

# Gas Flow Computer (Instructor-Led Training)

## Course Description

This course provides basic knowledge the successful operation of the flow computer, the device that receives the process variables from the primary and secondary measurement devices and uses its onboard calculation ability to determine flow rate and volume.

## Course Prerequisites

- GTA Web-Based Training
  - EFM Models
- GTA Instructor-Led Training
  - Basic PLCs
  - Basics of EFM

## Course Objectives

Upon completion of this course, the student will have received instruction designed to assist him/her in the following:

- Describe the purpose of flow computers.
- Identify the different components of the flow computer system.
- Explain flow computer inputs, outputs, communication requirements, and applications.
- Describe various flow computer power source options.
- Discuss physical installation considerations.
- State flow computer calibration procedures.
- Discuss flow computer verification following installation.
- Describe gas flow computer configuration and operation of Bristol 3350-20B, Bristol 3350-25B, and Bristol 3335-RTU flow computers.

## Course Outline

1. Flow Computer Fundamentals
  - a. Purpose
  - b. Inputs
  - c. Outputs
  - d. Communications
  - e. Applications
  - f. Types of Gas Flow Computers
    - i. Line Mount Flow Computers
    - ii. Panel Mount Flow Computers
  - g. Remote Transmitting Units
  - h. Architecture and Communications
  - i. Programmable Logic Controllers
  - j. Functionality
  - k. Communications
  - l. Distributed Control Systems and DCS Elements
  - m. Applications
2. Installation
  - a. Environment and Climate
  - b. Safety
  - c. Site Accessibility
  - d. NEC Compliance
  - e. Power Requirements
  - f. General Flow Computer Installation Steps
3. Calibration
  - a. RTU Cold Start Initialization
  - b. Meter Test Maintenance Mode
  - c. Initial Conditions
  - d. RTU and Meter Configuration with UOI
  - e. Analog Input Zero List 20/List 100

- f. Analog Input Span List 21/List 100
  - g. Transducer Failure and Override Limits List 24/List 100
  - h. Alarm Limits List 31/List 100
  - i. Station Configuration List 100
  - j. Set Date and Time
  - k. Optional PID Control Configuration List 102 and List 100 Continuation
  - l. Analog Output Selection List 1 (Optional)
  - m. Communication Port Configuration List 97
4. Verification
5. Configuration
- a. Bristol 3335 RTU General Information
    - i. Enclosures
    - ii. CPU Module
    - iii. 80386EX-Based CPU Engine Boards
    - iv. Power Sources
    - v. Overview of Modules and PC Boards
    - vi. System Interconnect (SI) Board
    - vii. System Monitor Module
    - viii. Power Supply Module
    - ix. Enhanced Communication Engine Module (ECE Module)
    - x. Communication Ports
    - xi. I/O Modules
    - xii. Analog Input (AI) Module and Analog Output (AO) Module
    - xiii. Discrete Input Module and Discrete Output Module
    - xiv. Solid State DC Relay Discrete Output Module
    - xv. High-Speed Counter Module
    - xvi. 3335 Hardware Configuration
    - xvii. CPU Engine Switch and Jumper Configuration
    - xviii. Memory and Peripheral Board Switch SW1 - (Mode)
    - xix. Switch SW1-1 - System Firmware FLASH Download

- xx. Memory and Peripheral Board
  - 1. Memory and Peripheral Board Switch SW2 - (Node Address)
  - 2. Memory and Peripheral Board Reset Button SW5
  - 3. Memory and Peripheral Board Jumper W1 (RAM Battery)
  - 4. Memory and Peripheral Board Status LEDs DS1-DS6
  - 5. Memory and Peripheral Board Watchdog and Idle LEDs DS7 & DS8
- b. 32-Bit CPU Engine Board Switches SW3 & SW4
- c. CPU Board Communication Port LEDs DS9-1 through DS9-4
- d. Extended Memory Board Jumpers W1, W2, and W3 (Factory Installed)
- e. Extended Memory Board Jumper W4 (Factory Installed)
- f. 2 Port Enhanced Comm. Board
- g. Setting DIP Switches
- h. Setting Jumpers
- i. LED Indicators
- j. Loopback Testing
- k. High-Density AI Module Jumper Configuration
- l. Selecting 1-5V or 4-20 mA Inputs
- m. 1-5V DC Isolated Input
- n. 4-20 mA Transmitter Using +24V DPC Power Source
- o. 4-20 mA Transmitter using Auxiliary +24V Power Supply
- p. High-Density AO Module Switch and Jumper Configuration
- q. Selecting 1-5V or 4-20 mA Outputs
- r. 1-5V DC Output
- s. Jumpers and Adjustments
- t. Discrete Input Card Module Jumper Configuration
  - i. Terminal Designations
  - ii. Bi-State Voltage Signal as Input
  - iii. Relay Contact or PDM Transmitter as Input
  - iv. Dry Contact Powered by DPC Supply
  - v. High-Density Discrete Input Card Module Jumper Configuration

- vi. Terminal Designations
- vii. LED On-Off Option - Jumper W17
- u. Internally Sourced Relay Contact or Open Collector DI
  - i. Single-Ended Driven Relay Contact DI
  - ii. Driven Differential Relay Contact DI
  - iii. Discrete Output Card Module Jumper Configuration
  - iv. Terminal Designations
  - v. LED On-Off Option
- v. Open Collector/Open Drain Type Modules
  - i. Relay-Contact Type Modules
  - ii. Solid State DC Relay DO Module Jumper Configuration
  - iii. Terminal Designations
  - iv. The External Circuit
  - v. High Density High Speed Counter Module Jumper Configuration
  - vi. HSC Input Configurations New
  - vii. Configurations for HSC-Powered Devices (Non-Isolated)
  - viii. Open Collector providing SET Input
  - ix. Signal Grounding Options
  - x. LED On-Off Option
- w. High-Speed Counter 4 Input Module Jumper Old Configuration
  - i. Terminal Designations
  - ii. HSC Input Configurations
  - iii. Configurations for HSC-Powered Devices (Non-Isolated)
  - iv. Open Collector providing SET Input
  - v. Signal Grounding Options
  - vi. LED On-Off Option
- x. 3335 DC Power System
  - i. Power Supply Module (DC-DC Converter)
  - ii. System Monitor Module
  - iii. Wiring and Setup

- iv. Power Terminals
- v. System Interconnect Board
- vi. Grounding Option
- vii. Bristol Babcock Teletrans Interface System
- viii. Cable Connections
- ix. Field Wiring Connections
- x. Transmitter Setup and Configuration
- xi. LED Indicators
- xii. TELE-RTU 3530-25B
- xiii. Enclosure
- y. 3530-25B RTU CPU Board
  - i. Display/Switch Panel Assembly
  - ii. Serial Communications Ports
  - iii. 12V Battery
  - iv. Field Wiring
  - v. Low Power I/O Expansion Board (LPI/OEB) Option
  - vi. Eight Discrete I/O
  - vii. Four Analog Inputs (Two Support Current Loop)
  - viii. One Analog Output
  - ix. One High-Speed Counter Input
  - x. One RS-232 or RS-485 Asynchronous Serial Communication Port
  - xi. TELEFLOW 3530-20B
  - xii. Enclosure
- z. 3530-20B RTU CPU Board
  - i. 3530-20B Multivariable Transducer
  - ii. Display/Switch Panel Assembly
  - iii. 12V Battery
  - iv. Field Devices

## **Recommended Resources**

- GTA Gas Flow Computers Participant Guide
- GTA Gas Flow Computers Instructor Presentation.
- Internet sites related to industrial flow computer applications.
- Textbooks or other publications related to industrial flow computers.