Instructions Included

Instructions Included (Continued)

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Purpose & Scope

This instruction outlines general practices and procedures for the installation and wiring of standalone, electronic interface Hexagram STAR MTUs. *When installing an MTU, always refer to these instructions <u>in addition to</u> any specific instructions for the meter/MTU combination you will be installing and programming.*

> *Note:* STAR MTUs are shipped to the customer in sealed enclosures and have passed extensive testing and calibration procedures at the factory. No additional calibration or adjustment is required, or can be made, without breaking the factory seal. As calibrated, these devices radiate a tiny fraction of the power allowable by FCC *Radio Frequency Exposure Limits* 47 CFA CH 1.1310. There are no radio-frequency safety issues relating to the use of this product based on this regulation.

Recommended Supplies

We recommend the following supplies, for which quantities will depend upon the number of MTUs to be installed and the conditions encountered at each installation location.

Item	Hexagram Part Number	Quantity
AMP Tel-Splice, 2-conductor	043-1910	As needed
Scotchlok, UR 2-3 wire gel-filled butt connector	043-1913	As needed
3-conductor, 22 ga, solid wire, black UV jacket	070-0506	As needed
3-conductor, 22 ga, solid wire, grey UV jacket	070-0508	As needed
AA alkaline battery, 1.5 volt (for Psion)	042-0036	As needed
Back-up battery for Psion MTU Programmer	042-0037	As needed
3M DBR-6 Direct Burial Kit (for pit unit splices)	043-1912	As needed
Sealant — White RTV	084-0082	As needed
Black electrical tape		As needed
Tie-wraps, black		As needed
Staples, telephone type, 9/16" (Arrow T-25)		As needed
Sharpie permanent marker, fine point		As needed
Plastic masonry anchors #6 x 1", ¼" diameter		As needed
for use with Original Flatpak MTUs		
Hexagram plastic spacers	056-5155H1	As needed
Phillips exterior screws 8 x 2 ½" (deck screw)		As needed
Phillips exterior screws 8 x 3" (deck screw)		As needed
Drywall screws, #6 x 1-5/8" Phillips, coarse (for indoor use)		As needed
Drywall screws, #6 x 2" Phillips, coarse (for indoor use)		As needed
MTU spacer for pipe or bar mount	056-5155K	As needed
18″ heavy-duty UV-resistant tie wrap (for bar mounting gas MTUs)	067-0030	As needed
10-32 x 1½″ pan head machine screw (for bar mounting gas MTUs)	069-103248CS	As needed
10-32 nut, stainless steel (for bar mounting gas MTUs)	069-3011	As needed
#10 7/16" flat washer, stainless steel (for bar mounting gas MTUs)	069-3004	As needed
for use with NEW Compact Flatpak MTUs		
Long Spacers/Standoffs (for pit lid installations)	056-8150L	As needed
Short Spacers/Standoffs (for pit lid installations)	056-8150S	As needed
Phillips exterior screws 8 x 1 3/4" (deck screw)		As needed
Drywall screws, #6 x 1-5/8" Phillips, coarse (for indoor use)		As needed

Recommended Tools

- Cordless drill (⅜", variable speed, 1800-2000 rpm, adjustable torque settings)
- Drill bit, ¼", carbide tipped
- Drill bit, ¼" x 12", carbide tipped
- #2 Phillips power screwdriver bits
- Stapler for ¼" wire and cable (Arrow T-25M)
- Diagonal side cutters/wire cutters
- Needle nose pliers – small
- Wire stripper
- Connector crimping tool 3M 9EY
- Safety goggles
- Screwdriver, #1 Phillips
- Screwdriver, #2 Phillips
- Screwdriver, 5/16" slotted
- Screwdriver, ¼" slotted
- Screwdriver, small slotted, ⅛" blade
- Hammer
- Clipboard
- Flashlight with batteries
- Extension cord with trouble light
- MTU Programmer with cable, programming coil and STAR Programming Software

MTU Wiring

General - Many MTUs connect to the meter by means of a 3-conductor, 22-gauge solid conductor wire. The wire is housed in a PVC jacket with UV inhibitors. A black-jacketed wire is supplied on single-port MTUs and for port 1 of dual-port MTUs. A grey jacket is used for the port two input to dual port MTUs.

Wire Length – MTUs are provided with a standard wire length of 12 feet. Additional wire may be used if necessary. A maximum run of up to 500 feet can be used to position the MTU in a favorable location. Use like-colors for cable jackets and individual wires when extending MTU wiring.

Some specific meters may impose other wire length limitations. Consult the meter manufacturer.

Wire Routing - Wires should be attached to walls with 9/16" staples. If wire clearance holes are needed to route wire from the meter to the MTU, drill a ¼" hole using an appropriate drill bit. The installer is responsible for the selection of an appropriate location for any hole to be drilled.

Note: Wiring must be in accordance with all national and local codes.

Wire Protection - A drip loop below the MTU is not required.

Inspect wire to ensure that routing and stapling have not caused wire damage. Pull the wire lightly at each staple to make sure that the staple is not set too tightly.

Any splices made to wire must be suitable for the environment and made in accordance with national and local codes.

MTU Instructions
General Installation and Wiring Guidelines

They must be secure and made in accordance with the connection supplier's instructions. Generally, gel-filled Insulation Displacement Connectors (IDCs) such as 3M ScotchLok or AMP Tel-Splice connectors should be used on all wire-to-wire connections.

Splices located outdoors or in meter pits should be further protected through the use of a direct burial kit. This consists of a gel-filled plastic tube that houses the individual wire-to-wire splices to provide additional protection from the elements.

MTU Positioning and Mounting

General - MTUs must be positioned and mounted properly to ensure optimum RF signal propagation. Each MTU contains an internal antenna near the top front surface of the sealed enclosure. As a result, the MTU should always be mounted vertically and the STAR logo should face the installer.

Since MTU transmissions are similar in nature to cellular phone signals, a cellular phone can be used to help to determine if a location is suitable for MTU mounting. If the cellular phone signal drops dramatically or indicates no signal at the desired location, it is possible that the MTU signal will also be blocked at this location. In this case, the MTU will have to be mounted in a different location, possibly on the outside of the structure.

Keep the MTU away from all other electrical wires.

> *Note:* Do not mount the MTU under wiring such as Romex, AC power wires, cable TV wire, or telephone wire. Do not allow these wires to lay on top of, or in front of the MTU.

> *Note:* Keep the MTU six inches away from metal items such as pipes, conduit, electric meters, electrical boxes, and downspouts.

Make sure screws used to mount the MTU do not protrude and pierce or otherwise damage any wires, cables, or pipes.

Use of Spacer – There are two primary styles of MTUs. The Original Flatpak STAR MTU requires the use of a spacer (Hexagram Part Number 056-5155H1) when the MTU is mounted on any surface other than wood. The NEW Flatpak STAR MTU is a modified design that can be directly mounted to a variety of surfaces without the use of a spacer. See the examples below for additional information.

NEW Flatpak STAR MTU – An example of the NEW Flatpak STAR MTU is shown below. These MTUs are approximately 6.5" x 4.25" x 1.5" thick, and can be mounted on most surfaces without the use of a spacer.

Wood/Vinyl/Metal
← Siding or Brick →

Original Flatpak STAR MTU – An example of an Original Flatpak STAR MTU is shown below. These MTUs are 6.5" x 5.5" X 1" thick, and require a spacer if mounted on any material other than wood.

Wood
← Siding →

Non-Wood
← Surfaces →
(Vinyl/Metal
Siding or Brick)

1" Minimum
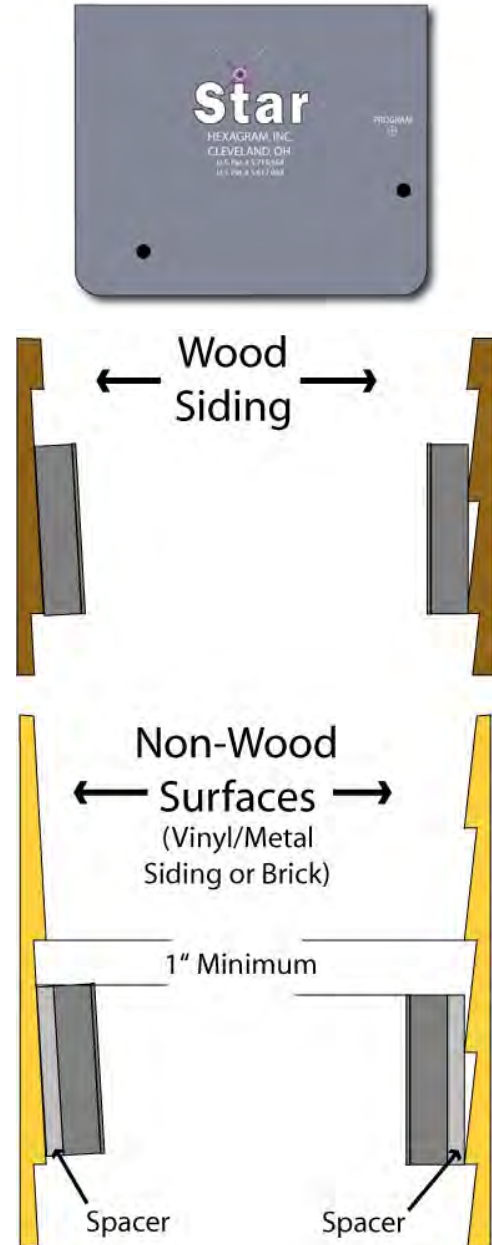
Spacer   Spacer

Note: Do not use a spacer when mounting an Original Flatpak STAR MTU on wood.

MTU Instructions
General Installation and Wiring Guidelines

Outdoor Mounting

MTUs mounted outdoors are typically mounted to the side of buildings, to a stationery post, to the piping surrounding the meter, or to a pit lid.

Mounting to a Buiding or Post

If the unit is being mounted to the outside of a building, the MTU will be connected to wires that lead from the inside to the outside of the building. If existing wire is used, it must be of the same quality as specified in *MTU Wiring*. It must also be in good condition, without breaks, damage, or corrosion.

Step 1 – Select a mounting location for the MTU that will allow optimum signal transmission.

Step 2 – Run wiring from the MTU to the meter. If a splice is required, it may be placed inside or outside. For special circumstances, contact your supervisor.

If using existing wiring, remove any box that houses the outside wires.

Step 3 – Mount the MTU on the side of the building.

- The MTU must be mounted level, vertically with the STAR logo facing the installer. Allow a 1" space between the top of the MTU and the overhang of the siding above it. **This is critical for proper radio signal transmission.**

- **Use a Spacer** (Hexagram Part Number 056-5155H1) if mounting an Original Flatpak STAR MTU on a non-wood surface.

⚠️	**CAUTION!**
	Do not over tighten screws. Excessive torque will crack the MTU enclosure. Do not tighten screws beyond the point that the MTU touches the mounting surface.

Step 4 – Make the appropriate connections to the meter. Refer to the specific MTU Instruction for the meter in use.

Bar or Pipe Mounting

Particularly in outdoor gas applications, it is sometimes convemient to mount the MTU to the connecting piping. With the Original Flatpak STAR MTU this is easily done using a bar-mount spacer and two 18" long tie-wraps, (See Recommended Supplies.)

Step 1 - Thread the tie-wraps into the bar mount spacer as shown here.

Step 2 - Attach the spacer to the MTU using #10-32 stainless steel screws, nuts and washers. Tighten the screws to 12 to 15 in-lb. On a standard drill driver with 0 to 24 torque settings, this is typically the #10 setting.

Step 3 - Wrap the tie wraps around the bar as needed, pulling the ties around (through the spacer plate) as they are tightened.

Step 4 - Adjust the MTU as needed and pull the tie wraps tight.

Step 5 - Trim off the excess tie wrap, leaving about a ½" tab.

Step 6 – Once Installation is complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

Pit-Lid Mounting

For water or gas meters located in meter pits, MTUs can be mounted to the lower surface of the pit lid if an approved, non-metallic pit lid is used. In these applications, the MTU is mounted with it's front surface facing the bottom surface of the lid, as shown below

Original Flatpak STAR MTU
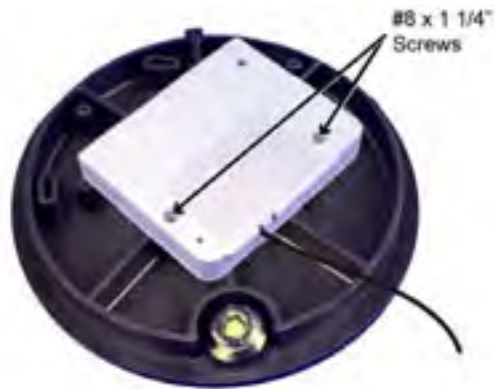
When NEW Flatpak STAR MTUs are mounted in this manner, spacers are used between the MTU mounting tabs and the lower surface of the pit lid, as shown below.

Revised Flatpak STAR MTU
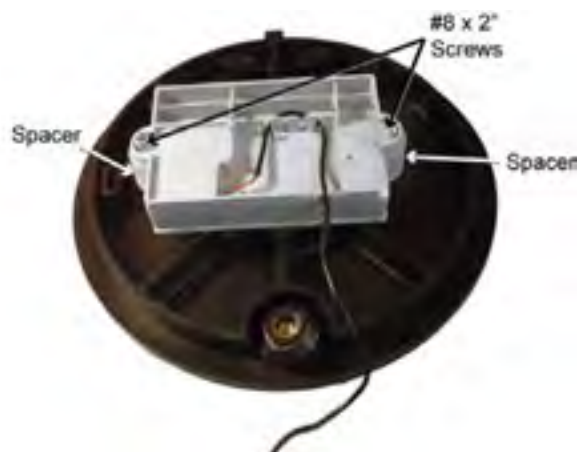
MTU Instructions
General Installation and Wiring Guidelines

A long spacer is available, for use when the lower surface of the pit lid is a flat, solid surface. A short spacer is used when the lower surface of the pit lid in use has a ribbed construction.

Contact Hexagram for information on approved non-metallic pit-lids.

Indoor Mounting

For an inside mount, mount the MTU vertically on a ceiling joist. It is important to mount the MTU as high as possible.

Note: The MTU must be mounted above grade.

Because the outside wall of a building can have metal siding or foil insulation, keep the MTU a few inches away from the outside wall. Transmissions easily pass through wood and masonry.

Do not install an MTU inside if the basement has a metal ceiling or foil-lined insulation in the ceiling or if it has foil on the sidewalls running from grade to ceiling. This will prevent the signal from transmitting effectively.

Large metal objects such as heating ducts, steel cabinets or metal ceiling structures can block MTU transmissions. Select locations that are at least five to ten feet away from objects such as these.

Do not mount the MTU if large metal objects, such as heating ducts, block both the front and rear of the MTU. If absolutely necessary, a single large metal object may be located several feet away from the MTU.

Unfinished Basement

Step 1 – Select a mounting location for the MTU that will allow optimum signal transmission. In unfinished basements, this is typically high on a ceiling joist, at least a few inches away from outside walls.

Step 2 – Mount the MTU.

- The MTU must be mounted level, vertically with the STAR logo facing the installer. Allow a 1" space between the top of the MTU and any overhang above it. **This is critical for proper radio signal transmission.**

- **Use a Spacer** (Hexagram Part Number 056-5155H1) if mounting an Original Flatpak STAR MTU on a non-wood surface.

CAUTION!
Do not over tighten screws. Excessive torque will crack the MTU enclosure. Do not tighten screws beyond the point that the MTU touches the mounting surface.

Step 3 – Run wiring from the MTU to the meter. Carefully staple the wire to the wall every 18" and at every change in direction using 9/16" staples. All turns are to be at right angles. If wire must be run on masonry, secure it with wire clips. Run wires parallel to the joist. If a joist must be crossed, run at a 90 degree angle. If the MTU input cable must be extended, use an appropriate splice. Make sure inner conductors are not nicked during stripping.

Step 4 – Make the appropriate connections to the meter. Refer to the specific MTU Instruction for the meter in use.

Finished Basement

Step 1 – Select a mounting location for the MTU that will allow optimum signal transmission. In Finished basements, this may be high on a ceiling joist in an unfinished section of the basement or high on an interior wall near a window or outside wall, but at least a few inches away from outside walls.

> *Note:* Ceilings may contain metal. Therefore, the MTU should be placed 2 to 3 inches down from a plaster or 'dropped' ceiling.

Step 2 – Mount the MTU.

- The MTU must be mounted level, vertically with the STAR logo facing the installer. Allow a 1" space between the top of the MTU and any overhang above it. **This is critical for proper radio signal transmission.**

- **Use a Spacer** (Hexagram Part Number 056-5155H1) if mounting an Original Flatpak STAR MTU on a non-wood surface.

> **CAUTION!**
> Do not over tighten screws. Excessive torque will crack the MTU enclosure. Do not tighten screws beyond the point that the MTU touches the mounting surface.

Step 3 - Run wiring from the MTU to the meter. Run all wiring behind the wall if possible. Carefully staple the wire to the wall every 18" and at every change in direction using 9/16" staples. All turns are to be at right angles. If wire must be run on masonry, secure it with wire clips. Run wires parallel to the joist. If a joist must be crossed, run at a 90 degree angle. If the MTU input cable must be extended, use an appropriate splice. Make sure inner conductors are not nicked during stripping.

Step 4 – Make the appropriate connections to the meter. Refer to the specific MTU Instruction for the meter in use.

MTU Instructions
General Installation and Wiring Guidelines

Do

- ✓ Do check your cell phone for presence of a strong signal before entering a building or basement. Do install the MTU if the signal remains strong at the installation location. (Note: This is a guideline only. It does not guarantee that the MTU will be received by the DCU. However, if cell phone service is affected by the location, it is possible that the MTU transmission will also be blocked.)
- ✓ Do select the best possible location for MTU installation that will allow optimum signal transmission.
- ✓ Do select a location for MTU installation that is above grade.
- ✓ Make sure that the MTU is located near an outside wall, but not on an outside wall.
- ✓ Make sure the MTU in installed within 500 feet of the meter.
- ✓ Do make sure that no staples have pierced the installation wire.
- ✓ Do mount the MTU vertically and level with the STAR Logo facing the installer.
- ✓ Do keep the MTU a few inches away from the outside wall in case of metal siding or foil insulation.
- ✓ Do use a spacer when mounting an Original Flatpak STAR MTU on any surface other than plaster or wood.
- ✓ Do use a spacer if you need to make a splice near the MTU and if the MTU is mounted outside.
- ✓ Do keep the MTU at least 6" (the width of the MTU) from all pipes, conduit, electric meters, electrical boxes, downspouts, dumpsters, garbage cans, water, electric and gas meters, etc.
- ✓ Do keep at least 4" between MTUs side to side and 3" top to bottom, when installing multiple MTUs.

- ✓ Do mount an MTU 2" to 3" below a plaster ceiling or the metal grid of a drop ceiling.
- ✓ Do use amp splices and 3M DBR Gel kits when making splices in pits.
- ✓ Do make sure the correct meter type and size is selected.
- ✓ Do make sure the MTU is programmed on.
- ✓ Do program the MTU as the last step. Make sure it is mounted, wired, all splices are completed and tucked into place and wires are stapled in place.
- ✓ Do follow all national and local codes when installing MTUs.
- ✓ Do inspect all splices, connections and wiring for damage.
- ✓ Do route all wires away from the MTU case.

Don't

- ✓ Don't install the MTU if the cell phone signal was strong outside the building or basement and then goes into "no service" or a very weak signal at the MTU installation site.
- ✓ Don't select a location for MTU installation that is easy to install, but will not allow for good signal transmission.
- ✓ Don't select a location for MTU installation that is below grade.
- ✓ Don't place the MTU under Romex, AC power wires, cable or TV wire, telephone wire, etc. Don't allow these wires to lay on top of or in front of the MTU.
- ✓ Don't mount the MTU right next to conduit or metal pipes.
- ✓ Don't over tighten the screws when mounting the MTU.
- ✓ Don't route the MTU wire along the top or front of the MTU.
- ✓ Don't mount the MTU near 2 or more metal objects such as heating ducts.
- ✓ Don't mount the MTU behind metal objects such as washers, dryers, furnaces, hot water tanks, metal sinks, metal shelves, dumpsters, garbage cans, water, electric or gas meters, or any other large metal objects.
- ✓ Don't mount the MTU in a basement that has metal ceilings unless there is an opening in the ceiling that is above grade where the MTU can be installed.
- ✓ Don't mount the MTU near electrical wires.
- ✓ Don't stack MTUs on top of each other (back to front).
- ✓ Don't install an MTU if the case is cracked or broken.
- ✓ Don't mount the MTU in the center of a basement.

- ✓ Don't make a connection or splice if any of the wires are nicked or cut. Re-strip the wire and start over.
- ✓ Don't damage insulation with staples, or by rough handling.
- ✓ Don't stretch wire when installing.
- ✓ Don't exceed 500 feet total wire length between the MTU and the meter.

Purpose & Scope

This instruction provides a procedure for installing a STAR direct-mount MTU on the following Rockwell/Equimeter/Sensus meters: **R175, R200, R250, R275, R310, R315, RT210.**

Rockwell/Equimeter/Sensus Gas Meter
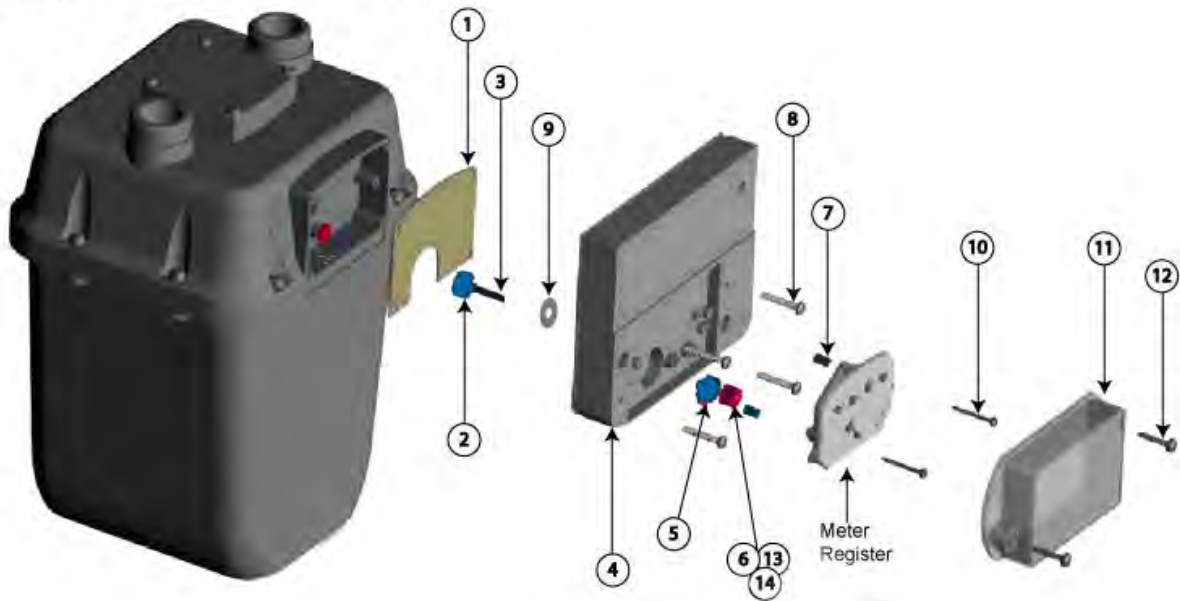
Parts Required

Ref. #	Item	Part Number	Quantity
1	Gasket (pre-applied to MTU)	066-5155C	1
2	Blue Coupler, MTU	056-5155E	2
3	Retaining Shaft, MTU	056-5155D	1
4	MTU, Direct Mount	per project	1
5	Magnet	036-0002	1
6	Gear, Blue, Standard	056-5155G4	1
7	#6 Round Spacer, Nylon	068-60812-EX	2
8	10-24 x 1 1/8" Slotted, Fillister Head Machine Screw	069-102436H	4
9	#10 Flat Washer, Acetal	069-3019	1
10	#6 x 1 1/4" Combo Panhead Sheet Metal Screw	069-060040C3	2
11	Register Cover, MTU	109-7712A	1
12	#10 x 3/4" Tri-lobular Screw	069-101424A2	2
13	Gear, Red, Extended	056-5155G3	1
14	Gear, Yellow, Odometer	056-5155G2	1

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Cordless drill ⅜", variable speed, with adjustable torque settings
- #2 Phillips bit
- Safety goggles
- Phillips screwdriver
- Slotted screwdriver

Installation Procedure

Before installing the MTU, anti-tamper, safety, and security hardware must be removed from the clear register cover.

Step 1 - Remove the existing clear register cover by removing the four screws. Discard the screws and cover.

Step 2 - Remove the register by removing the two screws. Set the register aside. Discard the screws.

Step 3 - Insert the four 10-24 x 1⅛" screws through the holes on the MTU as shown.
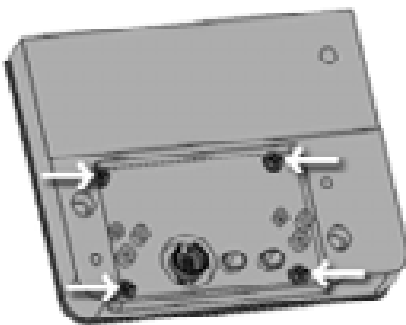
Step 4 – Turn the MTU over and insure that there is a pre-applied gasket on the back of the MTU as shown below.
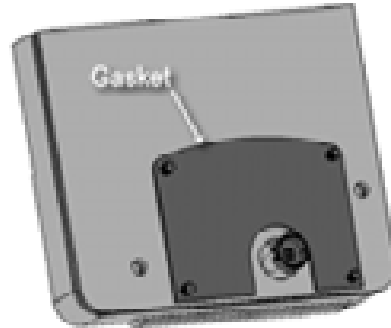
Note: Couplers are pre-assembled to the MTU. Insure that the couplers are firmly attached to the shaft and that the coupler on the front side of the MTU contains the magnet. Also, verify that the plastic washer is in place between the rear coupler and the MTU.

Step 5 - Position the MTU on the meter. Rotate the coupler so that the gear tooth on the coupler engages with the gear teeth on the gas meter. Orientation is not critical, but you should be able to feel the teeth "bite" when you turn the coupler from the front of the MTU.

Step 6 - Tighten the four 10-24 x 1-⅛" screws to 12 to 15 in-lb. On a standard drill driver with 0 to 24 torque settings, this is typically the #10 setting. Tighten corner to corner.

Step 7 - Check the coupler. It should have slight play — it should not bind or turn too freely.

Step 8 – Select gear to fit between the register and the MTU without binding. Typically, the correct gear can be selected based upon the type of index in use, as shown in the following table.

Type of Index	Coupler Drive Gear
Plastic, dial-type	**Blue** Gear (Part # 056-5155G4)
Brass, dial-type	**Red** Gear (Part # 056-5155G3)
Plastic, odometer-type	**Yellow** Gear (Part # 056-5155G2)

Place the selected gear into the coupling. The head of the pin on the gear needs to be facing out.

CAUTION!

Do not over tighten screws. Excessive torque may damage the MTU enclosure. **Power tools are not recommended for use on steps 9-12.**

Step 9 - On the register, insert the screws and spacers.
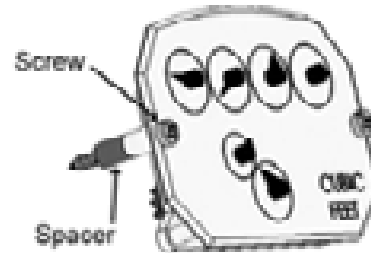
Note: Spacers may not be required with odometer-style registers.

Step 10 - Mount the register to the MTU, fastening it to the mounting holes shown below. **Hand tighten to a torque not to exceed 3-5 inch-pounds.** Make sure the index register gear and the MTU coupler gear are engaged.

Step 11 - After you feel engagement between the index register gear and the MTU coupler gear, tighten the register screws until they are snug.
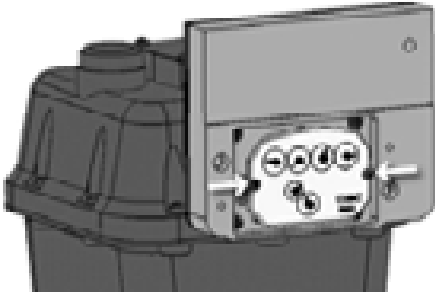
Step 12 - Place the new cover over the register so that the top label or arrow is on top and the vent holes are on the bottom. Align the cover with the mounting holes on the MTU, press it into place, and insert the #10 x 1" screws. **Hand tighten to a torque not to exceed 3-5 inch-pounds.** The gasket should be compressed slightly.

Step 13 - Replace any anti-tamper, safety, or security hardware onto the p-lastic cover as required.

Step 14 – Once Installation is complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

Purpose & Scope

This instruction provides wiring information for connecting STAR MTUs to any of the following popular water meters:

- AMCO and/or ABB water meters (all sizes) equipped with **Invision, Scancoder, RS Pulser, or Type A Industrial Pulser** registers and with the AMCO/ABB **V100 (PSMT)** meter and the **S130/5UM** hot and cold water meters.

- Neptune and/or Schlumberger water meters (all sizes) equipped with **ARB-V**, **Auto/ProRead or E-Coder PLUS** registers.

- Sensus and/or Invensys water meters (all sizes) equipped with **ECR** or **ICE** registers.

- Hersey water meters equipped with **Translator** or **ER2** registers.

- Badger water meters (all sizes) equipped with **Read-O-Matic**, **RTR** or **ADE** registers.

- Metron water meters (all sizes) equipped with **OER** registers.

Supplies and Tools Required

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

Step 1 - Select a mounting location for the MTU that will allow optimum signal transmission, and install any needed wiring. Be sure to follow all General Installation and Wiring Guidelines as outlined in **Publication 471-2000**.

Step 2 – Select the wiring diagram that applies to the meter you are connecting and make the appropriate wiring connections.

a. **Direct Wiring to Meter -** MTU wiring is supplied stripped to a standard length that fits water meters with screw terminals. Simply wrap the wires around the screw terminal and tighten the screw hand tight. Over tightening the screw can stress and possibly damage the wire.

b. **Water Meter with Integral Cable -** If the water meter is supplied with an integral cable and a cable-to-cable splice is necessary, use a gel-filled wire splice designed for outdoor (moisture applications) to seal the individual connections.

MTU Instruction
for Most Popular Water Meters

Note: When connecting a dual port MTU to a compound meter, connect port 1 (black jacket) to the primary, or high-flow register and port 2 (grey jacket) to the secondary or low-flow register.

Step 3 – Make a final visual check of the wiring from the MTU to the meter register. Verify that the cable routing is neat, secure and professional.

Step 4 – Once installation and wiring are complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

Wiring Diagrams

AMCO Invision

MTU Cable	Invision Register
Red	G (Green)
Black	B (Black)
White	R (Red)

AMCO/ABB Scancoder
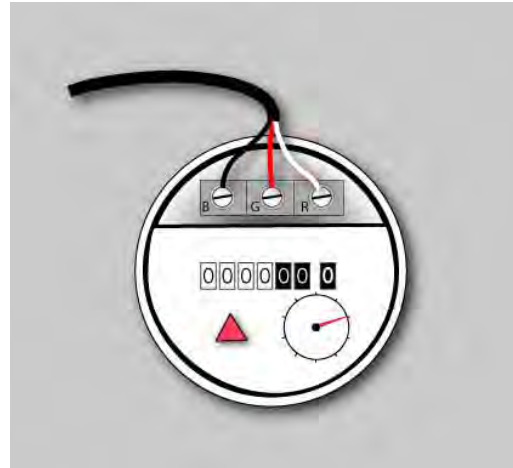
MTU Cable	Scancoder Register
Red	G (Green)
Black	B (Black)
White	R (Red)

AMCO/ABB RS Pulser

MTU Cable	RS Pulser Register
Red	R (Red)
Black	B (Black)
White	B (Black)
No Connection	G (Green)

AMCO/ABB Type A Industrial Pulser
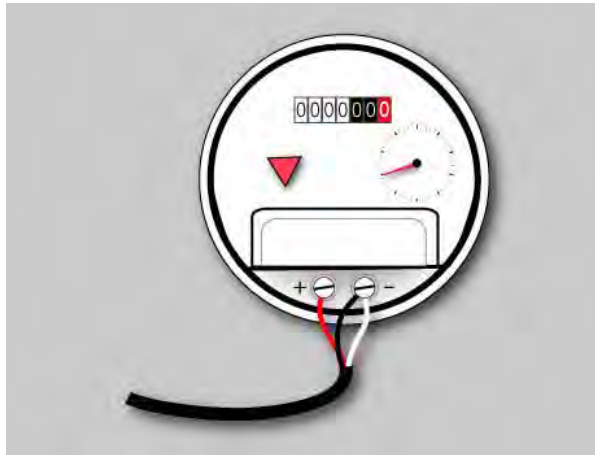
MTU Cable	Type A Industrial Pulser Register
Red	**+** Positive
Black	**−** Negative
White	**−** Negative

AMCO Digital Register
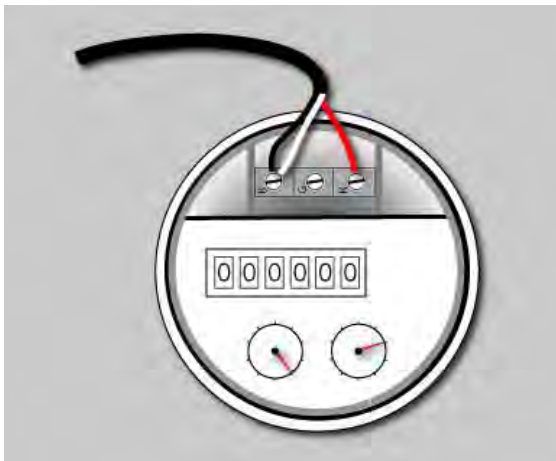
MTU Cable	AMCO Digital Register
Red	R (Red)
Black	B (Black)
White	B (Black)
No Connection	G (Green)

AMCO/ABB V100 (PSMT)
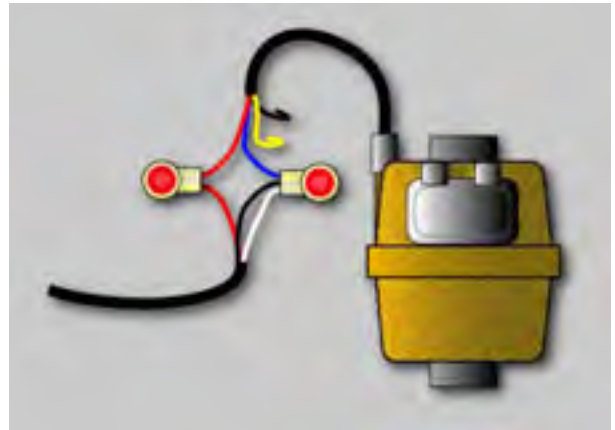
MTU Cable	V100 (PSMT) Cable
Red	Red
Black	Blue
White	Blue
No Connection	Black
No Connection	Yellow

AMCO S130/5UM Hot Water

MTU Cable	S130/5UM Cable
Red	Brown
Black	White
White	White

MTU Instruction
for Most Popular Water Meters

AMCO S130/5UM Cold Water
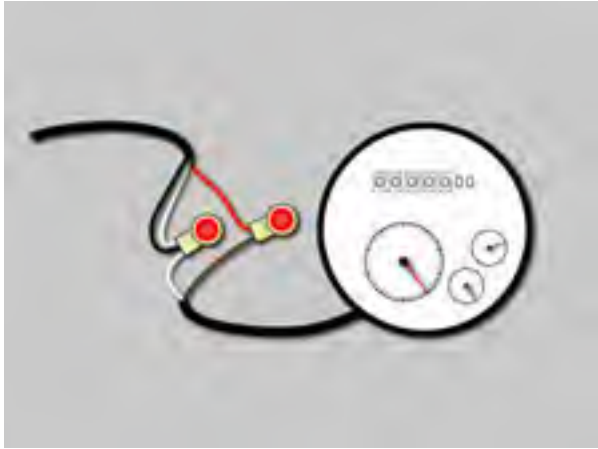
MTU Cable	S130/5UM Cable
Red	Brown
Black	White
White	White

Neptune/Schlumberger ARB-V or Auto/ProRead

MTU Cable	ProRead Register
Red	B (Black)
Black	G (Green)
White	R (Red)

Note: **Auto/ProRead** registers must be programmed for 3-wire mode.

Neptune/Schlumberger E-Coder PLUS

MTU Cable	E-Coder PLUS Register
Red	B (Black)
Black	G (Green)
White	R (Red)

Sensus/Invensys ECR or ICE
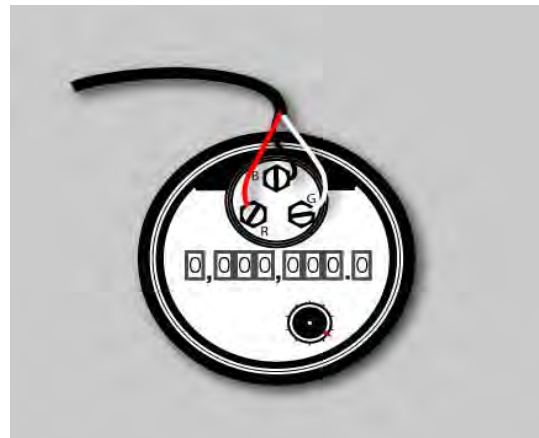
MTU Cable	Sensus/Invensys Register
Red	R (Red)
Black	B (Black)
White	G (Green)

Note: The 8-digit Sensus **ICE** Register must be programmed to deliver 6 consecutive digits of reading information for proper operation with STAR MTUs.
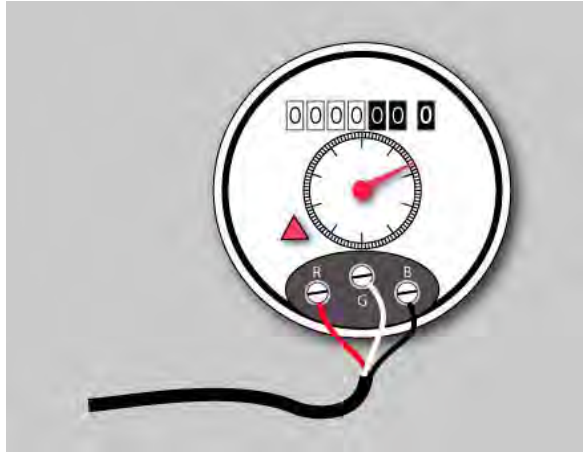
Hersey Translator

MTU Cable	Hersey Register
Red	R (Red)
Black	B (Black)
White	G (Green)

Note: The Hersey **Translator** Register must be programmed for 6-digit readings for proper operation with STAR MTUs.

Hersey ER2
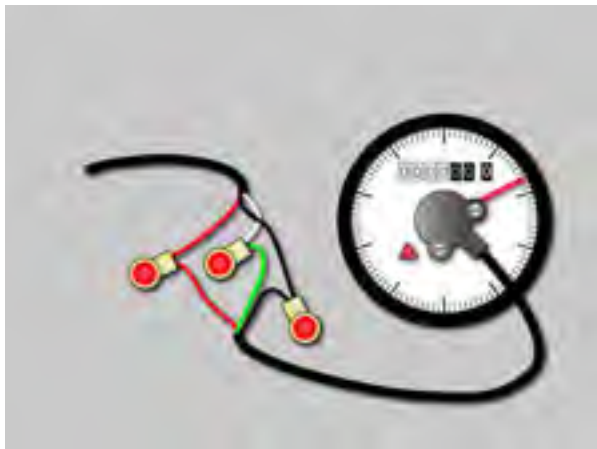
MTU Cable	ER2 Cable
Red	R (Red)
Black	B (Black)
White	G (Green)

Badger RTR
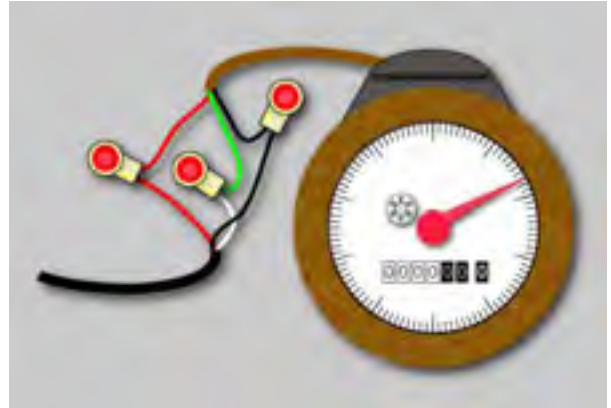
MTU Cable	RTR Cable
Red	R (Red)
Black	B (Black)
White	G (Green)

Note: Some **RTR** registers may be provided with only a black wire and a white wire with a shield. For this variation, Trim the shield off and connect as listed below.

MTU Cable	RTR Cable
Black	B (Black)
White	B (Black)
Red	W (White)
No Connection	White-Shield

MTU Instruction
for Most Popular Water Meters

Badger ADE
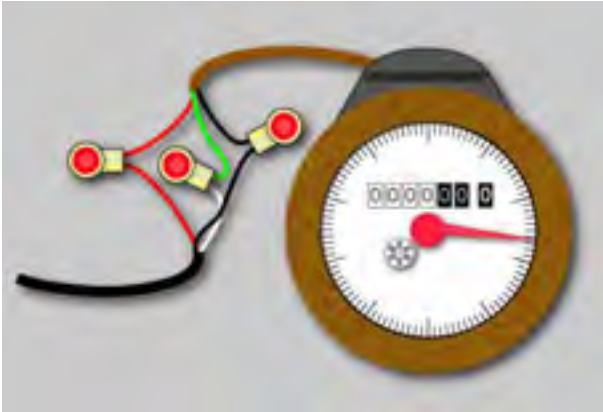
MTU Cable	ADE Cable
Red	R (Red)
Black	B (Black)
White	G (Green)

Note: The Badger **ADE** register must be programmed for 6-digit readings for proper operation with a STAR MTU.

Badger Read-O-Matic
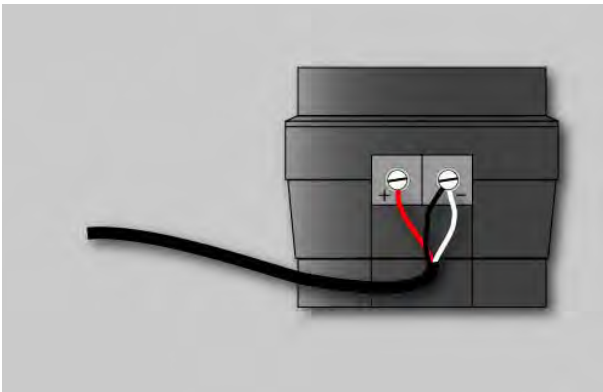
MTU Cable	Read-O-Matic Terminals
Red	**+** Positive
Black	**-** Negative
White	**-** Negative

Metron OER Register

MTU Cable	OER Cable
Red	R (Red)
Black	B (Black)
White	G (Green)

Note: The 5-digit Metron **OER** register must be configured for an additional trailing zero for proper operation with STAR MTUs.

Purpose & Scope

This instruction provides a procedure for installing a STAR direct-mount MTU on the following American Meter Company meters: **AC-175, AL-175, AT-175, AC-250, AL-250, AM-250, AR-250, AT-210/250, AT-350, AL-425, AC-630.**

American Meter Company Gas Meter

MTU Coupler Engagement to half-foot drive.

MTU Coupler Engagement to quarter-foot drive.

Meter Register

Parts Required

Ref. #	Item	Part Number	Quantity
1	Gasket	066-5155E	1
2	Coupler, MTU	056-5155E1	2
3	Retaining Shaft, MTU	056-5155D	1
4	MTU, Direct Mount	per project	1
5	Magnet	036-0002	1
6	#8 x 3/8" Combo Panhead Sheet Metal Screw	069-080012C4A	2
8	¼-20 x 1 1/4" Slotted Fillister Head Machine Screw	069-142040GA	2
9	Register Cover	109-7712A	1
10	#10 x 1" Combo Panhead Sheet Metal Screw	069-100032C3A	2

MTU Instruction
for American Meter Company Gas Meters

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Safety glasses
- Phillips screwdriver
- Slotted screwdriver

Installation Procedure

Before installing the MTU, all anti-tamper, safety, and security hardware must be removed from the clear register cover.

Step 1 - Remove the existing clear register cover by removing the four screws that hold it. Discard both the screws and the cover.

Step 2 - Remove the register by removing the two screws that hold it. Set the register aside. Discard the screws.

Step 3 - Mount the register onto the MTU, fastening the register to the mounting holes shown here with the #8 x 3/8" screws provided.

Start one of the two screws into the mounting hole, and then slide the register beneath the screw aligning the wiggler on the register with the MTU coupler.

⚠️	**CAUTION!**
	Do not over tighten screws. Excessive torque may damage the MTU enclosure. **Use of Power tools is not recommended.**

Then insert the second screw and tighten both screws to a torque not to exceed 3-5 inch-pounds.

Note: On some odometer-style registers like the one shown below, slight protrusions on the back of the register assembly can interfere with proper alignment of the register. Should this occur, use a diagonal cutting plier to trim the two wire guides on the MTU to the right of the coupler. Trim these guides as close to flush with the MTU enclosure as possible. (See MTU photo below.)

Odometer-Style Register - Front

Odometer-Style Register - Back

Protrusions

Trim Here

Step 4 – Check that the register is properly engaged by rotating the coupler on the back of the MTU and observing the register dials.

Step 5 – Next, Insert the two ¼-20 x 1 1/4" machine screws through the holes on the MTU as shown here.
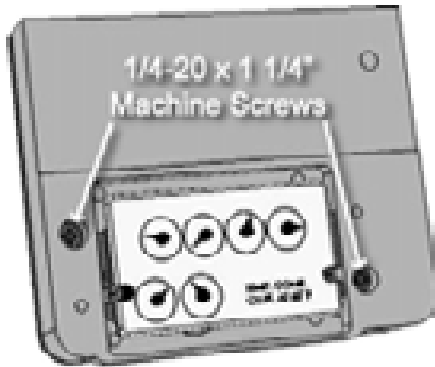
Step 6– Turn the MTU over and place the gasket on the back of the MTU so that it aligns over the two screws.
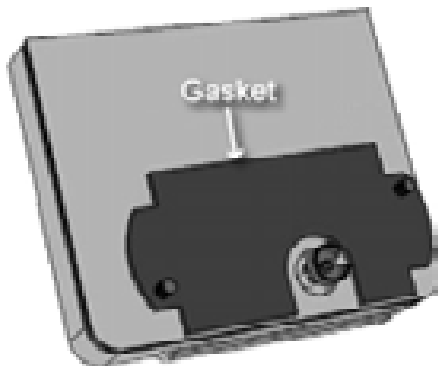
Step 7 – Next, position the MTU on the meter. Tighten the two ¼-20 x 1 1/4" mounting screws most of the way, and then rotate the register dials slightly to engage the wiggler on the gas meter. The wiggler must engage with the rear coupler on the MTU as shown in these illustrations. (Coupler shown detached from the MTU for illustration purposes only.)
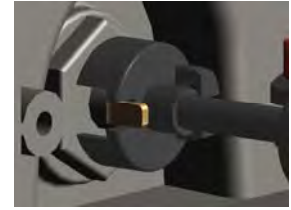
Half-foot Drive   **Quarter-foot Drive**

Step 8 – Now, firmly hand tighten the two screws to 12 to 15 in-lb. Be careful not to over tighten the screws. Excessive torque may damage the MTU enclosure. Because of this, power tools are not recommended for this procedure.
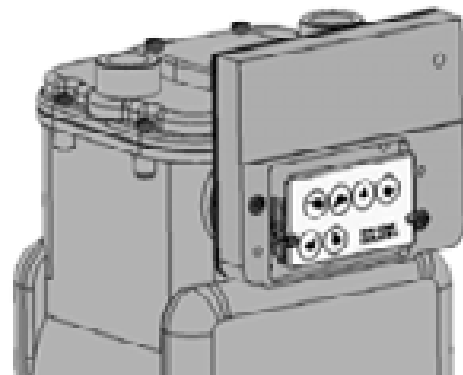
Step 9 - Check the coupling one more time. It should have slight play — it should not bind or turn too freely.

Step 10 - Place the new cover over the register so that the top label or arrow is on top and the vent holes are on the bottom. Align the cover with the mounting holes on the MTU, press it into place, and insert the #10 x 1" screws. Hand tighten to a torque not to exceed 3-5 inch-pounds. The gasket should be compressed slightly.

Step 11 – Replace any anti-tamper, safety, or security hardware onto the plastic cover as required.

Step 12 – Once Installation is complete, program the MTU using the STAR Programmer Software and your MTU Programmer.
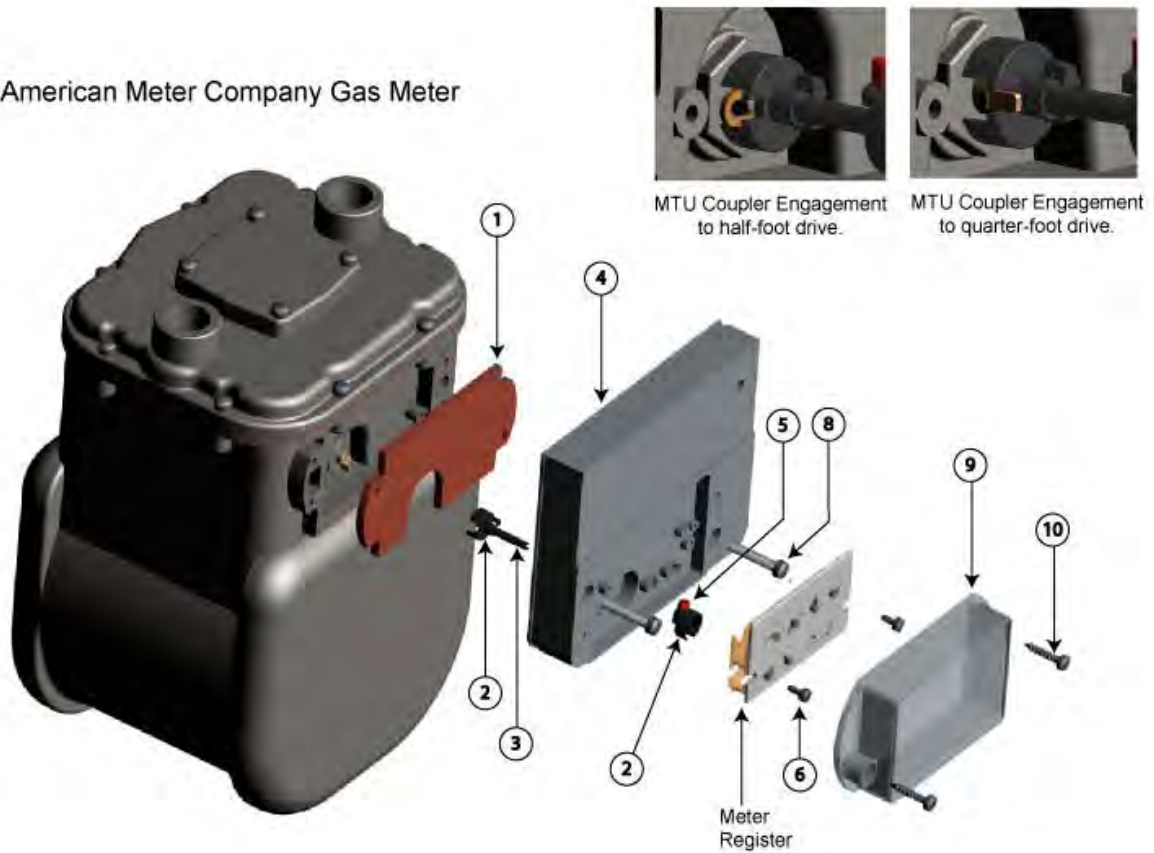
Purpose & Scope

This instruction provides a procedure for installing a STAR indirect-mount MTU on the following American Meter Company meters: **5B-225, 225.** Please also refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

American Meter Company Gas Meter

Wire to MTU

Drive foot engagement to half-foot drive.

Meter Register
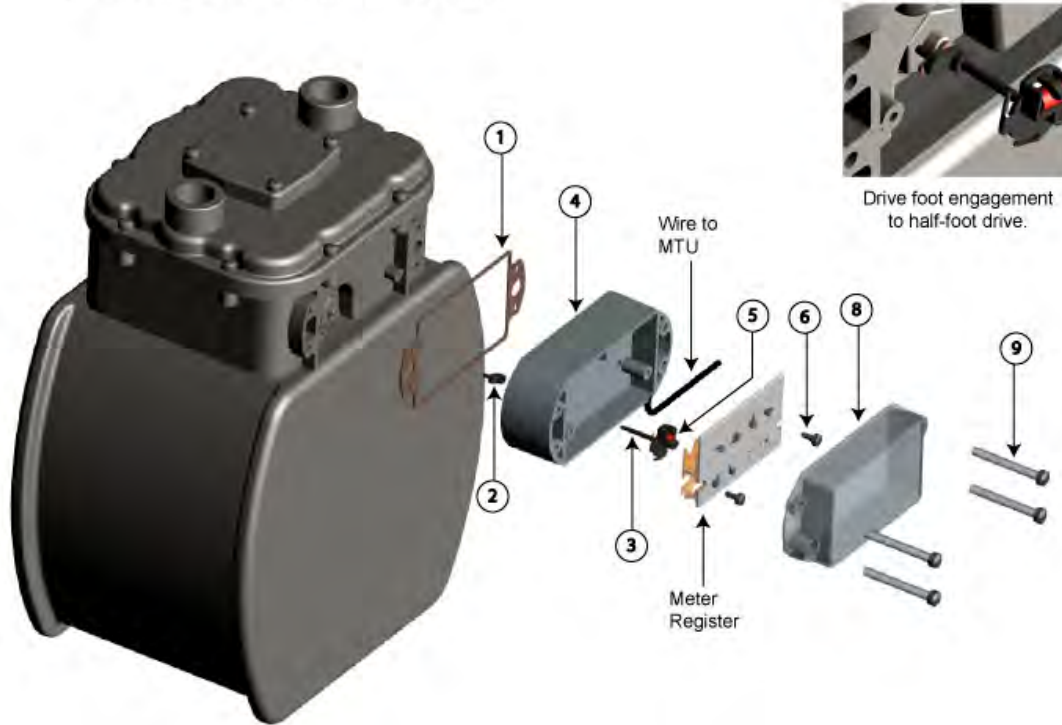
Parts Required

Ref. #	Item	Part Number	Quantity
1	Gasket	Part of Item 4	1
2	Drive Foot	Part of Item 4	1
3	Magnet Spyder	Part of Item 4	1
4	American Meter 225 Sensor	109-7393B	1
5	Magnet	036-0002	1
6	#8 x 3/8" Combo Panhead Sheet Metal Screw	069-080012C4A	2
9	¼-20 x 2" Slotted Fillister Head Machine Screw	069-142064HA	4
Not Shown	MTU, Indirect Mount	per project	1
Not Shown	MTU spacer for pipe or bar mount	056-5155K	1
Not Shown	18″ heavy-duty UV-resistant tie wrap	067-0030	2
Not Shown	10-32 x 1½″ pan head machine screw	069-103248CS	2
Not Shown	10-32 nut, stainless steel	069-3011	2
Not Shown	#10 7/16" flat washer, stainless steel	069-3004	2

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Cordless drill ⅜", variable speed, adjustable torque settings
- #2 Phillips power screwdriver bit
- Safety goggles
- Phillips screwdriver
- Slotted screwdriver
- 7/16″ nutdriver or boxwrench
- Diagonal side cutter

Installation Procedure

Installing the Sensor Assembly

Before installing the Sensor Assembly, anti-tamper, safety, and security hardware must be removed from the clear register cover.

Step 1 - Remove the existing clear register cover by removing the four screws. Set the clear register cover aside. Discard the screws.

Step 2 - Remove the register by removing the two screws. Set the register aside. Discard the screws.

Step 3 - If the meter has a stamped metal right angle drive foot (not a round plastic pin), verify that the nylon spacer washers are in place, as shown here.

Step 4 - If the meter has a stamped metal right angle drive foot, orient the drive foot of the index to the position of the magnet coupler of the sensor as shown. The index foot should be over the open or flat area of the coupler. It should not engage the elongated slot/hole in the magnet coupler. When properly installed, the magnet coupler will simply push on the outside of the index foot to rotate it.

Step 5 - If the meter has a round plastic pin, align the register to the American 225 Meter Adapter. The pin on the register must be in the hole in the coupler, as shown. Make sure the index foot rotates freely.

Step 6 - Place the wire into the channel to the right.

> ⚠️ **CAUTION!**
>
> Do not over tighten screws. Excessive torque may damage the MTU enclosure. **Power tools are not recommended for use on step 7.**

Step 7 - Fasten the register to the adapter with the two #8 x 3/8" screws provided. **Hand tighten to a torque not to exceed 3-5 inch-pounds.**

Step 8 - Rotate the adapter arm 180 degrees from the position of the meter indexer. An example is shown.

Step 9 - Mount register with adapter and the original plastic cover to the meter.

Step 10 - Attach the register and adapter assembly to the meter with the four ¼-20 x 2 fillister head screws. Tighten the screws to 12 to 15 in-lb. On a standard drill driver with 0 to 24 torque settings, this is typically the #10 setting.

Step 11 - Replace any anti-tamper, safety, or security hardware onto the cover as required.

Step 12 - Mount the MTU, following the wiring and mounting guidelines outlined in **Publication 471-2000**, *General Installation and Wiring Guidelines*. If necessary, the MTU cable can be extended up to 500 feet.

Note: If desired, you can mount the MTU on the supply line using the bar-mounting procedure below.

Step 13 – Once installation is complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

Bar-Mounting the MTU

Step 1 - Thread the tie-wraps into the MTU spacer as shown here.

MTU Instruction
for American Meter Company Gas Meters

Step 2 - Attach the spacer to the MTU using the provided screws and washers. Tighten the screws to 12 to 15 in-lb. On a standard drill driver with 0 to 24 torque settings, this is typically the #10 setting.

Step 3 - Wrap the tie wraps around the bar as needed, pulling the ties around (through the spacer plate) as they are tightened.

Step 4 - Adjust the MTU as needed and pull the tie wraps tight.

**Step 5 -** Trim off the excess tie wrap, leaving about a ½" tab.

Step 6 – Once Installation is complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

Purpose & Scope

This instruction provides a procedure for mounting a STAR Flatpak MTU to a **Carson Industries Model 1419-3 or 1419-5 pit lid**. This procedure does not detail the wiring of the MTU to the meter that may be encountered inside of the pit. Please refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* in addition to any meter specific MTU installation and programming instructions.

CARSON 1419-3   CARSON 1419-5

Parts Required

Item	Part Number	Quantity
MTU	As required for installed meter	1
¼" x 3 ½" Phillips flat-head stainless steel machine screw	Source locally	2
¼' Stainless Keps nut	Source locally	2
¼" Stainless flat washer	Source locally	2

Tools Required

To mount the MTU to these Carson pit lids, you will need the following tools and equipment:

- Drilling fixture for Model 1419 lids.
- Safety goggles
- #3 Phillips driver bit
- 7/16" Nut driver
- 17/64" standard drill bit
- MTU Programmer
- Cordless Drill 3/8", variable speed, with adjustable torque settings.

Note on setting the torque range: On a drill-driver that has about 20 settings (positions), set the adjustment to #6. Use the lower speed range of the drill-driver. This should amount to approximately 8 in-lbs of torque. Reference the operating instructions for your particular drill to more accurately determine what setting to use to achieve a torque range of approximately 8 in-lbs.

MTU Instruction
for Carson Industries 1419-3 and 1419-5 Pit Lids

Installation Procedure

Step 1 - Mount the drilling fixture onto either model of the Carson Pit Lid. The fixture is keyed so that it will align in only one direction.

Step 2 - Hold the fixture secure in position on the lid and drill two holes into the lid using the supplied 17/64" drill bit, through the guide holes in the fixture.

Step 3 - Remove the fixture from the lid.

Step 4 - Countersink the 2 holes using the supplied ¾" 82 degree countersink, only deep enough for the screw heads to be flush or slightly below the surface of the lid.

Step 5 - Insert 2 stainless screws through the holes drilled in the top side of the lid.

Step 6 - Turn the lid over and attach the FlatPak as shown below. Note the FlatPak orientation. The front side (with the STAR logo) must be placed against the bottom of the lid. Apply a ¼" stainless steel flat washer to each screw, then apply the ¼-20 stainless steel keps nut to each screw.

Step 7 - Tighten the hardware with the torque driver. Use the nutdriver or combination wrench to hold the nut if necessary. Tighten hardware just past snug.

⚠	**CAUTION!** Use no more than 12-15 in-lbs of torque. Do not over tighten hardware.

Step 8 - Turn the lid over and verify that the heads of the screws are flush or below the lid surface.

> ⚠️ **CAUTION!**
> Be sure to follow all General Guidelines outlined in Publication 471-2000 along with the specific wiring instructions for the meter being used.

Step 9 – Wire the MTU to the meter, folding and forming wires into valve box as necessary so that they do not interfere with lid locking mechanism and cannot become pinched.

Step 10 - Installation is now complete. You can now proceed to program the MTU using the STAR Programmer Software and your MTU Programmer.

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Purpose & Scope

This instruction provides a procedure for mounting a STAR Flatpak MTU to an **Armor Access brand rubber composite pit lid**. This procedure covers the mounting of an Original Flatpak STAR MTU or the New Flatpak STAR MTU to these pit lids. This procedure does not detail the wiring of the MTU to the meter that may be encountered inside of the pit. Please refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* in addition to any meter specific MTU installation and programming instructions.

Parts Required

Item	Part Number	Quantity
MTU	As required for installed meter	1
Long Spacers (for pit lid mounting of New Style Flatpak MTUs)	056-8150L	2 per New Style MTU installation
#10 x 2 1/2" Phillips Pan Head Type AB Stainless Steel Sheet Metal Screw		2 per New Style MTU installation
#10 x 2" Phillips Truss Head Type AB Stainless Steel Sheet Metal Screw		2 per Original Style MTU installation

Tools Required

To mount the MTU to these Armor Access pit lids, you will need the following tools and equipment:

- Safety goggles
- #3 Phillips driver bit
- Cordless Drill 3/8", variable speed, with adjustable torque settings.

Note on setting the torque range: On a drill-driver that has about 20 settings (positions), set the adjustment to #6. Use the lower speed range of the drill-driver. This should amount to approximately 8 in-lbs of torque. Reference the operating instructions for your particular drill to more accurately determine what setting to use to achieve a torque range of approximately 8 in-lbs.

MTU Instruction
for Armor Access Rubber Pit Lids

Installation Procedure

Mounting an Original Flatpak STAR MTU to an Armor Access pit lid.

Step 1 – If there is a recess on the bottom surface of the pit lid, place the MTU into the recess. If no recess, center the MTU as shown onto the inside surface of the lid.

Pit Lid with No Recess

Pit Lid with Recess

Step 2 - Attach the MTU to the pit lid with the 2" stainless sheet metal screws

through the recessed mounting holes as shown. Torque screws to approximately 8 in-lbs. MTU should be snug and flush to the surface of the pit lid.

Pit Lid with No Recess

Pit Lid with Recess

Step 3 – Wire the MTU to the meter, making sure that the wire is routed so that it does not become pinched when the lid is closed.

Step 4 - Installation is now complete. You can now proceed to program the MTU using the STAR Programmer Software and your MTU Programmer.

> **CAUTION!**
> Be sure to follow all General Guidelines outlined in Publication 471-2000 along with the specific wiring instructions for the meter being used.

Mounting a New Flatpak STAR MTU to an Armor Access pit lid.

Step 1 – Center the MTU as shown onto the bottom surface of the pit lid. Place plastic spacers under the mounting lugs on the MTU as shown below. Be sure to use the long spacers (Hexagram Part Number 056-8150L).

Step 2 - Attach the MTU to the pit lid with the 2 ½" stainless sheet metal screws through the 2 mounting holes and the spacers as shown. Torque screws to approximately 8 in-lbs. The MTU should be snug and suspended by the spacers above the bottom surface of the pit lid by approximately ½".

Step 3 – Wire the MTU to the meter, making sure that the wire is routed so that it does not become pinched when the lid is closed.

Step 4 - Installation is now complete. You can now proceed to program the MTU using the STAR Programmer Software and your MTU Programmer.

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Purpose & Scope

This instruction provides a procedure for installing **FORM 2s** and **FORM 12S Invensys Icon MTU/Electric Meter Assemblies.**

Supplies and Tools Required

Physical Installation of the ICON Form 2S and Form 12S MTU/Electric Meter Assemblies into compatible meter sockets can be accomplished without the use of tools.

Testing of the meter socket, however, may require specialized equipment. Check with the local electric utility for required testing procedures.
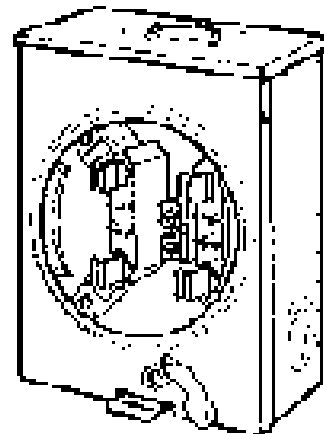
⚠️	**WARNING!** Be sure to follow all local safety procedures and do not touch the exposed electrical terminals in the meter socket. These terminals carry the full incoming service voltage. Touching these terminals may result in death or serious injury.

Installation Procedure

Step 1 – Complete all test procedures required by the local electric utility and verify that the meter socket has been correctly installed and wired.

MTU Instruction
for Invensys Icon MTU/Electric Meter Assembly

Step 2 – (For Form 12S meters only – Skip this step for Form 2S meters) The neutral-blade of the Form 12S meter can be moved. The figure below shows the rear of the meter base with the neutral-blade in the factory default, 9 o'clock position (referenced by looking into the meter socket.)
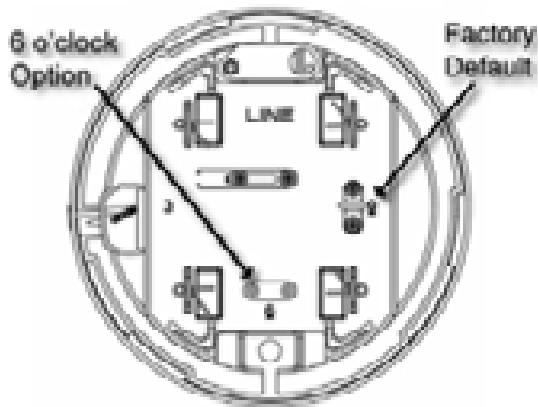
The neutral-blade can be moved to the 6 o'clock or 3 o'clock position to fit varying Form 12S meter sockets using a #1 Phillips screwdriver, as follows:

a. **Locate the configurable neutral-blade –** On the rear of the meter base, locate the configurable neutral-blade.

b. **Remove screws –** Remove the two screws on either side of the neutral-blade.

c. **Remove neutral-blade –** Remove the neutral-blade from its molded socket.

d. **Seat neutral-blade –** Seat the neutral-blade into the desired location.

Note: When replacing the screws, ensure that they are snug, and that the heads are flush with the neutral-blade.

e. **Replace screws –** Place the two screws in the new neutral-blade location.

Step 3 – Place the meter/MTU assembly into the meter socket, carefully aligning the contact blades with the corresponding jaws in the meter base.

Step 4 – Install a T-bar and /or any seals necessary to meet local requirements.

Step 5 – Make a final visual inspection to ensure that the meter/MTU assembly is seated and sealed properly.

Step 6 – Installation is now complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

When programming the integral MTU mounted in this meter, hold the programming coil above the top center of the meter, as shown here.

Purpose & Scope

This instruction provides procedures for installing and programmin STAR MTUs equipped with voltage or temperature sensing pulse adapters including the following: **501-7786P, 501-7786T, 501-7786-PP, 501-7786PR, 501-7786PT, 501-7786PT2.** Please also refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

Parts Required

Item	Part Number	Quantity
Submetering MTU with temperature sensing pulse adapter.	501-7786T	1 (As required)
Submetering MTU with voltage sensing pulse adapter.	501-7786P	1 (As required)
Dual-port Submetering MTU with voltage sensing pulse adapters.	501-7786PP	1 (As required)
Dual-port Submetering MTU with a voltage sensing pulse adapter and a reed switch input.	501-7786-PR	1 (As required)
Dual-port Submetering MTU with voltage and temperature sensing pulse adapters.	501-7786-PT	1 (As required)
Thermocouple, Type E, 20 gauge	071-0850	1 per temperature sensing port.
Wire Splice, 3M Scotchlok 314	043-1914	2 per temperature sensing port.
Cable Tie, 5.6", Black, UV	067-0007	3 per temperature sensing port.
Pressure Sensitive Hold-downs	067-0051	2 per temperature sensing port.
Drywall screws, #6 x 2" Phillips, coarse (for indoor use)	Source locally	2 per MTU
Plastic masonry anchors #6 – 12 x 1", ¼" diameter	Source locally	2 per MTU

MTU Instruction
for STAR Submetering MTUs with Pulse Adapters

Tools Required

- Crimping Pliers for Insulation Displacement Connectors (IDCs)
- Wire cutters/stripper
- Cleaner (non-residue type) and rag/paper towel
- Stapler for ¼" wire and cable (Arrow T-25M)

Introduction

STAR Submetering MTUs with Pulse Adapters provide accurate, high-resolution data for point-of-use allocation billing for a wide variety of HVAC appliances.

Note: Only on-off devices are suitable for application of these pulse adapter MTUs.

- **Voltage Sensing Pulse Adapters** can be applied to gas appliances that are controlled by a standard 24VAC gas valve.

- **Temperature Sensing Pulse Adapters** can be applied to gas water heaters, fireplaces and other HVAC appliances that do not have 24 VAC controls

These units produce an extremely accurate pulse at a rate of 10 seconds per pulse (0.1 Hz or 6 pulses per minute) when the specified input conditions (voltage or temperature) are met. These pulses are counted by the MTU which periodically transmits the accumulated count to nearby Data Collector Units.

Note: The submetering MTUs discussed in this instruction are for indoor use (dry locations) only.

Connecting Voltage Sensing (Type P) Inputs

Voltage Sensing (Type P) inputs are provided with a 2-wire connection that can be wired across (in parallel with) the 24 VAC gas valve solenoid of the furnace or other HVAC appliance.

Simply connect the **RED** and **BLACK** wires across the gas valve solenoid. Once connected in this way, a voltage of between 18 and 30 VAC applied across the valve solenoid will cause the MTU to begin pulsing and recording usage.

> **CAUTION**
> Do not connect the white wire of the MTU when connecting voltage sensing inputs. Cut the white wire back to the cable jacket. Connecting the white wire may damage the MTU.

Typical Furnace Application

This procedure covers a typical installation of a voltage/current sensing pulse adapter on a gas furnace.

Step 1 - Turn the furnace setting to "Pilot" so that it will not operate during the installation process.

Step 2 - Mount the MTU on a wall, joist or other convenient location near the furnace to be monitored. Run the cable from the MTU to the gas valve solenoid of the device. Trim or extend the MTU cable, as needed. Care must be taken to protect the cable from damage by hot surfaces or sharp sheet metal. Use insulated staples or cable ties as needed.

Note: Be sure to follow all General Mounting & Wiring Guidelines outlined in Publication 471-2000.

Step 3 – Connect the **RED** and **BLACK** leads from the MTU across (in parallel with) the 24 VAC control input to the gas valve. On most gas valves, these connections can be made at the terminals on the gas valve solenoid.

Step 4 – Program the MTU using the MTU Programmer as outlined in the *Programming* section of this document.

Step 5 - Return the furnace setting to "Run".

Connecting Temperature Sensing (Type T) Inputs

Temperature Sensing (Type T) inputs are provided with a two wire connection designed to be directly connected to a Type E thermocouple that is supplied with the temperature sensing MTU. When the thermocouple reaches a temperature of 110° - 130° C (230° - 265° F), the MTU will begin pulsing and recording usage.

By convention, Type E thermocouples are supplied with two color-coded leads.

- The **VIOLET** lead is the positive side and must be connected to the **RED** wire of the MTU Input Cable.

- The **RED** lead of the thermocouple is the negative side and must be connected to the **BLACK** wire of the MTU input cable.

Typical Hot Water Heater Application

This procedure covers a typical installation of a temperature sensing pulse adapter on a gas hot water heater.

Step 1 - Turn the hot water heater setting to "Pilot" so that the heater will not operate during the installation process.

Step 2 - Insert the copper thermocouple sleeve into the space under the draft-inducer cone at the top of the water heater. Position the tip of the thermocouple **INTO** the center of the flue as shown below. (½ to ¾ of an inch)
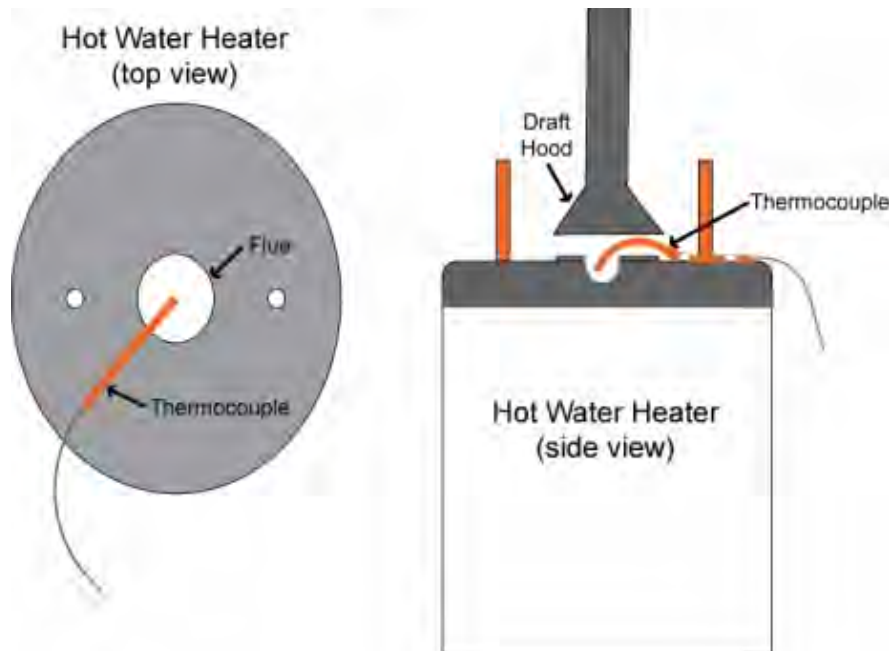
Gently shape the copper sleeve on the thermocouple so that it does not contact the metal surface of the draft hood or the top of the hot water tank as shown in the side view illustration.

Step 3 - Clean the surface area of the hot water heater under the thermocouple. Dry thoroughly. Locate and mount the two pressure sensitive hold-downs in the cleaned area. Locate one hold-down at the approximate center of the copper sleeve and the other at the very end so that they firmly anchor the thermocouple. Thread a cable tie through the slot in the hold-downs to fasten the thermocouple. If necessary, gently form the copper sleeve to facilitate mounting while insuring that the tip of the thermocouple is in the center of the flue and the copper sleeve is not in contact with metal surfaces.

Step 4 - After the thermocouple sleeve is secure, route the thermocouple wire near the inlet or outlet water pipe. Use the third cable tie to secure the thermocouple wire to the pipe as a strain relief.

Step 5 - Mount the MTU on a wall, joist or other convenient mounting location using two screws. Run the cable from the MTU to the end of the thermocouple wire. Trim excess MTU cable, as needed. Care must be taken to protect the cable from damage by hot surfaces or sharp sheet metal. Use insulated staples or cable ties as needed.

Note: Be sure to follow all General Mounting & Wiring Guidelines outlined in Publication 471-2000.

Step 6 - Splice the MTU wire to the thermocouple wire using the two IDCs provided.

- Connect the **VIOLET** thermocouple wire to the **RED** MTU wire.

- Connect the **RED** thermocouple wire to the **BLACK** MTU wire.

Do not remove the insulation from either the MTU wires or the thermocouple wires; the IDC is designed to pierce the insulation.

Step 7 – Program the MTU using the MTU Programmer as outlined in the *Programming* section of this document.

Step 8 - Return the hot water heater setting to "Run".

Typical Burner/Fireplace Application

This procedure covers a typical installation of a temperature sensing pulse adapter on a burner or fireplace.

Step 1 - Set burner or fireplace control so that the appliance does not come on during installation.

Step 2 - Fasten thermocouple so that the tip is near, but not in, the flame when the gas is burning. Use metal clamps or wire fasteners to secure the thermocouple. (NOTE: Clamps or wire fasteners are not provided by Hexagram. Individual installation conditions will determine the type of fastener to be used.) A location must be selected that allows the thermocouple tip to reach at least 130° C (400° F). However, the tip temperature must not exceed 350° C (660° F). If a pilot light is present, keep the thermocouple at least 6" away from the pilot flame.

Step 3 - Route thermocouple wire away from the appliance.

Step 4 - Mount the MTU on a wall, joist or other convenient mounting location well away from the heat source using two screws.

> ⚠️ **CAUTION**
>
> The MTU must be located away from the appliance and ONLY in a location that remains at room temperature.

Run the cable from the MTU to the end of the thermocouple wire. Trim excess MTU cable, as needed. Care must be taken to protect the cable from damage by hot surfaces or sharp sheet metal. Use insulated staples or cable ties as needed.

Note: Be sure to follow all General Mounting & Wiring Guidelines outlined in Publication 471-2000.

Step 5 - Splice the MTU wire to the thermocouple wire using the IDCs provided. Use a cable tie(s) to provide strain relief for the wiring.

- Connect the **VIOLET** thermocouple wire to the **RED** MTU wire.

- Connect the **RED** thermocouple wire to the **BLACK** MTU wire.

Do not remove the insulation from either the MTU wires or the thermocouple wires; the IDC is designed to pierce the insulation.

Step 6 - Secure the MTU wire. Verify that the MTU cable does not run near the burner and does not enter any region where the temperature will exceed 70° C (160° F).

Step 7 – Program the MTU using the MTU Programmer as outlined in the *Programming* section of this document.

Step 8 - Reset the burner or fireplace control so that the appliance can run.

Programming

Note: The 501-7786PT2 MTU requires Star Programmer Software version 6.0.0 and meter table version 3.85 or higher.

Step 1 - Turn on the Psion MTU Programmer by pushing **On/Esc**.

> *Note:* A "Communication Error" message may occur:
>
> - If an attempt is made to read and/or program the MTU and the MTU is receiving input from the gas appliance to which it is wired.
>
>   **OR**
>
> - If an attempt is made to read and/or program the MTU and there is a wiring error in the wiring between the MTU and the thermocouple.
>
> Verify that the gas appliance is off and that the thermocouple is correctly connected.

Step 2 - Highlight the STAR icon (in the Psion desktop screen) using the left/right arrow keys. Press **Enter**.

At this point, the STAR software loads along with the Meter table, Database table, and Appointment table. If these are loading for the first time, it may take several minutes. When complete, the serial number verification screen will appear.

MTU Instruction
for STAR Submetering MTUs with Pulse Adapters

Step 3 - A screen asking if the operator wishes to change the Psion's serial number is displayed.
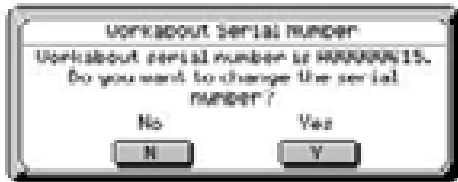
This number should match the last four digits of the serial number etched on the back of the Psion. Typically, select **N** to accept the serial number as is. Pressing **Y** will take the operator to a screen where the serial number can be changed, if necessary.

Step 4 – You are now at the logon screen.

Log on by entering the following information:

a - Operator: The Psion operator file will accommodate up to 99 separate operator user codes. This user code is "Install" followed by an assigned operator code. Enter your assigned code number immediately after "Install" without any spaces. Press Enter when finished. Example: Install6

b - Enter the password. This password will typically be assigned by a project manager. Press **Enter** when finished. Example: **Acme**

Note: Use the **DEL** key to backspace and make corrections.

NOTE: - At midnight, the software automatically resets to require re-entry of the log-on information. This is a security measure in case the Psion is lost or stolen.

Step 5 - The "Set Time & Date" screen is displayed.

Make any corrections to the time and date as required. Press **Enter** when finished. It is not necessary to reset the time if it is less than 5 minutes off.

Step 6 - The main menu of the STAR software is now displayed.

At the top of the screen the installer identification is displayed. The bottom of the screen has instructions for navigation. Most of the screens in the STAR software have this instruction feature at the bottom of the screen. The menu consists of options you can select, as described in the following table. The actual options you see will depend on the configuration of your system. Some choices may not be available on your system.

STAR Programming Software – Main Menu Choices

Menu Item	Function
Add MTU	Select this item when a new MTU is being connected to an existing meter.
Add MTU And Replace Meter	Select this item when a new MTU is being added **and** the current meter is being replaced.
Add MTU And Meter	Select this item when a new MTU and meter are being installed where no previous equipment existed.
Replace MTU	Select this when an existing MTU is being replaced and no meter changes are occurring.
Replace Meter	Select this when an existing meter is being replaced and no MTU changes are occurring.
Replace MTU And Meter	Select this when an existing MTU and meter are being replaced.
Reprogram MTU	Use this selection when reprogramming an MTU with no equipment changes.
Read MTU	Select this to read the current configuration information from an MTU.
Turn MTU Off	Select this to turn an MTU off, causing its transmissions to stop.
Operator log-off	To log off the STAR Programmer software, select this option and press **Enter**.
About STAR Programmer	Choose this menu option if you need to contact a customer service representative at Hexagram.

To select the desired programming mode, use the up/down arrow keys to scroll to the mode on the STAR program Main Menu screen and press **Enter**. Follow the instructions on the screen and enter the requested data. At any time before installation data is actually written to the MTU, the operator can cancel out of the programming operation by pressing **On/Esc**. The operator will be required to enter a reason as to why programming was cancelled.

Once programming has been successfully completed, the MTU will be turned on and will Start transmitting its wake up data to the DCU every five minutes. It will transmit for less than a second of every five minutes for forty-five minutes.

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Purpose & Scope

This instruction provides wiring information for use in connecting a STAR MTU to AMCO and/or ABB water meters (all sizes) equipped with **Invision, Scancoder, RS Pulser, Type A Industrial Pulser, or AMCO Digital** registers and with the **AMCO/ABB V100/PSMT** meter, and the **S130/5UM** hot and cold water meters.

Invision

MTU Cable	Invision Register
Red	G (Green)
Black	B (Black)
White	R (Red)

Scancoder

MTU Cable	Scancoder Register
Red	G (Green)
Black	B (Black)
White	R (Red)

Supplies and Tools Required

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

Step 1 - Select a mounting location for the MTU that will allow optimum signal transmission, and install any needed wiring. Be sure to follow all General Installation and Wiring Guidelines as outlined in **Publication 471-2000**.

Step 2 – Select the wiring diagram that applies to the meter you are connecting and make the appropriate wiring connections.

a. **Direct Wiring to Meter -** MTU wiring is supplied stripped to a standard length that fits water meters with screw terminals. Simply wrap the wires around the screw terminal and tighten the screw. It is recommended that the screws be tightened to no more than 4 – 5 in-lbs. Overtightening the screw can stress and possibly fracture the wire.

MTU Instruction
for AMCO and ABB Water Meters

b. Water Meter with Integral Cable - If the water meter is supplied with an integral cable and a cable-to-cable splice is necessary, use a gel-filled wire splice designed for outdoor (moisture applications) to seal the individual connections.

Note: When connecting a dual port MTU to a compound meter, connect port 1 (black jacket) to the primary, or high-flow register and port 2 (grey jacket) to the secondary or low-flow register.

RS Pulser

MTU Cable	RS Pulser Register
Red	R (Red)
Black	B (Black)
White	B (Black)
No Connection	G (Green)

Type A Industrial Pulser

MTU Cable	Type A Industrial Pulser Register
Red	**+** Positive
Black	**-** Negative
White	**-** Negative

AMCO Digital Register

MTU Cable	AMCO Digital Register
Red	R (Red)
Black	B (Black)
White	B (Black)
No Connection	G (Green)

Step 3 – Make a final visual check of the wiring from the MTU to the meter register. Verify that the cable routing is neat, secure and professional.

Step 4 – Once installation and wiring are complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

V100/PSMT
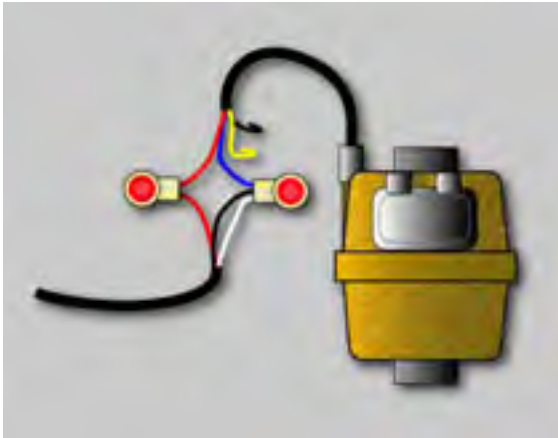
MTU Cable	V100/PSMT Cable
Red	Red
Black	Blue
White	Blue
No Connection	Black
No Connection	Yellow

S130/5UM Hot Water

MTU Cable	S130/5UM Cable
Red	Brown
Black	White
White	White

S130/5UM Cold Water

MTU Cable	S130/5UM Cable
Red	Brown
Black	White
White	White

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Purpose & Scope

This instruction provides wiring information for use in connecting a STAR MTU to **Neptune** and/or **Schlumberger** water meters (all sizes) equipped with **ARB-V, Auto/ProRead, or E-Coder PLUS** registers.

ARB-V or Auto/ProRead

MTU Cable	ARB-V or Auto/ProRead Register
Red	B (Black)
Black	G (Green)
White	R (Red)

Notes:

- **Auto/ProRead** registers must be programmed by the manufacturer for 3-wire mode.

E-Coder PLUS

MTU Cable	E-Coder PLUS Register
Red	B (Black)
Black	G (Green)
White	R (Red)

Notes:

- **E-Coder Plus** registers require a special purpose NTG MTU (Hexagram Part Number 501-11586D) to make use of the E-Coder's advanced leak, tamper and reverse flow detection capabilities.

MTU Instruction
for Neptune and Schlumberger Water Meters

Supplies and Tools Required

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

Step 1 - Select a mounting location for the MTU that will allow optimum signal transmission, and install any needed wiring. Be sure to follow all General Installation and Wiring Guidelines as outlined in **Publication 471-2000**.

Step 2 – Select the wiring diagram that applies to the meter you are connecting and make the appropriate wiring connections.

   a. **Direct Wiring to Meter -** MTU wiring is supplied stripped to a standard length that fits water meters with screw terminals. Simply wrap the wires around the screw terminal and tighten the screw. It is recommended that the screws be tightened to no more than 4 – 5 in-lbs. Over-tightening the screw can stress and possibly fracture the wire.

   b. **Water Meter with Integral Cable -** If the water meter is supplied with an integral cable and a cable-to-cable splice is necessary, use a gel-filled wire splice designed for outdoor (moisture applications) to seal the individual connections.

Note: When connecting a dual port MTU to a compound meter, connect port 1 (black jacket) to the primary, or high-flow register and port 2 (grey jacket) to the secondary or low-flow register.
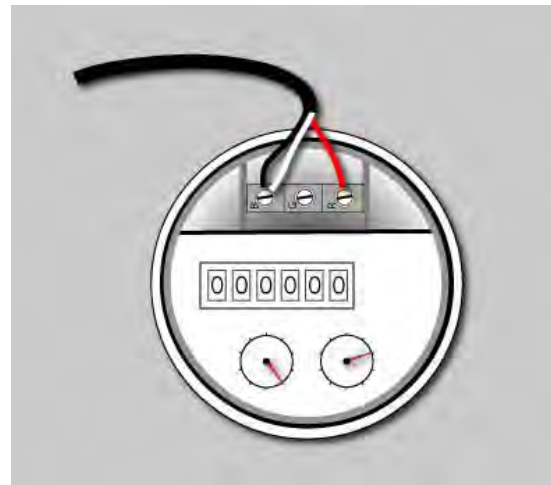
Step 3 – Make a final visual check of the wiring from the MTU to the meter register. Verify that the cable routing is neat, secure and professional.

Step 4 – Once installation and wiring are complete, program the MTU using the STAR Programmer Software and your MTU Programmer.
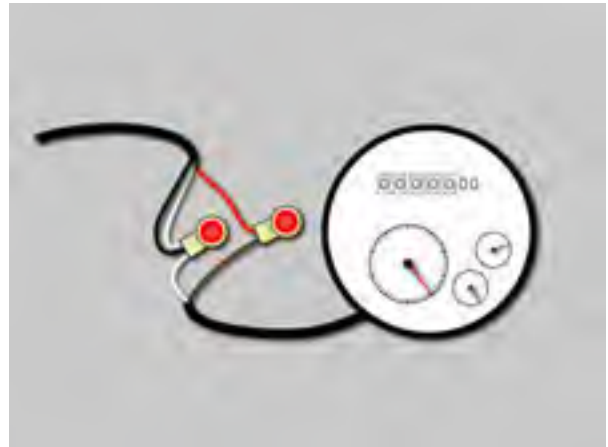
NTG MTU

The NTG MTU is a special purpose MTU designed specifically to support the advanced capabilities of Neptune's E-Coder solid-state register. This MTU provides the following special functions when coupled to an E-Coder Plus register and properly programmed.

   • **8-Digit Readings –** The NTG MTU reads and transmits the full 8-digit reading from the E-Coder at the programmed read interval, typically every 12 hours. A full range of read intervals are supported, including temporary read intervals for temporary monitoring purposes.

- **Alarm Polling –** The NTG MTU also automatically polls (reads) the E-Coder alarm indicators every 15 minutes. This happens automatically, independently of the standard read interval mentioned above. If the NTG MTU detects **any change in the alarm status** of the E-Coder Plus register, an alarm transmission is generated immediately, reporting the change in alarm status to the DCUs.

Compatibility with Neptune E-Coder Registers

Hexagram's NTG MTU is compatible with Neptune E-Coder Plus solid state registers revision 05.98 or higher.

Checking E-Coder Revision Level

To check the revision level of an E-Coder register, use your hand to block all light from striking the E-Coder's solar cell for approximately 20 seconds. Then, remove your hand allowing light to strike the solar cell. The E-Coder's display will briefly flash all 8s, and then reveal a display like that shown below.

The four digit number at the right of the display is the revision level. In the illustration above, the revision level shown is **05.98**.

Compatibility with Neptune ARB-V and ProRead Registers

Upon initial installation, an NTG MTU can also be used with meters equipped with Neptune's ARB-V or ProRead registers. These are standard absolute encoder registers without the advanced capabilities of the E-Coder register. When used with ARB-V or ProRead registers, the NTG MTU operates in standard mode, providing 6-digit readings and no specialized alarm polling.

Note: Auto/ProRead registers must be programmed by the manufacturer for 3-wire mode.

It is important to note that once an NTG MTU is programmed to function in the advanced mode with an E-Coder register, it can no longer be returned to standard operation. To caution the user, the display shown below will appear when first programming an NTG MTU for use with an E-Coder:

⚠️	**CAUTION!** Once an NTG MTU is programmed for use with an E-Coder it can no longer be used with other (non-E-Coder) registers.

MTU Instruction
for Neptune and Schlumberger Water Meters

Once the user selects **Yes** on the above screen and successfully completes programming the NTG MTU for use with an E-Coder Plus register, the NTG MTU can no longer be used with an ARB-V or ProRead register. From this point forward, only E-Coder meter types will be available for selection when programming this NTG MTU.

Error Codes

When an E-Coder meter type is selected while programming an NTG MTU with the MTU Programmer, the MTU attempts to communicate with the register using a special protocol that reads the status of the E-Coders leak, tamper and reverse flow detection indicators. If the MTU cannot successfully communicate with the register, an error code will be displayed on the MTU Programmer, as shown below.

Pressing **Enter** in response to this display will display the current settings for the MTU, including the error code, as shown below.
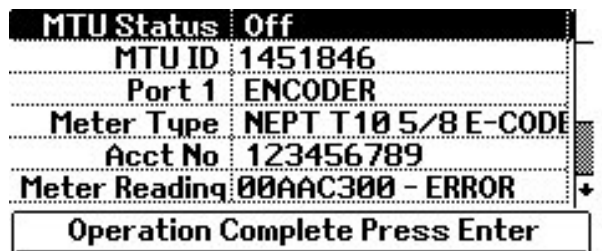
This error indicates one of the following problems:

- Attempting to use an E-Coder meter type with a register that is not an E-Coder.

- A defective E-Coder register.

- Improper wiring between the NTG MTU and the E-Coder. (Refer to Publication 471-2110 for E-Coder wiring information.)

Purpose & Scope

This instruction provides wiring information for use in connecting a STAR MTU to **Sensus** and/or **Invensys** water meters (all sizes) equipped with **ECR** or **ICE** registers.

ECR or ICE

MTU Cable	Sensus/Invensys Register
Red	R (Red)
Black	B (Black)
White	G (Green)

Supplies and Tools Required

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Application Notes

- The 8-digit Sensus ICE Register must be programmed to deliver 6 consecutive digits of reading information for proper operation with STAR MTUs.

Installation Procedure

Step 1 - Select a mounting location for the MTU that will allow optimum signal transmission, and install any needed wiring. Be sure to follow all General Installation and Wiring Guidelines as outlined in **Publication 471-2000**.

Step 2 – Select the wiring diagram that applies to the meter you are connecting and make the appropriate wiring connections.

a. **Direct Wiring to Meter -** MTU wiring is supplied stripped to a standard length that fits water meters with screw terminals. Simply wrap the wires around the screw terminal and tighten the screw. It is recommended that the screws be tightened to no more than 4 – 5 in-lbs. Overtightening the screw can stress and possibly fracture the wire.

b. **Water Meter with Integral Cable -** If the water meter is supplied with an integral cable and a cable-to-cable splice is necessary, use a gel-filled wire splice designed for outdoor (moisture applications) to seal the individual connections.

Note: When connecting a dual port MTU to a compound meter, connect port 1 (black jacket) to the primary, or high-flow register and port 2 (grey jacket) to the secondary or low-flow register.

MTU Instruction
for Sensus and Invensys Water Meters

Step 3 – Make a final visual check of the wiring from the MTU to the meter register. Verify that the cable routing is neat, secure and professional.

Step 4 – Once installation and wiring are complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

Purpose & Scope

This instruction provides wiring information for use in connecting a STAR MTU to **Hersey** water meters (all sizes) equipped with **Translator** or **ER2** registers.

Translator

MTU Cable	Hersey Register
Red	R (Red)
Black	B (Black)
White	G (Green)

Supplies and Tools Required

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Application Notes

- The Hersey Translator Register must be programmed for 6-digit readings for proper operation with STAR MTUs.

ER2
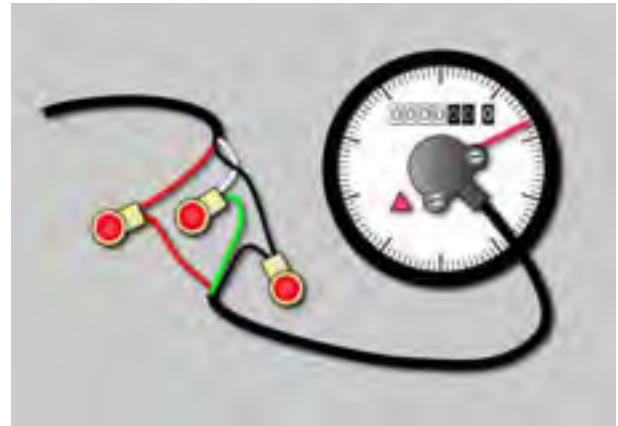
MTU Cable	ER2 Cable
Red	R (Red)
Black	B (Black)
White	G (Green)

Installation Procedure

Step 1 - Select a mounting location for the MTU that will allow optimum signal transmission, and install any needed wiring. Be sure to follow all General Installation and Wiring Guidelines as outlined in **Publication 471-2000**.

Step 2 – Select the wiring diagram that applies to the meter you are connecting and make the appropriate wiring connections.

a. **Direct Wiring to Meter -** MTU wiring is supplied stripped to a standard length that fits water meters with screw terminals. Simply wrap the wires around the screw terminal and tighten the screw. It is recommended that the screws be tightened to no more than 4 – 5 in-lbs. Overtightening the screw can stress and possibly fracture the wire.

b. **Water Meter with Integral Cable -** If the water meter is supplied with an integral cable and a cable-to-cable splice is necessary, use a gel-filled wire splice designed for outdoor (moisture applications) to seal the individual connections.

Note: When connecting a dual port MTU to a compound meter, connect port 1 (black jacket) to the primary, or high-flow register and port 2 (grey jacket) to the secondary or low-flow register.

Step 3 – Make a final visual check of the wiring from the MTU to the meter register. Verify that the cable routing is neat, secure and professional.
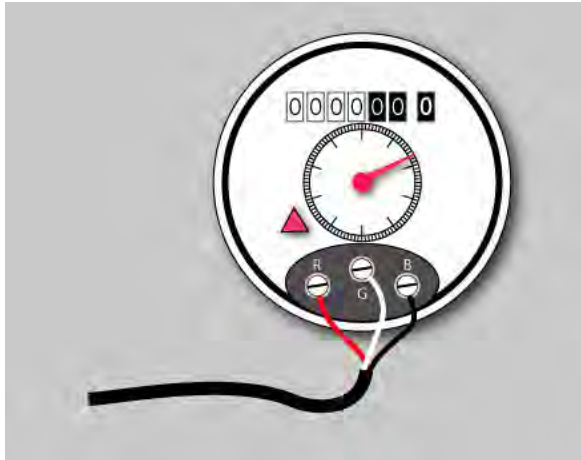
Step 4 – Once installation and wiring are complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

Purpose & Scope

This instruction provides wiring information for use in connecting a STAR MTU to **Badger** water meters (all sizes) equipped with **Read-O-Matic**, **RTR, or ADE** registers.

RTR

MTU Cable	RTR Cable
Red	R (Red)
Black	B (Black)
White	G (Green)

ADE
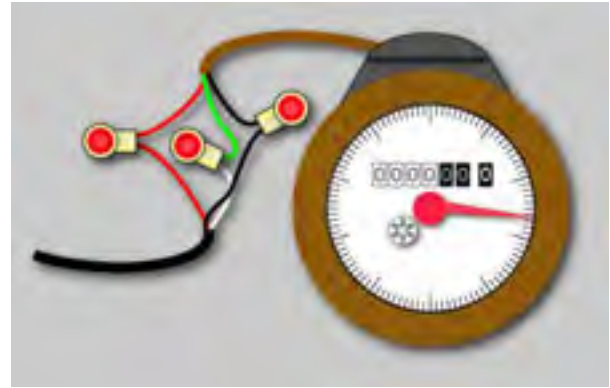
| MTU Cable	ADE Cable
Red	R (Red)
Black	B (Black)
White	G (Green)

Supplies and Tools Required

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Application Notes

- Some Badger **RTR** registers may be provided with only a black wire and a white wire with a shield. For this variation, Trim the shield off and connect as shown below.

MTU Cable	RTR Cable
Black	B (Black)
White	B (Black)
Red	W (White)
No Connection	White-Shield

- The Badger **ADE** register must be programmed for 6-digit readings for proper operation with a STAR MTU.

Installation Procedure

Step 1 - Select a mounting location for the MTU that will allow optimum signal transmission, and install any needed wiring. Be sure to follow all General Installation and Wiring Guidelines as outlined in **Publication 471-2000**.

Step 2 – Select the wiring diagram that applies to the meter you are connecting and make the appropriate wiring connections.

a. **Water Meter with Integral Cable -** If the water meter is supplied with an integral cable and a cable-to-cable splice is necessary, use a gel-filled wire splice designed for

outdoor (moisture applications) to seal the individual connections.

Note: When connecting a dual port MTU to a compound meter, connect port 1 (black jacket) to the primary, or high-flow register and port 2 (grey jacket) to the secondary or low-flow register.

b. **Direct Wiring to Meter -** MTU wiring is supplied stripped to a standard length that fits water meters with screw terminals. Simply wrap the wires around the screw terminal and tighten the screw. It is recommended that the screws be tightened to no more than 4 – 5 in-lbs. Overtightening the screw can stress and possibly fracture the wire.

Step 3 – Make a final visual check of the wiring from the MTU to the meter register. Verify that the cable routing is neat, secure and professional.

Step 4 – Once installation and wiring are complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

Read-O-Matic
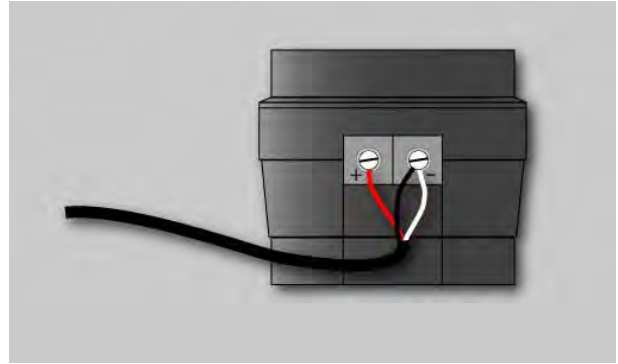
MTU Cable	Read-O-Matic Terminals
Red	**+** Positive
Black	**-** Negative
White	**-** Negative

Purpose & Scope

This instruction provides wiring information for use in connecting a STAR encoder-type MTU to a **Flow Metrix MLOG Sensor**.

Supplies and Tools Required

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

Step 1 – Mount the MLOG Sensor in accordance with the manufacturer's instructions.

Step 2 - Select a mounting location for the MTU that will allow optimum signal transmission, and install any needed wiring. Be sure to follow all General Installation and Wiring Guidelines as outlined in **Publication 471-2000**.

Step 3 – Connect the three wires from the MTU cable to the three wires of the MLOG cable as shown in the following table.

MTU Cable	MLOG Sensor
Red	R (Red)
Black	B (Black)
White	G (Green)

Use gel-filled wire splices designed for outdoor applications to seal the individual connections. For pit installations, seal and enclose the three individual connections using a direct burial splice kit to complete the waterproof splice.

Note: If the MLOG sensor is connected to a dual port MTU along with a meter, the meter should be connected to port 1 and the MLOG Sensor should be connected to port 2. For a dual port MTU, port 1 is the black jacketed cable and the port 2 cable has a grey jacket.

Step 4 – Make a final visual check of the wiring from the MTU to the MLOG Sensor. Verify that the cable routing is neat, secure and professional.

Step 5 – Once installation and wiring are complete, program the MTU using the STAR Programmer Software and your MTU Programmer. During programming, select "**MLOG LEAK DETECTOR**" as the meter type and set the read interval to 6 hours.

Note: The read interval for the MTU connected to the MLOG Sensor MUST be set for 6 hours.

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Purpose & Scope

This instruction provides a procedure for use in connecting a STAR MTU to an **IMAC Pulsimatic Transmitter** and installing the Pulsimatic Transmitter on a **Rockwell/Equimeter Model 750-10000** Intermediate or Large Capacity Diaphragm Gas Meters. Please also refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

Parts Required

Item	Part Number	Quantity
IMAC Pulsimatic Transmitter for Rockwell/Equimeter Model 750-10000 Intermediate and Large Capacity Diaphragm Gas Meters. One pulse per revolution.	035-8150A	1
IMAC Mounting Hardware - Rockwell	069-8150F	1
Index Cover without security cap bosses ***NOTE:*** This item is needed only if the existing Index Cover has the security cap bosses. If the existing Index Cover does not have the security cap bosses, it can be reused.	056-5155D	1
MTU, Reed/Weigand Pulse	501-6327R[1]	1

[1]   Any STAR MTU with an available Type R Port may be used for this installation.

MTU Instruction
for Rockwell/Equimeter Model 750-10000 Gas Meters

Tools Required

- Slotted (Flat-blade) screwdrivers in the following blade tip width sizes: 5/32" narrow-blade, 9/32", and ½". If desired, use torque driver, 10 foot-lb. range.
- ½" combination (hand) wrench or socket/ratchet wrench. A torque wrench is recommended (30 inch-lb. range).
- 8" adjustable wrench.
- 5/16-18 blind-hole (bottoming) tap and mating size T-handle.
- Canned compressed air.

Also see Publication 471-2000, General Installation and Wiring Guidelines for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

There are two parts to this procedure. First, the MTU must be wired to the IMAC Pulsimatic Transmitter (IPT). Once this is complete, you can then install the Pulsimatic Transmitter onto the Rockwell gas meter.

Wiring the MTU to the Pulsimatic

Step 1 – Unpack all of the components required to install the IPT. This should include the IPT itself, gasket and a hardware kit that includes (2 each) brass threaded rods, stainless flat-washers and hex nuts.

Step 2 - When wiring to the IPT, support the IPT off of the work surface on the outside (topside) of its base so that pressure is not applied to the center drive shaft. Remove the cable clamp (screw) from inside the base.

Step 3 – Trim the stripped ends of the MTU cable to ¼" or slightly shorter. When inserted into the terminal block, only a small amount of bare wire should be visible. Bare wire should not extend beyond the walls of the terminal block. This will present a shorting potential.

Step 4 – Feed the MTU input cable through the sealtight strain relief in the base of the IPT. Loop the cable so that stripped ends of the wires can be easily inserted into the terminal block screws. The screws should already be open enough. Place cable clamp over the wire as shown.

Step 5 – Insert the BLACK and WHITE wires into the COM terminal screw. Tighten the screw.

Step 6 – Insert the RED wires into the NC BLU terminal screw. Tighten the screw.

Step 7 – Pull most of the slack out of the cable (leave a slight amount of slack) and reattach cable clamp as shown below. **DO NOT** pull the cable taut.

Step 8 – Tighten the nut on the sealtight strain relief. You will need to tighten the nut almost fully down (as shown) before it will bite on the MTU cable.

Step 9 – Check that all wired terminal block screws are tight.

Step 10 – Depending on the installation location, you may be able to mount the MTU at this time. During installation, the IPT body should be supported so as not to hang (apply tension) on the MTU cable. During the installation, do not allow the heavier body of the IPT to suddenly jerk the MTU cable as this could potentially damage the cable internally.

Step 11 – Install the MTU into its intended location per the recommended procedure found in the standard Hexagram MTU installation manual.

Installing the Pulsimatic Transmitter

Step 1 – If necessary, remove tamper seals that cover the index cover screws. Loosen and remove screws securing the index cover. You may discard these screws as they will not be re-used. Remove the cover. If the cover has the tamper seal bosses, this cover will be need to be replaced.

Step 2 – Loosen and remove the screws securing the index to the index plate. **_Save these screws_** as they will be re-used. Remove the index and set aside.

Step 3 – If the index cover screws were difficult to remove, the threads in the index plate may need to be cleaned out before installing the hardware that retains the IPT. Use the blind-hole tap to carefully clean out/ clean up the threads of the (2) cover holes. Blow out the holes with compressed (canned) air.

NOTE: It is not necessary to clean the index mounting-hole threads as these holes are not reused.

Step 4 – Thread the (full thread) ends of the securing studs (2) into the index cover screw holes of the index plate. Lightly snug the studs by grasping them by the flat that is machined into the top of the stud. Apply the gasket over the studs as shown.
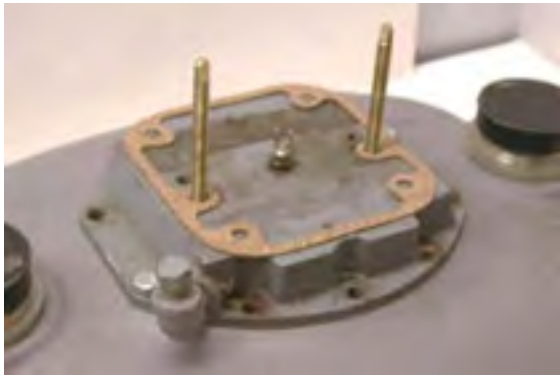
Step 5 – Before setting the IPT over the mounting studs, you must align the shaft drive pin of the IPT so that it will engage inside the fork portion of the meter drive foot.
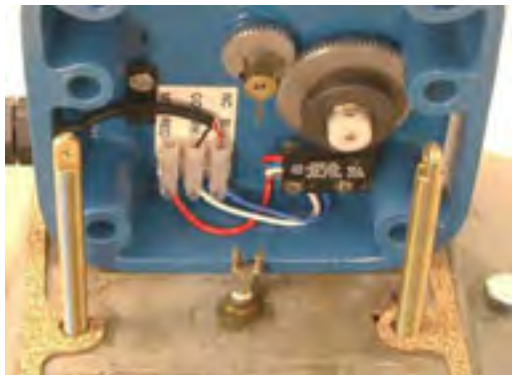
Step 6 – Place the IPT (middle set of holes) over the mounting studs. Make sure that the IPT drive pin engages the fork of the meter drive foot.

Step 7 – Mount the register onto the base of the IPT using the same screws that originally secured the register to the index plate (meter head). The drive foot of the index must engage the fork of the IPT drive shaft. Tighten/torque the screws to approximately 4-5 ft-lb.

NOTE: If the index cover that was removed has the security cap boss extensions, this cover will need to be replaced with an index cover without the security cap bosses.

Step 8 – Although not necessary, it may be desired to keep water or dirt from collecting in the unused corner mounting holes. If closing them is desired, use a permanent outdoor rated non-shrinking putty or caulk such as an RTV.

Step 9 – Place the index cover onto the studs. It will fit over the index one way only. Apply a flat washer and nut onto each stud. Snug, and then tighten these nuts an additional ½ to ¾ turn maximum. The finished torque value is 25 – 30 inch-lb.
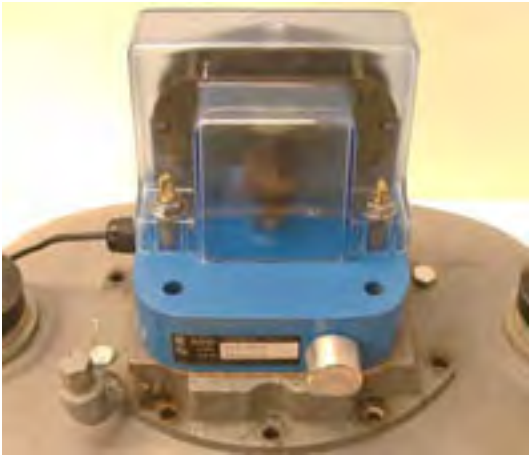
Step 10 – Install Wire/Lead security seals if desired. Installation is complete.

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Purpose & Scope

This instruction provides a procedure for use in connecting a STAR MTU to an **IMAC Pulsimatic Transmitter** and installing the Pulsimatic Transmitter on an **American Model AL800-AL5000** Industrial & Commercial Diaphragm Gas Meters. Please also refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

Parts Required

Item	Part Number	Quantity
IMAC Pulsimatic Transmitter for American Models AL800-AL5000 Commercial and Industrial Diaphragm Gas Meters. One pulse per revolution. Long shaft.	035-8150B	1
IMAC Mounting Hardware - American	069-8150G	1
MTU	501-6327R[1]	1

> [1]   Any STAR MTU with an available Type R Port may be used for this installation.

MTU Instruction
for American Model AL800-AL5000 Gas Meters

Tools Required

- Slotted (Flat-blade) screwdrivers in the following blade tip width sizes: 5/32" narrow-blade, 9/32", and ½".

- ½" combination (hand) wrench or socket/ratchet wrench. A torque wrench is recommended (60 inch-lb. range).

- 8" adjustable wrench.

- 18-18 blind-hole (bottoming) tap and mating size T-handle.

- Canned compressed air.

Also see **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

There are two parts to this procedure. First, the MTU must be wired to the IMAC Pulsimatic Transmitter (IPT). Once this is complete, you can then install the Pulsimatic Transmitter onto the American gas meter.

Wiring the MTU to the Pulsimatic

Step 1 – Unpack all of the components required to install the IPT. This will generally include the IPT itself, gasket and a hardware kit that includes (2 each) brass threaded rods, stainless flat-washers and hex nuts.

Step 2 - When wiring to the IPT, support the IPT off of the work surface on the outside (topside) of its base so that pressure is not applied to the center drive shaft. Remove the cable clamp (screw) from inside the base.

Step 3 – Trim the stripped ends of the MTU cable to ¼" or slightly shorter. When inserted into the terminal block, only a small amount of bare wire should be visible. Bare wire should not extend beyond the walls of the terminal block. This will present a shorting potential.

Step 4 – Feed the MTU input cable through the sealtight strain relief in the base of the IPT. Loop the cable so that stripped ends of the wires can be easily inserted into the terminal block screws. The screws should already be open enough. Place cable clamp over the wire as shown.

Step 5 – Insert the BLACK and WHITE wires into the COM terminal screw. Tighten the screw.

Step 6 – Insert the RED wires into the NC BLU terminal screw. Tighten the screw.

Step 7 – Pull most of the slack out of the cable (leave a slight amount of slack) and reattach cable clamp as shown below. **DO NOT** pull the cable taut.

Step 8 – Tighten the nut on the sealtight strain relief. You will need to tighten the nut almost fully down (as shown) before it will bite on the MTU cable.

Step 9 – Check that all wired terminal block screws are tight.

Step 10 – Depending on the installation location, you may be able to mount the MTU at this time. During installation, the IPT body should be supported so as not to hang (apply tension) on the MTU cable. During the installation, do not allow the heavier body of the IPT to suddenly jerk the MTU cable as this could potentially damage the cable internally.

Step 11 – Install the MTU into its intended location per the recommended procedure found in the standard Hexagram MTU installation manual.

Installing the Pulsimatic Transmitter

Step 1 – If necessary, remove tamper seals from any of the 4 screws that secure the index plate. Loosen and remove the screws securing the index plate assembly. You may discard these screws as they will not be re-used. Remove the index plate assembly from the top of the meter. Do not disassemble the index cover from the index plate.

Step 2 – If the index plate mounting screws were difficult to remove, the threads in the meter head (handhole plate) may need to be cleaned out before installing the hardware that will retain the IPT and index plate stack. Use the blind-hole tap to carefully clean out/ clean up the threads of the (2) cover holes. NOTE THAT THESE THREADS ARE #18-18. MAKE SURE TO USE THE PROPER TAP. Blow out the holes with compressed (canned) air.

MTU Instruction
for American Model AL800-AL5000 Gas Meters

Step 3 – Place the adapter plate contained in the installation parts onto the head of the meter with the ear holes aligned over the index plate mounting holes of the meter head. The embossed "AL800-AL5000" on the adapter plate is oriented to the front of the meter.

Step 4 – AFTER PLACING THE APAPTOR PLATE, Thread the (18-18 thread) ends of the securing studs (4) into the index cover screw holes of the index plate. Lightly snug the studs by grasping them by the flat that is machined into the top of the stud.

Step 5 - Apply the seal plate over the studs.
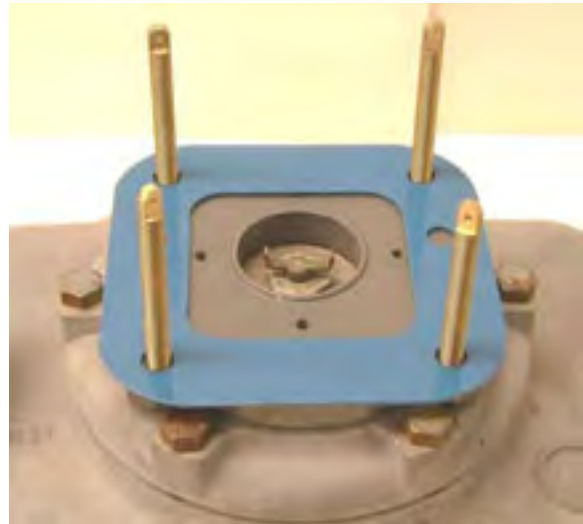
Step 6 – Before setting the IPT over the mounting studs, you must align the shaft drive pin of the IPT so that it will engage inside the fork portion of the meter drive foot.

Step 7 – Place the IPT (4 corner holes) over the mounting studs. Make sure that the IPT drive pin engages the fork of the meter drive foot.

Step 8 – Before mounting the index plate assembly, the drive foot of the index must engage the fork of the IPT drive shaft. Mount the index plate assembly onto the base of the IPT over the same (4) corner studs.

Step 9 – Complete the assembly by securing the index plate onto the studs, with the supplied (4) flat washers and nuts. Tighten these nuts a finished torque of 60 inch-lb. (5 ft-lb.).

Step 10 – Install Wire/Lead security seals if desired. Installation is complete.

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Purpose & Scope

This instruction provides a procedure for installing a STAR bracket direct-mount MTU on a **Sprague/Schlumberger/Actaris Model 175, 250 or 400 and 400A (slant-face) Gas Meter**.
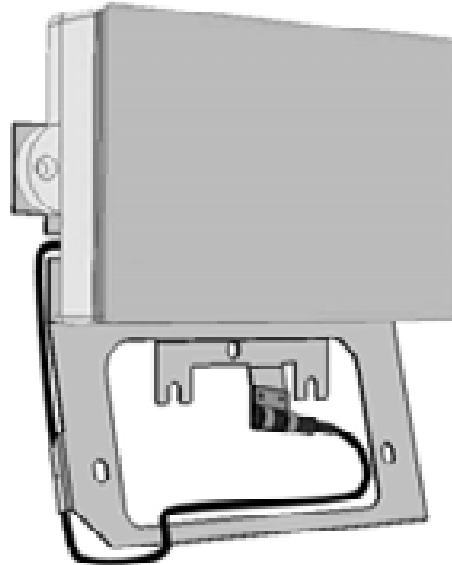
Parts Required

Item	Part Number	Quantity
MTU, Bracket Direct Mount, for Sprague 175, 250 and 400	501-8150H-A or 501-8150HD5-A	1
#10-24 x 3/8" Slotted Fillister Head Machine Screw	069-102412HA	2
Wheel/Magnet Assembly	109-7126A	1

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Safety goggles
- #1 and #2 Phillips screwdrivers
- #1 and #2 Slotted screwdrivers
- 5/32" diameter medium grit tapered round file
- Metal nibbler tool, 1/8" cut
- Small, diagonal plastic cutting pliers

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

Before installing the MTU, anti-tamper, safety, and security hardware must be removed from the clear index cover.

Note: Early slant-face Sprague gas meters were equipped with a cast aluminum framed index cover held in place by two screws. Later models are equipped with a plastic index cover held in place by three screws. This procedure can be used with either style.

MTU Instruction
for Sprague/Schlumberger/Actaris Gas Meters

Step 1 – Remove the clear index cover from the meter by removing the screws that hold it. The clear index cover and index cover screws will be reused. Clean and inspect these items and set them aside until needed. Replace if damaged.

Step 2 – Remove the index by removing the two screws that hold it to the meter. Set the Index aside until later. The screws that held the index to the meter can be discarded.

Step 3 – Remove the drive foot from the meter drive shaft by unthreading it counterclockwise. The drive foot will not be reused and can be discarded. Then, thread the magnet wheel clockwise onto the shaft. Tighten the magnet wheel until snug to the end of the threads on the drive shaft.

⚠️ **CAUTION!** Be careful not to cross-thread the magnet wheel when installing it on the meter drive shaft. Cross-threading can cause misalignment of the magnet wheel which in turn can cause binding or erratic performance.

Step 4 – Thread the two #10-24 x 3/8" machine screws provided about one full turn into the index mounting holes.

Step 5 – Place the MTU bracket assembly into position on the meter, hooking the two tabs on the bracket behind the heads of the index mounting screws.

Step 6 – Replace the index by hooking the two tabs on the index behind the heads of the index mounting screws. Insure that the drive foot on the index will be driven by the pin on the magnet wheel as it rotates. Several styles of indexes and index drive mechanisms may be encountered. Use the photos below as a guide. Note that on indexes with a slotted drive foot, it is intended that the pin on the magnet wheel engages the slot on the drive foot.

Brass Index with Slotted Drive Foot

Brass Index with Offset Drive Foot

Plastic Index with Metal Drive Foot

Step 7 – Route the sensor wire so that it does not interfere with the magnet wheel or the index gears. Hand tighten index mounting screws. Gently move the 2-foot hand to check for some free play to insure that the register is not binding up.

Step 8 – Notch the index cover to allow the sensor wire to exit through the bottom left edge. On the clear plastic index cover, you can remove (cut away) the inner tab from the molded drain opening at on the bottom left edge of the cover.

Position clear index cover on meter head and route sensor cable though notch.

NOTE: If the meter is equipped with a cast aluminum framed index cover, enlarge the drain hole at the bottom left edge of the cover to approximately 5/32" using a metal nibbler and/or tapered file. Clean up any sharp edges with the tapered file before mounting the index cover.

Step 9 – Secure MTU bracket assembly and the clear index cover to the meter head using the three screws that originally held the clear index cover. Tighten index cover screws.

Step 10 - Replace any anti-tamper, safety, or security hardware onto the clear index cover as required.

Step 11 – Once Installation is complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

Purpose & Scope

This instruction provides a procedure for installing a STAR bracket direct-mount MTU on a **Lancaster Model 250 (slant-face) Gas Meter**.
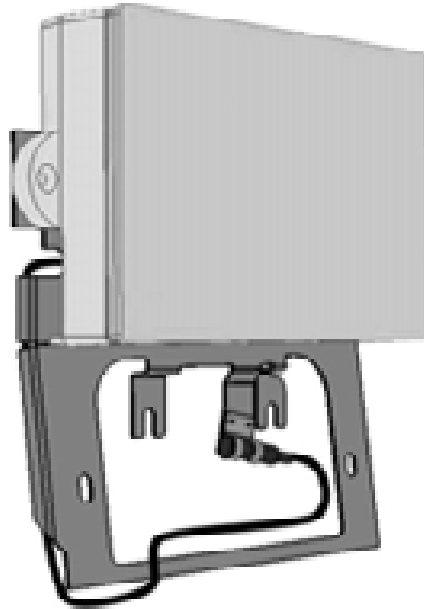
Parts Required

Item	Part Number	Quantity
MTU, Bracket Direct Mount, for Lancaster 250	501-8150H-B or 501-8150HD5-B	1
#10-24 x 3/8" Slotted Fillister Head Machine Screw	069-102412HA	2
Wheel/Magnet Assembly	109-7126A	1

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Safety goggles
- #1 and #2 Phillips screwdrivers
- #1 and #2 Slotted screwdrivers
- 5/32" diameter medium grit tapered round file
- Metal nibbler tool, 1/8" cut
- Small, diagonal plastic cutting pliers

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

Before installing the MTU, anti-tamper, safety, and security hardware must be removed from the clear index cover.

Step 1 – Remove the clear index cover from the meter by removing the two screws that hold it. The clear index cover and index cover screws will be reused. Clean and inspect these items and set them aside until needed. Replace if damaged.

MTU Instruction
for Lancaster Model 250 Gas Meters

Step 2 – Remove the index by removing the two screws that hold it to the meter. Set the Index aside until later. The screws that held the index to the meter can be discarded.

Step 3 – Remove the drive foot from the meter drive shaft by unthreading it counterclockwise. The drive foot will not be reused and can be discarded. Then, thread the magnet wheel clockwise onto the shaft. Tighten the magnet wheel until snug to the end of the threads on the drive shaft.

> ⚠️ **CAUTION!**
> Be careful not to cross-thread the magnet wheel when installing it on the meter drive shaft. Cross-threading can cause misalignment of the magnet wheel which in turn can cause binding or erratic performance.

Step 4 – Thread the two #10-24 x 3/8" machine screws provided about one full turn into the index mounting holes.

Step 5 – Place the MTU bracket assembly into position on the meter, hooking the two tabs on the bracket behind the heads of the index mounting screws.

Step 6 – Replace the index by hooking the two tabs on the index behind the heads of the index mounting screws. Insure that the drive foot on the index will be driven by the pin on the magnet wheel as it rotates. Several styles of indexes and index drive mechanisms may be encountered. Use the photos below as a guide. Note that on indexes with a slotted drive foot, it is intended that the pin on the magnet wheel engages the slot on the drive foot.

Brass Index with Slotted Drive Foot

Brass Index with Offset Drive Foot

Plastic Index with Metal Drive Foot

Step 7 – Route the sensor wire so that it does not interfere with the magnet wheel or the index gears. Hand tighten index mounting screws. Gently move the 2-foot hand to check for some free play to insure that the register is not binding up.

Step 8 – Next, create an exit notch for the sensor wire by using a nibbler or plastic cutting plier to add a notch approximately 5/32" in diameter to the bottom left edge of the clear index cover. Do not interfere with the drain hole already molded into the clear index cover. Clean up the edges of the notch using a round tapered file. Then position clear index cover on meter head and route sensor cable though notch.

Step 9 – Secure MTU bracket assembly and the clear index cover to the meter head using the two screws that originally held the clear index cover. Tighten index cover screws.

Step 10 - Replace any anti-tamper, safety, or security hardware onto the clear index cover as required.

Step 11 – Once Installation is complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

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Purpose & Scope

This instruction provides a procedure for installing a STAR bracket direct-mount MTU on a **Lancaster Model 175 (slant-face) Gas Meter**.
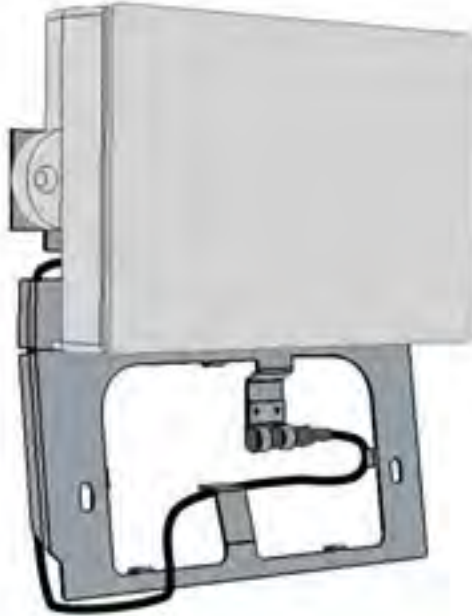
Parts Required

Item	Part Number	Quantity
MTU, Bracket Direct Mount, for Lancaster 175	501-8150H-C or 501-8150HD5-C	1
#6-32 x ¼" Phillips Panhead Machine Screw	069-063208AA	2
#6 Flat Washer (precision thickness)	069-2648	2
Wheel/Magnet Assembly	109-7126A	1

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Safety goggles
- #1 and #2 Phillips screwdrivers
- #1 and #2 Slotted screwdrivers
- 5/32" diameter medium grit tapered round file
- Metal nibbler tool, 1/8" cut
- Small, diagonal plastic cutting pliers

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

Before installing the MTU, anti-tamper, safety, and security hardware must be removed from the clear index cover.

MTU Instruction
for Lancaster Model 175 Gas Meters

Step 1 – Remove the clear index cover from the meter by removing the two screws that hold it. The clear index cover and index cover screws will be reused. Clean and inspect these items and set them aside until needed. Replace if damaged.

Step 2 – Remove the index by removing the two screws that hold it to the meter. Set the index aside until later. The screws that held the index to the meter can be discarded.

Step 3 – Remove the drive foot from the meter drive shaft by unthreading it counterclockwise. The drive foot will not be reused and can be discarded. Then, thread the magnet wheel clockwise onto the shaft. Tighten the magnet wheel until snug to the end of the threads on the drive shaft.

> ⚠ **CAUTION!**
> Be careful not to cross-thread the magnet wheel when installing it on the meter drive shaft. Cross-threading can cause misalignment of the magnet wheel which in turn can cause binding or erratic performance.

Step 4 – Place the MTU bracket assembly into position on the meter. Use an index cover screw to temporarily hold the MTU bracket assembly in position.
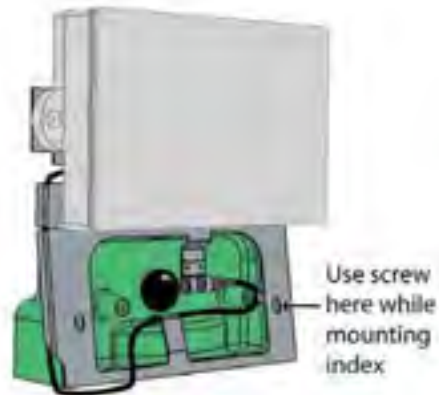
Route the sensor wire around the right-hand index-mounting post then back and under the finger hook so that it does not interfere with the magnet wheel or the index gears.

Step 5 – Reattach the index to the meter using the screws and washers provided.

> *Note:* The washers provided are a precision thickness designed to properly position the index. Use no substitutes.

The washers are to be placed between the back of the index and the mounting posts. The screws provided with the MTU replace the original index mounting screws. Insure that the drive foot on the index will be driven by the pin on the magnet wheel as it rotates, then hand tighten the index mounting screws. Gently move the 2-foot hand to check for some free play to insure that the register is not binding up.

Step 6 – Next, create an exit notch for the sensor wire by using a nibbler or plastic cutting plier to add a notch approximately 5/32" in diameter to the bottom left edge of the clear index cover. Do not interfere with the drain hole already molded into

the clear index cover. Clean up the edges of the notch using a round tapered file. Then position clear index cover on meter head and route sensor cable though notch.

Step 7 – Secure MTU bracket assembly and the clear index cover to the meter using the screws that originally held the clear index cover. Tighten index cover screws.

Step 8 - Replace any anti-tamper, safety, or security hardware onto the clear index cover as required.

Step 9 – Once Installation is complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

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Purpose & Scope

This instruction provides a procedure for use in wiring and mounting a STAR MTU to a **Mercury Mini-Max Electronic Gas Volume Corrector** that has been programmed to be compatible with the STAR MTU. Please also refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

Parts Required

Item	Part Number	Quantity
Gas Bracket Direct Mount MTU for use with the Mini-Max.	501-8150R or 501-8150RR	1

Tools Required

- 5/32" narrow-blade, slotted (flat-blade) screwdriver
- Phillips screwdriver
- 8" adjustable wrench.
- Wire cutter/stripper

Also see **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

MTU Instruction
for Mini-Max Electronic Gas Volume Corrector

Installation Procedure

Step 1 – Attach the MTU Bracket Assembly onto the top of the Mini-Max gasket and to the gas meter by removing the appropriate hardware from the gas meter and then reinstalling the hardware.

Step 2 – If both the corrected and uncorrected readings from the Mini-Max will be monitored, there will be two wires coming out of the back of the 501-8150RR MTU thru a notch in the bracket. One wire is black and connects to port 1 of the MTU. This will be used for the Corrected Reading. The gray wire connects to port 2 of the MTU and will be used for the Uncorrected reading.

If only the corrected reading will be monitored, the 501-8150R MTU will have only a single black wire which is used for the corrected reading.

Step 3 – Remove the smaller strain relief connector nut completely and place it over the wire(s). Push the wire(s) into the connector leaving approximately 4 to 5 inches of wire inside the unit. Place the connector cap back onto the stain relief and hand tighten.

Step 4 – Remove the terminal block TB1 from the circuit board. This will unplug by pulling it straight out. The top terminal (Terminal 1) is common.

Terminal	Signal
1	Common
2	Corrected Pulse Output
3	Uncorrected Pulse Output
4	Alarm (-)
5	Alarm (+)

Step 5 – Strip ¼ inch of insulation off of each MTU wire. Insert the black and white wires into Terminal 1 (Common). Tighten the screw on the side. Make sure the wires are captured securely. Insert

the red wire from the black cable into Terminal 2. Tighten the screw on the side. Insert the red wire from the gray cable (if used) into Terminal 3. Tighten the screw on the side.

Step 6 – Press the terminal block back onto the connector on the circuit board. Make sure   that it seats fully. This completes the wiring of the MTU.

Mini-Max Configuration Notes

The Mini-Max must be properly programmed to have the corrected and uncorrected outputs available on TB1. Per the Mini-Max Operator's Guide:

- Item No. 093 should be set to Code 0. This will select the Corrected output to be on for TB1 slot 2.

- Item No. 094 needs to be programmed to Code 2 in order to select the Uncorrected output to be on TB1 slot 3.

- Item 096 and 097 should be set to Code 2, which will set the display to 6 digits and match the reading length stored in the MTU.

- Item No. 115 should be left at the default of 0 which will give a pulse width of 0.0625 Sec.

- Item No. 090 and 092 need to be programmed to match the scaling in the MTU. Ex. Code 1 = CU FT x 10; Code 2 = CU FT x 100.

Other settings may be needed for the Mini-max to operate correctly. See the Mini-Max Operators Guide for further instructions.

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Purpose & Scope

This instruction provides a procedure for installing a STAR indirect-mount MTU on a
Sprague Model 175 (flat-face) Gas Meter.

Parts Required

Item	Part Number	Quantity
MTU, Indirect Mount, for Sprague 175	501-6327H, 501-6327HH or 501-6327HD5	1
10-24 x 3/8" Slotted, Fillister Head Machine Screw	069-102412HA	2
Wheel/Magnet Assembly	109-7126A	1
MTU spacer for pipe or bar mount	056-5155K	1
18" heavy-duty UV-resistant tie wrap	067-0030	2
10-32 x 1½" pan head machine screw	069-103248CS	2
10-32 nut, stainless steel	069-3011	2
#10 7/16" flat washer, stainless steel	069-3004	2

MTU Instruction
for Sprague Model 175 Gas Meters

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Small, diagonal plastic cutting pliers
- 7/16″ boxwrench
- Safety goggles
- #1 and #2 Phillips screwdrivers
- #1 and #2 Slotted screwdrivers

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

Installing the Sensor Assembly

Before installing the Sensor Assembly, anti-tamper, safety, and security hardware must be removed from the clear register cover.

Step 1 – Remove the clear index cover from the meter by removing the screw that holds it. The clear index cover and the index cover screw will be reused. Clean and inspect these items and set them aside until needed. Replace if damaged.

Step 2 – Remove the index by removing the two screws that hold it to the meter. Set the index aside until later. The screws that held the index to the meter can be discarded.

Step 3 – Remove the drive foot from the meter drive shaft by unthreading it counterclockwise. The drive foot will not be reused and can be discarded. Then, thread the magnet wheel clockwise onto the shaft. Tighten the magnet wheel until snug to the end of the threads on the drive shaft.

Step 6 – Replace the index by hooking the two tabs on the index behind the heads of the index mounting screws. Insure that the drive foot on the index will be driven by the pin on the magnet wheel as it rotates. Several styles of indexes and index drive mechanisms may be encountered. Use the photos below as a guide. Note that on indexes with a slotted drive foot, it is intended that the pin on the magnet wheel engages the slot on the drive foot.

Brass Index with Slotted Drive Foot

Brass Index with Offset Drive Foot

⚠ CAUTION!	Be careful not to cross-thread the magnet wheel when installing it on the meter drive shaft. Cross-threading can cause misalignment of the magnet wheel which in turn can cause binding or erratic performance.

Step 4 – Start the two 10-24 x 3/8" machine screws into the index mounting holes. Thread each screw in approximately one full turn.

Step 5 – Attach the sensor to the meter by positioning the keyhole-shaped slots of the sensor bracket over the index mounting screws as shown here. Route the sensor wire through the slot at the bottom right-hand corner of the sensor bracket and back to the left under the magnet wheel so that it does not interfere with the magnet wheel or the index gears.

Plastic Index with Metal Drive Foot

Step 7 – Route the sensor wire so that it does not interfere with the magnet wheel or the index gears. Hand tighten index mounting screws. Gently move the 2-foot hand to check for some free play to insure that the register is not binding up.

Step 8 – Next, create an exit notch for the sensor wire by cutting away a small piece of the corner where the left hand edge of the clear index cover meets the ridge at the bottom of the meter head.

Step 9 – Secure the clear index cover to the meter using the screw that originally held it. Tighten the index cover screw.

Step 10 - Replace any anti-tamper, safety, or security hardware onto the clear index cover as required.

Bar Mounting the MTU

Step 1 - Thread the tie-wraps into the MTU spacer as shown here.

Step 2 - Attach the spacer to the MTU using the provided screws and washers. Tighten the screws to 12 to 15 in-lb. On a

standard drill driver with 0 to 24 torque settings, this is typically the #10 setting.

Step 3 - Wrap the tie wraps around the bar as needed, pulling the ties around (through the spacer plate) as they are tightened.

Step 4 - Adjust the MTU as needed and pull the tie wraps tight.

Step 5 - Trim off the excess tie wrap, leaving about a ½" tab.

Step 6 – Once Installation is complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

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Purpose & Scope

This instruction provides wiring information for connecting a STAR MTU to a **Metron-Farnier Water Meter** equipped with an **OER** register.

Metron OER Register

MTU Cable	OER Cable
Red	R (Red)
Black	B (Black)
White	G (Green)

Supplies and Tools Required

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Application Notes

- The 5-digit Metron **OER** register must be configured for an additional trailing zero for proper operation with STAR MTUs.

Installation Procedure

Step 1 - Select a mounting location for the MTU that will allow optimum signal transmission, and install any needed wiring. Be sure to follow all General Installation and Wiring Guidelines as outlined in **Publication 471-2000**.

Step 2 – Select the wiring diagram that applies to the meter you are connecting and make the appropriate wiring connections.

    a. **Direct Wiring to Meter -** MTU wiring is supplied stripped to a standard length that fits water meters with screw terminals. Simply wrap the wires around the screw terminal and tighten the screw. It is recommended that the screws be tightened to no more than 4 – 5 in-lbs. Overtightening the screw can stress and possibly fracture the wire.

    b. **Water Meter with Integral Cable -** If the water meter is supplied with an integral cable and a cable-to-cable splice is necessary, use a gel-filled wire splice designed for outdoor (moisture applications) to seal the individual connections.

Note: When connecting a dual port MTU to a compound meter, connect port 1 (black jacket) to the primary, or high-flow register and port 2 (grey jacket) to the secondary or low-flow register.

Step 3 – Make a final visual check of the wiring from the MTU to the meter register. Verify that the cable routing is neat, secure and professional.

Step 4 – Once installation and wiring are complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

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Purpose & Scope

This instruction provides a procedure for mounting a STAR MTU to a **Nicor Type A, Type C** or **Type X** composite pit lid. This procedure covers the mounting of an Original Flatpak STAR MTU or the New Flatpak STAR MTU to these pit lids. This procedure does not detail the wiring of the MTU to the meter inside of the pit. Please refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* in addition to any meter specific MTU installation and programming instructions.

Parts Required

Item	Part Number	Quantity
MTU	As required for installed meter	1
#8 x 1-1/4" Truss Head Phillips Sheet Metal Screw, 18-8 stainless steel (McMaster # 93406A201)		2 per Original Style MTU installation
Spacers (for pit lid mounting of New Style Flatpak MTUs)	056-8150S	2 per New Style MTU installation
#8 x 2" Phillips Pan Head Sheet Metal Screw, 18-8 stainless steel (McMaster #92470A205)		2 per New Style MTU installation

Tools Required

To mount the MTU to these pit lids, you will need the following tools and equipment:

- Safety goggles
- #3 Phillips driver bit
- Cordless Drill 3/8", variable speed, with adjustable torque settings.

Note on setting the torque range: On a drill-driver that has about 20 settings (positions), set the adjustment to #6. Use the lower speed range of the drill-driver. This should amount to approximately 8 in-lbs of torque. Reference the operating instructions for your particular drill to more accurately determine what setting to use to achieve a torque range of approximately 8 in-lbs.

MTU Instruction
for Nicor Composite Pit Lids

Installation Procedure

NOTE: The Nicor Type A, Type C and Type X lids differ only slightly in their rim and latching mechanism. STAR MTUs can be mounted to either a Type A, Type C or a Type X lid using this procedure.

Mounting an Original Flatpak STAR MTU to a Nicor pit lid.

Step 1 – Place the pit lid top down on a solid surface, positioning the metal latch mechanism nearest to you as shown in the photo below.

Step 2 – Note the mounting posts on the bottom of the pit lid. Several posts are provided for mounting a variety of equipment. The posts used for mounting an Original Flatpak STAR MTU are highlighted in the photo below.

Step 3 – Position the MTU face-down on the bottom surface of the pit lid. Place 2 stainless sheet metal screws through the 2 recessed mounting holes as shown, and guide the screws into the holes on the designated mounting posts.
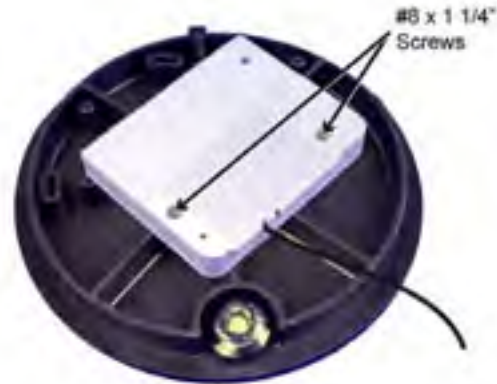
Step 4 - Torque screws to approximately 8 in-lbs. MTU should be snug and flush to the surface of the pit lid.

Step 5 – Wire the MTU to the meter, making sure that the wire is routed so that it does not become pinched when the lid is closed.

Step 6 - Installation is now complete. You can now proceed to program the MTU using the STAR Programmer Software and your MTU Programmer.

> **CAUTION!**
> Be sure to follow all General Guidelines outlined in Publication 471-2000 along with the specific wiring instructions for the meter being used.

Mounting a New Flatpak STAR MTU to a Nicor pit lid.

Step 1 – Place the pit lid top down on a solid surface, positioning the metal latch mechanism nearest to you as shown in the photo below.

Step 2 – Note the mounting posts on the bottom of the pit lid. Several posts are provided for mounting a variety of equipment. The posts used for mounting a New Flatpak STAR MTU are highlighted in the photo below.

Step 3 – Position the MTU face-down on the bottom surface of the pit lid. Place plastic spacers under the mounting lugs on the MTU as shown below.

Step 4 - Place 2 stainless sheet metal screws through the 2 mounting holes and the spacers, and guide the screws into the holes on the designated mounting posts.

Step 5 – Torque screws to approximately 8 in-lbs. MTU should be snug and flush to the surface of the pit lid.

Step 6 – Wire the MTU to the meter, making sure that the wire is routed so that it does not become pinched when the lid is closed.

Step 7 - Installation is now complete. You can now proceed to program the MTU using the STAR Programmer Software and your MTU Programmer.

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Purpose & Scope

This instruction provides a procedure for use in installing a **Hexagram STAR MTU and Large Meter Pulser** on an **American Model AL800-AL5000** Industrial & Commercial Diaphragm Gas Meters. Please also refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

Parts Required

Item	Part Number	Quantity
#18-18 x 2.6" slotted round head bolt, stainless	069-181880DS	4
#12-24 x 2-¼" slotted fillister head screw, stainless	069-122472HS	2
American index cover gasket	066-0033	1
Security cups	066-0336	2
Security caps	066-0337	2
2-pin drive disk	056-11585C	1
Tall, 2-slot coupler with magnet	056-11585B	1
Shaft, standard	056-5155D	1
Adapter, 5155 style MTU enclosure to pulser body	056-11585D	1
¼-20 x 1-½" Phillips pan head machine screw, stainless	069-142048AS	2
¼-20 nylock nut, stainless	069-3222	2
#8-18 x ½" Phillips pan head thread forming screw, stainless	069-080016A4S	2
MTU/Pulser Assembly (or separate MTU and pulser)	per project	1

MTU Instruction
for American Model AL800-AL5000 Gas Meters

Tools Required

- Screwdriver, #2 Phillips
- Screwdriver, 3/8" slotted (flat-blade)
- 7/16" box wrench
- 18-18 blind-hole (bottoming) tap and mating size T-handle
- 12-24 blind-hole (bottoming) tap and mating size T-handle
- Canned compressed air

Also see **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

There are two parts to this procedure. First, the pulser must be mounted to the meter. Once this is complete, you can mount the MTU remotely or directly on the pulser using the adapter provided. If you are mounting the MTU on the pulser, it can be mounted at either the front or back of the meter.

Step 1 – If necessary, remove tamper seals from any of the 4 screws that secure the index base plate and the two screws that secure the index box to the base plate.

Note: If the index base plate has integral security towers like the one on the left below, it must be replaced with the flat style index base plate like the one shown on the right.

Step 2- Loosen and remove the four screws securing the index base plate assembly to the meter. You may discard these screws as they will not be re-used. Remove the index box and base plate assembly from the top of the meter.

Step 3 – Disassemble the index box from the base plate by removing the two screws that secure the index box to the base plate. You may discard these screws as they will not be re-used.

Step 4 – If the index box and/or base plate mounting screws were difficult to remove, the threads in the meter head may need to be cleaned out before installing the new hardware that will retain the index base plate, the pulser and the index box. Use the blind-hole taps to carefully clean the threads of the index box and base plate mounting holes.

> ⚠️ **CAUTION!**
> The index base plate mounting holes use a #18-18 thread. The index box mounting holes use a #12-24 thread. Be sure to use the proper tap for each hole. Using the wrong tap will result in damage to the meter head.

After using the tap, blow out the holes with compressed (canned) air.

Step 5 – Place the index base plate onto the head of the meter. Align the index base plate with the index plate mounting holes on the meter head and the large opening in the base plate is centered over the drive mechanism.

Step 6 – Break out the tab for either the front or rear wire exit on the bottom edge of the pulser body, depending on how you plan to mount the MTU. (See the illustration below.)

Step 7 – Assemble the couplers and shaft to the pulser body as shown in the illustration below. Ensure that the magnet is mounted on the Tall Coupler, and that the retaining shaft is securely snapped into both the Tall Coupler and the 2-Pin Drive Disk.

Step 8 – Place the pulser on the index base plate, aligning the bottom coupler on the pulser with the wiggler on the meter. Align the corner mounting holes on the pulser with the mounting holes on the index base plate.

MTU Instruction
for American Model AL800-AL5000 Gas Meters

Step 9 – Fasten the pulser to the meter body using the four #18-18 x 2.6" slotted, stainless steel round head bolts provided. Install security cups, if desired, as shown below.

Step 10 – If the index box assembly has a silicone gasket applied around its bottom edge and that gasket is in good shape, you can discard the index cover gasket supplied with the pulser and skip to **Step 11**. Otherwise, place the index cover gasket on the pulser, aligning the gasket as shown below.

NOTE: When using the cork gasket supplied with the pulser, be sure that the bottom edge of the index box is clean and free of any silicone and/or dirt particles.

Step 11 – Place the index box assembly on the pulser, aligning the the drive foot with the two-pin drive disk. Fasten the index box to the meter with the two #12-24 x 2-¼" slotted, stainless steel fillister head screws provided.

Installation of the pulser is now complete. If you will be remotely mounting the MTU, refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs. Continue to **Step 12** if you will be mounting the MTU to the pulser body.

NOTE: The pulser and MTU can be supplied pre-wired or as separate assemblies. If provided as separate components, connect the three wires in the pulser cable (red, black, and white) to the corresponding wires in the MTU cable.

Step 12 – Continue here to mount the MTU to the pulser using the adaptor provided. Begin by positioning the adaptor on the back (or front) of the pulser body and attach it using the two #8-18 x ½" Phillips pan head thread forming screws provided, as shown below.

Step 13 – Bundle the excess wire into the compartment on the adaptor.

Step 14 - Mount the MTU to the adaptor using the two ¼-20 x 1-½" Phillips pan head machine screws and the ¼-20 nylock nuts.

Step 15 – Installation is now complete.
Program the MTU using the STAR
Programmer Software and your Field
Programmer.

Purpose & Scope

This instruction provides a procedure for use in installing a **Hexagram STAR MTU and Large Meter Pulser** on a **Rockwell/Equimeter Model 750-10000** Intermediate or Large Capacity Diaphragm Gas Meters. Please also refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

Parts Required

Item	Part Number	Quantity
5/16 -18 x 2 1/4" slotted fillister head bolt, stainless	069-561872HS	2
5/16 -18 x 3" slotted fillister head bolt, stainless	069-561896HS	2
Gasket, large pulser, upper, Rockwell Index Cover	066-11585B	1
Gasket, large pulser, lower, standard	066-11585A	1
Standard coupler – with magnet	056-11703B	1
Tall, 2-slot coupler	056-11585B	1
Shaft, standard	056-5155D	1
Adapter, 5155 style MTU enclosure to pulser body	056-11585D	1
¼-20 x 1-½" Phillips pan head machine screw, stainless	069-142048AS	2
¼-20 nylock nut, stainless	069-3222	2
#8-18 x ½" Phillips pan head thread forming screw, stainless	069-080016A4S	2
MTU/Pulser Assembly (or separate MTU and pulser)	per project	1

MTU Instruction
for Rockwell/Equimeter Commercial Gas Meters

Tools Required

- Screwdriver, #2 Phillips
- Screwdriver, 3/8" slotted (flat-blade)
- 7/16" box wrench
- 5/16-18 blind-hole (bottoming) tap and mating size T-handle
- Canned compressed air

Also see **Publication 471-2000,** *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

There are two parts to this procedure. First, the pulser must be mounted to the meter. Once this is complete, you can mount the MTU remotely or directly on the pulser using the adapter provided. If you are mounting the MTU on the pulser, it can be mounted at either the front or back of the meter.

Step 1 – If necessary, remove tamper seals that cover the index cover screws. Loosen and remove the screws securing the index cover. You may discard these screws as they will not be re-used. Remove the index cover and set it aside.

Step 2 – Loosen and remove the screws securing the index to the index plate. You may discard these screws as they will not be re-used. Next, remove the index and set it aside.

Step 3 – If the index cover screws and index mounting screws were difficult to remove, the threads in the index plate may need to be cleaned out before installing the pulser assembly. Use the blind-hole tap to carefully clean the threads of the four 5/16" holes. Blow out the holes with compressed (canned) air.

> **CAUTION!**
> The index base plate mounting holes use a 5/16-18 thread. Be sure to use the proper tap. Using a tap other than a 5/16-18 tap will result in damage to the meter head.

Step 4 – Position the lower gasket on the meter as shown in the illustration below.

Step 5 – Break out the tab for either the front or rear wire exit on the bottom edge of the pulser body, depending on how you plan to mount the MTU. (See the illustration below.)
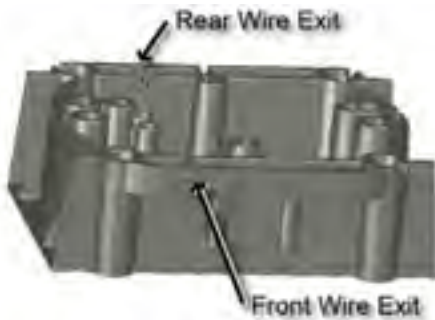
Step 6 – Assemble the couplers and shaft to the pulser body as shown in the illustration below. Ensure that the magnet is mounted on the Standard Coupler, and that the retaining shaft is securely snapped into both couplers.
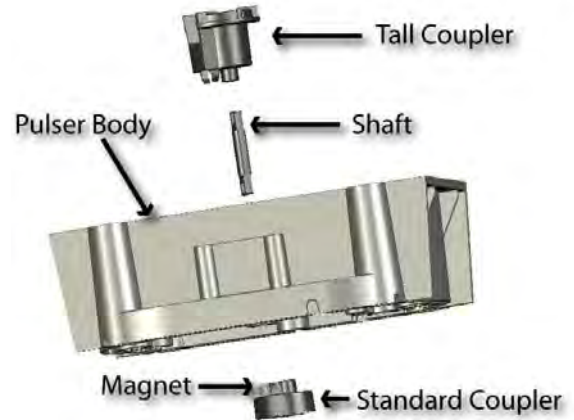
MTU Instruction
for Rockwell/Equimeter Commercial Gas Meters

Step 7 – Place the pulser on the meter, aligning the lower coupler so that it will engage the fork portion of the meter drive foot as shown below.

Ensure that the pulser body sits properly on the gasket and that the wire is routed through the wire exit notch.

Step 8 – Next, place the upper gasket on top of the pulser as shown in the illustration below.

Step 9 – Mount the index onto the pulser using the 5/16 -18 x 2 1/4" slotted fillister head bolts provided, as shown in the illustration below. Ensure that the drive foot on the index engages with the slot in the top of the tall coupler.

Step 10 – Next, mount the index cover onto the pulser using the 5/16 -18 x 3" slotted fillister head bolts provided, as shown in the illustration below.

Installation of the pulser is now complete. If you will be remotely mounting the MTU, refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs. Continue to **Step 11** if you will be mounting the MTU to the pulser body.

NOTE: The pulser and MTU can be supplied pre-wired or as separate assemblies. If provided as separate components, connect the three wires in the pulser cable (red, black, and white) to the corresponding wires in the MTU cable.

Step 11 – Continue here to mount the MTU to the pulser using the adaptor provided. Begin by positioning the adaptor on the back (or front) of the pulser body and attach it using the two #8-18 x ½" Phillips pan head thread forming screws provided, as shown below.

Step 12 – Bundle the excess wire into the compartment on the adaptor.

MTU Instruction
for Rockwell/Equimeter Commercial Gas Meters

Step 13 – Mount the MTU to the adaptor using the two ¼-20 x 1-½" Phillips pan head machine screws and the ¼-20 nylock nuts.

Step 14 – Installation is now complete. Program the MTU using the STAR Programmer Software and your Field Programmer.

Purpose & Scope

This instruction provides a procedure for use in installing a **Hexagram STAR MTU and Large Meter Pulser** on an **Sprague/Actaris Model 675A, 800A or 1000A** Industrial & Commercial Diaphragm Gas Meters. Please also refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

Parts Required

Item	Part Number	Quantity
¼-20 x 2-1/4" slotted fillister head bolt, stainless	069-142072HS	6
Sprague index cover gasket	066-0034	1
Gasket, large pulser, lower, standard	066-11585A	1
Standard coupler - with magnet	056-11703B	1
Tall, 2-slot coupler	056-11585B	1
Shaft, standard	056-5155D	1
Adapter, 5155 style MTU enclosure to pulser body	056-11585D	1
¼-20 x 1-½" Phillips pan head machine screw, stainless	069-142048AS	2
¼-20 nylock nut, stainless	069-3222	2
#8-18 x ½" Phillips pan head thread forming screw, stainless	069-080016A4S	2
MTU/Pulser Assembly (or separate MTU and pulser)	per project	1
Shaft, extended	056-12466B	1
½" OD x ¼" L round nylon spacer	068-141608EX	2

MTU Instruction
for Sprague/Actaris 675A, 800A and 1000A Gas Meters

Tools Required

- Screwdriver, #2 Phillips
- Screwdriver, 3/8" slotted (flat-blade)
- 7/16" box wrench
- 1/4-20 blind-hole (bottoming) tap and mating size T-handle
- Canned compressed air

Also see **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

There are two parts to this procedure. First, the pulser must be mounted to the meter. Once this is complete, you can mount the MTU remotely or directly on the pulser using the adapter provided. If you are mounting the MTU on the pulser, it can be mounted at either the front or back of the meter.

Step 1 – If necessary, remove tamper seals from any of the four screws that secure the index cover to the meter body.

Step 2- Loosen and remove the four screws securing the index cover to the meter. You may discard these screws as they will not be re-used. Remove the index cover from the top of the meter.

Step 3 – Remove the two screws securing the index to the top of the meter. You may discard these screws as they will not be re-used. Remove the index and set it aside.

Step 4 – If the index base plate mounting screws were difficult to remove, the threads in the meter head may need to be cleaned out before installing the hardware that will retain the index base plate, the pulser and the index box. Use the blind-hole tap to carefully clean the threads of the index base plate mounting holes.

| ⚠️	**CAUTION!** The index base plate mounting holes use a 1/4-20 thread. Be sure to use the proper tap. Using a tap other than a ¼-20 tap will result in damage to the meter head.

After using the tap, blow out the holes with compressed (canned) air.

Step 5 – Place the lower gasket onto the meter, aligning it as shown to insure that the openings for the index bolts and index cover bolts match up with the threaded holes on the top of the meter.

Step 6 – Break out the tab for either the front or rear wire exit on the bottom edge of the pulser body, depending on how you plan to mount the MTU. (See the illustration below.)
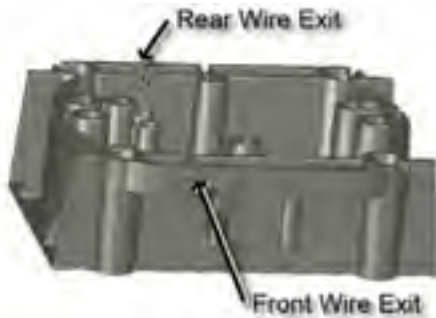
Step 7 – Assemble the couplers and shaft to the pulser body as shown in the illustration below. Ensure that the magnet is mounted on the Standard Coupler, and that the retaining shaft is securely snapped into both couplers.
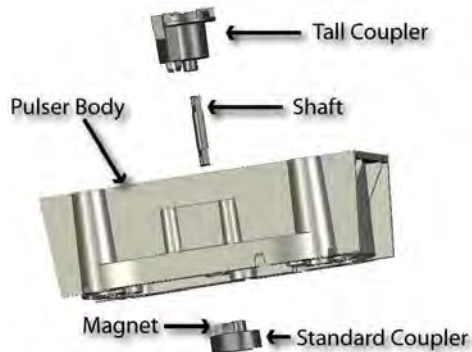
Step 8 – Place the pulser on the lower gasket, aligning the bottom coupler on the pulser with the wiggler on the meter. Align the corner mounting holes on the pulser with the mounting holes on the index base plate.

Step 9 – Position the index on top of the pulser, aligning the drive pin on the index with the slot on the tall coupler. Ensure that there is no binding.

Note: On some models, a 'shorter' index may not allow sufficient clearance between the tall coupler and the index. In this case, replace the standard shaft with the extended shaft and insert the nylon spacers provided between the index and the pulser body.

MTU Instruction
for Sprague/Actaris 675A, 800A and 1000A Gas Meters

Fasten the index to the meter with two of the ¼-20 x 2-1/4" slotted, stainless steel fillister head bolts provided.

Step 10 – Place the index cover gasket in position on top of the pulser and then place the index cover on the top of the gasket. Fasten the index cover to the meter using the four remaining ¼-20 x 2-1/4" slotted, stainless steel fillister head bolts.

Installation of the pulser is now complete. If you will be remotely mounting the MTU, refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs. Continue to **Step 11** if you will be mounting the MTU to the pulser body.

NOTE: The pulser and MTU can be supplied pre-wired or as separate assemblies. If provided as separate components, connect the three wires in the pulser cable (red, black, and white) to the corresponding wires in the MTU cable.

Step 11 – Continue here to mount the MTU to the pulser using the adaptor provided. Begin by positioning the adaptor on the back (or front) of the pulser body and attach it using the two #8-18 x ½" Phillips pan head thread forming screws provided.

Step 12 – Bundle the excess wire into the compartment on the adaptor.

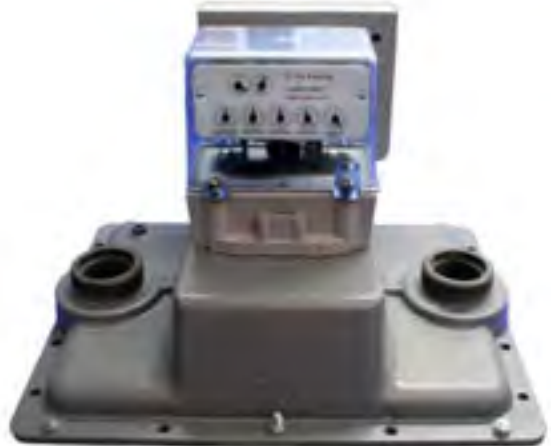**Step 13 -** Mount the MTU to the adaptor using the two ¼-20 x 1-½" Phillips pan head machine screws and the ¼-20 nylock nuts.

Step 14 – Installation is now complete. Program the MTU using the STAR Programmer Software and your Field Programmer.

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Purpose & Scope

This instruction provides a procedure for use in installing a **Hexagram STAR MTU and Large Meter Pulser** on **Dresser Roots-Type Gas Meters with Vertical Mechanical Index**. Please also refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

Parts Required

Item	Part Number	Quantity
5/16-18 x 3" slotted round head bolt, stainless	069-561896DS	4
#12-24 x 2-¼" slotted fillister head screw, stainless	069-122472HS	2
American index cover gasket	066-0033	1
Security cups	066-0336	2
Security caps	066-0337	2
2-pin drive disk	056-11585C	1
Tall, 2-slot coupler with magnet	056-11585B	1
Shaft, standard	056-5155D	1
Adapter, 5155 style MTU enclosure to pulser body	056-11585D	1
¼-20 x 1-½" Phillips pan head machine screw, stainless	069-142048AS	2
¼-20 nylock nut, stainless	069-3222	2
#8-18 x ½" Phillips pan head thread forming screw, stainless	069-080016A4S	2
MTU/Pulser Assembly (or separate MTU and pulser)	per project	1

MTU Instruction
for Dresser Gas Meters with Vertical Mechanical Index

Tools Required

- Screwdriver, #2 Phillips
- Screwdriver, 3/8" slotted (flat-blade)
- 7/16" box wrench
- 5/16-18 blind-hole (bottoming) tap and mating size T-handle
- 12-24 blind-hole (bottoming) tap and mating size T-handle
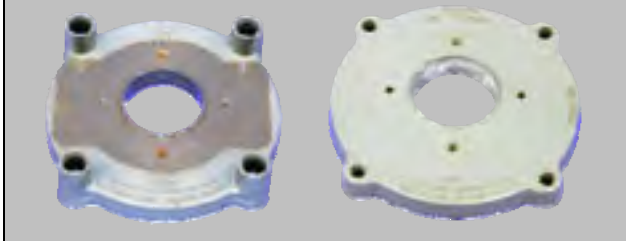- Canned compressed air

Also see **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

There are two parts to this procedure. First, the pulser must be mounted to the meter. Once this is complete, you can mount the MTU remotely or directly on the pulser using the adapter provided. If you are mounting the MTU on the pulser, it can be mounted at either the front or back of the register.

Step 1 – If necessary, remove tamper seals from any of the 4 screws that secure the index base plate and the two screws that secure the index box to the base plate.

Note: If the index base plate has integral security towers like the one on the left below, it must be replaced with the flat style index base plate like the one shown on the right.

Step 2- Loosen and remove the four screws securing the index base plate assembly to the instrument drive. You may discard these screws as they will not be re-used. Remove the index box and base plate assembly from the top of the meter.

Step 3 – Disassemble the index box from the base plate by removing the two screws that secure the index box to the base plate. You may discard these screws as they will not be re-used.

Step 4 – If the index box and/or base plate mounting screws were difficult to remove, the threads in the meter head may need to be cleaned out before installing the new hardware that will retain the index base plate, the pulser and the index box. Use the blind-hole taps to carefully clean the threads of the index box and base plate mounting holes.

> ⚠️ **CAUTION!**
> The index base plate mounting holes use a 5/16-18 thread. The index box mounting holes use a #12-24 thread. Be sure to use the proper tap for each hole. Using the wrong tap will result in damage to the meter head.

After using the tap, blow out the holes with compressed (canned) air.

Step 5 – Place the index base plate onto the instrument drive of the meter. Align the index base plate with the index plate mounting holes on the instrument drive so that the large opening in the base plate is centered over the drive mechanism.

Step 6 – Break out the tab for either the front or rear wire exit on the bottom edge of the pulser body, depending on how you plan to mount the MTU. (See the illustration below.)

Step 7 – Assemble the couplers and shaft to the pulser body as shown in the illustration below. Ensure that the magnet is mounted on the Tall Coupler, and that the retaining shaft is securely snapped into both the Tall Coupler and the 2-Pin Drive Disk.

Step 8 – Place the pulser on the index base plate, aligning the bottom coupler on the pulser with the wiggler on the meter. Align the corner mounting holes on the pulser with the mounting holes on the index base plate.

Step 9 – Fasten the pulser to the instrument drive using the four 5/16-18 x 3" slotted, stainless steel round head bolts provided. Install security cups, if desired, as shown below.

Step 10 – If the index box assembly has a silicone gasket applied around its bottom edge and that gasket is in good shape, you can discard the index cover gasket supplied with the pulser and skip to **Step 11**. Otherwise, place the index cover gasket on the pulser, aligning the gasket as shown below.

NOTE: When using the cork gasket supplied with the pulser, be sure that the bottom edge of the index box is clean and free of any silicone and/or dirt particles.

Step 11 – Place the index box assembly on the pulser, aligning the the drive foot with the two-pin drive disk. Fasten the index box to the meter with the two #12-24 x 2-¼" slotted, stainless steel fillister head screws provided.

Installation of the pulser is now complete. If you will be remotely mounting the MTU, refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs. Continue to **Step 12** if you will be mounting the MTU to the pulser body.

NOTE: The pulser and MTU can be supplied pre-wired or as separate assemblies. If provided as separate components, connect the three wires in the pulser cable (red, black, and white) to the corresponding wires in the MTU cable.

Step 12 – Continue here to mount the MTU to the pulser using the adaptor provided. Begin by positioning the adaptor on the back (or front) of the pulser body and attach it using the two #8-18 x ½" Phillips pan head thread forming screws provided.

Step 13 – Bundle the excess wire into the compartment on the adaptor.

Step 14 - Mount the MTU to the adaptor using the two ¼-20 x 1-½" Phillips pan head machine screws and the ¼-20 nylock nuts.

Step 15 – Installation is now complete. Program the MTU using the STAR Programmer Software and your Field Programmer.

Purpose & Scope

This instruction provides a procedure for use in installing a **Hexagram STAR MTU and Large Meter Pulser** on **Romet Roots-Type Gas Meters with Vertical Mechanical Index.** Please also refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

Parts Required

Item	Part Number	Quantity
5/16-18 x 3" slotted round head bolt, stainless	069-561896DS	4
#12-24 x 2-¼" slotted fillister head screw, stainless	069-122472HS	2
American index cover gasket	066-0033	1
Security cups	066-0336	2
Security caps	066-0337	2
2-pin drive disk	056-11585C	1
Tall, 2-slot coupler with magnet	056-11585B	1
Shaft, standard	056-5155D	1
Adapter, 5155 style MTU enclosure to pulser body	056-11585D	1
¼-20 x 1-½" Phillips pan head machine screw, stainless	069-142048AS	2
¼-20 nylock nut, stainless	069-3222	2
#8-18 x ½" Phillips pan head thread forming screw, stainless	069-080016A4S	2
MTU/Pulser Assembly (or separate MTU and pulser)	per project	1

MTU Instruction
for Romet Gas Meters with Vertical Mechanical Index

Tools Required

- Screwdriver, #2 Phillips
- Screwdriver, 3/8" slotted (flat-blade)
- 7/16" box wrench
- 5/16-18 blind-hole (bottoming) tap and mating size T-handle
- 12-24 blind-hole (bottoming) tap and mating size T-handle
- Canned compressed air

Also see **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

There are two parts to this procedure. First, the pulser must be mounted to the meter. Once this is complete, you can mount the MTU remotely or directly on the pulser using the adapter provided. If you are mounting the MTU on the pulser, it can be mounted at either the front or back of the meter.

Step 1 – If necessary, remove tamper seals from any of the 4 screws that secure the index base plate and the two screws that secure the index box to the base plate.

Note: If the index base plate has integral security towers like the one on the left below, it must be replaced with the flat style index base plate like the one shown on the right.

Step 2- Loosen and remove the four screws securing the index base plate assembly to the instrument drive. You may discard these screws as they will not be re-used. Remove the index box and base plate assembly from the top of the meter.

Step 3 – Disassemble the index box from the base plate by removing the two screws that secure the index box to the base plate. You may discard these screws as they will not be re-used.

Step 4 – If the index box and/or base plate mounting screws were difficult to remove, the threads in the meter head may need to be cleaned out before installing the new hardware that will retain the index base plate, the pulser and the index box. Use the blind-hole taps to carefully clean the threads of the index box and base plate mounting holes.

> ⚠️ **CAUTION!**
> The index base plate mounting holes use a 5/16-18 thread. The index box mounting holes use a #12-24 thread. Be sure to use the proper tap for each hole. Using the wrong tap will result in damage to the meter head.

After using the tap, blow out the holes with compressed (canned) air.

Step 5 – Place the index base plate onto the instrument drive of the meter. Align the index base plate with the index plate mounting holes on the meter head so that the large opening in the base plate is centered over the drive mechanism.

Step 6 – Break out the tab for either the front or rear wire exit on the bottom edge of the pulser body, depending on how you plan to mount the MTU. (See the illustration below.)

Step 7 – Assemble the couplers and shaft to the pulser body as shown in the illustration below. Ensure that the magnet is mounted on the Tall Coupler, and that the retaining shaft is securely snapped into both the Tall Coupler and the 2-Pin Drive Disk.

Step 8 – Place the pulser on the index base plate, aligning the bottom coupler on the pulser with the wiggler on the meter. Align the corner mounting holes on the pulser with the mounting holes on the index base plate.

Step 9 – Fasten the pulser to the instrument drive using the four 5/16-18 x 3" slotted, stainless steel round head bolts provided. Install security cups, if desired, as shown below.

Step 10 – If the index box assembly has a silicone gasket applied around its bottom edge and that gasket is in good shape, you can discard the index cover gasket supplied with the pulser and skip to **Step 11**. Otherwise, place the index cover gasket on the pulser, aligning the gasket as shown below.

NOTE: When using the cork gasket supplied with the pulser, be sure that the bottom edge of the index box is clean and free of any silicone and/or dirt particles.

Step 11 – Place the index box assembly on the pulser, aligning the the drive foot with the two-pin drive disk. Fasten the index box to the meter with the two #12-24 x 2-¼" slotted, stainless steel fillister head screws provided.

Installation of the pulser is now complete. If you will be remotely mounting the MTU, refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs. Continue to **Step 12** if you will be mounting the MTU to the pulser body.

NOTE: The pulser and MTU can be supplied pre-wired or as separate assemblies. If provided as separate components, connect the three wires in the pulser cable (red, black, and white) to the corresponding wires in the MTU cable.

Step 12 – Continue here to mount the MTU to the pulser using the adaptor provided. Begin by positioning the adaptor on the back (or front) of the pulser body and attach it using the two #8-18 x ½" Phillips pan head thread forming screws provided.

Step 13 – Bundle the excess wire into the compartment on the adaptor.

MTU Instruction
for Romet Gas Meters with Vertical Mechanical Index

Step 14 - Mount the MTU to the adaptor using the two ¼-20 x 1-½" Phillips pan head machine screws and the ¼-20 nylock nuts.

Step 15 – Installation is now complete. Program the MTU using the STAR Programmer Software and your Field Programmer.

Purpose & Scope

This instruction provides a procedure for installing a STAR direct-mount MTU on the following Actaris/Sprague/Schlumberger residential gas meters: **175, 250 and 400 (Slant-face).**
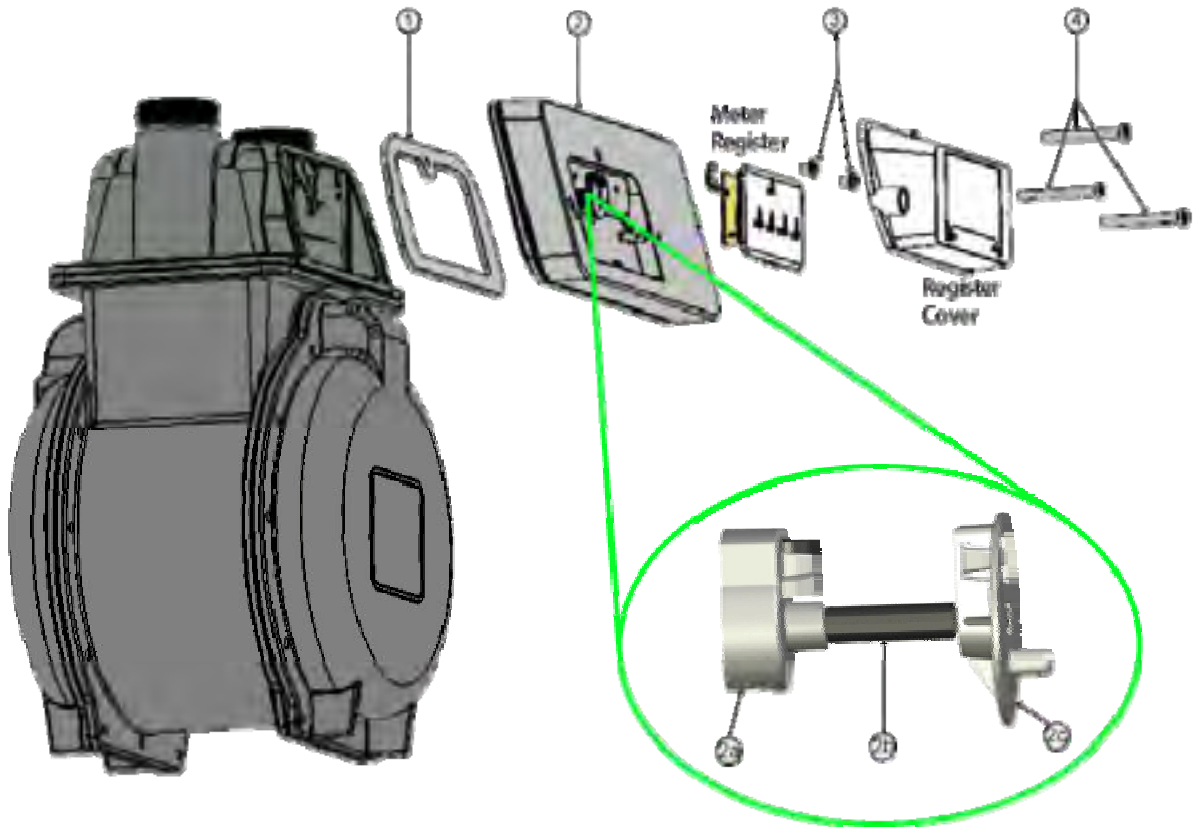
Parts Required

Ref. #	Item	Part Number	Quantity
1	Gasket	066-11583	1
2	MTU, Sprague Direct Mount	per project	1
2a	Magnet Coupler	056-11703B	1
2b	Coupler Shaft	056-5155D	1
2c	Register Coupler	056-11583D	1
3	#10 x 3/8" combo head thread form screw, Type A, zinc	069-100012C3A	2
4	10-24 x 2" slotted fillister head machine screw, zinc	069-102464HA	3

MTU Instruction
for Actaris/Sprague/Schlumberger Gas Meters

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Safety glasses
- #2 Phillips screwdriver
- ¼" Slotted screwdriver
- 2 alignment studs – Hexagram part number xxx-yyyy

Installation Procedure

Before installing the MTU, all anti-tamper, safety, and security hardware must be removed from the clear register cover.

Step 1 - Remove the existing clear register cover by removing the three screws that hold it. Set the cover aside and discard the screws.

Step 2 - Remove the register by removing the two screws that hold it. Set the register aside and discard the screws.

Step 3– Remove the paper backing from the gasket provided to expose the pressure sensitive adhesive. Place the gasket on the back of the MTU with the adhesive surface facing the MTU so that it aligns over the three mounting screws and the raised gasket surface of the MTU.

Step 4 – Next, turn the MTU over and mount the register onto the MTU (see illustration below) fastening the register to the MTU with the #10 x 3/8" screws provided.

Start the two screws into the mounting holes, and then slide the register beneath the screws, making sure that the wiggler on the register is aligned with the MTU coupler.

Tighten both screws to a torque not to exceed 3-5 inch-pounds.

⚠	**CAUTION!**
	Do not over tighten screws. Excessive torque may damage the MTU enclosure. **Use of power tools is not recommended.**

Step 5 – Check that the register is properly engaged by rotating the coupler on the back of the MTU and observing the register dials.

Step 6 – Next, thread alignment studs into the threaded mounting holes on the left and right side of the index box, as shown below.

Step 7 – Next, slide the MTU over the alignment studs, positioning the coupler on the MTU to ensure that it engages correctly with the wiggler on the gas meter.

Step 8 – Now, slide the clear register cover over the alignment studs while you hold the MTU in position with your free hand.

Step 9 - Next, insert one of the #10-24 x 2" screws through the top-center hole on the clear register cover. Tighten this screw just sufficiently to hold the MTU and register cover to the meter.

MTU Instruction
for Actaris/Sprague/Schlumberger Gas Meters

Step 10 – Next, remove one of the alignment studs and replace it with another one of the #10-24 x 2" screws provided. Continue in a similar manner, replacing the other alignment stud with a #10-24 x 2" screw. Tighten all three screws to a torque not to exceed 12 -15 inch-pounds. The gasket should be compressed slightly. Be careful not to over tighten the screws. Excessive torque may damage the MTU enclosure. Because of this, power tools are not recommended for this procedure.

Step 11 - Replace any anti-tamper, safety, or security hardware onto the plastic cover as required.

Step 12 – Once Installation is complete, program the MTU using your field programmer and the STAR Programmer Software.

Purpose & Scope

This instruction provides a procedure for mounting a STAR MTU to an **Armorcast Composite Pit Lid**. This procedure covers the mounting of an Original Flatpak STAR MTU or the New Flatpak STAR MTU to these pit lids. This procedure does not detail the wiring of the MTU to the meter inside of the pit. Please refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* in addition to any meter specific MTU installation and programming instructions.

Parts Required

Item	Part Number	Quantity
MTU	As required for installed meter	1
Hillman #370342 (10-12x1") Anchors		2 per installation
#8 x 2" Galvanized Sheet Metal Screws		2 per Original Style MTU installation
Long Spacers (for pit lid mounting of New Style Flatpak MTUs)	056-8150L	2 per New Style MTU installation
#8 x 2 1/2" Galvanized Sheet Metal Screws		2 per New Style MTU installation

Tools Required

To mount the MTU to these pit lids, you will need the following tools and equipment:

- Safety goggles
- #2 Phillips driver bit
- Hammer
- #2 Phillips Screwdriver
- Cordless Drill 3/8", variable speed, with adjustable torque settings.

MTU Instruction
for Armorcast Composite Pit Lids

Note on setting the torque range: On a drill-driver that has about 20 settings (positions), set the adjustment to #6. Use the lower speed range of the drill-driver. This should amount to approximately 8 in-lbs of torque. Reference the operating instructions for your particular drill to more accurately determine what setting to use to achieve a torque range of approximately 8 in-lbs.

Installation Procedure

Mounting an Original Flatpak STAR MTU to an Armorcast pit lid.

Step 1 – Place the pit lid top down on a solid surface.

Step 2 – Note the pre drilled mounting holes on the bottom of the pit lid. The holes used for mounting an Original Flatpak STAR MTU are highlighted in the photo below.

Original Flatpak Mounting Holes

Step 3 – Use a hammer to gently tap anchors into the holes indicated in the previous photo.

Step 4 – Position the MTU face-up on the bottom surface of the pit lid. Place 2 #8 x 2" galvanized sheet metal screws through the mounting holes as shown below, and guide the screws into the anchors.

#8 x 2" Screws
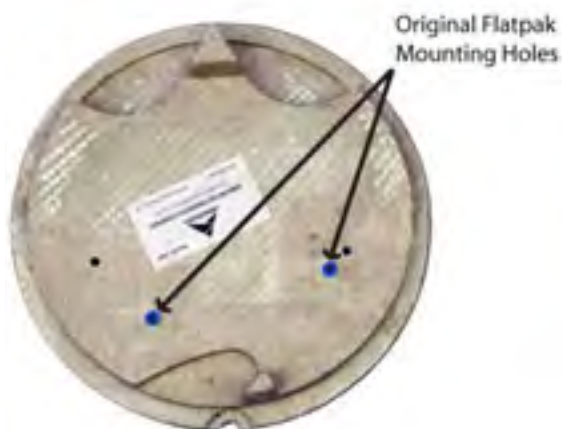
⚠️	**CAUTION!**
	Do not over tighten screws. Excessive torque may damage the MTU enclosure. Do not tighten screws beyond the point that the MTU touches the mounting surface. Power tools are not recommended for use when mounting an Original Flatpak STAR MTU to Armorcast lids.

Step 5 – Hand tighten the screws to approximately 8 in-lbs. MTU should be snug to the surface of the pit lid.

Step 6 – Wire the MTU to the meter, making sure that the wire is routed so that it does not become pinched when the lid is closed.

Step 7 - Installation is now complete. You can now proceed to program the MTU using the STAR Programmer Software and your MTU Programmer.

⚠️ **CAUTION!**
Be sure to follow all General Guidelines outlined in Publication 471-2000 along with the specific wiring instructions for the meter being used.

Mounting a New Flatpak STAR MTU to an Armorcast pit lid.

Step 1 – Place the pit lid top down on a solid surface.

Step 2 – Note the pre drilled mounting holes on the bottom of the pit lid. The holes used for mounting an New Flatpak STAR MTU are highlighted in the photo below.

Step 3 – Use a hammer to gently tap anchors into the holes indicated in the previous photo.

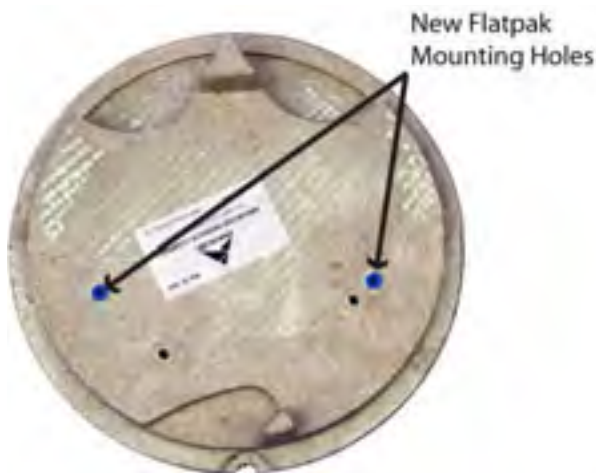**Step 4 –** Position the MTU face-down on the bottom surface of the pit lid as shown below. Insure that cable exit from the MTU faces the rim of the lid.

Step 5 - Place plastic spacers under the mounting lugs on the MTU as shown below. Position the spacers so that the notched ends mate up with the mounting tabs on the MTU. Note that the spacers should provide a gap of approximately 3/8" between the bottom surface of the lid and the top surface of the MTU.

Step 6 - Place 2 #8 x 2 ½" galvanized sheet metal screws through the mounting holes and the spacers, and guide the screws into the anchors.

Step 7 – Torque screws to approximately 8 in-lbs. MTU should be snug to the surface of the pit lid.

Step 8 – Wire the MTU to the meter, making sure that the wire is routed so that it does not become pinched when the lid is closed.

Step 9 - Installation is now complete. You can now proceed to program the MTU using the STAR Programmer Software and your MTU Programmer.

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Purpose & Scope

This instruction provides a procedure for use in installing a **Hexagram STAR MTU and Pulser** on a **Sprague/Actaris** '**Curb-type'** Gas Meter with top mounted index.

Parts Required

Ref	Item	Part Number	Qty
1	#10-32 x 2" slotted fillister head machine screw, brass	069-103264HC	4
2	Register (Index) Cover	056-0561	1
3	Cover Gasket, notched	066-0037	1
4	#6-19 x ½" Phillips pan head, hi-low thread forming screw, stainless	069-060016A4S	2
5	Single-pin Index Drive, with Magnet	056-11583D	1
6	Shaft, standard	056-5155D	1
7	MTU/Pulser Assembly	506-11703	1
8	Coupler	056-11703B	1
9	Neoprene rubber gasket	066-0035	1

Tools Required

- Wire Brush
- Screwdriver, #2 Phillips
- Screwdriver, 3/8" slotted (flat-blade)
- Two (2) Alignment Studs

Also see **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

There are two parts to this procedure. First, the pulser must be mounted to the meter. Then, the MTU must be mounted in a nearby location that will allow RF transmissions to propagate.

MTU Instruction
for Sprague/Actaris 'Curb-type' Gas Meters

Refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

Step 1 – If necessary, remove tamper seals from any of the four screws that secure the index cover to the meter body.

Step 2- Loosen and remove the four screws securing the index cover to the meter. You may discard these screws as they will not be re-used. Remove the index cover and the index cover gasket from the top of the meter and discard. You will replace both the cover and the gasket during reassembly.

Step 3 – Remove the two screws securing the index to the top of the meter. You may discard these screws as they will not be re-used. Remove the index register and set it aside.

Step 4 – Verify that the couplers and shaft are attached to the pulser body as shown below. Ensure that these components are securely snapped together and that the magnet is in place on the Single-pin Index Drive.
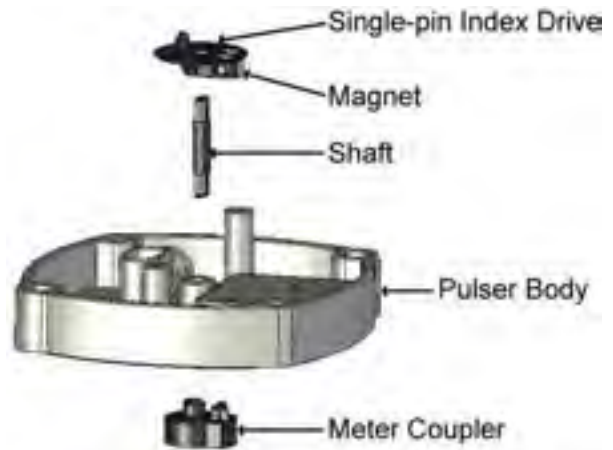
Step 5 – Mount the index to the pulser using the #6-19 Phillips screws provided. You can start the screws in the posts on the pulser body first. Then engage the tabs on the index with the mounting screws. Ensure that the pin on the index drive engages the wiggler on the index.

Step 6 – Place the gasket provided onto the meter, aligning it as shown to insure that the openings for the index cover bolts match up with the threaded holes on the top of the meter. Use the two (2) alignment studs to aid in alignment and assembly of parts.

NOTE: PG&E Code 23-2097 for cover gasket and Code 23-4931 for plastic cover.

Step 7 – Position the pulser and index on the meter, aligning the four holes with the threaded holes on top of the meter. Ensure that the coupler on the pulser engages the drive dog on the meter. You can orient the index in any direction.

Step 8 – Place the supplied index cover and notched index cover gasket on the pulser, again aligning the notches in the gasket with the index mounting posts. Then fasten the assembly to the meter using the four #10-32 x 2" brass machine screws provided. Alternately tighten opposite screws to evenly compress the gaskets.

NOTE: Use "red" security caps and "putty" to seal screw wells.

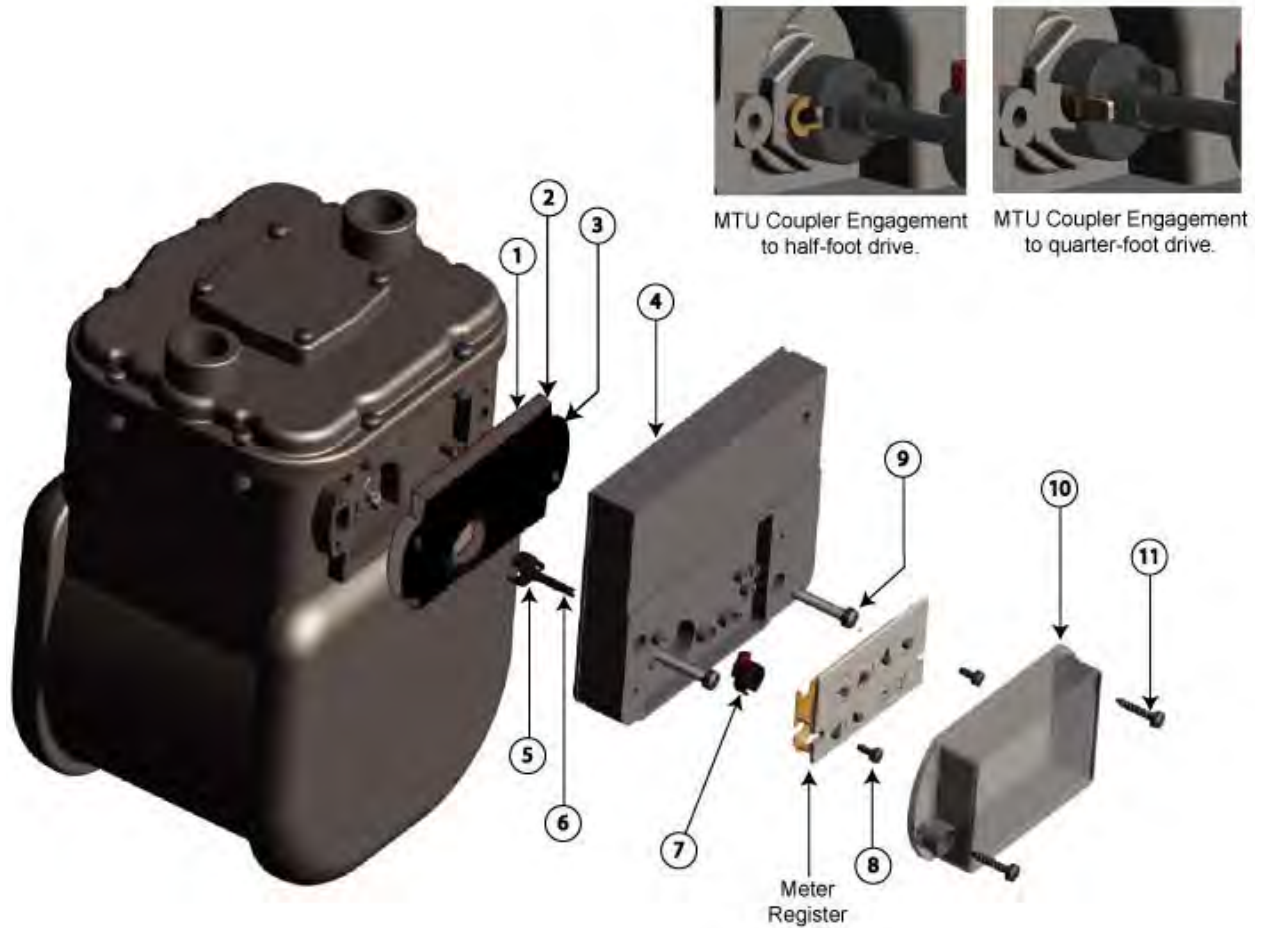# MTU Instruction
for Sprague/Actaris 'Curb-type' Gas Meters

Step 9 – Mount the MTU. Please refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

Step 10 – Installation is now complete. Program the MTU using the STAR Programmer Software and your Field Programmer.

Purpose & Scope

This instruction provides a procedure for installing a STAR direct-mount MTU on American Meter Company **5B-225** meters.

MTU Coupler Engagement to half-foot drive.

MTU Coupler Engagement to quarter-foot drive.

Meter Register

Parts Required

Ref. #	Item	Part Number	Quantity
1	Cork Gasket	066-12466B	1
2	Adaptor Plate	056-12466A	1
3	Rubber Gasket	066-12466A	1
4	MTU, Direct Mount	per project	1
5	Coupler, MTU	056-5155E2	1
6	Extended Shaft	056-12466B	1
7	Coupler, MTU with Magnet (Magnet 036-0002)	056-5155E2	1
8	#8 x 3/8" Combo Head Sheet Metal Screw, Zinc	069-080012C4A	2
9	¼-20 x 1 5/8" Slotted Fillister Head Machine Screw	069-142040GA	2
10	Register Cover	109-7712A	1
11	#10 x 1" Combo Head Sheet Metal Screw, Zinc	069-100032C3A	2

MTU Instruction
for American Meter Company Gas Meters

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Safety glasses
- Phillips screwdriver
- Slotted screwdriver

Installation Procedure

Before installing the MTU, all anti-tamper, safety, and security hardware must be removed from the clear register cover.

Step 1 - Remove the existing clear register cover by removing the four screws that hold it. Discard both the screws and the cover.

Step 2 - Remove the register by removing the two screws that hold it. Set the register aside. Discard the screws.

Step 3 – Assemble the couplers and extended shaft to the MTU. Ensure that the coupler with the magnet is on the front (register side) of the MTU and that the extended shaft protrudes from the back of the MTU with the other coupler. The notch of the front side coupler (with magnet) should be at the 12 o'clock position when the notch on the backside coupler faces 3 o'clock (90°).

Back of MTU
(Meter Side)

Front of MTU
(Register Side)

Step 4 - Mount the register onto the MTU, fastening the register to the mounting holes shown here with the #8 x 3/8" screws provided.

Start one of the two screws into the mounting hole, and then slide the register beneath the screw aligning the wiggler on the register with the MTU coupler.

> ⚠️ **CAUTION!**
> Do not over tighten screws. Excessive torque may damage the MTU enclosure. **Use of Power tools is not recommended.**

Then insert the second screw and tighten both screws to a torque not to exceed 3-5 inch-pounds.

Note: On some odometer-style registers like the one shown below, slight protrusions on the back of the register assembly can interfere with proper alignment of the register. Should this occur, use a diagonal cutting plier to trim the two wire guides on the MTU to the right of the coupler. Trim these guides as close to flush with the MTU enclosure as possible. (See MTU photo below.)

Odometer-Style Register - Front

## Odometer-Style Register - Back

Protrusions

Trim Here

Step 5 – Check that the register is properly engaged by rotating the coupler on the back of the MTU and observing the register dials.

Step 6 – Next, Insert the two ¼-20 x 1 5/8" machine screws through the holes on the MTU as shown here.

Step 7– Turn the MTU over and place the rubber gasket on the back of the MTU so that it aligns over the two screws.
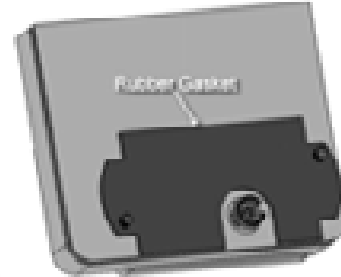
Step 8 – Next, place the adaptor plate on the back of the MTU so that it aligns over the two screws.

Step 9 – The cork gasket is normally pre-applied to the adaptor plate. Ensure that it is in position on the back of the adaptor plate.

Step 10 – Next, position the MTU on the meter. Tighten the two ¼-20 x 1 5/8" mounting screws most of the way, and then rotate the register dials slightly to engage the wiggler on the gas meter.

The wiggler must engage with the rear coupler on the MTU as shown in these illustrations. (Coupler shown detached from the MTU for illustration purposes only.)

Half-foot Drive   **Quarter-foot Drive**

Step 11 – Now, firmly hand tighten the two screws to 12 to 15 in-lb. Be careful not to over tighten the screws. Excessive torque may damage the MTU enclosure. Because of this, power tools are not recommended for this procedure.

insert the #10 x 1" screws. Hand tighten to a torque not to exceed 3-5 inch-pounds. The gasket should be compressed slightly.

Step 14 – Replace any anti-tamper, safety, or security hardware onto the plastic cover as required.

Step 12 - Check the coupling one more time. It should have slight play — it should not bind or turn too freely.

Step 13 - Place the new cover over the register so that the top label or arrow is on top and the vent holes are on the bottom. Align the cover with the mounting holes on the MTU, press it into place, and
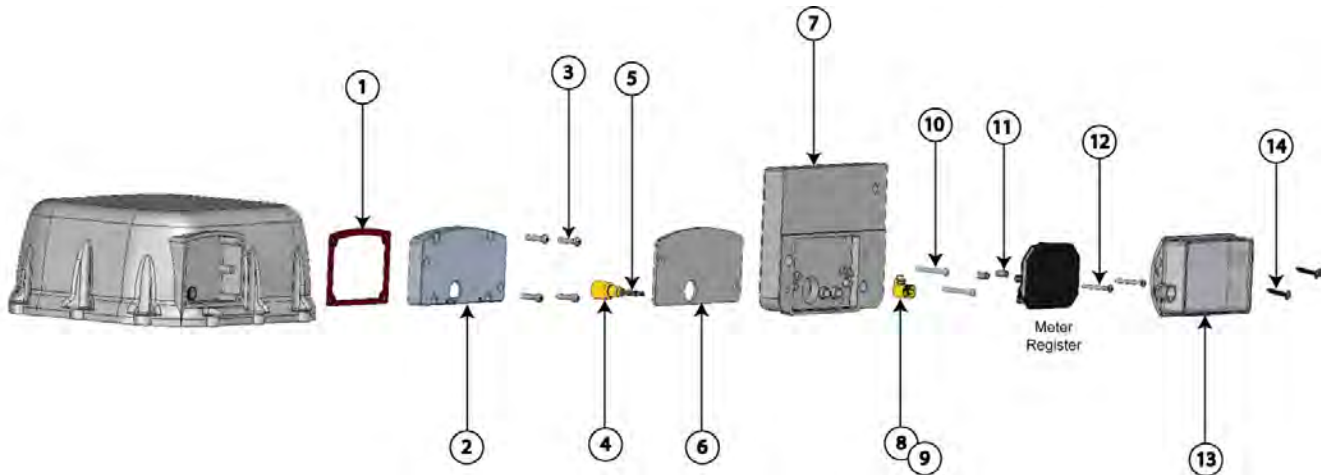
Step 15 – Once Installation is complete, program the MTU using your Field Programmer and the STAR Programmer Software.

Purpose & Scope

This instruction provides a procedure for installing a STAR direct-mount MTU on the Rockwell/Equimeter/Sensus R415 Meters.

Parts Required

Ref. #	Item	Part Number	Quantity
1	Gasket, Adaptor Plate to Meter	066-0032	1
2	Adapter Plate, R415	056-12331C	1
3	10-24 x 3/4" Slotted, Fillister Head Machine Screw, Zinc	069-102424HA	4
4	Coupler, Female, 18 Tooth Gear (orange)	056-12331B	1
5	Coupler Shaft, MTU	056-5155D	1
6	Gasket, Adaptor Plate to MTU	066-12331A	1
7	MTU, Direct Mount	506-7712RO	1
8	18 Tooth Gear, Male, R415 (orange)	056-12331A	1
9	Magnet	036-0002	1
10	¼-20 x 1 1/4" Slotted, Fillister Head Machine Screw, Zinc	069-142040HA	2
11	#6 Round Spacer, Nylon	068-0051	2
12	#6 x 1 1/4" Combo Panhead Sheet Metal Screw, Zinc	069-060040C3A	2
13	Register Cover, MTU	109-7712A	1
14	#10 x 1" Combo Head Sheet Metal Screw, Zinc	069-100032C3A	2

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Cordless drill ⅜", variable speed, with adjustable torque settings
- #2 Phillips power screwdriver bit
- Safety goggles
- Phillips screwdriver
- Slotted screwdriver
- Putty knife

Installation Procedure

Before installing the MTU, anti-tamper, safety, and security hardware must be removed from the clear register cover.

Step 1 - Remove the existing clear register cover by removing the four screws. Discard the screws and cover.

Step 2 - Remove the register by removing the two screws. Set the register aside. Discard the screws.

Step 3 - Remove the existing gasket and use the putty knife to clean any remnants of the old gasket from the mating surfaces.

Step 4 – Insure that the new cork gasket is properly applied to the meter (ribbed) side of the adaptor plate and fasten the adaptor plate and gasket to the meter using the four 10-24 x ¾" machine screws provided.


Step 5 – Remove and discard the existing couplers and shaft from the MTU and assemble the new couplers and shaft to the MTU, positioning the female coupler at the back of the MTU and the 18-tooth gear with magnet at the front as shown below. Ensure that both couplers are securely snapped on to the coupler shaft.

Back of MTU
(Meter Side)

Front of MTU
(Register Side)

Step 6– Insert the two ¼-20 x 1-1/4"
machine screws into the holes on the
MTU as shown.
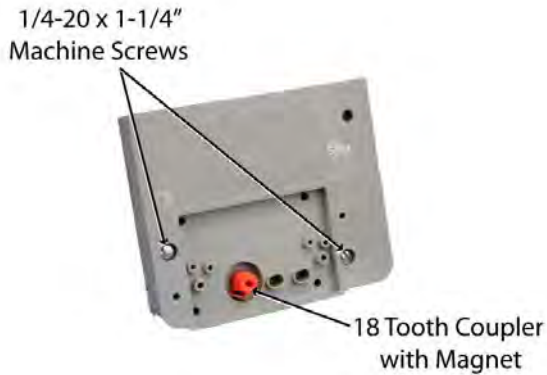
1/4-20 x 1-1/4"
Machine Screws

18 Tooth Coupler
with Magnet

Step 7 – Turn the MTU over and position
the rubber gasket over the screws and
female coupler as shown.

Step 8 - Position the MTU on the meter,
sliding the female coupler over the drive
gear on the meter. Tighten the MTU
mounting screws to 12 to 15 in-lb.

Check the coupler. It should have slight
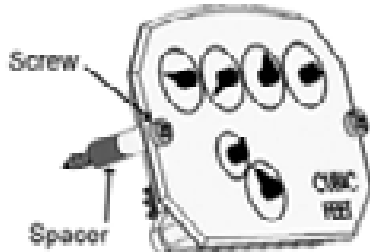play — it should not bind or turn too
freely.

> ⚠ **CAUTION!**
> Do not over tighten screws.
> Excessive torque may
> damage the MTU enclosure.
> **Power tools are not
> recommended for use on
> steps 8-12.**

MTU Instruction
for Rockwell/Equimeter/Sensus Gas Meters

Step 9 - On the register, insert the two #6 x 1-1/4" sheet metal screws and spacers as shown.

Step 10 - Mount the register to the MTU, fastening it to the mounting holes shown below. **Hand tighten to a torque not to exceed 3-5 inch-pounds.** Make sure the index register gear and the MTU coupler gear are engaged.

Step 11 - Place the new cover over the register so that the top label or arrow is on top and the vent holes are on the bottom. Align the cover with the mounting holes on the MTU, press it into place, and insert the #10 x 1" screws. **Hand tighten to a torque not to exceed 3-5 inch-pounds.** The gasket should be compressed slightly.

Step 12 - Replace any anti-tamper, safety, or security hardware onto the plastic cover as required.
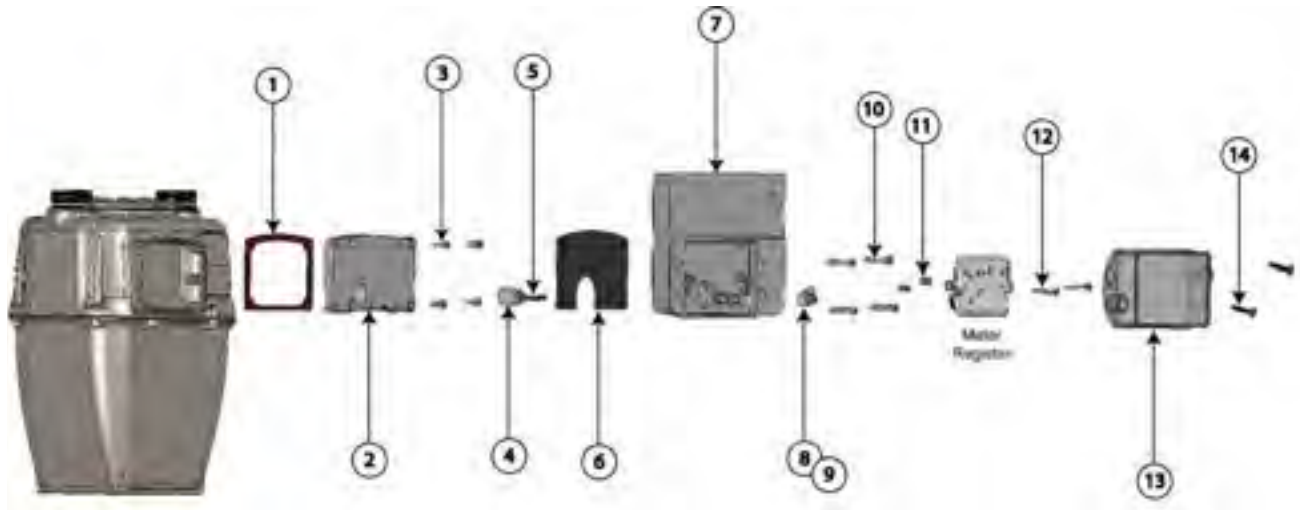

Step 13 – Once Installation is complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

Purpose & Scope

This instruction provides a procedure for installing a STAR direct-mount MTU on the following Rockwell/Equimeter/Sensus 175S meters.

Parts Required

Ref. #	Item	Part Number	Quantity
1	Gasket, Adaptor Plate to Meter	066-0032	1
2	Adaptor Plate, 175S	056-12330CC	1
3	10-24 x 1/2" Slotted, Fillister Head Machine Screw, Zinc	069-102416HA	4
4	Coupler, Female, 12 Tooth 175S	056-12330B	1
5	Coupler Shaft, MTU	056-5155D	1
6	Gasket, Adaptor Plate to MTU	066-12330C	1
7	MTU, Direct Mount	per project	1
8	12 Tooth Gear, Male, 175S	056-12330A	1
9	Magnet	036-0002	1
10	10-24 x 1-1/8" Slotted, Fillister Head Machine Screw, Zinc	069-102436HA	4
11	#6 Round Spacer, Nylon	068-0051	2
12	#6 x 1 1/4" Combo Head Sheet Metal Screw, Zinc	069-060040C3A	2
13	Register Cover, MTU	109-7712A	1
14	#10 x 1" Combo Head Sheet Metal Screw, Zinc	069-100032C3A	2

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Cordless drill ⅜", variable speed, with adjustable torque settings
- #2 Phillips power screwdriver bit
- Safety goggles
- Phillips screwdriver
- Slotted screwdriver

Installation Procedure

Before installing the MTU, anti-tamper, safety, and security hardware must be removed from the clear register cover.

Step 1 - Remove the existing clear register cover by removing the four screws. Discard the screws and cover.

Step 2 - Remove the register by removing the two screws. Set the register aside. Discard the screws.

Step 3 – Insure that the cork gasket is properly applied to the meter (ribbed) side of the adaptor plate and fasten the adaptor plate and gasket to the meter using the four 10-24 x 1/2" machine screws provided.
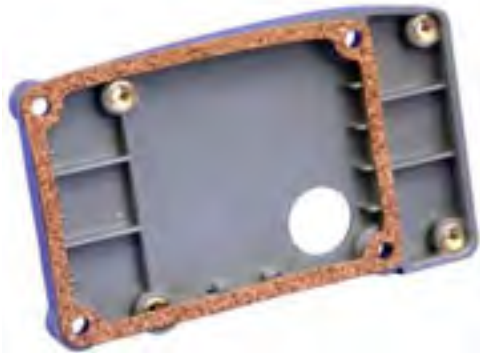
Step 4 – Remove and discard the existing couplers and shaft from the MTU and assemble the new couplers and shaft to the MTU, positioning the female coupler at the back of the MT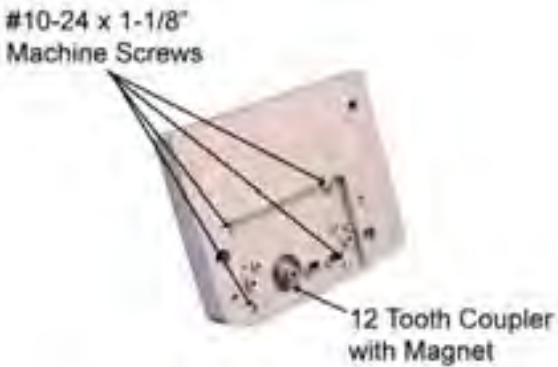U and the 12-tooth gear with magnet at the front as shown below. Ensure that both couplers are securely snapped on to the coupler shaft.

Back of MTU
(Meter Side)

Front of MTU
(Register Side)

Step 5 – Insert the four #10-24 x 1-1/8" machine screws into the holes at the corners of the index box as shown.

#10-24 x 1-1/8"
Machine Screws

12 Tooth Coupler
with Magnet

Step 6 – Turn the MTU over and position the rubber gasket over the screws and female coupler as shown. The cork side of the gasket should face out as shown below.

Step 7 - Position the MTU on the meter, sliding the female coupler over the drive gear on the meter. Tighten the MTU mounting screws to 12 to 15 in-lb.

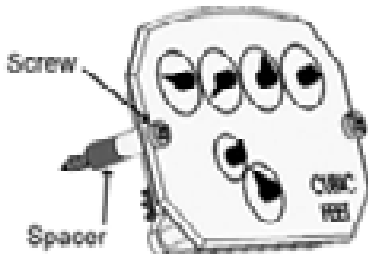Check the coupler. It should have slight play — it should not bind or turn too freely.

⚠	**CAUTION!** Do not over tighten screws. Excessive torque may damage the MTU enclosure. **Power tools are not recommended for use on steps 8-12.**

Step 8 - On the register, insert the two #6 x 1-1/4" sheet metal screws and spacers as shown.

Step 9 - Mount the register to the MTU, fastening it to the mounting holes shown below. **Hand tighten to a torque not to exceed 3-5 inch-pounds.** Make sure the index register gear and the MTU coupler gear are engaged.

Step 10 - Place the new cover over the register so that the top label or arrow is on top and the vent holes are on the bottom. Align the cover with the mounting holes on the MTU, press it into place, and insert the #10 x 1" screws. **Hand tighten to a torque not to exceed 3-5 inch-pounds.** The gasket should be compressed slightly.

Step 11 - Replace any anti-tamper, safety, or security hardware onto the plastic cover as required.

Step 12 – Once Installation is complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

Purpose & Scope

This instruction provides a procedure for use in installing a **Hexagram STAR MTU** on a **Rockwell 175-EMCO** Gas Meter. Please also refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

Parts Required

Item	Part Number	Qty
Magnet Clip with Magnet	056-12469A	1
Sensor Clip	056-12469B	1
MTU/Sensor Assembly	506-7712BRO1	1

Tools Required

- Screwdriver, #2 Phillips
- Screwdriver, 1/4" slotted (flat-blade)
- Round file

Also see **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

Step 1 – If necessary, remove any anti-tamper seals or security hardware from the index cover.

Step 2- Loosen and remove the two screws securing the index cover to the meter. Set the screws and the index cover aside. These items will be reused during reassembly.

Step 3 – Remove the index by removing the two screws securing the index to the meter. Set the screws aside.

Step 4 – Turn the index over and slide the magnet clip onto the index drive dog as shown. Slide the clip onto the drive dog until it snaps into place.

MTU Instruction
for Rockwell 175-EMCO Gas Meters

Step 5 – Snap the sensor clip onto the back of the index as shown.

Step 6 – Position the index on the meter and attach the index using the index mounting screws removed in Step 3. Ensure that the meter drive engages the index drive dog as shown below.

Step 7 – Snap the sensor of the MTU into the sensor clip as shown.

Step 8 – Using a round file, file a 1/8" notch .on the lower left corner of the rim of the index cover. This notch will provide an exit for the sensor wire.

Notch

Step 9 – Route the sensor cable to the left of the index and position the MTU and index cover on the meter aligning the sensor cable with the notch in the meter body at the bottom left of the index cover. Fasten the MTU and index cover to the meter using the original screws removed in Step 2.

Step 10 – Installation is now complete. Program the MTU using the STAR Programmer Software and your Field Programmer.

Purpose & Scope

This instruction provides a procedure for installing a STAR remote-mount MTU on the following Rockwell/Equimeter/Sensus meters: **R175, R200, R250, R275, R310, R315, RT210.** Please also refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.

Parts Required

Item	Part Number	Quantity
MTU, Rockwell Remote Mount, with sensor	per project	1
#6 x 3/4" Philips Panhead Sheet Metal Screw	069-06000242A	2
#10-24 x 1-1/2" Slotted, Fillister Head Machine Screw	069-102448HA	4

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Safety goggles
- Phillips screwdriver
- Slotted screwdriver

Installation Procedure

Before installing the MTU, anti-tamper, safety, and security hardware must be removed from the clear register cover.

Step 1 - Remove the existing clear register cover by removing the four screws that hold it. Set the cover aside. Discard the screws.

Step 2 - Remove the register by removing the two screws. Discard the screws.

Step 3 – Position the register on the front of the sensor assembly, aligning the drive gear with the index drive. Mount the index to the sensor assembly using the two #6 x 3/4" screws provided.

Step 4 – Carefully remove the protective cap from the drive coupler on the rear of the sensor assembly. Note the tooth on the inner surface of the coupler.

Step 5 - Position the sensor on the meter. so that the tooth on the coupler engages with the teeth on meter's index drive gear. If engaged correctly, the cork gasket on the sensor will fit flush against the surface of the index box.

Step 6 – Position the clear register cover on the front of the sensor and fasten the assembly to the meter using the four 10-24 x 1-1/2" screws provided. Hand tighten these screws to a torque not to exceed 12-15 inch pounds.

Step 7 - Replace any anti-tamper, safety, or security hardware onto the plastic cover as required.

Step 8 – Mount the MTU, following the wiring and mounting guidelines outlined in **Publication 471-2000**, *General Installation and Wiring Guidelines*. If necessary, the MTU cable can be extended up to 500 feet.

Step 9 – Once Installation is complete, program the MTU using your Field Programmer and the STAR Programmer Software.

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Purpose & Scope

This instruction provides a procedure for installing **Landis & Gyr Focus MTU/Electric Meter Assemblies.**

⚠	**WARNING!**
	Be sure to follow all applicable electrical codes, standards and safety procedures during all phases of operation, service and repair of this device. Any work on energized meters and meter sockets presents a danger of electrical shock. Meter socket terminals carry the full incoming service voltage. Touching these terminals may result in death or serious injury.
	The information contained in this document is intended to be an aid to qualified metering personnel. It is not intended to replace the extensive training necessary to handle metering equipment in a safe manner.

Supplies and Tools Required

Physical Installation of the Landis & Gyr Focus MTU/Electric Meter Assemblies into compatible meter sockets can be accomplished without the use of tools.
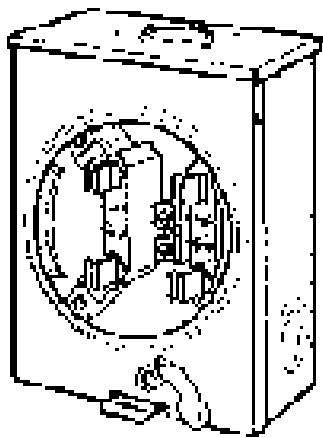
Testing of the meter socket, however, may require specialized equipment. Check with the local electric utility for required testing procedures.

MTU Instruction
for Landis & Gyr Focus MTU/Electric Meter Assembly

Installation Procedure

Step 1 – Complete all test procedures required by the local electric utility and verify that the meter socket has been correctly installed and wired.

Step 2 – If applicable, remove the existing meter assembly from the meter socket.

Step 3 – Place the meter/MTU assembly into the meter socket, carefully aligning the contact blades with the corresponding jaws in the meter base.

Step 4 – Make a final visual inspection to ensure that the meter/MTU assembly is seated, sealed properly, and receiving power.

Step 5 – Installation is now complete, program the MTU using the STAR Programmer Software and your Field Programmer.

When programming the integral MTU mounted in this meter, hold the programming coil at the 9 o'clock position as shown here.

Position Programming Probe Here ➡

Purpose & Scope

This instruction provides a procedure for installing **Landis & Gyr S4 MTU/Electric Meter Assemblies.**

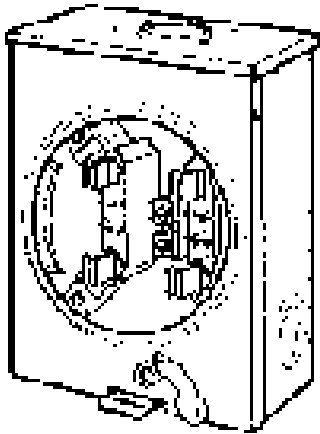|	**WARNING!**
⚠️	Be sure to follow all applicable electrical codes, standards and safety procedures during all phases of operation, service and repair of this device. Any work on energized meters and meter sockets presents a danger of electrical shock. Meter socket terminals carry the full incoming service voltage. Touching these terminals may result in death or serious injury.
	The information contained in this document is intended to be an aid to qualified metering personnel. It is not intended to replace the extensive training necessary to handle metering equipment in a safe manner.

Supplies and Tools Required

Physical Installation of the Landis & Gyr S4 MTU/Electric Meter Assemblies into compatible meter sockets can be accomplished without the use of tools.

Testing of the meter socket, however, may require specialized equipment. Check with the local electric utility for required testing procedures.

MTU Instruction
for Landis & Gyr S4 MTU/Electric Meter Assembly

Installation Procedure

Step 1 – Complete all test procedures required by the local electric utility and verify that the meter socket has been correctly installed and wired.

Step 2 – If applicable, remove the existing meter assembly from the meter socket.

Step 3 – Place the meter/MTU assembly into the meter socket, carefully aligning the contact blades with the corresponding jaws in the meter base.

Step 4 – Make a final visual inspection to ensure that the meter/MTU assembly is seated, sealed properly, and receiving power.

Step 5 – Installation is now complete, program the MTU using the STAR Programmer Software and your Field Programmer.

When programming the integral MTU mounted in this meter, hold the programming probe at the 3 o'clock position as shown here.

Position Programming Probe Here

Purpose & Scope

This instruction provides a procedure for mounting a New Flatpak STAR MTU to a rectangular **DFW composite pit lid**. This procedure does not detail the wiring of the MTU to the meter that may be encountered inside of the pit. Please refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* in addition to any meter specific MTU installation and programming instructions.

Parts Required

Item	Part Number	Quantity
MTU	As required for installed meter	1
Long Spacers (for pit lid mounting of New Style Flatpak MTUs)	056-8150L	2 per MTU installation
#10 x 2 1/2" Phillips Pan Head Type AB Stainless Steel Sheet Metal Screw		2 per MTU installation

Tools Required

To mount the MTU to these DFW pit lids, you will need the following tools and equipment:

- Safety goggles
- #3 Phillips driver bit
- 3/32" drill bit
- Cordless Drill 3/8", variable speed, with adjustable torque settings.

Note on setting the torque range: On a drill-driver that has about 20 settings (positions), set the adjustment to #6. Use the lower speed range of the drill-driver. This should amount to approximately 8 in-lbs of torque. Reference the operating instructions for your particular drill to more accurately determine what setting to use to achieve a torque range of approximately 8 in-lbs.

MTU Instruction
for DFW Rectangular Composite Pit Lids

Installation Procedure

Mounting a New Flatpak STAR MTU to a rectangular DFW composite pit lid.

Step 1 – Place the lid top down and use a template to mark and drill two pilot holes in the bottom surface of the pit lid as shown below.

Note: A paper template is included in this document. The spacing between the two holes must be 6.81" (6 13/16").

The pilot holes should be along the solid ridge running across the pit lid as shown, positioned away from the finger hole.
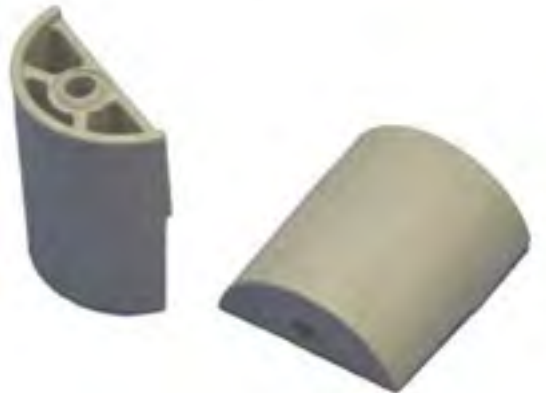

Drill Pilot Holes with 3/32" Drill

Step 2 - Place plastic spacers under the mounting tabs on the MTU as shown below, and attach the MTU to the pit lid with the 2 ½" stainless sheet metal screws. Insert the screws through the mounting holes and spacers and into the pre-drilled pilot holes.

#10 x 2 1/2" Screws

Be sure to use the long spacers (Hexagram Part Number 056-8150L). You will note that one end of the spacers has a semi-circular ridge that mates with the mounting tabs on the MTU.

Be sure to position the MTU as shown, with the top (antenna) section of the MTU positioned in the approximate center of the lid.

Torque screws to approximately 8 in-lbs. The MTU should be snug and suspended by the spacers above the bottom surface of the pit lid by approximately ½".

⚠	**CAUTION!** Be sure to follow all General Guidelines outlined in Publication 471-2000 along with the specific wiring instructions for the meter being used.

Step 3 – Wire the MTU to the meter, making sure that the wire is routed so that it does not become pinched when the lid is closed.

Step 4 - Installation is now complete. You can now proceed to program the MTU using the STAR Programmer Software and your MTU Programmer.

Template

6.81"

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Purpose & Scope

This instruction provides a procedure for mounting a STAR Flatpak MTU to a **Carson Industries Polyplastic Model 1015-5 pit lid**. This procedure does not detail the wiring of the MTU to the meter that may be encountered inside of the pit. Please refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* in addition to any meter specific MTU installation and programming instructions.

Parts Required

Item	Part Number	Quantity
MTU Flatpack - Model 8150	As required for installed meter	1
Long Plastic Zip Ties	Source locally	2
Electric Drill	Source locally	1
¼" Drill Bit	Source locally	1

MTU Instruction
for Carson Industries 1015-5 Pit Lids

Tools Required

To mount the MTU to the Carson pit lids, you will need the following tools and equipment:

- Safety goggles
- Long plastic zip ties
- 1/4" standard drill bit
- Cordless Drill with variable speed and adjustable torque settings

Note on setting the torque range: On a drill that has about 20 settings (positions), set the adjustment to #6. Use the lower speed range of the drill. This should amount to approximately 8 in-lbs of torque. Reference the operating instructions for your particular drill to more accurately determine what setting to use to achieve a torque range of approximately 8 in-lbs.

Installation Procedure

Step 1 – Drill a hole through the left and right center ribs of the pit lid. The hole should be approximately one inch from the center of the lid and about ½ inch from the top of the rib.

Step 2 – Position the MTU with the label side face down against the underside of the pit lid. The mounting tabs of the MTU should be aligned with the center ribs with the newly drilled holes. **Ensure that the metal hinge of the pit lid view door is below the bottom of the MTU.**

Step 3 – Thread plastic zip ties through each of the drilled rib holes and through the holes of the MTU mounting tabs.

Step 4 – Gently pull through the zip ties so that the MTU is secured to the pit lid. **Do not over tighten the zip ties. Excessive torque may bend the mounting tabs and break the seal of the MTU.** There should be a little movement with the MTU once the zip ties have been sufficiently tightened.

Step 5 – Once secured, remove the unnecessary length from the zip tie ends.

MTU Instruction
for Carson Industries 1015-5 Pit Lids

Step 6 – The MTU STAR logo should be visible through the pit lid view door after proper placement and mounting.

Step 7 – Wire the MTU to the meter, folding and forming wires into valve box as necessary so that they do not interfere with lid locking mechanism and cannot become pinched.
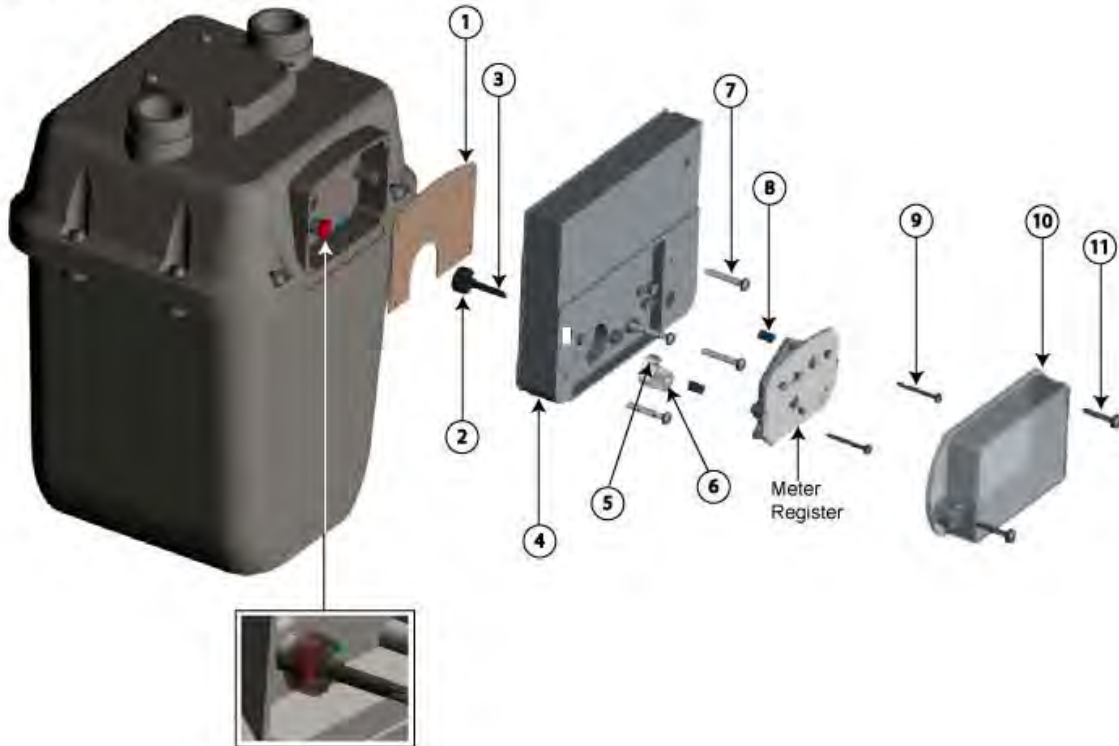
Step 8 – Installation is now complete. You can now proceed to program the MTU using the STAR Field Programmer Software and your Field Programmer.

Purpose & Scope

This instruction provides a procedure for installing a STAR direct-mount MTU on Rockwell/Equimeter/Sensus **MR-8** residential gas meters.

Rockwell/Equimeter/Sensus Gas Meter

Detail showing MTU coupler engagement to drive gear of meter

Parts Required

Ref. #	Item	Part Number	Quantity
1	Gasket	066-5155C	1
2	Coupler, MTU	056-13183A	1
3	Retaining Shaft, MTU	056-5155D	1
4	MTU, Direct Mount	501-6327/7712	1
5	Magnet	036-0002	1
6	Gear/magnet holder	056-13183B	1
7	10-24 x 1 1/8" Slotted, Fillister Head Machine Screw	069-102436HA	4
8	#6 Round Spacer, Nylon	068-60812-EX	2
9	#6 x 1 1/4" Combo Panhead Sheet Metal Screw	069-060040C3A	2
10	Register Cover, MTU	109-7712A	1
11	#10 x 1" Combo Panhead Sheet Metal Screw	069-100032C3A	2

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Cordless drill ⅜", variable speed, with adjustable torque settings
- #2 Phillips power screwdriver bit
- Safety goggles
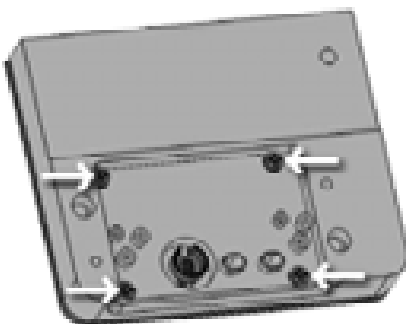- Phillips screwdriver
- Slotted screwdriver

Installation Procedure

Before installing the MTU, anti-tamper, safety, and security hardware must be removed from the clear register cover.
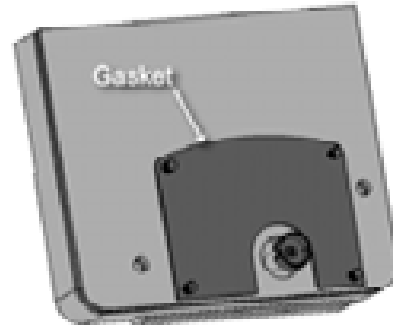
Step 1 - Remove the existing clear register cover by removing the four screws. Discard the screws and cover.

Step 2 - Remove the register by removing the two screws. Set the register aside. Discard the screws.

Step 3 - Insert the four 10-24 x 1⅛" screws through the holes on the MTU as shown.

Step 4 – Turn the MTU over and place the gasket on the back of the MTU so that it aligns over the four screws, as shown.

Step 5 - Position the MTU on the meter. Rotate the coupler so that the gear tooth on the coupler engages with the gear teeth on the gas meter. Orientation is not critical, but you should be able to feel the teeth "bite" when you turn the coupler from the front of the MTU.

Step 6 - Tighten the four 10-24 x 1-⅛" screws to 12 to 15 in-lb. On a standard drill driver with 0 to 24 torque settings, this is typically the #10 setting. Tighten corner to corner.

Step 7 - Check the coupler. It should have slight play — it should not bind or turn too freely.
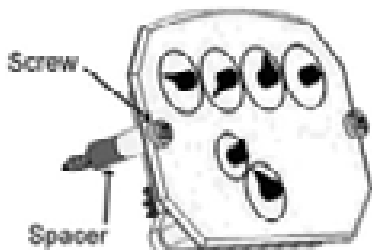
CAUTION!

Do not over tighten screws. Excessive torque may damage the MTU enclosure. **Power tools are not recommended for use on steps 9-12.**

Step 8 - On the register, insert the screws and spacers.

Step 9 - Mount the register to the MTU, fastening it to the mounting holes shown below. **Hand tighten to a torque not to exceed 3-5 inch-pounds.** Make sure the index register gear and the MTU coupler gear are engaged.

Step 10 - After you feel engagement between the index register gear and the MTU coupler gear, tighten the register screws until they are snug.

Step 11 - Place the new cover over the register so that the top label or arrow is on top and the vent holes are on the bottom. Align the cover with the mounting holes on the MTU, press it into place, and insert the #10 x 1" screws. **Hand tighten to a torque not to exceed 3-5 inch-pounds.** The gasket should be compressed slightly.

Step 12 - Replace any anti-tamper, safety, or security hardware onto the plastic cover as required.

Step 13 – Once Installation is complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

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Purpose & Scope

This instruction provides a procedure for mounting a STAR Flatpak MTU to a **Mid-States 12" Round Pit Lid** (Model Number MS-IL1-SN). This procedure does not detail the wiring of the MTU to the meter that may be encountered inside of the pit. Please refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* in addition to any meter specific MTU installation and programming instructions.

Parts Required

Item	Part Number	Quantity
MTU Flatpack - Model 8150	As required for installed meter	1
Adjustable lid bracket	056-8150H	1
#10-32 x 1-3/4" Phillips pan-head machine screw, stainless	069-103256AS	2
#10-32 x ½" Phillips pan-head machine screw, stainless	069-103216AS	1
Short Spacers	056-8150S	2

Tools Required

To mount the MTU to 12" round Mid-States pit lids, you will need the following tools and equipment:

- Safety goggles
- Cordless Drill with variable speed and adjustable torque settings
- #2 Phillips power screwdriver bit

Note on setting the torque range: On a drill that has about 20 settings (positions) set the adjustment to #6. Use the lower speed range of the drill. This should amount to approximately 8 in-lbs of torque. Reference the operating instructions for your particular drill to more accurately determine what setting to use to achieve a torque range of approximately 8 in-lbs.

MTU Instruction
for Mid-States 12" Round Pit Lids

Installation Procedure

Step 1 – Place the pit lid top-side down on a solid surface, positioning the metal latch nearest to you as shown in the photo below.

Step 2 – Pre-assemble the MTU, spacers and bracket as shown below, using the two #10-32 x 1-3/4" machine screws through the back of the MTU mounting tabs and spacers. Thread the bracket onto the screw at the left side of the MTU

Step 3 – Turn the MTU face down onto the bottom surface of the pit lid positioning it as shown below. Align the slot in the bracket with the mounting post at the top right and insert the #10-32 x ½" machine screw. Then tighten all hardware to approximately 8 in-lbs.

Step 4 – Here's another view of the finished assembly. Note the position of the bracket.

Step 5 – Wire the MTU to the meter, bundling the excess wire as necessary so that it does not interfere with lid locking mechanism and cannot become pinched when the lid is placed on the pit.

> ### CAUTION!
> Be sure to follow all General Guidelines outlined in Publication 471-2000 along with the specific wiring instructions for the meter being used.

Step 6 – Installation is now complete. You can now proceed to program the MTU using the STAR Field Programmer Software and your Field Programmer.

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Purpose & Scope

This instruction provides a procedure for temporarily mounting a STAR Flatpak MTU to a **Alliance Rectangular Pit Lid** (illustrated below). This procedure does not detail the wiring of the MTU to the meter that may be encountered inside of the pit. Please refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* in addition to any meter specific MTU installation and programming instructions.

Parts Required

Item	Part Number	Quantity
MTU Flatpack - Model 8150	As required for installed meter	1
Long Plastic Zip Ties	Source locally	2
Electric Drill	Source locally	1
¼" Drill Bit	Source locally	1

Tools Required

To mount the MTU to the Alliance rectangular pit lids, you will need the following tools and equipment:

- Safety goggles
- Long plastic zip ties
- 1/4" standard drill bit
- Cordless Drill with variable speed and adjustable torque settings

Installation Procedure

Step 1 – Drill two holes through ribs on the bottom of the pit lid as shown below. Each hole should be approximately ½ inch from the top of the rib

MTU Instruction
for Alliance Rectangular Pit Lids

Step 2 – Position the MTU with the label side face down against the underside of the pit lid and thread plastic zip ties through each of the drilled holes and through the holes of the MTU mounting tabs.

Step 3 – Gently pull through the zip ties so that the MTU is secured to the pit lid. **Do not over tighten the zip ties. Excessive torque may bend the mounting tabs and break the seal of the MTU.** Tighten only until the MTU contacts the lower surface of the pit lid. Trim the excess length from the zip tie ends.

⚠ **CAUTION!**
Do not over tighten the zip ties when mounting the MTU. Excessive torque can bend the MTU mounting tabs.

⚠ **CAUTION!**
Be sure to follow all General Guidelines outlined in Publication 471-2000 along with the specific wiring instructions for the meter being used.

Step 4 – Wire the MTU to the meter, forming wires as necessary so that they do not interfere with lid locking mechanism and cannot become pinched.

Step 5 – Installation is now complete. You can now proceed to program the MTU using the STAR Field Programmer Software and your Field Programmer.

Purpose & Scope

This instruction provides a procedure for installing a STAR direct-mount MTU on the following Actaris/Sprague/Schlumberger residential gas meters: **1A, 175, and 240 (Flat-face).** Please also refer to **Publication 471-2000**, *General Installation and Wiring Guidelines* for general information covering the wiring and mounting of STAR MTUs.
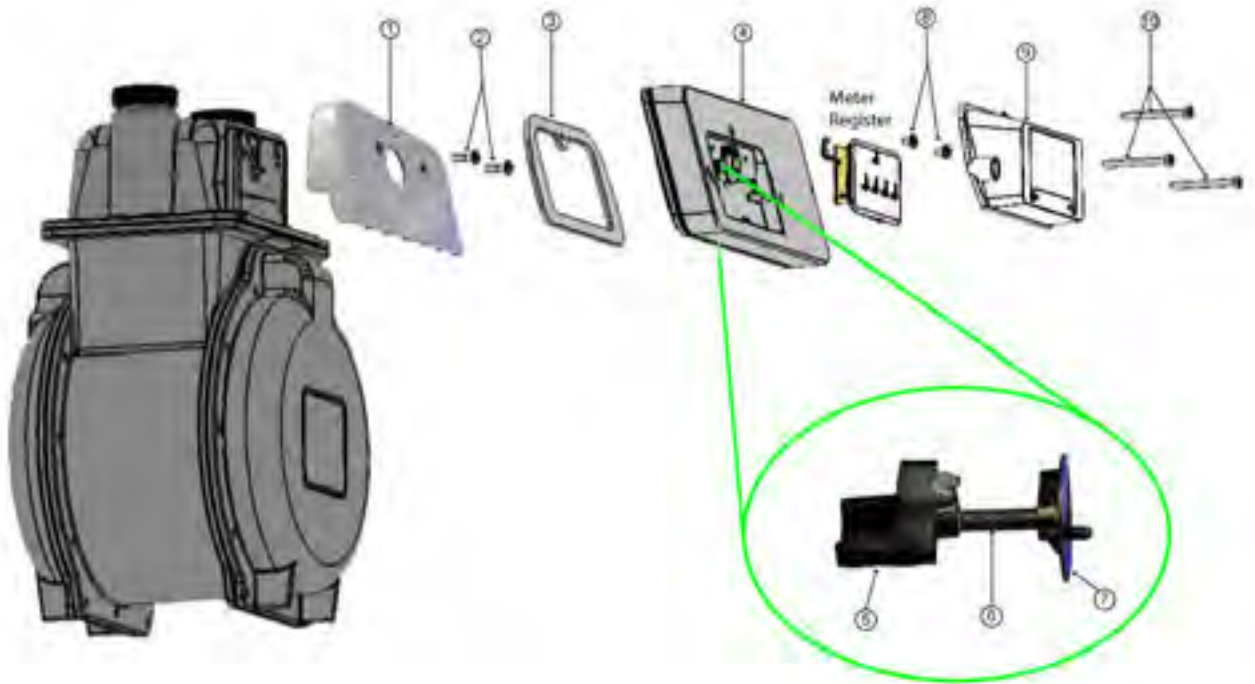
Parts Required

Ref. #	Item	Part Number	Quantity
1	Adaptor	056-12705A	1
2	10-24 x .75" Phillips pan head machine screw, zinc	069-102424A	2
3	Gasket	066-11583	1
4	MTU, Sprague Direct Mount	per project	1
5	Tall Magnet Coupler	056-12705B	1
6	Coupler Shaft	056-5155D	1
7	Register Coupler	056-11583D	1
8	#10 x 3/8" combo head thread form screw, Type A, zinc	069-100012C3A	2
9	Clear Register Cover	056-12705C	1
10	10-24 x 2" slotted fillister head machine screw, zinc	069-102464HA	3

MTU Instruction
for Actaris/Sprague/Schlumberger Gas Meters

Tools Required

To mount the MTU to these meters, you will need the following tools and equipment:

- Safety glasses
- #2 Phillips screwdriver
- ¼" Slotted screwdriver
- 2 alignment studs – Hexagram part number xxx-yyyy

Installation Procedure

Before installing the MTU, all anti-tamper, safety, and security hardware must be removed from the clear register cover.

Step 1 - Remove the existing clear register cover by removing the screws that hold it. Discard the screws and the cover.

Step 2 - Remove the register by removing the two screws that hold it. Set the register aside and discard the screws.

Step 3 – Mount the adaptor to the meter head using the two #10-24 x .75" provided. Tighten these screws to a torque not to exceed 15 -18 inch-pounds.

Step 4– Remove the paper backing from the gasket provided to expose the pressure sensitive adhesive. Place the gasket on the back of the MTU with the adhesive surface facing the MTU so that it aligns over the three mounting screws and the raised gasket surface of the MTU.

Step 5 – Next, assemble the couplers and shaft to the MTU. Place the flat, disc-shaped coupler on the shaft and insert the shaft through the front (register) side of the MTU.

Back of MTU
(Meter Side)

Front of MTU
(Register Side)

Then snap the magnet holder on the shaft from the back of the MTU. Ensure that both couplers are firmly attached to the shaft.

Step 6 – Now, mount the register onto the MTU (see illustration below) fastening the register to the MTU with the #10 x 3/8" screws provided.

#10 x 3/8"
Screws
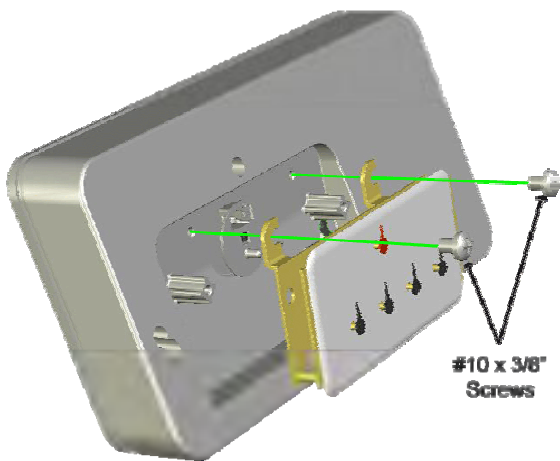
Start the two screws into the mounting holes, and then slide the register beneath the screws, making sure that the wiggler on the register is aligned with the MTU coupler.

Tighten both screws to a torque not to exceed 3-5 inch-pounds.

> ⚠️ **CAUTION!**
> Do not over tighten screws. Excessive torque may damage the MTU enclosure. **Use of power tools is not recommended.**

Step 7 – Check that the register is properly engaged by rotating the coupler on the back of the MTU and observing the register dials.

MTU Instruction
for Actaris/Sprague/Schlumberger Gas Meters

Step 8 – Next, thread alignment studs into the threaded mounting holes on the left and right side of the adaptor, as shown below.

Step 9 – Next, slide the MTU over the alignment studs, positioning the coupler on the MTU to ensure that it engages correctly with the wiggler on the gas meter.

Step 10 – Now, slide the clear register cover over the alignment studs while you hold the MTU in position with your free hand.

Step 11 - Next, insert one of the #10-24 x 2" screws through the top-center hole on the clear register cover. Tighten this screw just sufficiently to hold the MTU and register cover to the meter.

Step 12 – Next, remove one of the alignment studs and replace it with another one of the #10-24 x 2" screws provided. Continue in a similar manner, replacing the other alignment stud with a #10-24 x 2" screw. Tighten all three screws to a torque not to exceed 12 -15 inch-pounds. The gasket should be compressed slightly. Be careful not to over tighten the screws. Excessive torque may damage the MTU enclosure. Because of this, power tools are not recommended for this procedure.

Step 13 - Replace any anti-tamper, safety, or security hardware onto the plastic cover as required.

Step 14 – Once Installation is complete, program the MTU using your field programmer and the STAR Programmer Software.

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Purpose & Scope

This instruction provides wiring information for use in connecting a STAR MTU to **Actaris Dattus fm2 & fm3 Commercial and Industrial Gas Meters.**

Notes:

- The pulse output of the **Dattus** meter can be customer configured. For successful operation with a STAR MTU, the pulse rate must be configured so as not to exceed 3 pulses per second at the maximum flow rate supported by the meter.

MTU Instruction
for Actaris Dattus Gas Meters

Supplies and Tools Required

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

Step 1 - Select a mounting location for the MTU that will allow optimum signal transmission, and install any needed wiring. Be sure to follow all General Installation and Wiring Guidelines as outlined in **Publication 471-2000**.

Step 2 – Connect the MTU cable to the Dattus Pulse Ouput cable according to the table below.

MTU Cable	Dattus Pulse Output Cable
Red	Red (Channel 1 +)
Black	Green (Channel 1 -)
White	Green (Channel 1 -)

Step 3 – Make a final visual check of the wiring from the MTU to the meter. Verify that the cable routing is neat, secure and professional.

Step 4 – Once installation and wiring are complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

Star

MTU Instruction
for Severn Trent Water Meters

Purpose & Scope

This instruction provides wiring information for use in connecting a STAR MTU to **Severn Trent Water Meters.**

Step 2 – Connect the MTU cable to the meter cable according to the table below.

MTU Cable	Meter Cable
Red	Red
Black	Black
White	Green

Step 3 – Make a final visual check of the wiring from the MTU to the meter. Verify that the cable routing is neat, secure and professional.

Step 4 – Once installation and wiring are complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

Supplies and Tools Required

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

Step 1 - Select a mounting location for the MTU that will allow optimum signal transmission, and install any needed wiring. Be sure to follow all General Installation and Wiring Guidelines as outlined in **Publication 471-2000**.

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Purpose & Scope

This instruction provides wiring information for use in connecting a STAR MTU to **Endress & Hauser PROMAG Water Meters.**

Supplies and Tools Required

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Notes:

- The pulse output of the **PROMAG** is configurable. For successful operation with a STAR MTU, the pulse rate must be configured so as not to exceed 3 pulses per second at the maximum flow rate supported by the meter.

MTU Instruction
for Endress & Hauser PROMAG Water Meters

Installation Procedure

Step 1 - Select a mounting location for the MTU that will allow optimum signal transmission, and install any needed wiring. Be sure to follow all General Installation and Wiring Guidelines as outlined in **Publication 471-2000**.

Step 2 – Connect the MTU cable to the terminal strip located .under a cover plate around to the right of the meter display. (See the photo and wiring table below.)

Step 3 – Make a final visual check of the wiring from the MTU to the meter. Verify that the cable routing is neat, secure and professional.

Step 4 – Once installation and wiring are complete, program the MTU using the STAR Programmer Software and your MTU Programmer.

MTU Cable	PROMAG Terminal Strip
Red	Terminal #24 (**+**)
Black	Terminal #25 (**-**)
White	Terminal #25 (**-**)

Purpose & Scope

This instruction provides wiring information for use in connecting a STAR MTU to **Actaris Cyble Water Meters.**

Supplies and Tools Required

See **Publication 471-2000**, *General Installation and Wiring Guidelines* for a complete list of recommended tools and supplies for MTU Installation.

Installation Procedure

Step 1 - Select a mounting location for the MTU that will allow optimum signal transmission, and install any needed wiring. Be sure to follow all General Installation and Wiring Guidelines as outlined in **Publication 471-2000**.

Step 2 – Connect the MTU cable to the Cyble or Cyble Coder cable as shown in the tables below.

Cyble Sensor (Pulser)

MTU Cable	Cyble Sensor Cable (Grey Jacket)
Red	Brown
Black	White
White	White
Connect to an "**R**" type STAR MTU Port.	

MTU Instruction
for Actaris Cyble Water Meters

Cyble Coder

MTU Cable	Cyble Coder Cable (Black Jacket)
Red	Red
Black	Black
White	Green
Connect to a "**D**" type STAR MTU Port.	
Note: The Cyble Coder must be configured for a 6-digit reading	

Step 3 – Make a final visual check of the wiring from the MTU to the meter. Verify that the cable routing is neat, secure and professional.

Step 4 – Once installation and wiring are complete, program the MTU using the STAR Programmer Software and your MTU Programmer.