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FOUR AND FIVE PHASE STEPPING MOTOR WIRING WITH LIMIT SWITCHES

1 Four Phase Stepping Motors

on June 17, 1985 a memorandum regarding stepping motor wiring was circulated by G.M. Van Derlaske and G. Watson. That memo specifically addressed wiring for Superior Slo-Syn four phase stepping motors (or their equivalent), without provision for limit switches. This memo includes an updated wiring scheme which allows for routing of the limits through the same motor connectors and cable suggested in the previous memo. In the interest of standardization, it is suggested that this new scheme be followed by those who have followed the old one, and who now wish to route the limit switch senses through the original cable without, making a new one. To reiterate (from the previous memo), the following connectors and cable should be used:

1.1 For Terminating the Stepping Motor Leads:

1. Use the 9 pin, bulkhead connector (BNL #A-73471) with male contacts (BNL #A-73496).

2. Use crimp tool AMP #169400 (BNL #H-19544) with die AMP #169414 (BNL #H-19555), extraction tool is AMP #305183 (BNL #H-15642)

1.2 Cable Assembly

The cable length is dependent upon your application in the field, but the cable should be terminated as follows:

1. A 9 pin connector (BNL #A-73476), backed up with a strain relief (BNL #A-73456), and wires terminated by female socket pins (BNL #A-73497).

2. Use 8 conductor shielded cable (BNL #A-30770).

Pinouts are as follows:

Pinout	Stepping Motor	Cable
1	White/Red (SW2)	Orange
4	Red (SWI)	Red
7	White (SW3/SW4 Return)	White
3	Black (SWI/SW2 Return)	Black
6	White/Green (SW4)	Yellow
9	Green (SW3)	Green
2	CCW Limit Switch	Blue
5	Limit Common	Braid
8	CW Limit Switch	Brown

1.3 Some reminders:

1. With the new scheme it is no longer possible to "key" the connectors with a plastic pin, since all the pinouts are used.

2. CW and CCW depend, of course, on how one views the motor shaft. In the motor step sequence which can be found in the Superior literature, CW rotation is as viewed from the nameplate (back) end of the motor.

3. One lead from each limit switch should be connected to the "limit common" (which can be grounded), pinout 5, the other to the appropriate pinout (2 or 8).

4. Induced spikes on the limit wires in the cable have sometimes been observed during high frequency stepping. Suitable capacitors across the limit switch leads (i.e., between pinouts 2 and 5, and between 5 and 8) can be used to suppress these. In some instances it may be preferable to reduce noise by,u,sing a cable with twisted pair conductors. Such a cable can be purchased from outside, e.g. Alpha Wire multipair shielded cable.

5. The cable conductors are AWG 20, which has been suitable for many applications. For applications involving high motor currents or very long cable lengths, thicker gauge conductors should be used; this determination must be made in the field. AWG 18 or lower multiple conductor cable can be purchased from outside, e.g. from Alpha Wire. For AWG 18 or AWG 16 conductors, the male contacts to use with the connector are BNL #A-73498, and the female sockets are BNL #A-73499.

2 Five Phase Stepping Motors

Five phase stepping motors manufactured by Berger Lahr are coming into common use at NSLS. To promote standardization, it is suggested that the following connectors and cable be used for such motors:

2.1 For Terminating the Stepping Motor Leads:

1. Use the 16 pin bulkhead connector (BNL #A-73472) with male contacts (BNL #A-73496).

2. Use the same tools described earlier for the four phase motors.

2.2 Cable Assembly

The cable should be terminated as follows:

1. A 16 pin connector (BNL #A-73477), backed up with a strain relief (BNL #A-73458), and wires terminated by female socket pins (BNL #A-73497).

2. Use 15 conductor shielded cable (BNL #A-30773).
   Pinouts are as follows:

Pinout	Stepping Motor	Cable
1	Yellow (WI Supply)	Yellow
2	White (WI Return)	White
3	Blue (W2 Supply)	Blue
4	Red (W2 Return)	Red
5	Orange (W3 Supply)	Orange
6	Green (W3 Return)	Green
7	Grey (W4 Supply)	Grey
8	Black (W4 Return)	Black
9	Brown (w5 Supply)	Brown
10	Violet (W5 Return)	Violet
11	Optional CW Limit See Below	White/Green
12	Optional CCW Limit See Below	White/Red
13	CW Limit Switch	White/Yellow
14	CCW Limit Switch	White/Blue
15	Home Switch	White/Black
16	Limit/Home Common	Braid

2.3 More reminders:

1. If the connectors are keyed, then the plastic pin (BNL #A-73890) should go into pinout 11, if not in use for a limit switch lead.

2. The Berger Lahr literature defines the "positive" direction as CW when the motor shaft is viewed from the nameplate (back) end of the motor.

3. To maintain consistency with the wiring for the four phase motor limits, one lead from each limit switch is connected to the "limit/home common" (which can be grounded), pinout 16. If it is necessary to keep all the leads from the limit switches separate, then the second CW limit switch lead should go to pinout 11 and the second CCW limit switch lead should go to pinout 12.

4. Wiring for a home switch is included for those who use such a switch. One lead should go to pinout 15, the other to the "limit/home common", pinout 16.

5. The cable conductors are AWG 20. As mentioned earlier, some applications may require thicker gauge or twisted pair conductors. Remember that for AWG 18 or AWG 16 conductors, the male contacts to use with the connector are BNL #A-73498, and the female sockets are BNL #A-73499.