1330-1 rev A-C Dual Arm Tool Changer Control Board Description and Explanation of Operation

The 1330-1A is identical to the 1330-0A and -0B in terms of connections and operation with the following exceptions: an Index (pocket 1) sensor input has been added (this was added in -0B), the triacs have been replaced with reversing contactors and overload relays (these replace the contactors and overload relays that were off-board), overcurrent sensing has been removed, overload sensing is done by the overload relays, there are separate LED's for turret motor overload and arm motor overload. 1330-1B adds an interlock input (J14) for the tool cage and tool inserter on 50-taper and HMC machines.

The 1330-1 and may be used on both Fadal and Siemens controls, but since there is now the 1331 board for Siemens that should be used for Siemens instead
The 1330-1 should always be used on 50-taper and HMC machines.

Inputs:

8-bit data port with strobe and ack for commands (bi-directional) - J4

7 sensors - J1, J2, and J13:

Tool Count - proximity sensor, Namur PNP, active source
Home position - proximity sensor, Namur PNP, active source
Tool Change Position - proximity sensor, Namur PNP, active source
Stopping Position - proximity sensor, Namur PNP, active source
Drawbar down sensor - Hall Sensor, active low
Bucket Down - reed sensor, NPN, normally open
Bucket Up - reed sensor, NPN, normally open
Turret Index - proximity sensor, Namur PNP, active source

(All sensor inputs except for drawbar can be configured for different sensors than those shown.)
All sensor inputs have LED's indicating their status. These inputs cannot be checked with a volt meter because the sensors are current devices.

+5V, +12V, GND - J5

120 VAC (J6 pin 1)
RET (J6 pin 2)

Estop (120 VAC) - J6 pin 3 (from 1100-1 TB1 pin 10)
Disables all 120V and 230V outputs from the 1330 when VMC is in Estop.

Drawbar and Arm Interlock - J6 pins 5 and 6 (from 1100-2 TB1 23 & 24)
Disables arm and drawbar when spindle is on. Drawbar SSR on 1100-2 must be jumpered or arm and drawbar will not work.)

Door Interlock (120 VAC) - J6 pin 7 (from 2000-1A J2 pin 3 or 1310-1C J1 pin 9)
Disables arm when doors are open.
(If there is no 1310 or 2000 board, J6 pin 7 must be jumpered to J6 pin 8.)

Cage Door/Tool Inserter Interlock (120 VAC) – J14
Disables turret when tool inserter is in use or cage door is open.
(J14 must be jumpered is there is no tool cage door.)

Head Position Sensor - J11 (Hall sensor or magnetic reed switch)
Disables arm movement (K9) if the Z-axis is not at tool change position. If no tool change position sensor is installed, then J11 pins 2 and 3 must be jumpered.

Outputs:

2 motors:
- Motor for turret - 3-phase, bi-directional (5 triacs) (Interlocked with Estop)
- Motor for arm - 3-phase, bi-directional (5 triacs) (Interlocked with Estop, doors, spindle, and head position)

3 valves:
- Drawbar (interlocked with Estop, spindle, and head position)
- Tool Down (interlocked with Tool Up and Estop)
- Tool Up (interlocked with Tool Down and Estop)

Contactor supplying 230 V 3-phase to 1330 (interlocked with Estop and overcurrent)
(The contactors have been moved on board so this output is no longer needed for 1330 operation. It is available if required.)

LED Indicators:

Sensor Inputs (Green):
- Tool Count - On at each tool position, off between tool positions.
- Arm at Home - On when arm is in home (or idle) position.
- Arm at Spindle - On when the arm is at the spindle.
- Stopping - On when arm is at home or at the spindle.
- Drawbar - On when drawbar is down.
- Tool Down - On when tool bucket is down.
- Tool Up - On when tool bucket is up.
- Turret Index – One when turret is at pocket 1 position.

ATC Fault (Red) - On when there is a tool change fault.
Heartbeat (Green) - Blinks indicating CPU is alive and functioning.
Turret Overload (Red) - Indicates turret motor overload has occurred.
Arm Overload (Red) - Indicates arm motor overload has occurred.
Output Indicators (Yellow):

Turret FWD	On when turret moving forward. (Turret CCW)
Turret REV	On when turret moving reverse. (Turret CW)
Arm FWD	On when arm moving.
Arm REV	On when arm commanded in reverse by Dual Arm menu
Drawbar	On while drawbar solenoid is commanded on (K1)
Tool Down	On while tool down solenoid is commanded on (K2)
Tool Up	On while tool up solenoid is commanded on (K3)
Contactor	On while 3-phase contactor is commanded on (K4)

Overload Sensing:

Motor overloads are sensed by the overload relays on the reversing contactors. These will shut off the respective reversing contactor (K10 or K11) and light an LED (D17 or D18). If the Reset on the overload relay has been set to “A”, the relay will automatically

reset after it cools. If the Reset is set to “H”, the reset button on the overload relay will have to be pressed to reset. It cannot be reset until the relay has cooled.

FUNCTIONAL EXPLANATIONS:

For board to have 120V for the SSR's:
- VMC must not be in Estop (Estop relay (K5) passes 120V thru CB1 to SSR's).
- CB1 must not be tripped.

For board to have 3-phase power:
- Board must have 120V power (see above).
- There must not be an overload (D17 or D18 lit).
- Contactor SSR (K4) must be energized.

For board to have 3 phase power to Arm Contactor:
- Board must have 120V power (see above).
- Board must have 3-phase power (see above).
- Spindle must not be on (and Drawbar relay on 1100-2 must be jumpered); this energizes the Drawbar Interlock relay (K7).
- If CE machine, 120V output from 2000 (J2 pin 3) or 1310 (J1 pin 9) board must go to J6 pin 7 (doors must be closed);
  if not CE, J6 pin 7 must be jumpered to J6 pin 3
  (CNC should not allow arm movement with doors open).

For drawbar to be energized:
- Board must have 120V power.
- Spindle must be off (Drawbar Interlock relay energized; this passes 120V power to Drawbar SSR and floats Drawbar enable to AND gate).
- Drawbar SSR must be energized.

For Tool Up or Tool Down solenoid to be energized:
- Board must have 120V power (see above).
- SSR for Tool Up or Tool Down must be energized.
  (Logic on the 1330 will disable Arm Up if Arm down is on and vice versa.)

For Turret Fwd or Turret Rev to be active (turret in motion):
- Board must have 120V power (see above).
- Board must have 3-phase power (see above).
  (Spindle may be one. Turret motion with the spindle on is allowable but not arm motion.)
- Tool inserter must be removed from bracket (50-taper machines).
- Tool cage door must be closed or Tool Door Interlock Override switch must be pushed (50-taper and HMC machines).
- J14 must be jumpered if not a 50-taper or HMC machine.
- Overload relay for turret must not be tripped (D17 off).
- Turret Fwd or Turret Rev (not both) must be active (low).

For Arm Fwd or Arm Rev to be active (arm in motion):

Board must have 120V power (see above).

Board must have 3-phase power (see above).

Spindle must be off (Drawbar Interlock relay energized; this pulls arm enable to OR gates low).

Z-axis must be at tool change position (LED D20). (If there is no head position sensor (J11) then J11 pins 2 and 3 must be jumpered. Shunt ELE-0088 is recommended for this.)

If CE machine, 120V output from 2000 or 1310 board must go to J6 pin 7 (doors must be closed);

if not CE, J6 pin 7 must be jumpered to J6 pin 3

(CNC should not allow arm movement with doors open).

If all the above is true the Arm Power relay will be energized.

Overload relay for arm must not be tripped (D18 off).

Arm Fwd or Arm Rev (not both) must be active (low).