THE GENERAL ELECTRIC I-70 SINGLE-PHASE METER

...CONTINUES A TRADITION OF EXCELLENCE

GENERAL ELECTRIC

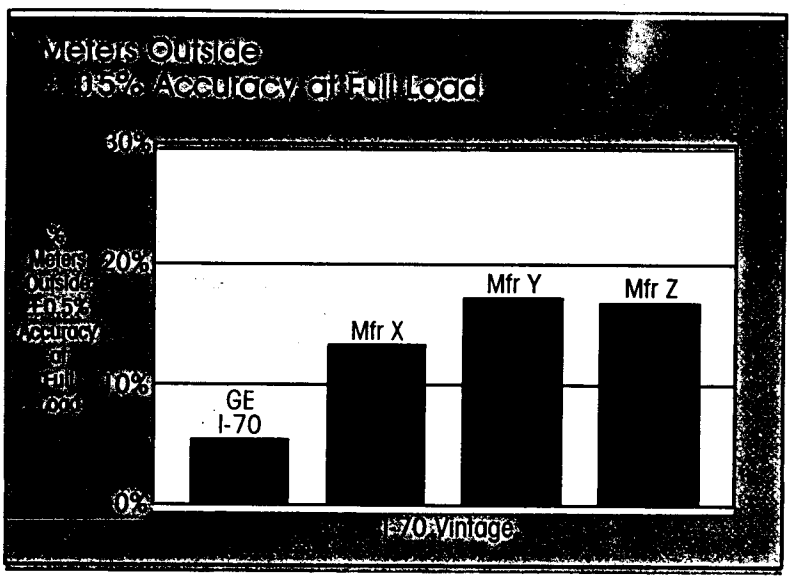


Figure 1.
Composite of in-service accuracy data for nine major utilities based on 1985 full-load tests. Results prove I-70 superior performance. This data is particularly significant because the nine utilities used different screening and standardization procedures. On all test measurements, the combined data base proved the same thing: General Electric's I-70 is the industry's most accurate, stable watthour meter.

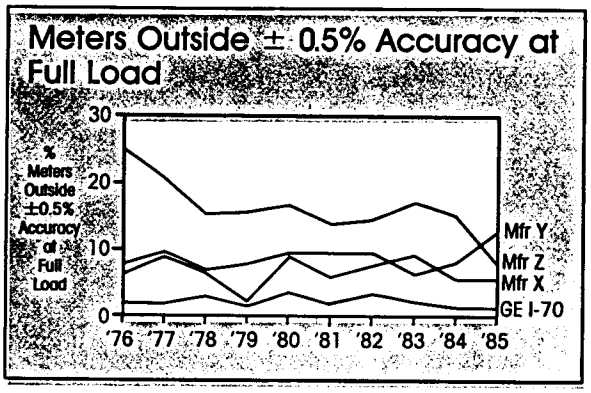


Figure 2.
Major utility's in-service accuracy tabulations based on full-load data for ten years. The chart displays the percent of meters tested which were outside the ± 0.5 percent accuracy limit. Yet even if a range of ± 1 percent or ± 2 percent were selected as the limits, the ranking order would remain the same. The GE I-70 meter shows less than 4 percent of the meters tested outside the established range.

Sample of In-Service Accuracy of Older Vintage Meters

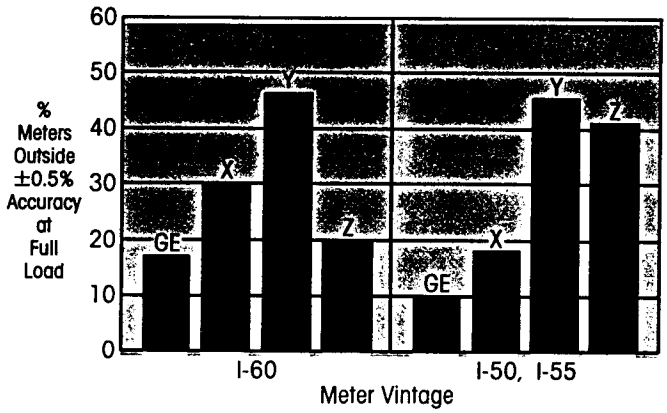


Figure 3.
GE is significantly better in all vintage comparisons.

Less calibration after shipment

The data used to create this tabulation (Figure 4) was provided to GE by a major utility which statistically sample-tests incoming shipments. The summary shown represents results obtained for six months of 1986.

It is significant to recall that in 1950 General Electric introduced to the utility industry the concept of statistical testing of meters, and established its Certified Accuracy program. Over the years, the industry accepted and implemented statistical programs, and this had the effect of greatly reducing their testing costs.

The success of such programs is intimately tied to consistent meter performance, measured by Bar X and Sigma. GE led the way in 1950, and other manufacturers followed suit.

This example of leadership is only one of many GE metering contributions to the utility industry.

As-Received Accuracy

	FULL LOAD		LIGHT LOAD	
	$\bar{X}$	σ	$\bar{X}$	σ
GE I-70	−.02	.13	+.10	.16
Mfr X	−.13	.08	−.05	.19
Mfr Y	−.09	.12	+.06	.17
Mfr Z	−.02	.10	+.13	.19

Figure 4.
Sample of 1986 "as-received" accuracy figures. Accuracy here saves expense and inconvenience of additional testing.

GENERAL ELECTRIC

I-70 SINGLE-PHASE METER

Utility experience continues to demonstrate its superior accuracy, stability and economy.

General Electric's I-70 meter is the optimum achievement in watthour meter accuracy and stability, ranking most accurate and stable in many measurement categories.

The accurate operation of the GE I-70 allows for more equitable customer billing. Your customers pay for what they receive; you receive the revenues you earn. Accurate meters mean a fair customer billing statement at the end of the month. That adds up to satisfied customers and a more profitable operation for you.

The high standards of accuracy and stability that have been designed and built into the GE I-70 also mean less maintenance costs and readjustment time spent. As the cost per kWh rises, your utility can no longer accept the waste of imprecise, inaccurate metering. That's why the GE I-70 is your best buy. Let's look at the statistics.

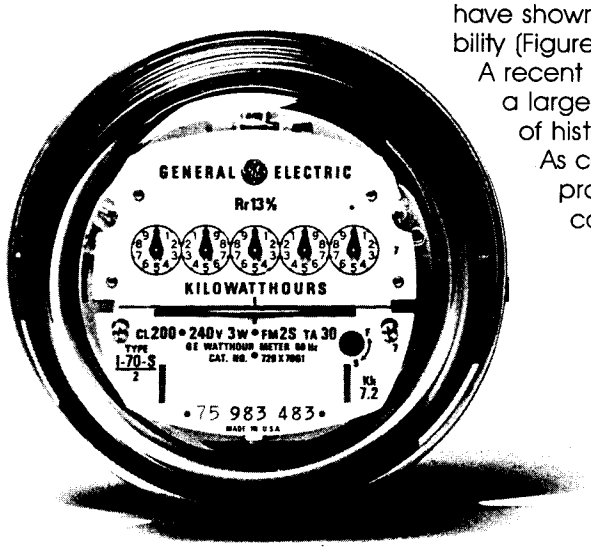
Unsurpassed in-service accuracy

In a recent study of full-load data from nine major utilities, in-service accuracy data was compiled on the four competitors' single-phase meters available today. A range of ± 0.5 percent was chosen because many utilities require that meters outside this range be re-adjusted.

Comparative results charted in Figure 1 show that GE's nearest competitor (manufacturer X) has over twice as many meters outside the ± 0.5% range than does GE. Manufacturers Y and Z have over three times as many. A tight deviation in in-service accuracy — such as that shown by the GE I-70 meter — provides more equitable customer billing. That means reduced costs to your utility.

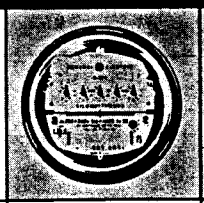
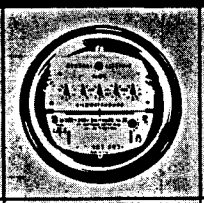
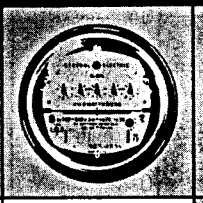
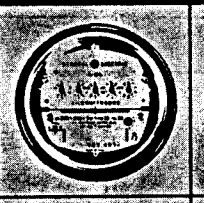
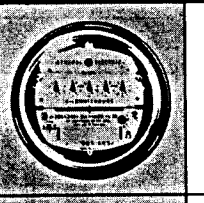
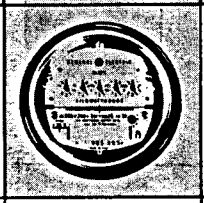
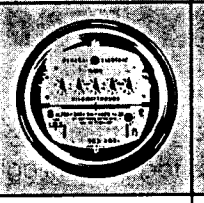
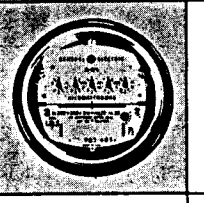
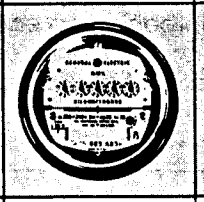
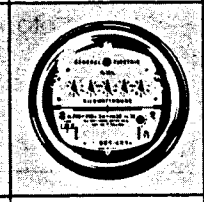
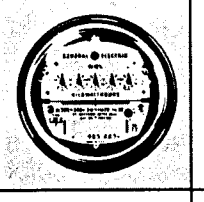
A second study of one major utility's watthour meter full load performance data — on I-70 vintage meters over a ten-year period (1976-1985) — further proved that the GE I-70 meters have shown consistently superior in-service stability (Figure 2).

A recent study of older meters, compiled at a large utility in 1985, provides a sample of historical accuracy by vintage (Figure 3). As can be seen, General Electric's products fare best in all vintage comparisons.



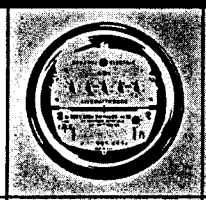
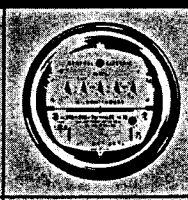
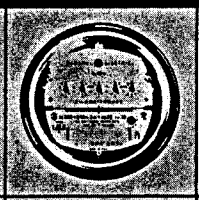
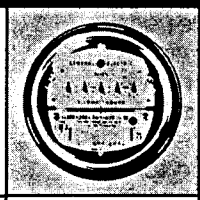
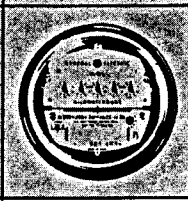
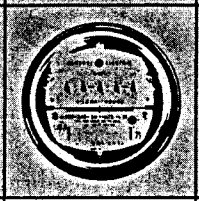
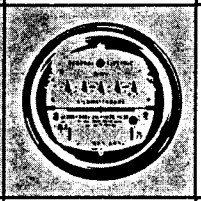
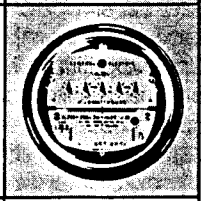
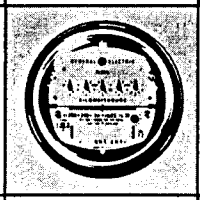
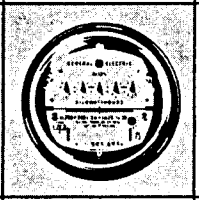
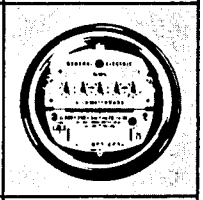
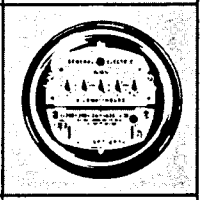
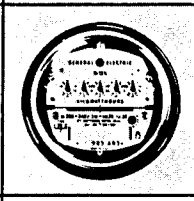
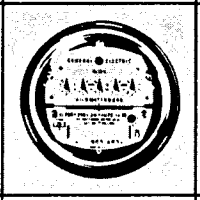
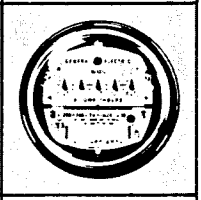
Reliability and performance through a total commitment to quality and innovative engineering

See why General Electric's ... leads the industry in stability, accuracy and long life.

Customer Benefits	Largest current coil cross-section low temperature rise	Body bound stator riveting (within stator and stator to frame)	Highest torque	Thermal and mechanical stabilization processes	Precise alignment of rotor bearings	Low friction long-life bearings
Long term stability						
Accuracy at half voltage						
Long term protection						
Resistance to temporary overloads						
Lowest starting watts						
Lowest watts loss						
Reduced maintenance						
Low temperature rise						

Check these features and compare benefits

I-70 Single-Phase Meter

Efficient stator design (pole piece, voltage flux return, excellent stator alignment)	Highly stable retarding magnets (improve resistance to knockdown due to high current surges, temporary overloads)	Aluminum frame shielding of retarding magnets	Excellent voltage compensation	Current limiting resistor in relief gap system	Magnetically stable suspension system
					
					
					
					
					
					
					

as proven by industry experience.

Surge protection — repeatedly!

The GE I-70/2 Current-Limiting Relief Gap system can offer protection from as many as 200 surges.

The Relief Gap is a dimensionally-controlled arc gap that carries the voltage transient to ground when a voltage "spike" apears at the meter, providing superior protection over the simple relief gap systems found on some other models.

In many of today's installations, the available power-follow current can exceed the capability of the simple gap. Tests show that meters with simple gaps can be adversely affected if available power-follow current exceeds 5000 amps. The design of the GE I-70/2 Current-Limiting Relief Gap system limits power-follow current to approximately 200 amperes, regardless of available power-follow current, and is therefore capable of repeated firings. Longer life of GE surge relief gaps helps reduce maintenance costs associated with replacement of the gap system.

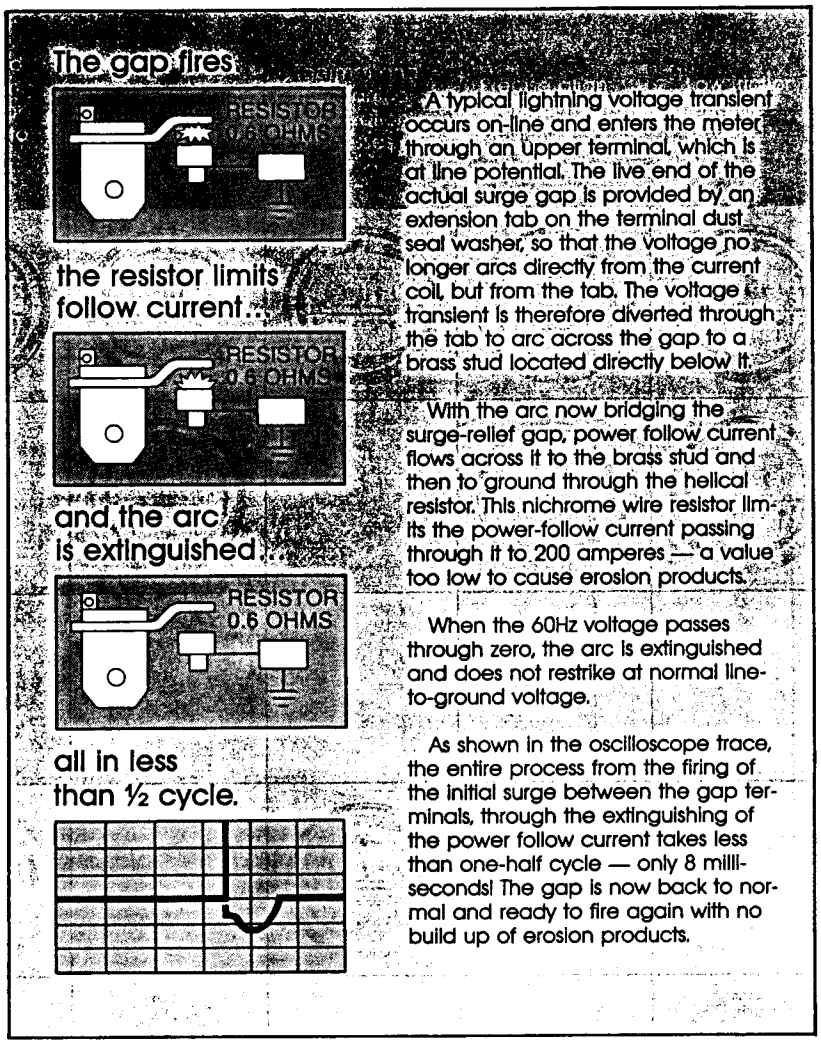


Figure 7.

Half-voltage accuracy

The I-70 maintains its accuracy at half-voltage (120V when calibrated at 240V). See Figure 8. Again, the I-70 proved superior to all competitors.

Accuracy at 120V when Calibrated at 240V

	FULL LOAD	LAG	LIGHT LOAD	WEIGHTED AVG $\frac{4 \times FL + LL}{5}$
GE I-70	− .01	− .40	− .21	− .05
Mfr X	+ .69	+1.94	−1.48	+ .26
Mfr Y	+ .56	− .40	+ .13	+ .47
Mfr Z	−1.73	+2.11	−2.48	−1.88

Figure 8.
Half-voltage accuracy comparison.

Key Design Factors Affecting Meter Performance

Lowest starting watts

"Starting watts" literally means the watts load required to start the meter rotor turning. For any load below the starting watts level, the utility loses revenue. Meters with the lowest starting watts create added revenue. Figure 5 shows that the I-70 meter is by far the best in this category.

Lowest watts loss during operation

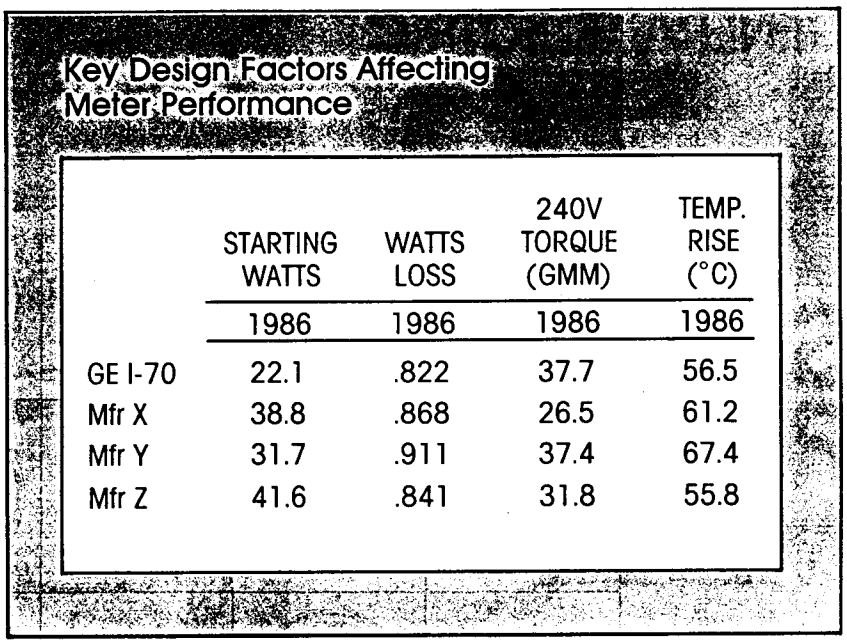
Because a watthour meter does not measure its voltage coil energy loss, utilities see voltage coil watts loss as a system loss. Voltage coil loss plus torque determine the quality of a watthour meter design. They show whether or not the manufacturer has designed an optimum meter — another measure of accuracy. Figure 5 illustrates the ratings for the GE I-70 versus three competitors. The GE I-70 meter is rated number one in watts loss.

Highest torque tested

The General Electric I-70's high torque level — highest of the four meters — also contributes significantly to in-service accuracy and to sustained in-service performance. All GE I-70 meters show high operating torque levels, especially at lighter loads where meters most commonly run. Figure 5 shows the GE I-70 to be number one in torque level.

Low temperature rise

Temperature rise is defined as the hot-spot rise in the meter current circuit, measured at class load (ANSI C-12.1, Test 12). The I-70 runs cool and cooler things last longer.



	STARTING WATTS	WATTS LOSS	240V TORQUE (GMM)	TEMP. RISE (°C)
	1986	1986	1986	1986
GE I-70	22.1	.822	37.7	56.5
Mfr X	38.8	.868	26.5	61.2
Mfr Y	31.7	.911	37.4	67.4
Mfr Z	41.6	.841	31.8	55.8

Figure 5.
General Electric's I-70 has consistently maintained the low starting watts, low watts loss, high torque and low temperature rise characteristic of the most efficient meter design.

Effects of temporary overloads

The ability to maintain high meter accuracy under all operating conditions depends on the stability of the meter magnet. Utilities are concerned about the possibility of the percent registration of their meters changing when subjected to short-circuit conditions.

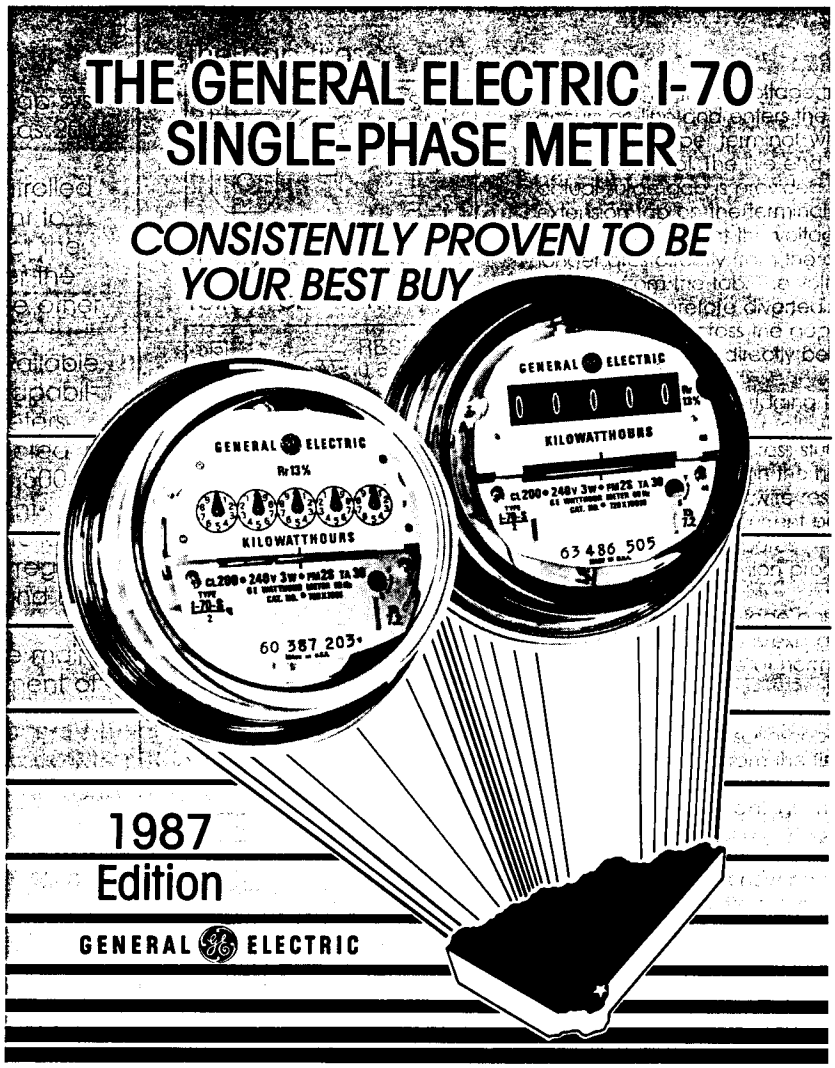
The GE I-70 meter offers outstanding resistance to the effect of temporary overloads, and shows superior performance not only at the ANSI C-12 requirements of 7000 amps peak but also at 9900 amps peak (Figure 6).

Full Load Deviation From Reference

	7000A PEAK	9900A PEAK
GE I-70	−.19	+.51
Mfr X	−.70	−.23
Mfr Y	+.34	+1.07
Mfr Z	+.37	+3.08

Figure 6.

GENERAL ELECTRIC I-70 SINGLE-PHASE METER



Measure these single-phase meter performance factors against the competition...

- Long-term stability
- As-received accuracy
- Lowest starting watts and watts loss, and low temperature rise
- Highest torque
- Temporary overload resistance
- Current-Limiting Relief Gap

. . . and it's no contest.

On line,
it's demonstrably best.
The General Electric I-70.

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GENERAL ELECTRIC

GEA-11484A
1/87 7.5M