AN2533/AN25[illegible]3

UNIVERSAL, BIPOL[illegible]

±3 1/2-DIGIT (±1999-COUNT)

DIGITAL PANEL INSTRUMENT

The AN2533/AN2553 breakthrough instrument design reflects Analogic's world leadership in digital panel instrumentation . . . . . and the experience gained in producing more than 250,000 instruments.

Never before has the OEM user been offered so many and varied opportunities to incorporate "value-added" features into a digital panel instrument - - - increasing the profitability of his product, and exploiting fully his own design expertise. In fact, by standardizing on either of the two configurations, most OEM users can satisfy **all** of their 3 1/2 digit DPI requirements.

The AN2553 is the more versatile configuration. Its design includes an internal power and signal interface connector which accepts a general purpose plug-in card on which the user can install proprietary analog-interface circuitry. . . . . or Analogic can add the special purpose circuitry during manufacture, whichever is more economical. (Typical analog-interface functions that may be provided are: ac and dc current measurement, extended range ac and dc voltage measurement, active multipole filtering, information reinforcement filtering, thermocouple or RTD temperature transducer conditioning, LVDT excitation and demodulation, frequency-to-voltage conversion, current sourcing, auto-ranging, and ultra high impedance buffering.)

The AN2553 and AN2533 both provide power and space for an optional **digital** circuit card for such add-in features as isolated parallel BCD output, digital linearization, and set-point control. Here again, the add-ons may be provided by the user, or, for quantity requirements, engineered and built in by Analogic.

The AN2533 provides the same advanced performance features and inherent versatility of the AN2553, except that the analog-interface connector is omitted. The basic design common to both is so flexible and adaptable that this lower cost version provides far more value-added application freedom than any conventional design.

In either configuration, exceptional confidence in high quality and reliability is warranted by: (1) Application of worst-case error analysis to ensure specification integrity throughout rated life; (2) Minimizing the component count without "corner-cutting;" (3) Exclusive use of premium, field-proven components; (4) 100% burn-in of all IC's; (5) Use of CMOS digital circuitry resulting in extremely low internal temperature rise (less than 10°C); (6) Generous derating margins; (7) 100% testing of subassemblies; (8) 4-day burn-in of all completed instruments **before** final test; and (9) Comprehensive, detailed quality-assurance procedures.

Design features that contribute to the wide-range versatility of this design include: a true symmetrical front end; dual-slope, long-period signal integration; choice of bright, luminous, 0.55" (14mm) gas plasma or 0.43" (11mm) LED display; common-mode rejection ratios up to 160dB; normal mode rejection ratios up to 100dB; and a universal 100/117/220/240 Vac power supply.

Compare 3 1/2-Digit Instruments - Study all available specifications. Consider this instrument's potential to maximize the value added to your product. We believe you will agree that we have made available the best general purpose DPI to fulfill present and foreseeable measurement needs.

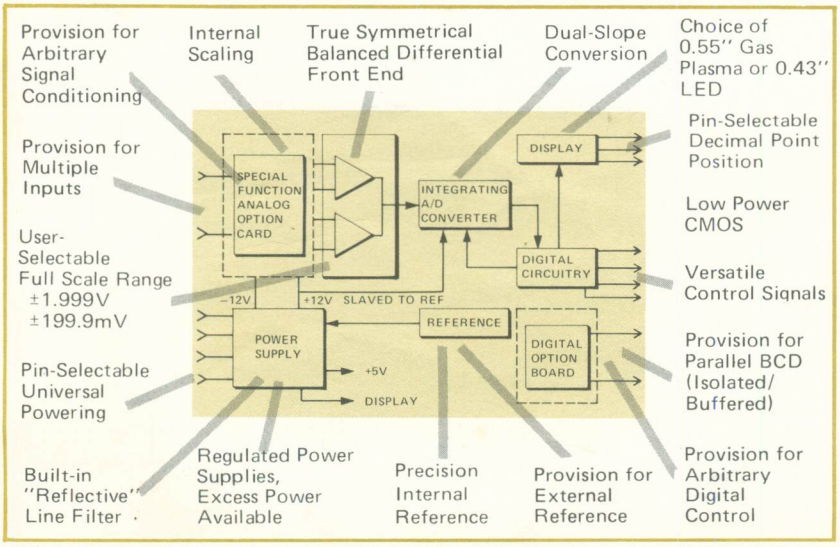


Figure 1. Simplified Block Diagram

FEATURES

- **ACCURACY AND STABILITY**
  Resolution: ±1999 counts
  Error: Less than ±0.05% Rdg ±1 count
  Noise: Deadband less than 0.1 count
  Temperature Coefficient: <35ppm/°C typical
- **DISPLAY OPTIONS**
  0.55" (14mm) gas plasma or 0.43" (11mm) LED, self-illuminating
  Automatic polarity
  Pin-selectable decimal points
  Dummy Zeros
- **UTMOST RELIABILITY**
  Low parts count; yet incorporating those needed for safe performance margins
  Cool operation:
  only 2 watts power consumption
  low-power CMOS circuitry
  Standard, proven, volume-production IC chips
- **USE-ORIENTED INPUT CONDITIONING**
  True-differential, balanced symmetrical inputs†
  Low bias current
  High input impedance
  Built-in signal offsetting capability
- **VERSATILE CONTROLS**
  External run/hold
  Remote display control
  User-selectable full scale range
- **UNIVERSAL POWERING**
  Universal transformer; pin connectable
  100, 117, 220 or 240Vac, 49 to 500Hz
  Highly regulated internal supply voltages;
  +5V, +12V, −12V with excess capability
- **PROVEN INTERFERENCE REJECTION**
  High CMRR & NMRR capabilities
  Built-in "reflective" line filter
- **ADAPTABLE MECHANICAL PROVISIONS**
  International DIN/NEMA standard case
  UL 94V-0 Rated
  Front-panel removeable, †easily serviced
- **WIDE ENVIRONMENTAL RANGE**
  Operating temperature range: −10°C to +60°C
  High rejection of electric fields
  Operational in harsh shock & vibration stresses
- **OEM INSTRUMENT-TO-PRODUCT TRANSFORMATIONS**
  By plug-in PC-board assemblies for thermocouple and RTD temperature indicators; pH meters; load cell, bridge, and LVDT weight, force, and pressure instrumentation; etc.
- **SYSTEM-COUPLING OF ANALOG INPUTS AND DIGITAL OUTPUTS**
  Low input bias currents:
  to fractions of picoamperes!
  Very high impedance input circuits:
  to 10^{12} ohms!
  Isolated and buffered parallel BCD outputs
  Power-sharing and coupling capabilities

†U.S. Patent numbers 3718923, 3751717, 3751791 and others pending

ANALOGIC®
. . . The Digitizers

AN2533 & AN2553 SPECIFICATIONS

		AN2553 EXPANSION CAPABILITIES
ANALOG INPUT		
Configuration	Bipolar balanced symmetrical differential inputs	Any arbitrary input transducer signal conditioning, plus filtering, amplifying, impedance-matching, and analog linearizing, etc.
Full-Scale Range	±1.999Vdc or ±199.9mVdc, user-selectable (special scaling available in OEM-quantity)	Any arbitrary input signal scaling
Bias Current	10nA nominal, 30nA maximum	As low as 10^{-13} amperes
Offset Current	5nA nominal, 10nA maximum	As low as 10^{-13} amperes
Dynamic Input Impedance	1000 megohms nominal	As high as 10^{12} ohms
Normal Mode Rejection	>30dB @ 60Hz with std. hi-freq. filter; up to 100dB with optional lo-freq. filter	Up to 100dB
Common Mode Rejection		
Isolated Digital I/O: CMV Range:	±500Vdc or peak ac	
CMRR:	>80dB intrinsic (See Application Data)	Up to 160dB
Non-Isolated Digital I/O: CMV Range:	±2.5Vdc or peak ac-input V	
CMRR:	>80dB intrinsic	
Zero-Offsetting	±30 counts nominal at 1-volt full scale	Any arbitrary value consistent with maximum input voltage specifications
Maximum Differential Input Voltage	±20V without damage	Up to ±1000V without damage
ACCURACY/STABILITY		
Accuracy	±0.05% of reading ±1 count	
Resolution	±1999 counts	
Monotonicity	Guaranteed	
Range Tempco	35ppm of reading/°C typical, 70ppm of reading/°C maximum	
Offset Tempco	20μV/°C typical	
Recommended Recalibration Interval	12 months	
CONVERSION		
Technique	Dual-slope integration, each measurement independent of the previous measurement	
Control	Displayed conversion controlled by internal (clock) or external (arbitrary system-developed control logic) command (low level applied to Pin 6 of Connector J1)	Built-in, arbitrary system-developed control logic (See Application Data, page 4)
Rate	~2 readings/second (internal) or any lower rate controlled by external command	Any arbitrary rate less than 2 readings/second, controlled by built-in logic command (See Application Data, page 4)
Input Integration Period	100 milliseconds nominal	
DISPLAY		
Type	7-segment gas plasma 0.55" (14mm) or LED 0.43" (11mm), planar	
Number of Digits	3 full-decade digits, and "1" in most significant digit position (See Ordering Guide, page 3 and Fig. 11, for dummy zero options.)	
Decimal Point	Externally programmable in three positions (See Application Data, page 4)	
Polarity	Automatic, plus or minus sign displayed	
Overload (More than 1999 Counts)	All digits blanked; polarity and decimal point remain lighted	
DIGITAL SIGNALS (See Timing Diagram, Figure 3.)		
Logic Levels (All Inputs and Outputs)	DTL/TTL/CMOS compatible. Sinks 1.6mA at low level (0 to 0.5V) and sources 40μA at high level (+3.5 ±1V)	
External Blanking	Low level input (on Pin 7) blanks three least significant digits	
Hold	Low level input (on Pin 6) retains last reading in display (See Figure 7.)	
Overload	Low level output (on Pin 7) indicates a measurement greater than 1999 counts	
Clock	Continuous (100kHz nominal)	
Latch	High level output (on Pin J) indicates that counter contents are being transferred into latches	
Carry	Rising edge (on Pin F) indicates counter carry (See Application Data)	
EOC	Rising edge (on Pin K) signals end of conversion (EOC)	
Polarity	High logic level (on Pin 8) indicates measurement is negative	
BCD OPTION CARDS	Isolated and/or buffered parallel BCD outputs (See Application Data).	
MTBF	43,000 hours calculated	
POWER		
Input Voltage	100, 117, 220, or 240Vac rms ±10%, 49 to 500Hz	
Available Output Voltage	+4.75Vdc ±5% at 30mA +12Vdc ±8% at 10mA; −12Vdc ±8% at 10mA	
Consumption	2 watts nominal*	
ENVIRONMENTAL & PHYSICAL		
Operating Temperature	−10°C to +60°C (+14°F to +140°F)	
Storage Temperature	−25°C to +85°C (−13°F to +185°F)	
Relative Humidity	0 to 95%, noncondensing	
Weight	12 ounces nominal (340 grams)	
Case	High-impact molded plastic case UL 94V-0 Rated standard; metal case available as an option	
Dimensions	DIN-Standard: 96mm (3.78 inches) bezel width x 48mm (1.89 inches) bezel height x 104.9mm (4.13 inches) max. depth (see Figure 8)	

*Slightly higher with LED displays

INPUT SIGNAL ENHANCEMENT & INTERFERENCE REJECTION

The AN2533/AN2553 exceptional overall signal interference rejection is a combination of:

(1) The intrinsic front end (input terminal related) CMR
(2) The normal mode input filter rejection, and
(3) The long-time integration in the dual slope A/D converter.

As a result, the user has a remarkable flexibility in obtaining accurate normal mode (series) noise rejection.

TRUE, BALANCED, DIFFERENTIAL INPUT & CMR

The very high impedance, true balanced symmetrical differential front end (not to be confused with some pseudo-differential types) provides the user with the versatility for making direct additive or subtractive measurements of local or remote noisy inputs from one or more sources, referenced to arbitrary system power or instrument ground. The digitized output represents the true difference of input potentials, and, therefore, it is insensitive (see specifications) to voltage variations and fluctuations common to both terminals. Thus, the input differential circuitry itself can contribute to the rejection of common mode potentials referred to instrument ground. In addition, because of the high degree of isolation of the power transformer, excellent rejection ratios are achieved for common mode voltages up to ±350V with respect to power line ground.

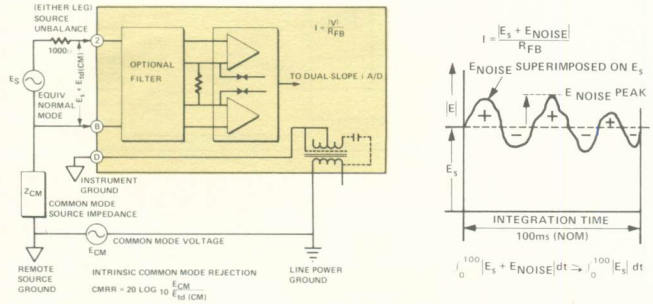


Figure 4. Transformation of Common Mode Signals, E_{CM}, to Normal Mode Signals, $E_{td(CM)}$, NMR, and Rejection by Integration

NORMAL MODE REJECTION

Normal mode interference signals, resulting either from conversion of common mode voltage to differential voltage or from additive (series) interferences, may be filtered out by a combination of passive or active input filtering and conversion integration. The standard DPI (see specs) is supplied with a nominal 20Hz low pass single-pole filter which, in combination with the integration effect, yields approximately 30dB rejection at 50/60Hz. There is ample provision within the AN2533/53 to incorporate either lower frequency and multipole passive filters and/or active filters which utilize the input differential amplifiers as their active elements (see Example A, page 5), so as to obtain normal mode rejections up to 100dB or greater at 50/60Hz.

INTERFERENCE REJECTION BY INTEGRATION

Remaining interference components (after front-end terminal related and input filter rejection) are still further reduced by the 100ms integration. For net signal level-to-peak noise ratios higher than one, the bipolar integration is complete so that, even for non-synchronous 50 or 60Hz interference, rejection greater than 20dB will be achieved.

Overall common mode rejection ratios of greater than [illegible] (for example, 80dB intrinsic CMRR, +60dB NMRR, +20dB integration rejection) at 50 or 60Hz with 1000 ohm unbalance in either input line can **readily** be obtained!

ANALOG FUNCTION CARD

Using either the Analogic AN450 General Purpose Analog Function Card with Filter (see Fig. 11), which is typically capable of handling 30 arbitrary components, including potentiometers, dual in-line ICs, and discrete 2-and 3-lead components, or by designing his own such card, the user may build in proprietary circuitry for any arbitrary signal conditioning, excitation, or linearizing function, utilizing the available excess regulated power, stable reference, and additional input terminals for optimum system compatibility.

The General Purpose Analog Function (kluge) Card, with a pre-engineered layout for optimum component space utilization, is held securely in the DPI by connector J3 and the case without the need for any additional mounting hardware.

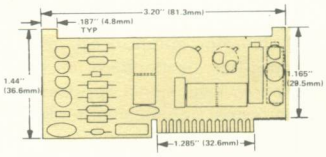


Figure 5. Typical Kluge Card Layout

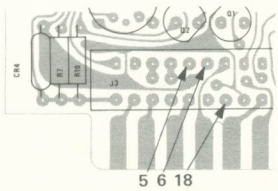


Figure 6. PC-Board Scaling Connections

ARBITRARY SCALING

With a 10,000Ω feedback resistor (R_{FB}) connected as shown in Figure 2, the DPI is normally calibrated at the factory for a full-scale range of 1 volt/1,000 counts. A thermally tracking internal resistor, 1.1kilohms, may be connected in parallel with the 10,000 ohm resistor by a jumper between positions 5 and 6 on the main assembly PC board (AN2533) or by connections on the analog option board (AN2553). The parallel resistance of 1,000 ohms provides the user-selectable sensitivity of 100mV/1,000 counts (100μV/count). Any other sensitivity may be obtained by a net resistance between positions 6 and 18 according to the formula $R = \frac{\text{Voltage/1,000 Counts}}{0.1\text{mA}}$.

HOLD

To hold a displayed reading, gate a HOLD command (the comparator output shown in Figure 2) with the rising edge of EOC (available at pin K), and then generate a DTL low level signal (HOLD). When applied to Pin 6 of the DPI connector, the HOLD signal will keep the last conversion displayed, while the DPI continues to update the measurement internally. When HOLD is removed, the next valid measurement is transferred to the display latches.

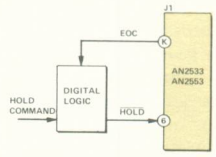


Figure 7. Generating a Hold Command

ANALOGIC LIBRARY OF SPECIAL FUNCTION CARDS

DIGITAL CIRCUIT OPTIONS

AN404 Function PC Card DIN Standard
AN406 Latched, Buffered Parallel BCD Output Card
AN408 Isolated, Buffered Parallel BCD Output Card

ANALOG CIRCUIT OPTIONS

AN450 Analog Function PC Card with Input Filter
AN451 Analog Function PC Card without Input Filter
AN452 Thermocouple Cold-Junction Compensation Card
AN453 RTD Temperature Card
AN454 Input Filter Card
AN455 Industrial Current Receiver Card
AN456 Industrial Voltage Receiver Card
AN461 True RMS AC Voltmeter Card
AN462 Power Line Voltage Monitor Card
AN463 Microvolt Receiver Card
AN466 Linearized Thermocouple Card

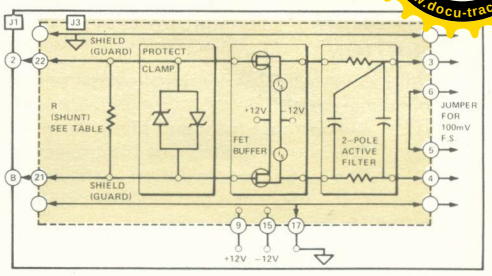
APPLICATION DATA

The examples below are only a few of the essentially limitless applications of the AN25[illegible]. The[illegible] indicate the wide range of applications, versatility, and ease of using this digital panel in[illegible]me[illegible]

A Assemble A Precision Current Meter

F.S. RANGE	UNIT COUNT	SHUNT, R
2.000 Amp	1mA	0.100Ω
200.0mA	100μA	1.000Ω
20.00mA	10μA	10.00Ω
2.000mA	1μA	100.0Ω
200.0μA	100nA	1.000KΩ
20.00μA	10nA	10.00KΩ
2.000μA	1nA	100.0KΩ
200.0nA	100pA	1.000MΩ
20.00nA	10pA	10.00MΩ
2.000nA	1pA	100.0MΩ

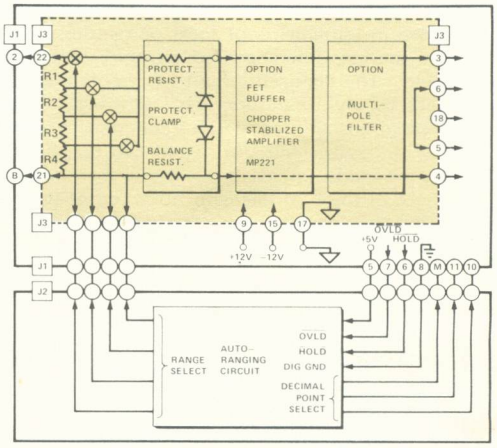
To measure current from amperes to picoamperes, simply select the standard 100mV/1,000 count DPI sensitivity and install the appropriate shunt resistance. Depending on the signal amplitudes and interferences, design protective clamps, low leakage FET buffers, and multipole filters. Appropriately guard for higher sensitivity operation by eliminating leakage current paths. Digitize the output in any arbitrary engineering units by modifying the shunt resistance between Pins 6 and 18 of J3. By connecting either end of the shunt to analog ground, or by other means, assure circuit conformance to common mode limits.



B Build An Extended Range Voltmeter

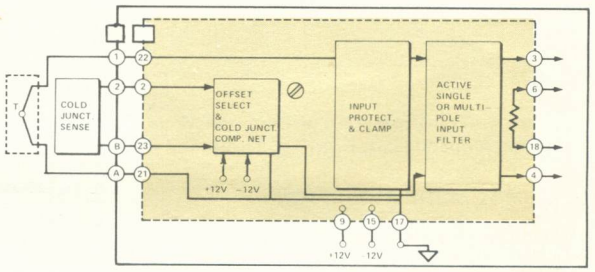
To measure any voltage from kilovolts to microvolts, use either of the selectable standard DPI sensitivities and the appropriate voltage divider network. Depending upon whether a single-range or multiple-range voltmeter is desired, design suitable switching circuits to be activated either by externally programmed range select signals, or optionally, by range control signals developed on the digital function card. Protect the input circuitry with resistive and clamping components, and introduce an optional FET buffer, chopper stabilized amplifier, or standard amplifier module such as the Analogic MP221 if needed in very low level signal applications. Incorporate an optimal filter to obtain the necessary signal enhancement. Measured voltages may be scaled in arbitrary engineering units by suitable modifications to the input divider network alone, or coupled with appropriate scaling resistors, R_{FB}.

	SINGLE-RANGE			MULTIPLE-RANGE	
	1000V	100V	10V	EITHER	
R1	999K	990K	900K	9M	900K
R2	1K	10K	100K	900K	90K
R3	0	0	0	90K	9K
R4	0	0	0	10K	1K



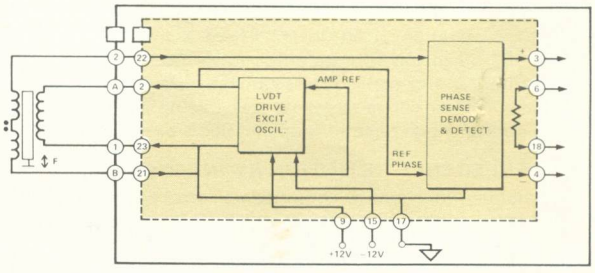
C Construct A Thermocouple Temperature Indicator

Cold-junction-compensated temperature indicators, utilizing **any type** of thermocouple, with excellent common mode (greater than 160dB!) and normal mode (greater than 100dB!) rejection can easily be constructed with just a few components. A semiconductor or resistive cold junction sensing element, stably powered by the DPI +12V power reference, can generate an offset and cold-junction-compensation variable voltage which can be directly subtracted (or added) from the thermocouple-developed voltage via the true differential balanced input circuitry. Input resistor and zener clamps may provide protection, and filter components as shown in "A" above may form an active two-pole filter. The appropriate resistor across Pins 6 and 18 of J3 scales the output directly in temperature-related engineering units.



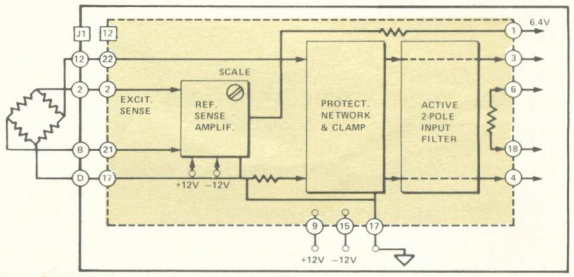
D Develop An LVDT Position Or Force Indicator

The excitation winding of an LVDT may be driven over a wide range of frequencies by an excitation oscillator powered by the ±12V regulated supplies and amplitude regulated by the precision +12V supply. The combined differential winding output of the LVDT can then be phase-sensitive demodulated in a simple switching circuit whose phase reference is derived from the excitation oscillator. The filter output of the phase sensitive demodulator can then be applied directly to the differential inputs of the DPI. Again, the output may be scaled in any desired force or linear units by choosing the appropriate resistor across Pins 6 and 18 of J3.

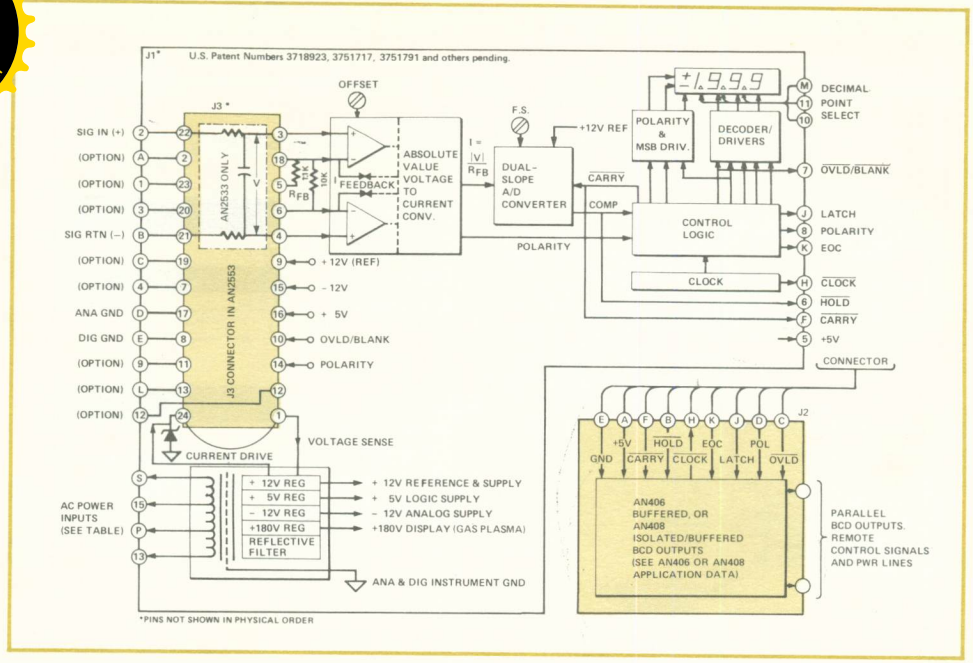


E Engineer A Ratiometric Load Cell Meter

The ratiometric capability of the AN2533/2553 may be exploited to perform ratiometric measurements of bridge transducer outputs with an accuracy independent of the external excitation supply variations. Available input pins may be utilized to sense the voltage across the bridge via a reference sense amplifier whose output may be applied via Analog Function Card Connector J1, Pin 1, to control the DPI reference. The differential output of the bridge may be scaled, offset, or amplified, or may be applied directly to the differential inputs. As described above, the scaling resistor between Pins 6 and 18 of J3 converts the output to arbitrary engineering units.



Analogic Application Engineers would be pleased to provide additional examples and assistance to OEM users.



Pin Designations

J1 (bottom)

ANA OPT[1]	A	1	ANA OPT
SIG RTN (–)[2]	B	2	SIG INPUT
ANA OPT[1]	C	3	ANA OPT[1]
ANA GND	D	4	ANA OPT[1]
DIG GND	E	5	+5V OUT
CARRY	F	6	HOLD
CLOCK	H	7	BLANK IN/OVLD OUT
LATCH	J	8	POLARITY
EOC	K	9	DIG OPT[1]
DIG OPT[1]	L	10	DEC PT 1
DEC PT 3	M	11	DEC PT 2
DIG OPT[1]	N	12	DIG OPT[1]
AC LINE[3]	P	13	AC LINE[3]
DIG OPT[1]	R	14	DIG OPT[3]
AC LINE[3]	S	15	AC LINE[3]

[1] In AN2553, available for user selection with Special-Function card.
[2] AN2533 connection as shown. In AN2553, available for user selection with Special-Function card.
[3] See Table below for powering selection.

TRANSFORMER CONNECTIONS

LINE VOLTAGE*	P	13	S	15
100V	●			●
117V (120)	●		●	
220V		●		●
237V (240)		●	●	

*49 to 500Hz.

Figure 2. Functional Block Diagram

Operating Features & Principles of Operation

As shown in Figure 2, the AN2533 contains a balanced signal enhancement input filter; a floating true differential front end; an absolute-voltage-to-current converter; a dual-slope ratiometric, current-to-count integrating analog-to-digital converter; clock-driven logic control circuitry, decoders, drivers and displays; and regulated power supplies derived from the secondary windings of a universal transformer.

Signal input to connector J1 is conditioned by the built-in filter (AN2533) or by arbitrary signal conditioning on the analog option card inserted in internal connector J3 (AN2553), resulting in a potential difference (V) at J3, pins 3 and 4, connected to the non-inverting inputs of the differential input amplifiers. The conditioned signal input (V) develops a unidirectional signal current (I), whose magnitude depends on the value of the selected feedback resistance (R_{FB}), according to the simple Ohm's Law formula shown in Figure 2. The signal current linearly charges a high quality, low leakage, integrating capacitor during the signal integration phase of the dual slope conversion. The current generation circuitry also includes the polarity sensing for display.

Under control of the 100kHz clock-driven logic, the signal integration phase lasts 10,000 counts, thus adding to the overall signal enhancement by providing very high rejection of normal mode interfering noise. At the end of the 10,000 counts, the $\overline{\text{CARRY}}$ control signal causes the integrator to switch into the reference integration phase, during which the integrating capacitor is discharged at a constant rate determined by a current derived from the precision +12V reference until the comparator changes state. The precision resistor network determining the integrating reference current is mounted on the same substrate as the built-in selectable feedback resistance (R_{FB}). Thus maximum thermal tracking of ratio-determining dual-slope performance components is obtained. This contributes to the exceptional overall thermal stability of the conversion. Moreover, because the signal integration phase is at least 5 times as long as the reference integration phase (10,000 counts to a maximum of 2,000 counts), noise disturbances are reduced significantly in the output.

The count accumulated during the reference integration phase is latched into the storage register, decoded, and, in addition to the polarity sensed in the current generator, used to update the display about twice a second for optimal flicker-free readings. When the count exceeds 1999, the Control Logic generates an overload (OVLD) signal which blanks the decimal digits while leaving the polarity sign and the selected decimal point lighted.

In addition to decimal point programming, the user may blank the least three significant digits or may choose to hold a displayed conversion by applying DTL-compatible signals at the designated terminals of J1. It is of interest to note that the instrument continues to update its digitized measurement, making available a valid display after the HOLD signal is released.

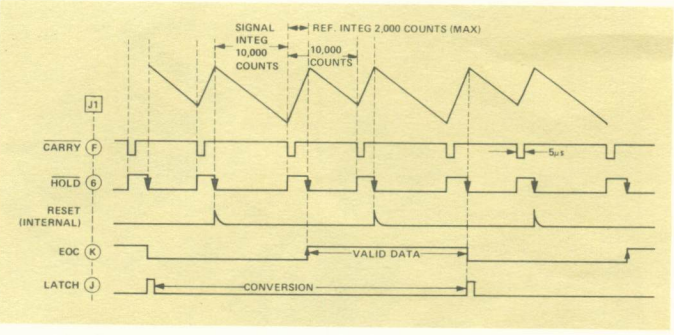


Figure 3. Timing Diagram

DTL/TTL-compatible digital output signals of LATCH, CARRY, EOC, HOLD, and CLOCK, as well as the OVLD and POLARITY signals, are available at connector J1, and are related to the charge-discharge cycle of the integrating capacitor as shown in the timing diagram of Figure 3.

Analog Function Card

Connector J3, when utilized, brings to the analog function card a number of input signal connections, as shown, and all power sources and their ground return references for use in such signal conditioning circuits as described in the Application Data.

Digital Function Card

There is an excess of +5V to power the snap-in digital option card on which isolated and/or buffered BCD outputs are generated. Connections are made via the standard panel instrument connectors. (See Application Data, page 6.)

ORDERING GUIDE

Simply Specify ——— [ ] – [ ] – [ ] – [ ]

Universal Digital Panel Instrument	AN2533
Expanded Digital Panel Instrument	AN2553
Gas Plasma Display	S
LED Display	L
UL 94V-0 Rated Plastic DIN/NEMA Case (Order PL10-5563 Connector)*	P
Extruded Aluminum DIN/NEMA Case (Order PL10-5563 Connector)*	M
One Dummy Zero (LED Only)	1DZL
Two Dummy Zeros (LED Only)	2DZL

*Optional Screw-Terminal Connector (Analogic PL10-5535) available for solderless wiring for plastic or metal case (See Figure 9)

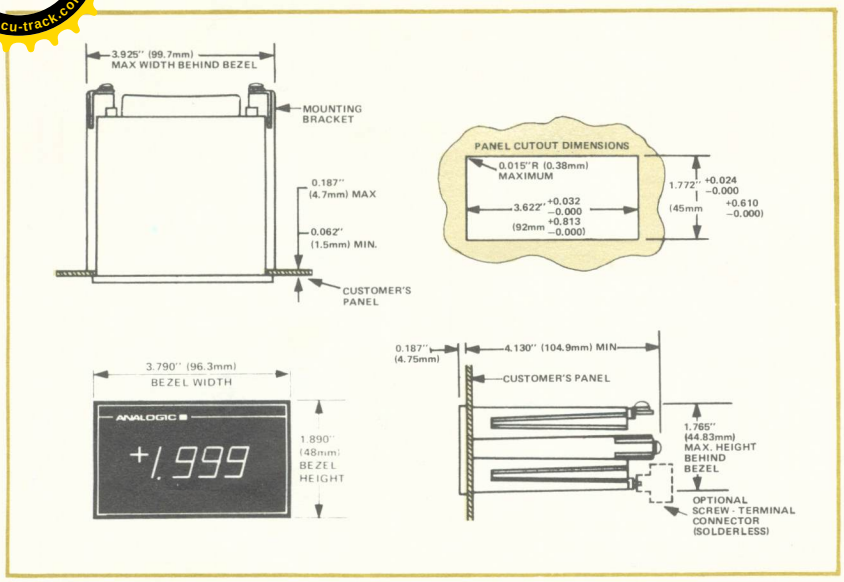


Figure 8. Panel Mounting and Outline Dimensions

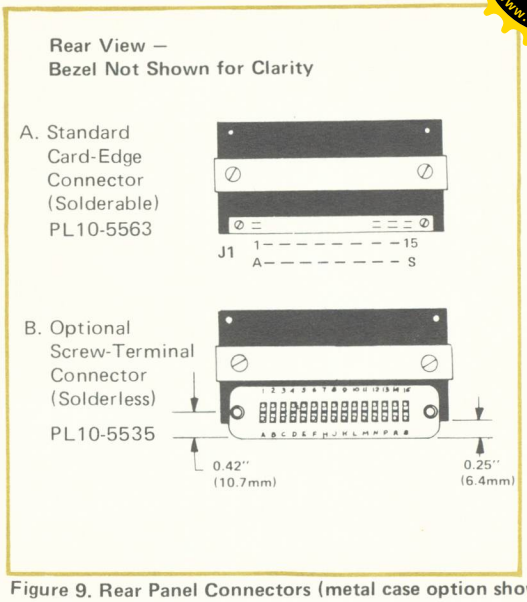


Figure 9. Rear Panel Connectors (metal case option shown)

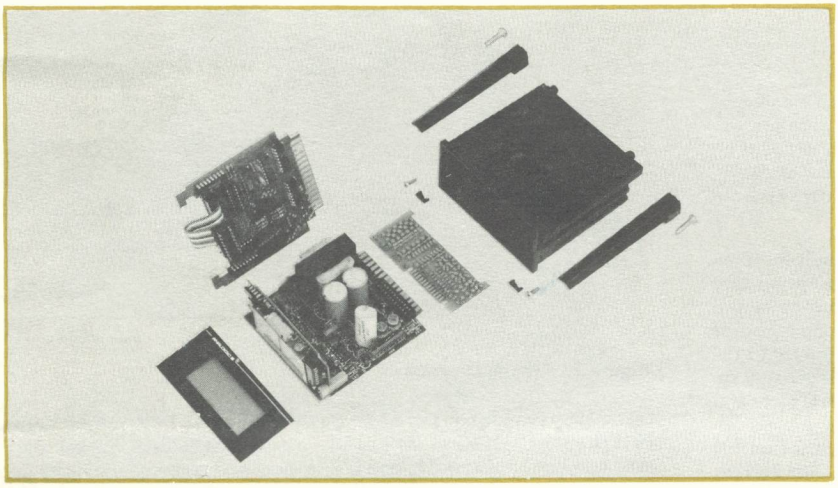


Figure 10. Complete DPI and Additional Function Cards

For LED displays only, either one (1DZL) or two (2DZL) "dummy" zeros may be added to the right end of the digital readout. These zero digits are "fixed"; that is, they always display "0" (1DZL) or "00" (2DZL) for all input signals within the specified range.

Specify For	−1DZL*	−2DZL*
1999 Range	+1999 0	+1999 00
3999 Range	+3999 0	+3999** 00

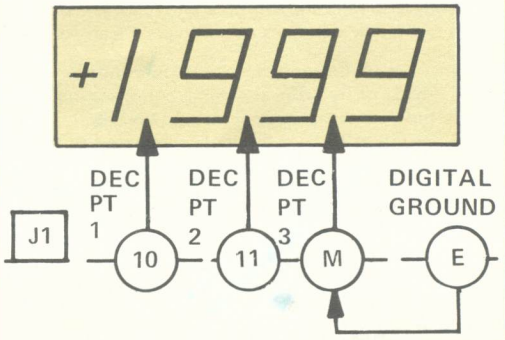
Dummy Zeros

*Add to end of Order Code. Factory installation only.

**For positive inputs, negative sign does not light. For overload inputs, decimal point and middle horizontal segments of dummy zeros are lit; negative sign lights for negative overload only.

Figure 11. "Dummy" Zero Display

DECIMAL POINT SELECTION



To display the desired decimal point, simply connect the appropriate pin as shown to Digital Ground (Pin E, J1) using a jumper lead.

Figure 12. Decimal Point Position Terminals

NEED APPLICATIONS HELP?

CONSULT NEAREST ANALOGIC SALES OFFICE OR REPRESENTATIVE.

ANALOGIC®

ANALOGIC CORPORATION ■ Audubon Road ■ Wakefield, Massachusetts 01880
Tel. (617) 246-0300 ■ TWX (710) 348-0425 ■ Telex 94-9307
ANALOGIC INTERNATIONAL ■ Audubon Road ■ Wakefield, Massachusetts 01880
Tel. (617) 246-0300 ■ TWX (710) 348-0425 ■ Telex 94-9307
ANALOGIC AG ■ Kanalstrasse 15 ■ Postfach CH-8152 ■ Glattbrugg ■ Switzerland
Tel. (41) 1-810-0666 ■ Telex 845-59699
ANALOGIC LIMITED ■ 68 High Street ■ Weybridge, Surrey KT13 8BN ■ England
Tel. (44) 932-41251 ■ Telex 851-928030
ANALOGIC REGIONAL OFFICES ■
Cincinnati, Ohio (606) 371-0064 ■ San Jose, Calif. (408) 247-6401
Tustin, Calif. (714) 838-7243 ■ Garland, Texas (214) 681-0483
Houston, Texas (713) 777-6360

Bulletin No. 16-10015 REV 8

APPLICATION DATA

AN2553

Setup Instructions

ANALOGIC®

GENERAL

1. To operate your AN2553 Digital Panel Instrument, a "KLUGE" card must be inserted in the internal J3 socket on the main PC-board assembly and connections made on that card to the input differential amplifiers. (See the AN2533/AN2553 Data Sheet.)
2. The KLUGE card may be either:
   a) A custom-designed card manufactured by Analogic; or
   b) Analogic card AN450, containing a standard input filter; or
   c) Analogic General Purpose Card AN451, or
   d) A card designed and produced by the user to interface with the AN2553, mating with connector J3 on the main PC-assembly of AN2553.

INSTRUCTIONS

A. If the KLUGE card incorporates an input-connecting circuit such as in category a), b), or d) above, then:
   (1) Plug the card into connector J3.
   (2) Attach signal inputs to the appropriate external J1 terminals as determined by the card-mounted circuitry.
   (3) Attach the source power to the appropriate power input terminals as shown in the table of Powering Connections on the Data Sheet.

B. If the KLUGE card is a general-purpose Analogic AN451, then:
   (1) Identify the instrument connector (J1) terminals to which the signal inputs, SIG IN (+) and SIG RTN (–), are to be connected.
   (2) Refer to the J1-J3 interconnection table below, and determine the J3 terminals at which the signal inputs will be present after they have been connected as required by step (1) above.
   (3) Install any desired signal-conditioning circuitry between the P3 edge-connector terminals on the general purpose card.
   (4) Plug the card into mating J3 connector.
   (5) Attach signal inputs to the selected J1 terminals; attach power to appropriate J1 terminals according to the instructions shown in the AN2533/AN2553 Data Sheet.

C. The AN2553 is now ready for operation. See Data Sheet for Scaling Instructions.

J1 – J3 CONNECTIONS FOR AN2553

INTERNAL AN2553 CIRCUIT	OR EXTERNAL J1 CONNECTION	J3		OR EXTERNAL J1 CONNECTION	INTERNAL AN2553 CIRCUIT
REF SENSE	———	1	24	———	REF DRIVE
———	J1 – A	2	23	J1 – 1	———
*SIG IN (+)	———	3	22	J1 – 2	———
*SIG RTN (–)	———	4	21	J1 – B	———
FEEDBACK	———	5	20	J1 – 3	———
FEEDBACK	———	6	19	J1 – C	———
———	J1 – 4	7	18	———	FEEDBACK
DIG GND	J1 – E	8	17	J1 – D	———
+12V REF	———	9	16	J1 – 5	+5V
$\overline{\text{OVLD/BLNK}}$	———	10	15	———	–12V
———	J1 – 9	11	14	J1 – 8	POLARITY
———	J1 – 12	12	13	J1 – L	———

*Inputs to Differential Amplifiers after signal conditioning.

ANALOGIC AUDUBON ROAD • WAKEFIELD, MASSACHUSETTS 01880 • TEL. (617) 246-0300 • TWX (710) 348-0425 • TELEX 94-9307

CERTIFICATE OF CALIBRATION

For Digital Panel Instrument AN2539/53 —S—P _____ **Serial No.** 1222540

ANALOGIC CERTIFIES that this Digital Panel Instrument has been duly inspected and tested prior to shipment, and that it meets or exceeds all of the requirements specified in its published mechanical, electrical and operational performance characteristics. All tests were performed using methods that preserve NBS traceability for the instrument.

NOTE: The following tests were performed after
a) 96 hours minimum burn-in at a nominal 50°C and at nominal line voltage unless otherwise specified.
b) Vibration at 5G's for 30 seconds at 60Hz in a horizontal plane.

I. CALIBRATION

Zero Span + _____ • 7 mV for +001 Reading
– _____ • 7 mV for –001 Reading

Positive Inputs (mV)	Reading	
000	000	✓
+400	+399	
	+400	✓
	+401	
+800	+799	
	+800	✓
	+801	
+1800	+1798	
	+1799	
	+1800	✓
	+1801	
	+1802	

Negative Inputs (mV)	Reading	
000	000	✓
–400	–399	
	–400	✓
	–401	
–800	–799	
	–800	✓
	–801	
–1800	–1798	
	–1799	
	–1800	✓
	–1801	
	–1802	

II. DISPLAY TEST

All numerals are decoded and displayed ✓

III. OVERRANGE

Three LED's blank with both ±2.010 volts applied ✓

IV. SUPPLY VOLTAGE COMPLIANCE

Supply Voltage	Input	Difference in Reading (a – b)	
105 Vac	1.000V	+1	✓
130 Vac	1.000V	0	✓
		–1	✓

V. COMMON MODE

Conditions: Apply ±1800mV to input
Apply ±700mV between Analog Ground and Signal Return

Change in Reading		
	000	✓
	001	

VI. MISCELLANEOUS

a) All three Decimal Points externally programmable ✓
b) External Display Blanking ✓

FORM 16-500004 REV. 2

Tested By: GP Date 5-25-82

Accepted By: QA 11 Q.A. Inspector

Date MAY 27 1982

ANALOGIC CORPORATION ■ AUDUBON ROAD ■ WAKEFIELD, MASSACHUSETTS 01880 ■ TEL. (617)246-0300 ■ TWX(710)348-0425

PDF-XChange Viewer Click to buy NOW! www.docu-track.com

The minimum connections required for use as a conventional measurement instrument are:

1. Signal Input

   Single Ended: Connect (+) side of signal input to J1-2; connect (–) side of signal input to J1-B and J1-D.

   Differential Input:* Connect (+) side of signal input to J1-2; connect (–) side of signal input to J1-B; connect analog ground to Pin J1-D.

2. AC Input

   For 100Vac: connect ac line between J1-P and J1-15

   For 117Vac: connect ac line between J1-P and J1-S

   For 220Vac: connect ac line between J1-13 and J1-15

   For 240Vac: connect ac line between J1-13 and J1-S.

3. Decimal Point

   DP1 — connect J1-E to J1-10 to light the decimal between the MSD and hundreds digit [1.888]

   DP2 — connect J1-E to J1-11 to light the decimal between the hundreds and tens digit [18.88]

   DP3 — connect J1-E to J1-M to light the decimal between the tens and ones digit [188.8]

4. For the AN2553, a kluge card must be installed in J3, (on motherboard). See product data sheet.

See Product Data Sheet for maximum common mode voltages.