MA-10
Portable Watthour Meter Standards

- **Displays energy in watthours**
- **Lightest portable standard available**
- **Totally autoranging inputs**
- **VARhour/Qhour models available**
- **Complete line of meter test accessories available**

DESCRIPTION

The MA-10 watthour standards are rugged, portable and specifically designed to test watthour meters, using the comparison method, in the field or the laboratory.

The MA-10 standards are engineered to meet the most stringent quality measurements in regard to accuracy, stability and reliability. They are one of the top selling, most accurate standards available.

Also, a complete line of test accessories are available to fully utilize the MA-10 standards for field and shop testing of solid state and induction meters.

APPLICATIONS

The standards provide a true watthour display with a Kh of 1 for the entire operating range. This feature allows for a much simpler percent registration calculation. Models with VARhour and Qhour capabilities are available for testing multifunction solid state meters.

The MA-10 series are totally autoranging on the potential input, current input and auxiliary power input. Totally autoranging inputs make it impossible to damage the unit by applying a signal to the wrong input. The three summing current inputs can be used to perform closed link testing.

FEATURES AND BENEFITS

- Autoranging potential, current and auxiliary power
- Backlit, six-digit LCD display
- Floating decimal point for direct reading in watthours
- Three current inputs support closed link testing
- Logic gate control to keep potential away from the operator, as well as a case ground terminal
- Models with VARhour and Qhour capabilities are available for testing multifunction solid state meters

ACCESSORIES

Accessories available to enhance functionality of the standards include:

(RM-1N) Solid State Meter Interface - a counter which automatically starts and then stops the test after it has counted the desired number of pulses from the meter

(RM-PCA) Computer Interface - link to a computer to utilize meter testing software

(RM-1S) Remote Reset Switch - a normally closed push button switch to further enhance the ease of use and safety of field testing

(RM-1H) Infrared Optical Pickup - used to sense the infrared pulses from the calibration LED found on most solid state meters

(RM-OA) Optical Adapter - used with solid state meters whose infrared calibration pulse is omitted from the optical communications port

(RM-KYZ) Pulse Input Adapter - used to sense the KYZ output pulses of induction type or solid state meters

(RM-DS) Meter Disk Sensor - a reflective pickup assembly used to sense the desk rotation of an induction type meter

(RM-1P) Electronic Light Valve - used to interface the output of the RM-1N Solid State Meter Interface

SPECIFICATIONS

Normal Operating Conditions

Input Voltage: 60 to 600 VAC (Autoranging)
Input Current: 0.2 to 50 Amps (Autoranging) 150 Amps max. when paralleling 3 inputs
Power Factor: See accuracy definition
Ambient Temperature: 68° to 86° F (20° to 30° C)
Relative Humidity: 0 to 95%
Auxilliary Power Voltage: 80 to 600 VAC (Autoranging)
Frequency: 48 to 62 Hz
Orientation: Unrestricted
Recalibration Interval: 365 days
Warmup Time: 30 seconds
Shock and Vibration: Any which is nondestructive

Input

Terminal: BNC, digital display gate

Output

Digital Display: 6-digit, LCD, 12.7 mm (0.5 in) high character with floating decimal point and LED backlight. Readout in Watthours, VARhours, Qhours.
Terminal: BNC
Pulse Value (Wh/pulse): 0.00001 200 Amp models - 0.00002

Influences Affecting Accuracy

Temperature:
±0.001%/ °C typical,
±0.003%/ ° C maximum to -20° to +70° C (-4° to +158° F)

Protection
Isolation: Complete: Input/Output/Power/Case/Control
Dielectric Withstand: 2.3 kVrms, 60 Hz, 60 seconds
Surge Withstand: IEEE 472 and ANSI 37.90
Fuses: Schurter #0342516 or Radian #3001000 for potential input and auxiliary power

Dimensions

7.5 H x 5.5 W x 5.5 D in.
(190.5 H x 139.7 W x 139.7 D mm.) excluding latches and strap

Weight

2.5 kg (5.5 lb) shipping weight
3.6 kg (8 lb) shipping weight

Shipping Dimensions

12 H x 9.75 W x 9.75 D in.
(305 H x 248 W x 248 D mm.)

Accuracy

All errors are in percent of reading at any combination of the normal operating conditions. Note that stability is included within the mxiumum accuracy specifications for Watthours, Qhours and VARhours. *Power factor is referenced to Watthours and it is also assumed that voltage is the reference vector.

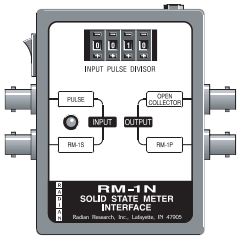
	Watthour	Qhour
At Unity Power Factor (0°)	±0.01% typ, ±0.05% max	±0.035% typ, ±0.1% max
At 0.5 Lag Power Factor (-60°)	±0.02% typ, ±0.05% max	±0.025% typ, ±0.1% max
At Power Factor P<0.5 Lag (ϕ between -60° and -90°)	±0.05% P maximum	

	VARhour
At 0.0 Lag Power Factor (-90°)	±0.025% typ, ±0.1% max
At 0.866 Lag Power Factor (-30°)	±0.035% typ, ±0.1% max

ACCESSORIES

Designed to meet field and shop testing applications, the RM-1N provides for totally automated testing of both solid state and induction meters. A compact electronic counter, the RM-1N controls the test by automatically starting the display of the standard and then stopping the display after it has counted a specified number of pulses.

The rate of output to input pulses can be set by selecting the appropriate input pulse divisor. In this manner, the duration of the test can be set with the input pulse divisor of the RM-1N.



Solid State Meter Interface
Cat. No. RM-1N

Shop Testing - the RM-1N will interface any solid state meter with existing calibration equipment. Input pulses are received via the RM-1H Optical Pickup. The output pulses of the RM-1N are fed into the optics assembly of a calibration test board. Interface to the test board's optics can be done via the RM-1P Electronic Light Valve or directly to a test board's open collector input (if available).

Field Testing - the output of the RM-1N, in field testing applications, is used to gate the display of any standard. The input pulses to the RM-1N are received via the RM-1H Optical Pickup. The RM-1H senses pulses from the infrared calibration LED found on most solid state meter designs. These infared pulses are then sent to the pulse input of the RM-1N to be counted.

TECHNICAL SPECIFICATIONS

Inputs:

Pulse Input: for RM-1H, RM-KYZ or RM-DS
RM-1S Input: to reset RM-1N and standard
Max. Input Frequency: 60 pulses per second
Outputs: Open Collector Output; for interface to standard or open collector input of test table RM-1P Output; for connection to RM-1P Electronic Light Valve
Accuracy: .0001% transfer error for life
Input Power: Internal 9V battery or 120V AC adapter (provided with unit)
Battery Life: Approximately 400-500 hours of operation

Remote Reset Switch

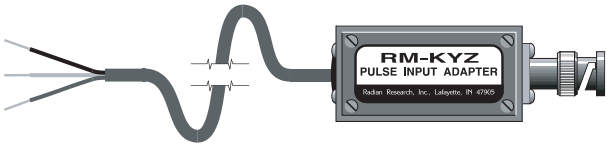
Cat. No. RM-1S

A normally closed push button switch to further enhance the ease of use and safety of field testing.

The MA-1S will connect directly to the input BNC of a MA-10 standard or to the MA-1S Input of the MA-1N Solid State Meter Interface. The switch of the MA-1S is hermetically sealed to provide increased reliability during field use. The push-button has tactile feel to provide instantaneous feedback of switch actuation.

Pulse Input Adapter

Cat. No. RM-KYZ

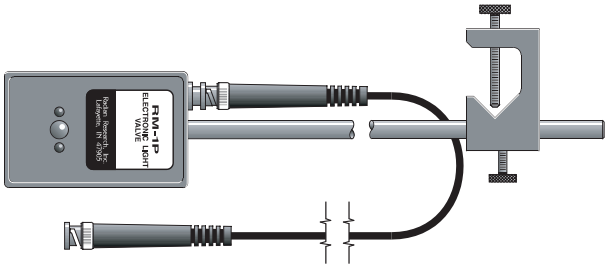


Used to sense the KYZ output pulses of induction type or solid state meters.

The pulses received from the meter's KYZ output are conditioned and fed into the input section of the RM-1N Solid State Meter Interface or the RM-109 Digital Watthour Comparator. With the RM-KYZ and the RM-1N or RM-109, testing of KYZ equipped meters is done automatically.

Electronic Light Valve

Cat. No. RM-1P

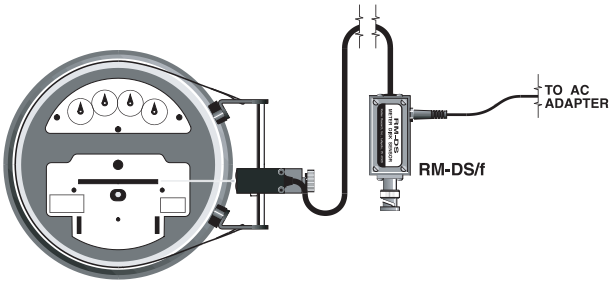


Used to interface the output of the RM-1N Solid State Meter Interface.

The RM-1P will operate with both incandescent and infrared optic assemblies. To trigger incandescent source optics, the RM-1P uses a super luminous LED. To trigger infrared (modulated or non-modulated) source optics, the RM-1P uses an infrared sensor and emitter combination. Using the RM-1P with the RM-1N and RM-1H, solid state meters can effectively be interfaced to older test board designs.

Meter Disk Sensor

Cat. No, RM-DS



A reflective pickup assembly used to sense the disk rotation of an induction type meter.

The pulses generated by the RM-DS are fed into the input section of the RM-1N Solid State Meter Interface or the RM-109 Digital Watthour Comparator. With the RM-DS and the RM-1N or RM-109, testing of induction type meters is done automatically and with a high degree of accuracy as compared to using a conventional push-button or snap switch.

Optical Adapter

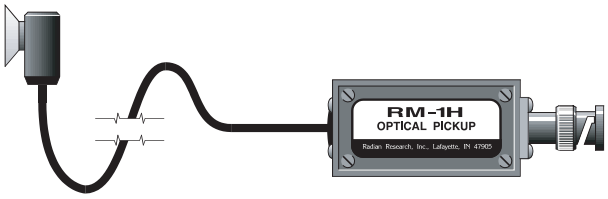
Cat. No. RM-OA

Used with solid state meters whose infrared calibration pulse is omitted from the optical communications port.

The RM-OA magnetically couples to the communication port of solid state meters. The suction cup of the RM-1H is attached to the clear polycarbonate cover of the RM-OA. The RM-OA incorporates a rare earth permanent magnet for exceptional holding power over the life of the product.

Infrared Optical Pickup

Cat. No. RM-1H



Used to sense the infrared pulses from the calibration LED found on most solid state meters.

The pulses from the RM-1H are fed into the input section of the RM-1N Solid State Meter Interface or RM-109 Digital Watthour Comparator. With the RM-1H and the RM-1N or RM-109, testing of solid state watthour meters is done automatically. The wide angular displacement of this sensor allows for fast, non-critical alignment. Also, automatic gain control circuitry of the RM-1Hv is also available for those solid state meters that have a visible calibration LED.

ORDERING INFORMATION

Item (Qty)	Cat. No.
Portable Watthour	
Standard (250-1,3 equivalent)	MA-10-01
200 Amp Standard	MA-10-02
Standard with I/O Port	MA-10-03
VARhour Standard	MA-10-06
VAR/Qhour Standard	MA-10-07
VARhour 200 Amp Standard	MA-10-08
VARhour/Qhour 200 Amp Standard	MA-10-09
Accessories	
Remote Reset Switch - 6' (BNC)	RM-1S
Remote Reset Switch - 9' (BNC)	RM-2S
Input Cable - 6' (BNC-BNC)	RM-1C
Input Cable - 9' (BNC-BNC)	RM-2C
Input Cable - 4' (BNC-BNC)	RM-3C
I/O Cable for Multifunction Standards - 3'	RM-7C
Optical Pickup for Infrared LED	RM-1H
Optical Pickup for Visible LED	RM-1H/v
Electronic Light Value	RM-1P
Solid State Meter Interface	RM-1N
Meter Disk Sensor/Field Mount	RM-DS/f
Meter Disk Sensor/Shop Mount	RM-DS/s
Meter Disk Sensor/Suction Mount	RM-DS/sm
Pulse Input Adapter	RM-KYZ
Optical Adapter for Meter Communications Port	RM-0A
Photo Counter Interface	RM-1A
Transit Container	RM-TC
Computer Interface	RM-PCA