



Version 2.8.1

FIREFLY® AMR SYSTEM REFERENCE MANUAL

CONFIDENTIAL AND PROPRIETARY
© 2000-2004 By Datamatic, Ltd.
All Rights Reserved



3600 K Avenue
Plano, TX 75074
24-Hour Customer Support

(888) 326-5032 or (214) 540-5200
Internet: <http://www.datamatic.com>
Email: csupport@datamatic.com

THIS DOCUMENT CONTAINS THE TRADE SECRETS AND PROPRIETARY INFORMATION OF DATAMATIC, LTD. NEITHER THIS DOCUMENT NOR ANY PART THEREOF MAY BE REPRODUCED WITHOUT THE EXPRESS WRITTEN CONSENT OF DATAMATIC, LTD., NOR SHALL ANY INFORMATION CONTAINED HEREIN RELATING TO THE FUNCTIONING OF THE ELECTRONIC METER READING SYSTEM BE DISCLOSED TO ANYONE WHO DOES NOT HAVE A NEED TO KNOW THE CONTENTS AND UNDER NO CIRCUMSTANCES SHOULD THIS INFORMATION BE DISCLOSED TO ANY PERSON NOT EMPLOYED BY THE UTILITY WITHOUT THE EXPRESS WRITTEN CONSENT OF DATAMATIC, LTD.

Table of Contents

Chapter 1: System Overview	6
System Features	6
FIREFLY AMR System Features.....	6
Interfacing Options	6
Meter Options	7
Installation Options.....	7
Reading Methodologies	7
Customized Programming Options.....	7
Equipment.....	7
ROADRUNNER Handheld Computer.....	7
Key Descriptions.....	7
Keyboards	11
Radio Frequency Receiving Unit (RFRU).....	12
Programming/Profiling Unit (PPU) for Water FIREFLYs	12
Programming/Profiling Unit (PPU) Cable.....	12
Config Tester (CT) for Water FIREFLYs.....	13
FIREFLY Meter Interface Unit (MIU) – Water	13
FIREFLY Optical Sensor	14
Optical Sensor Tape Specification	14
Installation Preparation.....	15
Installation Considerations	15
Water FIREFLY Installation	15
Installing the Optical Sensor-End FIREFLY.....	15
Meter Preparation	15
Background Check for Firmware Version 0210 and Prior Sensor	
Firmware Versions Only	16
Sensor Flap	16
Sensor Placement	16
Installing the Wire-end FIREFLY	17
Installing the Wire-end FIREFLY with a Logical Switch	18
Profile Data Extraction with Water FIREFLYs.....	18
Electric FIREFLY MIU	21
Meter Reading	21
Demand Data	21
Profile Data.....	21
Power	22
Electric FIREFLY Specifications	22
Gas FIREFLY MIU	23
Meter Reading	23
Profile Data.....	24
Powering	24
Gas FIREFLY Specifications	24
Profile Data Extraction for Gas and Electric FIREFLYs	25
Viewing Profile Data in RouteSTAR MVP	27
Viewing ProfilePLUS Data via RouteSTAR MVP.....	27
Viewing Data in ProfilePLUS.....	30
Global Settings Menu	30

Appendix A: Glossary of Terms	37
Appendix B: Equipment Maintenance	45
RMA Return Maintenance Authorization	45

***FCC ID: ODYD740, ODYD2200, ODYD2212, ODYD2300, and
ODYD2500 Datamatic, Ltd.***

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- 1) This device may not cause harmful interference, and***
- 2) This device must accept any interference received, including
interference that may cause undesired operation.***

WARNING: These devices operate under Part 15 of the FCC rules.

***Modifications to these devices not expressly authorized by
Datamatic, Ltd. may affect your ability to legally operate these
devices.***

Chapter 1: System Overview

This document covers the setup and operation of the FIREFLY Radio Frequency Automatic Meter Reading (AMR) system, used in conjunction with the RouteSTAR® Meter Reading System (RouteSTAR MVP®).

All information presented herein assumes the installation and understanding of the RouteSTAR MVP software and associated ROADRUNNER ruggedized, handheld computers. *Refer to the ROADRUNNER system manual and Training Guides for additional information.*

The RouteSTAR MVP system is designed to provide a fast, efficient method of collecting meter reading data from a variety of sources. This includes FIREFLY AMR meter readings as well as ProfilePLUS™ historical usage data.

More specifically, utility meters are outfitted with FIREFLY Meter Interface Units (MIUs) that transmit meter readings and associated information. Field personnel collect these radio frequency readings via ROADRUNNERs equipped with an integrated Radio Frequency Receiving Unit (RFRU) or ROADRUNNER Mobile.

Likewise, the MIUs provide a feature called ProfilePLUS to keep track of historical usage data. This data helps solve billing disputes, and enable variable rate billing and load management studies. ROADRUNNERs are used in conjunction with Programming/Profiling Units (PPUs) for water FIREFLYs to extract this data on demand.

System Features

FIREFLY AMR System Features

- ProfilePLUS: Usage data based on programmable interval setting.
- Quick and easy installation.

Interfacing Options

- 1. Optical “through-the-glass” sensor end.
- 2. Pulse or encoded wire-end.
- 3. Under-glass interfacing (electric meters).

- 4. Direct-mount to gas meters

Meter Options

Water	Electric	Gas
Pulse meters	Single-Phase Meters	Analog Index Meters
Encoded meters		
Analog meters with one sweep hand		

Installation Options

- Field installation in less than 10 minutes in most cases—
- Above ground.
- Below ground: Pits, vaults, and basements.

Reading Methodologies

- Walk-by with the ROADRUNNER handheld.
- Drive-by with the ROADRUNNER Mobile system.

Customized Programming Options

- Programmable ID, communications, and profiling interval.
- Profiling capability: Interval consumption logging.

Equipment

ROADRUNNER Handheld Computer





Key Descriptions

There are two different types of keys on each keypad: data keys and function keys.

Data keys are the letter and number keys, **A** - **Z** and **0** - **9**. They are used to insert data into the ROADRUNNER.



Function keys are labeled on the keyboard or the template. They are used to perform a special procedure or function.


The **SHIFT** key shifts between the numeric and alphabetic keyboard on the ROADRUNNER 860 and activates some of the function keys.







Note: Under the column for the **ROADRUNNER X7**, the following keys:  ,  ,  ,  refer to the cursor pad located in the upper right corner of the keyboard. This key groups together the four arrow keys, also called the direction keys.





Cursor Pad

Function	ROADRUNNER X7	ROADRUNNER 860
<u>Menu</u> Displays the Main Menu	[F1]	[F1]
<u>Contrast Up</u> Lightens the screen intensity when the APD is displayed.	[FNCTN] [F4]	
<u>Send</u> Initiates the communication procedure to send/receive data to/from the MVP PC.	[F3]	[F3]
<u>Contrast Down</u> Darkens the screen intensity when the APD is displayed.	[FNCTN] [F5]	
<u>Light</u> Turns the display backlight on/off. The light will turn off automatically after approximately 2½ minutes of inactivity, to conserve power.	[FNCTN] [F3]	[F5]
<u>On/Off</u> Turns power on and off to the ROADRUNNER. To conserve battery power, the ROADRUNNER automatically turns itself off after approximately 2 ½ minutes of non-use.	[F1] / [FNCTN+F1]	[ON/OFF]
<u>Search</u> Initiates the Search function.	[F2]	[A]
<u>Correct</u> Corrects entered data; used in conjunction with other function keys to make corrections to codes or messages.	[F4]	[C]
<u>End</u> Erases data in the current field, or acts as an escape key, exiting a menu or function and returning to the APD.	[FNCTN] [ESC]	[END]
<u>Skip</u> Enters a Skip Code in the reading field that specifies the reason a reading was not entered.	[E]	[E]
<u>Trouble</u> Enters a Trouble Code, designating that an unusual condition or problem exists at the	[F]	[F]

Function	ROADRUNNER X7	ROADRUNNER 860
meter.		
<u>Survey</u> Survey messages are displayed and allows the meter reader to enter survey responses.	[G]	[G]
<u>Interrogate</u> Begins user-selected FF interrogation method.	[I]	[I]
<u>Special Message</u> Displays special messages, if present, which have been sent from the Host. If used in conjunction with the [CORRECT] key, a special message may be entered or edited.	[J]	[J]
<u>Totals</u> Displays the total number of normal, demand, checks and total devices in the route. Also displays the total devices read, skipped, blank, with trouble codes, failed audits and the route number.	[K]	[K]
<u>New Meter</u> Adds a new meter to the current route.	[L]	[L]
<u>Shift</u> On the X7, switches between upper and lower case alpha characters. On the 860ES, switches back and forth between the numeric function mode and alpha mode.		[SHIFT]
<u>Account Info</u> Displays the customer's name, address, account number, and sequence number.	[N]	[N]
<u>Meter Info</u> Displays the device information associated with the device record displayed on the APD. Information includes meter number, meter type, number of dials and number of decimals.	[O]	[O]
<u>Route Info</u> Displays route information including route number, current date and time, meter reader ID, total meters, total read, total skips, total blanks, trouble codes, and failed audits. A second screen contains vehicle information including vehicle ID, and beginning and ending mileage.	[P]	[P]
<u>Clear</u> Erases data in the current field.	[FNCTN] [DEL]	[CLEAR]
<u>Account Number</u> Displays the account number during a search, correction, or view.	[Q]	[Q]
<u>Meter Number</u> Displays the meter number during a search,	[R]	[R]

Function	ROADRUNNER X7	ROADRUNNER 860
correction, or view.		
<u>Sequence Number</u> Displays the sequence number during a search, correction, or view.	[S]	[S]
<u>Top</u> Scrolls through menus. Finds the beginning of a route when used with the [SEARCH] key. <i>TIP: Press the [SEARCH] then the [TOP] key to find the beginning of the route.</i>	 [F2] 	[A] 
<u>Instruction</u> Displays the instruction message during a search, correction, or view.	[T]	[T]
<u>Location</u> Displays the meter location during a search, correction, or view.	[U]	[U]
<u>Read Type</u> Displays the meter read type during a search or correction.	[V]	[V]
<u>Bottom</u> Scrolls through menus. Finds the end of a route when used with the [SEARCH] key. <i>TIP: Press the [SEARCH] then the [BOTTOM] key to find the end of the route.</i>	 [F2] 	[A] 
<u>Blank</u> Displays blank devices during a search.	[W]	[W]
<u>Constant</u> Displays the device constant during a search, correction, or view.	[X]	[X]
<u>Previous Est</u> Displays the previous estimate for a device.	[Y]	[Y]
<u>Repeat</u> Repeats the last search criteria entered.	[F2] [ENTER]	[A] [ENTER]
<u>No</u> Responds "NO" to Yes/No questions.	[ESC]	[NO]
<u>Space</u> Enters a space when typing in text.	[SP]	[SP]
<u>Enter/Yes</u>	[ENTER]	[ENTER]

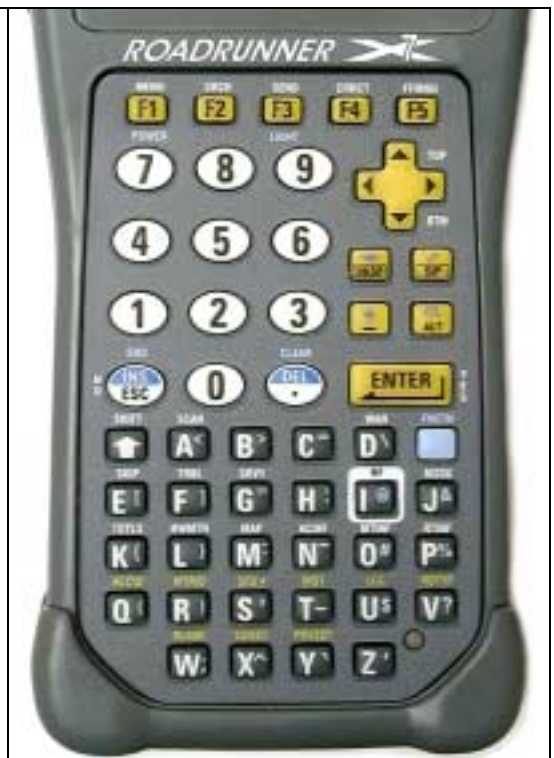
Function	ROADRUNNER X7	ROADRUNNER 860
Accepts entry of information typed in and is the 'Yes' answer for Yes/No questions.		
<u>FIREFLY Menu</u> Displays the FIREFLY Menu when the ROADRUNNER application includes AMR.	[F5]	[SHIFT] [I]
<u>Backspace</u> Moves the cursor to the left one character and erases the character.	[BKSP] OR 	

Keyboards

ROADRUNNER 860



ROADRUNNER X7



Radio Frequency Receiving Unit (RFRU)

The ROADRUNNER Radio Frequency Receiving Unit (RFRU) receives and buffers radio readings, then downloads them to the ROADRUNNER handheld unit when interrogated ("I" key).

The ROADRUNNER RFRU is an integrated, internal unit, powered by a rechargeable NiCad battery pack.



Programming/Profiling Unit (PPU) for Water FIREFLYs



The Programming/Profiling Unit (PPU) is used to configure the MIUs, and to extract ProfilePLUS historical reading information.

The PPU creates a "positive snap" interface with the MIU for hands-free operation, and when cabled to the ROADRUNNER handheld, enables communication.

The PPU is powered with one 9-volt battery.

Programming/Profiling Unit (PPU) Cable

A cable is used to connect the PPU to a ROADRUNNER for programming and extraction of profile data from a Water FIREFLY.

Config Tester (CT) for Water FIREFLYs



The Config Tester (CT) is similar to the PPU. It is a stand-alone device for resetting the FIREFLY to dormant and factory configurations. Once coupled with the MIU and activated, there are three lights which display the status:

Yellow = Updating
Green = Successful
Red = Unsuccessful

FIREFLY Meter Interface Unit (MIU) – Water

The FIREFLY Meter Interface Unit (MIU) tracks and transmits reading data. Each MIU includes ProfilePLUS which tracks and stores over 1,700 of the most recent readings. For example, the MIU can be configured to record 72+ days of hourly consumption readings, enabling the resolution of billing complaints.

The FIREFLY signal includes the meter number, meter reading, battery voltage, tamper flag, and a leak indicator.



The FIREFLY MIU is powered with a 3.6-volt lithium chloride D-cell battery.

Material:	Polycarbonate
Construction:	Ultrasonic welding
Temperature Rating:	Sensor-end: 0° C to +85° C Wire-end: -40° C to +85° C
Radio communications:	916.5 MHz
Radiated power:	1 milliwatt per millisecond

FIREFLY Optical Sensor



The FIREFLY MIU uses a unique and highly sophisticated optical sensor unit to track meter activity. An infrared strobe is integrated into the sensor and generates its own light, regardless of ambient conditions. The sensor is oriented so that the register needle approaches the sensor from the cable side and perpendicular to the cable. The indicators on the top side of the sensor need to be aligned with the passing sweep hand. As the needle sweeps past the sensor, it changes the light reflected back from the meter face, and an incremental count is registered.

The Optical Sensor is affixed to the meter face using a high-bond adhesive tape. Specifications for the tape follow.

Optical Sensor Tape Specification

Manufacturer	3M.
Material	Acrylic Foam-Closed Cell.
Thickness	.045 inch.
Color	White/gray.
Release Liner	.002 inch clear polyester.
Application Temp	32°+ Fahrenheit.
Curing	24-96 hours.
Peel Adhesion Test	18lb. per square inch (to stainless at room temp).
ASTM	B-3330. D-897.
Tensile Strength	110 lbs. per square inch.
Static/Shear Test	At 72 degrees – 1250 lbs.
(Slide pressure)	At 150 degrees – 500 lbs.
Temperature Tolerance	300 degrees.
Pressure Activated	16 lbs.

Installation Preparation

Installation Considerations

1. Signal distance varies depending on the location of the MIU. FIREFLYs installed above-ground generally transmit the greatest distance.
2. The material of a pit or vault lid affects the transmission range. For example, a transmitter has a greater range sending from a pit with a plastic lid than a cast iron lid.
3. Lids with holes of a diameter of roughly 1 3/4 inches make it possible to mount the FIREFLY MIU through the lid. This can increase transmission range significantly.
4. Complete field installation of an MIU takes 5-10 minutes, depending on the meter location and mounting application.
5. If the lid has a hole for the unit, use the cap and wing nut assembly ("lid lock" pictured at right). Ensure that enough space exists between the box lid and the ground for the unit to sit. If not, remove some of the dirt from the bottom of the box. **Do not over-tighten lid locks.**



Water FIREFLY Installation

Installing the Optical Sensor-End FIREFLY

Meter Preparation

1. Remove meter box lid.
2. Survey the meter, checking lid, hole depth, and overall cleanliness.
3. Check for meter disqualifications and enter the corresponding skip code.
4. Clean excess dirt from meter lid, exposing meter number and verify it with the account on the ROADRUNNER.
5. Flip lid back and pre-clean meter face/lens using Fast Orange™ non-pumice cleaner and a cloth or cotton swab to remove residue.
6. Clean meter face/lens with 99% isopropyl alcohol and a **NEW** lint-free cotton swab.

Note: Use Isopropyl rubbing alcohol, 99% by volume. Lower concentrations do not clean or evaporate as well and adversely affect the sensor-to-meter bond.

7. Re-wipe the surface of the meter lens with a clean, new cotton swab each time until the swab comes up clean, and the clean lens squeaks when wiped.
8. After cleaning, ensure that the lens is *completely dry*; allow time for the alcohol to evaporate

Background Check for Firmware Version 0210 and Prior Sensor Firmware Versions Only

1. Connect the ROADRUNNER to the FIREFLY via the PPU.
2. On the ROADRUNNER 860 Press **SHIFT** **I** to display the FIREFLY main menu and on the ROADRUNNER X7 press **F5**.
3. For 0210 and prior sensor firmware versions, Press **A** to begin testing the FIREFLY optics. For 0211 and future sensor firmware versions go to the Sensor Placement section below.



The values shown are in decimal and the test keys on Power Level 2 (P2). A successful test and sensor target placement is achieved when the P2 value is 60 or greater.

**After completing the sensor background test, determine if another alcohol cleaning is needed on the register face prior to installation of the sensor.*

Sensor Flap

Within each case of FIREFLYs, 24 rubber Sensor Flaps are included for every installation. Utilizing these Sensor Flaps insures a stable environment during the calibration process.

Sensor Placement

1. Insert sensor cable through sensor flap.
2. Remove the adhesive backing from the high-bond tape on the Optic Sensor face.
3. Install sensor to the location of the best background according to the background check (for 0210 and prior sensor firmware version FIREFLYs).

4. Orient the sensor so the water meter needle approaches the sensor from the cable side and perpendicular to the cable. There are indents on each side of the sensor base that are to be in line with the needle when it passes.
5. Attach the sensor to the water meter lens surface.
6. **Since the 3M tape provides a pressure sensitive seal, the installer must apply 16 lbs. of pressure to the MIU sensor immediately after attaching to the lens surface. The next step is to maintain constant pressure for a minimum of 60 seconds.**



Tip: Palm the sensor and lean onto it to apply the appropriate pressure.

7. A full cure on the seal is achieved in 24 - 96 hours. Do not touch, pull, move, or handle the sensor in any way during this period.
8. Apply approved adhesive around the sensor to seal it completely in case the pit fills with water prior to the 24 - 96 hour cure time, or if the meter face is curved and not flat.

Note: If the sensor is initially misplaced, do not attempt to remove the sensor by twisting the sensor body. A fully cured sensor requires breaking the seal at the adhesive tape joint with a flat tool such as a screwdriver. Insert the screwdriver between the aluminum base and meter lens and twist.

9. Mount the FIREFLY MIU to an appropriate wall, stake or through hole in meter box/vault lid with the threaded neck pointing up.
If using a stake, bury the stake in the ground adjacent to the meter register at least 6 inches. The platform area of the pole needs to face inward.
Position the MIU on the pole platform.
Attach the MIU to the pole with the binding material, such as a zip tie (14").

If utilizing a lid lock, make certain NOT to over tighten the FIREFLY within the lock. Also be sure to never rest the weight of the lid on the FIREFLY.
10. Place sensor flap over sensor, insuring a snug fit.
11. Program the MIU and set to "AutoCAL".
12. Prior to leaving, take an RF read.

Installing the Wire-end FIREFLY

1. Connect FIREFLY wire-end to meter contacts using Posi-lock connector or Gel caps.
2. Use approved method specified in the Training Guide for wire connections.

3. Mount the FIREFLY to an appropriate wall, stake, or through hole in the meter box / vault lid.
4. If using a stake, bury the stake in the ground adjacent to the meter register at least 6 inches. The platform area of the pole needs to face inward.
5. Position the MIU on the pole platform.
6. Position the FIREFLY MIU with the threaded neck pointing up.
7. Attach the MIU to the pole with the binding material.

Note: Do not connect a multi-meter, probe or other interrogating device to the FIREFLY wires. Doing so may cause the unit to globally reset, erasing all programmed data!

Installing the Wire-end FIREFLY with a Logical Switch

The FIREFLY Logical Switch **MUST** be handled with care at all times. A drop or shock of any kind could affect the performance of the Logical Switch.

Use the following instructions to install FIREFLYs:

1. Set Reading Mode to RV Mode.

Clean the Register

2. Clean the register with a rag to make sure there is no mud or dirt that would get caught between the collar and glass.

Attach the Logical Switch to the Register

3. Place the Logical Switch on the register and secure with the two screws attached on the switch.

Profile Data Extraction with Water FIREFLYs

When extracting profile data for an account loaded on the ROADRUNNER, always enter the meter reading prior to profile extraction. With an RF-enabled ROADRUNNER, utilize the Read and Verify function. With non-RF ROADRUNNERS, enter the read manually.

Note: If extracting profile data for an account not loaded on the ROADRUNNER, collecting the meter reading is not necessary.

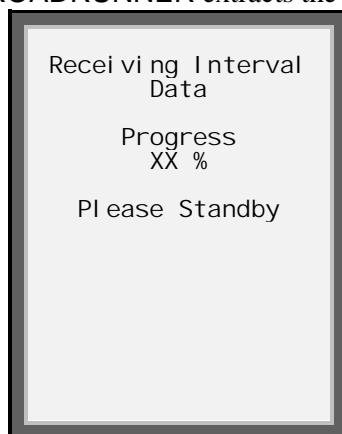
Attach the 9-pin end of the Datamatic-supplied cable to the PPU and the other end to the top port of the ROADRUNNER 860 or the side port of the ROADRUNNER X7. Remove the rubber plug from the side of the MIU, uncovering the infrared port. Make sure the optical windows for both the PPU and MIU are clean and unobstructed. Snap the PPU onto the MIU and turn the PPU power on.

Note: When the PPU is not in use, it **MUST** be switched to the OFF position, to prolong battery life.

- From the meter record, on the ROADRUNNER 860 press **SHIFT** **I** or **F5** on the ROADRUNNER X7 to access the FIREFLY Menu.
Or,
- Press **F1**, **4**, then **6** to access the FIREFLY Menu.
- Choose **5** **Profile Extract** from the FIREFLY Menu.

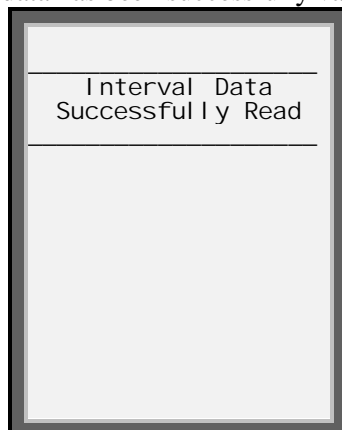


The ROADRUNNER extracts the profile data from the MIU.

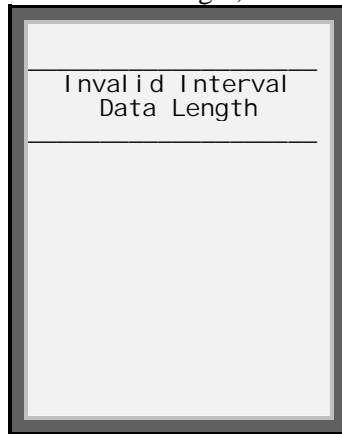


The process takes up to 60 seconds with water FIREFLYs and 2 minutes on electric or gas.

After data has been successfully validated, the following screen displays:



If data is of invalid length, or has corrupt values, this message is displayed:



This is followed by a prompt to retry extraction:



If “Yes” is selected, the Receiving Interval Data screen is re-displayed with the percentage indicator starting at 0%. Profile extraction restarts from the beginning. If the user selects “No”, profile extraction exits to the current APD.

Electric FIREFLY MIU



Meter Reading

The Electric FIREFLY MIU unit counts disc rotations, which are typically 7.2 watt-hours per rotation. The meter reading is stored in a 32-bit register in units of 0.1 watt-hours with a rollover at 99,999,999.9 watt-hours. The sensor constant, watt-hours per rotation, is set in the configuration data, and is typically initialized to 72 decimal (48 hexadecimal).

The meter reading tracks the electric meter mechanical registers, this includes both forward and reverse rotations. That is, when the meter rotates forward, the meter reading goes up, and if the meter rotates in reverse direction, the electronics reading decreases just as the mechanical register decreases. The reverse rotation reading is also stored in a 32-bit register, which cumulates the reverse rotations in units of 0.1 watt-hours. The reverse rotation register increases with reverse rotations; it never decreases.

Demand Data

Demand data is based on the change in the meter reading register over a demand interval. The demand interval is fixed to 15 minutes. The demand is recorded in units of kilowatts. Demand is only calculated on the net forward power for the interval. If there is net reverse consumption for the interval, then that interval is discarded. The peak demand of the current 30-day cycle that is in process and the peak demand of the previously completed 30-day cycle are stored.

Profile Data

The unit gathers and stores consumption profile data. The individual profile data elements are calculated from the change in the meter reading over the interval time, and then divided by the scale factor. The profile data is gathered according to configurable parameters, interval length, and scale factor. Valid values gathered range from + 32768 to -32767; positive and negative consumption is monitored. The data is stored in non-volatile memory in a LIFO (Last In, First Out) manner. A total of 16,256 intervals are

saved in the LIFO. The profile data is extracted via a wireless link using the ROADRUNNER X7 handheld computer. At a 15-minute profile interval, 165 days of profile data is collected.

Power

The unit is powered from the 240VAC line within the electric meter. Beware that the unit is not grounded, but is floating at the AC line potential. **DO NOT TOUCH** the electronics when connected to 240VAC. Also be aware that components in the power delivery system do heat up. It is important to approach all devices connected to AC power with caution to ensure safe handling. ESD precautions should always be used when handling electronic equipment.

Electric FIREFLY Specifications

Functional

Meter reading	9 digit 99,999,999.9 watt-hours, 0.1 watt-hour units; tracks mechanical register—forward and reverse.
Reverse meter reading	9 digits 99,999,999.9 watt-hours, 0.1 watt-hour units cumulative reverse consumption.
Meter constant	User configurable, 0.1 watt-hour revolutions. Typically 7.2 watt-hours per rotation: constant 72.
Reverse rotation flags	Set if reverse rotation observed, 2 month FIFO.
Demand data	Units of kilowatts, constant 72 15-minute demand, and 30-day interval, 2 intervals FIFO.
Power outage	Counts and day/time stamps power outage.
Profile data	User set interval, between 1 minute and 4 1/4 hours. Signed 16-bit data. Units of 0.1 watt-hours, adjusted by scale factor. 16,256 intervals in FIFO organization. <i>Example: 15 minutes per interval provides 165 days data.</i>
Local clock	Crystal based.

Operating

Operating temperature	-40° to +85° C.
Operating voltage	240 VAC
Operating current	24 milliamps.
Sensor	Infrared, optical.
Meter disk marking	Painted disk.

Radio communications

FCC Part 15.	902-928MHz ISM band .
Data rate	9600bps 1-way, 19200bps 2-way.

Radiated power 1 mW

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 radiates radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation.

If this equipment causes interference to radio or television reception, as 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 the 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.

Gas FIREFLY MIU



Meter Reading

The Gas FIREFLY MIU unit counts rotations of the meter drive. The meter reading is stored in a 32-bit register in units equal to the sensor constant with a rollover at

999,999,999 cubic feet. The sensor constant, cubic feet per rotation, is set in the configuration data, and is programmable to match the index size of the meter. The meter reading tracks the meter index incrementing upward as the meter registers consumption.

Profile Data

The unit gathers and stores consumption profile data. The individual profile data elements are calculated from the change in the meter reading over the interval time, and then divided by the scale factor. The profile data is gathered according to configurable parameters, interval length, and scale factor. Valid values gathered range from + 32768 to -32767; positive and negative consumption is monitored. The data is stored in non-volatile memory in a LIFO (Last In, First Out) manner. A total of 7,936 intervals are saved in the LIFO. The profile data is extracted via a wireless link using the ROADRUNNER X7 handheld computer.

Powering

An attached 3.6 volt lithium battery powers the unit.

Gas FIREFLY Specifications

Functional

Meter reading	9 digit 99,999,999.9 watt-hours, 0.1 watt-hour units; tracks mechanical register—forward and reverse.
Meter constant	User configurable, set to match the drive size of the meter.
Profile data	User set interval, between 1 minute and 4 1/4 hours. 8-bit data. 7,936 intervals in FIFO organization. <i>Example: 60 minutes per interval provides 330 days data.</i>

Operating

Operating temperature	-40° C to +85° C.
Operating voltage	3.6 VDC.
Sensor	Magnetic

Radio communications

FCC Part 15.	902-928MHz ISM band .
Data rate	9600bps 1-way, 19200bps 2-way.
Radiated power	1 mW

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 radiates radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation.

If this equipment causes interference to radio or television reception, as 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 the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

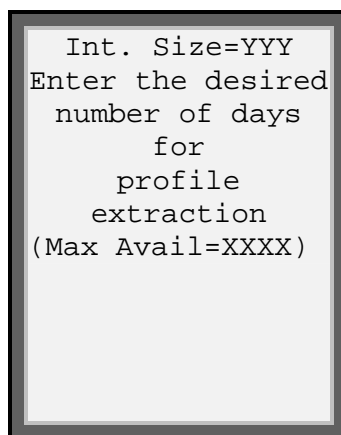
Consult the dealer or an experienced radio/TV technician for help

Profile Data Extraction for Gas and Electric FIREFLYs

This same process occurs if communication is broken; the user is asked to retry extraction.

For 0400 firmware 2-way Gas and 0020 firmware 2-way Electric FIREFLYs, the user will be able to select how much profile data is desired during profile extraction.

The software will determine the number of available data bins and display the following screen to allow the user to select the number of days of profile data to extract:



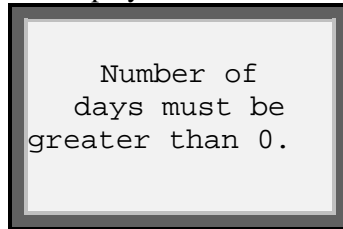
```

Int. Size=YYY
Enter the desired
number of days
for
profile
extraction
(Max Avail=XXXX)
  
```

YYY indicates the interval size in minutes. For example, if the interval size is 30 minutes, the display will be: Int. Size=30 mins.

XXXX indicates the number of days available in the profile data buffer. If there is less than one day available, the value of XXXX will be "< 1 day". If there is one day

available, this value will be “1 day”. If there is more than one day, this value will be “XXXX days”. The valid range for the number of days is from 1 up to the maximum calculated number of days. If the user enters a value of 0, the following warning message will be displayed:

A rectangular box with a double border, containing the text: Number of days must be greater than 0.

```
Number of
days must be
greater than 0.
```

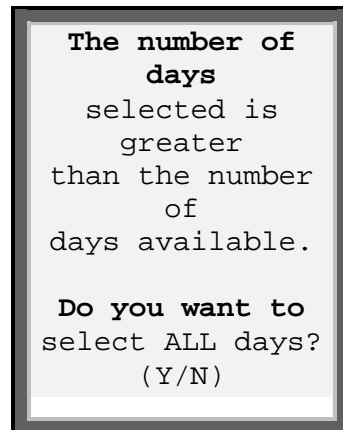
After the user dismisses this prompt, the user will be prompted to re-enter the number of days.

If the user selects the escape key sequence at the prompt to enter the number of days, the profile extraction process will be canceled and the following message will be displayed to alert the user:

A rectangular box with a double border, containing the text: Profile Extraction Canceled!.

```
Profile
Extraction
Canceled!
```

If the value the user enters is greater than the number of days available, the user will be alerted and asked whether or not they want to select ALL days as in the following display screen:

A rectangular box with a double border, containing the text: The number of days selected is greater than the number of days available. Do you want to select ALL days? (Y/N).

```
The number of
days
selected is
greater
than the number
of
days available.

Do you want to
select ALL days?
(Y/N)
```

Selecting “Y” will cause the profile extraction process to request all available profile data bins. Selecting “N” will cause the user to re-enter the number of days available. The default is “N” if the user selects the escape key sequence.

When the extraction is done, the user will be alerted by an audible beep along with a message that the extraction has completed successfully.

Once a profile extraction has succeeded, the user is prompted to save configuration information. This is detailed in the next message.

At the end of the workday, profile data in the ROADRUNNER is uploaded along with any other meter readings in the normal fashion. Profile data is then viewed on the MVP PC.

Viewing Profile Data in RouteSTAR MVP

Viewing ProfilePLUS Data via RouteSTAR MVP

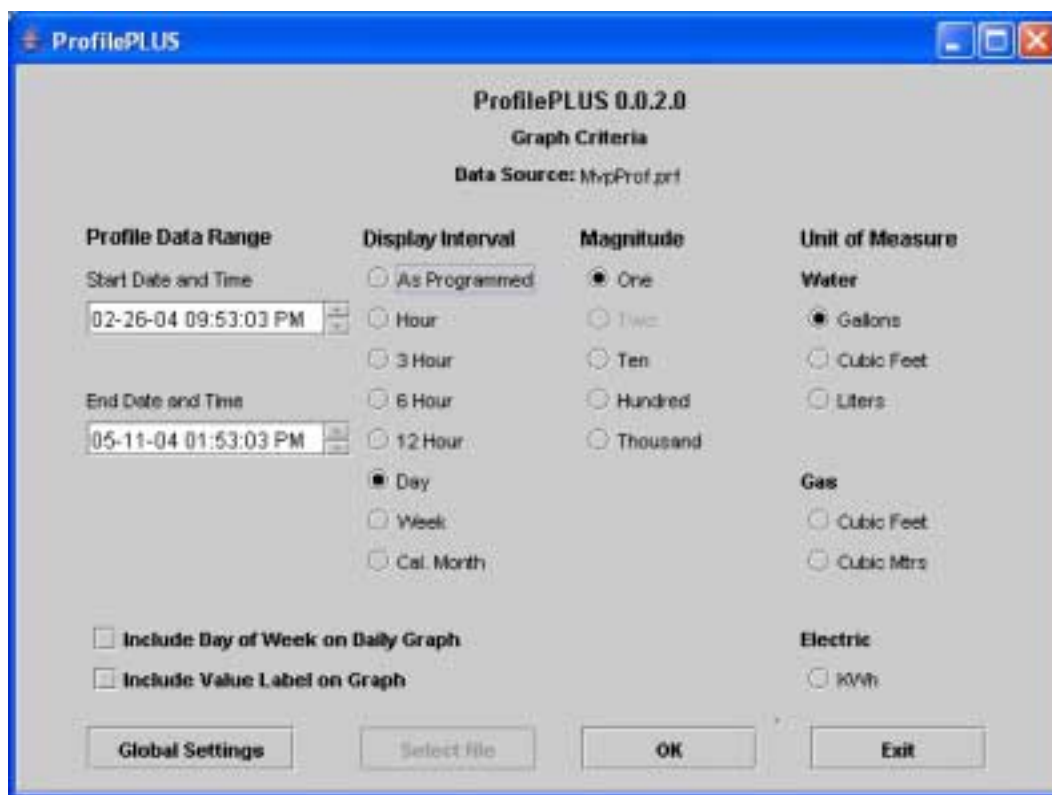
- Select the FIREFLY icon from the **Detail Summary View** (left side) of the **Route Manager View**.

Meters with extracted data display in the **Detail SummaryArea**. (right side) of the **Route Manager** view.

- Select a meter number in the **Detail SummaryArea**.

MeterNumber	ImportDate	TimeRead	StartDate	EndDate
M598591	05/11/2004	10:38:00	03/12/2004	05/11/2004
M856747	05/11/2004	11:24:00	03/12/2004	05/11/2004
H919550	05/11/2004	11:12:00	03/12/2004	05/11/2004
8733627	05/11/2004	10:34:00	03/12/2004	05/11/2004
M027592	05/11/2004	10:52:00	03/12/2004	05/11/2004
C576579	05/11/2004	10:41:00	03/12/2004	05/11/2004
1008206	05/11/2004	09:13:00	03/12/2004	05/11/2004
K471424	05/11/2004	09:26:00	03/12/2004	05/11/2004
1008249	05/11/2004	09:42:00	03/12/2004	05/11/2004
F259825	05/11/2004	08:37:00	03/12/2004	05/11/2004
A567266	05/11/2004	12:56:00	03/12/2004	05/11/2004
67	05/11/2004	12:52:00	03/12/2004	05/11/2004
26831949	05/11/2004	15:14:30	04/11/2004	05/11/2004
Q01536924	05/12/2004	13:53:03	02/26/2004	05/11/2004

- Double-click on the meter number.
- A prompt to enter **Starting** and **Ending Dates** appears.



Profile Data Range

Start Date and Time	The date and time of the first bin of extracted profile data
End Date and Time	The date and time of the last bin of extracted profile data

NOTE: To change the value of a field (month, day, year or hour) highlight the field and change the value by clicking the up/down arrows to the right or by using the arrows on the computer keyboard.

Display Interval

As Programmed	Display the profile bin data as it was programmed into the FIREFLY
Hour	Display the profile bin data in one hour increments
3 Hour	Display the profile bin data in 3 hour increments
6 Hour	Display the profile bin data in 6 hour increments
12 Hour	Display the profile bin data in 12 hour increments
Day	Display the profile bin data in 24 hour day increments
Week	Display the profile bin data in 7 day week increments
Cal. Month	Display the profile bin data in calendar month increments

NOTE: Once a file is selected for graphing and the start and end dates and times are displayed, the appropriate time interval radio button is automatically selected. If the time interval is large, the shorter time interval buttons are grayed out. If the time interval is small, the longer time interval selections are automatically grayed out. The selections will change as the user adjusts the time interval. Any time interval button not grayed out may be selected by the user to override the automatic setting, if desired.

Also, the time of the bin represents the hour in which it closed.

Magnitude

One	Sets a multiplier of one (1) for the graph data and adjusts the totals displayed accordingly.
Two	Sets a multiplier of two (2) for the graph data and adjusts the totals displayed accordingly. (For Gas FIREFLYs only, all other FIREFLYs will have this option grayed out)
Ten	Sets a multiplier of ten (10) for the graph data and adjusts the totals displayed accordingly. For example, a bin value of 3 will be represented as 30.
Hundred	Sets a multiplier of one hundred (100) for the graph data and adjusts the totals displayed accordingly. For example, a bin value of 3 will be represented as 300.
Thousand	Sets a multiplier of one thousand (1000) for the graph data and adjusts the totals displayed accordingly. . For example, a bin value of 3 will be represented as 3,000.

Unit Of Measure

Automatically selects the unit of measure for each type of FIREFLY (as determined by the Global Settings), or allows the user to select the unit of measure the graph will display.

WATER	Available options are: Gallons, Cubic Feet, or Liters
GAS	Available options are: Cubic Feet, or Cubic Meters
Electric	Available option is: Kilowatt Hour

Include Day of Week on Daily Graph	When selected, will display the day of the week above each bar of a Daily Graph.
Include Value Label on Graph	When selected, will display the value of the bar on each graph.
Global Settings	Calls the global settings menu (see below).
OK	Executes the graph.
Exit	Closes the ProfilePLUS graphing dialog box.

Viewing Data in ProfilePLUS

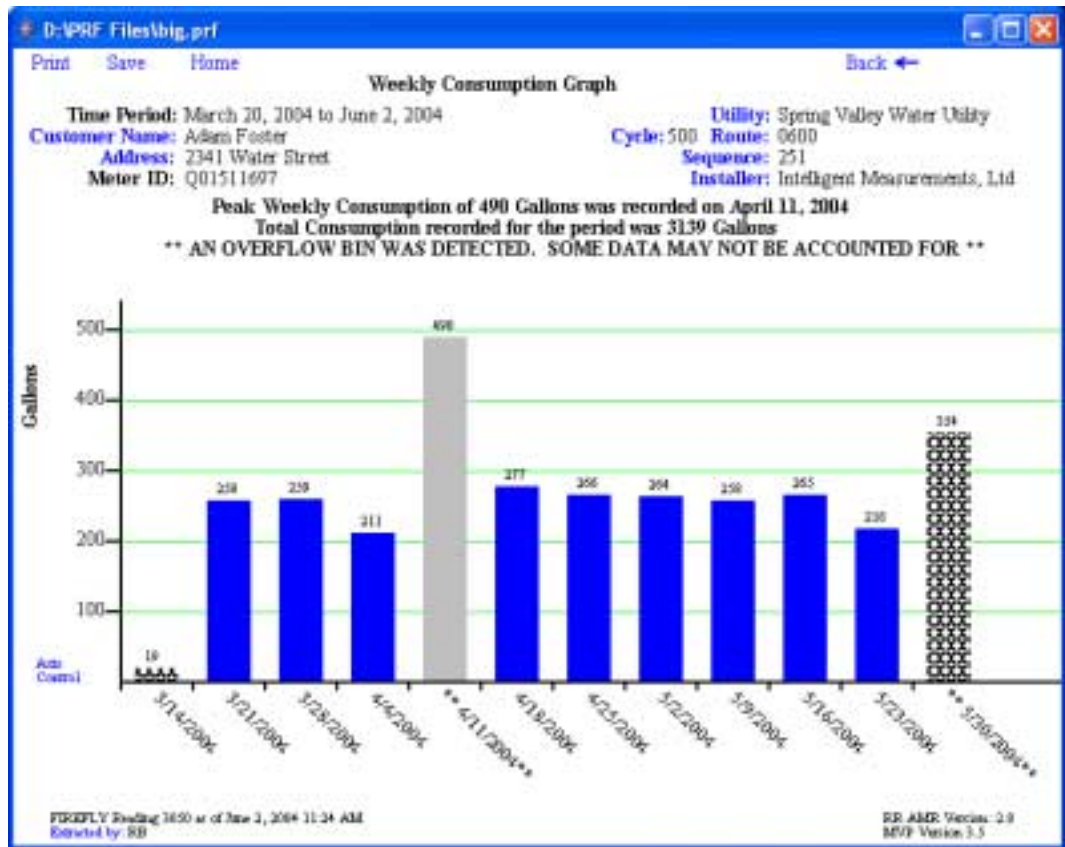
Global Settings Menu

ProfilePLUS Global Settings

Display Interval Default <input type="checkbox"/> As Programmed <input type="checkbox"/> Hour <input type="checkbox"/> 3 Hour <input type="checkbox"/> 6 Hour <input type="checkbox"/> 12 Hour <input checked="" type="checkbox"/> Day <input type="checkbox"/> Week <input type="checkbox"/> Cal Month	Water Units <input checked="" type="radio"/> Gallons <input type="radio"/> Cubic Feet <input type="radio"/> Liters Water Magnitude <input checked="" type="radio"/> One <input type="radio"/> Ten <input type="checkbox"/> Hundred <input type="checkbox"/> Thousand	Gas Units <input type="radio"/> Cubic Feet <input checked="" type="radio"/> Cubic Mtrs Gas Magnitude <input checked="" type="radio"/> One <input type="radio"/> Two <input type="radio"/> Ten <input type="radio"/> Hundred <input type="radio"/> Thousand	Electric Unit kWh Elect. Magnitude <input checked="" type="radio"/> One <input type="radio"/> Ten <input type="radio"/> Hundred <input type="radio"/> Thousand	Profile Graph Display Settings <input type="checkbox"/> Include Day of Week on Daily Graph <input checked="" type="checkbox"/> Include Value Labels on Graph <input checked="" type="checkbox"/> Include Customer Name <input checked="" type="checkbox"/> Include Customer Address <input type="checkbox"/> Include Meter ID <input type="checkbox"/> Include FIREFLY Reading, Date, and Time <input checked="" type="checkbox"/> Include Reader ID <input checked="" type="checkbox"/> Include Gas Temp Comp Value (Gas FF only) <input checked="" type="checkbox"/> Include Gas Press Comp Value (Gas FF only) <input checked="" type="checkbox"/> Display Utility Name <input checked="" type="checkbox"/> Display Cycle/Route/Sequence <input checked="" type="checkbox"/> Display Installer Name
--	--	--	--	---


OK Cancel


The Global Settings menu is used to set the default display information desired for each type of FIREFLY and for each graph. These settings may be adjusted any time by selecting the Global Settings button from the main graphing dialog box. It can also be accessed from a profile graph by selecting the Home link, which takes the user back to the main graphing dialog box. These settings are static until changed by the user and applied by clicking the OK button.




The image above represents a “Weekly Consumption Graph” for a Water FIREFLY. The header information is displayed based on the option selected in Global Settings.

Double-clicking on a graph bar allows the user to “drill-down” to smaller interval graphs until the smallest possible resolution (or profile interval) is reached. The user is then notified they have reached the smallest available time interval.

Graph bars representing incomplete data bins contain X’s (Sample: )

The peak consumption bar is solid black (Sample: )

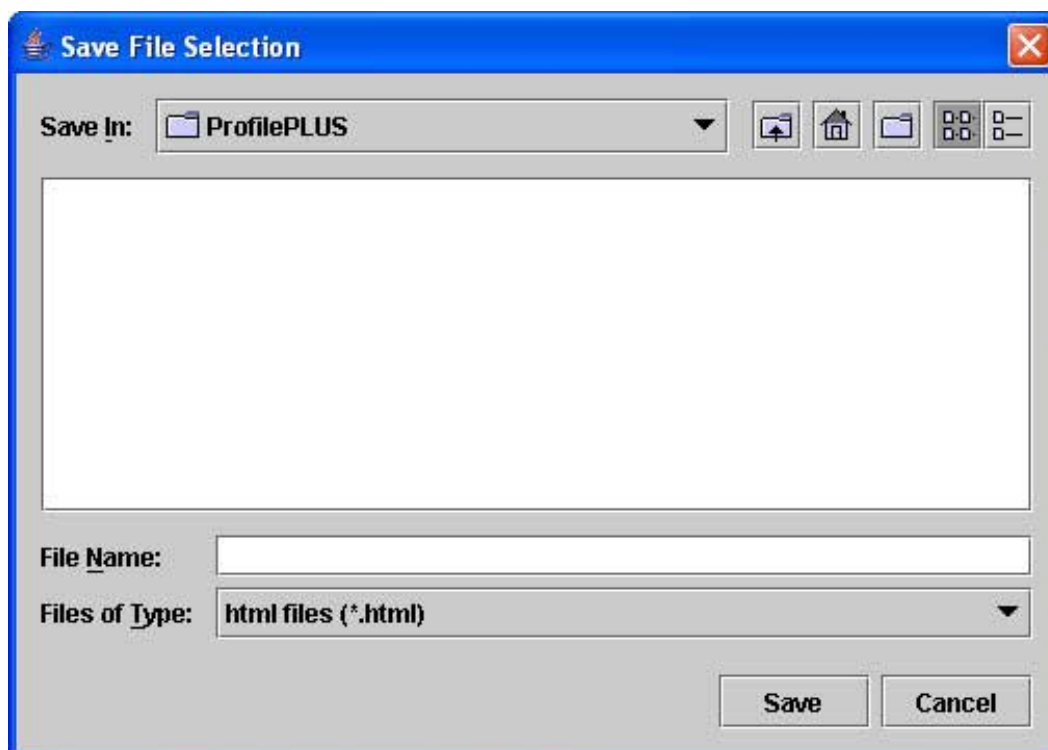
Bars that contain overflowed data bins are denoted by gray with asterisks at the beginning

and end of the time labels (Samples: bar:  time label)

On the top right side are targets to go back ([Back](#) ←) and to go forward ([Forward](#) →) that enable the user to scroll back and forward between called graphs.

The Print link calls the print dialog box where the user can adjust the print parameters. The graph printout is automatically formatted in landscape mode. Sometimes it can take awhile for the print dialog box to appear so the background of the print target goes gray and stays gray until the user presses the print or cancel buttons to exit the print dialog.

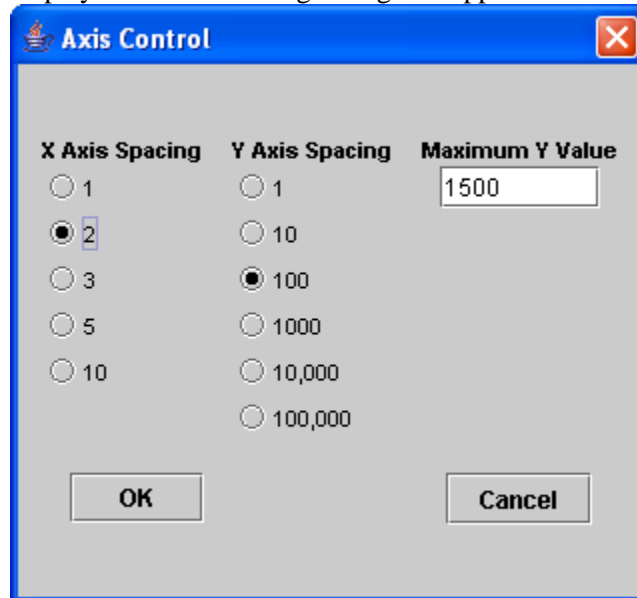
The Save link allows the user to save the graph as an HTML page with an embedded .jpg (image file) so the graph can be viewed in a browser window. The user can select the name and directory where the HTML page will be saved.



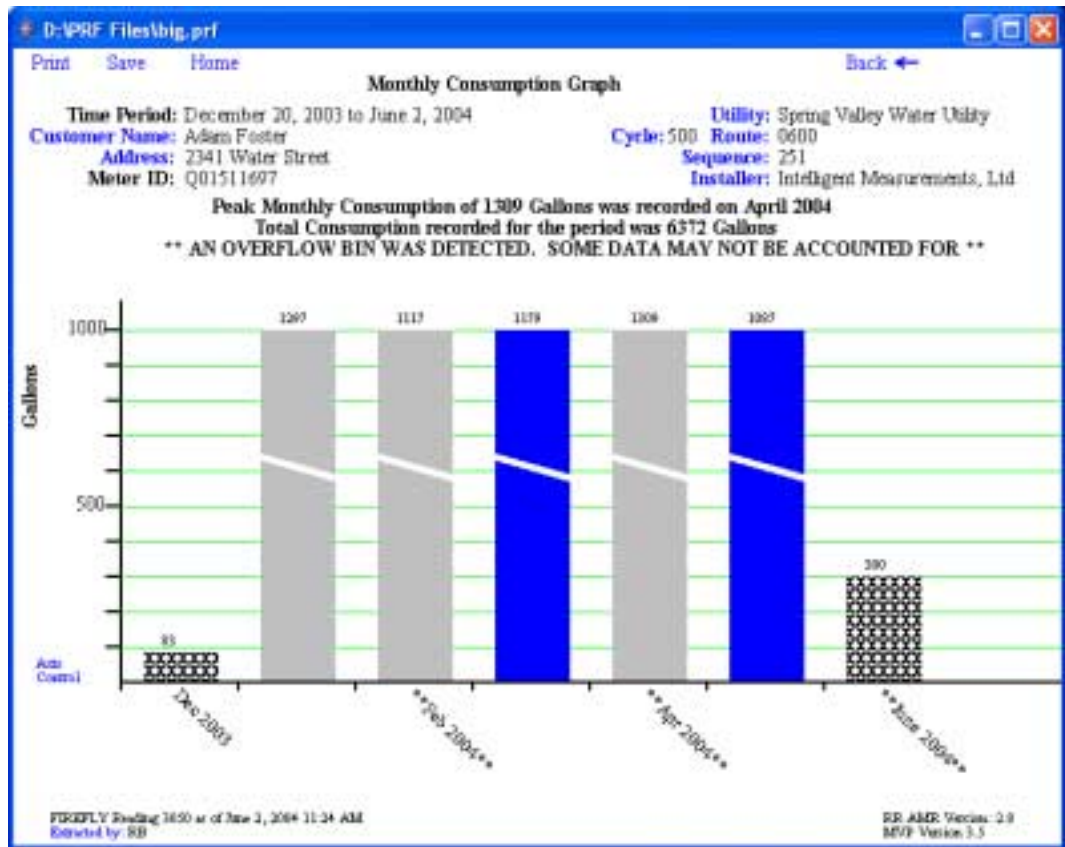
Double-clicking on sample.html brings up the default browser on the computer.

NOTE: Saved images of graphs do not support any links or “drill-down” features. They are meant to be viewed only.

The Axis Control link (located on the graph at the intersection of the X and Y axis) is used to adjust the spacing of the x-axis labels and the maximum value of y-axis that is displayed. The following dialog box appears when *Axis Control* is double-clicked:



The example above specifies that the maximum value of the y-axis will be 1500, the y-axis label intervals every hundred units, and date/times listed on the x-axis will be labeled every two time intervals.



Graph bars with “breaks” (or white diagonal lines) indicate that the actual value is higher than the user-defined maximum y-axis value).

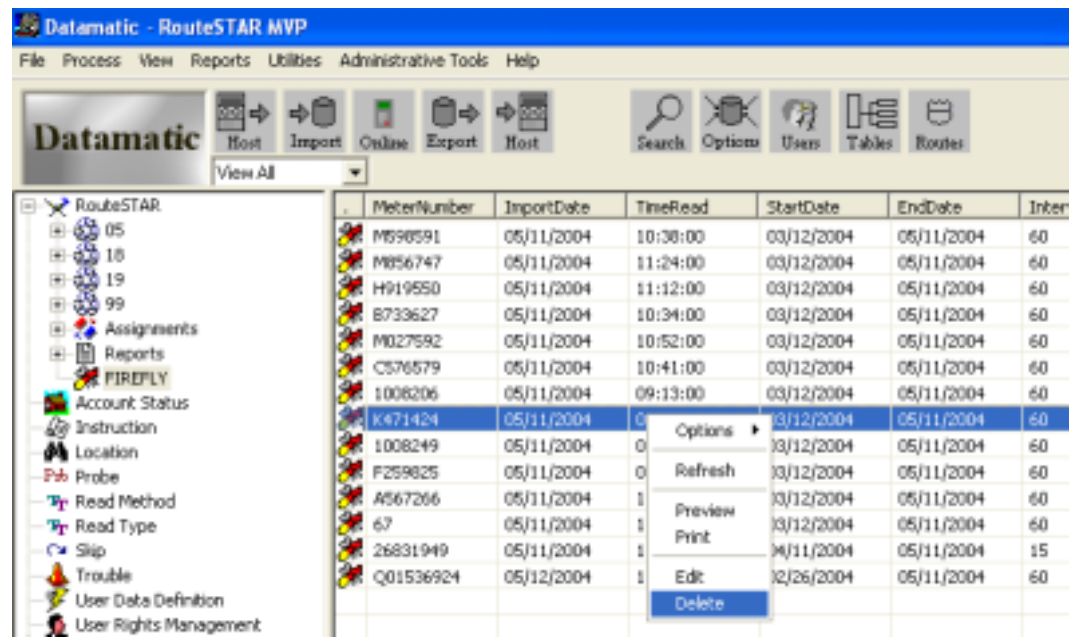
Customer Name, Address, Utility, Cycle, Route, Sequence, and Installer labels may be edited by double-clicking on the appropriate blue labels in the heading.

Below is a sample dialog box for editing the Address label:

Pressing OK in each dialog box applies the changes to the graph. The changes will remain applied on each graph viewed (by double-clicking on a graph bar to “drill-down”, by pressing the “Back” link, or by pressing the “Forward” link) until the ProfilePLUS graphing program is closed.

Removing Profile Data

1. Open **Summary View Area** (left side) of **Route Manager**.
2. Double-click on the **FIREFLY** icon on the left-hand side of the screen.
3. Select meter to be deleted.
4. Right click on the meter and select the option to **Delete**.



Yes Confirm deleting profile data for highlighted meters.

No Return to viewing data without deleting profile data for selected meters.



Appendix A: Glossary of Terms

Account Number

An alphanumeric, twenty-character field identifying the customer account number. If the account number is less than twenty characters, the unused space is left blank. This unused space also is used to display other relevant information pertaining to the account and is displayed just as it is sent from the HOST. This additional information includes items such as the number of months since the last reading or an indicator of an equal payment plan.

Account Status Code

A code that indicates the current status of each account. It corresponds to a table of four alphanumeric entries determined by the utility and is displayed on the ROADRUNNER. Examples include ACT for active account, IACT for inactive, VAC for vacant-active, SEA for seasonal, COM for commercial account, etc.

Address

A data field containing the street name and assigned number of the residence up to a total of 40 characters in length. When imported into RouteSTAR MVP from the DLL this field is divided into two fields of 20 characters in length for ease of display on the ROADRUNNER.

ASCII

American Standard Code for Information Interchange. Standard text character set used by MS-DOS applications.

ASCII File

A text file that uses the ASCII character set.

Attenuation

Attenuation is any obstacle that weakens or impedes the RF signal.

Audit

A function of the ROADRUNNER that verifies the reading is a number that falls between a high or low value set by the billing system. If the reader's entry fails audit, the ROADRUNNER does nothing, gives a warning, or requires verification by the reader, depending on the settings and rights for that user in RouteSTAR MVP. When a meter reading fails audit, the reader most often is required to re-enter the reading.

Automatic Primary Display (APD)

The ROADRUNNER screen that contains the basic information about a meter or account, including the data entry field for the readings. This screen can show the meter

number, type of meter (water, kilowatt, etc.), address and meter location, and special instructions. There is a separate APD for each meter. The APD is customizable for each user in RouteSTAR MVP.

Book

Alternate term for a route. (*See Route Number*)

Broadcast Message

A free form statement, up to 80 characters long, sent to all ROADRUNNERS receiving a route on a given day. The statement appears to the meter reader during the initial daily log-on procedure. It is included in the DLL as part of the 'H0' record or created within RouteSTAR MVP if not included in the Import File.

Changed Instruction Code 1 or 2

An Instruction Code that has been corrected by the meter reader in the field. This value must replace the original Instruction Code in the master record on the HOST.

Changed Location Code

A location code that has been corrected by the meter reader in the field. This value must replace the original Location Code 1 or 2 in the master record on the HOST.

Changed Sequence Number

A sequence number that has been corrected by the meter reader in the field. This value must replace the original HOST Sequence Number in the master record on the HOST.

Constant

A display field commonly used to show the multiplier to the meter reader. Other data such as meter size are substituted in this field.

Cycle

A set of routes, which proceed as a group through the meter reading process. Many utility companies run 21 cycles each month, one cycle each day of the week, though this is not a requirement of the RouteSTAR MVP system.

Cycle Number

A numeric data field containing a value designating a group of routes to be read. It is recommended that these values be assigned to each group of routes in sequential order to maximize the full functionality of the RouteSTAR MVP system.

Decimals, Number of

A numeric value, set on the HOST, that determines the number of digits placed to the right of the decimal point on a meter reading. This value is generally set to a quantity greater than zero only when reading electric demand or electric probe meters.

Demand Devices

An electric meter that collects time of use and interval data. The readings displayed on the meter are entered on the ROADRUNNER manually or collected using an optical probe. The TOU and interval data must be collected using the optical probe.

Devices

In RouteSTAR MVP the term used to designate meters. Devices also signify a "no reading" record that requires the reader to check a lock, gate or a light at a substation, for example. Likewise, a compound meter is represented as two (2) separate devices, possibly with the same address, customer name, account number, etc.

Dials, Number of

The number of dials indicates the number of digits expected for a meter reading. This information is used to audit the entered reading and to control the reading field size displayed on the ROADRUNNER. For readings with decimal places defined, the number of dials does not include the decimal point even though a decimal point appears in the read field on the ROADRUNNER display.

EDISK

A procedure that is performed on a ROADRUNNER 860 that reallocates memory so that routes load properly and the unit doesn't run out of memory. The EDISK function creates a logical drive (C:) on the ROADRUNNER and allocates memory for the program on that logical drive. The command is located on the B: drive and syntax to create a logical drive is (EDISK 0 240) where "240" represents the amount of memory allocated for use by A drive. **Note: AMR 2.8.1 and above requires EDISK 2 only.** Please see the RouteSTAR MVP Installation and Upgrade Instructions, ROADRUNNER User Manual and RouteSTAR MVP User Manual.

Ending Mileage

An ending odometer reading requested during the Log-out procedure when Vehicle Information prompt is activated on the ROADRUNNER.

Estimate Flag

A prompt for the meter reader, set on the MVP PC, requesting a response for estimating readings on meters that are either blank or skipped. The meter reader is required to enter a "YES" or "NO" response that is then passed to the HOST in the Export File and triggers an automatic estimating function on the HOST if available.

Failed Audit Code

A value that is set by the ROADRUNNER indicating the meter reading failed the HI/LO audit and was re-entered or forced by the meter reader.

Flash

A process where the EPROM chip is reprogrammed on a ROADRUNNER 860. "Flashing" the unit is outlined in the ROADRUNNER Manual.

Function Key

A key that is defined by software to perform a specified task.

Header Record

Information found at the top of an Import or Export File, which designates the beginning of a route. These records contain basic route related information such as the cycle number, route number, and survey information in the Import File, and start / end date and times, reader ID, totals, vehicle information and survey text in the Export File. Optional headers are included in the Import File for the Broadcast and Route Messages.

Header ID

The indicator field of the Header Record that signifies the beginning of detail information for a particular route. 'H0', 'H1', 'H2' are ID values used within the RouteSTAR MVP system.

High Audit Value

A ten-character field that indicates the top limit of a range within which a reading falls. This value is calculated on the HOST and passed to RouteSTAR MVP in the Import File detail record for a meter.

HOST

The computer that performs the billing function for the utility company. The HOST generates the routes to be read which are sent to the MVP PC; it also receives the readings from the MVP PC, which are then billed. The HOST is a mainframe, minicomputer, UNIX-system or PC. The HOST and the MVP PC, in some situations, are the same computer.

HOST Sequence Number

The controlling value that determines the sequence in which a route is read. This value is maintained on the HOST but is corrected or changed within the RouteSTAR MVP software. (*See Changed Sequence Number*).

Import

A function of the RouteSTAR MVP software. The import procedure reads an Import File and merges that information into the database. Before import is run, the Import File must be successfully transferred from the HOST and in the proper format for RouteSTAR MVP. This procedure involves programs not provided in RouteSTAR MVP or by Datamatic. Once this transfer is complete, then import is run.

Instruction Code

A four-digit code that gives account instructions to the meter reader. This code corresponds to a table of code descriptions. Certain codes are designated as *flash-and-beep* or *alert-and-hold* to make the meter reader aware of the instruction attached to the meter. The system provides for two instruction codes per meter that which are maintained on the HOST. Some examples of instruction codes include, bad dog, low ceiling, etc. (*See Changed Instruction Code*).

Lithium Cell – ROADRUNNER 860 Only

A backup energy source that provides power to a handheld when the main power source is removed or is too weak to provide adequate power. Also called a *backup battery*, a *backup cell*, *lithium battery*, a *lithium backup*, or simply a “*lithium*”.

Location Code

A four-digit code that identifies where the meter is located on a given property. Each code corresponds to a table of text entries, within RouteSTAR MVP, which define the code. Examples of location codes are BL for Back Left, 01 for Basement (*See Changed Location Code*).

Low Audit Value

A ten-character field that indicates the bottom limit of a range within which a reading falls. This value is calculated on the HOST and passed to RouteSTAR MVP.

Meter Number

An alphanumeric identifier made up of twenty characters. The *meter number* often consists of such items as the meter serial number and/or a code that identifies the manufacturer. Unused space is filled with blanks or other information.

Meter Reader ID

A ten-digit alpha/numeric field containing the meter reader's identification.

Meter Reading

(n) A ten-character *field* containing either a meter reading or a skip flag of “SK” followed by a user-defined skip code indicating the reason the meter was not read. A blank field indicates the meter was not attempted. (v) *The process* of collecting data from meters for billing purposes. There are several ways to read meters and record the data including use

of paper and pen, using handheld computers, automatically using telephone equipment or with RF equipment.

Metre Probe

Probing device marketed by Metre Pro that probes all types of touch read devices.

Mode

The activity of the FIREFLY is set to either Active or Dormant (inactive). The FIREFLY is transmitting while in Active mode.

MVP Scheduler

A utility function of RouteSTAR MVP, **MVP Scheduler** allows the user to perform certain functions on the MVP PC in unattended mode (i.e. after hours). Once activated, **MVP Scheduler** immediately begins the scheduled operations or delays until a specified start time. Execution of scheduled operations occurs in the order in which they appear on a schedule specified by the user. The **MVP Scheduler** function is located on the **Utility** menu of RouteSTAR MVP.

Name

A data field associated with each device that contains the customer's name. This field is up to 20 characters long.

New Meter

A meter that the meter reader locates while reading a route but is not currently part of the route in the ROADRUNNER. The meter reader has the capability to add these "found" meters and FIREFLY readings to the route in the ROADRUNNER.

Old Seal ID

This ten-digit field represents the number printed on electric meter seals used to prevent tampering. It is maintained on the HOST and passed down to the RouteSTAR MVP. The value of the seal ID is corrected or changed on the ROADRUNNER and is then submitted back to the HOST as the *New Seal ID*. This new value then replaces the existing value in the master record on the HOST.

Online

A function of the RouteSTAR MVP software that initiates the communication between the ROADRUNNERS and the MVP PC.

Optical Sensors

Also called *optical couplers* or *optics*. These are input/output devices that function by converting electronic signals to pulses of light and vice versa. Various probing devices use optics to communicate with certain meters and they are also used by some handheld devices to communicate with a PC.

Power Level

Power Level is a sensitivity value for the MIU sensor determined by meter qualification.

Previous Estimates, Number of

A 2-digit field holding a value that represents the number of times a meter has been consecutively estimated by the billing system. This counter is passed down to the RouteSTAR MVP system and is used to issue a warning to the reader if the preset limit has been reached and the reader attempts to skip the meter.

Previous Read Date

A four-character field containing the last month and day in which a reading was recorded for a meter. Format is MM/DD.

Previous Reading

A ten-character field that contains the last recorded reading from the HOST. This field is displayed on the MVP PC and is optionally displayed on the ROADRUNNER for the meter reader.

Probe

A data collection device used as an interface between the ROADRUNNER and the electronic data recorder on some electric power meters. Data is transferred as light pulses through optics located on the meter.

Profile Interval

The profile interval is the frequency, in minutes, at which the FIREFLY records usage.

Program Transfer

Process by which the customer loads the program onto their ROADRUNNER. The process varies depending upon the model of ROADRUNNER being used.

Read Date; Read Time

The month, day and year, hours, minutes and seconds that a meter reading is taken. The internal clock on the ROADRUNNER is used to record the date and time and is controlled by the PC.

Read Type Code

A four-digit, alpha-numeric value that indicates the type of meter from which a reading is to be gathered. It corresponds to a table of 20-character descriptions such as WATER METER, ELECTRIC METER, TOUCH-READ WATER, etc., which are displayed on the ROADRUNNER and help the meter reader match the meter being read.

Record ID

This field is used to define the beginning of a detail record in the RouteSTAR MVP record formats. D1 records contain account specific information, D2 records contain special messages associated with a specific account, and D3 records designate new or changed meters not included in the download data from the HOST.

Resequencing Flag

A code entered by the meter reader during the communications procedure indicating whether the route is to be resequenced by the HOST or not. This is entered only if the utility company selects the resequence option when setting the system parameters.

ROADRUNNER

Datamatic, Ltd. trade name for hand-held computers used to record meter readings.

Rollover

Rollover is set equal to the number of moving dials on the meter.

Route Direction

Determines how the meters in a route are displayed or searched -- either forwards (in ascending order) or backwards (in descending order) by *sequence number*.

Route Message

A note, associated with a specific route, sent to the ROADRUNNER.

Route Number

Six-digit number that identifies a specific route in the RouteSTAR system. Depending on the option selected for import, the system requires the first two-digits of the route number to identify the cycle. A *route* is also referred to as a *book*.

RouteSTAR MVP

Name of the software package that handles data between a HOST computer and small handheld meter reading computers.

MVP PC

Trademark for the combination of RouteSTAR MVP and a PC. The MVP PC receives and stores routes sent from the HOST and, upon request passes them on to the ROADRUNNER so the meters are read. The MVP PC also assembles and stores information sent from the ROADRUNNER then, upon request, sends this information to the HOST for billing.

Scale

The scale is used in graphing profile data. This value is usually set the same as the constant.

Send/Receive Function

A communications option on the ROADRUNNER handheld in which the meter data is uploaded and the route is deleted or replaced by another route.

Sign-On

Process of entering preliminary information into the ROADRUNNER before beginning to read meters. Includes meter reader ID, read date, vehicle information, and read direction.

Skip Code

A code entered by the meter reader that indicates a reason why the meter cannot be read. Each code identifies a specific reason, such as customer refused access, bad dog, etc.

Skipped Meters

Meters that have a skip code because readings are attempted but cannot be obtained.

Special Message

Messages displayed on the ROADRUNNER that provide additional information about a meter. One field of 280 characters each are displayed “as is” from the HOST and might include additional directions to help locate the meter, reminders of electric fences, etc. These instructions need to be used conservatively; in some cases system design limits the number of meters that have a special instruction.

Start Date; Start Time

The month, day and year, hours, minutes and seconds that a meter reader begins reading a route. The Start Date and Time is registered upon reading the first meter in the route and has the following formats for each field: Start Date = ‘CCYYMMDD’ and Start Time = ‘HHMMSS’.

Starting Mileage

A beginning odometer reading requested during the Log-in procedure when Vehicle Information prompt is activated on the ROADRUNNER.

Stop Date; Stop Time

The month, day and year, hours, minutes and seconds that a meter reader completes reading a route. The Stop Date and Time is registered upon reading the last meter in the route and has the following formats for each field: Stop Date = 'CCYYMMDD' and Stop Time = 'HHMMSS'.

Survey Flag

A one-character field indicating to RouteSTAR MVP that a survey question is attached to a specific meter.

Survey Response 1 & 2

A ten-character alpha-numeric field containing the answer given by the meter reader when responding to a survey question.

Survey Response Length 1 & 2

A two-character numeric field indicating the length of the intended response up to 10 characters.

Survey Response Type 1 & 2

A one-character alpha-numeric field used to indicate the type of response expected from the meter reader. The options are Y or N, numeric or alpha-numeric.

Survey Text 1 & 2

A 40-character field that provides a meter reader with a survey question to be answered. The survey key on the ROADRUNNER must be pressed in order for the meter reader to answer the question.

Threshold

Variance in reflectivity of the meter (between sweep needle and meter face).

Touch Read

Type of meter reading where the reader uses a handheld communications device that automatically reads the data from a specific type of water meter. Much like *probe* reading on electric meters (q.v.).

Transmit Interval

Tx Interval is how often, in seconds, the FIREFLY transmits data via an RF signal.

Trouble Code

A code entered into the ROADRUNNER by the meter reader to signal an unusual condition at a meter or that the meter requires some type of service or repair. Trouble codes include conditions such as wrong number of dials, broken meter glass, meter set backwards, etc.

Type

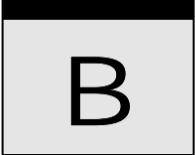
The FIREFLY MIU Sensor type sets proper functionality for optic, pulse, or encoder meter support.

Uploading

The process of *sending* meter readings from the ROADRUNNER to the MVP PC. After uploading is complete, the MVP PC then sends the meter readings to the HOST.

Vehicle ID

The identification number of the vehicle used by the meter reader. This is requested during the log-in procedure if the Vehicle Information prompt is activated.

B

Appendix B: Equipment Maintenance

RMA Return Maintenance Authorization

To send in your unit for preventative maintenance, contact Customer Support to receive a Return Maintenance Authorization (RMA). Always contact Customer Support for an RMA before sending Datamatic equipment. Datamatic will not service equipment without an RMA.

1. Complete Datamatic's Equipment Return Request Form on the web at www.datamatic.com/callcenter/ccRMAform.asp or call Datamatic's Customer Service support line at 888-326-5032.
2. If the equipment needs troubleshooting, Customer Service provides assistance via phone.
3. If the equipment requires return, the Customer Service Representative opens an RMA.
4. You will be asked to provide the equipment serial number, your return shipping address, and how you will be shipping the equipment (e.g., via UPS Ground or USPS Priority Mail).
5. Datamatic Customer Service will create an RMA and email or fax you a copy.
6. Verify that the information on the RMA is correct (e.g., the serial number, return address, etc.).
7. Make two copies of the RMA received from Datamatic.
8. Keep one copy of the RMA form for your records and enclose the other copy with the equipment being shipped.

If Datamatic receives a shipment without an RMA, Datamatic will hold the shipment until a representative from your company contacts Customer Support for an RMA.

If Datamatic is not contacted, your equipment may be returned to you without being serviced.