Module Overview

Utilizing licensed GE Fanuc Series 90-30 I/O interface technology, the 7351 module plugs directly into GE Fanuc 90-30 or PACsystem RX3I racks and accepts signals from one digital LDT transducer that outputs Start / Stop or PWM signals. Communicating through I/O registers assigned to the slot, these modules supply absolute position and tachometer data to any 90-30 CPU.

This manual explains the installation and operation of the following module.

Module	Number of Channels	Maximum Resolution
7351	1	0.001 inch or 0.1 mm

Table of Contents

General Information

Important User Information
The products and application data described in this manual are useful in a wide variety of different applications. Therefore, the user and others responsible for applying these products described herein are responsible for determining the acceptability for each application. While efforts have been made to provide accurate information within this manual, AMCI assumes no responsibility for the application or the completeness of the information contained herein. Throughout this manual the following two notices are used to highlight important points.

WARNINGS tell you when people may be hurt or equipment may be damaged if the procedure is not followed properly.

CAUTIONS tell you when equipment may be damaged if the procedure is not followed properly. No patent liability is assumed by AMCI, with respect to use of information, circuits, equipment, or software described in this manual. The information contained within this manual is subject to change without notice. UNDER NO CIRCUMSTANCES WILL ADVANCED MICRO CONTROLS, INC. BE RESPONSIBLE OR LIABLE FOR ANY DAMAGES OR LOSSES, INCLUDING INDIRECT OR CONSEQUENTIAL DAMAGES OR LOSSES, ARISING FROM THE USE OF ANY INFORMATION CONTAINED WITHIN THIS MANUAL, OR THE USE OF ANY PRODUCTS OR SERVICES REFERENCED HEREIN.

Standard Warranty
ADVANCED MICRO CONTROLS, INC. warrants that all equipment manufactured by it will be free from defects, under normal use, in materials and workmanship for a period of [18] months. Within this warranty period, AMCI shall, at its option, repair or replace, free of charge, any equipment covered by this warranty which is returned, shipping charges prepaid, within 18 months from date of invoice, and which upon examination proves to be defective in material or workmanship and not caused by accident, misuse, neglect, alteration, improper installation or improper testing. The provisions of the "STANDARD WARRANTY" are the sole obligations of AMCI and excludes all other warranties expressed or implied. In no event shall AMCI be liable for incidental or consequential damages or for delay in performance of this warranty.

Returns Policy
All equipment being returned to AMCI for repair or replacement, regardless of warranty status, must have a Return Merchandise Authorization number issued by AMCI. Call (860) 585-1254 with the model and serial numbers along with a description of the problem. A "RMA" number will be issued. Equipment must be shipped to AMCI with transportation charges prepaid. Title and risk of loss or damage remains with the customer until shipment is received by AMCI.

24 Hour Technical Support Number
Technical Support, in the form of documents, FAQs, and sample programs, is available from our website, www.amci.com. 24 Hour technical support is also available on this product. For technical support, call (860) 585-1254. Your call will be answered by the factory during regular business hours, Monday through Friday, 8AM - 5PM EST. During non-business hours, an automated system will ask you to leave a detailed message and the telephone number that you can be reached at. The system will page an engineer on call. Please have your product model number and a description of the problem ready before you call.

Chapter 1: Installing the 7351 module

Inserting the 7351 into the Baseplate

Note: As part of our licensing agreement, AMCI purchases the module case directly from GE-Fanuc to insure 100% compatibility with their baseplate. (We also purchase their backplane interface IC under license to insure 100% electrical compatibility with the system.) Because of this, the 7351 installs in the baseplate like every other 90-30 I/O module.

⚠ **WARNING**   **REMOVE POWER FROM THE BASEPLATE BEFORE INSTALLING OR REMOVING ANY 90-30 I/O MODULE.** Installing or removing any module while power is applied may damage the module or baseplate and/or cause unexpected operation with possible injury to personnel.

To Insert the 7351
1. Grasp the module firmly with the front of the module facing you.
2. Tilt the module upwards and insert the case's top hook into the top notch of the slot.
3. Rotate the 7351 into the baseplate until the locking lever snaps into the bottom notch of the slot. It doesn't require a great deal of force to engage the backplane connectors, so do not force the module into the baseplate. Doing so may damage the backplane connectors.
4. Visually inspect the module to be sure it is properly seated.

To Remove the 7351
1. Remove the Transducer Input Connector.
2. Locate the locking lever on the bottom of the 7351 and firmly press in up. This pivots the locking hook out of the slot's bottom notch.
3. Rotate the bottom of the module out from the baseplate and disengage the hook at the top of the 7351 from the slot's top notch

Software Configuration

A 7351 module communicates with the PLC through the input and output registers assigned to the slot. The input registers are used to transmit status, position, and velocity data (in counts / second) to the PLC. The output registers are used to setup the module and offset the Position Data from the sensor.

Before you can communicate with the 7351 module, you must configure the slot that it resides in. The 7351 module has been tested with the Proficy, VersaPro, and Logicmaster software packages.

Proficy Configuration

1. In the Project tab of the Navigator, expand the Hardware Configuration node by clicking the + to the left of it. The tree expands to show the default set of racks. Each rack has its model number shown to the right of it.
2. Click on the + to the left of the rack where you want to install the 7351 module.
3. Right click on the slot where the AMCI module is to be installed and select "Add Module..." from the menu that appears.
4. Click on the *3rd Party* tab in the Module Catalog window.
5. If it is not already highlighted, select the 3RD PARTY Catalog Number and click on the OK button. The following window will appear.
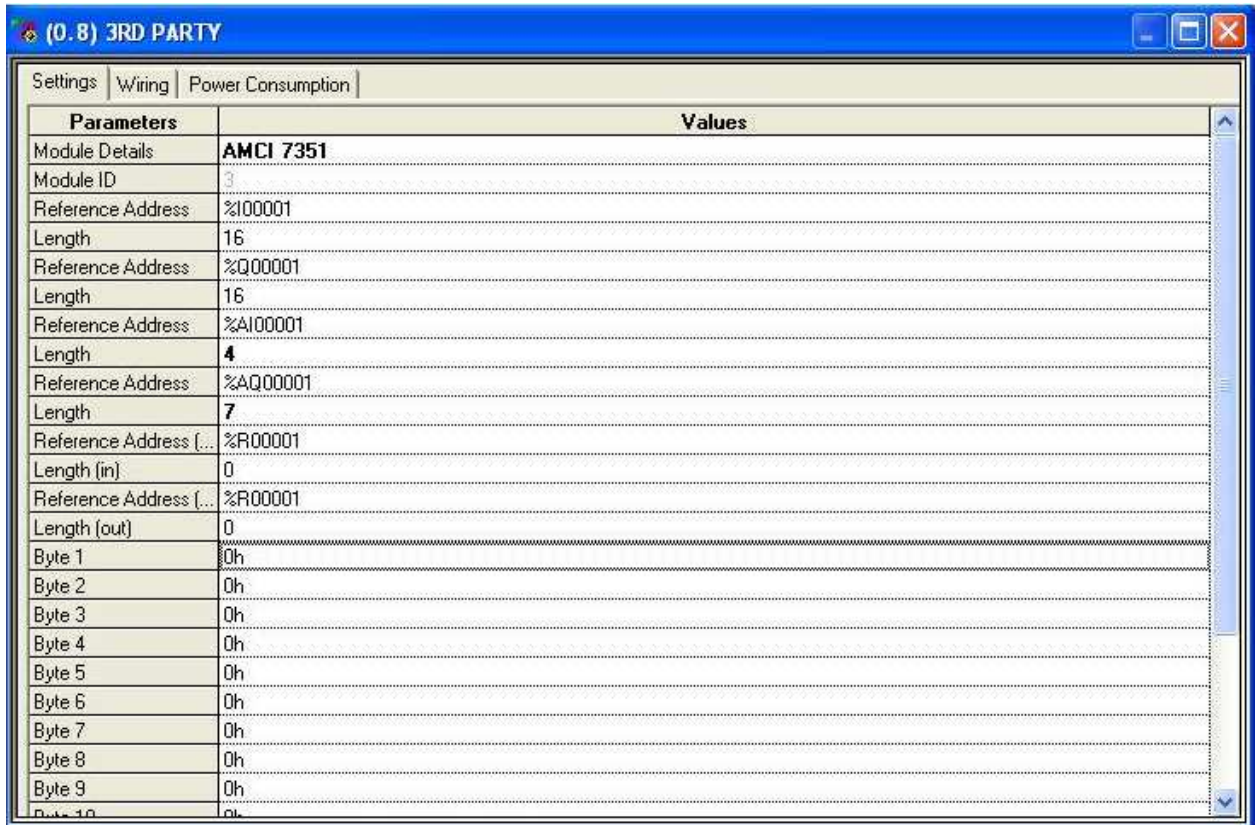
6. Enter the following information into this window.

   Module Details: Optional field, 32 characters max, typically the vendor name and model number are entered here.

   Module ID: Fixed at 3.

   Reference Addresses: The addresses you use depend on your application. When you choose them, make sure there is no overlap with addresses used elsewhere in your program. The length parameters for the 7351 module are shown in the following table.

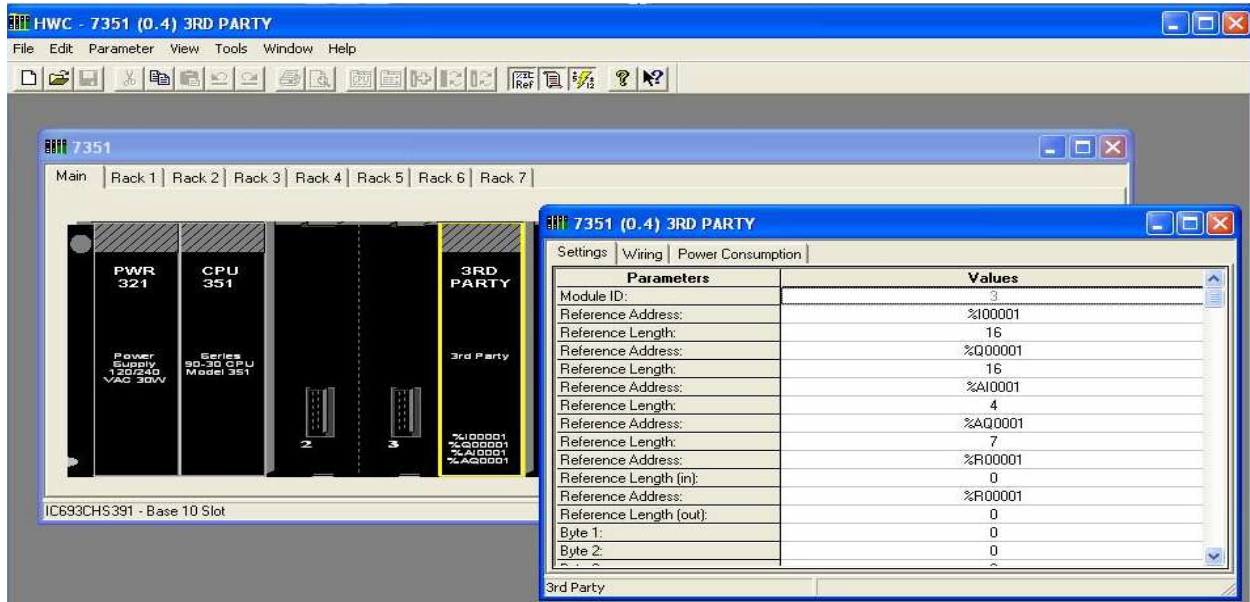| Module	Number of %I bits	Number of %Q bits	Number of %AI words	Number of %AQ words
7351	16	16	4	7

⚠️ **WARNING** The Byte 1 through Byte 16 parameters and the %R Reference Addresses in and out <u>must</u> be left at their default values of zero.

7. There are two other tabs available on the Module Configuration screen, *Wiring* and *Power Consumption*. Entering data in these fields is optional, but recommended.

VersaPro Configuration

If you are using the VersaPro software, adding the 7351 is accomplished in *Hardware Configuration.*

1. Open Hardware Configuration by clicking on the VIEW menu and selecting Hardware Configuration, or by pressing ALT+4.
2. Right click on the slot where the 7351 module is to be installed and select "Add Module..." from the menu that appears.
3. Click on the 3rd Party tab in the Module Catalog that appears.
4. Select "3rd Party" and then click on OK. A window similar to the following figure will appear.

5. To configure the slot, enter the reference addresses and lengths. The addresses you use depend on your application. When you choose them, make sure there's no overlap with addresses used elsewhere in your program. The length parameters for 7351 module is shown in the following table.

Module	Number of %I bits	Number of %Q bits	Number of %AI words	Number of %AQ words
7351	16	16	4	7

Notes: The %R registers are not used and <u>must</u> be left at their default values.
Bytes 1 - 16 are not used and <u>must</u> be left at their defaults of zero.

Logicmaster 90 Configuration

1. Enter the Logicmaster 90 Configuration Package.
2. Press F1 to open I/O Configuration.
3. Move the cursor to the slot that the 7351 module will resides.
4. Press F8 to display other module types and then press F3 to select 'frgn' (foreign).
5. To configure the slot, enter the data shown in the table in the VersaPro configuration section above. The addresses you use depend on your application. When you choose them, make sure there's no overlap with addresses used elsewhere in your program. Also note that the %R registers and Bytes 1 - 16 are not used and must be left at their default values.

Chapter 2: Module Specifications

Module Location
Any 90-30 or RX3i baseplate I/O slot. The following table shows the number of bits and words used by the 7351 module.

Module	Number of %I bits	Number of %Q bits	Number of %AI words	Number of %AQ words
7351	16	16	4	7

Baseplate Power Requirements
230mA max at 5Vdc

Compatible Transducers
These units are compatible with digital LDT sensors that output Start / Stop or PWM (with external interrogation) signals. Sensors manufactured by MTS, Balluf, Ametek, and Turck have been used with the 7351 module.

Programmable Parameters
Apply Preset Value Command
LDT Type
Measurement Unit
LDT Gradient
Full Scale Length
Full Scale Count
Preset Value
Count Direction
Velocity Update Time

Data Transfer
Data updated automatically during program scan. Programming the module is accomplished with a *Programming Cycle*, which uses two handshaking bits (Transmit and Acknowledge).

Data Available to Processor
Status Bits, Position Data, and Velocity Data (in counts / second)

Position Update Time
Minimum value of 2ms. Maximum value dependent on the length of the sensor and the position of the magnet on the sensor.

Program Storage
EEPROM. Endurance of 100,000 write cycles.

Environmental Conditions
Operating Temperature: 0 to 60° C
Relative Humidity: 5 to 95%   (non-condensing)
Storage Temperature: -40 to 85° C

LED Function

AMCI 7300

Run ⬤
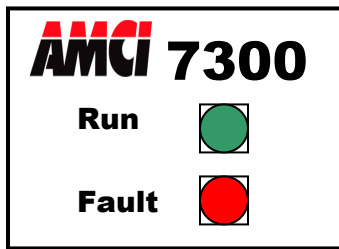
Fault 🔴

Run LED

Solid Green: This LED is on when the module is operational.

Fault Status

Off:	No fault conditions exist. The Fault LED will turn off when a working transducer is attached.
Solid Red:	Module fault
Flashing Red:	LDT Error. Causes include,

- Broken Transducer cable
- Improperly wired cable
- Non-compatible transducer
- LDT Type Parameter setup parameter does not match the sensor type
- Magnet is not on the sensor
- Magnet is on the sensor but outside of the usable range
- External Power supply not attached to both the 7351 module and the sensor

Transducer Input Connector

The Transducer Input Connector has eight contacts. The MS-8 mating connector is supplied with the 7351 module.

User Supplied Power

The 7351 module will operate with sensors that operate from a $\pm$15Vdc or a 24Vdc external power supply.

The 7351 module will draw a maximum of 60mA of current from the positive side of the external supply. Add this amount to the amount of current that your sensor will require when sizing your external power supply. The 7351 module does not draw any power from the negative side of your external power supply.

Wiring Information

7351 module, MS-8 Connector

+Stop	Or	+Start/Stop	Or	+Gate
-Stop		-Start/Stop		-Gate
-Interrogate				
+Interrogate				
Cable Shields				
-15Vdc	Or	No Connection		
Supply Common				
+15Vdc	Or	+24Vdc		
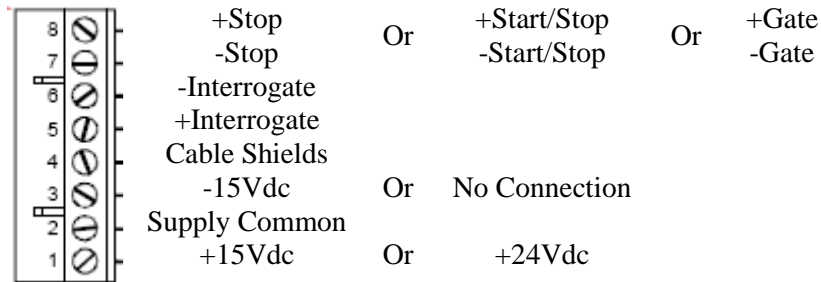
Note: Pin 1 is located at the <u>bottom</u> of the MS-8 connector when it is plugged into the 7351 module.

Wiring Notes:

- When the connector is plugged into the 7351 module, pin 1 is located at the **BOTTOM** of the module.
- Because a 7351 module can be used with sensors from several manufacturers that use different cable types and wire colors, only the module's connector along with the appropriate signal names are shown in this document.
- The ±15Vdc or +24Vdc external power supply shown in the above diagram must be externally supplied by the user.
- The 7351 module does not use any power from the –15V supply side. This terminal is simply a convenient place to connect the sensor to the –15Vdc power supply.
- Based on the sensor's manufacturer and output type, the ±Stop signals shown above may be named ±Start/Stop or ±Gate.
- Use the information provided by the sensor's manufacture to determine the type and maximum length of cable that should be used to connect the sensor to the 7351 module.
- Transducer signals are generally low voltage, low power signals. It can be installed in conduit along with other low power cabling such as communication cables and low power ac/dc I/O lines. It cannot be installed in conduit with ac power lines or high power ac/dc I/O lines.
- Like all signal and communication cable, the transducer cable should be shielded. These shields <u>must</u> be grounded at one end of the cable *only*. Because the rack cabinet is typically a better ground than the machine, AMCI recommends that the cable shields be terminated at the 7351 module.
- The cable shields must be treated as conductors at any cable junctions.

Chapter 3: Programmable Parameters

You configure your 7351 module by setting the values of its programmable parameters. These parameters are stored in the modules nonvolatile memory. Therefore, you do not have to configure the module after every power up. The nonvolatile memory is an EEPROM that is rated for approximately 100,000 write cycles.

Apply Preset Value Command:
Setting this bit during a programming cycle causes the 7351 module to force the position data to the Preset Value.

Setting the Apply Preset Data bit causes the module to generate the internal offset necessary to force the position data to zero. The internal offset is saved in the 7351 module's EEPROM memory, so it is not necessary to home the module at every power up. This internal offset will also be cleared whenever the LDT Type, Full Scale Length, or Full Scale Count parameters are programmed.

⚠ **WARNING**   The 7351 module's EEPROM memory is guaranteed for 100,000 write cycles before writing to it will cause it to fault. Therefore continuously setting this bit should be avoided. If your application requires you to continuously Apply the Preset, consider performing this operation in your PLC program. A FAQ showing how to Offset the Position Data in the PLC is located in the FAQ section of our website.

LDT Type
This two bit parameter specifies the type of LDT, AMCI, Balluff, sensors with Start / Stop outputs, or sensors with PWM outputs, that will be connected to the 7351 module.

➢ The default value is AMCI, which specifies a sensor with Start / Stop outputs and a Gradient Value measured in meters / second
➢ LDT sensors are no longer available from AMCI. Sensors sold under the AMCI name were manufactured by Balluff under the following part numbers, *BTL-2-K2-xxxx-Z-S32* (rod style), *BTL-2-K2-xxxx-P-S32* (profile style), and *BTL-2-K2-xxxx-F-S32* (profile with captive magnet). The xxxx in the part number is the length of the sensor in millimeters.
➢ The Balluff LDT type specifies a sensor with Start / Stop outputs and a Gradient Value measured in meters / second
➢ Setting the LDT Type to Start / Stop output pulses will use a Gradient Value that is specified in µs/in or µs/mm.
➢ Setting the LDT Type to PWM output requires that the sensor be configured for external interrogation and four recirculations and will use a Gradient Value that is specified in µs/in or µs/mm.
➢ Balluff currently sells their sensors with a gradient value specified in µs/inch. If this is true of your sensor, simply program the 7351 module for a Start / Stop or PWM LDT Type, and enter your gradient value in µs/inch.

Measurement Unit
This parameter specifies the measurement unit for the Full Scale Length parameter and affects the values that can be entered for the Full Scale Count. If the LDT Type is Start / Stop pulses or PWM, this parameter will also affect the units of the LDT gradient.

➢ The default value is inches and a gradient value in µs/inch
➢ This parameter has units of inches or millimeters

LDT Gradient

This is a calibration parameter supplied by the LDT manufacturer. Setting the LDT type to AMCI or Balluff will require you to enter the gradient in meters / second. Setting the LDT type to Start/Stop or PWM will require you to enter the gradient in µs/in or µs/mm.

➢ The gradient value need not be programmed for operation, but accuracy will suffer
➢ Default value of 2812.85 m/s
➢ A gradient measured in m/s has a range of 2531.00 to 3175.00 m/s, and is entered in six digits
➢ A gradient measured in µs/inch has a range of 8.00000 to 9.99999 µs/inch, and is entered in six digits
➢ A gradient measured in µs/mm has a range of 0.31500 to 0.39360 µs/mm, and is entered in five digits
➢ Balluff currently sells their sensors with a gradient value specified in µs/inch. If this is true of your sensor, simply program the 7351 module for a Start / Stop or PWM LDT Type, and enter your gradient value in µs/inch.

Full Scale Length

This parameter is typically set to the length of the sensor. However, the Full Scale Length can be set to any value that simplifies the value used for the Full Scale Count.

➢ The default value is 16 inches
➢ The Full Scale length is based on the Measurement unit parameter
➢ Range is 2 to 327 inches or 50 to 8305 millimeters

Full Scale Count

This parameter sets the number of counts to be measured over the specified Full Scale Length. The result of dividing the Full Scale Count by the Full Scale Length determines the resolution of the sensor. For example, programming a Full Scale Count of 16000 and Full Scale Length of 16 will give you a resolution of 0.001 inches.

➢ The default value is 16000 counts
➢ When the Measurement Unit parameter is set to inches: Range = 2 to (Full Scale Length * 1000)
➢ When the Measurement Unit parameter is set to millimeters: Range = 2 to (Full Scale Length * 10)
➢ Default resolution is 0.001 inches

Preset Value

The Preset Value parameter allows you to set the value of the position data to any count value within its range. Programming the Preset Value does not change the position data; it only sets in the module's memory the value that the position value will change to when an *Apply Preset* command is initiated.

➢ The default value is 0
➢ Range = -999,999 to +999,999

Count Direction

This parameter specifies the direction, relative to the head of the LDT, the magnet must travel to increment the position count.

➢ The default value is positive
➢ Setting the direction to positive forces the position count to increment as the magnet travels away from the LDT's head.
➢ Setting the direction parameter to negative forces the position count to increment as the magnet moves towards the LDT's head.
➢ To be effective, it may be necessary to use the Apply Preset command when changing the count direction.

Velocity Update Time

This parameter sets the time between velocity updates. It *only* affects the update time of the velocity data. It does not affect the update time of the position value, which has a minimum value of 2ms.

➢ The default Tachometer Response is 120 milliseconds.
➢ The Tachometer Response can be set to 120 or 32 milliseconds.
➢ The velocity data resolution is determined by, and identical to, the position resolution. For example, setting the position resolution to 0.001 inch will force the velocity data to read in 0.001 inches per second.

Chapter 4: Backplane Programming

The 7351 module is programmed over the backplane through the input and output words assigned to it. Because these words are constantly updated, the unit implements a simple hand-shaking protocol to control when it accepts new programming data. This hand-shaking protocol is called a Programming Cycle

Programming Cycle

A Programming cycle consists of six steps and is controlled by the *Transmit Bit* in the output data words and the *Acknowledge Bit* in the input data words.

1. Write the new programming data into the output data words with the Transmit Bit reset. This step insures that the correct data is in the output data words before the Programming Cycle begins.
2. Set the Transmit bit. A Programming Cycle is initiated when this bit makes a 0 to 1 transition.
3. Once the unit is done with the programming data, it will set any necessary error bits and the Acknowledge Bit in its input data words.
4. Once you see the Acknowledge Bit set, check for any errors. The error bits are only valid while the Acknowledge Bit is set.
5. Respond to any errors and reset the Transmit Bit.
6. The 7351 module responds by resetting the Acknowledge Bit. The Programming Cycle is now complete.

EEPROM Parameter Memory

Parameter values are stored in a non-volatile EEPROM memory. This memory type can store parameter values in the absence of power for over twenty years, but you can only write to it a limited number of times before it will be damaged. The EEPROM Memory that AMCI uses is guaranteed for a minimum of 100,000 write cycles.

Every time you have the Apply Preset Value Command bit set during a programming cycle, the 7351 module calculates an offset and stores this value in the EEPROM. If your application requires you to continuously Apply the Preset Value, consider doing this in the PLC instead of in the 7351 module.

A FAQ showing how to offset the position data in the PLC is located on the following page of our website.
http://www.amci.com/faqs.asp

Output Registers: (Data sent from the PLC to the 7351 module)

The 7351 module is configured through 16 %Q bits and seven %AQ registers.   The function of these bits and words is shown below.

Data Type	Function	Range
%Q Bits	Control Word (see below)	See description below
%AQ register 1	LDT Gradient Double Precision Integer	• 8.00000 to 9.99999 µs/inch for Start / Stop or PWM LDT type sensors, entered as 800000 to 999999
%AQ register 2		• 0.31500 to 0.39360 µs/mm for Start / Stop or PWM LDT type sensors, entered as 31500 to 39360 • 2541.00 to 3175.00 m/s for AMCI or Balluff LDT type sensors, entered as 253100 to 317500
%AQ register 3	Full Scale Length	2 to 327 inches 50 to 8305 millimeters
%AQ register 4	Full Scale Count Double Precision Integer	2 to (1000 * Full Scale Length) when measured in inches
%AQ register 5		2 to (10 * Full Scale Length) when measured in millimeters
%AQ register 6	Preset Value Double Precision Integer	-999,999 to 999,999
%AQ register 7		

Control Word

Bit 16	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01
Transmit Bit	Clear EEPROM Error	0	0	Velocity Update	Program Velocity Update	Direction	Program Direction	Program Preset Value	Program Full Scale Count	Program Full Scale Length	Measurement Unit	LDT Type		Program LDT Setup	Apply Preset

Bit 1: <u>Apply Preset:</u> Set to offset the position data to the Preset Value programmed in %AQ registers 6 and 7. (The Internal Offset generated by an Apply Preset operation will be reset to zero when the LDT Setup, Full Scale Length, or the Full Scale Count parameters are programmed)

Bit 2: <u>Program LDT Setup:</u> Set this bit to program the LDT Type bits (bits 3 and 4), the Measurement Unit (bit 5), and the LDT Gradient value in %AQ registers 1 and 2. When this bit is reset to "0", bits 3, 4, 5, and the Gradient Value will be ignored. Programming the LDT Setup parameters clears the internal offset generated by an Apply Preset operation.

Bit 3: <u>LDT Type</u>: Set these bits according to the information in the following table. The 7351 module only reads these bits when bit 2, the Program LDT Setup bit, is set to "1".

Bit 4	Bit 3	LDT Type
0	0	AMCI LHT Series LDT (no longer available)
0	1	Balluff LDT, K2 output type, gradient in m/s
1	0	LDT with PWM (four recirculations, external interrogation) output gradient in µs/in or µs/mm.
1	1	LDT with start / stop output, gradient in µs/in or µs/mm

Bit 5: <u>Measurement Unit</u>: Reset to "0" when programming the Full Scale Length in inches and the Gradient Value in µs/in. Set to "1" to program the Full Scale Length in millimeters and the Gradient Value in µs/mm. Please note that regardless of the measurement unit selected, the AMCI and Balluff LDT types always have their Gradient Values programmed in m/s.

Bit 6: <u>Program Full Scale Length</u>: Set to "1" to change the Full Scale Length parameter to the value programmed in %AQ register 3. Programming the Full Scale Length clears the internal offset generated by an Apply Preset operation.

Bit 7: <u>Program Full Scale Count</u>: Set to "1" to change the Full Scale Count parameter to the value programmed in %AQ registers 4 and 5. Programming the Full Scale Count clears the internal offset generated by an Apply Preset operation.

Bit 8: <u>Program Preset Value</u>: Set to "1" to change the Preset Value parameter to the value programmed in %AQ registers 6 and 7. Please note that programming the Preset Value <u>does not change</u> the position value. It only stores the value in the module's memory. Set bit 1, the Apply Preset bit, to change the Position Data to the Preset Value.

Bit 9: <u>Program Direction</u>: Set to "1" to program the Count Direction parameter to the value designated in bit 10.

Bit 10: <u>Direction</u>: "0" = Positive Direction (counts increase as the magnet moves away from the sensor's head) "1" = Negative Direction (counts increase as the magnet moves towards the sensor's head) The state of this bit is only read when Bit 9, the Program Direction bit is also set.

Bit 11: <u>Program Velocity Update Time</u>: Set to "1" to program the Velocity Update Time parameter to the value designated by bit 12.

Bit 12: <u>Velocity Update Time</u>: "0" = Velocity update time = 120ms, "1" = Velocity update time = 32ms. The state of this bit is only read when Bit 11, the Program Velocity Update time bit is also set. The Velocity Update time <u>does not</u> affect how often the position value is updated.

Bits 13 & 14: Reserved, must be set to zero

Bit 15: <u>Clear EEPROM Error</u>. Set this bit to one to clear an EEPROM Memory Fault. Setting this bit <u>does not</u> reset the setup parameters to their default values.

Bit 16: <u>Transmit Bit</u>. The zero to one transition of this bit initiates a Programming Cycle.

⚠ WARNING The Internal Offset generated by an Apply Preset operation will be reset to zero when the LDT Setup, Full Scale Length, or the Full Scale Count parameters are programmed.

Input Registers (Data sent from the 7351 module to the PLC)

The 7351 module reports its position, velocity, and status information through 16 %I bits and four %AI registers. The function of these bits and words is shown below.

Data Type	Function	Units
%I Bits	Status Word (see below)	See description below
%AI register 1	Position Data in Double Integer Format	Counts
%AI register 2		
%AI register 3	Velocity Data in Double Integer Format	Counts / Second
%AI register 4		

Status Word

Bit 16	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01
Acknowledge Bit	LDT Error	0	EEPROM Error	0	0	0	0	Message Ignored	Command Error	0	0	Preset Value Error	Full Scale Count Error	Full Scale Length Error	Gradient Error

Bit 1: <u>Gradient Error:</u> Set when the programmed Gradient Value is outside of its expected range. Causes for this error are incorrect Gradient Value, incorrectly specified Gradient Units, or incorrect Measurements Units.

Bit 2: <u>Full Scale Length Error:</u> Set when the programmed Full Scale Length is outside of the expected ranges of 2 to 327 inches or 50 to 8305mm. Note that this error can be caused by setting the Full Scale Length greater than 327mm and having the Measurement Unit parameter specified as inches.

Bit 3: <u>Full Scale Count Error:</u> The Full Scale Count is not in the range of 2 to (Full Scale Length * 1000) if the Measurement Unit is specified in inches, or 2 to (Full Scale Length * 10) if the Full Scale Count is specified in millimeters.

Bit 4: <u>Preset Value Error:</u> Set when the Preset Value is outside the range of –999,999 to 999,999.

Bits 5 & 6: <u>Reserved for future use</u>

Bit 7: <u>Command Error</u>. Set under four conditions.

- Attempt to program the module while there is an EEPROM error.
- Only the Transmit bit is set in the Control Word.
- %Q bits specified as zero are set to 1.
- If an attempt is made to Apply the Preset when there is a LDT error.

The Command Error status bit will be reset when valid data is sent to the 7351 module.

Bit 8: <u>Message Ignored</u>: If an error bit is set, the error must be cleared by first programming the affected parameter with valid data. This bit is set, along with the original error bit, if you attempt to program a different parameter before clearing the error.

Bit 13: <u>EEPROM Error</u>. Set on an EEPROM memory fault. The 7351 module will have to be returned for repair if setting the clear EEPROM bit, or cycling power, does not clear this fault condition.

Bit 14: <u>Reserved for future use</u>

Bit 15: <u>LDT Error</u>. This bit will be set when the 7351 module is not receiving valid signals from the sensor. Possible causes are;

- Broken Transducer cable
- Improperly wired cable
- Non-compatible transducer
- LDT Type Parameter setup parameter does not match the sensor type
- Magnet is not on the sensor
- Magnet is on the sensor but outside of the usable range
- External Power supply not attached to both the 7351 module and the sensor

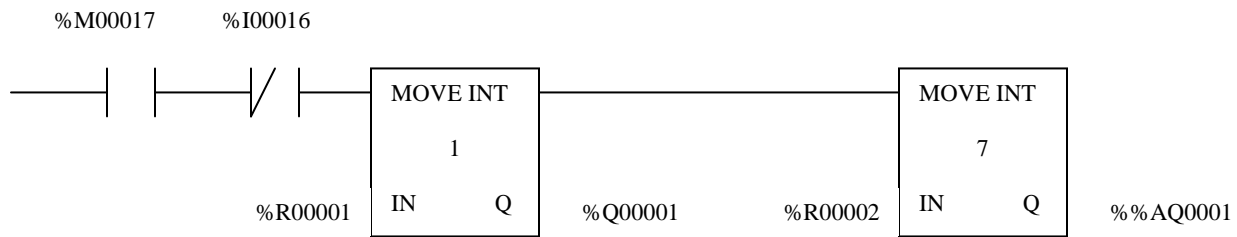This error bit will clear itself when the cause of the problem has been corrected.

Bit 16: <u>Acknowledge Bit</u>. Set by the module to acknowledge the receipt of programming data from the processor. The module resets the Acknowledge Bit after the processor resets the Transmit Bit.

Chapter 5: Sample Program

The three rung ladder logic below shows how to program a 7351 module. This example assumes that the 7351 module has been assigned the lowest possible register and bit addresses. The program also uses %R1 to %R8 to store the data that is sent to the 7351 module.

%R1 = 62 (3E hex) = Bits to copy to %Q1 to %Q16. Programs the LDT Setup for start / stop pulses, the gradient in µs/in, the Full Scale Length, and the Full Scale Count.
%R2 & %R3 = 903000 = Gradient Value in Double Precision Integer Format of 9.03000 µs/in
%R4 = Full Scale Length = 16
%R5 & %R6 = Full Scale Count in Double Precision Integer Format = 16,000

Bit %M00017 is used to initiate a Programming Cycle. When this bit is set, either manually or by the ladder logic program, and the Acknowledge Bit (%I00016) from the 7351 module is not set, copy the data stored in %R1 to Control Word Bits %Q00001 and the seven words of programming data, starting at %R2, into the data words %AQ1 to %AQ7. Please note that bit 16 of %R1, which is copied to the Transmit bit of the 7351 module, is not set.

```
%M00017        %I00016
  ─┤ ├──────┤/├────┬──── MOVE INT ────────────── MOVE INT ───
                   │        1                        7
                   │
          %R00001  └─ IN    Q ── %Q00001   %R00002 ─ IN    Q ── %%AQ0001
```

As long as a Programming Cycle is initiated, and the 7351 module has not responded by setting its Acknowledge Bit, set the Transmit Bit %Q00016.

```
%M00017        %I00016                                 %Q00016
  ─┤ ├──────┤/├─────────────────────────────────────( )─────
```
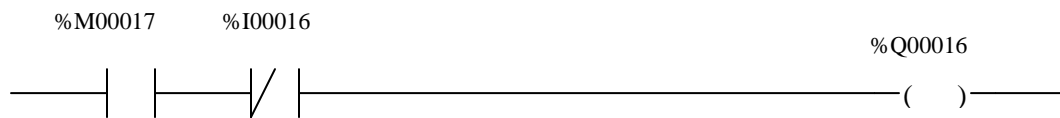
Once the 7351 module responds by setting its Acknowledge bit (%I00016) terminate the Programming Cycle by resetting (%M00017), the bit that initiated the Programming Cycle.

```
%M00017        %I00016                                 %M00017
  ─┤ ├──────┤ ├─────────────────────────────────────( R )────
```
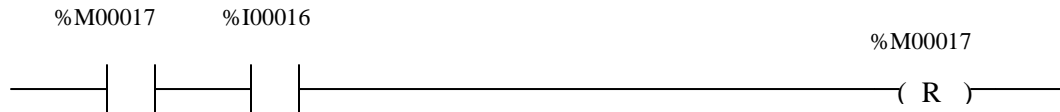
Chapter 6: Specification Revision History

Revision 0.0 was created on 1/29/08 and replaces manual 7300-C94M. Referenced that the AMCI LDTs are no longer available and used Start/Stop and PWM in place of Temposonics RPM and DPM.

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