VME58 - STEP/PAK TRANSITION BOARD (BC5)
USER'S MANUAL

Argonne National Laboratory - APS - XFD/Beamline Controls - 3/5/96

1. GENERAL DESCRIPTION

The VME58 to StepPak transition board, hereon referred to as BC5, is a 6U VME style module designed to allow for the connection of an OMS VME58 stepper motor controller to a StepPak motor driver. The BC5 can be connected to other types of motor drivers, including microsteppers, with minor modifications. If a StepPak is used, with an SPC3 communications module in its crate, then the BC5 is pin for pin compatible via eight front-panel DB25 connectors. The connectors are unique to each of the eight axes supported by the VME58. This allows for flexibility when the system requires different motor drivers to be connected to one controller. The front panel also includes two Lemo-style connectors. One provides a step output for any one of the eight axes (jumper selectable). The other is an "Emergency Stop" input that allows the user to connect an external normally-closed push-button switch that will stop all eight motors.

Step and direction signals from the VME58 are routed to RS-422/RS-485 compatible differential drivers, which can be switched to single ended operation if necessary. Encoder inputs are routed to RS-422/RS-485 compatible differential receivers and can also be easily jumpered for single-ended operation. 10uF noise decoupling capacitors are provided for the limit lines.

There is a bread-board area included on the module with easy access to the step and direction signals. This means that they can be manipulated with custom electronics to run motor drivers with other than a step/dir input configuration; step/step drivers, for example. Power is brought to the bread-board area from the VME backplane and need only be jumpered to be activated.

2. SETTING UP FOR OPERATION

When setting up to run motors with the SPC3 equipped StepPak, the BC5 transition board must have all of its step and direction switches in the up position for differential operation, which the SPC3 expects. If single-ended operation is required for any of the axes, move that axis' step and direction switches to the down position, and be sure to reference the signals to the VME ground pin on the DB25 connector. If the "step out" front-panel connector is going to be used, the desired axis should be selected with the appropriate jumper on the JP1-JP8 jumper block.

The BC5 module is designed to be installed in the back of a standard VME crate. In order to do this, two cables and a small P2 "paddle" board are needed. The paddle board must be plugged in to the P2 connector directly behind the appropriate VME58 module. From there, two short 34 position ribbon cables are run to the BC5 board, with 34-socket headers on both ends. J1 on the paddle board goes to J1 of BC5, and J2 to J2. With these connections made, and the board properly configured, it can now be fastened to the crate with the thumbscrews.

Even if it won't be used, the E-stop input must be accounted for. The BC5 board will not transmit the step and direction signals if this input is left open. Therefore, if there is no E-stop button present, a shorting jumper must be connected to this input (see Sec. 5). At this point, the DB25 connectors need only be cabled to their appropriate StepPak connector (on the SPC3 front panel), and installation of the BC5 module is complete.

3. CONFIGURATION OPTIONS

It is important to note that the BC5 module is compatible with two types of OMS VME58 modules. Namely, the VME58-8, and the VME58-44. The VME58-8 has 8 axes of motor control with no encoder support. Therefore, the BC5 setup to run with it is simple and can be accomplished with the description in the previous section. The VME58-44 has 4 axes of motor control and can support up to 4 encoders, also.

One BC5 module is capable of handling one or two VME58-44 boards. If one VME58-44 board is used, then the configuration of BC5 is the same as before except that the encoder signals must be configured on the board. If the encoder signals, PhaseA, PhaseB, and Index, originate from a differential source, then the corresponding jumpers on the BC5 board should remain off. If any of these signals are single-ended, a jumper should be installed. At this point, since the minus input to the differential receiver is now biased at 1.5V (see Fig. 1), nothing should be connected to its input on the DB25 connector. The source of the single-ended signal should have its positive end connected to the same "+" input on the DB25, but its low side should be tied to VME ground, which is provided on the connector.

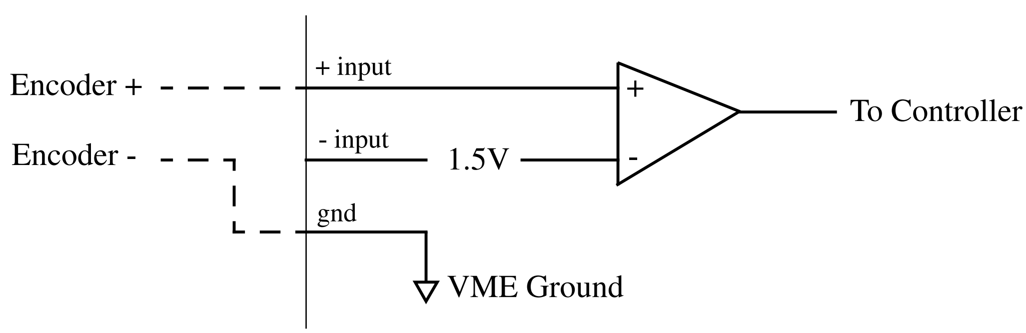

Fig. 1 *single-ended operation of encoder inputs*

If two VME58-44 boards are to be used, another P2 paddle board must be utilized. Leaving the first VME58-44 set up normally, configure the second with a paddle board plugged into its P2 connector on the VME backplane. Then, run the J1 34-conductor ribbon cable to the BC5 board's J2 connector. This will map the second VME58-44's channels 1-4 to channels 5-8 on BC5.

4. BREAD BOARD AREA

The BC5 module's bread board area is designed to make the transition board as flexible as possible. With this goal in mind, the *step* and *direction* signals for each axis are broken out of the board via jumpers (JP9-JP24), and are designated "From VME58" and "To Driver". "From VME58" means that this is essentially the raw signal from the VME58 controller board, after the E-stop stage. "To Driver" simply continues this signal to the BC5's RS-485 electronics and on to the motor driver. Figure 2 should help to visualize what this means in terms of where in the system these signals are broken out.

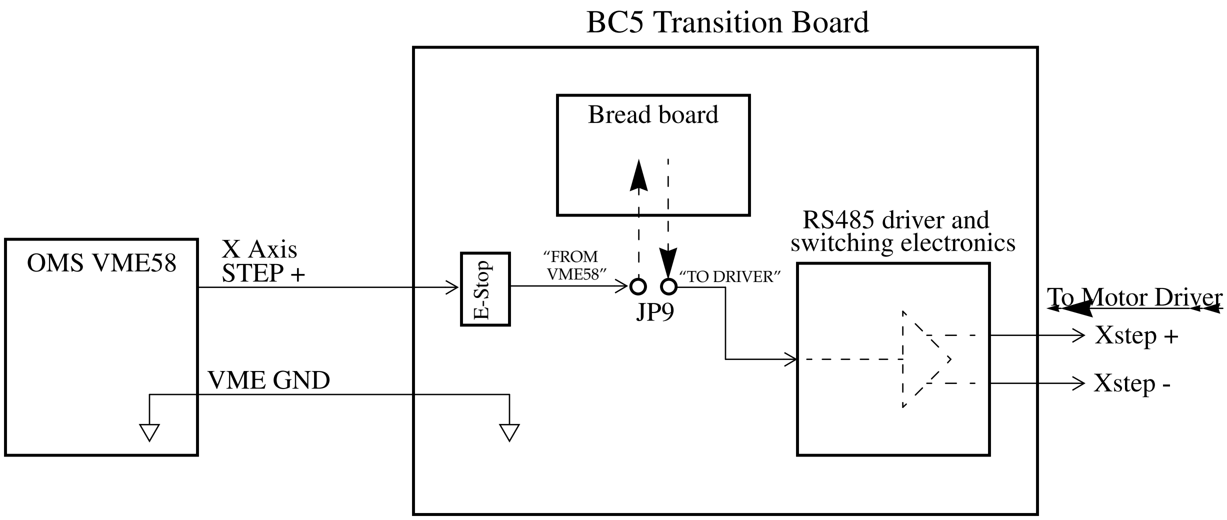

Fig. 2 *bread board access - block diagram*

Power is available for the bread board area that originates from the VME crate's +5V supply. A jumper wire must be soldered into the designated holes on the board. A micro-fuse can be substituted for one of the jumpers if so desired.

5. EMERGENCY STOP INPUT

All eight step signals are routed directly from the VME58 to the inputs of an SN74LS244 octal line driver. The E-stop input on the BC5 front panel is connected to the enable inputs of this chip. With a normally-closed push-button switch attached to this input, the chip is enabled and the step signals are able to proceed. If for any reason there is a break in this circuit (button pushed, cable off) the 244's outputs will be tri-stated and the step signals will be cut off. If the E-stop function is not needed/used, it may be overridden (step signals "permanently" enabled) by attaching a shorting jumper to the BC5 front-panel E-stop input.

We have developed a prototype of an E-stop fan-in/status board that allows for the connection of multiple switches to the system. We plan to develop this further in the near future.

6. HOME SWITCH INPUTS

The BC5 board has two home switch inputs per motor axis. This was done so that the user has the option of bringing a home switch signal back to the controller on either the motor cable or the encoder cable. The two signals are logically or'ed on the BC5 board. Therefore, if one input is to be used, the other input MUST be tied to the system ground.

7. DB-25 CONNECTOR PIN ASSIGNMENTS

PIN	Dir	Function	PIN	Dir	Function
1	-	uncommitted	14	-	uncommitted
2	In	overtravel	15	Out	auxiliary
3	Out	step +	16	Out	step -
4	Out	direction +	17	Out	direction -
5	In	high limit (NC)	18	In	high limit (NO)
6	In	low limit (NC)	19	In	low limit (NO)
7	In	encoder A +	20	In	encoder A -
8	In	encoder B +	21	In	encoder B -
9	In	index +	22	In	index -
10	In	home1 (motor con.)	23	In	home2 (encoder con.)
11	-	ground/shield	24	-	ground/shield
12	In	driver status	25	-	uncommitted
13	-	uncommitted			

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