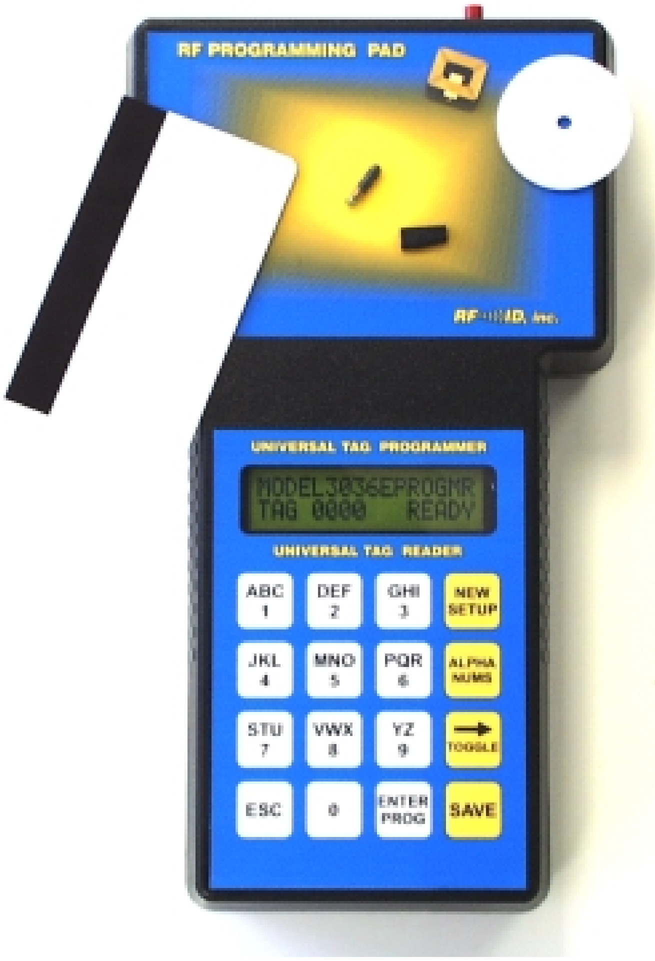
RFID, INC.

MODEL 3036E

HAND HELD READER
HAND HELD PROGRAMMER

OPERATING MANUAL



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ABOUT THE PROGRAMMER

Model#	Part Number
3036E	

This manual describes the Programmer’s intended uses, provides definitions for users new to the technology, educates users as to what makes up a Tag’s programming, and trains users on how to program and read Tags. This Programmer is extremely user friendly, plug and play. Indeed, experienced users could operate the unit without the need of this manual simply by following the commands displayed on the screen.

Inclusive with your order of a Model 3036E Hand Held Reader Writer is the AC power supply and charger. This unit can be operated on its own internal battery or while being powered from an AC outlet.

The Reader Writer is intended to offer users the following benefits:

(a) The ability to source custom programmed Tags immediately
(b) The ability to read and program Tags remotely
(c) The ability to read and program Tags without the need of a software program
(d) The ability to read and program Tags without the need of a PC
(e) Mobility to easily carry the Programmer to a customer site

This Reader Writer compliments all of RFID, Inc.’s Read Station hardware on our 148 KHz R^3 product line.

The Programmer contains an antenna just under the area marked “RF Programming Pad.” This antenna sends out the excitation signal, both electro-magnetically powering the Tag and programming the Tag’s EEPROM memory. The Programmer offers a 2 line by 16 character liquid crystal display. This LCD prompts the user with instructions and feedback. There is an internal battery, able to last 8 hours of continuos programming and an AC power adapter that operates the Programmer as well as charges the battery.

This Programmer comes in Tag memory version of 8, 16, or 32 characters of capacity. This particular version offers 16.

If you are not technically inclined, you may find reading this manual in its entirety will facilitate your full understanding before beginning operation.

Definitions:

RF: Radio Frequency.

RFID: Radio Frequency Identification.

RO: Read Only, the operation by which a Tag can be programmed once at the factory and then its memory can never again be altered.

OTP: One Time Programmable, same as RO.

WORM: Write Once Read Many, same as RO.

RW: Read Write, the ability to change a Tag's code through RF.

Tag Data: The data to be programmed into the Tag's memory.

Characters: Those individual units that make up a Tag's entire data.

Constants: Those characters that never change.

Left Justified: Characters beginning to the right of the 8, 16, or 32 programmed characters.

Right Justified: Characters ending at the left of the 8, 16, or 32 programmed characters.

Alpha: Data consisting of letters.

Nums: Data consisting of numbers, abbreviation for "numerics."

Alpha-Numerics: Data consisting of letters and numbers.

EEPROM: Electrically Erasable Programmable Read Only Memory.

Programming Pad: Flat face at the top of the Programmer, this is where Tags need to be placed in order to be programmed.

ABOUT THE TAGS

Tags are formerly called Transponders, but have also been called labels. Whatever the noun, it is important to understand what is being programmed into its memory.

Our Technological History

Since 1984, all of RFID, Inc.'s Tags were read only. Actually the Tag's EEPROM chip was re-programmable many thousands of times by electrically contacting the PCB, but the Tags were made read only by the fact that they were enclosed in hardened plastic and could not be further contacted. There were several versions of a Tag termed non-contact programmable and touted as read write, which was a fair description when debuted in 1984, but not by today's standards. There were also several versions that were contact re-programmable, that is the Tag's housing left an exposed area whereby it could be contacted via pins from a programmer. But this left many deficiencies, such as mechanical operations susceptible to eventual failure, Tags being rendered not as rugged or watertight as their RO brethren, and a hefty amount of human handling to mention a few.

Today it is commonplace for all RFID technologies to offer RW functioning, programmable through RF, tens of thousands of times. As of September 2000, all of RFID Inc.'s Tags are RW. In a finished packaged, they are supplied with a Lot Number which contains the letters "TMLF." If these letters are not present on your Tag labels then your Tags were probably purchased prior to September 2000 and are not RW. Although, the Model 3036E will read all Tags from the R^3 product line whether they are the older RO, OTP, WORM, or the newer RW Tags.

Tag Data and Programming

It is important to understand that these newer RW Tags carry 256 bits. The Programmer will take the 8, 16, or 32 characters you specify and translate them into bits, filling the full 256 available. When a Tag is read it transmits in bits and it is the Interfaces and Readers, Read Station Hardware, that translate the data bits to output into different formats, like a common serial string. Hence, this is the reason all of RFID, Inc.'s Tags are interchangeable with all of our Read Station systems and output protocols. So, you the user need only concern yourself with what alpha-numeric programming you desire on the Tag. If you want a Tag programmed ABC, you specify ABC and let the Programmer do the conversion to our proprietary bit scheme and program the 256 bits necessary into the Tag's memory.

With the serial Interfaces, data is sent back to a serial port in the following format: <LF>nnnnnnnnnnnnnnnn<CR>, where variable n represents data. If a multiplex system is being used the Tag data is preceded by a hexadecimal character indicating the Read Station address and a space character.

With the parallel Interfaces, data is sent back in a binary format: 0000 0001 0111 1111 represents 17F as the first 4 digits are reserved for Reader addresses, if applicable, under a multiplex scenario.

It is a common misbelief that if you want a Tag programmed 17F that all you need to know is that number. Not so! You need to know how to fill in the remaining characters, because again, ALL of the characters must be specified. The Programmer will prompt you for all of the 16 characters. If you have had your Tags programmed by us in the past, you can call our customer service center and we will assist you by looking up how your complete Tag characters have been filled in the past. You or someone in your company may have filled out programming sheets to be submitted with orders for Tags, and you may be able to look this up in your files. You may want to talk to someone in your company who will know what your software and controls system is looking for when a Tag is to report.

Primarily, you need to know if the 17F is to be right justified, left justified, or some variation thereof. An example of right justified using 16 characters is:

000000000000017F

and an example of left justified using 16 characters is:

17F0000000000000.

There are even users who use only the first 5 characters of a Tag's code, left justified, as their particular Reader cuts off and does not report any character past the 5th position, although the Tag reports and the Reader receives all 16 characters. An example of that programming is:

0017F00000000000.

For users of the Parallel (hex, BCD) Read Station systems, your programming must be right justified and limited to 4 characters in a simplex configuration (one Reader and Read Head without addressing) and 3 characters in a multiplex configuration as the address will be inserted in the left most position. All programming is of course limited to characters 0 thru 9 and A thru F. A Tag programmed 17F in a simplex configuration will report as:

0000 0001 0111 1111.

See pages 10 and 11 of our 12 page literature piece entitled "R^3 Specifications and Data Sheet" for this information and a programming sheet should you need one for internal uses or for your customers to fill out and understand. This Data Sheet can be sourced online from our website, we can email you a copy, or mail you a hard copy. Note, the PDF version of this document may have page numbers that differ slightly. We can also email, provide a text version in Word, if you wish to customize it for presentation to your customers with your own logo, etc.

Electrical and Packaging Specifications

Power Supply:	At the AC side, 120 VAC, 60 Hz, 15W, regulated only At the Programmer, 12 VDC @ 500 mA
Read Distance:	Very minimal, up to 6” with our largest Tag.
Write Distance:	Very minimal and Tag dependent, less than 2 inches. This was necessary so that all Tags could be programmed with the same coil.
Temperature Range:	-40 to +55 C operating -55 to +85 C non-operating
Dimensions:	9 5/16” x (5 1/8” at the head) (3 11/16” at the base) 1 5/8” deep
	23.7 cm x (13 cm at the head) (9.4 cm at the base) 4.2 cm deep
Weight:	1.3 lbs. .60 kgs.
Battery:	Recharges automatically through AC adapter when connected. 7.2 volts 1100 mAh

OPERATING THE PROGRAMMER

Modes

There are basically 3 modes, or steps to operate the Programmer:

1. Set your programming options
   a. Set constant characters option to Yes or No
   b. Set Tag data justification option to Left or Right
   c. Enter the constant characters
   d. Set auto increment option to Yes or No
   e. Set hexadecimal or decimal option
2. Enter Tag data and program
3. Read Tags

At the top of the Programmer you will find a red power button and a connection hole for the AC power supply. Although there is no indication as to what is considered "ON" or "OFF", when powered "ON", the switch will be extended in a position further out than when it is switched "OFF". Also, in the "ON" position the LCD will display some form of prompt whereas in the "OFF" position the LCD will simply be blank.

Before going forward, let's review the keys on the keypad.

NEW SETUP – this key is like rebooting. It takes you back to step 1, but only from step 2 above, during Tag programming. Pushing this key will erase any programming options already selected.

ALPHA NUMS – this key will soon be replaced with the designation READ TAG. You will be sent a new label as soon as they become available to place over this key. Pressing this key will allow the reading of a Tag within proximity of the Programming Pad.

However, there are limited times at which this key can be used. You can read Tags when you initially turn on the Programmer and select the Read mode, or you can read Tags once you have entered into step 2 above, during Tag programming.

The screen will display the Tag data on the second line, preceded by TAG DATA READ: on the first line. In order to exit this screen you must press the escape key and you will be returned to the programming function you had been performing, or to the first menu option, depending on how you entered the Read mode.

TOGGLE – this key moves the cursor from data character to data character, or allows you to toggle between menu options to answer a prompt. Simply selecting a number or letter does not move the cursor. The cursor will remain over the current character until you press the toggle key, which only allows the cursor to move once to the right. Once you reach the end of the 16 data characters, the cursor will return to the first character.

SAVE – this key is used primarily as the Enter or Return key is used on a normal keyboard. Once you have selected an option, pressing this key will SAVE that option into memory and move you to the next step.

ESC – this key will take you back one menu option at a time during Step 1 (setting programming options) or back you out of the Read mode.

DATA KEYS – These keys are used of course to enter numbers and letters or symbols, see page 10 for a list of symbols. Pressing the 1 key continually will cycle you through 1, A, B, C, and – (dash).

Powering Up
Upon powering up the Model 3036E Reader Writer the following messages should be displayed, indicating a successful self-test has been conducted and the Programmer is ready for use:

RFID, Inc. V1.00
READER WRITER

(for 3 seconds, followed by a prompt)

MODE?
[PROGRAM]

Here you can toggle between the option to program or read Tags. Press Save to enter a mode. If you have entered the Read mode, have read some Tags and wish to return to the Mode Menu option, simply press escape, toggle to [PROGRAM] and begin selecting your programming options. Likewise, if you are in the Program Mode Menus you can use the escape key to back up through each level until you reach the Mode Menu.

If you decide to program Tags and choose this [PROGRAM] from the Mode Menu the next prompt will be:

CONSTANTS? [NO]

We are now beginning the process of selecting our programming options. Constants are fixed data characters. Some users require portions of their data characters to remain the same, and others to increment. For example, a customer may require 100 Tags be programmed "ACME-ENGINE00001 through ACME-ENGINE00100. The Constant function allows a user to specify the first 11 characters remain the same, on either a Left or Right Justified basis (this option selected later), such that only the final 5, or even 3 in this example, need to be input. This option is particularly helpful if Tags are not sequentially numbered and the Auto Increment function cannot be used.

Answering [NO] will take you directly to the Auto Increment prompt and will bypass the Tag Data Justified option.

Answering [YES] and pressing Save will produce the prompt:

HOW MANY
CONSTANTS? 00

From here you can set the number of characters to remain constant and for the above example you would toggle to 11, and press Save producing the prompt:

JUSTIFY TAG
DATA [RIGHT]

Here we are going to instruct the Programmer which side we intend our data to be on AND which side we intend our constant characters to be on. In the above example, the data is justified right, whereas the constants would be on the left, so we would answer [RIGHT] and Save. But if we wanted Tags programmed 00001ACME-ENGINE through 00100ACME-ENGINE we would set Tag justification to the left. With either choice our next prompt is:

ENTER CONSTANTS:
0000000000000000

At this point, for the above example, the user would enter ACME-ENGINE, in the 11 character positions predefined above, then press the SAVE key. The next prompt displayed is:

AUTO INCREMENT
[NO]

Auto Increment is a function that allows users to let the Programmer select the next number in a sequence of Tags to be programmed.

ADVANCED FEATURE HINT 1

Auto Incrementing on a particular data character

There is another very important function this option serves. It can be used to freeze certain characters such that in the Auto Increment mode, a certain character increments. For example, let's say a user requires Tags to increment on the 5th position from the left. The constants option can be set to [YES], 11 toggled to and SAVED at the HOW MANY CONSTANTS? prompt, [LEFT] toggled to and SAVED at the JUSTIFIED? prompt, and then simply choose no particular Constants (leaving them all zeros) by saving through the next screen. Answer [YES] to Auto Increment, answer [DEC] at the next prompt.

We have just frozen the 11 characters to the right so that our Tags will begin to increment at the 12th position from the right, or the 5th position from the left.

END ADVANCED FEATURE HINT 1

Still in the Auto Increment option, toggling NO and pressing SAVE takes you directly to the next prompt, step 2 below. Toggling YES and pressing SAVE brings:

HEXADECIMAL OR
DECIMAL: [DEC]

Most users will use Decimal. If you are unsure, select Decimal. If you are a Hex user, you will know it. Decimal offers most of the normal characters available on an ASCII keyboard. See the Symbol section on page 10 for a list of ASCII symbols available with this Programmer. Unless you want an education in Hexadecimal, skip this paragraph. Hexadecimal offers only the characters of 0-9 and A-F. Hexadecimal is most often used with our Model 2024E Parallel Interface.

Upon making your selection of Decimal or Hexadecimal, press SAVE, and the next prompt displayed is **STEP 2:**

ENTER TAG DATA
0000000000000000

We are now entering the 2nd mode of operation, setting the Tag data and programming.

This is where you will input the Tag data you wish to be programmed into the Tag. If you do not input any data, pressing the ENTER PROG key will immediately program the Tag to zeros. But nothing has been damaged, simply set the data you require and reprogram the Tag again. You can choose which data character to position the cursor over by using the TOGGLE key, and using the white keys to select number or letters.

Upon defining your first Tag, you must select SAVE for the final time. This will Save all of the programming options you have chosen and the Tag Data you wish to begin with. DO NOT FORGET TO SAVE THESE OPTIONS before proceeding to program your first Tag.

Upon successful programming of a Tag, the screen will flash this indication for 1 second. If you have set the Auto Increment option to [YES], the next Tag data to be programmed will present itself on the screen, ready for you to press the ENTER PROG key.

ADVANCED FEATURE HINT 2
Incrementing Tags from a number other than zero.
Let's say you require Tags with data 8500 through 9000. As long as you have selected Yes to the Auto Increment menu option, you can, at any time during Step 2, enter the Tag data as:

0000000000008500, press ENTER PROG, and upon successful programming the next Tag data to be programmed will automatically appear as 0000000000008501, ready for programming.
END ADVANCED FEATURE HINT 2

ADVANCED FEATURE HINT 1 & 2 combined
Incrementing Tags from a number other than zero, other than right justified
Let's combine the 2 hints to previously discussed to program Tags numbered 8500 through 9000 at different digits positions, such as:

0000008500000000, 0000008501000000, 0000008502000000……, 0000009000000000.

From the constants menu option you would need to Save Yes, set the constants to 6, set the Tag justification to Left, Save all zeros at the Enter Constants prompt by simply pressing Save, select Yes at the Auto Increment menu option, select DEC at the Hexadecimal or Decimal menu option, at the Enter Tag Data screen (step 2) toggle over to the 7th character from the left and enter 8, and then toggle to the 8th character and enter 5, then press SAVE. You have just saved all of the programming options set above.

What you have done is frozen the 6th characters farthest to the right as highlighted, 0000008500000000, such that the auto incrementing begins at the 7th character from the right.

Now press ENTER PROG. Your first Tag will program, SUCCESSFUL!!! will flash on the screen, and the next number 0000008501000000 will appear, ready for programming.
END ADVANCED FEATURE HINT 1 & 2 combined

ADVANCED FEATURE HINT 3

Programming a Tag not defined in your Saved options

So you're in the middle of programming the Tags defined above and a very savvy intelligent co-worker walks in the room needing a Tag programmed to "RFIDINC-RULES!!!". At the ENTER TAG DATA prompt, right in the middle of whatever sequence of Tags you are programming, simply enter/toggle the new data, and press ENTER PROG. This single Tag will be programmed, and your saved options will re-appear as well as the next Tag in the increment cycle.

END ADVANCED FEATURE HINT 3

Symbols

If you require symbols to be used instead of letters or numbers, the following are symbols are found under the corresponding keys listed:

Key	Symbol
1	-
2	!
3	#
4	$
5	%
6	&
7	*
8	+
9	=
0	?

Error Messages

During programming, there are 2 error messages, *NO TAG PRESENT* and DEFECTIVE TAG! which will flash on the screen for 1 second, both resulting from one of the following:

(a) no Tag has been placed on the Programming Pad.

(b) there is a Tag but it is in the wrong position/orientation.

(c) if there is a Tag on the Pad it is not being recognized and is therefore faulty.

The Programming Pad - where and how to orient Tags

Since this Programmer must be able to program a wide variety of Tags, its programming range is limited to several inches and variance of Tag positioning differs from Tag to Tag. For most Tags, centrally locating the Tag and laying it flat on the Pad enhances a Tag's opportunity to be programmed successfully. However, and especially with smaller Tags and metal mount Tags, the upper left and lower left corners are especially effective. You will find larger Tags to program successfully when placed just about anywhere on the Programming Pad as well as up to about 4 inches away.

You do not necessarily need to place the Tags on the Programming Pad. With a little experimentation, you will find at what orientations/angles you can hold the Programmer at in relation to the Tag to program the Tag while it is mounted in your application.

Reading Tags with the Programmer

With many varying Tag sizes and types, orientations and read ranges will differ but only slightly as reading Tags is a much simpler operation than programming them. Most Tags can be read when presented to the Programming Pad, to the backside of the Programming Pad (the rear of the unit), or when presented to the left side of the Programmer while pressing the ALPHA NUMS (to be replaced later with a READ TAG key). This key will only work however if you have entered the Read mode, the very first prompt when turning the unit on, or at any time during Step 2. You can continually read Tags by re-pressing the ALPHA-NUMS key, and exit this mode by pressing the escape key.

When a successful read has been achieved, the Programmer will beep and the Tag data will be displayed as TAG DATA READ:. If no Tag is present the display will indicate so and no audible beep will be emitted. You must press ESC to exit this screen and return to the previous screen.

Actually, of course, the antenna located under the Programming Pad is not directionalized to operate just toward the direction of the Pad. It could be made to do so by placing a piece of metal behind it in the base of the housing, but it is preferable Tags be programmed and read not just at the Programming Pad, but out the back and sides as well given the many varied applications and Tag installation methods. So the antenna is omni-directional.

Warranty

RFID, inc. products are warranted against defects in materials and workmanship for one (1) year from date of shipment. RFID, inc. shall, at its option, either repair or replace products that prove to be defective and are returned with freight prepaid to RFID, inc.'s plant within the warranty period. The foregoing warranty shall not apply to defects resulting from abuse, misuse, accident, alteration, neglect or unauthorized repair or installation. RFID, inc. shall have the right of final determination as to the existence and cause of the defect.

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