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Certification Exhibit

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Manual

MARS
COMPANY



MARS *SmartTransmitter* MK-I/II
MARS *SmartTransmitter* VHP
FlowBridge FlowCast
Installation and Programming Guide

Revision 1.E (CM)

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MARS Company

A Division of OW Investors, LLC

800.782.5268

sales@marswater.com

Table of Contents

Table of Contents	1
Introduction	3
Connecting to a Meter	4
Wiring Configurations	5
Programming Configurations - Overview	7
MK-I/II Programming Configurations - Step-by-Step Guide	8
MK-I/II Programming Configurations - Parameters Explained	9
MK-I/II Programming Configurations – Meter Type Settings	10
VHP Programming Configurations - Step-by-Step Guide	12
VHP Programming Configurations - Parameters Explained	14
VHP Programming Configurations – Meter Type Settings	15
Troubleshooting	17
Contact Us	19
Information to the User (FCC Information)	21

Introduction

Welcome to the exciting world of MARS Automated Meter Reading (AMR) Solutions. In the following pages we will learn how to connect and program a MARS *SmartTransmitter* MK-I/II, a MARS *SmartTransmitter* VHP (Very High Power), a FlowBridge FlowCast, and to perform occasional troubleshooting.

There are a few points to remember while reading through the manual that can potentially help avoid some common mistakes, and also give suggestions to help streamline the process of installing MARS AMR.

- There are various materials that may be needed for each task, which are presented in the beginning of each section. It is recommended that you have these nearby.
- *Notes are listed in italics next to or underneath the section they are referring to. They will list suggestions or offer advice on the adjacent topic.*
- **Sections in BOLD letters must be followed exactly, otherwise device operation will be adversely affected or the manufacturer's warranty will be voided.**
- Underlined items are references to other sections of this manual.

As always, feel free to refer to the Contact Us section of the manual to call or email MARS if you have any questions or if you would like additional information.

Connecting to a Meter

Materials Needed

- MARS *SmartTransmitter/FlowBridge* FlowCast
- Meter with AMR output
- Gel Caps with Gel Cap Tool (optional)
- Wire Strippers (optional)
- Screwdriver (optional)
- Mounting Equipment (optional)

Depending on the installation environment, whether it is inside of a meter pit or on a wall, the materials needed may differ slightly as a pit mounted *SmartTransmitter/FlowBridge* FlowCast installation may require a pit mount bracket or AMR-ready pit lid. This is installation specific, and will vary between installations.

For a meter with screw terminals available for AMR output, wire strippers and a screwdriver will be required. Use the wire strippers to ensure there is enough bare wire to make reliable contact with the screw terminals. Then use the screwdriver to attach each wire to its respective terminal, as outlined in [MARS *SmartTransmitter/FlowBridge* FlowCast Wiring Configurations](#).

For a meter with a pre-wired lead, wire strippers will be needed to remove the outer jacket on the lead and Gel Caps are recommended by MARS to attach the *SmartTransmitter/FlowBridge* FlowCast to the meter. First, remove the outer jacket on the pre-wired lead. **When removing the outer jacket, do not strip the inner 2 or 3 wires. These should not be stripped as this will cause unreliable performance.** Once the outer jacket is removed, use the Gel Caps and Gel Cap Tool to connect the 2 or 3 wire leads to their respective wire on the MARS *SmartTransmitter/FlowBridge* FlowCast, as outlined in [MARS *SmartTransmitter/FlowBridge* FlowCast Wiring Configurations](#).

Once these connections are made and the installation environment is appropriately prepared with any additional equipment, the MARS *SmartTransmitter/FlowBridge* FlowCast is ready to be programmed.



Wiring Configurations

The diagrams below show the connections that must be made for each different type of meter. These must be made correctly for the system to function normally. Unless directed otherwise by MARS or MARS authorized personnel, follow these wiring instructions.

MARS Encoder
Radio Green — Meter Green
Radio Red — Meter Red
Radio Black — Meter Black

Sensus Encoder
Radio Green — Meter Green
Radio Red — Meter Red
Radio Black — Meter Black

Neptune AutoRead
Radio Green — Meter Red
Radio Red — Meter Black
Radio Black — Meter Green

Elster AMCO Absolute Encoder (InVISION)
Radio Green — Meter Red
Radio Red — Meter Green
Radio Black — Meter Black

AMCO / ABB / Kent Scancoder
Radio Green — Meter Red
Radio Red — Meter Green
Radio Black — Meter Black

Severn Trent – First Generation
Radio Green — Meter Terminal 3
Radio Red — Meter Terminal 1
Radio Black — Meter Terminal 5

Badger ADE
Radio Green — Meter Green
Radio Red — Meter Red
Radio Black — Meter Black

3+ -Wire Pulse/Generator Meter
Radio Green — Meter Signal Wire
Radio Red — Meter Tamper Wire
Radio Black — Meter Commons

Master Meter / 2-Wire Pulse/Generator Meter
Radio Green — Meter Red
Radio Red — (3-wire Gel Cap)
Radio Black — Meter Black

Hersey Encoder
Radio Green — Meter Green
Radio Red — Meter Red
Radio Black — Meter Black

Neptune ProRead
Radio Green — Meter Red
Radio Red — Meter Black
Radio Black — Meter Green

Neptune ARB V
Radio Green — Meter Red
Radio Red — Meter Black
Radio Black — Meter Green

Elster AMCO Digital Register (pulse)
Radio Green — Meter Black
Radio Red — Meter Green
Radio Black — Meter Red

Severn Trent – Second Generation
Radio Green — Meter Green
Radio Red — Meter Red
Radio Black — Meter Black

Badger RTR
Radio Green — Meter Red
Radio Red — (3-wire Gel Cap)
Radio Black — Meter Black

Elster AMCO V-100 PSMT
Radio Green — Meter Red
Radio Red — Meter Yellow
Radio Black — Meter Black & Blue

*Pit Mount MK - II / VHP
SmartTransmitter*

*Wall Mount MK - II / VHP
SmartTransmitter*

*FlowBridge FlowCast /
MK-IV*

Inductive Coil Locations

Center SmartReader nozzle on these points.

MK - I SmartTransmitter

Programming Configurations - Overview

The MARS *SmartTransmitter* and the FlowBridge FlowCast are programmed via an inductive coil and the parameters are set using the MARS *SmartReader* handheld device. The software that is involved is very different between the traditional MK-I or II and the VHP MARS *SmartTransmitter*. If you are unsure if the proper software is installed, please refer to the [Contact Us](#) section of this manual and call MARS to confirm.

The FlowBridge FlowCast can be programmed to be compatible with either the MK-I/II instructions or VHP instructions outlined in this manual. As this is set by MARS during manufacture, please refer to MARS to determine which configuration steps must be followed.

Before programming a MARS *SmartTransmitter* or FlowBridge FlowCast, be sure the *SmartReader* is fully charged. The center of the black nozzle on the *SmartReader* must be centered over the locations (*shown on the left*) when a function is being processed, and **the center of the black nozzle of the *SmartReader* MUST be flush with the *SmartTransmitter*/FlowBridge FlowCast housing. The *SmartReader* can NOT be moved or pulled away from the *SmartTransmitter*/FlowBridge FlowCast until the function in process is complete.** When the function is complete, the light on the rear of the *SmartReader* will stop flashing and the device will emit either an escalating tone (low to high) with a solid green LED for a successful command, or a low, flat tone with a solid red LED for a failed command.

To program the MARS *SmartTransmitter*/FlowBridge FlowCast, follow the appropriate instructions in this manual. There are many functions that are not manufacturer specific, all of which will be outlined. Manufacturer specific information will be listed in a simplified format in this section as well.

Programming Configurations - Step-by-Step Guide

MK – I/II ONLY

1. Power on the *SmartReader* by either pushing the red power button or pulling the trigger.
2. On the “Main Menu”, press the down-arrow key twice to highlight “MARS RADIO SET-UP”. Press the Enter key or pull the trigger.
3. At the password prompt, type in 2764 and press the Enter key or pull the trigger.
4. Press the F1 key on the *SmartReader* and hold the nozzle of the *SmartReader* against the *SmartTransmitter* as outlined in this section’s Overview. Press the Enter key or pull the trigger. This will pull the current settings from the *SmartTransmitter*.
Note: You may need to repeat Step 4 once or twice to get a reading. Many factors can either cause interference, and if you move the nozzle off of the radio before the operation is completed the SmartReader may not correctly communicate with the SmartTransmitter.
5. Once the configuration is pulled from the *SmartTransmitter*, they can now be edited. To edit each parameter, use the up-arrow and down-arrow keys to highlight each field and press the Enter key. Choose the parameter to be set using the up-arrow and down-arrow keys and press the Enter key. You will notice that the “Current:” option at the top of the screen (for most parameters) will change to the option that was selected. Press the Exit key **once** to return to the “MARS RADIO SET-UP” screen. You may program all parameters at one time. Proceed to Step 6 when all relevant parameters are set. On the next page is an explanation of each parameter, and the available choices.
6. Once each parameter is programmed to your specification, press the F6 key on the *SmartReader* and hold the nozzle of the *SmartReader* against the *SmartTransmitter* as outlined in this section’s Overview. Press the Enter key or pull the trigger. This will send each changed command to the *SmartTransmitter*.
Note: Many factors can either cause interference, and if you move the nozzle off of the radio before the operation is completed the SmartReader may not correctly communicate with the SmartTransmitter.
7. After programming, confirm the changed settings are correct by repeating the F1 function completed in Step 4. Remember, a successful read tone is the escalating tone, whereas the unsuccessful tone is the low, flat tone.
8. When the correct settings are confirmed in the device, press the F2 key from the “MARS RADIO SET-UP” menu. Hold the nozzle of the *SmartReader* against the *SmartTransmitter* as outlined in this section’s Overview. Press the Enter key or pull the trigger. This will force an interrogation of the register, and will check the connection. This is the last function that will need to be done to program a *SmartTransmitter*.
Note: You may need to repeat Step 8 once or twice to get a reading. Many factors can either cause interference, and if you move the nozzle off of the radio before the operation is completed the SmartReader may not correctly communicate with the SmartTransmitter.

Programming Configurations - Parameters Explained

MK – I/II ONLY

Radio on?	Options are “ON” or “OFF”. “ON” setting will cause the device to transmit.
Enc Type	Select the meter manufacturer from this list. This enables the <i>SmartTransmitter</i> to “understand” what the meter is “saying” and correctly interpret the data. <i>Refer to the manufacturer-specific information in this section for more info.</i>
TX rate	Sets the interval between transmissions. Default is “004sec”, or every 4 seconds.
Read Rate	ENCODER ONLY. Sets the interval between interrogations. Default is “240min”, or every 4 hours. MARS recommends this be kept at this time; decreasing the interval between interrogations WILL negatively impact battery life.
Time	Current time in 24-hour format. Example: 7:00PM = 19:00, NOT 07:00.
Day	Current day of the week.
Freq	NOT USER CHANGEABLE. Current transmit frequency.
Time Mode?	Options are “OFF”, “TIMED”, “MON-FRI” and “T & M-F”. This enables the <i>SmartTransmitter</i> to “sleep” at the designated intervals set below. When enabled, this option will significantly extend the performance and usable life of the <i>SmartTransmitter</i> . <ul style="list-style-type: none"> • “OFF” will make the <i>SmartTransmitter</i> transmit 24/7. • “TIMED” will make the radio “sleep” (stop transmitting) at the End Time and “wake up” (start transmitting) at the Start Time. • “MON-FRI” will make the radio “sleep” (stop transmitting) on Saturday and Sunday and “wake up” (start transmitting) Monday through Friday. • “T & M-F” combines both the “TIMED” and “MON-FRI”, so the <i>SmartTransmitter</i> will only “wake up” (start transmitting) Monday through Friday between the Start Time and End Time, and “sleep” (stop transmitting) at night and on the weekends. This is the MARS recommended setting.
Start Time	“Wake up” time for the Time Mode setting. See above.
End Time	“Sleep” time for the Time Mode setting. See above.
Radio ID:	PULSE / ARB-V ONLY. 10-digit ID for the <i>SmartTransmitter</i> to transmit. When connected to an encoded register, the <i>SmartTransmitter</i> will ALWAYS assume the ID of the register.
Serial No:	NOT USER CHANGEABLE. Internal serial number.
Pulse Fact	PULSE / ARB-V ONLY. 8-Digit pulse multiplier for the internal odometer of the <i>SmartTransmitter</i> . It is ALWAYS read left to right. This tells the <i>SmartTransmitter</i> what each pulse means as far as advancing the internal odometer to match the meter. <i>Example: Meter is configured for 1 pulse/gallon. The utility wants to bill in 100’s of gallons with 6 digits. “Pulse Fact”=00000001, “Pulse Num”= current reading, and “Pulse Digits”=6.</i>
Pulse Num	PULSE / ARB-V ONLY. Starting point for the internal odometer in pulse or ARB-V mode. Input the current reading for the register in this field. It is ALWAYS read left to right. <i>Take care to note that the units when calculating the Pulse Factor, Pulse Number, and Pulse Digits align! Otherwise, you may experience undesired operation.</i>
Pulse Digits	PULSE / ARB – V ONLY. Number of digits, or wheels, for the internal odometer to read and transmit. Normally this would be 6, but in pulse or ARB-V mode this can be changed to suit the customers’ needs.

Programming Configurations - Meter Type Settings

MK-I/II ONLY

Encoder Type

The encoder type is dependent upon the configuration of the encoded register at the factory. The options for the encoder type are listed below, along with the meters that fall into each specific category. For the meter that is used, the parameter that it coincides with is the parameter that is input into the “Enc Type” field.

Enc Type	Meter Connected to the MARS SmartTransmitter/FlowBridge FlowCast
SENSUS	Standard output protocol, MARS, Sensus, Invensys, encoders configured for Sensus output, such as the Elster AMCO InVISION Absolute Encoder with the blue leak detector.
AMCO	Elster AMCO InVISION Absolute Encoder with white leak detector, ABB/Kent Scancoder
NEPTUNE P	Neptune ProRead, Schlumberger ProRead
STMS	Severn Trent SmartMeter (Example: SM700E)
HERSEY	Hersey encoder
BADGER	Badger ADE
NEPTUNE A	Neptune AutoRead
ARB V	Neptune ARB-V
PULSE	Standard 2 or 3+ wire pulse switches/registers, Elster AMCO Digital Register, Badger RTR, Master Meter pulse, Performance Meters pulse, Severn Trent SM700P, Elster AMCO PSMT

As these are popular configuration choices, there are many other configurations that are possible with the MARS SmartTransmitter/FlowBridge FlowCast. For further information, or to check meter compatibility, please see the [Contact Us](#) section in this manual.

Radio ID, Pulse Factor, Pulse Digits, and Pulse Number

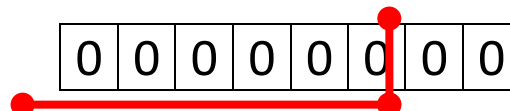
When calculating the pulse parameters for a pulse register or Neptune ARB-V, the following pieces of information are required: the unique 10-digit ID number for the *SmartTransmitter* to broadcast, amount of pulses per unit (usually printed on the face of the register), amount of digits (wheels from left to right) to be broadcast for the reading system to collect and the current reading of the meter. The 10-digit ID number, current reading (pulse number) and pulse digits (wheels) can be directly input into these fields, leaving the pulse factor left.

To calculate the pulse factor, start with the 8-digit internal odometer like this...

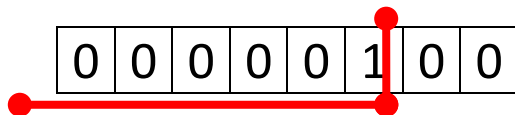
0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---

...and mark off (from the LEFT) the pulse digits (wheels).
For the purpose of an explanation, we will assume 6 pulse digits.

0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---

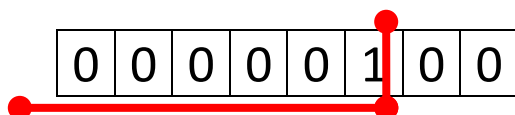


For the purpose of demonstration, let's assume that the register is in gallons, and that we want to transmit the reading in 10's of gallons, or one revolution of the sweep hand. The example register completes one pulse for every revolution of the sweep hand (1 pulse / 10 gallons). This is what one sweep would make the internal odometer look like:



As of this moment, we can safely input a pulse factor of 100, or as it would be in the setup software, 00000100.

To calculate this out, especially for registers that are not as straightforward as this, assume a register advance of 1 on wheel number 6 (again in our example).



How many pulses did it take us to get to this point (a full revolution of the sweep hand)? This will be variable a in the MARS Pulse Factor Formula.

$$\text{Pulse Factor} = \frac{\begin{array}{c} \mathbf{00000100} \\ \text{(internal 8-digit odometer reading with leading zeros to fill all 8 digits)} \end{array}}{\begin{array}{c} \mathbf{a} \\ \text{(number of pulses for a full sweep hand revolution)} \end{array}}$$

Using this formula and “padding” zeros in front of the pulse factor to keep 8 digits, this is the pulse factor to use when configuring these radios.

This pulse factor, which can now be put into the the “Pulse fact” field in the “MARS RADIO SET-UP” software, will now allow the MARS SmartTransmitter/FlowBridge FlowCast to accurately count the pulses off of the pulse-type meter.

Programming Configurations - Step-by-Step Guide

VHP ONLY

1. Power on the *SmartReader* either by pushing the red power button or pulling the trigger.
 2. Confirm the time and date at the top of the screen are correct. **This must be accurate, as the *SmartReader* updates the time in the *SmartTransmitter* according to the time and date in the *SmartReader*.** If the time is incorrect, continue to Step 3. If it is correct, proceed to Step 4.
 3. To reset the time and date in the *SmartReader*:
 - a. Press the down-arrow key 3 times to highlight “ADMIN”. Press the Enter key or pull the trigger.
 - b. “SMART-READER SETUP” is automatically selected. Press the Enter key or pull the trigger.
 - c. Press the down-arrow key 3 times to highlight “TIME & DATE”. Press the Enter key or pull the trigger.
 - d. Key in the time and date in this format: YYYY-MM-DD HH:MM.
 - e. Press the Tab key 5 times until the Day of the Week list appears. Use the up and down-arrow keys to select the Day of the Week.
 - f. Press the Enter key or pull the trigger when done. The time and day at the top of the screen will be updated. Press the Exit key twice.
 - g. Press the up-arrow key twice to select “MARS RADIO SET-UP” and press the Enter key or pull the trigger. Proceed to Step 5.
 4. Press the down-arrow once to highlight “MARS RADIO SET-UP”. Press Enter key or pull the trigger.
 5. You now have the option to use either a user defined setting or a preset configuration. If these configurations are preset, proceed to Step 5a. If these are not set, proceed to Step 6.
 - a. Use the arrow keys to highlight the configuration and press the Enter key or pull the trigger.
 - b. Press the F4 key and follow any prompts. When this function is complete, the *SmartTransmitter* is programmed.
 - c. Press the Exit key twice, up-arrow key once, and use the “TEST READING” function to check the register. **Programming is complete.**
- Note: You may need to repeat Step 5c once or twice to get a reading. Many factors can either cause interference, and if you move the nozzle off of the radio before the operation is completed the *SmartReader* may not correctly communicate with the *SmartTransmitter*.*
6. To set Configuration 1-3, use the up and down-arrow keys to highlight the specific Configuration. Press the Enter key.
 7. Highlight the first option to change. Press the Enter key.

8. Use the number pad to key **2764** at the password warning and press the Enter key.
9. Use the up and down-arrow keys highlight each parameter to be changed. Press the Enter key or pull the trigger. *Refer to the section MARS SmartTransmitter/FlowBridge FlowCast Programming Configurations – VHP Parameters Explained for an overview of the options available.*
10. Select the appropriate option from the list using the up and down-arrow keys. Press the Enter key or pull the trigger. You will be returned to the Configuration screen each time.
11. Follow Steps 9 and 10 for each parameter to be changed. When done, press the Exit key twice.
12. Pull the trigger or press the Enter key twice to reenter the Configuration. This will allow you to use the Configuration and disallow further changes unless the password is entered as in Step 8.
13. Use the arrow keys to highlight the configuration and press the Enter key or pull the trigger.
14. Press the F4 key and follow any prompts. When this function is complete, the *SmartTransmitter* is programmed.
15. Press the Exit key twice, up-arrow key once, and use the “TEST READING” function to check the register. If the meter is successfully read, **programming is complete**.

Note: You may need to repeat Step 14 once or twice to get a reading. Many factors can either cause interference, and if you move the nozzle off of the radio before the operation is completed the SmartReader may not correctly communicate with the SmartTransmitter.

Programming Configurations - Parameters Explained

VHP ONLY

Radio	Options are "ON" or "OFF". "ON" setting will cause the device to transmit.
Register	Select the meter manufacturer from this list. This enables the <i>SmartTransmitter</i> to "understand" what the meter is "saying" and correctly interpret the data. <i>Refer to the VHP manufacturer-specific information in this section for more info.</i>
TX rate	Sets the interval between transmissions. Default is "044sec", or every 44 seconds.
Time	NOT USER CHANGEABLE. Current time in 24-hour format. Example: 7:00PM = 19:00, NOT 07:00.
Day	NOT USER CHANGEABLE. Current day of the week.
Time Mode?	Options are "OFF", "TIMED", "MON-FRI" and "T & M-F". This enables the <i>SmartTransmitter</i> to "sleep" at the designated intervals set below. When enabled, this option will significantly extend the performance and usable life of the <i>SmartTransmitter</i> . <ul style="list-style-type: none"> • "OFF" will make the <i>SmartTransmitter</i> transmit 24/7. • "TIMED" will make the radio "sleep" (stop transmitting) at the End Time and "wake up" (start transmitting) at the Start Time. • "MON-FRI" will make the radio "sleep" (stop transmitting) on Saturday and Sunday and "wake up" (start transmitting) Monday through Friday. • "T & M-F" combines both the "TIMED" and "MON-FRI", so the <i>SmartTransmitter</i> will only "wake up" (start transmitting) Monday through Friday between the Start Time and End Time, and "sleep" (stop transmitting) at night and on the weekends. This is the MARS recommended setting.
Start Time	"Wake up" time for the Time Mode setting. See above.
End Time	"Sleep" time for the Time Mode setting. See above.
Radio ID:	PULSE / ARB-V ONLY. 10-digit ID for the <i>SmartTransmitter</i> to transmit. When connected to an encoded register, the <i>SmartTransmitter</i> will ALWAYS assume the ID of the register.
Serial No:	NOT USER CHANGEABLE. Internal serial number.
Pulse Fact	PULSE / ARB-V ONLY. 8-Digit pulse multiplier for the internal odometer of the <i>SmartTransmitter</i> . It is ALWAYS read left to right. This tells the <i>SmartTransmitter</i> what each pulse means as far as advancing the internal odometer to match the meter. <i>Example: Meter is configured for 1 pulse/gallon. The utility wants to bill in 100's of gallons with 6 digits. "Pulse Fact"=00000001, "Pulse Num"= current reading, and "Pulse Digits"=6.</i>
Digits	PULSE / ARB – V ONLY. Number of digits, or wheels, for the internal odometer to read and transmit. Normally this would be 6, but in pulse or ARB-V mode this can be changed to suit the customers' needs.
Reading	PULSE / ARB-V ONLY. Starting point for the internal odometer in pulse or ARB-V mode. Input the current reading for the register in this field. It is ALWAYS read left to right. <i>Take care to note that the units when calculating the Pulse Factor, Pulse Number, and Pulse Digits align! Otherwise, you may experience undesired operation.</i>
No-Flow	Options are "OFF" or "ON". Sets the no-flow alarm. This will set a flag to alert the user while reading the route if this condition exists.
Leak Lrg	Options are "OFF" or "ON". Sets the large leak detection alarm. This will set a flag to alert the user while reading the route if this condition exists.
Leak Sml	Options are "OFF" or "ON". Sets the small leak detection alarm. This will set a flag to alert the user while reading the route if this condition exists.
Wheel Num	This is the wheel for the alert flags to monitor, and is set as the digit of the odometer from the left . For small leak detection, MARS recommends setting the wheel number to the 10's of gallons wheel to avoid any false alarms. <i>Please refer to the pulse parameter information in this section for more information on odometer wheels.</i>

Programming Configurations – Meter Type Settings

VHP ONLY

Encoder Type

The encoder type is dependent upon the configuration of the encoded register at the factory. The options for the encoder type are listed below, along with the meters that fall into each specific category. For the meter that is used, the parameter that it coincides with is the parameter that is input into the “Register” field.

Register	Meter Connected to the MARS SmartTransmitter/FlowBridge FlowCast
AMCO Enc	Elster AMCO InVISION Absolute Encoder with white leak detector, ABB/Kent Scancoder
AMCO Puls	Elster AMCO Digital Register, Elster AMCO PSMT
AMCO Gen	Elster AMCO Generator Pulse registers
Badgr Enc	Badger ADE
Badgr Puls	Badger RTR
Badgr Gen	Badger Generator Pulse registers
Hersey Enc	Hersey encoder
Mastr Puls	Master Meter Pulse register / switch
Nep Auto	Neptune AutoRead register
Nep ProRe	Neptune ProRead register
Nep ARB V	Neptune ARB-V
Perf Enc	Performance Meters encoder
Sens Enc	Standard output protocol, MARS, Sensus, Invensys, encoders configured for Sensus output, such as the Elster AMCO InVISION Absolute Encoder with the blue leak detector.
STMS Enc	Severn Trent SmartMeter (Example: SM700E)
Other Puls	Standard 2 or 3+ wire pulse switches/registers, Performance Meters pulse, Severn Trent SM700P

As these are popular configuration choices, there are many other configurations that are possible with the MARS SmartTransmitter/FlowBridge FlowCast. For further information, or to check meter compatibility, please see the [Contact Us](#) section in this manual.

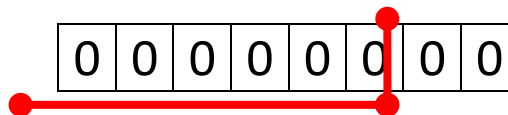
Radio ID, Pulse Factor, Pulse Digits, and Pulse Number

When calculating the pulse parameters for a pulse register or Neptune ARB-V, the following pieces of information are required: the unique 10-digit ID number for the *SmartTransmitter* to broadcast, amount of pulses per unit (usually printed on the face of the register), amount of digits (wheels from left to right) to be broadcast for the reading system to collect and the current reading of the meter. The 10-digit ID number, current reading (pulse number) and pulse digits (wheels) can be directly input into these fields, leaving the pulse factor left.

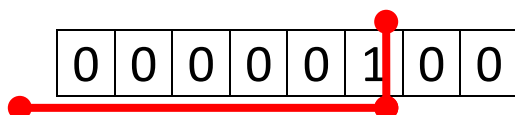
To calculate the pulse factor, start with the 8-digit internal odometer like this...

0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---

...and mark off (from the LEFT) the pulse digits (wheels).
For the purpose of an explanation, we will assume 6 pulse digits.

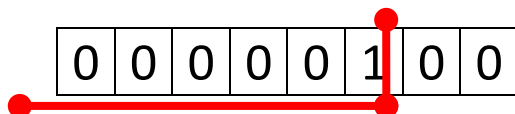


For the purpose of demonstration, let's assume that the register is in gallons, and that we want to transmit the reading in 10's of gallons, or one revolution of the sweep hand. The example register completes one pulse for every revolution of the sweep hand (1 pulse / 10 gallons). This is what one sweep would make the internal odometer look like:



As of this moment, we can safely input a pulse factor of 100, or as it would be in the setup software, 00000100.

To calculate this out, especially for registers that are not as straightforward as this, assume a register advance of 1 on wheel number 6 (again in our example).



How many pulses did it take us to get to this point (a full revolution of the sweep hand)? This will be variable a in the MARS Pulse Factor Formula.

$$\text{Pulse Factor} = \frac{\text{00000100}}{a}$$

(internal 8-digit odometer reading with leading zeros to fill all 8 digits)
 (number of pulses for a full sweep hand revolution)

Using this formula and "padding" zeros in front of the pulse factor to keep 8 digits, this is the pulse factor to use when configuring these radios.

This pulse factor, which can now be put into the "Pulse fact" field in the "MARS RADIO SET-UP" software, will now allow the MARS SmartTransmitter/FlowBridge FlowCast to accurately count the pulses off of the pulse-type meter.

Troubleshooting

Problem	Solution
Register is not interrogating.	<ul style="list-style-type: none"> • Check the meter for functionality with a touchpad. Attach a testing touchpad to the meter. There is a “READ” function in the Main Menu of the <i>SmartReader</i> that will allow the device to read any encoder. • Make sure you are holding the devices together as outlined in MARS SmartTransmitter/FlowBridge FlowCast Programming Configurations – Overview. • Check the settings in the <i>SmartTransmitter</i> using the F1 key. • Check wiring to make sure the meter and <i>SmartTransmitter</i> are connected correctly. • See section labeled Contact Us.
<i>SmartTransmitter</i> is not communicating with the <i>SmartReader</i>.	<ul style="list-style-type: none"> • Make sure you are holding the devices together as outlined in MARS SmartTransmitter/FlowBridge FlowCast Programming Configurations – Overview. • Go to Main Menu → Radio Tools → Radio Info (scroll down past the bottom of the Main Menu screen to find Radio Tools). “X” should be a number VERY close to 908750000. If it is not near this number, go to the Main Menu → Radio Tools → Set Rx Frequency (scroll down past the bottom of the screen for this option). Press Enter. Key in 908750000 on the number pad. Press Enter. The receiver frequency will be updated. • Make sure the nozzle is properly attached to the <i>SmartReader</i>. • See section labeled Contact Us.
<i>SmartTransmitter</i> is not transmitting outside of meter pit / building.	<ul style="list-style-type: none"> • Several reasons exist for this issue. The main reason includes EM/RF Interference. A good overview is available here: http://en.wikipedia.org/wiki/RF_interference • Check the battery voltage (MK-II and VHP pit/wall only). • See section labeled Contact Us.
<i>SmartTransmitter</i> is cracked.	See section labeled Contact Us .

If at any time you would like to speak with MARS concerning troubleshooting or issues you may be experiencing in the field, please refer to the [Contact Us](#) page.

Contact Us

If you would like to contact MARS Company regarding any material contained in this book, or if you have additional questions, please find our information below.

MARS Company

Ocala, FL USA

Toll Free: 800.782.5268

Telephone: 352.694.7195

Fax: 352.694.7397

Web: <http://www.marswater.com/amr-support-request/>

Email: sales@marswater.com
customerservice@marswater.com

Information to the User

Warning:

Changes or modifications to this device not expressly approved by MARS Company could void the user's authority to operate the equipment.

FCC Class B:

"NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help."

RF Exposure:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Innovation, Science, and Economic Development (ISED) Canada:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet équipement est conforme aux limites d'exposition aux radiations dans un environnement contrôlé. Cet équipement doit être installé et utilisé à distance minimum de 20 cm entre le radiateur et votre corps. Cet émetteur ne doit pas être co-localisées ou opérant en conjonction tout autre antenne ou transmetteur.