TRANSMAGNETICS

C670
A689
695
A1618
Revised April 1987

SOLID STATE COMPUTING MODULES

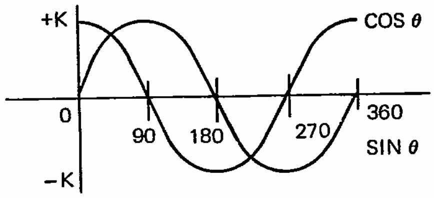
FEATURES:

- No calibration, adjustments or warmup.
- Ultra reliable:
- Infinite resolution.
- Factory repairable, hermetically sealed for total protection.
- Designed for P.C. board mounting.
- All models are short circuit proof.
- Meets MIL-STD-202D. Methods 101C, 105B, 106C, 107C, 202D, 204D and 205D.

Coordinate rotation, polar to rectangular or rectangular to polar conversion, sine-cosine generation and similar trigonometric computing functions that in the past were implemented with mechanical resolver servo-systems, can now be performed with our small, highly reliable, solid state modules.

LINEAR DC TO SINE-COSINE, MODEL C670

Converts a D.C. voltage, representing an angle, into two output voltages that are proportional to the sine and cosine of the desired angle.



Input: −10VDC to +10VDC
(See Input Variations)

Input Z: 95K minimum.

Output:
Two D.C. voltages: one proportional to K sine θ, the other to K cosine θ. K is 10 volts ±1% over specified operating temperature range.

Output Impedance: 1 Ω maximum.

***Accuracy:**

at 25°C	Code "C" 0° to +70°C	Code "M" −55°C to +85°C
±10′	±30′	±1.2°

*Angular accuracy is determined by ratio of $\frac{\text{sine out}}{\text{cosine out}}$

Input Variations:

On special order, the input angle may be offset from 0° to 360°; the scale factor (volts per degree) may be changed from 0.5 volt/180° to 100 volts/180°: the angular limits of rotation may be as low as a 90° span, and the output may be reversed.

Dynamic Response: For a 180° step input, 5 ms maximum for output to reach rated accuracy.

Load Resistance: 2000 ohms minimum for rated accuracy.

Output Drive Capability: 5 mA for rated accuracy. Output is short circuit proof.

Output Ripple: 10 mv RMS max.

DC Power Requirements: ±15VDC ±3% at 40 mA maximum
+ 5VDC ±3% at 30 mA maximum

Operating Temperature: Model C: 0°C to +70°C
Model M: −55°C to +85°C

Storage Temperature: −65°C to +125°C.

Weight: Approx. 10 oz.

Potting: For high shock or vibration applications, units should be potted. Add "P" after part number.

Part Number Designation:

C670- XXXX(XX) X XX X X

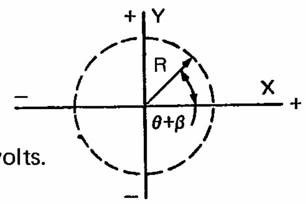
- X: Add "P" if potting required
- X: Operating Temp. (C or M)
- XX: Indicates magnitude of K for full scale angle. Disregard polarity
- X: S: +voltage for + angle; R: +voltage for − angle.
- (XX): Offset, if any including polarity
- XXXX: 180: +180° to −180°; 090: + 90° to − 90°; Add "A" suffix for 0° to θ format. Ex: 180A: 0° to 180; 360A: 0° to 360

∡	R	S
180°	-10	+10
90°	-5	+5
270°	+5	-5

COORDINATE ROTATOR MODEL A689

Accepts rectangular inputs (X and Y) and rotates these coordinates through an angle that is proportional to a linear DC input.

Input:
Rectangular Input θ:
X = R Cosine θ, (−10 to +10VDC).
Y = R Sine θ, (−10 to +10VDC).
R may vary from ±20 mV to ±10 volts.



Angular Input β: +10 to −10VDC
Representing angles from 0 to 360°.

Input Z: 100K minimum.

Output: R Sine $(\theta + \beta)$
R Cosine $(\theta + \beta)$

***Accuracy:**

at 25°C	Code "C" 0° to +70°C	Code "M" −55°C to +85°C
±10′	±30′	±1.2°

*Angular accuracy is determined by ratio of $\frac{\text{sine out}}{\text{cosine out}}$

Dynamic Response: For a 180° step input, 5 ms maximum

Output Impedence: 1 Ω maximum

Load Resistance: 2000 ohms minimum for rated accuracy.

Load Resistance: 2000 ohms minimum for rated accuracy.

Output Drive Capability: 5 mA for rated accuracy. Output is short circuit proof.

Output Ripple: 10 mV RMS maximum

DC Power Requirements: ±15VDC ±3% at 75 mA maximum
+ 5VDC ±3% at 50 mA maximum

Operating Temperature: Model C: 0°C to +70°C
Model M: −55°C to +85°C

Storage Temperature: −65°C to +125°C.

Weight: Approx. 10 oz.

Potting: For high shock or vibration applications, units should be potted. Add "P" after part number.

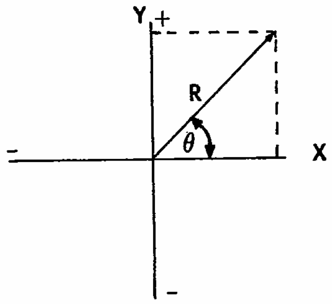
Part Number Designation:

A689 * *

- *: Add "P" if potting required
- *: Operating Temp. (C or M)

RECTANGULAR TO POLAR, MODEL 695

Converts rectangular coordinates (X, Y) into polar coordinates (R, θ)



Input: X = R Cosine θ
Y = R Sine θ

R may vary from 20mV to 10 V DC

Input Z: 100 KΩ minimum

Output:

a) $R = \sqrt{X^2 + Y^2}$. Varies from +50 mV minimum to +10 V DC maximum. (200:1 minimum Dynamic Range)

b) $\theta = \tan^{-1}\frac{Y}{X}$ Varies from −10V DC to +10V DC representing 0 - 360°.

Cross Over Point is Non-ambiguous

Accuracy: ±15 minutes at R = 10 V DC at 25°C
Accuracy varies inversely with R. Typical values are 25 minutes at R = 1 V DC and 3° at R = 0.050 V DC

Stability: θ ±.015°/°C at R = 10VDC
R 10 ± .01% FS/°C

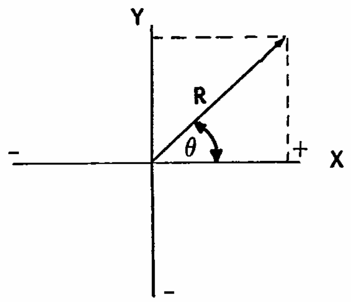
Dynamic Response:
For a 180° step input, 2 ms maximum for output to reach rated accuracy.

Load Resistance: 3000 ohms minimum for rated accuracy.
Capacity Loading: 100 pF maximum
Output Drive Capability: 5 mA for rated accuracy. Output is short circuit proof.
Output Ripple: 10 mV rms maximum excluding switching transients
DC Power Requirements: ±15 V DC ±3% at 75 mA maximum

Operating Temperature: Model C: 0°C to +70°C
Model M: -55°C to +85°C
Storage Temperature: -65°C to +125°C.
Weight: Approx. 11 oz.
Potting: For high shock or vibration applications, units should be potted. Add "P" after part number.
Part Number Designation:
695**
└Add "P" if potting required
└Operating Temp. (C or M)

POLAR TO RECTANGULAR, MODEL A1618

Converts polar coordinates (R, θ) into rectangular (X, Y)



Input:
R: ±20mV to ±10VDC
θ -10VDC to +10VDC representing 0-360°

Input Z: 100K minimum

Output:
X = R Cosine θ (-10 to +10VDC)
Y = R Sine θ (-10 to +10VDC)

Accuracy:

	At 25°C	Code C 0° to +70°C	Code M −55°C to +85°C
θ =	±10′	±30′	+1.2°

$\theta = \tan^{-1}$ Y/X. θ varies inversely with R. Typical values are 10 minutes at R = to 10VDC, 30 minutes at R = 1VDC and 3° at R = 0.05VDC.

Dynamic Response: For a 180° step input, 5 ms maximum for output to reach rated accuracy.

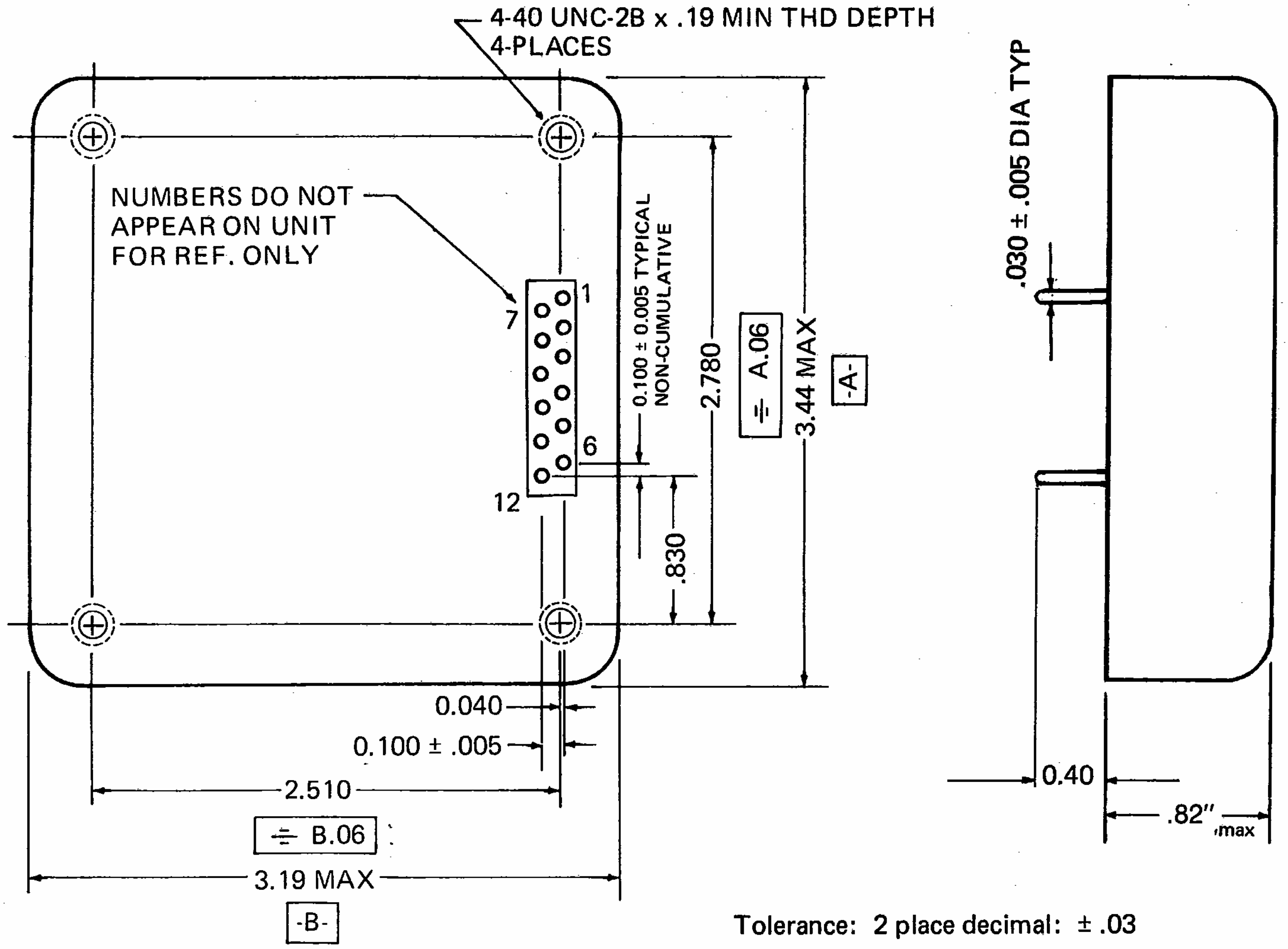
Output Z: 1Ω maximum

Load Resistance: 2000 ohms minimum for rated accuracy.

Output Drive Capability: 5 mA for rated accuracy. Output is short circuit proof.

Output Ripple: 10 mV RMS maximum

DC Power Requirements: ±15VDC ±3% at 75 mA maximum
+ 5VDC ±3% at 50 mA maximum
Operating Temperature: Model C: 0°C to +70°C
Model M: -55°C to +85°C
Storage Temperature: -65°C to +125°C.
Weight: Approx. 10 oz.
Potting: For high shock or vibration applications units should be potted. Add "P" after part number.
Part Number Designation:
A1618**
└Add "P" if potting required
└Operating Temp. (C or M)



Tolerance: 2 place decimal: ± .03

All dimensions in inches

PIN CONNECTIONS

	C670	A689 *	695	A1618
1	+15VDC	+15VDC	Common	+15VDC
2	Common	Common	R Sin θ input	Common
3	NC	R Cos θ Input	NC	R Input
4	Cos θ Out	R Cos $(\theta+\beta)$ Out	R Cos θ Input	R Cos θ
5	*+5VDC	*+5VDC	R Out	*+5VDC
6	-15VDC	-15VDC	+15 V DC	-15VDC
7	θ Input	β Input	NC	θ Input
8	NC	R Sin θ Input	NC	NC
9	*See note	*See note	NC	*See note
10	Sine θ Out	R Sin $(\theta+\beta)$ Out	θ Out	R Sin θ
11	+15VDC	+15VDC	-15 V DC	+15VDC
12	Common	Common	Common	Common

*If external +5VDC is not available for pin 5, connect pin 9 to 11 to generate +5VDC internally.

TMI

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