

SFY Functional Safety Frequency-to-DC Transmitter with Display



SFY

Functional Safety Frequency-to-DC Transmitter with Display



User's Manual

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Demand Moore Reliability

Customer Support

Moore Industries is recognized as the industry leader in delivering top quality to its customers in products and services. We perform a sequence of stringent quality assurance checks on every unit we ship. If any Moore Industries product fails to perform up to rated specifications, call us for help. Our highly skilled staff of trained technicians and engineers pride themselves on their ability to provide timely, accurate, and practical answers to your process instrumentation questions. Our headquarters and other facilities phone numbers are listed below.

There are several pieces of information that can be gathered before you call the factory that will help our staff get the answers you need in the shortest time possible. For fastest service, gather the complete model and serial number(s) of the problem unit(s) and the job number of the original sale.

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Safety Messages

Please read this manual in its entirety. It should answer most of your questions. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product. Should you still have questions please visit our web site at www.miinet.com or contact any of our sales/support offices nearest you.

Your safety and the safety of others is very important. We have provided many important safety messages in this manual. Please read these messages carefully. These safety messages alert you to potential hazards that could hurt you or others or render damage to units.

All Moore Industries instrumentation should only be used for the purpose and in the manner described in this manual. If you use this product in a manner other than that for which it was intended, unpredictable behavior could ensue with possible hazardous consequences.

Each safety message is associated with a safety alert symbol. These symbols are found in the throughout the manual. The definition of these symbols is described below:

Pay particular attention wherever you see the following symbols:



Note – Information that is helpful for a procedure, condition or operation of the unit.



Caution – Hazardous procedure or condition that could damage or destroy the unit.



Warning – Hazardous procedure or condition that could injure the operator.

Qualified Personnel

The Moore Industries' product/systems described in this manual may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these Moore Industries' products/systems.

Proper use of Moore Industries products

Moore Industries' products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Moore Industries'. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

We have reviewed the contents of this publication to ensure consistency with the hardware and/or software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions. Specifications and information are subject to change without notice.

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SFY Quick Start Guide

The SFY is ready to install and is either set up with your specified configuration or the default configuration below. If you need to change any parameters this can be done using the SFY PC Configuration Software (see Section 4).

After programming your transmitter, install the unit into your application using the installation and connection information (see Section 3).

If you are using the SFY in a safety instrumented system, then you must read and follow the Safety Section 6 in this user manual.

Default/Factory Configuration

Input:

Measurement Mode: Frequency
Range: 10-110Hz
Input Hysteresis: 10mV
Timeout Period: 10s
AC/DC Input: AC
Fail On Input Timeout: Enabled
Low Pass Filter: Disabled
Averaging Filter: 8
Minimum Debounce Period: 10mS
Scaling Disabled

Output:

4-20mA
PV Damping: 0s
Fail Mode: Low (3.6mA)
Display Mode: Primary Variable

Section 1 - Introduction

The Moore Industries' Safety Frequency-to-DC Converter (SFY) is part of Moore Industries' FS Functional Safety Series to provide a high level of availability for safety critical applications and for use as a component part of a safety instrumented system.

This manual contains information needed to install, operate and maintain this product. When the SFY is used in a SIL rated safety application, please refer to Section 6 SFY in Safety Instrumented Systems.

Overview

The SFY monitors the signal, outputting the selected variable (frequency, period, high pulse width, low pulse width or contact closure) both to its display and to a 4-20mA signal that is linear and input-scalable. The SFY features a large integral display that shows real-time process status.

Incredibly versatile, the SFY programs in less than a minute to accept varying frequency signals from AC or DC flow measurement devices such as turbine meters and magnetic pick-up coils.

The SFY can be used in Safety Instrument Functions (SIF) where frequency or pulse signals need to be monitored. Examples of these includes turbine over speed protection, critical exhaust fans for personal safety, compressor monitoring, and protection. FMEDA reports are available with the required safety data to ensure that the SFY meets the requirements in each SIF.

In the example below, the SFY is used as part of an SIF to shut down a turbine if it exceeds a specified speed.

Figure 1.1 Turbine Over Speed Protection System



Model Numbers and Options

The following section provides details of the Moore Industries model number and the available options for the SFY.

Moore Industries model numbers for the SFY are structured as follows:

SFY / PRG / 4-20MA / 12-42DC / [HP]
Unit / Input / Output / Power / [Housing]

Refer to Section 9 Ordering Information for a quick reference table of ordering information. Further details are provided for each model below.

INPUT

The SFY supports a programmable AC or DC signal input. The input type is programmed using the PC configuration software (see section 4).

PRG

For inputs from 20mV-30Vac or 100mV-30Vdc.

The DC non zero-crossing signal can be from 100mV to 30V and monitors frequency ranges of 0.02Hz to 25kHz (5kHz maximum for signals below 200mV), periods of 40µsec to 50 seconds (200µsec minimum for signals below 200mV), pulse widths of 0.5 to 50msec (for signals 1V or greater) or contact closure frequency less than 20Hz.

The AC zero-crossing signal can be from 20mV to 30Vac and monitor frequency ranges of 0.5Hz to 25kHz (1Hz minimum for signals below 1V and 10Hz minimum for signals below 200mV) or periods from 40µ to 50 seconds (200µsec minimum for signals below 200mV).

10-250AC

For inputs from 10-250Vac or 100mV-30Vdc.

The DC input capability is the same as described above for the PRG option.

The AC zero-crossing signal can be from 10-250Vac and monitor frequency ranges of 1Hz to 25kHz or periods from 40µsec to 50 seconds.

OUTPUT

4-20MA

The SFY has a 4-20mA output which is user scalable and isolated from the input.

POWER

12-42DC

The SFY is a 2-wire, loop-powered instrument. It is powered either by an external 12-42Vdc power supply, or by a DCS (or PLC) input channel that provides power (12-42Vdc) to the loop.

HOUSING

[HP]

The SFY is available in an HP housing.

The HP unit can also be ordered in an explosion proof or protective enclosure e.g., BH, SB etc. or with a clip for DIN-rail or track mounting.

Section 2 - Calibration and Bench Check

Calibration

Every SFY is calibrated to our specifications prior to delivery to our customers. We recommend that you check the calibration every year (see the Bench Check procedures below) and notify Moore Industries if you suspect a problem with the accuracy of your instrument. Please refer to the Long Term Stability Table in Section 8 of this manual.

A true calibration of the SFY can only be performed at Moore Industries using specialized equipment.

Calibration by the end user can be performed in the field by capturing or trimming the input and/or trimming the analog output.

Input trimming increases the measurement accuracy of your instrument by matching the reading of its actual input to its scaling. Likewise, output trimming increases the measurement accuracy of the SFY by calibrating its analog output to the device that is receiving the output (such as a DCS). This ensures that the output of the SFY is being correctly interpreted.

The SFY offers the use of a Sensor Trimming function as well as an Output Trimming function from within the SFY Configuration software.

Please refer to Section 4 of this manual for instructions to perform Sensor Trimming and/or Output Trimming.

Bench Check

We highly recommend that you perform a bench check of your SFY prior to installing it in the field. Doing this will ensure that it is operating within your expectations or requirements.

The bench check is a quick way to determine that your SFY is functioning as expected. Depending on your organization's requirements, you may also be required to perform a complete Proof Test on your SFY. The instructions for the Proof Test can be found in Section 6 of this manual.

As a prelude to performing the bench check you should configure your SFY as it is to be used in your final application. Refer to Section 4 for the SFY Configuration instructions using the SFY PC Configuration software.

The equipment necessary to perform a bench check can be found in Table 4.1.

Note that there are two different versions of the SFY.

SFY/PRG - The model number that starts with SFY/PRG is for use with input signals with amplitudes of 0.02-30Vac and 0.1-30Vdc.

SFY/10-250AC - The model number that starts with SFY/10-250AC is for use with input signals with amplitudes of 10-250Vac and 0.1-30Vdc.

The difference between the two is that the SFY/10-250AC version is designed to accept high AC voltage inputs (such as mains supplies).

To avoid damaging the instrument, be sure to check which version you have before applying an input signal.

Bench Check Procedure

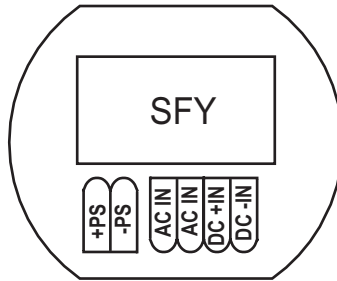
1. Configure the SFY

Refer to Section 4 to first configure your SFY for your specific application.

2. Sensor Input

In order to provide an input to your SFY you will need to use an appropriate frequency input simulator. Check the model number of the SFY you will be testing. If the model number string begins with SFY/PRG then the amplitude of the Input signal is limited to 30V (AC or DC). If the model number string begins with SFY/10-250AC then the amplitude of the Input signal can be between 10-250Vac and/or 0.1-30Vdc. Use whichever input source is correct for your intended application. Please see Figure 2.1 for the correct sensor input connections. Note that Input terminals 1 and 2 are used for AC (zero-crossing) signals and terminals 3 and 4 are used for DC signals.

Figure 2.1 Terminal Designations



3. Power Input

Connect the appropriate power source as shown in Figure 2.1.

4. Set your input simulator to the low end of your configured input span. For example, if your input is configured for a frequency of 0-1000Hz then set your frequency input simulator to simulate 0Hz. Verify that the SFY is reading 0Hz on its display window. Verify that the analog output is correct. For example, a 1V reading across your 250 ohm resistor equates to a 4mA output.

5. Set your input simulator to the high end of your configured input span and verify that the SFY's display window correctly reflects the input. Verify that the analog output is correct. For example, a 5V reading across your 250 ohm resistor equates to a 20mA output.

You have now confirmed that your SFY is operating correctly and can now be confidently installed into your application.

Section 3 - Installation and Wiring

Instructions in this section and others may require special precautions to ensure the safety of the personnel performing the operations. Notes, Cautions and Warnings that may cause potential safety issues are indicated throughout this manual by symbols, please refer to page 3 of this manual to view and familiarize yourself with these safety message symbols.



Note: Make sure to calibrate and bench check the instruments prior to installation. Also, install all instruments in their intended application and on their rail before making any electrical connections.

Mounting

The SFY is built in a HP housing and can be shipped with one of our durable field-mount enclosures, such as the BH. Both BH and SB provide explosion-proof and weather protection for your instrument.

The SFY is also versatile enough to be mounted on a surface, relay track, or pipe.

Figure 3.1 Dimensions of HP Housing

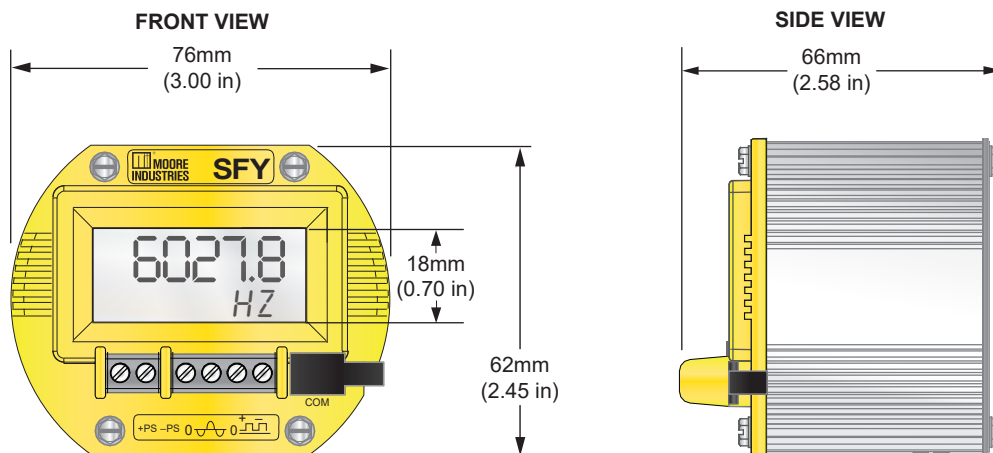


Figure 3.2 Dimensions of BH Housing

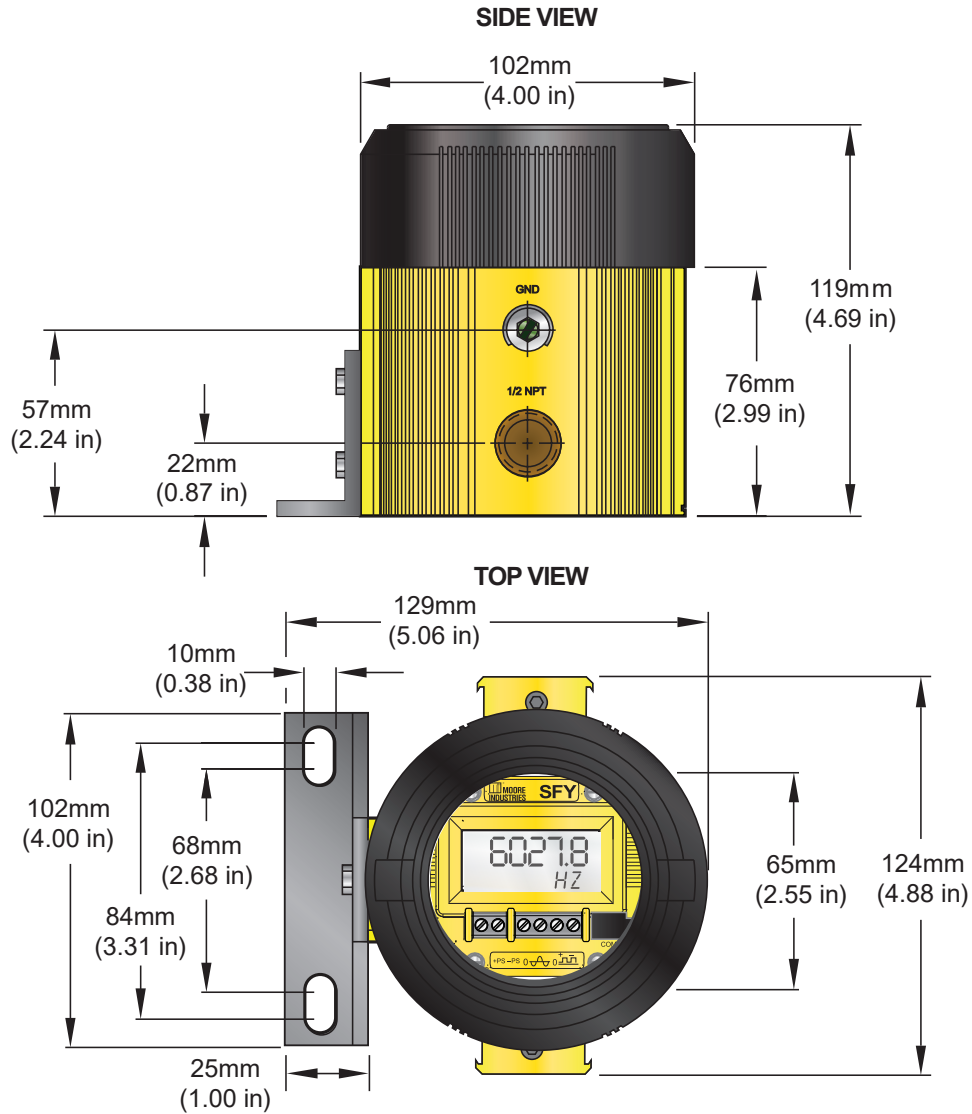
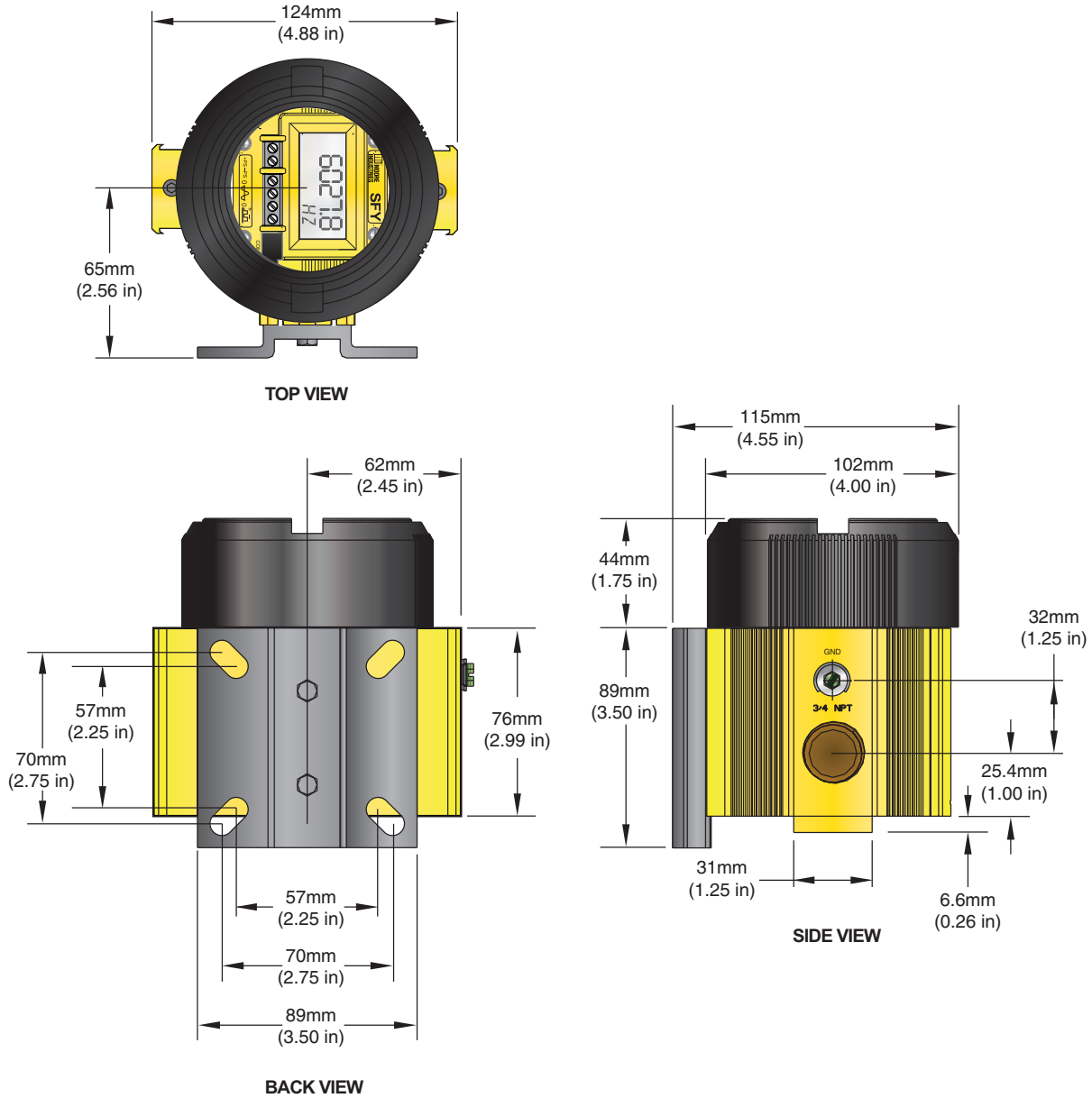


Figure 3.3 Dimensions of BH3 Housing



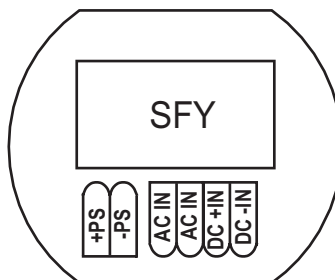
Electrical Connections

When installing any Moore Industries product, always follow all local regulations and standards for grounding, shielding, and safety.



WARNING: Terminals on this unit may be connected to hazardous voltages. Before making ANY connections to this unit, always remove power from the loop or instrument power terminals. See **Figure 3.4 Terminal Designations**

Figure 3.4 Terminal Designations



Installation Category

All terminals are rated CAT I.

Equipment Ratings

The SFY does not generate hazardous voltages, they provide a 0-30Vdc or 0-250Vac input and a 4-20mA output. Products connected to the SFY should be designed to receive this type of input.



WARNING: If this unit is used in a manner not specified by Moore Industries, the protection provided by the equipment may be impaired.

Input/Output Wiring

The Input/Output connections can be made with 14 to 24 AWG (2.5mm² to 0.2mm²) wire.

The end of each conductor should be stripped no more than 0.25in (7mm).

Tighten the screws on the terminal block to 4.4 - 5.3 lbf/in² (0.5 - 0.6 N/m²).

Recommended Ground Wiring Practices

Moore Industries recommends the following ground wiring practices:

- Any Moore Industries product in a metal case or housing should be grounded.
- The protective earth conductor must be connected to a system safety earth ground before making other connections.
- All input signals to, and output signals from, Moore Industries' products should be wired using a shielded, twisted pair wiring technique. Shields should be connected to an earth or safety ground.
- For the best shielding, the shield should be run all the way from the signal source to the receiving device. (see Note below)
- The maximum length of un-shielded input and output signal wiring should be 2 inches.



Note: Some of Moore Industries' instruments can be classified as receivers (IPT2, IPX2, etc.) and some can be classified as transmitters (TRX, TRY, etc.) while some are both a receiver and a transmitter (SPA2, HIM, etc). Hence, your shield ground connections should be appropriate for the type of signal line being shielded. The shield should be grounded at the receiver and not at the signal source.

CE Certification-related Guidelines

The grounding and wiring practices described above must be followed in order for the unit(s) to meet the requirements set forth in EMC standard EN61326.

Section 4 - SFY PC Configuration

All operating parameters of the SFY are set using a PC, a serial communication cable and Moore Industries' Intelligent PC Configuration software. When the PC Configuration program is loaded and running, most of the parameters for the connected transmitter are shown on a single screen. This makes it easy to determine which aspects of transmitter operation need to be changed to suit the application requirements.

Once the software settings are made, they are downloaded to the transmitter in the form of a configuration file and stored in the non-volatile unit memory. You can choose to save a backup copy of the file on your PC hard drive or external media.

Program the SFY by connecting the SFY to the PC, setting the appropriate parameters in the PC program, and downloading the configuration.



Note: Refer to the SFY Quick-Start Guide to see the default factory settings for your unit.

Installing the Configuration Software

Refer to Table 4.1 for the equipment needed.

1. Check the Moore Industries website www.miinet.com for the latest software package to ensure you have the latest release. Also if you are not able to go online install software using the included Moore Industries Interface Solution PC Configuration Software CD. Insert CD into the CD drive of the PC. Access the CD and open the "SFY PC Configuration Software" folder.
2. Double-click the installation program located in the folder. Follow the prompts to correctly install the program.

Once the Configuration Program is installed onto your PC, the SFY can be connected to equipment to simulate input and monitor output. You can then change the operating parameters of the unit.

No Unit Needed

It is not necessary to connect the SFY to a PC to create configuration files using the software. The Configuration Program can be run without connecting an SFY, and most parameters can be set without the benefit of an input from a sensor or SFY.

This makes it easy to create a set of operating parameters, save them to disk, and download them to one or more instruments at a later time.

The SFY **must** be connected to the PC in order to: trim input, trim output, assign a tag, perform a loop test, receive (via download) a configuration file, and save the configuration file (via upload) from the SFY's memory.

Connecting the SFY to the PC

The first step in configuring the SFY is connecting the transmitter to the PC program and attaching the appropriate input devices. Connect the SFY as shown in Figure 4.1 below; refer to Table 4.1 for a description of required equipment. After the SFY is configured, you can begin programming the basic parameters.

Table 4.1 Assembling the Necessary Equipment

Device	Specifications
Frequency Input Simulator	Variable, Accurate to $\pm 0.005\%$ of reading
Power Supply	24Vdc, $\pm 10\%$
Precision Load Resistor	250 ohm with $\pm 0.01\%$
Multimeter	Accurate to $\pm 0.025\%$ of reading
Personal Computer	Microsoft Windows-based PC; 16Mb free RAM; 20Mb free disk space on drive Microsoft Windows-based PC; 1 serial port or USB port
Communications Cable	Moore Industries Non-isolated cable P/N: 803-040-26, Isolated cable P/N: 803-039-26, USB cable P/N: 804-030-26
Communications Software	Version 1.0 or greater, CD part number: 750-75E05-01



Caution: Unplugging the programming cable or resetting power while downloading to the unit could result in a default configuration/calibration and the unit may have to be returned to the factory.

Figure 4.1 Connecting the SFY to the PC

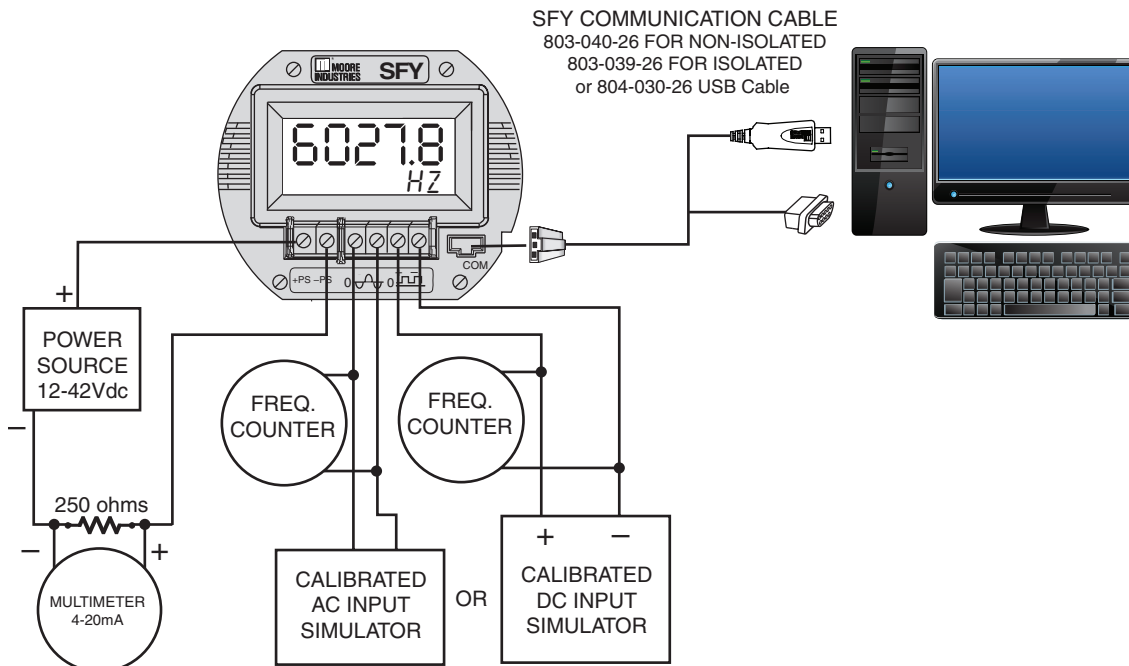
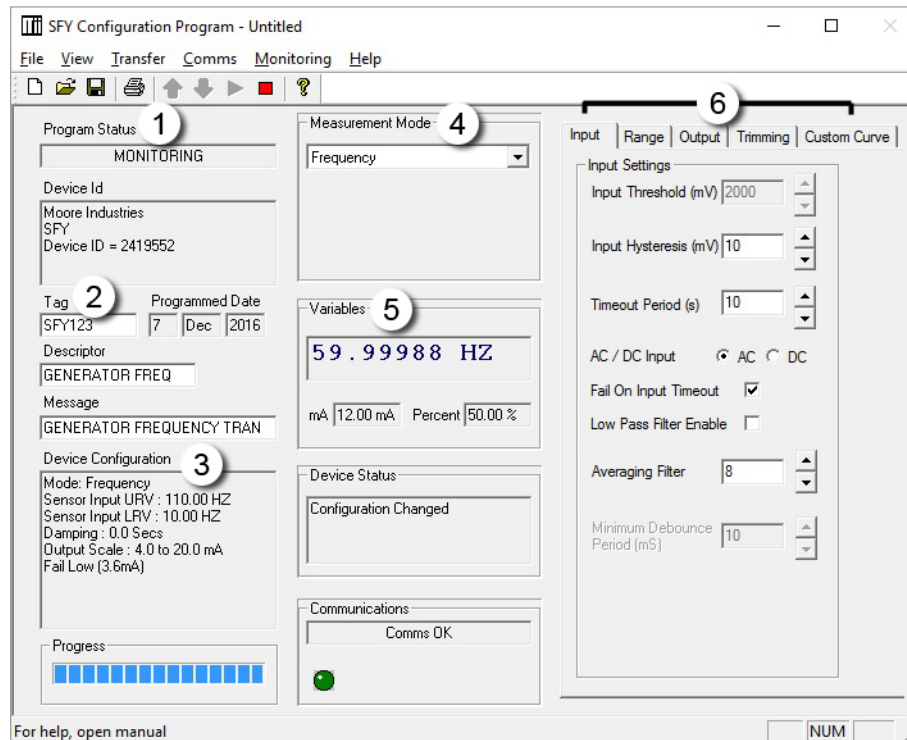


Figure 4.2 All of the SFY Operating Parameters can be set from the Main Screen of the Configuration Program



The PC Software is made up of these sections:

1. **Program Status & Device ID**—The *Program Status* portion of the screen displays the activity of the connected unit. It will show you if the unit is *Idle*, *Uploading*, *Downloading* or *Monitoring*. *Device ID* displays the type of device that is being polled and its ID number.
2. **Tag/Descriptor/Message**—These boxes are used to program a SFY with an individual tag, descriptor or message used for easily identifying the unit. The *Programmed Date* stores the last time that the unit's configuration was updated.
3. **Device Configuration**—Displays the current configuration of the attached SFY.
4. **Measurement Mode**—The drop-down menu selects which type of measurement the SFY will monitor.
5. **Variables/Device Status/Communications**—These sections display the status of the SFY and its process. The *Variables* section displays the input to the SFY, SFY output and the percent of span. The *Device Status* provides advanced diagnostic information on the SFY. The *Communications* box displays the status of the SFY's communication with the PC Program.
6. **Input/Range/Output/Trimming/Custom Curve Tabs**—These tabs change the right side of the screen to allow you to set the appropriate part of the SFY's configuration. See corresponding sections of this manual for additional information on these tabs.

Basic Parameters

Programming the *Basic Parameters* involves selecting the desired parameters in the PC Program, then downloading those parameters to the SFY. Begin by entering the device identification and measurement mode parameters into the configuration software.

Device Identification Information

The *Tag* (8 characters, maximum), *Descriptor* (16 characters, maximum) and *Message* (32 characters, maximum) boxes allow you to assign a unique identity to each SFY.

Measurement Mode

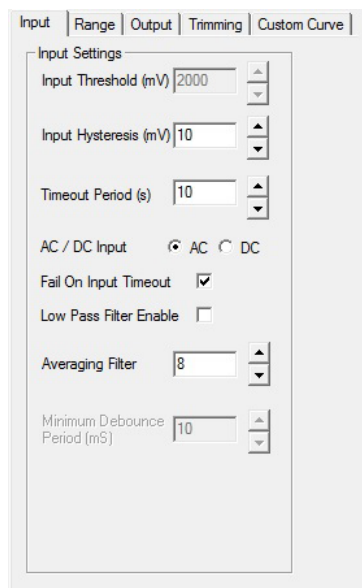
Select from Frequency, Period, Pulse Width High, Pulse Width Low and Contact Closure. This selects the variable to be measured and displayed. (Unless a custom EGU is selected in the Custom Curve tab.) See Figure 4.2.

Input Parameters

When setting input parameters, please read the following information for guidance. All input voltages above 3V are internally clamped at 3V and all AC signals are squared and measured at the zero crossing. The settings for input threshold and hysteresis assume a maximum input of 3V.

Use the Input tab in Figure 4.3 to enter the following parameters:

Figure 4.3 Input Parameters Tab



AC / DC Input: Select the type of input the SFY will measure.

Input Threshold: Input threshold is applicable to DC inputs only. Input Threshold is the input voltage above which the input is considered high. For input voltages above 3V, it is recommended to set this to the default setting of 2V (maximum is 2.5V). For input voltages below 3V, it is recommended to set this to 2/3 of the peak-to-peak (p-p) input signal voltage plus the low state signal voltage.

Input Hysteresis: This is the difference between high and low voltage points at which the input circuit detects changes of input state. For DC inputs this must be less than the threshold. For example, if the threshold is set for 2V, and the hysteresis is set for 1.2V, the SFY will detect high for >2V and low for <0.8V.

- For DC input voltages above 3V, it is recommended to set this to the default setting of 1.2V (maximum is 1.5V).
- For DC input voltages below 3V, it is recommended to set this to 1/3 of the peak-to-peak (p-p) input signal voltage plus the low state signal voltage.
- For AC inputs the hysteresis is used to minimise noise interference. Above 3V, it is recommended to set this to 150mV.
- For AC inputs below 3V, it is recommended to set this to 10% of the signal voltage level.

Fail On Input Timeout: This feature is used to detect an input failure. If this setting is on, and your input signal does not cross the zero in the case of AC signals, or does not change voltage levels in the case of DC signals for the set Timeout Period then device will trip an Input Failure Fault.

Figure 4.4 AC Input Fault Graph

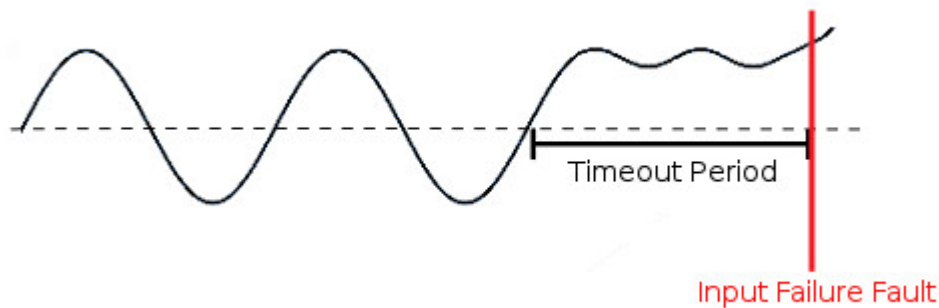
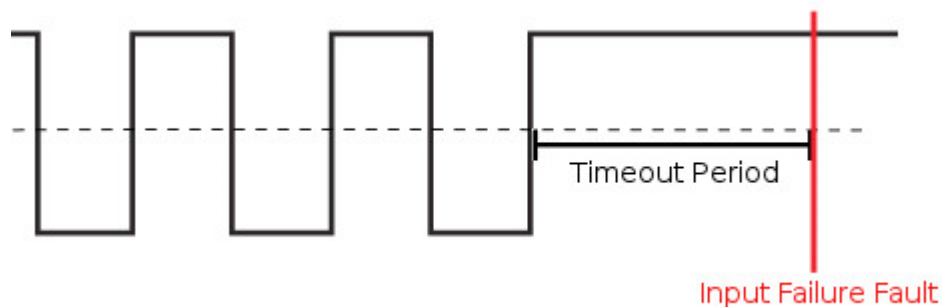


Figure 4.5 DC Input Fault Graph



This fault will put the analog output at the failure level, additionally the device will display "ERROR NO INPUT" and the configuration software will show "Device Error" while in monitor mode. The device will remain in this fault state until the signal is detected again at which point the device will leave the fault state and normal operation will resume.



Note: If the input type is Frequency or Contact Closure and the Fail on Input Timeout setting is on then the Lower Range Value should be greater than 0 Hz. This is because 0 Hz will trip the Input Failure state.

Timeout Period: The Timeout Period is only used if the Fail on Input Timeout is enabled. It is the number of seconds before the SFY declares an Input Failure Fault. The Timeout Period can be configured at a minimum of 0.5sec to a maximum of 600sec, factory default is set to 10sec.



Note: The timeout period should be set greater than the largest period of the input range. If not then the Input Failure Fault could trip unintentionally.



Caution: The Fail on Input Timeout Feature **MUST** be enabled if the SFY is used in a safety application.

Low Pass Filter Enable: Reduces noise by filtering out high frequency signals.



Note: Moore Industries recommends having the Low-Pass filter turned on when the upper input range value is Less than 150Hz (especially on the 10Vac - 250Vac units).

Averaging Filter: Shows the number of readings the SFY averages together to provide the displayed reading. This can be used to compensate for bent blades in a monitored turbine by setting the value to equal the number of blades on the turbine (i.e. if the turbine has four blades, set the Averaging Filter to 4).

Minimum Debounce Period: Available only when contact closure is selected in measurement mode. This value eliminates noise from a contact closure input, but lowers the maximum measurable frequency.

After selecting the input parameters, continue by clicking the Range tab and proceeding to the Programming the Range Parameters section.

Range Parameters

The *Range* tab permits you to set or capture the acceptable input range and establish range limits.

- Use the *Lower Range Value* cell to set the input value that will correspond to a 4mA output. In the same way, use the *Upper Range Value* to set the input value that corresponds to a 20mA output.
- Reverse the output (causing the output to increase as the input decreases) by setting the *Lower Range Value* higher than the *Upper Range Value*.
- The *Capture Lower Range* and *Capture Upper Range* buttons permit you to trim the upper and lower range of the sensor (if necessary). Just click the appropriate button to begin trimming.

You are given the option of scaling your process variable reading. To do this, click the *Enabled* check box in the *Scaling* section. Scaling allows you to take your process variable and manipulate the reading to a more customized range.

- In the *Upper Scaling Value* text box, enter the value you wish displayed when your input is at its full range. Repeat the step for the value you wish displayed when your input is at its zero value and enter that into the *Lower Scaling Value* box.

At the *Scaled Mode Display Label* box, enter the specific EGU (Engineering Unit) that you want as your display.

- The *Range Limits* section allows you to designate when the input will be considered bad (over or under range). For example, if you have set the *Lower Range Value* for 20, you can set the *Under Range* for 10 and check the *Enable* box, allowing the input to decrease below 10Hz before an error is registered. In this case, the display shows *Under/Over range*, and the output is in *Failure Mode* (see *Programming Output Parameters*).

Figure 4.6 Range Parameters Tab

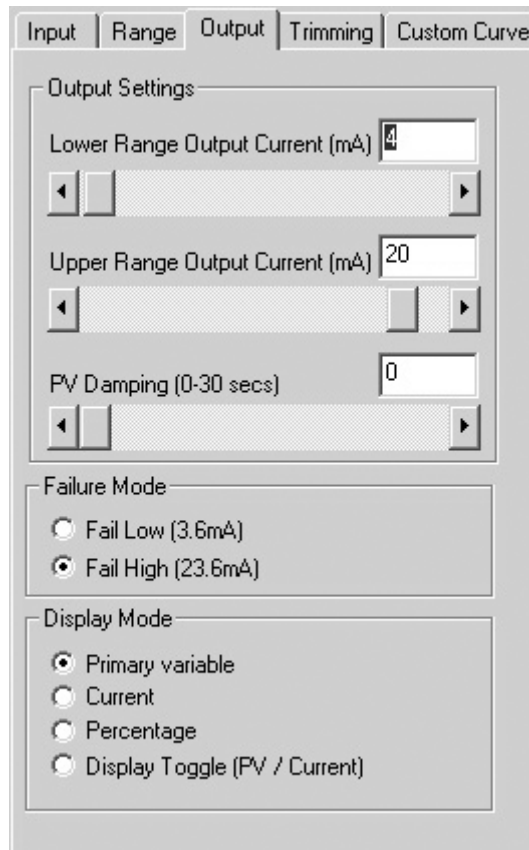
The screenshot shows the 'Range' tab of the configuration interface. It is divided into three main sections:

- Range:** Displays 'Sensor Limits = 0.0 to 25000.0 HZ'. It includes input fields for 'Upper Range Value' (110) and 'Lower Range Value' (10), along with 'Capture Lower Range' and 'Capture Upper Range' buttons.
- Scaling:** Features an 'Enabled' checkbox (unchecked) and a 'Quick Set' button. It has input fields for 'Upper Scaling Value' (110) and 'Lower Scaling Value' (10), and a 'Scaled Mode Display Label' text box.
- Range Limits:** Contains input fields for 'Over Range' (110) and 'Under Range' (10), each with an associated 'Enable' checkbox (unchecked).

Output Parameters

The *Output* section of the PC software is composed of three sections: *Output Settings*, *Failure Mode* and *Display Mode*. Use the functions of *Output Settings* to set the current range from 3.8 to 21.6mA (usually 4-20mA). The minimum span is 4mA.

Figure 4.7 Output Parameters Tab



Output Settings

The output can be reversed (causing the output to increase as the input decreases) by setting the *Lower Range Value* in the *Range* tab as higher than the *Upper Range Value* (See Figure 4.5).

PV (Primary Variable) *Damping* precisely reads the input then specifies an exponential change in the output by 60% over the time set in the *PV Damping* box. This reduces the effect of sudden spikes and helps stop unnecessary alarms by smoothing the reading.

Failure Mode

Failure Mode lets you set the output of the transmitter when it is malfunctioning. It will either transmit a 3.6mA (set to *Fail Low*) or a 23.6mA (set to *Fail High*) signal.



Note: The *Failure Mode* has no effect unless one of the fail conditions is active (i.e. *Fail On Input Time-out* or *Over/Under Range Limits*).

Display Mode

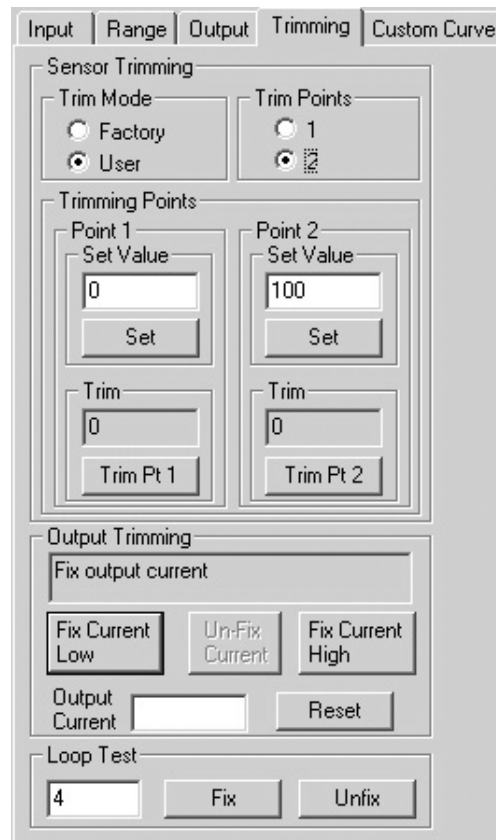
Display Mode selects which variable will be displayed on the transmitter's display. Choose between *Primary Variable*, *Current*, *Percentage* and *Display Toggle*. (*Display Toggle* switches back and forth from the primary variable to current and back in one-second increments). The PC Program's display is not changed by changing the selection under the *Display Mode*.

After the *Range* parameters have been selected, you can continue on by clicking on the *Trimming* tab, and proceeding to *Programming the Trimming Parameters*.

Trimming Parameters

The Trimming tab includes Sensor (input) Trimming, Output Trimming and Loop Test functions.

Figure 4.8 Trimming Parameters Tab



Sensor Trimming

Sensor trimming increases the measured accuracy of your transmitter by matching the reading of its actual input to either a calibrated source or the master device to which it is transmitting. This causes the SFY's process variable and output to match its input.

Most transmitters can only trim at the 0% and 100% points of the scale, but the SFY can trim any point along the scale. Note that one-point trimming applies an offset to the sensor reading, while two-point trimming applies both an offset and gain.

Before you attempt to trim the SFY, ensure that the correct sensor is attached to the transmitter, then go to the Trimming tab as shown at the left, and:

1. Select the User radio button under Trim Mode, then answer Yes to the "Please confirm that you want to do this" prompt.
2. Select one or two trim points by clicking the appropriate button under Trim Points.
3. Enter the value you want to trim into the Set Value box under point 1 and click Set. Apply the value you entered in the Set Value section to the SFY. Click on the Trim Pt 1 button. This matches the signal from the sensor to the first point you selected.
4. If you selected two trim points, enter the second value that you want to trim into the Set Value box under point 2 and click Set. Then apply the value you entered in the Point 2 box to the SFY. Click on the Trim Point 2 button. This matches the signal from the sensor to the second point you selected.
5. You have now finished trimming your sensor and can continue on to Output Trimming.

Output Trimming

Output Trimming increases the accuracy of your transmitter by matching the reading of its recorded output to its actual output. Essentially, this means that it will eliminate any error in the unit that is reading the SFY's output.

To start trimming the output, hook-up the transmitter in the loop shown in Figure 4.1, and connect either a multimeter (preferably), or the unit that will be reading the SFY's signal to the transmitter's output.

1. Click the *Fix Current Low* button. This should cause the SFY to output 4mA. If it is outputting a different value, enter the value that the SFY is outputting (in mA) into the *Output Current* box, then click *Trim Low*.
2. Check what your multimeter displays as the transmitters output. If it is still not precisely 4mA, enter it into the *Output Current* box again and click *Trim Low* again. Repeat until your multimeter displays an acceptable reading.
3. When you are finished, click *Unfix Current*. After doing this, the output will still be trimmed, but the output will no longer be fixed at 4mA.
4. Continue by clicking the *Fix Current High* button. This should cause the SFY to output 20mA. If the output is a different value, enter it into the *Output Current* box, then click *Trim High*.
5. Check what your multimeter displays as the transmitters output. If it is still not precisely 20mA, enter it into the *Output Current* again and click *Trim High* again. Repeat until your multimeter displays an acceptable reading.
6. When you are finished, click *Unfix Current*. After doing this, the output will still be trimmed, but the output will no longer be fixed at 20mA.



Note: Clicking the RESET button will completely undo output trimming.

Loop Test

Use the *Loop Test* to trim other instruments in the loop.

1. To begin the loop test, enter the mA value you want the SFY to output to the Loop into the *Loop Test* text box. Click *Fix*.
2. Monitor the effect of this on the other instruments in the loop, and adjust accordingly.
3. If necessary, repeat steps 1 and 2 and enter a different value in the *Output Current* box.
4. When you are finished, click *Unfix*.

After the trimming parameters have been selected, you can continue on by either downloading the configuration or clicking the *Custom Curve* tab, and proceeding to the *Programming the Custom Curve Parameters* section.

Custom Curve Parameters

The *Custom Curve* section of the configuration software allows you to setup your own custom curve table with up to 128 points. In effect, this allows you to tell the transmitter what it should output when it receives a certain input. Use the *Custom Curve* tab for customizing the display's engineering units, reversing the output, signal limiting and creating custom curves.

Figure 4.9 Custom Curve Parameters Table

The screenshot shows a software interface for configuring the Custom Curve parameters. At the top, there are five tabs: 'Input', 'Range', 'Output', 'Trimming', and 'Custom Curve'. The 'Custom Curve' tab is selected. Below the tabs, there is a 'Custom Curve' section with a 'Custom Curve' label and a 'Set' button. Underneath, there is a 'Custom Curve (Y Value) Range & Units' section with three input fields: 'Lower Range' (set to 0), 'Upper Range' (set to 100), and 'Display EGU label'. At the bottom of the window, there are three buttons: 'Read', 'Set', and 'Edit Table'.

Follow these directions to setup your custom curve table:

1. Check the *Enabled* box in the *Custom Curve* section. Click the *Set* button and wait for the transmitter to finish downloading the information.
2. Input the *Lower Range* and the *Upper Range* into the appropriate boxes. The point you enter in the *Lower Range* will become the zero point of the transmitter, and the transmitter will send out a 4mA signal (or the selected output signal, if the zero output is set at a value other than 4mA) when this point is reached. Likewise, the point you enter into the *Upper Range* will cause the transmitter to output 20mA (or full output signal, if different) when that point is reached.
3. Enter the desired engineering unit into the *Display EGU label* box. This will control what type of engineering unit (up to 5 alphanumeric characters, excluding symbols) is displayed by the Configuration Software and on the SFY's display.
4. Click *Set* to download all of the information to the transmitter.



Note: "Read" will upload the information from the transmitter to the configuration program. This can be used to take the last table that you have downloaded to the transmitter and enter it into the PC Configuration Software.

5. Click *Edit Table* to begin creating your own custom curve table (see next page for instructions).




Caution: Once you enable the custom curve, you must edit the table in order for your transmitter to work properly.

Editing the Custom Curve Table

To edit custom table points, click *Edit Table* in the *Custom Curve* tab, then follow the directions below.

1. If you have already written a custom table in Microsoft® Excel (and saved it in a .csv format) or in our PC Configuration Software, you can open it from the *Edit Table* menu. Go to *File* (at the top, left corner of the screen, on the command bar), and click *Open*, then select the appropriate file.
2. If you have NOT already written a custom table, begin writing one by clicking the *Edit Table* button and selecting the number of points you would like to define. Do this in the *Number of Points* section.
3. Make sure that the *Custom Curve Enabled* box is checked. If not, check it and click the *Set* button.
4. Fill in the values in the *X* and *Y* columns. *X* is the input column representing the value that is input into the SFY. *Y* is the output column—it represents the value (in engineering units) that the transmitter will output when the value in the *X* column is input. It is also the value that will be displayed in the PC Software and on the SFY display. If an input falls in between two *X* values, then the output will be scaled to match the percentage difference between the two *X* points.
5. When you have filled in all of the custom curve points, click *Download*. This will download the information from the PC Configuration Software to the transmitter. If you later want to retrieve the file from the transmitter to the PC Configuration Software, you can reattach the transmitter and click *Upload*. You are now done configuring your custom table, and if you have made changes to other parts of the configuration program, you are ready to download the configuration file.

Downloading the Configuration File

After the configuration has been set to your satisfaction, it can be downloaded to the unit by selecting *Download* from the *Transfer Menu* or by pressing the *Download* button () on the status bar. Downloading the configuration displayed in the PC program overwrites the unit's current configuration.

Downloading the configuration to the SFY may take up to 30 seconds to complete. It is important to let the sequence finish before taking any other action.

Once completed, the *Device Configuration* portion of the screen (in the bottom-left corner) will change to match the configuration listed on the rest of the screen. The status indicator in the top left hand corner of the view will then indicate the program has reverted back to its idle mode.

Section 5 - Operation and Maintenance

When the SFY is used in a safety loop, please refer to the Safety Instrumented Systems section of this manual before operating your unit.

Operation

Once calibrated and installed in a 4-20mA loop the SFY begins to operate immediately. Depending upon environmental conditions, it can be expected to operate unattended for extended periods of time.

Maintenance

Moore Industries suggests a quick check for terminal tightness and general unit condition every year. Always adhere to any site requirements for programmed maintenance. The calibration of this instrument should be checked every year and re-calibrated only when necessary.

Section 6 - SFY in Safety Instrumented Systems

The SFY is designed for use as an element of a safety instrumented system as defined by IEC61508-4 paragraph 3.4.1.

This user manual contains all of the information needed to configure, install, operate and maintain this product. For safety applications the SFY must only be used in accordance with this information and the restrictions and limitations as detailed below.

Functional Safety Description

The SFY has been certified, by exida ®, to IEC 61508:2010, by proven in use, for systematic integrity up to SIL 3 and for random integrity up to SIL 2 (HFT=0). This means that an SFY is approved for single use in Safety Instrumented Systems (SIS) up to SIL 2 and in a redundant architecture (1oo2, 2oo3, etc.) up to SIL 3 using Route 2H. It is classified as a Type B device according to IEC 61508.

The SFY is a Functional Safety Series Programmable Frequency Transmitter which accepts varying frequency signals from AC or DC flow measurement devices such as turbine meters and magnetic pick-up coils. It monitors the signal, outputting the selected variable (frequency, period, high pulse width, low pulse width or contact closure) both to its display and to a 4-20mA signal that is linear and input-scalable. The device is loop-powered.

For safety systems, the SFY performs as a transmitter which processes the input signal and sets a proportional 4-20mA isolated output current with better than 2% accuracy. Faults are indicated by an out of range output signal (<3.6mA or >21mA). The display is not part of the safety path.

Failure Rate Data

The SFY FMEDA report from exida ®, MII Q16-04-145 R004 V1R1 FMEDA SFY (Moore Industries' Document No: 700-702-41), provides the failure data required for calculations to use the SFY as part of a Safety Instrumented System.

Product life

For the SFY, the components have a useful lifetime of 50+ years. However, IEC 61508-2, section 7.4 states that a useful lifetime based on experience has more weight than the calculated figures; Note 3 in the section comments that the useful lifetime of a transmitter is most often within 8 to 12 years.

Installation

No special installation is required in addition to the standard installation practices in this user manual. Refer to the specifications table of this user manual for ambient conditions and required power input. Prior to use in a safety function, the user must validate the operation of the device offline.

The loop current must be monitored by the PLC for out of range values ie. outside normal operating range (<3.6mA or >21mA).

Configuration

The unit can be configured using a PC configuration program and USB cable, as described in this manual. Do not attempt to configure the SFY while the unit is performing its safety function. After making any configuration changes, the user must validate the operation of the SFY offline to ensure that the changes work safely, prior to putting it back into operation.

The following considerations and restrictions will apply when using the SFY in a safety application:

Fail On Input Timeout: The 'Fail On Input Timeout' feature (on the Input Tab) must be enabled.

Sensor Trimming: Sensor trimming should be used with extreme care as this facility is allowed to trim the input accuracy by as much as 2% of the trimming point value. It is the user's responsibility to ensure that the safety application can tolerate this.

Output Trimming: AO trimming should be used with extreme care as this facility is allowed to trim the AO accuracy by as much as 2% of the trimming point value. It is the user's responsibility to ensure that the safety application can tolerate this. During trimming the AO current is fixed. It is important to Unfix the current before exiting the configuration or the unit will not operate correctly.

Loop Test: During loop test the AO current is fixed. It is important to Unfix the current before exiting the configuration or the unit will not operate correctly.

Process Safety Time

Process safety time is the minimum time from the initiation of a hazardous event to the point where the hazardous event is unavoidable. Any safety function designed to either prevent the event or at least mitigate its effect must be capable of performing its specified safety function in a time period very much less than the process safety time.

The SFY has a typical response time (end to end) of 400msec. The total diagnostic test time of the unit is 10 minutes.

Operation and Maintenance

Do not connect the PC communications cable to the SFY and do not attempt to configure the unit while the unit is performing its safety function.

Proof Test Procedure

It is normal practice with SIS that the components undergo periodic proof tests to expose dangerous faults that are not detected by internal diagnostic tests. Thus, this section specifies how the dangerous undetected faults determined during the FMEDA can be detected during proof testing. Calculation of the required proof test interval can be made using data in the FMEDA report (exida® document MII Q16-04-145 R004 V1R1 FMEDA SFY.pdf).

The proof tests described here are designed to cover all possible dangerous undetected faults that can be detected without opening the case. Proof test coverage achieved with these tests for the particular application is 83%. Periodically testing the SFY using the proof test steps outlined below, the accumulated PFDAVG value can be reduced to a smaller but nonzero value. To completely test for all possible dangerous undetected faults, the unit must be sent back to the factory for a comprehensive proof test inspection.

Table 6-1. Proof Test Steps

Step	Action
1	Make sure that the loop can be shut down safely. Remove power and disconnect the SFY from the loop and the input.
2	Check for isolation between input to output; check input and output to case.
3	Connect +/-PS terminals to 24Vdc supply, in series with a 250 ohm, 0.01% resistor. Connect a DVM (0.025% or better accuracy) across the resistor.
4	Connect sensor simulator(s) to the input terminals. These must reflect the actual instrument configuration.
5	Apply power and check instrument response at 0% and 100% of span. Verify that the analog output is within 1% of expected value (i.e. 4-20mA). Also verify the reading on the display. Vary the loop supply voltage and verify that the loop current is stable.
6	Remove input from SFY and wait for the configured timeout period (0.5 to 600 seconds). Verify that the display shows a 'Broke Input' message.
7	If all results are satisfactory, the SFY may be reinstalled in the loop. If the SFY is to be used in another application, configure it for that application and repeat the above steps. If it is to be kept as a spare, run the proof test after configuration for its next use.

Repair and Replacement

The SFY is not intended to be repaired on site and has no components needing maintenance or regular replacement. On device failure, the SFY should be returned to Moore Industries Worldwide Headquarters in North Hills, CA 91343 U.S.A for repair and refurbishment (refer to Returns Procedures at the end of this manual).

The SFY is a certified Safety component. Repair or replacement of any component without authorization from Moore Industries International, Inc. will invalidate any remaining warranty and the IEC61508 certification.

Recording and Reporting of SFY Performance

It is the end user's responsibility to maintain records of all safety component failures, especially those that might be classified as potentially dangerous. This feedback data not only helps the supplier identify and rectify reliability issues but also to provide quantitative data to increase confidence in the FMEDA analysis of dangerous failure rates. Please ensure that any components returned to Moore Industries International, Inc. are returned with a clear report identifying the fault experienced.



Section 7 - Applications

This section provides some examples of typical applications for the SFY.

Turbine Over Speed Protection

In the example below the SFY is used as part of an SIF to shut down a turbine if it exceeds a defined speed.

Figure 7.1. Turbine Over Speed Protection System



Compressor Monitoring and Protection

Critical compressors often need an independent safety protection system. The SFY can be used as part of the SIF to monitor the speed and provide data to a safety logic solver.

To accomplish this, a magnetic pickup is attached to the compressor shaft (Figure 7.2). The pickup provides a frequency output. The SFY takes the pickup signal, converts it to a 4-20mA output proportional to the compressor shaft speed, and transmits it to the SIS Logic Solver. Should there be an unwanted change in speed, it can be detected at the Logic Solver.

Figure 7.2. Compressor Monitoring and Protection



Specific Conditions of Use

The following instructions must be adhered to when the SFY is used in hazardous locations and potentially explosive atmospheres.

FMus Installations

Nonincendive Class I, Division 2, Groups A-D

The model SFY shall be installed in compliance with the enclosure, mounting, spacing, and segregation requirements of the ultimate application.

The COM port shall not be used in Hazardous areas.

In non-hazardous areas, maximum operating parameters of the "COM" port shall not exceed 3.0V, 300mA and 240mW

Section 8 - Specifications

<p>Performance Input Accuracy: See Tables 8.1 to 8.7 Output Accuracy: ±0.015% of span Overall Accuracy: The overall accuracy of the unit is the combined input and output accuracies. It includes the combined effects of linearity, hysteresis, repeatability, and adjustment resolution. Does not include ambient temperature effect. Input Hysteresis: See Tables 8.5 to 8.7 Input Threshold: See Tables 8.4 to 8.7 Stability: See Table 8.1 Minimum Frequency: Twice the lower range Digital Input Filter: 3dB point is at 10kHz Step Response Time: 300msec maximum, 200msec typical from the time an input is applied to the output reaching 90% of its final value + actual input Rise Time: 100sec maximum for the output to change from 10% to 90% of its scale of an input step change of 0% to 100% + actual input Isolation: 500Vrms between input, output, and case continuous, and will withstand a 500Vac dielectric strength test for one minute with no breakdown Ripple: 10mVp-p measured across a 250 ohm resistor Overcurrent Limiting: 25mA maximum Maximum Voltages: 48Vdc output, maximum; DC input, 48Vdc, maximum; AC input, 30Vac maximum for 0.02-30AC model, 250Vac maximum for 10-250AC model</p>	<p>Performance (Continued) Input Impedance: >30kohms for DC and contact closure inputs; 2kohms for input >6V, 4kohms typical@50Hz and 56kohms typical@1kHz for input <6V for 0.02-30AC model; >125kohms for 10-250AC model Load Capability: 508 ohms@24V Output Current Limiting: 3.8mA and 21.4mA for input under range and over range; 3.6mA and 23.6mA for input failure Load Effect (current outputs): Negligible within specified power limits Power Supply Effect: ±0.002% of span per 1V change Startup Time: Performance within specification less than 1sec after power is applied for frequency higher than 100Hz and average of 8 samples Damping: Adjustable from 0 to 30 seconds with PC software Linearization: Configurable up to 128 points with PC software Moving Average: Configurable up to 16 segments with PC software Low Pass Filter: On/Off is software configurable Display Type: LCD; Top Row, 10.16mm (0.4 in) high black digits on a reflective background; Bottom Row, 5.72mm (0.225 in) high black digits on a reflective background</p>	<p>Display (Continued) Display Update Rate: 100msec Format: Top row is five alphanumeric characters, plus sign and decimal point; bottom is five alphanumeric characters Range: -99999 to 99999 Minimum Display Span: 1.00 Ambient Conditions Operating & Storage Range: -40°C to +85°C (-40°F to +185°F) Relative Humidity: 0-95%, non-condensing Ambient Temperature Effect: Input to output, ±0.007% of span/°C maximum; Digital Accuracy, ±0.003% of span/°C maximum RFI/EMI Immunity: 20V/m@ 80-1000MHz, 1kHz AM, when tested according to IEC61000-4-3 Noise Rejection: Common mode, 120dB typical@100mVp-p input Weight SFY HP: 227 grams (5.3 ounces) SFY in BH housing with glass cover: 1451 grams (3 pounds, 12.4 ounces)</p>
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Table 8.1. Stability for All Models*

		Input-to-Display (% of Reading)			Display-to-Output (% of Output Span**)		
		1 year	3 years	5 years	1 year	3 years	5 years
Frequency/Period		0.001	0.0017	0.0022	0.08	0.139	0.179
Pulse Width	1 Sec	0.001	0.0017	0.0022			
	0.1 Sec	0.0015	0.0026	0.0034			

*Combine Input-to-Display and Display-to-Output values to determine overall stability.
**Consult factory for improved long-term drift specifications.

Table 8.2. DC Input Range and Accuracy for All SFY Models

Input Type	Input Range		Accuracy (% of reading)	Min. Span
	Frequency	Amplitude		
Frequency	0.02Hz to 5kHz	100mV-30V	0.01±1LSD	See Table 8
	0.02Hz to 25kHz	200mV-30V	0.05±1LSD	
Period	200µsec to 50sec	100mV-30V	0.01±1LSD	500µsec
	40µsec to 50sec	200mV-30V	0.05±1LSD	
Pulse Width	0.5msec to 50sec	1-30V	0.05±1LSD ±2µsec	500µsec
Contact Closure	<20Hz		0.01±1LSD	0.1Hz

NOTE:
AC indicates zero-crossing signal.
DC indicates non-zero crossing signal.

Table 8.3. AC Input Range and Accuracy for PRG Input Type

Input Type	Input Range		Accuracy (% of Reading)	Min. Span
	Frequency	Amplitude		
Frequency	0.5Hz to 25kHz	1-30V	0.05±1LSD	See Table 8
	1Hz to 5kHz	200mV-30V	0.01±1LSD	
	1Hz to 25kHz	200mV-30V	0.05±1LSD	
	10Hz to 5kHz	20mV-30V	0.01±1LSD	
Period	40µsec to 2sec	1-30V	0.05±1LSD	500µsec
	200µsec to 1sec	200mV-30V	0.01±1LSD	
	40µsec to 50sec	200mV-30V	0.05±1LSD	
	200µsec to 100msec	20mV-30V	0.01±1LSD	

Table 8.4. AC Input Range and Accuracy for 10-250V Input Type

Input Type	Input Range		Accuracy (% of reading)	Min. Span
	Frequency	Amplitude		
Frequency	1Hz to 5kHz	10-250V	0.01±1LSD	See Table 8
	1Hz to 25kHz	10-250V	0.05±1LSD	
Period	200µsec to 1sec	10-250V	0.01±1LSD	500µsec
	40µsec to 50sec	10-250V	0.05±1LSD	

Table 8.5. Frequency Input Parameters

Input Range	Threshold		Hysteresis		Filter (3db Point)	Measured Frequency
	Resolution	Range	Resolution	Range		
100mV-30V (DC)	1mV	0.01-2.5V	1mV	0.01-1.5V	10kHz	0.02Hz to 25kHz
20mV-30V (AC)			1mV	0.002-0.15V	10kHz	0.5Hz to 25kHz
10V-250V(AC)			1mV	0.002-0.15V	10kHz	0.5Hz to 25kHz

Table 8.6. Period Input Parameters

Input Range	Threshold		Hysteresis		Filter (3db Point)	Measured Period
	Resolution	Range	Resolution	Range		
100mV-30V (DC)	1mV	0.01-2.5V	1mV	0.01-1.5V	10kHz	40µsec to 50sec
20mV-30V (AC)			1mV	0.002-0.15V	10kHz	40µsec to 2sec
10V-250V (AC)			1mV	0.002-0.15V	10kHz	40µsec to 2sec

Table 8.7. Pulse Width Input Parameters

Input Range	Threshold		Hysteresis		Filter (3db Point)	Measured Pulse Width
	Resolution	Range	Resolution	Range		
100mV-30V (DC)	1mV	0.01-2.5V	1mV	0.01-1.5V	10kHz	0.2msec to 50sec

Table 8.8. Frequency Range Minimum Span

Maximum Frequency Range	Minimum Span
10Hz	0.1Hz
5kHz	1Hz
25kHz	25Hz

Section 9 - Ordering Information

Unit	Input	Output	Power	Options	Housings
SFY Functional Safety Frequency-to-DC Transmitter with Display	PRG Input Amplitudes Supported: 0.02-30Vac* 0.1-30Vdc* (Programmable with supplied configuration software, see Tables on page 35 for details)	4-20MA User scalable with supplied software	12-42DC Loop-Powered	None	BH2NG (*) or (‡) Aluminum Explosion-Proof enclosure with two, ½-inch NPT entry ports and a glass cover BH2TG (*) or (‡) Aluminum Explosion-Proof enclosure with two, ¾-inch NPT entry ports and a glass cover BH2MG (*) or (‡) Aluminum Explosion-Proof enclosure with two, M20 x 1.5 entry ports and a glass cover BH3NG (*) or (‡) Aluminum Explosion-Proof enclosure with three, ½-inch NPT entry ports and a glass cover BH3TG (*) or (‡) Aluminum Explosion-Proof enclosure with two, ¾-inch NPT side-entry ports, one ½-inch NPT bottom-entry port, and a glass cover BH3MG (*) or (‡) Aluminum Explosion-Proof enclosure with two, M20 x 1.5 side-entry ports, one ½-inch NPT bottom-entry port, and a glass cover SB2NG (*) or (‡) 316 Stainless Steel 2-Hub, Explosion-Proof enclosure with two, ½-inch NPT entry ports and a glass cover SB2MG (*) or (‡) 316 Stainless Steel 2-Hub Explosion-Proof enclosure with two, M20 x 1.5 entry ports and a glass cover HP Hockey-puck housing with spring clips for mounting in standard field enclosures DN Snap-in mounting for HP case on TS-32 DIN-rail FL Mounting flanges on HP suitable for relay track or surface-mounting FLD Mounting flanges on HP suitable for 3½" relay track mounting
	10-250AC Input Amplitudes Supported: 10-250Vac* 0.1-30Vdc* (Programmable with supplied configuration software, see Table 9.1 for details)				
<div style="border: 1px solid black; padding: 5px; width: fit-content;"> *AC indicates zero-crossing signal; DC indicates non-zero crossing signal </div>					

When ordering, specify:

Unit / Input / Output / Power / Options [Housing]

Model number example:

SFY / PRG / 4-20MA / 12-42DC [BH2NGP]

Accessories

Each SFY order comes with one copy of our Intelligent PC Configuration Software (Windows® compatible) on CD.

Table 9.1. To order additional software or cables:

Part Number	Part
750-75E05-01	Intelligent PC Configuration Software
804-030-26	Fuse Protected, Non-Isolated USB Communication Cable
803-039-26	Isolated Configuration Cable (9-pin Serial Port)
803-040-26	Non-Isolated Configuration Cable (9-pin Serial Port)

Warranty Disclaimer

Moore Industries ("The Company") makes no express, implied or statutory warranties (including any warranty of merchantability or of fitness for a particular purpose) with respect to any goods or services sold by the company. The company disclaims all warranties arising from any course of dealing or trade usage, and any buyer of goods or services from the company acknowledges that there are no warranties implied by custom or usage in the trade of the buyer and of the company, and that any prior dealings of the buyer with the company do not imply that the company warrants the goods or services in any way.

Any buyer of goods or services from the company agrees with the company that the sole and exclusive remedies for breach of any warranty concerning the goods or services shall be for the company, at its option, to repair or replace the goods or services or refund the purchase price. The company shall in no event be liable for any consequential or incidental damages even if the company fails in any attempt to remedy defects in the goods or services, but in such case the buyer shall be entitled to no more than a refund of all monies paid to the company by the buyer for purchase of the goods or services.

Any cause of action for breach of any warranty by the company shall be barred unless the company receives from the buyer a written notice of the alleged defect or breach within ten days from the earliest date on which the buyer could reasonably have discovered the alleged defect or breach, and no action for the breach of any warranty shall be commenced by the buyer any later than twelve months from the earliest date on which the buyer could reasonably have discovered the alleged defect or breach.

Return Policy

For a period of thirty-six (36) months from the date of shipment, and under normal conditions of use and service, Moore Industries ("The Company") will at its option replace, repair or refund the purchase price for any of its manufactured products found, upon return to the Company (transportation charges prepaid and otherwise in accordance with the return procedures established by The Company), to be defective in material or workmanship. This policy extends to the original Buyer only and not to Buyer's customers or the users of Buyer's products, unless Buyer is an engineering contractor in which case the policy shall extend to Buyer's immediate customer only. This policy shall not apply if the product has been subject to alteration, misuse, accident, neglect or improper application, installation, or operation. THE COMPANY SHALL IN NO EVENT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

To return equipment to Moore Industries for repair, follow these four steps:

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

Warranty Repair –

If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status for you over the phone. Be sure to include the RMA number on all documentation.

Non-Warranty Repair –

If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
 - a) A note listing the symptoms that indicate the unit needs repair
 - b) Complete shipping information for return of the equipment after repair
 - c) The name and phone number of the person to contact if questions arise at the factory
3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.
4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.



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