 277 V compressors, set POWER SUPPLY switch to 240 V and follow instructions for 240 V compressors.

Infinity is indicated on the digital display by a “1” on the left side. The rest of the display will be blank except for a decimal point which may or may not appear on the right side. The display will show “1” or “1.”

Compressors that have shut down on internal overload or winding protection may require a cooling down period before attempting to start them with the Digital Analyzer. Check the compressor manufacturer’s recommendations.

## **TESTING CAPACITORS**

1. Set POWER switch to OFF and disconnect Digital Analyzer from power.
2. Set POWER SUPPLY switch to proper voltage.
3. Set REVERSING switch to NORMAL.
4. Disconnect system wiring from capacitor.
5. Connect BLACK and RED COMPRESSOR TEST LEADS to capacitor. For polarized (DC) capacitors, connect BLACK lead to NEGATIVE and RED lead to POSITIVE terminals.
6. Connect Model 12501 to power.
7. Set POWER switch to TEST.
8. Rotate SELECTOR switch to CAP HI (0-2000 MFD) or CAP LO (0-200 MFD).

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9. Push and hold READ switch to obtain microfarad (MFD) reading. There may be a 5 second delay before the reading appears on the display. The capacitor will be automatically discharged when the READ switch is released. The display may show a reading without pushing the READ switch. DO NOT USE this reading.

“000” or “00.0” indicates a shorted capacitor. “1” or “1.” (infinity) indicates an open capacitor. Run capacitors should be +10% of the rated value. Start capacitors should be within the rated range.

### **INITIAL SET UP**

Before connecting the Digital Hermetic Analyzer to power, make connections to the compressor as follows:

1. Set POWER and SELECTOR switches to OFF.
2. Set POWER SUPPLY switch to correct supply voltage.
3. Disconnect all system wiring from compressor terminals.
4. Connect RED test lead to RUN terminal.
5. Connect WHITE test lead to START terminal.
6. Connect BLACK test lead to COMMON terminal.
7. Connect GREEN test lead to COMPRESSOR CASE.
8. Connect Analyzer to power supply of correct voltage for the compressor. For 240 V compressors use the 240 V Adaptor Leads.

NOTE: The green lead of the 240 V Adaptor Cord must be connected to proper ground. DO NOT CONNECT TO COMPRESSOR CASE.

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## **TESTING WINDING RESISTANCE**

1. Follow INITIAL SET UP.
2. Set REVERSING switch to NORMAL.
3. Set POWER switch to TEST.
4. Rotate SELECTOR switch to START OHMS to read start winding resistance.
5. Rotate SELECTOR switch to RUN OHMS to read run winding resistance.

If display reads infinity, the winding is open. Consult the compressor manufacturer's specifications for proper start and run winding resistance and compare to the readings obtained, (cont)

6. When measuring very low resistance values, the resistance of the test leads must be subtracted from the reading obtained to determine the actual resistance of the winding. After determining test lead resistance, record the values for future reference.

Test Lead Resistance for Start Winding: Short WHITE and BLACK tests leads together and note reading.

Test Lead Resistance for Run Winding: Short RED and BLACK test leads together and note reading.

## **GROUND TEST**

The ground test uses a megohmmeter to measure the resistance between the compressor windings and case. This determines if any of the windings are grounded and gives an indication of the winding insulation condition.

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**WARNING: DO NOT TOUCH COMPRESSOR OR TEST LEADS DURING GROUND TEST. 500 VOLTS IS PRESENT AT THE COMPRESSOR TEST LEADS DURING THE GROUND TEST.**

1. Follow INITIAL SET UP
2. Set REVERSING switch to NORMAL.
3. Set POWER switch to TEST.
4. Rotate SELECTOR switch to MEGOHMS.
5. Push READ switch to obtain megohm reading on display.
6. NOTE: The display may show a reading without pushing the READ switch. DO NOT USE this reading.
7. After taking the reading, set POWER switch to OFF and disconnect analyzer from power.
8. Rotate SELECTOR switch to OFF before disconnecting compressor test leads. Voltage will be present at the compressor test leads for up to 1 minute after releasing the READ switch.

If reading is 100 megohms or greater (“1” indicates infinity), the compressor winding insulation is in good condition. Below 100 megohms, the winding insulation may be deteriorating or contaminants in the compressor oil or refrigerant may be affecting the insulation. A system cleanup (compressor oil change, replacing or adding filter/driers, deep evacuation) may improve the resistance of the insulation. Below 20 megohms, the insulation may be too severely damaged for a system cleanup to increase the resistance. A reading of zero megohms indicates the windings are grounded.

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## **STARTING THE COMPRESSOR**

If the windings are not open or grounded, the compressor may be started with the Digital Analyzer. Make sure the instrument is connected to the correct voltage for the compressor. Follow the appropriate procedure below.

### ***SPLIT PHASE OR CAPACITOR START COMPRESSORS:***

1. Follow INITIAL SET UP.
2. Set COMPRESSOR switch to proper setting.
3. For capacitor start compressors, set CAPACITOR switch to proper value. For split phase compressors, CAPACITOR switch is not used.
4. Set REVERSING switch to NORMAL.
5. Push START switch to right and hold.
6. Set POWER switch to RUN.
7. Release START switch when compressor starts. **DO NOT REVERSE THIS PROCEDURE.** Compressor should start unless it is tied up. If compressor does not start, release START switch and turn POWER switch to OFF.
8. Run winding volts (RUN VOLTS), start winding volts (START VOLTS), running amperes (RUN AMPS) and start plus run amperes (TOTAL AMPS) can be measured while the compressor is operating by rotating the SELECTOR switch to the proper position.
9. Before disconnecting test leads from compressor, turn POWER switch to OFF position and disconnect the Digital Analyzer from power.

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## ***PERMANENT SPLIT CAPACITOR (PSC) COMPRESSORS:***

1. Follow INITIAL SET UP.
2. Set REVERSING switch to NORMAL.
3. COMPRESSOR, CAPACITOR and START switches are not used.
4. Connect run capacitor to EXTERNAL RUN CAPACITOR jacks using white capacitor leads. Use the system run capacitor if it tested good or a replacement of the correct value.
5. Set POWER switch to RUN. Compressor should start unless it is tied up. If compressor does not start, turn POWER switch to OFF.
6. Run winding volts (RUN VOLTS), start winding volts (START VOLTS), running amperes (RUN AMPS) and start plus run amperes (TOTAL AMPS) can be measured while the compressor is operating by rotating the SELECTOR switch to the proper position.
7. Before disconnecting test leads from compressor, turn POWER switch to OFF position and disconnect the Digital Analyzer from power.

### **IF COMPRESSOR STARTS**

If the compressor will start and run with the Digital Analyzer and did not run with the regular system connections, the fault lies with the capacitor, relay, overload or other system controls or wiring.

### **IF COMPRESSOR IS TIED UP**

The techniques on the following page may be used to try to free a tied up compressor. The methods are presented in order of increasing danger to both compressor and operator. Use caution and consider safety first as you perform them.

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Poke Start: Split phase or PSC compressors that start hard may be helped by following the instructions for starting a capacitor start compressor. Set the COMPRESSOR switch to CAP START and the CAPACITOR switch to 100 MFD. For PSC compressors, connect the run capacitor to the EXTERNAL RUN CAPACITOR jacks. The added poke of the starting capacitor may free up the compressor. A hard start kit may need to be installed for future starting.

Reverse Start: Interchanging run and start windings for starting is often thought to free some tied up compressors. Theory says it's hopeless, but it can be tried by turning the REVERSING switch from NORMAL to REVERSE, then attempting to start the compressor. Follow instructions under "STARTING THE COMPRESSOR". Return switch to NORMAL position after test. Jump Start: 120 V compressors may free themselves if they are given a 240 volt jolt. Follow starting instructions under "STARTING THE COMPRESSOR" but connect the Digital Analyzer to 240 V. If compressor starts, do not run on 240 V for more than a few seconds.

## **MEASURING RESISTANCE**

The Model 12501 can be used as an ohmmeter with a range of 0 to 200 ohms.

1. Set POWER SUPPLY switch to proper voltage.
2. Set REVERSING switch to NORMAL.
3. Set POWER switch to OFF.
4. Connect Model 12501 to power.
5. Set POWER switch to TEST.
6. Rotate SELECTOR switch to RUN OHMS.

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7. Short the RED and BLACK test leads together and note display reading. This is the resistance of the test leads and should be subtracted from reading made in the previous step to obtain the correct resistance.

8. Use the RED and BLACK test leads to obtain reading.

### **REPAIR SERVICE**

When returning an instrument for repair, please include a complete description of the problem. Be as specific as possible. Returning an instrument simply marked “defective” will slow the repair process considerably.

Package each instrument carefully using sufficient packing inside the case to protect the meter face. We cannot be responsible for shipping damages. Before returning an instrument for repair, any fuses and/or batteries should always be checked for proper operation.

### **LIMITED WARRANTY**

Model 12501 Professional Series Digital Hermetic Analyzer is warranted against defects in workmanship or materials under normal use for one year. Manufacturer assumes no liability on the actual use of this equipment. Safety responsibility lies with the user. Liability in all events is limited to the purchase price paid and liability under the aforesaid warranty is limited to replacing or repairing any parts which are defective in materials or workmanship and returned to our distributor. Distributor should return merchandise with full description of customer complaint.

In return for shipping merchandise PREPAID to factory service location, Thermal Engineering Company will make a good faith effort for prompt disposition regarding any product which proves to be defective within or without warranty. A complete description of the problem should be included. If product was damaged in transit to you, file claim with carrier.

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