	Documnent/File name **MANTTT802R1NE.docx**	Document Type **External**	Revision **1**
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TTT Racing Products

TTT802 Gearshift Controller, Part # 12-620-9-R1N-S (Standard), -P (Paddleshift)

Overview:
Gearshift Controller for 4, 5, 6 or 7 speed sequential gearboxes with gear sequence **R-1-N-2-3-4-5-6-7**.
Large 58 mm red gear indicator display and Rpm / shift-light-bar with green, yellow, red and white Leds.

Key features:
- Gear Position Indicator
- Rpm / Shift-light Led-bar
- Closed Loop Paddle-shift control (optional)
- Closed Loop Flat-shift control
- Measuring Gearshift times in 1/1000 sec.
- Measuring Gearbox Race time
- Oil change indicator
- Rpm limiter
- Launch control
- Automatic display intensity
- Special functions on request

Calibrating the gearbox barrel sensor is an easy task. There is no need for computers, or even buttons. It is done in seconds and the Rpm / Shift-light bar turns into a voltmeter to guide the user to the right position when fixing the gearbox barrel sensor to the box.

Built in computer port gives user access to all parameters for flat-shift and Rpm limiter as well as other functions such as measured gear shift times, gearbox race time, gear shift counter etc. We supply an easy to use Windows-application, TTT802R1N Manager, that supports all these functions.
The installation of the program is done thru our website www.ttt-racing.com

Housing:
Black anodized aluminium with polycarbonate front panel

Size & Weight:
65 x 110 x 30 mm. 220 grams

Power Supply:
12-14 Volt DC, Average current 100mA (max. 300mA)
Recommended fuse 0,5 – Max. 1 Amp <u>must</u> be installed
In the power supply line

Connections:
There are 2 connectors located on the rear, one 16 pole, A, and one 22 pole, B.

Functions:

Gear Position Indicator

The calibrated gear barrel sensor is continuously sensed and the controller converts the reading into gear in position. The 9 different possible positions are R - 1 - N - 2 - 3 - 4 - 5 - 6 - 7.

Rpm- / Shift-light Bar

By measuring the connected ignition pulses the rpm is calculated and compared to the settings for each level of the bar. The result of the comparison then controls how many Leds are lit. The setting for each bar level can be individually entered for each gear position. It is possible to chose 3 different "bar types". One dot from left & right, two dots from left & right or the default one, fill from left & right.

Rpm Limiter

The Gearshift Controller limits the rpm to the maximum allowed rpm corresponding to the setting for the particular gear position. The maximum rpm setting can be individually entered for each gear position.

Launch Control

Holding down the Start switch being in 1st gear position limits the rpm to a preset start value. By connecting a Start Rpm limit adjust potentiometer it can then be used to increase or decrease the actual start rpm limit. When the Start switch is released the allowed rpm increases with time until it has reach the rpm limit setting for 1st gear. How fast it increases depends on the start ramp time setting. By connecting a Ramp time adjust potentiometer it can then be used to increase or decrease the actual start ramp time.

Positions of the potentiometers are indicated, when being adjusted, on the Rpm- / Shift-light bar. When Ramp-Time is being adjusted the character shows a small "T" and the potentiometer position is indicated on the bar. When Start-Rpm is being adjusted the character shows a "^" and the potentiometer position is indicated on the bar.

Closed Loop Flat-shift Control

The main sensor used by the control is the high resolution calibrated gear barrel sensor which continuously informs the controller about the exact position of the barrel. The reading from the gear barrel sensor is monitored and if the sensor gives a false reading the flat-shift function is disabled. Barrel sensor error is indicated with an "E" on the display and when the fault disappears the display goes back to indicate actual Gear Position. If the software detects a small barrel sensor misalignment that might depend on bad calibration or mechanical wear in the sensor or gearbox the display indicates a small "N" in the Neutral Gear Position. Both these error detections can be individually enabled/disabled using the TTT802R1N Manager.

Flatshift function, cut gearing up/down and blip gearing down, can be selected individually for each gear. When the controller detects a beginning shift-up or shift-down the ignition pulses are manipulated and they are not completely activated again until the barrel sensor indicates that we are in a safe position to do so.

In the TTT802R1N Manager the user can chose if the Gear Position Indicators decimal dot should indicate the flatshift functions "cut" and "blip".

There are several possible ways that the controller can detect a beginning shift-up or shift-down sequence. One is using a digital or analog Lever sensor or just using the barrel position or both. Setting up the limit (s) for the sensor etc. is done in the TTT802R1N Manager. There are also user settings to set barrel sensitivity individually on each gear.

When putting the gear in Neutral the ignition cut, if active, will remain active for 1 second and the blip output, if active, will stay active until timer "Blip Timeout" deactivates the output. The "Blip Timeout" value is setup in the TTT802R1N Manager.

Thanks to the closed loop system the driver can shift fast or slow, just the way he likes, which is a big advantage compared to more simple timing controlled flat-shift systems. Shifting fast really means <u>fast</u>.

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Closed Loop Paddle-shift control (Optional. Only in –P)

The main sensor used by the control is the high resolution calibrated gear barrel sensor which continuously informs the controller about the exact position of the barrel. The reading from the gear barrel sensor is monitored and if the sensor gives a false reading the paddle-shift function is disabled. (Se flatshift function). When a valid shift-up or shift-down command is present the corresponding digital FET output activates the shift valve to start the shift sequence and at the same time the ignition pulses are manipulated and is not completely activated again until the barrel sensor indicates that gears are in a safe position to do so. If the shift command is considered valid or not, depends on several different circumstances. All to ensure a safe shift function. Thanks to the closed loop system the shifting is both fast and reliable which is a big advantage compared to more simple timing controlled paddle-shift systems. Shifting fast really means <u>fast</u>

Gear shift time measurement

The shortest gear shift up and down for each gear, 1, 2, 3,…top gear, are measured in milliseconds and can be read in the TTT802R1N Manager.

Gearbox race time

The race time in gear 1, 2, 3, …top gear, total and on each gear, are measured and can be read and cleared using the TTT802R1N Manager.

Gear Shift counter

The total number of gear shifts up, gear 1, 2, 3, …to top gear, is counted and can be read and cleared using the TTT802R1N Manager.

Display test / Show Firmware version

When the TTT802 is powered up with the gear in Neutral the display shows "V" "7" "." "0" (if firmware = 7.0) and then the display and bar segments are toggled for aprox. 4 second. If there is no Rpm input the display test will appear even in other gears than Neutral.

Oil change Interval

During the first 10-15 seconds after the TTT802 has been powered up the "N" for Neutral position will be replaced with a "0" if the Oil change interval has been reached. The interval can be setup and the oil change confirmed using the TTT802R1N Manager.

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Setting up Gear Barrel sensor and Calibrate Gear Positions:

Initiate: To initiate the calibration procedure just "wave" with a magnet in front of the rpm / shift-light bar within the first 10 seconds after the Gearshift Controller has been turned on. By doing so the display will indicate R with a flashing dot. The bar turns into a voltmeter where the top white led indicates the barrel sensors "mid" position.

Setup Gear Barrel sensor: It is important that all Gear positions "fits" in the sensors measuring range, 0-360 degrees, and that the sensor is approximately the same amount of degrees from its end positions on R and Top Gear. On a 6-speed gearbox where the Neutral is in the middle of 1 and 2 on half the angle that is between all other gears, the 3rd gear should be close to 180 degrees. This is when the white dot in the bar indicates the barrel sensors "mid" position. The barrel sensor can also be read in the TTT802R1N Manager and after calibration the calibrated positions can be read.

Calibrate Gear Positions: When the sensor is fixed the actual calibration procedure can be performed. Select Reverse gear, then confirm this gear position using the magnet. Dot stops flashing. The display should now indicate R with the dot turned on.
Shift to 1st gear. The display changes to 1 with a flashing dot. Confirm using the magnet. Dot stops flashing.
Shift to Neutral. The display changes to N with a flashing dot. Confirm using the magnet. Dot stops flashing.
Shift to 2nd gear. The display changes to 2 with a flashing dot. Confirm using the magnet. Dot stops flashing.
Continue like this until the last gear is confirmed. If you have a 5-speed gearbox the display should now indicate 5 with the dot turned on and if you have a 6-speed gearbox it should indicate 6 with the dot turned on.
(Up until this point the user can cancel the calibration procedure by turning of the power supply to the Gearshift Controller. By doing so nothing has been altered in the memory and the status of the Controller is the same as before the calibration procedure were initiated.)
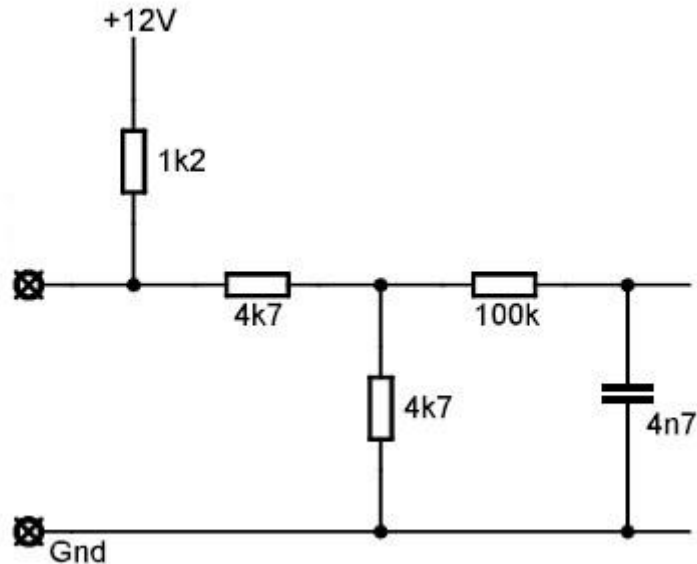To finalize the calibration and to set the last confirmed gear as the top gear, just confirm using the magnet one last time and the calibration procedure is ready. The dot turns off and the display indicates the actual gear in position.

Input / Output schematic and specification:

Digital Inputs x 6, DI2-DI7

For sensor with open collector type NPN or mechanical switch. Active low when input < 1,5 Volts. Input range 0 – 12 Volts (Vbatt).

Digital Pulse Input (Ignition Pulse) x 1, DI1
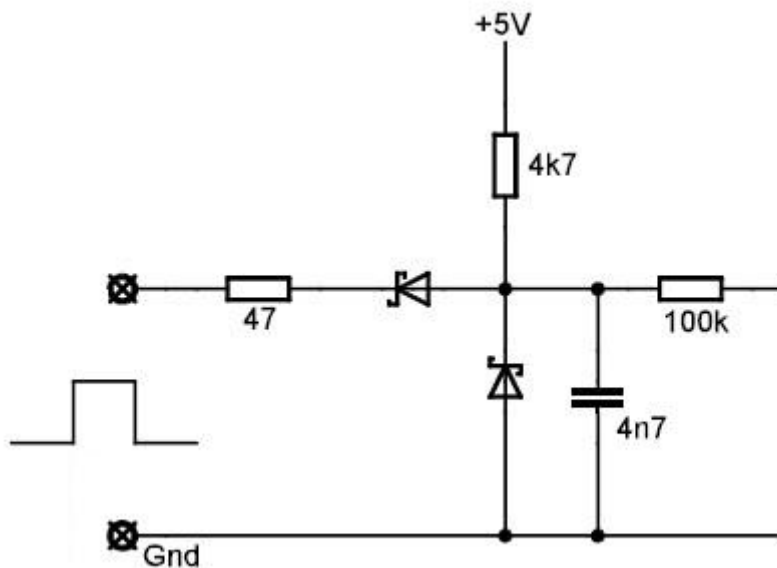
Normally connected to output on ECU, ignition amplifier (Rpm out) or ignition interface with open collector type NPN. Active low when input < 1,1 Volts. Input range 0 – 12 Volts (Vbatt).
Note: For units with serial numbers 1001-1028 the input must be < 0,8 Volts to guarantee low.

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Analog Inputs x 4, AI1-AI4
Input resolution 11-bits.
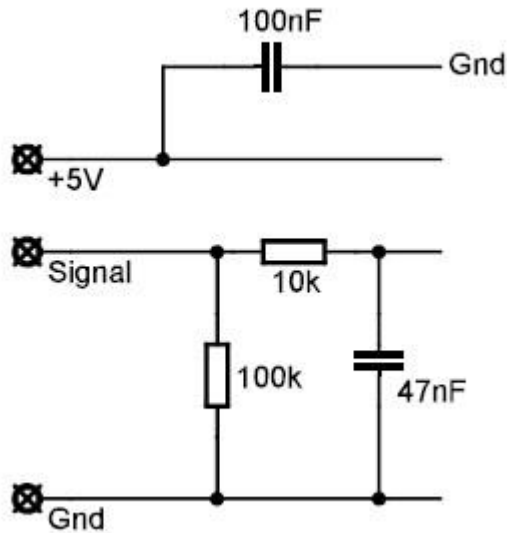
AI1 & AI2: For potentiometers or sensors with an output within the range 0 – 5 Volts.
AI3 & AI4: For Launch Control setting adjustment potentiometers. Potentiometers needs a series resistor to Gnd. See schematics below. This is how the TTT905 Quick Trim unit is built.

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Digital Pulse Output (Rpm) x 1, DO1
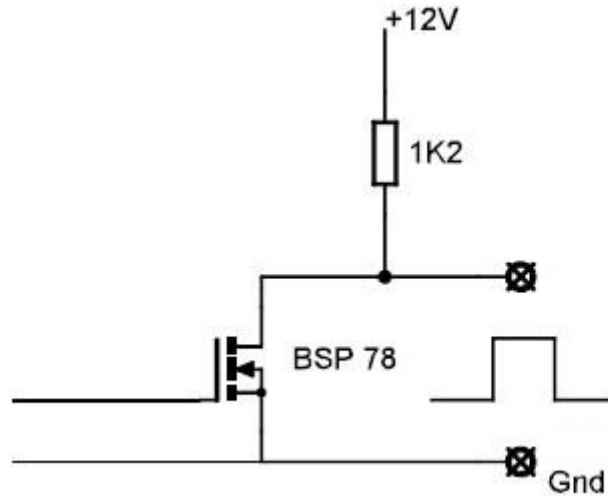
Normally connected to input on rev counter with low level input (Does not work with high voltage ignition type input). Output pulse range: 0 – 12 Volts (Vbatt).

Digital Outputs x 3, DO3- DO5
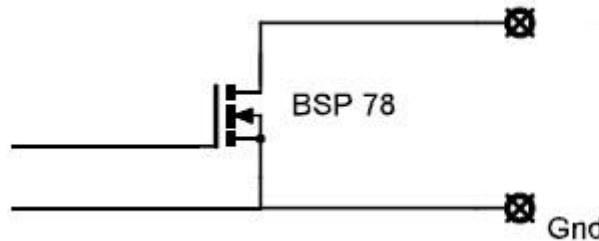
Low side switch normally connected to load sourced from 12 Volts (Vbatt). Maximum allowed current 2 Amp. Outputs have built in protection for short circuit, overload and high temperature.

Digital Output (Ignition Cut) x 1, DO2
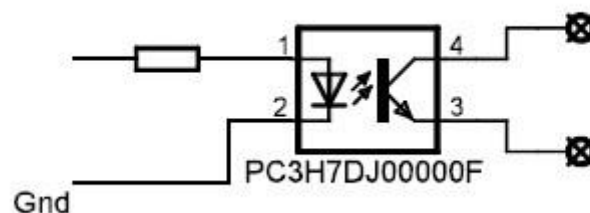
Galvanic isolated open collector output type NPN normally connected to cut input on ECU or ignition interface. Recommended load resistance is 4k7 (4700ohm). Maximum load: 10mA @ 12 Volts (Vbatt).
Note: Units with Serial Numbers 1001-1028, maximum load: 5mA @ 12 Volts (Vbatt).

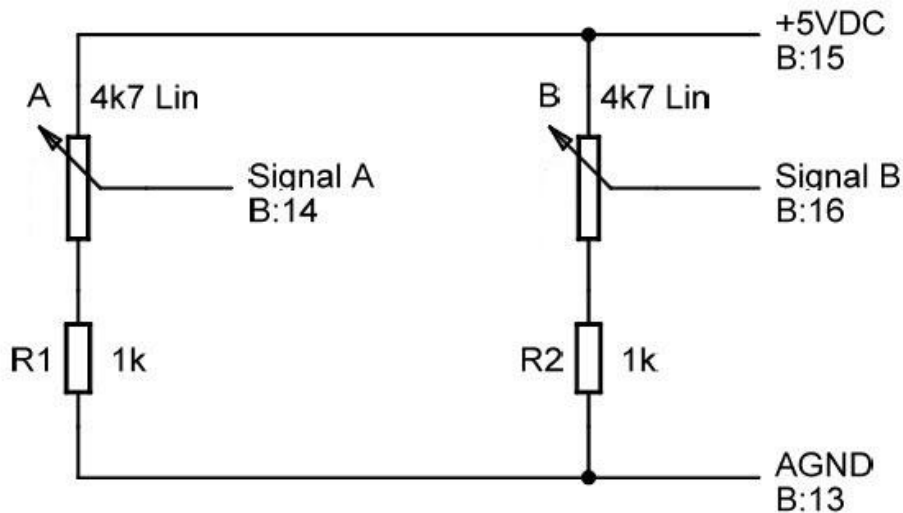|	Documnent/File name **MANTTT802R1NE.docx**	Document Type **External**	Revision **1**
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Related products.

Part # 12-625-4	TTT802 Sun Visor
Part # 12-630-8	TTT802-S Cable harness
Part # 12-635-3	TTT802-P Cable harness "paddleshift"
Part # 12-627-2	TTT802 Cable kit with "flying wires"
Part # 12-639-9	TTT802-QT Cable harness "add-on" for Start Switch and Quick Trim (or custom mounted potentiometers) for adjusting Launch control settings.
Part # 12-640-7	TTT802-BAL Cable harness "add-on" for Blip output and analog lever sensor.
Part # 12-649-8	Communication cable RS232 for TTT802. 1,5m.
Part # 12-650-6	Extension cable 500mm 4-pole DR25.
Part # 12-651-5	Extension cable 500mm 2-pole DR25.
Part # 12-660-5	TTT905 Quick Trim (Can be used to adjust Launch Control settings)
Part # 12-671-3	TTT748 Ignition Interface (for carburettor motors with Hal-sensor distributors).
Part # 12-675-9	TTT924 1-6 Channel Ignition Interface, "ignition cut", when used with ECU without cut input. Handles from 1 to 6 coils with integrated amplifiers.
Part # 12-678-6	TTT937 Power Switch, Ignition Interface, "ignition cut", when used with ECU without cut input. Interrupts ignition coil power (Vbat).
Part # 20-615-6	VGX360-5KP Contact less high resolution, 360 degr. barrel sensor
Part # 30-521-9	Gear Lever sensor. Proximity sensor M8 x 1
Part # 30-510-1	Speed sensor. Hal sensor M12 x 1
Part # 40-110-4	Mounting bracket for proximity sensor M8 x 1 on Tractive gearlever

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Connections:

A - 16-pole Matching Connector, Molex Microfit 3,0 430251600

A:1	Ground, PC Com interface
A:2	Tx, PC Com interface RS232 level – Transmit data
A:3	Rx, PC Com interface RS232 level – Receive data
A:4	DO1, Digital FET output, RPM-out Ignition pulses to RPM-meter
A:5	DI1, Ground
A:6	DI1, Digital input Ignition Pulse
A:7	DO2, Galvanic Isolated ground for output ECU/Ignition Cut
A:8	DO2, Galvanic Isolated output, open collector, for ECU/Ignition Cut
A:9	Ground
A:10	DO5, Digital FET output, active low, to control Blip
A:11	Ground
A:12	DO4, Digital FET output, active low, to control Paddleshift Valve Shift Down
A:13	Ground
A:14	DO3, Digital FET output, active low, to control Paddleshift Valve Shift Up
A:15	Powersupply (Ground)
A:16	Powersupply 12 VDC (+Vbat) **Note!!!** Fuse 0,5 – Max.1 Amp. must be installed in the powerline

B – 22-pole Matching Connector, Molex Microfit 3,0 430252200

B:1	DI5, DI6, DI7 (Gnd)	
B:2 (*)	DI7, Digital input 12VDC (Spare)	*(DI6 input on prototypes)*
B:3 (*)	DI6, Digital input 12 VDC Speed sensor	*(Gnd on prototypes)*
B:4	DI5, Digital input 12 VDC Gear Lever sensor	
B:5 (*)	12 VDC for sensors and switches	*(Gnd on prototypes)*
B:6 (*)	12 VDC for sensors and switches	*(DI4 input on prototypes)*
B:7 (*)	DI4, Digital input 12VDC N-R-Interlock / Start switch	*(Gnd on prototypes)*
B:8	DI3, Digital input 12VDC Paddle Shift-Down sensor	
B:9	DI2, DI3, DI4, Ground	
B:10	DI2, Digital input 12VDC Paddle Shift-Up sensor	
B:11	AI4, Analog Ground	
B:12	AI4, +5VDC	
B:13	AI3, Analog Ground	
B:14	AI4, Analog input Start Ramp time adjust potentiometer	
B:15	AI3, +5VDC	
B:16	AI3, Analog input Start Rpm limit adjust potentiometer	
B:17	AI2, Analog Ground	
B:18	AI2, Analog input Analog Lever	
B:19	AI2, +5VDC	
B:20	AI1, Analog input Gearbox Barrel Position	
B:21	AI1, Analog Ground	
B:22	AI1, +5VDC	

(*) Different functions compared to prototype units!!!

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TTT802-S Cable harness
Part # 12-630-8

TTT802 Molex Microfit 3.0 Connectors.
A = 16-pole.   B = 22-pole

+12 Volt (Vbat) Gnd — FUSE — **Power** — 0.5 m AWG20
A16 +12 Volt Supply
A15 Gnd

Ignition pulses to Rpm-meter — **RPM-Out** — 0.4 m AWG22
A4 DO1. FET, Rpm Output
A9 Gnd

Use Com-cable to connect to computer. — Mini SureSeal Male 1 2 3 — **Com** — 1.0 m AWG22
A1 Gnd
A2 Tx Data. RS232 Output
A3 Rx Data. RS232 Input

Connect directly to Ignition interface or use Extension-cable to connect to ECU — Mini SureSeal Male 1 2 3 4 — **ECU/Ign** — 0.9 m AWG22
A8 DO2. Isolated, Cut Output
A5 Gnd, Ign Pulse
A6 DI1. Ign Pulse Input
A7 Gnd, Cut

Lever Proximity -sensor — Mini SureSeal Male 1 2 3 — **Lever** — 1.0 m AWG22
B1 Gnd
B5 +12 Volt to sensor
B4 DI5. Lever sensor Input

VGX360 Gearbox Barrel Position sensor — Mini SureSeal Male 1 2 3 — **Barrel** — 2.1 m AWG22
B21 Gnd
B22 +5 Volt to sensor
B20 AI1. Analog Barrel Position Input

TTT802-BAL "Add-on"
Part # 12-640-7

TTT802 Molex Microfit 3.0 Connectors.
A = 16-pole.   B = 22-pole

Analog Lever -sensor — Mini SureSeal Male 1 2 3 — **Analog Lever** — 1.4 m AWG22
B17 Gnd
B19 +5 Volt to sensor
B18 AI2. Analog Lever sensor Input

Connect directly to Blip solenoid/valve (Powered from Vbat) or use Extension-cable to connect to ECU — Mini SureSeal Male 1 2 — **Blip** — 1.0 m AWG20
A11 Gnd
A10 DO5. FET, Blip Output

TTT802-QT "Add-on"
Part # 12-639-9

TTT802 Molex Microfit 3.0 Connector. B = 22-pole

Start Switch — **Start Switch** — 0.4 m AWG22
B7 DI4. Start Switch Input
B9 Gnd

Connect directly to TTT905 Quick Trim unit or use Extension cable to separate dual potentiometers with series resistors — Mini SureSeal Male 1 2 3 4 — **Quick Trim** — 0.6 m AWG22
B14 AI4. "A" Ramp Time Adjust
B16 AI3. "B" Rpm Adjust
B13 Gnd
B15 +5 Volt to potentiometers