

DM2800 SERVICE MANUAL

(PRELIMINARY)

SECTION 1

1. Introduction

The DM2800 is a high precision milling and drilling CNC machine. The machine has been designed and factory adjusted to provide trouble free operation with minimal maintenance and care. If service is required this manual provides the information required to isolate the problem, usually with the help of our local distributor or one of our service engineers. It is in the user's interest to be familiar with the location of the few boards in the power pack, how they operate in general and some of our diagnostic philosophy.

2. Warranty

Please refer to the warranty card that came with the machine.

3. Software release

The ROM checksum (Goto MANUAL MODE, YES to DIAGNOSTICS) is the current release level. This level we believe to be relatively free of bugs. Occasionally we release a new level to incorporate improvements and to clear up any bugs that may be found in the current release. If the user suspects a bug, we need a sample program and if verified, the user will get a free update when the new level is released. If the user wants a software update we offer a one day turn around on the controller.

SECTION 2

Some service problems are self imposed. They fall into three categories - the machine, the programming and communication on the RS232-C and with some care they can be avoided.

1. Introduction

- 1) Do not use an air nozzle to clear chips away from the workpiece. The smaller chips can be blown easily through the air filter into the electronics and can cause all kinds of problems. They can be blown into the slides and accumulate with the oil causing mechanical problems. It is recommended to brush or vacuum the chips.
- 2) For graphite or ceramic it is mandatory to vacuum or flush with coolant. The first material is highly conductive and the second highly abrasive.

- 3) For health reasons also, breathing aerosols of metal particles and coolant generated by the air nozzle is not enhancing to one's lifestyle.
- 4) Periodically inspect:
 1. **Oil level in the lubrication pump.** Use medium way oil obtained from your local tool distributor.
 2. Dust filters in the power pack. Check for the presence of metal dust, coolant in the bottom of the power pack.
 3. **Belt condition.**
 4. **Coolant level if used.**
- 5) Be careful with coolants. Some types will cause rusting of the vise, table or slides. The machine should not be left with splashed coolant over it for extended periods of time.
- 6) Do not grudge an excess of lubricating oil. Under lubrication can cause ball screw flaking and a variety of other problems.
- 7) If the machine has not been used for several weeks prime the oil pump first by pulling up the knurled knob. Oil dries out and can lock the axis. Use the emergency move to free the axes and spread oil.
- 8) Make sure the power lines are clean. Voltage surges will produce erratic behavior. These are produced by large AC motors being switched off or on as in air conditioners, large machines etc, by other companies down the road. This situation can produce a tremendous amount of frustration and the use of a line conditioner should be investigated.
- 9) Do not use the finger nails to press the membrane keyboard as this can damage it.
- 10) Do not plug or unplug the controller with power on, either at the desktop unit. This may cause program alteration in the CMOS memory or other damage.

2. On the program side

- 1) The user if he can should attend our programming class. Especially if he has no CNC background.
- 2) When starting off do very small programs to make yourself familiar with the operations. Do trial runs in the air or on plastic. Break a big program up into small parts and incrementally check it by building it up gradually.
- 3) If an unexpected move occurs and you don't know why rerun the part. Repeatability of wrong moves is a sign of a program mistake, entry mistake or a misunderstanding of the manual.

- 4) In production runs put in GO X, GO Y instructions before the SET UP. This will preserve the SET UP for the next day. The procedure is described in the manual.
- 5) Use END NEWPART instruction at the end. This allows the machine to self correct against the limit switches. If the tool does not go back exactly to the original SET UP position note the deviation on that particular axis. There may be a problem (oil, coolant, chips) contaminating that limit switch.

3. On the communication side

Please check your interface card and you are operating out of the right port. Please check that your RS232C cable is correctly wired, check with our drawing in the communication manual. The computer has to be IBM or IBM compatible. Check an upload first. Enter a small program into the controller and see if you can upload it to the computer.

4. When there is a problem

- 1) Please call your local distributor first. He may be able to help you. If he cannot he will refer the problem to us. Call our 800 number (800 - 421 - 5010) and ask for the service department. The service girl will note the call then route it to the appropriate service engineer. Her sole responsibility is to make sure the problem is fixed as soon as possible and she will confirm with you that if has been fixed. Do not bypass her as things have a tendency to go wrong.
- 2) If the problem is the program, it is difficult to debug this over the phone. Send or fax (408 - 773 - 8910) the drawing and your program and we shall try and run it here. If it involves exotic materials or exotic tools include these as well.
- 3) If the problem is the machine, the service engineer may ask you to try a few things so he can get a clear picture of the problem. It is helpful to him if you can locate the appropriate board or part and have a rough idea how things operate. The servicing is at the board level. We will exchange boards or the appropriate part. The service girl will give you an RMA number. Delivery is by normal Federal Express. For faster delivery the user pays the difference.
- 4) On the mechanical side of the machine there is very rarely a service problem. The ball screws and nut combinations should not be dis-assembled at all. Everything is preloaded and factory adjusted. This also holds for the spindle assembly. The spindle motor is brushless and should not be touched. The axes motors (likewise brushless) and mounting plates can be unscrewed to check the motor (it will run in air under emergency move) and to check the belt and timing gears.

SECTION 3

1. DIAGNOSTIC PHILOSOPHY

This is very simple. Switch the machine ON and see how far you get on bringing the machine up in stages. Open the power pack door to check

STAGE 1 Is there power in the system?

Check the lights on the +5V power supply and 48V power supply - do the fans come on.

If no power (the circuit breaker does not come on) you have problem on the power side.

Check emergency switch, wall socket plug, 10A fuse.

STAGE 2 Is there power (+5V DC) at the controller?

The controller display should come on to display READY? Any other message indicates a problem with the controller. Check the cable plug is correctly inserted into the controller.

STAGE 3 Answer YES to READY and check the next phase, the axes initialization. Each axes moves away slightly from the limit switch, then moves towards it (detects it goes in and comes out (so it just touches it)). If one axis does not do this but stays stationary you have a motor / drive problem. Confirm by switching the machine off, then on, and trying the emergency move on that axis.

If the axes moves in to the limit switch and sits and hums you have a limit switch detect problem, by switching off on then going to the emergency move back the axis off and check the limit switch again. The problem may be there (most probably), at the limit switch board or at the distribution board.

STAGE 4 Check the spindle. Go to local. Turn the spindle on and increase the speed. If the spindle does not rotate check the 5A circuit breaker and then check the 1A fuse. If these are good then the motor amplifier (probably) or the D/A converter board has a problem. If there is no speed control at all then it is the amplifier.

If the RPM indicator is not working, the board is located behind the spindle front plate.

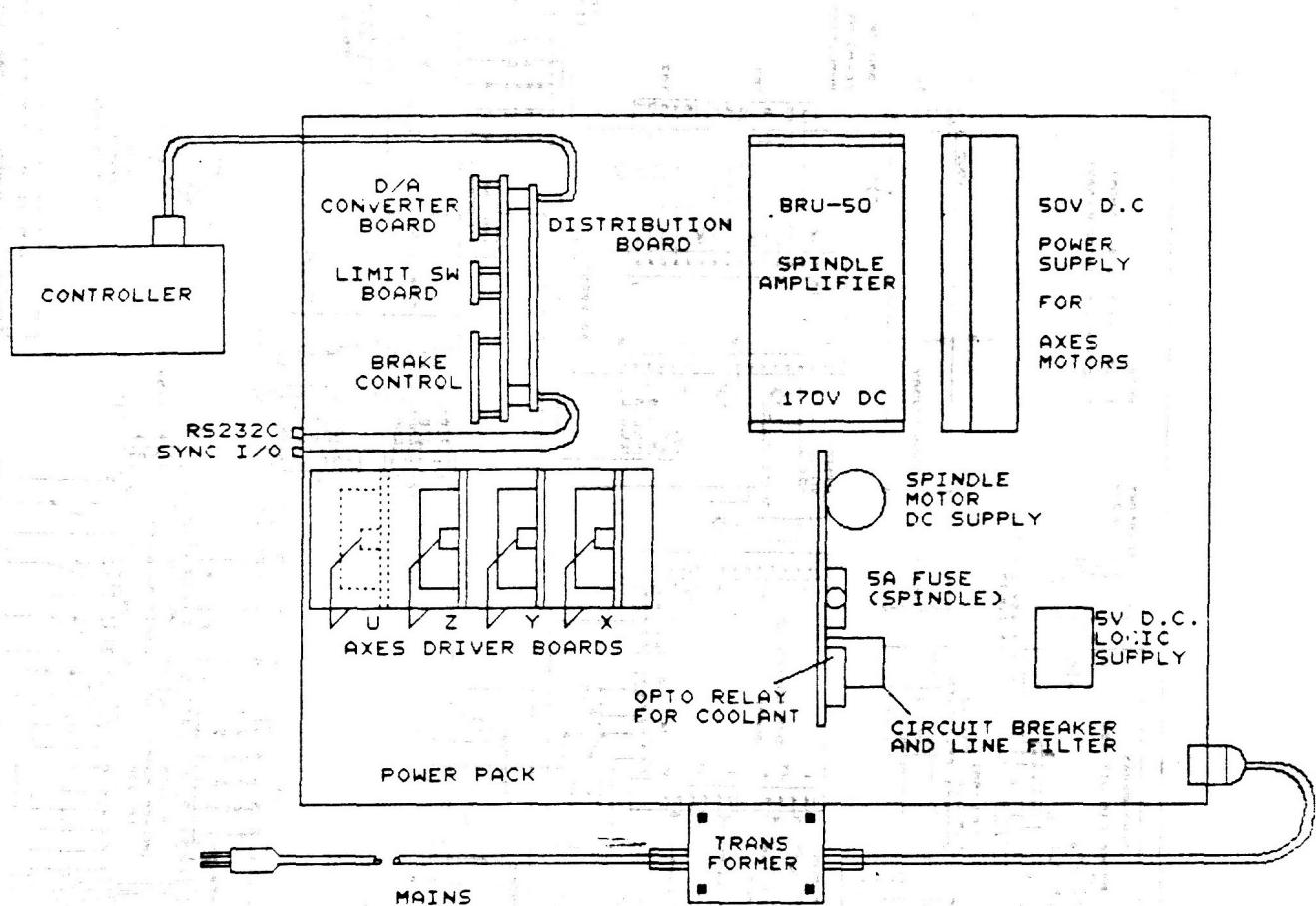
If you have located at what stage the problem exists then there is only one more test you can do if it is a motor axis problem on X or Y. Switch the machine off and unplug it from the wall then interchange the X and Y driver boards. If the problem stays with the axis it is the motor. If the problem moves to the other axis it is the driver board.

Once you have a fair idea of where the problem lies please contact our service department.

When you receive a board for exchange on the machine, make sure you touch the machine to ground out any static on you before handling the board. Remove and insert connectors from the base, not by the cabling itself.

Always remove the power plug from the wall before doing any board or component swapping.

SECTION 4



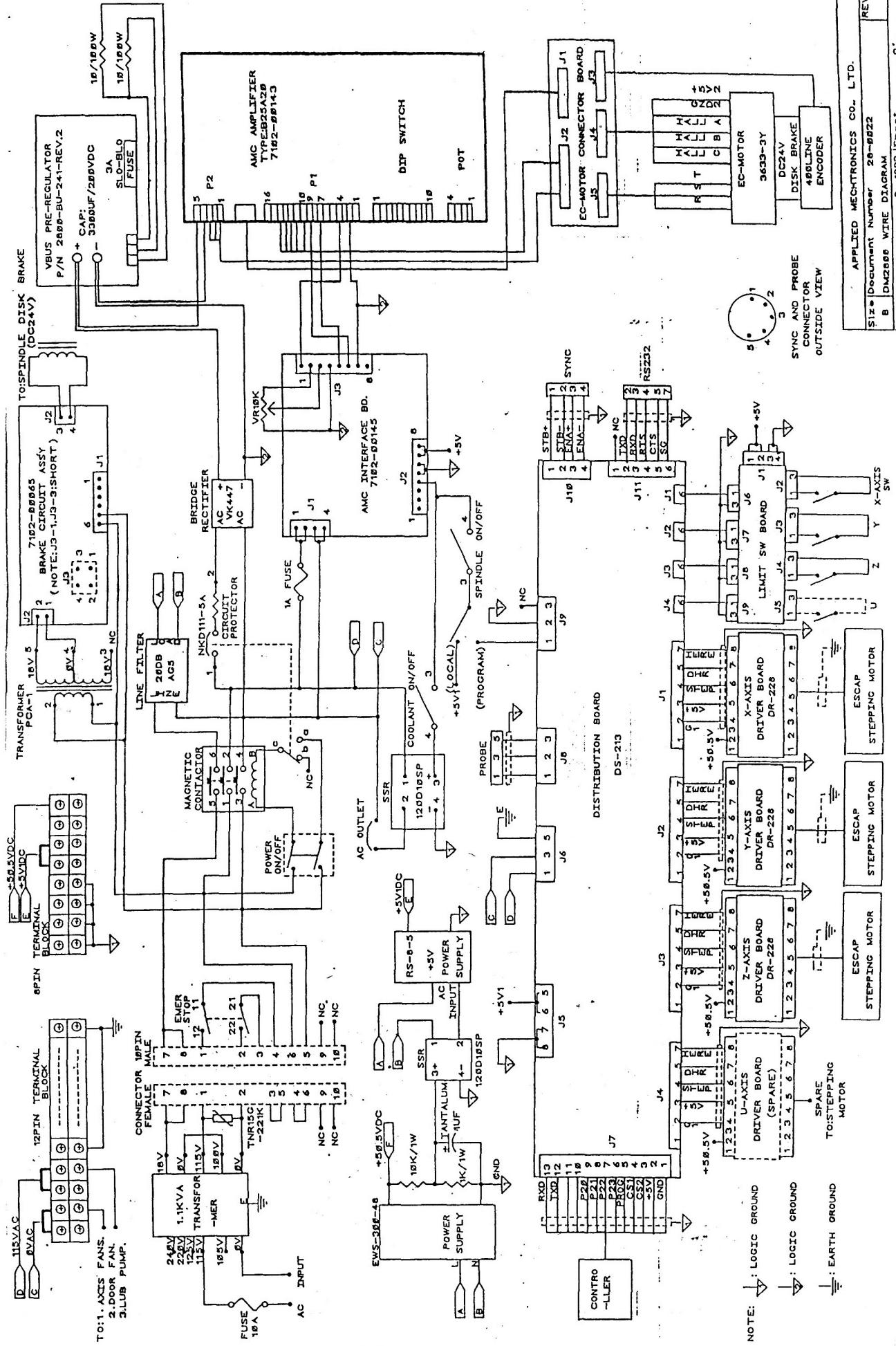
1. Operation overview

Above is the layout of the power pack. On the next page is the block diagram of the electronics.

The controller controls the operation of the machine. Logic signals to control the axes driver boards, the spindle off/on, sync I/O, RS232C are sent to the distribution board which distributes them. The distribution board also collects signals from the limit switches (via the limit switch board), from the axes driver boards (am here) from the sync I/O and RS232C and the probe.

The axes driver boards have signals in (50V DC, 5V, STEP, DIRECTION, AM HERE) through a connector at the back of the board. At the front is the 8 line connector to the synchrostep stepper motor. The u,x,y driver boards are interchangeable, the z is not.

On the power, side the power first goes through a 10A fuse then the emergency switch then the transformer. Internally 115V AC is used and this goes to the power supply switchers and to be rectified for the spindle amplifier. There is a 5A circuit breaker on this line to handle a stalled spindle.



NOTE:  : LOGIC GROUND
 : GROUND
 : EARTH GROUND

Block diagram of the EC-MOTOR control system:

- EC-MOTOR**: Represented by a rectangle with two output terminals.
- 3613-3Y**: Represented by a rectangle with two output terminals.
- DC-24V**: Represented by a rectangle with one output terminal.
- DISK BRAKE**: Represented by a rectangle with one output terminal.
- 4-BIT LINE**: Represented by a rectangle with one output terminal.
- ENCODER**: Represented by a rectangle with one output terminal.
- SYNC AND PROBE CONNECTOR**: Represented by a rectangle with one output terminal.
- OUTSIDE VIEW**: Represented by a rectangle with one output terminal.
- LIMIT SW BOARD**: Represented by a rectangle with four output terminals (labeled J1, J2, J3, J4).
- X-XCIS DRIVER BOARD DR-228**: Represented by a rectangle with six output terminals (labeled J5, J6, J7, J8, J9, J0).
- Y-XCIS DRIVER BOARD DR-228**: Represented by a rectangle with six output terminals (labeled 1, 2, 3, 4, 5, 6).
- Z-XCIS DRIVER BOARD DR-228**: Represented by a rectangle with six output terminals (labeled 1, 2, 3, 4, 5, 6).

Connections:

- The EC-MOTOR and 3613-3Y outputs connect to the LIMIT SW BOARD (J1, J2, J3, J4).
- The DC-24V output connects to the LIMIT SW BOARD (J1, J2, J3, J4).
- The DISK BRAKE output connects to the LIMIT SW BOARD (J1, J2, J3, J4).
- The 4-BIT LINE output connects to the LIMIT SW BOARD (J1, J2, J3, J4).
- The ENCODER output connects to the LIMIT SW BOARD (J1, J2, J3, J4).
- The LIMIT SW BOARD outputs (J1, J2, J3, J4) connect to the X-XCIS DRIVER BOARD (J5, J6, J7, J8, J9, J0).
- The X-XCIS DRIVER BOARD outputs (J5, J6, J7, J8, J9, J0) connect to the Y-XCIS DRIVER BOARD (1, 2, 3, 4, 5, 6).
- The Y-XCIS DRIVER BOARD outputs (1, 2, 3, 4, 5, 6) connect to the Z-XCIS DRIVER BOARD (1, 2, 3, 4, 5, 6).
- The Z-XCIS DRIVER BOARD outputs (1, 2, 3, 4, 5, 6) connect to the SYNC AND PROBE CONNECTOR.
- The SYNC AND PROBE CONNECTOR output connects to the OUTSIDE VIEW module.

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|-------------------|-----------------|--------------|------|
| APPLIED MECHANICS | | | REV. |
| SIZE: | Document Number | 26-0922 | |
| B | DW2800 | WIRE DIAGRAM | |
| DATE: | October 2, 1992 | Sheet 2 | of 2 |

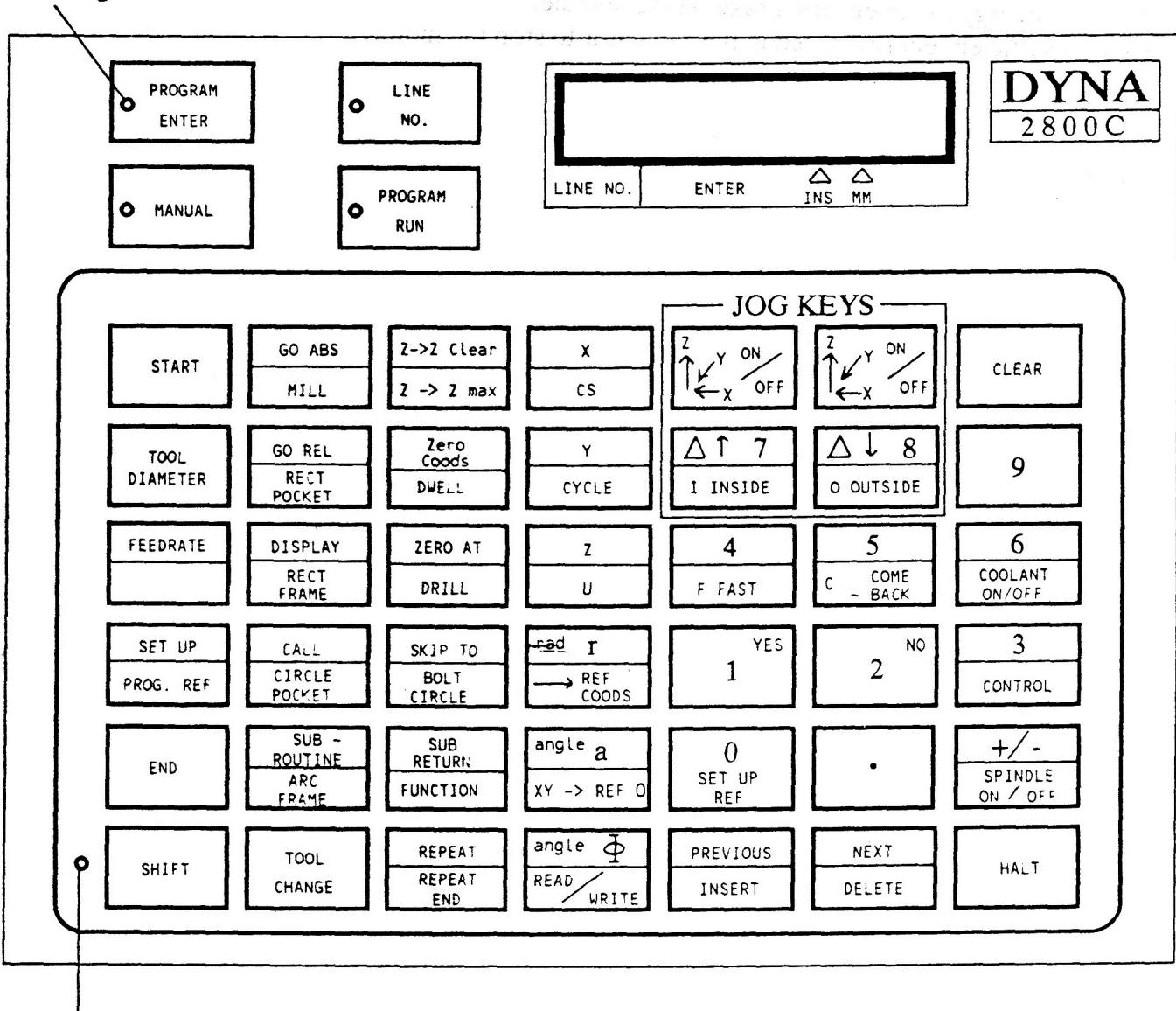
The emergency brake on the spindle works as follows. With power on, the brake relay keeps voltage on across a large capacitor.

When power is turned off via the emergency switch, the relay flips over and connects the stored capacitor energy to the electric brake on the spindle.

There is sufficient energy stored in the capacitor to stop the motor.

QUICK KEY GUIDE TO DM2800

Mode lights



Shift down light

MAIN 2800 KEYS AND THEIR FUNCTIONS

| | |
|-----------------|--|
| PROGRAM ENTER : | Entering programs into the controller. |
| MANUAL : | Tool calibration, manual moves and diagnostics. |
| LINE NUMBER : | For selecting a specific line number in the controller, clearing memory or sections of memory, uploading or downloading programs, inserting or deleting lines in programs. |
| PROGRAM RUN : | To run the program in the controller. |
| START : | Goes at the beginning of a program. Asks for INCH? or MM? and a program number. NN can be from 00 - 99. |
| TOOL DIA. : | Must be entered for each tool to allow for cutter compensation. (inside or outside). |
| FEEDRATE : | Specified in inches per minute or cm per minute for each axis individually or all together. (.05 - 100 IPM or .13 - 254 CM / MIN). |
| SETUP : | Used for setting up the program reference point on X, Y, Z, C, U. This must be done on the machine during program run. Setup creates the part zero. The letters will capitalize when the setup key is pushed. Use the no key to select the next axis in the display. |
| END : | Goes at the end of your program. Asks for "END", "END NEWPART", or "END NEW REFERENCE". |
| SHIFT : | Press the shift key to gain access to the blue key functions. |
| GO ABS : | Absolute move from the zero coordinate on a specified axis or axes. |
| GO REL : | Incremental move from the current tool position on a specified axis or axes. |
| DISPLAY : | Display current X, Y, Z values of the tool. This can be executed anywhere in the program except in a canned cycle. |
| CALL : | Call up subroutine, asks for a subroutine number. |

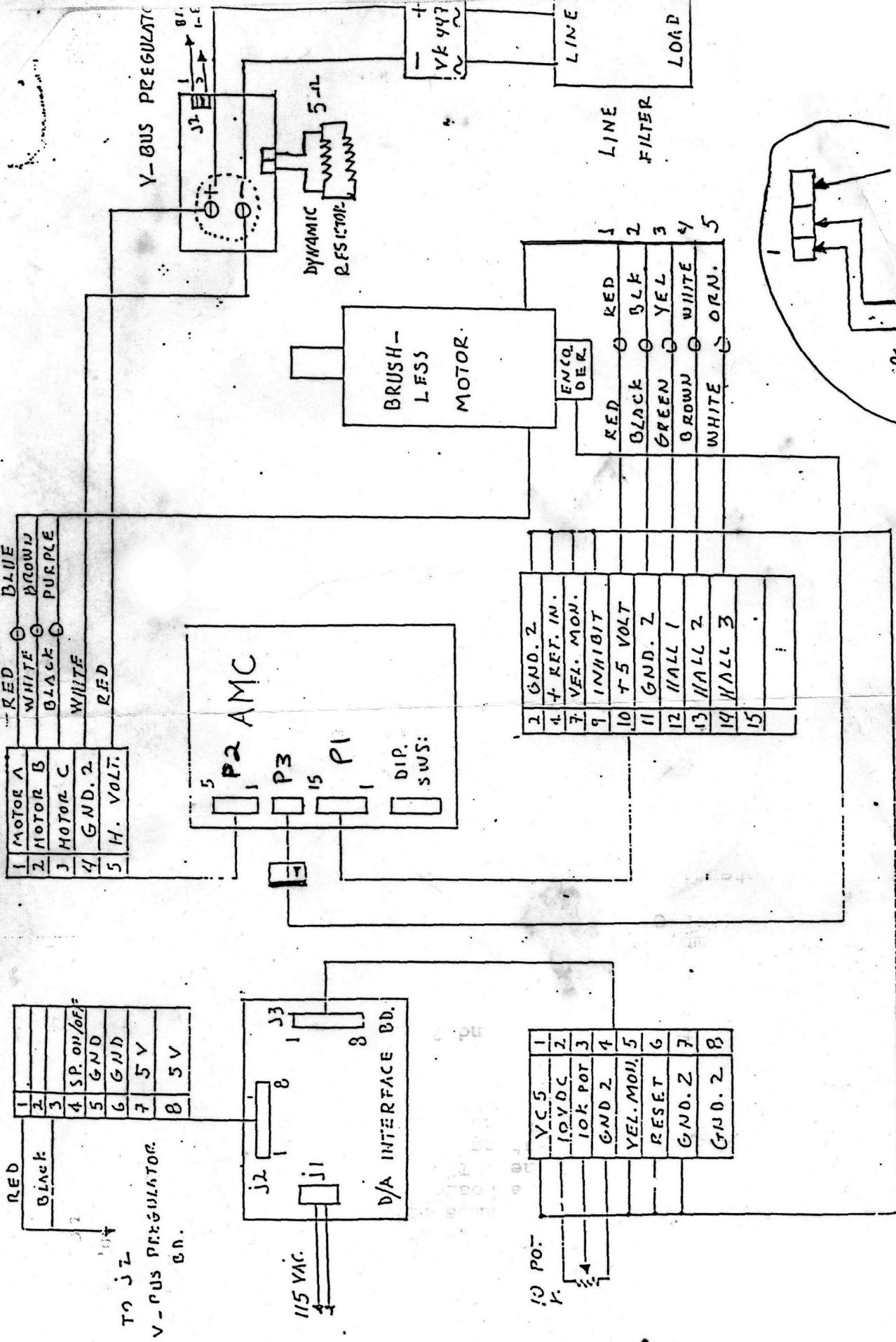
| | |
|---------------------------|---|
| SUB - ROUTINE : | Goes at the beginning of a subroutine and numbers the subroutine. (macro program). |
| SUB - RETURN : | Goes at the end of the subroutine. Ends the subroutine and returns to the program. |
| TOOL CHANGE : | Used to allow for tool change, tool number. |
| Z > Z CLEAR : | Moves Z to the clearance point specified in the setup line in the program. |
| ZERO COODS : | Creates a local zero at the current tool location. Any combination of axes may be used. Be careful with Z. |
| ZERO AT : | Creates a local zero at a specified point. The tool does not move there. |
| SKIP TO : | Allows you to skip to any line in the program and then continue on from that line in the program. |
| REPEAT : | Repeat all or certain sections of the program a specified number of times. Asks for number of repeats. |
| REPEAT END : | Ends the repeat cycle, goes at the end of the section being repeated. |
| X, Y, Z, U : | used to enter specific axis moves on the machine or rotary table. |
| RAD : | To enter a radius value. For arcs in XY plane. |
| ANGLE : | To enter an angle value. For arcs in XY plane. |
| ANGLE Q : | Used to generate 3 axis circular arcs. |
| X, Y, Z JOG KEYS : | Manually jog axis in direction specified by arrows. Top keys are continuous move and the lower keys are in .001 increments. |
| 0 - 9 KEYS : | To enter numerical data and decimal point. |
| PREVIOUS : | Used to go back and look at previous lines in a program. Used in the line no. mode and program enter mode. |
| NEXT : | Used to enter data into the controller. Like a enter or return key. Allows you to move ahead one line in the program. |

| | |
|---------------------------|---|
| CLEAR : | For clearing a line of data in program enter mode or for clearing all or sections of memory in the controller. |
| (+ / -) | To insert positive or negative data. (default is positive). |
| HALT : | Stops a program when desired, the next key allows the program to continue. |
| > REF COODS : | Cancels out any existing local zeros and restores the original set up zero. |
| XY > REF 0 | Moves the tool to the reference zero. |
| CS : | Change sign. Reverses the sign of the current tool tip position. Can be used with any axis. |
| INSIDE / OUTSIDE : | Allows cutter compensation on single axis moves only. Also on polar moves. |
| FAST | Allows a rapid move. |
| COMEBACK : | Go to a point and then return to the start point. |
| Z > Z MAX : | Move Z up to the maximum height. |
| DWELL : | Delays action of the program. (10 = 10 seconds). |
| SET UP REF : | Used to tell controller that this coordinate point has been set as the reference. (In set up during program run). |

MILL —
RECT POCKET —
RECT FRAME —
CIRCLE POCKET — Canned routines.
ARC FRAME —
DRILL —
BOLT CIRCLE —

| | |
|---------------------------|---|
| FUNCTION : | Used for scale OFF / ON |
| SPINDLE ON / OFF : | Turns spindle off / on in program mode. |

VIA 2860 SPINDLE INTERFACE CONNECTION (NEW ONE)



DIP. SWS. 6, 8, 9, 10 → ON POSITION

CIRCU EN LIMIT POT. → CW MAX.