

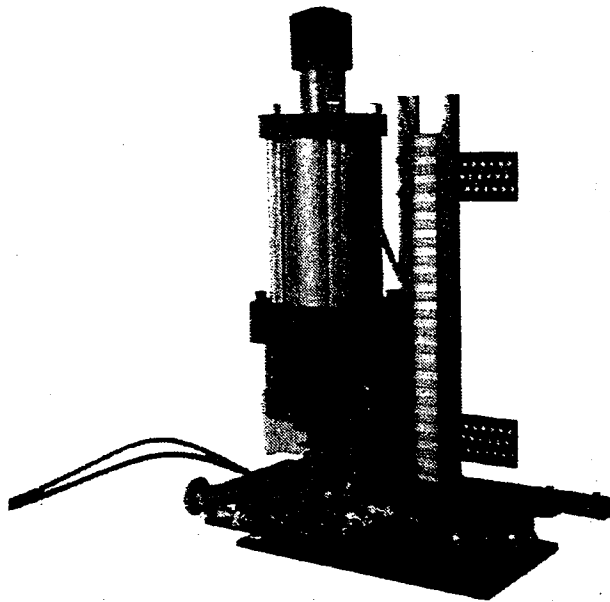


Ribbon Cable Termination Machine

AM8642 Eng. No.

11-20-0418 Order No.

**For ".156 IDT" Connector
7674 & 7675 Series
Instruction Manual**



*** DESCRIPTION**

*** OPERATION**

*** MAINTENANCE**

Doc. No	11-32-8184
Release Date	1980/04
Revision:	A
Revision Date:	1997/06/19

WARNING

- NEVER** USE THIS MACHINE WITHOUT THE GUARDS OR SAFETY DEVICES THAT ARE INTENDED TO PREVENT HANDS FROM REMAINING IN THE TERMINATION OR FEED AREAS. **RUNNING THIS MACHINE WITHOUT GUARDS, UNDER ANY CIRCUMSTANCES, CAN CAUSE SERIOUS INJURY.**
- NEVER** OPERATE, SERVICE, OR ADJUST THIS MACHINE, OR INSTALL TERMINATION TOOLING, WITHOUT PROPER INSTRUCTION AND WITHOUT FIRST READING AND UNDERSTANDING THE INSTRUCTIONS IN THIS MANUAL.
- NEVER** INSTALL TERMINATION TOOLING OR SERVICE THIS MACHINE WHILE IT IS CONNECTED TO ANY AIR SOURCE. DISCONNECT AIR BY UNPLUGGING THE TERMINATOR FROM ITS AIR SOURCE.

WORK SAFELY AT ALL TIMES

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LOCAL MOLEX SALES OFFICE**

AM8642 Ribbon Cable Terminator

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SECTION 1

**GENERAL DESCRIPTION, SET UP
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1 GENERAL DESCRIPTION

1.1 DESCRIPTION

The MOLEX AM8642 ribbon cable harness assembly machine was designed as a fast, reliable and inexpensive method of assembling .156 KK IDT series (.156 center Insulation Displacement Technology) harnesses. An operator hand loads the individual connectors (7674 & 7675 series) into the drop rails. Then the operator pushes the feed button to move the connector into position to terminate the cable. The cable is positioned in the termination head and the foot pedal is pressed. The cable will automatically be terminated and the next connector indexed into position. This machine is ideally suited for medium volume, semi-automatic applications.

1.2 FEATURES

- This terminator will do either Feed-To or Feed-thru terminations.
- This terminator is totally air operated, No electricity needed.

1.3 TECHNICAL SPECIFICATIONS

1.3.1 Dimensions

Length	29.8 cm (11.75")
Depth	20.9 cm (8.25")
Height	43.8 cm (17.25")

1.3.2 Weight

21.0 kg. (46.3 lbs.) Unpacked

1.3.3 Pneumatic Requirements

Pressure: 5BAR (80 p.s.i.) min.

Consumption: 3.5L/ Min.(.125 CFM)

1.4 DELIVERY CHECK

Carefully remove the machine from its crate. Check to see that the following items are included in this package:

	Qty.
Termination Machine	1
Foot Pedal Assembly	1
Instruction Manual	1
Filter-Regulator-Lubricator Assy	1

1.5 TOOLS

The following tools may be needed to operate and adjust this machine:

- 1 English Hex Wrench Set.
- 1 5X Eye Loupe
- 1 Needle Nose Pliers

1.6 INSTALLATION

- 1.6.1** Place the ribbon cable harness assembly machine on a level surface with enough space around it to allow for operation and easy loading of connectors.

1.6.2 Foot Pedal

Plumb the 2 hoses from the foot pedal to the appropriate fittings on the terminator if not already hooked up. See Pneumatic Diagram in Appendix A.

1.6.3 Air Supply

Since there are so many variations in air connections, Molex does not supply any type for air installation. Thus the user

must supply a fitting of his choice to connect air of the correct pressure and volume to the 1/4NPT port on the F-R-L unit. Use 8mm (1/4") line minimum. Once attached, adjust the regulator on the F-R-L to 80-85psig (5.0-5.3BAR). Fill the lubricator bowl to the line with S.A.E. 10 motor oil or equivalent.

1.7 SETUP

1.7.1 Magazine Drop Rails

See Fig. 1.3. To adjust the rails to the proper spacing, remove the screws that hold the outer rail to the brackets. Use a connector of the desired circuit size as a spacer between the rails. Reinstall the outer rail, putting the screws in the holes which line up with the tapped holes in the brackets behind the rail. The connector should slide freely in the drop rails.

1.7.2 End Wall Retainer

See Fig. 1.1. End wall retainers are provided to prevent connector end walls from flaring out in termination. An adjustable outer end wall retainer is necessary to accommodate different connectors sizes. This retainer is located on the right side of the termination punches. To adjust the end wall retainer, load the appropriate connector, then disconnect the air supply and remove the clear plastic guard. Remove the screw that holds the retainer assembly and locate it so the flag that protrudes down is just beyond the left end of the connector. Reinstall the screw and replace the guard.

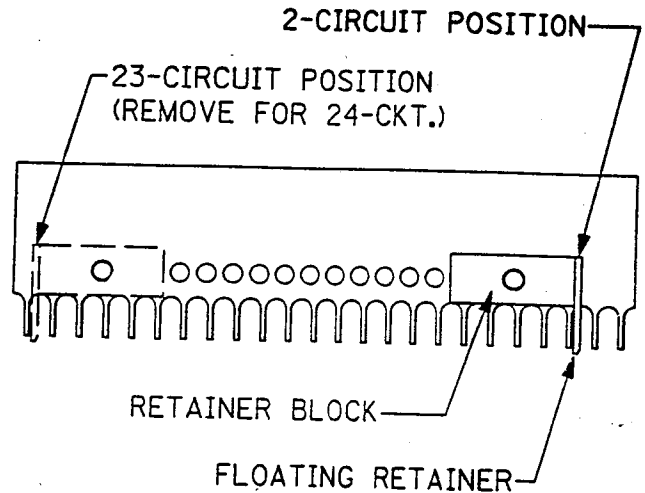


Fig. 1.1
END WALL RETAINER

1.7.3 Stroke

See Fig. 1.3. The stroke on the termination ram is pre-adjusted at the factory. If it becomes necessary to re-adjust the stroke, release the locking set screw on the knurled portion of the adjustment knob. This is located at the top of the ram cylinder. Turning the knob counter-clockwise lowers the termination depth. Turning it clockwise will raise the termination depth. When the depth is set, re-tighten the set screw.

1.8 OPERATION

1. Load the magazine with connectors of the same circuit size (see "Setup" for setting up the magazine drop rails). A minimum of five(5) connectors should always be in the magazine during operation.
2. To feed the connectors into the termination station, depress the feed button and allow a connector to drop down into the feed track. Then release the feed button. The feeder will

automatically locate the connector in the proper position for termination.

3. (a) See Fig. 1.2A. If feed-to terminations are desired, lower the cable stop, load pre-notched cable into the cable track, guiding it along the back and over the top of the connector to the cable stop.

(b) See Fig. 1.2B. If feed-thru terminations are desired, raise the cable stop. Then slide the pre-notched cable through the cable track along the back rail until the notches are centered over the connector

4. While holding the cable in place, depress the foot valve and hold until the ram drives the cable all the way down to its proper depth in the connector. Then release the foot valve.

5. When the foot valve is released, the next connector will automatically feed into the termination station. This will also push the terminated connector forward for removal from the track.

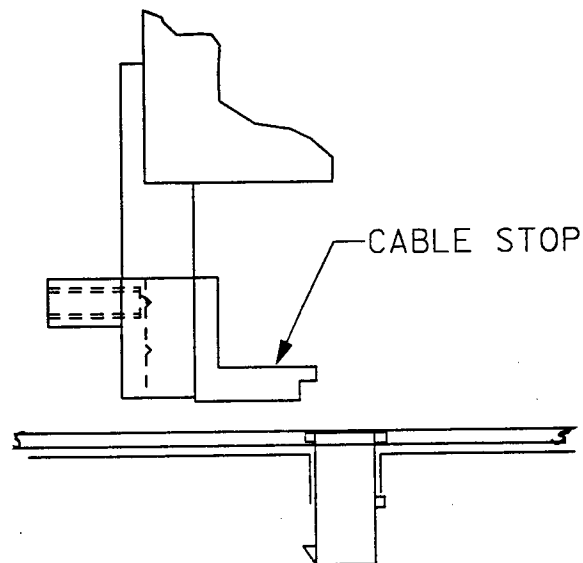


Fig. 1.2B
FEED-THRU
(CABLE STOP UP)

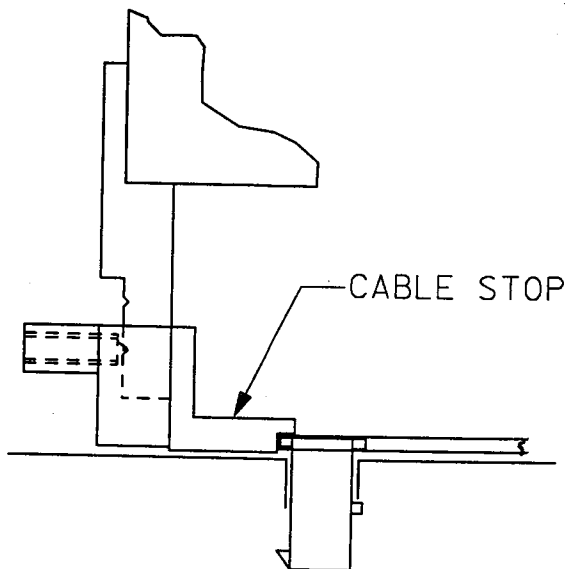
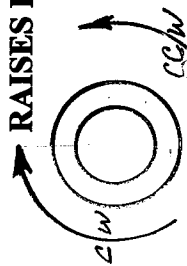


Fig. 1.2A
FEED-TO
(CABLE STOP DOWN)

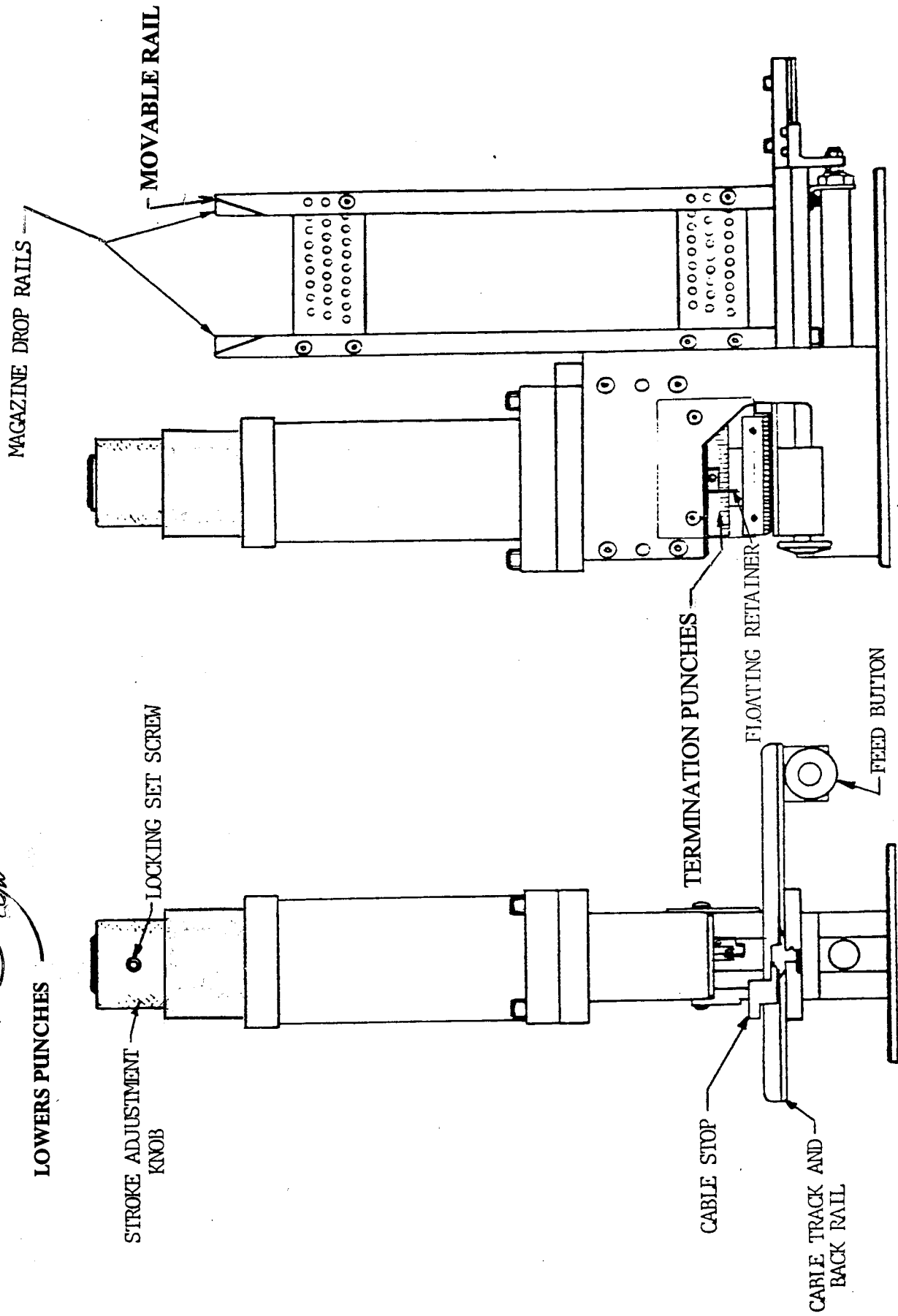
RAISES PUNCHES



LOWERS PUNCHES

Fig. 1.3

OVERALL VIEW



SECTION 2

MAINTENANCE AND PROBLEM CHECKLIST

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2 MAINTENANCE

WARNING

Disconnect the compressed air line during all maintenance operations.

2.1 CLEANING

See Chart 2.1 for recommended Preventive Maintenance Schedule.

2.1.1 For efficient operation, the terminator should be cleaned daily with a soft bristle brush to remove any debris and terminal plating dust from the tooling area. For continuous operation this may have to be done several times throughout the day.

2.1.2 When it is necessary to change tooling, care should be taken to remove any debris from tapped holes or mounting surfaces. Debris can prevent tooling from being properly locked into position.

2.1.3 Using compressed air to clean tooling is not recommended. Chips can wedge in the tooling and/or fly at an operator.

2.1.4 Keep the air filter clean. A visible coating of dirt in the bowl indicates that the unit needs cleaning. To clean, remove the bowl and filter unit and clean with denatured alcohol.

2.2 LUBRICATION

2.2.1 Sparingly lubricate the sliding parts approximately every month with S.A.E. 10W motor oil or equivalent.

2.2.2 Check the oil level in the lubricator bowl periodically and fill as needed with S.A.E. 10W motor oil.

2.3 PERISHABLE PARTS

These parts make contact with the connector and can wear over time. The customer is responsible for maintaining a set of these parts and Molex recommends that they keep at least one spare set on hand at all times.

Molex Part No. Description

11-21-5862 Right Termination Punch

11-21-5863 Left Termination Punch

2.4 SPARE PARTS

These are parts that are available to support the terminator in service. They are moving or otherwise functioning parts that could be damaged or malfunction. It is suggested that the customer may want to keep some or all of them on hand to reduce down time. These parts are identified in the Bill of Materials in Appendix A.

CHART 2.1 PREVENTIVE MAINTENANCE

DAILY: Clean, See Section 2.1

MONTHLY: Check air filters & clean as necessary, See 2.1.4.

Lubricate sliding parts, See 2.2.1.

Check oil level in lubricator, See 2.2.2.

CHECK SHEET		MONTH	YEAR					
		MON	TUE	WED	THU	FRI	SAT	SUN
(Daily) Clean (Check box when done)	WEEK 1							
	WEEK 2							
	WEEK 3							
	WEEK 4							
	WEEK 5							
(Monthly)	Air Filters		Lub ricate			Oil Level		

Chart may be copied for mounting.

Schedule should be adjusted up or down depending on usage.

It is Molex's recommendation that a log of preventive maintenance be kept with the machine.

2.5 PROBLEM CHECKLIST

The following is a list of possible problems, their causes and their solutions.

<u>PROBLEM</u>	<u>CAUSE</u>	<u>SOLUTION</u>
Wire not terminated properly in connector.	1. Improper gauge wire	See product catalog for proper terminal.
	2. Connector not lined up with termination punch.	Check connector feed for proper operation
	3. Termination punch too high.	Adjust termination stroke.
	4. Air pressure too low.	Adjust air pressure.
Connector not feeding in track.	1. Check for debris in the track	Clear Track
	2. Air pressure too low	Adjust air pressure

SECTION 3

STATISTICAL PROCESS CONTROL (SUMMARY)

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3.3 PRODUCTION... ..	3-3

3.1 I.D.T. TERMINATION PROCESS CONTROL

The I.D.T termination process is the interaction of a terminal, wire, tooling, personnel, methods and procedures, and environmental attributes that, when controlled, produce a quality termination. Quality control is an important aspect to quality termination. It should not take excessive setup or inspection time to implement, and can save a harness manufacturer thousands of dollars in potential rework or re-manufacturing.

The key to quality is to target nominal specifications while continuously reducing variability. Variability is the slight changes that occur from wire to wire. There are two types of variability, common and special. Common sources of variation are those causes that affect the process uniformly, and are created from numerous small sources. Common variability are inherent tolerances within a reel of wire, terminals or connector housings. Also, common variability is created by the natural tolerances of the harness assembly machines. Reduction of variability at the common level normally has to come from changes at the wire, terminal, and tooling manufacturer.

The second source of variability is referred to as special cause. Unlike common cause, special sources of variation occur irregularly and unpredictably. Without checks throughout a run, a tool becoming loose after the first hundred cycles, or a damaged tool from a jam, may be undetected until thousands of assemblies are made.

This section assumes that the termination depth is being measured with a resolution of .025 mm (.001 in), and pull force is measured with a resolution of 1 N (.25lbs).

3.2 PROCESS CAPABILITY

Molex qualifies each I.D.T terminator for termination depth and vertical pull force. (where applicable) This qualification is performed on a specified sample, and is targeted at 2 CpK. Before a new tool is put in production, it is recommended that a capability study be done by the customer using their specific wire in their process. A capability study is based on the assumption of a normal distribution (bell-type curve). It provides an estimate on the probability of a measurement being outside of specification.

CpK	+/- Sigma	% Yield	PPM
0.67	2	95.45	45,500
1	3	99.73	2,699
1.33	4	99.99	63
1.67	5	99.99+	0.57
2	6	99.99++	0

PPM - Parts per million potential defects.

A minimum of a 25 piece sample should be run. The average and standard deviation should be calculated for each specification.

A capability index defined by the formula below. Cp may range in value from 0 to infinity, with a larger value indicating a more capable process. A value >1.33 is normally considered acceptable.

$$\frac{\text{Tolerance}}{6 \times \text{Standard Deviation}}$$

The CpK index indicates whether the process will produce units within the tolerance limits. CpK has a value equal to Cp if the process is centered on the mean of specification; if CpK is negative, the process mean is outside the specification limits; if CpK is between 0 and 1 then some of the 6 sigma spread falls outside

the tolerance limits. If CpK is larger than 1, the 6 sigma spread is completely within the tolerance limits. CpK is calculated with the lesser of the following formulas:

$$\frac{(USL - MEAN)}{3 * \text{Std Deviation}}$$

$$\frac{(LSL - MEAN)}{3 * \text{Std Deviation}}$$

USL = Upper Specification Limit,

LSL = Lower Specification Limit

Six sigma is a goal of many companies because it represents virtually zero defects. The ability of a company to achieve a six sigma level is dependent on the amount of common variability in their process. A termination hand tool will produce more variability than a bench mounted terminator. Operator run terminators will produce more variability than a fully automatic machine.

A portion of the variability in harness assembly will come from the instruments used to measure the parts and the ability of an operator to repeat the measurement. A drop gauge will measure more accurately than a dial caliper. An automatic pull force system will measure better than a hook type scale. It is important that the measurement gage has enough resolution. Also, two operators may measure the same part differently, or the same operator may measure the part different when using two types of gages. A gage capability study is recommended to identify what part of the variability is coming from measurement error. The variability from measurement error can keep CpK's low.

The capability of the process should be re-confirmed if the production data is significantly different from the capability study.

3.3 PRODUCTION

Once the level of capability is established, the machine is ready for production.

Many harness manufacturers run only a few hundred or few thousand wires at one time. In this case, it is not practical or economical to run a twenty-five piece capability with every setup.

3.3.1 Setup Confirmation

After the setup of the termination process, terminate five terminals with a shallow termination depth. Visually inspect for tooling marks on the terminal and housing, and measure termination depth. Make the appropriate adjustments to the machine. (Refer to product termination specification and problem checklist sections if needed.) After all adjustments have been made, terminate five more samples for termination depth measurement. Then measure and document the average depth, the maximum reading, and the minimum reading. The range is considered the maximum reading minus the minimum reading. With a drop gauge and an experienced operator, the range for termination depth is normally only a few thousandth of an inch. This data becomes the first point on the control chart.

When the termination depth has been confirmed, the vertical pull force can be measured. This checks the capability of the insulation crimp (strain relief) to hold the wire to within the specification limits. This is best done with an automatic pull force system.

3.3.2 Production (Control Charting)

It should be normal procedure for the operator to visually check the terminal area for damage or improper termination. Termination should be checked throughout the run. The frequency of each check is determined by the risk you wish to take for scraping parts. A check every 250 to 500 parts is recommended.

Control Charting

Termination depth is normally control charted since it is a quick nondestructive measurement and is critical for the electrical reliability of the termination. There are three primary purposes for control charting. First, the number of setup samples are normally small, and its statistical value is limited. Second, since special-cause effects on a process are irregular and unpredictable, it is necessary to have a means of catching changes in the process as soon as they occur. This prevents thousands of terminations from being scrapped after the run is over. Third, and most important, this data is necessary to assess and improve the process.

Once the tooling process is setup and the wire size is not changing, keep one control chart for wire color changes, wire length changes, or setup adjustments. Record the data point on the chart before an adjustment is made. If data is recorded after each adjustment, the process most likely will assume control and provide little data for improving the process. Write as many notes on the chart as possible. The only truly effective and economically sensible manner of managing a manufacturing process is to understand, monitor, and reduce sources of variability inherent to the process itself. Every minute the process is down for setup or adjustment is unproductive.

Refer to the Example Control Chart on page 29. What does this sample chart tell us? A process shift occurred between measurement 12 and 13. This type of shift could occur due to a change in wire, a change in connector lots, a jam in the machine that damaged the tooling, a change in operators, or an adjustment to the machine. Since the measurements are still within specification, would you stop production to make adjustments?

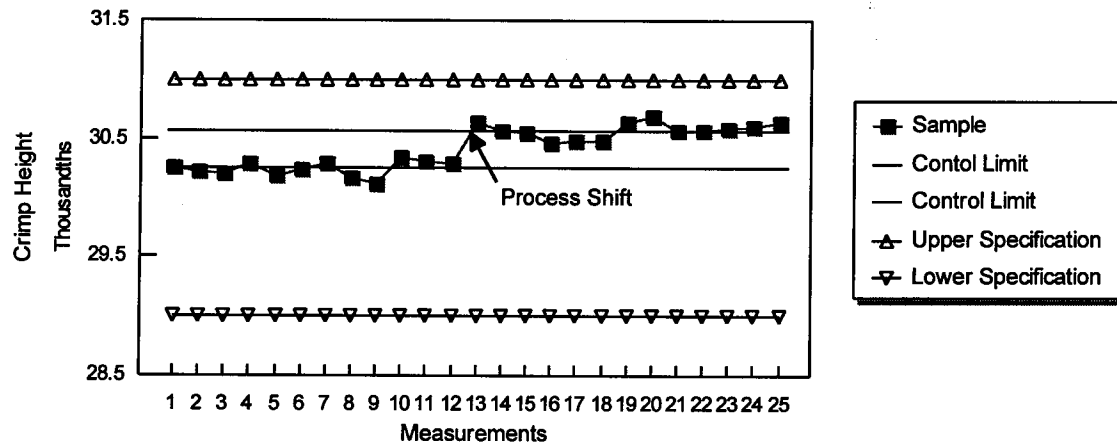
A shift in the process due to a change in wire insulation may warrant a termination depth adjustment. A shift after a jam would not indicate an adjustment, but a close evaluation of the tooling. A shift in the process between operators would not indicate an adjustment, but an evaluation of measurement capability. The idea of the control chart is to identify what caused the shift to justify if an adjustment to the process is warranted.

I.D.T. termination processes have been producing product within specification for many years. Today with statistical process control, the philosophy of quality is being within specification, is being replaced by being on target with continuous reduction in variability. Control charting is a tool that truly allows a company to understand their process.

ATTENTION

Reference must always be made to product application / termination specification to determine harness assembly parameters.

Example Control Chart



SECTION 4

APPLICATION OF KK PRODUCT & TERMINATION INFORMATION

NOTE: The following document is uncontrolled and may therefore not be the latest. For the latest, contact your sales representative and ask for Drawing SDES-7674-0002.



MOLEX INCORPORATED
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WIRE TERMINATION SPECIFICATION

- 1.0 APPLICABLE DRAWINGS:
THIS SPECIFICATION APPLIES TO THE .156 CENTERLINE INSULATION DISPLACEMENT CONNECTOR SERIES.
- 2.0 SCOPE:
THIS SPECIFICATION IS DESIGNED TO INSURE THE PROPER PERFORMANCE OF THE .156 SERIES OF INSULATION DISPLACEMENT CONNECTORS
- 3.0 GENERAL:
THE .156/(3.96) CENTER INSULATION DISPLACEMENT CONNECTOR SYSTEM IS DESIGNED TO INTERCONNECT .045/(1.14) SQUARE PINS AND MOLEX RIBBON CABLE OR DISCRETE WIRE (REQUIREMENTS OUTLINED IN THIS SPECIFICATION.)
- 4.0 CONDUCTOR REQUIREMENTS: SEE FIGURE 1 (7,10,16,19 STRANDED WIRE IS APPROVED BY MOLEX)
- 4.1 CONDUCTOR SIZE IDENTIFICATION:
- TERMINALS STAMPED WITH THE LETTER 'A' ACCEPTS UL WIRE NOS.
1007/1569/1061 - 18 AWG SOLID, TINNED
1007/1569/1061 - 18 AWG STRANDED, TOPCOATED OR FUSED
- TERMINALS STAMPED WITH THE LETTER 'B' OR 'M' ACCEPTS UL WIRE NOS.
1007/1569/1061 - 20 AWG SOLID, TINNED
1007/1569/1061 - 20 AWG STRANDED, TOPCOATED OR FUSED
1007/1569/1061 - 18 AWG STRANDED, TINNED
- TERMINALS STAMPED WITH THE LETTER 'B' OR 'M' ACCEPTS MOLEX CABLE.
40174 - 18 AWG STRANDED, TINNED
7517 - 18 AWG STRANDED, TINNED
- TERMINALS STAMPED WITH THE LETTER 'C' OR 'L' ACCEPTS UL WIRE NOS.
1007/1569/1061 - 20 AWG STRANDED, TINNED
- TERMINALS STAMPED WITH THE LETTER 'F' OR 'J' ACCEPTS UL WIRE NOS.
1007/1569/1061 - 22 AWG SOLID, TINNED
1007/1569/1061 - 24 AWG SOLID, TINNED
1007/1569/1061 - 22 AWG STRANDED, TOPCOATED OR FUSED
1007/1569/1061 - 24 AWG STRANDED, TOPCOATED OR FUSED
1007/1569/1061 - 22 AWG STRANDED, TINNED
- TERMINALS STAMPED WITH THE LETTER 'F' OR 'J' ACCEPTS MOLEX CABLE.
7382 - 22 AWG STRANDED, TINNED
8868 - 22 AWG STRANDED, TOPCOAT

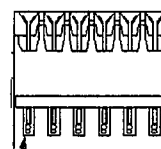


FIGURE 1

- 4.2 INSULATION REQUIREMENTS:
INSULATION DIAMETER: .095 MAX
INSULATION HARDNESS: 85 TO 96 ON THE SHORE A SCALE

- 4.3 OTHER WIRE SIZES AND INSULATION MATERIAL MUST BE APPROVED BY MOLEX.

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MOLEX INCORPORATED

LISLE, ILL.

60532

U.S.A.

WIRE TERMINATION SPECIFICATION

5.0 TERMINATION REQUIREMENTS:

5.1 WIRE INSERTION DEPTH:

WIRE SHOULD BE INSERTED TO A DEPTH JUST BELOW MOLDED STRAIN RELIEFS (WHERE THE MOLDED WIRE STRAIN RELIEFS RETURN TO THEIR NORMAL POSITION.)

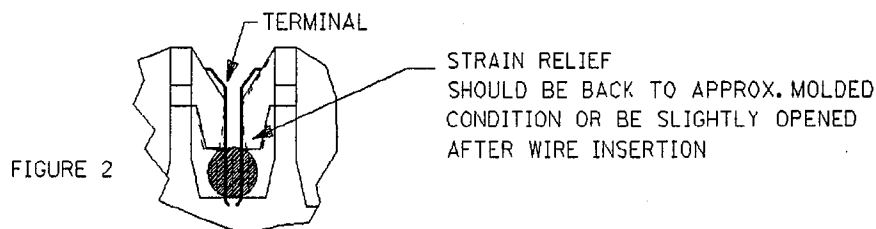


FIGURE 2

5.2 WIRE CUT OFF

THE WIRE MUST BE DISPLACED IN BOTH INSULATION DISPLACEMENT SLOTS AND MUST PROTRUDE THROUGH THE SECONDARY SLOT BY $(1.14) \pm .040$ MIN. AS SHOWN IN FIGURE 3

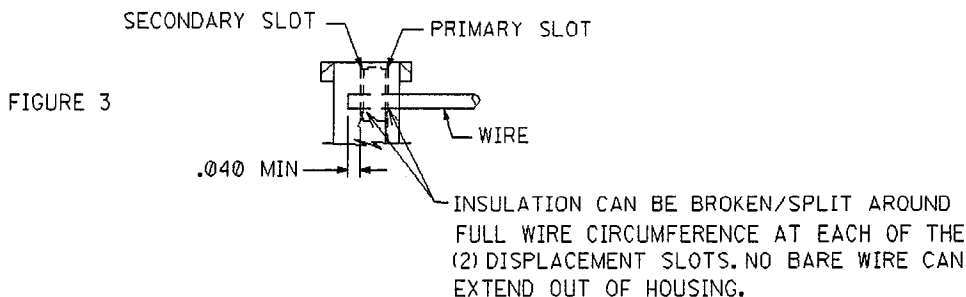
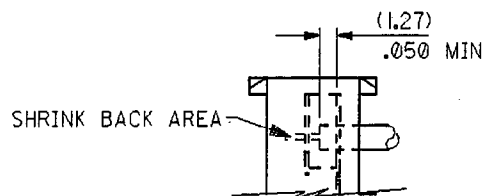


FIGURE 3

5.3 INSULATION SHRINK BACK

INSULATION SHRINK BACK IS PERMISSIBLE ON ALL CONDUCTORS EXCEPT STRANDED PROVIDED THE INSULATION EXTENDS THROUGH ONE I.D. SLOT BY $(1.27) \pm .050$ MIN. AS SHOWN IN FIGURE 4. ON STRANDED WIRE THE JACKET MUST BE TRAPPED IN BOTH INSULATION DISPLACEMENT SLOTS.



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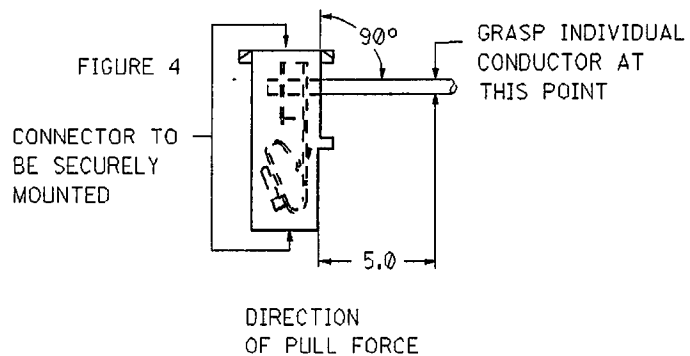


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WIRE TERMINATION SPECIFICATION

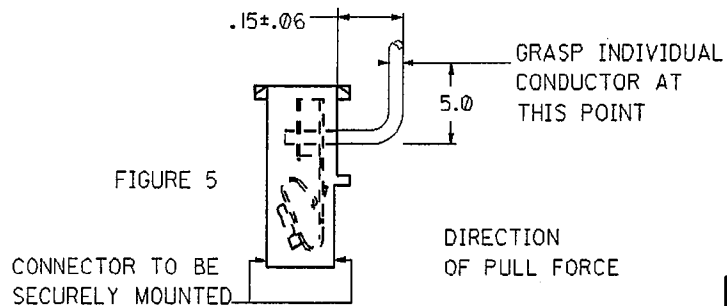
- 5.4 HORIZONTAL PULL OUT FORCE (FOR UL1061 WIRE WITH SEVEN STRANDS)
THE CONNECTOR MUST MAINTAIN THE FOLLOWING MIN. PULL OUT VALUES WHEN A FORCE IS APPLIED AT A RATE OF 1 INCH PER MINUTE TO THE CABLE IN A DIRECTION PERPENDICULAR TO THE INSULATION DISPLACEMENT SECTION, AS SHOWN IN FIGURE 4. (NOTE CABLE MUST BE SLIT TO FORM INDIVIDUAL CONDUCTORS AFTER TERMINATION BUT PRIOR TO TESTING)

AWG	PULL FORCE
18 AWG	20.0 LBS MIN
20 AWG	17.0 LBS MIN
22 AWG	12.7 LBS MIN
24 AWG	8.0 LBS MIN



- 5.5 VERTICAL PULL OUT FORCE (FOR UL1061 WIRE WITH SEVEN STRANDS)
THE CONNECTOR MUST MAINTAIN THE FOLLOWING MIN. PULL OUT VALUES WHEN A FORCE IS APPLIED AT A RATE OF 1 INCH PER MINUTE TO THE CABLE IN A DIRECTION PARALLEL TO THE INSULATION DISPLACEMENT SECTION, AS SHOWN IN FIGURE 5. (NOTE CABLE MUST BE SLIT TO FORM INDIVIDUAL CONDUCTORS AFTER TERMINATION BUT PRIOR TO TESTING)

AWG	PULL FORCE
18 AWG	5.0 LBS MIN
20 AWG	3.8 LBS MIN
22 AWG	3.5 LBS MIN
24 AWG	2.4 LBS MIN



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WIRE TERMINATION SPECIFICATION

5.6 TORSIONAL RESISTANCE

CONNECTOR MUST WITHSTAND A MAXIMUM TWIST ON A TERMINATED CABLE OF 130° WITHOUT DISTURBING THE INSULATION DISPLACEMENT INTERFACE IN THE PRIMARY OR SECONDARY SLOTS (SEE FIGURE 3) (NOTE CABLE MUST BE SLIT TO FORM INDIVIDUAL CONDUCTORS AFTER TERMINATION BUT PRIOR TO TESTING)

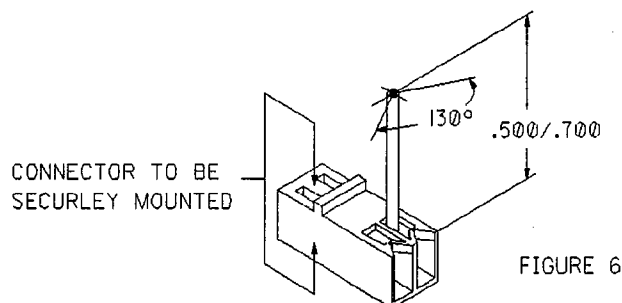


FIGURE 6

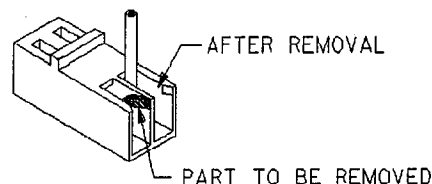
5.7 VISUAL INSPECTION:

AFTER TERMINATION, INSULATION DISPLACEMENT SECTION OF THE TERMINAL TO BE FREE OF TOOL MARKS FROM TERMINATION EQUIPMENT

6.0 TERMINATION EVALUATION PROCEDURE

STEP 1 - STRAIN RELIEF REMOVAL

REMOVE SHADED PORTION OF THE STRAIN RELIEF USING A RAZOR BLADE

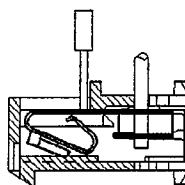
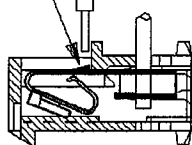


STEP 2 - REMOVAL OF TERMINAL

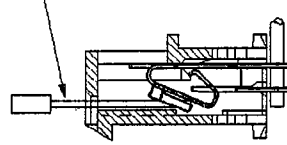
INSERT PROBE INTO LOCKING TANG WINDOW AND DEPRESS THE LOCKING TANG UNTIL IT CLEARS HOUSING, THEN PUSH THE TERMINAL OUT OF THE HOUSING USING A BLUNT .025 SQ. PIN

LOCKING TANG

PROBE



.025 SQ PIN



DRWG. NO.

SMES-7674-0002

REV.

SHT.

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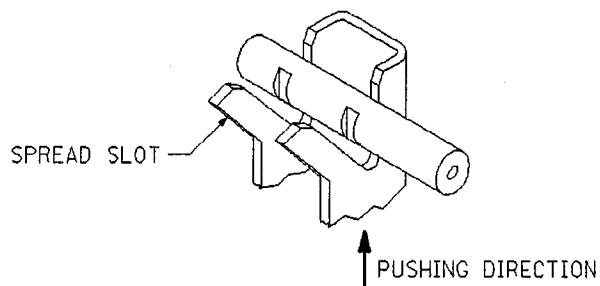


MOLEX INCORPORATED
LISLE, ILL. 60532 U.S.A.

WIRE TERMINATION SPECIFICATION

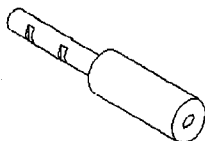
STEP 3 -CONDUCTOR REMOVAL

USING A SMALL PAIR OF PLIARS SPREAD THE I.D.T. SLOT
AND REMOVE CONDUCTOR BY PUSHING IN DIRECTION SHOWN



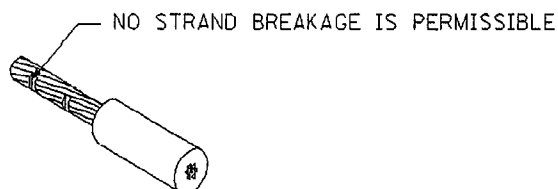
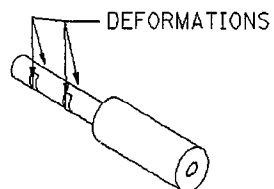
STEP 4 -REMOVING INSULATION

INSULATION TO BE REMOVED WITHOUT DISTURBING I.D.T. AREA



STEP 5 -CONDUCTOR INSPECTION

FOUR DEFORMATION POINTS MUST BE CLEARLY VISIBLE WHEN
USING 10X MAGNIFICATION



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APPENDIX A

PARTS LISTS, ASSEMBLY

DRAWINGS & SCHEMATICS

The following pages contain the machine Bill of Materials, Assembly Drawings, Electrical Schematics and Pneumatic Diagram. There are several things that will help you better understand and use this material:

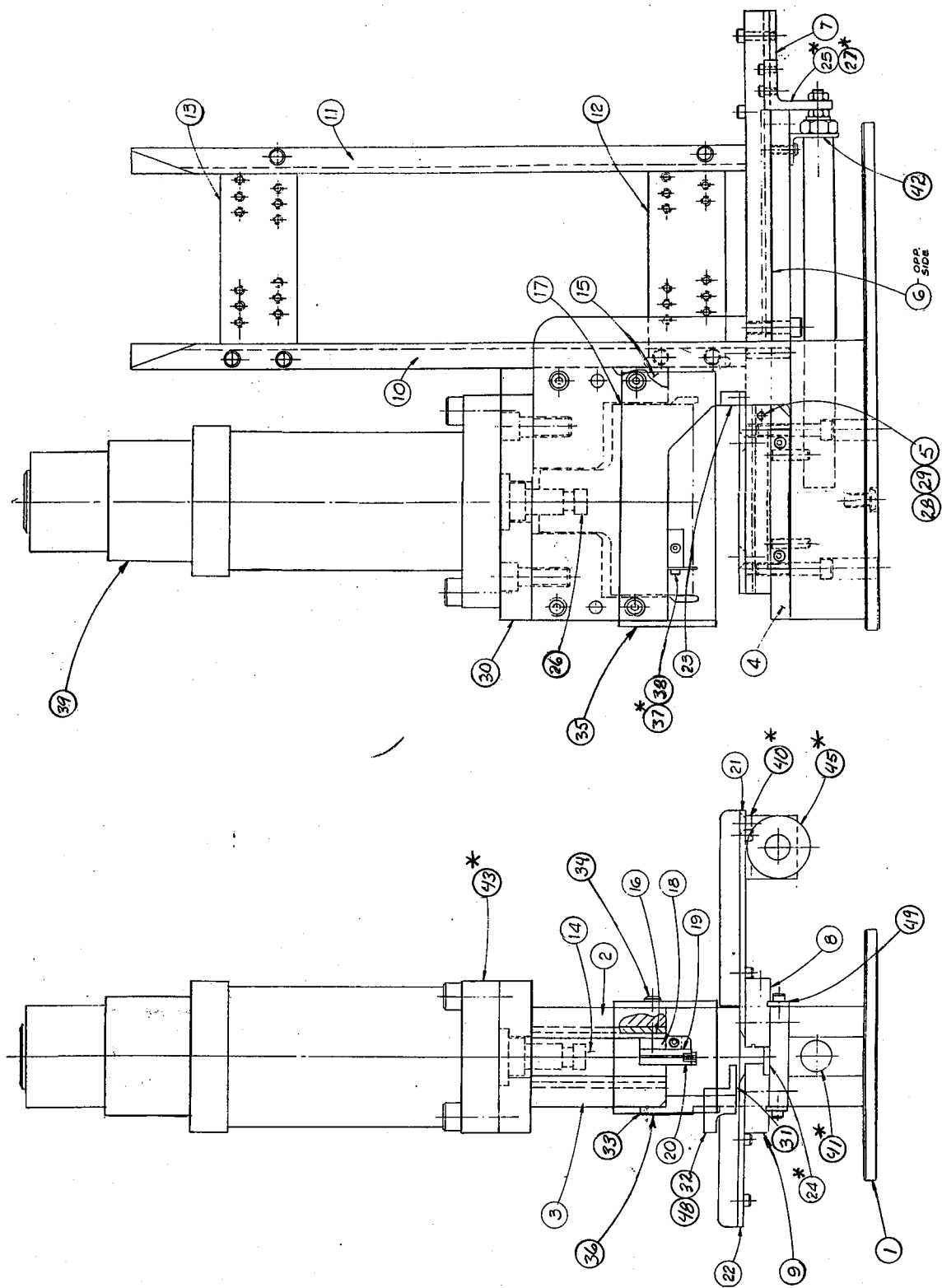
1. The "**Item No.**" in the Bill of Material matches the number in the balloon on the Assembly drawings.
2. The "**Order No.**" is the number to use if you are ordering one of that particular item.
3. "**RSP**" appearing at the end of the Description column means this item is a **Recommended Spare Part**. See Section 3.4.
4. The "**Req'd**" number is the quantity required per machine.
5. An asteric beside the item number balloon on the assembly drawings signals a **Recommended Spare Part**.

PARTS LIST

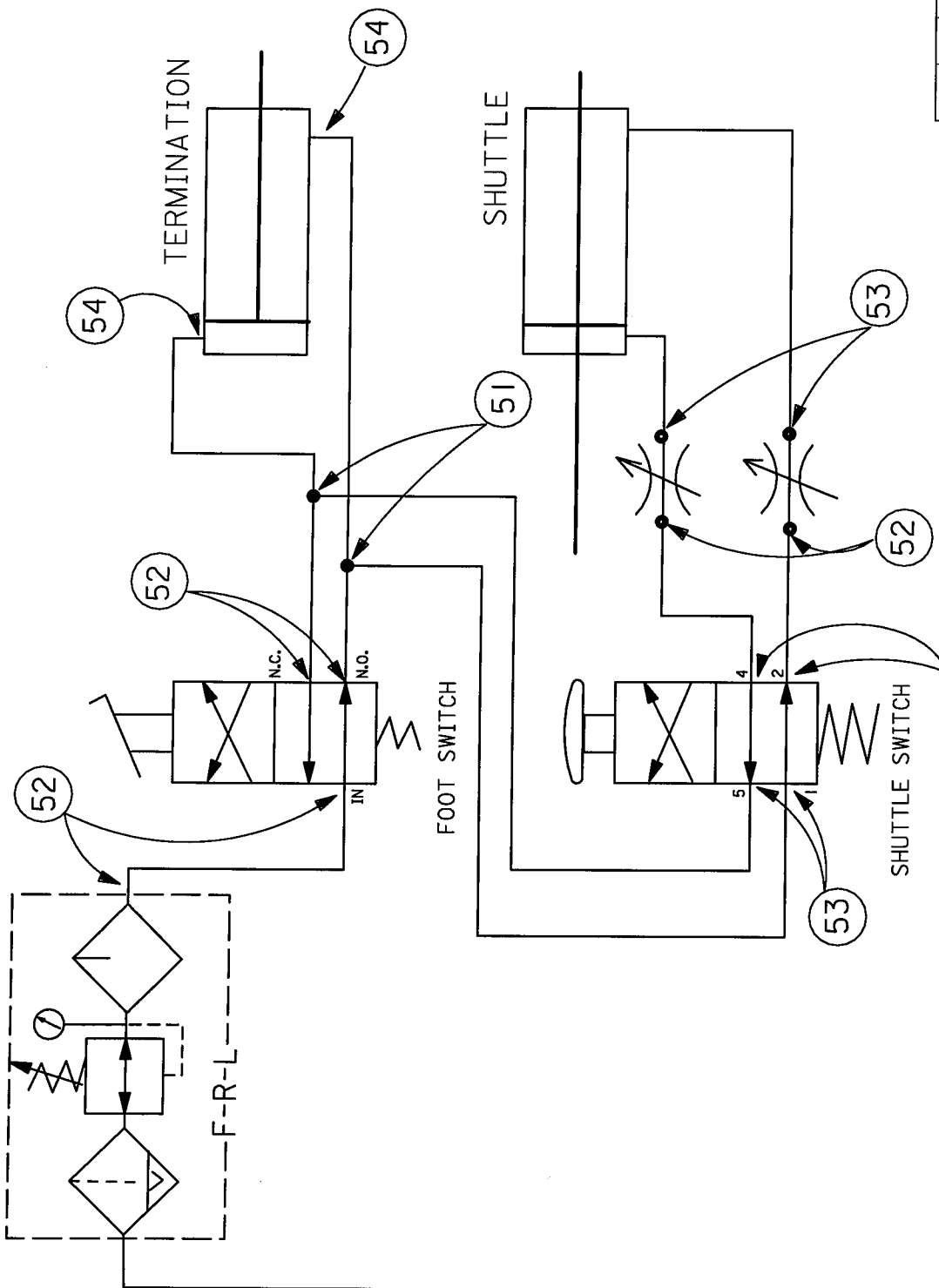
Item	Order No.	Description	Req'd.
1	11-21-5846	Plate, Base	1
2	11-21-5847	Frame, Right Mount	1
3	11-21-5848	Frame, Left Mount	1
4	11-21-5849	Base, Shuttle	1
5	11-21-5850	Guide, Right Shuttle	1
6	11-21-5851	Guide, Left Shuttle	1
7	11-21-5817	Guide, Extended Shuttle	1
8	11-21-5852	Guide, Right Front	1
9	11-21-5853	Guide, Left Front	1
10	11-21-5854	Track, Stationary Magazine	1
11	11-21-5855	Track, Adjustable Magazine	1
12	11-21-5856	Bracket, Lower Track	1
13	11-21-5857	Bracket, Upper Track	1
14	11-21-5858	Spacer, Front	1
15	11-21-5859	Spacer, Rear	1
16	11-21-5824	Bearing, Slide	2
17	11-21-5860	Slide	1
18	11-21-5861	Retainer, Blade	1
19	11-21-5862	Blade, Right Insertion Perishable Part	1
20	11-21-5863	Blade, Left Insertion Perishable Part	1
21	11-21-5864	Track, Right Cable	1
22	11-21-5865	Track, Left Cable	1
23	11-21-5866	Guide, Track	1
24	11-21-5867	Feeder RSP	1
25	11-21-5868	Arm, Feeder RSP	1
26	11-21-5834	Adaptor, Rod End	1
27	11-21-5835	Bushing, Feeder Arm RSP	1
28	11-21-6248	Spring	1
29	11-21-5869	Pin, Housing Locator	1
30	11-21-5870	Plate, Cylinder Mounting	1
31	11-21-5871	Stop, Cable	1
32	11-21-5839	Stop, Back Section Cable	1

PARTS LIST

Item	Order No.	Description	Req'd.
33	11-21-5840	Slide, Cable Stop Mount	1
34	11-21-7339	Guard	1
35	11-21-7340	Guard, Front	1
36	11-21-7341	Guard, Left Side	1
37	11-21-6597	Retainer, Floating RSP	1
38	11-21-6598	Block, Floating Retainer Mount	1
39	11-21-8202	Guard, Cylinder Adjustment	1
40	11-31-5211	Spacer, Valve	1
41	11-21-3325	Cylinder, Feeder RSP	1
42	11-21-2647	Bracket, Cylinder	1
43	11-21-3326	Cylinder, Termination RSP	1
44	11-21-2649	Valve, Foot Operated Air (Not Shown) RSP	1
45	11-21-2651	Valve, Air RSP	1
46	11-21-1294	Control, Flow (Not Shown) RSP	2
47	11-15-0289	Guard, Foot Pedal Not Shown	1
48	11-32-2258	Plunger, Ball	1
49	11-32-2259	Gib, Guide Block	2
50	11-21-0008	Assembly, Filter-Regulator-Lubricator Not Shown	1
51	11-31-1902	Fitting, 1/4" Union Tee	2
52	11-31-8943	Fitting, 1/4" Tube, 1/4NPT Straight	6
53	11-31-8944	Fitting, 1/4" Tube, 1/4NPT Right Angle	6
54	11-32-1059	Fitting, 1/4" Tube, 3/8NPT Rght Angle	2
55			
56			
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AM8642
Assembly, Pneumatic Terminator



ITEM	DESCRIPTION	ORDER NO.	QTY
51	1/4T X 1/4P TEE	11-31-1902	2
52	1/4T X 1/4P ST	11-31-8943	6
53	1/4T X 1/4P RA	11-31-8944	2
54	1/4T X 3/8P RA	11-32-1059	2

DIMENSIONS SHOWN (METRIC) INCH UNLESS OTHERWISE SPECIFIED TOLERANCES: ANGULAR $\pm 1/2^\circ$		INCH 3 PLACE $\pm$ --- 2 PLACE $\pm$ --- 1 PLACE ---	METRIC --- ± 0.13 ± 0.25
DRAFT WHERE APPLICABLE MUST REMAIN WITHIN DIMENSIONS			
DRWG. BY	DA	CHK'D. BY	
APP'D. BY		SCALE	1" = 1"

TITLE PNEUMATIC SCHEMATIC		SHEET NO. 1 OF 1	DATE 81 / 08 / 03
PART NO. AM8640-65		DRWG. NO.	

MFG. SH. =	REV. =	LTR. =
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B	ADDED F-R-L PUT ON CAD GTH 97-6-24	REVISIONS
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MOLEX INCORPORATED LISLE, ILL. 60532	9(RED)
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APPENDIX B

GLOSSARY

CARRIER..... Strip that temporarily holds the terminals together. Carriers are sometimes attached outside the connector during assembly and must be removed upon completion.

CIRCUIT SIZE..... Number of conductors in a connector.

CRIMP..... To form a terminal around a wire conductor or insulator.

DAISY CHAIN..... A connector harness that consists of connectors in the middle. (only possible with feed thru type connectors.)

DISCRETE WIRE..... individual wires terminated to a connector.

EAGLE..... Type of strain relief found on some I.D.T. connectors, molded in the housing and creating a "V" shaped barb

HOUSING..... Plastic connector body.

INSERTION..... Loading terminals into the connector body.

I.D.T..... Type of terminal that pierces wire insulation and makes contact with the conductor. This eliminates the need for wire stripping and lowers required force for termination. (Insulation displacement technology)

MASS TERMINATION... Process of terminating multiple wires to a connector in one operation.

NEST..... Portion of a machine that moves or holds the connector during termination.

PAWL..... A spring loaded device that moves and holds the connector during termination.

PILOT..... Pins that locate the connector during termination.

PUNCH..... device that crimps or terminates wires to terminals.

SENSORS..... Electrical switch that signals a machine control when something moves in its path.

STRAIN RELIEF..... Part of a connector or terminal that prevents wire from pulling out or flexing at contact points.

TERMINAL..... Electrical conductor inside connector body, usually made from plated brass.

TERMINATION..... Process of loading wires into terminals.

TERMINATION HEAD.. Part of a machine that terminates wires to the connector.

APPENDIX C

TERMS AND CONDITIONS

Lease New	C-3
Buy New	C-5
Lease Refurbished	C-6

Molex distributes their Harness Assembly Machines through several different plans:

1. Lease New --- The customer may lease a new machine for a prearranged period of time;
2. Buy New ----- The customer may purchase a new machine outright;
3. Lease Refurbished ---- If available, a customer may lease a completely refurbished machine for a prearranged period of time;
4. Buy Refurbished ----- Again if available, a customer may purchase a refurbished machine outright.

The terms and conditions, including warranties, vary for each plan. The following pages list the generic parts of these 4 plans.

MOLEX EQUIPMENT LEASE TERMS AND CONDITIONS

ARTICLE I OWNERSHIP OF EQUIPMENT

- 1.01 ALL EQUIPMENT is owned by LESSOR. No right, title or interest in the EQUIPMENT shall pass to LESSEE other than, conditioned upon LESSEE'S performance hereunder, the right to maintain possession and use of the EQUIPMENT.

ARTICLE II SERVICE OF EQUIPMENT

- 2.01 LESSOR will provide LESSEE with instructions as to the set up, operation and maintenance of the equipment and, at LESSEE'S expense, an inventory of recommended perishable tooling.
- 2.02 LESSOR will service the EQUIPMENT (except for minor repairs and/or maintenance) to the extent provided for in the succeeding paragraphs.
- 2.03 If, during the first ninety (90) days after LESSEE received possession of the EQUIPMENT, the EQUIPMENT fails to perform in a satisfactory manner (except by reason of LESSEE'S misuse or negligence), LESSOR will repair the EQUIPMENT, at no cost for parts and labor, as soon as possible after notification.
- 2.04 After the first ninety (90) days of LESSEE'S possession, should the EQUIPMENT fail to operate satisfactorily (except by reason of LESSEE'S misuse or negligence), LESSOR will supply LESSEE with all the required perishable parts at the current standard selling price as soon as possible after notification. Spare parts will continue to be provided on a no-charge basis throughout the term of the lease. Should LESSEE be unable to repair the equipment, LESSOR will repair the inoperable equipment as soon as possible after notification.
- 2.05 By definition, perishable parts are those items that come in contact with the product media during the termination process. The media, normally, would be terminals, wire, connectors, cable, and the like. Examples of perishable parts are: punches, anvils, insertion blades, connector/terminal guides, etc. Where-in examples of spare parts are: motors, solenoids, valves, cylinders, et al.
- 2.06 If LESSOR cannot repair the EQUIPMENT as stated in paragraphs 2.03 and 2.04 hereof, LESSOR will replace the EQUIPMENT or any portion thereof, as soon as possible.
- 2.07 LESSOR cannot be responsible for the quality of connectors or terminals other than those of LESSOR. Accordingly, notwithstanding paragraphs 2.03 and 2.04 and/or 2.06 hereof, LESSOR reserves the right to charge LESSEE the cost of labor and/or parts for repairing EQUIPMENT which is applying connectors or terminals other than LESSOR's.
- 2.08 LESSOR cannot be responsible for any modifications performed by LESSEE on the EQUIPMENT or the performance of the EQUIPMENT when used in association with machine components not supplied by LESSOR. Accordingly, notwithstanding paragraphs 2.03, 2.04 and/or 2.06 hereof, LESSOR reserves the right to charge LESSEE the cost of labor, and/or parts for the repairing the EQUIPMENT modified by LESSEE or used in association with machine components not supplied by LESSOR.

ARTICLE III WARRANTIES AND REMEDIES

- 3.01 In case of breach of warranty by LESSOR, LESSEE'S sole remedy shall be repair, or, at LESSOR's option, replacement of the EQUIPMENT.
- 3.02 Under no circumstances shall LESSEE be entitled to any special or consequential damages for any action or non-action taken by LESSOR in connection with furnishing or servicing the EQUIPMENT.

ARTICLE IV LESSEE'S OBLIGATIONS

- 4.01 General - LESSEE shall use the EQUIPMENT in a careful manner, shall comply with all the laws relating to its possession, use, and maintenance and shall be responsible for keeping the EQUIPMENT in good repair, condition and working order and will not modify the EQUIPMENT without the prior written consent of LESSOR.

MOLEX EQUIPMENT LEASE TERMS AND CONDITIONS

ARTICLE IV LESSEE'S OBLIGATIONS (Continued)

- 4.02 Inspection - LESSEE shall permit LESSOR to inspect the EQUIPMENT and any pertinent records concerning the EQUIPMENT during LESSEE'S business hours.
- 4.03 Insurance - LESSEE shall provide, maintain, and pay for insurance against loss, theft, damage, and destruction of the EQUIPMENT. LESSEE shall also provide, maintain, and pay for public liability insurance, both personal injury and property damage, covering the EQUIPMENT in form and amount satisfactory to LESSOR.
- 4.04 Liens - LESSEE shall keep the EQUIPMENT free and clear of all levies, liens and encumbrances caused by LESSEE and shall not permit the EQUIPMENT to become a fixture on any premises.
- 4.05 Taxes - LESSEE shall pay all charges and taxes, which may now or hereafter be imposed upon the leasing, rental, possession or use of the EQUIPMENT. LESSOR shall have the right to invoice LESSEE any such taxes that it has paid.
- 4.06 Risk of loss - LESSEE assumes and shall bear the entire risk of loss, theft, destruction, and damage to the EQUIPMENT from any and every cause whatsoever from the date of delivery until return of the EQUIPMENT to LESSOR's plant excepting only that damage directly attributable to LESSOR's negligence. In the event of damage, LESSEE shall, as soon as possible, replace or repair the EQUIPMENT.
- 4.07 Indemnification - LESSEE shall indemnify, hold harmless, and (at LESSOR's option but at LESSEE'S expense) defend LESSOR against any and all claims, actions, liabilities, losses, damages, and expenses including attorney's fees, arising out of LESSEE'S breach of its obligations under this Agreement.

ARTICLE V TERMINATION

- 5.01 Either party hereto may terminate this Agreement for nonperformance under any provision hereof within 10 days after the complaining party has made written demand therefore.
- 5.02 Lessor, at its sole discretion, may terminate this Agreement in the event of LESSEE'S bankruptcy, receivership, insolvency, assignment for the benefit of creditors or similar action or condition relating to LESSEE or LESSOR's property.
- 5.03 Upon termination of this Agreement for any reason except LESSOR's breach, LESSEE, at its expense, will return the EQUIPMENT in as good condition as received less normal wear, tear and depreciation to one of LESSOR's facilities situated in Illinois that shall be designated by LESSOR.

ARTICLE VI MISCELLANEOUS

- 6.01 All notices hereunder shall be in writing and mailed to the respective parties, by registered or certified mail, at the address set forth in the preamble on the face of this Agreement.
- 6.02 This Agreement cannot be varied except by a writing signed by authorized agents of the parties. The definition of EQUIPMENT may be enlarged with the written consent of the parties. Any additional items which become EQUIPMENT shall be fully governed by this Lease Agreement.
- 6.03 This Agreement shall be governed by the Laws of the State of Illinois.
- 6.04 Any provision herein held unenforceable by a court of competent jurisdiction shall not affect any other provision herein and may be modified by such court so that it becomes reasonable and enforceable and, as modified, will be enforced as any other provision.

MOLEX EQUIPMENT SALES TERMS & CONDITIONS

ARTICLE I SERVICE OF EQUIPMENT

- 1.01 SELLER will provide BUYER instructions as to the set up, operation and maintenance of the EQUIPMENT and an inventory of suggested perishable tooling, if ordered, at BUYER'S expense.
- 1.02 SELLER will service the EQUIPMENT (except for minor repairs and/or maintenance) to the extent provided for in the succeeding paragraphs.
- 1.03 If, during the first thirty (30) days after BUYER received possession of the EQUIPMENT, the EQUIPMENT fails to perform in a satisfactory manner (except by reason of BUYER'S misuse or negligence), SELLER will repair the EQUIPMENT, at no cost for parts and labor, as soon as possible after notification.
- 1.04 If, during the first year after BUYER received possession of the EQUIPMENT, the EQUIPMENT fails to perform in a satisfactory manner (except by reason of the BUYER'S misuse or negligence), SELLER will repair the EQUIPMENT, at no cost for spare parts and labor, as soon as possible after notification. The replacement of perishable parts during the remaining eleven (11) months of the warranty is the responsibility of the BUYER.
- 1.05 By definition, perishable parts are those items that come into contact with the product media during the termination process. The media, normally, would be terminals, wire, connectors, cable and the like. Examples of perishable parts are: punches, anvils, insertion blades, connector/terminal guides, etc. Wherein examples of spare parts are: motors, solenoids, valves, cylinders, et. al.
- 1.06 If SELLER cannot repair the EQUIPMENT as stated in Paragraph 1.03 and 1.04 hereof, SELLER will replace the EQUIPMENT, or any portion thereof, still under warranty.
- 1.07 After the first year of BUYER'S possession, should EQUIPMENT fail to operate satisfactorily, SELLER will supply BUYER with all the required parts at the current standard selling price, as soon as possible after notification. Should BUYER be unable to repair the EQUIPMENT, SELLER will repair the inoperable EQUIPMENT, as soon as possible after notification, at then current service charges.
- 1.08 SELLER cannot be responsible for the quality of the connectors or terminals other than those of the SELLER. Accordingly, notwithstanding Paragraphs 1.03, 1.04, 1.06 and/or 1.07 hereof, SELLER reserves the right to charge BUYER the cost of labor and/or parts for repairing EQUIPMENT which is applying connectors or terminals other than SELLERS.
- 1.09 SELLER cannot be responsible for any modifications performed by the BUYER on the EQUIPMENT or the performance of the EQUIPMENT when used in association with machine components not supplied by the SELLER. Accordingly, notwithstanding Paragraphs 1.03, 1.04, 1.06 and/or 1.07 hereof, SELLER reserves the right to charge BUYER the cost of labor and/or parts for repairing the EQUIPMENT modified by the BUYER or used in association with machine components not supplied by SELLER.

ARTICLE II WARRANTIES AND REMEDIES

- 2.01 In case of breach of warranty by SELLER, BUYER'S sole remedy shall be repair, or at SELLER'S option, replacement of the EQUIPMENT.
- 2.02 Under no circumstances shall BUYER be entitled to any special or consequential damages for any action or non-action taken by SELLER in connection with furnishing or servicing the EQUIPMENT.

C-5

**MOLEX EQUIPMENT LEASE
TERMS AND CONDITIONS
FOR REFURBISHED EQUIPMENT**

*ARTICLE I
OWNERSHIP OF EQUIPMENT*

- 1.01 ALL EQUIPMENT is owned by LESSOR. No right, title or interest in the EQUIPMENT shall pass to LESSEE other than, conditioned upon LESSEE'S due to performance hereunder, the right to maintain possession and use of the EQUIPMENT.

*ARTICLE II
SERVICE OF EQUIPMENT*

- 2.01 LESSOR will provide LESSEE with instructions as to the set up, operation and maintenance of the equipment and, at LESSEE'S expense, an inventory of recommended perishable tooling.
- 2.02 LESSOR will service the EQUIPMENT (except for minor repairs and/or maintenance) to the extent provided for in the succeeding paragraphs.
- 2.03 If, during the first thirty (30) days after LESSEE received possession of the EQUIPMENT, the EQUIPMENT fails to perform in a satisfactory manner (except by reason of LESSEE'S misuse or negligence), LESSOR will repair the EQUIPMENT, at no cost for parts and labor, as soon as possible after notification.
- 2.04 After the first thirty (30) days of LESSEE'S possession, should the EQUIPMENT fail to operate satisfactorily (except by reason of LESSEE'S misuse or negligence), LESSOR will supply LESSEE with all the required perishable parts at the current standard selling price as soon as possible after notification. Spare parts will continue to be provided on a no-charge basis throughout the term of the lease. Should LESSEE be unable to repair the equipment, LESSOR will repair the inoperable equipment as soon as possible after notification.
- 2.05 By definition, perishable parts are those items that come in contact with the product media during the termination process. The media, normally, would be terminals, wire, connectors, cable, and the like. Examples of perishable parts are: punches, anvils, insertion blades, connector/terminal guides, etc. Where-in examples of spare parts are: motors, solenoids, valves, cylinders, et al.
- 2.06 If LESSOR cannot repair the EQUIPMENT as stated in paragraphs 2.03 and 2.04 hereof, LESSOR will replace the EQUIPMENT or any portion thereof, as soon as possible.
- 2.07 LESSOR cannot be responsible for the quality of connectors or terminals other than those of LESSOR. Accordingly, notwithstanding paragraphs 2.03 and 2.04 and/or 2.06 hereof, LESSOR reserves the right to charge LESSEE the cost of labor and/or parts for repairing EQUIPMENT which is applying connectors or terminals other than LESSOR'S.

- 2.08 LESSOR cannot be responsible for any modifications performed by LESSEE on the EQUIPMENT or the performance of the EQUIPMENT when used in association with machine components not supplied by LESSOR. Accordingly, notwithstanding paragraphs 2.03, 2.04 and/or 2.06 hereof, LESSOR reserves the right to charge LESSEE the cost of labor, and/or parts for the repairing the EQUIPMENT modified by LESSEE or used in association with machine components not supplied by LESSOR.

*ARTICLE III
WARRANTIES AND REMEDIES*

- 3.01 In case of breach of warranty by LESSOR, LESSEE'S sole remedy shall be repair, or, at LESSOR'S option, replacement of the EQUIPMENT.
- 3.02 Under no circumstances shall LESSEE be entitled to any special or consequential damages for any action or non-action taken by LESSOR in connection with furnishing or servicing the EQUIPMENT.

*ARTICLE IV
LESSEE'S OBLIGATIONS*

- 4.01 General - LESSEE shall use the EQUIPMENT in a careful manner, shall comply with all the laws relating to its possession, use or maintenance and shall be responsible for keeping the EQUIPMENT in good repair, condition and working order and will not modify the EQUIPMENT without the prior written consent of LESSOR.
- 4.02 Inspection - LESSEE shall permit LESSOR to inspect the EQUIPMENT and any pertinent records concerning the EQUIPMENT during LESSEE'S business hours.
- 4.03 Insurance - LESSEE shall provide, maintain, and pay for insurance against loss, theft, damage, or destruction of the EQUIPMENT. LESSEE shall also provide, maintain, and pay for public liability insurance, both personal injury and property damage, covering the EQUIPMENT in form and amount satisfactory to LESSOR.
- 4.04 Liens - LESSEE shall keep the EQUIPMENT free and clear of all levies, liens and encumbrances caused by LESSEE and shall not permit the EQUIPMENT to become a fixture on any premises.
- 4.05 Taxes - LESSEE shall pay all charges and taxes, which may now or hereafter be imposed upon the leasing, rental, possession or use of the EQUIPMENT. LESSOR shall have the right to invoice LESSEE any such taxes that it has paid.
- 4.06 Risk of loss - LESSEE assumes and shall bear the entire risk of loss, theft, destruction, or damages to the EQUIPMENT from any and every cause whatsoever from the date of delivery until return of the EQUIPMENT to LESSOR'S plant excepting only that damage directly attributable to LESSOR'S negligence. In the event of damage, LESSEE shall, as soon as possible, replace or repair the EQUIPMENT.
- 4.07 Indemnification - LESSEE shall indemnify, hold harmless, and (at LESSOR'S option but at LESSEE'S expense) defend LESSOR against any and all claims, actions, liabilities, losses, damages, and expenses including attorney's fees, arising out of LESSEE'S breach of its obligations under this Agreement.

*ARTICLE V
TERMINATION*

- 5.01 Either party hereto may terminate this Agreement for nonperformance under any provision hereof within 10 days after the complaining party has made written demand therefore.
- 5.02 Lessor, at its sole discretion, may terminate this Agreement in the event of LESSEE'S bankruptcy, receivership, insolvency, assignment for the benefit of creditors or similar action or condition relating to LESSEE or LESSOR'S property.
- 5.03 Upon termination of this Agreement for any reason except LESSOR'S breach, LESSEE, at its expense, will return the EQUIPMENT in as good condition as received less normal wear, tear and depreciation to one of LESSOR'S plants situated in Illinois that shall be designated by LESSOR.

*ARTICLE VI
MISCELLANEOUS*

- 6.01 All notices hereunder shall be in writing and mailed to the respective parties, by registered or certified mail, at the address set forth in the preamble on the face of this Agreement.
- 6.02 This Agreement cannot be varied except by a writing signed by authorized agents of the parties. The definition of EQUIPMENT may be enlarged with the written consent of the parties. Any additional items which become EQUIPMENT shall be fully governed by this Lease Agreement.
- 6.03 This Agreement shall be governed by the Laws of the State of Illinois.
- 6.04 Any provision herein held unenforceable by a court of competent jurisdiction shall not affect any other provision herein and may be modified by such court so that it becomes reasonable and enforceable and, as modified, will be enforced as any other provision.