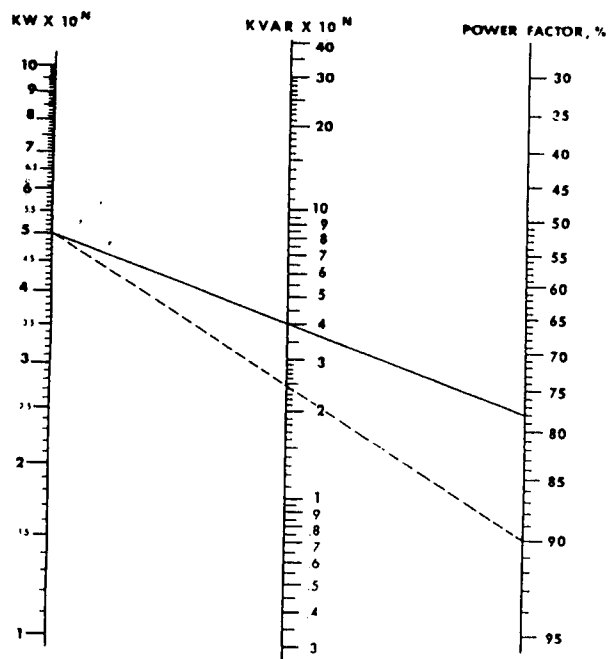


Nomograph for Determining Power Factor

Part No. 981750
4/89



EXAMPLE:

Readings of 50KW and 40KVAR from LAW-79C chart are plotted on nomograph. Draw a line to Power Factor scale and read the power factor — 78%. If power factor is to be improved to 90%, draw a line from 90% to 50KW. Read the KVAR where the line crosses the KVAR scale — 24.2 KVAR. Subtract this from LAW-79C KVAR reading of 40. $40 - 24.2 = 15.8$ KVAR of capacitance necessary to correct power factor to 90%.

OPERATING INSTRUCTIONS FOR **AMPROBE®** AC KILOWATT/ KILOVAR RECORDERS MODELS LAW-78 (78T)/LAW-79C (79CT)

See Precautions for Personal and Instrument
Protection on Page 4

See Limited Warranty on Page 3

 **AMPROBE INSTRUMENT®**
DIVISION OF CORE INDUSTRIES INC., LYNBROOK, NEW YORK 11563

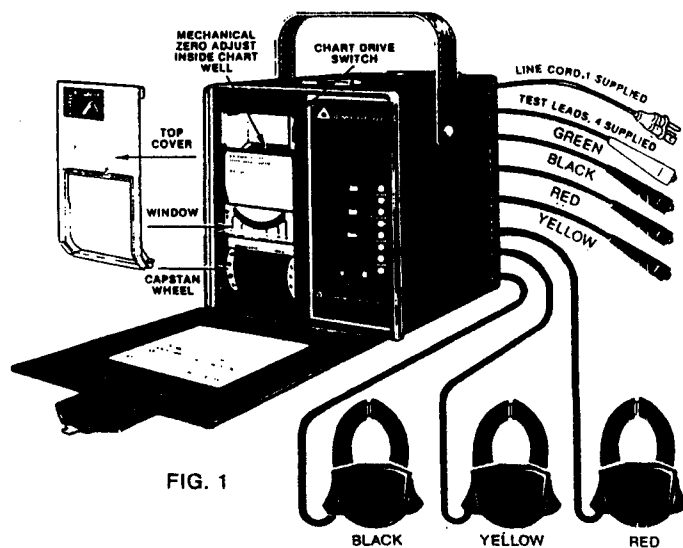


FIG. 1

LIMITED WARRANTY

Congratulations! You are now the owner of an AMPROBE® instrument. It has been quality crafted according to quality standards and contains quality components and workmanship. This instrument has been inspected for proper operation of all of its functions. It has been tested by qualified factory technicians according to the long-established standards of AMPROBE INSTRUMENT.

Your AMPROBE instrument has a limited warranty against defective materials and/or workmanship for two years from the date of purchase provided that, in the opinion of the factory, the instrument has not been tampered with or taken apart.

Should your instrument fail due to defective materials, and/or workmanship during the two-year warranty period, return it along with a copy of your dated bill of sale which must identify instrument by model number and serial number.

For your protection, please use the instrument as soon as possible. If damaged, or should the need arise to return your instrument, it must be securely wrapped (to prevent damage in transit) and sent prepaid via Air Parcel Post insured or UPS where available to:

Service Division
 AMPROBE INSTRUMENT
 630 Merrick Road (For U.P.S.)
 P.O. Box 329 (For P.P.)
 Lynbrook, NY 11563-0329

Outside the U.S.A. the local Amprobe representative will assist you. Above limited warranty covers repair and replacement of instrument only and no other obligation is stated or implied.

Serial number is die stamped in lower right hand corner of the scale plate.

PRECAUTIONS FOR PERSONAL AND INSTRUMENT SAFETY

1. Read these instructions throughly and follow them carefully.
2. In many instances you will be working with dangerous levels of voltage and/or current, therefore, it is important that you avoid direct contact with any uninsulated, current-carrying surfaces. Appropriate insulating gloves and clothing should be worn.
3. Before connecting or disconnecting the meter to or from the circuit to be tested, turn off all power to the circuit.
4. Before applying test leads to circuit under test, make certain all switches are set to proper range and function.
5. Before using any electrical instrument or tester for actual testing, the unit should be checked on a known live line to make certain it is operating properly.
6. If the instrument should fail to indicate, do not touch circuit until you have checked to see that all instrument switches are in proper position and instrument has been checked on a known live line.

IMPORTANT: Failure to follow the instructions or to observe the above precautions may result in personal injury and/or damage to the instrument and/or accessories.

OPERATING INSTRUCTIONS FOR AMPROBE® AC KILOWATT/KILOVAR RECORDERS

The LAW-78/79C can, on a time sharing basis, sequentially record both AC kilowatts and kilovars on the same chart. The two variables are recorded in the following sequence: eight dots for kilowatts then two dots for kilovars which results in two distinct patterns. One complete sequence of recording kilowatts and kilovars (8 dots and 2 dots) takes 50 seconds with a chart speed of 12 inches per hour; 10 minutes with a speed of one inch per hour.

The LAW 78/79C recorder is supplied with a line cord, four color-coded voltage test leads and three color-coded current transducers. All are permanently attached to the recorder and are stored in the compartment in the back of the recorder case. One roll of chart paper is supplied.

OPERATION:
Zero Adjusting,
Mechanical and Electrical

1. With chart drive switch in "OFF" position (See Fig. 5 and 6) exposing the word "OFF" check mechanical zero setting of pointer before making any electrical connections to the instrument. See Fig. 2. If adjustment is necessary proceed as follows:

A. Remove top cover—pull bottom ledge of frame toward you and lift. The top cover will come loose. (See Fig. 3.)

B. With strip chart roll removed from the chart well, the zero adjust star wheel is located in the bottom of chart well. (See Fig. 4.)

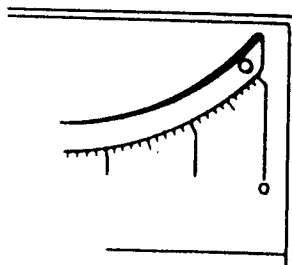
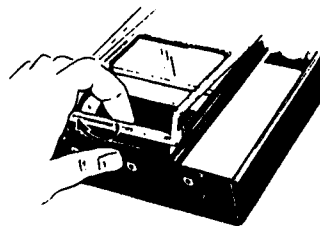


FIG. 2



Pull-Lift up
FIG. 3

6

C. Apply finger to star wheel and turn until pointer lines up with zero at the extreme right side of the scale. (See Fig. 2.)

2. Connect line cord to proper line voltage and frequency. Do not make any other electrical connections (current transducers or meter voltage leads). With the chart drive switch in "OFF" position, check the zero setting of the pointer. If adjustment is necessary, turn the "ELECTRICAL ZERO ADJUST" screw located at the bottom of the control panel on the front of the recorder.

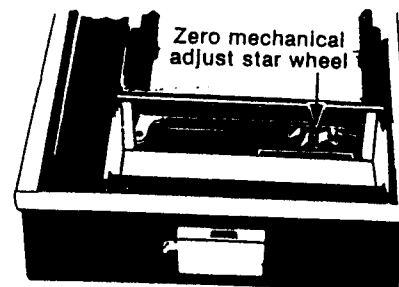
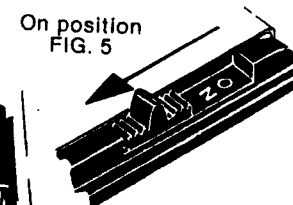
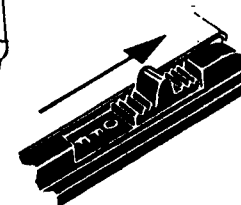


FIG. 4



On position
FIG. 5



Off position
FIG. 6

7

SWITCH POSITIONS FOR RECORDING OR INDICATING

1. The chart drive switch is located to the right of the chart well.
2. In the downward position (exposing the word "ON"), the recording mechanism is in operation feeding the strip chart and providing a permanent record of the variable being measured. (See Fig. 5.)
3. In the upward position (exposing the word "OFF"), the recording mechanism is uncoupled stopping the chart feed and printing. (See Fig. 6.)

NOTE: Make sure chart drive switch is pushed all the way until click is heard when changing its position.

Except for the "ON/OFF" switch, all switches are located on the control panel on the front of the recorder.

HOW TO USE AS A RECORDER

1. After adjusting pointer to zero as outlined above, with chart drive in "OFF" position, insert strip chart as follows:
2. A. Place chart in the well at top of recorder. Unroll about nine inches of chart with printed, white side up. (See Fig. 7.)

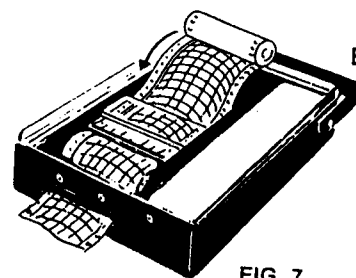


FIG. 7

B. Slip leading edge of paper under glass. If leading edge is ragged, cut small piece off at an angle. Feed over capstan wheels and through slot in bottom of recorder.

C. Line up time arrow (see Fig. 8.) with any time line on left of strip chart. This will synchronize the travel chart with the time lines on the chart.

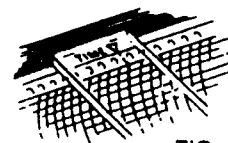


FIG. 8

NOTE: Make sure the holes on both sides of the strip chart engage the sprockets of the capstan wheels.

- D. Replace metal top cover. Position the "U" bend at top of cover on to the metal projections of the chart well, then snap front down. Make sure strip chart is not binding with cover in place.
- E. Write time of start of recorder on strip chart through opening.
3. Set the "KVAR-TIME SHARING-KW" switch to the proper position. "TIME SHARING" to record both Kilowatts and Kilovars.

"KW" to record only Kilowatts.
 "KVAR" to record only Kilovars.

4. If current in conductors is unknown, measure current using an AC clamp-on volt/ammeter and set "AMPS" switch to proper range 0-50, 0-100 or 0-200.
5. If circuit voltage is unknown, measure voltage using an AC voltmeter and set "VOLTS" switch to proper voltage and phase.
6. See Table of Ranges, and set "X1/2-X1" switch to proper position as indicated in table. The red LEDs on the control panel will indicate the range that has been selected.

TABLE OF RANGES/SWITCH POSITIONS

VOLTS	AMPS		X 1/2 - X1	KW/KVAR RANGE	
	LAW-78(T)	LAW-79C (CT)		LAW-78(T)	LAW-79C (CT)
120-10	0-200	0-50	1/2	37.5	10
120-10	0-400	0-100	1/2	75	20
120-10	0-800	0-200	1/2	150	40
208-220-10	0-200	0-50	1/2	37.5	10
208-220-10	0-400	0-100	1/2	75	20
208-220-10	0-800	0-200	1/2	150	40
220-277-10	0-200	0-50	1/2	75	20
220-277-10	0-400	0-100	1/2	150	40
220-277-10	0-800	0-200	1/2	300	80
208-220-30	0-200	0-50	1	75	20
208-220-30	0-400	0-100	1	150	40
208-220-30	0-800	0-200	1	300	80
240-30	0-200	0-50	1/2	75	20
240-30	0-400	0-100	1/2	150	40
240-30	0-800	0-200	1/2	300	80
480-550-30	0-200	0-50	1	150	40
480-550-30	0-400	0-100	1	300	80
480-550-30	0-800	0-200	1	600	160

NOTE:

1. THE ABOVE NOMINAL VOLTAGES MAY BE EXCEEDED BY 10%.
2. USE 480V-550V-30 SETTING FOR 380V - 30.

7. Set "KVAR LAG/LEAD" switch to "KVAR LAG" position. Once recording is started, observe KVAR trace on strip chart. If it is below "0" line, push "KVAR LAG/LEAD" switch to "KVAR LEAD" position.
8. Connect current transducers and voltage test leads as shown in the appropriate illustration on next page.

CAUTION: Do not use current transducers on uninsulated conductors in circuits in which the voltage is above 3000 volts AC

Important General Notes:

1. When using the test lead with the green insulator, connect this to the Neutral before connecting other leads.
2. Each color-coded current transducer must be connected to the same phase line that the matching color-coded voltage test lead is connected.
3. The current transducers must be clamped around the conductors so that the name "AMPROBE" faces toward the load.
4. Any current transducer or voltage test lead that is not needed on a particular system should be stored in the back of the recorder case.
5. Push chart drive switch down to "ON" position (See Fig. 5.)

CURRENT TRANSDUCER AND

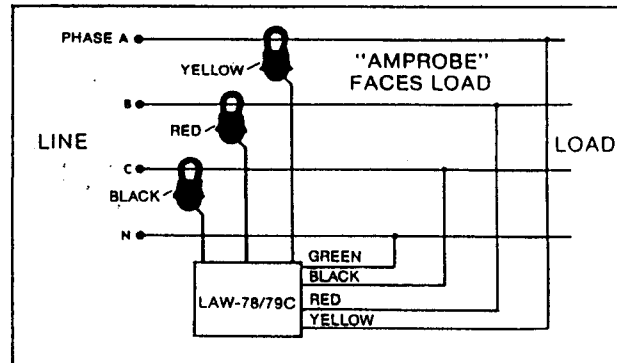


FIG. 9 For 4-wire, three phase systems

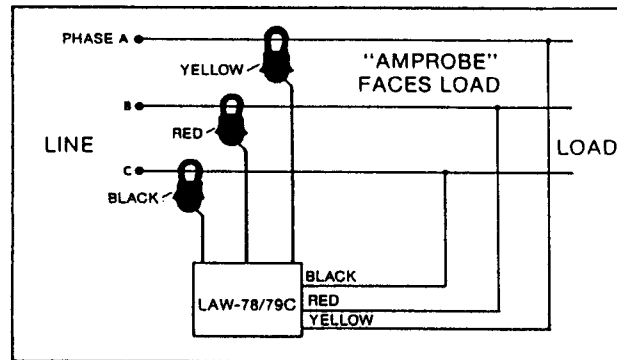


FIG. 10 For 3-wire, three phase systems

VOLTAGE TEST LEAD CONNECTIONS

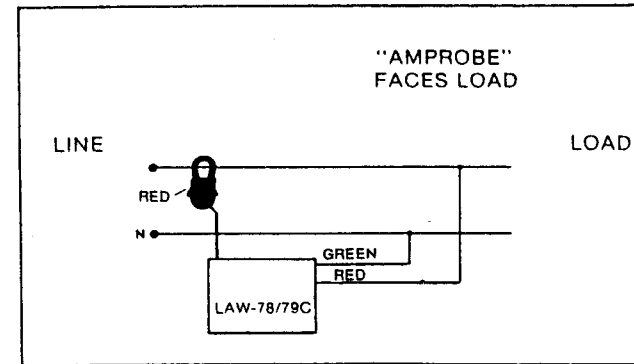


FIG. 11 For 2-wire, single-phase systems

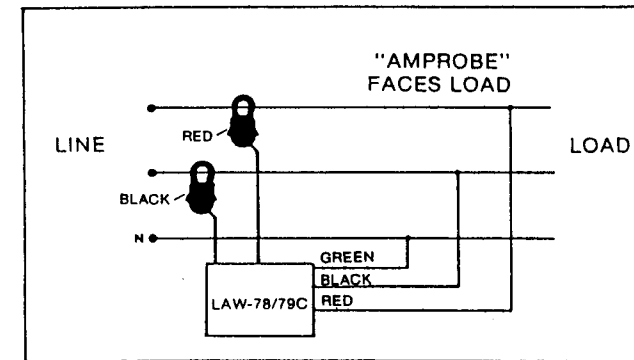
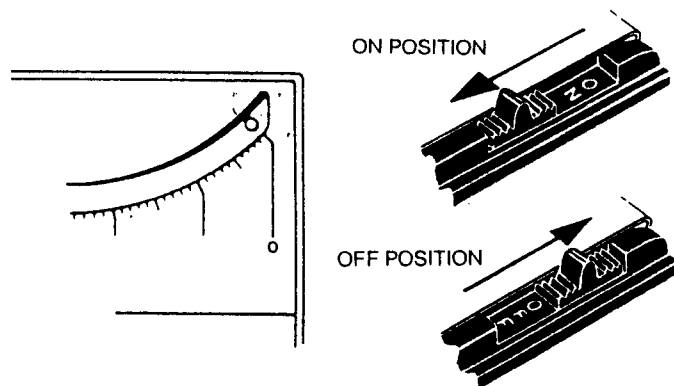


FIG. 12 For 3-wire, single-phase systems

HOW TO USE AS INDICATING METER



1. Move chart drive switch to "OFF" position.
2. Remove chart from instrument exposing scale plate and pointer to full view.
3. Adjust pointer to mechanical and electrical zero as indicated on page 6 and replace top cover.
4. Follow Steps 3 through 8 of "How To Use As A Recorder" and connect as shown in appropriate Fig. 9, 10, 11, or 12.

NOTE: Recorder line cord must be connected.

5. Read pointer on appropriate range on scale plate.

SPECIFICATIONS

Ranges: LAW-79C (CT) 0-10/20/40/80/160 KW/KVAR*
LAW-78 (T) 0-37.5/75/150/300/600 KW/KVAR*
*Leading or Lagging

Inputs: LAW-79C (CT) 0-50/100/200 Amps AC
LAW-78 (T) 0-200/400/800 Amps AC
120/208/220/240/277/600 Volts AC

Max. Conductor Dia.: 1" (2.5cm) LAW-79C (CT); 2" (5.1cm) LAW-78 (T)

Accuracy: Based on Power Factors above 50%
Watts $\pm 3\%$ FS; Vars $\pm 4\%$ FS Based on sinusoidal wave form

Dot Patterns: Watts 8 dots Vars 2 dots

Chart Speed: Depends upon speed specified at time of ordering.
See label between two white sprocket wheels.

Accessories: The AMPROBE Energizer A-47L may be used with the LAW-79C on 120 VAC systems to add three additional ranges 0-1.0/2.0/3.0* Kilowatts. The Models CT-50-1/CT-50-2 may be used to increase current input by 50 times (5,000/3,000 amperes respectively). May add $\pm 3\%$ of reading to accuracy spec when PF is above 80%; $\pm 4\%$ of reading when PF is below 80%. A1-2 and A1-3 Inverters may be used to operate the recorder from a 12 VDC battery.
*Based on 15 amp continuous rating of A-47L, LAW-79 only.

Lead Length: All leads are 5 feet long. They may be extended to 100 feet by splicing in #18 stranded copper wire. Polarity must be observed when splicing in extensions.