CANADA

DEPARTMENT OF TRADE AND COMMERCE

STANDARDS BRANCH

E-4 (re-issue)

OTTAWA Sept. 9, 1965.

NOTICE OF APPROVAL

FOR

FERRANTI TYPE "FMFR" 2-ELEMENT POLYPHASE REACTIVE ENERGY METER

Apparatus

Rating	
Current Range	0.2-10 amperes
Voltage	120 volts and 240 volts
Elements	Two pairs
Circuit	3 phase 3 wire
Frequency	60 cycles
Disc Constant (kh)	1.25 Kvarh polyphase
	* 1.0826 whr single phase
Register	4-dial clock-type with test dial.
Phase Rotation	ABC
# Power factor range	1.0 to zero lagging

* When verified as a watthour meter on single phase, the disc constant becomes 1.0826 -- see description.

Reverse running stop prevents the disc from running backward on leading power factors.

A Maximum Demand Indicator "D" is approved for use on Ferranti Types "FMFR" 2-Element Polyphase Reactive Energy Meter and "FMF" 2-Element Polyphase Watthour Meter circular "E3". This register is similar in appearance to that illustrated on the back of page 1 of circular "E6".

When this demand indicator is installed, "Type FMFR will become "FMFRD" and Type FMF will become "FMFD".

Description

The type "FMFR" 2-element polyphase reactive energy meter is intended for use with instrument transformers and is similar in design and appearance to the type "FMF" receiving approval under E 3, but differs in the number of turns on the current coils and in the internal connections of the voltage coils.

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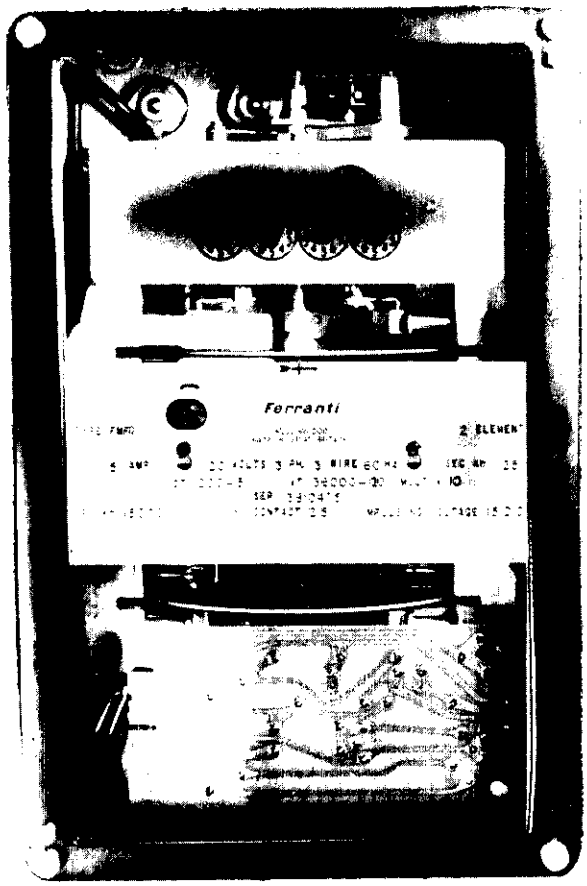
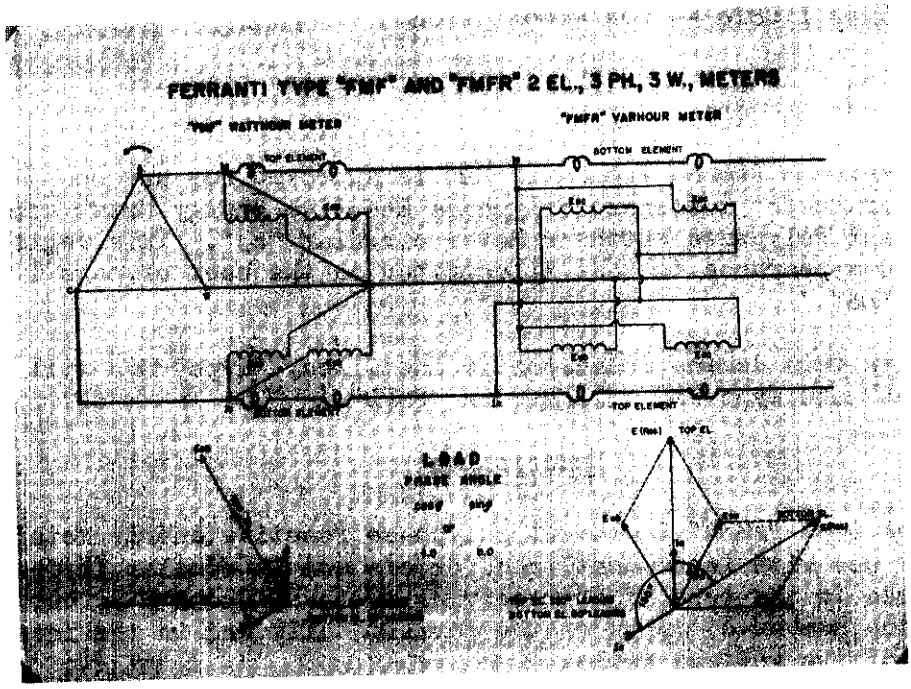
FERRANTI TYPE "FMFR" 2-ELEMENT POLYPHASE REACTIVE ENERGY METER (re-issue)





Description (cont'd)

Like the type FMF it has four separate elements, two operate on the upper disc and two on the lower disc, which we will call collectively the "upper" and "lower" elements.

The leads from each of the four current coils are brought out to separate studs for balancing purposes.

To measure varhours on this meter, the voltage applied to the potential coils must lag those of a corresponding watthour meter by 90°. The way that this is done is shown by the internal wiring and vector diagrams on the back of this circular.

Line current "A" is shown going through the current windings of both top of elements, and similarly line current "C" goes through the current windings of both bottom elements. The potential windings of the elements associated with current "A" are supplied with BC voltage in one unit and AC voltage in the other unit. The net torque of these two units is same as it would have been had the two units been combined into one element and had been supplied with "A" current and the resultant of voltages BC and AC. This resultant voltage lags voltage AB by 90° and thus satisfies the requirement for varhour measurement.

Similarly the two units comprising the bottom element and carrying current "C" react as if they had been supplied with the resultant of voltages AB and AC, so that this element also satisfied the requirement for varhour measurement.

The polyphase calibration of this meter is based on the resultant of the two voltages applied to the elements, so that when this meter is verified on single phase, the current and voltage are in phase so that for a given current and voltage the disc runs faster than on polyphase by a factor of $2/\sqrt{3}$, so that the polyphase disc constant is reduced by $\sqrt{3}/2$ to change the varhour constant of 1.25 into a watthour constant of 1.0826.

The successful operation of this meter is dependent upon the torque of each of the four elements being equal, so for verification purposes it will be treated as having 4 elements.

This meter is approved for use when equipped with a transistorized pulse generator similar to that approved for use with the type FMF, but the pulses in this case will be in varhours.

The type FMFR 2-element polyphase reactive energy meter is only available in switchboard mounting and its use is restricted to temperatures between 0°C and 50°C.

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Description (cont'd)

As this instrument will operate correctly on a polyphase circuit only when the phase rotation is in accordance with the internal connections, the nameplate and the terminals are marked accordingly.

Special instructions will be issued from headquarters to the district(s) where these meters are presented for verification.

Approval granted to: Ferranti-Packard Electric Limited,
St. Catharines, Ontario.

W.J.S. Fraser,
Chief, Standards Laboratory,
Standards Branch.

K. Cryer,
Chief, Electricity & Gas Division,
Standards Branch.

Reference: SL-100-105
SE-85-4