



Module Overview

Utilizing licensed Allen-Bradley interface technology, these Resolver Interface Modules can be added as expansion modules to Rockwell Automation's MicroLogix 1100, 1200, and 1400 rack systems.

The 1141 is a one channel module that can be connected to one resolver, and the 1142 is a two channel module that can be connected to either two independent single resolver transducers or a single dual resolver transducer.

Both the 1141 and 1142 modules have an input that can be configured for stop time monitoring (channel 1 only), to capture the current position, or to offset the current position to a previously programmed preset value (channel 1 only). This input will operate at either at 24Vdc or 120Vac.

The 1141A and 1142A have the additional ability to be programmed to interface to Autotech and standard Gemco resolvers that have a transformation ratio of 1.4.



Table of Contents

General Information		2
Installing the 114X Module	Chapter 1	4
	Installing the Hardware	4
	MicroLogix 1500 Configuration	5
Module Specifications	Chapter 2	6
	Module Specifications	6
	Front Panel & LED Functions	7
	Connector Pinout	7
	Input	9
	Transducer Wiring	9
	CTL-X & CML-X diagrams	9
	Wiring Notes	10
Programmable Parameters	Chapter 3	11
	Apply Preset	11
	Count Direction	11
	Transducer Fault Latch	11
	Tachometer Response	11
	Tachometer Units	12
	Disable Channel 2	12
	Reference Voltage Frequency	12
	Resolver Type	12
	Input Functionality	13
	Input Polarity	13
	Full Scale Count	13
	Preset Value	13
	Transducer Type	14
	Number of Turns	14
Backplane Programming	Chapter 4	15
	Programming Cycle	15
	EEPROM Parameter Memory	15
	Input Registers	16
	Status Word	17
	Output Registers	20
	Control Word	21
	Setup Word	21
Manual Revision History	Chapter 5	22

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) 583-7271. 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 114X module

WARNING Disconnect power before attempting to install or remove the 114X module.

Chapter 1: Installing the 114X module



Disconnect power before attempting to install or remove the 114X module

1. Verify that your system's power supply has adequate reserve current capacity. The 114X module requires 45mA at +5Vdc and 48mA @24Vdc.
2. The 114X module is not hot swap capable, power must be removed before removing or installing any module.
3. The 114X can be mounted on the following DIN Rails

EN 05 022 – 35 X 7.5 (35 X 7.5 mm)
EN 05 022 – 35 X 15 (35 X 15 mm)
4. Close the DIN rail latch on the module before mounting the module on the rail.
5. Press the DIN rail mounting area of the module against the rail. The latch will open as you install the module and will snap into place when the module is properly seated on the DIN rail.
6. The communication bus is carried between the modules through the ribbon cable attached to every module.
7. If necessary, remove the bus connector cover from the PLC and or from the module that the 114X will be connected to.
8. Use the pull loop on the connector to plug the ribbon cable from the 114X into either the module or the PLC directly to the left of 114X module.
9. Reinstall the bus connector cover.
10. It is very important to use the pull loop to disconnect modules. Pulling on the ribbon cable may damage the cable or the module.

Configuring a MicroLogix PLC for the 114X module

1. Open or create the RSLogix 500 project in which you want to use the 114X module.
2. Double click on I/O Configuration in the project tree.
3. Select the slot where the 114X module will be installed.
4. Double click on “Other.. Requires I/O Card Type ID” from the bottom of the list of available modules.
5. Enter the following information in the window that appears.

Vendor ID:	3
Product Type:	9
Product Code:	26
Series/Major Rev/Min Rev:	A
Input Words:	8
Output Words:	8
Input Bits:	0
Output Bits:	0
Extra Data Length:	0
Ignore Configuration Error:	<i>Your Choice, but not recommended</i>

6. The 114X module will now appear in the I/O Configuration with a Part Number of Other and a Description of I/O Module – ID Code = 26
7. Input Data (data from the 114X module to the PLC) will appear in Input Image Table registers I:X.0 to I:X.7, where X is the slot number.

Output Data (data from the PLC to the 114X module) will be written to registers O:X.0 to O:X.7, where X is the slot number.

Chapter 2: Module Specifications

Power Requirements

45mA @5Vdc
48mA @ 24Vdc typical
80mA @24Vdc with reference voltage shorted

Throughput Time:

Reference Voltage Frequency	Position Update	Backplane Update
5KHz	200 μ s	1ms
2.5kHz	400 μ s	1.2ms

Compatible Transducers

The 1141 module is compatible with one AMCI single resolver based transducer, including the HT-20 series, the H25-XX series, and the HT-20-X series transducer. The 1142 module is compatible with any two single resolver transducer, or one of the HTT-20-X dual resolver multiturn series where X can be 100, 180, 1000 or 1800 turns. The use of other transducers may also be supported with the use of AMCI RM reference modules. Please visit our website, www.amci.com for more information on these resolver transducers. Click on www.amci.com/resolvers.asp for a direct link to page containing the resolver information.

The 1141A and 1142A are compatible with all of the above AMCI resolver transducers, and can also be programmed to work with resolvers that have a Transformation Ratio of 1.4. The 1142A module can be programmed to work with Autotech RL210 128 turn transducers.

Programmable Parameters

Apply Preset	Input Polarity
Full Scale Count	Resolver Type (1141A and 1142A only)
Preset Value	Disable Channel 2 (1142 and 1142A only)
Count Direction	Reference Voltage Frequency
Tachometer Response	Transducer Type (dual resolver transducers only)
Transducer Fault Latch	Number of Turns (dual resolver transducers only)
Input Functionality	Tachometer units (1RPM or 0.1RPM)

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, Tachometer Data (in RPM or 0.1 RPM) (both channels)
Stop Time and Brake Applied Position (channel 1 only)
Captured current position

Program Storage

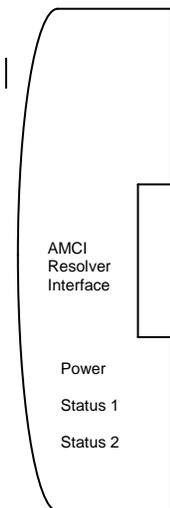
EEPROM. Endurance of 100,000 write cycles.

Environmental Conditions

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

Front Panel & LED Function

114X Front Panel and LED Function



Power: Module has power and communicating with the PLC

Status 1 & 2 LEDs

LED Pattern	Meaning
Solid Green	No Faults (Resolver Transducer and cable are OK)
Blinking Green	Clearable transducer fault
Blinking Red	Non-Clearable transducer fault

Status 2: The Status 2 LED will be off on 1141 modules, and when an 1142 module has been configured to work with dual resolver transducers, or when channel 2 has been disabled.

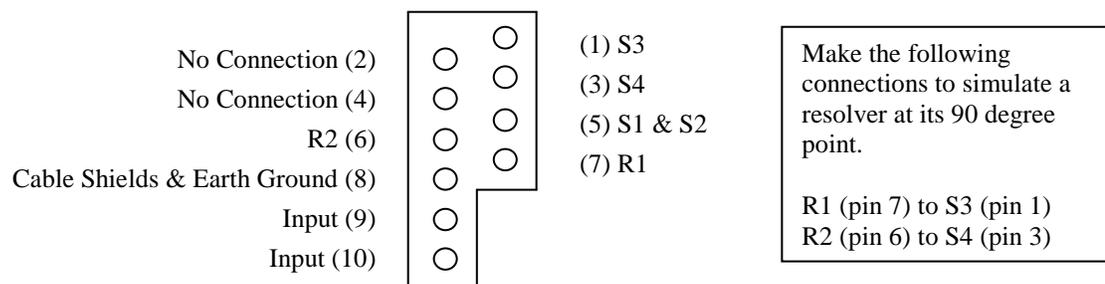
Status 1: Additional Error Codes (The Status 2 LED will be off.)

- Long Red/Short/Off Shorted Reference Voltage
- Solid Red EEPROM Data Error (The module can still be used but it will always power up with the factory defaults.)
- Long and 1 Short Failure to initialize communication with ASIC
- Long and 2 Short Communication with ASIC lost
- Long and 3 Short Incorrect or unexpected data from ASIC
- Long and 9 Short Power up hardware test failed (EEPROM/Digital Pot.)

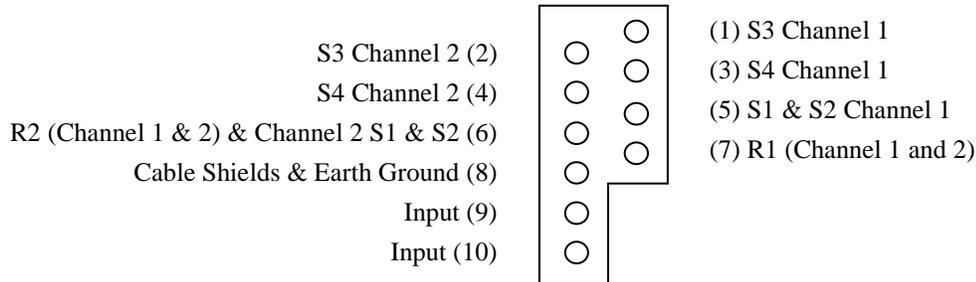
Connector Pinout

The input and sensor signals are brought into the 1141 and 1142 modules through a 10-pin connector.

1141 and 1141A Connector Wiring



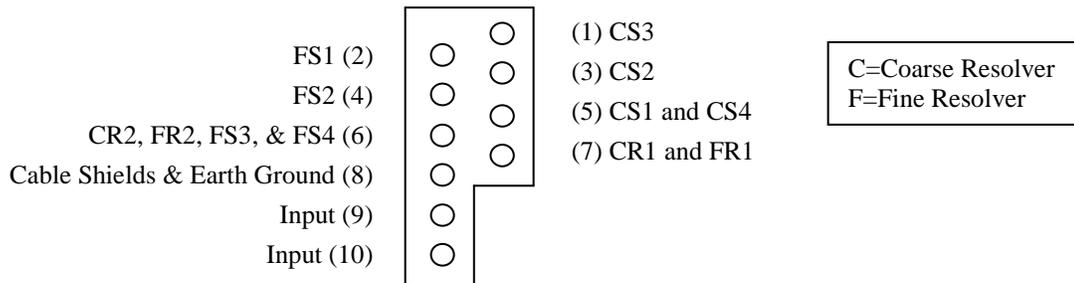
1142 and 1142A Two Single Resolver Connector Wiring



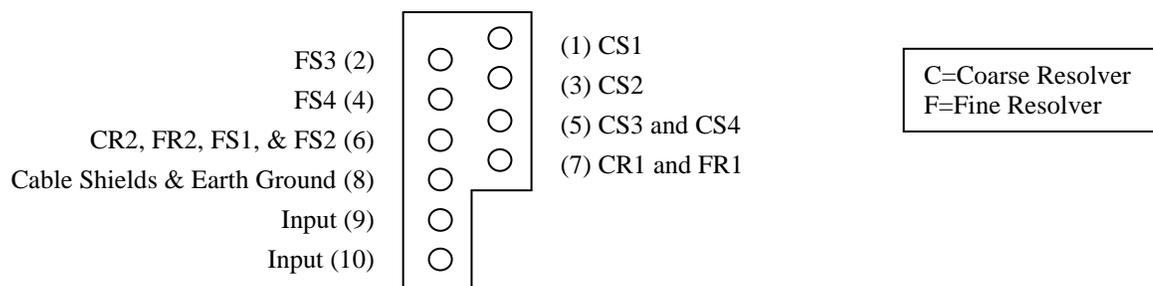
Make the following connections to simulate the resolvers of either channel at its 90 degree point. PLEASE NOTE, ONLY ONE CHANNEL AT A TIME CAN BE SIMULATED.

Channel 1 = R1 (pin 7) to S3 (pin 1) and R2 (pin 6) to S4 (pin 3)
 Channel 2 = R1 (pin 7) to S3 (pin 2) and R2 (pin 6) to S4 (pin 4)

1142 and 1142A Dual Resolver Connector Wiring



1142 and 1142A Dual Resolver Autotech 128 Turn Connector Wiring



Input

The two Input terminals accept a 24Vdc or a 120Vac signal across the two terminals. The input is bipolar, that is, positive voltage can be applied to either pin. The input function is programmable and can be selected to monitor the stopping time and brake applied position of channel 1, to capture the current position, or to apply the preset of channel 1.

The input can be programmed to act on either the ON to OFF (power removed) or the OFF to ON (power applied) transition of the input, with the default being the ON to OFF transition.

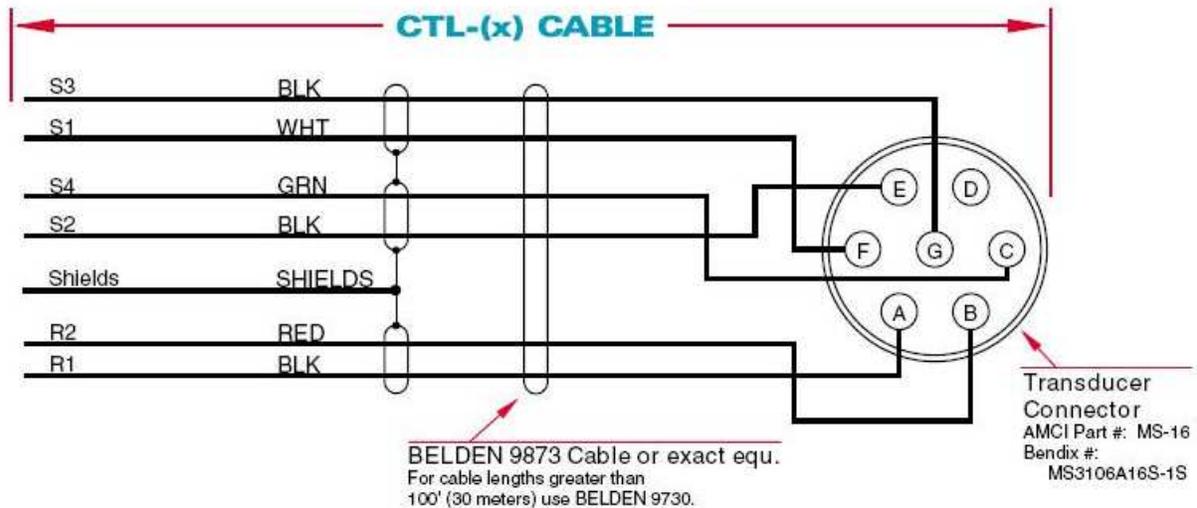
	DC	AC
On State	10 to 30Vdc	79 to 132Vac
Off State	0 to 2Vdc	0 to 2Vac
Current Draw	5mA @ 24Vdc	10mArms @ 120Vac



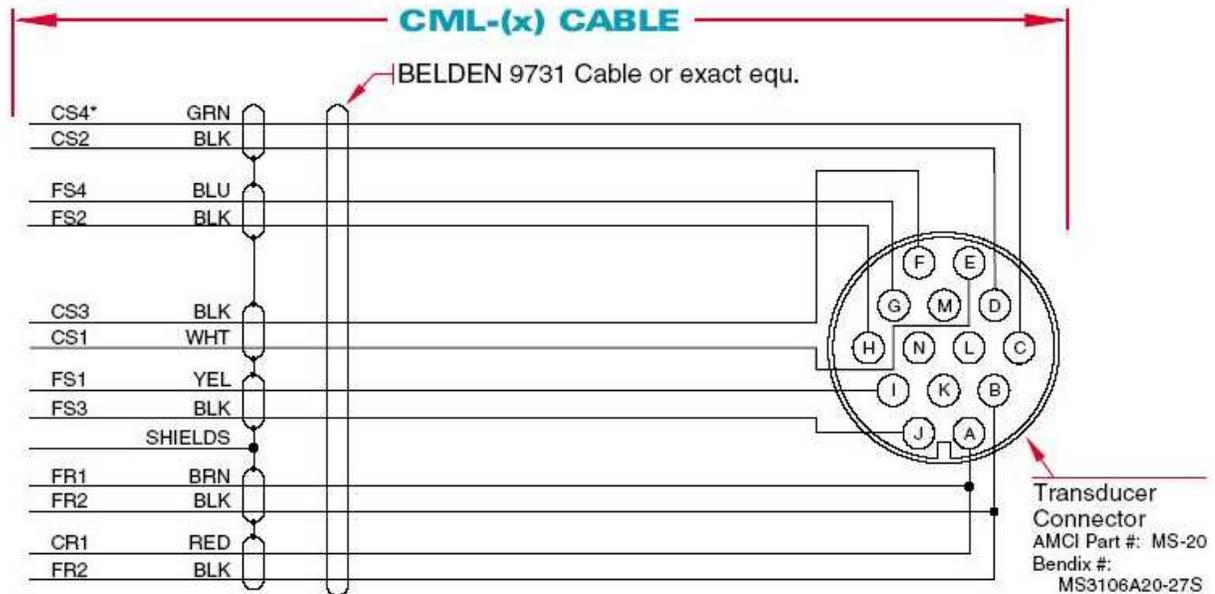
If the input has been configured to Apply the Preset to the channel 1 position, each inactive to active transition of the input will count as one of the EEPROM's 100,000 write cycles.

Pre made cables are available from AMCI. These cables come with a Bendix connector that mate with the resolver transducer. The other end is pigtailed at the factory for easy connection to the 114X module's connector. These cables have a part number of CTL-X for single resolver transducers and CML-X for the dual resolver transducers. In both cases, X equals the length in feet.

The CTL-X cable shown below is used to connect an AMCI single resolver transducer to the 114X module. Two of these cables will be needed to connect two AMCI resolvers to the 1142 module configured to use two single resolver transducers.



The CML-X cable shown below is used to connect an AMCI Dual Resolver transducer to the 1142 module.



*Industry standard resolver designations. The "F" or "C" prefix refers to the Fine or Coarse resolver in the transducer. The Fine resolver yields the position within the turn, while the difference in position between the Fine and Coarse resolvers yields the number of turns completed.

Wiring Notes:

- AMCI recommends the use of either the Beldin 9873 or 9730 or equivalent cables to connect the single resolver transducers to the 114X module. While the Beldin 9730 can be used for any length of cable run, the 9783 can only be used for runs of less than 100 feet.
- Resolver signals are low voltage, low power signals. If you are using A-B guidelines for cabling installation, treat the cable as a Category 2 cable. 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 resolver cable should be shielded. These shields must be grounded only at one end of the cable. Because the control cabinet is typically better grounded than the machine, AMCI recommends that you attach the shields at the module end of the cable run.
- Shield pin 7 IS NOT connected to either the 114X module or to earth ground and is included as a convenient place to land the shield wires. To drain the electronic noise away, a heavy wire **MUST ALSO BE RUN** from the pin 7 to your earth ground bus.
- Treat the shields as conductors at any junctions. Do not ground the shields at the junction box.
- If the resolver cable must cross power feed lines, it should do so at right angles.
- Route the cable at least five feet from high voltage enclosures, or sources of "rf" radiation.

Chapter 3: Programmable Parameters

You configure your unit by setting the values of its *Programmable Parameters*. These parameters are stored in nonvolatile memory. Therefore, there is no need to configure the 114X after every power up. The nonvolatile memory is an EEPROM that is rated for approximately 100,000 write cycles.

Apply Preset

There are TWO Apply Preset bits, one for each channel. Setting one of these bits while programming the 114X module will cause the channel's current position data to be changed to the programmed Preset Value. The result of the Apply Preset operation is saved through power down.

It is also possible to configure the module's input to Apply the Preset Value to the channel 1 position, or to the dual resolver position of an 1142 module.

Note: Programming a channel's setup data will undo the result of an Apply Preset operation.

Count Direction

This parameter sets the direction of transducer shaft rotation that increases the position count. *If the transducer is wired as specified in this manual* and the count direction is set to *positive*, the count will increase with clockwise rotation, (looking at the shaft). If the count direction is set to *negative*, the position count will increase with counter-clockwise rotation.

- The default Count Direction Value is *Clockwise*.

Note: It is also possible to reverse the count direction by reversing S2 S4 wire pairs in the transducer cable. If you are designing the 114X into an older system, it is possible that your drawings already have the pairs reversed and you may not need to set this parameter. Once the machine is setup, you can easily change this parameter if the position is increasing in the wrong direction.

Transducer Fault Latch

Transducer faults can be caused by improper wiring, electrical noise, or a damaged transducer. When the unit detects a fault condition, it reports this fault over the backplane. Normally, a transducer fault is not latched by the 114X module and the Transducer Fault conditions will be cleared as soon as the 114X module detects valid resolver signals. If you have a situation where electrical noise is causing spurious transducer faults that you can safely ignore, leave this parameter in its default condition. However, if you want to reliably capture these transient faults, then you must enable the Transducer Fault Latch parameter. In this case, you must send a Clear Error command to the 114X module to clear the fault.

- The default Transducer Fault Latch value is set to *Self Clearing*.

Tachometer Response

This parameter sets the time between tachometer updates. It *only* affects the update time of the velocity. It *does not* affect the update time of the position value, which is always 200 microseconds or 400 microseconds.

- The default Tachometer Response is 120 milliseconds.
- The Tachometer Response can be set to 120 or 32 milliseconds.

Tachometer Units

This parameter allows you to select between tachometer units of 1RPM or 0.1RPM. Because only whole numbers can be transferred to the input image table, a velocity value with units of 0.1RPM will appear to be 10 times the actual velocity. For example, if the resolver is rotating at 56.7 rpm, the velocity value reported in the input image table will be 567.

- The default Tachometer units is 1RPM.
- On 1142 modules, each channel can be programmed with its own Tachometer Units parameter.

Disable Channel

This bit level parameter allows you to disable channel 2 of an 1142 module. This parameter is useful if you are only using one single resolver transducer and do not want the 1142 to display a resolver errors on the second channel.

- The 1142 module's default setting has channel 2 enabled
- A disabled channel 2 will be enabled when its setup parameters are programmed.
- Setting the Disable Channel bit when programming the single turn channel one setup, or the dual resolver setup, will cause a Setup Word Error to be generated.

Reference Voltage Frequency

This bit level parameter allows you to choose the frequency of the reference voltage that is sent from the 114X module to the resolver. The default value of 5kHz will work in most instances. However, programming the reference voltage frequency to 2.5kHz may improve performance on systems with longer cables.

- The default Reference Voltage Frequency is 5kHz
- The Reference Voltage Frequency can be set to 5kHz or 2.5kHz
- This parameter affects both channels of 1142 and 1142A modules

Resolver Type

The *Resolver Type* parameter only exists on 1141A and 1142A modules and allows you to use them with Autotech transducers. On 1142A modules, the Resolver Type parameter will affect both channels of a 1142A module.

- The default Resolver Type value is *AMCI*.
1. Setting this parameter on 1141 or 1142 modules will cause a Setup Word Error to be generated.
 2. AMCI has bolt-in replacements for most Autotech transducers and we strongly suggest using them in place of Autotech transducers whenever possible.
 3. If you decide to keep the existing Autotech resolver, AMCI recommends that you replace the existing Autotech cable with the Beldin 9730, for single resolver transducers, or the Beldin 9731 for dual resolver transducers.
 4. You can bring both AMCI and Autotech single-turn resolvers into one unit. Set the Resolver Type to *AMCI* and install a RM-3 to interface the Autotech transducers.
 5. For more information on interfacing with Autotech transducer, see the AMCI's FAQ, "*Using Transducers From Other Manufacturers*", posted on our website, www.amci.com.

Input Functionality

The 114X's input can be configured to perform one of the following functions.

1. Measuring the Stop Time and the Brake Applied position of channel 1.
 2. Capture the current position data. The position data on both channels will be captured at the same time on 1142 modules.
 3. Apply the Preset to the channel 1 position data.
 4. The input status bit in the input image table can be configured to either indicate when the input is active, or to indicate when the input has transitioned. When configured to detect a transition, the input status bit will remain set until a command bit in the output image table is used to reset it. Please note that the operation of the input will still occur even if PLC has not sent the command to reset the input status bit.
- The default Input Functionality is measuring the Stop Time and Brake Applied position.
 - The default Input Status functionality is to indicate the active state of the input.

Input Polarity

The input can be programmed so that the desired operation occurs when the input transitions from ON to OFF or OFF to ON. Transitions in the other direction will be ignored.

- The default is On to OFF.
- In most press applications the brake activates when the brake signal is removed, ensuring that the press will stop if something happens to the controller.

Full Scale Count

The Full Scale Count specifies the total number of counts generated by the 114X. In the case of single turn transducers, it is the total number of counts over the one turn. In the case of multi turn transducers, it is the total number of counts over the transducer's number of turns.

For All Single-Resolver Transducers

- The default Full Scale Count is 8192.
- Range is 2 to 8192. Setting the Full Scale Count to 360 gives 1 degree resolution.

For AMCI Dual Resolver Multiturn Transducers

- Default value is (Number of Turns * 8192) if Transducer Type equals 100 or 180
- Default value is (Number of Turns * 819.2) if Transducer Type equals 1,000 or 1,800
- Range is 2 to (Default Value)

For Autotech Multi turn Transducers (Transducer Type equals 128)

- Default value is (Number of Turns parameter) * 1,024
- Range is 2 to (Default Value)

Preset Value

The Preset Value parameter allows you to set the value of the position data to any count value within its Full Scale Count range. The range of the Preset Value is 0 to (Full Scale Count - 1). Programming the Preset Value does not change the position data; it only sets the value that the position will change to when an *Apply Preset Command* is initiated, or when the correct transition of the input, configured to Apply the Preset, has been detected.

- The default Preset Value is equal to zero
- The Preset Value range is 0 to (Full Scale Count -1)

Transducer Type

(Multi turn Transducer Parameter Only)

The Transducer Type parameter exists for dual resolver multi-turn transducers only. This parameter does not exist on 1141 modules or on a channel that is programmed to be used with a single-resolver transducer. The Transducer Type parameter defines the type of multi-turn transducer attached to the module. The 114X needs this information in order to decode the multi-turn position correctly. This parameter also defines the values that can be programmed into the *Number of Turns* parameter.

- If the *Resolver Type* parameter is set to *AMCI*, the Transducer Type parameter can be set to 100, 180, 1,000, or 1,800.
- If the *Resolver Type* parameter is set to *Autotech*, the Transducer Type parameter must be set to 128.

Number of Turns

(Multi turn Transducer Parameter Only)

The Number of Turns parameter exists for dual resolver multi-turn transducers only. This parameter does not exist on 1141 modules or on a channel that is programmed to be used with a single-resolver transducer. The maximum number of turns that a dual resolver multi-turn transducer can encode is fixed by the gearing inside of it. However, the 114X has the ability to divide this maximum number of turns into smaller multi-turn cycles. The unit does this without loss of absolute position within the smaller cycle. For example, the 180 turn mechanical cycle of an HTT-20-180 can be broken down into three electronic cycles of sixty turns each. The 180 turn cycle could also be broken down into sixty cycles of three turns each.

The range of values for the Number of Turns parameter is dependent on the value of the *Transducer Type* parameter.

- **When Transducer Type = 100:** Number of Turns is programmable to 1, 2, 4, 5, 10, 20, 25, 50, or 100.
- **When Transducer Type = 180:** Number of Turns is programmable to 1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 30, 36, 45, 60, 90, or 180.
- **When Transducer Type = 1,000:** Number of Turns is programmable to 10, 20, 40, 50, 100, 200, 250, 500, or 1,000.
- **When Transducer Type = 1,800:** Number of Turns is programmable to 10, 20, 30, 40, 50, 60, 90, 100, 120, 150, 180, 200, 300, 360, 450, 600, 900, or 1,800.
- **When Transducer Type = 128:** Number of Turns is programmable to 1, 2, 4, 8, 16, 32, 64, or 128.

Chapter 4: Backplane Programming

The 114X module is programmed over the backplane through the input and output words assigned to it. Because these words are constantly updated, the 114X 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.

- a. 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.
- b. Set the Transmit bit. A Programming Cycle is initiated when this bit makes a 0 to 1 transition.
- c. 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.
- d. Once you see the Acknowledge Bit set, check for any errors. The error bits are only valid while the Acknowledge Bit is set.
- e. Respond to any errors and reset the Transmit Bit.
- f. The 114X module responds by resetting the Acknowledge Bit. The Programming Cycle is complete.

Sample Programs

Sample programs demonstrating the Programming Cycle described above can be downloaded from the following page of our website.

<http://www.amci.com/sampleprograms.asp>

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 bit set during a programming cycle, or if the input that has been configured to Apply the Preset transitions from inactive to active, the 114X module calculates an offset and stores this value in the EEPROM, using one of the available 100,000 write cycles. If your application requires you to continuously Apply the Preset Value, consider doing this in the PLC instead of the 114X module.

A FAQ showing how to calculate and apply a preset value is located on the following page of our website.

<http://www.amci.com/faqs.asp>

Input Registers: (Eight 16 bits words sent from the 114X module to the PLC)

The following table shows the input data format for 1141 module.

Input Data for 1141 or 1141A modules

16 bit Word	Function	Units
0	Status Word	See description below
1	Position channel 1	Counts
2	Velocity channel 1	RPM or 0.1RPM
3	0	
4	0	
5	Stop Time or Channel 1 Capture Value	Milliseconds or Counts
6	Brake Applied Position	Counts
7	0	0

- Depending on how the module's input is configured to be used, Word 5 will report either the Stop Time or the Channel 1 Capture Value.
- Word 6 will be zero if the input has been configured to capture the channel 1 position.
- Words 5 and 6 will be reset to zero at power up or after a programming cycle.

The 1142 module has two possible configurations. It can be configured to interface to two Single Resolver Transducers, which includes the HT-20, H25-XX, and the HT-20-X series, or one Dual Resolver Multiturn transducer, which includes the HTT-20-X series.

**Input Data for 1142 or 1142A modules configured to
use two single turn resolvers**

16 bit Word	Function	Units
0	Status Word	See description below
1	Position channel 1	Counts
2	Velocity channel 1	RPM or 0.1RPM
3	Position channel 2	Counts
4	Velocity channel 2	RPM or 0.1RPM
5	Stop Time or Channel 1 Capture Value	Milliseconds or Counts
6	Brake Applied Position or Channel 2 Capture Value	Counts
7	0	0

- Depending on how the module's input is configured to be used, Word 5 will report either the Stop Time or the Channel 1 Capture Value.
- Depending on how the module's input is configured to be used, Word 6 will report either the Brake Applied Position or the Channel 2 Capture Value. Because there is only one input, the channel 1 and channel 2 positions will be captured at the same time.
- Words 5 and 6 will be reset to zero at power up or after a programming cycle.

Single Resolver Transducer Input Data Notes

- Input words 3 and 4 will be zero when channel 2 is disabled
- The Stop Position reflects the position of Resolver 1 when the Brake Input is applied and the Stop Time reflects the time in milliseconds from the active edge of the Brake Input until the position change of Resolver 1 is less than 8 counts out of 8192 counts/turn for 125mS

Input Data for 1142 or 1142A modules configured to use one Dual Resolver Transducer

16 bit Word	Function	Units
0	Status Word	See description below
1	Upper 3 digits position	Counts
2	Lower 3 digits position	
3	Velocity	RPM or 0.1RPM
4	Not used	
5	Upper 3 digits captured position	Counts
6	Lower 3 digits captured position	
7	Not used	

Dual Resolver Transducer Input Data Notes

- When configured to read the position data from a dual resolver transducer, the 114X module reports the position data in two words. The upper word contains the thousands places and the lower word contains the 100s, 10s, and 1s places. For example, if the position value is 12,345, than the upper word would contain 12, and the lower word would contain 345. Multiply the upper word by 1000 and add the lower word to it to combine these two values into one register.

Status Word (Input Word 0)

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	Bit 00
Acknowledge Bit	Ch 1 Transducer Fault	Ch 2 Transducer Fault	Input Status	Ch 2 Velocity at zero	Ch 1 Velocity at zero	Command Error	Message Ignored	Number of Turns Error	Transducer Type Error	Ch 2 Preset Value Error	Ch 2 Full Scale Count Error	Ch 2 Setup Word Error	Ch 1 Preset Value Error	Ch 1 Full Scale Count Error	Ch 1 Setup Word Error



The next two pages contain a more detailed description of each of the Status Word's bits.

Setup Word Error: Set under the following conditions

1. Set if any of the reserved bits are set in the setup word
2. Set if the Disable Channel Bit (bit 4) is set when either the channel 1 single resolver transducer setup or the dual resolver transducer setup are sent to the module.
3. Attempting to set the Resolver Type parameter on an 1141 or an 1142 module.
4. Setting any of the Input Configuration bits, setup word bits 8 to 11, when programming channel 2 of an 1142 module.

Full Scale Count Error: Set under the following conditions

1. Set if the Full Scale Count is outside of the range of 2 to 8192 for single resolver transducers.
2. Set if the Full Scale Count is outside of the range of (2 to 8192 * Number of Turns) for HTT-20-100 and HTT-20-180 AMCI dual resolver transducers.
3. Set if the Full Scale Count is outside of the range of (2 to 819.2 * Number of Turns) for HTT-20-1000 and HTT-20-1800 AMCI dual resolver transducers.
4. Set if the Full Scale Count is outside of the range of (2 to 1024 * Number of Turns) for Autotech RL210 dual resolver transducers.
5. Set if the lower word of a Dual Resolver transducers Full Scale Count is outside of the range of 0 to 999.

Preset Value Error:

1. Set when the Preset Value is outside the range of 0 to (Full Scale Count – 1).
2. Set if when using the Input to Apply the Preset, the module fails to store the new offset data in the EEPROM.

Transducer Type Error:

Dual Resolver Transducer Programming Error on 1142 modules only. This bit is set if the transducer type is not equal to 100, 180, 1000, or 1800 if the module is configured for AMCI transducers, or 128 if the module is configured for Autotech transducers. This bit will always be reset when the module is being used with two single resolver transducers.

Number of Turns Error:

Dual Resolver Transducer Error on 1142 modules only. This bit is set if the number of turns is invalid for the transducer type selected. This bit will always be reset when the module is being used with two single resolver transducers.

Message Ignored: Set under the following conditions

1. This bit will be set if you attempt to program the module if a programming error exists on a different channel. For example, if you attempt to program channel 2 when there is a channel 1 Full Scale Count Error.
2. If you try to Apply the Preset Value to a channel that is in transducer fault.
3. If while programming the resolver setup or Applying the Preset, the module fails to store the new data in the EEPROM.

Command Error: Set under the following conditions

1. Set if more than one of the Command Bits 2, 3, or 4 are set at one time.
2. Set if any of the reserved command word bits are set.
3. Set if the Apply Preset Channel 2 bit is set when channel 2 has been disabled or if the 114X module has been configured for a Dual Resolver Transducer.
4. If there is a value in any of the unused output words.
5. Setting the transmit bit without setting any other command bits.
6. Programming channel 2 on an 1141 or an 1141A module.
7. Attempting to Apply the Preset of channel 2 of an 1141 module.
8. Attempting to program the dual resolver setup of an 1141 or 1141A module.

Velocity At Zero:

This bit will be set if there if the calculated velocity data is less than 1rpm.

Input State:

This state of this bit will depend on how the Input Polarity and input functionality parameters have been programmed.

- For ON to OFF functionality, this bit will be set when power is removed.
- For OFF to ON functionality, this bit will be set when power is applied.
- For Input Latch functionality, this bit will be set by a transition of the input as defined by the input polarity, and will remain set until a command to reset is received from the output image table.

Transducer Fault:

This bit will be set if a transducer Fault has been detected. Possible causes are a miss wired cable, an incompatible resolver transducer, a faulty transducer, or a faulty 114X module. A document showing *How Do I Test an AMCI Resolver System* to determine which of the previous is the cause of the Transducer Fault is available from the FAQ section of our website. <http://www.amci.com/faqs.asp>

Acknowledge Bit:

This bit is set whenever the Transmit Bit in the Output Registers is set and indicates that the 114X module has received the new programming data. The 114X module will reset this bit when it detects that the Transmit Bit has been reset, and the module is ready to accept new commands and or programming data from the PLC.

Output Registers: (Eight 16 bit words sent from the PLC to the 114X module)

The 114X has two possible configurations. It can be configured to use two Single Resolver Transducers- which includes the HT-20, H25-XX, and the HT-20-X series- or one Dual Resolver Multiturn transducer, which includes the HTT-20-X series.

The following two tables show the Output Data format for the two possible configurations.

Output Data for Single Resolver Transducers

16 bit Word	Function	Range	Default
0	Command Word	See Description Below	
1	Setup Word	See Description Below	
2	Full Scale Count	2 to 8192	8192
3	Preset Value	0 to (Full Scale Count – 1)	0
4	0	0	
5	0	0	
6	0	0	
7	0	0	

Two programming cycles will be necessary to program both channels when it has been configured to use two single resolver transducers

Output Data for Dual Resolver Transducer

16 bit Word	Function	Range	Default
0	Command Word	See Description Below	
1	Setup Word	See Description Below	
2	Transducer Type	For AMCI: 100,180,1000,1800 For Autotech: 128	100
3	Number of Turns	For Type 100: 100,50,25,20,10,5,4,2,1 For Type 1000: 1000,500,250,200,100,50,40,20,10 For Type 180: 180,90,60,45,36,30,20,18,15,12,10,9,6,5,4,3,2,1 For Type 1800: 1800,900,600,450,360,300,200,180,150,120, 100, 90,60,50,40, 30,20,10 For Type 128: 128,64,32,16,8,4,2,1	100
4	Upper Full Scale Count	For AMCI (Type 100,180): 2... (Number of Turns)*8192	409,600
5	Lower Full Scale Count	For AMCI (Type 1000,1800): 2... (Number of Turns)*819.2 For Autotech (Type 128): 2...(Number of Turns)*1024	
6	Upper Preset Value	(0 to (Full Scale Count – 1))	0
7	Lower Preset Value		

Command Word (Output Word 0)

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	Bit 00
Transmit Bit	Clear Errors	0	0	0	0	0	0	Clear Latched Input Capture Flag	0	0	Program Dual Resolver setup	Program Single Resolver Ch 2 setup	Program Single Resolver Ch 1 setup	Apply Preset Channel 2	Apply Preset Ch 1 or Dual Resolver Transducer

Setup Word (Output Word 1)

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	Bit 00
0	0	0	0	Input Polarity 0 = ON to OFF, 1 = OFF to ON	Latching Input Flag 0 = Input Status, 1 = Input Elase	Input Function (see Programming notes below)		0	Tachometer Units 0 = IRMP, 1 = 0.1 RPM	Reference Voltage Frequency (0 = 5KHz, 1 = 2.5KHz)	Ch 2 Single Setup Only 0 = enable ch 2, 1 = disable ch2	Resolver Type (0 = AMCI, 1 = Autotech)	Transducer Fault Latch (0 = self clearing, 1 = latched)	Velocity Update (0 = 120ms, 1 = 32ms)	Count Direction (0 = CW, 1 = CCW)

Programming Notes

1. All of the setup parameters must be present each time a programming block has been sent to the unit.
2. Programming the setup parameters will clear the internal offset generated by an Apply Preset operation.
3. Programming the setup parameters and or issuing the clear error command will reset the stop time, brake applied position, or the captured position values.
4. Resolver Type Bit 3 only exists on 1141A and 1142A modules. Setting this bit on 1141 or 1142 modules will cause a Setup Word Error to be generated.
5. The Disable Channel 2 bit only exists on 1142modules and in the channel 2 single resolver setup word. This bit is reserved on 1141 modules and in both the channel 1 single resolver setup word and the dual resolver setup word of 1142 modules.
6. The Input Functions defined by bits 8 to 11 only exist on the channel 1 setup word, or in the setup word of a Dual Resolver Transducer.

Programming Notes continued on the next page

-
7. The input functionality defined by bits 8 and 9 have the following functions.

Bit 9	Bit 8	Input Function
0	0	Stop Time and Brake Applied Position, channel 1 only. This functionality will have no effect on an 1142 module configured to work with a Dual Resolver Transducer.
0	1	Capture current position, both channels of a 1142
1	0	Apply Preset Channel 1 or Dual Resolver Position
1	1	Reserved

8. For Dual Resolver Transducer setup, the Full Scale Count and Preset values are divided into two words. The upper word contains the thousands places and the lower word contains the 100s, 10s, and 1s places of the values. For example, if the Full Scale Count value is 123456, than the upper word would contain 123, and the lower word would contain 456.
9. If the 1142 module has been programmed to work with two Single Resolver transducers, programming the Dual Resolver Transducers setup will immediately cause the module to begin reporting the Dual Resolver Transducer data.

If the 1142 module has been programmed to work with a Dual Resolver Transducer, programming either of the Single Resolver Setups will immediately cause the module to begin reporting Single Resolver Transducer data.

10. Programming the Reference Voltage Frequency on either of the channels will affect both channels.
11. The default reference voltage frequency of 5kHz will work in most instances. However, programming the reference voltage frequency to 2.5kHz may improve performance on systems with longer cables.
12. Programming the Resolver Type parameter on either of the channels will affect both channels. If you have to use one AMCI and one Autotech resolver, set the module for AMCI and use a RM-3 reference module between the 114X module and the Autotech resolver.

Chapter 5: Manual Revision History :

Revision 0.0 was created on 3/1/10 and was the initial release of the specifications.

Revision 1.0 was created on 10/15/10. The following changes were made.

- Corrected incorrect wiring diagrams for the 1142 dual resolver and Autotech 128 turn wiring.
- Corrected the reversed channel 1 and channel 2 transducer fault bits.
- Made the disable channel 2 programming function clearer.

File: 1141_1142_manual.doc
Date: 10/15/10