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AMCO Automated Systems
TRACE Short Range Programmer
FCC ID: G8JSRP03
FCC Part 15.231
RTL WO# 2003077

APPENDIX H: MANUAL

Please see the following pages.

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USER GUIDE

TRACE®

Short Range Programmer VRT

AMCO
Automated Systems

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Copyright Acknowledgements

FCC Compliance

The TRACE Short Range Programmer has been type accepted by the Federal Communications Commission under Part 15C, low power communication device transmitter. FCC ID: G8JSRP02

This device complies with Part 15 rules. Operation is subject to the following conditions:

- This device may not cause harmful interference, and

- This device must accept any interference received, including interference that may cause undesired operation.

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 distance 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 experience radio/TV technician for help.

Changes or modifications not expressly approved by AMCO Automated Systems could void the user's authority to operate the equipment.

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Short Range Programmer-VRT
USER GUIDE

Table of Contents

Chapter One

Introduction

The TRACE® Short Range Programmer (SRP) is an important part of AMCO Automated Systems' portfolio of products for automated meter reading (AMR) enabling quick and easy initial programming of TRACE transponders in the field.

About this Document

This *Short Range Programmer User Guide* provides instructions for operating the SRP.

Audience

This document is designed for utility industry installers and supervisory staff. In order to establish appropriate levels of detail for the material, this document assumes the following:

- The user is proficient in reading meters of the type currently compatible with TRACE transponders and possesses all the skills necessary to conduct meter reading by conventional means.

- The user has little or no prior expertise in the TRACE AMR technology.

- The user is familiar with common data entry devices and techniques.

Conventions

In the interest of brevity and simplicity, this document uses the following conventions:

- Additional information relevant to a given instruction step may be shown in one of three ways:

  1. A bulleted item covers "how-to" and verification information.

  2. *An italicized NOTE contains relevant background information.*

  3. *An italicized and bolded **CAUTION** contains information important to the safety of either the user or the equipment.*

- Much of the information in this guide applies to all transponder firmware (software programs located inside the transponder). Where the information is unique to Version 9 or VRT firmware, the symbols (V9) and/or (VRT) will appear in the text.

- Where reference to other parties is made, the generic masculine pronouns (he, his, him) are used. This in no way reflects bias or gender discrimination in any manner related to the users, publishers or authors of this document.

Chapter Two

Short Range Programmer-VRT Overview

The TRACE Short Range Programmer-VRT (SRP-VRT) is a low power, short range programmer/interrogator activated by a single button for ease of use in the field. Designed for initial transponder programming, the SRP's maximum range is limited so that it can only communicate with the nearest transponder.

SRP and Components

The SRP is a one-piece handheld unit containing rechargeable batteries. An internal antenna located near the top of the unit provides both transmit and receive communications. An external power supply allows the user to recharge the internal batteries.

The SRP is shipped with the following components:

- SRP handheld unit

- External power supply with cable and connector

Internal antenna for transmit and receive

Label indicating SRP is VRT-compatible

4 line by 20 character LCD display

17 button keypad

6 volt charging power supply

Charging jack

2 INTERROGATE buttons
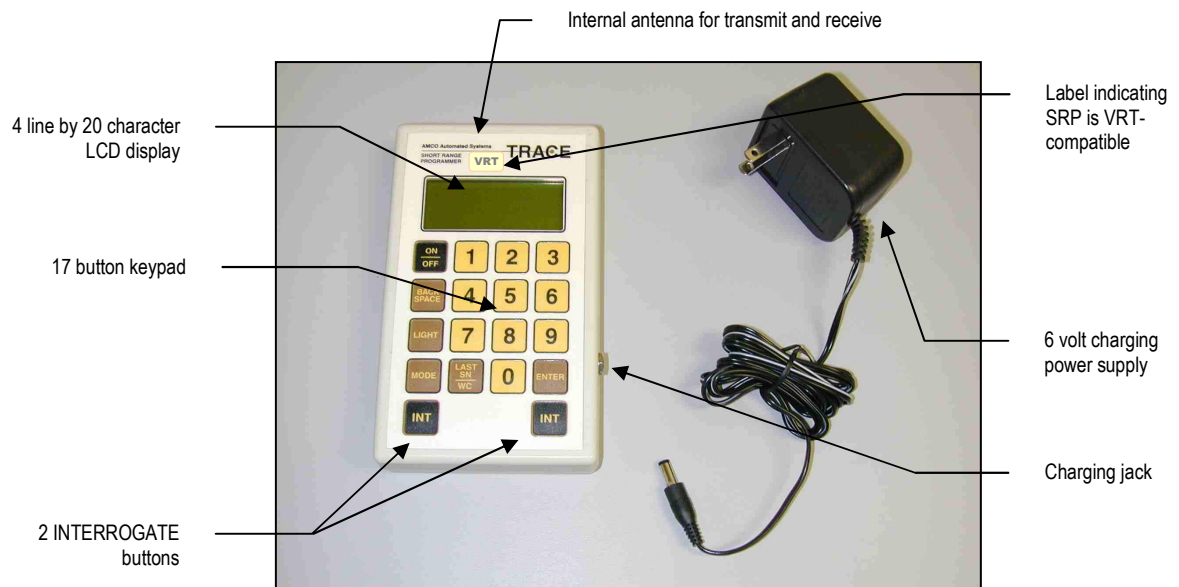
SRP Handheld Unit. The handheld SRP unit has a four-line by 20-character LCD display and an 18-button keypad, which includes five function keys and two Interrogate (INT) keys. The charging jack is located on the right-hand side of the unit.

Range. The SRP's range extends outward to approximately twelve (12) inches from the top of the handheld unit. Actual communication range may vary dependent upon environmental conditions.

Battery Life. The internal battery allows approximately 24 hours of normal operation on a single charge. Recharging takes about 2 hours.

How the SRP Works

The SRP is both an interrogator (can talk to and receive information from transponders) and a programmer (can program transponders). It sends out a radio frequency (RF) signal embedded with special authorization codes that the transponder recognizes, and thus establishes communications with the transponder for performing various functions.

It is designed to operate at short range (within about 12 inches of the transponder) for programming transponders with the current meter index value (and other parameters) at the time of installation. This range limitation helps ensure the SRP programs *only* the intended transponder and reads back that same transponder's status to verify its programming.

The SRP has functions built into its internal programming (firmware) that allow the user to determine precisely which transponder is being read and/or programmed. It also allows the user to search for a specific transponder by serial number if there are a number of transponders in the area.

With the SRP, the user can also determine and reset the tamper status of transponders, read meter index data and synchronize transponder time with SRP time.

Specifications

The following table shows the SRP specifications:

Power	UL approved, rechargeable batteries
RF Transmitter	Frequency: 451.35 MHz
RF Receiver	Frequency: 415 MHz
FCC Compliance	The SRP has been type accepted by the FCC for use under Part 15C
FCC ID	G8JSRP02
Weight	10 oz (approx.), charger 10 oz. (approx.)
Dimensions	3.75 in. x 6.25 in. x 1.375 in.
Operating Temperature	20°F to +140°F

Chapter Three

SRP Operation

The SRP makes programming transponders quick, easy and reliable. Its limited range (about 12 inches)—along with its ability to locate individual transponders by serial number—ensure the SRP programs *only* the intended transponder. Verification of the new data is a snap with one touch of a button.
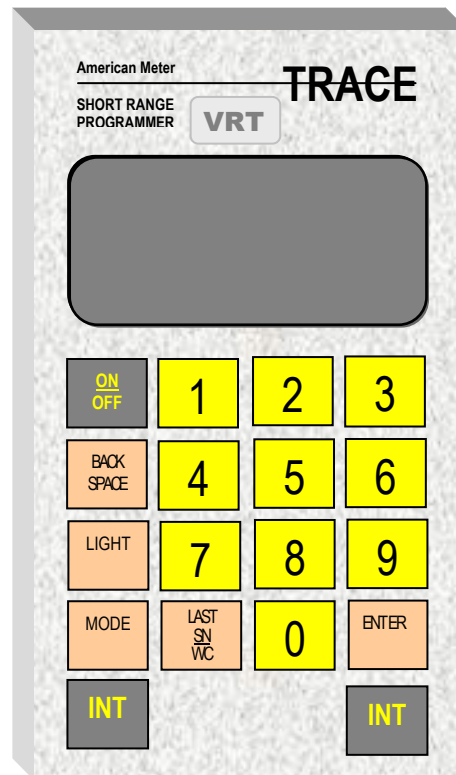
Keypad Buttons and Functions

The SRP keypad has 16 small buttons and two identical "INT" (interrogate) buttons at the bottom. The five tan buttons represent user-accessible SRP functions. The yellow number buttons allow you to enter numerical data manually.

ON/OFF. Alternately turns the SRP on and off. The SRP automatically shuts off after 2 minutes of non-use to conserve battery power.

BACK SPACE. Moves the cursor (dark flashing box) back one position to allow the user to change the character displayed in the cursor's position.

LIGHT. Alternately turns the display backlight on and off. Backlight uses battery power and should be turned off when not needed.

MODE. Cycles through all SRP functional modes, advancing one mode per press of the button.

LAST SN/WC. Toggles between the *last successfully interrogated serial number* (LAST SN) and *wild card* (WC).

ENTER. Moves the cursor from one input field to the next on the displayed screen.

INTERROGATE. Searches for and initiates communication with the selected transponder (if a serial number was entered) or the nearest transponder (if Wild Card is used). This button is also used to program the baseline meter reading, correction factor *(V9 and VRT)* and a variety of other features *(VRT)* into transponders.

SRP Modes

The SRP has eight functional modes for a variety of operations.

1. **Clock – 24 Hour Format Mode.** Allows the user to set the current time and date into the SRP.

   - When interrogating any transponder the SRP may also broadcast its current time. If the SRP is in Broadcast Mode, all VRT transponders within range of the interrogation will reset their internal clocks to match the SRP time.

2. **FIND SN/VERS/TYPE Mode.** Allows you to read and display the transponder's serial number, type and firmware version.

   - You can interrogate transponders either by using the Wild Card option (to search for any nearby transponders) or by entering a specific transponder serial number.

   - Once the SRP has read the desired transponder, you are ready to perform other functions and switch to other modes as required.

   - *NOTE: Find is the only mode in which interrogation acquires transponder firmware version and type information needed for other operations.*

3. **READ METER INDEX Mode.** Reads the transponder's electronic index (e-index).

    - From this mode, you can also press "INT" (interrogate) to read the transponder's serial number and any tamper flags set during or since installation.

4. **READ PRE-DIVIDER and CF Mode.** Reads the sub-count, pre-divider and compensation factor *(V9 and VRT)* recorded in the transponder.

5. **Read History / TOU Mode** *(VRT).* *Reserved for factory use only.* Reads and programs the transponder time-of-use accumulators and history. Also reads the transponder current date and time.

6. **Set Meter Parameters Mode** *(VRT).* *Reserved for factory use only.* Programs the transponder's date, time and pre-divider.

7. **PROGRAM METER INDEX Mode.** Programs the meter index value into the transponder. This mode can also be used to program the compensation factor into the transponder *(V9 and VRT).*

8. **Transponder TX Test Mode.** *Reserved for factory use only.* This diagnostic mode is used by the manufacturer to gauge the performance of a transponder's transmitter.
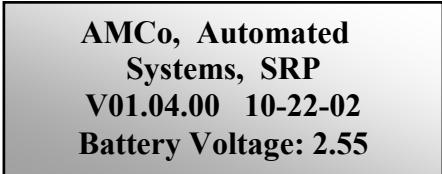
Power On/Off

The SRP is powered by rechargeable batteries providing about 24 hours of normal operation between recharges.

Turning the SRP ON

Press the ON/OFF button once to turn the SRP on.

- **Power-on Screen.** Each time it is turned on, the SRP conducts a self-test. The screen displays the SRP firmware version, current battery voltage, and one of two messages, either "Battery Voltage: X.XX" (where X.XX is voltage) or "RECHARGE BATTERY."

> **AMCo, Automated**
> **Systems, SRP**
> **V01.04.00   10-22-02**
> **Battery Voltage: 2.55**

- If "RECHARGE BATTERY" appears, you need to recharge the batteries (indicating a voltage of 1.99 or less). If this message appears with known fully charged batteries, contact AMCO Automated Systems.

Turning the SRP OFF

Manual Power-off. Pressing the ON/OFF button at any time during operation will power off the SRP. The last transponder serial number successfully interrogated will be saved.

Automatic Power-off. After 2 minutes of non-use, the SRP will automatically power off to conserve the battery.

Setting Time and Date and Broadcast Mode

The user can set the current time and date in the SRP and also in the VRT Transponders by using the optional "Broadcast Time" feature.

In this mode the SRP will broadcast its current time during each interrogation and VRT transponders will reset their time according to the broadcast. For these reasons, it is important that the SRP time be accurate when VRT transponders will be within range of any SRP interrogation.

The Broadcast Time feature is always reset to "Off" when the SRP is turned off, but may be turned on as described in the following steps.

Accessing Time and Date Set Mode

1. Press the MODE button until the SRP Time and Date Set mode ("Clock-24 Hour Format") displays.

> **Clock-24 Hour Format**
> **Date: 10-04-02**
> **Time: 08:30:24**
> **Broadcast Time OFF**

2. Verify the date and time are correct.

To Change Date or Time

1. Press the LAST SN/WC button.

2. Press the ENTER button to skip correct values and move to value(s) you wish to change.

3. (Date) Enter the correct date using the SRP keypad and press ENTER.

4. (Time) Enter the correct time using the SRP keypad and press ENTER

To Turn Broadcast Time ON and OFF

1. To Turn Broadcast Time ON: Press ENTER while in the Clock-24 Hour Format screen.

   - If the time and date settings are already correct, you can simply press ENTER to turn Broadcast Time ON.

   - If you wish to change time or date settings, do so, then press ENTER to record the changes and switch Broadcast Time to ON.

   - The SRP will now transmit its current time at each transponder interrogation.

   - NOTE: Broadcast Time will default to the "Off" setting when you turn off the SRP. However, your latest time and date settings will be preserved in SRP memory.

2. To turn Broadcast Time OFF: Switch the SRP off and back on again.

   - Broadcast Time is always reset to OFF when the SRP is powered off.

   - Your latest time and date settings are preserved, even when the SRP is turned off.

How to Interrogate and Program Transponders

In order to program a transponder you must first locate it and interrogate (read) it to verify that it is the one you want and to determine its characteristics. This is referred to as "finding" the transponder.

The Find mode identifies the transponder's firmware version, which, in turn, tells the SRP which modes can be used with that transponder.

Using Find Mode

To Find a Transponder

1. Press the MODE button repeatedly until the display shows the "Find Serial Number" screen:

> **FIND SN/VERS/TYPE**
> **Serial No..   ????????**
>
> **? = W.C.**

If __no__ serial number is currently displayed and you want to find a specific transponder:

2. Enter the serial number of the transponder you want...
   or...

Press the LAST SN/WC button to display the serial number of the last transponder successfully "found."

If a serial number is currently displayed and you want to find all transponders within range:

3. Press the LAST SN/WC button to change the display to 'Wild Card' (all question marks).

    •   This will list all transponders within range of the SRP.

To Interrogate a Transponder

1. Hold the SRP close to the transponder and press either of the two INT (interrogate) buttons.

> **FIND SN/VERS/TYPE**
> **Serial No.. ????????**
>
> **INTERROGATING**

•   If the interrogation is successful, the screen will display the transponder serial number, meter type and transponder firmware version:
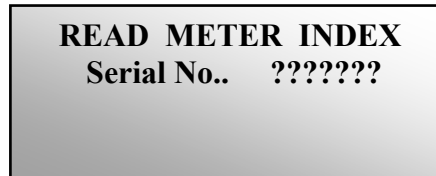
> **FIND   SN/VERS/TYPE**
> **Serial No.. 03571641**
> **TYPE=GAS   VERS=09**

•   If the interrogation is NOT successful, the screen will display the "CARRIER NOT DETECTED" message (indicating no signal from transponder) or "RECEIVE DATA ERROR" (indicating radio signal interference). *This message displays for 2 seconds (during which time the SRP will not interrogate), then returns to the initial mode screen.*

2. If the interrogation is NOT successful, move the SRP to a slightly different position relative to the transponder (closer, farther away or to one side) and interrogate again.

    •   Radio waves can bounce off of, or be absorbed or deflected by, various materials (especially metals) which can create differences in signal strength from one spot to another.

Using Read Meter Index Mode

This mode reads the meter index (meter count). It will display whole units only. (For pre-divider/sub-count values use Read Pre-divider mode.)

1. Press the MODE button repeatedly until the display shows the "Enter Read Meter Index" screen.

> **READ METER INDEX**
> **Serial No..   ???????**

2. Acquire the transponder serial number.

   • Acquire serial number either: (a) by using the Find mode first or (b) by manually entering the serial number in this mode.

3. Press one of the two INT (interrogate) buttons.

   • <u>If the interrogation is successful,</u> the SRP will display the transponder serial number, the current meter index value and the tamper indicator, if applicable (as shown below):

> **READ METER INDEX**
> **Serial No..   ???????**
> **INDEX NO.. 00001234**
> **   TAMPER**
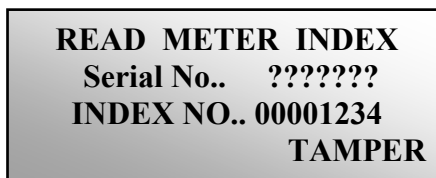
   • Any TAMPER indication that appears will not appear again on the next interrogation. (Tampers are automatically "cleared" after interrogation.)

   • <u>If the interrogation is NOT successful</u>, the screen will display the "CARRIER NOT DETECTED" message (indicating no signal from transponder) or "RECEIVE DATA ERROR" (indicating radio signal interference). *These messages display for 2 seconds, during which time the SRP will not interrogate..*

4. If the interrogation is NOT successful, move the SRP to a slightly different position relative to the transponder (closer, farther away, or to one side) and interrogate again.

   • Radio waves can bounce off of, or be absorbed or deflected by, various materials (especially metals) which can create slight differences in signal strength from one spot to another.

Using Read Pre-divider (and CF) Mode

This mode reads the current sub-counts and pre-divider along with the current compensation factor *(V9 and VRT).*

NOTE: *The CF displays with the pre-divider only if the transponder firmware supports CF and this can only be determined if the transponder is interrogated first in the Find mode.*

1. Press the MODE button repeatedly until the display shows either of the two "Read Pre-divider" screens below:

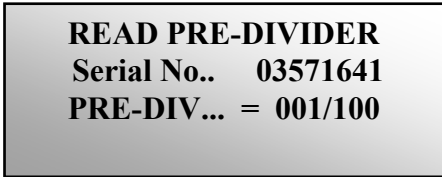   - For transponders accessed directly through Pre-divider mode:

   ```
   READ PRE-DIV and CF
   Serial No..    03571641
   ```

   - For V9 and VRT transponders interrogated in Find mode:

   ```
   READ PRE-DIVIDER
   Serial No..    03571641
   ```

2. If the serial number represents the target transponder, go to step 4.

3. If Find mode was not used, or the displayed serial number is not the serial number of the target transponder, enter the serial number of the desired transponder.

4. Press either of the two INT (interrogate) buttons to read the pre-divider (and CF if applicable).

   - <u>If interrogation is successful,</u> the screen will display the serial number and pre-divider (and CF if applicable) as shown in the examples below:

   - The pre-divider is displayed in the form SSS/PPP where SSS is the current sub-count and PPP is the actual pre-divider.

   ```
   READ PRE-DIVIDER
   Serial No..    03571641
   PRE-DIV... =  001/100
   ```

- For V9 and VRT transponders which were interrogated in Find mode, the compensation factor also displays on the lower line:

```
READ PRE-DIV and CF
Serial No..   03571641
PRE-DIV...   001/100
COMP FACT.= 200/250
```

- If the interrogation is NOT successful, the screen will display the "CARRIER NOT DETECTED" message (indicating no signal from transponder) or "RECEIVE DATA ERROR" (indicating radio signal interference). *This message displays for 2 seconds, during which time the SRP will not interrogate.*

5. If the interrogation is NOT successful, move the SRP to a slightly different position relative to the transponder (closer, farther away, or to one side) and interrogate again.

- Radio waves can bounce off of, or be absorbed or deflected by, various materials (especially metals) which can create slight differences in signal strength from one spot to another.

Using Program Index (and CF) Mode

This mode programs the current meter index value and compensation factor *(V9 and VRT).*

NOTE: The compensation factor may be programmed only if the transponder firmware supports CF and this can only be determined if the transponder was interrogated first in the Find mode.

1. Press the MODE button repeatedly until the display shows either of the following two Program Index (and CF) screens:

- For transponders accessed directly in Program Index (and CF) mode:

```
PROGRAM METER INDEX
Serial No..   03571641
Index No...   00001348
```

- For V9 and VRT transponders which were interrogated in Find mode the compensation factor ratio also displays on the lower line:

PROGRAM METER INDEX
Serial No..   03571641
Index No...   00001348
CF Ratio...   001/001

2. If the serial number represents the target transponder, go to step 4.

3. If Find mode was not used or the serial number displayed is not the serial number of the target transponder, enter the desired serial number.

   - To enter serial number, press the ENTER button until the cursor (flashing dark box) appears over the first digit of the Serial No. input field. Enter the serial number. Press the ENTER button when completed.

4. Read the meter conventionally (visually, from the mechanical index).

   - The SRP display will also show the CF Ratio (where applicable).

5. Enter the meter index value using the SRP keypad.

   - This field requires 7 digits. Read and enter index value from left to right, just as you would normally read and write any numerical value. Include as many leading zeroes as are needed to fill positions to the left of the meaningful digits.

6. Enter the compensation factor using SRP keypad. (V9 and VRT transponders)

   - CF Ratio obtained in step 4 (where applicable).

   - To enter the CF value, press the ENTER button until the cursor (flashing dark box) appears over the CF Ratio numerator (top number) and/or denominator (bottom number). Enter the correct value. Press the ENTER button when completed.

7. Press either of the two INT (interrogate) buttons.

   - This programs the baseline meter index value and compensation factor *(v9 and VRT)* into the transponder memory.

   - <u>If programming is successful</u>, the SRP will display the "PROGRAM VERIFIED" message.

   - <u>If programming is NOT successful</u>, the screen will display the "PRGRM COMPARE ERROR" message.

8. If the interrogation is NOT successful, move the SRP to a slightly different position relative to the transponder (closer, farther away, or to one side) and interrogate again.

- Radio waves can bounce off of, or be absorbed or deflected by, various materials (especially metals) which can create slight differences in signal strength from one spot to another.

Using Read History and TOU Mode *(VRT)*

Reserved for factory use only.

This mode reads the transponder time-of-use (TOU) accumulators and history.

NOTE: Should you need to read transponder TOU, Daily History and other factory-installed defaults using the SRP, contact Customer Service at AMCO Automated Systems.

Using Set Meter Parameters Mode *(VRT)*

Reserved for factory use only.

This mode programs the transponder's date, time and pre-divider.

NOTE: Should you need to reprogram transponder TOU, Daily History and other factory-installed defaults using the SRP, contact Customer Service at AMCO Automated Systems.

Using Transponder TX Test Mode

Reserved for factory use only.

NOTE: This is an in-shop transponder transmitter diagnostic tool used by the manufacturer.

Charging Batteries

The SRP batteries typically deliver between 2.0 volts and (when fully charged) 2.6 volts If the voltage drops near 2.0 (as shown on the power-on screen), you should recharge the batteries.

Battery charger. A 6 volt external power supply allows you to recharge the internal batteries by connecting the SRP to the charger and plugging the charger into a standard 120 VAC outlet. The SRP can be operated while it is charging if needed to troubleshoot transponders in the shop.

CAUTION: When the battery is completely dead, it may take up to 15 minutes on charge before the unit will resume operation.

Battery charger. Plug into 120 VAC wall outlet

Connect charger jack to port on SRP
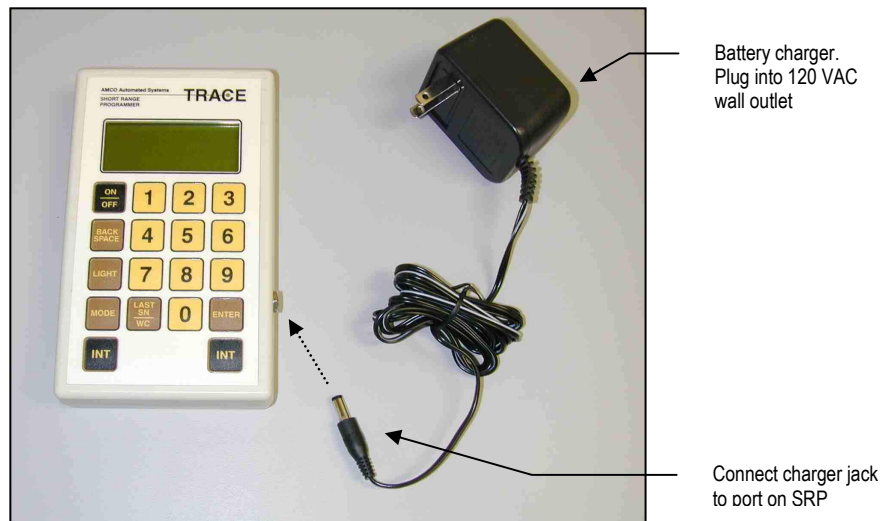
Chapter Four

Troubleshooting

The following table offers troubleshooting tips for some common SRP conditions. For all other matters, contact AMCO Automated Systems.

Symptom	Possible Cause	Solution
Upon start-up, SRP displays "RECHARGE BATTERY" message.	Battery voltage too low.	Recharge batteries.
Upon interrogation, SRP displays the "CARRIER NOT DETECTED" message and does not display transponder data.	The SRP is out of range of the transponder.	Move the SRP (and particularly the top, where antenna resides) closer to the transponder.
	The SRP is receiving outside interference.	Move the SRP (and particularly the top, where antenna resides) closer to the transponder. If other TRACE readers or programmers are operating nearby, wait until they have moved away and try again.
	Manually entered transponder serial number is not valid.	Wait 2 seconds, re-enter the desired serial number and interrogate again. If interrogation fails again, check source of serial number and verify/correct number.
	Transponder is not responding to interrogation signal.	Move the SRP (and particularly the top, where antenna resides) closer to the transponder. If other TRACE readers or programmers are operating nearby, wait until they have moved away and try again.
	First History/TOU or Set Meter Parameters program command interrogation *(VRT)*.	Interrogate for the second time.
	Second or subsequent History/TOU or Set Meter Parameters program command interrogation attempted beyond 1 minute timeout *(VRT)*.	Restart command sequence by re-entering transponder serial number in SN-ADR/CMD field and interrogating. Repeat command interrogation.
Upon interrogation, SRP displays "READ DATA ERROR."	The SRP is receiving outside interference.	Move the SRP (and particularly the top, where antenna resides) closer to the transponder. If other TRACE readers or programmers are operating nearby, wait until they have moved away and try again.
	Two or more transponders are within in range of the SRP simultaneously.	Set the SRP (and particularly the top, where antenna resides) directly on the desired transponder.

Symptom	Possible Cause	Solution
Upon attempting to read or program index or pre-divider, SRP displays "Wild Card Not Valid" message.	These operations do not allow the Wild Card option.	Enter serial number manually or obtain serial number via Find mode.
Upon interrogation, SRP displays "CS/LOAD ERR" and "TAMPER" messages.	This occurs normally at first interrogation after a transponder has been powered up (either new or reset).	Interrogate again to clear messages.
Upon interrogation, SRP displays "CKSUM ER" message.	This occurs normally after the second interrogation of a new or reset transponder and will remain until transponder is programmed.	Program transponder.