R–CAM 2A Cable Assembly Machine
760700–[ ]

409–5725
10 JAN 96 Rev A

AMP

customer manual

AMP

R–CAM 2A Cable Assembly Machine 760700–[ ]

DANGER

SAFETY PRECAUTIONS PREVENT INJURY

Safeguards are designed into AMP* machines to protect operating personnel from most hazards during normal machine operation. However, as with most machinery, certain precautions must be taken by the operator and repairman.

Never insert hands into an installed machine/applicator, or any part of a machine that is operated by electricity or compressed air, without first pulling the machine power cable plug from the outlet receptacle and/or shutting off the compressed air at the line valve and disconnecting the air hose. This will prevent injury in the event that switches or other controls are accidentally activated.

A grounded electrical outlet should always be used to receive the plug on the machine power cable.

To improve clarity, photographs and drawings may not show machine/applicator guards. In some cases, it is impractical to show the variety of guards designed to meet specific safety requirements, as set forth in codes and standards adopted by customers and/or enforced in a given locale.

Though a guard may not be shown, and procedures may not reflect the need for its removal, the guard **must** be in place during normal operation of the machine/applicator.

TECHNICAL ASSISTANCE CENTER

CALL TOLL FREE 1–800–722–1111
(CONTINENTAL UNITED STATES AND PUERTO RICO ONLY)

GENERAL MACHINE POLICY

All machines remain the property of AMP Incorporated. The customer shall have no title to the machine(s) and his interest shall be limited to the use of said machine(s) for the purpose indicated, during the stated term, at the specified plant.

No major change or modification shall be made without written consent of AMP Incorporated. Spare and component parts are available at nominal prices.

A list of component parts is included in the instructional material or drawings supplied with each machine.

The customer shall be fully responsible for the maintenance of the machine(s) including servicing, repair, and replacement of damaged or broken parts. Each machine shall be returned in usable condition — reasonable wear and tear excepted. Before returning the machine, contact AMP Incorporated, Harrisburg, Pennsylvania requesting instructions for shipping and disposition.

AMP Field Service Engineers are available to provide assistance in the adjustment or repair of the machine when problems arise which your maintenance personnel are unable to correct. Contact AMP Incorporated.

INFORMATION REQUIRED WHEN CONTACTING AMP INCORPORATED

AMP Incorporated offers the **Technical Assistance Center** as a means of providing technical assistance when required.

When contacting AMP Incorporated by telephone regarding service to a machine or tool, it is suggested that a person familiar with the device be present with a copy of the manual (and drawings) to receive instructions. Many difficulties can be corrected in this manner.

When calling the Technical Assistance Center, be ready with the following information:

1. Customer name
2. Customer address
3. Person to contact (name, title, telephone number and extension)
4. Person calling
5. Machine or tool number (and serial number if applicable)
6. Product part number (and serial number if applicable)
7. Urgency of request
8. Nature of problem
9. Description of inoperative component(s)
10. Additional information/comments that may be helpful

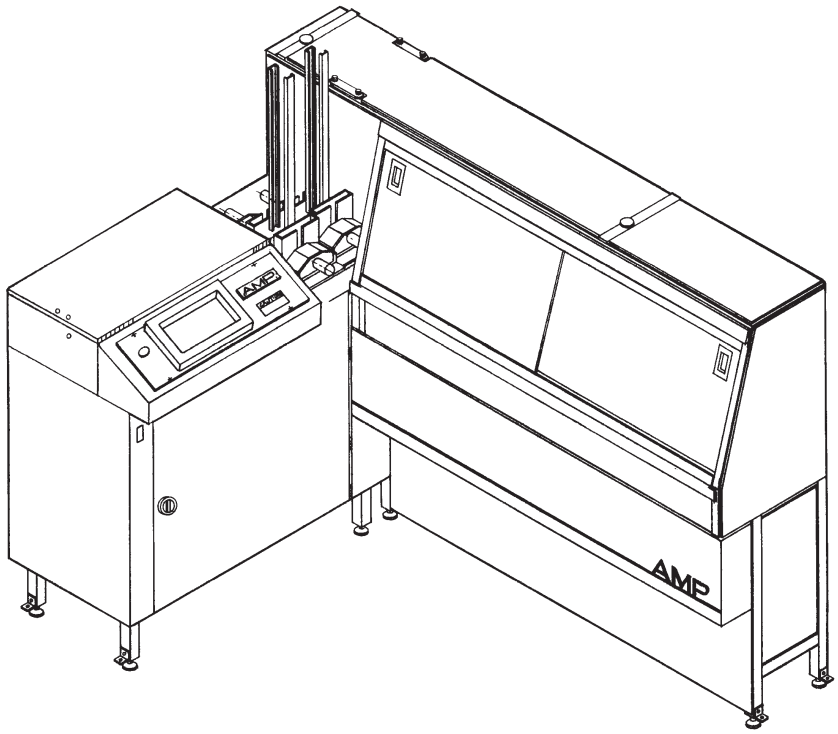


Figure 1 91–32

1. INTRODUCTION

The AMP R–CAM 2A Automatic Cable Assembly Machine 760700–6 (shown in Figure 1) is supplied with tooling to terminate tube loaded AMP–LATCH* Novo Receptacles and Card Edge connectors onto 28 AWG planar ribbon cable. Tooling for other connectors can be ordered separately.

The machine will produce single–ended, double–ended, or daisy–chained cable assemblies ranging in length from 69 to 1219 mm [2.7 to 48.0 in.]. If a tail is desired, tail length should be included in the maximum length. Up to 130 cable assembly part numbers can be stored in machine memory.

Information contained in this manual pertains to description, receiving inspection and installation, setup and operation, preventive maintenance, adjustments, and repair or replacement of parts. Refer to Figure 2 for detailed machine specifications. Refer to AMP Instruction Sheet 408– 9525 for uncrating and unpacking. For information beyond the scope of this manual, contact the Technical Assistance Center. Refer to page 2 of this manual for details.

When reading this manual, pay particular attention to **DANGER, CAUTION,** and **NOTE** statements.

DANGER *Denotes an imminent hazard which may result in moderate or severe injury.*

CAUTION *Denotes a condition which may result in product or equipment damage.*

NOTE *Highlights special or important information.*

Revisions to this manual are provided in Section 10, REVISION SUMMARY.

NOTE *Electrostatic Discharge (ESD) damage can occur during the handling of static sensitive components. The ESD damage is usually caused by human body discharge and object discharge.*

The following practices are recommended to minimize damage due to ESD:

1. The operator must use an ESD floor mat which is properly grounded.
2. The machine should rest on an ESD bench mat.

3. The machine should be grounded to the bench mat by way of a cable from the machine base plate to the socket on the bench mat.
4. The operator should be grounded using a wrist strap.
5. All grounding should be to a common point ground.

NOTE *All ESD equipment is customer supplied.*

NOTE *Measurements are in metric units [followed by U.S. customary units in brackets].*

SPECIFICATIONS AND CAPABILITIES

Machine Dimensions (Approx)	
Length	2591 mm [102 In.]
Width	1473 mm [58 In.]
Height	1524 mm [60 In.]
Weight (Approx)	435.5 kg [960 Lb.]
Air Requirements	
Pressure (Min)	551 kPa [80 Psi]
Capacity (Min)	3.8 liters/sec [8 cfm]
Electrical Requirements	
Voltage (–6 Machine Only)	120 Vac
Voltage (–7 Machine Only)	220 Vac
Frequency	50 – 60 Hz
Circuit	Single Phase
Current	15 A
Electronic Tester	
Capacity (ribbon cable)	9 to 64–conductor
Test Voltage (shorts and conductance)	5 Vdc
HVT (High Voltage Test) Voltages■	
Receptacle	1000 Vdc
Card Edge	900 Vdc
HDF	1000 Vdc
Dip Plug	1000 Vdc
Low Profile Receptacle	800 Vdc
Sensitivity	
Conductance Test (fails if greater than)	200 ohms
Shorts Test (fails if less than)	600 ohms
HVT (fails if less than	50 M ohms
Noise Levels – at operators' position – while machine cycles●	80 – 85 db
Ambient Operating Environment	
Temperature	5–40°C [41–104°F]
Relative Humidity◆ (noncondensing)	20 to 90 percent

●*Typical machine cycles occur every 8 to 15 seconds with each cycle lasting approximately 1 second.*

■*Test voltages are automatically selected based upon the current assembly. Connector styles dictate max voltages.*

◆*Higher relative humidity can cause erroneous HVT failures and can cause damage to ESD components.*

Figure 2

2. DESCRIPTION

2.1. Physical Description (Figure 3)

The machine is a free–standing unit requiring either 120 or 220 Vac electrical power and an air supply for operation. See Figure 2 for machine specifications. It is fully enclosed in guards and covers for personnel protection during operation. The machine is supported on ten adjustable legs which allow for leveling the unit when setting up. The guards that enclose the work area during operation slide in tracks on the framework and are connected to interlocks which stop machine operation if a guard is moved during operation.

The machine is configured in an “L” shape with the machine base (long side of the “L”) containing cable conveying equipment, connector modules and two pneumatic terminators. The remainder of the machine (short side of the “L”) consists of a load station and a computer control cabinet.

The upper and lower terminators are mounted, respectively, above and below the cable transfer mechanism on the machine base. The upper terminator is activated during the process to terminate connectors mounted in the “cover down” position in connector modules. The lower terminator is activated to terminate connectors mounted in the “cover up” position. See Figure 4.

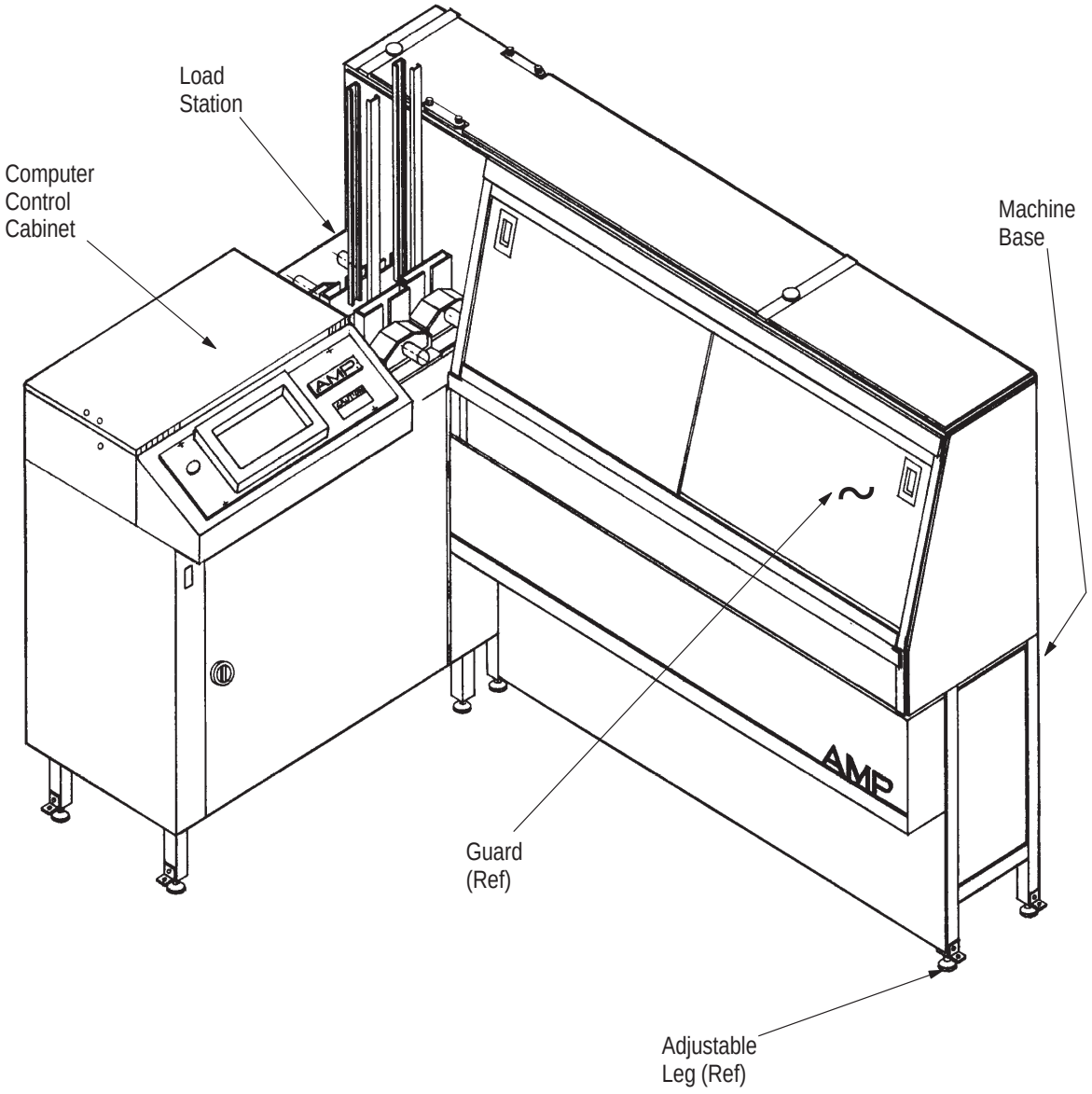


Figure 3

91–32

The cable transfer assembly features a timing belt which is attached to the first of four tooling shuttles upon which the connector modules are mounted. The tooling shuttles are mounted on one of two rails on one side of the machine base and in a channel on the other side. The timing belt is driven by a stepper motor/pulley arrangement and moves the first shuttle containing the lead module to the appropriate termination location. All subsequent tooling shuttles are then moved into the termination area. After their connectors have been terminated, they are then moved from the termination area as the first shuttle moves through the machine cycle.

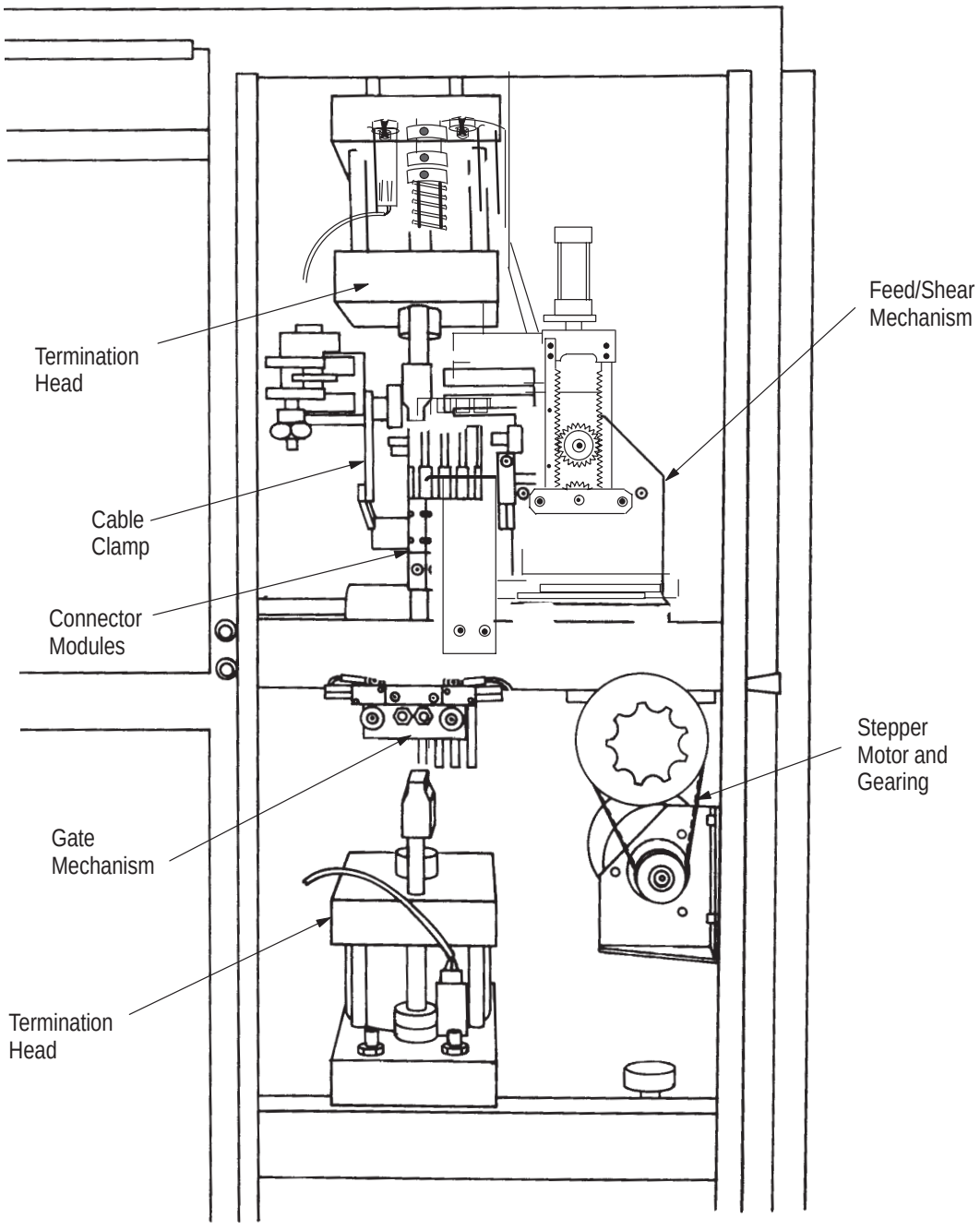


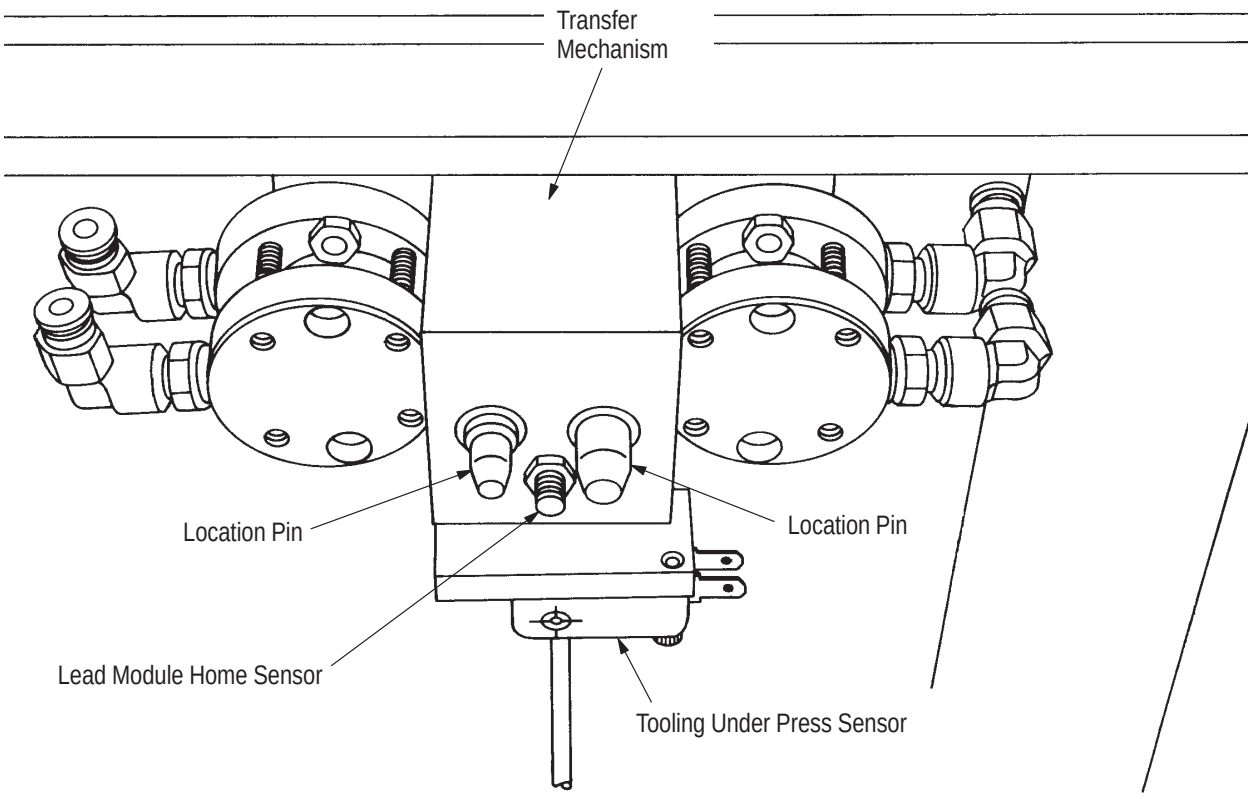
Figure 4

91–33

A transfer gate, located on the rear of the machine frame above the lower terminator, controls the position of the tooling shuttles for termination. The transfer gate is a pair of pins which are actuated by air cylinders and locate the tooling shuttle/connector module assembly accurately in the termination area. See Figure 5.

A cable feed/shear assembly is used to feed and shear the cable. The feed/shear assembly has four air cylinders which control its functions. One cylinder extends the feed shear unit to position cable guides through connector modules 2, 3, and 4 before feeding the cable through to connector 1. A pinch roller cylinder actuates to press the cable against the feed roller and a feed cylinder actuates a rack which drives the cable feed roller until the rack makes contact with the feed adjustment block located at the base of the assembly. This block is positioned for the type of connector being terminated. A shear cylinder actuates the shear blade mechanism. An index cylinder, located beneath the feed/shear assembly, moves the tooling shuttle/connector module assemblies into the termination area. See Figure 7.

A cable support assembly is used to assist in stabilizing a cable if the distance between the last two connectors on the cable is greater than eight inches. If the distance exceeds eight inches, a clamping mechanism on the cable support assembly slides into position and clamps onto the cable after the next–to–last connector module is moved out from the termination area. After the cable is sheared, pulled into position, and terminated, the clamp of the cable support assembly unclamps and retracts. See Figure 8.



Transfer Gate Area

Figure 5

91–34

Tooling Shuttles

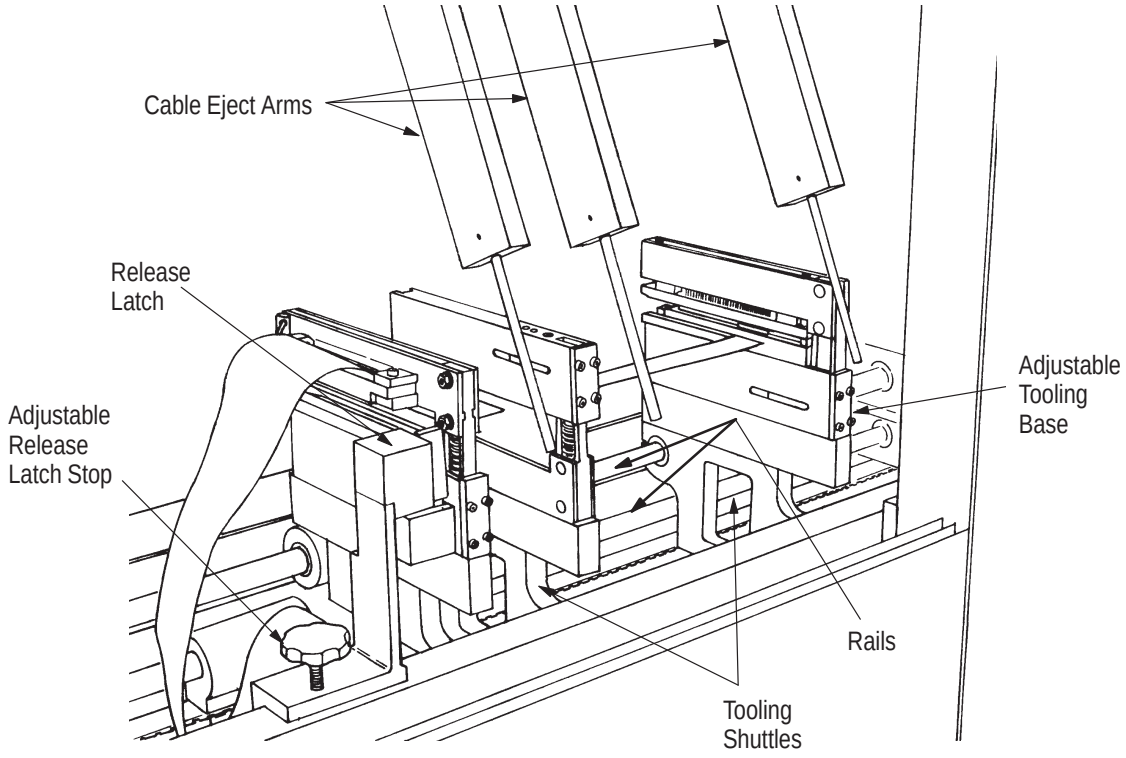


Figure 6

91–35

Feed/Shear Assembly (Removed from machine for clarity)

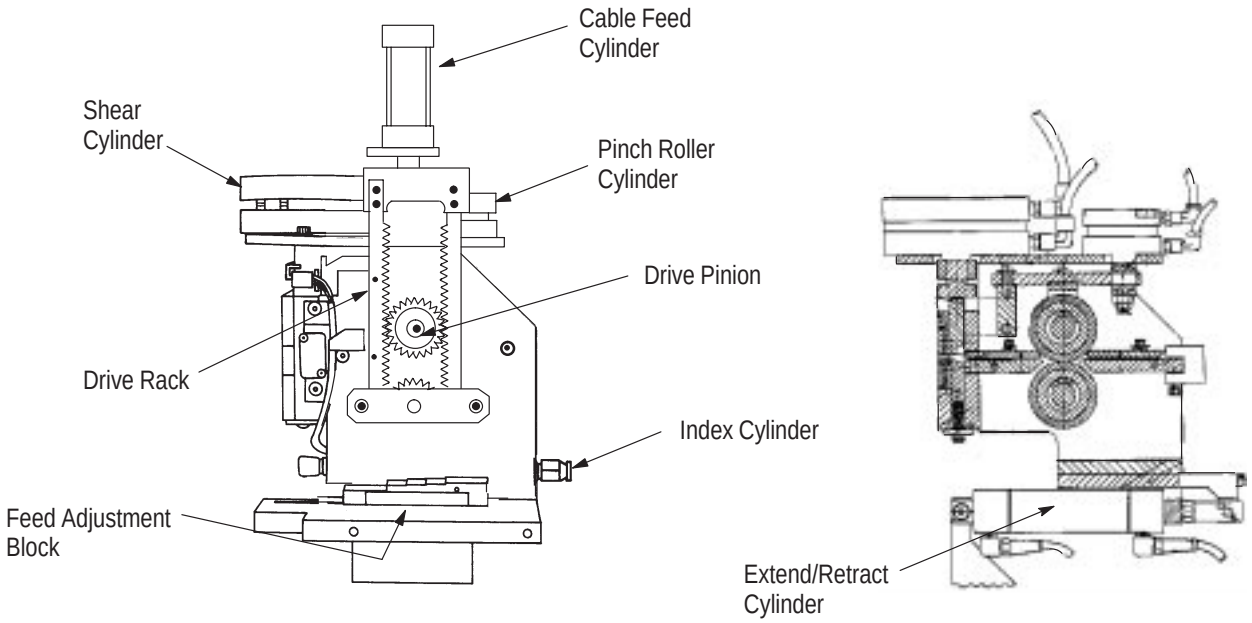


Figure 7

91–36

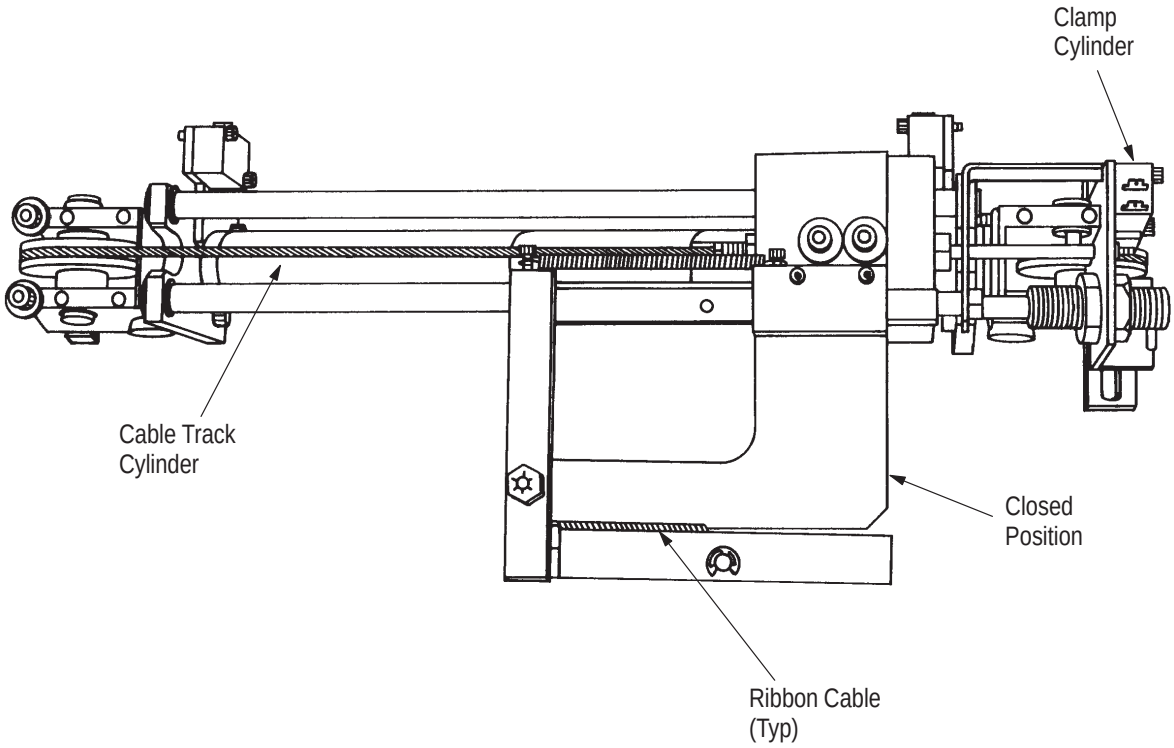


Figure 8 91–37

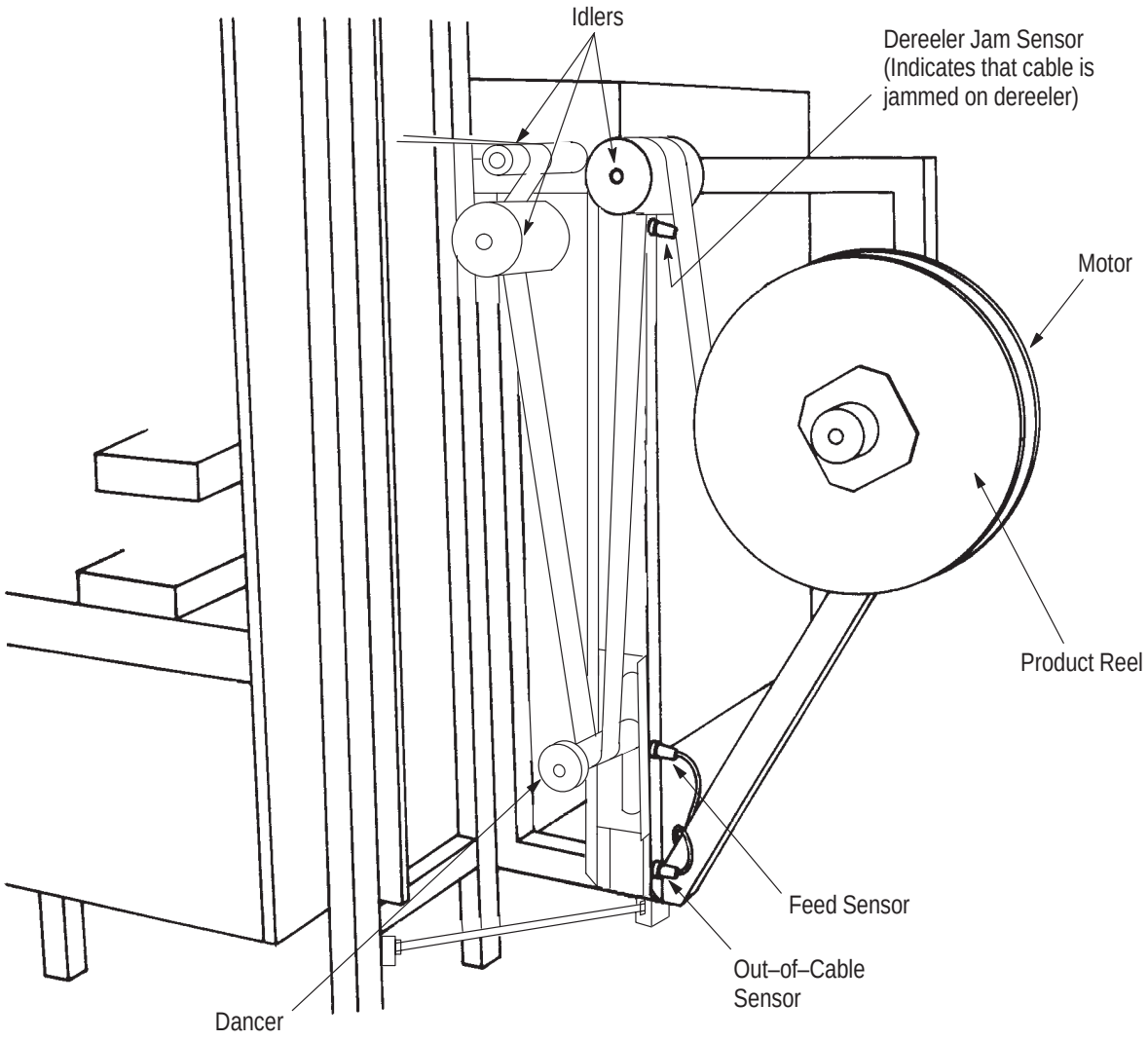
A cable dereeler assembly feeds the cable from a reel to the machine through three stationary rollers, one moving roller, and a motorized shaft. The moving roller maintains a loop in the cable through its own weight. As the moving roller moves off a sensor, located on the dereeler bracket, the motorized shaft is activated and the cable used from the loop is replaced from the reel. See Figure 9.

The cable eject assembly consists of an air–cylinder–actuated shaft with four adjustable arms mounted on it. Once a cable has either been completed, or determined through electrical testing to be defective, the first tooling shuttle moves to its final position. The adjustable latch release of the cable eject assembly releases the latch on the first module, thereby releasing the assembly for removal from the connector modules by the eject arms. See Figure 6. The air cylinder actuates a crank attached to the cable eject shaft and the adjustable arms sweep the cable out of the connector modules. If the assembly is good, a door closes on the eject bin of the machine and the assembly slides into the collecting device. If it is bad, the door remains open and the cable falls into the scrap chute of the machine.

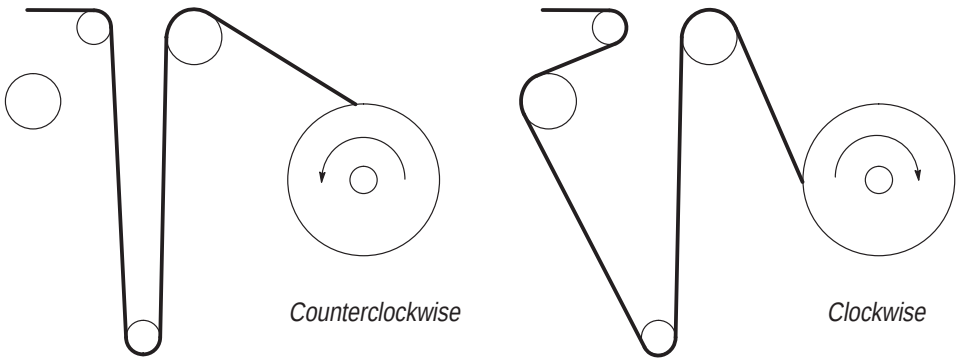
The connector modules are of two types. The connector module located on top of the first shuttle is the leading connector module and the three remaining are trailing connector modules. See Figure 6.

The three trailing connector modules, which correspond to connectors 2, 3, and 4 (if applicable) of a cable assembly, have inserts dedicated to a particular connector style which are slid into them for termination purposes. These inserts have a fixed stop on the housing side to properly position the connector. Shorting assemblies (AMP Part Number 760755 for card edge connectors and AMP Part Number 760838 for receptacle connectors) are also inserted into the modules for testing purposes. The modules can be configured for either connector cover up or connector cover down orientation. When a connector is terminated by the machine, probes enter the connector to check the termination for electrical continuity. When the termination head is retracted, the probes exit the connector and the terminated connector is checked for short circuits.

The leading connector module differs in configuration and function from the trailing connector modules. Inserts dedicated to a particular connector style are slid into the module for termination purposes. Dedicated probes are also inserted into the module. The lead module can only be configured for connector “cover down“ orientation. When a connector is terminated in this module, the probes are inserted into the connector and the module latches shut. During this time the termination is checked for short circuits. Signals to perform this test and the tests for all subsequent terminations are transmitted through a ribbon cable attached to this module. The module is opened prior to the finished cable assembly being ejected by the cable eject assembly.



Dereeler Configuration



NOTE: *Cable must be dereeled as shown, depending on the way the ribbon cable is reeled. The reversing switch on the motor must be set accordingly.*

Figure 9

91–38

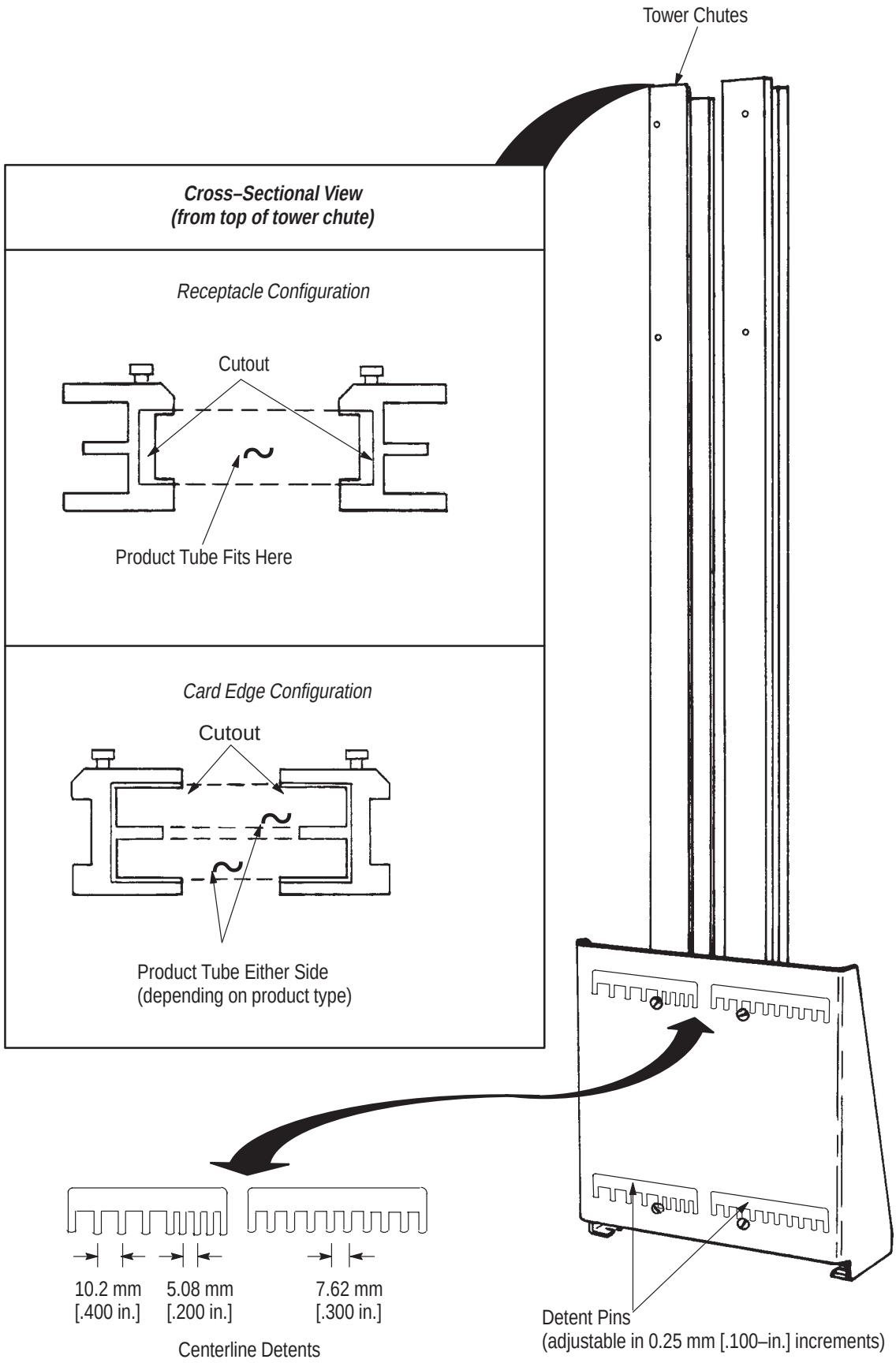


Figure 10

91–39

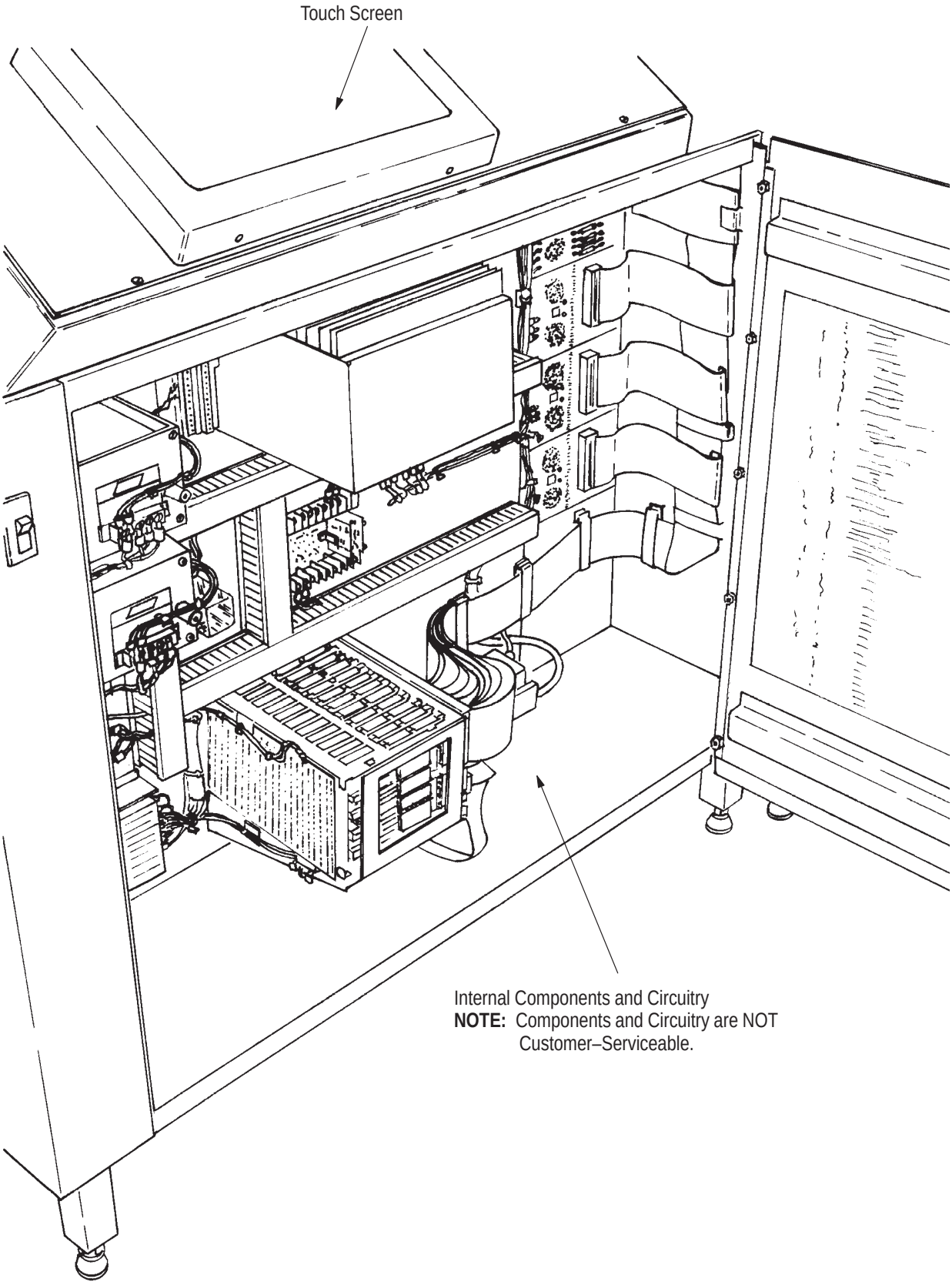


Figure 11

91–40

After all terminated connectors have passed the OPEN and SHORT electrical tests, the cable assembly is subjected to a fast High Voltage Test (HVT), as it is being moved to the eject position. If it fails the fast test, it is automatically subjected to a slow HVT.

NOTE

When the machine determines that a cable assemble is defective (has either opens, shorts, or HVT failures), the termination process is stopped, the cable is sheared, and the defective assembly is moved to the eject area. The connectors that have been used in making the defective cable assembly are selectively reloaded into the appropriate connector modules by the load station. The machine can be programmed to stop after each testing failure, 3 consecutive failures, or to complete bad assemblies.

The load station assembly features four stations that can be dedicated to a particular type of connector and orientation. The connectors (packaged in tubes) are placed into dedicated product load towers. See Figure 10. An escapement ram removes a connector from the bottom of the load tower, allowing it to drop into a product guide. Load rams then transfer the connectors from the product guides into the connector modules. Through–beam sensors ensure that the connectors have fallen into the product guides and an optical sensor ensures that the proper size connectors have been loaded into the connector modules prior to termination.

The computer control cabinet, located under the load station, houses the computer hardware and software necessary for machine functions as well as supporting the operator control console for machine operation. The screen on the control console features touch commands and is programmable for a variety of cable/connector configurations. See Figure 11. The computer hardware and software CANNOT be serviced by the customer. Contact the Technical Assistance Center in the event of a problem.

2.2. Functional Description

Prior to the start of a machine cycle, the part number for the cable assembly and the quantity to be made must be entered on the control console.

The escapement rams for the first and second (if required) load stations are actuated and the connectors are dropped into the product guides. After verifying that the connectors have dropped into the product guides, the process is repeated for the third and fourth load stations (if required). When all connectors have been selected and dropped into the product guides, the load rams transfer the connectors into the connector modules and an optical sensor verifies their correct size. The load rams retract, the feed/shear assembly moves forward sliding cable guides through connectors 4, 3, and 2. The cable feed is actuated to thread the cable through the connectors in the modules. The cable end is located within the connector in the lead (first) module.

The terminator is actuated to terminate the first connector and to insert probes into the connector for the subsequent electrical tests, and the lead module is locked in a closed position. Connector 1 is now tested for shorts.

A stepper motor is switched on and the lead (first) tooling shuttle is moved the appropriate distance for the remaining terminations. Electrical testing for opens and shorts is performed on the remaining connectors. A High Voltage Test is performed on the completed cable assembly before it is ejected from the machine.

NOTE

If the distance between the last two terminations is greater than eight inches, a cable support mechanism is activated to grip the cable to support it for proper termination.

After all terminations are completed, a stepper motor is activated and the cable is moved to the eject area of the machine where the lead module is opened and eject arms sweep the cable assembly out of the modules and into a collection device.

After the cable assembly is ejected, a stepper motor reverses direction and the tooling shuttles are gathered together by the return movement of the lead shuttle. The lead shuttle actuates a sensor which tells the machine control that the modules are returned and in their proper location for the next cycle.

2.3. Detailed Sequence of Operations

This is a detailed description of a typical cable assembly sequence of the R–CAM 2A machine. It includes the names and identification numbers of all outputs and inputs as they are actuated.

The initial condition of the machine for a production run is as follows:

1. The machine power is turned on.
2. The machine has been homed and is in the RUN MODE.
3. The part that is to be run has been entered in the EDIT MODE and selected in the RUN MODE.
4. The machine has been set up for the production run.

The following is the HOME condition of all of the Inputs and Outputs on the machine.

INPUT BOARD NO. (931355–1)

LED NO.	SENSOR NAME	SENSOR TYPE	CONDITION	LED
24	S124 EJECT ARM	PROXIMITY	MADE	ON
23	S123 AIR PRESSURE	DIAPHRAGM	MADE	ON
22	S122 DEREELER – JAM	PROXIMITY	NOT MADE	OFF
21	S121 DEREELER – ON/OFF	PROXIMITY	MADE	ON
20	S120 CONN. NO. 2, NO. 3 DROP	THRU–BEAM	NOT BROKEN	ON
19	S119 DEREELER – NO CABLE	PROXIMITY	NOT MADE	OFF
18	S118 CONN. NO. 1, NO. 4 DROP	THRU–BEAM	NOT BROKEN	ON
17	S117 LOAD RAM (COUNT)	THRU–BEAM	NOT BROKEN	ON
16	S116 LOAD RAM SPLIT CYCLE	MAGNETIC REED	NOT MADE	OFF
15	S115 SHEAR	THRU–BEAM	NOT BROKEN	ON
14	STEPPER MOTOR ON/OFF (K314)	RELAY CONTACT	CLOSED	ON
13	S113 (A–F) INTERLOCKS	MAGNETIC REED	MADE	ON
12	S112 TOP PRESS RAM	PROXIMITY	MADE	ON
11	S111 BOTTOM PRESS RAM	PROXIMITY	MADE	ON
10	S110 GATE NO. 1	PROXIMITY	MADE	ON
09	S109 GATE NO. 2	PROXIMITY	MADE	ON
08	S108 MODULE UNDER PRESS	PROXIMITY	MADE	ON
07	S107 HOME (LEAD MODULE)	PROXIMITY	MADE	ON
06	S106 CABLE SUPPORT EXTEND	PROXIMITY	NOT MADE	OFF
05	S105 CABLE SUPPORT RETRACT	PROXIMITY	MADE	ON
04	S104 CABLE CLAMP	PROXIMITY	MADE	ON
03	S103 CABLE FEED	PROXIMITY	MADE	ON
02	S102 BIN DIVIDE	PROXIMITY	MADE	ON
01	EMERGENCY STOP (E–STOP)	PUSH BUTTONS	CLOSED	ON

INPUT/OUTPUT BOARD NO. (932614–1)

LED NO.	OUTPUT NAME	LED
24	CPU WATCHDOG LED	BLINKS WHEN CPU IS RUNNING
23	SPARE OUTPUTS	OFF
THROUGH		
15	SPARE OUTPUTS	OFF
14	E–STOP RELAY 214	OFF
13	E–STOP RELAY 213	ON

LED NO.	SENSOR NAME	SENSOR TYPE	CONDITION	LED
12	SPARE INPUTS		OFF	OFF
THROUGH				
03	SPARE INPUTS		OFF	OFF
02	S202 FEED/SHEAR UNIT EXT.	PROXIMITY	NOT MADE	OFF
01	S201 FEED/SHEAR UNIT RET.	PROXIMITY	MADE	ON

OUTPUT BOARD NO. (931357–1)

LED NO.	OUTPUT NAME	LED
24	L324 MAIN AIR SOLENOID	ON
23	SPARE	OFF
22	L322 SHEAR SOLENOID	OFF
21	L321 BIN DIVIDE SOLENOID	OFF
20	L320 CONN. DROP NO.1 SOLENOID	OFF
19	L319 CONN. DROP NO. 2 SOLENOID	OFF
18	L318 CONN. DROP NO. 3 SOLENOID	OFF
17	L317 CONN. DROP NO. 4 SOLENOID	OFF
16	L316 LOAD RAM SOLENOID	OFF
15	L315 LOAD RAM SPLIT–CYCLE	OFF
14	STEPPER MOTOR RELAY K314	ON
13	DEREELER RELAY SSR–313	OFF
12	L312 TOP PRESS RAM SOLENOID	OFF
11	L311 BOTTOM PRESS RAM SOLENOID	OFF
10	L310 GATE NO. 1 SOLENOID	ON
09	L309 GATE NO. 2 SOLENOID	ON
08	L308 TOOLING INDEX EXT. SOLENOID	OFF
07	L307 FEED/SHEAR UNIT SOLENOID	OFF
06	L306 CABLE SUPPORT SOLENOID	OFF
05	L305 PINCH ROLLER SOLENOID	OFF
04	L304 CABLE CLAMP SOLENOID	OFF
03	L303 CABLE FEED SOLENOID	OFF
02	L302 TOOLING INDEX RET. SOLENOID	ON
01	L301 EJECT ARM SOL./COUNTER	OFF

The following is a description of a two connector cable assembly that is 203.2 mm [8.00 in.] long or more.

1. Both START boxes are touched.

   One stop box appears in the place of the two start boxes and the main menu box.

2. Connectors are loaded into the product guides.

   Connector drop cylinders No.1 and No. 2 (L320, L319) retract and then extend, causing the connectors to drop into the product guides. This action is a timed motion, there are no switches to indicate that the motion is complete. As the connectors drop, they pass through the thru–beam pairs S118 and S120. Breaking the beam turns the LED off for these sensors.

3. The load rams extend and push the connectors to the pre–load position.

   Solenoid L316 turns on and waits until the load ram split cycle sensor S116 is made, causing solenoid L315 to turn on. This blocks off the exhaust side of the cylinder making it stop at mid stroke.

4. The load rams extend and push the connectors into the tooling modules.

   Solenoid L315 is turned off, allowing the cylinder to exhaust and load the connectors into the tooling modules. The connector size is verified by sensor S117 as the cylinder extends.

5. The load rams retract.

   Solenoid L316 turns off.

6. The feed/shear unit extends sliding the cable guides into the tooling modules.

   Solenoid L307 turns on and the feed/shear unit extends, unmaking sensor S201 and at the very end of motion makes sensor S202.

7. The cable is fed into the modules.

   Solenoid L303 turns on, extending the feed cylinder. The flag on the feed cylinder rack unmakes sensor S103 and then at full extension another flag makes the same sensor.

8. The top terminator ram extends and terminates the lead connector.

   Solenoid L312 turns on, extending the top terminator ram. The collar on the cylinder unmakes sensor S112 and then at full extension another collar makes the same sensor.

9. The pinch roller opens.

   Solenoid L305 turns on, opening the pinch roller. This is a timed motion.

10. The feed cylinder retracts.

    Solenoid L303 turns off, retracting the feed cylinder. The flag unmakes sensor S103 and then at full retraction another flag makes the same sensor.

11. The lead connector is tested for SHORTS.

12. The top terminator ram retracts.

    Solenoid L312 turns off, retracting the top terminator ram. The collar on the cylinder unmakes sensor S112 and then at full retraction another collar makes the same sensor.

13. Gate No.1 opens.

    Solenoid L310 turns off, opening gate No. 1. Sensor S110 is initially made, then not made, and then made again at the completion of the cylinder stroke.

14. Gate No. 2 opens.

    Solenoid L309 turns off, opening gate No. 2. Sensor S109 is initially made, then not made, and then made again at the completion of the cylinder stroke.

15. The lead module carriage is moved by the stepper motor, pulling the cable out to the shear position.

16. Cable support cylinder extends.

    Solenoid L306 turns on and moves the cable support cylinder in, unmaking sensor S105 and, at the very end of motion, makes sensor S106.

17. The cable clamp closes to grip the cable.

    Solenoid L304 turns on and extends the cable clamp cylinder and clamps the cable. Sensor S104 is initially made, then not made, and then made again at the completion of the cylinder stroke.

18. The pinch roller closes.

    Solenoid L305 turns off closing the roller. This is a timed motion.

19. The cable is sheared.

    Solenoid L322 turns on, extending the shear cylinder and shearing the cable. The beam on sensor S115 is made, then broken, and then made again at the completion of the cylinder stroke.

20. The shear retracts.

    Solenoid L322 turns off, retracting the shear cylinder. The beam on sensor S115 is made, then broken, then made again at the completion of the cylinder stroke.

21. The lead module carriage is moved by the stepper motor, pulling the sheared end of the cable to the required position to terminate the second connector.

22. Gate No. 1 closes.

    Solenoid L310 turns on, closing gate No. 1. Sensor S110 makes, then unmakes, then makes again at the completion of the cylinder stroke.

23. The tooling index cylinder extends and pushes the remaining modules into gate No. 1.

    Solenoid L308 turns on and solenoid L302 turns off, extending the tooling index cylinder. Sensor S108 is made when the tooling module is against gate No. 1 and under the press.

24. Gate No.2 closes.

    Solenoid L309 turns on, closing gate No. 2. Sensor S109 makes, then unmakes, then makes again at the completion of the cylinder stroke.

25. The tooling index cylinder is relaxed.

    Solenoid L308 is turned off, removing pressure from the cylinder.

26. The top terminator ram extends and terminates the second connector.

    Solenoid L312 turns on, extending the top terminator ram. The collar on the cylinder unmakes sensor S112 and then at full extension another collar makes the same sensor. If the second connector was oriented cover up, the bottom terminator ram would have closed. The solenoid for the bottom terminator ram is L311 and the sensor is S111.

27. The cable assembly is tested for OPENS.

28. The top/bottom terminator ram retracts.

    Solenoid L312 (L311) turns off, retracting the terminator ram. The collar on the cylinder unmakes sensor S112 (S111) and then at full retraction another collar makes the same sensor.

29. Gate No. 1 opens.

    Solenoid L310 turns off, opening gate No. 1. Sensor S110 makes, then unmakes, then makes again at the completion of the cylinder stroke.

30. Gate No. 2 opens.

    Solenoid L309 turns off, opening gate No. 2. Sensor S109 makes, then unmakes, then makes again at the completion of the cylinder stroke.

31. The cable clamp opens.

    Solenoid L304 turns off and retracts the cable clamp cylinder and unclamps the cable. Sensor S104 makes, then unmakes, then makes again at the completion of the cylinder stroke.

32. Cable support cylinder retracts.

    Solenoid L306 turns off and moves the cable support cylinder out, unmaking sensor S106, and at the very end of motion, making sensor S105.

33. The cable assembly is tested for SHORTS.

34. The cable assembly is tested with HIGH VOLTAGE.

35. The lead module carriage is moved by the stepper motor, pulling the cable out 203.2 mm [8.00 in.] to the eject location. The lead module makes contact with the latch release and unlatches the lead module, allowing the cable to be ejected from the machine.

36. The feed/shear unit retracts.

    Solenoid L307 turns off and the feed/shear unit retracts, unmaking sensor S202, and at the very end of motion, making sensor S201.

37. The cable is ejected from the machine.

    Solenoid L301 turns on and extends the cable eject cylinder, ejecting the completed cable assembly. Sensor S124 makes, then unmakes, then makes again at the completion of the cylinder stroke.

38. The tooling index cylinder retracts.

    Solenoid L302 turns on, retracting the tooling index cylinder.

39. The lead module is returned to the home position, picking up the second module along the way.

NOTE *If additional cable assemblies are to be made, connectors will be dropped into the product guides while the lead module is returning home (Steps 2 and 3).*

When the stepper motor stops, the home sensor S107 is made.

40. Gates No. 1 and No. 2 close, locking the modules into place.

    Solenoid L310 turns on, closing gate No. 1. Sensor S110 makes, then unmakes, then makes again at the completion of the cylinder stroke.

41. The eject arms retract.

    Solenoid L301 turns off and retracts the cable eject cylinder. Sensor S124 makes, then unmakes, then makes again at the completion of the cylinder stroke.

NOTE *If additional cable assemblies are to be made, the sequence now returns to step 4.*

2.4. Additional Operating Sequence Information

A. If a Cable Assembly Fails an Electrical Test:

1. If an assembly fails, regardless of whether it is a short, open, or HVT failure, the machine will shear it off at that point and eject it by closing the bin divider door.

   Solenoid L321 turns on and extends the cylinder which opens the bin divider door. Sensor S102 makes then unmakes, then makes again at the completion of the cylinder stroke.

2. The bin divider will then be closed the next time a complete GOOD cable assembly is made.

   Solenoid L321 turns off and retracts the cylinder which closes the bin divider door. Sensor S102 makes, then unmakes, then makes again at the completion of the cylinder stroke.

B. If a Cable Assembly has More than Two Connectors:

1. Additional connectors must be dropped. This is done during step 2.

NOTE *Step references are to the preceding Paragraph (2.3., Detailed Sequence of Operation).*

Connectors 1 and 2 will drop first and then 3 and 4 will be dropped since the same thru–beam sensors (S120 and S118) are used. The solenoids for connector drops 3 and 4 are L318 and L319, respectively.

2. The following applies to the second connector for a 3–connector cable assembly and both the second and third connectors for a 4–connector assembly.

   a. Both gates No. 1 and No. 2 open (steps 13 and 14).

   b. The first pull of the stepper motor pulls the cable out for the next termination (step 15).

   c. Gate No. 1 closes.

   d. The Index cylinder extends.

   e. Gate No. 2 closes.

   f. Index cylinder relaxes.

   g. The appropriate terminator ram closes. Top terminator ram for cover down, bottom terminator ram for cover up.

   h. The cable assembly is tested for OPENS.

i. The terminator ram retracts.

j. The cable assembly is tested for SHORTS.

3. If another connector is to be terminated then substeps a through j above will be repeated.

C. Cable Support

If a two connector cable assembly is under 203.2mm [8.00in.] in length, or a cable assembly that has more than 2 connectors and the length between the next to the last and the last connector is less than 203.2 mm [8.00 in.], then the cable support cylinder and the cable clamp are not required. Steps 16, 17, 31, and 32 will be skipped.

3. RECEIVING INSPECTION AND INSTALLATION

3.1. Receiving Inspection

The machine is thoroughly inspected during and after assembly. Before it is shipped, a final series of tests and inspections is made to ensure proper functioning. Still, the following inspection should be performed as a safeguard against problems generated during shipment.

NOTE *An AMP Incorporated Field Service Engineer is assigned the task of setting up the machine in a customer facility to ensure the quality and reliability of the machine. The machine should be placed in a well–lighted location that provides adequate working space and has the specified air and electrical outlets available for the machine.*

1. Carefully uncrate the machine per the instructions provided in AMP Instruction Sheet 408–9525, Uncrating and Unpacking Instructions for the AMP R–CAM 2A Machine.

NOTE *Retain the shipping crate for future return of the machine if necessary.*

2. Thoroughly inspect the entire machine for evidence of damage that may have occurred during transit. If the machine is damaged, file a claim against the carrier and notify AMP Incorporated immediately.

3. Check all wiring for loose connections and for frayed or broken wire and insulation.

4. Check all air lines for evidence of loose connections or leaks.

3.2. Considerations Affecting Machine Placement

Location of the machine is critical to efficient operation. The space provided for the machine must be sufficient to allow the operator to load ribbon cable reels, make adjustments, unload finished cable assemblies, and perform maintenance without interference from surrounding equipment or materials.

3.3. Machine Installation

1. Select a well–lighted location with an electrical outlet of 120 Vac, 60 Hz, 15 A, single–phase; and air supply that is capable of maintaining 552 kPa [80 psi], 3.76 liters/s [8 scfm], through a cycle of operation.

2. Place the major machine components (machine base and computer control cabinet/load station) in relative proximity to one another.

3. Raise the two inside adjustable legs of the machine base off the floor. Level the base using the two adjustable legs on each end of the unit. The usual height setting is 38.1 mm [1.5 in.] from the floor to the bottom of the frame. Lower the two inside adjustable legs until they touch the floor.

4. Slide the control cabinet into position allowing space between the face of the control cabinet and the machine base to permit connection of the following electrical cables and pneumatic hoses:

CAUTION *The next three electrical connections listed below must be made before the units are placed together and secured.*

a. P100 to J100

b. P12A to J12A

c. P101A to J101A

d. Insert the two pneumatic hoses from the base assembly into the associated union bulkhead fittings on the control cabinet.

5. After making the connections listed above, slide the control cabinet up to, but not touching the machine base. Locate the pinned bar on the bottom of the machine base. Adjust the two legs on the control cabinet closest to the bar until the bottom of the cabinet is just resting on the bar. Adjust the remaining two legs on the other end of the control cabinet until there is equal clearance between the machine base and the cabinet from the bottom to the top of the machine base frame. Slide the control cabinet against the machine base and secure with the four cap head screws.

6. Make the following seven electrical connections:
   a. P11 to J11
   b. P12 to J12
   c. P21 to J21
   d. P31 to J31
   e. P32 to J32
   f. P62 to J62
   g. Power cable from the Cirris tester to outlet above J62

7. Attach the dereeler assembly to the frame of the machine with the hardware provided and make the following electrical connection:
   a. P119 to J119

8. Open the door of the control cabinet under the operator control console and examine the card rack attached near the floor of the control cabinet in the foreground of the electrical/electronic assemblies to make certain that all cards are properly seated in the rack.

9. Connect the air supply to the machine but DO NOT TURN AIR ON.

10. Make certain that the machine power switch, located on the exterior of the control cabinet is switched “off” and connect the electrical power to the machine (main power input is located just above connection labeled J119).

11. Close all doors and guard on machine to engage interlocks on electrical/electronic system.

DANGER *DO NOT DEFEAT MACHINE INTERLOCKS! They have been placed on the machine to ensure personnel safety. Bypassing or defeating interlocks will place machine operating personnel at possible hazard and may invalidate any express warranties by AMP Incorporated regarding the machine.*

4. MACHINE SETUP AND PRODUCTION OPERATION

The R–CAM 2A machine is equipped with a programmable setup/run procedure that is operated from the touch screen display on the control cabinet. The program incorporated into the electronics of the machine is designed to allow an operator to respond to a given set of options and to select, or program, the required functions for a production run.

4.1. Machine Setup

The basic setup procedure is as follows:

1. Turn the ON/OFF switch on the control cabinet (it is located below and to the left of the touch screen) to the “on” position.

2. Turn the air supply “on” by rotating the lock out valve on the main air supply input connection.

3. Load product (connectors) and ribbon cable as described in Paragraph 4.3, Production Operation.

NOTE *Items indicated in capitals in this description will relate to commands or options viewed on the touch screen.*

4. The MAIN SCREEN (POWER OFF) screen will appear. The current software revision number will be shown on the screen.

NOTE *When contacting AMP for assistance or clarification, always provide the resident (current) software revision number on your particular machine.*

5. There are four conditions which may not allow you to proceed until corrected, followed by touching a RETURN screen.
   a. EMERGENCY STOP SWITCH PUSHED (There are three EMERGENCY–STOP switches)

b. AIR PRESSURE LOW (Air may not be supplied to the machine)
c. INTERLOCK SWITCH OPEN (there are seven interlocked guards)
d. CABLE DEREEL PROBLEM (sensor 112 [cable jammed] is made)

6. The HOME SYSTEM screen should now be displayed with the following boxes:

At this point make sure there are no connectors loaded in the product guides or modules; there is no interference of carriage and eject arm; no interference of carriage and cable support; and no scrap cable in the feed/shear unit.

NOTE *The program is designed with dual commands, in some instances, which require touching both boxes within .6 seconds of one another. This is a safety feature which limits the possibility of accidentally activating the machine.*

7. Touch both HOME boxes within .6 seconds of one another. The following will occur:
   a. Main air supply is turned “on.”
   b. Stepper motor is energized.
   c. All cylinders and lead module carriage are returned to the “home” position.

NOTE *If any errors occur, the machine operator will be notified by an ERROR screen.*

NOTE *Although it is used very infrequently, the operator may touch both ENERGIZE boxes (rather than HOME boxes) with the result being that the carriage is NOT returned to the “home” position. This allows the operator to go directly to the manual mode of operation.*

4.2. Programming/Main Menu Screen

MODES

EDIT MODE	SETUP MODE
DIAGNOSTICS MODE	MANUAL MODE
REPORT OPTION	STEP MODE
CHECKLIST	RUN MODE

A. Edit Mode

Touching the EDIT MODE box brings up the EDIT MODE menu which allows the operator to edit (change) an existing part number, create a new part number for the machine to run, or remove a part number from the part number directory. Up to 130 part numbers may be stored.

1. EDIT PART NUMBER

   a. Touching this box will cause the machine to display the ACCESS CODE screen. The operator must touch “1” and then ENTER.

   The screen will now display the **current** part number and all data associated with it.

   b. To enter a **new** part number, touch the P/N box. The next screen displayed is an alpha–numeric keypad which allows the operator to enter up to 11 characters (number,letters, dashes, dots, or combinations thereof) to form a part number.

   Alphabet keys have three characters. To imprint the first character, touch the correct box; to imprint the second character, first touch the “2nd” box, and then the correct character box; to imprint the third character, first touch the “3rd” box, and then the correct character box.

NOTE *When the "2nd" or "3rd" boxes are touched, they are highlighted on the screen so that the machine operator will know which character will be selected from the alphabet keypad.*

Numeric keys simply require touching the appropriate key to obtain the desired numbers. Spaces are created by touching the SPACE key.

c. When the desired part number has been created, touch ENTER and it becomes the **current** part number.

d. Touch NEXT to return to the EDIT MODE screen.

2. SELECT NUMBER OF CONNECTORS

Touching this box will allow the operator to select the number of connectors per cable assembly. Touch the box up to four times to obtain the desired number. Each time the box is touched, it will toggle to the next available number (1, 2, 3, or 4).

3. SELECT NUMBER OF CONDUCTORS

a. Touching this box will display a screen which requires the operator to select the number of ribbon cable conductors from a numeric keypad as well as defining the location of up to two keying plugs if used.

NOTE *The machine will not test the continuity of conductors having keying plugs. For example: if O (no plugs) is selected, all conductors will be tested for continuity; if 9 and 10 (plugs at locations 9 and 10 of the cable) are selected, the machine will test all but those conductors for continuity.*

b. After plug locations have been selected (if needed), touch the screen to enter the number of conductors (9 through 64) and touch ENTER. A box will appear around the selected number.

c. Touch NEXT to return to EDIT P/N mode.

4. SELECT OVERALL LENGTH

a. Touch OVERALL LENGTH box.

b. Touch appropriate numbers, including decimal, to indicate the centerline spacing between connectors for the assembly. Minimum length is 68.58 mm [2.70 in.], maximum length is 1219.2 mm [48.0 in.].

c. After selecting cable length, touch ENTER.

NOTE *If it is determined that a mistake has been made after ENTER has been touched, touch CLEAR and re–enter the correct numbers.*

d. Touch NEXT to return to the original screen. If all information is correct, touch NEXT to go to the next screen.

5. COMPANY NAME

This screen allows the operator to enter up to 40 characters of a company name or other pertinent information relating to the production run. When finished with this screen, touch ENTER.

6. CONNECTOR DATA

This screen allows the operator to enter required data on each connector to be terminated on the cable assembly.

a. The screen will ask for the following information on each connector:

1. PART NUMBER – Operator enters appropriate part number. To enter the connector part number, touch the P/N box. The box will disappear and "> <" will be displayed. Enter a part number up to 11 digits and then touch ENTER.

NOTE *The style, cover orientation, and polarization will all toggle to the next available selection when touched .*

2. STYLE – Operator enters connector style:

RECEPTACLE
CARD EDGE
LOW PROFILE
I/O PIN
HDF
DIP

NOTE *DIP connectors may ONLY be used in the lead module (connector no. 1) of the machine. I/O connectors may ONLY be used in the trailing modules (connectors 2, 3, or 4) of the machine.*

3. COVER ORIENTATION – Operator enters UP or DOWN

NOTE *Lead tooling module is always COVER DOWN.*

4. POLARIZATION – For setup ONLY of connector orientation and product guides:

LEAD
TRAIL
NONE

When all information for that connector has been selected, touch NEXT.

b. After information for all connectors has been entered the screen will ask: THIS ASSEMBLY WILL BE MADE WITHOUT A TAIL: IS THIS CORRECT? The operator must touch either YES or NO.

If a two–connector assembly with a tail is selected, or a three–or–four–connector assembly is selected, the next screen to appear will allow the operator to enter intermediate lengths between connectors. The tail length equals the overall length minus the total of all intermediate lengths.

Touch the appropriate intermediate length box. The box will disappear and a blinking cursor will appear. Enter the desired length 38 mm [1.50 in.] minimum. Touch ENTER.

When all lengths have been entered, touch NEXT.

c. A checklist screen will appear to verify information. The question OK TO SAVE? and YES NO appear at the bottom of screen.

If any information is incorrect, touch NO to return to the first edit mode screen.

If all information is correct, touch YES and the part number will be saved in the machine memory. This will be the **current** part number.

7. REMOVING A CONNECTOR PART NUMBER
   a. Touch REMOVE PART NUMBER box.
   b. Enter access code: “2”.
   c. Screen will ask for part number to be removed. Key part number in. Touch ENTER. Touch NEXT.
   d. Screen will ask if the entered part number is to be removed. Touch YES or NO.

8. PART NUMBER DIRECTORY

Touch this box to view an alpha/numerical listing of the stored part numbers.

a. To view more parts than the 15 displayed, touch the PAGE DOWN box and an additional 15 parts will be displayed

b. Touch the PAGE UP box to return to the beginning of the list.

c. When finished viewing part numbers, touch NEXT box to return to the EDIT MODE screen.

9. RETURN TO MAIN MENU

Return to the MAIN MENU by touching the MAIN MENU box.

B. Diagnostics Mode

The R–CAM 2A machine software features a diagnostics mode which checks the continuity of electrical and electronic components which operate the machine. The diagnostics are available through MAIN MENU, POWER OFF, or MANUAL MODE screens.

The machine diagnostics monitor activities through the various pc boards located in the control cabinet. The functions are also monitored by LEDs located at the board edges. A description of LED function and status is located on the inside of the control cabinet door just under the touch screen display.

The diagnostics check the following:

— Input Board No. 1
— Input/Output Board No. 2
— Output Board No. 3

The diagnostics relating to these boards show LED activity, but are also interactive. For example: if an emergency stop is activated, the switch condition is displayed on the screen.

— Cable Tester

This function is used to perform a manual shorts, opens, or HVT test; conduct the performance test of the tester using test kit 189253–1 or –3; or perform a test of the serial communications port of the machine used with the tester.

C. Report Options

These functions allow the operator to display or print the following:

1. DISPLAY LOG

This provides information on the last 300 machine events. A battery–backed memory maintains a listing of:

a. parts entered
b. part numbers changed
c. quantities programmed or completed
d. quantity to make changed
e. operational machine errors (test failures, e–stops pushed, etc.)

The log provides time and date of event as well as number of good and bad assemblies produced at that time. When the 301st event is recorded, the first event is erased so that only the 300 most recent events are maintained. The highlighted line on the display is the most recent event. To view previous events, beyond the 15 displayed on the screen, touch NEXT PAGE to display them.

2. DISPLAY REPORT

This function allows the operator to identify production runs with the following information:

a. part number
b. company name
c. time and date that a batch was started and completed
d. quantity of good assemblies completed

If the machine is equipped with an external printer, both DISPLAY LOG and DISPLAY REPORT may be printed out to provide a permanent record of machine function or as a packing slip for a particular production run. To print DISPLAY LOG or DISPLAY REPORT, touch NEXT SCREEN and enter the item desired and the quantity.

3. DISPLAY TOTALS

This function allows the operator to display the following:

a. total terminated connectors
b. total good assemblies
c. total bad assemblies

Totals are based on the amount of production since the time and date displayed on the screen. This may be used for daily or weekly tracking of machine production. The amounts represent the total productivity since the machine was last RESET. To take the display totals back to zero and begin accumulating new total amounts, touch RESET.

4. PRINT LOG

NOTE *Refer to Section 9 for printer information and connection instructions.*

This function allows the operator to print up to 300 log entries when enabled.

a. Determine the number of logs to be printed and enter that number on the screen.

b. Touch ENTER. If an error has been made in the number of logs to be printed, touch CLEAR and re–enter the desired number. BACKSPACE (<–) may also be used to remove and change a number.

c. The screen will display boxes saying PRINT and NEXT. If PRINT is touched, the indicated log entries will be printed.

NOTE

If a printer is not connected, off line, or out of paper, the machine will time out (approximately 20 seconds) and display PRINTER ERROR on the screen. The error condition must be identified and corrected before printing .

d. Touch NEXT to return to the REPORT OPTIONS menu.

5. PRINT REPORT

This function operates in much the same way as PRINT LOG with the exception being that it prints the reports installed in the machine.

a. Select the number of reports to be printed and enter the number (1 through 20) on the screen. Only the 20 most recent reports are saved, and the last report printed is the most recent.

b. Touch PRINT to print the selection.

c. Touch NEXT to return to the REPORT OPTIONS menu.

6. PRINT TOTALS

This function works much the same as PRINT LOG and PRINT REPORT except that it prints the time and date of the last totals display reset and the respective totals of all good assemblies, bad assemblies, and terminated connectors since the last machine reset.

a. Touch PRINT.

b. When printing has been completed, touch NEXT to return to the PRINT OPTIONS menu.

7. PRINT BATCH

This function differs from other print options in that it operates while the machine is running. It prints out a report of assemblies produced (both good and bad) as the machine is running.

a. Touch ENABLE to activate the PRINT BATCH function. When enabled, the printer will begin by printing the current part number, company name, and the start time. As the machine runs, the printer will print a report of each good, short, open or HVT failure produced during the run. At the end of the batch, the printer will print the total good, short, open, HVT failures and the stop time.

b. If DISABLE is touched, the printer will not operate in this function.

NOTE

If any printer errors occur while PRINT BATCH is enabled, the machine will stop until the error is corrected, or until the DISABLE box is touched. Touching DISABLE during a printer error allows the machine to run but, ends the batch count past the point when the error occurred.

D. Check List

This function allows the operator to verify information on a current part number with the same list that appears at the end of EDIT MODE. It provides the machine operator the opportunity to check connector/cable assembly information prior to running a job.

E. Setup Mode

1. CONNECTOR OFFSET

This mode, available from the main menu, allows the operator to adjust the position of the last, or trailing, connector relative to the sheared end of the ribbon cable. This feature allows the machine to compensate for minor distance changes which may be caused by the different makes of cable being run in the machine.

a. Touch CONNECTOR OFFSET to enter the offset for the last connector. The offset allows the operator to position the last connector relative to the sheared length of the cable prior to connector termination.

b. Enter a positive number to increase the spacing between the last connector and the previous connector.

c. Enter a negative number to decrease the spacing between the last connector and the previous connector.

NOTE *The connector offset value is shown on the CHECKLIST screen and is stored with the current part number.*

2. TESTING OPTIONS

This function allows the operator to enable and disable the testing features of the machine.

a. Touching 3 BAD results in the machine stopping after three **consecutive** bad terminations have been made.

b. Touching EACH BAD results in the machine stopping after **each** bad termination that is made .

c. Touching DISABLE results in the testing option being disabled.

The current option is displayed on the screen and, if disabled, the RUN and STEP modes will indicate that it is disabled.

3. SET CLOCK

A numeric keypad is displayed which allows the operator to set or reset the clock in military time. The current time and date displayed on this screen, or the characters: MM–DD–YY HH–MM.

NOTE *It is important to keep the time and date accurate for proper record keeping and log information.*

4. MOTOR PARAMETERS

This function is used to change the carriage stepper motor retract velocity and acceleration/deceleration rates. The default settings are displayed and should not be changed. If change is necessary, contact AMP Incorporated.

5. LOAD RAM SENSOR

This function is used to select the style of the load ram flag installed on the machine. Older machines may have a comb flag style instead of the current adjustable flag style. Touch the box which describes the style flag on the machine.

NOTE *Improper selection will result in an error message when the connectors are loaded into the connector modules.*

6. TEST DELAYS

a. SHORTS TEST (Default 10 [.01 seconds]).

This delay occurs after the terminating unit opens but before the shorts test is performed. The terminating unit retract sensor could be made slightly before the complete end of the cylinder stroke, causing the tester to perform the shorts test before the shorting probes are removed from the connector. If false indications of shorts occur in the run mode and a manual shorts test passes with no shorts, this is an indication that the delay might need to be increased.

Touch **SHORTS TEST**, enter the desired delay time in hundredths of a second, then press ENTER.

b. OPENS TEST (Default 0 seconds)

This delay occurs after the terminating unit is closed on the training connector modules but before the opens test is performed. The terminating unit extend sensor could be made slightly before the complete end of the cylinder stroke, causing the tester to perform the opens test before the probes are fully seated into the connector. If false indications of opens occur in the run mode and a manual opens test passes with no opens, this is an indication that the delay might be required.

Touch **OPENS TEST**, enter the desired delay time in hundredths of a second, then press ENTER.

7. REJECT OPTIONS

This function allows the operator to either COMPLETE BAD cable assemblies or to EJECT BAD cable assemblies.

a. If COMPLETE BAD is touched, the machine will complete a bad assembly but will deliver it to the eject chute as a completed, although bad, assembly.

b. If EJECT BAD is selected, the machine will eject the assembly as soon as it is determined to be bad and deliver it through the eject chute.

NOTE *If COMPLETE BAD is selected, the RUN and STEP modes will display a message indicating this at the bottom of their respective screens.*

F. Manual Mode

Machine operation in this mode allows the operator to segment the machine cycle to view specific operations as they occur. To enter MANUAL MODE, touch the box and proceed as follows:

1. The ACCESS CODE screen will appear.
   a. Touch “3”.
   b. Touch ENTER.

   The MANUAL Mode menu will be displayed.

MANUAL MODE MENU

CONNECTOR LOAD	FEED/SHEAR
CABLE SUPPORT	EJECT CARRIAGE
TERMINATION	TESTER DIAGNOSTICS

MAIN MENU

NOTE *If any cylinder should not complete its motion during a specific time out period, an ERROR screen will appear and indicate the problem. Try to determine the cause of the error: cylinder jammed by an obstruction, air pressure not correct, damaged tooling, or a bad sensor. To clear the error, touch the RETURN box.*

NOTE *Cylinder motions that would possibly cause damage to the machine are electronically checked during machine operation to specifically keep tooling from hitting.*

NOTE *Screen boxes indicate what action will occur when a particular box is touched*

DANGER *Machine interlocks ARE DISABLED during manual mode to allow the operator or setup person to make adjustments. Before exercising ANY cylinder, check for obstructions!*

2. CONNECTOR LOAD STATION
   a. Touch the bar at the bottom of the screen which reads: PRESS HERE TO ACTIVATE SELECTED OUTPUT.
   b. Touch desired output.

   There are four connector load cylinders which move the ram escapements. These are designated as CONNECTOR DROP No. 1, CONNECTOR DROP No. 2, CONNECTOR DROP No. 3, and CONNECTOR DROP No. 4. Retracting the cylinder causes the ram escapement to move back, and if any product is in the load towers, the next connector will be dropped into place. Extending the cylinder moves the ram escapement forward and pushes the connector into the product guide. As the connector falls into the product guide, it passes a thru–beam sensor so the central processing unit (CPU) will detect it.

   The load ram cylinder is a rodless cylinder that pushes the connectors into the tooling modules. Partially extending the cylinder causes the load rams to push the connectors in the product guides up to a pre–load position. Extending the cylinder causes the load rams to push the connectors into the tooling modules. Retracting the cylinder causes the load rams to return to their rest position.

3. CABLE SUPPORT STATION

The cable support is a cylinder which moves the cable clamp assembly into position. Moving the cylinder in locates the clamp assembly in position to clamp the cable. Moving the cylinder out returns the clamp assembly to the “rest” position.

The cable clamp cylinder closes the bottom jaw of the cable clamp to grip the cable before shearing and support it during termination of the last connector.

4. TERMINATION STATION

The module index cylinder moves the modules forward under the presses. Extending the cylinder moves the tooling modules into gate No. 1 (assuming it is closed). Relaxing the cylinder removes air to both sides of the cylinder. Retracting the cylinder returns it to “rest” position.

There are two terminators which terminate the connectors. They are designated “top press” and “ bottom press” in the machine drawings. The top press is activated to terminate a connector that is cover “down ” and the bottom press is activated to terminate a connector that is cover “up.” Closing the press will extend the cylinder and close the tooling module that is under the press. Any connector that is in the tooling module when a press is activated will be terminated. Opening the press will return the cylinder to its “rest” position.

There are two gates which capture the tooling module under the presses for termination. They are designated Gate No. 1 and Gate No. 2 in the drawings. Gate No. 1 captures the leading edge of the tooling module and Gate No. 2 captures the trailing edge of the tooling module pin. Closing the gate extends the pin into the tooling module path and opening the gate retracts the pin.

5. FEED SHEAR STATION

The pinch roller cylinder opens and closes the pinch roller that feeds the cable. With the roller closed, the cable is held and can be fed by the machine. When the roller is open, the cable can be moved freely by hand; this is the position for loading the cable. A manually–operated switch located at the rear of the machine inside of the guard may be used to open and close the pinch rollers when the machine is not energized.

The shear blades are actuated by a cylinder that, when extended, closes the blades and shears the cable. Retracting the cylinder opens the shear blades.

The cable feed cylinder moves a rack that rotates the pinch rollers to feed the cable. When the pinch rollers are closed, extending the cylinder will feed the cable to the length set by the feed adjustment block. Retracting the cylinder will back feed the cable unless the pinch roller is opened.

The feed shear cylinder moves the feed/shear unit so the cable guides or “duck bills” can be inserted into the loaded connector modules. Extending the unit retracts the cylinder and moves the unit so the “duck bills” are inserted into tooling modules. Retracting the unit extends the cylinder and moves the unit to the rest position.

6. EJECT CARRIAGE STATION

The stepper driver can be turned on or off by touching the CARRIAGE MOTOR box. This energizes or de–energizes relay K213.

The carriage can be moved forward eight inches at a time. Touching the MOVE CARRIAGE 8 INCHES box will move the first carriage forward eight inches.

CAUTION *When moving the carriage make sure that the lead module latch release is not obstructing the movement of the first tooling module.*

The carriage can be returned to the home position. Touching the HOME CARRIAGE box will return the first carriage, or tooling module, to the home position. Both gates will close, capturing the carriage and, if extended, the feed/shear unit will retract.

The eject arms are bars which push the cable assembly out of the tooling modules. Extending the eject arms will push the cable assembly out of the tooling modules, provided the lead module latch has been released. Retracting the eject arms will return them to the rest position.

The bin divider is a door which directs the cable assemblies to the good or bad chute. Opening the bin divider causes the cylinder to extend and position the door to eject bad cable assemblies. Closing the bin divider positions the door to eject good assemblies.

When finished using MANUAL MODE, the operator may go to DIAGNOSTICS MODE or return to MAIN MENU by touching the appropriate box.

7. CABLE TESTER

The cable tester mode is used to solve problems in the testing system and can be used to check a completed cable assembly. The OPEN, SHORT, and HVT tests can be executed in this mode.

Touch the OPEN, SHORT, or HVT box.

a. OPEN Test

In the run and step modes this test is conducted when the terminator is closed and the shorting bars are inserted into the second, third, and fourth connectors of the assembly. First the even number points are turned on, providing current paths to ground for all odd points. Then the odd test points are turned on, providing current paths to ground for the even points. In both instances, the CPU checks to see that all of the points are conducting.

Touching the OPEN box will execute this test and will display the status of all 64 test points, an “O” will indicate an open line and a “ – ” will indicate a line that conducts current. When no cable assembly is attached to the test points in the first tooling module, all lines should indicate open.

b. SHORT Test.

In the run and step modes, this test is conducted after the termination of the first connector and after every other termination only when the terminator is opened and the shorting bars are removed. Every eighth point is turned on, providing a current path to ground for the adjacent conductors. This every eighth point is tested over the entire assembly. For all points turned on, the CPU checks to see that adjacent points are not conducting .

Touching the SHORT box will execute the test and will display the status of all 64 test points, an “S” will indicate a shorted line and a “ – ” will indicate no short. When no cable assembly is attached to the test points in the first tooling module, all lines should indicate no shorts.

c. HVT Test

In the run and step modes this test is conducted after the last connector is terminated, the cable is sheared, and only on those assemblies that have passed the previous OPEN and SHORT tests. The HVT test in these modes consists first of a FAST test which tests groups of conductors. If this FAST test fails, a SLOW test which tests individual conductors is automatically performed. If the SLOW test fails it will report which conductors have failed.

NOTE *This test can only be executed when all guards are closed.*

DANGER *DO NOT defeat machine interlocks.*

DANGER *A DANGER MAY EXIST FOR PERSONS WITH CARDIAC PACEMAKER IMPLANTS OR OTHER HEART RELATED CONDITIONS.*

DANGER *DO NOT execute this test when the test probes or the end of the cable assembly are in contact with the machine frame.*

DANGER *DO NOT execute this test when the assembly has not been sheared from the reel of cable.*

Touching the “HVT” box will execute the test and display the status of all 64 test points, an “H” will indicate a failed conductor and a “ – ” will indicate no failure. When no cable assembly is attached to the test points in the first tooling module, all lines should indicate no failures. If the system fails HVT, disconnect the ribbon cable “B1” from the tester and then perform the test to determine if it is the cable or the tester. HVT failures can occur if any oily contaminants are on the sheared end of the test cables. Try to keep the lead tooling module as clean and lightly lubricated as possible.

8. Diagnosing Testing Problems

This section deals with diagnosing problems which may arise in conjunction with messages displayed on the display console.

NOTE *If horizontal module alignment is performed and no change is detected, check for excessive material on the edges of the ribbon cable. This may tend to move the connector when the cable is fed.*

a. Machine indicating OPEN conductors on the assembly.

1. Check registration of cable within the connectors. Adjust tooling modules to align if necessary.

2. Damaged header in module 1. Inspect and replace if damaged.

3. Damaged shorted test probe in modules 2, 3, or 4. Inspect and replace if damaged.

4. If the terminating cylinder sensor extend actuating collar makes the sensor prematurely, the tester will see this as “OPENS” because the test is performed before the shorting probes enter the connector. Increase the Opens Test Delay. If this resolves the problem, adjust the actuating collar for the proper setting.

5. Intermittent or failed “B1 or C” test cables. Disconnect the “C” cable from the test header in module No.1. Attach a completely shorted 64 position header to the “C” cable and execute an OPEN test. All lines should indicate no opens. If open lines correspond to the lines indicated when

a cable assembly was run, check the “B1 and C” cables for opens. If the problem still exists, contact AMP Technical Assistance Center.

b. Machine indicating SHORT conductors on the assembly.

1. Check registration of cable within the connectors. Adjust tooling modules to align if necessary.

2. Damaged header in module 1. Inspect and replace if damaged.

3. If the terminating cylinder sensor retract actuating collar makes the sensor prematurely, the tester will see this as “SHORTS” because the test is performed before the shorting probes are removed from the connector. Increase the Shorts Test Delay. If this resolves the problem, adjust the actuating collar for the proper setting.

4. Disconnect the “C” cable from the test header in module No.1 and execute a SHORT test. All lines should indicate no shorts. If shorts appear, disconnect the “B1” cable from the tester. Execute a SHORT test. If the problem still exists, contact AMP Technical Assistance Center.

c. Machine indicating HVT failure on the assembly.

1. Check registration of the cable within the connectors. Adjust tooling modules to align. To evaluate cable registration, remove the connector cover and view the cable in the contact slots with a magnifying glass or microscope.

NOTE *If horizontal module alignment is performed and no change is detected, check for excessive material on the edges of the ribbon cable. This may tend to move the connector when the cable is fed.*

2. Damaged header in module 1. Inspect and replace if damaged.

3. Check module 1 tooling inserts and the sheared end of cable “C” for dirt and contaminants. If they are dirty, clean them with a nonresidue spray cleaner such as tuner cleaner.

4. Excessive humidity conditions may cause HVT failures.

5. Disconnect the “C” cable from the test header in module No.1 and execute a HVT test. All lines should indicate no failures. If failures appear, disconnect the “B1” cable from the tester. Execute a HVT test. If the problem still exists, contact AMP Technical Assistance Center.

9. Checking a completed cable assembly

a. To check for OPENS, load the lead connector into the first tooling module and latch it closed. A quick, forceful push will close the module. Other connectors must have a shorting bar installed in their tooling module to provide a return path for the current. There are two methods to install a shorting bar:

1. Load the other connector in the appropriate tooling module and, using MANUAL mode, close the appropriate terminator on that module. Do not close this module by hand, you may not be able to get good closure of the tooling module, resulting in possible open lines. Execute the OPEN test.

2. Install a shorted header into the connector of the assembly being tested. Execute the OPEN test.

NOTE *Open lines will appear beyond the conductor count of the assembly when executing the OPEN test.*

b. To check for SHORTS, load the lead connector into the first tooling module and latch it closed. A quick, forceful push will close the module. The SHORT test can now be executed on this assembly.

c. To check for HVT failures, load the lead connector into the first tooling module and latch it closed. A quick, forceful push will close the module. An HVT test can now be executed on this assembly.

NOTE *This test can only be executed when all guards are closed.*

DANGER *DO NOT defeat machine interlocks.*

DANGER *A DANGER MAY EXIST FOR PERSONS WITH CARDIAC PACEMAKER IMPLANTS OR OTHER HEART RELATED CONDITIONS.*

DANGER *DO NOT execute this test when the test probes or the end of the cable assembly are in contact with the machine frame.*

DANGER *DO NOT execute this test when the assembly has not been sheared from the reel of cable.*

G. Run Mode

Touching the RUN MODE box on the MAIN MENU will display a screen showing the following:

– PART NUMBER TO BE RUN

– QUANTITY OF ASSEMBLIES

– START MACHINE

The operator must enter the part number to be run, unless it is the **current** part number, in which case nothing must be entered. The operator may then touch NEXT and go to the CHECKLIST screen of that particular assembly which will show all of the information required for the cable assembly to be run.

If it is a new part number to be run, it must first be entered into the machine memory through the EDIT MODE. The new part number **must** then be selected in the RUN MODE to make it the **current** part number to run!

When the current part number is selected, the machine will go through screens giving directions regarding MACHINE SETUP. When this sequence is complete, the machine will request an emergency stop and then go through normal power–up and back to the RUN MODE.

At RUN MODE, the operator must touch the QUANTITY TO MAKE. The next screen indicates the current amount to make. Enter the amount and then touch ENTER and NEXT.

The next screen (RUN MODE) will reset the COMPLETED ASSEMBLIES counter number back to zero (Good – 0, Bad – 0).

CAUTION *Make certain that the machine is loaded with product and is properly setup for the production run.*

To operate the machine, perform the following:

1. Touch START and START. The machine will begin the run.

NOTE *If both the good and bad assembly counts are equal to zero, the machine will stop and request that the eject arms and the lead module latch release be properly set.*

2. Resume production by touching START and START.

NOTE *After touching START and START, those boxes will be replaced by a STOP box. If STOP is touched, it will be highlighted on the screen and the machine will stop after the current cycle is complete.*

CAUTION *If while running, anything unusual is observed about the machine (physical hazard, etc.), PUSH THE EMERGENCY STOP TO STOP THE MACHINE IMMEDIATELY.*

As each cable is completed, the counters will be incremented (good/bad). When the completed good assemblies EQUALS quantity to make, the machine will stop at the end of that cycle and display BATCH COMPLETE on the screen.

NOTE *In this mode, the batch is considered complete only when the number of good assemblies equals the quantity to make, regardless of the number of bad assemblies that may have been made during the production run.*

H. Step Mode

The STEP MODE follows the same basic sequence as RUN MODE but with several exceptions:

1. Touching the STEP and STEP boxes results in a specific action or sequence being performed.

2. For each action or sequence to be performed, STEP and STEP must be touched until a machine cycle is completed.

The STEP MODE allows the operator or maintenance personnel to observe the machine actions and motions individually through a complete cycle. This mode is excellent for troubleshooting or for operator training.

4.3. Production Operation

This section contains procedures for machine setup, including the loading of cable, and machine production operation.

After the cable assembly has been programmed into the machine and selected, the following instructions provide the operator/setup person with a procedural method of configuring the machine to run the desired cable assembly.

DANGER *If use of the machine setup screens has been declined by the operator, the machine must be turned OFF or placed in an EMERGENCY STOP mode when performing any setup procedures.*

A. Setup Procedure

The procedure is as follows:

1. Change the product guide rails and load rams to match connector style and orientation where needed by doing the following:
   a. Remove the load ram by pulling up on the retractable plunger and sliding the ram out.
   b. Remove the product guide rail by pulling out the locking pin and sliding the guide rail out.
   c. Slide the correct product guide rail into position and insert the locking pin.
   d. Slide the correct load ram into position and insert the retractable plunger.

NOTE *The load ram and the product guide rail which correspond to the first connector must be configured for connector cover DOWN orientation. All load rams and guide rails are marked for connector style and orientation.*

2. Position connector towers to match connector style, size, and orientation where needed by doing the following:
   a. If a station is to have receptacle connectors in it, the connector towers should have the single slotted sides facing each other. For card edge connectors, the double slotted sides should face each other. See Figure 10.
   b. Place the towers into their bases by locating a combination of slots in the bases to adjust the towers apart by 2.54 mm [.100 in.] increments to match the connector length with minimum side to side clearance.

3. Load cable into the machine by doing the following:
   a. Depress the emergency stop switch if not done previously.
   b. Remove the pinch roller pressure by lifting up on the remote pinch roller switch, and remove any cable remaining in the machine.
   c. Remove the cable guides from the Feed/Shear unit and install the proper size cable guides for the cable to be used. Do not tighten the mounting screws at this time!
   d. Place a reel of ribbon cable on the dereeler and feed the cable through the dereeler roller system. See Figure 9.

NOTE *The connector modules should be moved away from the cable feed/ shear unit so that the cable may be fed through the unit.*

   e. Feed the ribbon cable into the Feed/Shear unit so that the cable extends out through the cable guides. Slide the cable guides against both edges of the cable. Pinch them together top to bottom and tighten the mounting screws. Make certain that the feed rack is up as far as it will go. Lower the pinch roller by depressing the remote pinch roller switch and then shear the cable by depressing and then lifting up the remote shear switch.
   f. Set the cable feed adjustment block so that the style of connecter no. 1 (Lead) is directly under the cable feed rack. A ball detent will engage to hold it in position.

4. Change the connector modules to match connector orientation, size, or style as needed by referring to Figure 12 and by doing the following:
   a. To change the orientation of a given connector, remove the tooling module from the machine. Pull the locating rod retainer back, push the locating rod until its end protrudes from the other side of the connector module, and adjust the position of the locating rod until the retainer can be engaged. Place the module back on to its tool base.

b. To change the number of positions for connector modules 2, 3, or 4, the continuity checking features must be changed. Begin by removing the locating rod and cover insert. Remove the housing insert and continuity insert base.

NOTE *Do not lose the two compression springs while performing this function.*

1. Remove the shorting assembly (AMP Part Number 760838 for receptacle or 760755 for card edge) from the continuity insert base.

a. To make the changes for a receptacle, carefully remove the straight pin header (AMP Part Number 852046–1) from the shorting assembly. Depending upon the previous configuration, it may be possible to re–use the straight pin header by using the same end (if the new configuration has fewer positions) or the other end (if the new configuration has more positions).

NOTE *The operator/setup person will have to examine the removed pin headers for suitability and decide, based on production rates and working conditions, whether to re–use the header or replace it.*

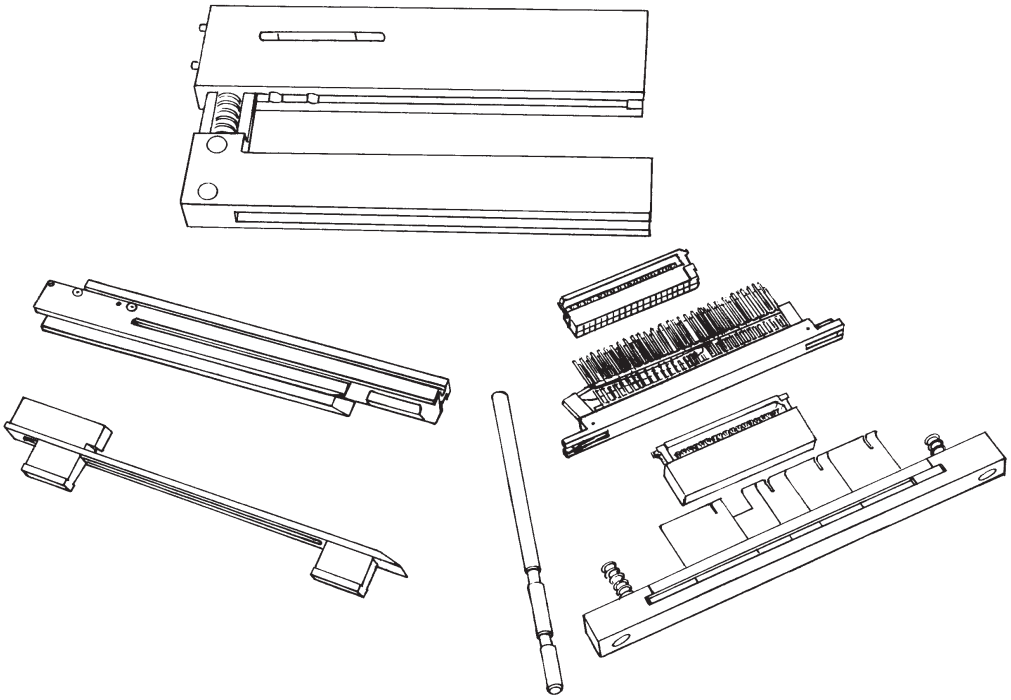


Figure 12

91–41

Remove the two pins on the header adjacent to the positions being checked for continuity (for example: remove pins 35 and 36 if checking a 34–position connector), install the header back into the shorting assembly, and replace the shorting assembly in the continuity insert base.

b. To make the necessary changes for a card edge connector, rearrange the inserts to provide the proper configuration. The number 1 position is that which is closest to the spring plunger. The insert labelled 4 should be the last one used for continuity checking (the notch on this insert allows room for the connector housing). Place the shorting assembly back into continuity insert base.

2. After making all changes to the shorting assembly, slide the housing insert and continuity insert base back into the connector module. Slide the cover insert into place and install the locating rod and latch it in place.

CAUTION *It is easier to slide the housing insert and the continuity insert base into the connector module together as a unit.*

3. Place the connector module on its tool base.

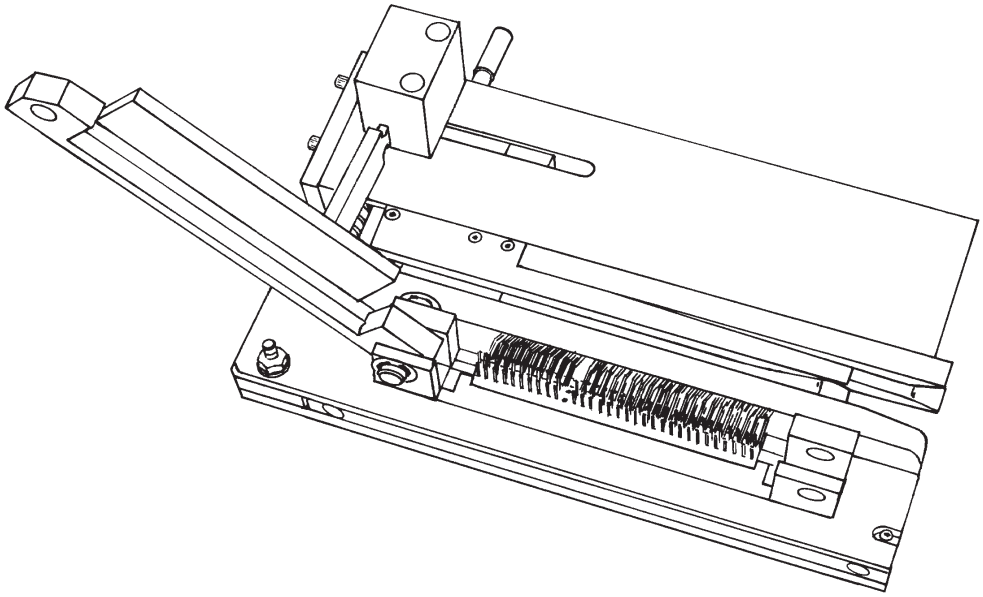


Figure 13 91–42

c. Changing the number of positions of a given connector in the first (lead) connector module (shown in Figure 13) is similar to the procedures described for modules 2, 3, and 4. However, some differences in procedure must be observed.

1. Before taking the first module off of the machine, disconnect the “C” cable attached to it by pulling out the detent pin, swing out the connector latch, and disconnect the cable from the right angle test header.

2. Remove the cover insert, housing insert, and continuity base insert as previously described.

3. To make the necessary changes for receptacles, remove the right angle test header (AMP Part Number 90674–1) from the continuity base insert and replace it with a header that has been configured for the appropriate size (pins must be removed adjacent to the last two pins used for checking continuity, as previously described).

4. To make the necessary changes for card edge connectors, remove the probe assembly and replace with the appropriate dash number of AMP Part Number 760841.

5. To re–insert these assemblies in the connector module, first assemble the housing insert and the continuity insert base so that the probes protrude through the housing insert. Then, carefully slide the assembly into the connector module. Slide the cover insert into place, insert the locating rod, and latch it in place. Place the connector module back on the tooling shuttle, reconnect the “C” cable, close the connector latch, and insert the detent pin.

d. To change connector style, follow all of the applicable procedures described in the preceding paragraphs and insert the correct cover and housing inserts.

5. Adjust the eject arms (see Figure 6) by doing the following:

a. After completing all other setup procedures, power up the machine. Enter the RUN MODE and start the machine. It will stop after making the first cable assembly of the batch and request that the eject arms and the lead module latch release be properly set.

b. Open the front guard of the machine to gain access to the eject mechanism.

c. Adjust the eject arms so that one is just behind module 1 and one is just ahead of each trailing module used.

d. Position the latch release so it opens module 1 with slight clearance between it and the module.

e. Close the front guard and eject the cable by touching START and START.

5. PREVENTIVE MAINTENANCE

An inspection of the machine should be made daily and prior to each production run. Any required repair or adjustment should be made immediately to prevent serious damage to the machine. It is recommended that daily and weekly maintenance schedules be established, maintained, and documented to ensure the quality and service of the machine.

NOTE *AMP Incorporated can provide preventive maintenance service agreements. Service is performed by Field Service Engineers. Contact the Technical Assistance Center.*

5.1. Daily Maintenance

DANGER *ALWAYS disconnect electrical power supply and air supply to the machine when performing maintenance.*

Daily maintenance should be performed by the operator/setup person. Any repair or adjustment exceeding the knowledge or responsibility of the person performing maintenance should be referred to the supervisor responsible for the machine.

The daily maintenance procedure is as follows:

1. Wipe the machine with a clean, dry, lint–free cloth to remove dust and foreign matter.
2. Use a suitable solvent or cleaning fluid to remove any grease or oil on exposed surfaces, especially around the tooling and cable feed rollers.
3. Use an air hose to blow any chips or metal particles from the machine.

DANGER *Compressed air used for cleaning must be reduced to less than 207 kPa [30 psi], and effective chip guarding and personal protective equipment (including eye protection) must be used.*

4. Clean, then lubricate the carriage rails with lightweight oil.
5. Lubricate sliding surfaces of all four tooling modules with lightweight oil. This should be included when changing the modules during routine setup between production runs.

5.2. Weekly Maintenance

Weekly maintenance should include all of the procedures listed in Paragraph 5.1, Daily Maintenance, plus the following:

1. Lubricate the upper and lower terminator die rods with light weight oil.
2. Lubricate shoulder screw pivot point and the two cylinder rods on the cable clamp assembly.
3. Inspect the entire machine for loose components and hardware.
4. Inspect all moving parts for evidence of damage or excessive wear. Repair or replace parts as necessary.
5. Inspect any wiring for loose connections and for frayed or broken insulation. Repair or replace as necessary.
6. Inspect the air lines and connections for evidence of leaks. Repair or replace as necessary.
7. Check the level of oil in the airline lubricator bowl and fill if necessary with Mobil Mist Lube 24 (If unable to obtain this lubricant, contact the *Technical Assistance Center* for additional information.

5.3. Quarterly Maintenance

Quarterly maintenance should include all of the procedures listed in Paragraph 5.1, Daily Maintenance, Paragraph 5.2, Weekly Maintenance, plus the following:

1. Lubricate all seven grease fittings with NLGI◆ No. 2 all–purpose grease. Wipe away any excess to prevent contamination of the drive belt.
2. Lubricate the feed rack and associated gears on the feed/shear unit with NLGI No.2 all purpose grease.

◆ National Lubricating Grease Institute

6. TROUBLESHOOTING

PROBLEM: Machine indicates OPEN conductors on assembly.

PROBABLE CAUSE: Damaged shorting bar or first module test probes.

REMEDY: Inspect and replace if damaged.

PROBABLE CAUSE: Intermittent or failed test leads.

REMEDY: Disconnect the test lead, cable “C”, from the first tooling module. Attach a completely shorted 64 position header to the test lead and execute an OPEN test. All lines should indicate no opens. If they do and correspond to the lines indicated when a cable assembly was run, begin checking cable “C” for opens and then cable “B1”. If the problem still exists, contact AMP Technical Assistance Center.

PROBLEM: Machine indicating SHORT conductors on assembly.

PROBABLE CAUSE: Registration of cable within the connector.

REMEDY: Adjust tooling modules to align.

PROBABLE CAUSE: Damaged shorting bar or first module test probes.

REMEDY: Inspect and replace if damaged.

PROBABLE CAUSE: With no cable attached to test lead, and a SHORT test indicates shorts exist when all lines should indicate no shorts.

REMEDY: Begin checking cable “C” for shorts, then cable “B1” and then the tester (without any cables attached) for shorts. If the problem still exists after examination of cables “C” and “B1”, and the tester, contact AMP Technical Assistance Center.

PROBLEM: Machine indicates HVT failure on assembly.

PROBABLE CAUSE: Registration of cable within the connectors.

REMEDY: Adjust tooling modules to align.

PROBABLE CAUSE: Damaged first module test probes.

REMEDY: Inspect and replace if damaged.

PROBABLE CAUSE: With no cable attached to test lead, and an HVT test indicates failures when all lines should indicate no failures.

REMEDY: Begin checking cable “C”, cable “B1” and the tester (without any cables attached) for failures. High–voltage failures are not always easily identified by looking at a cable assembly. Any slight misregistration in the cable may cause a cable to fail the high–voltage test. Abusive handling of the test cables may also cause a high–voltage failure. If the problem still exists, contact AMP Technical Assistance Center.

7. ERROR MESSAGES

The machine will, at times, display various error messages to alert the operator of a condition that requires his or her attention. Most of the following messages are accompanied by a reason for the message. Some of the messages are self–explanatory.

7.1. Miscellaneous

AIR PRESSURE LOW

Sensor S123 has been unmade. Air pressure has fallen below 414 kPa [60 psi]. All machine motion has been stopped and all outputs and motors have been de–energized. The machine will have to be HOMED. If a malfunction is suspected, check sensor by using Manual Mode I/O Screens. Adjustments might be required.

BATTERY BACK RAM FAILURE

Message occurs at power on. Failure in battery backed ram. All counts, logs, and current part program lost. All part number information is still in eeprom.

BIN DIVIDER FAULT

Cylinder did not make sensor S102 after actuation.

CABLE LENGTH TOO LONG

Programmed length exceeds machine maximum.

CABLE LENGTH TOO SHORT

Programmed length is smaller than machine minimum.

CHECK OVER ALL CABLE LENGTH

Programmed cable length with intermediate lengths exceeds machine maximum.

***** CHECK SUM ERROR *****

***** INITIALIZING EEPROM *****

Message occurs at power on. All machine memory has been reset. All part number information is lost!

INTERLOCK SWITCH OPEN

Machine interlocks are open. Check and close all doors.

MACHINE DID NOT COMPLETE CYCLE

The machine cannot leave step mode unless the current cycle is complete.

PART NUMBER NOT FOUND

Entered part number does not exist in memory.

EEPROM WRITE ERROR

Error in writing to eeprom. This error should be reported to AMP Technical Assistance Center immediately.

EMERGENCY STOP SWITCH PUSHED

Emergency stop switch is depressed (input 101). All machine motion has been stopped and all outputs and motors have been de–energized. Twist the palm button to release it. The machine will have to be HOMED.

LENGTH CALCULATION ERROR

Programmed cable length with intermediate lengths and connector widths exceeds machine maximum.

INTERLOCK SWITCH OPEN

Machine interlocks are open. Check and close all doors.

INTERLOCK SWITCH FAULT

Interlocked door has been opened (input 113). All machine motion has been stopped and all outputs and motors have been de–energized. The machine will have to be HOMED. If a malfunction is suspected, check sensor by using Manual Mode I/O Screens. Adjustments might be required. Machine door is open.

***** PRINTER ERROR *****

Attached printer is off line or has a problem.

7.2. Load Station Assembly

CONNECTOR #1 DID NOT DROP

Thru–beam sensor did not see a connector drop into the product guide. Normal out–of–product indication. Sensitivity adjustment of sensor S118 may be required.

CONNECTOR #2 DID NOT DROP

Thru–beam sensor did not see a connector drop into the product guide. Normal out–of–product indication. Sensitivity adjustment of sensor S120 may be required.

CONNECTOR #3 DID NOT DROP

Thru–beam sensor did not see a connector drop into the product guide. Normal out–of–product indication. Sensitivity adjustment of sensor S120 may be required.

CONNECTOR #4 DID NOT DROP

Thru–beam sensor did not see a connector drop into the product guide. Normal out–of–product indication. Sensitivity adjustment of sensor S118 may be required.

LOAD RAM IN

Motion cannot occur because load rams are in the tooling modules.

RAM SPLIT CYCLE ERROR

Load Ram Cylinder did not make sensor S116 after actuation.

NOTE *The following two messages pertain to the comb–style sensor assembly.*

NO COUNT

The load rams have not extended far enough into the tooling modules. Possibly double connectors in the tooling modules or a connector jam.

WRONG SIZE CONNECTOR

CONNECTOR POSITIONS COUNTED:

The load rams have not extended properly. An erroneous count of connector positions indicates that the load rams have extended too far (no connectors loaded) or not far enough (double load or jam). The thru–beam counting sensor S117 could be misadjusted. Check that the load rams, product guides, and tooling modules all match connector styles including all unused modules.

NOTE *The following three messages pertain to the adjustable flag style sensor.*

LOAD RAMS NOT FULLY EXTENDED

Sensor S117 was not made. The load rams have not extended far enough into the tooling modules. Possibly double connectors in the tooling modules or a connector jam.

LOAD RAMS EXTENDED TOO FAR

Sensor S117 was made then unmade. Check adjustment of sensor flag.

LOAD RAM SENSOR FLAG NOT PROPERLY ADJUSTED

This message is displayed when connectors are first loaded on a cable assembly when the previously run assembly had different size connectors. The machine stops with the load rams extended. Adjust the sensor flag at this time as follows:

1. Loosen the two knurled knobs on the load ram slide.
2. Position the vane so that when lifted up, the pilot on the sensor bracket engages the vane.
3. Tighten the two knurled knobs.
4. Touch RESTART RESTART to resume operation.

7.3. Dereeler Assembly

CABLE DEREEL PROBLEM

Dereeler has jammed. Sensor S122 was made. All machine motion has been stopped and all outputs and motors have been de–energized. The machine will have to be HOMED. If a malfunction is suspected, check sensor by using Manual Mode I/O Screens. Adjustments might be required.

NO CABLE. BOTTOM DEREELER SWITCH SENSED

Cable has run out. Sensor S119 was made. Pressing restart will make one cable assembly. Watch the remaining cable carefully. Do not allow the end to enter the feed/shear assembly.

7.4. Feed/Shear Assembly

CABLE FEED CYLINDER NOT RETRACTED

Cable Feed Cylinder did not make sensor S103 after actuation.

CABLE FEED CYLINDER NOT EXTENDED

Cable Feed Cylinder did not make sensor S103 after actuation.

FEED/SHEAR UNIT NOT RETRACTED

Cylinder did not make sensor S210 after actuation.

FEED/SHEAR UNIT NOT EXTENDED

Cylinder did not make sensor S202 after actuation.

SHEAR CYLINDER NOT EXTENDED

Shear Cylinder did not make sensor S115 after actuation.

SHEAR CYLINDER NOT RETRACTED

Shear Cylinder did not make sensor S115 after actuation.

7.5. Press Assembly

TOP PRESS NOT CLOSED

Cylinder did not make sensor S112 after actuation.

TOP PRESS NOT OPENED

Cylinder did not make sensor S112 after actuation.

BOTTOM PRESS NOT CLOSED

Cylinder did not make sensor S111 after actuation.

BOTTOM PRESS NOT OPENED

Cylinder did not make sensor S111 after actuation.

7.6. Gate Assembly

CARRIAGE (LEAD MODULE) NOT AT HOME

Lead module did not return to its home position. Sensor S107 was not made.

GATE #1 CLOSED

Motion cannot occur because gate #1 is closed.

GATE #1 NOT CLOSED

Gate Cylinder did not make sensor S110 after actuation.

GATE #1 NOT OPENED

Gate Cylinder did not make sensor S110 after actuation.

GATE #2 CLOSED

Motion cannot occur because gate #2 is closed.

GATE #2 NOT CLOSED

Gate Cylinder did not make sensor S109 after actuation.

GATE #2 NOT OPENED

Gate Cylinder did not make sensor S109 after actuation.

TOOLING NOT UNDER PRESS

Motion cannot occur unless tooling is under the press. If tooling is present check sensor S108.

7.7. Cable Clamp Assembly

CABLE CLAMP NOT CLOSED

Cylinder did not make sensor S104 after actuation.

CABLE SUPPORT CYLINDER NOT IN

Cylinder did not make sensor S106 after actuation.

CABLE SUPPORT CYLINDER NOT AT REST

Cylinder did not make sensor S105 after actuation.

7.8. Cable Eject Assembly

EJECT ARM FAULT

During running, the eject arms did not make sensor S124.

SET EJECT ARM AND LATCH RELEASE

Set the eject arms and first module latch release for proper ejection of cable. Close the doors before pressing restart.

7.9. High Voltage Cable Tester

If these error messages occur, do the following:

1. Record the message, time and date, and where in the machine sequence the error occurred.
2. Turn the machine OFF.
3. Turn the machine ON and try to resume operation.
4. If the errors continue, report this to AMP Technical Assistance Center.

***** TESTER ERROR *****

SERIAL COMMUNICATION ERROR – OVERRUN ERROR

***** TESTER ERROR *****

SERIAL COMMUNICATION ERROR – CHECKSUM ERROR

***** TESTER ERROR *****

SERIAL COMMUNICATION ERROR – FRAMING ERROR

***** TESTER ERROR *****

SERIAL COMMUNICATION ERROR – NO RESPONSE OR INCORRECT ECHOED CHARACTERS

***** TESTER ERROR *****

CABLE TESTER ERROR – RELAY FAILURE

***** TESTER ERROR *****

CABLE TESTER ERROR – UART ERROR

***** TESTER ERROR *****

TESTER PROGRAMMING ERROR

***** TESTER ERROR *****

CABLE TESTER ERROR – (up to 6 characters from tester)

8. SENSOR SETTINGS AND ADJUSTMENTS

INPUT BOARD No. 1		
LED NO.	**SENSOR NAME**	**SENSOR TYPE●**
24	S124 EJECT ARM	PROXIMITY (983300–1)
Adjust the sensor so that the metal flag makes the sensor when it is retracted and extended. The sensor is not made only when the cylinder is in motion (LED on–off–on). Maximum sensing distance is 2.03 mm [.080 in.].		
23	S123 AIR PRESSURE	DIAPHRAGM (932810–1)
Sensor is made if air pressure is greater than 414 kPa [60 psi].		
22	S122 DEREELER – JAM	PROXIMITY (932856–3)
Adjust the sensor so that the metal edge of the dancer makes the sensor. Maximum sensing distance is 1.27 mm [.050 in.].		
21	S121 DEREELER – ON/OFF	PROXIMITY (932856–2)
Adjust the sensor so that the metal edge of the dancer makes the sensor. Maximum sensing distance is 1.27 mm [.050 in.].		
20	S120 CONNECTOR DROP No. 2, No. 3	THRU–BEAM PAIR (931956–1, 931957–1)
Align the receiver with the emitter. With the light beam unbroken, turn the sensitivity screw on the receiver down until the LED goes out. Then turn it up until the LED just turns on.		
19	S119 DEREELER – NO CABLE	PROXIMITY (932856–1)
Adjust the sensor so that the metal edge of the dancer makes the sensor. Maximum sensing distance is 1.27 mm [.050 in.].		
18	S118 CONNECTOR DROP No. 1, No. 4	THRU–BEAM PAIR (931956–2, 931957–2)
Align the receiver with the emitter. With the light beam unbroken,turn the sensitivity screw on the receiver down until the LED goes out. Then turn it up until the LED just turns on.		
17	S117 LOAD RAM	THRU–BEAM (931959–1)
Comb Style Flag Place four 10 position connectors into the product guides and push load rams into the tooling modules. Adjust the thru–beam so that last tooth is centered with sensor. (LED turns off). *Adjustable Style Flag (Vane)* The bracket supporting the thru–beam sensor should be centered in its mounting slot. The machine stops for adjustment of the flag during operation. Loosen the two knurled knobs on the load ram slide. Position the vane so that the pilot on the sensor bracket engages the vane. Tighten the two knurled knobs. Resume operation.		
16	S116 LOAD RAM SPLIT CYCLE	MAGNETIC REED (931958–1)
Place reed sensor about mid stroke of cylinder. When running, if connectors are sliding into the path of the returning tooling modules, move the sensor closer to the rest position of the cylinder.		
15	S115 SHEAR	THRU–BEAM (931958–1)
Adjust the thru–beam sensor so that the metal flag does not break the thru–beam at both the rest or the extended positions of the cylinder. The beam is broken only when the cylinder is in motion (LED on–off–on).		
14	STEPPER MOTOR (K314)	RELAY CONTACT
Relay is energized after the Homing sequence.		
13	S113 (A–F) INTERLOCKS	MAGNETIC REED (932841–1)
The switch is closed when the magnet is present. All 7 interlocks are wired in series. When the switches are closed the LED is on.		
12	S112 TOP PRESS RAM	PROXIMITY (983300–1)
Adjust the sensor and the collars (2) so that the sensor is made when the cylinder is at both the rest and extended positions. First mount and adjust the sensor for distance from the collars and then move the collars until the sensor is just made. **Do not place the split of the collar over the target area of the sensor**. The sensor is not made only when the cylinder is in motion (LED on–off–on). Maximum sensing distance is 2.03 mm [.080 in.].		
11	S111 BOTTOM PRESS RAM	PROXIMITY (983300–1)
Adjust the sensor and the collars (2) so that the sensor is made when the cylinder is at both the rest and extended positions. First mount and adjust the sensor for distance from the collars and then move the collars until the sensor is just made. **Do not place the split of the collar over the target area of the sensor**. The sensor is not made only when the cylinder is in motion (LED on–off–on). Maximum sensing distance is 2.03 mm [.080 in.].		

LED NO.	SENSOR NAME	SENSOR TYPE●
10	S110 GATE No. 1	PROXIMITY (983300–1)
Adjust the sensor so that it is made when cylinder is at both the rest and extended positions. The sensor is not made only when the cylinder is in motion (LED on–off–on). Maximum sensing distance is 2.03 mm [.080 in.].		
09	S109 GATE No. 2	PROXIMITY (983300–1)
Adjust the sensor so that it is made when the cylinder is at both the rest and extended positions. The sensor is not made only when the cylinder is in motion (LED on–off–on). Maximum sensing distance is 2.03 mm [.080 in.].		
08	S108 CARRIAGE UNDER PRESS	PROXIMITY (983300–1)
Adjust the sensor so that it is made with the rod of the tooling module as it is locked in place by the two gates. Maximum sensing distance is 2.03 mm [.080 in.].		
07	S107 HOME (LEAD MODULE)	PROXIMITY (931954–1)
Position the sensor as referenced on Gate Assembly drawing 760705. Adjust the flat head screw on the lead tooling module rod so that it almost touches the end of the sensor. Home the carriage in manual mode and observe the first module when the gates close. If they do not close freely, adjust the flat head screw in or out until the gates do close freely. Maximum sensing distance is 0.76 mm [.030 in.].		
06	S106 CABLE SUPPORT EXTEND	PROXIMITY (983300–1)
Adjust the sensor so that it is made when the cable support is extended. Maximum sensing distance is 2.03 mm [.080 in.].		
05	S105 CABLE SUPPORT RETRACT	PROXIMITY (983300–1)
Adjust the sensor so that it is made when the cable support is retracted. Maximum sensing distance is 2.03 mm [.080 in.].		
04	S104 CABLE CLAMP	PROXIMITY (983300–1)
The sensor and the actuator should be adjusted so that the sensor is made when the cylinder is at both the rest and extended positions. The sensor is not made only when the cylinder is in motion (LED on–off–on). Maximum sensing distance is 2.03 mm [.080 in.].		
03	S103 CABLE FEED	PROXIMITY (983300–1)
The sensor and the actuators should be adjusted so that the sensor is made when the cylinder is at both the rest and fully extended positions. The extended position varies depending on the stop block. The sensor must be made at all positions. The sensor is not made only when the cylinder is in motion (LED on–off–on). Maximum sensing distance is 2.03 mm [.080 in.].		
02	S102 BIN DIVIDER	PROXIMITY (983300–1)
Adjust sensor so that the metal flag makes the sensor when it is retracted and extended. Maximum sensing distance is 2.03 mm [.080 in.].		
01	EMERGENCY STOP	PUSH BUTTONS

INPUT/OUTPUT BOARD No. 2

LED NO.	SENSOR NAME	SENSOR TYPE●
02	S202 FEED/SHEAR UNIT EXTENDED	PROXIMITY (983300–1)
Adjust the sensor so that it is just made when the feed/shear unit is extended. The flat head screw can be adjusted to vary the sensing distance. Maximum sensing distance is 2.03 mm [.080 in.].		
01	S201 FEED/SHEAR UNIT RETRACTED	PROXIMITY (983300–1)
Adjust the sensor so that it is just made when the feed/shear unit is retracted. The flat head screw can be adjusted to vary the sensing distance. Maximum sensing distance is 2.03 mm [.080 in.].		

●● GENERAL SENSOR TYPES AND CONDITIONS

PROXIMITY: Senses when metal is in the target area. When metal is sensed, the corresponding LED is turned on.
THRU–BEAM: Senses when the light beam is broken. When the light beam is broken the corresponding LED is turned off.
MAGNETIC: Switch closes when the magnet is near. When the switch is closed the corresponding LED is turned on.
DIAPHRAGM: Switch closes when air pressure is present. When the switch is closed the corresponding LED is turned on.

9. PRINTER INFORMATION

There are four different items that can be sent to a serial printer; a continuous good/bad batch report, a test report log, a machine event log, and the machine totals.

For the purposes of statistical process control, the machine is able to print continuously the test report of each cable during the running of a batch. A header includes the part number and company name, quantities, and “good” or “bad” for each assembly made. A summary indicates the number of good and bad assemblies made at the completion of the batch. If a printer problem develops, such as off–line, out of paper, etc., the machine will display a printer error. The machine operation can then continue by disabling this option or fixing the printer problem. This option is enabled or disabled in the report options menu on the machine.

The test report is intended to be a report that can be included with a shipment to a customer. It includes the part number, company name, start time–and–date, completed time–and–date and the quantity made good. Under report options on the machine you can enter the number of reports wanted up to 20. Only the 20 most recent reports are saved, and the last printed will be the most recent. These can also be viewed on the machine itself.

The machine event log records many machine events. All run errors, most mode changes and part changes are considered as events. Only the most recent 300 events are stored and can be sent to the printer from the machine, or viewed on the machine itself.

The machine totals includes the total terminated connectors, total good assemblies, and total bad assemblies made from the last time it was reset. The reset time–and–date is also recorded. They can be reset at the machine itself.

The printer must be a serial printer with a buffer that prints ASCII characters. The cable configuration may change from printer to printer. The signal lines are indicated in the table. Set up the printer for serial communication at 9600 bits per second, 8 data bits, one stop bit, and no parity bit. The table shown is for an Epson■ printer with a serial adapter.

Epson printer 25 pin plug			R–CAM 2A 25 pin receptacle
Shield GND	1		
Rx	2	3	Tx
Busy/Ready	20	4	Clear to send
GND	7	7	GND

The busy/ready line from the printer must be high to indicate that the printer is ready (Active High).

The mating connector for the R–CAM 2A serial port is:

207463–2	Receptacle
205089–1	Socket (machine screw) or
66569–3	Socket (solder cup)
206390–1	Cable Clamp

The mating connector for the Epson serial printer port is:

207464–1	Plug
205090–1	Pin (machine screw) or
66570–3	Pin (solder cup)
206390–1	Cable Clamp

10. REVISION SUMMARY

Since the previous release, the following changes and additions were made to this document:

Per EC 0150–3347–95:

- Added caution concerning Electrostatic Discharge (ESD) damage
- Added noise level values in Figure 2

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