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TECHNICAL NOTE

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Subject:	**CONNECT command operation**

Electronic gearing in servo systems is one of the most useful features. The Trio *Motion* Coordinator line has the ability to electronically CONNECT a slave axis to a master reference axis. The master reference is typically an encoder output connected to the Trio controller.

Using the CONNECT command, a user can gear any axis to any other axis. The user can also choose a gear ratio (positive, or negative to reverse direction) within the valid range of accuracy. The floating-point math system used in Trio controllers allows up to an 8-digit floating point value **x.xxxxxxx, xx.xxxxxx, or xxx.xxxxx,** in the CONNECT command.

```
CONNECT(ratio, master_axis)
```

The CONNECT command uses the ratio value to multiply the input encoder counts each servo period. The resulting integer is applied to the slave axis, and the fraction of encoder count is accumulated and added.

CONNECT command operation:

Gear to a master encoder running at 3000rpm with 4000 counts per revolution (post quad).
This equals 50 rps x 4000 = 200,000 encoder counts per second into the Trio controller.

At the default servo update rate of 1ms, this results in 200 encoder counts per ms.

Example 1:

`CONNECT(1.12345, master_axis)` command

The output demand to the slave axis would be 1.12345 x 200 = 224.69 encoder counts on the next servo period. The 0.69 encoder count fraction will be accumulated and added to the output to maintain the ratio accuracy.

Example 2:

`CONNECT(1.12346, master_axis)` command

The output demand to the slave axis would be 1.12346 x 200 = 224.692 encoder counts on the next servo period. The 0.692 encoder count fraction will be accumulated and added to the output to maintain the ratio accuracy.

Example 3:

`CONNECT(1.333, master_axis)` command

The output demand to the slave axis would be 1.333 x 200 = 266.6 encoder counts on the next servo period. The 0.6 encoder count fraction will be accumulated and added to the output to maintain the ratio accuracy.

Example 4:

Gear to a master encoder running at 1750rpm with 4000 counts per revolution (post quad).
This equals 29.16666 rps x 4000 = 116,666.6667 encoder counts per second into the Trio controller.

At the default servo update rate of 1ms, this results in 116.66666 encoder counts per ms.

`CONNECT(1.333, master_axis)` command

The output demand to the slave axis would be 1.333 x 116.66666 = 155.51666 encoder counts on the next servo period. The 0.51666 encoder count fraction will be accumulated and added to the output to maintain the ratio accuracy.

Note that since the 0.51666 is cannot be completely represented as a floating-point number as in Example 3, this ratio and speed combination would have more drift potential.

Example 5:

Gear a slave axis 1:1,000,000 to an encoder running at 3000 rpm with 10,000 counts per revolution (post quad).

This equals 50 rps x 10000 = 500,000 encoder counts per second into the Trio controller.

At the default servo update rate of 1ms, this results in 500 encoder counts per ms.

`CONNECT(0.000001, master_axis)` command

The slave axis would be commanded 1 encoder count every 2 seconds (500,000 counts /sec x 2 sec).

Note: Some ratio values used with CONNECT such as 1.00, 0.50 are represented with 100% accuracy in the floating-point math system, and would gear without long-term drift. Most other fractional ratio values will have long-term drift dependent on the ratio value and encoder frequency due to floating-point math, and non-terminating ratio values. See the MOVELINK command to gear non-terminating ratios such as 1.333333 or 1.666666 using separate (slave,master) values.