CIR-24NG CUSTOMER INTERFACE RELAY INSTRUCTION SHEET

Premium Solid State

INPUT LED's

TB1

2 1 N G K Y Z K Y Z
7 2 E N INPUT INPUT
7 0 U D #1 #2
V V

BLK WHT GRN

Optimal entrance location for line voltage conductors

POWER CONNECTION (For 120VAC)

USB Programming Port

UTILITY COMPARTMENT

INPUT FROM METER #2
INPUT FROM METER #1

OVERFLOW LED's
1 2 3 4

1/4 AMP Fuses F1 F2

OUTPUT LED's
RED GRN RED GRN RED GRN RED GRN

TB2
Y K Z Y K Z Y K Z Y K Z
1 1 1 2 2 2 3 3 3 4 4 4

1/4 AMP Fuses F3 F4

***** OUTPUT RATINGS *****
Voltage: 250VAC/VDC
Current: 180mA
Max. Power Dissipation: 1500mW
@ 70C

CUSTOMER COMPARTMENT

OUTPUT #1
OUTPUT #2

OUTPUT #4
OUTPUT #3

CUSTOMER'S TERMINALS

MOUNTING POSITION - The CIR-24NG may be mounted in any position. Four mounting holes are provided.

POWER INPUT - For 120VAC power, connect the CIR-24NG to the 120V and NEU terminals. Connect the 120VAC "hot" lead to the **120V** terminal. For 208 to 277 VAC operation, use the 277V and NEU terminals. Connect the 277VAC "hot" lead to the **277V** terminal. Connect the **NEU** terminal to neutral. Connect the **GND** terminal to the electrical system ground. Use either L1 **OR** L2, but not both. The CIR-24NG must be wired Phase to Neutral, not Phase to Phase. If no true neutral is available, connect both the NEU and GND terminals to the electrical system ground. The GND terminal MUST be connected. DO NOT leave the GND terminal unconnected.

METER CONNECTIONS - The CIR-24NG is designed for 2-Wire (Form A) or 3-Wire (Form C) inputs. For 2-Wire (Form A) inputs, connect the K and Y wires from the meter. For 3-Wire (Form C) inputs, connect all three wires, K, Y and Z. As appropriate and required for your application, connect the K, Y, & Z leads from Meter #1's dry contact pulse output to the K, Y, & Z terminals on INPUT #1 of the terminal strip in the utility compartment. Connect Meter #2 to K, Y and Z terminals of Input #2. The Y and Z input terminals provide a "pulled up" sense voltage of +13VDC to the meters' "Y" and "Z" terminals. The CIR-24NG's "K" input terminals provide a common return. The CIR-24NG's KYZ inputs are compatible with electromechanical or solid state pulse initiators. When using an open-collector transistor output or open-drain FET to interface a meter with the CIR-24NG, the transistor's emitter pin or the FET's *source* pin must be connected to the K input terminal. The transistor's collector or the FET's *drain* pin must be connected to the Y or Z input terminals.

INPUT CONFIGURATION - The CIR-24NG's meter inputs are programmable and may be configured as either 2-Wire (Form A) or 3-Wire (Form C). See Page 3 for configuring the CIR-24NG's inputs.
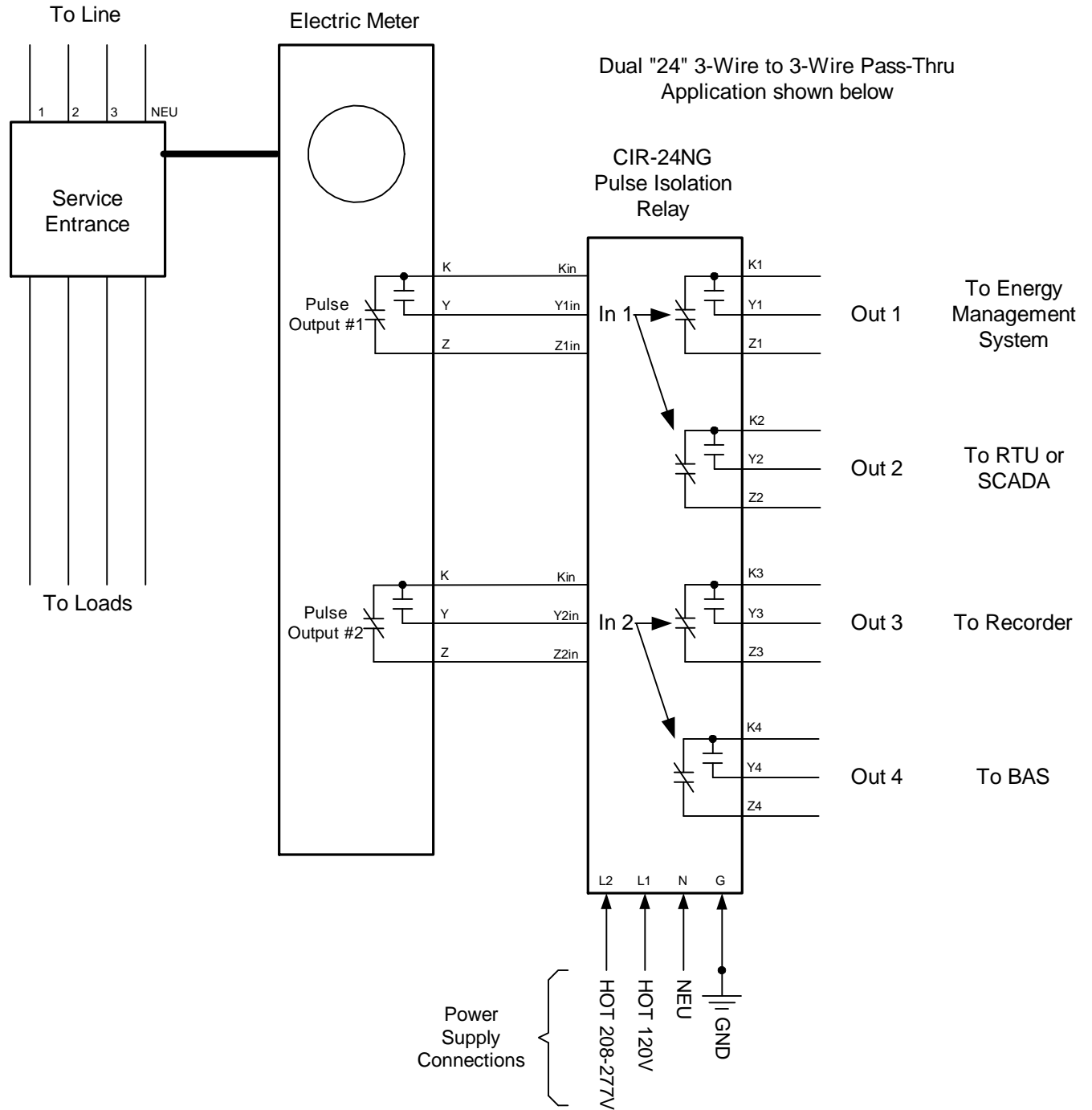
OUTPUT CONFIGURATION - The CIR-24NG's outputs are programmable and may be configured as either 2-Wire (Form A) or 3-Wire (Form C). See Page 3 for configuring the CIR-24NG's outputs.
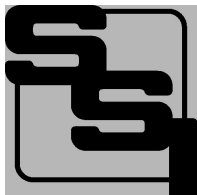
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CIR-24NG Wiring Diagram

To Line

Electric Meter

Dual "24" 3-Wire to 3-Wire Pass-Thru
Application shown below

CIR-24NG
Pulse Isolation
Relay

Service
Entrance

1 2 3 NEU

To Loads

Pulse
Output #1

K   Kin
Y   Y1in
Z   Z1in

In 1

K1
Y1
Z1

Out 1

To Energy
Management
System

K2
Y2
Z2

Out 2

To RTU or
SCADA

Pulse
Output #2

K   Kin
Y   Y2in
Z   Z2in

In 2

K3
Y3
Z3

Out 3

To Recorder

K4
Y4
Z4

Out 4

To BAS

L2 L1 N G

HOT 208-277V   HOT 120V   NEU   GND

Power
Supply
Connections

CIR-24NGWiringDiagram.vsd

PULSE INPUTS - Two 2-Wire (Form A) or 3-Wire(Form C) pulse inputs are provided on the CIR-24NG. Each input may be independently programmed as either a Form A or C input. Determine the interface - 2-Wire or 3-Wire - you will be using with the meter and connect either K and Y for Form A, or K, Y and Z for Form C to the inputs. Each input supplies the +13VDC wetting voltage to the meter's dry-contact outputs so no external power supply is needed. Observe polarity if using a Bi-Polar open-collector transistor or open-drain FET transistor to drive the inputs of the CIR-24NG, where the Y and Z terminals are positive (+) and the K terminal is negative (-). Each Y input has a RED LED above the Y input terminal to show when the Y input is active. Each Z input has a GREEN LED above the Z input terminal to show when the Z input is active.

OUTPUTS - Four three-wire isolated outputs are provided on the CIR-24NG, with output terminals K1, Y1 & Z1; K2, Y2, & Z2; K3, Y3 & Z3; and K4, Y4 & Z4 and are located in the bottom of the enclosure in the customer compartment. Outputs are solid state dry-contact type and must be provided with a wetting voltage from an external source, usually provided by the pulse receiving device. Contacts are rated at 120VAC/VDC MAX and current limited to 180mA. Transient suppression for the contacts of the solid state relays is provided internally. Each relay must be assigned or "mapped" to one of the two input channels, using the SSI Universal Programmer V1.1.0 or later. The CIR-24NG's outputs may be configured as either a Form A or Form C output. The Form C (3-Wire) output is the classic "Toggle" output where a pulse is defined as a change-of-state from K-Y continuity to K-Z continuity or visa versa. LEDs on each output show the output's status. In Form C output mode, RED and GREEN LEDs indicate the K-Y closure or K-Z closure, respectively. In the Form A output (2-Wire) "Fixed" mode, only the K and Y output terminals are used. The RED LED indicates a K-Y closure. In the Form A output mode, the duration of the closure is programmed for a fixed time or pulse width. There are 8 different pulse widths available.

FORM A PULSE WIDTHS - 8 different pulse widths for Form A closures are available as follows: 50, 100, 200, 500, 1000, 2000, 5000, and 10000 mS. The fixed output length can be disabled by entering Disabled from the pulldown list. When the fixed length is disabled the output pulse width mirrors the input pulse width, so it is the same.

MAXIMUM POWER DISSIPATION OF OUTPUTS - Output devices are rated at a maximum of 1500 mW. Care should be taken to insure that the wetting voltage used across the output device times the current (or burden) of the input of the downstream device, does not exceed the maximum power output dissipation of 1500mW. Normally this is not a problem since most downstream instrumentation devices are high impedance and present a very low burden, usually less than 10mA. For example, if 120VAC is used, the maximum allowable current across the output is 12.5 mA. If 12VDC is used, the maximum current allowable across the output is approximately 125mA, well under the 180mA current rating of the device. Therefore, the maximum dissipation when using 12V is 1500mW since the current is limited to .125 Amp. Calculate the maximum current using the following formula: 1500milliWatts / Voltage = Max. Current (burden) in milliamps. Adjust the voltage or current used across the output to insure that the maximum power dissipation, voltage and current maximums are not exceeded.

FUSES - Each output has its own Fuse rated at 250mA F1, F2, F3 and F4 correspond to outputs 1, 2, 3, and 4, respectively. Maximum fuse ratings are designated on the silkscreen under or adjacent to each fuse position.

OPERATING MODES - The CIR-24NG has five operating modes as follows:
      1.) Form C In/Form C Out - Pass thru; Output closure time equals Input closure time.
      2.) Form A In/Form A Out - Pass thru; Output closure time equals Input closure time.
      3.) Form A In/Form A Out - Pass thru with Fixed Width Output timing.
      4.) Form A in/Form C Out - Conversion Mode; Output Changes each time the input changes.
      5.) Form C In/ Form A Out - Conversion Mode with Fixed Width Output timing.
These modes are assignable by the designated Input and Output Combination programmed into the CIR-24NG. Each output is therefore assigned a mode based on the Input Form, the Output Form and the pulse width assigned, if applicable. Since each output is independently assignable, two or more outputs mapped to an input can operate in different modes.
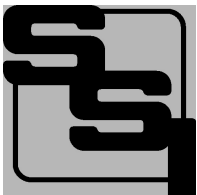
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WORKING WITH THE CIR-24NG RELAY

OPERATING MODES: The CIR-24NG Programmable Customer Interface Relay has 5 operating modes. Three are "**Pass-Thru**" modes while two are "**Conversion**" modes.

Mode 1 - Form C In/Form C Out: In this Pass-Thru mode, both the input and the output are set to Form C (3-wire) mode. The Form C output(s) follow the Form C input. Output pulse widths equal the input pulse widths. The RED dot shown in the timing figures indicate a K-Y closure and the output's RED LED is on. The Green dot in the timing figures indicate a K-Z closure and the output's Green LED is on.

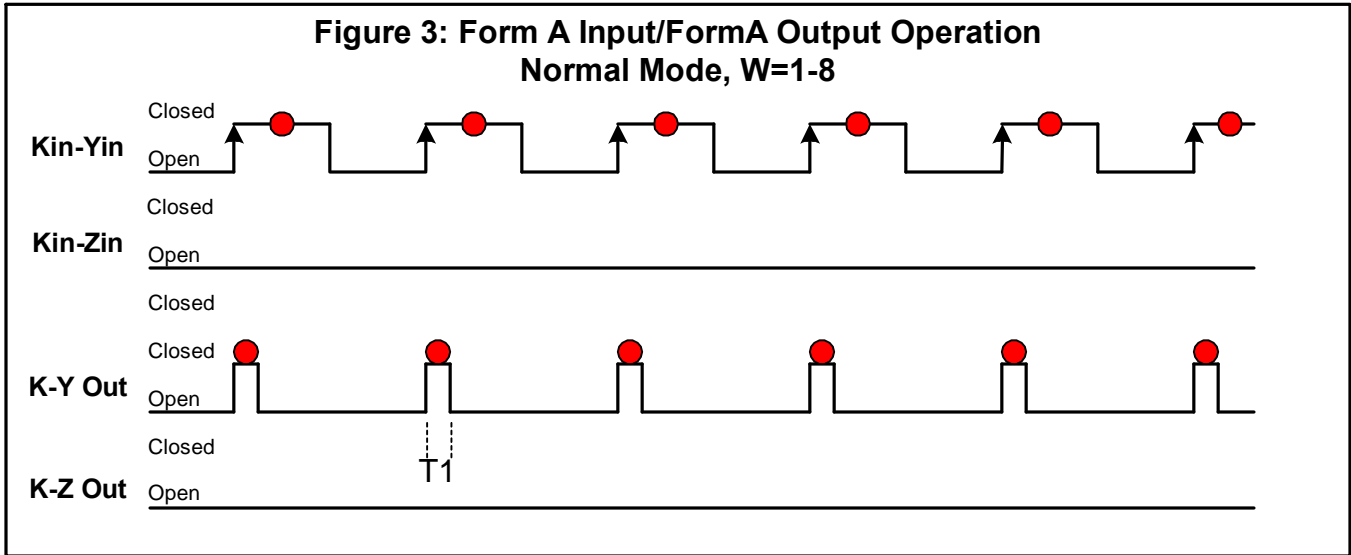**Figure 1: Form C Input/Form C Output Operation**

Default Mode
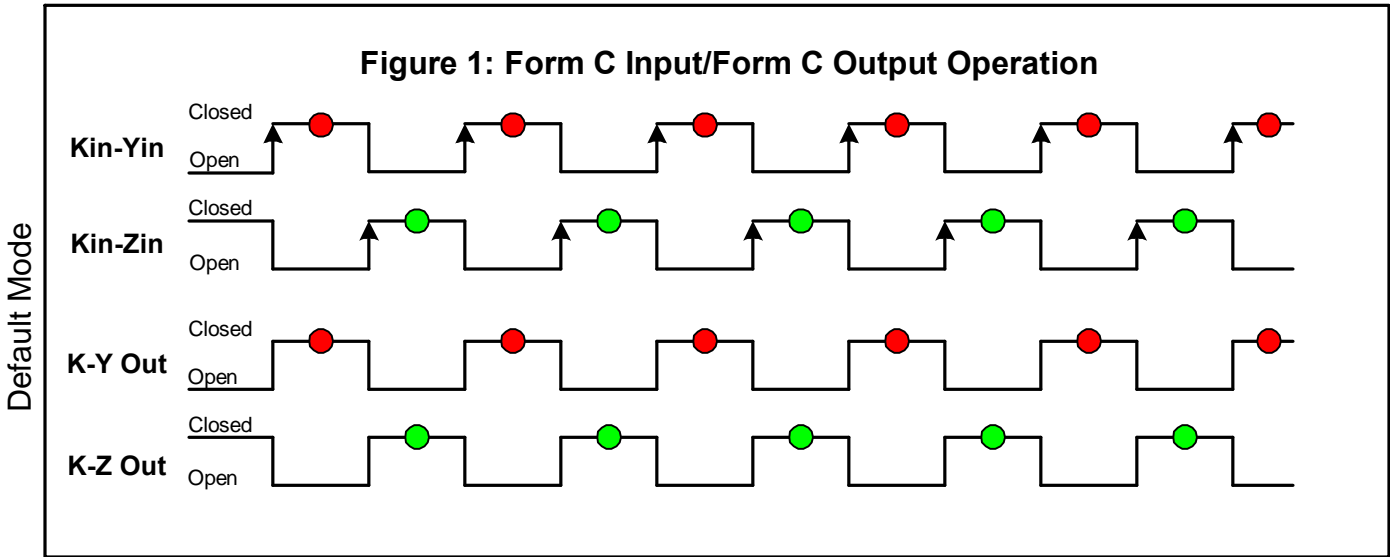
Mode 2 - Form A In/Form A Out: In this Pass-Thru mode, both the input and the output are set to Form A (2-wire) mode and the fixed Output Pulse Width is disabled. The Form A output(s) follow the Form A input. Output pulse widths equal the input pulse widths.

Figure 2: Form A Input/FormA Output Operation
Normal Mode
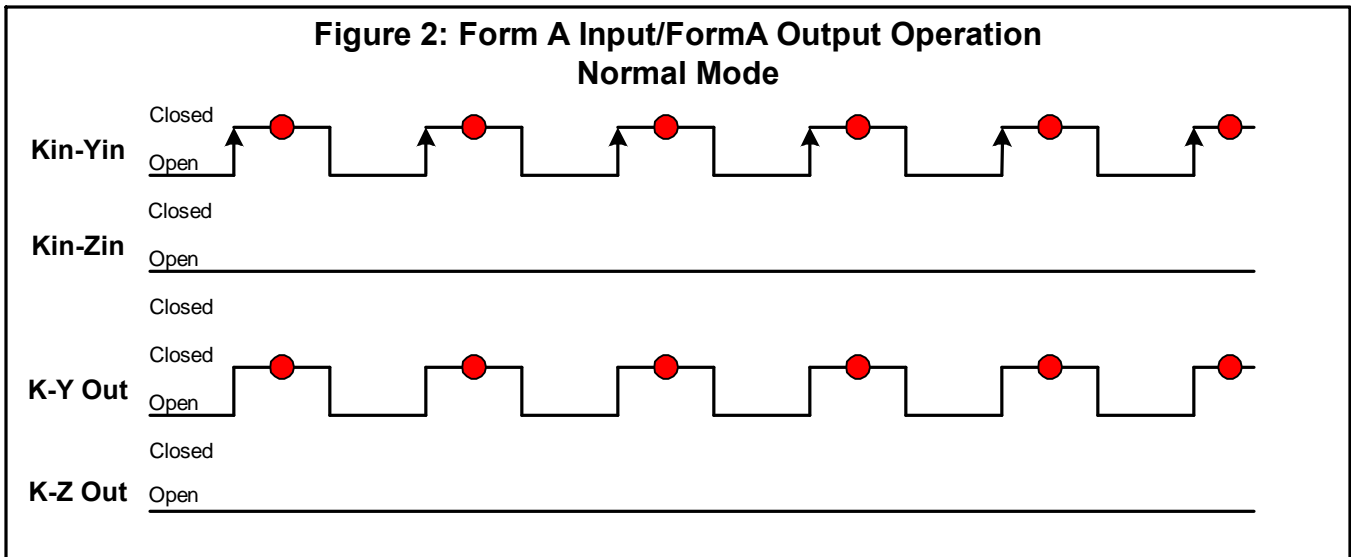
* Zin is not used in the 2-wire (Form A) input mode.

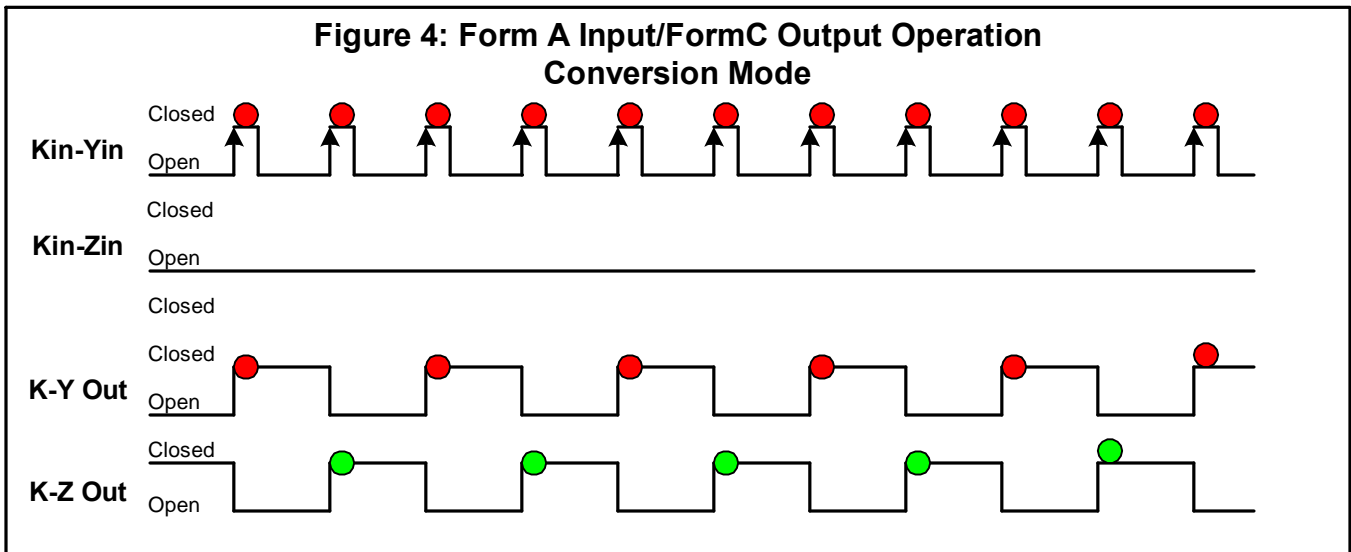Contact the factory for technical support at (888)272-9336.

WORKING WITH THE CIR-24NG RELAY(con't)

Mode 3 - Form A In/Form A Out with fixed Output Pulse Width: In this Pass-Thru mode, both the input and the output are set to Form A (2-wire) mode. The Form A output(s) follow the Form A input, but close for the selected pulse width duration.

Figure 3: Form A Input/FormA Output Operation
**Normal Mode, W=1-8**

In this mode the Form A output is set to 50mS, up to 10,000mS, so output pulses are a fixed width as defined by the Pulse Width entry box. If input pulses are faster than output pulses, an overflow can occur in this mode. That means that output pulses cannot keep up with input pulses because of the timing constraints of the fixed pulse width. In the event that this happens, the Overflow LED corresponding to the output(s) affected would come on. Pick a shorter Output Pulse Width or disable the fixed pulse width, then click on <Send Parameters>, and then click on <Reset Overflow>.

Mode 4 - Form A In/Form C Out: In this Conversion mode, the Input is set to Form A (2-Wire) and the output is set to Form C (3-wire). Upon each closure of the Form A input, the Form C output changes state to the opposite state. This conversion function allows the input and output pulse values to be equal.

Figure 4: Form A Input/FormC Output Operation
Conversion Mode

Contact the factory for technical support at (888)272-9336.

Mode 5 - Form C In/Form A Out with fixed Output Pulse Width: In this Conversion mode, the input is set to Form C (3-Wire) and the output is set to Form A (2-wire). The Form A output(s) gives a fixed width pulse upon the change of state of the Form C input. An overflow may occur if the pulse rate is too high and the output pulse width is too long. This conversion function allows the input and output pulse values to be equal.

Figure 5: Form C Input/Form A Output Operation (W1-8) Conversion Mode
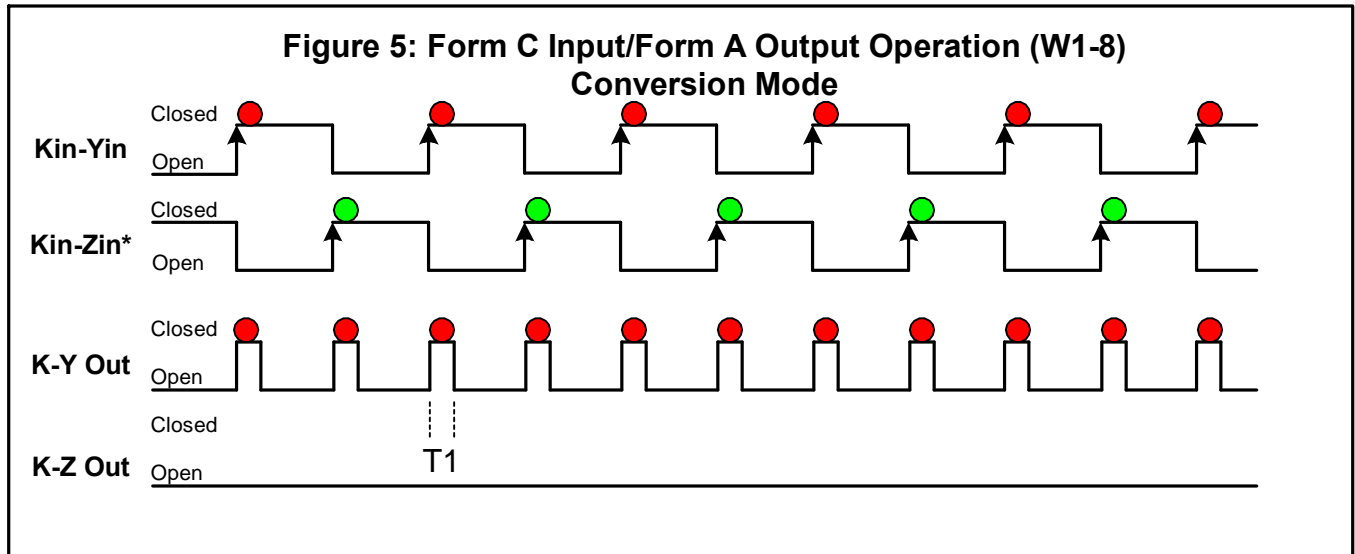
In this mode the Form A output is set to a fixed pulse width. The Fixed Pulse Width cannot be disabled in this mode as it is an illegal condition. The output must be programmed with a fixed output pulse width. If an overflow occurs, shorten the output pulse width time.

Mapping each Output to an Input: The four outputs of the CIR-24NG must be assigned, or "mapped", to an input that they follow. Any output may be mapped to either input. Common configurations are the "13+11" where outputs 1 through 3 are mapped to Input #1; Output #4 is mapped to Input #2. This configuration is common when multiple devices each receive the same isolated pulse on outputs #1 to #3 and an End-Of-Interval pulse is on output #4.

All four outputs may be assigned to one input giving four isolated contacts. The unused input may be disabled.

Another popular configuration is the "24" where two outputs each follow one input. For example outputs #1 and #2 follow input #1 and outputs #3 and #4 follow Input #2. This configuration is used for delivered and received kWh pulses, or for kwh and kVARh pulses.

The factory default configuration is as follow:
Outputs #1 and #2 are mapped to input #1, Form C Input/Form C Outputs
Outputs #3 and #4 are mapped to Input #2, Form C Input/Form C Outputs

Contact the factory for technical support at (888)272-9336.

SSI Universal Programmer

The SSI Universal Programmer is a windows-based programming utility for the CIR-24NG Series and other SSI products. Download the SSI Universal Programmer from the SSI website at www.solidstateinstruments.com/sitepages/downloads.php. There are two versions available for download:
Windows 10 and Windows 7 64-bit Version 1.1.0 or later
Windows 7 32-bit V1.1.0 or later
If you are using Windows 7, check your computer first to insure you download the right version.
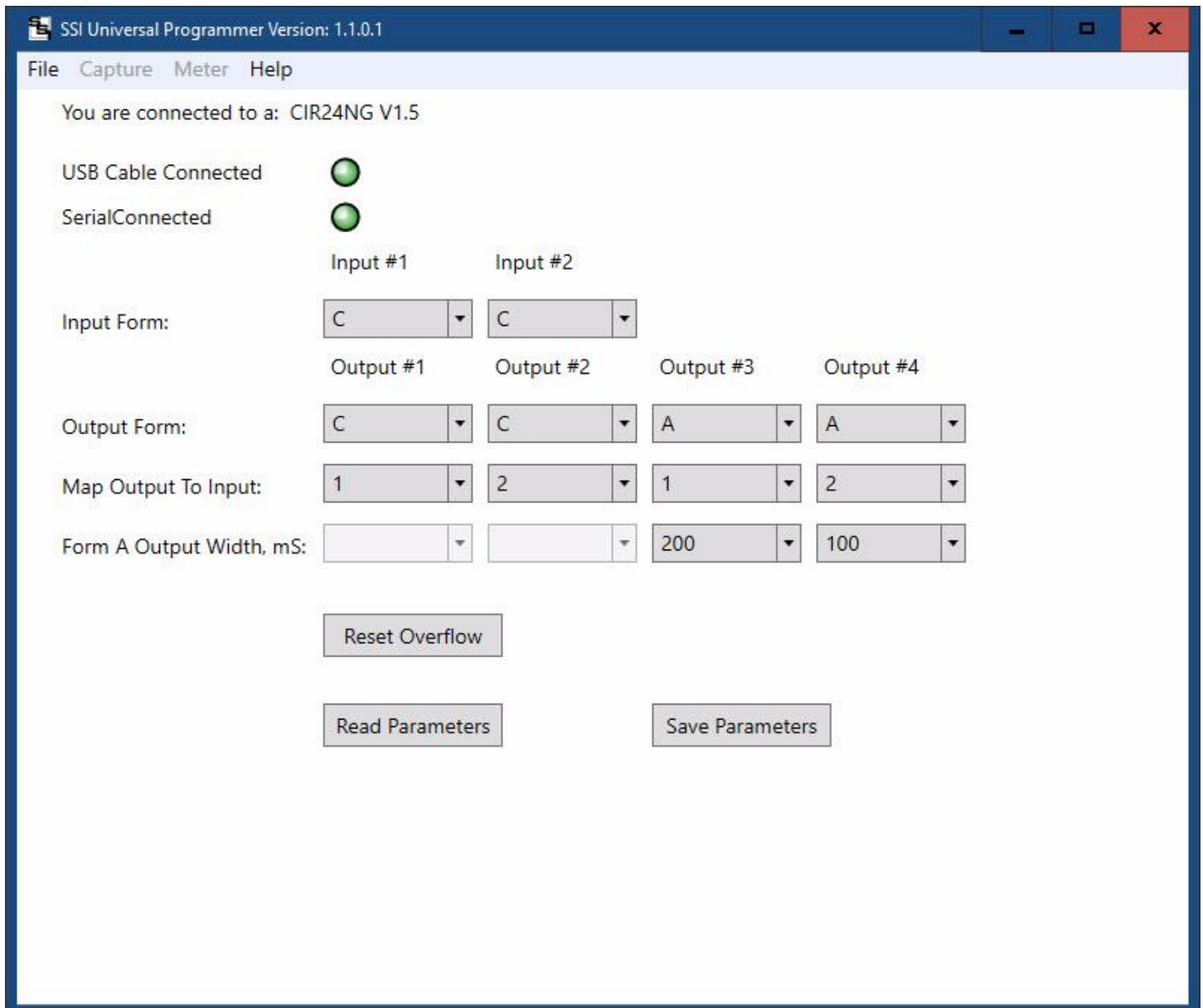
Reset Factory Defaults- You can reset the CIR-24NG to the factory defaults by pulling down the File menu and selecting Reset Factory Defaults. This will put the CIR-24NG back into Operating Mode #1.

CIR-24NG Programming

Setting the CIR-24NG's Settings

Set the CIR-24NG's input and output pulse types, input to output mapping and the pulse timing by using the USB [Type B] Programming Port on the CIR-24NG board. All system settings are configured using the USB Programming Port. Download the **SSI Universal Programmer** software V1.1.0 or later, available as a free download from the SSI website.   Alternately, the MPG-3 can be programmed using a terminal program such as TeraTerm. See "Setting up the Serial Port" on Page 9.

Programmer Startup

Before starting the program connect the USB cable between your computer and the CIR-24NG. Make sure that the CIR-24NG is powered up. Click on the SSI Universal Programmer icon on your desktop to start the program. In the upper left corner you will observe two Green simulated LEDs, one indicating that the USB cable is connected and the other that the CIR-24NG is connected to the programmer. Make sure both Green LED's are "lit" .

USB Cable Connected: 🟢

Serial Connected: 🟢

Input Form

The CIR-24NG has two inputs. Each input can be designated as a Form A (2-Wire) or Form C (3-Wire) input. Set the each input for the number of wires (or "form") that is connected to the meter. If three wires are coming from the meter set the input to Form C. If only two wires are used, set to Form A. Use the pull-down menu to select the correct input Form. See the screen shot of the SSI Universal Programmer on Page 7.   Once you have selected the desired input Forms click <Save Parameters>.

Output Form

The CIR-24NG has four independent 3-Wire outputs. Each output can operate in the legacy 3-Wire (Form C) mode or the 2-Wire (Form A) mode. Red and Green Output LEDs show the pulse output status. See additional information on Page 5. Use the **Output Form** pull-down menus for each output and select "**C**" in the pulldown and click <Save Parameters>.

Use the **Output Form** box to enter "**A**" to select the FORM A Fixed mode. In the Fixed mode, only the K-Y output is used. This is the standard 2-Wire system where the output contact is normally-open until such time as a pulse is generated. When a pulse is generated, the contact is closed for either the same duration as the input or for a the fixed time interval, in milliseconds, selected in the Form A Width box. Form A mode is generally associated with Energy (kWh) measuring systems.   Select "A" in the **Output Form** pulldown box and click <Save Parameters>.

Form A Pulse Width

If you are using an output of the CIR-24NG's in the Form A (Fixed) Mode, set the output closure time or pulse width, selectable at **25mS, 50mS, 100mS, 200mS, 500mS,1000mS, 2000mS, 5000mS or 10000mS** (1 second) using the Form A Width box. Upon a pulse being generated, the K-Y terminals of a Form A output will close for the selected number of milliseconds and light the RED Output LED only. This setting applies only to the Form A output mode, and does not affect the toggle output mode. Use the shortest closure time possible that will be reliably received by the pulse receiving equipment, so as not to unnecessarily limit the output's maximum pulse rate. You can also select **Disable** in the pulldown menu which causes the output to close for the same duration as the input. Select the desired pulse width from the pulldown in the Form A Width box and click <Save Parameters>.   If the output type selected is Form C, the Form A Pulse Width box will be grayed out.

Output to Input Mapping

The CIR-24NG contains the ability to "map" each of the four outputs to either one of the two inputs. That means that all kinds of flexible configurations can be programmed using the **Map Output to Input** pulldown menus. Select which input you want each output to follow. As you can see in the example on Page 7, Outputs #1 and #3 are mapped to follow Input #1 and Outputs #2 and #4 are mapped to follow Input #2. Once you have selected Input 1 or Input 2 from each output's pulldown menu, click on <Save Parameters>.

Read Parameters

To read back the current settings from a CIR-24NG at any time, simply click on <Read Parameters>. The current settings in the CIR-24NG will be displayed.

Reset Overflow

If an output in Form A mode accrues a number of pulses greater than 127, an Overflow condition occurs. This simply means that given the timing constraints on the output primarily from the Form A Pulse Width, the output cannot keep up outputting pulses at the desired speed. In this event, change the Form A Pulse Width to a smaller number, click <Save Parameters> and then click <Reset Overflow>. The Overflow indicators for the output(s) which are in overflow condition and the corresponding register will be reset.

Capturing Data with the SSI Universal Programmer
It is also possible to Log or capture data using the SSI Universal Programmer. When the logging function is enabled, the information received from the Module or the meter can be logged to a file. This will be helpful in trying to troubleshoot intermittent connectivity issues. Click on the Capture pulldown menu and select setup. Once a file name and directory have been designated, click on Start Capture. To end the Logging, click on Stop Capture.

Special Note: Even though there are three wires (K,Y, & Z) on pulse outputs, it is common to use K and Y, or K and Z, for many two-wire systems that require or desire a generally symmetrical 50/50 duty cycle pulse at any given time. The toggle mode is used for systems that are doing demand monitoring and control and need regularly spaced or "symmetrical" pulses. If you are in FORM C Toggle output pulse mode, and your pulse receiving device uses only two wires, and the pulse receiving device only counts the output's contact closure as a pulse(not the opening), then the 3-Wire pulse value must be doubled in the Pulse Receiving Device.

Programming with a Terminal Program
The CIR-24NG can be programmed using a terminal program like Tera Term, Putty, Hyperterminal or ProComm. Set the baud rate for 57,600, 8 bit, 1 stop bit and no parity. Be sure that the Receive is set for CR+LF and turn on Local Echo.

List of CIR-24NG Commands (?)
For help in selecting or using the serial commands with the CIR-24NG, simply press the H or ? key. The serial link on the CIR-24NG will return a full list of the commands.

'INxy<CR>' - Set input, x-input(1-2) y=Type(C,A)
'OUTxy<CR>' - Set output, x-output(1-4) y=Type(C,A)
'MAPxy<CR>' - Map Output/Input, x-output(1-4) y=Input(1-2)
'Wxy<CR>' - Set pulse width, x-output(1-4), y-Pulse Width(0-8)   (See below)
'CX<CR>' - Clear overflow (X=1-4)
'R<CR>' - Read Parameters
'Z<CR>' - Set Factory Defaults
'V<CR>' - Query Firmware version

Form A Pulse Width
'Wxy<CR>'- Pulse Width in Form A mode, milliseconds - 25 to 10000mS, 100mS default;

Form A Pulse Width Selections:
'wx0<CR>' or Wx0<CR>' - 25mS Closure
'wx1<CR>' or 'Wx1<CR>' - 50mS Closure
'wx2<CR>' or 'Wx2<CR>' - 100mS Closure
'wx3<CR>' or 'Wx3<CR>' - 200mS Closure
'wx4<CR>' or 'Wx4<CR>' - 500mS Closure
'wx5<CR>' or 'Wx5<CR>' - 1000mS Closure
'wx6<CR>' or 'Wx6<CR>' - 2000mS Closure
'wx7<CR>' or 'Wx7<CR>' - 5000mS Closure
'wx8<CR>' or 'Wx8<CR>' - 10000mS Closure