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Brushless Tachometer Instructions

K662

DESCRIPTION

The Model K662 "Brushless Tachometer" is a precision frequency-to-voltage converter that decodes the pulse rate of a rotary pulse generator to produce a very stable DC control voltage that is proportional to the shaft speed of the rotary pulse generator.

Two mill-duty styles of motor mountable rotary pulse generators are recommended for use with the K662 Converter, the Avtron "M-Series" style, or the "Slap Tach" style. The M-Series pulse generator is foot or face mountable to a NEMA 56C face. The "Slap Tach" mounts directly to a motor without the need for a flexible coupling or flange adapter.

APPLICATION

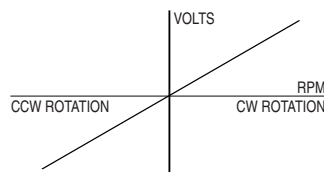
Brushless Tachometers are typically used to produce the feedback voltage for a speed regulated drive system. The accuracy, linearity, and reliability of a Brushless Tachometer make the unit more cost-effective than analog tachometer generators such as General Electric types, BC46, BC42, 5PY, the AEI type BD2510, or the Reliance type RE210.

OUTPUT VOLTAGE

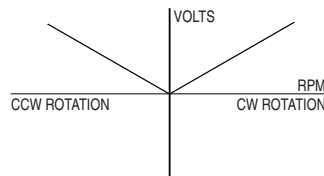
The output voltage of the K662 Converter is 10 volt DC at 900, 1800, or 3600 RPM, jumper selectable. The nature and polarity of the output voltage is determined by the pulse generator specified for use with the converter.

PULSE GENERATOR SELECTION

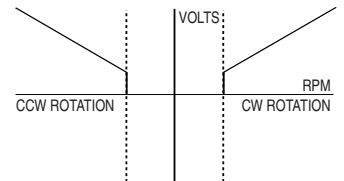
A. Pulse Generators with two phase (A, B) type outputs are bidirectional types that will make the K662 output voltage reverse when the drive runs backward. These pulse generators can be used with nearly any drive, and have a 4 or 6 wire interconnection with the K662.



B. Pulse Generators with zero-speed, single phase type outputs will make the K662 output voltage have the same polarity if the drive runs forwards or backwards. These pulse generators have a 3-wire interconnection with the K662 Converter and can be used with non-regenerative drives where the tachometer does not have to determine the direction of rotation.



C. Single phase reluctance type Pulse Generators are the most economical type. They use a 2-wire interconnection with the K662 Converter. The output voltage will have the same polarity if the drive runs forwards or backwards, and will drop to zero at low RPM. (Depending upon the cable length, this occurs at 30-50 RPM.) This Pulse Generator is frequently used with drive systems that have tach loss prevention.



For further information on which Pulse Generator to specify, consult Avtron (216) 642-1230.

NOTE

When using single phase, zero speed type Pulse Generators, the output polarity can be reversed by a jumper on the K662 Converter.

When using two phase (A, B) type Pulse Generators, the output polarity may be reversed by reversing the 0A-0B inputs.

The K662 provides a full scale output of ± 10 VDC at up to 20 milliamperes of current. The unit can be programmed for 10 V DC at 900, 1800, or 3600 RPM full scale by a jumper on TB1. The K662 provides a high conversion speed for a very stable, linear output. Because only the rotary pulse generator is mounted directly to the machine, the K662 is to be located in a separate equipment enclosure, isolated from vibration and other adverse environmental effects. This will provide reliable operation and extended service life.

INSTALLATION

Install the associated rotary pulse generator in accordance with the Pulse Generator Installation Instructions and specific instructions for the pulse generator used.

The K662 should be mounted in an equipment enclosure. When mounting on a vertical panel, position the K662 mounting face with the longer dimension vertical to minimize tension loading on the upper mounting hardware.

Do not mount K662 near sources of large electrical noise such as contactors, motor starters, etc. The K662 should be located in an environment where the ambient temperature does not exceed 140°F.

REPAIR OR REPLACEMENT

To minimize costly downtime, it is recommended that a spare K662 be kept on hand. In the event of a suspected malfunction, the unit can be quickly removed and the spare installed with no setup changes required.

If the unit is to be sent back to the factory, it is suggested that the user notify Avtron's Field Service Department and supply them with the model and part number of the unit. A brief description of the suspected fault is also helpful.

PREPARATION FOR USE

STEP 1: GAIN PROGRAMMING

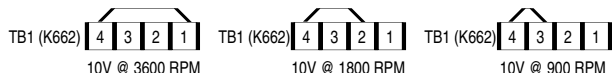
CAUTION

Always confirm that a jumper exists in one of these configurations before placing the unit into operation.

Select proper jumper on TB1 as shown to achieve 10 V DC at 900, 1800, or 3600 RPM full scale.

NOTE

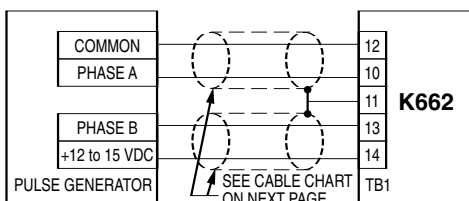
Unit is shipped with jumper set for 10 V at 900 RPM full scale.



STEP 2: INPUT CONNECTIONS

Connect the rotary pulse generator to the input of the K662 per the appropriate style interconnection diagram below. Refer to the instruction sheet for the specific pulse generator to get the correct connections for that model and output connector option. Note: K662 TB1 terminal numbering does not reflect the physical locations of terminal points.

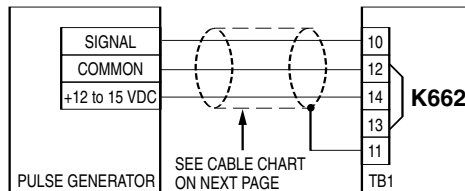
STYLE 1: Pulse generators with two phase (A,B) type outputs.



Typical for pulse generators such as Avtron Model M485 and M193B.

The K662 input is single ended. When using pulse generators with differential outputs such as Avtron Models M3, M193B, M285, M4, M485, and M685 follow the examples for single ended applications and leave the complementary outputs unterminated. The above connections will result in positive output of the K662 for clockwise rotation as viewed from the anti-drive end of the pulse generator. Counter clockwise rotation will result in negative output. To reverse polarity, reverse phase A and phase B connections at TB1 (K662).

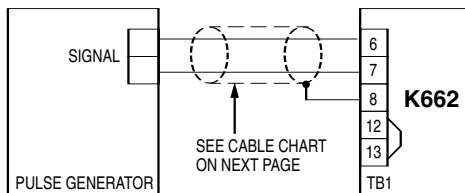
STYLE 2: Pulse generators with single phase zero speed outputs.



Typical for Avtron pulse generators.

The above connections will result in positive output of the K662 for both clockwise and counter clockwise rotation of the pulse generator. For negative output omit the jumper between K662 terminals 12 and 13 on TB1.

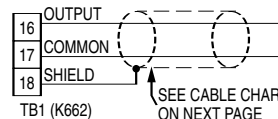
STYLE 3: Pulse generators with single phase reluctance type outputs.



Typical for pulse generators such as Avtron Model M627A, M628A, and K670.

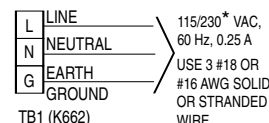
The above connections will result in positive output of the K662 for both clockwise and counter clockwise rotation of the pulse generator. For negative output omit the jumper between K662 terminals 12 and 13 on TB1.

STEP 3: OUTPUT CONNECTIONS



Output COMMON is isolated from earth ground.

STEP 4: AC POWER CONNECTIONS



*For 230 VAC input power, remove cover and connect jumpers as shown on printed circuit board silkscreen.

SPECIFICATIONS

All specifications are based on using a 240 PPR Pulse Generator. For specifications when using a different PPR Pulse Generator, consult the factory.

INPUT

1. Power.....115 VAC $\pm 15\%$, approx. 0.25 A
2. Transformer isolated
3. Reluctance Input
 - a. Impedance600 ohms $\pm 20\%$ between 100 to 14,400Hz
DC resistance is 40 ohms
 - b. Input Speed0 to 3600 RPM at 10 V full scale
0 to 1800 RPM at 10 V full scale
0 to 900 RPM at 10 V full scale
 - c. Input Waveform0.5 V to 5.0 V sine wave
4. Zero Speed Input
 - a. Impedance10 K ohms
 - b. Input SpeedSame as above
 - c. Input Waveform5.0 to 15.0 volts square wave
 - d. Pulse Generator
 - Power Output.....13.5 VDC @ 100 mA Typical
12.0 VDC @ 150 mA Typical

SIGNAL OUTPUT

1. Full Scale Voltagea) (Bidirectional) $\pm 10 \pm 1$ VDC
b) (Unidirectional) 10 ± 1 VDC
2. Programmable Output Gains
.....10 V full scale at 900, 1800, & 3600 RPM of pulse generator with 240 pulses per revolution (PPR).

3. Signal Output Polaritya) (Bidirectional): Determined by phase order from rotary pulse generator; i.e., $\emptyset A$ leads $\emptyset B$ for (+) output.
.....b) (Unidirectional): Determined by jumper on TB1; i.e., jumper on terminals (12) and (13) of TB1 is (+) output. Remove jumper for (-) output.

OUTPUT LINEARITYMaximum 0.002% of full scale

1. Temperature DriftMaximum $\pm 0.05\%$ of full scale from 32° to 140°F
2. StabilityMaximum $\pm 0.02\%$ of full scale over 30 days

OUTPUT RIPPLEVolts peak-to-peak depends upon the input speed. Open loop ripple at 10 V full scale at 3600 RPM is .1 VRMS at 25 RPM, 0.015 at 250 RPM, and 0.003 VRMS at 2500 RPM. This is significantly lower than conventional brush type generators above 25 RPM. The ripple amplitude is comparable to DC generators below 25 RPM but at a higher frequency, which has less effect on speed.

RISE TIME0.01 seconds for full scale step change in frequency. (Time to reach 90% of final value.)

LOAD IMPEDANCE100 K ohms (minimum) for full scale 10 VDC output

LOAD CURRENT20 mA output current maximum

K662

Model K662 Replacement Parts List

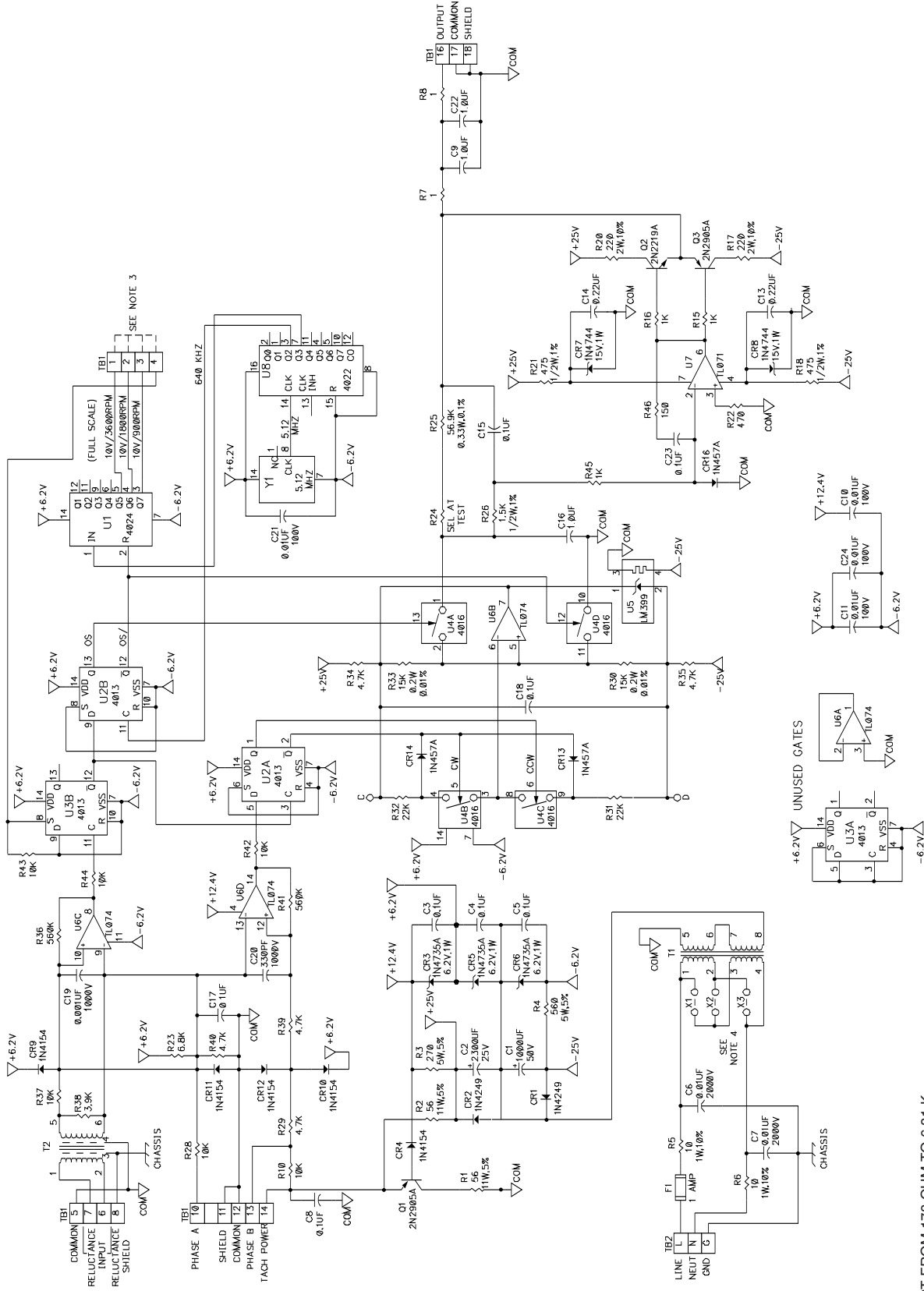
Schematic Reference	Part No.	Description	Qty. Unit
	A16025	P.C. Board Assembly	1
C1	221549	Capacitor, 1000 uf, 50 V	1
C2	221563	Capacitor, 3300 uf, 25 V	1
C3, 4, 5, 8, 15, 17, 18, 23	241056	Capacitor, .1 uf, 50 V	8
C6, 7	245095	Capacitor, .01 uf, 2 KV	2
C9, 16, 22	241115	Capacitor, 1.0 uf, 100 V	3
C10, 11, 21, 24	241005	Capacitor, .01 uf, 100 V	4
C13, 14	241058	Capacitor, .22 uf, 50 V	2
C19	245108	Capacitor, .001 pf, 1 KV	1
C20	245111	Capacitor, 330 pf, 1 KV	1
CR1, 2	354301	Semiconductor, 1N4249	2
CR3, 5, 6	354499	Semiconductor, 1N4735A	3
CR4, 9, 10, 11, 12	354419	Semiconductor, 1N4154	5
CR7, 8	354156	Semiconductor, 1N4744	2
CR13, 14, 16	354397	Semiconductor, 1N457A	3
R1, 2	134512	Resistor, 56 Ohms, 11 W, 5%	2
R3	134083	Resistor, 270 Ohms, 5 W, 5%	1
R4	134155	Resistor, 560 Ohms, 5 W, 5%	1
R5, 6	110086	Resistor, 10 Ohms, 1 W, 10%	2
R7, 8	110515	Resistor, 1.0 Ohms, 1/2 W, 10%	2
R10, 28, 37, 42, 43, 44	110037	Resistor, 10 K, 1/2 W, 10%	6
R15, 16, 45	110025	Resistor, 1 K, 1/2 W, 10%	3
R17, 20	110198	Resistor, 220 Ohms, 2 W, 10%	2
R18, 21	123021	Resistor, 475 Ohms, 1/2 W, 1%	2
R22	110021	Resistor, 470 Ohms, 1/2 W, 10%	1
R23	110035	Resistor, 6.8 K, 1/2 W, 10%	1
R24		Resistor, Select at Test	1
R25	135029	Resistor, 56.9 K, .33 W, 1%	1
R26	123027	Resistor, 1.5 K, 1/2 W, 1%	1
R29, 34, 35, 39, 40	110033	Resistor, 4.7 K, 1/2 W, 10%	5

Schematic Reference	Part No.	Description	Qty. Unit
R30, 33	135022	Resistor, 15 K, .20 W, .01%	2
R31, 32	110041	Resistor, 22 K, 1/2 W, 10%	2
R36, 41	110057	Resistor, 560 K, 1/2 W, 10%	2
R38	110032	Resistor, 3.9 K, 1/2 W, 10%	1
R46	110015	Resistor, 150 Ohms, 1/2 W, 10%	1
U8	376825	Integrated Circuit, 4022 (Motorola P/N MC14022AL)	1
U7	376703	Integrated Circuit, TL071 (Texas Instr. P/N TL071CJG-4)	1
U6	376708	Integrated Circuit, TL074 (Texas Instr. P/N TL074CJ-4)	1
U5	376665	Integrated Circuit, LM399 (National Semiconductor P/N LM399H)	1
U4	376809	Integrated Circuit, 4016 (RCA P/N 4016BF/3)	1
U2, 3	376803	Integrated Circuit, 4013 (Motorola Semiconductor P/N MC14013BCLDS)	2
U1	376805	Integrated Circuit, 4024 (RCA P/N CD4024BE)	1
Q2	373625	Transistor (2N2219A)	1
Q1, 3	373982	Transistor (2N2905A)	2
T2	A14525	Transformer	1
T1	370752	Transformer (Signal Transformer P/N DST5-20)	1
	358557	Pad, Transistor (Thermalloy P/N 7717-159N White)	1
Y1	349127	Oscillator, Clock 5.12 MHz (MTRON Industries P/N MCO-T1-S3)	1
F1	324066	Fuse, 1 A, 250 V (Littelfuse P/N 314001)	1
TB2	364684	Terminal Block (Reed Devices P/N 6 PCR-3)	1
TB1	364688	Terminal Block (Reed Devices P/N 6 PCR-18)	1
	C17141	Schematic	REF

CABLE SELECTION CHART			
Number of Conductors	Wire Gauge	Maximum Run	Belden P/N or equivalent
2 (1-shielded pair)*	16	1,000 ft.	8719
3 (shielded)*	16	1,000 ft.	8618
4 (2-shielded pairs)	20	400 ft.	9402
3 (shielded)	20	400 ft.	8772
4 (2-shielded pairs)	22	250 ft.	8723
3 (shielded)	22	250 ft.	8771

* For runs greater than 400 ft., use the TACH connector adapter part number A18497 for connecting the K662 to an M737A or M738 Pulse Generator.

NOTE: Avtron standard warranty applies. Copies available upon request. Specifications subject to change without notice.



- 5 - R24 SELECT FROM 178 OHM TO 6.81 K
 - 4 - USE X1 AND X3 FOR 115 VAC OPERATION;
USE X2 ONLY FOR 230 VAC.
 - 3 - JUMPER TBI-4 TO TBI-1, -2, OR -3 TO ACHIEVE
DESIRED GAIN.
 - 2 - CAPACITOR VALUES ARE IN MICROFARADS
AND ARE 50 V
 - 1 - RESISTORS VALUES ARE IN OHMS AND ARE
1/2 W, 10%.
- NOTES: UNLESS OTHERWISE SPECIFIED