

Service Handbook  
**STANDARD SERIES**  
**10000 AUTO-LIFT DRUMS**  
**WITH RADIAL GAP MOTORS**  
 [Electro/Mechanical Subsystem]

Model No. XLF Serial No. 62755

Publication Serial No. 0101

**BRYANT COMPUTER PRODUCTS**



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# FOREWORD

This Service Handbook contains information for the guidance of personnel responsible for the installation, operation and maintenance of Series 10000 Auto-Lift Magnetic Data Storage Drums manufactured by Bryant Computer Products — a Division of Ex-Cell-O Corporation — 850 Ladd Road, Walled Lake, Michigan, 48088.

It is assumed that personnel responsible for the performance of the procedures contained herein are familiar with the operation and maintenance of high-precision electro/mechanical equipment. Data pertinent to the specific drum purchased can be furnished in appendices at the back of this handbook at the customers option.

# CHANGE PAGE

This Service Handbook is subject to change as additional information becomes available and as engineering improvements are incorporated into production equipment.

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# SECTION 1

## GENERAL DESCRIPTION

### 1-1 INTRODUCTION

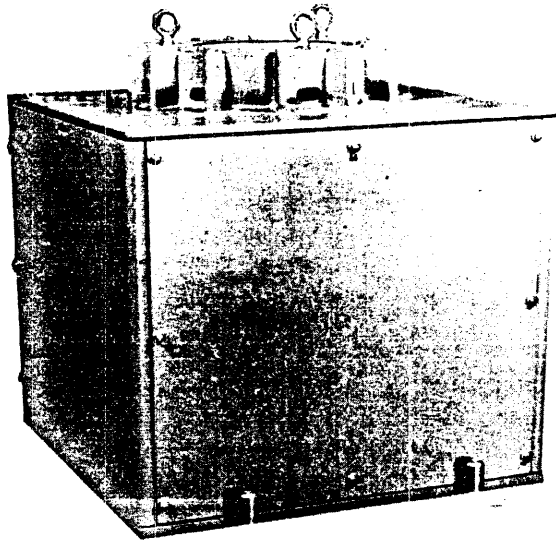
This service handbook contains the information required to operate and maintain standard Bryant Computer Product's, Series 10000 Auto-Lift<sup>R</sup> Drums equipped with radial gap motors and AH-020 Uni-Just<sup>R</sup> flying heads (see Figure 1-1). Maintenance information for the drums — which will generally be referred to herein as Bryant's Series 10000 Drums — includes a general description; receiving, storage or installation, and shipping instructions; operating instructions; principles of operation; preventive maintenance instructions; and corrective maintenance instructions. Data applying to the drum for which this handbook is furnished can be included as an appendix. Additional appendices can be furnished for insertion of drum test data, wire lists, recommended spare parts list, and miscellaneous data; except for the recommended spare parts list, these items will generally be found in the separately prepared print package. Though the appendices are furnished to add to the flexibility of this handbook, it must be realized that information is furnished relative to only standard drums. If a Bryant option — for example, the purchase of a Bryant electronics interface option — is selected, maintenance information for the interface option can be provided. However, due to the complexity — or nature — of this type of equipment, such information would have to be incorporated in a separate, specially prepared volume.

#### NOTE

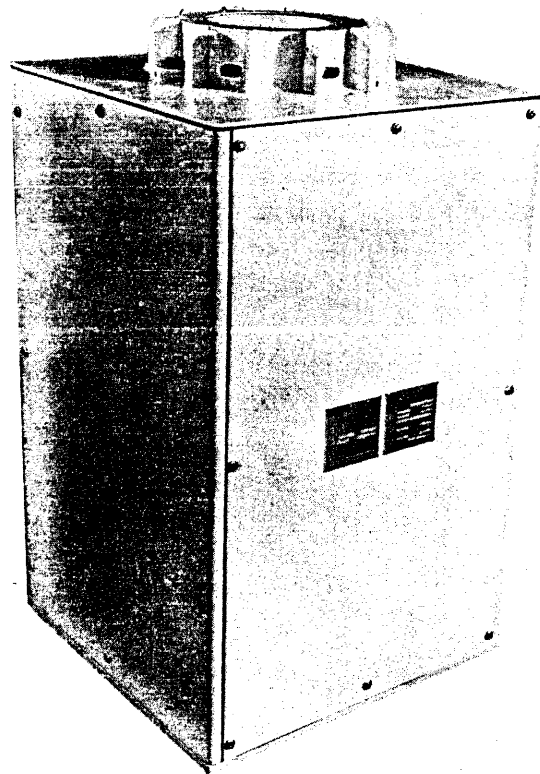
This service handbook is specifically prepared for use with only the standard configurations of Bryant's Series 10000 Auto-Lift Drums; these configurations exclude, turn on/turn off controls, electronics interfacing, etc. However, special information relating to drums containing these options can be prepared where so specified by the customer; such information can be included at the end of this handbook or under separate cover depending on the extensiveness of the material.

### 1-2 GENERAL DESCRIPTION

The Bryant Series 10000 Drums are data storage devices that are designed to store and retrieve digital data sequentially or randomly. Storage is accomplished by magnetically coupling the data through non-positionable, flying, write/read heads onto the plated surface of a rotating drum. A total of four drum models are available in the drum series discussed herein. These include the Models 10128, 10256, 10384 and 10512. The first two digits of the model designation denote the nominal diameter of the drum; that is, each of the drums discussed in this handbook have a nominal diameter of 10-inches. The remaining three digits of the model



a. MODEL 10128/10256



b. MODEL 10512

Figure 1-1 Typical Bryant Series 10000 Auto-Lift Drums - Assembled View, Access Panels Installed

## 1-2 GENERAL DESCRIPTION (Cont.)

number denote the number of active general data storage heads that are provided in a standard configuration of the model; that is, the standard drum models are available with 128, 256, 384, and 512 active general data storage heads, respectively. Though of varying height, each drum model is essentially the same in that each consists of a drum housing in which is mounted a drum/spindle/lift assembly and a radial gap motor. Mounted external to the drum housing are head bar assemblies — the types and quantities of which vary depending on the drum model involved — and two cable harnesses with each harness designed to suit a particular head bar installation. A typical Series 10000 drum with access panels removed is shown in Figure 1-2.

1-2-1 DRUM HOUSING — The drum housing is a casting on which are mounted a housing cap and a base plate; the entire assembly, in turn, is supported on shock mounts. Access panels (with gaskets) are fastened to the housing cap and base plate to form an enclosure about the drum housing proper. Windows furnished in the housing enable access to the plated recording surface of the drum mounted within the casting. The windows are designed to accommodate the installation of head bar assemblies on which are mounted Bryant designed, magnetic, write/read heads. Each head bar is secured across a window in a manner that enables its heads to access the plated surface of the drum and thereby magnetically record data on and retrieve data from the plating material. The number and size of windows available in a housing depends on the drum model involved (see Figure 1-3).

a. A common housing is used in the case of both the Model 10128 and 10256 drums. The housing has four windows, each of which can accommodate as many as four, 20-head position, head bar assemblies. Though all four windows are used in a standard 10256 drum configuration, only two of the windows are utilized in a standard 10128 drum configuration.

b. The housing of the Model 10384 drum has eight windows. The four larger, upper windows of the housing can each accommodate as many as four, 20-head position, head bar assemblies. The remaining four, smaller, lower windows can each accommodate as many as four, 11-head position, head bar assemblies.

c. The housing of the Model 10512 drum has eight windows of equal size with each window capable of accommodating as many as four, 20-head position, head bar assemblies.

1-2-2 DRUM/SPINDLE/LIFT ASSEMBLY — The drum/spindle/lift assembly — a proprietary item — is vertically mounted within the drum housing. The assembly consists of a spindle and a drum that are interconnected by a lift mechanism (see Figure 1-4). The lower and upper ends of the spindle of the assembly are each retained within the base plate and housing cap, respectively, of the drum housing by a bearing cage/ball bearing assembly; the bearing cage/ball bearing assembly at the upper end of the spindle is, in turn, spring pre-loaded and supported in an upper bearing ball slide assembly. Vertical orientation of the drum with respect to the spindle is maintained through upper and lower drum/spindle ball slides.

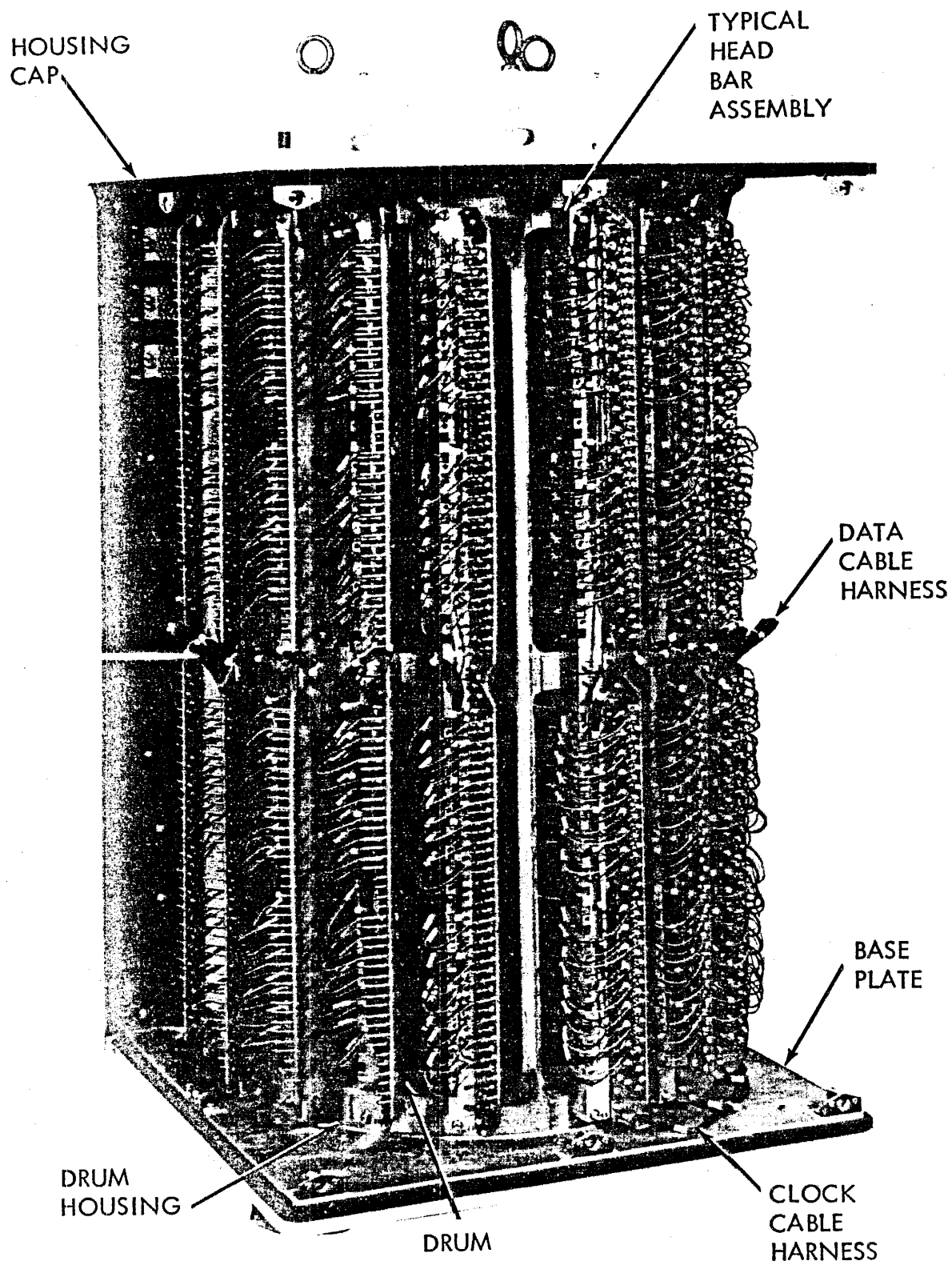
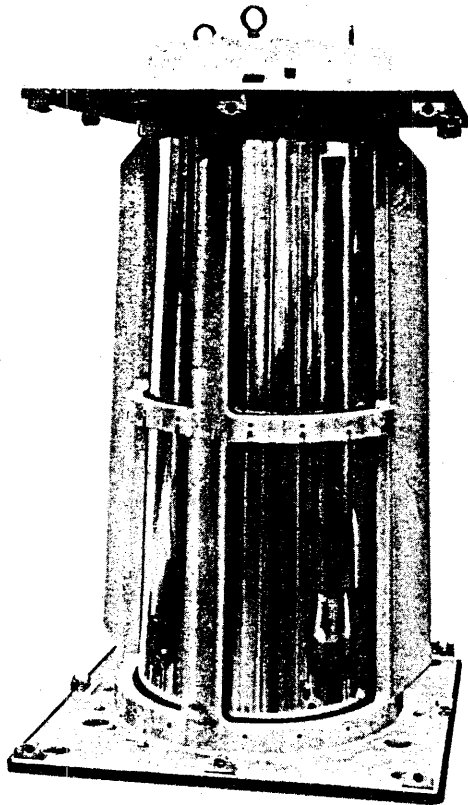
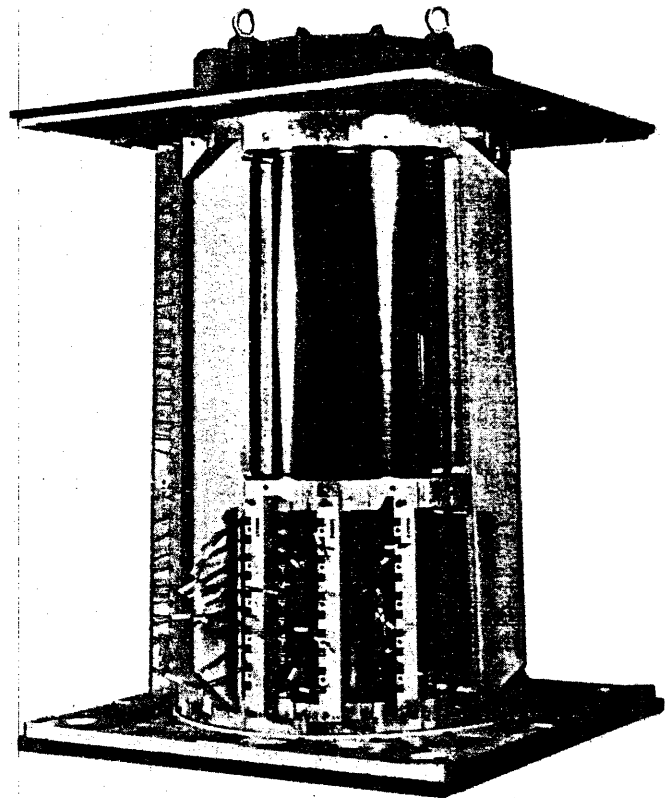


Figure 1-2 Typical Bryant Series 10000 Auto-Lift Drum - Covers Off View Identifying Major Assemblies

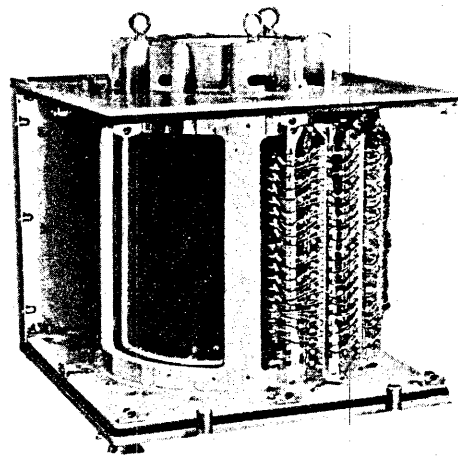




a. MODEL 10512



b. MODEL 10384



c. MODEL 10128/10256

Figure 1-3 Bryant Series 10000 Auto-Lift Drums - Drum Housings, Access Panels Removed

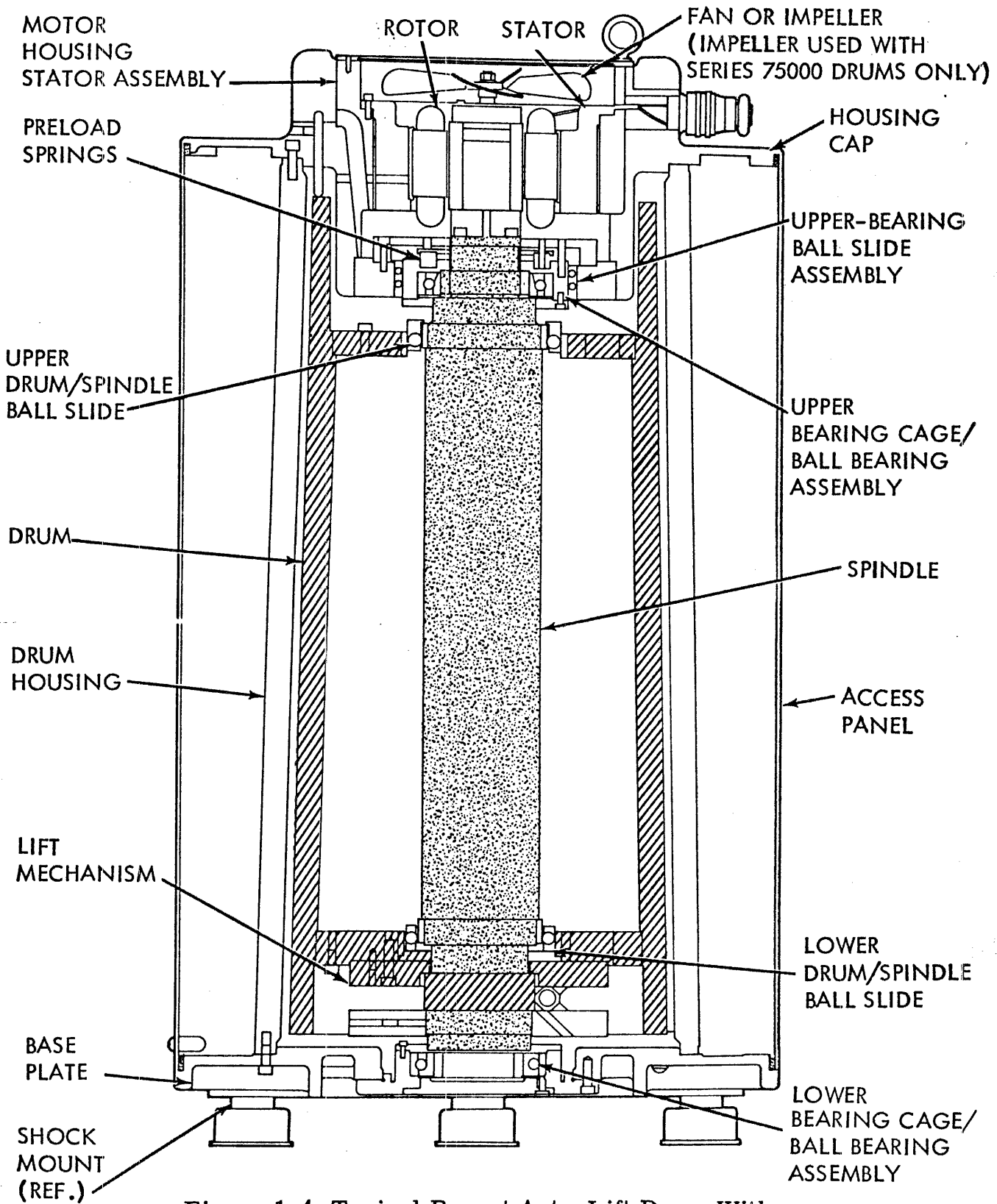


Figure 1-4 Typical Bryant Auto-Lift Drum With Radial Gap Motor - Sectional View

## 1-2-2 DRUM/SPINDLE/LIFT ASSEMBLY (Cont.)

a. The lower and upper bearing cage/ball bearing assemblies contain Grade 9 ABEC bearings which are factory prelubricated. The upper and lower bearing cages — each containing a ball bearing outer race that is shrunk fit within the cage — are keyed to the housing cap and base plate in a manner that inhibits their rotation within the housing. With the sleeve inner race — the race on which the balls of the bearing ride — shrunk fit onto the respective ends of the spindle, the spindle is enabled to rotate within the drum housing on the balls of the outer races. The ball slide installation of the upper bearing cage/ball bearing assembly enables axial expansion and contraction of the elements of the drum. That is, axial expansion or contraction of the spindle during heat fluctuations within the drum enclosure results in a corresponding vertical movement of the ball bearings outer race and bearing cage assembly through the ball slide. This action, which maintains the contact angle of the balls of the outer race of the upper bearing cage assembly constant with respect to the inner race that is shrunk fit on the spindle, enhances the life of the assembly's bearings. The ball bearing assemblies can be replaced in the field without re-setting heads.

b. The upper and lower drum/spindle ball slides enable vertical movement of the drum with respect to the spindle when lift mechanism operation is initiated.

c. The lift mechanism is a unique centrifugal operating mechanism — resembling a flyball governor — that requires no operating adjustments for the life of the drum. In addition to its tying the spindle and drum together to enable spindle rotation to be imparted to the drum, the lift mechanism also functions to raise the drum vertically — through the ball slides of paragraph b. — to the recording attitude when motor speed reaches a pre-established range; correspondingly, springs within the mechanism function to lower the drum through the ball slides when the motor speed falls below a pre-established range.

d. The tapered recording surface of the drum is plated with a high performance, magnetic medium that provides a tough, abrasive resistant surface. The plating ensures extremely uniform playback and resolution characteristics with very low noise level.

1-2-3 RADIAL-GAP MOTOR — The radial-gap motor consists of a rotor, which is secured to the upper end of the spindle of the drum/spindle/lift assembly, and a stator assembly, which is secured within the housing cap (see Figures 1-2 and 1-4). Standard motor options for each drum model are: 1800 and 3600 rpm, 208-volt, three-phase, 60-Hz; and 3000 rpm, 380-volt, three-phase, 50-Hz.

1-2-4 HEAD BAR ASSEMBLIES — Two head bar assemblies of different length are available for use with the standard drums depending on drum model (see paragraph 1-2-1 a. through c.). The head bars are both precision machined to accommodate the installation of standard Bryant AH-020 Uni-Just aerodynamic heads; the shorter bar is machined to retain a maximum of 11 heads whereas the longer bar (see Figure 1-5) is machined to retain a maximum of 20 heads. Springs located in the slots of the head bars serve to preload the installed heads away from the drum surface whenever the mounting screws of the heads are loosened. For standard drums, the head bars are fabricated to enable only radial adjustment of installed heads; for non-standard drums, head bars that will enable circumferential and axial adjustments are available as options. Though each drum has provisions for accommodating more heads than are indicated in its model designation, the balance of the head positions of the head bars are available for use in clock applications and for use as customer and manufacturers spares. Allocation of the head positions for the different drum models are as follows:

#### NOTE

For information relating to the allocations of head positions on the drum for which this handbook has been issued, refer to the test data furnished with the drum.

a. A total of eight and sixteen head bars are mounted in the windows of the 10128 and 10256 drums, respectively. The lowest head position of each of the 20-head position head bar assemblies of both drums are reserved exclusively for clocks and, as required, manufacturers spares. Three of these head positions are reserved exclusively for use in recording standard clocks; three additional head positions are available — at the customer's option — for use in recording additional clocks while the remaining head positions are reserved for manufacturers use. The second lowest head position of each of the head bar assemblies are left open in order to provide a buffer separation between clocks and general data storage heads mounted on the bars; these head positions are thereby effectively reserved for use as manufacturers spares. The remaining eighteen head positions of each head bar of both drums are reserved for customers and manufacturers use in general data storage. Heads for general data storage are allocated as follows:

- (1) In the case of the eight head bars of the standard Model 10128 drum, 128 of the remaining 144 head positions are reserved for use in general data storage and a total of eight additional head positions (one, two, or four in each of the two used windows) are optionally available to the customer for use as spares; the eight remaining head positions are reserved for manufacturers use.
- (2) In the case of the sixteen head bars of the standard Model 10256 drum, 256 of the remaining 288 head positions are reserved for use in general data storage and a total of 16 additional head positions (one, two, or four per window) are optionally available to the customer for use as spares; the 16 remaining head positions are reserved for manufacturers use.

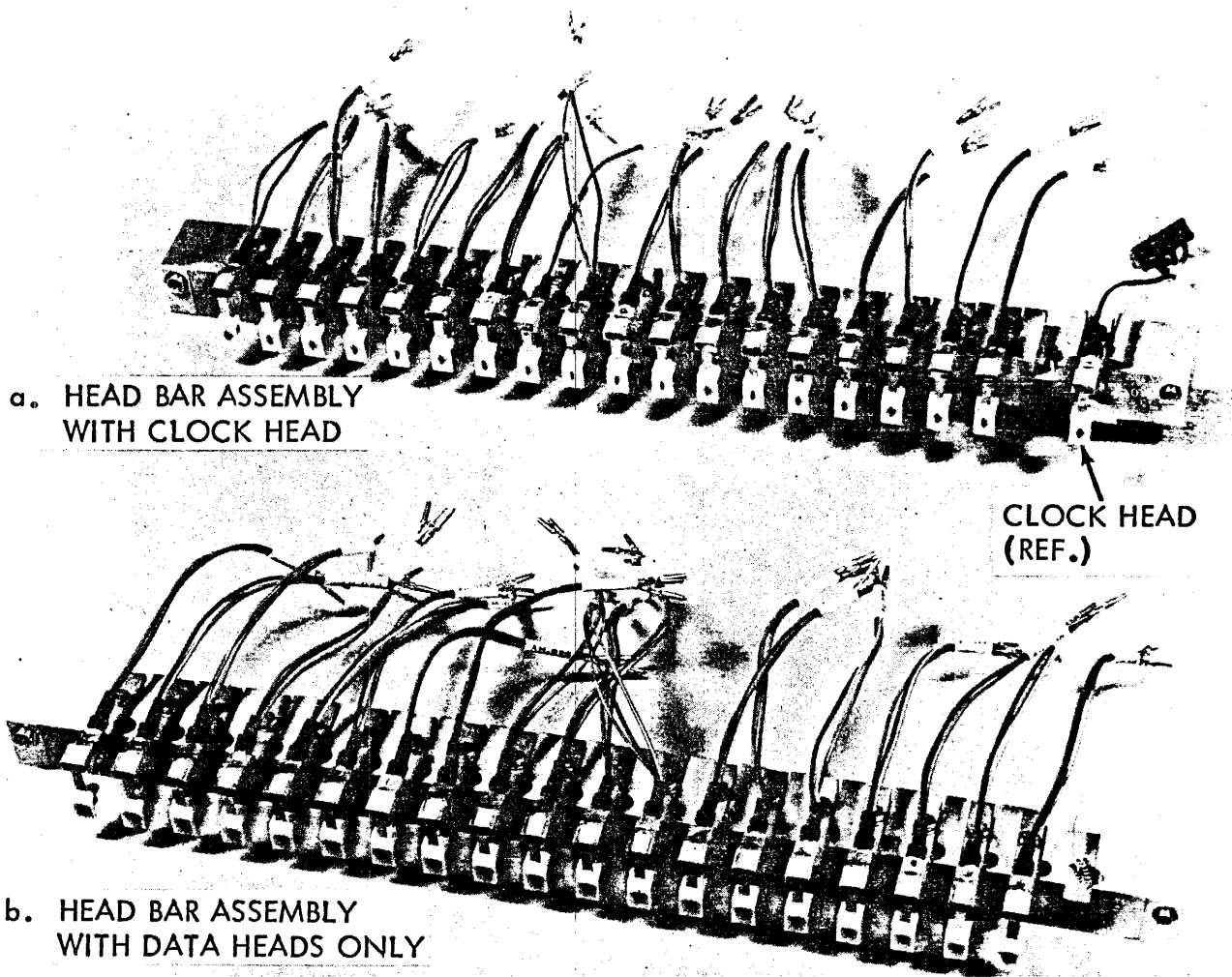


Figure 1-5 Typical Head Bar Assemblies Used On Bryant Series 10000 Auto-Lift Drums

1-2-4 HEAD BAR ASSEMBLIES (Cont.)

b. A total of sixteen head bars are mounted in the lower windows of the 10384 and 10512 drums. The lowest head position of each of the 11- and 20-head position head bar assemblies of these windows of the Model 10384 and 10512 drums, respectively, are reserved exclusively for clocks and, as required, manufacturers spares. Three of these head positions are reserved exclusively for use in recording standard clocks; six additional head positions are available — at the customer's option — for use in recording additional clocks while the remaining head positions are reserved for manufacturers use. The second lowest head position of each of these same head bar assemblies are generally left open in order to provide a buffer separation between clocks and general data storage heads mounted on the bars; these head positions are thereby effectively reserved for use as manufacturers spares. The remaining nine and 18 head positions of the head bar assemblies in the lower windows of the 10384 and 10512 drums, respectively, as well as all 20 head positions of the 20-head position head bars in the upper windows of the drums are reserved for customers and manufacturers use in general data storage. Heads for general data storage are allocated as follows:

- (1) In the case of the 32 head bars of the standard Model 10384 drum, 384 of the remaining 464 head positions are reserved for use in general data storage and a total of 32 additional head positions (one, two, four, or eight per large, upper window only) are optionally available to the customer for use as spares; the 48 remaining head positions are reserved for manufacturers use.
- (2) In the case of the 32 head bars of the standard Model 10512 drum, 512 of the remaining 608 head positions are reserved for use in general data storage and a total of 32 additional head positions (one, two, or four per window) are optionally available to the customer for use as spares; the 64 remaining head positions are reserved for manufacturers use.

1-2-5 UNI-JUST<sup>R</sup> HEADS — The Uni-Just heads (see Figure 1-6) are basically standard Bryant AH-020 magnetic recording heads that are used for both clocks and data. The head consists of a pole piece structure that is encapsulated in an epoxy which is then molded into an aerodynamic pad. Leads from the pole piece of a data head terminate at taper pins; leads from the pole piece of a clock head terminate at a three pin connector. When installed in a head bar, the head is secured to the head bar by a screw; a spring on the bar preloads the head so that if the screw is loosened, the head will retract from the vicinity of the drum surface. See Table 1-1 for the electrical and mechanical specifications of the AH-020 heads used on the drums.

**Table 1-1 Specifications for AH-020 Uni-Just Aerodynamic Heads\***

Inductance-half-coil (at 140 kilocycles)	17 to 24 microhenries
D-C resistance	1 ohm nominal
Balance half-coil to half-coil	10%

\* Clock head part numbers differ from data head part numbers only because the pole pieces terminate at connectors rather than at taper pins.

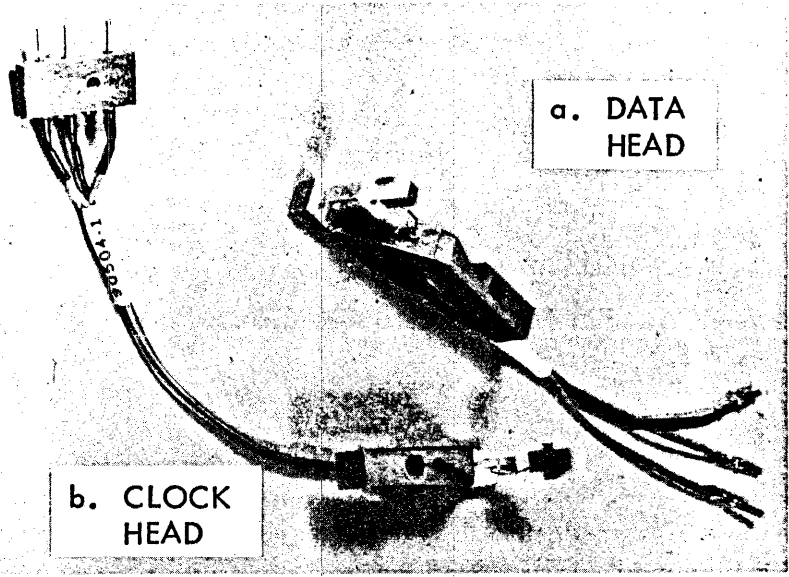


Figure 1-6 Data and Clock Heads Used On Bryant Auto-Lift Drums

1-2-6 CABLE HARNESES — Standard drums are furnished with two cable harnesses (see Figure 1-2). One is made up of data-head buss and head-select lines (see Figure 1-7), the second contains all clock lines. The leads of the data head harnesses are each prewired to terminal boards and are terminated at standard interface connectors that are secured to the rear-interface connector panel of the drum. The two buss lines of each data head consist of a twisted-pair of unshielded wires that are connected to interface connector J2 of the harness; select lines for each head are connected by a single unshielded wire to interface connector J3 of the harness. The leads of the clock head harnesses are each prewired to individual, three-pin connectors and are terminated at standard interface connectors that are secured to the rear interface connector panel of the drum. The three lines of each active clock head connector are connected by twisted-triplet, shielded wire to interface connector J5 of the clock harness. Coincidentally, if a spare clock option is selected, the three lines of each spare clock head connector are identically connected to interface connector J6 of the clock harness. With active and spare clocks identically connected to different connectors, the loss of the active clocks can be circumvented by merely switching the customers connection from J5 to J6. The shield of each set of clock head leads is terminated at a pin of the clock interface connector. Several data cable harness configurations providing different wiring matrices are optionally available for use with each of the standard drum configurations. These are briefly described in the following paragraphs.

#### NOTE

An unlabeled connector opening in the rear interface connector panel of the drum contains an air filter that enables ventilation of the drum enclosure. For information relating to the cable harness that is included with the drum for which this handbook has been issued, refer to engineering documentation supplied with the drum.

a. In the case of the Model 10128 drum, one harness option offers two busses with 64 head select lines; a second option offers four busses with 32 head select lines; and a third option offers eight busses with 16 head select lines.

b. In the case of the Model 10256 drum, one harness option offers four busses with 64 head select lines; a second option offers eight busses with 32 head select lines; and a third option offers 16 busses with 16 head select lines.

c. In the case of the Model 10384 drum, one harness option offers six busses with 64 head select lines; a second option offers 12 busses with 32 head select lines; and a third option offers 24 busses with 16 head select lines.

d. In the case of the Model 10512 drum, one harness option offers two groups of four busses with 64 head select lines; and a second option offers two groups of 16 busses with 16 head select lines.

1-2-7 HEAD SELECTION DIODES — The head selection diodes are mounted on the terminal boards of the standard data cable harnesses. The diodes are connected for either positive or negative level head selection (cathode away from or toward the head, respectively) depending on customer requirements. The capacitive affect that a group of selection diodes and heads will have on a write amplifier can be minimized by customer selection of a disconnect diode option.



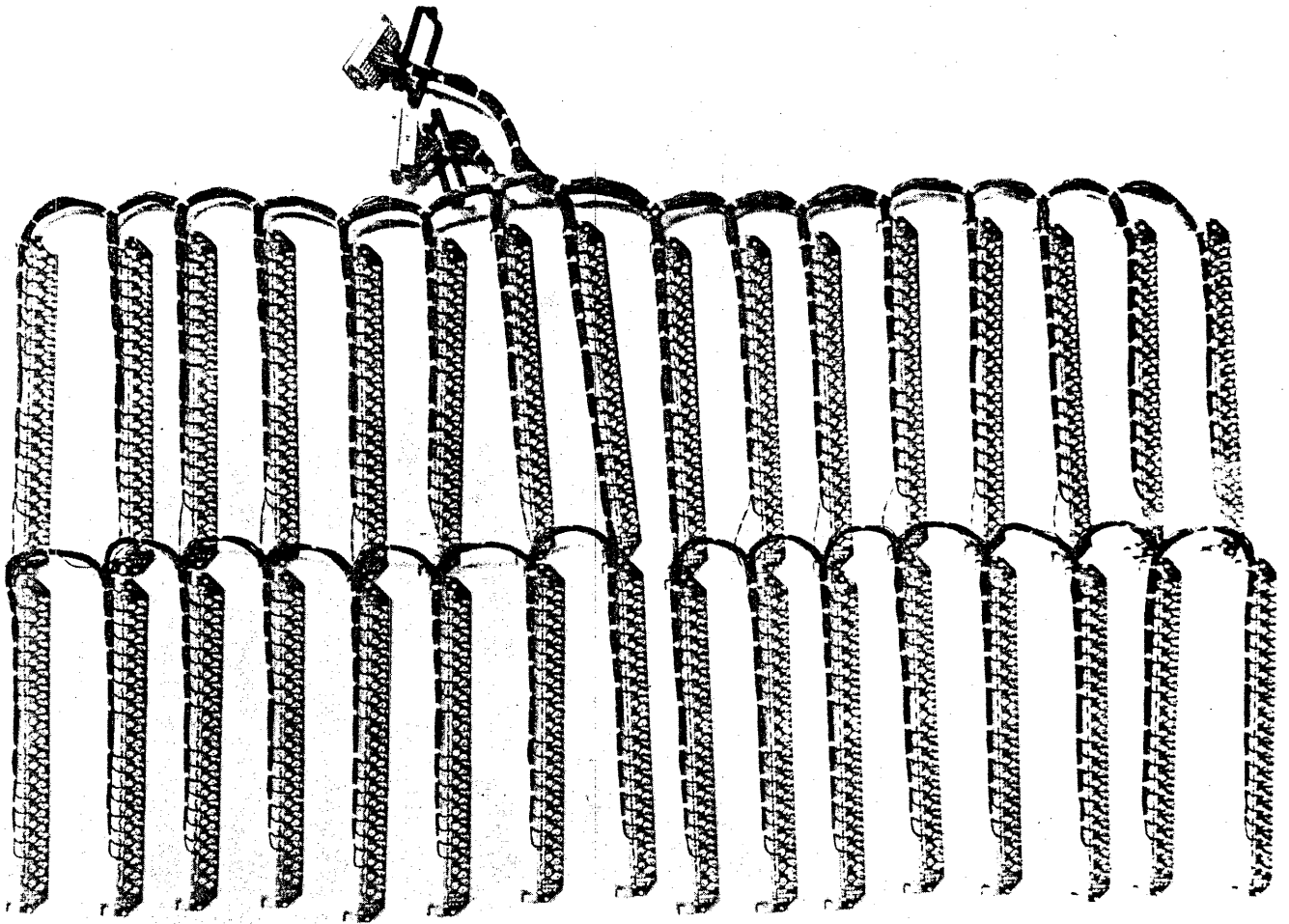


Figure 1-7 Typical Cable Harness for a Bryant Auto-Lift Drum.

**1-3 DATA**

General data applying to all Model 10000 drums are listed in Table 1-2. For details relating to the specific drum for which this handbook is furnished, refer to engineering documentation that is supplied with the drum. Such information specifies the type of motor, cable harness, etc., that are furnished with the drum.

**Table 1-2 Model 10000 Auto-Lift Drums — General Data**

<u>Physical Characteristics</u>	
Model 10128/10256	
Height	20-1/4 inches
Width	17-3/4 inches
Depth	17-3/4 inches
Weight (approx.)	
10128	155 lbs.
10256	160 lbs.
Model 10384	
Height	28-1/16 inches
Width	17-3/4 inches
Depth	17-3/4 inches
Weight (approx.)	250 lbs.
Model 10512	
Height	33-1/8 inches
Width	17-3/4 inches
Depth	17-3/4 inches
Weight (approx.)	265 lbs.
<u>Environmental Limitations</u>	
Temperature (Ambient)	
Operating	50 to 100°F (10 to 38°C)
Non-Operating	-65 to 160°F (-54 to 72°C)
Relative Humidity	Up to 95% without condensation

**Table 1-2 Model 10000 Auto-Lift Drums — General Data (Cont.)**

Thermal Shock*	With covers in place, drum will withstand a 50°F step change while operating
Altitude	
Operating	Up to 15,000 feet above sea level
Non-Operating	Up to 50,000 feet above sea level
Axis of Rotation	± 15 degrees maximum from vertical

Motor Data

Type	Radial Gap, Induction — designed for 6% maximum slip at nominal power
------	---

Power and Speed Options\*\*

208 volt, 60 Hz, three phase, 1800 rpm

Drum Model	Start Current (Amps/Phase)	Run Current (Amps/Phase)	Run Power (Watts)
10128	2.5	0.8	100
10256	3.5	1.0	120
10384	4.5	1.3	150
10512	5.0	1.5	170

208 volt, 60 Hz, three phase, 3600 rpm

Drum Model	Start Current (Amps/Phase)	Run Current (Amps/Phase)	Run Power (Watts)
10128	6.0	1.2	240
10256	8.5	1.6	300
10384	12.0	2.5	400
10512	14.0	3.0	500

\* Following a thermal shock, the drum should not be used for data recording purposes until the drum has stabilized at the new room ambient.

\*\* Voltage tolerance, + 10%; Frequency tolerance, ± 1 Hz

**Table 1-2 Model 10000 Auto-Lift Drums — General Data (Cont.)**

380 volt, 50 Hz, three phase, 3000 rpm

Drum Motor	Start Current (Amps/Phase)	Run Current (Amps/Phase)	Run Power (Watts)
10128	2.5	0.8	175
10256	3.5	1.0	225
10384	4.5	1.0	300
10512	5.0	1.5	360

# SECTION 2

## RECEIVING, STORAGE OR INSTALLATION, AND SHIPPING INSTRUCTIONS

### 2-1 INTRODUCTION

This section provides the procedures relating to receiving, storing, installing, preparing for shipment, and shipping Bryant's Series 10000 Auto-Lift Drums. All such procedures shall be performed by qualified technicians. If assistance is required, Bryant's qualified staff of servicemen are always on call to perform such customer service.

2-1-1 PERSONNEL QUALIFICATIONS — Personnel responsible for performing the procedures of this section shall be technically qualified; also, each individual shall have participated in Bryant's standard training course in the operation, maintenance, and utilization of Auto-Lift Drums. One man shall be selected to coordinate all activities as well as to ensure that all possible caution is taken to protect both personnel and equipment. In addition, each individual performing the procedures contained herein shall be thoroughly familiar with the drum turn-on and turn-off procedures.

2-1-2 RECOMMENDED INSTALLATION AREA — To minimize the frequency of various preventive and corrective maintenance functions, it is recommended that the drum be installed and operated in an installation area that meets, as a minimum, the American Society for Testing and Materials (ASTM) Class C ("dust control" assembly area) environment. In such an environment, particle sizes versus particle counts per cubic foot are: particles of five- to 25-micron size, 300 particles per cubic foot; particles of 26- to 100-micron size, 150 particles per cubic foot; and particles of greater than 100-micron size, 30 particles per cubic foot.

2-1-3 SPECIAL TOOLS AND ACCESSORIES SUPPLIED — Various special tools and accessories are included with the drum at the time of shipment. A complete list of the equipment that is supplied in the print and tool package received with the drum is given in Table 2-1.

**Table 2-1 Special Tools and Accessories Supplied**

Nomenclature	Quantity	Part No.	First Use Para.
Eye bolts	As required	See Note 1	2-4-1 h.
Plug pins	3	B90318	2-4-1 n.
Motor connector plug (mating half)	1	See Note 1	2-4-1 p.

**Table 2-1 Special Tools and Accessories Supplied (Cont.) )**

Nomenclature	Quantity	Part No.	First Use Para.
Head squaring fixture	1	AD-087	6-3-2-2 d. (3)
Wrench, 3/16-inch open-end	1	C-56650-1	6-3-2-2 e. (2)
Head adjustment tool	1	B-AD-022	6-3-3-2 d.
Print package containing:			
Service handbook			
One set control drawings	1	See Note 2	
Test data			
Quality control check list			
<b>NOTES:</b>			
1 — Part Number and/or quantity are as noted in Quality Control Check List in Print Package.			
2 — Made up in accordance with specific job requirements.			

2-1-4 EQUIPMENT REQUIRED BUT NOT SUPPLIED — To properly install, operate and maintain the drum, certain small hand tools and materials not supplied with the drum are required. A list of recommended equipment is given in Table 2-2.

**Table 2-2 Equipment Required But Not Supplied**

Nomenclature	Quantity	Source (See Note 1)	Part No.	First Use Paragraph
Desiccant	One 8-ounce bag	See Note 2		2-5 h.
Torque Wrenches and Bits	1 set	Bryant	C-97011-1	5-1-4
Micrometer Depth Gage	1	Starret with 0 to 1-inch rod	Style No. 440	5-5-1-2 l.
Bearing Puller (013 size)	1	Bryant	AD-076	5-5-1-2 q.
Glass Stone	1	Norton, Behr Manning Div.	HF 143	5-5-1-2 u.
India Oilstone, Medium	1	Norton, Behr Manning Div.	MB 24	5-5-1-2 u.
Hot Plate	1	Thermolyne, 0-600°F	Model HP-A 1915B	5-5-1-2 v.

**Table 2-2 Equipment Required But Not Supplied (Cont.)**

Nomenclature	Quantity	Source (See Note 1)	Part No.	First Use Paragraph
Thermometer	1	See Note 3		5-5-1-2 v.
Oil, Machine, light weight	1 pint			5-5-1-2 v.
Loctite "C"	A/R	Loctite Corp.		5-5-1-2 w. (4)
Extraction Tool (for non-insulated Series 53 taper pins)	1	Aero Marine Products Inc.	380305-1	5-6-1-2 e. (1)
Head Bar Support	1	Bryant	T614-1	5-6-1-2 f. (1) (d)
Kimwipe Tissues	1 Box	Kimberly Clark	Type 900L	5-6-1-2 g. (1)
Acetone, Reagent Grade (cleaning solution)	1 quart	Mallinckrodt Chemical Works	Transistor Code 2441	5-6-1-2 g. (1)
Alcohol, Isopropyl (rinsing solution)	1 quart	Mallinckrodt Chemical Works	Transistor Code 3033	5-6-1-2 g. (7)
Q-Tips, 6-inch Cotton Tipped	1 Box	Detroit First Aid Company	N/A	5-6-1-2 h. (2)
Insertion Tool (for non-insulated taper pins)	1	Aero Marine Products Inc.	380306-3	5-6-1-2 j. (3)
Crimping Tool (for non-insulated taper pins)	1	Aero Marine Products Inc.	47044	6-7-1 c.
Extraction Tool (for signal connector contacts)	1	Winchester Electronics, Inc.	107-1025	6-7-2 c.
Crimping Tool (for signal connector contacts)	1	Daniels Mfg. Corporation	M-1500A	6-7-2 e.
Insertion Tool (for signal connector contacts)	1	Winchester Electronics, Inc.	107-1015	6-7-2 f.

**NOTES:**

- 1 — Equivalents are acceptable.
- 2 — W. A. Hammond Drierite Co., Xenia, Ohio, as supplied in their No. 6 Mesh Drierite disposable desiccant bags of non-woven fabric material; bags shall remain in sealed moisture free type containers until they are to be used.
- 3 — Thermometer must be capable of measuring metal surface temperature of 130 to 250°F (54 to 121°C).

## 2-2 SPECIAL RECEIVING INSTRUCTIONS

Like all precision made equipment, the drum is packaged so that with reasonable care it will not be damaged during handling. However, if reasonable care is not exercised, severe physical shocks — such as those that can occur should the drum be accidentally dropped onto a surface — could result in permanent damage to the recording elements. A fork lift truck with a minimum capacity of 1000 lbs. can be used in handling.

## 2-3 STORAGE INSTRUCTIONS

The drum can either be stored in its shipping configuration (see Figure 2-1), or the drum can be stored by removing it from its shipping container and then mounting it in its intended location. In the latter storage condition where it is removed from its shipping container, Bryant recommends that the drum side panels be left in place at all times until the drum is to be used. Under no condition shall the panels be arbitrarily removed when the drum is in storage.

## 2-4 INSTALLATION INSTRUCTIONS

Included herein are the procedures for installing a Series 10000 Auto-Lift Drum and the checks that must be performed following installation.

### CAUTION

Though the drum bearings are protected through the use of shipping screws, care shall be exercised to ensure that the drum experiences as little physical shock as possible during handling.

2-4-1 PROCEDURES — Install the drum as follows:

#### NOTE

It is recommended that the drum be installed and operated in an area that meets the ASTM Class C environment as specified in paragraph 2-1-2.

- a. Thoroughly clean the installation area.
- b. Using a fork lift truck that is capable of handling a 500 pound load, move the drum to the area in which it is to be installed.
- c. Remove the envelope with packing list from the outside of the shipping container (see Figure 2-1). Open the envelope and use the quality control check list to check for contents of the shipping container.
- d. Remove the metal shipping bands from the drum's shipping container.



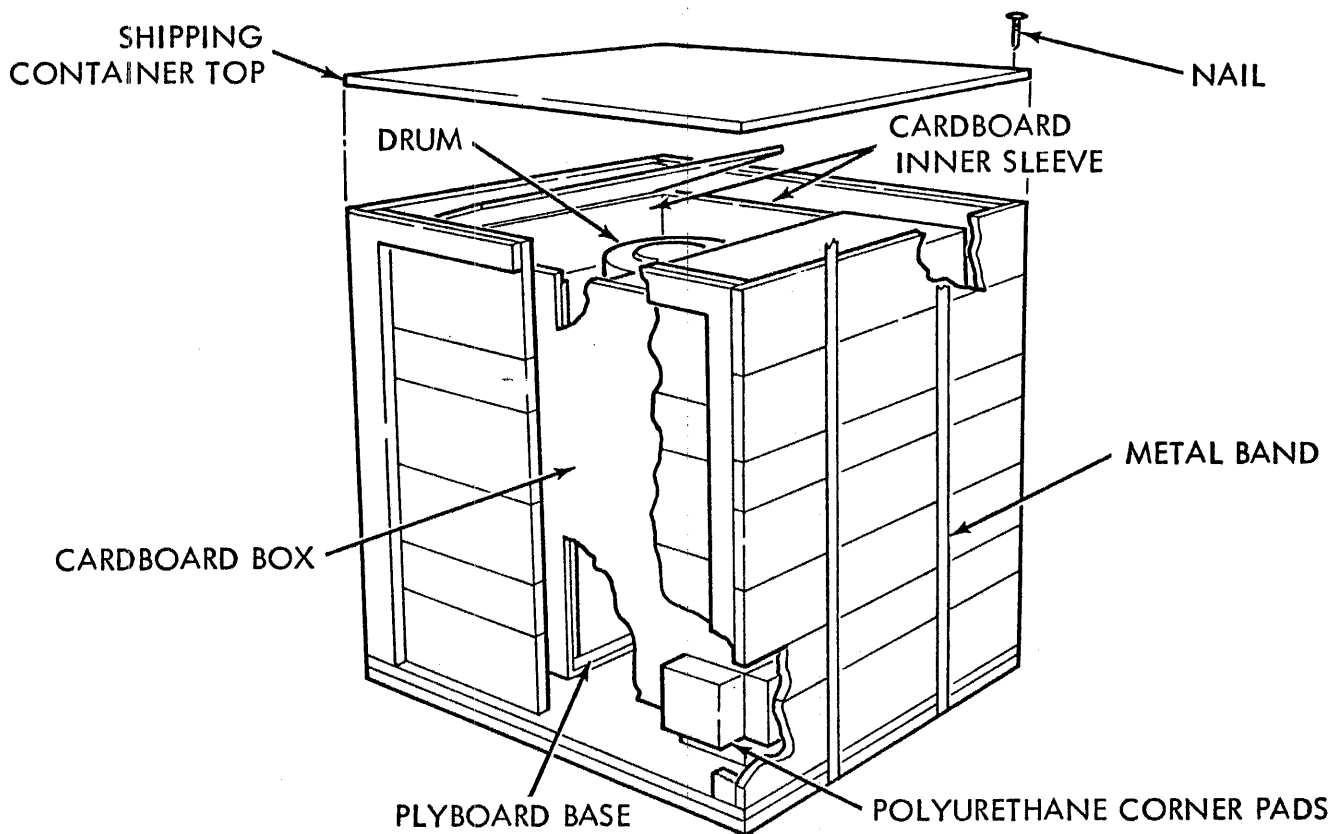


Figure 2-1 Shipping Packaging Configuration of Bryant Series 10000 Auto-Lift Drum

2-4-1 PROCEDURES (Cont.)

- e. Remove the nails securing the top of the shipping container and remove the top.
- f. Remove the polyurethane corner pads, print package, and special tools and accessories package from the wooden shipping container.
- g. Open the top flaps of the cardboard inner box and remove the cardboard inner sleeve.
- h. Install the three lifting eyebolts obtained from the special tools and accessories package in the three tapped holes located in the upper surface of the housing cap.

**CAUTION**

Always maintain the drum vertically oriented.  
If a lifting cradle or sling is used, use only non-fraying rope — such as nylon, not hemp — and carefully pad the drum enclosure to prevent damage.

i. Lift the drum together with the plywood base to which it is mounted clear of the cardboard inner box. With the area thoroughly cleaned, carefully set the drum on the floor and remove the overhead hoist. Remove the plastic bag — without tearing it — that is over the drum; save the bag for future use. Reinstall the overhead hoist.

j. If the temperature of the storage or transit area from which the drum has been moved is within 10°F of the ambient air temperature of the room in which the drum is to be operated, proceed as follows. Otherwise, if a difference in temperature of greater than 10°F exists, proceed immediately to step k. allowing the drum temperature to stabilize to room ambient for the period specified in Table 2-3.

**Table 2-3 Recommended Drum Temperature Stabilization Intervals**

Storage or Transit Temp. Diff. From Operating Room Ambient (°F)	Stabilizing Interval — Drum Not Operating (Hours)
11 to 20	8
21 to 30	12
31 and up	24

**CAUTION**

In the following step, the area surrounding the drum shall be thoroughly cleaned and the access panel(s) shall be removed for as little time as is absolutely necessary. Also, ensure that captive fasteners are free of their mating elements before drawing an access panel away from the drum; damage to the fasteners can otherwise result.

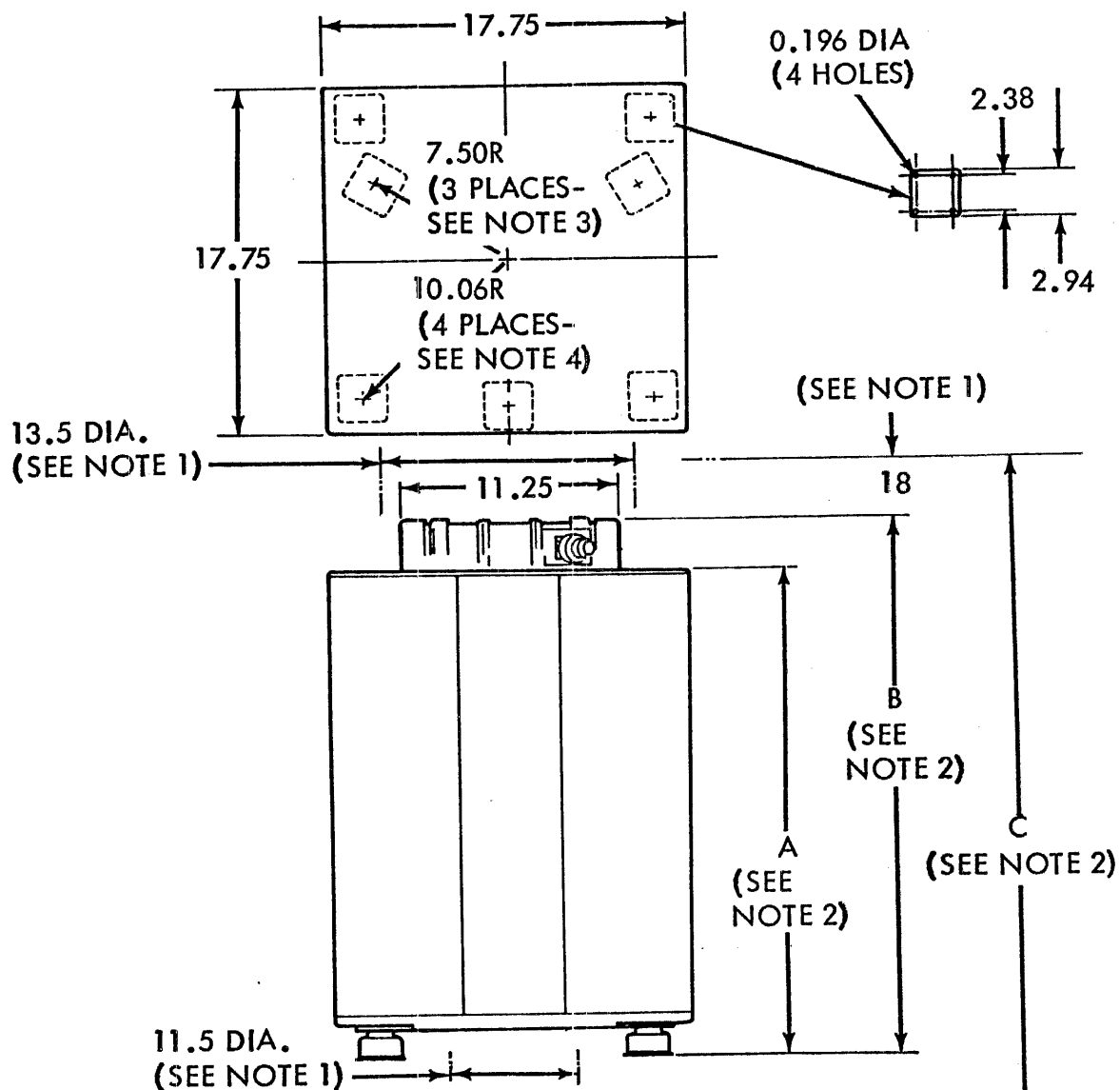
- (1) With the area thoroughly cleaned, loosen the captive fasteners securing the front access panel (for standard drums, the panel with the nameplate) to the drum by pressing in on each fastener and then rotating each fastener 90 degrees counterclockwise. With all captive fasteners checked for freedom, carefully remove the front access panel.
- (2) Remove and discard the bag of desiccant and retaining tape.
- (3) With the desiccant removed, immediately reinstall the cabinet's access panel exercising care to ensure that the end marked "TOP" along the upper inner edge of the panel is positioned to the top of the drum enclosure. When locking a panel fastener, exercise care to ensure that the fastener properly indexes into its mating receptacle; then, rotate the receptacle 50 degrees clockwise to lock it in place.

k. With the drum raised, remove the four screws, flatwashers, and lockwashers securing each of the shock mounts of the drum to the plywood base and remove the base; store the shipping container parts along with the removed plastic cover and plywood base with hardware in a safe place for use in future shipments.

l. The drum can now be installed in its final installation position if so desired; mounting and over-all dimensions of the drum are given in Figure 2-2. In installation, the drum must be properly ventilated. If the drum is not in a freestanding installation, ventilation must be provided to ensure that the drum heat is dissipated by removing the warm air from the immediate proximity of the drum. For each watt of motor power consumed (see Table 1-2 for applicable drum data), at least one cubic foot of air per minute must be passed over the outer shell of the drum housing in an evenly distributed manner.

**NOTE**

The panel with Bryant's nameplate denotes the front of standard drums.



**NOTES:**

- 1 - RECOMMENDED MINIMUM HEIGHT FOR MAINTENANCE
- 2 - HEIGHTS VARY DEPENDING ON DRUM MODEL

DRUM MODEL	MEASUREMENT		
	A(MAX.)	B(MAX.)	C(MIN.)
10128/10256	17.63	20.25	56.25
10384	25.46	28.07	64.07
10512	30.46	33.13	69.13

- 3 - APPLIES ONLY TO DRUMS WITH THREE SHOCK MOUNTS
- 4 - APPLIES ONLY TO DRUMS WITH FOUR SHOCK MOUNTS
- 5 - ALL MEASUREMENTS ARE IN INCHES

Figure 2-2 Mounting Dimensions of Bryant Series 10000 Auto-Lift Drums

- (1) Carefully move the drum to the support platform where it is to be mounted. This platform shall be of adequate strength to support the weight of the drum and shall enable access to the bottom and top of the drum.

**NOTE**

As many as three or four men (depending on the number of shock mounts that are furnished with the drum) would be helpful in the next step.

- (2) Slowly lower the drum onto the platform though, just before contacting the platform surface, turn the shock mounts on the base plate of the drum by hand and align their mounting holes with the platform's mounting holes; then set the drum on the platform. If a shock mount can't be turned to accomplish alignment, proceed as follows:

**CAUTION**

In the following step, the area surrounding the drum shall be thoroughly cleaned and the access panel(s) shall be removed from the drum for as little time as is absolutely necessary.

- (a) Thoroughly clean the area surrounding the drum.

**CAUTION**

Be sure all captive fasteners of the panel are free of their mating elements before drawing the panel away from the drum. Damage to the fasteners can otherwise result.

- (b) Loosen the captive fasteners securing the front panel (1, Figure 2-3) to the enclosure by pressing firmly in on each fastener and then rotating each fastener 90 degrees counterclockwise. With all fasteners completely loose, carefully remove the panel.
- (c) If only the two shock mounts at the front of the drum do not rotate by hand, proceed immediately to step (d). If other shock mounts will not rotate, proceed as follows for drums with four or three shock mounts, respectively, before proceeding to step (d).

1. In the case of a drum with four shock mounts, loosen captive fasteners securing side panel(s) (3 and 5, Figure 2-3) that will enable access to the non-rotating shock mount(s). With all fasteners completely loose, carefully remove the panel(s) and proceed with step (c).
  2. In the case of a drum with three shock mounts, remove both side panels as directed in step 1. Then, loosen the captive fasteners securing the outer edges of the two rear access panels (7 and 9, Figure 2-3) and carefully draw the panels from the rear of the drum housing.
- (d) Slightly loosen the 1/4 - 20 x 1-inch socket head cap screws holding each problem shock mount to it's corner of the drum. Rotate the mount by hand until its mounting holes are aligned with the platforms mounting holes, and then lower the drum onto the platform.

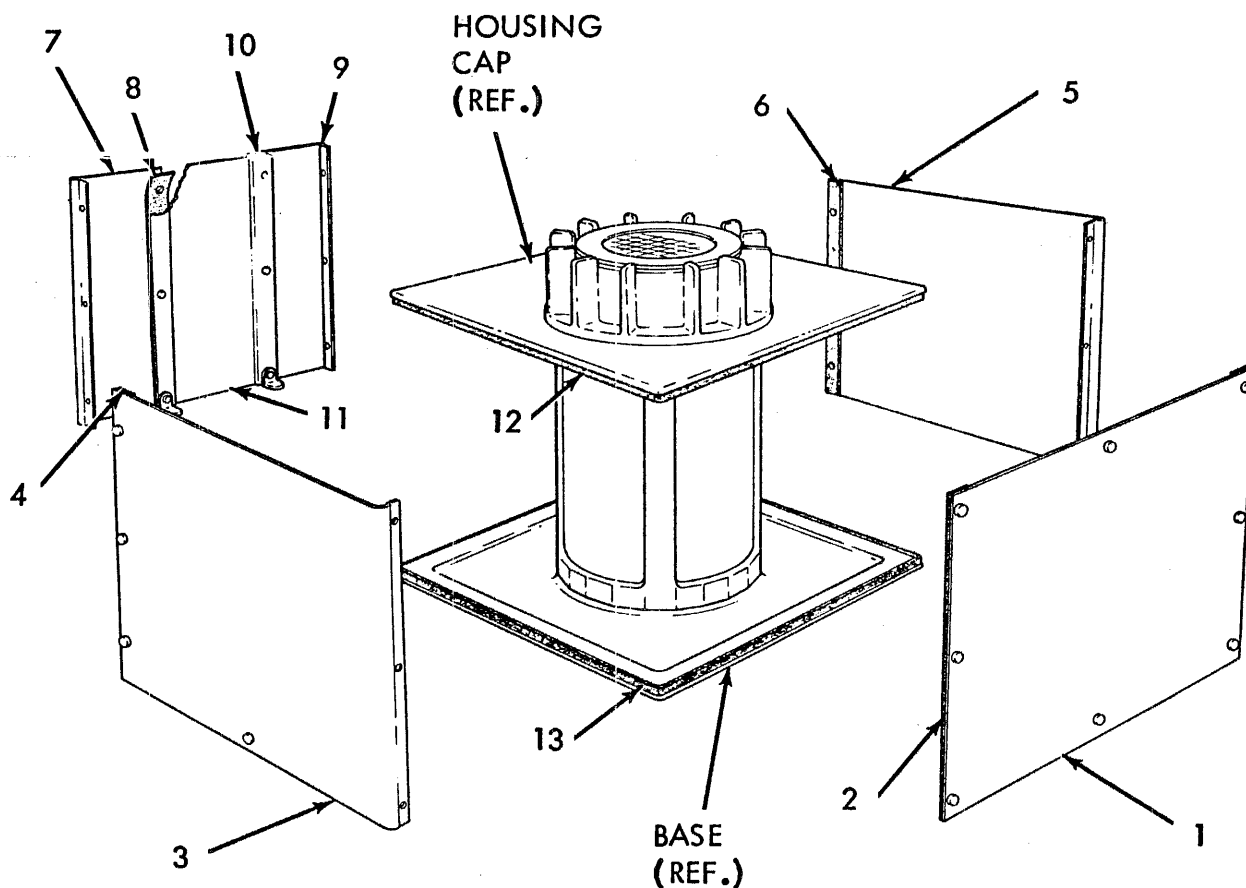


Figure 2-3 Panel Mounting Arrangments for Bryant Auto-Lift Drums Series 10000

Legend for Figure 2-3

Index No.	Part Number	Description							Units Per Assembly	Usable On Code
		1	2	3	4	5	6	7		
		AUTO-LIFT DRUM, Model 10128, standard								A
		AUTO-LIFT DRUM, Model 10256, standard								B
		AUTO-LIFT DRUM, Model 10384, standard								C
		AUTO-LIFT DRUM, Model 10512, standard								D
1	90508-2	PANEL ASSEMBLY, front							1	A, B
	90508-3	PANEL ASSEMBLY, front							1	C
	90508-4	PANEL ASSEMBLY, front							1	D
2	90334-2	GASKET, panel							2	A, B
	90334-3	GASKET, panel							2	C
	90334-5	GASKET, panel							2	D
3	90338-2	PANEL ASSEMBLY, right-side							1	A, B
	90338-3	PANEL ASSEMBLY, right-side							1	C
	90338-4	PANEL ASSEMBLY, right-side							1	D
4	90334-8	GASKET, panel							1	A, B
	90334-9	GASKET, panel							1	C
	90334-10	GASKET, panel							1	D
5	90337-2	PANEL ASSEMBLY, left-side							1	A, B
	90337-3	PANEL ASSEMBLY, left-side							1	C
	90337-4	PANEL ASSEMBLY, left-side							1	D
6	90334-8	GASKET, panel							1	A, B
	90334-9	GASKET, panel							1	C
	90334-10	GASKET, panel							1	D
7	90685-2	PANEL ASSEMBLY, right-rear							1	A, B
	90685-3	PANEL ASSEMBLY, right-rear							1	C
	90685-4	PANEL ASSEMBLY, right-rear							1	D

Legend for Figure 2-3 (Cont.)

Index No.	Part Number	Description							Units Per Assembly	Usable On Code
		1	2	3	4	5	6	7		
8	90334-2								1	A, B
	90334-11								1	C
	90334-12								1	D
9	90725-2								1	A, B
	90725-3								1	C
	90725-4								1	D
10	90334-2								1	A, B
	90334-11								1	C
	90334-12								1	D
11	90373-2								1	A, B
	90373-3								1	C
	90373-4								1	D
12	97337-4-6								A/R	
13	97337-4-6								A/R	



- (e) With all shock mounts aligned, tighten the 1/4 - 20 x 1-inch socket head cap screws loosened in step (c).
  - (f) Inspect gasketing on removed access panels and around visible edges of the drum housing cap and base plate. If gasketing is found damaged or displaced, replace or otherwise reposition gasketing as directed in Section 6.
  - (g) Immediately re-install the cabinet's removed access panels exercising care to ensure that the end marked "TOP", along the upper inner edge of the panel, is positioned to the top of the drum. Install the panels by reversing the applicable panel removal procedures of step (b). When locking a panel fastener, exercise care to ensure that the fastener properly indexes into its mating receptacle; then, rotate the fastener 90 degrees clockwise to lock it in place.
- (3) Secure the drum — through its shock mounts — to the platform using available hardware; use four screws, lockwashers, and flatwashers to secure each mount to the platform.
  - (4) Remove the hoist from the lifting eyebolts and remove the eyebolts from the top of the drum.
- m. Loosen the three setscrews (1, Figure 2-4) and remove the three, red-anodized shipping pins (2) from the top of the drum.
  - n. Install three green-anodized plug pins (3) — obtained from the hardware package secured to the lower edge of the drum — in place of the removed shipping pins. Secure the plug pins in position using the previously loosened setscrews; be sure that setscrews engage the flats of plug pins.
  - o. Store shipping pins and eyebolts for future use in maintenance or shipping.

**CAUTION**

Facility input power shall conform to that specified on the data plate mounted on the front cover panel of the drum.

**WARNING**

Facility input power for the drum motor shall remain off until otherwise directed in a procedure.

Legend for Figure 2-4

Index No.	Part Number	Description	Units Per Assembly	Usable On Code		
					1	2
		AUTO-LIFT DRUM, Series 10000, standard	(Ref)			
1	12142003801	SCREW, set, socket, 1/4 - 20 x 3/8 long	3			
2	90317-1	PIN, shipping	3			
3	90318	PIN, plug	3			

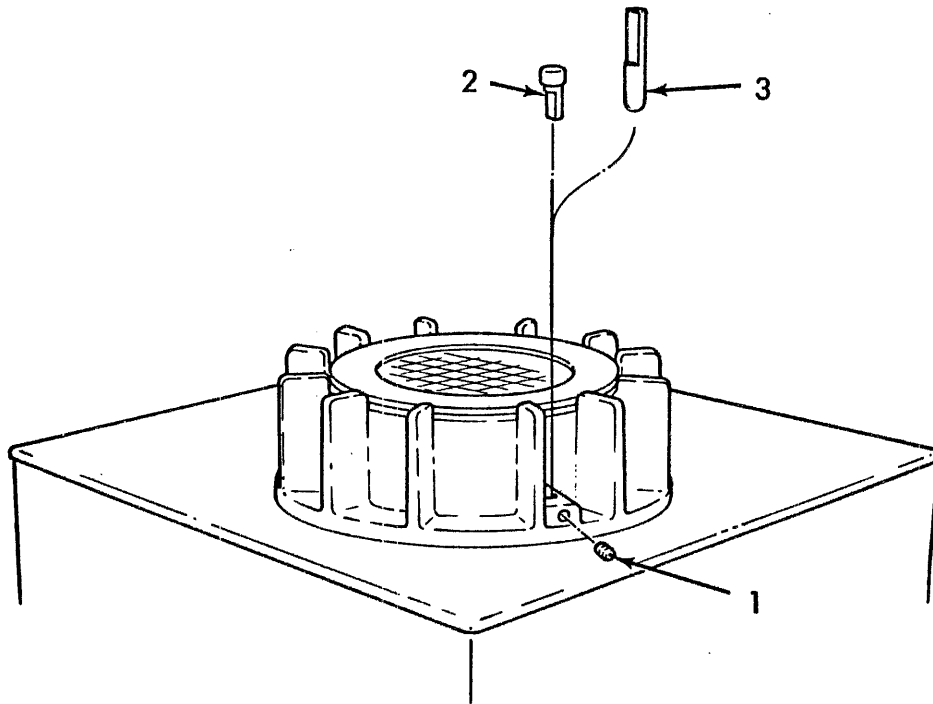


Figure 2-4 Location of Shipping Pins for Bryant Series 10000 Auto-Lift Drums

## 2-4-1 PROCEDURES (Cont.)

p. Though a drum motor power cable is not furnished with the drum — since different cable lengths are required for different facilities — a facility input power connector that is designed to mate with the drum motor connector is furnished as a part of the print and tool package supplied with the drum; this facility input power connector shall be connected so that: neutral of facility power is connected to pin E; the three input phases are connected to pins A, B, and C; and an equipment ground is connected to pin J (see motor wiring in Figure 2-5). With facility power off, connect the facility input power connector to the drum motor connector; however, turn on of the facility power shall not be performed until so instructed in the checks of the following paragraph.

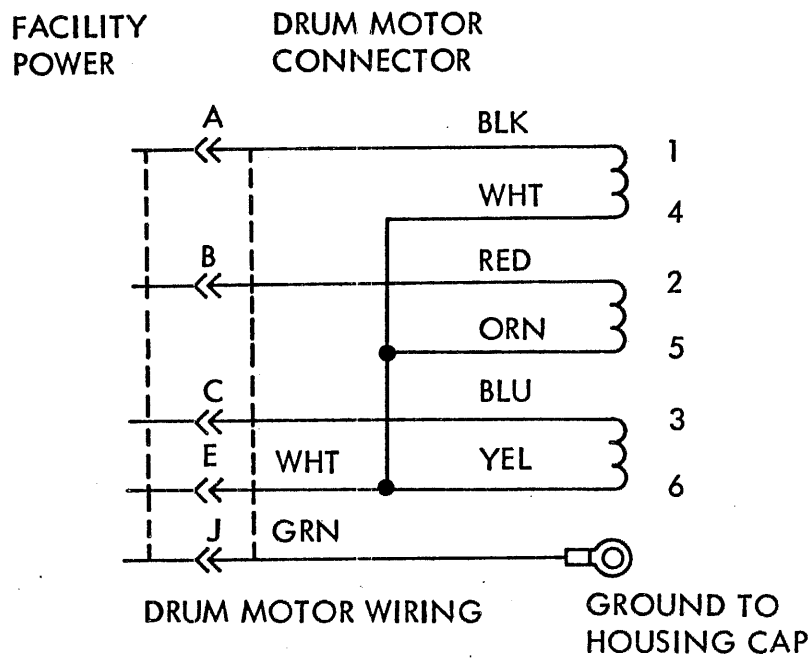
2-4-2 CHECKS — There are no controls or indicators furnished with the standard drum, therefore, all control — including drum turn on — must be initiated through the customer's equipment. Drum turn on shall be initiated only when so instructed in the following procedures.

a. If desiccant was not removed as directed in paragraph 2-4-1 j. because of an excessive ambient temperature difference, wait for the end of the time prescribed in Table 2-3 and then remove the desiccant as specified in the aforementioned paragraph. Do not proceed to the next step until the desiccant is removed.

b. After observing the precautions listed in the beginning of the operating instructions of Section 3, perform the turn on procedures of paragraph 3-3-1 a. through f. exercising extreme care to ensure that drum rotation is proper as directed in the procedure.

c. With turn on satisfactorily achieved, shut down the drum.

d. Check the write/read capability of the drum; this would probably best be done using the computer processor with which the drum is to be ultimately used. To use the processor, appropriate cabling must be connected to the connectors located in the outer-rear connector panels of the drum. For standard drums with standard head matrices and no Bryant options, mating connectors are furnished with the drum to accommodate customer designed interface connection to the start and finish connector J2, taps connector J3, and active clock connector J5 of the connector panel located at the back of the drum; the mating connectors are wired in a manner that will accommodate the drum cable harness connectors J2, J3, and J5 as wired per the wire list furnished with the drum. If a spare clock option is selected by a customer, connector J6 to which the spare clocks are wired will remain unused unless the active clocks at J5 fail. Should such failure occur, the customer connection to J5 can be immediately switched to J6 as directed under emergency operating procedures of Section 3. This action allows drum operation to continue until the problem with the active clock(s) can be remedied.



NOTE:  
PINS K AND L ARE  
USED FOR MOTOR  
THERMAL PROTECTOR  
WHEN SPECIFIED.

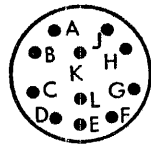


Figure 2-5 Drum Motor Wiring

## 2-5 PREPARATION FOR SHIPMENT OR EXTENDED STORAGE

Prepare the drum for shipment or extended storage as discussed in the following paragraphs. Before proceeding, however, obtain the shipping container parts — including plastic cover, cardboard inner box, cardboard inner sleeve, plywood base and related hardware, and wooden outer box — from storage. Also, obtain shipping pins and lifting eyebolts that were previously stored and obtain one fresh, eight-ounce bag of desiccant as specified in Table 2-2; desiccant bag shall remain in its moisture-free type container until it is required in the procedure.

### CAUTION

Before starting this procedure, thoroughly clean the area surrounding the drum.

### NOTE

The preparation for shipment or storage in the following paragraphs considers only a standard Bryant drum as originally supplied to the customer. Naturally, if the drum is placed in a cabinet or if special items are added to the configuration by the customer, such coverage is beyond Bryant's scope and is not considered herein.

- a. Shut down the drum and remove facility power cable from drum motor connector; also, remove all computer processor cabling from connectors from rear connector panel.
- b. Obtain the drum's shipping pins.

### WARNING

Perform the following procedure only after the drum comes to a complete stop.

- c. When drum rotation stops, loosen the three setscrews (1, Figure 2-4) and remove the green plug pins (3) from the top of the drum.
- d. Install the three red shipping pins (2, Figure 2-4) in place of the plug pins. While pressing the pins down firmly against the drum, secure the shipping pins in position using the previously loosened setscrews; be sure that setscrews engage the flats of the shipping pins.
- e. Install the three lifting eyebolts in the three tapped holes located in the upper surface of the housing cap of the drum; attach an overhead hoist to the eyebolts.

**CAUTION**

Always keep the drum vertically oriented. If a lifting cradle or sling is used, use only non-fraying rope, such as nylon — not hemp, and carefully pad drum enclosure to prevent damage.

f. Remove the four screws and related hardware securing each of the drum shock mounts to the platform on which the drum was mounted and carefully lift the drum from the platform.

**NOTE**

As many as three or four men (depending on the number of shock mounts that are furnished with the drum) would be helpful in the next step.

g. With the drum raised off the floor, install the drum on the plywood base originally used in shipment as follows:

- (1) Hand align the mounting holes of the shock mounts on the base plate of the drum with the mounting holes of the plywood shipping base. If a shock mount can't be turned by hand to accomplish alignment, proceed as directed in the applicable steps of paragraph 2-4-1 l. (2) except align the holes with those in the plywood base instead of the platform as specified in the step.
- (2) Secure the drum — through its shock mounts — to the plywood base using available hardware; use four screws, lockwashers, and flatwashers to secure each mount to the base.

h. Lower the drum to the floor and insert a bag of desiccant (silica gel) into the drum enclosure as follows:

**CAUTION**

In the following steps, the area surrounding the drum shall be thoroughly cleaned and the access panel shall be removed from the drum for as little time as is absolutely necessary.

- (1) Remove the bag of desiccant from its moisture free container. Inspect the bag to ensure that it is completely intact; if the bag is found torn, discard it and obtain another fresh bag. Then use a dry cloth or vacuum sweeper to remove any accumulation of dust that may have formed on the surface of the bag.

- (2) Be sure the area surrounding the drum is thoroughly cleaned before proceeding.



Be sure all captive fasteners are free of their mating elements before drawing the panel away from the drum. Damage to the fasteners can otherwise result.

- (3) Loosen the captive fasteners securing the front access panel to the drum enclosure by pressing firmly in each fastener and then rotating the fastener 90 degrees counterclockwise. With all captive fasteners checked to ensure they are free of the enclosure, carefully remove the front access panel.
- (4) Using masking tape or equivalent, secure the bag of desiccant to the front of the drums base plate.
- (5) Inspect gasketing on removed access panel and around visible edges of the drum housing cap and base plate. If gasketing is found damaged or displaced, replace or otherwise reposition gasketing as directed in Section 6.
- (6) Re-install the cabinet's removed access panel exercising care to ensure that the end marked "TOP" along the upper inner edge of the panel is positioned to the top of the drum enclosure. When locking a panel fastener, exercise care to ensure that the fastener properly indexes into its mating receptacle; then, with the fastener properly indexed, rotate the fastener 90 degrees clockwise to lock it in place.
  - i. Remove the hoist from the eyebolts and install the plastic bag obtained from storage over the drum ensuring that the eyebolts protrude through the openings provided in the bag. Seal the bag around the drum. Re-install the overhead hoist.
  - j. Carefully position polyurethane corner pads at the four bottom inner corners of the shipping container (see Figure 2-1) and then insert the cardboard inner box into the wooden shipping container so that it rests on the pads.
  - k. Lift the drum together with its plywood base and insert them into the cardboard inner box of the shipping container.
  - l. With the weight of the drum supported within the cardboard container, remove the overhead hoist from the lifting eyebolts of the drum.
  - m. Remove the three lifting eyebolts from the drum and package them with the plug pins (removed in step c.) in the special tools and accessories package supplied.

## 2-5 PREPARATION FOR SHIPMENT OR EXTENDED STORAGE (Cont.)

- n. Insert the cardboard inner sleeve over the drum housing cap.
- o. Close and seal the flaps of the inner cardboard box.
- p. Install four polyurethane corner pads on the top of the inner cardboard box.
- q. Insert the print package and special tools and accessories package (for contents, see Table 2-1) in the recess between the wooden shipping container and cardboard inner container. If other tools and materials, as specified in Table 2-2, were obtained and if they are to be shipped with the drum, it is recommended that they be packaged separately.
- r. Position the wooden top on the shipping container and secure it in place using nails.
- s. Route two metal bands vertically under and over the top of the wooden container, tighten the bands, and then secure them.
- t. If separately packaged tools of step q. have been made up, so indicate on the packaging list. Then, secure the envelope with packing list to the outside of the wooden crate. Also affix address labels to the drum shipping container.

### **CAUTION**

Though the drum bearings are protected through the use of shipping screws, care shall be exercised to ensure that the drum experiences as little physical shock as possible during handling.

- u. Using a fork lift truck that is capable of handling a 500 pound load, carefully move the drum to the shipping or storage area; also, move the separately packaged tools of step q. to the same area, as applicable.

## 2-6 SPECIAL SHIPPING OR STORAGE INSTRUCTIONS

The care in handling as delineated under paragraph 2-2 devoted to special receiving instructions also apply to special shipping or storage instructions.



# SECTION 3

## OPERATING INSTRUCTIONS

### 3-1 INTRODUCTION

Though this section is intended to provide the procedures to be followed when operating standard Bryant Auto-Lift drums, such procedures are primarily limited to cautions and generalities since there are no controls or indicators furnished with any of the standard drum configurations. In operation, it is recommended that all procedures be performed by qualified technicians. One man shall be selected to coordinate all activities as well as to assure that all possible caution is taken to protect both personnel and equipment.

#### NOTE

Though standard drums do not contain controls for operating the drums, special instructions can be furnished if a customer selects a Bryant option that offers such controls.

### 3-2 CAUTIONS

The drum shall have been installed on a suitable platform as described in paragraph 2-4-1 before drum operation is initiated for the purpose of storing computer data. Also, it is recommended that the drum be operated only in an area meeting the conditions specified in paragraph 2-1-2.

#### CAUTION

The shipping pins of the drum shall have been replaced with plug pins as directed in paragraph 2-4-1 steps m. and n. before any attempt is ever made to turn the drum on.

- a. Before removing the access panels from the drum, thoroughly clean the area surrounding the drum. Then, maintain the area thoroughly clean for as long as the panels are removed. Drum operation shall be kept to an absolute minimum when the panels are removed.
- b. In general, there is no limitation with respect to the turn on/turn off cycling of the drum motor, though common sense shall dictate no extravagant test of this rule.
- c. If a drum is ordered without prerecorded clocks, the customer must record his own clocks before the drum can be used to store data.

## 3-2 CAUTIONS (Cont.)

d. Before using the drum to store or retrieve data, the drum should be turned on and allowed to operate for a minimum of one hour. This action ensures speed and temperature stabilization of the drum for the normal room ambient operating temperature range specified in Section 1.

e. Whenever disconnecting or connecting harnesses to drum connectors, shut down the drum and then wait for the drum to: (1) retract from the heads; or, (2) come to a complete stop. Damage to the clocks can otherwise result.

## 3-3 STANDARD OPERATING PROCEDURES

Since standard drums are furnished without controls or indicators, all control — including drum turn on and turn off — is assumed to be initiated through the customer's equipment. Drum turn on shall be initiated only when so instructed in the following procedure.

### NOTE

When a customer orders custom controls, operating instructions can be furnished under separate cover at the customer's option.

### 3-3-1 TURN ON — Turn on the drum as follows:

a. If the drum has been exposed to a temperature of greater than 10°F or more from that at which it is to be operated, it is recommended that the drum remain static at room ambient temperature for a period equivalent to that specified in Table 2-3 before it is started; if the temperature difference is less than 10°F, the drum should be left inoperative for four hours in the room ambient in which it is to be operated before performing turn on.

### NOTE

The data plate on the front cover panel of the drum indicates all input power requirements.

b. Before starting the drum, check the input power connector to the drum motor to ensure that the correct voltage and frequency are applied and that wiring is correct.

### CAUTION

If rotation is improper in the next step and remedial action is not taken, data storage and retrieval could be permanently effected.

TURN ON (Cont.)

- c. With the drum temperature stabilized, check drum rotation as follows:
- (1) With one person observing the motor impeller through the cover in the top of the motor housing, apply power to the drum motor and then immediately remove the power. Observe that impeller rotates in direction indicated by arrow that appears on the motor cap.
  - (2) If rotation is correct, proceed immediately to step d.; however, if rotation is improper, proceed as follows:

**CAUTION**

Once the drum motor power connector connections are made, they shall not be changed; only the leads at the facility input power connector shall be switched.

- (a) Remove facility power from the facility input power connector.

**WARNING**

Be sure power is removed from facility input power connector before proceeding.

**CAUTION**

Be sure that neutral at pin E is not switched in the next step.

- (b) Disconnect the facility input power connector from the drum motor connector and then switch any two of the facility power connector leads to pins A, B, or C of the connector.
  - (c) With the wires switched, reconnect the facility input power connector to the drum motor connector and repeat step (1) to ensure that motor rotation is proper.
- d. With drum rotation proper, turn the drum on and observe the following:
- (1) Drum should immediately start to rotate and pick up speed; observe that there is no excessive hum from the motor. If response is improper, immediately shut down the drum.

### 3-3-1 TURN ON (Cont.)

- (2) Popping noises may be heard in the vicinity of the bearings. This phenomenon, which is caused by the channeling of the grease in bearing races, is generally no cause for alarm; however, if the noise does not stop in a relatively short period of time and, in fact, changes to a sound of increasing intensity, immediately shut down the drum. After the drum comes to a complete stop, restart the drum and repeat the procedures.
- (3) The drum should achieve operating speed within approximately two minutes of that time recorded in the log containing the drum test data. If there are any unusual sounds coming from the drum or if the drum is vibrating to an unusual degree, immediately shut down the drum and monitor the time for the drum to come to a complete stop.

e. With the conditions of step d. met, allow the drum to operate for one hour.

f. If the drum has not been operated for 14 or more days prior to the hour of operation just performed, shut down the drum and leave it set static for approximately three hours; the resultant cooling of the drum ensures proper grease formation around the bearings before the drum is placed into extended use.

3-3-2 USING THE DRUM TO STORE DATA — With turn on as directed in paragraph 3-3-1 e. satisfactorily achieved, the drum can be used to store data as directed in paragraph 3-5; however, it is assumed that the customer has connected required head wiring harnesses and written the required clocks. Should the active clocks of the drum be lost and should the drum be equipped with optional spare clocks, drum operation can be reverted to the spare clocks by performing the emergency operating procedures described in paragraph 3-6.

3-3-3 SHUT DOWN — The time for the drum to come to a complete stop after being shut down when operating at normal speed should be that specified in the applicable paragraph in Section 5.

### 3-4 WRITING AND MONITORING CLOCKS

The writing of clocks is the responsibility of the customer (unless the customer selects Bryant's clock writing option) and is not discussed here — though before writing clocks, turn on of the drum as described in paragraph 3-3-1 shall have been successfully accomplished. When monitoring the clocks, never use a volt/ohmmeter to perform a continuity check of a clock head when the head is installed on the drum, since the ohmmeter current flowing through the head winding will erase the clock. Also, when connecting an oscilloscope to the clock head to monitor the clock, proceed as follows:

### 3-4 WRITING AND MONITORING CLOCKS (Cont.)

- a. Ground the oscilloscope to the drum.
- b. Short the probes of the oscilloscope together.
- c. Attach one of the oscilloscope probes to the connector pin that is connected to the green lead of the head.
- d. Short the other oscilloscope probe to the probe attached in step c. and then connect the probe to the connector pin that is connected to the red lead of the head.

### 3-5 WRITING AND READING DATA

The writing of data on and the reading of data off the drum surface is controlled exclusively by the customer (unless the customer orders Bryant's complete interface option). To protect data that is stored on the drum, the cautions generally established in paragraph 3-4 for monitoring clocks shall be observed, as applicable, when monitoring data at the head.

### 3-6 EMERGENCY OPERATING PROCEDURES — USING SPARE CLOCKS

If the normal active clocks of a drum are damaged and the drum has optional spare clocks, emergency drum operation can continue by performing the following procedures:

#### **CAUTION**

Spare clocks shall be used only during emergencies. Drum operation shall always be reverted back to active clocks at the earliest possible time.

- a. Shut down the drum.

#### **CAUTION**

The drum shall have retracted from the heads or come to a complete stop before performing the next step; damage to the spare clock could otherwise result.

- b. When the drum retracts from the heads or comes to a complete stop, switch the cable connector at drum connector J5 to drum connector J6.
- c. Perform the standard operating procedures as applicable. At the earliest possible time, isolate the cause of failure of the active clocks as directed in Section 6. When the problem is corrected, immediately return drum operation to the active clocks.



# SECTION 4

## PRINCIPLES OF OPERATION

### 4-1 INTRODUCTION

Magnetic drum memory design dictates that a magnetic transducer must be maintained at a relatively fixed distance from and within proximity to a recording media under all conditions of a system's environment. Conditions considered include shock, vibration, thermal changes, and different atmospheric pressure and humidity levels. Through the Auto-Lift drum, Bryant has successfully achieved the design goal. Featured in the Auto-Lift drum design is a simple automatic mechanism that works with an adjustable flying head to meet the design dictates of a magnetic drum memory. Wholly different in concept and design, the mechanism and the heads have been operationally integrated with a tapered drum surface to assure the ultimate in fail-safe performance by completely eliminating the prime cause of drum failures — namely, head-to-drum contact. Bryant identifies the elements used in the drum design as the "Auto-Lift<sup>R</sup>" mechanism and "Uni-Just<sup>R</sup>" aerodynamic heads.

### 4-2 OPERATION OF THE AUTO-LIFT MECHANISM

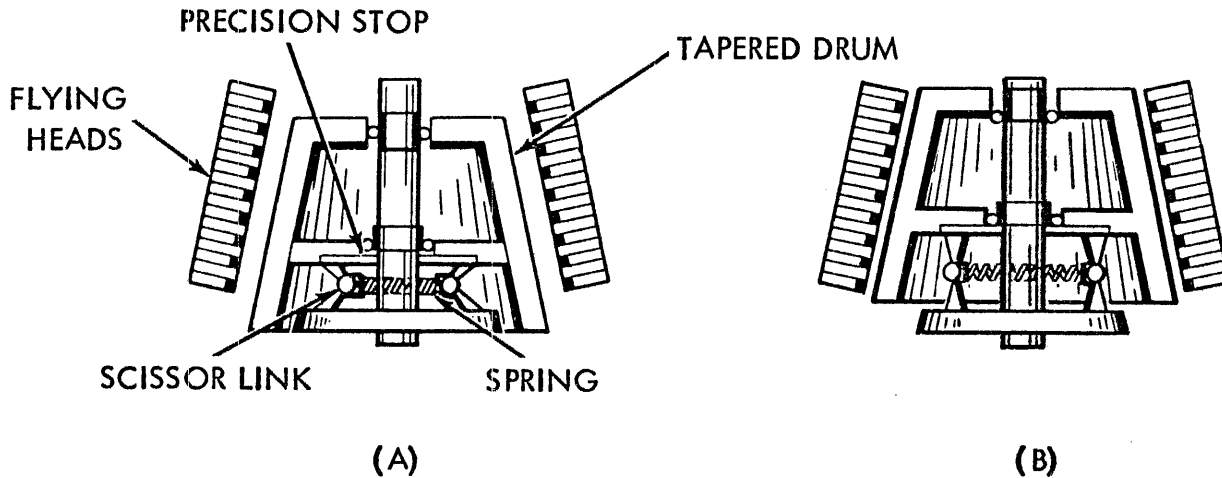
4-2-1 As shown in Figure 4-1, the mechanism for moving the drum axially comprises a pair of simple scissor links which are straightened out by centrifugal force as the drum accelerates to approximately 75% of its operating speed. Straightening of the links raises the drum against a precision stop which defines the upper operating limit of the mechanism. Thus, repeatability of the track location is exact. Spring tension is used to collapse the links and lower the drum as it slows down to approximately 65% of operating speed.

4-2-2 In the static, or down position, the drum surface is approximately 0.003-inch or more from the heads. By the time the drum rises to the up position, a sufficient air bearing is developed along the drum surface to cause the heads to move into a flying attitude approximately 0.0001 to 0.0002 inch from the surface.

4-2-3 This unique centrifugal mechanism, resembling a fly ball governor, is used in all Auto-Lift drums and functions automatically without operating adjustments for the life of the drum. No auxiliary motors, actuators or external control mechanisms are required.

### 4-3 OPERATION OF UNI-JUST AERODYNAMIC HEADS

4-3-1 Total drum reliability depends not only upon the ability of the drum to operate without head-to-drum contact during start/stop cycles, but also depends on: (1) the ability of heads to fly over a wide range of operating conditions; and (2) on the electro-



**NOTE:**

IN THE STOPPED - OR DRUM DOWN - POSITION (A) , THE HEADS ARE LOCATED AT LEAST 0.003 INCH FROM THE DRUM SURFACE TO ENSURE AGAINST START/STOP CONTACT. WHEN THE DRUM MOVES TO ITS UP POSITION (B), THE HEADS ARE SUPPORTED ON A LAMINAR FILM OF AIR CREATED BY DRUM ROTATION.

Figure 4-1 Simplified Functional Diagram of How Bryant's Auto-Lift Mechanism Operates

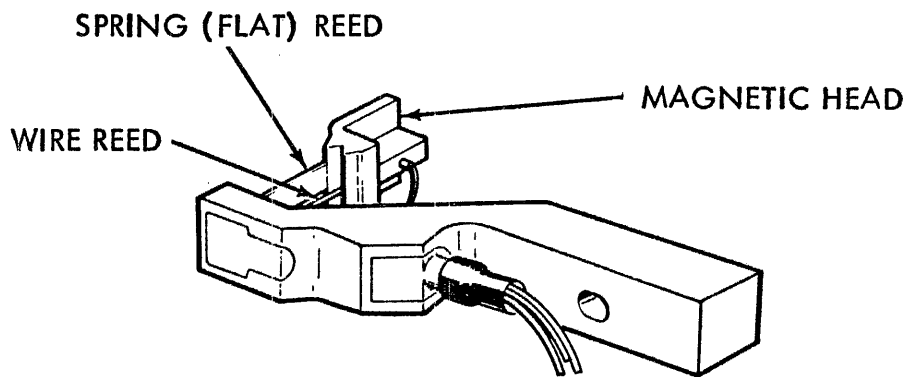


Figure 4-2 Typical Uni-Just Aero-Dynamic Head Assembly



#### 4-3-1 (Cont.)

magnetic performance of the heads. Bryant Uni-Just aerodynamic heads fly stably at all Auto-Lift operating speeds, and over a wide range of shock, vibration, and temperature conditions. They fly continuously — without skipping or bouncing — and provide virtually modulation-free playback signals.

4-3-2 All Uni-Just heads consist of a pole piece structure that is encapsulated in an epoxy which is then molded into an aerodynamic pad. A single mechanical design serves all of the standard Auto-Lift drums throughout their speed ranges, simplifying maintenance and reducing cost of production and spare parts inventory. Elements of a Uni-Just head are shown in Figure 4-2.

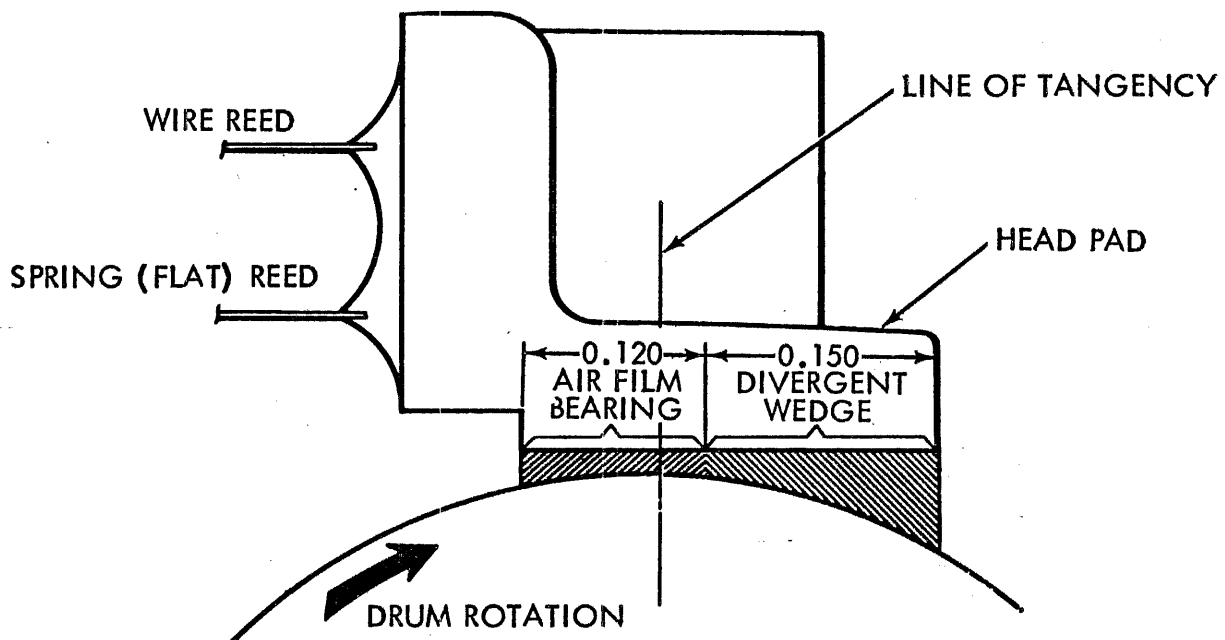
4-3-3 The proper head-to-drum aspect for producing a reliable laminar film of air for each Uni-Just head is established by precision lapping and polishing of the head face. Because of their sound geometry, Uni-Just heads are self-stabilizing. Also, the low-mass flying portion of the head responds instantly to drum runout thereby virtually eliminating unwanted modulation of the playback signal caused by the variations in head-to-drum spacing. The following depicts the four functional characteristics that contribute to the unique operation of all Uni-Just aerodynamic heads.

- a. Development of an adequate laminar film of air (popularly known as the "air bearing") ensures a reliable and uniform working relationship between the restrained head and rotating drum surface (see Figure 4-3).
- b. Deflection of the support reed and existence of a divergent wedge furnishes both a restoring force to enable the head to follow drum runout and an electrical/mechanical "preload" that is related to surface speed.
- c. A self-aligning suspension design allows the high-precision head to correct for minor mechanical misalignment.
- d. Minor adjustments of Uni-Just heads can be made to optimize the slight aerodynamic variations that occur from head-to-head in a normal production run.

4-3-4 The head is initially set for a mechanical preload (with respect to the drum positioned to the lifted attitude) that is optimized to suit drum diameter and speed. The drum is then operated at full speed and precision adjustment techniques when required are used to ensure that the heads are tightly coupled to the laminar air film (0.0001 to 0.0002 inch thick). This procedure assures that the head will provide state-of-the-art packing density and response characteristics.

#### 4-4 TAPERED DRUM SURFACE

An essential design feature of the Auto-Lift drum is its tapered recording surface design, a proprietary Bryant structural arrangement that has long permitted technicians to adjust fixed (non-flying) heads by manually positioning the drum surface to the heads rather than the heads to the drum surface. In the case of Auto-Lift drums, however, the drum is automatically moved up and down — with respect to the Uni-Just aerodynamic heads — by the Auto-Lift mechanism.



**NOTE:**

THE DRUM DIAMETER-TO-HEAD PAD ASPECT IS GREATLY EXAGGERATED TO BETTER ILLUSTRATE THE PHYSICAL RELATIONSHIP INVOLVED.

**Figure 4-3 Simplified Functional Diagram of Bryant's Uni-Just Aero-Dynamic Head**

# SECTION 5

## PREVENTIVE MAINTENANCE

### 5-1 INTRODUCTION

This section contains the preventive maintenance routines that will assure continuous, extended periods of trouble-free Auto-Lift drum operation. Though the prescribed maintenance can be performed by qualified technicians, Bryant recommends that required maintenance be performed by Bryant's qualified staff of servicemen who are always on call to perform such customer service.

5-1-1 PERSONNEL QUALIFICATIONS — Personnel responsible for maintaining the drum shall be technically qualified. One man shall be selected to coordinate all preventive maintenance activities — including establishment of sufficient lead time to assure that special equipment required in a procedure is available — as well as to assure that all possible caution is taken to protect both personnel and equipment. In addition, each individual performing the preventive maintenance procedures contained herein shall be thoroughly familiar with the operating instructions of Section 3. When specified in a procedure, additional qualifications for performing preventive maintenance includes:

a. Only those personnel who have attended and satisfactorily completed Bryant's general drum maintenance school shall be allowed to perform the maintenance as directed herein except for upper and lower bearing replacement.

b. Only those personnel who have attended and satisfactorily completed both Bryant's general and special drum maintenance schools shall be allowed to perform the upper and lower bearing replacement procedures as directed herein.

5-1-2 MAINTENANCE HINTS — Prepare a drum operating log. This log should be used to record the history of drum performance based on accumulated hours of operation. Such a log will be helpful to all parties concerned. If required responses — including those during normal drum turn-on/turn-off procedures — are not obtained when performing preventive maintenance, note the deficiency for subsequent troubleshooting and corrective maintenance; only in those cases where required action is obvious are corrective maintenance procedures specifically called out in the routine. Since qualified technicians should have their own tool kits, standard tools — such as wrenches, screwdrivers, and the like — are not specifically called out as equipment required in the individual routines.

5-1-3 PREVENTIVE MAINTENANCE PERFORMANCE SCHEDULE — Preventive maintenance is generally performed at prescribed, fixed intervals. Additional procedures fall within a category described as "site determined" and "as required" preventive maintenance intervals. In the case of all maintenance categories, the procedures to be performed are based on the environment specified in paragraph 2-1-2; in any worse environment, the frequency of performance must be increased. For example, in an extremely warm environment the "site determined" procedures will have to be performed more frequently than if the drum is operated in a climatically controlled environment. Similarly, in an environment having a greater dust content than that specified in paragraph 2-1-2, the "as required" procedures would be performed more frequently than if the drum was operated in the specified controlled environment. Table 5-1 identifies the routines that fall within each maintenance period; also included in the table are: the estimated meantime-to-completion of the task, excluding the time required for a drum to stop or to come up to speed; and comments relating to the time required to complete the task and the training qualifications required by personnel before performing the task.

**Table 5-1 Preventive Maintenance Schedule**

Interval	Function	Para .	Estimated Meantime-to Completion	Comments
After first continuous eight hours of operation	Drum speed run-down check	5-2	One hour max.	
Weekly	General Inspection	5-3	N/A	
Every three months		5-4		
	Drum enclosure air filter check	5-4-1	N/A	
	Drum speed run-down check	5-4-2		
	Drum surface and head pad cleanliness check	5-4-3	10 minutes	Notes 1 and 3
Site-Determined	Upper and lower bearing replacement	5-5	Five hours (avg.)	Notes 1 and 2

**Table 5-1 Preventive Maintenance Schedule (Cont.)**

Interval	Function	Para .	Estimated Meantime-to-Completion	Comments
As required	Drum surface and head pad cleaning	5-6-1		Notes 1 and 3
	Preferred Procedure	5-6-1-2		
	10128 Drum		11 hours	
	10256 Drum		12 hours	
	10384 Drum		18 hours	
	10512 Drum		20 hours	
	Optional Procedure	5-6-1-3		
	10128 Drum		Three hours	
	10256 Drum		Four hours	
	10384 Drum		Six hours	
	10512 Drum		Eight hours	
	Monitoring drum motor speed	5-6-2	One hour (approx.)	
<p><b>NOTES:</b></p> <p>1 — Estimated meantime-to-completion does not include the time required for the drum to come to a complete stop or to reach stabilized operating speed.</p> <p>2 — Maintenance personnel shall have satisfactorily completed Bryant's special and general drum maintenance school programs (see paragraph 5-1-1 b.); estimated meantime-to-completion does not include a manufacturer recommended five hour lubricant breakin period.</p> <p>3 — Maintenance personnel shall have satisfactorily completed Bryant's general drum maintenance school program (see paragraph 5-1-1 a.).</p>				

5-1-4 **SOCKET TYPE SCREW TORQUE REQUIREMENTS** — All socket type screws removed during the performance of maintenance shall — when reinstalled — be torqued in accordance with the values indicated in Table 5-2 unless otherwise specified.

**Table 5-2 Torque Value Chart for Socket Type Screws**

Screw Size	Torque in Inch-Pounds
#0-80	3
#4-40	6
#5-40	11
#6-32	12
#8-32	20
#10-32	25
1/4-20	30

**5-1-5**     GENERAL WARNINGS AND CAUTIONS — The performance of preventive maintenance often necessitates entrance into areas that are not directly affected by the procedure that is being performed, but which could pose a hazard to personnel and equipment. For this reason the following shall be observed when performing preventive maintenance procedures:

a. Before access panels are removed, thoroughly clean the area surrounding the drum cabinet. Then — throughout maintenance, maintain the area as dust free as possible.

b. Whenever possible, wait for the drum to stop rotating before removing the drum access panels. Keep drum operation to a minimum when access panels are removed.

c. When maintenance is being performed, always notify all remote operating stations.

d. Never touch drum surface with bare hands. Never allow objects that can cause damage to contact the drum surface.

e. As a general rule, exercise care when working around bare electrical wiring or rotating drum.

f. Always check to ensure that tools or other loose objects are not left in the cabinet before installing access panels.

g. Never leave the drum interior unnecessarily exposed. Always install all access panels on the drum when required preventive maintenance is completed or when the preventive maintenance procedures are to be interrupted for a period of time.

h. Before performing a procedure, read it through in its entirety. Then, before performing each step, read the step in its entirety so that there is no question as what is to be done.

## **5-2     AFTER FIRST CONTINUOUS EIGHT HOURS OF OPERATION**

Following the first continuous eight hours of operation after installation, shut down the drum motor and use a stop watch to record the time required for the drum to come to a complete stop; also, record the room temperature. The time at which rotation stops can be checked by viewing the drum rotor through the wire mesh filter covering the motor opening at the top of the drum's housing. The information recorded is used as a basis for future comparisons at three month intervals.

## **5-3     WEEKLY PROCEDURES**

If the drum is operating, monitor the drum for any unusual sounds; if any are detected, isolate the sound, if possible, and immediately shut down the drum; note the time it takes in minutes for the drum to come to a complete stop. On the other hand — with drum

### 5-3 WEEKLY PROCEDURES (Cont.)

operation satisfactory — inspect the exterior surfaces of the Auto-Lift drum enclosure paying particular attention to the wire mesh filter covering the motor opening at the top of the drum housing cap. All noticeable accumulations of dust shall be vacuumed from surfaces and from the area surrounding the drum. Under no condition shall the access panels of the drum be arbitrarily removed for the performance of this weekly inspection, since removal of covers — even for a short period of time — could cause the entry of more dust than would otherwise accumulate if the panels are just left in their installed position. Upon completion of inspection, add the drum's estimated or known accumulated operating time to the previously recorded operating time in the drums log. In addition to serving as a record of drum performance, this information can be used to establish the time for performing subsequent bearing replacement.

### 5-4 EVERY THREE MONTHS

The rundown speed of the drum, the cleanliness of the drum enclosure air filter, and the cleanliness of the drum surface and head pads shall be checked approximately once every three months. Before performing the procedures, review the information contained in paragraph 5-1 and related subparagraphs.

#### CAUTION

Because of head bar removal in paragraph 5-4-3, stored data should be protected (e.g., transferred to an alternate storage location). Such protection ensures that accidents during inspection will not result in the loss of data.

#### NOTE

It is suggested that the speed rundown check be planned to coincide with the performance of the drum surface and head pad cleanliness check (paragraph 5-4-3) and the drum surface and head pad cleaning procedure (paragraph 5-6), as applicable.

5-4-1 DRUM SPEED RUNDOWN CHECK — Perform the procedures of paragraph 5-2 except observe that the drum does not come to a complete stop any sooner than 75% of the time recorded following the initial eight hours of operation. Before performing the check, however, the drum shall be operating at normal speed and the room ambient shall be within no less than 10°F of that recorded following the initial eight hours of drum operation.

5-4-2 DRUM ENCLOSURE AIR FILTER CHECK — View through the mesh screen that is provided over one of the connector openings in a rear panel of the drum. Dirt buildup on the filter that is located behind the screen shall not be significant. If dirt buildup is very obvious, proceed with replacement of the filter as directed in Section 6.

5-4-3 DRUM SURFACE AND HEAD PAD CLEANLINESS CHECK — The drum surface and head pads should generally be checked for cleanliness following every three months of operation. The individual performing the check shall have attended Bryant's drum maintenance school so that he is thoroughly familiar with the importance of the cautions that are specified in the procedure and the means of assessing a dirt buildup condition that will necessitate cleaning of the drum elements. Approximately 10 minutes is required to complete the procedure once the drum comes to a complete stop. It is suggested that this procedure be performed following the drum speed rundown check of paragraph 5-4-1. Check the cleanliness of the drum surface and head pads as follows:

a. Shut down the drum. To ensure that the drum is not accidentally started, disconnect the power to the drum motor; the best way of doing this is to disconnect the facility power cable from the drum motor connector in the motor housing assembly of the drum.

b. Thoroughly clean the area surrounding the drum.

**CAUTION**

Maintain the area as dust free as possible as long as drum access panels are removed. The drum shall not be rotating when performing the procedure.

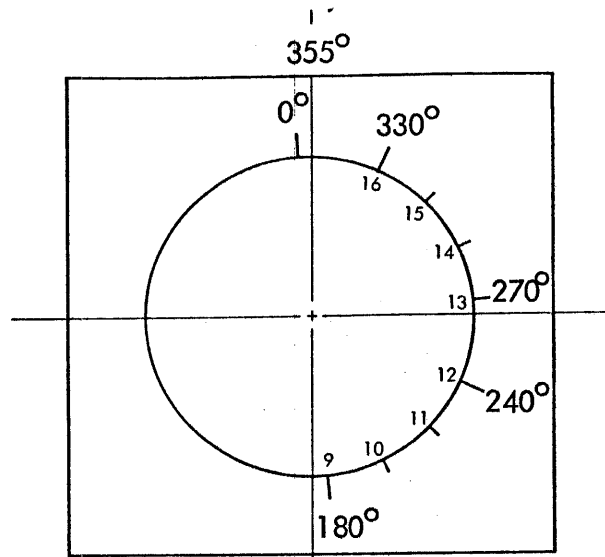
c. When drum rotation stops (fan — viewable through the screened cover on the top of the motor housing assembly — stops rotating), remove the front panel from the drum as directed in paragraph 2-4-1 l. (2) (b); in the case of a Model 10128 drum, also remove the panel located to the right of the front access panel of the drum.

d. Remove and inspect the heads of head bar number 12 of the Model 10128 drum, head bar number eight of the Model 10256 drum, or head bar numbers eight and 24 of the Model 10384 or 10512 drum (see Figure 5-1) as follows:

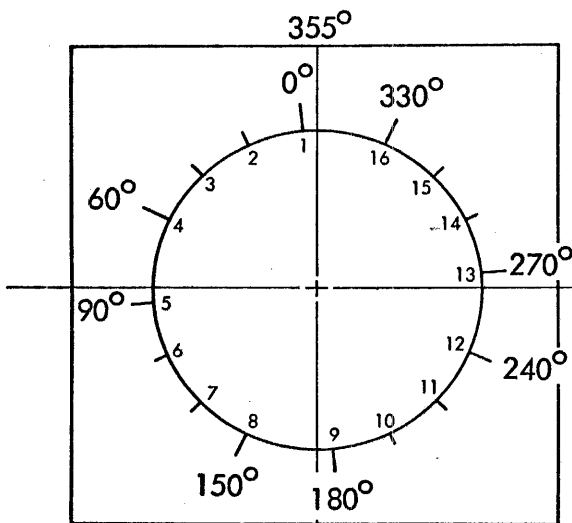
**CAUTION**

It is recommended that only one head bar be removed at a time when performing the following procedures. When pressing in on the head bar in the subsequent steps, avoid excessive pressure; that is apply only enough pressure to just maintain the head bar in position. Also, exercise extreme care to ensure that parts are not dropped into the drum assembly.

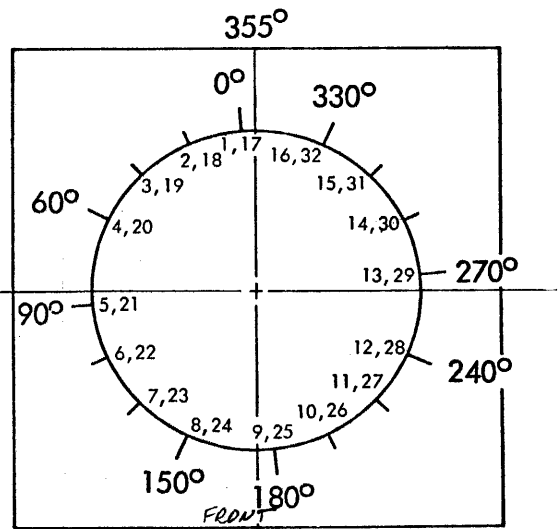




a. MODEL 10128



b. MODEL 10256



c. MODELS 19384 AND 10512

NOTES:

- 1 - NUMBERS INSIDE CIRCLES IDENTIFY HEAD BAR POSITIONS.
- 2 - IN THE CASE OF THE MODELS 10384 AND 10512 DRUMS, HEAD BAR ASSEMBLIES 1 THROUGH 16 ARE MOUNTED IN THE UPPER WINDOWS AND THE REMAINING HEAD BAR ASSEMBLIES ARE MOUNTED IN THE LOWER WINDOWS.

Figure 5-1 Head Bar Location-View From Top of Series 10000 Auto-Lift Drums

- (1) Perform the following initial procedure as applicable:
- (a) In the case of a general storage head bar kit (Figure 5-2), gently press in on the outer, center surface of the head bar (4) and remove the hardware securing the upper and lower ends of the head bar kit (2) together with its terminal board (1) to the casting of the drum housing.
  - (b) In the case of a general storage and clock head bar kit (Figure 5-3), remove the hardware (2 through 4) securing the connector of the kit's clock head to the L-bracket of the drum and withdraw the clock connector from the clock cable harness connector. Then, gently press in on the outer center surface of the head bar (8) and remove the hardware securing the upper and lower ends of the head bar kit (5) together with its terminal board (1) to the casting of the drum housing.

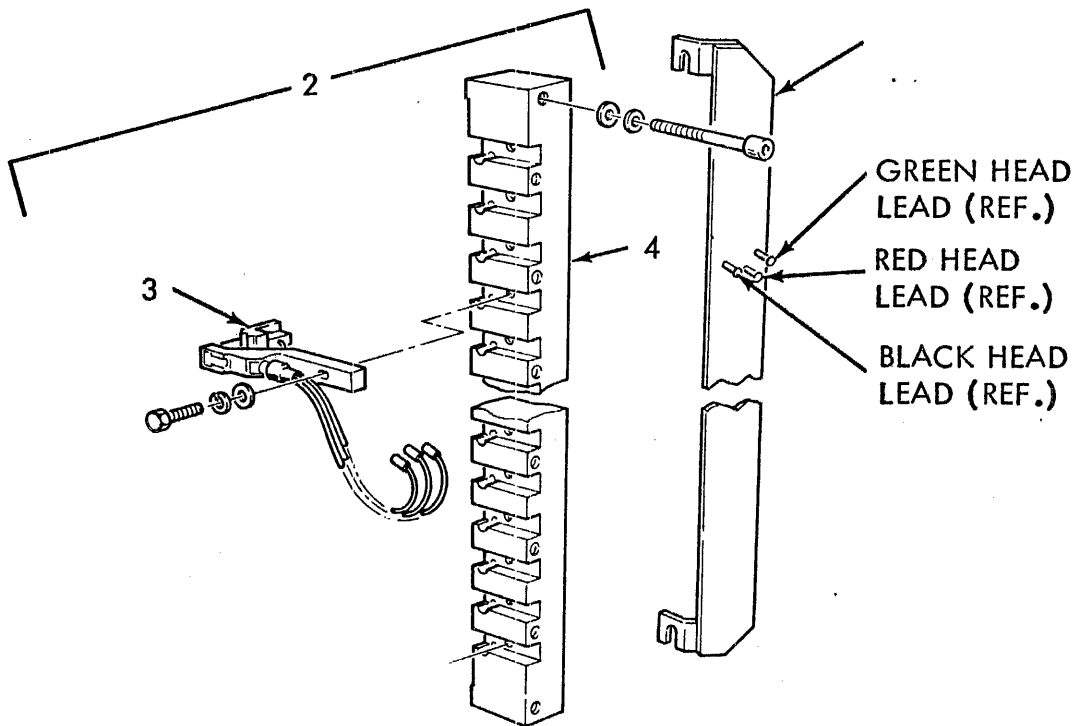


Figure 5-2 Typical Installation Details of General Storage Head Bar Assembly Kits, Bryant Part No. 90634

Legend for Figure 5-2

Index No.	Part Number	Description							Units Per Assembly	Usable On Code
		1	2	3	4	5	6	7		
		AUTO-LIFT DRUM, Model 10128, standard								A
		AUTO-LIFT DRUM, Model 10256, standard								B
		AUTO-LIFT DRUM, Model 10384, standard								C
		AUTO-LIFT DRUM, Model 10512, standard								D
1	(Ref.)	TERMINAL BOARD, part of cable harness furnished with drum							(Ref.)	
2	90634-3	HEAD BAR KIT, general storage, 20 heads							5 (See Note 1)	A
	90634-3	HEAD BAR KIT, general storage, 20 heads							13 (See Note 1)	B
	90634-3	HEAD BAR KIT, general storage, 20 heads							16	C
	90634-7	HEAD BAR KIT, general storage, 11 heads							13 (See Note 1)	C
	90634-3	HEAD BAR KIT, general storage, 20 heads							29 (See Note 1)	D
		(ATTACHING PARTS)								
	97316-22-31	SCREW, cap, socket head, s.s.							2	
		-----*								
3	AH-020	HEAD ASSEMBLY (20-head bar)							16	A, B, C, D,
	AH-020	HEAD ASSEMBLY (11-head bar)							8	C
		(ATTACHING PARTS)								
	97305-7-31	SCREW, cap, hex head, s.s.							1	
		-----*								

Legend for Figure 5-2 (Cont.)

Index No.	Part Number	Description	Units Per Assembly							Usable On Code
			1	2	3	4	5	6	7	
4	90069-1	HEAD BAR, general storage, 20 heads							1	A, B, C, D
	90069-2	HEAD BAR, general storage, 11 heads							1	C

NOTE 1 — Considers a standard series drum; for each additional general storage and clock head bar assembly kit — Bryant Part No. 90635, the number of general storage head bar assembly kits — Bryant Part No. 90634 — decrease by one.

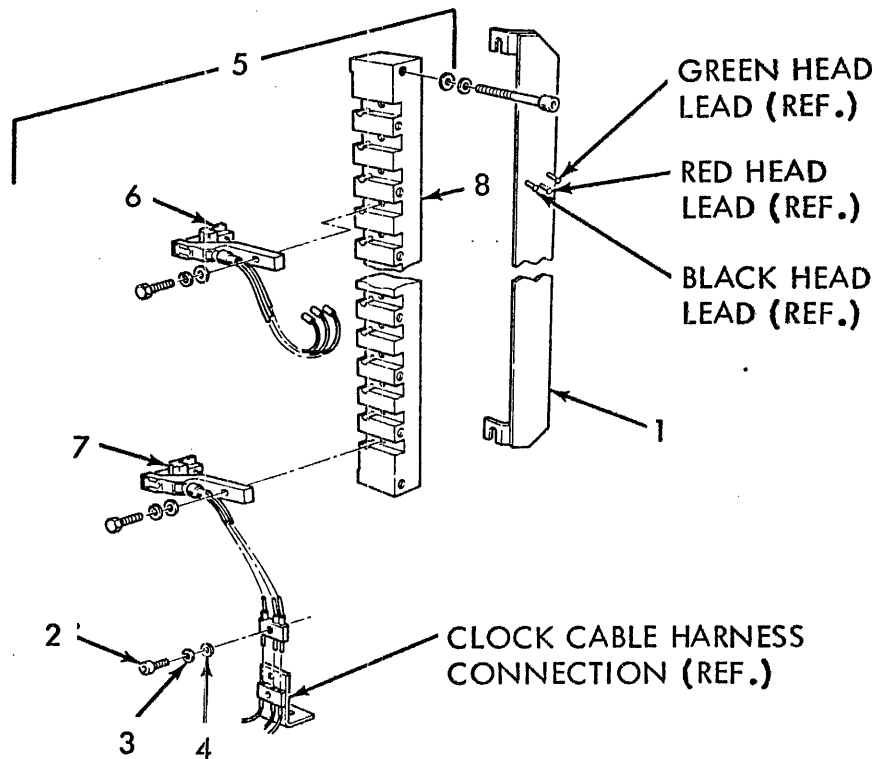


Figure 5-3 Typical Installation Details of a General Storage Head Bar Assembly Kit, Bryant Part No. 90635

Legend for Figure 5-3

Index No.	Part Number	Description							Units Per Assembly	Usable On Code
		1	2	3	4	5	6	7		
		AUTO-LIFT DRUM, Model 10128, standard								A
		AUTO-LIFT DRUM, Model 10256, standard								B
		AUTO-LIFT DRUM, Model 10384, standard								C
		AUTO-LIFT DRUM, Model 10512, standard								D
1	(Ref.)	TERMINAL BOARD, part of cable harness furnished with drum							(Ref.)	
		(ATTACHING PARTS)								
	97316-6-31	SCREW, cap, socket head, 6-32 x 3/8 long							2	
		-----*								
2	MS16995-3	SCREW, cap, socket head, No. 2-56 x 3/8 long							1	
3	MS35337-77	WASHER, lock, split, No. 2							1	
4	MS15795-802	WASHER, flat, No. 2							1	
5	90635-3	HEAD BAR KIT (CLOCK), general storage, 20 heads							3 (See Note 1)	A, B, D
	90635-2	HEAD BAR KIT (CLOCK), general storage, 11 heads							3 (See Note 1)	C
		(ATTACHING PARTS)								
	97316-22-31	SCREW, cap, socket head, s.s.							2	
		-----*								
6	AH-020	HEAD ASSEMBLY (20-head bar)							16	A, B, D
	AH-020	HEAD ASSEMBLY (11-head bar)							8	C
		(ATTACHING PARTS)								
	97305-7-31	SCREW, cap, hex head, s.s.							1	
		-----*								

Legend for Figure 5-3 (Cont.)

Index No.	Part Number	Description							Units Per Assembly	Usable On Code
		1	2	3	4	5	6	7		
7	90504-2				HEAD ASSEMBLY (CLOCK)			1		
					(ATTACHING PARTS)					
	97305-7-31				SCREW, cap, hex head, s.s.			1		
					-----*-----					
8	90069-3				HEAD BAR, general storage, 20 heads			1	A,B,D	
	90069-2				HEAD BAR, general storage, 11 heads			1	C	

NOTE 1 -- Quantities apply to standard drums only.

5-4-3 DRUM SURFACE AND HEAD PAD CLEANLINESS CHECK (Cont.)

**CAUTION**

Extreme care shall be exercised to ensure that the heads of the head bar and the drum surface are not touched by any objects during the subsequent procedures.

- (2) With the mounting hardware removed, draw the head bar straight out and away from the housing ensuring the head pads and drum surface are not touched by any objects.
- (3) Inspect the head pads of the head bar assembly and the drum surface for dirt buildup. Such buildup shall not be excessive (excessive as generally described in Bryant's drum maintenance school). There shall be no unusual marks on the drum surface (burnish marks or scratches). If dirt buildup is excessive or unusual marks are visible on the drum surface, proceed with the head pad and drum surface cleaning procedures of paragraph 5-6. Otherwise proceed to the next step.
- (4) With the inspection satisfactorily completed, insert the head bar straight into the drum housing ensuring that the head pads and drum surface are not touched by any objects.

- (5) Gently press in and down on the center of the head bar and secure the bar in position by reversing the applicable procedures of step (1).
- e. Vacuum any dust accumulation that may be detected in the drum interior.
- f. Inspect gasketing as directed in paragraph 2-4-1 l.(2)(f).

**CAUTION**

In the next step, ensure that inner edge of panel marked TOP is positioned to the top of the drum before it is installed.

- g. In the case of a Model 10128 drum, install the right front access panel on the drum as directed in paragraph 2-4-1 l.(2) (g). Then, for any drum, reinstall the front panel on the drum as directed in paragraph 2-4-1 l.(2) (g).
- h. Reconnect the facility power cable to the drum motor connector in the motor housing assembly of the drum. Return protected data to drum surface.

## 5-5 SITE DETERMINED

Though bearing assemblies having a 100,000 hour rated design life are used in Bryant's Auto-Lift drums, the replacement interval of such bearing assemblies is primarily governed by the life of the lubricant that is used to protect them. One of the best bearing lubricants available on the market today is used to lubricate Bryant's bearing assemblies. This lubricant — as in the case of any lubricant, however — is subject to breakdown at a much earlier time interval than that of the bearing assemblies. In fact, as the temperature at which a bearing assembly operates is increased, the life of the lubricant is correspondingly decreased; similarly, as the mass and operating speed of a drum is increased, lubricant life is further decreased. To ensure that the drum is not prevented from performing its function because of bearing failures that could result from lubricant breakdown, it is recommended that the bearing assemblies of models of the Series 10000 drums be replaced with new, properly qualified and lubricated bearing assemblies at the intervals specified in Tables 5-3 or 5-4, as applicable, for the indicated conditions. Though replacement at such intervals is not considered mandatory, such replacement will generally preclude lubricant breakdown and subsequent bearing failure during critical operating periods; that is, bearing replacement can take place around the prescribed interval when drum operation is not critical. Personnel who qualify for accomplishing replacement shall have met the requirements of paragraph 5-1-1 b. Approximately four to six man hours are required to replace both assemblies; this time estimate, however, excludes the bearing manufacturer's recommended two hour breakin operation followed by three hour cooling period after the drum comes to a complete stop. Only one bearing assembly shall be replaced at a time; in the following procedure, the upper bearing was arbitrarily selected as the first assembly to be replaced.

## NOTE

The operating temperature of a bearing can be determined by removing an access panel of the drum and mounting a thermocouple on the drum housing as near the upper bearing cage/ball bearing assembly (see Figure 1-4) as possible. If several drums are in a facility, the operating temperature of the bearing of each drum shall be checked regardless of drum model since wide variations could exist even for like models in identical ambients.

**Table 5-3 Recommended Minimum Bearing Replacement Intervals Based on Lubricant Life — Auto-Lift Drum Models 10128, 10256, 10384 and 10512 Operating at 1800 RPM**

Bearing Operating Temperature (°F)	Recommended Replacement Interval (Hours of Operation)
100	22,000
120	17,000
140	13,000

**Table 5-4 Recommended Minimum Bearing Replacement Intervals Based on Lubricant Life —Auto-Lift Drum Models 10128, 10256, 10384 and 10512 Operating at 3000 or 3600 RPM**

Bearing Operating Temperature (°F)	Recommended Replacement Interval (Hours of Operation)
100	19,000
120	14,000
140	10,000



5-5-1 UPPER BALL BEARING ASSEMBLY REPLACEMENT — This procedure necessitates shutdown of the drum before proceeding. Because this procedure takes several hours to complete, it is recommended that it be scheduled around the prescribed interval and at a time when it is known the drum will not be in use.

5-5-1-1 Special Equipment Required — In addition to the drum shipping pins (2, Figure 2-4), obtain the following special equipment:

**CAUTION**

DO NOT remove new ball bearing assembly from its package until so directed in the procedure.

- a. Upper ball bearing assembly, Bryant Part No. 97141-13 as received prelubricated and packaged from Bryant Computer Products
- b. Bearing puller, Bryant Part No. AD-076
- c. Three, 1/4-20 x 1-inch eyebolts
- d. Hot plate, Thermolyne Model HP-A 1915 B, or equivalent; also, a thermometer for measuring the heat of the plate from a minimum of 135°F to a maximum of 260°F
- e. Clean, lint-free, white gloves
- f. Two, 1/4-20 studs approximately 2-inches long
- g. Three, No. 10-32 x 1-1/4-inch long socket head cap screws
- h. A Starret micrometer depth gage with zero to 1-inch rod, or equivalent
- i. A glass stone, Norton HF 143 and an India Oilstone, Norton MB 24, or equivalent
- j. Oil, machine, light weight
- k. Loctite "C"

5-5-1-2 Replacement Procedure — Replace the upper bearing assembly as follows:

**WARNING**

The drum shall not be rotating when performing the following procedures.

**CAUTION**

Perform lower bearing replacement only after stored data has been protected (e.g., transferred to an alternate storage location). Such protection ensures that accidents during replacement will not result in the loss of data.

- a. Install drum shipping pins as directed in paragraph 2-5 a. through d. except that removal of the computer processor cabling as directed in step a. need not be done.

### 5-5-1-2 Replacement Procedure (Cont.)

- b. Remove two plug screws (see Figure 5-4) from the base plate of the drum and install the two studs of paragraph 5-5-1-1 f. in their place. Thread the studs into the base by hand until they are felt to contact the bottom edge of the drum.
- c. Remove the cover (1, Figure 5-5) from the drum housing.
- d. Remove fan (2) from the hold down screw (8).
- e. Remove motor housing assembly (5) leaving it connected to the motor connector. Set the housing assembly off to the side on the housing cap.

#### NOTE

Before removing the spindle extension in step f., observe that index mark appears as stated. If mark is not present, use a grease pencil, or the like, to establish reference.

- f. Remove hold down screw (8), washers (9 and 10), and spacer (11). Then, after checking that a mark on the rotor assembly (12) is in line with the reference mark on the end of the spindle extender (13), remove the rotor assembly (12) from the extender.

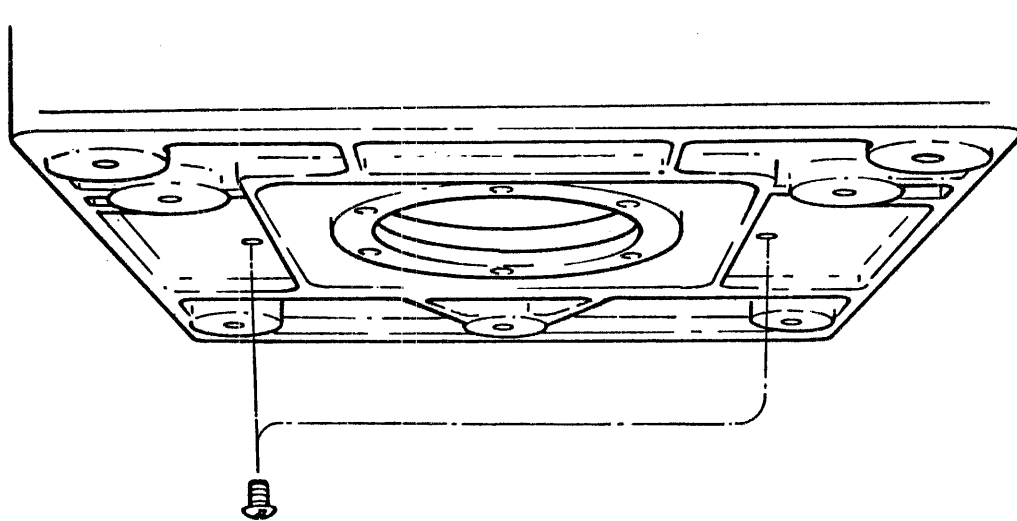


Figure 5-4 Location of Lower Plug Screws Series 10000 Auto-Lift Drums

5-5-1-2 Replacement Procedure (Cont.)

- g. Place a reference mark on the spindle extender (13) and on the cover plate (14). Remove the spindle extender.

**CAUTION**

The following step is extremely important. The indexing mark permits reassembly of the bearing cage and cover plate on the spindle in the same relative orientation they had originally, thus ensuring that the proper spindle rotational axis is maintained.

- h. Place aligning index marks (using a grease pencil or the like) on junctions of the inner surface of the housing cap and the cover plate (14).

**CAUTION**

The set screws in the cover plate (14) are factory preset to establish proper bearing preload. DO NOT attempt to loosen or otherwise touch the set screws of the cover. Also, DO NOT allow the bearing cage assembly (17) to rotate until after making the index mark of step k.

- i. Remove the hardware securing the cover plate (14) to the inner surface of the drum housing. Remove the cover by drawing it straight up and out of the drum; do not allow pressure plate (15) or bearing cage assembly (17) to rotate when performing this procedure.

j. Mark (with a grease pencil or the like) an index line on the pressure plate (15) opposite the mark made on the inside of the housing cap in step h. and then remove the pressure plate and compression springs (16) from the bearing cage assembly (17); again, ensure that bearing cage assembly does not rotate when performing the procedure.

k. With the bearing cage assembly (17) maintained in the position it was in before performing step h., mark (with a grease pencil or the like) an index line on the upper surface of the bearing cage assembly opposite the mark made on the inside of the housing cap of the drum housing in step h.

**NOTE**

The following measurement shall be made only when replacing the bearing for the first time. All future bearing replacement efforts shall utilize this recorded figure as the base measurement during reassembly of the ball slide assembly (21) into the motor cap.

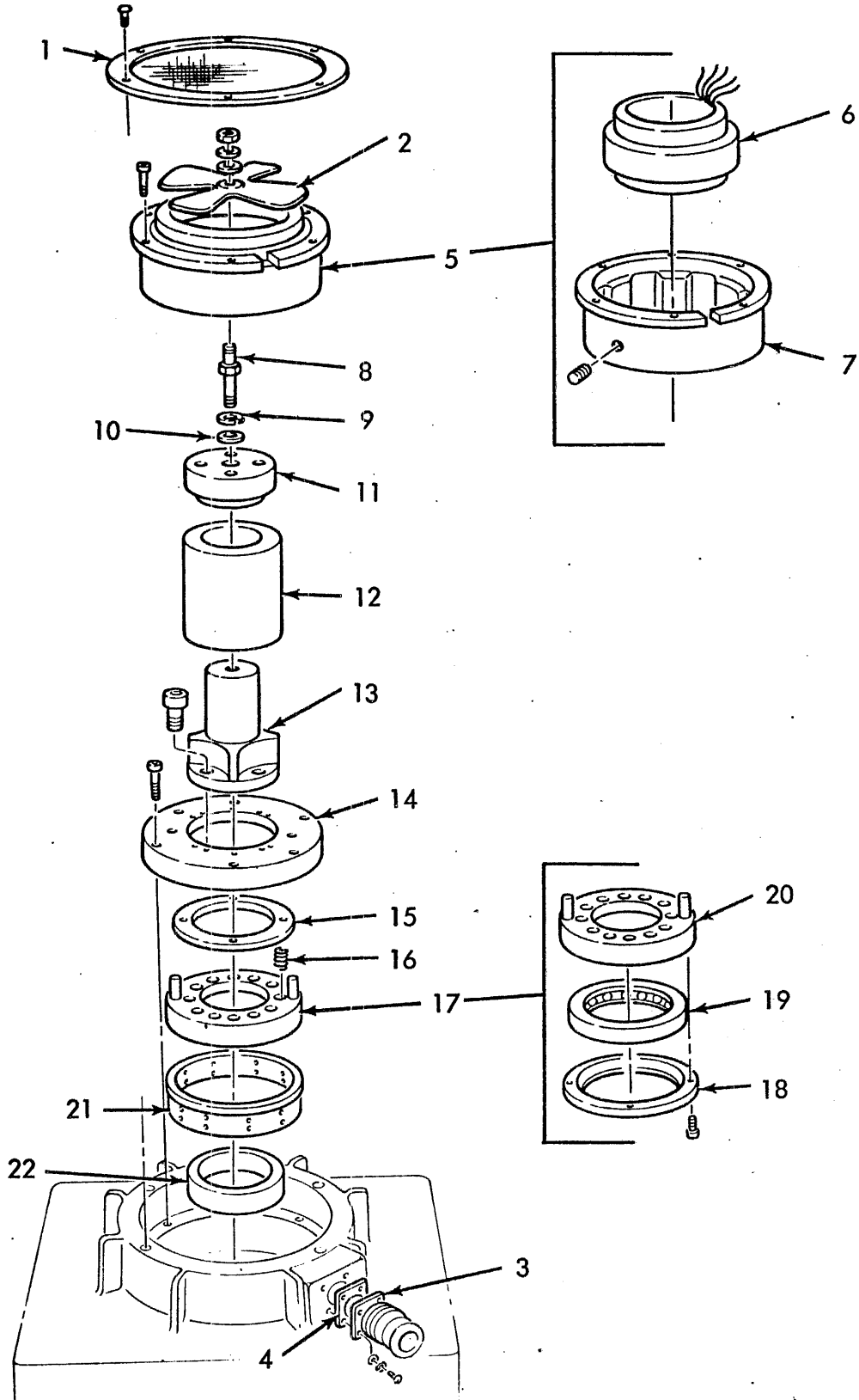


Figure 5-5 Motor and Upper Bearing Assembly Replacement, Exploded View Series 10000 Auto-Lift Drum

Legend for Figure 5-5

Index No.	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
		AUTO-LIFT DRUM, Series 10000, standard	(Ref.)	
1	90346	COVER (ATTACHING PARTS)	1	
	02063203801	SCREW, cap, socket, button head, 6-32 x 3/8 long	4	
	MS35337-79	WASHER, lock, split, No. 6	4	
	MS15795-805	WASHER, flat, No. 6 -----*	4	
2	97222	FAN (ATTACHING PARTS)	1	
	MS35690-410	NUT, hex, 1/4-20	1	
	MS35337-82	WASHER, lock, split, 1/4	1	
	MS15795-810	WASHER, flat, 1/4 -----*	1	
3	97225-1	CONNECTOR, motor	1	
4	97227-1	GASKET, motor connector (ATTACHING PARTS)	1	
	02044003801	SCREW, cap, socket, button head, 4-40 x 3/8 long, s.s.	4	
	None	WASHER, lock, split, No. 4	4	
	None	WASHER, flat, No. 4 -----*	4	
5	None	MOTOR HOUSING ASSEMBLY (ATTACHING PARTS)	1	
	MS16995-18	SCREW, cap, socket head, 6-32 x 1/2 long	6	
	MS35337-79	WASHER, lock, split, No. 6	6	
	MS15795-805	WASHER, flat, No. 6 -----*	6	



Legend for Figure 5-5 (Cont.)

Index No.	Part Number	Description							Units Per Assembly	Usable On Code
		1	2	3	4	5	6	7		
19	See Note 2								1	
20	90310								1	
										BEARING CAGE/SPRING PLATE, upper
21	See Note 3								1	
										BALL SLIDE ASSEMBLY
22	See Note 2								1	
										BEARING INNER RACE

NOTES:

- 1 — Part number varies depending on user requirements; see list of recommended spare parts for drum purchased.
- 2 — Part of bearing assembly, Bryant Part No. 97141-13.
- 3 — Made up of ball retainer, Bryant Part No. 90315; and 36, 1/4 diameter balls, Bryant Part No. 97273-7-2.

5-5-1-2 Replacement Procedure (Cont.)

l. When replacing an upper bearing assembly for the first time, use a micrometer depth gage of paragraph 5-5-1-1 h. to measure the distance between the upper phenolic surface of the ball slide assembly (21) and the inner surface of the housing cap. Reference mark the surface of the ball slide and housing cap where the measurement is made. Record this measurement to within 0.01 inch in the drum log; this measurement will be used as a basis in all future reassemblies of the upper bearing assembly.



Remove the bearing cap slowly to prevent damage to the spindle.

m. Install the three eyebolts obtained in paragraph 5-5-1-1 c. in the three tapped holes in the upper surface of the bearing cage assembly (17).

n. Grasping the eyebolts installed in step m., remove the bearing cage assembly from the motor cap of the drum housing. As the cage is withdrawn, the ball slide assembly (21) emerges with it; to facilitate subsequent reassembly (see step y.), note the relative position of the ball slide within the motor cap of the drum housing as the bearing cage is withdrawn from the slide. Withdraw the slide from the drum housing and set both the slide and bearing cage on a clean, dust free surface.

5-5-1-2 Replacement Procedure (Cont.)

o. Disassemble the bearing cage assembly (17) as follows:

- (1) Remove the hardware securing the bearing seal (18) to the assembly and remove the seal.



In the next step, apply pressure equally around the bearing outer race; this action prevents damage to the bore of the bearing cage as the race is jacked out.

- (2) Insert the socket head cap screws obtained in paragraph 5-5-1-1 g. into each of the three holes located on the inner periphery of the outer surface of the bearing cage/spring plate (20); then, by tightening each of the screws in equal increments, jack the bearing outer race (19) from the bearing cage/spring plate and discard the outer race. Remove the No. 10-32 screws from the bearing cage/spring plate.

p. Put an indicating mark on the drum spindle adjacent to the burnish mark on the bearing inner race (22).

q. Install the stud of the bearing puller on the end of the drum spindle. Install the bearing puller over the bearing inner race (22) and position the puller against the stud so as to protect the spindle. Then, tighten the screw on the top end of the bearing puller with the fingers until the lead end contacts the stud on the end of the spindle.

r. Using a wrench to turn the screw, jack the inner race of the bearing (22) free of the spindle using the bearing puller and discard the inner race.

s. Remove the stud from the end of the spindle.

t. While wearing clean, lint-free, white gloves, remove the new bearing assembly from its protective container; then, remove the inner race from the outer race of the bearing assembly and return the lubricated outer race to the protective container.

u. After wiping away all heavy accumulations of lubricant, use a glass stone to remove all traces of burrs from the shoulders of the new inner race and from the spindle of the drum. If burrs cannot be removed with the glass stone, consult Bryant's Product Services Department for action to be taken. If the medium India oilstone of Table 2-2 is suggested for use by the Product Services Department, use the glass stone for removal of any fine burrs.

v. Using the hot plate and thermometer, heat the inner race to 250°F (maximum). As the inner race is being heated, apply a very light coat of machine oil to the spindle where the inner race is to set. The coating will be as thin as possible, not dripping. Then — with the race heated — install the inner race (22, Figure 5-5) on the spindle such that the race's burnish mark — located on surface of small diameter end of the race — is visible when viewing the end of the spindle. Coincidentally, quickly rotate the race 10 to 15 degrees cw and then ccw to ensure it is fully seated on the spindle. Then, align the burnish mark of the race with the indicating mark placed on the spindle in step p.



**CAUTION**

The inner race must be fully seated against the shoulder on the spindle. If not, jack the inner race loose as directed in steps q. through s., clean the inner race as directed in step u., and repeat step v. until seating is satisfactory.

w. While wearing clean, lint-free, white gloves, assemble the bearing cage assembly (17) as follows:

- (1) Obtain the prelubricated outer race of the new bearing assembly.

**CAUTION**

In the next step, do not allow outer race to become cocked as it is inserted into the cage; damage to the cage bore can otherwise result.

- (2) Using the hot plate and thermometer, heat the bearing cage to 140°F (maximum). Then, with the outer race's surface on which the manufacturer's name is stamped positioned toward the inside of the bearing cage, insert the bearing outer race (19) into the bearing cage/spring plate (20). With the pressure plate (15) positioned over the race to distribute the load, a light metal hammer and punch used on the pressure plate can be used to gently tap the bearing outer race into the cage; accomplish insertion by alternately working at four equally spaced points about the face of the pressure plate until the race is fully seated in the cage.
- (3) Allow sufficient time for the bearing cage to cool to room ambient; as long as 1/2-hour may be required for this to occur.
- (4) Secure the bearing seal (18) to the bearing cage/spring plate using appropriate hardware; apply Loctite "C" sparingly to the threads of the screws.

x. Press the balls of the outer race of the bearing cage assembly as far back into the raceway as possible.

**CAUTION**

Take care that the balls of the outer race do not bind up when installing the bearing cage; this is ensured when step x. is properly performed.

## 5-5-1-2 Replacement Procedure (Cont.)

Installation of the ball slide and bearing cage assemblies in the next step is done by trial and error. The relative position of the bearing cage and ball slide assemblies as noted in step n. as the bearing cage was withdrawn can be used as a guide in starting the step.

y. Install eyebolts in the upper surface of the bearing cage assembly (17) as directed in step m. Carefully install the ball slide assembly (21) in the motor cap of the drum housing; locate it in a position comparable to that noted in step n. as the bearing cage was removed. While holding the ball slide assembly in position, carefully insert the bearing cage assembly into the ball slide assembly and slowly lower the combined bearing cage/ball slide assembly into the motor cap of the drum housing until the combined assembly is fully seated in the housing.

z. Using the reference marks of step l. and the micrometer depth gage, measure the distance between the upper phenolic surface of the ball slide assembly (21) and the inner surface of the housing cap. This measurement shall correspond to  $\pm 0.05$ -inch of that recorded in step l.; if the measurement does not agree, remove the bearing cage with ball slide and repeat step y. and this step, as required.

aa. Rotate the bearing cage 15 to 30 degrees cw and ccw; motion shall be unrestricted. If motion is restricted, either the installation of the inner or outer race of the bearing is improper or the bearing assembly is defective. Perform the procedure required to rectify an improper installation. When installation is complete, remove the eyebolts from the upper surface of the bearing cage assembly.

ab. With bearing movement unrestricted, align the index mark on the upper surface of the bearing cage assembly (17) with the mark made inside the motor cap of the drum housing.

ac. While maintaining the orientation of step ab., install a spring (16) in each of the holes provided in the upper surface of the bearing cage assembly (17). With the holes of the pressure plate aligned with the guide pins of the bearing cage assembly and with the mark made on the pressure plate (15) aligned with the mark made inside the housing cap, install the pressure plate in position on top of the springs.

ad. While maintaining the orientation of step ac. and with the mark made on the cover plate (14) aligned with that made on the inside of the housing cap, align the indexing holes in the cover plate with the two guide pins of the bearing cage assembly (17) and lower the cover plate into position. Using appropriate hardware, secure the cover plate to the housing cap; apply Loctite "C" sparingly to the threads of the screws.

## 5-5-1-2 Replacement Procedure (Cont.)

ae. Place the spindle extender (13) on the drum spindle; after aligning the mark on the assembly with the mark on the end of the spindle, secure the spindle extender in position. Similarly, install the rotor (12) and spacer (11) on the spindle extender. With the mark on the rotor aligned with the mark on the end of the spindle extender, use hardware (eight through 10) to secure the elements to the end of the spindle.

af. Perform lower bearing replacement as directed in paragraph 5-5-2.

ag. With both the upper and lower bearing assemblies replaced, proceed as follows:

- (1) Remove the three red anodized shipping screws from the top of the drum and install three green anodized plug screws in their place as directed in paragraph 2-4-1 m. and n.
- (2) Remove the two studs installed in the base plate of the drum in step b. and install two plug screws.
- (3) Turn the rotor by hand to make sure that the bearing balls are running freely; if they are not, repeat the replacement procedures in their entirety.
- (4) Carefully index the motor housing assembly (5, Figure 5-5) over rotor (12) and secure the assembly to the housing cap using appropriate hardware; rotate the rotor by hand and observe that the gap between stator (6) of the motor housing assembly (5) and the rotor (12) — throughout rotation — remains constant within 0.003-inch (shimstock can be used in this measurement). If the gap is not proper, loosen the setscrews that secure the stator in position, reorient the stator, secure the stator in position with the setscrews, and repeat the check until the required tolerance is achieved.
- (5) Secure fan (2) to end of rotor cap assembly.
- (6) Secure cover (1) to the housing cap.
- (7) Reconnect input power connector to the drum motor.
- (8) While observing the applicable cautions, turn on the drum as directed in paragraph 3-2 a. through e., as applicable, and then operate the drum for two hours. Following this operating interval, shut down the drum and check rundown time as directed in paragraph 5-2 recording the new rundown time and room ambient in the drum log. When the drum comes to a complete stop, allow it to cool for three hours.
- (9) Following cooling, turn drum on and check that clock playbacks are satisfactory. If clock phasing or amplitude is improper and cannot be compensated for, immediately contact Bryant Product Service. Otherwise, return protected data to the drum surface as applicable.

5-5-2 LOWER BALL BEARING REPLACEMENT — It is generally recommended that this procedure be performed following upper ball bearing replacement. Because this procedure takes several hours to complete, it is recommended that it be scheduled around the prescribed interval and at a time when it is known the drum will not be in use.

5-5-2-1 Special Equipment Required -- Obtain the following special equipment:

**CAUTION**

DO NOT remove new ball bearing assembly from its package until so directed in the procedure.

- a. Lower ball bearing assembly, Bryant Part No. 97141-13, as received pre-lubricated and packaged from Bryant Computer Products.
- b. A heat gun.
- c. Those items specified in paragraph 5-5-1-1 b., d. through g., and i. through k.
- d. Three No. 1/4-20 x 1-inch long socket head cap screws.

5-5-2-2 Replacement Procedure — Replace the lower bearing assembly as follows:

- a. Perform the procedures of paragraph 5-5-1-2 a. through c., as applicable.
- b. Remove the hardware securing the lower bearing cage cover (1, Figure 5-6) to the base of the drum housing and remove the cover.
- c. Mark (with grease pencil or the like) an index line on the lower bearing cage assembly (2) and the base of the drum housing.

**CAUTION**

The previous step is extremely important. The indexing mark will permit reassembly of the bearing cage on the spindle in the same relative orientation it had originally thus ensuring that the proper spindle rotational axis is maintained.

- d. Remove the hardware securing the bearing cage assembly to the base of the drum housing.

**CAUTION**

In step e., bring screws initially into contact with the drum shell by tightening with the fingers.

## 5-5-2-2 Replacement Procedure (Cont.)

e. Insert the three 1/4-20 x 1-inch long screws obtained with special equipment required into the tapped holes in the flange of the bearing cage assembly (2) that do not extend into the drum base.

### CAUTION

In step f., remove the bearing cage assembly slowly to prevent damage to the spindle.

### NOTE

Aluminum expands faster than steel, thus, by heating the outside of the steel mounting flange of the bearing cage assembly, the assembly can be pulled off the spindle without difficulty.

f. Jack the bearing cage assembly (2) free of the spindle by sequentially turning the screws of step e. in while simultaneously applying heat (with a heat gun) to the outside of the bearing cage mounting flange on the base. This procedure is necessary because there is an interference fit between parts. When the assembly is free of the spindle, remove the screws installed in step e. and place the assembly — with its flange side down — on a clean surface.

g. Disassemble the bearing cage assembly (2) as follows:

- (1) Remove the hardware securing the bearing seal (3) to the lower bearing cage assembly and remove the seal from the cage.

### CAUTION

In the next step, apply pressure equally around the bearing outer race; this action will prevent damage to the bore of the bearing cage as the race is jacked out.

- (2) Insert a No. 10-32 socket head screw into each of the three holes located on the inner periphery of the flanged surface of the bearing cage; then, by tightening the screws in equal increments, jack the bearing outer race (4) from the lower bearing cage (5) and discard the outer race. Remove the No. 10-32 screws from the bearing cage.

h. Put an indicating mark on the spindle adjacent to the burnish mark on the bearing inner race (6).

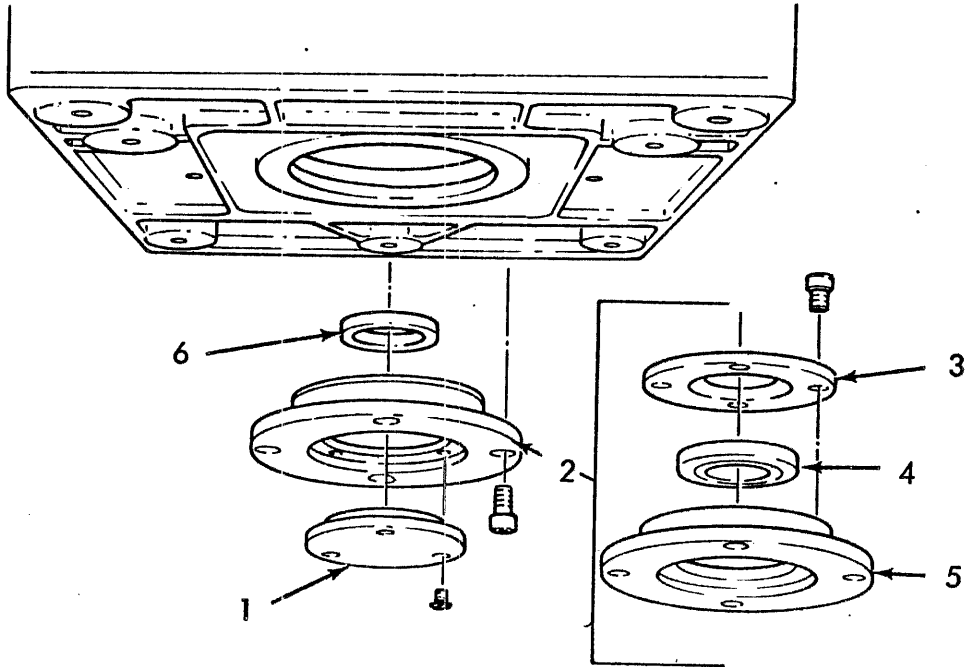


Figure 5-6 Lower Bearing Assembly Replacement, Exploded View Series 10000 Auto-Lift Drum

Legend for Figure 5-6

Index No.	Part Number	Description							Units Per Assembly	Usable On Code
		1	2	3	4	5	6	7		
		AUTO-LIFT DRUM, Series 10000, standard							(Ref.)	
1	90021	COVER, lower bearing cage (ATTACHING PARTS)							1	
	02103203801	SCREW, cap, socket head, 10-32 x 3/8 long -----*-----							3	
2	None	BEARING CAGE ASSEMBLY, lower (ATTACHING PARTS)							1	
	MS16995-49	SCREW, cap, socket head, 1/4-20 x 5/8 long -----*-----							6	
3	90038-3	SEAL, bearing (ATTACHING PARTS)							1	
	MS16995-17	SCREW, cap, socket head, 6-32 x 3/8 long -----*-----							4	
4	See Note 1	BEARING OUTER RACE							1	
5	90020	BEARING CAGE, lower							1	
6	See Note 1	BEARING INNER RACE							1	

NOTE 1 — Part of bearing assembly, Bryant Part No. 97141-13.

## 5-5-2-2 Replacement Procedure (Cont.)

i. Install the stud of a bearing puller on the end of the spindle. Install the bearing puller over the bearing inner race (6) and position the puller against the stud so as to protect the spindle. Then, tighten the screws on the top end of the bearing puller with the fingers until the lead end contacts the stud on the end of the spindle.

j. Using a wrench to turn the screw, jack the bearing inner race free of the spindle using the bearing puller and discard the inner race.

k. Remove the stud from the end of the spindle.

l. While wearing clean, lint-free, white gloves, remove the new bearing assembly from its protective container; then, remove the inner race from the outer race of the new bearing assembly and return the lubricated outer race to the protective container.

m. After wiping away all heavy accumulations of lubricant, use a glass stone to remove all traces of burrs from the shoulders of the new bearing inner race and spindle. If burrs cannot be removed with the glass stone, consult Bryant's Product Services Department for action to be taken. If the medium India oilstone of Table 2-2 is suggested for use by the Product Services Department, use the glass stone for removal of any fine burrs.

n. Using the hot plate and thermometer, heat the inner race to 250°F (maximum). As the inner race is being heated, apply a very light coat of machine oil to the spindle where the inner race is to set. The coating will be as thin as possible, not dripping. Then — with the race heated — install the bearing inner race (6, Figure 5-6) on the spindle such that the race's burnish mark — located on surface of small diameter end of the race — is visible when viewing the end of the spindle; coincidentally, quickly rotate the race 10 to 15 degrees cw and ccw to ensure it is fully seated on the spindle. Then, align the burnish mark of the race with the indicating mark placed on the spindle.

### **CAUTION**

The bearing inner race must be fully seated against the shoulder on the spindle. If not, jack the inner race loose as directed in steps i. through k., clean the inner race as directed in step m. and repeat step n.

o. While wearing clean, lint-free, white gloves, assemble the bearing cage assembly (2) as follows:

(1) Obtain the prelubricated bearing outer race of the new bearing assembly.



**CAUTION**

In the next step, do not allow bearing outer race to become cocked as it is inserted into the cage; damage to the cage bore can otherwise result.

- (2) Using the hot plate and thermometer, heat the bearing cage to 140°F (maximum). Then, with the outer race's surface on which the manufacturer's name is stamped positioned toward the inside of the cage, insert the bearing outer race (4) into the lower bearing cage (5). A light metal hammer and punch can be used to gently tap the outer race into the cage; accomplish insertion by working at four equally spaced points about the face of the race until the race is fully seated in the cage.
- (3) Allow sufficient time for the lower bearing cage to cool to room ambient; as long as 1/2-hour may be required for this to occur.
- (4) Secure the bearing seal (3) to the lower bearing cage (5) using appropriate hardware; apply Loctite "C" sparingly to the threads of the screws.

p. Press the balls of the outer race of the bearing cage assembly (2) as far back into the raceway as possible.

**CAUTION**

Take care that the balls of the outer race do not bind up when installing the bearing cage. This is ensured when step p. is properly performed.

q. Align the reference marks placed on the bearing cage assembly (2) and the base of the drum housing. Then, loosely secure the assembly to the base of the housing using appropriate hardware.

**CAUTION**

In the next step, do not apply heat directly to bearing or grease. Also, do not allow assembly to become cocked as it is inserted into the drum.

## 5-5-2-2 Replacement Procedure (Cont.)

r. Jack the bearing cage up onto the inner race mounted on the spindle by turning each of the mounting screws of the assembly in equal increments (1/4-turns); simultaneously, apply heat (with a heat gun) to the outside of the mounting flange of the bearing cage.

### **CAUTION**

The bearing cage must be fully seated against the shoulder on the spindle. If not, jack the bearing cage loose as directed in steps e. and f. and repeat steps q. and r. until the assembly is properly seated.

s. Install the lower bearing cage cover (1) using appropriate hardware; apply Loctite "C" sparingly to the screws.

t. With the upper bearing assembly replaced, proceed immediately to paragraph 5-5-1-2 ag.

## 5-6 AS REQUIRED

Performance of the subsequent procedures is required when a preventive or corrective maintenance function so necessitates action. Before performing the procedures, review the information contained in paragraph 5-1 and related subparagraphs.

5-6-1 DRUM SURFACE AND HEAD PAD CLEANING — The head pads of the head bars and the surface of the drum shall all be cleaned whenever one or the other are determined to be dirty (for example, see paragraph 5-4-3). Frequent cleaning may be required if the drum is operated in an environment that does not meet the minimum cleanliness requirements as specified in paragraph 2-1-2; also, frequent removal of the access panels of the drum — when special maintenance procedures are necessitated within the drum enclosure — may generally necessitate an increase in the frequency of performing drum surface and head pad cleaning procedures. Drum surface and head pad cleaning should be performed by either the preferred or optional cleaning methods described in the following paragraphs.

5-6-1-1 Special Equipment Required — Obtain the following special equipment:

a. Acetone (herein referred to as the cleaning solvent), Mallinckrodt Chemical Works Transistor Code 2441, or equivalent

b. Isopropyl Alcohol (herein referred to as the rinsing solution), Mallinckrodt Chemical Works Transistor Code 3033, or equivalent

c. Kimwipe tissues, Kimberly-Clark, Type 900L, or equivalent

5-6-1-1 Special Equipment Required (Cont.)

- d. Q-tips, 6-inch cotton tipped, Detroit First Aid Co., or equivalent
- e. Head bar support, Bryant Part No. T614-1
- f. Taper pin extraction tool, Bryant Part No. 380305-1
- g. Taper pin insertion tool, Bryant Part No. 380306-3

5-6-1-2 Preferred Drum Surface and Head Pad Cleaning Procedures — The preferred method of cleaning the drum surface and head pads necessitates the complete removal of all head bars from the drum. Though this may be a time consuming task, it will invariably ensure the protection of the equipment while at the same time enabling a more liberal application of cleaning and rinsing fluids to the drum surface than would otherwise be possible when performing the optional cleaning method described in paragraph 5-6-1-3. However, if time does not permit, proceed immediately to the optional cleaning method of paragraph 5-6-1-3 disregarding the following procedure, as applicable; a customer when using the optional cleaning procedure, though, shall do so at his own risk.

**CAUTION**

DO NOT clean drum until stored data has been protected (e.g., transferred to an alternate storage location). Such protection ensures that accidents during cleaning will not result in the loss of data.

- a. Shut down the drum. To ensure that the drum is not inadvertently started, disconnect the power to the drum motor; the best way of doing this is to disconnect the facility power cable from the drum motor connector in the motor housing assembly of the drum.
- b. Obtain the equipment specified in paragraph 5-6-1-1.
- c. Thoroughly clean the area surrounding the drum.

**CAUTION**

Maintain the area as dust free as possible as long as drum covers are removed.

- d. With the area thoroughly cleaned and when the drum stops rotating, remove the access panels (see Figure 2-3) from the drum enclosure as follows and in the order specified:

**CAUTION**

Be sure all captive fasteners of a panel are free of their mating elements before drawing the panel away from the drum. Damage to fasteners can otherwise result.

## 5-6-1-2 Preferred Drum Surface and Head Pad Cleaning Procedures (Cont.)

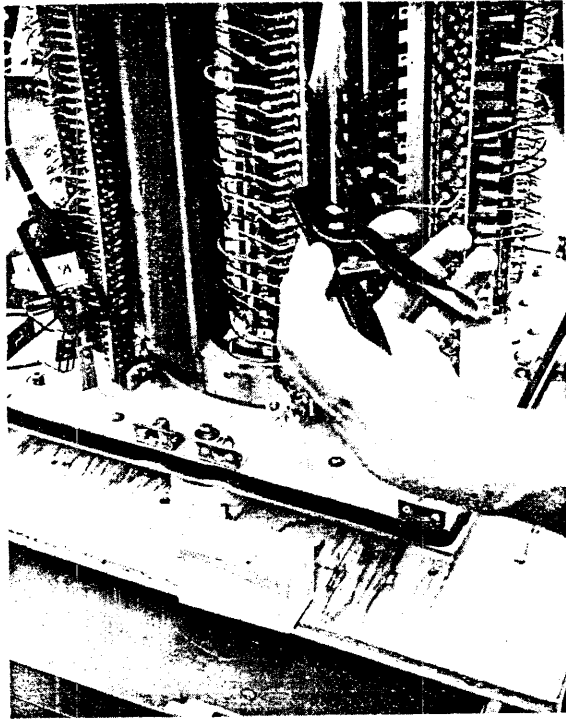
- (1) Loosen the captive fasteners securing the front panel to the enclosure by pressing firmly in on each fastener and then rotating each fastener 90 degrees counterclockwise. With all fasteners completely loose, carefully remove the panel and set it aside.
- (2) Remove the side panels by performing the applicable procedure of step (1).
- (3) Loosen the captive fasteners securing the rear connector panel(s) to the drum enclosure by performing the applicable procedure of step (1); while simultaneously positioning the panel(s) to which connectors are secured off to the side so that they can cause no damage to heads or the drum surface, carefully remove the center panel and connector free panel, as applicable, and set these panel(s) off to the side.

e. Remove the data head harness (harness routed under housing cap at top of drum) from the drum as follows:

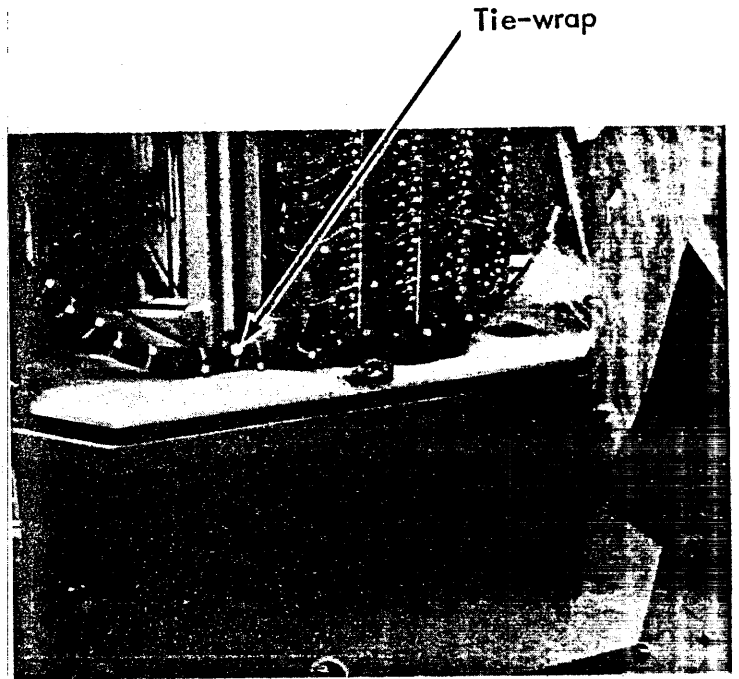
### NOTE

Two men would be helpful when performing the following procedure. Also, the procedure applies specifically to a standard drum with standard harness.

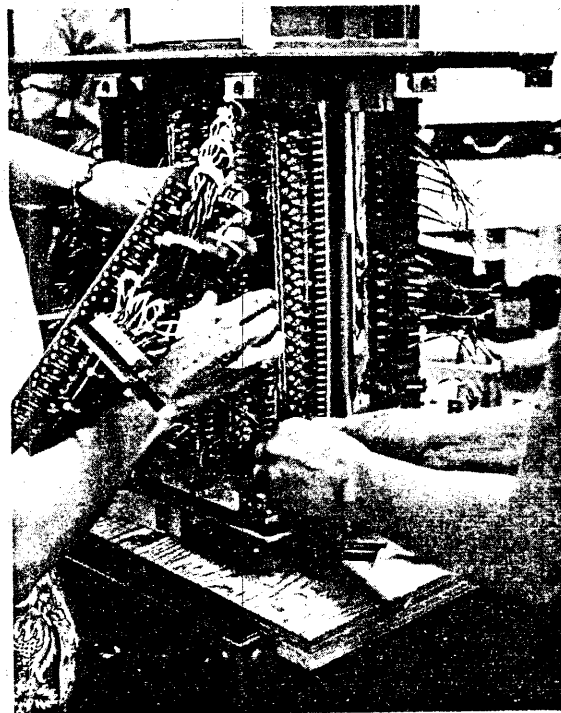
- (1) Using the taper pin extraction tool (see Figure 5-7), remove the taper pins of the leads of all data heads from the terminal board lugs. When removing the taper pins, do not pivot the pin in the terminal board lug; rather, use one smooth even motion to extract the pin from the lug. To facilitate reassembly, note any changes that are made to normal, head pad connections, such as cascading that may have been necessitated through use of a spare head position on a head bar. This can be facilitated by checking the following: for head locations, see head complement drawing furnished with the drum; also, check the QC 23-75 form furnished with the drum to be sure head wiring has not been changed from that reflected on the drum's head wiring wire list.
- (2) Cut any tie wraps (see Figure 5-7) that may be used to secure the data head harness to the drum housing.
- (3) Loosen, do not remove, the hardware securing the terminal boards (1, Figure 5-2 or 5-3) to each of the head bars of the drum.



a. Removing Taper Pins Using Taper Pin Extraction Tool



b. Typical Tie-wrap Used to Secure Cable Harness to Drum Housing



c. Removing Cable Harness With Terminal Boards From Drum

Figure 5-7 Removing Cable Harness From Auto-Lift Drum

**CAUTION**

Exercise extreme care to ensure that heads of head bars and drum surface are not touched in the following procedure. Permanent irreparable damage can otherwise result.

- (4) Remove the data head cable harness as directed in the subsequent steps, as applicable.
  - (a) In the case of a Model 10128 drum, start at head bar position nine (see Figure 5-1 a.) and remove the harness with terminal boards (see Figure 5-7) from head bars nine through 16. With all terminal boards removed, set the harness and connector panel aside.
  - (b) In the case of a Model 10256 drum, start at head bar position eight (see Figure 5-1 b.) and remove the harness with terminal boards (see Figure 5-7) from head bars eight through one. Coincidentally, with another man starting at head bar position nine, remove terminal boards from head bars nine through 16. With all terminal boards removed, set the harness and connector panel(s) aside.
  - (c) In the case of a Model 10384 or 10512 drum, start at head bar positions eight and 24 (see Figure 5-1 c.) and remove the harness with terminal boards (see Figure 5-7) from head bars eight through one and 24 through 17. Coincidentally, with another man starting at head bar position nine and 25, remove the harness with terminal boards from head bars nine through 16 and 25 through 32. With all terminal boards removed, set the harness and connector panel(s) aside.
- f. Remove each of the data head bars from the drum housing as follows:
  - (1) In the case of Model 10128 and 10256 drums, proceed as follows:
    - (a) Starting with the general storage and clock head bar assembly kits (see Figure 5-3), remove hardware (2 through 4) securing the connector of the kit's clock head to the L-bracket of the drum and withdraw the clock connector from the clock cable harness connector; standard drums include only three general storage and clock head bar assembly kits.

**CAUTION**

Exercise extreme care to ensure that parts are not dropped into the drum assembly when working in the drum enclosure. When pressing in on the head bar in the next step, avoid excessive pressure; that is, apply only enough pressure to just maintain the head bar in position.

- (b) Gently press in on the outer, center surface of the head bar (4, Figure 5-2 or 8, Figure 5-3) and remove the hardware securing the upper and lower ends of the kit (2, Figure 5-2 or 5, Figure 5-3) to the casting of the drum housing.

**CAUTION**

During and following head bar removal, exercise extreme care to ensure that the heads of the bar do not come into contact with objects that could damage them; remember that even the slightest amount of excessive pressure to the head pad can permanently damage the head's reed, which, in turn, results in irreparable damage to the head.

- (c) With the hardware of step (b) removed, pull the head bar assembly straight out and away from the housing ensuring the head pads do not contact any surfaces.
  - (d) As each head bar is removed, store it on a support that will ensure that no pressure is exerted on the individual head pads (see Figure 5-8). It is recommended that the head bars be covered with a lint free material during storage; caution shall be exercised to ensure that this material does not come into contact with the heads. If desired, the head pads can be cleaned concurrent with the cleaning of the drum surface as directed in step h.
- (2) In the case of Model 10384 and 10512 drums, proceed as follows:
    - (a) Remove each of the head bars one through 16 from the upper window mounting positions of the drum as directed in step (1) (b) through (d) carefully observing the caution preceding step (b).

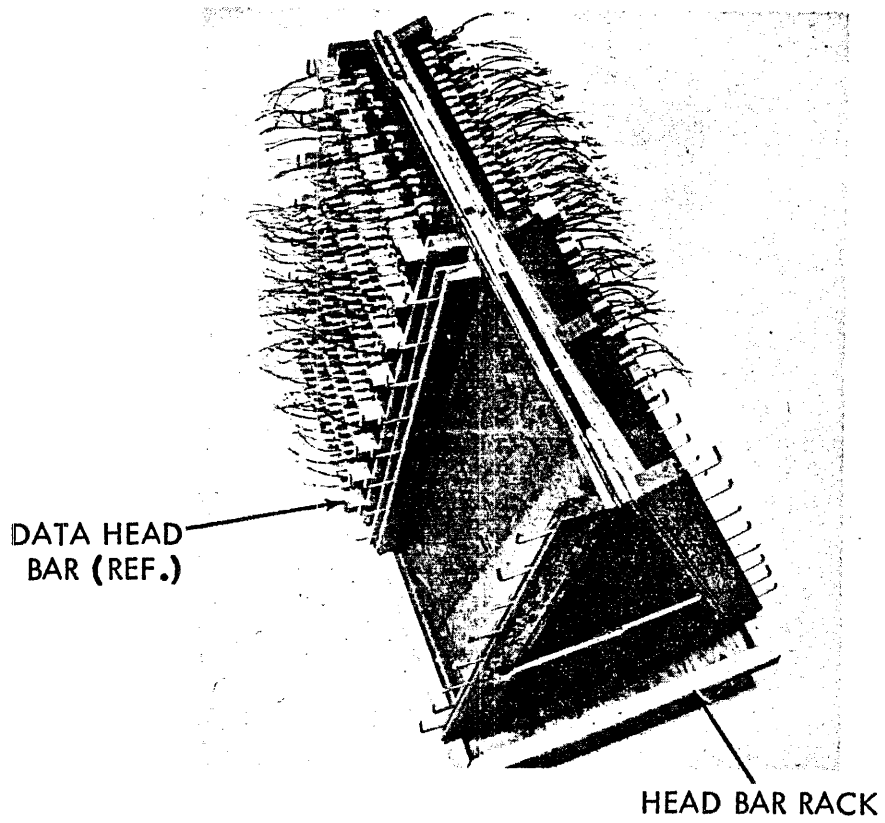


Figure 5-8 Typical Method of Supporting Removed Head Bars



- (b) Remove each of the head bars 17 through 32 from the lower window mounting positions of the drum as directed in step (1) (a) through (d).

**NOTE**

Head pads of removed head bars can be cleaned concurrent with drum surface cleaning; proceed to step h. for the procedures to be followed.

- g. Clean the drum surface as follows:

- (1) Dampen a pad of Kimwipe tissue with the cleaning solvent specified in paragraph 5-6-1-1 a. Do not saturate to the point where the solvent is dripping.
- (2) Reconnect the power (disconnected in step a.) to the drum motor, turn on the motor, allow the motor to operate for 30 seconds maximum and then shut the motor off.

**WARNING**

When working on the drum surface, position the tissue to the extreme left side of the drum housing's window. This action prevents the possibility of the fingers being drawn between the drum surface and the inside of the rib used to separate windows.

**CAUTION**

Do not move the tissue vertically on the drum surface.

**NOTE**

Cleaning and rinsing the drum surface is performed by starting at the highest position of a drum window and then working sequentially down to the lowest position. No attempt shall be made to completely clean the surface of the drum in a single pass; rather, several repeating passes from the top to the bottom of the drum are preferred as described in the following steps. Cleaning shall be performed in its entirety before performing the rinsing procedures. Use a new Kimwipe as soon as the old one begins to get dirty. Whenever drum speed decreases to near zero rpm, repeat the turn on procedures of step (2), as applicable. In the case of the 10384 and 10512 drums, cleaning shall be started in the upper window and then continued down through the lower window.

5-6-1-2 Preferred Drum Surface and Head Pad Cleaning Procedures (Cont.)

- (3) Starting at the highest point of a window of the drum housing, gently press the tissue against the drum surface and hold it in position through several drum revolutions (see Figure 5-9).
  - (4) Carefully pick the tissue up from the drum surface and move it to a lower position within the window so that it slightly overlaps the previous cleaning position.
  - (5) Repeat the procedure of step (4) until the entire drum area — accessible through the window(s) — has been wiped.
  - (6) Using a clean Kimwipe dampened with the cleaning solvent as directed in step (1), repeat the procedures of steps (3) through (5) until no dirt appears on the tissue following a complete wipe down of the drum surface as delineated in the steps.
  - (7) When the drum surface has been completely cleaned to the condition specified in step (6), dampen a pad of Kimwipe tissue with rinsing solution specified in paragraph 5-6-1-1 b. Do not saturate to the point where the solution is dripping.
  - (8) Rinse the drum surface using the tissue of step (7). This is done by performing the procedures of steps (3) through (6) except that the rinsing solution is used in place of the cleaning solvent. Continue to rinse until all traces of solvent are removed from the drum surface; a clean surface is indicated when a single Kimwipe remains clean throughout the total rinse of the drum surface.
  - (9) With the rinsing operation completed, shut down the drum as described in paragraph a.
  - (10) Vacuum all visible traces of dust from the interior drum housing surfaces.
- h. Clean the head pads of all head bars as follows:
- (1) Position the head bar on a workable attitude (see Figure 5-10).

**CAUTION**

Do not use cleaning solvent when cleaning head pads. Some types of heads can be irreparably damaged if such solvent is used in the cleaning procedure.

- (2) Dampen a Q-tip with the rinsing solution specified in paragraph 5-6-1-1 b. Do not saturate to the point where the solvent is dripping.



Figure 5-9 Typical Method of Cleaning Drum Surface -Preferred Procedure

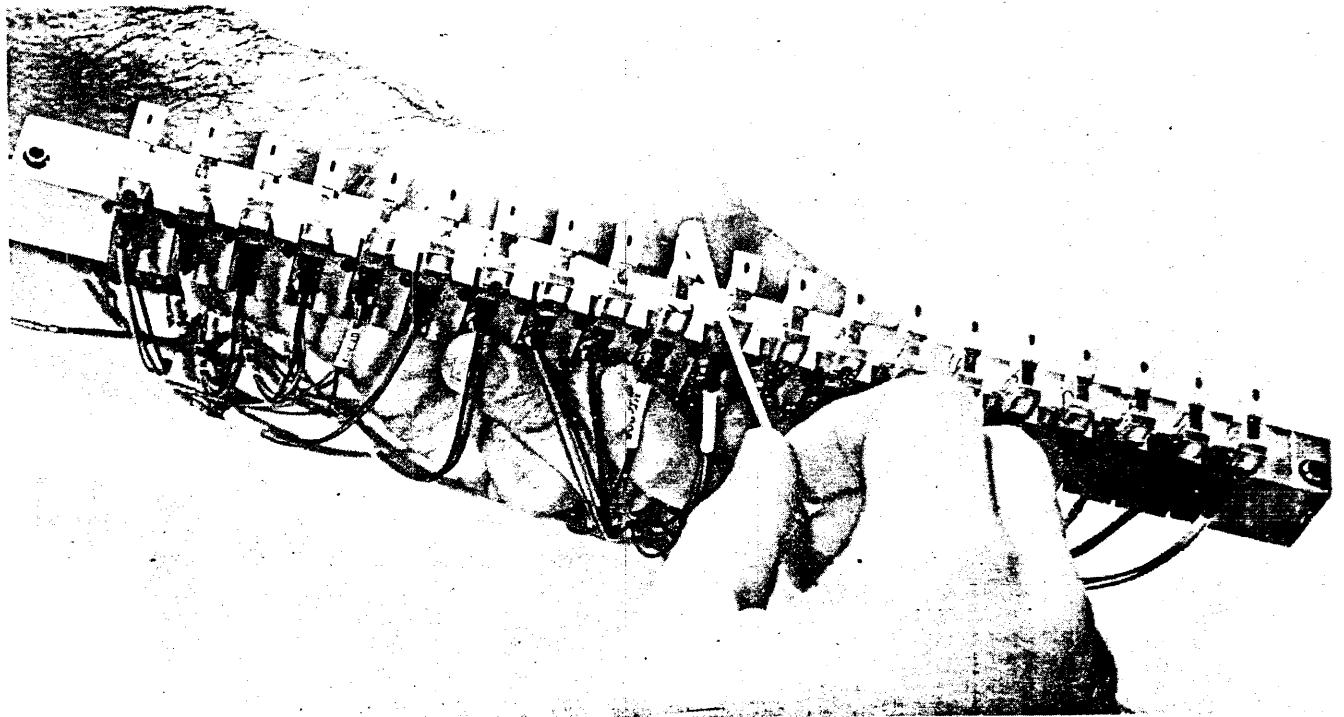


Figure 5-10 Typical Method of Cleaning the Head Pads - Preferred Procedure

**CAUTION**

Do not try to remove any dirt that may be imbedded in the head pad. Only use a very light pressure to remove surface dirt. Excessive pressure can result in irreparable damage to the head's reed, which, in turn, will require replacement of the head. Generally, any pressure that deflects the head pad may be considered excessive.

**NOTE**

There shall be no attempt to completely clean each head pad on a single pass; rather, several repetitive passes across all heads on the bar are preferred as described in the following steps.

- (3) Starting with the head pad at one end of the head bar, gently wipe the area of each head pad of the bar using the Q-tip of step (2), until all head pads are wiped.
- (4) Obtain a clean Q-tip, dampened as directed in step (2), and continue to repeat step (3) until a Q-tip remains clean throughout a complete pass.
- (5) After the heads of a head bar are cleaned, store the head bar in a position that will ensure that no pressure is exerted on the individual head pads (see Figure 5-8). It is recommended that the head bars be covered with a lint free material during such storage.

i. With the drum surface and the head pads of the head bars cleaned, wait for the drum to come to a complete stop. Then install the head bar assemblies as directed in the subsequent paragraphs, as applicable.

**CAUTION**

The drum shall not be rotating during the head bar installation procedures. If head bars are not installed in the same position from which they were removed, serious damage can occur to drum surface and/or head pads. Also, exercise extreme care to ensure that parts are not dropped into the drum assembly when working in the drum enclosure. Before installing a head bar, check the heads to ensure that none are bent

or cocked; this can be done by looking down the line of head surfaces to ensure there are none out of line. Replace all bent or cocked heads as directed in the applicable paragraph of Section 6 before installing the head bar.

- (1) In the case of Model 10128 and 10256 drums, proceed as follows:
  - (a) Match the number etched on the head bar with the number etched on the drum and install the head bar in the matching location. Installation shall be accomplished by directing the head bar straight into the housing window ensuring that the head pads do not contact the drum surface or housing and that the sleeve on the lower end of the head bar is inserted in the location recess of the drum housing.

**CAUTION**

When pressing in on the head bar in the next step, avoid excessive pressure; that is, apply only enough pressure to maintain the bar in position.

- (b) While pressing gently in and down on the outer, center surface of the head bar, secure the upper and lower ends of the head bar (4, Figure 5-2 or 8, Figure 5-3) to the drum using appropriate hardware.
- (c) When a general storage and clock head bar assembly kit (see Figure 5-3) is being installed, connect the clock head (7) to appropriate connector of clock cable harness (see Figure 5-3) and secure it to the L-bracket using appropriate hardware (2) through (4).

**NOTE**

Two men would be helpful when performing the following procedure. Also, the procedure applies to a standard drum with standard harness.

- (2) In the case of Model 10384 and 10512 drums, proceed as follows:
  - (a) Install each of the head bars 17 through 32 in the lower window mounting positions of the drum as directed in step (1) (a) through (c).
  - (b) Install each of the head bars one through 16 in the upper window mounting positions of the drum as directed in steps (1) (a) and (b).

5-6-1-2 Preferred Drum Surface and Head Pad Cleaning Procedures (Cont.)

j. Install the cable harness on the drum as directed in the subsequent paragraphs, as applicable.

**CAUTION**

Exercise extreme care to ensure that head pads and drum surface are not touched in the following procedure. Permanent, irreparable damage could otherwise result.

- (1) Install the data head cable harness as directed in the subsequent paragraphs, as applicable:
  - (a) In the case of a Model 10128 drum and starting at head position 16 (see Figure 5-1 a.), mount terminal boards (1, Figure 5-2 or 5-3) of the harness on the partially removed terminal board mounting hardware of head bars 16 through nine, inclusive.
  - (b) In the case of a Model 10256 drum and starting at head position one (see Figure 5-1 b.), mount the terminal boards (1, Figure 5-2 or 5-3) of the harness on the partially removed terminal board mounting hardware of head bars one through eight. Coincidentally, with another man starting at head bar position 16, similarly install the terminal boards of the other half of the harness on head bars 16 through nine.
  - (c) In the case of a Model 10384 or 10512 drum and starting at head positions one and 17 (see Figure 5-1 c.), mount terminal boards (1, Figure 5-2 or 5-3) of the harness on the partially removed terminal board mounting hardware of head bars one through eight and 17 through 24, inclusive. Coincidentally, with another man starting at head bar positions 16 and 32, similarly install the terminal boards of the other half of the harness on head bars 16 through nine and 32 through 25, inclusive.
- (2) With the harness installed, tighten the terminal board mounting hardware.

**NOTE**

When connecting head leads to the lugs of the terminal boards, refer to previously noted changes to normal head lead connections — see step e. (1).

## 5-6-1-2 Preferred Drum Surface and Head Pad Cleaning Procedures (Cont.)

- (3) Use a taper pin insertion tool to connect data head leads to the lugs of the wiring harnesses terminal boards (see Figure 5-2 or 5-3 for color code connections of leads to terminal board lugs). Perform the procedure as follows:

- (a) Insert head lead into tool slot as shown in Figure 5-11.

### CAUTION

Repeated attempts to engage a taper pin in a terminal board lug can cause excessive wear on the lug; to lessen the possibility of such wear, closely observe the single motion rule of the next step.

### NOTE

If a taper pin is found broken or bent, replace it immediately as directed in Section 6.

- (b) Position lead over lug into which it is to be inserted and use a single motion to insert it into the lug. To remove the tool, rotate it 1/4-turn ccw to free it from the lead. If a taper pin is observed to fit loosely, immediately replace it as directed in Section 6.

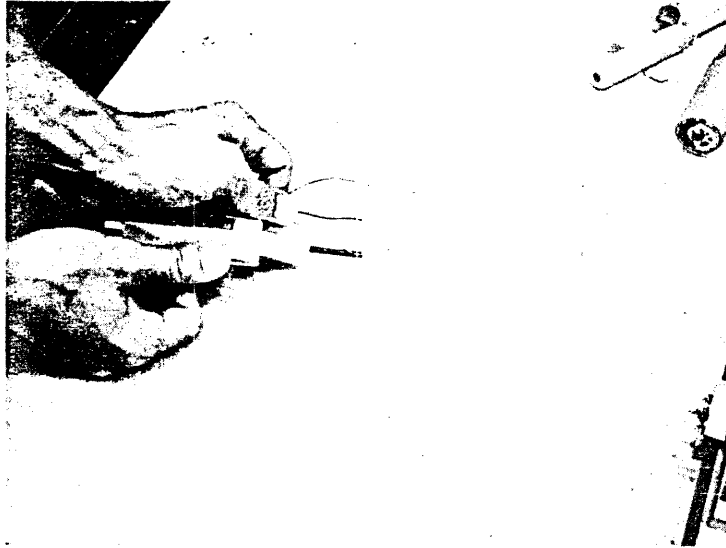
- (4) Install new tie wraps (see Figure 5-7) where applicable. Trim the tie wrap after it is snugged against the cable.

k. Inspect gasketing around the base plate and housing cap of the drum enclosure. Also inspect gasketing secured around the inner edges of each of the removed access panels. If gasketing is found damaged or displaced, replace or otherwise reposition gasketing as directed in Section 6.

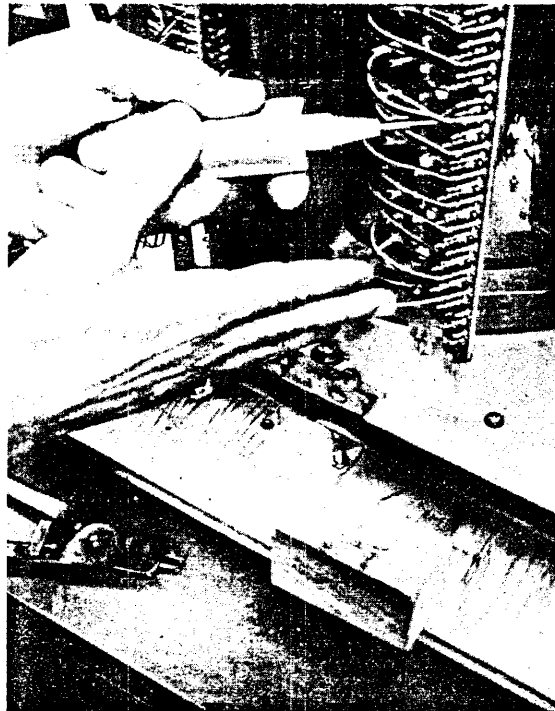
l. Install the access panels (see Figure 2-3) on the drum in the order specified as follows:

### CAUTION

Before installing a panel, check to ensure that the end marked TOP at the upper inner edge of the panel is positioned to the top of the drum enclosure. Also, check to ensure that captive fasteners properly index into their mating receptacles before securing them.



a. Method of Inserting Head  
Lead Into Tool Slot



b. Inserting Taper Pin Into  
Lug of Terminal Board

**Figure 5-11 Using Taper Pin Insertion Tool to Connect Taper Pins  
to Lugs of Cable Harness Terminal Board**



## 5-6-1-2 Preferred Drum Surface and Head Pad Cleaning Procedures (Cont.)

- (1) Install the two outer-rear and the center-rear access panels. In installation, be sure that end of panel marked TOP is positioned to the top of the drum enclosure; also, before securing captive fasteners, be sure they properly index into their mating receptacles before rotating them 90 degrees clockwise to lock them in place. Before installing the panel(s) with cable harness connectors, check the wires entering the connectors to ensure they are intact. If any leads are found broken, immediately repair them as directed in Section 6.
  - (2) Install the two side access panels on the drum and then install the front access panel by performing the applicable procedures of step (1).
- m. Reconnect the power (disconnected as directed in step a.) to the drum motor.
  - n. Perform the drum turn-on procedure of paragraph 3-3-1 a. through e., as applicable. Return protected data to the drum surface. Then perform normal diagnostic procedures to ensure playback of recorded data is proper throughout the drum. Failure to obtain proper playback through a data head may indicate that the head is making contact with the drum surface or was otherwise damaged during maintenance thereby necessitating corrective action.

5-6-1-3 Optional Drum Surface and Head Pad Cleaning Procedures — Though offered as a means of decreasing the down time of the drum to a minimum during cleaning, the optional cleaning procedure should be used only as an emergency expedient, since the procedure poses a possible hazard to the equipment if special care is not exercised in its performance. Of primary concern is the manner in which the head bar is removed in the procedure; that is, the head bar is withdrawn from the drum while still connected to the cable harness. Though the risk in damaging a head is considered greater when performing this procedure as compared to the preferred procedure, reasonable care exercised by maintenance personnel should result in ample protection to the equipment. In the case of the 10256 drum, two men are required in performance of the procedure; three men are required in the case of 10384 or 10512 drums.

- a. Perform the procedures of paragraph 5-6-1-2 a. through d.
- b. Remove the following data head bars from their window(s) by performing the applicable procedures of paragraph 5-6-1-2 f. (1) or (2) and rotate them up and out of the drum.
  - (1) In the case of a Model 10128 drum, no head bars need be initially removed to clean the drum surface since head bar positions one through eight are open (see Figure 5-1 a.).
  - (2) In the case of Model 10256 drums, remove head bars seven and eight; to protect the heads of the removed head bars, one man should hold the head bars as the other man cleans the drum surface.

5-6-1-3 Optional Drum Surface and Head Pad Cleaning Procedures (Cont.)

- (3) In the case of Model 10384 and 10512 drums, remove head bars seven and eight and 23 and 24; to protect the heads of the removed head bars, one man should hold head bars seven and eight, a second man should hold head bars 23 and 24, as a third man cleans the drum surface.

**WARNING**

In the next step, care must be exercised to ensure that the fingers are not drawn under the rib of the drum casting when cleaning the drum surface.

**CAUTION**

Under no condition shall the drum surface cleaning procedure of the next step be performed if the drum is in the lifted attitude; if the drum does lift, as evidenced by the rush of air that can be heard "when the heads start to fly", wait for the drum to drop before performing the procedure. When holding the Kimwipe against the drum surface, extreme care shall be exercised to ensure that the Kimwipe is not drawn into the adjacent head bars since irreparable damage can otherwise occur to the heads. Also, head pad cleaning when performing the optional procedure shall be performed only after the drum surface cleaning is performed in its entirety.

c. With the head bars removed and with the required number of men holding them free of the drum surface, perform the drum surface cleaning procedure as directed in paragraph 5-6-1-2 g. However, in step (2) of the procedure, the drum shall be operated for only a maximum of 20 seconds; this action should ensure that the drum does not lift during the procedure. Also, since the head bars were removed from the right side of the window(s) — wherein some measure of protection will be provided the installed head bars by the housing casting that separates windows, care must be exercised to ensure that the heads of head bar six (Model 10256 drum) or head bars six and 22 (Model 10384 or 10512 drums) are not touched while simultaneously ensuring that the fingers are not drawn under the rib separating the windows.

**CAUTION**

Head pad cleaning shall be performed only after drum surface cleaning is completed. Also, the drum shall have come to a complete stop before starting the procedure.

d. The head pads of the drum shall be cleaned only after the drum comes to a complete stop. Clean the head pads using the optional cleaning procedure as follows:

**CAUTION**

The drum shall not be rotating during the performance of this procedure.

- (1) Starting with one of the previously removed head bars, clean the head pads of the bar as directed in paragraph 5-6-1-2 h. (1) through (4).
- (2) With the heads of the head bar cleaned, reinstall the head bar on the drum as directed in paragraph 5-6-1-2 i.
- (3) Clean the other previously removed head bar(s) as directed in paragraph (1) and then install the bar(s) on the drum as directed in paragraph 5-6-1-2 i.

e. Remove each of the remaining head bars from the drum — preferably one at a time unless adequate protection is assured — as directed in paragraph 5-6-1-2 f. (1) and (2). With the head bar rotated out of the window, clean the head pads of each head bar as directed in step d. (1) and (2), as applicable.

f. With all head pads cleaned, perform the applicable procedures of paragraph 5-6-1-2 k. through n.

5-6-2 MONITORING DRUM MOTOR SPEED — The following is a suggested procedure that can be used to monitor the speed of the Auto-Lift drum if required.

5-6-2-1 Special Equipment Required — Obtain the following special equipment:

- a. One electronic counter, Hewlett Packard Model 523C, or equivalent
- b. One oscilloscope, Tektronix 555 — or equivalent, with a preamplifier to suit frequency limits of the drum
- c. A wristwatch or pocketwatch for telling time

5-6-2-2 Procedure — Check drum motor speed as follows:

a. Connect the output of the active tachometer clock head of the drum to the trigger input of the oscilloscope (see paragraph 3-4 for procedure to be followed); then connect the electronic counter to the trigger output of the oscilloscope.

b. If the drum is at a complete stop when performing this procedure, proceed as follows; otherwise, proceed to step c.

- (1) Turn on the drum and record the time. As the drum comes up to speed, the occurrence of any unusual noises shall necessitate drum shut down. If possible, however, isolate the point(s) of trouble before performing drum shut down; this information can be used in troubleshooting.
- (2) With the drum operating properly, observe that counter indicates between the times specified in Table 5-5 for the speed corresponding to that of the drum under check within two minutes of the time recorded in the test data of the drums log.

**Table 5-5 Electronic Counter/Speed Conversion Chart**

Nominal Drum Speed (rpm)	Electronic Counter Indication (Milliseconds)	
	Nominal Drum Speed	Nominal Drum Speed Less Slip (6%, Maximum)
1800	33.334	35.461
3000	20.000	21.266
3600	16.667	17.731

- (3) Monitor the drum speed for an additional 45 minutes and observe that counter does not indicate less than that indicated in the nominal drum speed less slip column of Table 5-5.

c. If the drum was up to speed when starting this procedure, simply observe that the counter indicates between the limits indicated in Table 5-5 for the nominal speed indicated on the drum's nameplate.

# SECTION 6

## CORRECTIVE MAINTENANCE

### 6-1 INTRODUCTION

Corrective maintenance is limited to those parts that are not classified as proprietary by Bryant, or to those parts in which special or elaborate factory type equipment is not required. This section provides, in part, the procedures for correcting deficiencies incurred in the drum during normal operation. Procedures for replacing upper and lower spindle bearings — which are normally replaced at prescribed intervals — will be found in the preventive maintenance section of this publication. Though the prescribed maintenance can be performed by qualified technicians, Bryant recommends that required maintenance be performed by Bryant's qualified staff of servicemen who are always on call to perform such customer service.

6-1-1 PERSONNEL QUALIFICATIONS — Personnel responsible for maintaining the drum shall be technically qualified and shall have participated in Bryant's drum training program (see paragraph 5-1-1 a. and b.). One man shall be selected to coordinate all corrective maintenance activities — including establishment of sufficient lead time to assure that special equipment required in a procedure is available — as well as to assure that all possible caution is taken to protect both personnel and equipment. In addition, each individual performing the corrective maintenance procedures contained herein shall be thoroughly familiar with the operating instructions of Section 3.

6-1-2 TROUBLESHOOTING TECHNIQUES — Troubleshooting as described herein is limited to the detection of only the more obvious failures that may occur to the drum. In no way is it intended or implied that these procedures can isolate all troubles that may be encountered with the drum — particularly those which are extremely rare or unusual in nature; in such instances, the maintenance technician must use deductive reasoning to isolate the fault or contact Bryant Computer Products Field Service Group for assistance. Before referring to the procedures, every effort should be made — where applicable — to ensure that a fault is not due to the equipment to which the drum is connected. Briefly the procedures are divided into troubleshooting electro/mechanical assemblies (see Table 6-1) and troubleshooting recording elements (heads and surface) (see Table 6-2).

#### **WARNING**

When performing the procedures, exercise care when working around rotating member of drum and when working in the vicinity of high voltages.

**Table 6-1 Troubleshooting Electro-Mechanical Assemblies of Drum**

Trouble	Possible Cause	Remedy
1. Drum does not rotate	Shipping screws are in place	Remove shipping screws as directed in paragraph 2-4-1 m. and n.
2. With proper power applied, loud motor hum and drum barely rotates	Power phase open	Check input power
	Stator winding open	Replace stator as directed in paragraph 6-2
3. Loud popping noise when drum reaches approximately half speed; sound rapidly increases in intensity	Lubricant in bearing assembly is channeling	Immediately shut down drum, wait for drum to come to a complete stop, and then re-start drum
4. Drum does not reach operating speed	Facility voltage low	Check voltage
5. Drum speed rundown occurs too quickly, high pitched sound coming from drum, and/or drum vibrating excessively	Defective bearing assembly(s)	Replace the bearing assemblies as directed in paragraph 5-5

**Table 6-2 Troubleshooting Recording Elements (Heads and Surface) of Drum**

**CAUTION**

Refer to paragraph 3-4 for the procedures to be followed when monitoring clocks directly through the clock heads.

Trouble	Possible Cause	Remedy
1. No clocking input from clock head to customer read amplifiers	Clock wasn't written or was inadvertently erased	Rewrite the clock
	Drum did not completely lift	See "Trouble 4" of Table 6-1

**Table 6-2 Troubleshooting Recording Elements (Heads and Surface)  
of Drum (Cont.)**

Trouble	Possible Cause	Remedy
2. Improper clock count	Customer read amplifier im- properly adjusted	Adjust the read amplifier
	Clock improperly written	Rewrite the clock
	Low head playback	Perform the applicable replacement procedure of paragraph 6-5
3. Improper data count	Controller circuits improper, head defective, or drum plating defective	Perform the applicable data head replacement procedures of paragraph 6-3

6-1-3 **MAINTENANCE HINTS** — Corrective maintenance shall be performed based on the individual's knowledge of the operation of the drum with respect to the system into which it is incorporated. Knowledge of the operation of the drum exclusive of its system relationship can be obtained from the information contained in this handbook and by participation in Bryant's general factory training program. It is not intended that this publication give all details as to the replacement of parts of a drum, particularly where replacement is based on standard accepted procedures, such as the replacement of an electrical component where wires must be unsoldered or removed from terminal lugs and where some minor mounting hardware must be removed to free the unit from a chassis on which it is mounted. Procedures for replacement of the drum/spindle/lift assembly are not provided herein, since replacement requires factory service where special jigs and fixtures necessary for such maintenance are available. Areas in which corrective maintenance can be performed are listed in Table 6-3.

**NOTE**

When corrective maintenance is performed, record the action taken, date performed, and known or estimated accumulated operating time of the drum.

**Table 6-3 Corrective Maintenance**

Components	Paragraph	Estimated Time To Completion*
Radial gap motor stator replacement	6-2	1 hour
Bearing assemblies	5-5	4 hours
Data head replacement	6-3	
Isolating the cause of improper playback	6-3-1	1 hour
Replacing a data head	6-3-2	10 minutes
Data head adjustment procedure	6-3-3	10 minutes
Using a spare data head position	6-4	1/2 hour
Clock head replacement	6-5	
Isolating the cause of clock failure	6-5-1	2 hours
Replacing a clock head	6-5-2	10 minutes
Clock head adjustment procedure	6-5-3	1/2 hour
Cabinet air filter replacement	6-6	1/2 hour
Taper and signal connector pin replacement	6-7	
Taper pin replacement	6-7-1	5 minutes
Signal pin replacement	6-7-2	5 minutes
Diode replacement	6-8	10 minutes
Gasket replacement	6-9	1/2 hour
Access panel fastener replacement	6-10	5 minutes

\* Estimated meantime-to-completion does not consider the time required for the drum to come to a complete stop or to reach stabilized operating speed.



## 6-2 RADIAL GAP MOTOR STATOR REPLACEMENT

Bryant recommends that only the stator of the radial gap drive motor be replaced in the field.

6-2-1 SPECIAL EQUIPMENT REQUIRED — Obtain a spare stator; for the applicable Bryant Part No., refer to Bill of Materials furnished with the drum.

6-2-2 PROCEDURE — Replace the drum's stator assembly as follows:

- a. Shut down the drum and disconnect the input power connector to the drum motor.
- b. Wait for the drum to come to a complete stop (this can be determined by viewing the fan through the screened cover of the motor housing).
- c. With the drum no longer rotating, remove the cover (1, Figure 5-5) from the drum housing.
- d. Remove the fan (2) from the hold down screw (8).
- e. Remove the hardware securing the motor housing assembly (5) to the drum housing. With the assembly partially removed from the housing, remove connector (3) and gasket (4) from the motor housing assembly and disconnect the stator leads of the motor housing assembly from the connector. Remove the motor housing assembly (5) from the drum housing.
- f. Loosen the two set screws that secure the stator (6) within the motor housing (7) and remove and discard the stator.
- g. Install the replacement stator (6, Figure 5-5) in the motor housing (7). Using the set screws of step f., secure the stator so that it is approximately centered in the housing.
- h. Route the stator wires of the motor housing assembly (5) through the opening in the motor cap of the drum and gasket (4) and connect the wires to the connector (3) as indicated in the drum motor wiring diagram of Figure 2-5. Then reinstall the connector with its gasket on the motor housing.
- i. Install the motor housing assembly (5) on the drum housing and secure it in place using appropriate hardware.
- j. Rotate the rotor by hand and observe that the gap between the stator (6) and rotor (12) — throughout rotation — remains constant within 0.003-inch (shim stock can be used in this measurement). If the gap is not proper, loosen the set screws that secure the stator in position, reorient the stator, secure the stator in position with the set screws and repeat the check until the required tolerance is achieved.
- k. With the stator properly positioned, install the fan (2) on the hold down screw (8) and secure fan in position using appropriate hardware.
- l. Install cover (1) on the motor housing assembly.
- m. Perform the drum turn on procedure of paragraph 3-3-1 paying particular attention to the drum rotation check of step c. of the procedure.

## 6-3 DATA HEAD REPLACEMENT

Should the playback from a data head be improper, a check should be made to isolate the cause of failure to the processor or to the drum. If the improper playback is isolated to the drum, it should be determined whether this playback failure is caused by improper wiring between the head and the head buss or head select connectors J2 and J3 of the drum, to a failed diode on the terminal board, the head, or the drum plating. It should not be immediately assumed that the cause of failure is exclusively due to the head.

### CAUTION

It is assumed — before this procedure is performed — that all clocks are satisfactory.

6-3-1 ISOLATING THE CAUSE OF IMPROPER PLAYBACK — Several things can be done to isolate the cause of improper playback. These are discussed in the following paragraphs.

6-3-1-1 Special Equipment Required — Obtain the following special equipment:

a. Taper pin extraction and insertion tools as specified under the equipment required but not supplied list (see Table 2-2).

b. A volt/ohmmeter, Simpson Model 260, 20 Kohms/vdc, or equivalent

6-3-1-2 Procedure — Isolate the cause of improper playback as follows:

### CAUTION

It is assumed that the failure detected is an isolated occurrence and is not random throughout the drum. Random errors throughout the drum could be caused by dirt build up. In such an event, the drum surface and head pad cleanliness check of paragraph 5-4-3 should be performed before proceeding.

### NOTE

To isolate the failure to the processor or the drum, the processor must be available for performing the check.

## 6-3-1-2 Procedure (Cont.)

a. After thoroughly cleaning the area surrounding the drum, perform the panel removal procedures of paragraph 5-6-1-2 d. except the drum can be operative, as applicable, and only those panels that will enable access to the head bar assembly containing the suspected defective head shall be removed. For head location, see the head complement drawing and head-wiring wire list furnished with the drum; also, check the QC 23-75 form furnished with the drum to be sure head wiring has not been changed from that reflected on the drums head-wiring wire list.

b. Initiate drum turn on as directed in paragraph 3-3-1, as applicable.

c. Perform the following initial checks:

- (1) Check that the hex head screw used to secure the head to the head bar is more than just finger tight; see Figure 6-1 for the typical mounting of a data head to a head bar. If the screw is loose and the head is fully retracted, proceed immediately to the adjustment procedures of paragraph 6-3-3; in this event, however, it is assumed that all heads previously found defective have been removed from the drum and that the head in question is known to be a good head. However, if there is any doubt as to the suitability of the head, replace the head as directed in paragraph 6-3-2.
- (2) Check the taper pin leads of the head to be sure that they are firmly seated in the terminal board lugs; if the taper pins are found loose, replace them as directed in the applicable paragraph of this section; it is suggested that a write/read operation then be performed through the head to be sure there is no further trouble. If the deficiency is remedied, inspect gasketing and reinstall the panels on the drum by performing the applicable procedures of paragraph 5-6-1-2 k. and l. Otherwise, proceed to step d.

### **CAUTION**

Before performing the write operation in the following procedures, be sure to transfer all recoverable data to another storage device.

### **NOTE**

The following procedure is intended only as a suggested means of isolating a failure. This procedure is not intended to circumvent pre-established diagnostic procedures.

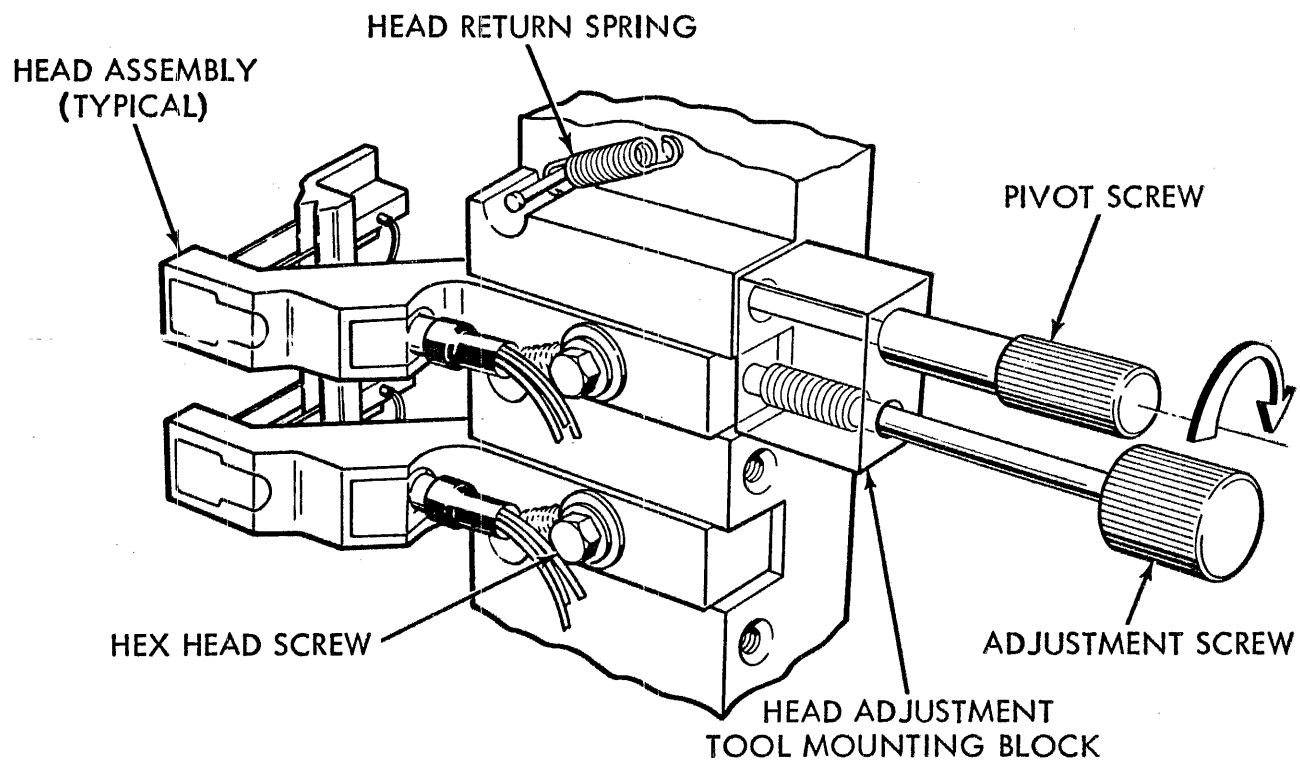


Figure 6-1 Head Adjustment Tool Installed on a Head Bar

## 6-3-1-2 Procedure (Cont.)

d. With drum turn on satisfactorily achieved, use the processor to write and read through all heads that are tied to the same buss that serves the suspected defective head. Also, write and read through all heads that are tied to the same head select lines that serve the suspected defective head. If only the originally suspected defective head fails in each instance, proceed to step e. However, if all heads tied to the buss lines are inoperative, check the buss between the harnesses terminal board, drum connector J2, and the processor; on the other hand, if all heads tied to the head select line are inoperative, check the head select wires between the harnesses terminal board, drum connector J3, and the processor. If processor wiring or circuits are defective, proceed as required but immediately inspect gasketing and reinstall the drum access panels as directed in paragraph 5-6-1-2 k. and l., as applicable. If drum wiring is defective, correct the wiring, as applicable; for the procedure in removing the signal connector pin, refer to the applicable paragraph of this section. It is suggested that a write/read operation then be performed through the head to be sure there is no further trouble. If the deficiency is remedied, inspect gasketing and reinstall the panels on the drum by performing the applicable procedures of paragraph 5-6-1-2 k. and l. Otherwise, proceed to step e.

e. If step d. has not isolated the failure, proceed as follows:

- (1) With the drum writing mode inhibited, use the taper pin extraction and insertion tools (see Figure 5-7 and 5-11) to switch the taper pin connections of the suspected defective head with those of an adjacent known good head; when removing and inserting the pins, do not rotate the pins in the lugs, but rather use one, smooth even motion to accomplish the task. Before doing this, however, be sure that there is no usable, recoverable stored data in either storage position. If there is such stored data, transfer the data to another storage location.

### **CAUTION**

The following procedure will result in destruction of stored data if data transfer was not initiated as directed in the previous step.

- (2) With drum turn on satisfactorily achieved, use the processor to write and then read through both of the heads of step (1). If improper playback appears at only the known good head, proceed to step (3). However, if playback is improper at only the suspected defective head, proceed as follows:

6-3-1-2 Procedure (Cont.)

- (a) Check the buss and head select wiring between the suspected defective connectors J2 and J3 of the drum. Replace defective wiring, as applicable; for the procedure in removing the signal connector pin, refer to the applicable paragraph of this section. It is suggested that a write/read operation then be performed through the head to be sure there is no further trouble. If there is still trouble, proceed immediately to step (b). Otherwise, if the deficiency is remedied, return taper pins switched in step (1) to their original positions, and inspect gasketing and reinstall the panels on the drum by performing the applicable procedures of paragraph 5-6-1-2 k. and l.

**CAUTION**

When performing the next step, do not connect the ohmmeter to a clock head or to a head that serves a track wherein recoverable data is stored. Such connection will result in the destruction of the clocks or data.

- (b) If the wiring was found satisfactory, remove the taper pins of the heads switched in step (1) from the lugs of the terminal board harness using the taper pin extraction tool (see Figure 5-7); when removing the pins, do not pivot the pins in the lugs, but rather use one smooth, even motion to extract the pin from the lug. Return the leads of the known good head to their normal terminal lugs. With the leads of the suspected defective head held free of the lugs of the terminal board, use an ohmmeter to check the forward and reverse bias of the diodes (located on the back of the terminal board) that serve the data head in question. In one direction the resistance should be almost infinite and in the other direction the resistance should be negligible. If a diode is found bad, replace it as directed in the applicable paragraph of this section. Then, insert the head leads into their normal lugs on the terminal board. It is suggested that a write/read operation then be performed through the head to be sure there is no further trouble. If the deficiency is remedied, inspect gasketing and reinstall the panels on the drum by performing the applicable procedures of paragraph 5-6-1-2 k. and l. Otherwise, proceed to replace the head as directed in paragraph 6-3-2 in order to isolate the failure to the drum head or drum surface.
- (3) If improper playback occurs at only the known good head, proceed as follows:
    - (a) Return the taper pin connections switched in step (1) back to their original positions.

6-3-1-2 Procedure (Cont.)

- (b) Inspect gasketing and reinstall the panels on the drum by performing the applicable procedures of paragraph 5-6-1-2 k. and l.
- (c) Check the processor for the cause of failure .

6-3-2 REPLACING A DATA HEAD — If failure is isolated to the data head or drum plating (see paragraph 6-3-1), the head should be immediately replaced, if possible, in order to further isolate the point of failure. Head replacement should be done by either the recommended or optional procedure, which follow.

**NOTE**

If time does not immediately permit replacement of the data head, use a spare head position as directed in paragraph 6-4; however, before using a spare head position, ensure that the suspected defective head is first removed from the drum as directed in the procedure. Regardless, if replacement is bypassed, it is recommended that the replacement procedure be performed at the earliest convenience.

6-3-2-1 Special Equipment Required — Obtain the following special equipment:

- a. A Bryant qualified data head assembly, Bryant Part No. AH-020. The replacement head shall remain in the Bryant supplied protective box (see Figure 6-2) until it is required in the procedure.
- b. Obtain a taper pin extraction tool and a taper pin insertion tool as called for in the equipment required but not supplied list (see Table 2-2).
- c. Check that the tools called for under head adjustment of paragraph 6-3-3 are available.
- d. The 3/16-inch open-end wrench and head squaring fixture included with the special tools and accessories supplied (see Table 2-1).
- e. A volt/ohmmeter, Simpson Model 260, 20K ohms/vdc, or equivalent.
- f. A bright light that can be positioned behind the head squaring fixture during the knife-edge check of a replacement head.

6-3-2-2 Recommended Replacement Procedure — With improper playback isolated to the head or drum plating, the recommended head replacement procedure necessitates the waiting for the drum to come to a complete stop before proceeding; this action ensures protection of both personnel and equipment.

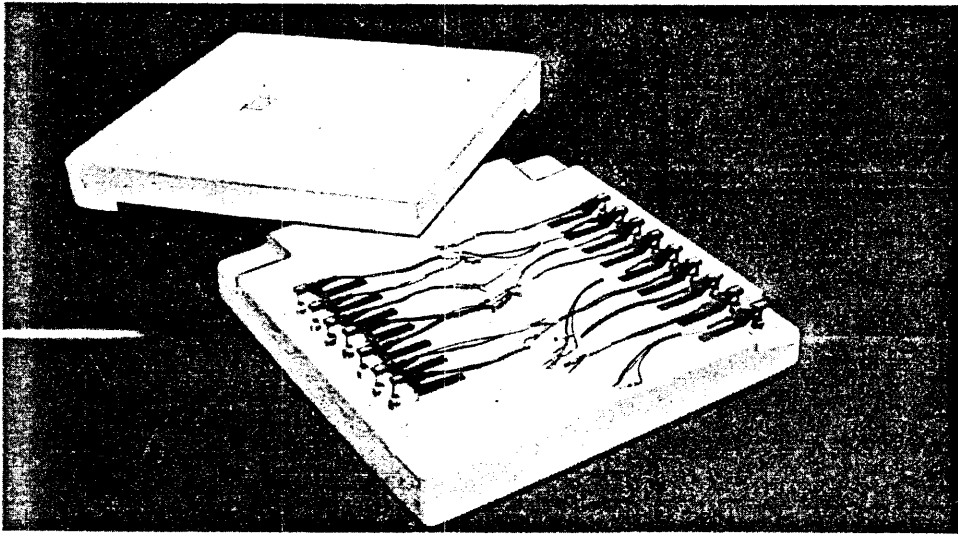


Figure 6-2 Typical Packaging of Spare Heads Supplied With a Drum



**CAUTION**

Bryant Aerodynamic magnetic heads and mounting assemblies are precision made devices that require the utmost care and skill to install. Servicing by the customer shall be performed only by those personnel who have previously gone through the procedure under the direction of a qualified Bryant instructor.

- a. Shut down the drum. To ensure that it is not inadvertently started, disconnect the power to the drum motor; the best way of doing this is to disconnect the facility power connector from the drum motor connector in the motor housing assembly of the drum.
- b. Obtain the equipment specified in paragraph 6-3-2-1.
- c. Perform the procedures of paragraph 6-3-1-2 a., as applicable, except the drum shall be inoperative during head replacement.
- d. Check the continuity and the squareness of the Bryant qualified head to be used in replacement as follows:

**CAUTION**

In the next step before removing a head, set the protective head box on a flat surface with its cover labeled TOP up. When resealing the box, be sure the TOP is properly indexed before setting it in position. Irreparable head damage can otherwise result.

- (1) Carefully remove the cover of the protective box containing the spare heads and remove the required replacement head. Check that the reeds of the head are not bent; if a reed appears bent, get another head and return the suspected defective head to Bryant Computer Products, 850 Ladd Road, Walled Lake, Michigan 48088, Attention: Product Assurance Department, for requalification. With the top of the box properly indexed, immediately close and reseal the box.

**CAUTION**

Do not allow the head to strike any surfaces; a bent reed will result in irreparable damage to the head.

6-3-2-2 Recommended Replacement Procedure (Cont.)

- (2) Using the volt/ohmmeter, check that the indicated resistance from the center tap (pin to which the black shield lead is connected) to either end of the coil of the head is 1 to 1.5 ohm, also check that the resistance across the full coil is 2 to 3 ohms.



If experience with the AD-087 head squaring fixture has been limited, practice its use as specified in the next step using a discarded head before proceeding. Aside from exercising proper care when knifing the head, the critical point of the procedure is when the head is twisted in order to square it. If extreme care is not exercised, the reed could be bent thereby causing irreparable damage to the head.

- (3) Mount the replacement head in the AD-087 head squaring fixture as shown in Figure 6-3 and advance the head pad until it just contacts the knife edge. With a bright light behind the knife edge and without forcing the head pad, there should be practically no light visible between the entire width of the head and the knife edge. If excessive light is visible, gently twist the head pad to compensate for the irregularity and repeat the check on the fixture. Repeat the procedure until the specified squareness is achieved.
  - (4) With the head properly squared, repeat the procedure of step (2). Then set the head in a place where it cannot be damaged.
- e. With the drum not rotating, replace the head to be removed as follows:
- (1) Remove the three taper pins of the suspected or known defective head from the lugs of the terminal board of the data cable harness to which it is connected. Removal is accomplished using the taper pin extraction tool (see Figure 5-7). When removing the pins, do not rotate the pin in the terminal board lug; rather, use one smooth, even motion to extract the pin from the lug.
  - (2) Use the 3/16-inch open-end wrench to loosen — do not remove — the hex head cap screw securing the head to the head bar and allow the head to move to the fully retracted position; see Figure 5-3 for the typical mounting of either a data or clock head to the head bar. With the head fully retracted, remove the hex head cap screw securing the head to the head bar and remove the head. If there is any doubt as to the suitability of the head removed, return the head to Bryant Computer Products, 850 Ladd Road, Walled Lake, Michigan 48088, Attention: Product Assurance Department, for requalification.



**Figure 6-3** Checking Head Squareness in the Head Squaring Fixture

## 6-3-2-2 Recommended Replacement Procedure (Cont.)

### CAUTION

Do not allow the head to strike any surfaces; a bent reed will result in irreparable damage to the head.

- (3) Carefully position the head qualified in step d. on the head bar in place of the removed head; make sure that the return spring of head bar is firmly seated between the head socket and the round head drive screw and that the head bracket is seated square in the head bar. With the head spring loaded to the fully retracted position (position furthest from the drum surface), tighten the head in position using its mounting hardware.
- (4) Connect the leads of the head to the terminal board of the data cable harness as directed in paragraph 5-6-1-2 j. (3).

### CAUTION

The replacement head shall be in the fully retracted position as directed in step e. (3) before proceeding to the next step.

f. Reconnect the facility power cable to the drum motor, but do not turn on the power until so directed in the procedure. Adjust the replaced head for proper playback as directed in paragraph 6-3-3.

6-3-2-3 Optional Replacement Procedure — The optional procedure is performed in the same manner as the recommended procedure of paragraph 6-3-2-2 except that the drum is allowed to operate as the procedure is performed. This optional procedure however poses an extreme hazard to the drum proper, not to mention the hazard posed to the individual performing the procedure. The hazard is due to the replacement of the head with the drum operating at speed!! This procedure should always be avoided whenever possible, or if it is performed, extreme care shall be exercised to ensure no slip occurs for should the head contact the drum surface, it could severely damage the plating not to mention the head; also, upon hitting the surface, it could be catapulted into other heads — causing additional head and drum plating damage — or into individuals standing the area — causing severe injury. The procedure shall be performed only at the customer's own risk; only an extremely talented technician should be allowed to perform the procedure.

6-3-3 DATA HEAD ADJUSTMENT PROCEDURE — Data head adjustment shall be performed only as directed in this procedure, and under no condition shall the head be arbitrarily adjusted beyond the limits specified. Only procedures for radially adjustable heads as furnished on standard drums is considered.

6-3-3-1 Special Equipment Required — Obtain the following special equipment:

- a. Obtain the head adjustment tool and 3/16-inch wrench from the special tools and accessories supplied with the drum.
- b. An oscilloscope, Tektronix Type 555 — or equivalent, with preamplifier to suit frequency limits and write/read characteristics.
- c. Arrange for provisions to alternately write and read ONE/ZERO patterns on the drum surface through the head to be adjusted.

6-3-3-2 Procedure — Adjust the data head(s) as follows:

**CAUTION**

The data head to be adjusted shall be a known good head. If there is any doubt as to its suitability, the head shall be replaced with a qualified head as directed in paragraph 6-3-2.

- a. Perform the preliminary procedures of paragraph 6-3-1-2 a. and b., if not already done, except, in this instance, the head to be adjusted is to be identified.
- b. Disconnect the taper pins of the head to be adjusted from the terminal lugs to which it is fastened as directed in paragraph 6-3-2-2 e. (1), as applicable, and connect the head leads directly to the device that can be used to write and read data.
- c. Using the 3/16-inch wrench from the special tools supplied, loosen the hex head screw of the head assembly to be adjusted — if not already done — and allow the spring of the assembly to fully retract the head (see Figure 6-1). Then tighten the head's hex head screw.
- d. Back off the adjustment screw of the head adjustment tool until the threaded end completely recesses into the mounting block (see Figure 6-1). Then with the threaded end of the adjustment screw positioned over the head to be adjusted, install the tool on the head bar by threading its pivot screw into the tapped hole that is next to the head; if adjacent heads are to be adjusted, thread the tool into the tapped hole between them. Thread the tool into the head bar only far enough to ensure positive mounting.
- e. With the head adjustment tool installed and with the hex head screw of the head tightened as directed in step c., rotate the head adjustment screw of the tool clockwise until it just touches the head assembly to be adjusted.
- f. Using the 3/16-inch wrench from the special tools supplied, loosen the hex head screw of the head assembly to be adjusted (see Figure 6-1); then, snug — do not tighten — the screw. By snug, it is meant that the screw is sufficiently tight to maintain the head assembly oriented within the slot of the head bar while simultaneously enabling movement within the slot when subsequently tightening the adjustment screw of the head adjustment tool.

### 6-3-3-2 Procedure (Cont.)

g. With drum turn on satisfactorily achieved and with the head to be adjusted connected directly to a device that can be used to write and read a ONE/ZERO, half-frequency pattern — i.e., 1/0/1/0/1/0, etc. — through all bit positions of the track, adjust the head for proper playback as follows:

- (1) Connect an oscilloscope to enable the viewing of data directly off the head (no amplification); set the oscilloscope to near maximum sensitivity.

#### **CAUTION**

Before proceeding with head adjustment, extreme care must be taken to ensure that the head to be adjusted has been properly qualified as directed in paragraph 6-3-2-2 d. and that the set up of the test equipment is correct. An open head or an improper connection in the test set up could result in the running of the bracket of the head into the drum surface while checking for playback; such action could not only destroy the head but could also result in irreparable damage to the drum surface.

- (2) With the speed and temperature of the drum stabilized, write a ONE/ZERO, half-frequency pattern through the head being adjusted.
- (3) Set the write/read device so the written pattern of step (2) can be read through the head. Observe the oscilloscope trace for the slightest detectable playback; if playback is detected, proceed immediately to step (5) otherwise proceed to step (4).
- (4) If playback is not detected in step (3), turn the head adjustment screw of the head adjustment tool positioned over the head 1/8-turn clockwise (maximum) and repeat steps (2) and (3) as required.
- (5) With the condition of step (3) met, turn the head adjustment screw of the head adjustment tool 1/16-turn counterclockwise and perform the procedure of steps (2) and (3); repeat this procedure until the wave pattern is just barely discernible on the scope.
- (6) Switch the sensitivity to a range that will enable the reading of a playback waveform that can be as great as 60 mv peak-to-peak.

**CAUTION**

Head adjustment preloads specified in the following steps are to be considered as the maximum safe mechanical preloads that shall be used. These limits are not to be exceeded without written authorization by Bryant's Product Engineering Department. It is generally recommended that preloads less than the maximums specified be used whenever possible as long as playback and resolution specifications for the particular drum can be achieved with the reduced preload.

- (7) Turn the head adjustment screw of the head adjustment tool  $1/16$ -turn clockwise maximum.
- (8) Perform the procedure of step (2) and then proceed to step (9).
- (9) Set the write/read device so that the written pattern can be read through the head. Observe the oscilloscope trace for a playback that is within the specified range for the drum purchased. If the indication is outside the desired range, proceed as follows; otherwise proceed to step (10).

**CAUTION**

Including the adjustment of step (7), a maximum adjustment of three,  $1/16$  turns of the head adjustment tool are allowed in the case of an 1800 rpm drum; in the case of a 3000 rpm drum, a maximum of four,  $1/16$  turns are allowed; in the case of a 3600 rpm drum, a maximum of five,  $1/16$  turns plus  $1/32$  additional turn are allowed.

- (a) If the output indication is less than required, adjust the head adjustment screw of the head adjustment tool an additional  $1/16$  turn clockwise (maximum) and repeat the procedures of steps (2) and (9). Perform this procedure only once, and then proceed as follows if playback is still insufficient:
  1. In  $1/16$  or  $1/32$  turn increments — as applicable, adjust the head adjustment screw of the head adjustment tool one additional  $1/16$  turn (maximum) for an 1800 rpm drum,  $1/8$  turn (maximum) for a 3000 rpm drum, or  $7/32$  turn (maximum) for a 3600 rpm drum and repeat the procedures of (2) and (9) as applicable.

### 6-3-3-2 Procedure (Cont.)

2. If the required playback is still not within the minimum limit, replace the head as directed in paragraph 6-3-2, as applicable, and repeat all procedures to this point. If playback is still poor, remove the head and note on the QC 23-75 form that the former head position — by number — is defective and give the reason for which it is considered defective; then, proceed to the selection of a spare head position for use in place of the defective head position as directed in paragraph 6-4 noting on the QC 23-75 form the number of the head used as a replacement for the defective head position. Otherwise, if the required playback is within tolerance, proceed to step (10).
- (b) If the indication is greater than required, adjust the head adjustment screw fractionally counterclockwise and repeat steps (2) and (9). Repeat this procedure until the playback is within the proper limits and then proceed to step (10).
- (10) With the head properly adjusted, tighten the clamping screw of the head (see Figure 6-1) and repeat the procedures of steps (2) and (9). A slight increase in playback can be expected.

h. With head adjustment satisfactorily completed, shut down the drum, remove the head adjustment tool from the head bar, remove the write/read device connections from the head adjusted, and reconnect the taper pins of the data head to the drum's cable harness as directed in paragraph 5-6-1-2 j. (3).

i. Inspect gasketing and reinstall the panel(s) that were removed from the drum by performing the applicable procedures of paragraph 5-6-1-2 k. and l.

j. Using the normal data channel, check the head for proper playback before using the head position to store data.

## 6-4 USING A SPARE DATA HEAD POSITION

As an expedient, drum head positions that are furnished to the customer as spares can be used in the storage of data until a failure — as detected in paragraph 6-3-1-2 e. — is specifically isolated to the head or drum surface. If a failure is subsequently isolated to a head after using a spare head position, operation can be reverted back to the original head position where a new head is installed, or the original head position may be left for use as a future spare with the original spare being used as the standard head, if desired. On the other hand, if a failure was isolated to the drum surface, the spare head position will then be permanently used as the storage head that replaces the head that was serving the bad portion of the drum surface; the head slot over the bad surface will be vacated. There are two methods by which connection can be made to the spare head of a standard drum. In the case



## 6-4 USING A SPARE DATA HEAD POSITION (Cont.)

where spare head positions are available on the head bar containing the defective head, the head connections to the cable harness terminal board serving the head bar can be cascaded from the lugs that serve the spare head up to the lugs that serve the head that was removed. In the case where there are no spare heads on the head bar, the head connections of a spare head located on another head bar can be wired directly to the terminal lugs of the head that was removed.

### 6-4-1 SPECIAL EQUIPMENT REQUIRED — Obtain the following special equipment:

- a. Obtain a taper pin extraction tool and a taper pin insertion tool as called for in the equipment required but not supplied list (see Table 2-2).
- b. For head bars where head wires to the terminal board are to be cascaded and where data stored through the heads must be saved, arrange for the alternate storage location for all data head positions of the head bar.
- c. For data heads on head bars without spare head positions, obtain a soldering iron and solder. Also obtain three colors of shielded wire. One wire should be color coded green, another red and the third black; wire size shall be as specified in the wire list for the head cable harness furnished with the drum.

### 6-4-2 CASCADING THE DATA HEADS OF HEAD BARS — After checking the Bryant QC 23-75 form furnished with the drum to ensure that the spare head position to be used is satisfactory, cascade the wiring of the heads of the head bar with a spare data head position as follows:

- a. Remove the suspected defective head as directed in paragraph 6-3-2-2 a. through c. and e. (1) and (2).



The drum shall never be operated with a suspected defective head installed.

- b. If the data stored through the heads of the head bar must be saved, dump the data at all head positions into another storage location.
- c. With the data of the tracks served by the head bar dumped, remove the write/read enable capability from the drum.
- d. Disconnect the taper pins of the three leads of all the heads located between the vacated head position and the spare head position (including those of the spare head) from the lugs of the terminal boards as directed in paragraph 6-3-2-2 e. (1).

## 6-4-2 CASCADING THE DATA HEADS OF HEAD BARS (Cont.)

e. Starting with the removed taper pin leads of the head located adjacent to the vacated head position, connect the leads to the terminal board lugs that served the vacated head position; reconnect the leads to the terminal board as directed in paragraph 5-6-1-2 j. (3) being careful that the correct color lead goes to the proper lug. Similarly, cascade each of the other heads to the next head position toward the vacated head position until all heads, including the spare head, are connected to the terminal board.

f. Since the spare head has been preadjusted, the drum can probably be placed into immediate use; however, it is recommended that the failure at the vacated head position be isolated to the head or drum surface as soon as practical if such has not already been done. This is done by actually installing a replacement head on the drum as directed in paragraph 6-3-2.

g. After checking for proper playback at all switched head positions, inspect gasketing and reinstall the panels that were removed from the drum by performing the applicable procedures of paragraph 5-6-1-2 k. and l.

6-4-3 USING A SPARE DATA HEAD OF ANOTHER HEAD BAR — After checking the Bryant QC 23-75 form furnished with the drum to ensure that the spare head position to be used is satisfactory, jumper the wires of a spare head of another head bar to the terminal board lugs that served the vacated head position as follows:

a. Remove the suspected defective head as directed in paragraph 6-3-2-2 a. through c. and e. (1) and (2).



The drum shall never be operated with a suspected defective head installed.

b. Select a spare head position of a head bar that is as close as possible to the vacated head position; selected head should be on same head select buss as defective head.

c. Cut the three lengths of wire previously obtained to a length that will enable them to reach from the spare head to the terminal board lugs of the vacated head position. As a rule, the length should be established based on the normal routing of the leads of the wiring harness and should be cut several inches longer than is necessary; the leads should not be arbitrarily drawn across head bars.

d. Secure taper pins to one end of the leads of step b. as directed elsewhere in this section.

e. Connect the taper pins of the wires of step c. to the terminal lugs of the terminal board that served the vacated head position; note that the color coded wires are connected to the proper lugs (see Figure 5-2 or 5-3).

f. Twist the three wires together and route them along the cable harness to the terminal board lugs to which the spare head is connected; tie wrap or equivalent can be used to hold the wires to the harness.

g. Cut the wires to a length that will enable their subsequent stripping and soldering to the terminal lugs serving the spare head.

h. Disconnect the taper pins of the three leads of the spare head as directed in paragraph 6-3-2-2 e. (1).

i. Before starting to solder the leads of step g. to the terminal board, place a piece of paper between the drum surface and terminal board. The paper should be large enough to prevent solder from splattering onto the drum surface.

**CAUTION**

Care must be exercised to ensure that the soldering iron is not allowed to overheat the terminal lug. Excessive heat could damage the lug mounting on the terminal board.

j. With the paper of step i. in position, wrap the leads of the twisted wire around the appropriate terminals serving the spare head and solder them to the lugs; note again that the color coded wires are connected to the proper lugs (see Figure 5-2 or 5-3).

k. Reconnect the leads of the spare head to the terminal board lugs to which the wires were just soldered being careful that the correct color coded wire of the head is connected to the proper lug (see Figure 5-3); reconnect the taper pins of the head as directed in paragraph 5-6-1-2 j. (3).

l. Since the spare head has been preadjusted, the drum can probably be placed into immediate use; however, it is recommended that the failure at the vacated head position be isolated to the head or drum surface as soon as practical if such has not already been done. This is done by actually installing a replacement head on the drum as directed in paragraph 6-3-2.

m. After checking for proper playback at all switched head positions, inspect gasketing and reinstall the panels that were removed from the drum by performing the applicable procedures of paragraph 5-6-1-2 k. and l.

## 6-5 CLOCK HEAD REPLACEMENT

Should a drum clock appear unsatisfactory, a check should be made to isolate the cause of failure to the processor or to the drum. If clock failure is isolated to the drum, determine whether this failure is caused by improper wiring between the head and clock connector J5 of the clock wiring harness, the head, or the drum surface. It should not be immediately assumed that the cause of failure is exclusively due to the head.

## 6-5 CLOCK HEAD REPLACEMENT (Cont.)

### NOTE

In the case of a drum with optional spare clocks, the user could immediately switch to the required spare clock as directed under emergency procedures of Section 3 and continue operation of the drum. However, it is recommended that the cause of clock failure be determined at the earliest time possible so that a new clock can be written either (1) in the original head position; or (2) in a new head position should the drum surface be found the cause of trouble.

6-5-1 ISOLATING THE CAUSE OF CLOCK FAILURE — Several things can be done to isolate the cause of clock failure. These are discussed in the following paragraphs.

6-5-1-1 Special Equipment Required — Obtain the following special equipment:

- a. An oscilloscope, Tekronix Type 555 — or equivalent, with preamplifier to suit system frequency limits and write/read characteristics.
- b. A volt/ohmmeter, Simpson Model 260, 20 Kohms/vdc, or equivalent.

6-5-1-2 Procedure — Isolate the cause of clock failure as follows:

- a. Perform the applicable procedures of paragraph 6-3-1-2 a. and b.
- b. Perform the following initial checks:
  - (1) Check that the hex head cap screw used to secure the head to the head bar is more than just finger tight; see Figure 6-1 for the typical mounting of a clock head to a head bar. If the screw is loose and the head is fully retracted, proceed immediately to the adjustment procedures of paragraph 6-5-3; in this event, though, it is assumed that all clock heads previously found defective have been removed from the drum and that the head in question is known to be a good head. However, if there is any doubt as to the suitability of the head, replace the head as directed in paragraph 6-5-2.
  - (2) Check that the connector is firmly seated in its clock harness connector.
- c. If step b. does not isolate the failure, disconnect the processors clock connector from drum connector J5. With drum turn on satisfactorily achieved, use an oscilloscope to monitor the clock at the connector observing the applicable precautions of paragraph 3-4; monitoring should be performed based on the customers knowledge regarding the clocks he has written. If the clock(s) is satisfactory, trouble exists at the processor. Immediately inspect gasketing and reinstall the drum's access panels as directed in the applicable procedures of paragraph 5-6-1-2 k. and l.; if the clock is unsatisfactory, proceed to step d.

**CAUTION**

When performing the next step, the ohmmeter shall never be connected to the clock head that serves a track wherein recoverable clocks are stored. Such connection will result in the destruction of the clocks.

d. Disconnect the clock head connector from the clock wiring harness connector and check continuity of the leads of the clock wiring harness connector to drum connector J5. If continuity is satisfactory, replace the clock head as directed in paragraph 6-5-2. If continuity is not satisfactory, correct defective wiring, as applicable; for the procedure in removing the signal connector pin, refer to the applicable paragraphs of this section. It is suggested that a check then be made for the clock output at connector J5 to be sure there is no further trouble. If the deficiency is remedied, inspect gasketing and immediately reinstall the drum's access panels as directed in the applicable procedures of paragraph 5-6-1-2 k. and l.

6-5-2 REPLACING THE CLOCK HEAD — If a failure is isolated to the clock head or drum plating (see paragraph 6-5-1), the head should be immediately replaced, if possible, in order to further isolate the point of failure.

**CAUTION**

Data protection (e.g., transferring data to an alternate storage source using spare clocks) should be performed, if possible, before proceeding.

6-5-2-1 Special Equipment Required — Obtain the following special equipment:

- a. A Bryant qualified clock head assembly, Bryant Part No. 90504-2. The replacement head shall remain in the Bryant protective box (see Figure 6-2) until it is required in the procedure.
- b. Check that the tools called for under head adjustment of paragraph 6-5-3-1 are available.
- c. Obtain the items of paragraph 6-3-2-1 d. through f.

6-5-2-2 Replacement Procedure — Replace the clock head as follows:

- a. Perform the procedures of paragraph 6-3-2-2 a. through d. except in step b. obtain the equipment specified in paragraph 6-5-2-1.
- b. Install the new clock head in place of the head to be replaced as follows:
  - (1) Remove the connector of the clock head from the clock cable harness by performing the applicable procedure of paragraph 5-6-1-2 f. (1).
  - (2) Remove the head from the head bar and replace it with a new head as directed in paragraph 6-3-2-2 e. (2) and (3).

6-5-2-2 Procedure (Cont.)

- (3) Connect the connector of the replacement clock head to the clock cable harness by performing the applicable procedure of paragraph 5-6-1-2 i. (1) (c).

c. Reconnect the facility power cable to the drum motor, but do not turn on drum power until so directed. Adjust the replaced head for proper playback as directed in paragraph 6-5-3.

6-5-3 CLOCK HEAD ADJUSTMENT PROCEDURE — Head adjustment shall be performed only as directed in this procedure, and under no condition shall the head be arbitrarily adjusted beyond the limits specified.

6-5-3-1 Special Equipment Required — Obtain the following special equipment:

- a. A clock writer that can write all of the required drum clocks.
- b. Head adjustment tool and 3/16-inch wrench from the special tools and accessories supplied with the drum.
- c. An oscilloscope, Tektronix Type 555 — or equivalent, with preamplifier to suit system frequency limits and write/read characteristics.

6-5-3-2 Procedure — Adjust the clock head as follows:

- a. Perform a preliminary clock head adjustment as described for the data heads in paragraph 6-3-3-2 except that in steps b. and h. a connector rather than taper pins are used.

**NOTE**

The writing of a tachometer clock will necessitate the rewriting of all clocks. The rewriting of the sector clock will necessitate the rewriting of the data clock. Other optional clocks will be rewritten as required.

b. The writing of clocks is peculiar to the customer's equipment and will involve either the customer's clock writer or Bryant's clock writer. In the case where the customer's clock writer is used, the customer can write the clocks in accordance with his own established procedures; wherein Bryant's clock writer is used, Bryant personnel will visit the drum installation site to rewrite the clocks for the customer therefore resulting in the absence of such procedures herein.

c. In the case where a replacement clock head was installed in the head position where the original clock head was found defective, the inability to re-record a good clock will indicate that the drum surface at that track position is defective. In such an event, remove the replacement head and reinstall it in one of the other available spare clock head

### 6-5-3-2 Procedure (Cont.)

positions provided on the drum and then repeat the clock writing procedures; before using the spare position, however, check the QC 23-75 form furnished with the drum to be sure the selected head position is suitable for use. At the same time, note on the form that the former clock head position is defective and identify the reason for which it is considered defective; also identify in the QC 23-75 form the number of the head used as a replacement for the defective head position.

d. With the completion of clock writing, inspect gasketing and immediately reinstall the panels removed from the drum by performing the applicable procedures of paragraph 5-6-1-2 k. and l. Rewrite data previously transferred, as applicable.

## 6-6 **CABINET AIR FILTER REPLACEMENT**

Replace the cabinet air filter element as directed in the subsequent paragraphs.

6-6-1 SPECIAL EQUIPMENT REQUIRED — Obtain one section of filter material, Bryant Part No. 90415-1 (85% Conosac Filter Medium, pink color, Continental Air Filters, or equivalent).

6-6-2 REPLACEMENT PROCEDURE — Replace the filter medium as follows:

a. Shut down the drum, clean the area surrounding the drum, and remove the drum's access panels as directed in paragraph 5-6-1-2 a., c., and d.; panel removal is necessary in order to access the inside of the connector panel to which the filter is secured.

b. Remove the filter assembly (1, Figure 6-4) and gasket (2) from the inside of the connector panel.

c. Disassemble the filter assembly (items 3 through 10) and discard the filter material (9).

d. In an area remote to the drum, clean all traces of dirt or dust build up from surfaces of the elements making up the filter assembly.

e. Using the clean section of filter material, reassemble the filter assembly reversing the disassembly procedure; trim the gasket (8) to size after assembly is completed.

f. Reinstall the filter on the connector panel.

g. Vacuum all visible traces of dust from the interior drum housing surfaces. Also, perform the drum surface and head pad cleanliness check of paragraph 5-4, as applicable, reinstalling all access panels on the drum as directed in paragraph 5-6-1-2 k. and l.

## 6-7 **TAPER AND SIGNAL CONNECTOR PIN REPLACEMENT**

The taper pin of data heads and signal connector pins of cable harnesses can be replaced as required.

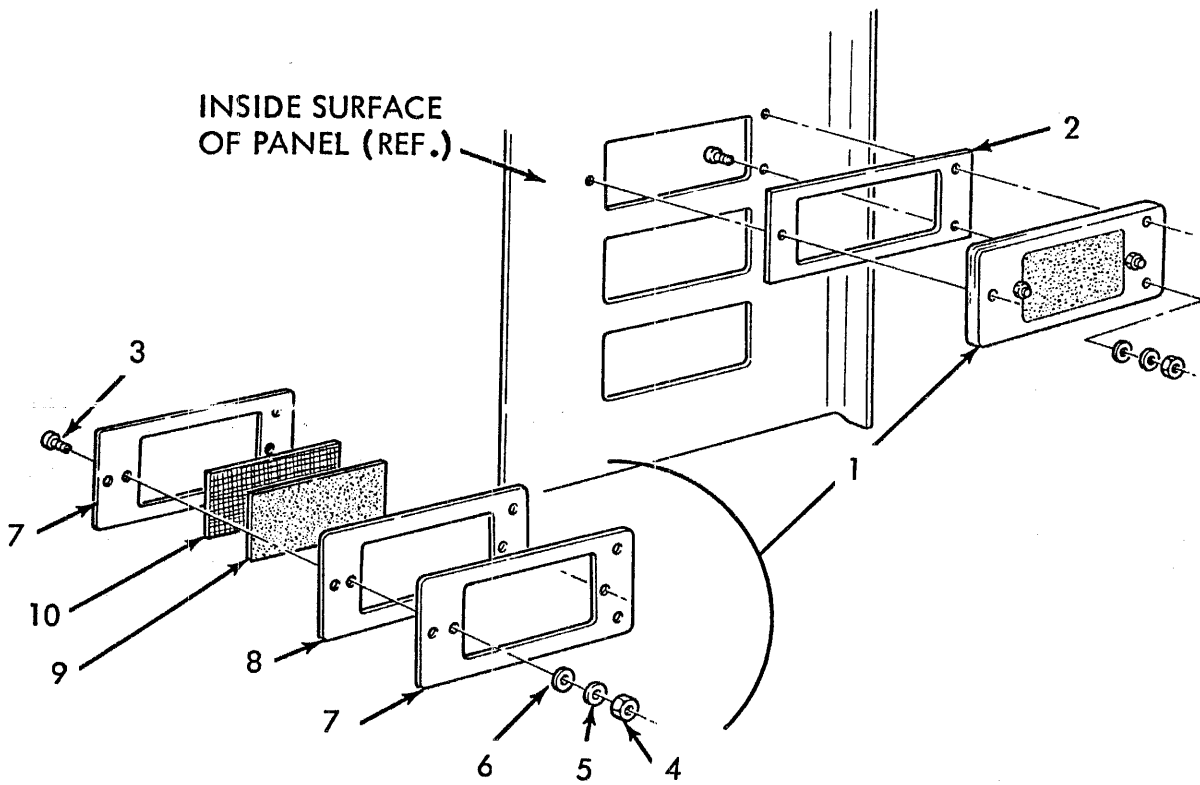


Figure 6-4 Installation Details of the Cabinet Air Filter Drum Panel



Legend for Figure 6-4

Index No.	Part Number	Description							Units Per Assembly	Usable On Code
		1	2	3	4	5	6	7		
		AUTO-LIFT DRUM, Series 10000, standard							(REF)	
1	90331	GASKET, connector cutout (75 pin)							1	
2	90417	FILTER ASSEMBLY  (ATTACHING PARTS)							1	
	02063205001	SCREW, cap, button socket head, 6-32 x 1/2 long							3	
	MS35649-64	NUT, hex, 6-32							3	
	MS35337-79	WASHER, lock, No. 6							3	
	MS15795-805	WASHER, flat, No. 6							3	
		-----*-----								
3		SCREW, cap, button head socket, No. 4-40 x 1/4 long							2	
4	MS35649-44	NUT, hex, No. 4-40							2	
5	MS35337-78	WASHER, lock, split, No. 4							2	
6	MS15795-803	WASHER, flat, No. 4							2	
7	90413	COVER, filter							2	
8	90331	GASKET, connector cutout							1	
9	90415-1	FILTER MATERIAL							1	
10	90416-1	SCREEN, filter							1	

6-7-1 TAPER PIN REPLACEMENT — If a data head wire breaks off at the taper pin, a new taper pin can be installed on the wire using the tools shown in Figure 6-5. These tools include the crimping tool — as called for in the equipment required but not supplied list of Table 2-2, a pair of wire cutters, and a wire stripper. Replace the taper pin of a head wire as follows:

a. Remove the head from the head bar as directed in paragraph 6-3-2-2 a. through c. and e. (1) and (2); also, remove the taper pin to which the head lead was connected from the terminal board lug.

**CAUTION**

In the next step, cut off as little wire as is absolutely necessary to accomplish pin replacement. If the lead is cut too short, the head will have to be replaced.

b. Use wire cutters and strippers, as required, to bare the end of the wire to which the taper pin is to be attached.

c. Insert the bared wire of step b. into the new taper pin and crimp the wire in position using the taper pin crimping tool.

d. Requalify the repaired head as directed in paragraph 6-3-2-2 d.

e. Reinstall the qualified head on the drum and perform all subsequent procedures called for in paragraph 6-3-2-2 e. (3) and (4) and f.

6-7-2 SIGNAL CONNECTOR PIN REPLACEMENT — If a wire of a cable connector breaks off at the signal connector pin, a new signal connector pin can be installed on the wire using a pair of wire cutters, a wire stripper, and the tools shown in Figure 6-6. The tools shown include the extraction tool, crimping tool, and insertion tool — as called for in the equipment required but not supplied list of Table 2-2. Replace the signal connector pin as follows:

a. Shut down the drum.

b. After thoroughly cleaning the area surrounding the drum, perform the panel removal procedures of paragraph 5-6-1-2 d. except remove only those panels that will enable access to the connector containing the defective lead. Correspondingly, remove any external connector that is connected to the panel connector.

c. Remove the signal connector pin that is to be replaced from the connector using the signal connector extraction tool.

**CAUTION**

In the next step, cut off as little wire as is absolutely necessary to accomplish pin replacement. If the wire is cut too short, the whole wire of the harness may have to be replaced.

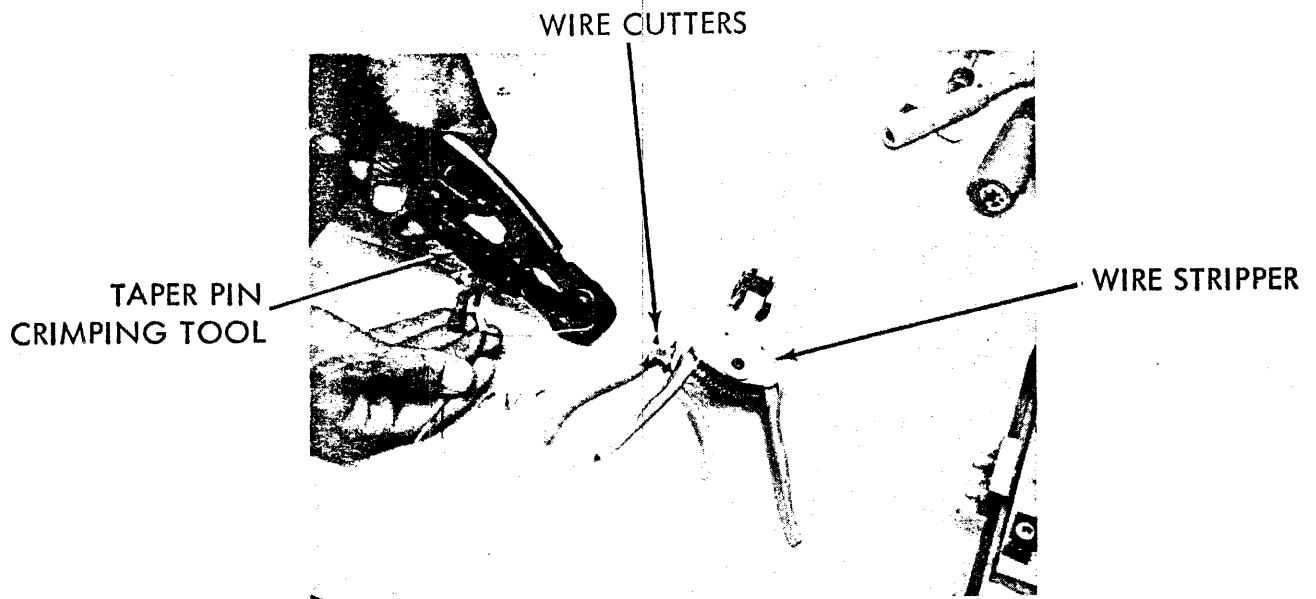


Figure 6-5 Tools Required for Replacing Head Taper Pins  
(Extraction and Insertion Tools Not Shown)

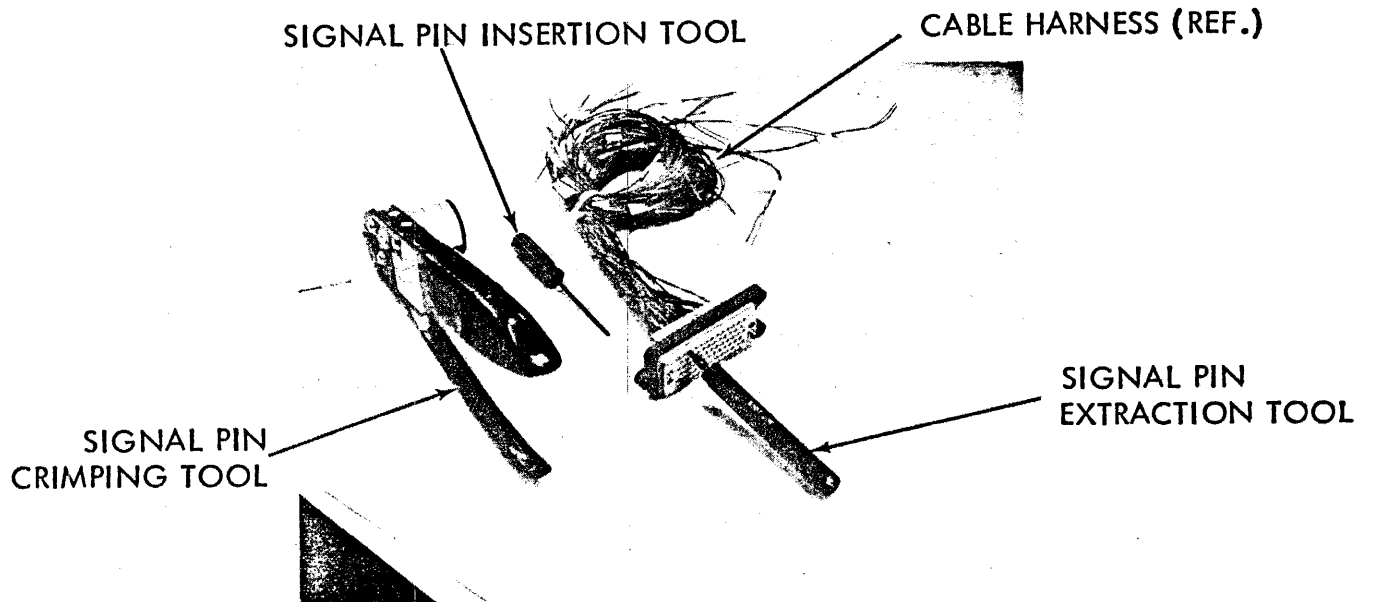


Figure 6-6 Tools Required for Replacing Signal Connector  
Pins (Wire Cutters and Stripper Not Shown)

## 6-7-2 SIGNAL CONNECTOR PIN REPLACEMENT (Cont.)

- d. Use wire cutters and strippers, as required, to bare the end of the wire to which the signal connector pin is to be attached.
- e. Insert the bared wire of step d. into the new signal connector pin and crimp the wire in position using the signal connector pin crimping tool.
- f. Reinstall the signal connector pin of step e. in the appropriate hole of the cable harness connector using the signal connector pin insertion tool.
- g. Check that the wiring installation is satisfactory.
- h. Reinstall the drum access panels as directed in paragraph 5-6-2-1. Correspondingly, reconnect any external connector that is to be connected to the panel connector.

## 6-8 DIODE REPLACEMENT

When replacing a diode that is mounted on a terminal board, place a sheet of paper between the terminal board and drum surface. This action will ensure that the drum surface is protected from splashing flux and solder when using the soldering iron to remove and install a new diode. When installing the new diode, be sure that its polarity is as specified for the system (negative or positive, as applicable).

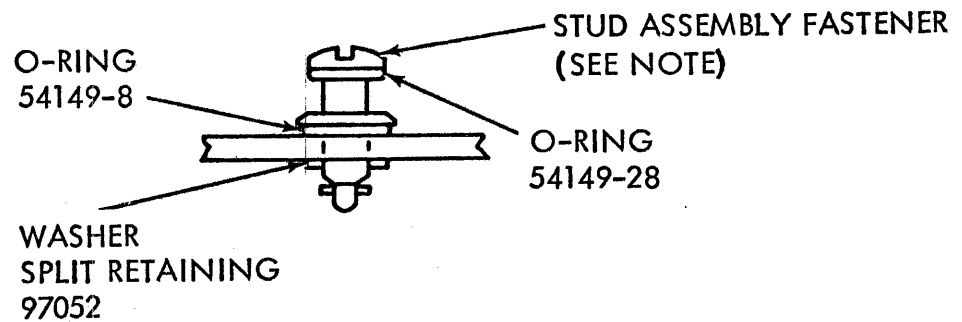
## 6-9 GASKET REPLACEMENT

Gasketing is secured by adhesive to the access panels, drum housing cap, and drum base (as shown in Figure 2-3). If the gasketing has merely loosened, attempt to re-affix it to the surface through the adhesive. If it has become torn or shredded, replace it with the applicable gasketing (see Figure 2-3).

## 6-10 ACCESS PANEL FASTENER REPLACEMENT

A limited quantity of each of the Camloc stud fasteners, O-rings and split retaining washers as listed in Figure 6-7 should be maintained on hand. Replace defective stud fasteners as follows:

- a. Shut down the drum, clean the area surrounding the drum, and remove the drum's access panels as directed in paragraph 5-6-1-2 a., c., and d.; panel removal is necessary only to the point at which the panel with the defective fastener is removed.
- b. Remove the split retaining washer and remove the fastener from the panel.
- c. Install a new fastener with O-rings as indicated in Figure 6-7 and secure the assembly in place using a split retaining washer.
- d. Reinstall the access panels on the drum by performing the applicable procedures of paragraph 5-6-1-2 k. and l.



**NOTE:**

THREE TYPES OF STUD ASSEMBLY FASTENERS ARE USED ON THE ACCESS PANELS. THE SIZE DEPENDS ON LOCATION AND, CORRESPONDINGLY, GASKET THICKNESS. GRIP THICKNESSES GIVEN CONSIDERS USING A CAMLOC 212-12 TYPE RECEPTACLE:

- 1 - CAMLOC 2600-7S, 0.210 TO 0.239 - INCH GRIP THICKNESS
- 2 - CAMLOC 2600-9S, 0.270 TO 0.289 - INCH GRIP THICKNESS
- 3 - CAMLOC 2600-11S, 0.330 TO 0.359 - INCH GRIP THICKNESS

Figure 6-7 Mounting of Access Panel Fasteners-

