AN 2573
the FIRST
Fully Programmable
Panel Mounted
Digital Rate Indicator

ANALOGIC ■

. . . The Digitizers

User Programmable AN 2573 delivers Total FLEXIBILITY

...in 3 unique ways

1. Universal Signal Input—The AN2573 accommodates inputs from millivolts to hundreds of volts, squarewaves, sinewaves, and pulses—spanning virtually every industrial rate measurement application.

2. User Control—A simple flip of a switch provides the user fingertip programmability of pulse or sinewave input, full-scale range, totalizer output and data averaging filter . . . and of course, the decimal points are selectable too.

3. Total Powering—Two AC power inputs, 100 VAC and 220 VAC ±20%, accommodate virtually any line voltage requirement worldwide. Two DC power options, 5 VDC and any input from 8 to 28 volts DC, provide the solution to portable instrumentation anywhere.

INTRODUCING THE AN2573

The AN2573 is an industrial grade, user programmable digital rate indicator capable of measuring RPM, inches per sec., liters per min., cycles per sec., feet per sec., bottles per min., and more. Due to the unique "Digitally Programmable Charge Pump Technique" the instrument accommodates virtually any transducer input signal from pulse inputs such as cam-driven microswitches or photo cells, to sinewave inputs from tachometers, flow meters and many other rate transducers. Concealed, yet front panel accessible microswitches provide all programming without special tools or operator training. Versatility is further enhanced by the programmable pulse output, which is ideal for totalizers and counters and by the analog output, which can be used for remote readout or strip chart recorders. In addition, a full complement of digital interface lines from latched and buffered parallel BCD to status, control and "handshaking" signals are provided—for processor, printer or comparator interfacing.

BRIGHT AND SHARP DIGITAL DISPLAY

The seven segment display is designed for maximum readability. Up close, several feet away, or off at an angle, the four large (.43 inch) red LED digits are bright, clear and free from glare or interpretation problems. Visual alarm indication for an input overload condition automatically blanks all digits to prevent an erroneous reading—but the polarity sign remains on to show that the instrument is working properly.

INNOVATIVE AUTOMATIC HYSTERESIS REJECTS NOISY SIGNALS

A unique automatic hysteresis circuit provides very stable readings in extremely noisy environments due to its wide dynamic range. It literally lifts the measurement above the noise level, automatically adjusting the input threshold to your actual transducer signal.

TOTALLY ISOLATED 2-WIRE INPUT FOR MAXIMUM FLEXIBILITY

A fully floating front end provides more than 3,000 volts isolation and greater than 200 db CMRR—so that shock hazards and problems due to ground loops, high common mode voltages, noise "spikes" or other such interference are designed out. Very low level turbine flow meter output signals can be measured as accurately as the more than 300 volts peak to peak AC power line.

BUILT IN DATA AVERAGING CAPABILITY

A digitally programmable analog filter with a total of 16 different time constants can be used to average data to smooth out sensor jitter, brush noise, or sudden changes in speed or flow. This allows you to match the response of the display to the response of your transducer—resulting in an optimized system.

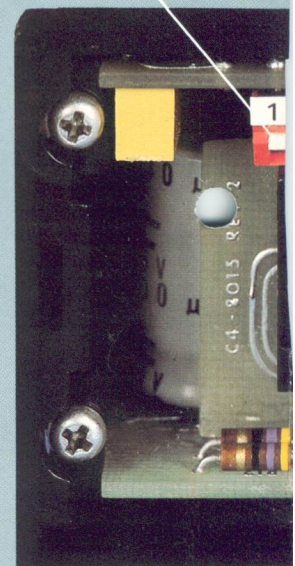### PACKAGED TO WITHSTAND SEVERE ENVIRONMENTS

This compact, lightweight instrument is packaged in a safe, rugged, high-impact plastic case made of UL94V-0 rated material and meets international DIN/NEMA panel mounting dimensions. Totally enclosed, the case keeps out dust, dirt and contamination, and also protects against shock, vibration stresses and rough handling. For even more severe environments, a metal case is available providing additional ruggedness, electrical shielding and interference rejection.

CONSISTENT PERFORMANCE ASSURED

High reliability through state of the art solid state electronics is backed up by comprehensive quality control and reliability procedures. The program includes life-test aging facilities for 100 hours temperature-cycled burn-in (0 to +50°C) and power on-off cycles on each instrument to insure long-term accuracy and repeatable performance. In addition, computerized testing of all subassemblies, vendor rating, vibration at 5G, 60 Hz for 30 seconds and all other testing is summarized by our certificate of calibration and conformance which you get with each instrument. This represents the industry's most comprehensive reliability documentation program for this class of instrumentation.

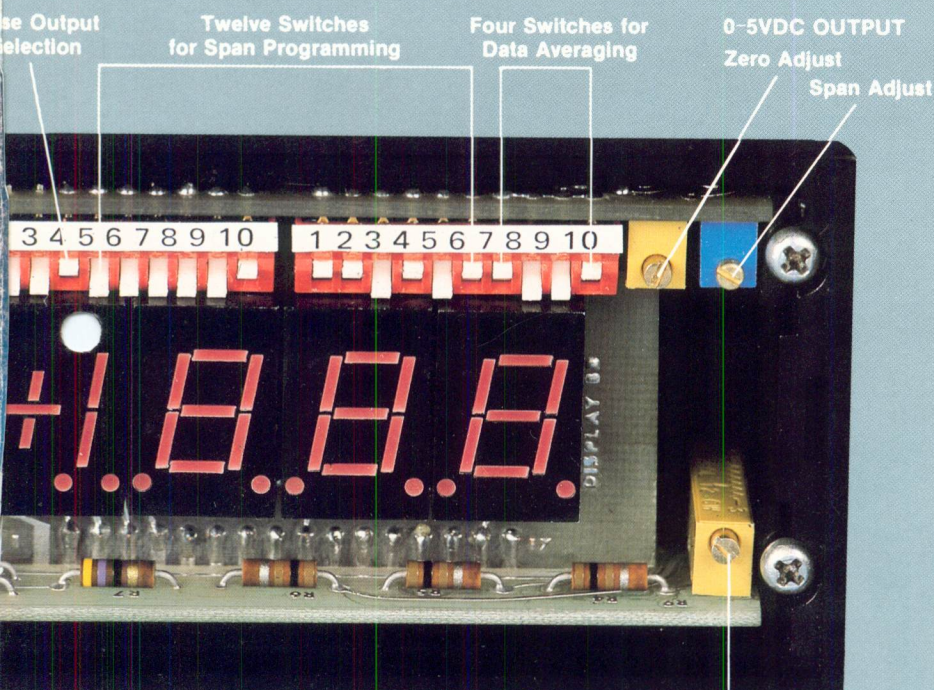## Front Panel Programmin

Sinewave or Pulse
Input Selection

Shown 2 1/2 times actual size

Accessible
g Controls at your Fingertips

se Output
election

Twelve Switches
for Span Programming

Four Switches for
Data Averaging

0-5VDC OUTPUT
Zero Adjust

Span Adjust

3 4 5 6 7 8 9 10   1 2 3 4 5 6 7 8 9 10

**AN2573 Front View
With Optical Lens Removed**

Full-Scale
Span Adjust

A truly universal instrument demands features and specifications not ordinarily required of dedicated devices. The specifications, operating characteristics and user oriented controls of the AN2573 represent a superior engineering accomplishment in measurement and control technology.

- *Digitally programmable rate indication*

- *Direct inputs from tach generators, flowmeters, photo cells, microswitches, etc.*

- *Programming of:*
  —Span, range and full scale
  —Data averaging
  —Pulse output
  —Decimal points

- *Floating and isolated (2000 volts) front end*

- *1400 volts isolation across power transformer*

- *CMRR greater than 200 db*

- *Accuracy of 0.05% of reading*

- *Readout resolution of 0.05%*

- *Automatic zero for long-term stability*

- *Bright and clear displays for maximum readability*

- *Buffered analog output available for recorders, controllers and remote readouts*

- *Latched and buffered parallel BCD outputs available for interfacing to printers, set-point controllers, data loggers or minicomputers*

- *High-precision, ultra-stable solid-state electronics*

- *Rugged, fully enclosed and shielded DIN/NEMA-standard metal case available*

- *Virtually immune to AC line noise and fluctuations, shock, vibration stresses, and temperature and humidity variations*

- *Screw-terminal connector for solderless wiring available*

- *Comprehensive test and reliability procedures insure lasting performance*

AN2573
Programmability
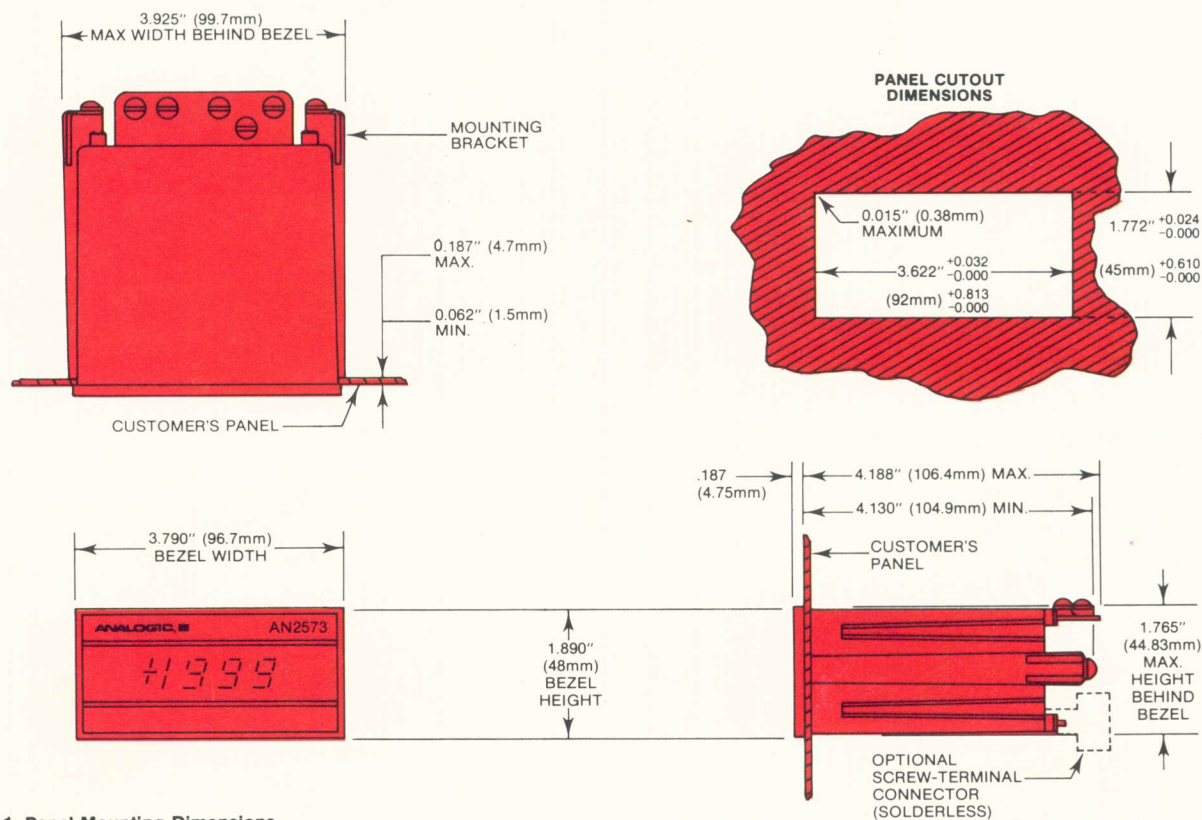**Rate:** Any input signal rate from 50 to 10,000 cycles per second can be programmed to display a full scale of 1999. Ranging, scaling, units conversion (e.g., from gal./min. to liters/min. etc.) can be done quickly by the flip of a switch in the factory, lab or field without ever removing the instrument from the front panel!

Input Signal: A single switch selects a pulse input (providing more than 1 volt noise margin) or a sinewave input (from 6m Vpp to 300 Vpp).

Isolated Pulse Output: A single switch selects either a true or inverted pulse output (CMOS, TTL or DTL compatible) for counters, totalizers, etc.

Averaging Filter: Data averaging is programmable in 16 steps from 0.35 seconds to 20 seconds step response.

Decimal Points: All three decimal points are jumper programmable on the rear connector for unit conversion and scale change.

The DPCPT
Design Concept
Analogic's unique Digitally Programmable Charge Pump Technique, DPCPT, is used exclusively to provide product enhancement, versatility, and flexibility for an otherwise dedicated rate indicator.

Each input cycle triggers, via an optical isolator, a highly stable programmable timer. During the pulse width a constant current source is steered to a capacitor paralleled by a discharge resistor. The voltage across the RC Network is directly proportional to the input signal frequency and the timer pulse width. The user simply programs the pulse width; thus any input from 50 Hz to 10 K Hz can be converted into a readout up to 1999 counts. It's as simple as that.

The timer is fully retriggerable—if the input frequency is greater than the programmed full-scale range, the meter indicates an overload condition to prevent erroneous readings. Clearly, the innovative DPCPT design concept adds unprecedented versatility, flexibility and value to the AN2573 and places this instrument into a class by itself.

3.925" (99.7mm)
MAX WIDTH BEHIND BEZEL

MOUNTING BRACKET

0.187" (4.7mm) MAX.

0.062" (1.5mm) MIN.

CUSTOMER'S PANEL

PANEL CUTOUT DIMENSIONS

0.015" (0.38mm) MAXIMUM

$1.772''^{+0.024}_{-0.000}$

$(45\text{mm})^{+0.610}_{-0.000}$

$3.622''^{+0.032}_{-0.000}$

$(92\text{mm})^{+0.813}_{-0.000}$

3.790" (96.7mm) BEZEL WIDTH

ANALOGIC. AN2573

+1999

1.890" (48mm) BEZEL HEIGHT

.187 (4.75mm)

4.188" (106.4mm) MAX.

4.130" (104.9mm) MIN.

CUSTOMER'S PANEL

1.765" (44.83mm) MAX. HEIGHT BEHIND BEZEL

OPTIONAL SCREW-TERMINAL CONNECTOR (SOLDERLESS)

Figure 1. Panel Mounting Dimensions

AN 2573 ORDERING CODE

SIMPLY SPECIFY—AN2573 ☐ ☐ ☐ ☐

For:
No BCD output — Enter X
Parallel Buffered BCD Output — 1

For:
+5VCD Power Input — Enter X
110 VAC ±20% — 1
220 VAC ±20% — 2
+8 to +28 VDC — 3

For:
Plastic Case UL 94V-O Rated — Enter P
Metal Case — M

For:
No Analog Output — Enter X
With Analog Output — A

(For optional connectors see Figure 2).

15-300004 Standard Card-Edge Connector (Solderable)

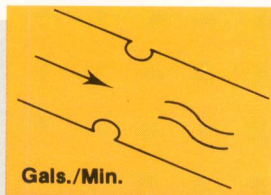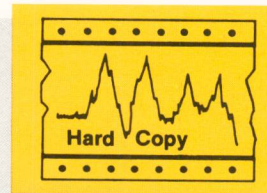PL10-5535 Optional Screw-Terminal Connector (Solderless)

Figure 2. Rear Panel Connectors

APPLICATIONS

INPUTS
(Sinewave, Pulses,
Microswitches,
Photo Cells, etc.)
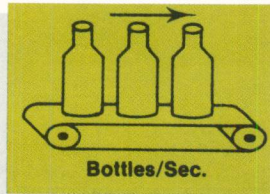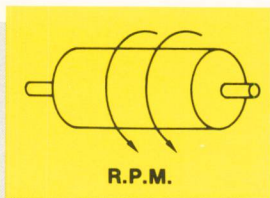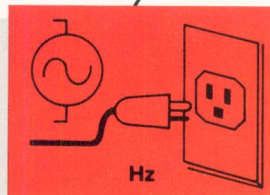
OUTPUTS
(Totalizer, Buffered and
Averaged Analog,
Latched and Buffered
BCD, Status and Control
and many more.)

Gals./Min.
FLOW

Hard Copy
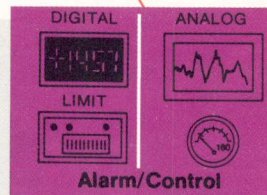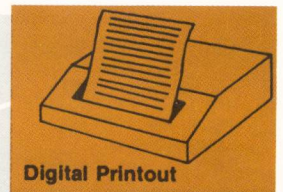**STRIP CHART**

Bottles/Sec.
RATE

Digital Printout
PRINTER

R.P.M.
ROTATION

+1999
AN2573

+1345
Isolated/Remote Readout
TOTALIZER

Hz
FREQUENCY

DIGITAL | ANALOG
LIMIT
Alarm/Control
REMOTE READOUT

Six Typical Applications

PROBLEM:
Measure and indicate consumption of fuel flowing through a pipe in GAL/MIN. or LITERS/MIN. and indicate amount of fuel used.

SOLUTION:
Connect turbine flow meter output directly to AN2573 input and program the display to read in either GAL/MIN. or LITERS/MIN. Connect two wires from totalizer to AN2573 and select type of totalizer output required for proper calibration.

PROBLEM:
Control tension of paper between feed spindle and take-up reel in pulp paper application.

SOLUTION:
Install tachometer on feed roller and take-up roller. Connect each to an AN2573 and program for FT/SEC. readout. Generate servo control signal for take-up drive motor by combining analog outputs from both units. Note: A digital control can also be implemented by feeding both AN2573 BCD outputs into a digital comparator/set point controller.

PROBLEM:
Monitor production rate efficiency of bottling operation and interface to central plant control computer.

SOLUTION:
Install photo cell on conveyor belt and measure interruptions of light beam; one per bottle passing by. Program AN2573 to read "100.0% efficiency" for proper bottling rate, connect totalizer to instrument and count number of processed bottles. Utilize BCD outputs and "handshaking" lines to interface to control computer for control, logging, computation and inventory control.

PROBLEM:
Monitor and control printing drum RPM in textile printing application and have variable "HIGH" and "LOW" limits.

SOLUTION:
Use magnetic pickup on drum spindle and program AN2573 for direct readout in RPM. Interface digital limit comparator to AN2573 via BCD outputs or use analog output to drive analog "HIGH" and "LOW" limit comparator.

PROBLEM:
Monitor and control variable frequency AC power generator.

SOLUTION:
Measure AC power frequency directly by programming AN2573 display to read "60.0Hz." Utilize analog output for comparison with desired frequency set point and have derived error signal drive

magnetic hysteresis clutch on generator.

PROBLEM:
Minimize fuel consumption in boiler application and provide readout for fuel consumption rate, boiler temperature and amount of fuel left in storage tank.

SOLUTION:
Install turbine flowmeter in burner feeder line and program AN2573 to read fuel consumption rate directly in GAL/MIN. Connect totalizer in count-down mode to display number of gallons left in storage tank. Install Analogic's model AN2572 thermocouple precision digital thermometer to measure and display burner flame temperature. Combine analog outputs from the AN2572 and the AN2573 and derive the control signal for the oxygen supply. Additionally, analog or digital alarm limits can be used for the flame temperature readout (AN2572) to instrument HIGH and LOW safety limits and controls.

INSTRUCTION MANUAL
Supplied with every instrument is a 40-page manual, filled with specifications, programming information, analog output interfacing, totalizer hook-up examples, digital interfacing, maintenance, calibration and more.

SIGNAL INPUT: User selectable for sinewave or pulse input (See below)

Configuration	Two wire, floating and isolated, DC coupled.
Input Resistance	100 K Ohm in parallel with 1000 pF.
Bias Current	50 nA typical
Input Frequency	0 to 10 KHZ
Input Protection	±300 VDC or AC RMS continuous without damage.

Sine Wave Input

Input Voltage	6mVpp to 300Vpp
Hysteresis	Automatic, 10% of input signal up to 100mV maximum Hysteresis

Pulse Input

Polarity	Pulses to be positive with respect to signal return.
Input Voltage	1.5V to 100V
Threshold Level	1V nominal
Pulse Width	50 μ sec. minimum

PERFORMANCE

Accuracy	±0.05% of reading ±1 count
Resolution	0.05% for 2000 counts
Offset Tempco	None, automatic zero
Range Tempco	100 ppm/°C typical
Step Response	User selectable in 16 steps from 0.35 sec. to 20 sec.

COMMON MODE

Signal Input to Analog Ground

Common Mode Voltage (CMV)	±2000 VDC or AC peak
Common Mode Rejection Ratio (CMMR)	>100 db @ 50 or 60 Hz

AC Power Line To Analog Ground

Common Mode Voltage (CMV)	±1400 VDC or AC peak
Common Mode Rejection Ratio (CMRR)	>120 db @ 50 or 60 Hz

RATE TO ANALOG CONVERSION

Technique	User programmable digital charge pump. Programmable from 10 μ sec. to 20 m sec. in 5 μ sec. increments.
Reference	Ultra stable ceramic resonator derived time base.

ANALOG TO DIGITAL CONVERSION

Technique	Dual Slope with automatic zero, 2.5 conversions per second nominal

OUTPUTS

Digital

Parallel BCD (Optional):	15 parallel lines provide latched and buffered BCD output, POLARITY, and PRINT command. All are TTL/DTL and CMOS compatible, 2 TTL loads each.
OVERRANGE	Logic "0" indicates that input exceeds +1999 counts, CMOS compatible, 0 to +5VDC.
EOC	Falling edge of "End of Conversion" signal indicates conversion complete, CMOS compatible, 0 to +5VDC.
Pulse Output	User selectable for true or inverted output. 0 to +5VDC swing, DTL, TTL and CMOS compatible; 3TTL loads.

Analog Output (optional)

Voltage	0 to +5VDC output (2.5mV per display count).
Current	2 mA drive capability, short circuit protected.
Offset Tempco	20 μ V/°C typical

DISPLAY

Type	Seven segment planar LED, red, 0.43" (11mm) high.
Polarity Indication	Automatic plus "+" sign displayed.
OVERRANGE Indication	All digits blanked to prevent erroneous readout, "+" sign remains on.
HOLD	Logic "O" (open collector or equivalent) holds last reading in display
BLANK	Logic "O" (open collector or equivalent) blanks display.
DISPLAY TEST	Logic "O" (open collector or equivalent) tests all 23 segments of display by displaying "1888."
Decimal Points	Externally programmable.

POWER

Choice of 4 Power inputs	**1.** +5VDC ±5% @ 170mA nominal.
	2. +8 to +28VDC @ 90mA nominal (Specifically designed for Automotive, Marine, Railroad, and Aircraft applications; protected against supply reversals).
	3. 110 VAC RMS ±20%, 47 to 500 Hz @ 1.6 watts nominal (88 to 132 VAC input range).
	4. 220 VAC RMS ±20%, 47 to 500 Hz @ 1.6 watts nominal (176 to 264 VAC input range).

ENVIRONMENTAL & PHYSICAL

Operating Temperature Range	−10°C to +50°C
Storage Temperature Range	−40°C to +85°C
Relative Humidity	0 to 90%, noncondensing
Case	DIN/NEMA standard, high impact molded plastic case, UL94V-O rated. Metal case available. (See ordering code)
Dimensions	DIN/NEMA (See Figure 1)
Weight	8 oz (226 grams) nominal, DC powered; 11oz (312 grams) nominal, AC powered.
EMI/RFI	Shielding on 5 sides with metal case option.
Special Line Noise Suppression	Provision made for surge suppressors, varistors and line input passive Pi filtering for industrial applications. Consult factory.

RELIABILITY

MTBF	>80,000 hours, calculated
Burn-In	>100 hours with 0°C to +50°C temperature cycles and power on/off cycles.
Vibration	Each unit vibrated at 5gs for 30 seconds.
Calibration	NBS traceable. Detailed certificate of calibration shipped with each unit.
Recalibration	Recommended 15-month intervals.
Warranty	12 months