Table 15: Interpretation of *Test DIP Switch* Display

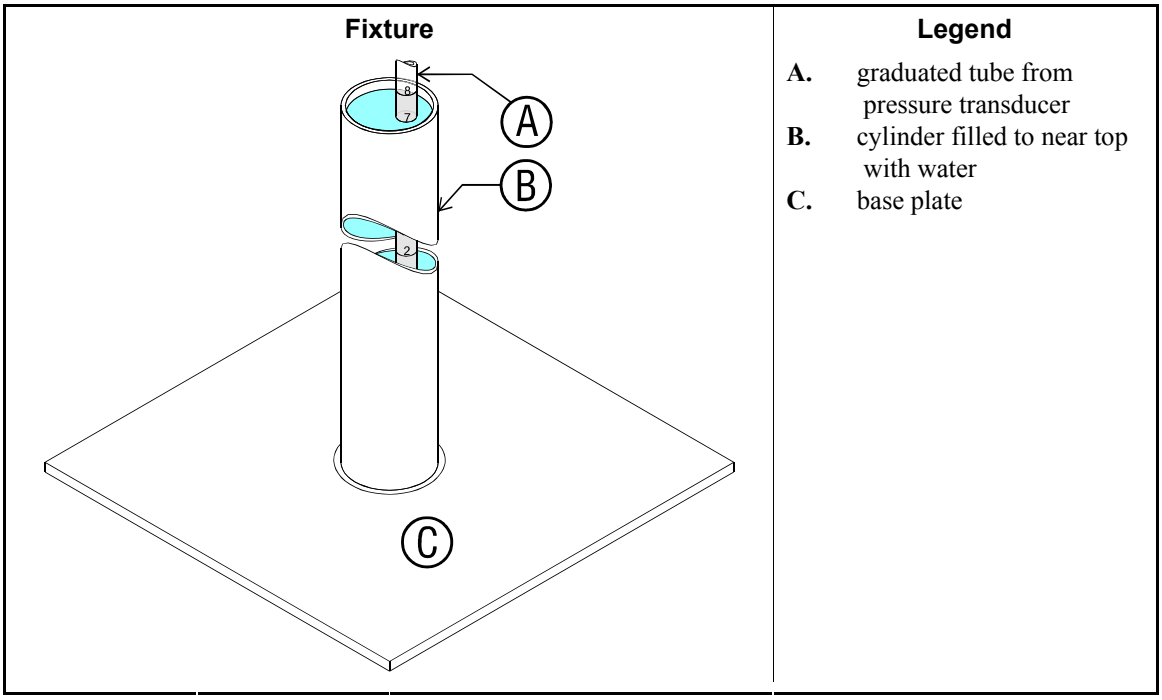
Industry Configuration	Standard Display Value	Value if Position 5 is ON	Value if Position 6 is ON	Value if Both Positions 5 and 6 are ON
Correctional	0	16	32	48
Hotel/Motel	1	17	33	49
Athletic	2	18	34	50
Healthcare	3	19	35	51
Restaurants	4	20	36	52
Commercial	5	21	37	53
Shirt Laundry	6	22	38	54
Offshore	7	23	39	55
Gear Guardian®	8	24	40	56

4.1.6. Testing Temperature and Level Sensors

The *Test Temperature & Level* selection on the *Manual menu* is used primarily by the Milnor® factory for testing and calibration of machines before delivery. For testing a temperature or level sensor in the field, the input to the sensor (level or temperature) must be controlled, but the sensor must remain connected to the processor board. The temperature sensor can be tested with a container of ice and water. A probe inserted in a container filled with ice and water will register approximately 32 degrees Fahrenheit (0 degrees Celsius).

Testing the pressure transducer requires a fixture similar to the one illustrated in Figure 8. As the graduated plastic tube from the transducer is lowered below the surface of the water, the displayed level values rise. If the values don't change, verify that there is absolutely no leaking in the pressure tube or at its connection to the transducer.

Figure 8: Level Sensor Testing Fixture



Display or Action	Explanation
R00088 A:01.7 C:01.0 R00099 A:082F [TEMP]	The top line of the display applies to the level sensing circuit. The "R" and the five characters immediately following it on the top line indicate the voltage being delivered by the pressure transducer on the processor board (see Figure 7). The "A" value is the actual instantaneous level read by the transducer. Because this display is only available when the drain is open, the actual level will normally reflect no water in the machine cylinder, although the number will be above 0. The "C" value is a calculated average of the transducer levels, used to negate the effects of rising and falling water levels caused by the reversing wash motion. Again, in normal conditions, this value will reflect that there is no water in the machine, although it may fluctuate between two values (e.g., 1.0 and 2.0) as it adjusts to the nearest whole inch. When using the level sensor test fixture (Figure 8), the display should indicate approximately the level to which the graduated plastic tubing is inserted into the water. The bottom line of the display applies to the temperature sensing circuit. Similar to the "R" value of the top line, the first six characters of the bottom line indicate the voltage being delivered by the temperature probe to the processor board (see Figure 7). The "A" value on the bottom line is the temperature in degrees Fahrenheit detected by the temperature probe.

Supplement 5

Testing the Pressure Transducer Circuit

The pressure transducer (illustrated in Figure 9) outputs a microvolt-level signal that increases

proportionally according to the pressure in the plastic tube. The instrumentation amplifier magnifies this signal by a factor of 1000 for the microprocessor. Because only very sensitive voltmeters are capable of reading a signal of less than one millivolt, better results are available by measuring the output voltage from the instrumentation amplifier. This procedure is described below:

CAUTION 36: Electrocution and Electrical Burn Hazards—Electric box doors—Operating the machine with any electric box door unlocked can expose high voltage conductors inside the box.

1. Locate the instrumentation amplifier on the processor board. This is a small integrated circuit chip with eight leads in socket IC20, near the pressure transducer.
2. Set your digital voltmeter to read a maximum of 5 volts DC. The output of this component, even when failed, will not exceed 5 VDC.
3. Locate pin 6 on the instrumentation amplifier. Note the notch in one end of the amplifier chip. If the board is oriented so the notch on the chip is at the left side of the chip, then pin 1 is the leftmost pin on the bottom row. Count pins counterclockwise to pin 6. If the orientation of the board is maintained (pin 1 at the lower left), then pin 6 will be the second chip from the right on the top row. This is the amplifier output pin.
4. Put the positive lead from your voltmeter on pin 6 of the amplifier chip, and the negative lead to a reliable electronic ground. Pin 5 (rightmost pin on top row) of the amplifier chip provides a suitable ground.

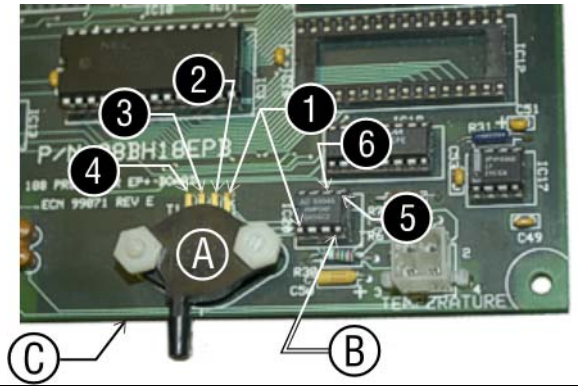
The output voltage read on the meter should be approximately 0.085 volts per inch of water in the machine cylinder. That is, if the machine is filled to a level of 4 inches (10 cm), the voltage measured between pins 5 and 6 of a functioning amplifier will be about 0.33 volts.

> **Note 13:** If your voltmeter is capable of reading microvolts, the transducer can be tested without the effect of the instrumentation amplifier. The notched pin on the transducer is pin 1 (ground). The reference voltage of slightly less than 1.5 VDC is applied to pin 3. Pins 2, 3, and 4 will all read the reference voltage relative to pin 1. The output voltage between pins 2 and 4 should equal approximately 0.085 millivolt per inch of water.

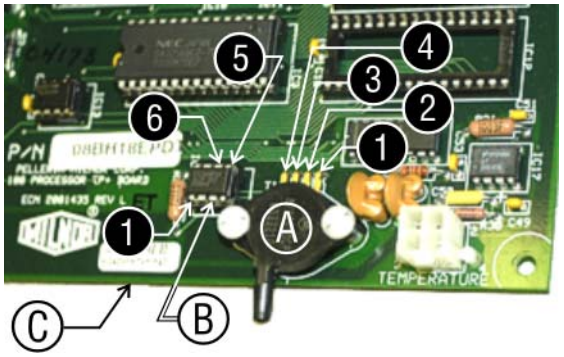
If the voltage is lower than expected, first check for leaks in the plastic tube connected to the pressure transducer. If no leaks are found, or if the voltage is significantly higher than expected, replace the processor board.

Figure 9: Pressure Transducer Component Identification

"Rev. E" Processor Board



"Rev. L" Processor Board



Legend

A. Pressure transducer
B. Instrumentation amplifier
C. Edge of processor board
1. Pin 1 of each component
2. Pin 2
3. Pin 3
4. Pin 4
5. Pin 5
6. Pin 6

4.1.7. Viewing Inputs and Outputs During Operation

While the machine must be idle to actuate outputs, inputs and outputs can be viewed (but not turned on or off) while the machine is operating.

Display or Action	Explanation
`23:04  F02S01  02:37` `L=A1/D1  Hot Wash`	This is a typical display while the machine is running a formula.
1 + ▲	displays the inputs. A plus sign (+) indicates the input is grounded, while a minus sign (–) indicates the input is not grounded.
`ABCDEFGHIJK` `+++--------`	typical display of input status while the machine is running. Refer to Table 13 to determine which input is represented by each character on the display.
⊞ + ▲	displays the first 11 outputs (Page 0). A plus sign (+) indicates the output is actuated, while a minus sign (–) indicates the output is turned off.
⊞ + ▼	displays the last 11 outputs (Page 1).
`PAGE abcdefghijk` `0   -+----+----`	typical display of first page of outputs (Page 0) while the machine is running. Refer to Table 14 to determine the component represented by each character on Page 0 and Page 1.

4.1.8. Viewing Water Level and Temperature Data During Operation

Display or Action	Explanation
	displays pressure transducer raw data and actual water level in tenths
03:45 STEP #01 05:36 08240 081 080 LEV 2	From left to right, the bottom line displays the pressure transducer raw data, the actual water level and the filtered water level in tenths, and the desired level.
	displays the calculated level, the desired level, and the temperature
03:48 STEP #01 05:36 LC07/LD07/T103 LEV 2	From left to right, the bottom line displays the calculate water level, the desired water level, and the water temperature. The level values on this display take into account any configured *offset height* (see Section 2.3.4.2).

— End of BICJHT03 —