

IDENTIFYING, HANDLING, PACKING AND SHIPPING  
MERCURY RELAYS, SWITCHES, AND TUBES

<u>CONTENTS</u>	<u>PAGE</u>
1. GENERAL . . . . .	2
2. INTRODUCTION . . . . .	2
3. MERCURY RELAYS AND SWITCHES . . . . .	3
4. MERCURY TUBES . . . . .	3
5. HANDLING AND PRECAUTIONS. . . . .	4
6. PACKAGING . . . . .	5
7. MARKS, LABELS, AND PLACARDS . . . . .	6
8. SHIPPING PAPERS . . . . .	6
9. CLEAN UP OF LEAKS AND SPILLS. . . . .	6
10. FIRST AID AND EMERGENCY CARE. . . . .	8

<u>EXHIBITS</u>	
1. MERCURY RELAY CODE DRAWINGS . . . . .	9
2. MERCURY SWITCH DRAWING. . . . .	13
3. MERCURY VAPOR TUBE DRAWINGS . . . . .	14
4. STRAIGHT BILL OF LADING . . . . .	15

<u>TABLES</u>	
1. MERCURY RELAY CODES AND CONTENT TABLE . . . . .	16
2. MERCURY SWITCH CODES AND CONTENT TABLE. . . . .	19
3. MERCURY TUBE CODES AND CONTENT. . . . .	20

PROPRIETARY

Not for use or disclosure outside Southwestern Bell  
Telephone Company except under written agreement.

1.0 GENERAL

- 1.01 This section details procedures to be followed by Southwestern Bell Telephone Company employees for the safe handling of mercury relays, switches and tubes.
- 1.02 This section is reissued for the following reason:
- To provide users with specific procedures for handling and segregating equipment containing mercury moving from a central office to a MARC Center.
- 1.03 Questions or clarification concerning this section should be directed to the Environmental Regulations staff, within the Real Estate Management and Training Section, as this organization has responsibility for maintenance of these procedures.

2.0 INTRODUCTION

- 2.01 Mercury relays, switches, and tubes are found in various units of telecommunications equipment. This section provides detailed procedures for identification, removal, packaging, and shipment.
- 2.02 Shipments of mercury relays, switches and tubes, both new and used, when transported by motor vehicle are not regulated as a hazardous material by the Department of Transportation. These procedures cover only shipment made by this mode of transportation.
- 2.03 Liquid mercury is classified as a hazardous material due to its poisonous nature and must not come into contact with the skin, eyes or internal parts of the body under any circumstances.
- 2.04 Mercury can be found in small amounts encapsulated in telephone equipment. For economic reasons and better administrative control, mercury relays, switches and tubes will be sent from the work site (e.g., central office) to the designated MARC Center for that location. Appendix 1 provides a complete list of MARC Center locations.

PROPRIETARY

Not for use or disclosure outside Southwestern Bell Telephone Company except under written agreement.

2.05 Under present scrap management practices, mercury relays and switches are sold for mercury reclamation. Subsequent disposition of units containing mercury must be handled in an environmentally sound manner and is the responsibility of the Logistics Services District. Refer to SW 745-010-902, Hazardous Material/Waste Material Reprocessing and Consolidation Centers, for guidelines to be followed when the above items are received at a MARC Center.

### 3.0 MERCURY RELAYS AND SWITCHES

3.01 Mercury relays, primarily used in ESS and Crossbar switching equipment, are relays with a mercury wetted contact type switch, hermetically sealed under pressure in a gas filled glass envelope. The entire assembly is sealed with a smooth metal casing. Some mercury relays are plug-in type relays and can be removed by pulling the relay from its socket. Other mercury relays have a soldered connection, such as those connected to circuit boards or packs, and should only be removed from the circuit boards by the use of desoldering equipment or by a method which does not damage the relay housing.

3.02 Mercury relays vary in size and shape and are classified according to relay code. The relay code identification will be printed on the metal casing of the relay. Table 1 lists the various relay codes, and amount of mercury contained in each type. There are three basic configurations of mercury relays:

- circular base
- rectangular base with prongs on the bottom
- rectangular base with prongs on the side

Exhibit 1 provides drawings and dimensions of mercury relays.

Exhibit 2 provides a mercury switch drawing. A list of mercury switch codes, and amount of mercury contained in each type is included as Table 2.

### 4.0 MERCURY TUBES

4.01 Mercury tubes currently used by Southwestern Bell are depressurized electron tubes containing specific amounts of mercury vapor. Mercury tubes are used in central office equipment, the power room and in various other telecommunication equipment.

PROPRIETARY

Not for use or disclosure outside Southwestern Bell Telephone Company except under written agreement.

4.02 Most of the mercury type tubes used are long and narrow, e.g., some 6" to 9.5" in length and all are very fragile. The mercury vapor tubes covered in this section are of the plug-in type. The tube codes and the amount of mercury vapor contained in each type are listed in Table 3. Drawings of mercury tubes are provided in Exhibit 3.

Note: Mercury vapor tubes that have been discontinued by the manufacturer are not illustrated. However, they will be very similar in physical appearance.

5.0 HANDLING AND PRECAUTIONS

5.01 When working with mercury relays, switches and tubes, safety eyeglasses or chemical safety goggles should be worn for protection against possible contact with the mercury. Contact lenses should not be worn when working with this material. (Refer to Section 10, First Aid and Emergency Care; Joint Practice 28, Review Packages No. 12 and 20; and related Personal Protective Clothing and Equipment Job Aids.)

5.02 Employees who have cuts, open sores, or abrasions, particularly on the hands, must not handle mercury relays, switches or tubes.

5.03 Mercury relays are airtight and although they are highly resistant to damage, care should be exercised to prevent physical damage. Large quantities of securely packaged mercury relays present no danger to personnel. The liquid mercury in the relay becomes a safety handling problem should the casing break and leak.

5.04 No food, drinking, or smoking shall be permitted in areas where mercury relays, switches or tubes are being handled.

5.05 Many, but not all of the mercury relays will have the following warning printed on the casing:

"THIS SIDE UP"      "DANGER"      "HIGH PRESSURE"      "DO NOT OPEN"

Other relays will have arrows on the casing indicating the direction for installation.

5.06 Installers must wear safety glasses for minimum eye protection when handling, or removing mercury relays, switches or tubes.

PROPRIETARY

Not for use or disclosure outside Southwestern Bell Telephone Company except under written agreement.

- 5.07 Chemical safety goggles must be worn when working with mercury vapor tubes at or above eye level or whenever working with mercury relays that are leaking from above eye level. Employees must wear acid resistant gloves to prevent mercury contact with the hands when working with leaking relays or switches.

## 6.0 PACKAGING

- 6.01 The packaging of relays, switches and tubes must be done in a manner that will prevent potential mercury leakage during shipment. Although mercury relays are not fragile, they must not be treated in a rough manner. Packaging procedures are as follows:

### RELAYS AND SWITCHES

- Obtain a fiber drum with a capacity of fifteen (15) to twenty (20) gallons.
- Line the drum with a 4 mil plastic bag.
- Pack the relays loosely in the plastic bag and seal with tape.
- All cartons must be sealed with 3" pressure sensitive tape.
- For equipment that is to be moved for reuse, the mercury relays must not be removed.
- When equipped frames are to be scrapped, all mercury relays must be located and removed from their respective equipment prior to the removal of equipment from a central office unless other arrangements are made with the Manager-Removal Operations. Appendix 2 provides a list of Managers in charge of Removal Operations.

### TUBES

- All mercury vapor tubes must be located and removed before any other apparatus is removed or dismantled when equipment is to be reused or junked.
- Defective and fully operative tubes must always be handled in a manner that will prevent breakage. Under no circumstances should any mercury vapor tube be deliberately broken.
- Contained and broken tubes with their bases still engaged in sockets must be removed by using a KS-5637 L-1 or KS-14428 Electron Tube Extractor. After use, the extractor must be washed thoroughly with soap and water.

### PROPRIETARY

Not for use or disclosure outside Southwestern Bell Telephone Company except under written agreement.

- Mercury vapor tubes should be individually wrapped with adequate cushioning material to prevent breakage. Whenever possible, the original packaging materials should be used to repackage mercury vapor tubes.
- All cartons must be sealed with 3" pressure sensitive tape.

6.02 Mercury vapor tubes, even when packaged, must not be located or stored in an unprotected area where damage could occur.

6.03 Questions concerning packaging should be referred to the Manager-Removal Operations.

#### 7.0 MARKS, LABELS, AND PLACARDS

7.01 Mercury relays, switches and tubes used in telecommunications equipment do not require DOT specification markings, packaging, warning labels, or placarding.

7.02 Shipping containers, however, should be marked as follows so that the contents can be easily identified by the recipient; for example:

"Mercury Relays, N.O.I." or "Mercury Tubes, N.O.I."

#### 8.0 SHIPPING PAPERS

8.01 Shipments of mercury must be accompanied by a properly filled out shipping document (i.e., bill of lading). Joint Practice 122, Transportation Policies and Procedures, provides detailed instructions for preparation of the bill of lading. A sample bill of lading is attached as Exhibit 4.

8.02 For mercury relays, switches, and tubes used by the Company, bills of lading should include an appropriate description of the material being shipped as outlined in 7.02 above.

#### 9.0 CLEAN UP OF LEAKS AND SPILLS

9.01 If mercury vapor tubes break, walk away from the immediate area for a few minutes to reduce the possibility of inhaling any concentrated mercury vapor before attempting to re-enter the area to pick up broken pieces.

PROPRIETARY

Not for use or disclosure outside Southwestern Bell Telephone Company except under written agreement.

- 9.02 Should a leak occur, the following procedures should be taken immediately:
- Acid resistant gloves must be worn to prevent mercury contact with the hands. Under no circumstances should loose mercury be touched with the bare hands.
  - Stop the flow of material.
  - Loose liquid mercury should only be picked up by scooping with rigid pieces of plastic or paper and then placed in a widemouth sealable plastic container. Such containers must be sealed tightly and resist damage causing leakage. These containers may be packed and shipped with the mercury relays and switches.
  - Should a mercury tube break, using a rigid piece of plastic or paper, place the broken pieces on a suitably sized rag. Hold and place the piece of rigid paper on the rag, wrap and tie the rag's diagonal ends securely.
  - Clean the affected floor area with another large damp cloth. When finished, spread it out so that the contaminated side is facing upward. Place the bundle of broken pieces in the center and tie each pair of the diagonal ends of the cloth securely.
  - Place this large bundle in an adequately large plastic bag, seal with tape, and mark the bag, "Broken Mercury Tubes." This bag will then be packed and shipped with the mercury vapor tubes.
- 9.03 Mercury is highly corrosive with respect to aluminum. Do NOT put tubes or broken pieces in aluminum containers.
- 9.04 Do NOT attempt to use vacuum cleaners, brooms, or rags to pick up spilled mercury.
- 9.05 When finished with cleaning up broken tubes, wash hands thoroughly with soap and water.
- 9.06 Clothing contaminated with mercury must be packaged in sufficiently sized double plastic bags marked "Mercury Contamination" and shipped with the mercury relays, switches and tubes. Containers of mercury items must NOT be disposed of through common rubbish removal service.

## PROPRIETARY

Not for use or disclosure outside Southwestern Bell  
Telephone Company except under written agreement.

10.0 FIRST AID AND EMERGENCY CARE

10.01 In the event of an accident, follow normal first aid and emergency procedures including but not limited to the following precautions and notify the employee's supervisor as soon as possible:

EYES - Should mercury get into the eyes, flush the victim's eyes immediately with large amounts of cool water. Hold upper and lower eyelids open while flushing. Continue this process for at least 15 minutes until all traces of mercury are removed. As stated previously, contact lens should not be worn when working with mercury relays, switches and tubes. If a victim is wearing contact lenses, have the victim remove them before flushing the eyes. Transport the victim to the appropriate emergency facility for additional treatment.

SKIN - Should liquid mercury be exposed to the skin (particularly open cuts, sores, or abrasions), flush with large amounts of cold water for a minimum of 5 minutes. Wash the wound thoroughly with warm water and a mild soap. Transport the victim to the appropriate emergency facility for additional evaluation.

INHALATION - Move the victim from the hazardous exposure to fresh air immediately. If breathing has stopped, begin artificial respiration. Keep the victim warm and at rest. Seek additional medical attention.

INGESTION - Have the victim rinse mouth with water, then drink large quantities of water or milk, if available. Follow up by contacting the local poison control center immediately for additional instructions and transport the victim to the appropriate emergency facility for additional treatment.

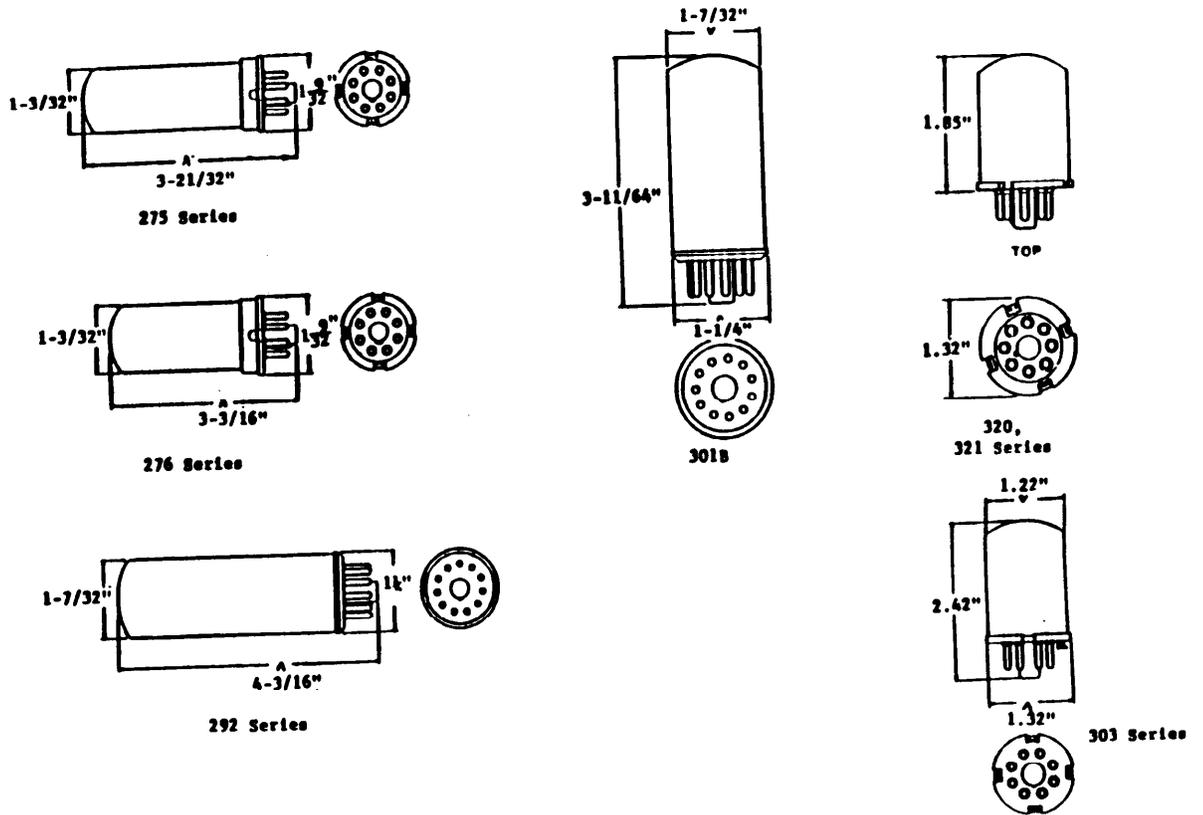
PROPRIETARY

Not for use or disclosure outside Southwestern Bell  
Telephone Company except under written agreement.

Exhibit 1

MERCURY RELAY DRAWINGS

CIRCULAR BASE

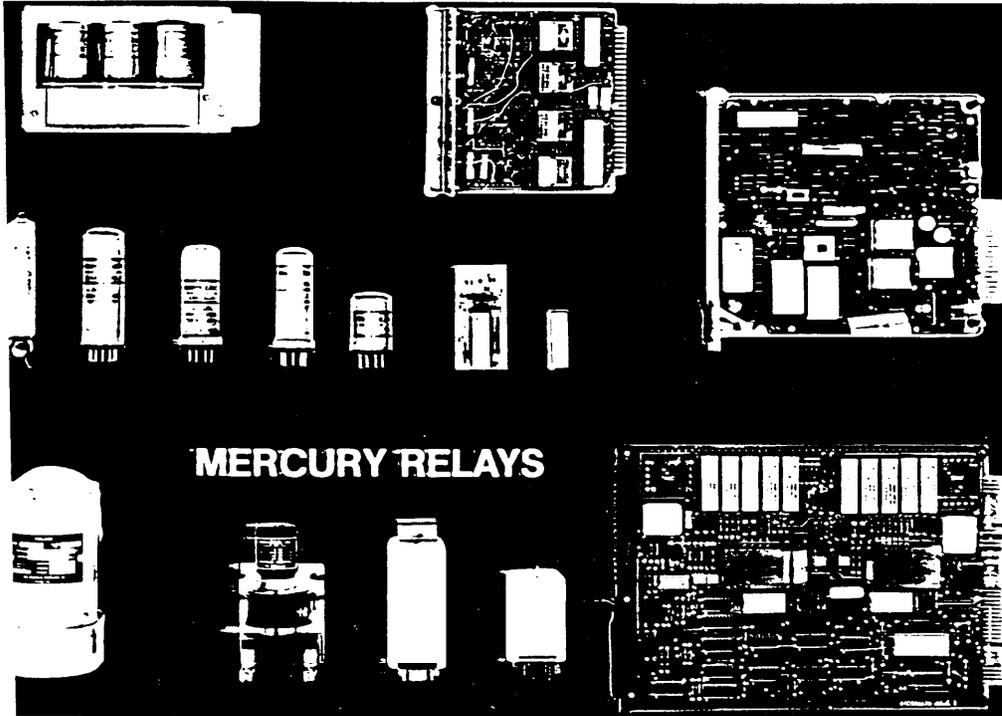


PROPRIETARY

Not for use or disclosure outside Southwestern Bell Telephone Company except under written agreement.

EXHIBIT 1

MERCURY RELAY DRAWINGS



1) MERCURY devices are identified by the signs:

- "THIS SIDE UP"
- "DANGER"
- "DO NOT OPEN"
- "HIGH PRESSURE"

2) Some devices also contain arrows indicating how they should be oriented for proper operation.

3) MERCURY devices are under high pressure and should be treated carefully to prevent puncture of the pressure vessel.

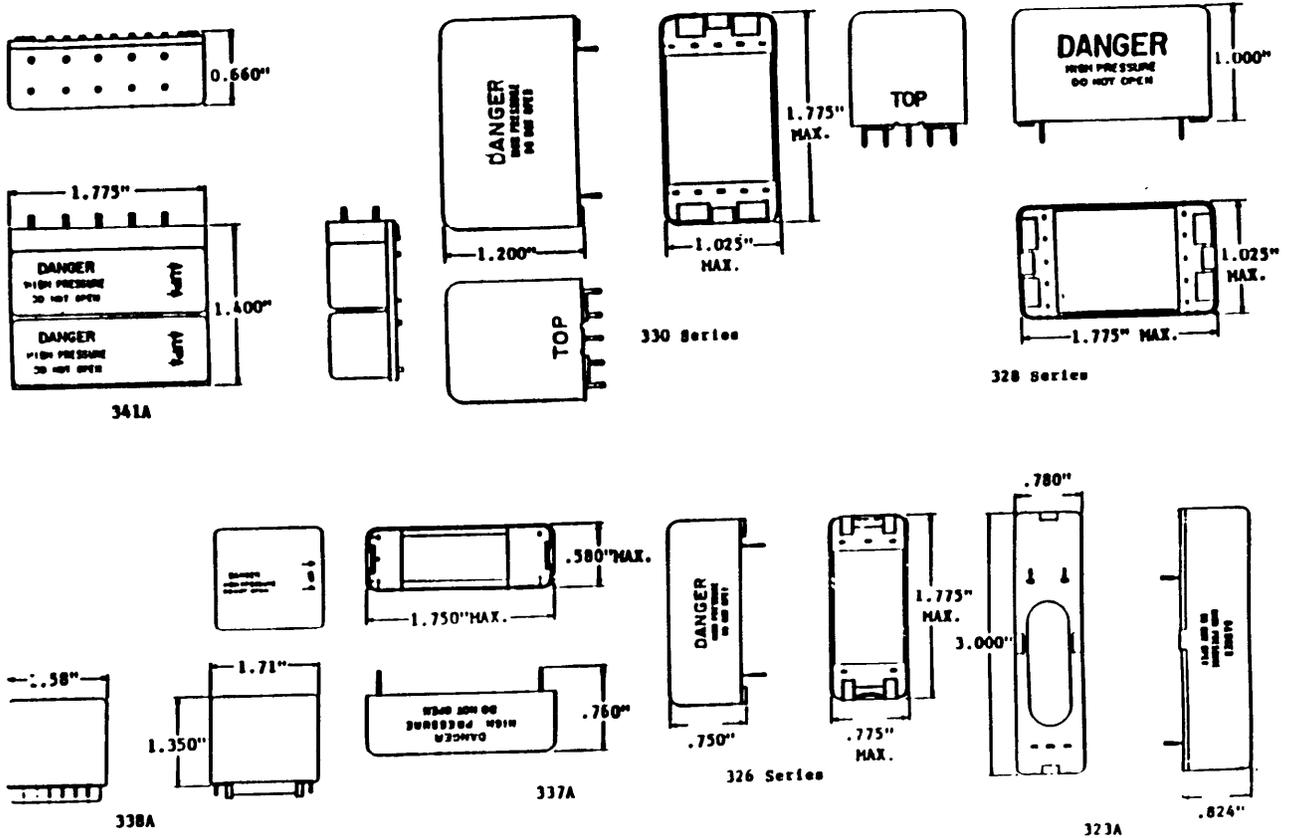
PROPRIETARY

Not for use or disclosure outside Southwestern Bell Telephone Company except under written agreement.

EXHIBIT 1

MERCURY RELAY DRAWINGS

RECTANGULAR BASE-BOTTOM AND SIDE PRONGS



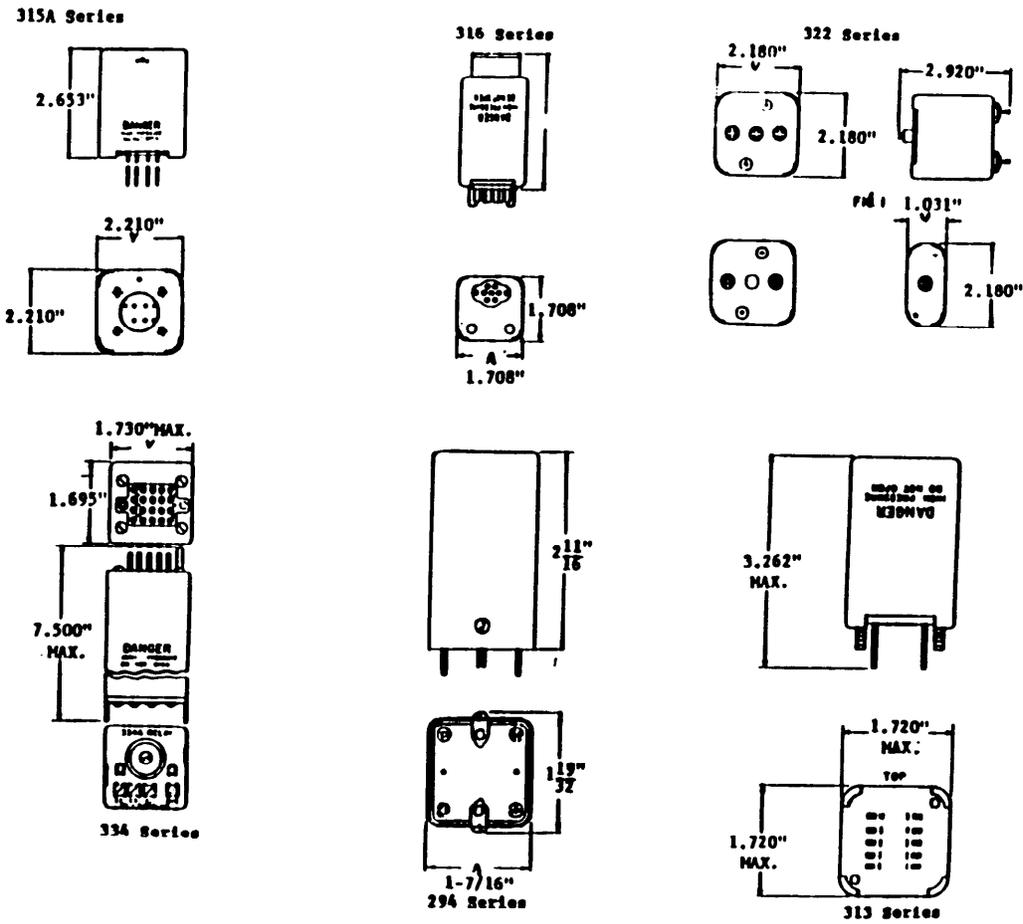
PROPRIETARY

Not for use or disclosure outside Southwestern Bell Telephone Company except under written agreement.

EXHIBIT 1

MERCURY RELAY DRAWINGS

RECTANGULAR BASE-BOTTOM AND SIDE PRONGS



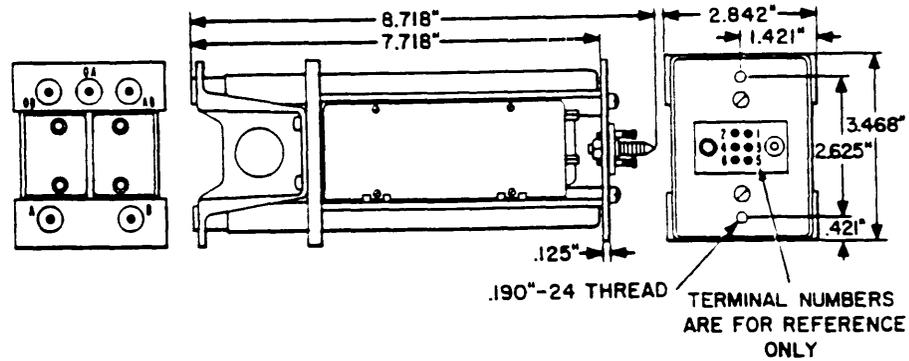
PROPRIETARY

Not for use or disclosure outside Southwestern Bell Telephone Company except under written agreement.

EXHIBIT 2

MERCURY SWITCH DRAWING

NO. 223 TYPE SWITCH  
(Card No. 1)



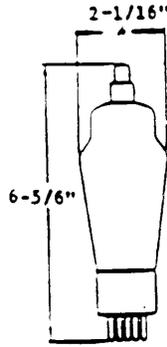
NO. 223A. ALSO GENERAL DESIGN  
AND DIMENSIONS OF NO. 223 TYPE

PROPRIETARY

Not for use or disclosure outside Southwestern Bell  
Telephone Company except under written agreement

EXHIBIT 3

MERCURY VAPOR TUBE DRAWINGS



287, 393, 323



354, 355

PROPRIETARY

Not for use or disclosure outside Southwestern Bell  
Telephone Company except under written agreement.



TABLE 1

MERCURY RELAY CODES AND CONTENT TABLE

RELAY CODE	DESIGN PLUG IN	DESIGN WIRE IN	GRAMS OF MERCURY/ UNIT
275A	X		2.98
B	X		2.98
C	X		2.98
D	X		2.98
E	X		2.98
F	X		2.98
276A	X		2.96
AA	X		2.96
AC	X		2.96
B	X		2.96
C	X		2.96
D	X		2.96
E	X		2.96
F	X		2.96
G	X		2.96
H	X		2.96
J	X		2.96
K	X		2.96
L	X		2.96
M	X		2.96
N	X		2.96
R	X		2.96
S	X		2.96
T	X		2.96
U	X		2.96
W	X		2.96
Y	X		2.96
292A	X		2.98
B	X		2.98
C	X		2.98
294A		X	1.15
B		X	1.15
C	X		1.15
301B	X		1.15
303A	X		1.15
B	X		1.15
C	X		1.15
D	X		1.15
E	X		1.15
F	X		1.15
G	X		1.15
H	X		1.15
J	X		1.15
K	X		1.15
L	X		1.15

RELAY CODE	DESIGN PLUG IN	DESIGN WIRE IN	GRAMS OF MERCURY/ UNIT
313A		X	2.30
B		X	1.15
C		X	1.15
314A	X		1.15
B	X		2.30
315A		X	1.15
316A	X		2.30
AA	X		2.30
AB	X		2.30
AC	X		2.30
AD	X		2.30
AE	X		2.30
AF	X		2.30
AG	X		2.30
AH	X		2.30
B	X		2.30
C	X		2.30
D	X		2.30
E	X		2.30
F	X		2.30
G	X		2.30
H	X		2.30
J	X		2.30
K	X		2.30
L	X		2.30
M	X		2.30
N	X		2.30
P	X		2.30
R	X		2.30
S	X		2.30
T	X		2.30
U	X		2.30
W	X		2.30
Y	X		2.30
320A	X		2.30
B	X		2.30
321A	X		2.30
B	X		2.30
322A		X	2.98
B		X	5.96
C		X	8.94
323A		X	2.98
326A		X	1.15
B		X	1.15
C		X	1.15
D		X	1.15
E		X	1.15

PROPRIETARY

Not for use or disclosure outside Southwestern Bell Telephone Company except under written agreement.

TABLE 1

MERCURY RELAY CODES AND CONTENT TABLE

RELAY CODE	DESIGN PLUG IN	DESIGN WIRE IN	GRAMS OF MERCURY/UNIT	RELAY CODE	DESIGN MOUNT	GRAMS OF MERCURY UNIT
328A		X	1.15	KS-2145PWB	X	5.80
B		X	1.15	KS-5721		
C		X	1.15	997275375	X	178.0
D		X	1.15	KS-5721L-1		
E		X	1.15	997485040	X	178.0
F		X	1.15	KS5721L2		
G		X	1.15	997731237	X	178.0
H		X	1.15	KS5721L3		
J		X	1.15	997485768	X	178.0
330A		X	2.30	KS5721L4	X	178.0
B		X	2.30	KS5721L21		
C		X	2.30	997485990	X	178.0
D		X	2.30	KS5721L22		
E		X	2.30	997245360	X	178.0
334A	X		1.15	KS5721L54		
B	X		1.15	997466875	X	178.0
C	X		2.30	KS5721L55		
D	X		2.30	997466883	X	178.0
337A		Y	0.90	KS7800		
338A		X	1.15	99731997	X	370.0
341A		X	1.80	KS7800		
334A		X	1.80	997320106	X	370.0
B		X	1.80	KS7801		
345A		X	0.05	997876420	X	370.0
B		X	0.05	KS7801		
346A		X	0.90	997732011	X	370.0
352A		X	0.05	KS7801		
353A		X	0.10	997732003	Y	370.0
354A		Y	0.02	KS7802		
D-171584	X		2.98	997876438	X	370.0
D-177431	X		5.80	KS7802		
GA-50143	X		2.98	997833702	X	370.0
GA-50879	X		2.98	KS7803		
GA-51221	Y		2.98	997876487	X	370.0
GA-52689	X		2.98	KS7804		
GA-52909	X		2.98	997876495	X	370.0
GA-53496	X		2.98	KS7805		
GA-53591	X		1.15	997876636	X	370.0
GA-53604	X		2.98	KS7808		
GA-53642	X		1.15	997731989	X	370.0
GA-53646	X		1.15	KS7809		
GA-53871	Y		2.98	997868146	X	370.0
GA-53998	Y		1.15	KS7811		
				997868112	X	370.0
				KS7812		
				997868120	X	370.0
				KS7813		
				997868138	X	370.0

PROPRIETARY

Not for use or disclosure outside Southwestern Bell Telephone Company except under written agreement.

TABLE 1

MERCURY RELAY CODES AND CONTENT TABLE

RELAY CODE	DESIGN MOUNT	GRAMS OF MERCURY/ UNIT
KS7816		
997862446	X	370.0
KS7817		
997320338	X	370.0
KS7818		
997862404	X	370.0
KS7819		
997861224	X	370.0
KS7821		
997861265	X	370.0
KS7822		
997833777	X	370.0
KS7823		
997861455	X	370.0
KS7824		
997861331	X	370.0
KS7826		
997861273	X	370.0
KS7827		
997861281	X	370.0
KS7827		
997731963	X	370.0
KS7828		
997861349	X	370.0
KS7829		
997861356	X	370.0
KS7830		
997833710	X	370.0
KS7831		
997833579	X	370.0
KS7832		
997833603	X	370.0
KS7833		
997833785	X	370.0
KS7834		
997804562	X	370.0
KS7835		
997731971	X	370.0

PROPRIETARY

Not for use or disclosure outside Southwestern Bell  
Telephone Company except under written agreement.

TABLE 2

MERCURY SWITCH CODES AND CONTENT TABLE

SWITCH CODE	DESIGN PLUG IN	WIRE IN	MOUNTED	GRAMS OF MERCURY/ UNIT
218A		X		2.98
218D		X		2.98
222B		X		2.98
223A			X	10.84
223B			X	10.84
223C			X	10.84
226B		X		1.15
226C		X		1.15
226D		X		1.15
GA52688		X		2.98
GA53645		X		1.15

PROPRIETARY

Not for use or disclosure outside Southwestern Bell  
Telephone Company except under written agreement.

TABLE 3MERCURY VAPOR TUBE CONDES AND CONTENT TABLE

<u>Product/Type</u>	<u>Grams of Mercury/Product</u>
TUBES - 249A	0.7
249B	0.7
249C	0.7
253A	0.7
255A	2.8
255B	2.8
258A	0.7
258B	0.7
266A	2.8
266B	2.8
266C	2.8
267A	0.7
267B	0.7
287A	0.7
301A	0.7
314A	0.7
315A	0.7
319A	0.7
321A	0.7
323A	0.7
323B	0.7
354A	0.7
355A	0.7
393A	0.7
394A	0.7
410A	1.4

PROPRIETARY

Not for use or disclosure outside Southwestern Bell  
Telephone Company except under written agreement.