AP4118 Tag Programmer User Guide

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WARNING TO USERS IN THE UNITED STATES

FEDERAL COMMUNICATIONS COMMISSION (FCC) RADIO FREQUENCY INTERFERENCE STATEMENT
47 CFR §15.105(a)

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the Federal Communications Commission (FCC) rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency (RF) energy and may cause harmful interference to radio communications if not installed and used in accordance with the instruction manual. Operating this equipment in a residential area is likely to cause harmful interference, in which case, depending on the laws in effect, the users may be required to correct the interference at their own expense.

NO UNAUTHORIZED MODIFICATIONS
47 CFR §15.21

CAUTION: This equipment may not be modified, altered, or changed in any way without permission from TransCore, Inc. Unauthorized modification may void the equipment authorization from the FCC and will void the TransCore warranty.

USE OF SHIELDED CABLES IS REQUIRED
47 CFR §15.27(a)

Shielded cables must be used with this equipment to comply with FCC regulations.

A license issued by the FCC is required to operate this RF identification device in the United States. Contact TransCore, Inc. for additional information concerning licensing requirements for specific devices.

TransCore, Inc.
USA

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Before You Begin

Chapter 1

Before You Begin

The AP4118 Tag Programmer User Guide provides information necessary for installing, operating, and troubleshooting the AP4118 Tag Programmer.

Purpose of This Guide

This *AP4118 Tag Programmer User Guide* discusses the proper setup and operation of the AP4118 Tag Programmer. This guide also provides procedures useful in troubleshooting any problems encountered after installation.

Intended Audience

The *AP4118 Tag Programmer User Guide* is designed to be used by technical personnel responsible for installing and operating AP4118 Tag Programmer and related software.

Related Documents

AP4118 Tag Programming Software User’s Guide

Guide Topics

This document presents the following information:

Chapter 1 – Before You Begin
Describes the purpose, intended audience, guide topics, related documentation, and document conventions.

Chapter 2 – Setting Up the Programmer
Provides instructions for setting up the tag programmer, preventing electrostatic discharge damage, and connecting the programmer to a host computer system.

Chapter 3 – Operating the Programmer
Describes how to program a tag and how to verify or read the data. This chapter also lists the RS–232 command set and describes the security character operation.

Chapter 4 – Troubleshooting Procedures
Lists problems that may be encountered during tag programmer operation and suggested solutions.

Appendix A – Programmer Specifications
Provides the programmer’s physical and environmental specifications.

Appendix B – RS–232 Connector Pin-outs Describes the interface configuration to a host computer.

Appendix C – TransCore 6-Bit ASCII Format Lists TransCore's 6-bit ASCII character codes.

Appendix D – 4-Bit ASCII Hex Codes Lists TransCore's 4-bit hexadecimal formats.

Appendix E – Programmer Response Codes Lists the tag programmer response codes.

Appendix F – Security Characters Lists the 6-bit security character codes.

Typographical Conventions

Table 1-1 lists the conventions used in this manual.

Table 1-1 Typographical Conventions

Convention	Indication
WARNING	This procedure might cause harm to the equipment and/or the user.
CAUTION	Concerns about a procedure
`Code`	Code, including keywords and variables within text and as separate paragraphs, and user-defined program elements within text appear in courier typeface.
Dialog Box Title	Title of a dialog box as it appears on screen
Function	Start with the characters, G4, and are in mixed case with no underscores, and include parentheses after the name, as in G4FunctionName().
Menu Item	Appears on a menu. Capitalization follows the interface.
Note	Auxiliary information that further clarifies the current discussion. These important points require the user's attention. The paragraph is in italics and the word Note is boldface.

Table 1-1 Typographical Conventions (continued)

Convention	Indication
NUL	Zero-value ASCII character or a zero-value byte
NULL	Zero-value pointers. Null-terminated string refers to strings of printable ASCII characters with a zero-value byte placed in memory directly after the last printable character of the string.

2

Setting up the Programmer

Chapter 2

Setting up the Programmer

This chapter provides instructions for setting up the tag programmer, preventing electrostatic discharge (ESD) damage to tags, and connecting to a host computer.

Required Supplies to Operate the Tag Programmer

The programmer is shipped with the items listed below. When unpacking your order, make sure all of the following items are included.

- AP4118 Tag Programmer
- Tag Programming software compact disk (CD)
- *AP4118 Tag Programming Software User Guide*
- Power transformer and cable to convert AC voltage to 12V DC
- Static-suppression wrist strap
- Programmer-to-PC RS–232 connecting cable

If any of the above items are missing from your order, contact your TransCore distributor.

Either a host system—such as a personal computer (PC)—or a communications terminal is required to operate the programmer. TransCore does not supply this equipment for the AP4118 Tag Programmer.

Preventing Electrostatic Discharge Damage

CAUTION

Caution

TransCore tags are sensitive to ESD, and precautions are necessary to ensure proper tag programming operation. Use the grounded ESD static-suppression wrist strap whenever using the programmer. Additional protection from ESD is recommended where practicable.

Static is generated by friction. Some causes of static include the following:

- Shoes moving across a carpeted or plastic floor
- Hot air blowing into a room from a hot-air duct
- Rubbing tags together

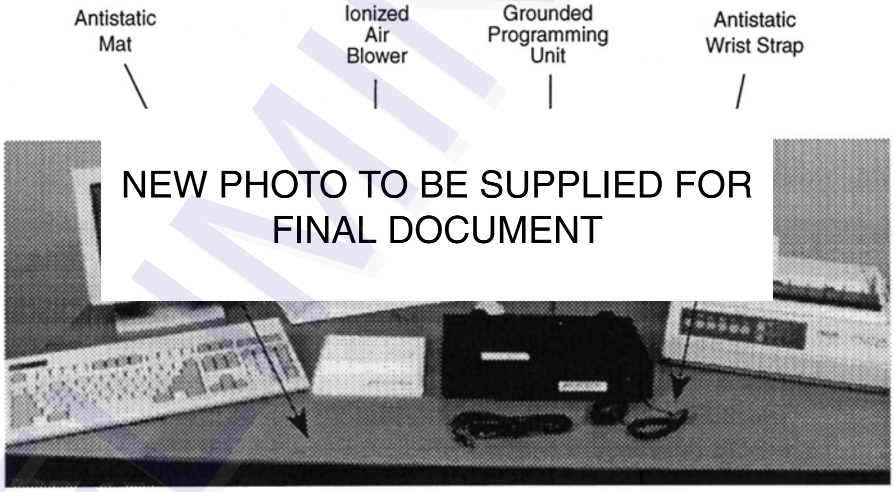
- Rubbing tags across a table top
- Wearing certain types of clothing

Electrostatic discharge may cause significant damage to the tag and will adversely affect a tag's operating performance. Typical symptoms of ESD include the following:

- Inability to program the tag
- Greatly reduced operating range
- Tag operating failure

Antistatic Workstation

In a factory or fixed indoor environment, position the programmer in an antistatic workstation. Well-designed workstations use a system of multiple precautions against ESD. Figure 2-1 shows an antistatic workstation.



NEW PHOTO TO BE SUPPLIED FOR FINAL DOCUMENT

Figure 2-1 Programming Workstation with ESD Controls

Contact the TransCore Action Center at (800) 755-0378 if you have any questions concerning the suitability of your programming station or environment.

You can take several precautions to prevent ESD from affecting programming operations. The most effective precautions are listed below. The potential for ESD damage decreases when two or more precautions are used together.

Using the ESD Wrist Strap

Caution
You should always attach the ESD wrist strap before beginning programming operations in any setting.

1. Be sure the programmer is connected to an earth ground.

2. Connect the banana plug of the ESD wrist strap to the ESD jack on the front of the unit.
3. Attach the ESD strap to your wrist by adjusting the hook and loop material.

Antistatic Mat

The antistatic work mat on which your programmer sits should be connected to earth ground through the standard 1 M-ohm resistance that should be provided with the mat. The mat should also be clean and free of any electrical path to direct earth ground.

Ionized Air Blower

You may choose to set up an ionized air blower at your workstation to provide additional ESD protection. Ionized air blowers neutralize tags from static build-up before programming.

ESD-Safe Tags Container

Keep tags in the original box on an antistatic mat or within an ESD-safe container until they are programmed. Grounded metallic containers are best for inhibiting ESD.

Connecting the Host Device

The programmer requires connection to a host device—a host computer or communications terminal—for normal operation. Figure 2-2 shows the connector from the programmer to the host.

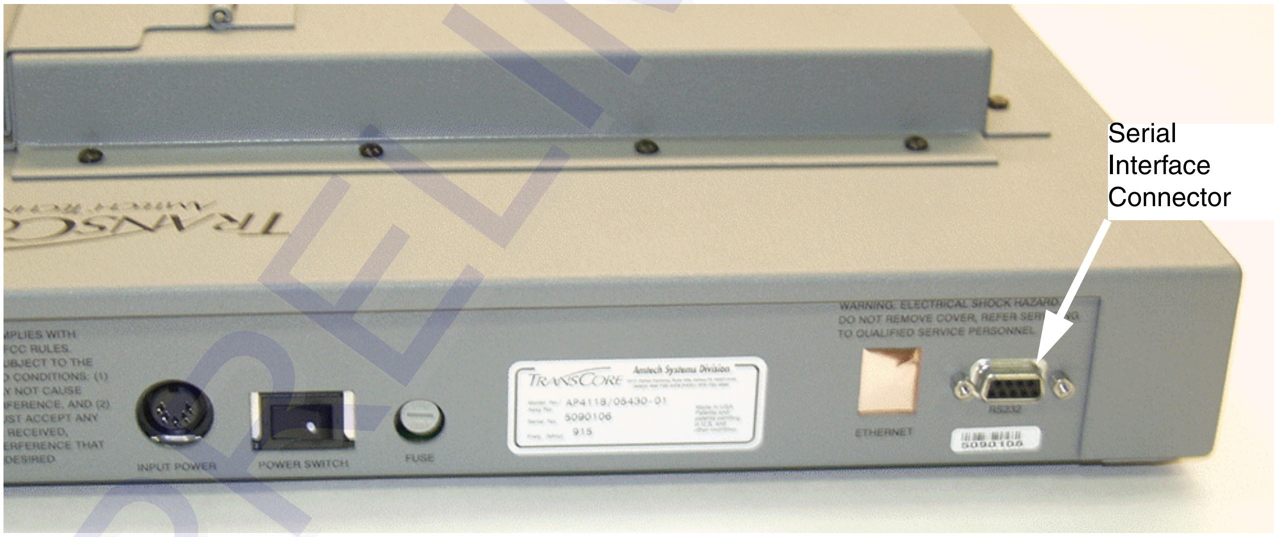

Serial Interface Connector
WARNING, ELECTRICAL SHOCK HAZARD
DO NOT REMOVE COVER, REFER SERVICING
TO QUALIFIED SERVICE PERSONNEL
INPUT POWER
POWER SWITCH
FUSE
ETHERNET
RS232
TRANSCORE

Figure 2-2 Serial Interface Connector

If the host system is a PC or a communications terminal, then a null modem will not be required.

The tag programmer’s PC interface complies with the RS–232 standard for data communications equipment and uses the protocol settings listed in Table 2-1. Refer to Appendix B for specifications of the programmer’s RS–232 pinouts.

Table 2-1 PC Interface Protocol Settings

Protocol	Setting
Data Rate	9600 bps
Data Bits	8
Parity	None
Stop Bits	1
Software Flow Control	None
Hardware Flow Control	None

To connect the programmer to the host computer

1. Connect the RS–232 cable from the unit to the host computer system.
2. Switch on power to the programmer. You should hear three beeps.

   If you do not hear the programmer beep or if the host system cannot communicate with the programmer, refer to Chapter 4, “Troubleshooting.”

3

Operating the Programmer

Chapter 3

Operating the Programmer

This chapter describes how to program a tag and how to verify or read back the data. This chapter also lists the RS–232 command set and describes the security character operation.

Before You Program Tags

Before programming, the programmer system must be set up as specified in Chapter 2, “Setting Up the Programmer.” The programmer must be connected either to a host system running Tag Programming (TP) software or to a communications terminal. You will need to manually enter the RS–232 control commands if you are using a communications terminal.

To load and use the TP software for programming tags, refer to the *AP4118 Tag Programming Software User Guide* provided with the programmer.

To operate the programmer using a communications terminal or a personal computer that does not use TP software, follow the steps in the Tag Programming Sequence and/or Tag Verification Sequence sections of this chapter, as appropriate to your task. Use the programmer commands listed in the RS–232 Command Set in this chapter.

The programmer is powered by 110 V AC/12 V DC 50/60 Hz. Refer to Chapter 2, “Setting Up the Programmer,” or to Appendix A, Programmer Specifications, for additional information.

Indicator Lights

Figure 3-1 shows the indicator lights used by the programmer during operation

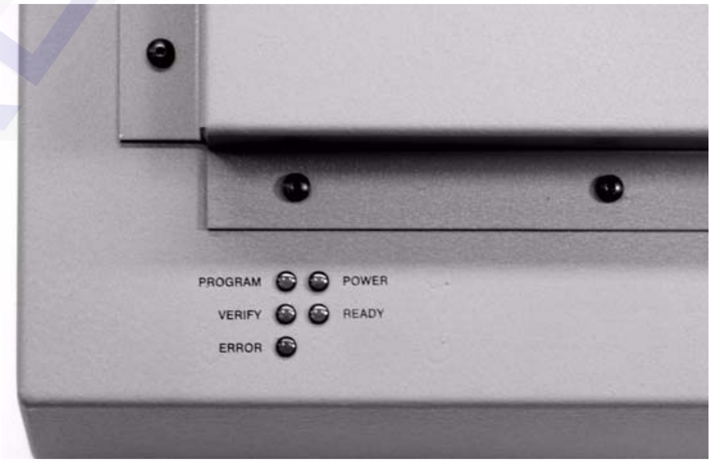


Figure 3-1 AP4118 Programmer Indicator Lights

PROGRAM	The tag is being programmed.
VERIFY	The programmer has read and verified the tag identification (ID) code.
ERROR	An error has occurred while programming the current tag.
POWER	The programmer is receiving power.
READY	The programmer is ready to program tags.

Sign-On

You should expect to see the following sign-on message on the screen of the host system or a communications terminal upon power-up or after you send the programmer command #30:

```
#Model AP4118 Ver X.XX
#Copyright 2005 TransCore
```

where X.XX is the current software version.

Command Execution Protocol

The programmer sends an appropriate acknowledgment to the host device upon the successful or unsuccessful execution of any command received.

All programmer commands are in the following format:

```
#abcxxxxxx...xxxxxx<cr>
```

where

#	start of command character. All commands must start with this character.
abc	the command
xxx...	user data
<cr>	carriage return

If command execution is successful, the programmer sends the response

```
#Done<cr>
```

If command execution is unsuccessful, the programmer sends the response

```
#Error<cr>
```

RS–232 Command Set

Programmer commands are listed below. Use these commands following the format described in the Command Execution Protocol section above.

Enable Tone Generator (#120<cr>)

The default state of the audible tone generator is tone enabled. The tone generator creates audible responses described as beep, triple beep, and solid tone. This command re-enables the programmer's audible response capability after it has been disabled by the #121 command.

Response:

```
#Done<cr>
```

Disable Tone Generator (#121<cr>)

This command disables the programmer's audible response capability. The default state of the audible tone generator is tone enabled.

Response:

```
#Done<cr>
```

Program Tag Using TransCore 6-Bit ASCII Format (#200xxx...<cr>)

The programmer programs the user's data (xxx...) into the tag using the TransCore 6-bit ASCII format. This format requires 20 characters of data. Refer to Appendix C for a description of this format.

During execution of this command, a series of beeps indicates that the programmer is waiting for a tag to be placed in the holder. If you do not place the tag in the holder and close the door within a 10-second limit, the programmer will abort this command.

Response:

```
#xxxxxxxxxxxxxxxxxxxx<cr>
#Done<cr>
```

or

```
#Error<cr>
```

Program Tag Using 4-Bit ASCII Hex Format (#201xxx...<cr>)

The programmer programs the user's data (xxx...) into the tag using the 4-bit ASCII hexadecimal (hex) format. This format requires 30 characters of data. Refer to Appendix D for a description of this ASCII hex format.

During execution of this command, a series of beeps indicates that the programmer is waiting for a tag to be placed in the holder. If you do not place the tag in the holder and close the door within a 10-second limit, the programmer will abort this command.

Response:

```
#xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx<cr>
#Done<cr>
```

or

```
#Error<cr>
```

Read/Verify Tag Data Using TransCore 6-Bit ASCII Format (#210<cr>)

The programmer reads the data from the tag, puts it into the TransCore 6-bit ASCII format, and sends it to the host device. Refer to Appendix C for a description of this 6-bit ASCII format.

During execution of this command, a series of beeps indicates that the programmer is waiting for a tag to be placed in the holder. If you do not place the tag in the holder and close the door within a 10-second limit, the programmer will abort this command.

Response:

```
#xxxxxxxxxxxxxxxxxxxx<cr>
#Done<cr>
```

or

```
#Error<cr>
```

Read/Verify Tag Data Using 4-Bit ASCII Hex Format (#211<cr>)

The programmer reads the data from the tag, puts it into the 4-bit ASCII hex format, and sends it to the host device. Refer to Appendix D for this ASCII hex format.

During execution of this command, a series of beeps indicates that the programmer is waiting for a tag to be placed in the holder. If you do not place the tag in the holder and close the door within a 10-second limit, the programmer will abort this command.

Response:

```
#xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx<cr>
#Done<cr>
```

or

```
#Error<cr>
```

Write/Verify A Page Of Data Using Hex Format (#220yyxxxx…<cr>)

The programmer programs the user hex data (xxxxxxxxxxxxxxxx), 16 hex characters, starting at hex address yy. The starting address (yy) must be on an 8 byte page boundary. For example, the starting address will be 00, 08, 10, 18 …F0, F8.

If the tag is not already in the tag holder, a series of beeps indicates that the programmer is waiting for a tag to be placed in the holder. If you do not place the tag in the holder, and close the door within a 10-second limit, the programmer will abort this command.

The programmer will not program the data if the programmer does not have permission to write to the memory area of the tag that is requested by the user. Each programmer will be assigned permissions at the factory, or will use a permissions tag that must be placed in to the programmer at pre-specified intervals.

Response:

```
#xxxxxxxxxxxxxxxx<cr>

#Done<cr>
```

or

```
#Error<cr>
```

Write/Verify A Byte Of Data Using Hex Format (#221yyxx<cr>)

The programmer programs the user hex data (xx), 2 hex characters, at hex address yy.

If the tag is not already in the tag holder, a series of beeps indicates that the programmer is waiting for a tag to be placed in the holder. If you do not place the tag in the holder, and close the door within a 10-second limit, the programmer will abort this command.

The programmer will not program the data if the programmer does not have permission to write to the memory area of the tag that is requested by the user. Each programmer will be assigned permissions at the factory, or through the use of a permissions tag that must be inserted into the programmer at pre-specified intervals.

Response:

```
#xx<cr>

#Done<cr>
```

or

```
#Error<cr>
```

Read A Page Of Data Using Hex Format (#230yy<cr>)

The programmer reads hex data (xxxxxxxxxxxxxxxx), 16 hex characters, starting at hex address yy. The starting address (yy) must be on an 8 byte page boundary. For example, the starting address will be 00, 08, 10, 18 …

If the tag is not already in the tag holder, a series of beeps indicates that the programmer is waiting for a tag to be placed in the holder. If you do not place the tag in the holder, and close the door within a 10-second limit, the programmer will abort this command.

The programmer will not read the data if the programmer does not have permission to read the memory area of the tag that is requested by the user. Each programmer will be assigned permissions at the factory, or through the use of a permissions tag that must be placed in to the programmer at pre-specified intervals.

Response:

```
#xxxxxxxxxxxxxxxx<cr>
#Done<cr>
```

or

```
#Error<cr>
```

Read A Byte Of Data Using Hex Format (#231yy<cr>)

The programmer reads a byte of hex data (xx), 2 hex characters, from hex address yy. If the tag is not already in the tag holder, a series of beeps indicates that the programmer is waiting for a tag to be placed in the holder. If you do not place the tag in the holder, and close the door within a 10-second limit, the programmer will abort this command.

The programmer will not read the data if the programmer does not have permission to read the memory area of the tag that is requested by the user. Each programmer will be assigned permissions at the factory, or through the use of a permissions tag that must be placed in to the programmer at pre-specified intervals.

Response:

```
#xx<cr>
#Done<cr>
```

or

```
#Error<cr>
```

System Reset (#30<cr>)

The command resets the programmer to its original power-on state with the self-test.

Response (system sign-on message):

#Model AP4118 Ver X.XX
#Copyright 2005 TransCore

where X.XX is the current software version

or

```
#Error<cr>
```

Display System Status (#40<cr>)

This command requests a 2-digit status response code from the programmer indicating the status of the last operation performed. Refer to Appendix E for a description of the programmer response codes that refer to system status.

Response:

```
#xx<cr>
```

where XX is the 2-digit response code. The code 00 indicates that the programmer performed the last operation without error.

Display Tag Door Switch Status (#42<cr>)

This command requests a 2-digit status response from the programmer indicating the status of its tag door switch.

Response:

```
#01<cr>door closed

#00<cr>door open
```

Programming a Tag

To program a tag

1. Send the programmer the appropriate #200<cr> or #201<cr> command along with the user data you want to program onto the tag. Use command #200 if you are using the TransCore 6-bit format for your data; use command #201 for the 4-bit hex data format.

2. When the programmer begins its 10-second timer, indicated by an audible beep once every second, slide the tag you want to program into the tag holder and close the door (Figure 3-2).

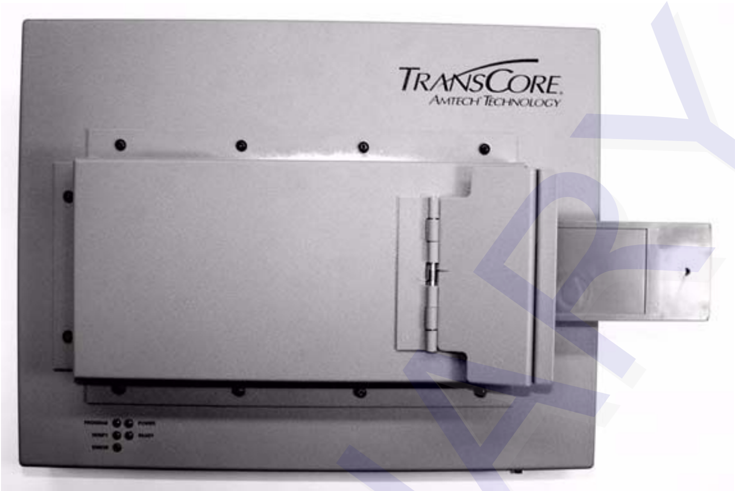


Figure 3-2 Tag in Tag Holder

If the tag is placed within the 10-second period, the programmer programs the user data, verifies the user data, and sends a response to the host system. If the tag is not placed within the 10-second period, the programmer aborts the command, sends the #Error<cr> response to the host, and emits a continuous audible tone.

When the tag is successfully programmed, the programmer responds with a triple beep and with the following response:

```
xxx...<cr>
#Done<cr>
```

where XXX... is the tag data read from the tag and encoded in the specified format.

If the tag programming process fails, the programmer responds with a continuous audible tone and with #Error<cr>.

If you receive this response, repeat this sequence beginning at step 1.

Verifying Tag Data

To verify the data on a tag

1. Send the programmer the appropriate #210<cr> or #211<cr> command. Use command #210 if you are using the TransCore 6-bit format for your data; use command #211 for the 4-bit hex data format.

2. When the programmer begins its 10-second timer indicated by an audible beep once every second, slide the proper tag into the tag holder and close the door.

   If you place the tag within the 10-second period, the programmer reads the tag data, checks for data integrity, and sends the tag data and a #Done response to the host system. If you do not place the tag down within the 10-second period, the programmer aborts the command and sends the #Error<cr> response to the host.

If the verification process is not successful, repeat this sequence beginning at step 1.

Security Characters

The tag security character function prevents the use of unauthorized tags in any TransCore electronic identification system. All AP4118 tag programmers have the capability, when enabled, to program specific, predefined security characters into a tag. This capability is enabled at the factory if it is specified in an authorized order. Security characters are available for American Trucking Associations (ATA) and International Standards Organization (ISO) tag data formats.

Note: *The security character function may only be used when you program your tag data in the 4-bit hex format using command #201. The security character function may NOT be used if you program your tag data with the 6-bit ASCII format using command #200, even though the security characters are 6-bit characters.*

When enabled, the security character function stores two characters, specific 6-bit patterns designated for security coding purposes, in the programmer's nonvolatile memory. These characters, selected at the factory for each programmer, may be two specific characters from the list of security characters in Appendix F or one character each from Appendix F and Appendix C.

When a tag programmer has tag security enabled, all tags programmed contain the assigned security characters in the designated positions of the tag data. Security characters comprise the second half of the 26th character through the first half of the 29th character when data is in the 4-bit hex format.

The programmer places security characters into their associated tag data locations when security characters in the tag data entered with command #201 match the internal security characters stored in the programmer by factory personnel.

The programmer will not store onto a tag security codes that differ from those stored in the programmer’s internal memory. If you attempt to program the tag with security characters that do not match the internal security characters of the programmer (i.e., incorrect or improperly obtained codes), the programmer automatically programs the space character into both security character locations.

When you input security characters while using TransCore’s Tag Programming software, those security characters will not be visible on the monitor.

4

Troubleshooting

Chapter 4

Troubleshooting

Table 4-1 lists some problems that you may encounter when programming tags, along with suggestions for troubleshooting each problem.

If a problem persists, call the TransCore Action Center at (800) 755-0378.

Table 4-1 Troubleshooting Problems and Solutions

Problem	Suggested Solutions
System does not beep at power-on.	• Check power transformer. • Replace the internal 5 A, 250V Fast Blo fuse
System powers on, but does not sign on.	• Verify RS–232 connection at the programmer and at the host. • Verify that host baud rate is set to 9600.
Programmer beeper is not heard during tag programming/verify sequence, or system continually beeps until time-out.	• Verify that the door is fully closed. • Verify that the optical switch that is activated by the tag door is clean and is clear of any dirt buildup.
Tag programming sequence fails repeatedly.	• Refer to the programmer response codes list in Appendix E to identify the problem. • Improve ESD protection in programming area.
Requested *verify* data does not match programmed data.	• Check for security code violations. • Check programmed data for accuracy.
System resets intermittently.	• Check for damage to DC power connection. • Check for a loose AC power connection.

A

Tag Programmer Specifications

Appendix A

Tag Programmer Specifications

This appendix lists the AP4118 Tag Programmer physical and environmental specifications.

Table A-1 lists the AP4118 Tag Programmer parameters and specifications.

Table A-1 AP4118 Tag Programmer Physical and Environmental Specifications

Parameter	Specification
Size (W x H x D)	14.3 x 3.2 x 11.5 in (36.3 x 8.1 x 29.2 cm)
Weight	6.8 lb (3.1 kg)
Input Voltage	12V DC
Power Consumption	12 W
Excessive Current Protection	5 A, 250V Fast Blo fuse
Operating Temperature	32°F to +122°F (0°C to +50°C)
Storage Temperature	-4°F to +185°F (-20°C to +85°C)
Humidity	95% noncondensing @77°F to 131°F (25°C to 55°C)
Enclosure	Dustproof
Operational Vibration	1.04 G_{rms}, 5-500 Hz, power spectral density-uniform 0.0022 G^2/Hz, 1 hour per axis
Shock	N/A
PC-to-Programmer Cable	RS–232 (data terminal equipment or with adapters)
RF Power	Tag holder: 50 mW
FCC Classification	Part 15, site license not required

Environmental

The programmer is designed to operate in typical office environment conditions. The programmer performs to the specifications listed in Table A-1 and is ready to program with a warm-up time of not more than three minutes.

B

RS–232 Connector Pin-outs

Appendix B

RS–232 Connector Pin-outs

Table B-1 identifies the pin-outs of the programmer's DB-9 rear panel RS–232 connector.

Table B-1 RS–232 Connector Pin-outs

Pin	Function
1	No connection
2	Transmit
3	Receive
4	No connection
5	Signal ground
6	No connection
7	RTS
8	CTS
9	No connection

C

TransCore 6-Bit ASCII Format

Appendix C

TransCore 6-Bit ASCII Format

In TransCore's 6-bit ASCII format, each ASCII data character is represented by a certain 6-bit pattern. These bit patterns are placed in specific groups of six consecutive bits within the tag. The ASCII characters and their corresponding 6-bit codes are listed in Table C-1. TransCore's 6-bit ASCII codes are produced by subtracting 00100000 from the character's 8-bit ASCII value.

Table C-1 6-Bit ASCII Codes

Character	6-Bit Code	Character	6-Bit Code
(space)	000000	G	100111
*	001010	H	101000
-	001101	I	101001
.	001110	J	101010
/	001111	K	101011
0	010000	L	101100
1	010001	M	101101
2	010010	N	101110
3	010011	O	101111
4	010100	P	110000
5	010101	Q	110001
6	010110	R	110010
7	010111	S	110011
8	011000	T	110100
9	011001	U	110101
A	100001	V	110110
B	100010	W	110111
C	100011	X	111000
D	100100	Y	111001
E	100101	Z	111010
F	100110		

D

4-Bit ASCII Hex Codes

Appendix D

4-Bit ASCII Hex Codes

In TransCore's 4-bit hex format, each ASCII character is represented by a certain 4-bit pattern. These bit patterns are placed in specific groups of four consecutive bits within the tag. The ASCII characters and their corresponding 4-bit hex codes are listed in Table D-1.

Table D-1 4-Bit ASCII Hex Codes

Character	4-bit Code
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

E

Programmer Response Codes

Appendix E

Programmer Response Codes

The programmer returns one of these codes in response to command #40, Display System Status. Table E-1 lists the response codes.

Table E-1 Programmer Response Codes

Code	Description
00	Operation Successful/No Error: The last operation performed by the programmer was executed without errors.
01	Illegal Command: The command sent to the programmer was not a valid command.
02	Invalid Tag Data: The user data sent to the programmer was in the incorrect format (such as an illegal hex character).
03	Presence Time-out on Program Cycle: The programmer did not recognize the placement of a tag on the programming head during the 10-sec period prior to a programming sequence.
04	Presence Time-out on Verify Cycle: The programmer did not recognize the placement of a tag on the programming head during the 10-sec period prior to a verification sequence.
05, 06, 07	Reserved
08	Data Compare Error: During a programming sequence, the data read from the tag did not correspond to the user data that was written to the tag.
09	Locked Tag: The programmer has detected a lock condition of the tag. The tag data is stored permanently and cannot be changed.
0A	No Frame Marker: The programmer could not decipher a frame marker from the tag. Either the tag is not present, is damaged, or is not making contact with the programming head pins.
0B	Bad Tag Parity: The checksum bits read from the tag did not correspond to the checksum that the programmer calculated from the tag data.
0C	Security Code Operation: The AP4118 has detected an attempt to write illegal security characters to the security character positions of the tag's ATA frame data. The AP4118 has then coded the SPACE character in the positions therefore altering the user's original tag data.
0D	Invalid Permissions: This programmer does not have permission to write data to the tag address that the user requested.

F

Security Characters

Appendix F

Security Characters

You may enter security characters into an Amtech tag if your programmer has been configured at the factory to perform the security character function. These ASCII security characters are encoded in the Amtech 6-bit data encoding scheme, and are listed in Table F-1.

Table F-1 ASCII Security Characters

Character	6-bit Code
!	000001
"	000010
#	000011
$	000100
%	000101
&	000110
'	000111
(	001000
)	001001
+	001011
,	001100
:	011010
;	011011
<	011100
=	011101
>	011110
?	011111
@	100000
[	111011
\	111100
]	111101
^	111110
_	111111
space	000000