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Subject: **Differences between P150 and P151**

Application Note

1. Reasons for replacing the P150 (Euro205):

There are a number of reasons for the Euro205 to be replaced with the P151 (Euro205x) but from the start the Euro205x was intended to be a direct replacement to the older Euro205.

1) Give the Euro card based product a performance increase to bring it into line with other current Trio products.
2) Being able to run the latest Trio Multitasking BASIC makes new features available to Euro card users, e.g. Ethernet and SERCOS.
3) Make changes to the internal structure of the product that allow for easier customisation of the basic card.
4) Component obsolescence – the DAC used to convert the P150 to a P155 will no longer be available.

2. Differences between P150 / P155 and P151:

The only changes discussed in this application note are the ones that could have an effect on an application where a P151 is used to replace a P150 or P155. For a full list of enhancements and changes please visit the Trio web site www.triomotion.com

CHANGE	REASON FOR CHANGE	POSSIBLE EFFECT ON EXISTING APPLICATIONS
Increased Processor speed giving 2x increase in BASIC execution speed	Bring Euro card in line with performance of other Trio products and allow latest MT BASIC to be run	In a system where the Trio controller interacts with another controller or PLC, for example, if the synchronisation relies on delays due to the time taken to execute the BASIC program then timing problems could arise due to the increased processing speed.
Added dual 12 bit analog inputs	Bring Euro card in line with other Trio products	Connection to one of the analog inputs can be made via the 96 way back plane connector on pin A17. On the P150 this was an unused pin so no connection should have been made to this pin but if any connection has been made the user needs to ensure that this will not cause damage to the analog input.
RS485 built in, no longer need external RS485 adapter	Bring Euro card in line with other Trio products	If an RS485 adapter is fitted in the system it is no longer required. This could mean a small change to external wiring.
Pin out of serial ports changed	Bring Euro card in line with other Trio products by adding RS485 port as standard	The serial port pin out has changed from that of the P150 to be the same as the P135 (MC206) and P170 (MC224).
Encoder ports now have bi-directional RS422 transceivers	Allows for possible use of absolute encoders and differential stepper outputs	If an axis is enabled as an open loop stepper output the RS422 transceivers will be configured as drivers so connecting an encoder or other driver to the line will cause a contention on the line and possible damage to the P151 or other device connected. *(See Note 1 below) As the RS422 lines can now be used as drivers as well as receivers no terminating resistors are fitted internally to the P151, unlike the P150. If required these must be fitted on the back plane as close to the RS422 pins as possible.

CHANGE	REASON FOR CHANGE	POSSIBLE EFFECT ON EXISTING APPLICATIONS
Watchdog relay replaced with solid state relay	To give improved long term reliability	The current rating of the relay is reduced to 100mA at 24V. The typical R_{on}=20Ω (on resistance) so with a 100mA load it would be expected to see a 2V drop across the relay.
Improved stepper pulse generation	Bring Euro card in line with other Trio products	To allow higher frequencies to be generated the stepper clock has changed from a 50:50 mark / space ratio to a fixed pulse width. For more details of the stepper operation see the extract from TN20_47 MC206 Stepper Output, in Appendix A.
Dual registration inputs	Bring Euro card in line with other Trio products	To make the registration inputs similar to other fixed format products, e.g. P135 (MC206), the registration inputs are now taken from inputs 0 to 3 for axes 0 to 3 respectively, instead of the shared registration and boost pins on the P150.

Note: (1) The open collector stepper outputs are still available to maintain compatibility with the P150. These are connected in parallel with the differential transceivers so the same stepper pulses will appear at both outputs if the axis is set to open loop stepper (atype=1). If stepper with position verification is set (atype=4) then the stepper outputs are only available as open collector outputs because the RS422 transceivers are needed for the encoder input.

Appendix A. Extract from TN20_47 applied to P150 / P151:

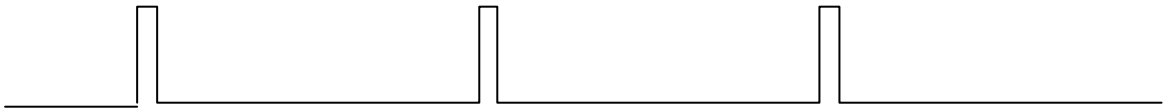
2. P150 (Euro205) stepper output:

The original scheme used on the P150 produces a square wave at the step output. This changes frequency as the step rate changes and the drive is assumed to turn the motor by one step on each falling edge of the waveform.

Some drives step the motor on the rising edge of the incoming pulse, so to allow for this there is an INVERT_STEP axis parameter. Set this ON for drives that clock on the rising edge.

3. P151 (Euro205x) stepper output

The step output of the P151 is a string of short pulses that have a varying mark-space ratio. Unlike the P150 board output, the P151 pulses always return to zero and so there is NO requirement to set up the active edge with INVERT_STEP.



The output pulse width is much shorter at low step rates than the width of the square-wave produced by the daughter board. This may make the P151 unsuitable for controlling older drives with slower opto-isolated step inputs. The output pulse widths are given in the following table.

Step Rate Band	Output Pulse Width
0KHz to 31KHz	16.0 µs
32KHz to 62KHz	8.0 µs
63KHz to 499KHz	1.0 µs
500KHz to 999KHz	0.5 µs
1MHz to 2MHz	0.25 µs

TABLE 1: P151 step output pulse width

4. Stepper axis parameters

Some axis parameters have a new function on the P151. The table below shows stepper parameters and their function.

Parameter Name	P150	P151
INVERT_STEP	Changes the active step edge.	Inverts step output.
MICROSTEP	OFF: smooth running at low step rates. Max output = 62.5 kHz. ON: Max output = 500 kHz.	OFF: Step + Dir output. ON: A + B Quadrature output.
VERIFY	OFF: Encoder counts Step + Dir via encoder input connector. ON: Encoder counts A + B quadrature input.	OFF: Encoder input counts Step + Dir. ON: Encoder input counts A + B quadrature.

TABLE 2: Stepper axis parameters

Notes:

1) P151 uses x16 multiplier for all internal stepper axes over the entire frequency range.
2) P150 uses x16 with MICROSTEP set to OFF and x2 when MICROSTEP=ON.
3) When used as Stepper axes, the P151 can count its own step pulses for registration purposes.