

DETAIL # 2 - CLAMP HEAD ASSEMBLY

QTY.	DESCRIPTION	DETAIL	PART NUMBER
1	CLAMP HEAD CYLINDER (5X4)	1	112-11005
1	HEAD CAP	2	113-07004
1	"C" FRAME	3	113-37504
1	CLAMP HEAD	4	113-09006
2	CAM RAIL	5	113-18007
1	L.S. ACTUATOR ARM	6	113-00048
1	ACTUATOR ROD	7	113-22070
2	SIDE CAM GUIDE BLOCK	8	113-08057
2	SIDE CAM	9	112-08500
1	TOP PLATEN	10	113-21086
2	GUIDE PLATE	11	113-26021
1	L.S. ACTUATOR BRACKET	12	113-04560
1	JAM NUT	13	112-00273
1	THREADED ROD	14	111-1118
2	SIDE CAM CYLINDER (4X1)	15	112-11018

DETAIL # 3 - CARRIAGE SLIDE

QTY.	DESCRIPTION	DETAIL	PART NUMBER
1	RAIL BUMPER	1	113-23003
1	CARRIAGE BLOCK	2	112-08004
4	OPEN PILLOW BLOCKS	3	112-08044
2	SHAFT-CASE	4	112-08043
2	SHAFT SUPPORT RAIL	5	112-08042



DETAIL #4 - PLASTIC CYLINDER ASSEMBLY

QTY.	DESCRIPTION	DETAIL	PART NUMBER
1	NOZZLE TIP (7/8-12)	1	112-31027
2	NOZZLE BAND SHEILD	2	112-21044
1	CAP SHUT-OFF	3	112-07029
1	SCREW TIF (1-1/2)	4	112-31020
1	BUSHING (1-1/2)	5	112-31013
1	WASHER (1-1/2)	6	112-31007
1 -	SCREW (1-1/2 X 6)	7-	112-27007
1	BARREL (1-1/2 X 6)	8	112-07007
1	BARREL KEY	9	113-40552
2	RING-LOCKING SPLIT	10	113-02022
1	RING-LOCKING SOLID	11	113-02021

DETAIL #5 - STORAGE HOPPER

QTY.	DESCRIPTION	DETAIL	PART NUMBER
1	STORAGE HOPPER	1	112-28002
2	PLATE-SHUTOFF STOP	2	113-24507
1	PLATE-SHUTOFF HOPPER	3	113-26036
1	GUIDE-SHUTOFF	4	113-15516



DETAIL #6 - DIE-SET ASSEMBLY

QTY.	DESCRIPTION	DETAIL	PART NUMBER
1	THRUST BEARING	1	112-48007
1	RETAINER-BEARING	2	113-24078
1	DIE-SET (MACHINED)	3	113-12020
1	ADAPTOR - SCREW	4	112-12031
1	ROLLER BEARING	5	112-48008

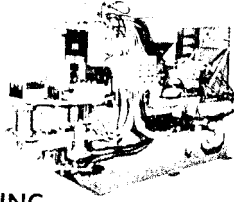
DETAIL #7 - TABLE ASSEMBLY

QTY.	DESCRIPTION	DETAIL	PART NUMBER
2	FELT RETAINER	1	113-24038
1	TRANSFER TABLE (14 X 6-7/8)	2	113-26504
2	GIB	3	113-15012
1	GUIDE-TABLE	4	113-15515
1	END PLATE - LEFT	5	113-26142
1	END PLATE - RIGHT	6	113-26141
1	RISER	7	113-23506
2	CYLINDER MOUNTING BRACKET	8	113-04583
1	HYDRAULIC TABLE CYLINDER	9	112-11021
2	KEY	10	113-38245

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# INJECTION MOLDING HINTS

**TRUEBLOOD**  
 PLASTIC INJECTION MOLDING MACHINES  
 SCREW CONVERSION UNITS  
 TOOLING



TWO  
 TO  
 THIRTY-THREE  
 OUNCE  
 CAPACITY

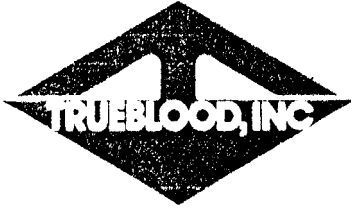
**TRUEBLOOD, INC.**

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 TELEPHONE: 513-845-3573

## MOLDING DIFFICULTIES

### POSSIBLE CORRECTIONS

	DROOLING AT NOZZLE	SHORT SHOT	SCREW DOES NOT RETURN	SINK MARKS	BURNING	SURFACE BLEMISHES	FLASHING	DULL SURFACE	LAMINATIONS	PARTS STICK IN MOLD	RUNNER BREAKS	PARTS DISTORT	DISCOLORATION OF SPRUE	FLOW LINES	BRITTLE PARTS	WAVY SURFACES	"WORM TRACKS" ON PART	MELT TEMPERATURE TOO HIGH	STREAKS ON PART	VOIDS IN PART
INCREASE INJECTION PRESSURE		X																		
DECREASE INJECTION PRESSURE							X							X	X					
INCREASE STOCK TEMPERATURE		X				X		X	X			X		X	X	X	X		X	
DECREASE STOCK TEMPERATURE				X		X			X			X		X	X	X	X		X	
INCREASE HOLDING PRESSURE AND TIME				X		X			X			X		X	X	X	X	X	X	X
DECREASE HOLDING PRESSURE AND TIME						X			X	X	X			X				X		X
INCREASE NOZZLE TEMPERATURE		X	X	X				X		X	X	X		X			X			X
CLEAR NOZZLE		X	X	X				X								X				X
CLEAR SHUT-OFF VALVE	X	X																		
INCREASE SCREW R. P. M.			X		X	X	X							X	X					
DECREASE SCREW R. P. M.																		X	X	
TIGHTEN NOZZLE OR SHUT-OFF VALVE												X						X	X	
INJECT WITH ROTATING SCREW		X			X	X	X			X	X		X	X					X	
INCREASE CLAMPING PRESSURE						X														
START INJECTION LATER	X																			
DECREASE INJECTION SPEED			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
INCREASE INJECTION SPEED	X													X	X					
INCREASE BACK PRESSURE	X				X	X	X			X	X		X	X	X	X			X	
DECREASE BACK PRESSURE		X	X																	
ENLARGE NOZZLE ORIFICE	X	X	X			X	X					X	X	X	X					
INCREASE MOLD TEMPERATURE	X			X	X	X	X	X	X	X	X	X	X	X	X					X
DECREASE MOLD TEMPERATURE			X	X	X	X	X	X	X	X	X	X	X	X	X					X
POLISH MOLD AND BREAK CORNERS				X	X	X	X		X	X	X			X	X		X			X
REWORK MOLD					X				X											
POLISH SPRUE, RUNNERS, AND GATES				X						X										
INCREASE SIZE OF GATES	X	X	X	X		X	X					X	X	X	X					X
PROVIDE VENTS IN MOLD	X		X									X	X	X	X					X
ENLARGE COLD SLUG WELL				X									X		X	X				
USE DRY MATERIAL		X		X		X	X					X	X	X	X					X
USE UNCONTAMINATED MATERIAL						X	X						X	X	X					X
FILL HOPPER OR REMOVE OBSTRUCTION		X																		
INCREASE FEED	X	X											X	X						X
USE MOLD RELEASE									X											
ADJUST NOZZLE PRESSURE	X								X											
CHECK RADIUS OF NOZZLE & OF SPRUE BUSHING	X							X	X											
REDUCE NOZZLE TEMP; BREAK SPRUE LATER	X							X	X											
REDUCE TEMPERATURE - REAR ZONE (EXCEPTION: INCREASE TEMP. FOR NYLON)		X																		
BALANCE MOLD FILLING; REWORK RUNNERS			X																	
PROVIDE AIR FOR EJECTION																				
LENGTHEN COOLING AND MOLD-OPEN TIME								X												
SHORTEN COOLING AND MOLD-OPEN TIME									X	X					X					X

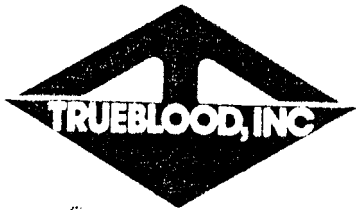


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## INSTRUCTIONS FOR REMOVING CAP, SCREW AND SCREW TIP ASM.

1. REMOVE SHUT-OFF CAP
2. PRE-HEAT CYLINDER TO 200 deg F. SHUT-OFF HEATER BANDS WHEN HEAT IS INDICATED.
3. REMOVE FRONT HEATER BAND ONLY.
4. REMOVE SCREWS FROM CAP.
5. TAP CAP WITH A SOFT HAMMER TO BREAK LOOSE AND REMOVE CAP.
6. REMOVE SCREW TIP ASSEMBLY WITH SPANNER WRENCH (SCREW IS LEFT-HANDED).
7. REMOVE SCREW FROM BARREL BY LOOSENING THE BOLT LOCATED IN THE SCREW ADAPTOR AND REPLACE BOLT WITH A THREADED ROD TO DRIVE THE SCREW OUT OF THE SCREW ADAPTOR AND KEY.
8. CLEAN ALL SURFACES OF SCREW LEADS AND SCREW TIP ASSEMBLY
9. REPLACE SCREW IN DRIVER ADAPTOR WITH KEY TIGHTEN SCREW - REPLACE CAP, HEATER BAND AND PIN.
10. HOOK-UP LINKAGE ON SHUT-OFF NOZZLE IF INCORPORATED WITH PRESS.





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## PREPARATION FOR START UP AND PURGE OPERATION

- I. A. FIRST CHECK TO SEE IF THE MAIN DISCONNECT IS IN THE "ON" POSITION. IF SO, THEN TURN THE HEAT SELECTOR SWITCH TO THE "ON" POSITION.
  1. THIS WILL ALLOW THE HEAT CONTROLLERS - LOCATED ON THE BACK OF THE MAIN ELECTRICAL ENCLOSURE TO HEAT UP TO AN ELECTRICALLY CONTROLLED SET POINT.
    - a. THE HEAT CONTROLLERS SEND A SIGNAL TO THE THERMOCOUPLES WHICH READ ITS SET POINT AND THEN TELLS THE CONTROLLER TO TURN ON OR OFF THE HEAT TO THE HEATER BANDS - LOCATED ON THE BARREL.
    - b. TO SELECT YOUR SET POINT, WHICH DEPENDS ON THE TYPE PLASTIC BEING USED, THERE ARE THUMBWHEEL SWITCHES ON THE HEAT CONTROLLERS.
- B. CHECK TO BE SURE THERE ARE INCOMING AND OUTGOING WATER LINES CONNECTED TO THE OIL COOLING UNIT - LOCATED AT THE REAR OF THE PRESS ON THE RIGHT-HAND SIDE. THIS ALLOWS WATER TO COOL THE HYDRAULIC OIL CONTINUOUSLY SO THAT THE OIL WILL NOT OVERHEAT AT 125 deg BREAKDOWN, CAUSING DAMAGE TO THE VALVES, SEALS AND MOTOR.
  1. WATER SAVER (OPTION) - THIS UNIT SAVES THE AMOUNT OF WATER USED BY ALLOWING WATER TO PASS THRU THE OIL COOLING UNIT WHEN THE WATER TEMPS. GO OVER A CERTAIN SET POINT. TO DO THIS, WE ENERGIZE A SOLENOID TO OPEN THE WATER INLET PASSAGE.
- C. TURN ON THE POWER TO THE HOT RUNNER SYSTEM (OPTION)
  1. THIS UNIT HEATS UP THE MOLD AT A PRESET POINT IN ORDER TO ACHIEVE THE PROPER PARTS CONFIGURATION.
    - a. WHEN USING THIS UNIT LOOK IN THE OPERATORS MANUAL FROM THE SYSTEMS MANUFACTURER FOR THE PROPER MOLD HEATING AND START UP FOR EACH PARTICULAR MATERIAL CHARACTERISTICS.



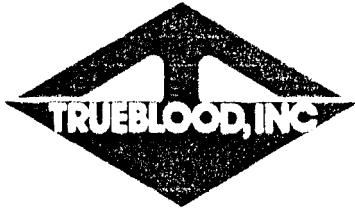


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**II. WHEN THE TEMPERATURE CONTROLLERS REACH THERE PRESET POINT THEN:**

- A. LOAD THE HOPPER WITH THE PROPER MATERIAL AND MAKE SURE THE HOPPER SHUT-OFF PLATE IS CLOSED.
- B. TURN ON THE TEMPERATURE CONTROL TO MOLD (OPTION) -- COOLING OR HEATING OF MOLD.
- C. TURN THE NOZZLE SELECTOR SWITCH TO THE OFF POSITION (OPTION).
  - 1. THIS ALLOWS THE MATERIAL TO PASS FROM THE BARREL TO THE MOLD ONLY WHEN NEEDED AND IN AFFECT HELPS STOP DROOLING OF EXTRA MATERIAL.
  - 2. IF THE NOZZLE SELECTOR SWITCH IS TURNED ON, THEN THE SHUT-OFF CAP REMAINS OPEN.
- D. OPEN THE HOPPER SHUT-OFF PLATE AND THEN TURN ON THE SCREW SELECTOR SWITCH.
  - 1. THIS ALLOWS THE SCREW MOTOR TO TURN, WHICH PACKS THE BARREL WITH MATERIAL FOR INJECTION.
- E. TURN ON THE SUCKBACK SELECTOR SWITCH (OPTION)
  - 1. THIS CAUSES A VACUUM AFFECT THAT PULLS BACK THE MATERIAL INTO THE BARREL, WHICH HELPS CONTROL DROOLING.
- F. MAKE SURE THE GUARDS ARE IN PLACE FOR THE PROPER SAFETY OF THE OPERATOR.





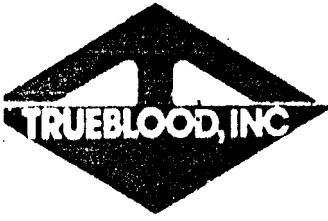
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**III. NOW THE PURGING OF THE MACHINE CAN BE INITIATED**

- A. TURN THE HAND-OFF-AUTO SELECTOR SWITCH TO THE OFF POSITION.
- B. PULL THE START-STOP PUSHBUTTON - THIS ALLOWS THE MOTOR TO TURN ON.
- C. TURN THE HAND-OFF-AUTO SELECTOR SWITCH TO THE HAND POSITION - THE PUMP PRESSURE LIGHT COMES ON.
- D. PUSH THE TRANSFER AND TABLE JOG PUSHBUTTONS SIMULTANEOUSLY TO CENTER THE BARREL BETWEEN THE MOLDS. MAKE SURE PERSONNEL ARE CLEAR OF THE NOZZLE TIP AREA BEFORE PURGING THE MACHINE.
- E. TURN THE CARRIAGE SELECTOR SWITCH TO THE OFF POSITION.
- F. THEN PUSH AND HOLD THE INJECT PUSHBUTTON (ENERGIZING THE INJECT SOLENIOD) DOWN UNTIL THE INJECTION DIE-SET BOTTOMS OUT, ACTUATING THE INJECT FORWARD LIMIT SWITCH (LS-9) ALLOWING THE MATERIAL TO PURGE OUT OF THE NOZZLE.
- G. WHEN THE INJECT PUSHBUTTON IS RELEASED (DE-ENERGIZING THE INJECT SOLENIOD AND ENERGIZING THE SCREW SOLENIOD) THE SCREW MOTOR THEN ROTATES UNTIL THE SUCKBACK LIMIT SWITCH (LS-8) IS ACTUATED (THIS DE-ENERGIZING THE SOLENIOD AND ENERGIZES THE SUCKBACK SOLENIOD FOR A PRESET TIME. WHEN THE TIMER TIMES OUT IT DE-ENERGIZES THE SUCKBACK SOLENIOD).
- H. FOR PURGING PROCESS ONLY: REPEAT ITEMS F. AND G. LISTED ABOVE APPROXIMATELY 3 MORE TIMES, THEN TURN THE CARRIAGE SELECTOR SWITCH TO THE ON POSITION.



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#### IV. RUNNING IN AUTOMATIC MODE

- A. TURN THE HAND/OFF/AUTO SELECTOR SWITCH TO THE AUTO POSITION. SYSTEM HIGH PRESSURE LIGHT IS NOW OFF.
- B. TURN THE KNOCKOUT PINS TO THE PROPER DESIRED SETTING
  1. OFF POSITION-
  2. HOLD POSITION-
  3. FULL POSITION-ASSUME PINS IN FULL POSITION
- C. CHECK THE FOLLOWING LIMIT SWITCHES FOR PROPER MACHINE FUNCTION:
  1. KNOCKOUT PINS RETRACTED-DOWN (LS-1 & 2) PINS DOWN SOLENOID (SOL-3HB) ENERGIZED.
  2. CLAMP OPEN-UP (LS-3).
  3. CAMS RETRACTED (LS-6 & 7).
  4. TABLE FULLY LEFT OR RIGHT (LS-4) ASSUME TABLE FULLY RIGHT.
  5. CARRIAGE FULLY RETRACTED-BACK (LS-12).
- D. NOW DEPRESS THE LEFT AND RIGHT CYCLE START PUSHBUTTON SWITCHES SIMULTANEOUSLY AND HOLD UNTIL THE TOP AND BOTTOM MOLDS MEET ACTUATING CLAMP CLOSED LIMIT SWITCH (LS-3). THEN THE SYSTEM HIGH PRESSURE LAMP COMES ON.
  - 1a. THE TABLE WILL TRANSFER TO THE LEFT OR RIGHT ENERGIZING SOLENOID (SOL-1HB OR HA).
  - 1b. AN INTERNAL DELAY TIMER IS ENERGIZED, DELAYING THE CLAMP CLOSE SOLENOID (SOL-6HB) FROM CLOSING BEFORE THE TABLE IS COMPLETELY TRANSFERED.
  2. WHEN THE TABLE TRANSFERED LIMIT SWITCH IS ENERGIZED (LS-4) AND THE DELAY TIMER TIMES OUT, THE CLAMP CLOSE SOLENOID (SOL-6HB) IS ENERGIZED (150 PSI) AND WHEN (LS-3) CLAMP CLOSE IS ACTUATED THEN THE TABLE TRANSFER SOLENOID (SOL-1HB OR HA) IS DE-ENERGIZED.
  3. THE OVERALL CYCLE AND INJECTION CYCLE TIMERS ARE ENERGIZED; CLAMP OPEN LIMIT SWITCH (LS-3) IS NOW TURNED OFF (NEUTRAL STATE).
    - a. LEFT OR RIGHT PINS SOLENOID (SOL-4 OR SOL-5), ONE OR THE OTHER, NEVER BOTH OF THEM AT THE SAME TIME. THIS TURNS OFF (SOL-1HB OR HA). THE PINS UP SOLENOID (SOL-3HA) IS ENERGIZED THEN THE LEFT OR RIGHT (SOL-4 OR SOL-5) KNOCKOUT PINS FIRE UP. THE PARTS ARE PUSHED UP OUT OF THE MOLD. THEN THE LEFT OR RIGHT SOLENOID (SOL-4 OR SOL-5) IS TURNED OFF ALONG WITH THE PINS UP SOLENOID (SOL-3HA).





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THEN THE PINS DOWN SOLENOID (SOL-3HB) IS ENERGIZED:

- b. CLAMP HEAD ASSEMBLY CLOSES TURNING THE CLAMP CLOSE LIMIT SWITCH (LS-3) ON. WHEN THIS SWITCH IS MADE THE CARRIAGE SOLENOID (SOL-10H) AND THE CAMS (LEFT OR RIGHT) SOLENOID (SOL-11H) TURN ON CAUSING CLAMP HIGH PRESSURE (1850 PSI) WHEN THE CAMS (LEFT OR RIGHT) LIMIT SWITCHES (LS-6 & LS-7) ARE ACTUATED.
4. WHEN THE CARRIAGE FORWARD LIMIT SWITCH (LS-12) ACTUATES, WE ENERGIZE THE NOZZLE SOLENOID (SOL-12) TO OPEN THE PASSAGE FOR THE MATERIAL TO BE INJECTED THROUGH (OPTION).
5. NOW WE ENERGIZE THE INJECT SOLENOID (SOL-9HA) AT AN INJECTION PRESSURE OF 200 PSI WHICH PUSHES THE MATERIAL FROM THE BARREL INTO THE MOLD. WHEN THE INJECTION FORWARD LIMIT SWITCH (LS-9) IS ACTUATED THIS DE-ENERGIZES THE NOZZLE SOLENOID (SOL-12H).
  - a. THE INJECTION TIMER TIMES OUT CAUSING THE INJECT SOLENOID (SOL-9HA) TO DE-ENERGIZE AND THE SCREW SOLENOID (SOL-9HB) TO ENERGIZE ALSO THE INJECTION PRESSURE DROPS TO 50 PSI-PUMP PRESSURE DROPS TO 500 PSI. THE SCREW MOTOR IS NOW TURNING SO THAT THE BARREL CAN REFILL WITH NEW MATERIAL.
  - b. WHEN THE SCREW STROKE LIMIT SWITCH (LS-8) IS ACTUATED, THE SCREW SOLENOID (SOL-9HB) DE-ENERGIZES AND THE SUCKBACK SOLENOID (SOL-13H-OPTIONAL) OR AN INTERNAL SUCKBACK TIMER ENERGIZES. THE PUMP SOLENOID (SOL-15H) IS DE-ENERGIZED.
6. THE OVERALL CYCLE TIMER DE-ENERGIZES. THIS DE-ENERGIZES THREE SOLENOIDS SIMULTANEOUSLY.
  1. CAMS LEFT AND RIGHT (SOL-11H)
  2. CARRIAGE (SOL-10H)
  3. TABLE LEFT OR RIGHT (SOL-11HA OR SOL-11HB)
7. NOW THE CLAMP HEAD ASSEMBLY IS READY TO COME UP SO WE ENERGIZE THE PUMP SOLENOID (SOL-15H) AT HIGH PRESSURE (1500 PSI) AND THE CLAMP SOLENOID (SOL-6HA) SIMULTANEOUSLY TO ALLOW THE CLAMP HEAD TO OPEN.





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8. WHEN THE CLAMP OPEN LIMIT SWITCH (LS-3) IS ACTUATED, WE DE-ENERGIZE BOTH THE PUMP SOLENOID (SOL-15H) AND THE CLAMP SOLENOID (SOL-6HA) AND ENERGIZE THE CYCLE OVER LIGHT LOCATED ON THE FRONT PUSHBUTTON PANEL.
9. TO REPEAT CYCLE FOR MORE PARTS RETURN TO STEP A.
10. TO PURGE BARREL AT END OF DAY;
  - a. TURN THE HOLD/OFF/FULL SELECTOR SWITCH TO THE OFF POSITION.
  - b. TURN THE HAND/OFF/AUTO SELECTOR SWITCH TO THE HAND POSITION.
  - c. TURN THE CARRIAGE SELECTOR SWITCH TO THE OFF POSITION.
  - d. THEN PURGE THE BARREL ACCORDING TO THE PURGE SEQUENCE.
  - e. TURN THE HEAT SELECTOR SWITCH, THE HOT RUNNER SYSTEM (KONA, DHE, ETC.) AND WATER LINES TO THERE OFF STATUS.
  - f. PUSH THE MOTOR PUSHBUTTON OR EMERGENCY STOP AND THE SYSTEM IS READY FOR ITS NEXT DAY START UP SEQUENCE.

#### V. RUNNING IN THE MANUAL MODE

##### A. CLAMP FUNCTION:

1. TURN THE HAND/OFF/AUTO SELECTOR SWITCH TO THE HAND POSITION, SYSTEM HIGH PRESSURE LIGHT IS ON.
  - a. READ SYSTEM PRESSURE AT THE PUMP GAUGE.
2. MAKE SURE THE FOLLOWING LIMIT SWITCHES ARE ACTUATED THE CLAMP OPEN LIMIT SWITCH (LS-3), THE TABLE LEFT OR RIGHT LIMIT SWITCH (LS-4) AND THE CARRIAGE FULLY RETRACTED LIMIT SWITCH (LS-12).
3. DEPRESS THE CLAMP CLOSE AND CLAMP JOG PUSHBUTTONS SIMULTANEOUSLY. THIS WILL ENERGIZE THE CLAMP CLOSE SOLENOID AT LOW PRESSURE (SOL-6HB) UNTIL THE CLAMP CLOSED LIMIT SWITCH (LS-3) IS MADE. RELEASE BOTH PUSHBUTTONS DE-ENERGIZING CLAMP CLOSE (SOL-6HB) AND ENERGIZING THE CAMS SOLENOID (SOL-11H). WHEN THE CAMS ARE ENERGIZED THE CAM LIMIT SWITCHES (LS-6 & 7) ARE NO LONGER ACTUATED. THE CLAMP HIGH PRESSURE LIGHT WILL COME ON AT THIS TIME.
4. NOW WE CAN DE-ENERGIZE THE CLAMP CLOSE FUNCTION BY DE-PRESSING THE CLAMP OPEN PUSHBUTTONS UNTIL THE
  - a. THIS DOES JUST THE REVERSE ORDER OF THE CLAMP CLOSE.





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1. CLAMP HIGH PRESSURE SOLENOID AND LIGHT DE-ENERGIZE.
2. CAMS SOLENOID DE-ENERGIZE CAUSING THE CAMS TO RETRACT, ACTUATING THE CAMS LIMIT SWITCHES (LS-6 & 7).
3. THEN THE CLAMP OPEN SOLENOID ENERGIZES RETRACTING THE CLAMP CYLINDER UNTIL THE CLAMP OPEN LIMIT SWITCH (LS-3) IS MADE WHICH DE-ENERGIZES THE CLAMP OPEN SOLENOID.

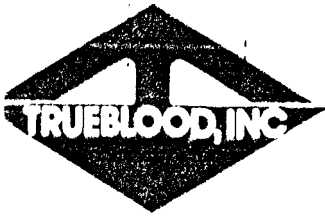
**B. KNOCKOUT HOLD FUNCTION:**

1. FIRST TURN THE HAND/OFF/SELECTOR SWITCH TO THE HAND POSITION, THE SYSTEM HIGH PRESSURE LIGHT COMES ON.
2. THE TABLE LEFT OR RIGHT LIMIT SWITCH (LS-4) MUST BE ACTUATED.
3. TURN THE HOLD/OFF/FULL SELECTOR SWITCH TO THE HOLD POSITION. PUSH THE TRANSFER PUSHBUTTON, THIS TRANSFERS THE TABLE LEFT OR RIGHT UNTIL THE TABLE STOPS, ACTUATING THE TABLE RIGHT OR LEFT (LS-4).
4. WHEN THE TABLE IS FULLY LEFT OR RIGHT, THE PINS UP SOLENOID (SOL-3HA) IS ENERGIZED EXTENDING THE KNOCKOUT PINS.
5. WHEN THE KNOCKOUT CYLINDER IS EXTENDED TO THE ADJUSTING ACTUATOR, THE PINS UP LIMIT SWITCH (LS-1 OR LS-2) IS ACTUATED. THIS DE-ENERGIZES THE PINS UP SOLENOID (SOL-3HA).
6. WHEN THE PINS DOWN PUSHBUTTON IS DEPRESSED IT ENERGIZES THE PINS DOWN SOLENOID (SOL-3HB) RETRACTING THE KNOCKOUT PINS. THE CORRESPONDING LIMIT SWITCH (LS-1 OR LS-2) IS ACTUATED AND DE-ENERGIZES THE PINS DOWN SOLENOID (SOL-3HB).

**C. KNOCKOUT FULL FUNCTION:**

1. FIRST TURN THE HAND/OFF/AUTO SELECTOR SWITCH TO THE HAND POSITION THE SYSTEM HIGH PRESSURE LIGHT COMES ON.
2. THE TABLE LEFT OR RIGHT LIMIT SWITCHES (LS-4) MUST BE ACTUATED.
3. TURN THE HOLD/OFF/FULL SELECTOR SWITCH TO THE HOLD POSITION. PUSH THE TRANSFER PUSHBUTTON, THIS TRANSFERS THE TABLE LEFT OR RIGHT UNTIL THE TABLE STOPS ACTUATING THE TABLE RIGHT OR LEFT (LS-4).
4. WHEN THE TABLE IS FULLY LEFT OR RIGHT, THE PINS UP SOLENOID (SOL-3HA) IS ENERGIZED EXTENDING THE KNOCKOUT PINS.





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5. WHEN THE KNOCKOUT CYLINDER IS EXTENDED TO THE ADJUSTING ACTUATOR, THE PINS UP LIMIT SWITCH (LS-1 OR LS-2) IS ACTUATED. THIS DE-ENERGIZES THE PINS UP SOLENOID (SOL-3HA).
6. WHEN THE PINS DOWN PUSHBUTTON IS DEPRESSED IT ENERGIZES THE PINS DOWN SOLENOID (SOL-3HB) RETRACTING THE KNOCKOUT PINS. THE CORRESPONDING LIMIT SWITCH (LS-1 OR LS-2) IS ACTUATED AND DE-ENERGIZES THE PINS DOWN SOLENOID (SOL-3HB).

#### D. TABLE FUNCTION:

1. TURN THE HAND/OFF/AUTO SELECTOR SWITCH TO THE HAND POSITION. SYSTEM HIGH PRESSURE LIGHT IS ON.
2. CHECK THE FOLLOWING LIMIT SWITCHES FOR PROPER MACHINE FUNCTION:
  - a. PINS DOWN (LS-1 OR LS-2).
  - b. CLAMP OPEN (LS-3).
  - c. TABLE LEFT OR RIGHT (LS-4).
  - d. CARRIAGE BACK (LS-12).
3. THEN DEPRESS THE TABLE TRANSFER PUSHBUTTONS. THIS ENERGIZES THE TABLE LEFT OR RIGHT SOLENOID (SOL-1HB OR SOL-1HA) MOVING THE TABLE TO THE OPPOSITE END.
4. WHEN THE TABLE RIGHT OR LEFT LIMIT SWITCH (LS-4) IS ACTUATED, IT DE-ENERGIZES THE TABLE LEFT OR RIGHT SOLENOID (SOL-1HB OR SOL-1HA).
5. TABLE JOG PROCEDURE:
  - a. DEPRESS THE TABLE JOG AND TRANSFER PUSHBUTTONS SIMULTANEOUSLY. THIS WILL FUNCTION AS PREVIOUSLY EXPLAINED ONLY WITH A SLOWER RESPONSE.
  - b. THE TABLE CAN BE STOPPED IN ANY POSITION BY RELEASING THE TRANSFER PUSHBUTTON.

#### E. CARRIAGE FUNCTION:

1. TURN THE HAND/OFF/AUTO SELECTOR SWITCH TO THE HAND POSITION. SYSTEM HIGH PRESSURE LIGHT IS ON.
2. TURN THE SUCKBACK SELECTOR SWITCH TO THE ON POSITION.
3. NOW ADJUST THE SCREW STROKE LIMIT SWITCH (LS-8) FOR THE PROPER SHOT SIZE REQUIRED. OPEN THE HOPPER SHUT OFF TO ALLOW THE MATERIAL TO ENTER THE BARREL.
4. TURN THE SCREW SELECTOR SWITCH TO THE ON POSITION. THIS ENERGIZES THE SCREW SOLENOID (SOL-9HB) ALLOWING THE SCREW TO ROTATE PACKING THE BARREL UNTIL THE SCREW STROKE LIMIT SWITCH (LS-8) IS ACTUATED. WHEN THE SWITCH IS ACTUATED IT DE-ENERGIZES THE SCREW SOLENOID (SOL-9HB) AND ENERGIZES THE SUCKBACK SOLENOID (SOL-13H) FOR A PROGRAMMED LENGTH OF TIME. WHEN THE TIMER TIMES OUT, IT DE-ENERGIZES THE SUCKBACK SOLENOID (SOL-13H).



\*



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5. DEPRESS THE INJECT PUSHBUTTON.
  - \*a. THE CARRIAGE SOLENOID (SOL-10H) ENERGIZES MOVING THE CARRIAGE FORWARD UNTIL CARRIAGE FORWARD LIMIT SWITCH (LS-9) IS ACTUATED.
  - b. THE INJECT SOLENOID (SOL-9HA) ENERGIZES. THIS CLOSES THE DIE SET INJECTING MATERIAL OUT OF THE BARREL. RELEASE THE INJECT PUSHBUTTON.
  - \*c. CARRIAGE SOLENOID (SOL-10HA) DE-ENERGIZES.
  - d. INJECT SOLENOID (SOL-9HA) DE-ENERGIZES.
  - \*e. THE CARRIAGE RETRACTS DE-ACTUATING THE CARRIAGE FORWARD LIMIT SWITCH (LS-9) AND ACTUATES THE CARRIAGE BACK LIMIT SWITCH (LS-12).

\* TO BE USED ONLY IF CARRIAGE SELECTOR SWITCH IS ON.



\*

## TROUBLE SHOOTING GUIDE TRUEBLOOD MOLDING MACHINE

0. MACHINE STARTS BUT DOES NOT OPERATE:
  - A. CHECK FOR "CPU" FAULT, RED INDICATOR ON FRONT OF UNIT. IF FAULT REFER TO SLC-100 TROUBLE SHOOTING GUIDE.
  
1. MACHINE WILL NOT START:
  - A. CHECK SWITCH IN CABINET TO BE SURE IT IS ON.
  - B. CHECK MAIN POWER FUSES.
  - C. CHECK SMALL TRANSFORMER.
  - D. CHECK 110 V. CIRCUIT FUSES.
  - E. CHECK "PUSH-PULL START-STOP" SWITCH.
  - F. SELECTOR SWITCH MARKED HAND/OFF/AUTO MUST BE IN OFF POSITION.
  - G. CHECK MOTOR LEADS.
  - H. CHECK MOTOR.
  - I. OVERLOAD HEATERS HAVE KICKED OUT. PUSH RE-SET BUTTON LOCATED ON MOTOR STARTER. USUALLY CAUSED BY BEING IN HAND POSITION TOO LONG.
  - J. CHECK LIMIT SWITCHES ON ALL SAFETY GUARDS.
  - K. CHECK WATER PRESSURE SWITCH, IF WATER IS OFF, MACHINE WILL NOT START.
  
2. NO HIGH PRESSURE - IN "HAND" POSITION:
  - A. SELECTOR SWITCH HAND/OFF/AUTO MUST BE IN HAND POSITION.
  - B. CHECK OUTPUT FUSE - 216.
  - C. CHECK ON HIGH PRESSURE VALVE.
  - D. IF VALVE IS GETTING HIGH POWER, THEN SPOOL IN VALVE IS STUCK.
  - E. IF MACHINE IS BEING STARTED FOR THE FIRST TIME, CHECK DIRECTION OF MOTOR ROTATION.
  
3. NO LINE PRESSURE - IN "AUTO" POSITION:
  - A. MUST PUSH BOTH CYCLE START BUTTONS SIMULTANEOUSLY. DOES NOT COME ON CHECK CYCLE START BUTTONS.
  - B. CHECK LIMIT SWITCHES ON K.O. PINS, CLAMP, AND CARRIAGE.
  - C. CHECK SELECTOR SWITCH HAND/OFF/AUTO MUST BE IN AUTO POSITION.
  - D. CHECK COIL ON HIGH PRESSURE VALVE.
  - E. CHECK SPOOL IN HIGH PRESSURE VALVE.
  - F. IF MACHINE IS BEING STARTED FOR THE FIRST TIME, CHECK THE DIRECTION OF THE MOTOR ROTATION.
  - G. VENT VALVE ON PUMP NEEDS ADJUSTED.
  - H. CHECK CIRCUIT FOR POWER SUPPLY TO VENT VALVE COIL.
  - I. CHECK FOR CPU FAULT.
  
4. KNOCKOUT PINS WILL NOT OPERATE:
  - A. THE SELECTOR SWITCH HOLD/OFF/FULL MUST BE IN THE HOLD OR FULL POSITION.
  - B. CHECK THE PINS LIMIT SWITCHES.
  - C. CHECK DIRECTIONAL VALVE FOR BAD COIL.
  - D. CHECK DIRECTIONAL VALVE FOR STUCK POPPET.
  - E. CHECK PILOT CHECK FOR STUCK POPPET.
  - F. CHECK SELECTOR SWITCH HAND/OFF/AUTO.

1  
KNOCKOUT PINS WILL NOT OPERATE: (Cont'd)

- G. CHECK FLOW CONTROL.
- H. CHECK SOLENOIDS.
- I. CHECK OUTPUT FUSES.
- J. CHECK ELECTRICAL PROGRAM.

5. TABLE WILL NOT TRANSFER:

A. "AUTO" POSITION

1. CHECK CYCLE START BUTTONS.
2. CHECK OUTPUT FUSES TABLE LEFT 011 AND TABLE RIGHT 012.
3. CHECK HYDRAULIC TABLE CYLINDER FOR BROKEN ROD OR CUSHIONS TO TIGHT.
4. CHECK LIMIT SWITCHES.

B. "MANUAL" POSITION

1. CHECK BUTTON MARKED CYCLE START FOR LOOSE CONNECTION.
2. CHECK OUTPUT FUSES 011 AND 012.
3. CHECK DIRECTIONAL VALVE FOR BAD COIL.
4. CHECK DIRECTIONAL VALVE FOR STUCK SPOOL.
5. CHECK NEEDLE VALVE FOR TABLE SPEED CONTROL TO BE SURE IT IS OPEN.
6. CHECK TRANSFER SWITCH.
7. CHECK LIMIT SWITCHES.
8. CHECK OUTPUT FUSES.

C. "TABLE JOG"

1. TABLE JOG SOLENOID.
2. CHECK FLOW CONTROL VALVE.
3. CHECK TABLE JOG SWITCH.
4. CHECK TABLE JOG FUSE 013.

6. CLAMPING HEAD WILL NOT OPERATE:

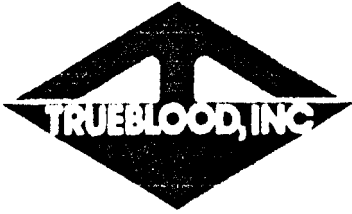
A. CLAMP SHOULD GO UP WHEN MACHINE IS PUT IN "HAND" POSITION. IF IT DOES NOT:

1. CLAMP JOG SWITCH IS ON.
2. CHECK DIRECTIONAL VALVE TO SEE THAT IT IS GETTING SIGNAL FOR THE CLAMP TO OPEN. IF CLAMP IS GETTING SIGNAL CHECK TO SEE IF
  - a. SPOOL IS STUCK
  - b. CHECK COIL IN DIRECTIONAL VALVE.
  - c. CHECK PRESSURE REDUCING VALVE.
  - d. CHECK NEEDLE VALVE ON CLAMP TO SEE IF IT IS SHUT OFF.
  - e. CLAMP HIGH PRESSURE VALVE.
  - f. CHECK IN LINE CHECK VALVES.
  - g. CHECK CLAMP OPEN AND CLOSE SWITCHES.
  - h. CHECK THE HAND/OFF/AUTO SWITCH.

7. CARRIAGE INJECTION DOES NOT OPERATE:

A. IF CARRIAGE DOES NOT MOVE FORWARD, CHECK THE INJECTION TIMER FOR PROPER OPERATION AND SETTING.

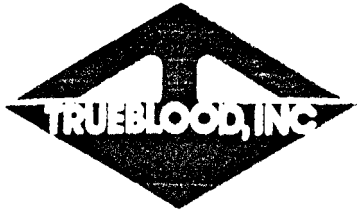
- B. CHECK DIRECTIONAL VALVE.
- C. CHECK DIRECTIONAL VALVE FOR STUCK SPOOL.
- D. CHECK LIMIT SWITCHES.
- E. CHECK PILOT CHECK VALVE.
- F. CHECK INJECTION BUTTON.
- G. CHECK INJECTION FUSES.
- H. CHECK HAND/OFF/AUTO SWITCH.
- I. CHECK INJECTION PRESSURE SETTING.
- J. CARRIAGE BLOCK OPERATING TOO HOT-INCREASE WATER SUPPLY TO COOL.
- K. LINE PRESSURE SET TOO LOW-800 P.S.I.
- L. FOUR-WAY VALVE STICKING OR SOLENOID BURNED OUT.
- M. AUTO: CARRIAGE OFF-ON SWITCH MUST BE ON, IN ORDER FOR MACHINE TO INJECT MATERIAL.
- N. CARRIAGE DOES NOT MOVE FORWARD CHECK FUSE 011



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8. SIDE CAMS
  - A. CHECK DIRECTIONAL VALVE FOR BADCOIL.
  - B. CHECK DIRECTIONAL VALVE FOR STUCK SPOOL.
  - C. CHECK PILOT CHECK VALVE FOR STUCK POPPET.
  - D. CHECK HIGH PRESSURE LINES.
  - E. CHECK FUSE 212.
  - F. CHECK PROGRAM.
  - G. CHECK "hand-off-auto" SWITCH.
9. SHUT-OFF NOZZLE:
  - A. CHECK DIRECTIONAL VALVE FOR BAD COIL.
  - B. CHECK DIRECTIONAL VALVE FOR STUCK SPOOL.
  - C. CHECK PILOT CHECK VALVE FOR STUCK POPPET.
  - D. CHECK LIMIT SWITCH LS-9.
  - E. CHECK TIMERS (OVERALL CYCLE AND INJECTION CYCLE).
  - F. CHECK "injection" SWITCH.
  - G. CHECK FUSE 213.
  - H. CHECK SWITCH MARKED "hand-off-auto".
  - I. CHECK FLOW CONTROL VALVE.
  - J. SHUT-OFF NOZZLE OFF-ON SWITCH MUST BE IN THE OFF POSITION FOR PROPER OPERATION. ON POSITION NOZZLE OPENS AND STAYS OPEN.
10. SCREW RETURN:
  - A. SWITCH MARKED "screw return" MUST BE IN "on" POSITION.
  - B. CHECK FLOW CONTROL VALVE.
  - C. CHECK DIRECTIONAL VALVE FOR BAD COIL.
  - D. CHECK DIRECTIONAL VALVE FOR STUCK SPOOL.
  - E. CHECK LS-11 AND LS-8.
  - F. CHECK "injection" SWITCH.
  - G. CHECK TIMERS (OVERALL CYCLE AND INJECTION CYCLE).
  - H. CHECK FUSE 116.
  - I. CHECK SWITCH MARKED "hand-off-auto".
  - J. CHECK HEATERS FOR PROPER HEAT.
  - K. CHECK DRIVE GEAR BOX.
  - L. CHECK SCREW MOTOR.
  - M. CHECK INSIDE PLASTIC CYLINDER FOR FOREIGN MATERIALS.
  - N. HOPPER SLIDE MUST BE OPEN.
  - O. SOME MATERIALS WILL STICK IN CARRIAGE BLOCK IF BLOCK IS NOT COOLED PROPERLY:
11. HORIZONTAL OR SIDE KNOCKOUT PINS WILL NOT OPERATE: (OPTION)
  - A. CHECK COIL IN DIRECTIONAL VALVE.
  - B. CHECK NEEDLE VALVE ON CYLINDERS.





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- C. CHECK LIMIT SWITCHES LS-1A, LS-2A, AND LS-4.
  - D. CHECK DIRECTIONAL VALVE FOR STUCK SPOOL.
  - E. CHECK SOLENOID ON K.O. PIN CYLINDERS.
  - F. CHECK ELECTRICAL CIRCUIT.
  - G. CHECK SELECTOR SWITCH MARKED "K.O.pins-off-on".
  - H. CHECK LEFT AND RIGHT SIDE EJECTOR PUSH BUTTONS.
  - I. CHECK LIMIT SWITCHES LS-13 AND LS-13-A.
  - J. CHECK FUSE.
12. PLASTIC CYLINDER MAINTENANCE:
- A. IF A HEAT CONTROLLER ON THE PLASTIC CYLINDER DOES NOT SHUT-OFF AND HEAT DOES NOT ATTAIN THE DESIRED TEMPERATURE, CHECK ALL HEATERS FOR BURNOUTS AND THE INCOMING VOLTAGE AT THE HEATERS. LOW VOLTAGE SACRIFICES VALUABLE WATTAGE.
  - B. IF A HEAT CONTROLLER DOES NOT SHUT-OFF AND HEAT OVERRIDES DESIRED TEMPERATURE, HAVE A REPRESENTATIVE FROM THE MANUFACTURER ADJUST THE INSTRUMENT.
  - C. MAKE SURE THAT ALL THERMOCOUPLES ARE CONTROLLING THE CORRECT HEATING ZONE AND HAVE NOT BEEN SWITCHED, AND ARE MAKING POINT CONTACT.
  - D. BE CERTAIN THAT ALL PLUGS FOR THE HEATERS ARE IN THE CORRECT RECEPTACLE, AND PROPER VOLTAGE SUPPLY IS AVAILABLE.
  - E. MAKE SURE THAT THE CYLINDER TEMPERATURE IS ADEQUATE FOR MELTING A GIVEN PLATIC BEFORE TRYING TO PUSH THE MATERIAL THROUGH THE CYLINDER. WHEN FIRST STARTING - UP A MACHINE, ALLOW APPROXIMATELY 20 MINUTES FOR WARM-UP TIME, BEFORE PURGING MACHINE, OR MOLDING OPERATION.
  - F. IF THE HYDRAULIC OPERATED SHUT-OFF NOZZLE DOES NOT OPERATE, MAKE CERTAIN LIMIT SWITCH LS-9 IS BEING ACTUATED, OIL SUPPLY IS ADEQUATE, AND HYDRAULIC VALVE IS FUNCTIONING PROPERLY, OR SOLENOID IS NOT BURNED-OUT.



# PREVENTIVE MAINTENANCE CHECK LIST

## LUBRICATION.

Reservoir and grease lines should be checked weekly. Check greasing unit for adequate amount of grease. High temperature grease recommended. In reference to Operations Manual, check all grease lines for leaks, breaks in lines, or leaks around fittings.

## HYDRAULIC OIL LEVEL.

Check hydraulic oil level monthly. (Located on right side of machine): Maintain not below  $\frac{2}{3}$  of gage level.

## HYDRAULIC OIL TEMPERATURE.

Check oil temperature daily. Should not read over 125°. If oil temperature exceeds limit, check water supply and oil cooler for stoppage. Remove end caps from oil cooler to check.

## WATER TEMPERATURE GAGE.

Check water temperature at gage daily. (Located on carriage block below hopper). Temperature should not exceed 150°.

## CYLINDERS.

Check all hydraulic cylinders weekly for leaks at fittings and around rod area. Check cylinder rods for scratches. If leaks occur around rod area, this may be corrected by installing new rod seal kits located inside the cylinder. When ordering rod seal kits, state model and serial number of cylinder. Also state make of cylinder if obtainable. If ordering from Trueblood, also state serial number of machine. Below is a list of cylinders that should be checked:

- a. **Table Cylinder.** Located behind front plate at shuttle table.
- b. **Locking Cam Cylinders.** Located on each side of clamp head area—outside of frame.
- c. **Injection Cylinder.** Located on injection unit on each side of die set assembly at rear of carriage.
- d. **Carriage Cylinder.** Located on base of machine at rear of injection assembly.
- e. **Nozzle Shut-off Cylinder.** Located at right side of shut-off nozzle.
- f. **Clamp Cylinder.** Located on top plate of clamp area. Remove front clamp guard to check cylinder rod.

## VALVE LEAKS.

Check all hydraulic valves weekly. Located throughout machine.

## DIRECTIONAL VALVE INDICATING LIGHTS.

Check directional valve indicating lights monthly for damage and activation when specific valve is in operation. Located on left side of machine.

**PREVENTATIVE MAINTENANCE CHECK LIST**  
**PAGE 2.**

**GAGES.**

Check all gages bi-weekly for damage and proper operation. They include: oil level gage, water temperature gage, injection pressure gage, and three glycerine-filled gages. Also, check gage isolator buttons for proper operation if there is not reading on injection gage or high pressure gage.

**HEATER BANDS AND THERMOCOUPLES.**

Check heater bands weekly with temperature probe AMP meter. Check thermocouples by continuity check.

**SCREW DRIVE GEAR BOX.**

Check screw drive gear box for correct grease supply. This should be checked quarterly. Shut machine off and check grease supply by removing filler cap screw on top of gear box. Grease supply should be within  $\frac{3}{4}$ " from top.

**SCREW TIP ASSEMBLY.**

Check screw tip assembly every six months by removing injection screw and removing screw tip from screw. Check for wear on angles of screw tip. Check wear on angles of bushing. Check O.D. of bushing.

**INJECTION SCREW.**

Check the injection screw every six months by removing the screw per Operation Manual Instructions. Visually check the screw for damage. Precision check O.D. of screw.

**INJECTION BARREL.**

Check the injection screw every six months by removing the injection screw per Operation Manual Instructions. Clean I.D. of barrel with wire brush.

**OIL CHANGE.**

Change the hydraulic oil yearly with recommended oil stated in Trueblood Operations Manual.

**ALIGNMENT OF TOOLING MOLDS AND MOLD SHOES.**

The alignment should be checked at time of setting up molds. Alignment can be checked daily by visually checking guide pins in mold shoes.

**LUBRICATION SUPPLY TO ALL WORKING SURFACES.**

Check all working surfaces weekly for adequate supply of grease. Working surfaces include the shuttle table plate, injection carriage guide rails, bronze bearings (located in die set turning injection screw), clamp head, and side locking cams.

**VISUAL INSPECTION OF WORKING SURFACES.**

Visual inspection of all working surfaces weekly should be made in addition to the lubrication supply areas for wear, such as scarred marks or metal particles.

**PREVENTATIVE MAINTENANCE CHECK LIST**  
**PAGE 3.**

**CLAMP HEAD AREA.**

Check cylinder rod to clamp head to assure tightness. Check tolerances between clamp head Guide Blocks, Detail #6-11, and Guide Plates, Detail #6-16, for wear. This is to be done visually and with feeler type gage. Tolerance should be approximately .005.

Check Detail #6-12 visually for wear.

Check Detail #6-17 for wear.

Check Side Locking Cams, Detail #6-12, when mold is closed for location against head inserts, Detail #6-17. Cams should be positioned approximately  $\frac{5}{8}$ " both sides.

**LIMIT SWITCHES AND ACTUATORS.**

If machine is operating normally, switches and actuators should be in condition. They should be checked monthly for loose screws or damage to above.

**OIL FILTER.**

The oil filter should be checked monthly.

**TRUEBLOOD SHUTTLE MODEL "A" PREVENTATIVE MAINTENANCE CHECK LIST**

	DAILY	WEEKLY	BI-WEEKLY	MONTHLY	QUARTERLY	6-MONTHS	YEARLY
1. LUBRICATION RESERVOIR & LINES.		X					
2. HYDRAULIC OIL LEVEL.				X			
3. HYDRAULIC OIL TEMPERATURE.	X						
4. WATER TEMPERATURE AT CARRIAGE.	X						
5. CYLINDERS FOR LEAKS.		X					
6. VALVE LEAKS.		X					
7. DIRECTIONAL INDICATING LIGHTS.				X			
8. GAGES.			X				
9. HEATER BANDS AND THERMOCOUPLES.		X					
10. LUBRICATION SUPPLY TO ALL WORKING SURFACES.		X					
11. VISUAL INSPECTION OF WORKING SURFACES.		X					
12. L.S. ACTUATORS FOR WORKING CONDITION.				X			
13. SCREW DRIVE GEAR BOX GREASE LEVEL.					X		
14. SCREW TIP ASSEMBLY.						X	X
15. INJECTION SCREW.						X	X
16. I.D. OF INJECTION BARREL.						X	X
17. OIL CHANGE.							X
18. ALIGNMENT OF TOOLING.	(To be checked at time of changeover)						

## Overall Recommendations

PM Check list should reduce future down time of machinery.

Listed procedures should be an asset to maintaining equipment and reducing overall cost of maintenance and parts.

Maintaining clean machinery will assist in recognizing hydraulic leaks and possible damaged components.

Most recommended spare parts are available at Trueblood, Inc., however, due to deletion of stock items at times by large orders may require customer to order in advance to reduce down time of equipment and production.

## Recommended Mechanical Spare Parts

- A. Shut-off Nozzle Cap Assembly, with Nozzle Tip.
- B. Injection Screw.
- C. Injection Barrel.
- D. Screw Motor.
- E. Screw Drive Gear Box.
- F. Injection Screw Tip Assembly.
- G. Clamp Head Locking Inserts, (2) each.
- H. Side Locking Cams, (2) each.
- I. Side Locking Cam Blocks, (2) each.
- J. Rear Thrust Bearing (Bronze), (1) each.
- K. Front Bearing (Bronze), (1) each.

**NOTE:**

Above part sizes depend upon model of the machine. Please state model and serial number of machine when ordering parts.

# Recommended Spare Parts Electrical and Hydraulic Only

- A. LIMIT SWITCHES (6)** Will replace any limit switch on press.
  - 1. #1-802T-NP
  - 2. #1-802T-A
  - 3. #1-802T-CP
  - 4. #1-BZV6-2RQ8
  - 5. #1-BZE6-2RQ8
  - 6. #1-802T-NPTP
- B. SETS OF ROD SEALS (4)** Assorted sizes.  
Will replace all cylinders (used for leaks around cylinder rods).
- C. CONTACT BLOCKS (4)** Will replace contacts on all pushbuttons.
  - 1. Two N.O. Contacts #BJK
  - 2. Two N.C. Contacts #BJJ
- D. COILS FOR DIRECTIONAL VALVES (2)** Will fit any directional valve.
- E. SMALL INDICATING LIGHTS (4)** For relays and directional valves.
  - 1. Two Amber
  - 2. Two Red
- F. INSTRUMENTS FOR HEATERS (1)** West or Barber-Colman.
- G. 60-SECOND TIMER (1)** For injection and overall timers.
- H. COIL FOR FLUID POWER VALVES (1)** Clamp high pressure and table jog.
- I. RELAYS (2)** Will replace any relay in main panel.
  - 1. One 8-Pole
  - 2. One 4-Pole
- J. PULL-PUSH SWITCH (1)** For stop or start (#51JAPRJU).
- K. U.S. GAUGE 2½" (1)** Pressure reducing valves.
- L. THERMOCOUPLE (1)** For heaters.
- M. POPPET & SPRING FOR CHECK VALVES (2)** For pilot check valves.
- N. SETS OF "O" RINGS** For directional valve (leaks).
  - 1. One set for Small Valves.
  - 2. One set for Large Valves.
- O. HEATER BAND (1)**
  - 1. Size depends on model of machine.
  - 2. Need 2 bands if machine has replaceable tip.
  - 3. Watts depends on size of machine.
  - 4. Voltage-230 Volts for all machines.
- P. DIRECTIONAL VALVES (4)**

1. Injection .....	(Trueblood Model #1)—#DG-5S4-0066C-50
2. Side Cams .....	(Trueblood Model #2)
Carriage .....	(Trueblood Model #3)
Nozzle .....	(Trueblood Model #6)—#DG-4S4-012A-50
3. Clamp .....	(Trueblood Model #7)—#DG-4S4-012C-50
4. Table .....	(Trueblood Model #4)
K.O. Pins .....	(Trueblood Model #5)—#DG-4S4-0133C-50
- Q. SCREW TIP ASSEMBLY (1)**
  - 1. Size depends upon diameter of screw.
- R. WRENCH KIT (1)** For screw disassembly and other fittings on machine.

# SLC-100 MAINTENANCE AND TROUBLESHOOTING GUIDE

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## **General**

The SLC 100 has been designed to simplify maintenance and troubleshooting procedures. By observing the diagnostic indicators on the front of the processor unit, the majority of faults can be located and corrected. These indicators, along with error codes displayed on the programmer, help trace the source of the fault to the user's input/output devices, wiring or the controller.

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## **Safety Considerations**

**Safety considerations are an important element of proper troubleshooting procedures. Actively thinking about the safety of yourself and others, as well as the condition of your equipment, is of primary importance. Several safety areas are discussed below.**

**Power Supplies:** Before working on a power supply, always remove the AC power source at the main power disconnect switch. When using more than one power supply, be sure to disconnect all of them.

**Replacing Fuses:** When replacing a fuse, be sure to remove all power from the system.

**Main Power Disconnect:** The main power disconnect switch should be located where operators and maintenance personnel have quick and easy access to it. Ideally, the disconnect switch is mounted on the outside of the enclosure, so that it can be accessed without opening the enclosure. In addition to disconnecting electrical power, all other sources of power (pneumatic and hydraulic) should be de-energized before working on an SLC 100 controlled machine or process.

**Activating Devices When Troubleshooting:** When troubleshooting, never reach into the machine to actuate a device. Unexpected machine motion could occur. Use a wooden stick. A metal rod is more likely to damage the machine and could conduct electricity back to you.

**Stand Clear of Machine:** When troubleshooting any controller problem, have all personnel remain clear of the machine. The problem could be intermittent, and sudden unexpected machine motion could occur. Have someone ready to operate an emergency stop switch in case it becomes necessary to shut off power to the machine.

**Program Alteration:** There are several causes of alteration to the user program, including extreme environmental conditions, Electromagnetic Interference (EMI), improper grounding, improper wiring connections, and unauthorized tampering. If you suspect the memory has been altered, check the program against an approved version such as on an EEPROM memory module.

**Hardware Redundancy:** Circuits installed on the machine for safety reasons, like overtravel limit switches, stop push buttons, and interlocks, should always be hard-wired directly to the master control relay. These devices must be wired in series so that when any one device opens, the master control relay is de-energized thereby removing power to the machine. Never alter these circuits to defeat their function. Serious injury or machine damage could result.

## Safety Considerations

(continued)

**Power Distribution:** There are some points about power distribution that you should be aware of. First, the master control relay must be able to inhibit all machine motion by removing power to the machine I/O devices when the relay is de-energized.

Second, if you are using a DC power supply, interrupt the load side rather than the AC line power. This avoids the additional delay of power supply turn-on and turn-off. The DC power supply should be powered directly from the fused secondary of the transformer. Power to the DC input and output circuits is connected through a set of master control relay contacts.

**Periodic Tests of Master Control Relay Circuits:** Any part can fail, including the switches in a master control relay circuit. The failure of one of these switches would most likely cause an open circuit which would be a safe power-off failure. However, if one of these switches shorts out, it no longer provides any safety protection. These switches should be tested periodically to assure they will stop machine motion when needed.

## Preventive Maintenance

The printed circuit boards of the controller must be protected from dirt, oil, moisture and other airborne contaminants. In order to protect these boards, the controller must be installed in an enclosure suitable for the environment. The interior of the enclosure should be kept clean and the enclosure door should be kept closed whenever possible.

Regularly inspect your terminal connections for tightness. Loose connections may cause improper functioning of the controller or damage the components of the system.

**WARNING:** To ensure personal safety and guard against damaging the equipment, inspect connections with incoming power OFF.

The National Fire Protection Association (NFPA) gives recommendations for electrical equipment maintenance. Refer to article 70B of the NFPA for general requirements regarding safety related work practices.

## Spare Parts

Stock a full set of spare parts to minimize down-time. We recommend that at least 10% (minimum of 1) of each SLC 100 component be stocked as spare parts. Recommended spare parts are listed below.

SPARE PARTS	CATALOG NUMBER
PROCESSOR UNIT	1742-LP101-LP102-LP103-LP104
EXPANSION UNIT	1745-F101-F102-F103-F104-F105
AC-POWER SUPPLY FUSES (5/package)	1745-F1
DC-POWER SUPPLY FUSES (5/package)	1745-F2
REPLACEMENT BATTERY (5/5) RAM MEMORY	1745-B1
REPLACEMENT RELAY BOARD PROCESSOR UNIT	1745-R1
REPLACEMENT RELAY BOARD BASIC EXPANSION UNIT	1745-R2
REPLACEMENT RELAY BOARD	1745-R3

## Troubleshooting

If installation and start-up procedures detailed in Chapters 18, 19, and 20 were followed closely, your SLC 100 will give you reliable service.

If a problem should occur, the first step in the troubleshooting procedure is to identify the problem and its source. Do this by observing your machine or process and by monitoring the diagnostic indicators on the controller. By doing this, the source of a problem can generally be narrowed down to the processor/expansion unit, wiring, or the input/output devices.

### Processor and Expansion Units

If a problem should occur within the processor/expansion unit, we recommend that you start troubleshooting the following areas.

**Power Supply:** The power supply is located in the processor/expansion unit. Its purpose is to convert incoming power to the logic level voltage required by the processor/expansion unit, programmer and EEPROM module. The DC POWER green LED indicator on the front of the processor/expansion unit is ON when the proper logic level voltage is at the output of the power supply. If the DC POWER indicator is not illuminated when incoming power is available, the following should be checked to identify the source of the problem:

1. Incoming power wiring and connections
2. Power supply fuse. See Page 214 for replacement procedures
3. Incoming power voltage level. See following paragraph

**Incoming Voltage Monitor:** The power supply monitors the voltage at the incoming power terminals.

SPECIFIED VOLTAGE	ALLOWABLE VOLTAGE RANGE
115 VAC	85-132 VAC
230 VAC	170-265 VAC
24 VDC	18-30 VDC

If the incoming voltage falls outside the allowable voltage range, the PC RUN indicator on the processor unit will extinguish and all outputs will be disabled. Note that the DC POWER indicator might not be extinguished because the voltage could be sufficient for the power supply to provide the necessary logic level voltage.

**Processor Restart Switch:** The restart switch (MAN/AUTO) on the processor can be used in conjunction with the incoming voltage monitor feature to aid in troubleshooting the controller. When the incoming voltage monitor detects abnormal line voltage, it shuts the processor down. The processor restart switch (MAN/AUTO) setting determines what happens when power is restored to acceptable levels. (The processor must have been in the Run mode when the outage occurred.)

If you place the restart switch in the Manual (MAN) position, the processor will not automatically enter the Run mode on power-up. Instead, the processor goes through its normal diagnostic tests, but the outputs remain disabled. To enter the Run mode, you must move the restart

**Processor and  
Expansion Units  
(continued)**

switch to the Automatic (AUTO) position or use the pocket programmer. This feature provides you with the additional safety of manually restarting the controller when you want.

In the AUTO position, upon power-up, the processor goes through its normal diagnostic tests then automatically enters the Run mode. (The processor must have been in the Run mode when power was removed.)

**Power Supply Fuse Replacement:** Under normal power-up conditions, the DC POWER indicator will illuminate. If a power supply fuse is blown, the DC POWER indicator will not illuminate. One of the following conditions could cause a blown power supply fuse:

- Excessive line voltage.
- Internal power supply malfunction.

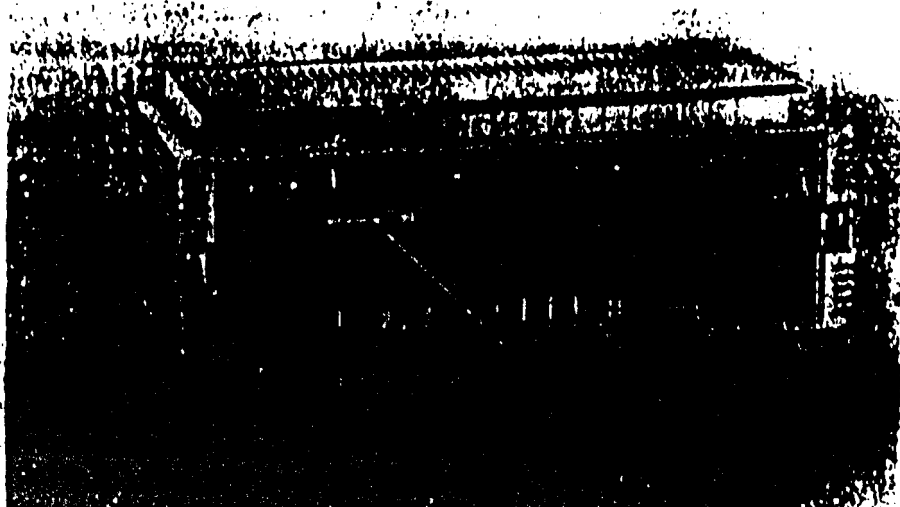
**CAUTION:** Use only replacement fuses of the type and rating specified for the unit. Improper fuse selection may result in equipment damage.

**WARNING:** Contact with AC line potentials may cause injury to personnel. Remove system power before attempting fuse replacement.

After the conditions causing the malfunction have been corrected, the fuse can be replaced. Figure 21.1 shows the location of the fuse. Replacement procedure:

1. Disconnect line power to processor/expansion unit.
2. Remove the EEPROM module if you are replacing the processor unit fuse. Loosen the 2 cover screws. Move the cover aside to expose the fuse. Cover does not have to be removed.
3. Locate the fuse. Use a miniature fuse puller to grip the fuse and remove it from its holder. Discard this fuse and replace it with the recommended replacement fuse.
4. Replace the cover and tighten the screws. Do not over tighten.
6. Restore power. The DC POWER indicator should now be lit.

**Figure 21.1**



**Processor and  
Expansion Units**  
(continued)

**Processor Fault Detection:** The processor continually monitors itself for any problems that might cause the controller to improperly execute the user program. A built-in "watch-dog" timer circuit will time out if a processor hardware malfunction occurs. Errors in memory data are also detected through built-in diagnostic routines.

If a processor hardware malfunction or a memory data error is detected, the processor CPU FAULT indicator will light and outputs are disabled. To clear a processor hardware fault, follow this procedure:

- 1 Toggle the processor restart switch (MAN/AUTO). If this does not clear the fault, then:
- 2 Turn processor power OFF, then ON. If the fault still does not clear:
- 3 Connect the pocket programmer to display the error code. Processor error codes, fault descriptions and remedies are listed in Figure 21.2

Figure 21.2

<i>ERROR CODES, FAULT DESCRIPTIONS, AND REMEDIES</i>		
<i>error code</i>	<i>DESCRIPTION</i>	<i>REMEDY</i> <i>NOTE: FIST TO TEXT ABOVE</i>
01	Processor hardware problem: malfunction has caused "watch-dog" timer to time-out.	Contact your local A-B representative for repair or replacement.
02	Processor hardware problem: unable to write in RAM.	Contact your local A-B representative for repair or replacement.
03	Processor hardware problem: internal communication error.	Contact your local A-B representative for repair or replacement.
04	Processor hardware problem: unable to write in RAM.	Contact your local A-B representative for repair or replacement.
05	Processor memory problem: incorrect checksum in user program.	Correct user program or delete program and re-enter.
06	Processor memory problem: parity error in user program op-code.	Correct user program or delete program and re-enter.
07	Processor memory problem: preset or accumulated values out of range of user program.	Correct user program or delete program and re-enter.
08	Processor memory problem: incorrect checksum in I/O table.	Correct user program or delete program and re-enter.
09	Processor scan time exceeds 100ms.	Reduce size of user program.

**Processor and  
Expansion Units  
(continued)**

Processor Fault Detection (continued): For your convenience, a processor diagnostic guide is shown in Figure 21.3.

Figure 21.3

<b>PROCESSOR DIAGNOSTIC REFERENCE GUIDE</b>				
<b>PROCESSOR STATUS INDICATORS</b>				
<b>DC POWER</b>	<b>PG RUN</b>	<b>CPU FAULT</b>	<b>BATTERY LOW</b>	<b>POSSIBLE SOURCE OF PROBLEM</b>
ON	ON	OFF	OFF	None; normal status indication in Run mode.
ON	OFF	OFF	OFF	None; normal status indication when not in Run mode.
ON	OFF (If controller is in Run mode.)	OFF	OFF	Processor restart switch in MAN position.
OFF	OFF	OFF	OFF	1. Incoming power absent. 2. Incoming power wiring/connection problem. 3. Blown power supply fuse. (To replace fuse, see Page 21-4.) 4. Power supply malfunction.
ON	OFF (If controller is in Run mode.)	ON	OFF	1. Processor hardware fault (error codes 1-4). See Figure 21.2. 2. Processor memory fault (error codes 5-9). See Figure 21.2. 3. Expansion unit problem (error code 26). See Page 21-12. 4. Incoming power below minimum voltage level (see Chapter 17, Specifications).
ON	ON (If controller is in Run mode.)	OFF	ON	Battery needs to be replaced.

**RAM Memory Battery Back-Up:** A lithium battery is housed in a small compartment on the front of the processor unit. This battery provides backup power to the processor RAM when external power is removed. The battery provides backup power for a typical life span of 2-3 years. Actual battery life span may vary depending on controller environmental conditions.

The processor **BATTERY LOW** indicator will be lit when the battery voltage falls below a threshold voltage. Replace the battery at this time.

**Battery Replacement:** You can replace the battery without disconnecting power or disturbing normal operation of the machinery. Use the following procedure to replace the battery (refer to Figure 21.4.):

1. Remove small compartment door on front of processor.
2. Remove battery from compartment. Unplug lead wires from processor.
3. Connect new battery making sure that the slot on the battery lead is correctly aligned with the key of the processor unit's socket. Insert battery into compartment.

**I/O Hardware** When troubleshooting, pay careful attention to these general warnings:

**WARNING:** Have all personnel remain clear of the controller equipment when power is applied. The problem may be intermittent and sudden unexpected machine motion could occur and result in injury. Have someone ready to operate an emergency stop switch in case it becomes necessary to shut off power to the controller equipment. Also see NFPA 70E Part II for additional guidelines for safety related work practices.

**WARNING:** Never reach into a machine to actuate a switch since unexpected machine motion can occur and cause injury. Use a wooden stick. A metal rod could damage the machine and/or conduct current to the person holding it.

**WARNING:** Remove all electrical power at the main power disconnect switches before checking electrical connections or inputs/outputs causing machine motion.

If the controller is operating in the Run mode but output devices do not operate as programmed, most likely the problem is one of the following:

- I/O devices.
- Wiring between I/O devices and user power.
- User power.

Identifying one of the above as a problem can usually be narrowed down by comparing the actual status of the suspect I/O with controller status indicators. This comparison technique is similar to procedures given in Start-Up, Chapter 20.

Each I/O device has two status indicators. One of these indicators is located on the front of the processor/expansion unit and the other is the "ON" LED on the programmer. These two status LEDs indicate the logical (TRUE/FALSE) nature of programmed instructions corresponding to connected I/O devices.

**Testing Outputs:** If an output device does not energize as expected, observe the appropriate status indicator on the processor/expansion unit to see if it is lit.

If the status indicator is lit but the output device does not energize, check wiring connections between the wiring terminals and output device. If wiring connections appear correct, use a test light or voltmeter to check for power at the output wiring terminals. If there is power at the wiring terminals, check your output device.

If there is no power at the wiring terminals, the processor/expansion unit output relay may be faulty. Reconnect the output device to a spare output terminal. If none is available, replace the output relay board.

If the status indicator is not lit, the logical status of the corresponding programmed instruction is FALSE. Connect the pocket programmer and monitor each instruction in the programmed rung and observe the "ON" LED status indicator on the programmer. A continuous path of TRUE condition instructions must exist in order for the status indicator to be lit

**I/O Hardware**  
(continued)

**Step 2. Testing Inputs, (continued).**

**WARNING:** Do not reach into a machine to actuate a switch by hand. Unexpected machine motion could cause injury. Stand clear of the machine and use a wooden stick to operate the switch.

If the input status indicator does not illuminate when the input device is ON, check the following:

- User power to the input device.
- Wiring between input device and user power
- The input device.

**CAUTION:** Remove system power before checking electrical connections or input devices

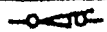





If the input status indicator illuminates, go to step 3

- 3 Using the programmer, place the controller in the Run or Test mode (mode 3, 4 or 5). Compare the programmer's ON status indicator with the actual ON/OFF status of the suspect input device.

If the programmer does not show the correct status indication for the suspect condition instruction, the input circuitry may not be supplying the required logic level voltage. In this case, reconnect the input device to a spare input circuit. If this does not solve the problem, contact your A-B representative for repair or replacement of the processor or expansion unit.

A guide for troubleshooting input devices is shown in Figure 21.6.

Figure 21.6

<b>INPUT DEVICE TROUBLESHOOTING GUIDE</b>				
<b>CONDITION OF INPUT DEVICE</b>	<b>LED INDICATOR</b>	<b>"ON" STATUS INDICATOR PROGRAMMER</b>		<b>SOURCE OF POSSIBLE PROBLEM</b>
 Closed: ON	ON	TRUE <input checked="" type="checkbox"/>	FALSE <input type="checkbox"/>	None; correct status indication.
 Open: OFF	OFF	FALSE <input type="checkbox"/>	TRUE <input checked="" type="checkbox"/>	None; correct status indication.
 Closed: ON	ON	FALSE <input type="checkbox"/>	TRUE <input checked="" type="checkbox"/>	1. Processor/expansion unit input circuitry fault. 2. Processor/programmer communication fault.
 Closed: ON	OFF	FALSE <input type="checkbox"/>	TRUE <input checked="" type="checkbox"/>	1. Wiring/power to processor/expansion unit input circuitry fault. 2. Processor/expansion unit input circuitry fault.
 Open: OFF	OFF	TRUE <input checked="" type="checkbox"/>	FALSE <input type="checkbox"/>	1. Programming error. 2. Processor/programmer communication fault.
 Open: OFF	ON	TRUE <input checked="" type="checkbox"/>	FALSE <input type="checkbox"/>	1. Processor/expansion unit input circuitry fault.