

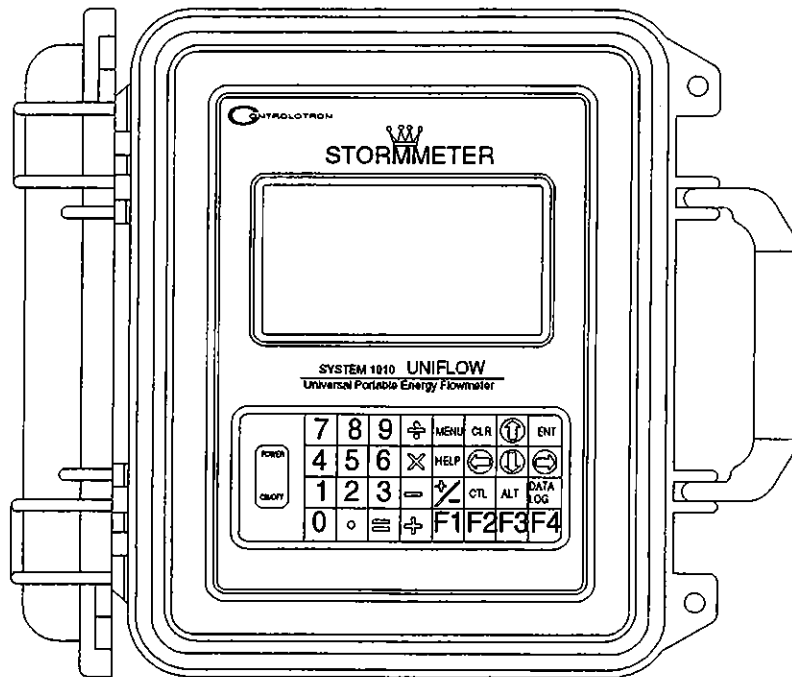
1.2.2 STANDARD PORTABLE FEATURES

All 1010 models shown include the following standard features:

Large 240 X 128 Pixel Display with 1-1/8 inch Characters

- Viewable from over 40 feet (12 meters)
- Allows hands-free operation with portable systems
- Graphics ability allows simultaneous digital and stripchart displays
- Push-button scrolling through all available graphic displays

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System 1010WP(DP), Portable Flowmeters

Single Path or Dual Channel/Path Operation

- Dual-channel systems provide two independent flowmeters in a single package for greater convenience and economy.
- The two measurement channels can be combined to form a single mathematical output (either subtractive or additive).
- Dual-beam operation combines two measurement paths into a single output (average of each path) that provides enhanced accuracy and immunity to most flow profile disturbances.
- Two independent channels allow the simultaneous use of Transit-Time and Reflexor™ flow measurement.

Operation with In-line Transducers

- 992DFT & 1011FT Flow Tubes are designed for small line sizes and extremely low flow applications

Compatibility with Clamp-on 990 transducers

- The Portable Installation Menu supports the use of both 991 and 1011 transducers. This benefits especially System 990 owners who upgraded to a 1010 model and still own 991 transducers.

Flexible Transducer Mounting Options

- EZ clamp and spacer bars make installing and spacing transducers fast and easy.
- Lightweight, rigid transducer mounting frames that can be coupled using spacer bars or installed separately for stand-alone mounting.
- Fixed length mounting tracks (for small transducers).

1.2.3 PERFORMANCE

Under standard conditions (measurements taken on a straight run of 15 diameters upstream and 5 diameters downstream; flow rate above 1 fps; non-aerated Newtonian liquids flowing at Reynolds numbers <2000 or >10000).

Transit-time Accuracy	At least 1% to 2% of indicated flow (better than 0.5% possible with calibration)
Flow Sensitivity	0.001 fps (0.0003 m/s) - even at zero flow
Zero Drift Stability	less than 0.015 fps (0.005 m/s)
Repeatability (small volume)	better than 0.5 %
Response Rate (Damping)	SmartSlew™ effective from 0.2 seconds to 5 minutes
Flow Velocity Range	Min. ±40 ft/s (±12 m/s), inc. zero flow
Linearity	0.003 ft/s (0.001 m/s)
Flow Profile Compensation	Automatic Reynolds number correction of reported flow rate

Integral Datalogger

All portable 1010 models include an integral datalogger that automatically logs data at selected intervals. These systems use a memory management algorithm to dynamically distribute all available system memory to the datalogger that is not in current use for site data storage. This results in a maximum capacity of over 200 Kbytes of data (single channel, compressed). The Datalogger includes an automatic report trigger that responds to selected real-time events. The keypad includes a "hot-key" to generate instant datalogger reports.

Analog Outputs

The system provides all the industry standard analog outputs, which can be scaled and ranged as required. The menu allows you to assign any available data function to an analog output. The digital display, stripchart and datalogger screens allow local viewing of all data functions.

4 to 20 mA Outputs

- All portable 1010 models provide two independent scaleable 4 to 20 mA isolated, loop-powered, outputs. Dual-channel models provide one current output per measurement channel.

0 to 10 Volt Outputs

- All portable 1010 models provide two independent scaleable 0 to 10 Vdc outputs. Dual-channel models provide one voltage output per measurement channel.

0 to 5000 Hz Pulse Rate Output

- All portable 1010 models provide two 0 Hz to 5000 Hz pulse rate outputs in the form of a buffered TTL signal similar to the final outputs of flowmeters such as turbines. Dual-channel models provide one pulse output per channel. Pulse outputs usually represent volumetric flow.

Alarm Functions

The 1010P flowmeters offer several alarms (shown by letter codes on the digital screen and in datalogger reports). Alarm relays are not standard equipment in the 1010 Portable systems, since they use significant battery current to sustain fail-safe operation. However, System 1010P provides buffered logic outputs (3 - 5 Vdc high, 0 - 1 Vdc low) for external device control which can be used as triggers for external relays, etc.

1.3 METER TYPES

Those familiar with our 990 systems, will appreciate System 1010's many new features; especially its ability to operate as several different meter types to meet the needs of almost any conceivable portable application. These features are described in the following paragraphs.

1.3.1 DUAL CHANNEL FLOW

In Dual Channel Flow mode, the meter becomes two entirely independent flowmeters operating simultaneously on two different pipes. Each pipe can be of a different size, transporting different liquids. In addition, either measurement channel can be set to operate as a clamp-on or in-line transit-time flowmeter, or a clamp-on Reflexor™ flowmeter.

1.3.2 DUAL PATH FLOW

In Dual-Path mode, both measurement channels operate on the same pipe using transit-time technology. Both measurement channels contribute to a single combined average output. The Dual-Path flowmeter configuration provides the highest possible accuracy, with excellent immunity from flow profile aberrations.

1.3.3 CH 1+2 OR CH 1-2 (ARITHMETIC) Flow

In an Arithmetic mode, the meter measures the flow of two channels independently, then creates a "virtual" channel, whose output is either the sum (Ch 1+2) or difference (Ch 1-2) of the two flow rates. Arithmetic mode supports either clamp-on or in-line transit-time only.

1.3.4 THICKNESS GAUGE

The Thickness Gauge allows you to obtain an accurate wall thickness measurement at a mounting location. This eliminates any uncertainty about the value of this critical parameter. The measurement range covers pipe walls from 0.1" (2.5 mm) to 2" (50.8 mm), depending on pipe sonic conductivity and condition of the inner wall of the pipe.

The thickness Gauge operation disables all flow measurement. Use the Channel Enable menu cell to re-establish flow measurement.

1.3.5 FLAW DETECTOR

The Flaw Detector provides an oscilloscope-type graphic display that shows sonic reflections consistent with pipe wall voids or other types of deterioration. Use the Flaw Detector to ensure that the pipe wall conditions of a prospective mounting location meet the requirements for clamp-on transducers.

When active, the Flaw Detector disables all flow measurement. Use the Channel Enable menu cell to re-establish flow measurement.

1.4 CHANNEL FUNCTIONS

The system's multi-tasking software allows you to operate one channel in Reflexor™ mode simultaneously with the other channel operating in Transit-Time mode. In addition, Transit-Time mode supports both clamp-on and in-line transducers.

1.4.1 TRANSIT-TIME MODE

All the 1010 models use transit-time flow measurement technology varying only in functionality and environmental housings. System 1010 improves the MultiPulse™ signal detection first used in 990 models by incorporating Controlotron's new Digitally Coded MultiPulse™ technology (DCM) featuring AutoMark™ receive signal detection.

Clamp-On

- Entirely non-invasive - installs in minutes without having to cut pipe or interrupt flow.
- Eliminates calibration errors due to wear - no moving parts and no contact between transducer and liquid.
- Operates bidirectionally - no special meter runs required.
- Works with most liquids flowing through metal or plastic pipes, including pipes with plastic, glass, epoxy and cement liners.

Flow Tube

The 992DFT and 1011FT flow tubes are the ideal solution for line sizes of three inches or under and for extremely low flow applications. Our flow tubes feature considerably less pressure drop than competing flowmeters such as coriolis or vortex shedding types.

Clamp-on Spool

The 1013S clamp-on spool supports applications with typically larger line sizes and volumetric flow rates than the 990 DFT or 1011FT flow tubes. It is intended for users that require a known and guaranteed intrinsic calibration.

1.4.2 REFLEXOR MODE

The System 1010 transit-time flowmeter is immune to the effects of liquid non-homogeneity caused by the inclusion of air or solid particulate. However, sonic beam scattering may occur when mineral-based solids or gaseous content is a high percentage of the volume. This can cause difficulty in operating the 1010 in transit-time mode due to signal attenuation. Liquid conditions that may be unsuitable for transit-time operation, actually aid Reflexor™ flow detection.

Dual-channel portable systems allow operation with one transit-time channel and one Reflexor™ channel measuring flow on the same pipe. There are some conditions though, such as an empty pipe, which do not permit operation in either Transit-Time or Reflexor™ mode.

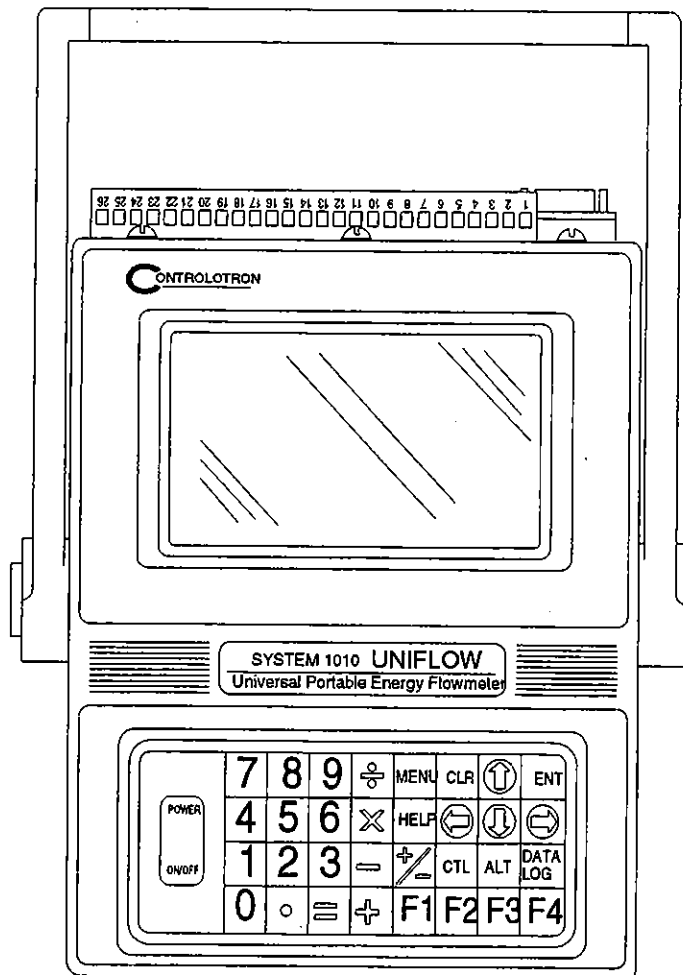
1.2 INTRODUCING THE 1010P/WDP FLOWMETER

Congratulations on your purchase of the System 1010P/WDP Portable flowmeter. Our unique 1010 Portable models are small, lightweight and versatile transit-time flowmeters that are easy to set up and operate. They represent the state-of-the-art in computerized instrumentation. We are confident that in a very short period of time you will appreciate your meter's unrivaled performance and features, especially Controlotron's ground-breaking enhanced transit-time Digitally Coded MultiPulse™ technology and the on-line automatic and interactive site setup help facility.

1.2.1 PORTABLE CONFIGURATIONS

We offer two basic chassis styles for 1010 Portable flowmeters. The 1010P and 1010DP miniaturized flowmeters use a lightweight plastic case for easy transporting and operation. The 1010WP and 1010WDP flowmeters use a compact and rugged submersible, weatherproof case. The following portable models are available:

- 1010P Single Channel Miniature Multi-Function Portable
- 1010DP Dual Channel Miniature Multi-Function Portable
- 1010WP Single Channel Miniature Multi-Function Portable
- 1010WDP Dual Channel/Path Miniature Multi-Function Portable



System 1010P(DP), Portable Flowmeters