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General Information for Surface Vessel Torpedo Tubes, Loading Trays, and Associated Equipment

Missile and Platform Systems Department



**Naval Undersea Warfare Center Division
Newport, Rhode Island**

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PREFACE

This document was prepared under NUWC Project No. AL0136, "Surface Ship Torpedo Tube Mk 32 Launcher Design, In-Service Engineering," principal investigator Daniel M. Godfrey (Code 8323). The sponsoring activity is the Program Executive Office for Mine and Undersea Warfare (PMS 411).

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13. ABSTRACT (Maximum 200 words) This document provides information on Surface Vessel Torpedo Tubes Mk 32 Mods 5, 7, 9, 11, 14, 15, 17, and 19 and the Hybrid Training Launcher. It also provides information on Torpedo Loading Trays Mk 2, 3, 7, 8, and 9, as well as on associated equipment consisting of the pressure gauge and pressure switch calibration tool, hydrostatic test set, the bore gauge, the breech mechanism stowage rack, Torpedo Test Shape Mk 2 Mod 0, and Shipping and Stowage Container Mk 778 Mod 0. The document further includes lists of applicable ORDALTs, block diagrams for ASW equipment configurations, and points of contact.				
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LIST OF ABBREVIATIONS AND ACRONYMS

ACP	Air charging panel
BMCB	Bulkhead mounted control box
CG	Center of gravity
C _L	Centerline
DMS	Digital multiplexer system
DET	Detachment
FCS	Fire control system
FTSCLANT	Fleet Technical Support Center, Atlantic
FTSCPAC	Fleet Technical Support Center, Pacific
HTL	Hybrid training launcher
IFJB	Interface junction box
IMA	Intermediate maintenance activity
IPB	Illustrated parts breakdown
MRC	Maintenance requirement card
NAVICP	Naval Inventory Control Point
NAVSEA	Naval Sea Systems Command
NUWC	Naval Undersea Warfare Center
OCB	Operations/control box
ORDALT	Ordnance alteration
PMS	NAVSEA Program Management Office
R	Radius
SVTT	Surface vessel torpedo tubes
TD	Technical document
TSP	Torpedo setting panel
TTS	Torpedo test shape
UFCS	Underwater fire control system
WCP	Weapon control panel

GENERAL INFORMATION FOR SURFACE VESSEL TORPEDO TUBES, LOADING TRAYS, AND ASSOCIATED EQUIPMENT

INTRODUCTION

The purpose of this document is to provide general descriptive information on surface vessel torpedo tubes, torpedo loading trays, and associated equipment. Specifically, the document provides data on the following:

- Torpedo Tubes Mk 32 Mods 5, 7, 9, 11, 14, 15, 17, 19 and the Hybrid Training Launcher;
- Torpedo Loading Trays Mks 2, 3, 7, 8, and 9;
- Torpedo tube support equipment, comprising pressure gauge and pressure switch calibration tool, Air Charging Panel (ACP) Mk 429 Mod 1, hydrostatic test set, bore gauge, breech mechanism stowage rack, and Torpedo Test Shape Mk 2 Mod 0 with Shipping and Storage Container Mk 778 Mod 0.

This technical document (TD) also lists applicable support documentation (technical manuals, drawings, and ORDALTs) for all tubes, trays, and support equipment.

SURFACE VESSEL TORPEDO TUBE (SVTT) MK 32

SVTT Mk 32 features independently operated fiberglass barrels installed in three basic configurations: (1) a single-barrel mount; (2) a two-barrel mount, one barrel mounted above the other, and (3) a triple-barrel mount arranged in a pyramid form. Other design features common to all mods include: (1) a removable securing mechanism which secures the torpedo to the barrel; (2) a removable breech mechanism that houses the high-pressure impulse air flask; (3) a 10-foot long, high-pressure charging line that provides connection between the high-pressure air source and the breech mechanism; and (4) the ability to electrically preset and launch Torpedoes Mk 44 and Mk 46. The SVTT Mk 32 Mods 15, 17, and 19 are able to electrically preset and launch advanced lightweight torpedoes including the Torpedo Mk 54. The tubes can be fired remotely or locally (manually). The manual firing mode is used only as an emergency measure.

A safety interlock system is used to prevent premature remote firing. The interlocks include a pressure switch that closes when minimum firing pressure is available and a manual actuation switch that indicates to the remote firing center that the tube has been properly prepared for launch. An interlock switch is installed in the rotating hose on the Mods 5, 7, 14, 15, 17, and 19 to ensure that the mount is trained outboard before remote firing can be accomplished. Additionally, Mod 9 has an interlock that requires the muzzle door to be open before remote firing can be accomplished. Mods 14 and 19 cannot be trained out unless the ship's bulkhead door is open.

The tubes employ high-pressure air to launch torpedoes. The impulse air is retained in an air flask by a normally closed firing valve. The flask, contained in the removable breech mechanism, is charged through an air-charging panel or an air-charging station that regulates the high-pressure air and provides a controlled rate of charge. The breech mechanism may also be charged from other regulated high-pressure air sources while in place or taken elsewhere on the ship for charging. Once charged, the high-pressure air source is disconnected from the breech mechanism. Readyng the barrel is accomplished by porting high-pressure air from the air flask through the control valve to the control box. When the firing order is given, the firing solenoid valve opens to allow air to pass through the valve to the plug puller mechanism and to remove the torpedo mating plug from the torpedo. The air then travels to the securing mechanism to open the jaws of the mechanism and release the torpedo. At the same instant, the lever on the securing mechanism actuates the normally closed flask firing valve. This allows high-pressure air to expand through the firing valve into the barrel and eject the torpedo.

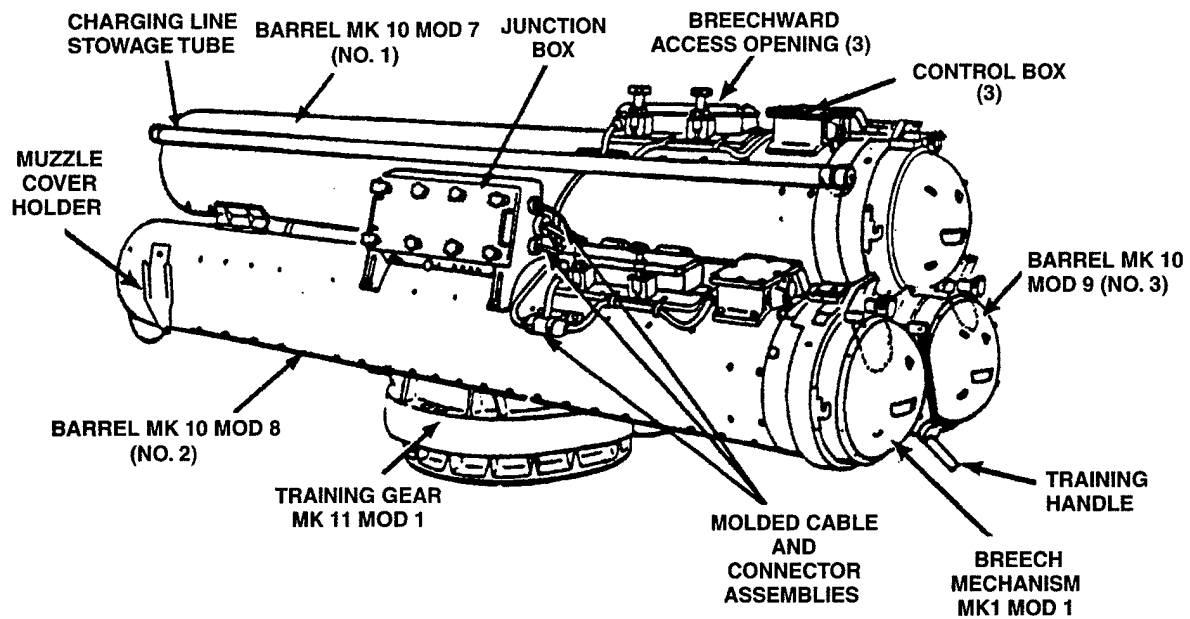
SVTT MK 32 MODS 5 AND 7

SVTT Mk 32 Mods 5 and 7 are designed to launch Torpedoes Mk 44 and Mk 46 from the weatherdecks of surface vessels. The torpedoes are pneumatically launched and may be fired locally (at the tube) or from a remote location. Physically, Mods 5 and 7 are identical except for electrical circuitry required to satisfy different fire control systems. Figure 1 illustrates both a port and a starboard tube configuration; figure 2 presents a dimensional view.

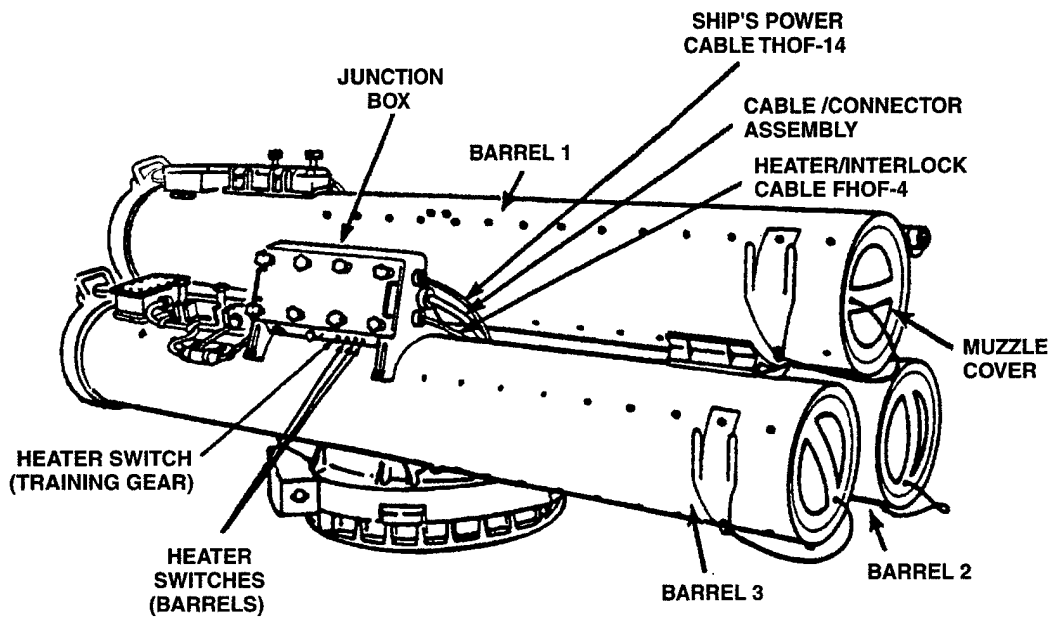
A normal shipboard installation consists of two tubes of the same mod, one port and one starboard. The main differences between the two are the locations of the junction box assembly, the training gear retractable stop, and the installed position of the index mark on the stationary base.

Major components of SVTT Mk 32 Mods 5 and 7 are three barrels, a training gear assembly, three interchangeable breech mechanisms, three interchangeable torpedo securing mechanisms, a junction box assembly, charging line, and charging line stowage tube.

Each tube consists of three fiberglass-reinforced polyester resin barrels mounted on a common training gear assembly. The primary differences among the barrels are those features required to mount them in different relative positions on the torpedo tube and minor variations in the breechward access openings. Each barrel uses identical breech mechanisms and torpedo securing mechanisms. The three barrels are mounted on a manually operated training gear assembly. A single charging line, with a stowage tube, is provided for charging breech mechanisms.



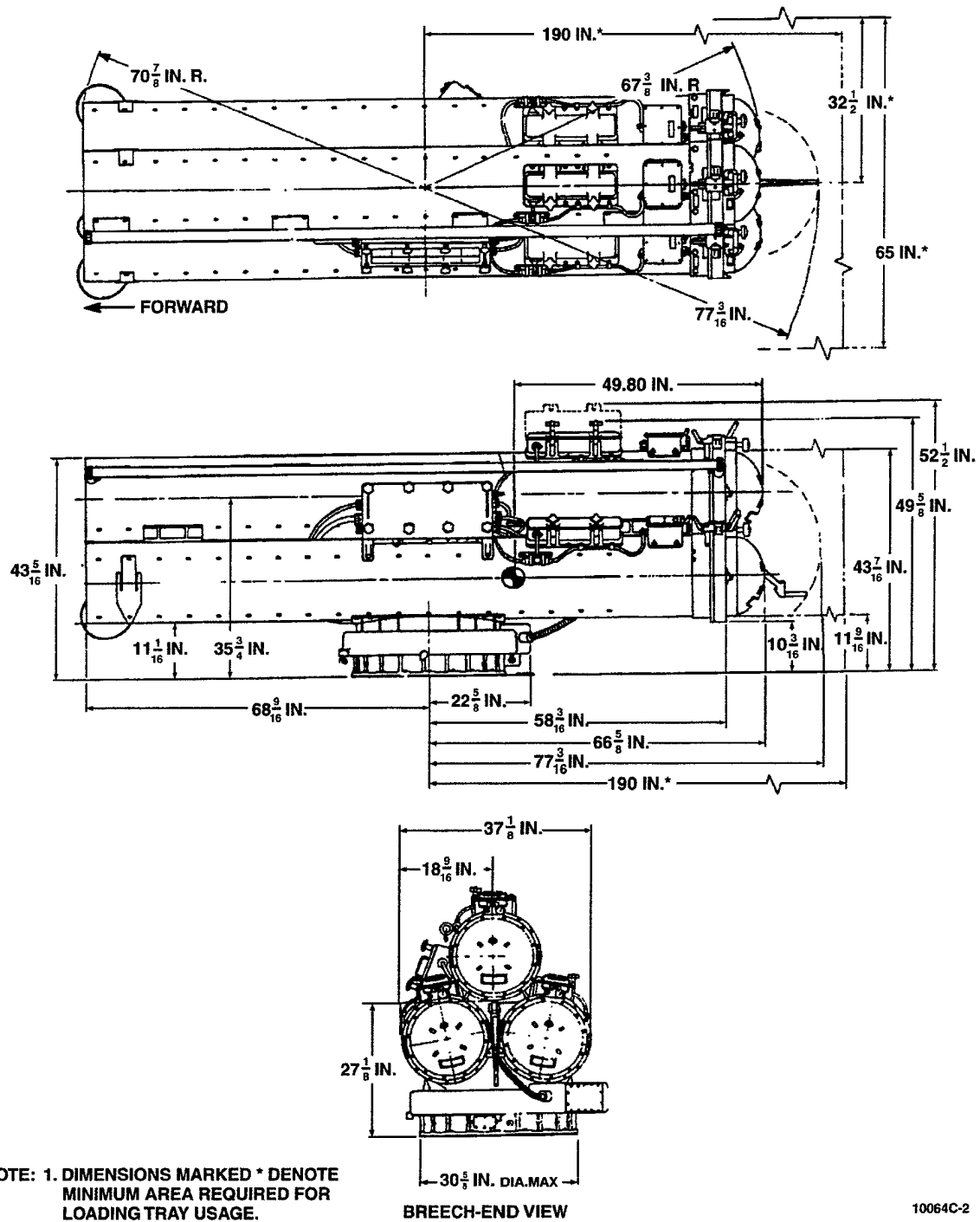
STARBOARD CONFIGURATION



PORT CONFIGURATION

10064C-1

Figure 1. SVTT Mk 32 Mods 5 and 7



10064C-2

Figure 2. SVTT Mk 32 Mods 5 and 7, Dimensional View

Environmental protection is provided by thermostatically-controlled heaters, built into the tube, that maintain critical areas of the tube above 32°F. A muzzle cover and the breech mechanism protect the interior of the tube and the weapon from the elements. A high-temperature sensing system monitors tube temperature rise at a remote monitoring station and cuts out power to barrel heaters when tube temperature reaches $130 \pm 8^\circ\text{F}$. The training gear assembly has its own heater circuit that operates independently.

Tables 1 through 3 list requirements, specifications, support documentation, and technical manuals for the SVTT Mk 32 Mods 5 and 7. The SVTT Mk 32 Mod 5 is used with Control Panel Mk 264 or 309 and SVTT Mk 32 Mod 7 with Fire Control System (FCS) Mk 114 and 116. Applicable ORDALTs are listed in appendix A and points of contact are listed in appendix C. Appendix D contains a block diagram for anti-submarine warfare equipment configuration for SVTT Mk 32 Mod 5 aboard FFG 7 class ships.

Further detailed information is provided in Naval Sea Systems Command (NAVSEA) technical manual SW395-AC-MMO-010.

Table 1. SVTT Mk 32 Mods 5 and 7, Requirements and Specifications

Requirement	Specification
<u>Electrical</u>	
115 Vac, 1Ø, 60 Hz	5.64 kVA
28 Vdc or	0.067 kVA or
35 Vac	0.105 kVA
<u>Pneumatic</u>	
Minimum source pressure	1800 psig
Capacity per air flask	Steel: 900 in. ³
Maximum charging rate per air flask	250 psig/min
Air should be filtered to 50 microns	
<u>Weights</u>	
Tube empty	2230 lb
Tube loaded (three Torpedoes Mk 44)	3110 lb
Tube loaded (three Torpedoes Mk 46)	3754 lb
<u>Cold Weather Protection</u>	
Barrel heaters (six strip heaters/barrel)	Power 1.16 kVA
Training gear heater	Power 1.93 kVA
<u>Reaction Loads (firing one barrel only)</u>	
Maximum firing reaction	F = 10,200 lb
Maximum firing moment (at base of mounting flange)	M = 364,650 in.-lb
Maximum wave load (static load of 1000 lb/ft ² over projected area of barrels)	P = 30,400 lb
Maximum static moment due to wave load (at base of mounting flange)	M = 824,600 in.-lb
<u>Fire Control System</u>	
SVTT Mk 32 Mod 5	Control Panel Mk 264 or Mk 309
SVTT Mk 32 Mod 7	FCS Mk 114 with Attack Console Mk 53
	FCS Mk 116 with Weapon Control Panel Mk 329
<u>Weapon Capability</u>	
	Torpedo Mk 44
	Torpedo Mk 46
<u>Tube Location</u>	
	Main Deck, 01 Level

Table 2. SVTT Mk 32 Mods 5 and 7, Support Documentation (Drawings)

Title	Drawing Number	
	Mod 5	Mod 7
Index List of Drawings	LD 162165	LD 162166
Assembly List of Drawings	LD 162135-1 LD 162135-2	LD 162155-1 LD 162155-2
Assembly Drawing	694718-1 694718-2	694720-1 694720-2
Installation Drawing	5759574-1 5759574-2	5759574-1 5759574-2
Lubrication Chart	694732	694732
Wiring Diagram	5545620	5545622
Electrical Schematic Diagram	5545621	5545623
External Wiring Diagram	5758495	5758497
Pneumatic Schematic	694731	694731

Table 3. SVTT Mk 32 Mods 5 and 7, Support Documentation (Technical Manuals)

Type	Number	Title
NAVSEA Technical Manual	SW395-AC-MMO-010/OP 3355	SVTT Mk 32 Mods 5 and 7: Description Operation, Maintenance, and IPB
NAVSEA Technical Manual	SW395-AC-MMD-010	SVTT Mk 32 Mods 5 and 7: Depot Level Overhaul Manual
NAVSEA Technical Manual	SW395-AC-MME-010	SVTT Mk 32 Mods 5 and 7: Shipboard Installation, Inspection, and Acceptance Testing
Military Specification	MIL-T-82570A (OS)	Military Specification: Torpedo Tube, Surface Vessel, Mk 32 Mods 5 and 7

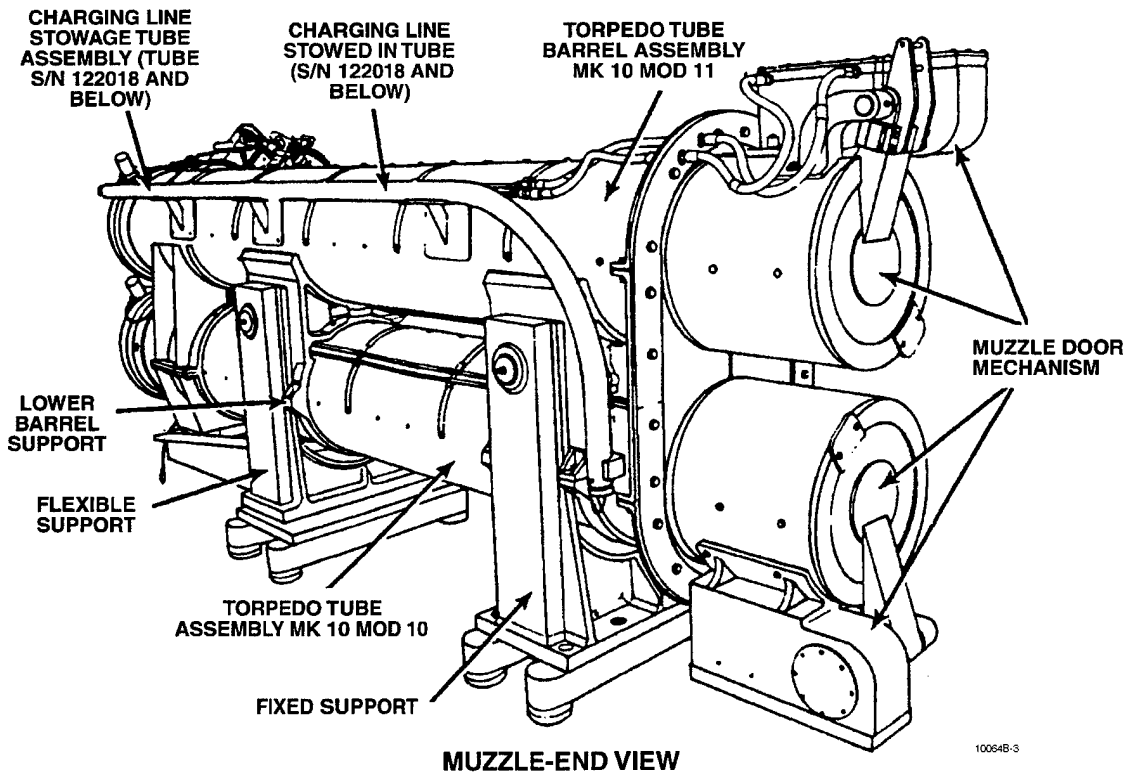
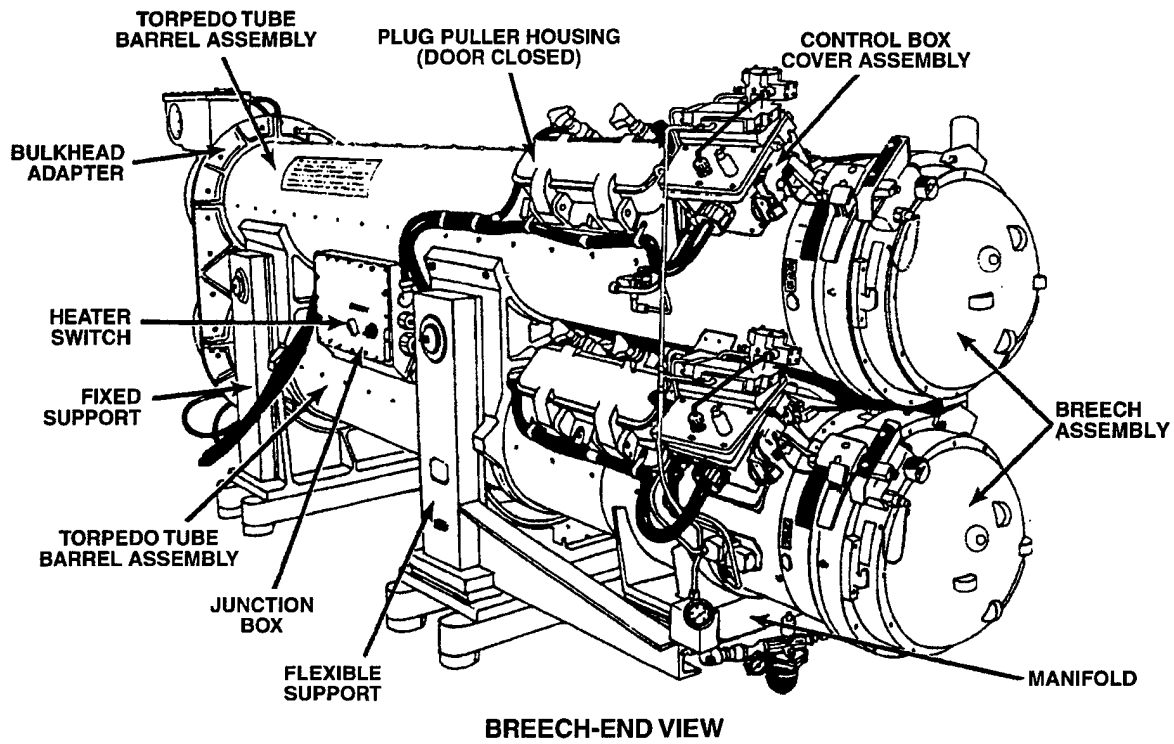
SVTT MK 32 MOD 9

SVTT Mk 32 Mod 9 is a two-barrel torpedo launcher designed for stationary port and starboard deckhouse installation to launch Torpedoes Mk 44 and Mk 46. The torpedoes are pneumatically launched and may be fired locally (at the tube) or from a remote location. Figure 3 indicates the major components of the tube; figure 4 provides a dimensional view.

SVTT Mk 32 Mod 9 has two barrels, one mounted above the other on forward fixed and aft flexible supports. The tube is installed at a fixed angle relative to the bow on the port and starboard sides. The barrels penetrate the outboard bulkhead of the torpedo room and extend approximately 38 inches beyond. When the barrels are installed on the supports, their vertical centerline has been rotated 45° in a counterclockwise direction. This aspect provides ready access from the left side of the tube to the plug puller housing, control boxes, and other components necessary for tube operation.

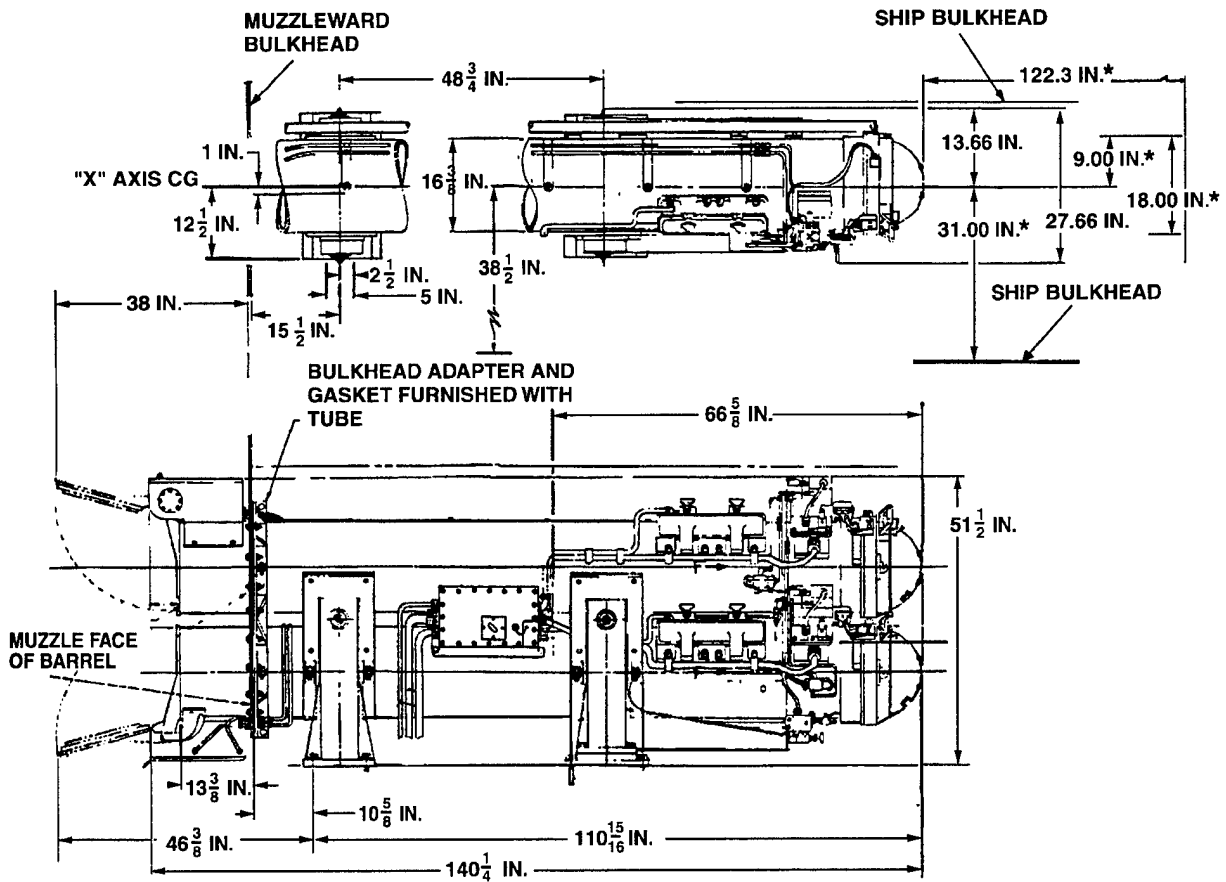
The tube requires both high- and low-pressure air from the ship's supply. The barrels of each tube are made of a fiberglass-reinforced polyester material. The only differences between the barrels are the mounting features and the directions that muzzle doors open. Each barrel uses identical breech mechanisms and torpedo securing mechanisms and is equipped with a remote electrically/pneumatically operated safe/ready valve that permits remote readying of the barrel. This valve is equipped with a manual overdrive. A single high-pressure line is provided for charging the breech mechanisms.

The muzzle door mechanism is equipped with a heater to prevent icing. Since the barrels are inside the deck house, they are not equipped with barrel heaters or overheat sensing circuits. Tables 4 through 6 list requirements, specifications, support documentation, and manuals for SVTT Mk 32 Mod 9. Applicable ORDALTs are listed in appendix A and points of contact are listed in appendix C.



10064B-3

Figure 3. SVTT Mk 32 Mod 9



10064B-4

NOTE: DIMENSIONS MARKED * DENOTE MINIMUM AREA REQUIRED FOR LOADING TRAY USAGE.

Figure 4. SVTT Mk 32 Mod 9, Dimensional View

Table 4. SVTT Mk 32 Mod 9, Requirements and Specifications

<u>Requirement</u>	<u>Specification</u>	
<u>Electrical</u>		
115 Vac, 1Ø, 60 Hz	2.125 kVA	
28 Vdc or	0.067 kVA or	
35 Vac	0.105 kVA	
<u>Pneumatic</u>		
	<u>Low-Pressure System</u>	<u>High-Pressure System</u>
Minimum pressure	150 psig	1800 psig
Capacity per air flask	150 in. ³	Steel: 900 in.
Maximum charging rate per air flask	2000 psig/min	250 psig/min
Air should be filtered to 50 microns		
<u>Weights</u>		
Tube empty	2010 lb	
Tube loaded (two Torpedoes Mk 44)	2890 lb	
Tube loaded (two Torpedoes Mk 46)	3026 lb	
<u>Cold Weather Protection</u>		
Muzzle door heaters	Power 0.92 kVA/bbl	
<u>Reaction Loads</u>		
	<u>Rear Support</u>	<u>Front Support</u>
Maximum compressive force	$F_c = 4700$ lb	$F_c = 3510$ lb force
Maximum tensile force	$F_t = 744$ lb	$F_t = 1890$ lb
Maximum moment		$M_{max} = 344,500$ in.-lb
<u>Fire Control System</u>	FCS Mk 114 with Attack Console Mk 53	
<u>Weapon Capability</u>	Torpedo Mk 44 Torpedo Mk 46	

Table 5. SVTT Mk 32 Mod 9, Support Documentation (Drawings)

Title	Drawing Number
Index List of Drawings	LD 621171
Assembly List of Drawings	LD 621172
Assembly Drawing	1448409
Installation Drawing	1448448
Lubrication Chart	1448420
Wiring Diagram	1448421
Electrical Schematic Diagram	1448418
External Wiring Diagram	1448449
Pneumatic Schematic	1448419

Table 6. SVTT Mk 32 Mod 9, Support Documentation (Technical Manuals)

Type	Number	Title
NAVSEA Technical Manual	SW395-AD-MMO-010	SVTT Mk 32 Mod 9: Description, Operation, Maintenance, and IPB
NAVSEA Technical Manual	SW395-AD-MME-010	SVTT Mk 32 Mod 9: Shipboard Installation, Inspection, and Acceptance Testing
Military Specification	MIL-T-82571A	Military Specifications: Torpedo Tube, Surface Vessel, Mk 32 Mod 9

SVTT MK 32 MOD 11

SVTT Mk 32 Mod 11 is a single-barrel configuration mounted at a fixed angle on rigid supports to launch Torpedoes Mk 44 and Mk 46. The Mod 11 has a safe/ready remote capability. Figure 5 illustrates SVTT Mk 32 Mod 11 and calls out the major components; figure 6 presents a dimensional view.

The tube is composed of a single barrel made of filament-wound fiberglass, a breech mechanism, a torpedo securing mechanism, a control box, a junction box, a breech access hatch and cover, a charging line and stowage tube, and three mounting supports.

The tube is designed to permit stowage of a torpedo and provide protection against adverse environmental conditions. Barrel heaters are provided for temperature control during cold weather conditions. Additionally, the Mod 11 contains features that permit remote presetting to the torpedo within the barrel during preparation of the tube for firing.

Tables 7 through 9 list requirements, specifications, support documentation, and technical manuals for SVTT Mk 32 Mod 11. Applicable ORDALTs are listed in appendix A and points of contact are listed in appendix C.

More detailed information on the SVTT Mk 32 Mod 11 is available in OP 4065.

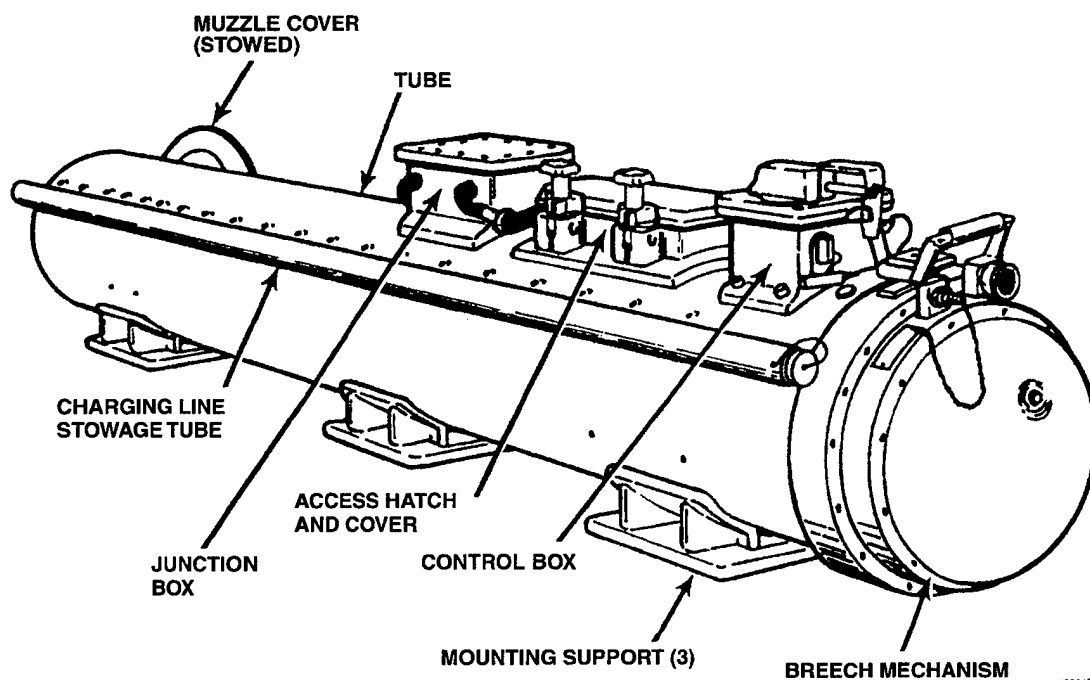


Figure 5. SVTT Mk 32 Mod 11

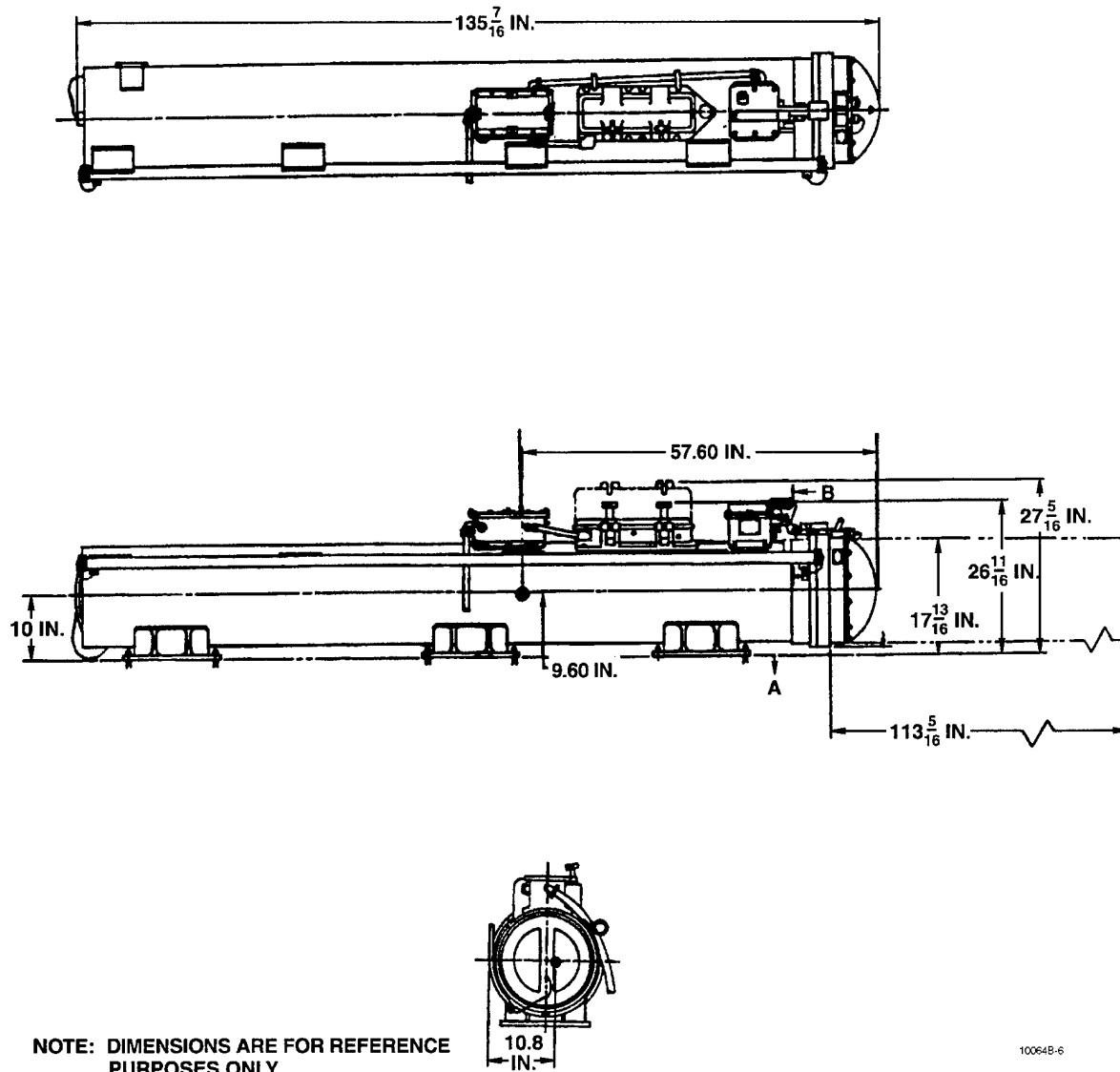


Figure 6. SVTT Mk 32 Mod 11, Dimensional View

Table 7. SVTT Mk 32 Mod 11, Requirements and Specifications

<u>Requirement</u>	<u>Specification</u>	
<u>Electrical</u>		
115 Vac, 1Ø, 60 Hz	1.5 kVA	
28 Vdc or	0.067 kVA or	
35 Vac	0.105 kVA	
<u>Pneumatic</u>		
	<u>Low-Pressure System</u>	<u>High-Pressure System</u>
Minimum pressure	150 psig	1800 psig
Capacity per air flask	10 in. ³	Steel: 900 in. ³
Maximum charging rate per air flask	2000 psig/min	250 psig/min
<u>Weights</u>		
Tube empty	650 lb	
Tube loaded (Torpedo Mk 44)	1100 lb	
Tube loaded (Torpedo Mk 46)	1160 lb	
<u>Cold Weather Protection</u>		
Six barrel heaters	Power 1.16 kVA each	
<u>Reaction Loads</u>		
Maximum firing reaction	F = 10,200 lb	
Maximum firing moment (at base of mounting saddles)	M = 102,000 in.-lb	
Maximum wave load (static load of 1000 lb/ft ² over projected area of barrel)	P = 18,340 in.-lb	
Maximum static moment due to wave load (at base of mounting saddles)	M = 183,400 in.-lb	
<u>Fire Control System</u>		
	Control Panel Mk 264 Mod 1	
	Control Panel Mk 309	
<u>Weapon Capability</u>		
	Torpedo Mk 44	
	Torpedo Mk 46	

Table 8. SVTT Mk 32 Mod 11, Support Documentation (Drawings)

Title	Drawing Number
Index List of Drawings	LD 632036
Assembly List of Drawings	LD 162748
Assembly Drawing	696557
Installation Drawing	3015018
Lubrication Chart	3015019
Wiring Diagram	3015069
Electrical Schematic Diagram	3014862
External Wiring Diagram	3014877
Pneumatic Schematic	3015020

Table 9. SVTT Mk 32 Mod 11, Support Documentation (Technical Manuals)

Type	Number	Title
Ordnance Publication	OP 4065	SVTT Mk 32 Mod 11: Description, Operation, Maintenance
Illustrated Parts Breakdown	OP 4065-IPB	SVTT Mk 32 Mod 11: Illustrated Parts Breakdown
Ordnance Data	OD 45487	SVTT Mk 32 Mod 11: Shipboard Installation, Inspection, and Acceptance Testing

SVTT MK 32 MOD 14

SVTT Mk 32 Mod 14 is a deckhouse-installed tube capable of launching Torpedoes Mk 44 and Mk 46. The Bulkhead Mounted Control Box (BMCB) Mk 60 Mod 0 and Operability Cable Mk 51 Mod 0, although functionally related to the tube, are located off-mount. The BMCB provides the capability of selecting either remote or local operation of the torpedo tube training gear and torpedo room firing door. Control and test functions are also routed through the BMCB. The Operability Test Cable Mk 51 Mod 0 may be used in lieu of the Test Set Mk 432 to conduct systems tests and to connect the BMCB and SVTT. The SVTT Mk 32 Mod 14 is illustrated in figure 7; a dimensional view is presented in figure 8. The BMCB Mk 60 Mod 0 is depicted in figure 9.

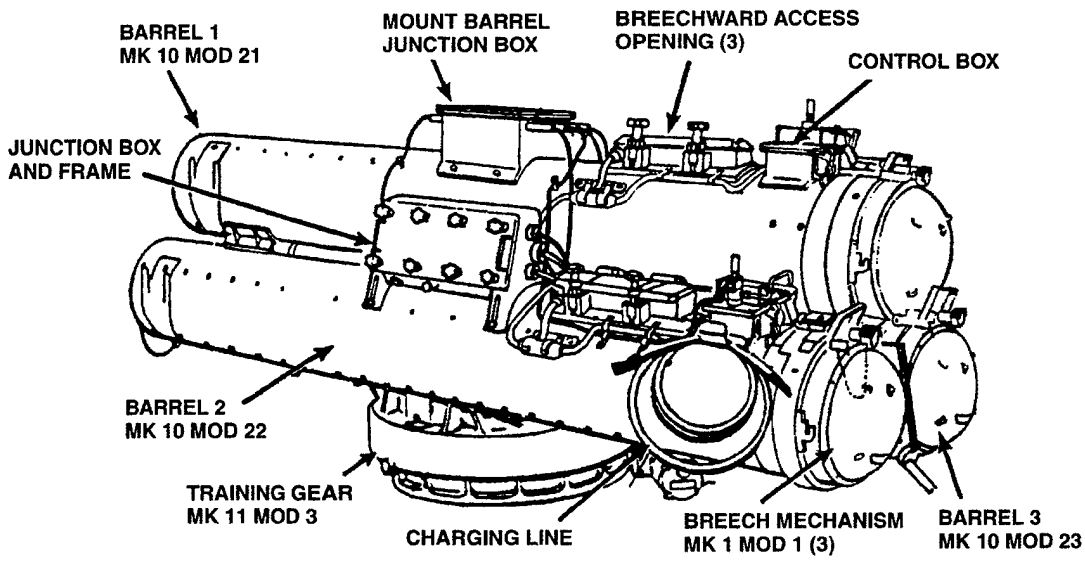
A normal shipboard installation consists of two tubes of the same mod, each located inside a port/starboard torpedo room. Differences between the port and starboard tubes involve the locations of the training gear stop assemblies, the junction box assembly, and the interchanged location of training interlock switches S201 and S202.

Major components of the SVTT Mk 32 Mod 14 are three barrels, a manually or electrically operated training gear assembly, three interchangeable breech mechanisms, three interchangeable torpedo securing mechanisms, a junction box assembly, a mount barrel junction box assembly located on the top barrel, and a charging line assembly.

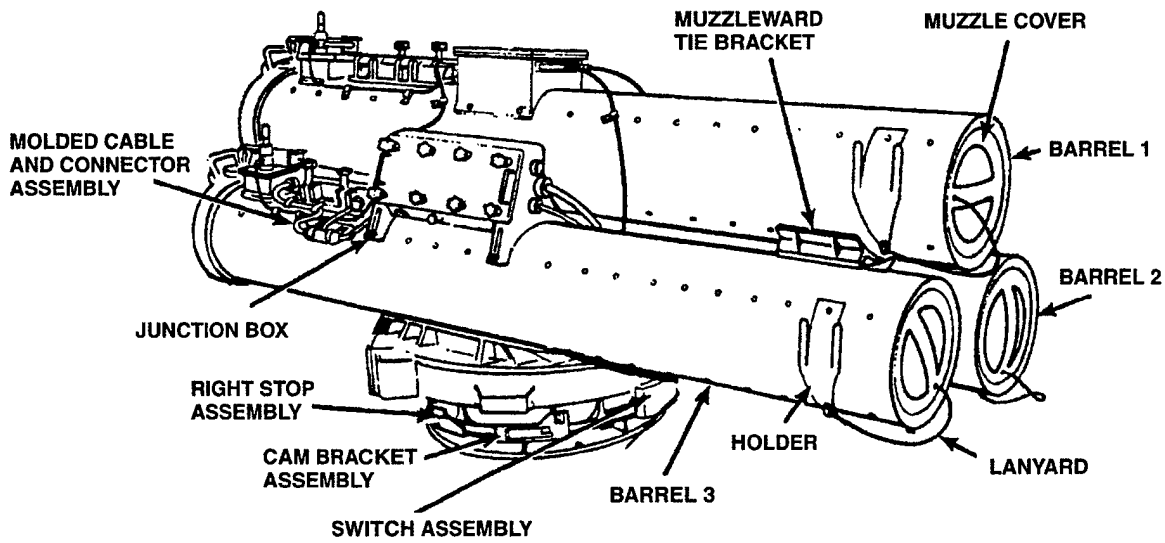
Each tube consists of three fiberglass-reinforced polyester resin barrels mounted on a common training gear assembly. The tube requires both high- and low-pressure air from the ship's supply. The primary differences among the barrels are those mounting features required to locate the barrels in different relative positions and minor variations in the breechward access openings. Each barrel uses identical breech mechanisms and torpedo securing mechanisms and is equipped with a pneumatically operated safe/ready subassembly that permits remote readying of the barrel. A single high-pressure line is provided for charging the breech mechanisms.

The tubes may be fired either remotely or locally; however, manual firing is intended only as an emergency measure. Torpedo presetting, remote firing, and training of the torpedo tube can be accomplished from the Torpedo Setting Panel Mk 331 or the Weapon Control Panel (WCP) Mk 329. Local training and operation of the torpedo firing door can also be accomplished from the BMCB Mk 60 Mod 0.

Tables 10 through 12 list requirements, specifications, support documentation, and technical manuals for the SVTT Mk 32 Mod 14, which is used with the FCS Mk 116. Applicable ORDALTs are listed in appendix A and points of contact are listed in appendix C. Appendix D contains a block diagram for anti-submarine warfare equipment configuration for SVTT Mk 32 Mod 14 aboard CG 47 and DD 963 classes of ships.



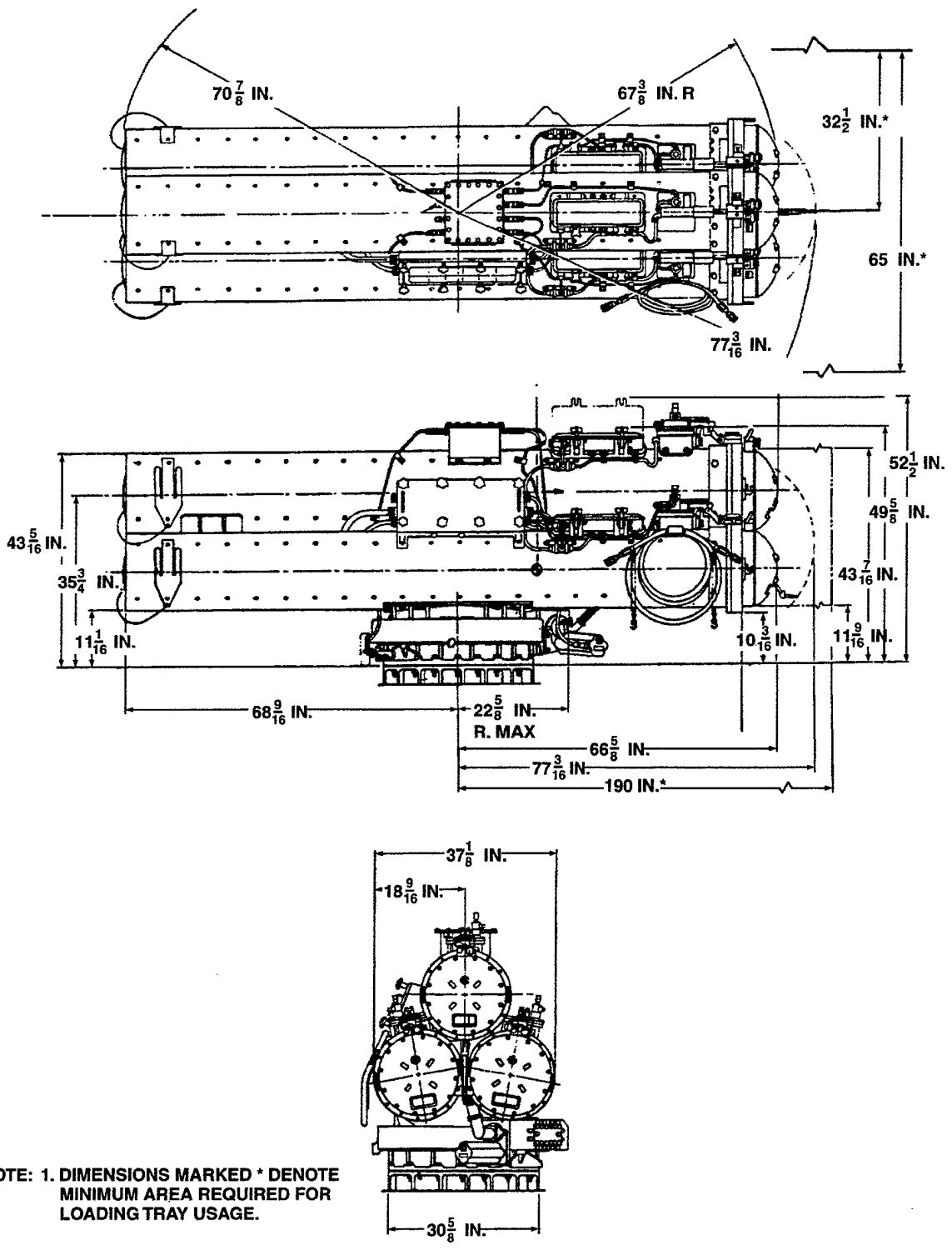
STARBOARD CONFIGURATION



PORT CONFIGURATION

10064C-7

Figure 7. SVTT Mk 32 Mod 14

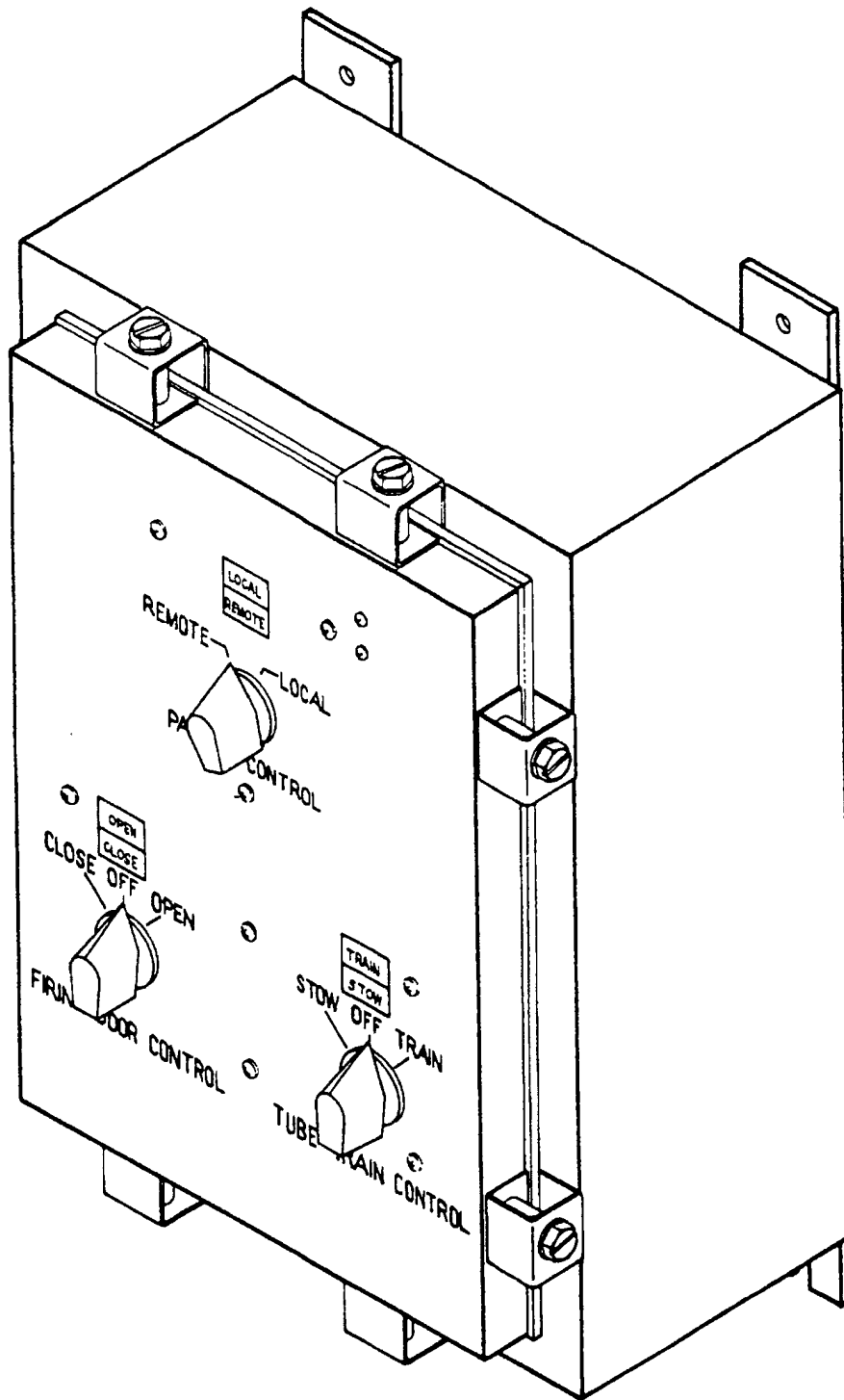


NOTE: 1. DIMENSIONS MARKED * DENOTE MINIMUM AREA REQUIRED FOR LOADING TRAY USAGE.

BREECH-END VIEW

10064C-8

Figure 8. SVTT Mk 32 Mod 14, Dimensional View



10064B-9

Figure 9. Bulkhead Mounted Control Box (BMCB) Mk 60 Mod 0

Table 10. SVTT Mk 32 Mod 14, Requirements and Specifications

<u>Requirement</u>	<u>Specification</u>	
<u>Electrical</u>		
115 Vac, 1Ø, 60 Hz (firing solenoid)	0.23 kVA	
115 Vac, 1Ø, 60 Hz (safe/ready solenoid)	0.23 kVA	
115 Vac, 3Ø, 60 Hz (train drive motor)	0.46 kVA	
35 Vdc	0.105 kVA	
<u>Pneumatic</u>	<u>Low-Pressure System</u>	<u>High-Pressure System</u>
Minimum source pressure	150 psig	1800 psig
Capacity per air flask	10 in. ³	Steel: 900 in. ³
Maximum charging rate per air flask	2000 psig/min	250 psig/min
Air should be filtered to 50 microns		
<u>Weights</u>		
Tube empty	2380 lb	
Tube loaded (three Torpedoes Mk 44)	3260 lb	
Tube loaded (three Torpedoes Mk 46)	3904 lb	
<u>Cold Weather Protection</u>	Tubes inside deckhouse	
<u>Reaction Loads (firing one barrel only)</u>		
Maximum firing reaction	F = 10,200 lb	
Maximum firing moment (at base of mounting flange)	M = 364,650 in.-lb	
Maximum static moment due to wave load (at base of mounting flange)	M = 824,600 in.-lb	
<u>Fire Control System</u>	UFCS Mk 116 TSP Mk 331 or WCP Mk 329 Mods 0 and 1	
<u>Weapon Capability</u>	Torpedo Mk 44 Torpedo Mk 46	
<u>Tube Location</u>	Main Deck	

Table 11. SVTT Mk 32 Mod 14, Support Documentation (Drawings)

Title	Drawing Number
Index List of Drawings	LD 632022
Assembly List of Drawings	LD 632023-1 LD 632023-2
Assembly Drawing	3014043-1 3014043-2
Installation Drawing	5758486-1 5758486-2
Lubrication Chart	3015083
Wiring Diagram	3022831
Electrical Schematic Diagram	3022834
External Wiring Diagram	3022829
Pneumatic Schematic	3022827

Table 12. SVTT Mk 32 Mod 14, Support Documentation (Technical Manuals)

Type	Number	Title
NAVSEA Technical Manual	SW395-AE-MMO-010	SVTT Mk 32 Mod 14 and Bulkhead Mounted Control Box Mk 60 Mod 0: Description, Operation, Maintenance, and IPB
Ordnance Data	OD 53209	SVTT Mk 32 Mod 14 and Bulkhead Mounted Control Box Mk 60 Mod 0: Shipboard Installation, Inspection, and Acceptance Testing
Military Specification	MIL-T-82726	Military Specifications: Torpedo Tube, Surface Vessel, Mk 32 Mod 14

SVTT MK 32 MOD 15

SVTT Mk 32 Mod 15 is a weatherdeck-installed launcher capable of launching Torpedoes Mk 46 and advanced lightweight torpedoes including the Mk 54 that is fully operational without local manning. Remote control safe/ready features are incorporated. An off-mount Interface Junction Box (IFJB) Mk 70 Mod 0 is installed to channel and distribute electrical signals to the port and starboard launchers.

A normal shipboard installation consists of two tubes of the same mod, one port and one starboard. The main differences between the two are the locations of the junction box assembly, the retractable stop, and the installed position of the index mark on the stationary base.

Major components of the SVTT Mk 32 Mod 15 are three barrels, each with a fly-through muzzle cover that is expelled from the muzzle end of the torpedo tube by blow-by air pressure past the torpedo at weapon launch before the torpedo can contact the door, three interchangeable breech mechanisms, three interchangeable torpedo securing mechanisms; a manually operated training gear assembly; a junction box assembly; a 10-foot and 75-foot charging line; and the off-mount IFJB Mk 70 Mod 0. An illustration of the torpedo tube, which indicates the major components, is shown in figure 10; figure 11 is a dimensional view. The IFJB Mk 70 Mod 0 is shown in figure 12.

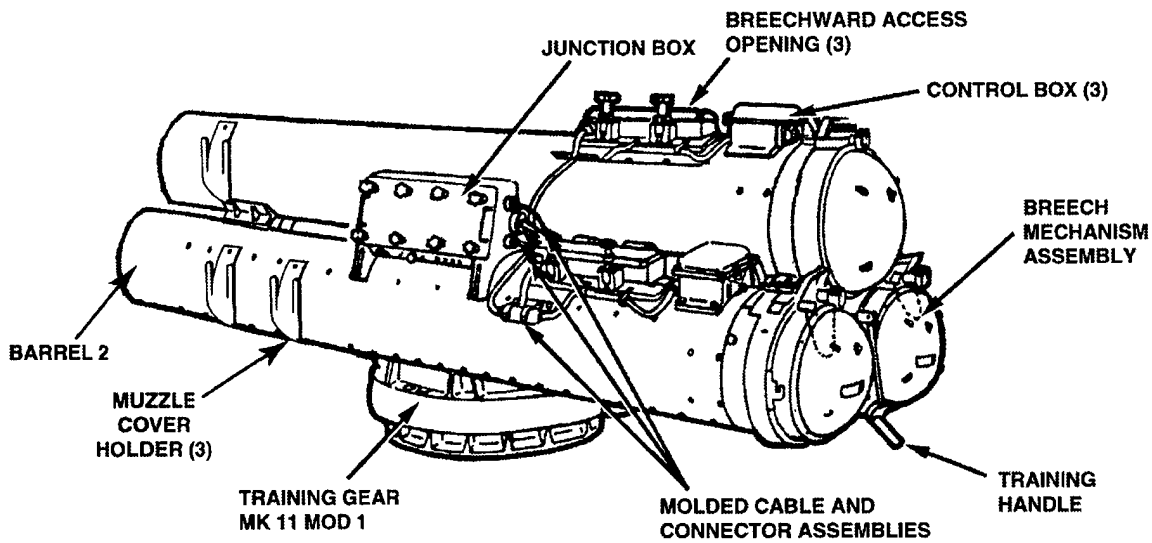
Each tube consists of three fiberglass-reinforced polyester resin or epoxy barrels mounted on a common, manual, training-gear assembly. The primary differences among the barrels are those features required to mount them in different relative positions in the torpedo tube and minor variations in the breechward access openings. Each barrel uses identical breech mechanisms and torpedo securing mechanisms.

Environmental protection is provided by thermostatically-controlled heaters, built into the barrels, that maintain critical areas of the tube above 32°F. A muzzle cover and the breech mechanism protect the interior of the barrels from the elements. A high-temperature sensing system monitors tube temperature rise at a remote monitoring station and cuts out barrel heaters when tube temperature is $130 \pm 8^\circ\text{F}$. The training gear assembly has its own independent heater circuit.

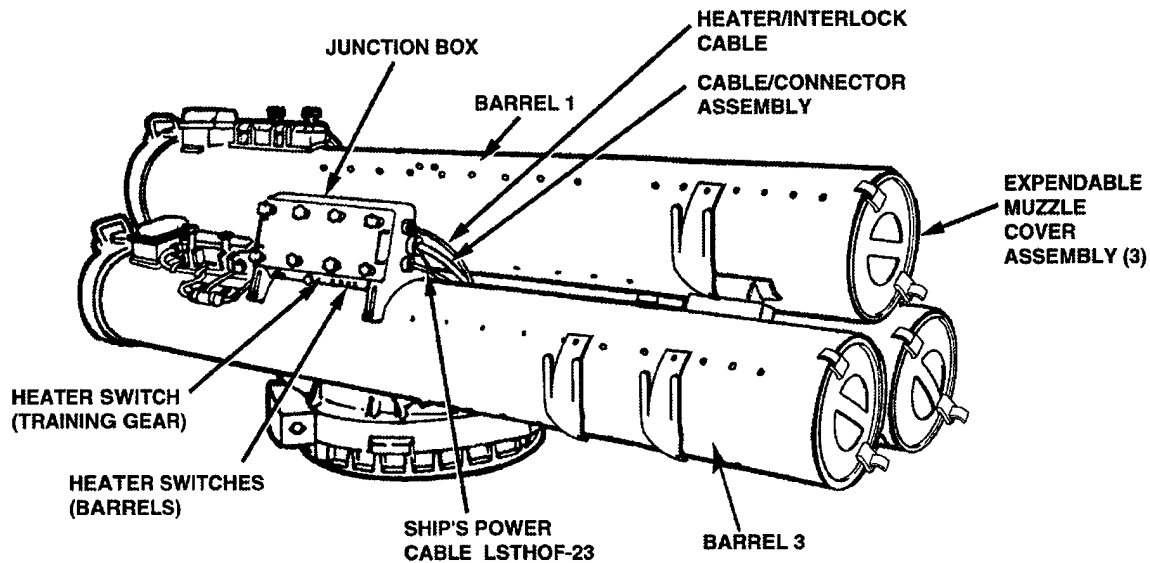
The tubes can only be fired remotely. Manual operation of the safe/ready and firing solenoids is intended for routine maintenance tests only. Torpedo presetting, readying, and firing is accomplished from the Underwater Fire Control System via Torpedo Setting Panel Mk 331.

Tables 13 through 15 list requirements, specifications, support documentation, and technical manuals for the SVTT Mk 32 Mod 15, which is used with FCS Mk 116. Applicable ORDALTs are listed in appendix A and points of contact are listed in appendix C. Appendix D contains a block diagram for anti-submarine warfare equipment configuration for SVTT Mk 32 Mod 15 aboard DDG 51 class ships.

Further detailed information is provided in NAVSEA technical manual SW395-AJ-MMO-010.



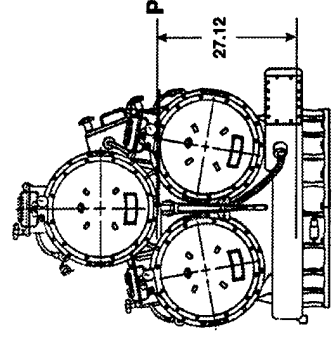
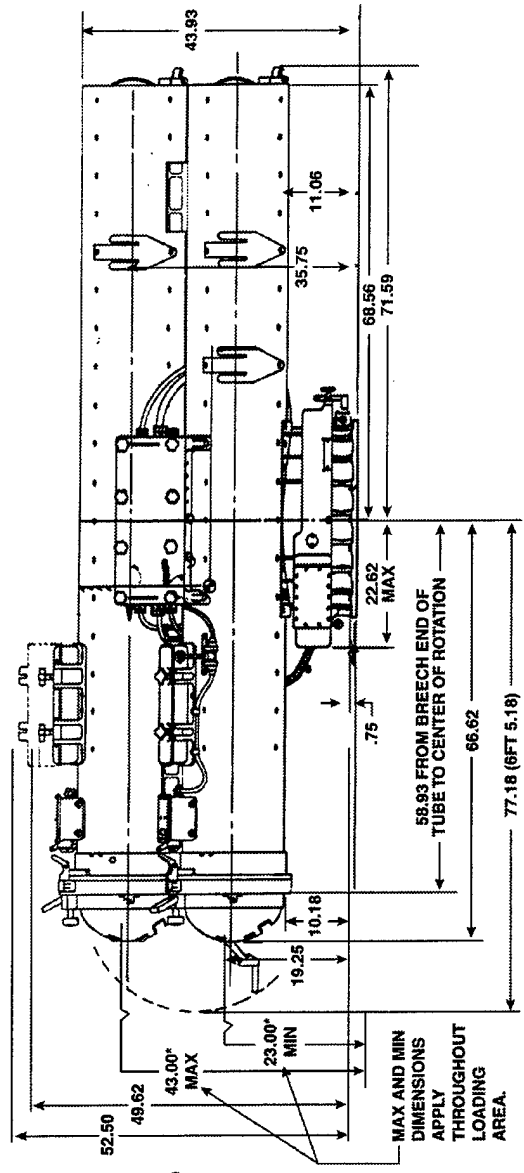
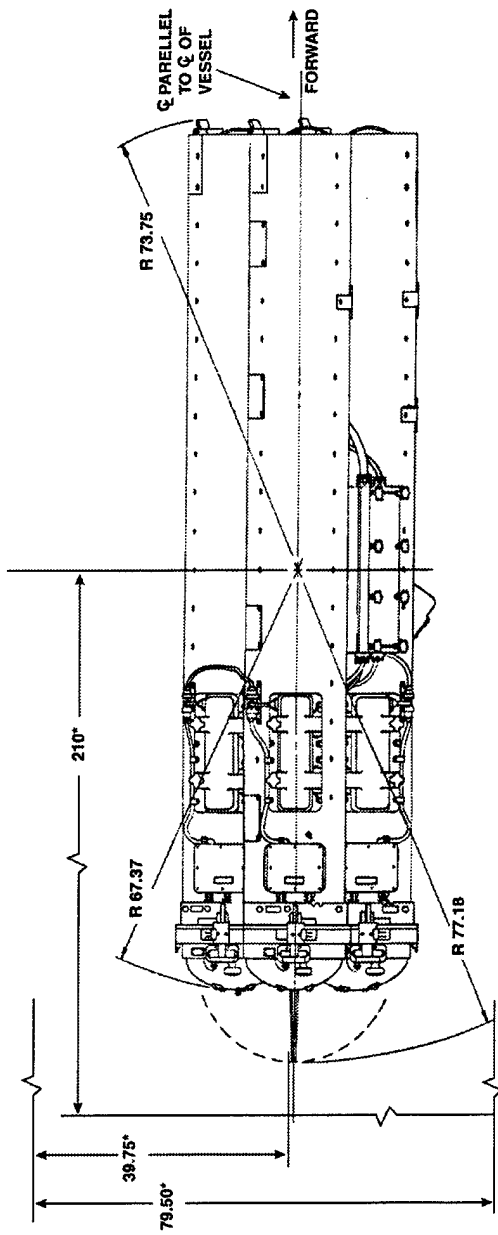
STARBOARD CONFIGURATION



PORT CONFIGURATION

Figure 10. SVTT Mk 32 Mod 15

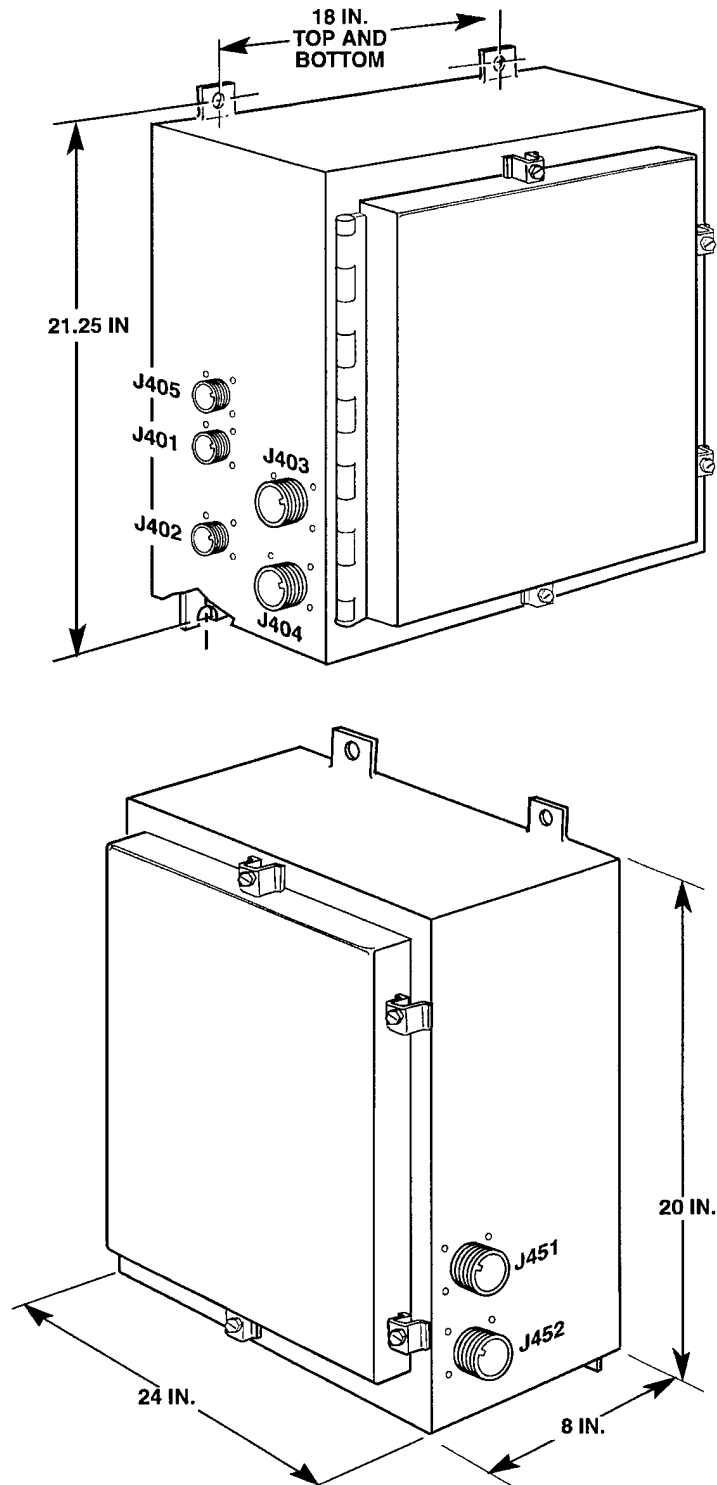
10064C-10



NOTE:
 1. DIMENSIONS MARKED * DENOTE DIMENSIONS APPLY THROUGHOUT LOADING AREA.
 2. ALL DIMENSIONS ARE IN INCHES.

10064C-11

Figure 11. SVTT Mk 32 Mod 15, Dimensional View



10064B-12

Figure 12. Interface Junction Box Mk 70 Mod 0

Table 13. SVTT Mk 32 Mod 15, Requirements and Specifications

<u>Requirement</u>	<u>Specification</u>
<u>Electrical</u>	
115 Vac, 1Ø, 60 Hz	7.81 kVA
28 Vdc	0.067 kVA
<u>Pneumatic</u>	
Minimum source pressure	1800 psig
Capacity per air flask	Steel: 900 in. ³
Maximum charging rate per air flask	250 psig/min
Air should be filtered to 50 microns	
<u>Weights</u>	
Tube empty	2255 lb
Tube loaded (three Torpedoes Mk 46)	3810 lb
<u>Cold Weather Protection</u>	
Barrel heaters (six strip heaters/barrel)	Power 1.94 kVA
Training gear heater	Power 2.00 kVA
<u>Reaction Loads (firing one barrel only)</u>	
Maximum firing reaction	F = 10,200 lb
Maximum firing moment (at base of mounting flange)	M = 364,650 in.-lb
Maximum wave load (static load of 1000 lb/ft ² over projected area of barrels)	P = 30,400 lb
Maximum static moment due to wave load (at base of mounting flange)	M = 824,600 in.-lb
<u>Fire Control System</u>	FCS Mk 116 with TSP Mk 331
<u>Weapon Capability</u>	Torpedo Mk 46 Advanced Lightweight Torpedoes
<u>Tube Location</u>	Main Deck, 01 level

Table 14. SVTT Mk 32 Mod 15 and IFJB Mk 70 Mod 0, Support Documentation (Drawings)

Title	Drawing Number
Index List of Drawings SVTT Mk 32 Mod 15	IL 6302995
Assembly List of Drawings SVTT Mk 32 Mod 15	PL 5978888
Assembly Drawing SVTT Mk 32 Mod 15	5978888
Installation Drawing SVTT Mk 32 Mod 15 and IFJB Mk 70 Mod 0	5979672
Lubrication Chart	5979648
Wiring Diagram SVTT Mk 32 Mod 15	5979637
Electrical Schematic Diagram SVTT Mk 32 Mod 15	5979636
External Wiring Diagram SVTT Mk 32 Mod 15 and IFJB Mk 70 Mod 0	5979670
Pneumatic Schematic	5979646
Assembly List of Drawings IFJB Mk 70 Mod 0	PL 5979707
Assembly Drawing IFJB Mk 70 Mod 0	5979707
Wiring Diagram IFJB Mk 70 Mod 0	5979639
Electrical Schematic Diagram IFJB Mk 70 Mod 0	5979642

Table 15. SVTT Mk 32 Mod 15, Support Documentation (Technical Manuals)

Type	Number	Title
NAVSEA Technical Manual	SW395-AJ-MMO-010/ Mk 32 Mod 15	SVTT Mk 32 Mod 15 and IFJB Mk 70 Mod 0: Description, Operation, Maintenance, and IPB
NAVSEA Technical Manual	SW395-AJ-IIN-010	SVTT Mk 32 Mod 15 and IFJB Mk 70 Mod 0: Shipboard Installation, Inspection, and Acceptance Testing
Military Specification	MIL-T-82869 (OS)	Military Specification: Torpedo Tube, Surface Vessel, Mk 32 Mod 15

SVTT MK 32 MOD 17

SVTT Mk 32 Mod 17 is designed to launch Torpedoes Mk 46 and advanced lightweight torpedoes including the Mk 54 from the weatherdecks of surface vessels. The torpedoes are pneumatically launched and may be fired locally (at the tube) or from a remote location. Figure 13 illustrates both a port and a starboard tube configuration; figure 14 presents a dimensional view.

A normal shipboard installation consists of two tubes of the same mod, one port and one starboard. The main differences between the two are the locations of the junction box assembly, the retractable stop, and the installed position of the index mark on the stationary base.

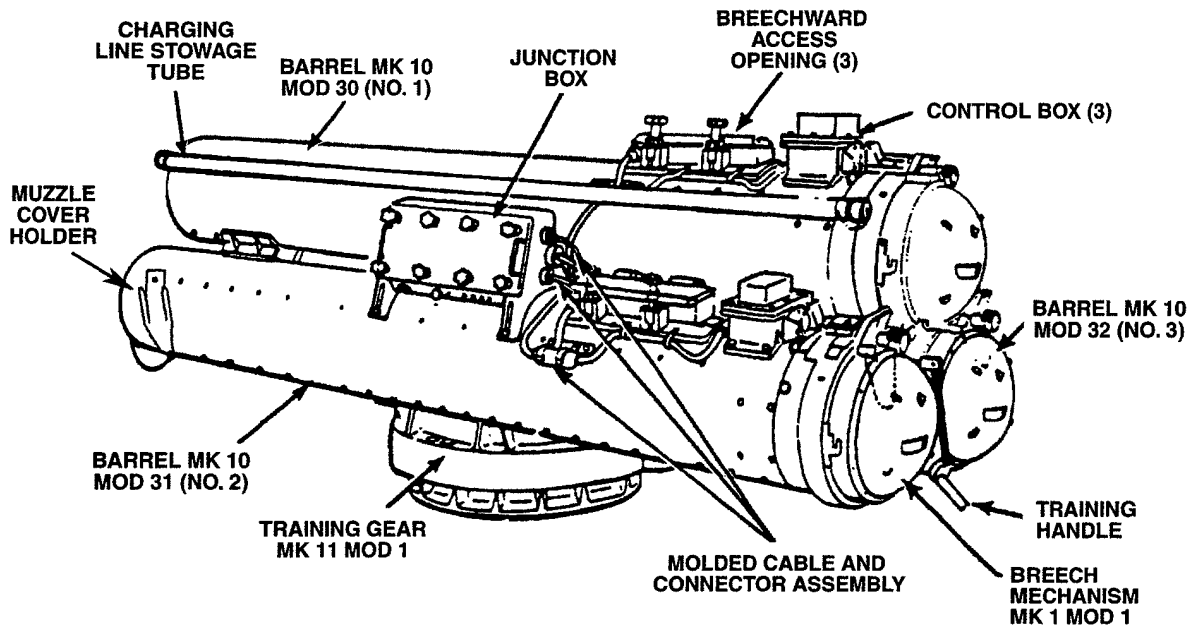
Major components of the SVTT Mk 32 Mod 17 are three barrels, a manually operated training gear assembly, three interchangeable breech mechanisms, three securing mechanisms, a junction box assembly, charging line, and charging line stowage tube.

Each tube consists of three fiberglass-reinforced polyester resin barrels mounted on a manually operated training gear assembly. The primary differences among the barrels are those features required to mount them in different relative positions in the torpedo tube and minor variations in the breechward access openings. Each barrel uses identical breech mechanisms and torpedo securing mechanisms. A single charging line, with a stowage tube, is provided for charging breech mechanism.

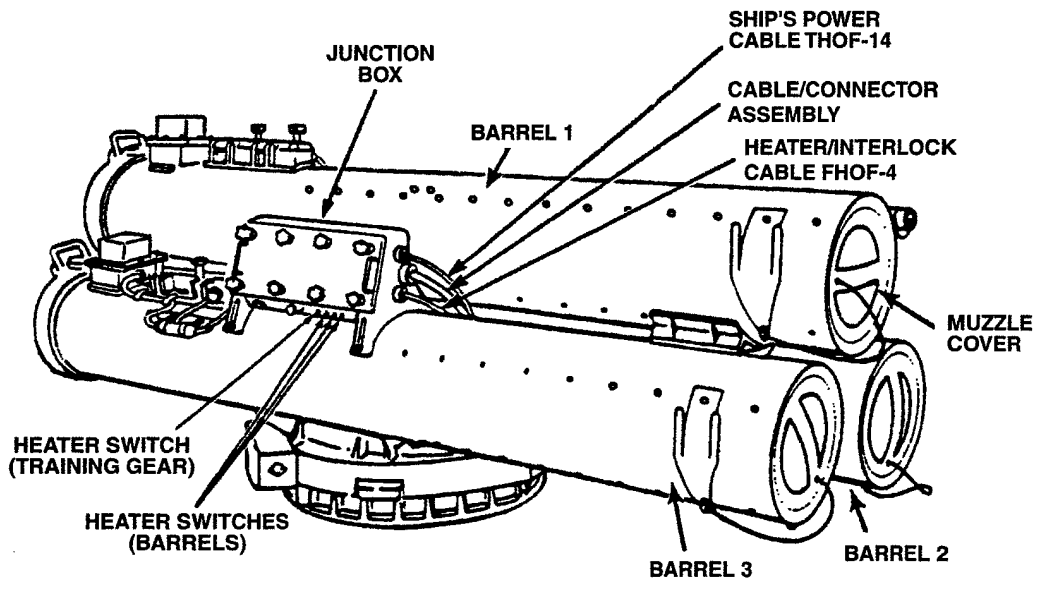
Environmental protection is provided by thermostatically-controlled heaters, built into the tube, that maintain critical areas of the tube above 32°F. A muzzle cover and the breech mechanism protect the interior of the tube and the weapon from the elements. A high-temperature sensing system monitors tube temperature rise at a remote monitoring station and cuts out power to barrel heaters when tube temperature reaches $130 \pm 8^\circ\text{F}$. The training gear assembly has its own heater circuit that operates independently.

Tables 16 through 18 list requirements, specifications, support documentation, and technical manuals for the SVTT Mk 32 Mod 17. The SVTT Mk 32 Mod 17 is used with the UFCS Mk 309. Applicable ORDALTs are listed in appendix A and points of contact are listed in appendix C. Appendix D contains a block diagram for anti-submarine equipment configuration for SVTT Mk 32 Mod 17 for FFG 7 class ships.

Further detailed information is provided in NAVSEA technical manual SW395-AM-MMO-010.



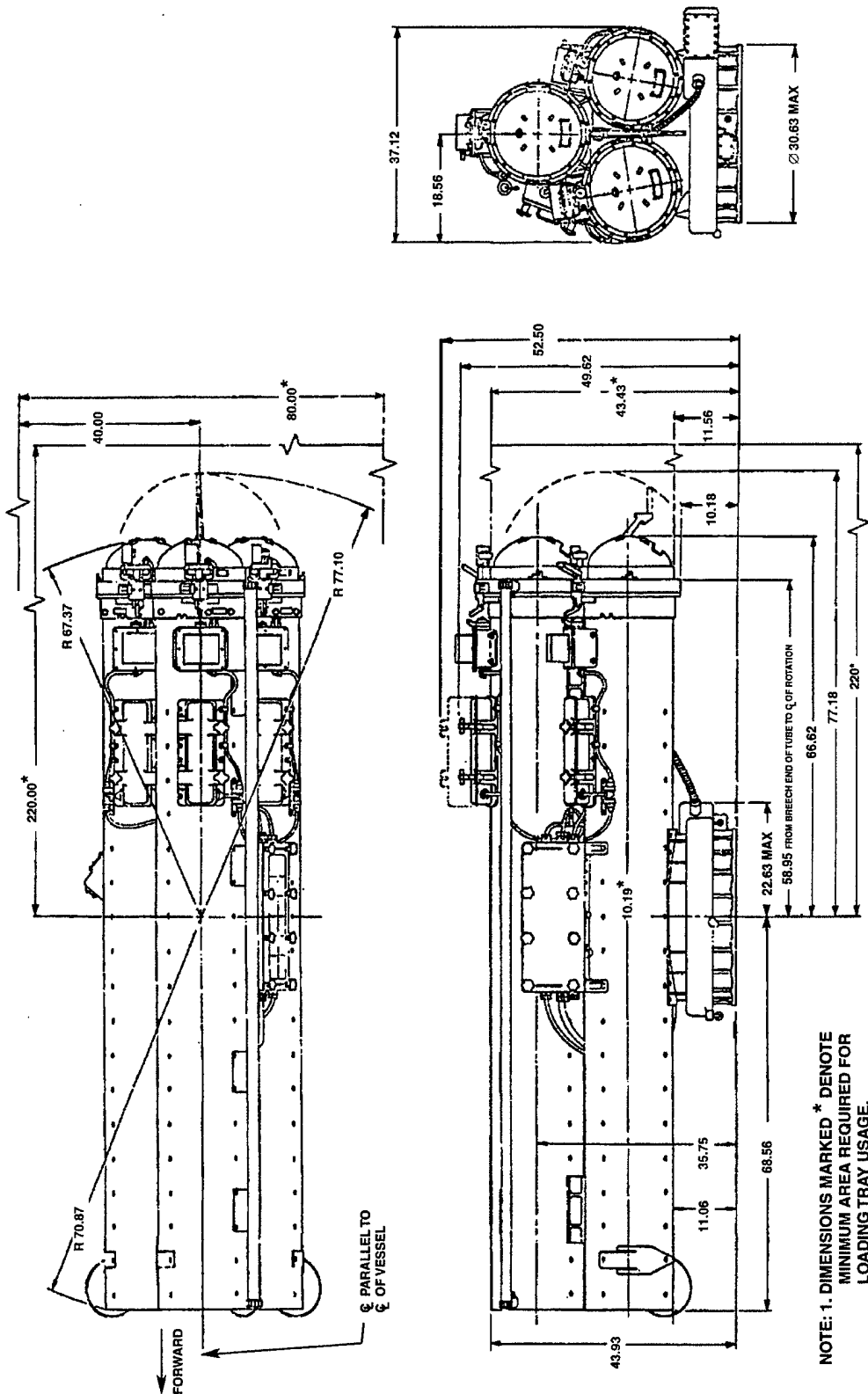
STARBOARD CONFIGURATION



PORT CONFIGURATION

10064C-13

Figure 13. SVTT Mk 32 Mod 17



10686C-14

Figure 14. SVTT Mk 32 Mod 17, Dimensional View

Table 16. SVTT Mk 32 Mod 17, Requirements and Specifications

Requirement	Specification
<u>Electrical</u>	
115 Vac, 1Ø, 60 Hz	6.06 kVA
28 Vdc	0.067 kVA
<u>Pneumatic</u>	
Minimum source pressure	1800 psig
Capacity per air flask	Steel: 900 in. ³
Maximum charging rate per air flask	250 psig/min
Air should be filtered to 50 microns	
<u>Weights</u>	
Tube empty	2230 lb
Tube loaded (three Torpedoes Mk 46)	3754 lb
<u>Cold Weather Protection</u>	
Barrel heaters (six strip heaters/barrel)	Power 1.16 kVA
Training gear heater	Power 1.93 kVA
<u>Reaction Loads (firing one barrel only)</u>	
Maximum firing reaction	F = 10,200 lb
Maximum firing moment (at base of mounting flange)	M = 364,650 in.-lb
Maximum wave load (static load of 1000 lb/ft ² over projected area of barrels)	P = 30,400 lb
Maximum static moment due to wave load (at base of mounting flange)	M = 824,600 in.-lb
<u>Fire Control System</u>	Control Panel Mk 309 Mod 2
<u>Weapon Capability</u>	Torpedo Mk 46 Advanced Lightweight Torpedoes
<u>Tube Location</u>	Main Deck, 01 level

Table 17. SVTT Mk 32 Mod 17, Support Documentation (Drawings)

Title	Drawing Number
Assembly List of Drawings	PL 6657371-1 PL 6657371-2
Assembly Drawings	6657371-1 6657371-2
Installation Drawing	6689070
Lubrication Chart	6689063
Wiring Diagram	6689096
Electrical Schematic Diagram	6689107
External Wiring Diagram	6689091
Pneumatic Schematic	6689105

Table 18. SVTT Mk 32 Mod 17, Support Documentation (Technical Manuals)

Type	Number	Title
NAVSEA Technical Manual	SW395-AM-MMO-010/ Mk 32 Mod 17	SVTT Mk 32 Mod 17: Description, Operation, Maintenance, and IPB
NAVSEA Technical Manual	TW395-AM-MMO-010 Mk 32 Mod 17 (FMS)	SVTT Mk 32 Mod 17 for Foreign Military Use: Description, Operation, Maintenance, and IPB
NAVSEA Technical Manual	SW395-AM-IIN-010	SVTT Mk 32 Mod 17: Shipboard Installation, Inspection, and Acceptance Testing

SVTT MK 32 MOD 19

SVTT Mk 32 Mod 19 is a deckhouse-installed tube capable of launching Torpedoes Mk 46 and advanced lightweight torpedoes including the Mk 54. BMCB Mk 60 Mod 0 and Operability Cable Mk 51 Mod 0, although functionally related to the tube, are located off-mount. The BMCB provides the capability of selecting either remote or local operation of the torpedo tube training and torpedo room firing door. Control and test functions are also routed through the BMCB. The Operability Test Cable Mk 51 Mod 0 may be used in lieu of the Test Set Mk 432 to conduct systems tests and to connect the BMCB and SVTT. The SVTT Mk 32 Mod 19 is illustrated in figure 15; a dimensional view is presented in figure 16. The BMCB Mk 60 Mod 0 is depicted in figure 9.

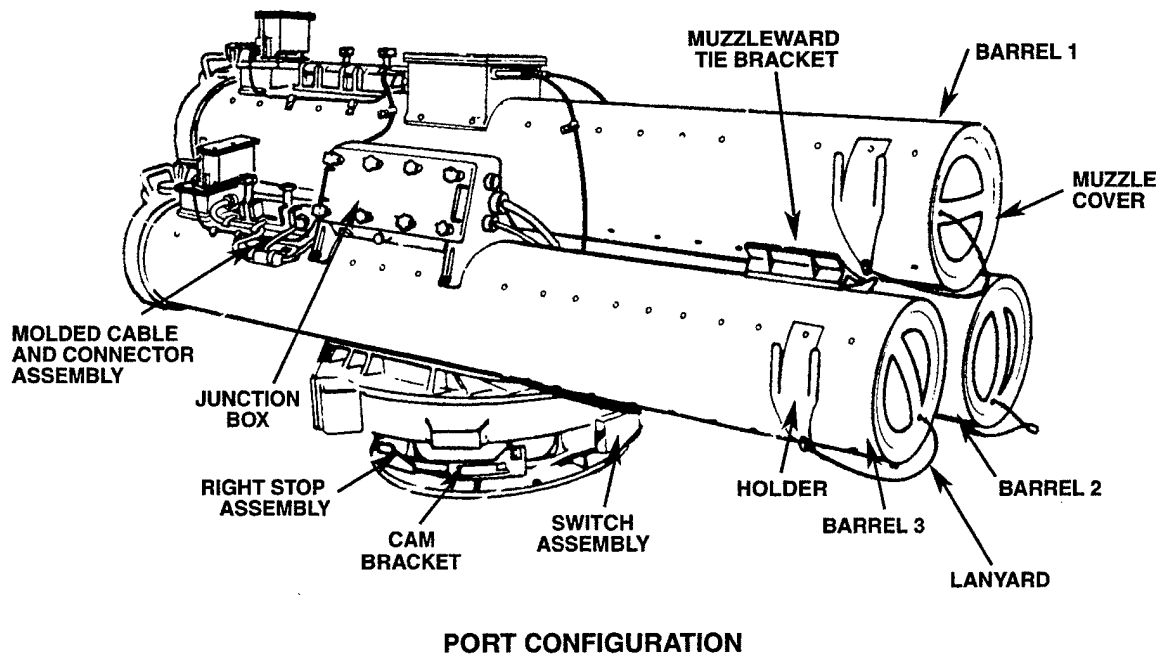
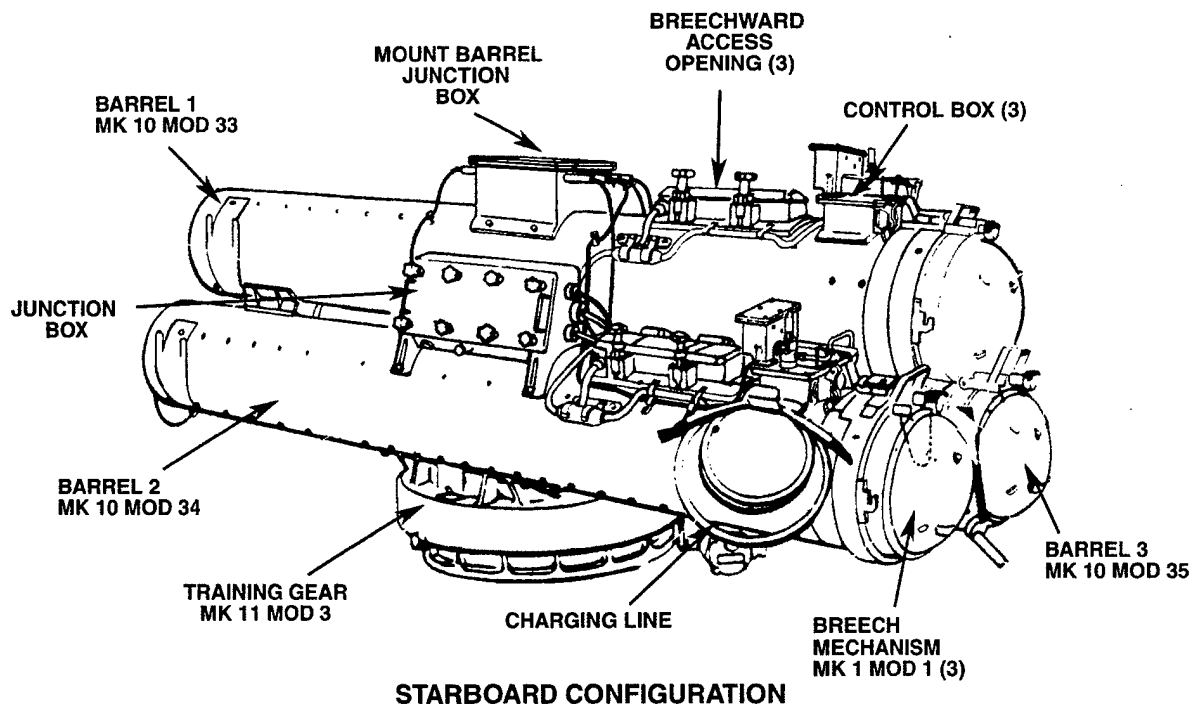
A normal shipboard installation consists of two similar tubes, each located inside a port/starboard torpedo room. Differences between the port and starboard tubes involve the locations of the training gear stop assemblies, the junction box assembly, and the interchanged location of training interlock switches S201 and S202.

Major components of the SVTT are three barrels, a manual or electrically operated training gear assembly, three interchangeable breech mechanisms, three torpedo securing mechanisms, a junction box assembly, a mount barrel junction box assembly located on the top barrel, and a charging line assembly.

Each tube consists of three fiberglass-reinforced polyester resin barrels mounted on a common training gear assembly. The tube requires both high- and low-pressure air from the ship's supply. The differences among the barrels are those mounting features required to locate the barrels in different relative positions and minor variations in the breechward access openings. Each barrel uses identical breech mechanisms and torpedo securing mechanisms and is equipped with a pneumatically operated safe/ready subassembly that permits remote readying of the individual barrels. A single high-pressure line is provided for charging the breech mechanisms.

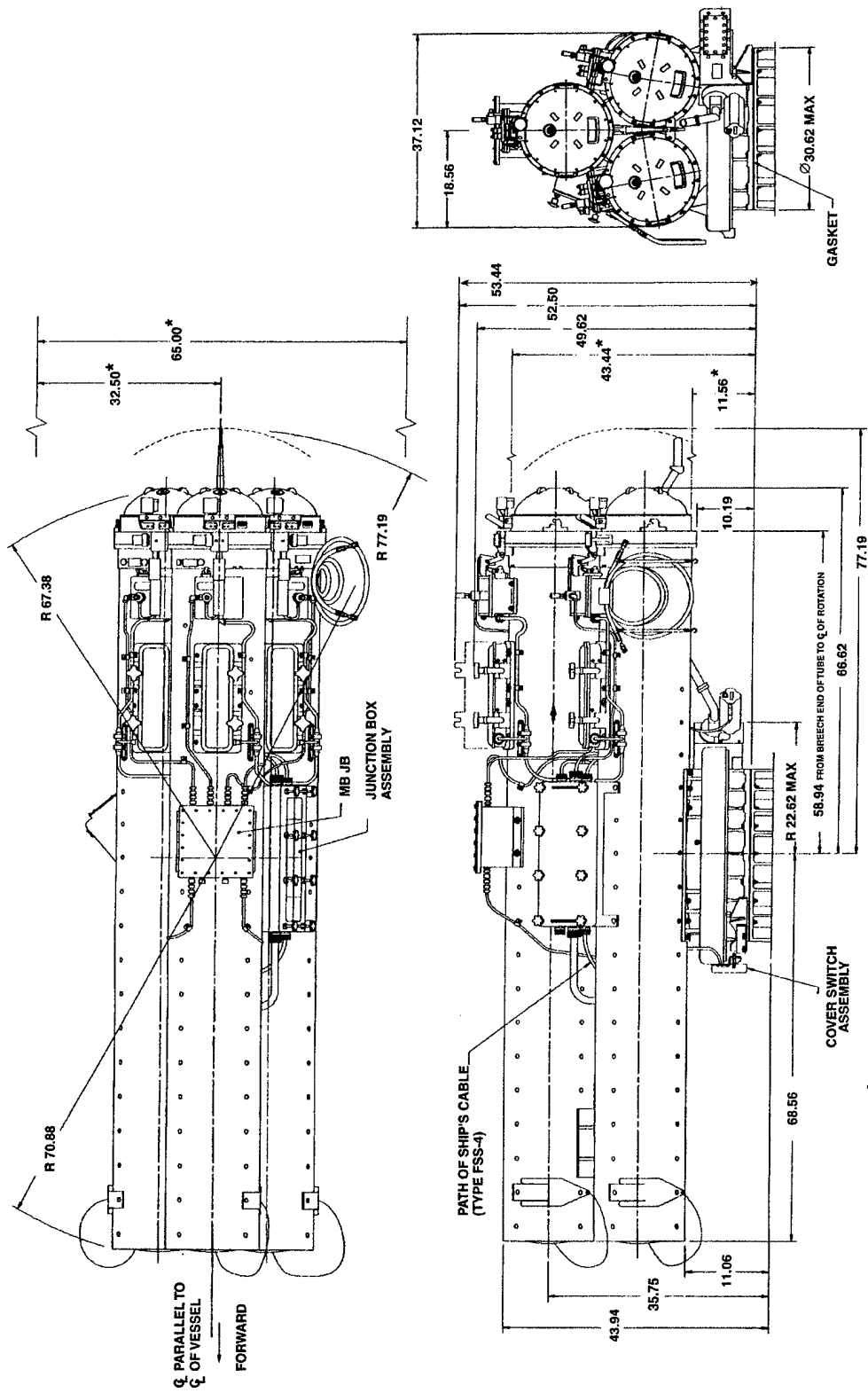
The tubes may be fired either remotely or locally; however, manual firing is intended only as an emergency measure. Torpedo presetting, remote firing, and training of the torpedo tube can be accomplished from either the Torpedo Setting Panel Mk 331 or the WCP Mk 329. Local training and operation of the torpedo firing door can also be accomplished from the BMCB Mk 60 Mod 0.

Tables 19 through 21 list requirements, specifications, support documentation, and technical manuals for the SVTT Mk 32 Mod 19, which is used with the FCS Mk 116. Applicable ORDALTs are listed in appendix A and points of contact are listed in appendix C. Appendix D contains a block diagram for anti-submarine warfare equipment configuration for SVTT Mk 32 Mod 19 aboard CG 47 and DD 963 classes of ships.



10064C-15

Figure 15. SVTT Mk 32 Mod 19



NOTE: 1. DIMENSIONS MARKED * DENOTE MINIMUM AREA REQUIRED FOR LOADING TRAY USAGE.

2. ALL DIMENSIONS ARE IN INCHES.

10064C16

Figure 16. SVTT Mk 32 Mod 19, Dimensional View

Table 19. SVTT Mk 32 Mod 19, Requirements and Specifications

<u>Requirement</u>	<u>Specification</u>	
<u>Electrical</u>		
115 Vac, 1Ø, 60 Hz (firing solenoid)	0.23 kVA	
115 Vac, 1Ø, 60 Hz (safe/ready solenoid)	0.23 kVA	
115 Vac, 3Ø, 60 Hz (train drive motor)	0.46 kVA	
<u>Pneumatic</u>	<u>Low-Pressure System</u>	<u>High-Pressure System</u>
Minimum source pressure	150 psig	1800 psig
Capacity per air flask	10 in. ³	Steel: 900 in. ³
Maximum charging rate per air flask	2000 psig/min	250 psig/min
Air should be filtered to 50 microns		
<u>Weights</u>		
Tube empty	2380 lb	
Tube loaded (three Torpedoes Mk 46)	3904 lb	
<u>Cold Weather Protection</u>	Tubes inside deckhouse	
<u>Reaction Loads (firing one barrel only)</u>		
Maximum firing reaction	F = 10,200 lb	
Maximum firing moment (at base of mounting flange)	M = 364,650 in.-lb	
Maximum static moment due to wave load (at base of mounting flange)	M = 824,600 in.-lb	
<u>Fire Control System</u>	UFCS Mk 116 TSP Mk 331 WCP Mk 329	
<u>Weapon Capability</u>	Torpedo Mk 46 Advanced Lightweight Torpedoes	
<u>Tube Location</u>	Main Deck	

Table 20. SVTT Mk 32 Mod 19, Support Documentation (Drawings)

Title	Drawing Number
Index List of Drawings	IL 7082009
Assembly List of Drawings	PL 7022419
Assembly Drawing	7022419-1 7022419-2
Installation Drawing	7082020
Lubrication Chart	7081999
Wiring Diagram	6689060
Electrical Schematic	6689124
External Wiring Diagram	6951515
Pneumatic Schematic	6819759

Table 21. SVTT Mk 32 Mod 19, Support Documentation (Technical Manuals)

Type	Number	Title
NAVSEA Technical Manual	SW395-AQ-MMO-010	SVTT Mk 32 Mod 19 and Bulkhead Mounted Control Box Mk 60 Mod 0: Description, Operation, Maintenance, and IPB

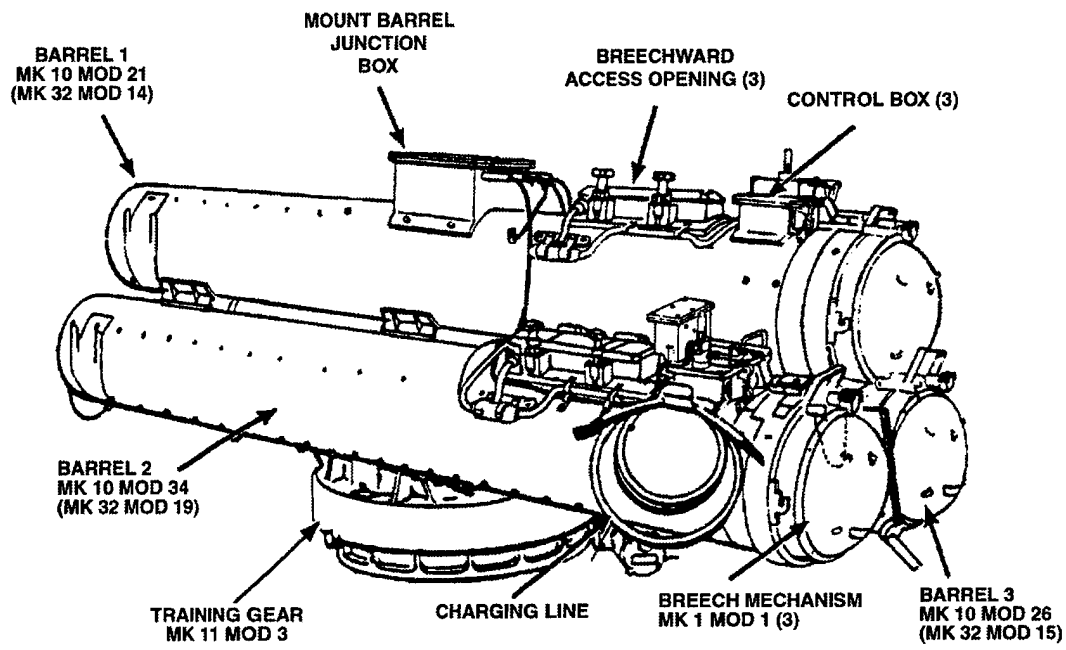
SVTT MK 32 HYBRID TRAINING LAUNCHER (HTL)

SVTT Mk 32 HTL is used by Navy training facilities to train torpedomen on the operation of three mods of the SVTT. The HTL combines barrels from the SVTT Mk 32 Mods 14, 15, and 19 in a triple-barrel launcher mounted on the same training gear used by the Mods 14 and 19. The BMCB Mk 60 Mod 0 provides the capability of selecting either remote or local operation of the torpedo tubes and provides for local training of the launcher. The operation/control box (OCB) is used to operate the HTL and to provide the status indications of the firing interlocks normally monitored by various types of FCSs in the fleet. The SVTT Mk 32 HTL is illustrated in figure 17; a dimensional view is presented in figure 18. The OCB is depicted in figure 19 and the BMCB Mk 60 Mod 0 in figure 9.

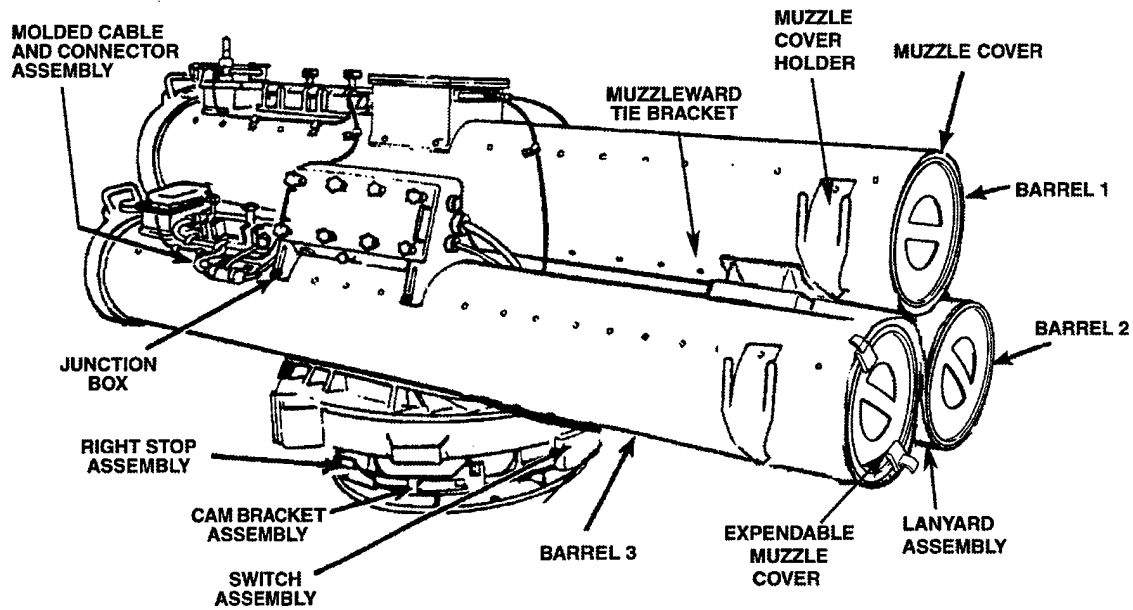
The HTL has three barrels mounted on a common trainable gear assembly. The top barrel is from a SVTT Mk 32 Mod 14; the lower left barrel is from a SVTT Mk 32 Mod 19; and the lower right barrel is from a SVTT Mk 32 Mod 15. The launcher is supplied in the port configuration and is wired for use with the OCB.

The launcher may be fired either remotely or locally. Remote operation and training of the launcher is accomplished at the OCB; local training can be accomplished from the BMCB.

Tables 22 through 24 list requirements, specification, support documentation, and technical manuals for the SVTT Mk 32 HTL and OCB. Applicable ORDALTs are listed in appendix A and points of contact are listed in appendix C.



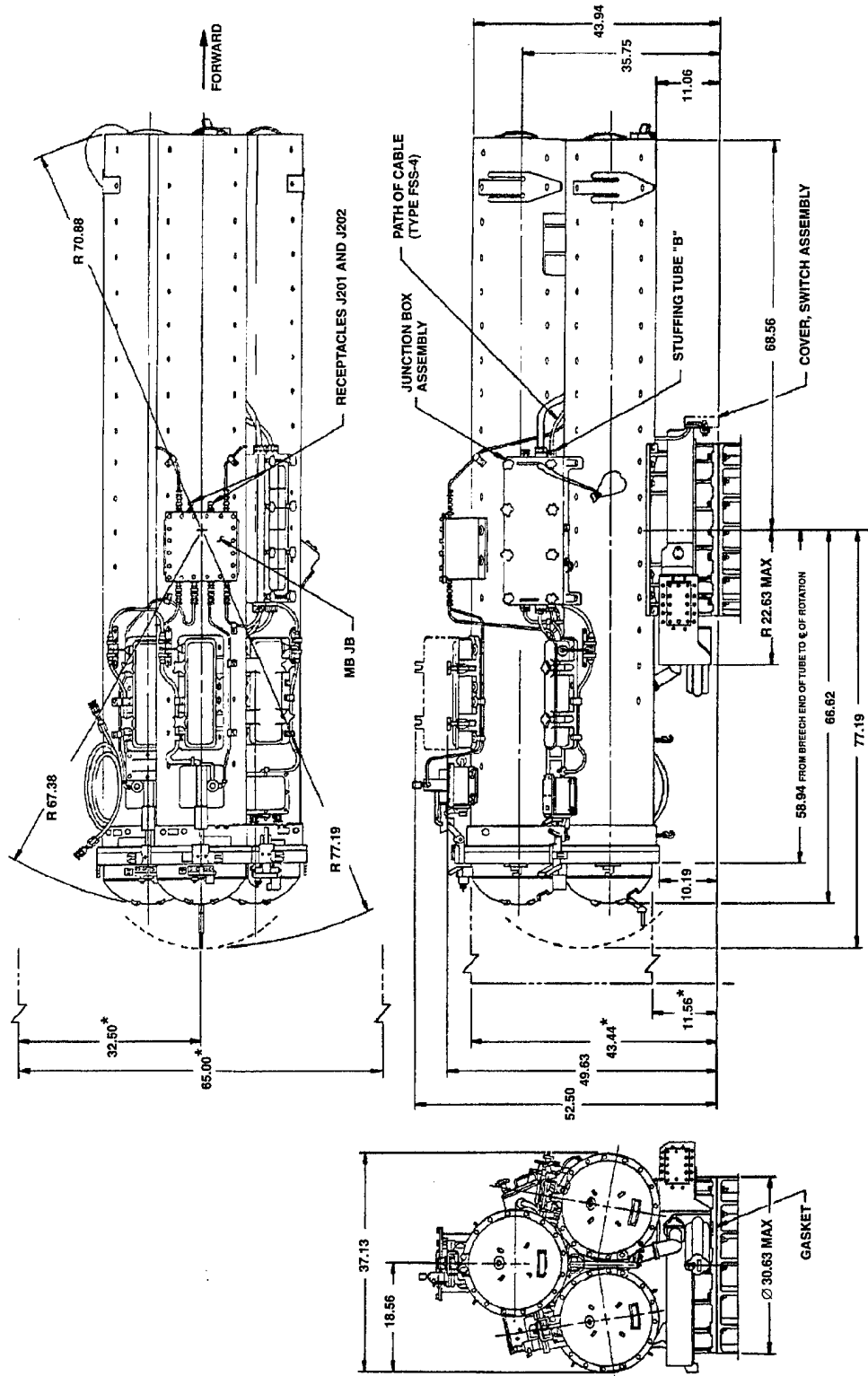
BREECH-END VIEW



MUZZLE -END VIEW

10064C-17

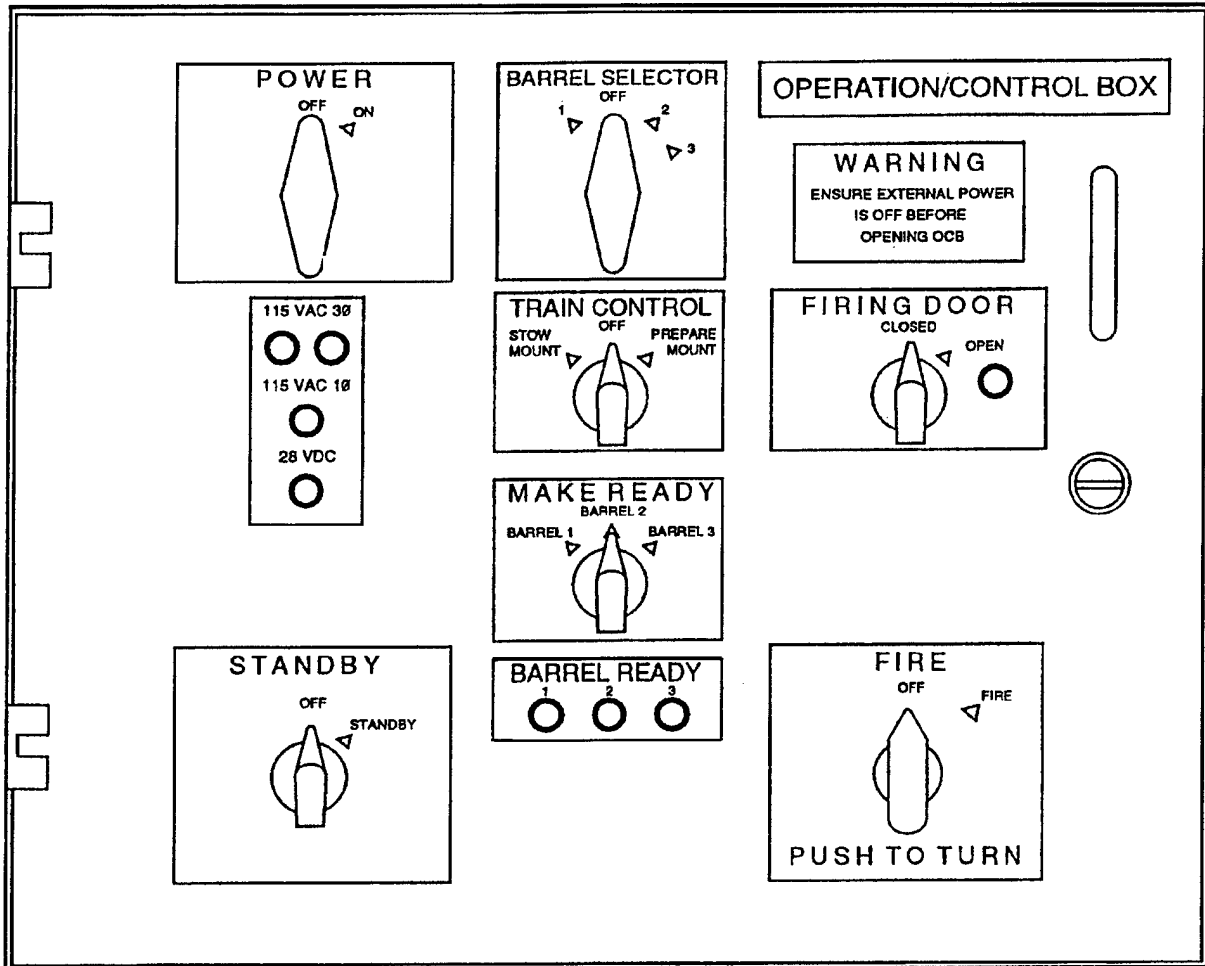
Figure 17. SVTT Mk 32 HTL



10584C-18

NOTE: 1. DIMENSIONS MARKED* DENOTE MINIMUM AREA REQUIRED FOR LOADING TRAY USAGE.
 2. ALL DIMENSIONS ARE IN INCHES.

Figure 18. SVTT Mk 32 HTL, Dimensional View



10064B-19

Figure 19. Operation/Control Box (OCB)

Table 22. SVTT Mk 32 HTL, Requirements and Specifications

<u>Requirement</u>	<u>Specification</u>	
<u>Electrical</u>		
115 Vac, 1Ø, 60 Hz (firing solenoid)	0.23 kVA	
115 Vac, 1Ø, 60 Hz (safe/ready solenoid)	0.23 kVA	
115 Vac, 3Ø, 60 Hz (train drive motor)	0.46 kVA	
115 Vac, 1Ø, 60 Hz (door power)	0.23 kVA	
<u>Pneumatic</u>	<u>Low-Pressure System</u>	<u>High-Pressure System</u>
Minimum source pressure	150 psig	1800 psig
Capacity per air flask	10 in. ³	Steel: 900 in. ³
Maximum charging rate per air flask	2000 psig/min	250 psig/min
Air should be filtered to 50 microns		
<u>Weights</u>		
Tube empty	2350 lb	
Tube loaded (three Torpedoes Mk 46)	3874 lb	
<u>Reaction Loads (firing one barrel only)</u>		
Maximum firing reaction	F = 10,200 lb	
Maximum firing moment (at base of mounting flange)	M = 364,650 in.-lb	
<u>Fire Control System</u>	OCB	
<u>Weapon Capability</u>	Torpedo Mk 46 Advanced Lightweight Torpedoes	
<u>Tube Location</u>	Fleet Training Centers	

Table 23. SVTT Mk 32 HTL, Support Documentation (Drawings)

Title	Drawing Number
Assembly List of Drawings	PL 7022436
Assembly Drawing	7022436
Installation Drawing	7022426
Lubrication Chart	7022421
Wiring Diagram	7022439
Electrical Schematic Diagram	7022437
External Wiring Diagram	7022439
Pneumatic Schematic	7022420

Table 24. SVTT Mk 32 HTL, Support Documentation (Technical Manuals)

Type	Number	Title
NAVSEA Technical Manual	SW395-AP-MMO-010	SVTT Mk 32 Hybrid Training Launcher, Bulkhead Mounted Control Box Mk 60 Mod 0, and Operation/Control Box: Description, Operation, Maintenance, and IPB

TORPEDO LOADING TRAY MKS 2, 3, 7, 8, AND 9

Torpedo loading trays Mk 2, 3, 7 and 8 are used to facilitate loading of Torpedoes Mk 44 and Mk 46 into the SVTT Mk 32. The Mk 9 loading tray is used with Torpedoes Mk 44, Mk 46 and advanced lightweight torpedoes including the Mk 54. Table 25 lists all mods of the SVTT Mk 32 and the compatible mark/mod torpedo loading tray.

The primary purpose of the loading tray is to protect the torpedo against misalignment during loading. The tray also serves as a cradle to stow torpedoes that are removed from the barrel during tube maintenance and dry-firing exercises.

The tray consists of a body, two pairs of legs that pivot about a central stud, a pushing ram, and support lugs that fasten to the torpedo tube breech ring to support the forward end of the loading tray. The basic frame is a welded pipe configuration with recessed areas to permit the removal of the torpedo handling sling and breech mechanism.

Once the correct legs are chosen and the forward end of the loading tray is attached to the support lugs, final vertical adjustment is made by a handwheel located above the legs. A shaft and handle assembly and slotted bracket ensure that the radial alignment of the tray and barrel are correct. After the torpedo is placed in the tray and the securing mechanism attached, the ram is fastened to the securing mechanism. Manual force on the ram will slide the torpedo into the barrel. For the Mk 9 loading tray, a pneumatic loading pole is used to slide the torpedo into the barrel once the torpedo is no longer supported by the tray rollers.

Table 25. SVTT Mk 32 Mod vs Loading Tray Mk/Mod

SVTT Mk 32 Mod	Tray Mk 2		Tray Mk 3		Tray Mk 7	Tray Mk 8	Tray Mk 9			
	Mod 0	Mod 1	Mod 0	Mod 1	Mod 0	Mod 0	Mod 0	Mod 1	Mod 2	Mod 3
5		X								
7	X									
9			X	X						
14	X				X	X				
15									X	
17									X	
19								X	X	X

TORPEDO LOADING TRAY MK 2 MODS 0 AND 1

The Torpedo Loading Tray Mk 2 Mod 0 is used with SVTT Mk 32 Mods 7 and 14 when loading and unloading Torpedoes Mk 44 and Mk 46. The loading tray is illustrated in figure 20; a dimensional view is presented in figure 21.

The Mod 1 tray serves the same function with the SVTT Mk 32 Mod 5 as the Mod 0 tray; however, it uses a special leg assembly to accommodate a barrel height difference due to launcher locations.

More detailed information is provided in SG420-C0-MMO-010, "Description, Installation, Operational Use, and IPB, Torpedo Loading Tray Mk 2 Mods 0 and 1."

Table 26 is a list of drawings for the Mk 2 Mods 0 and 1 loading tray.

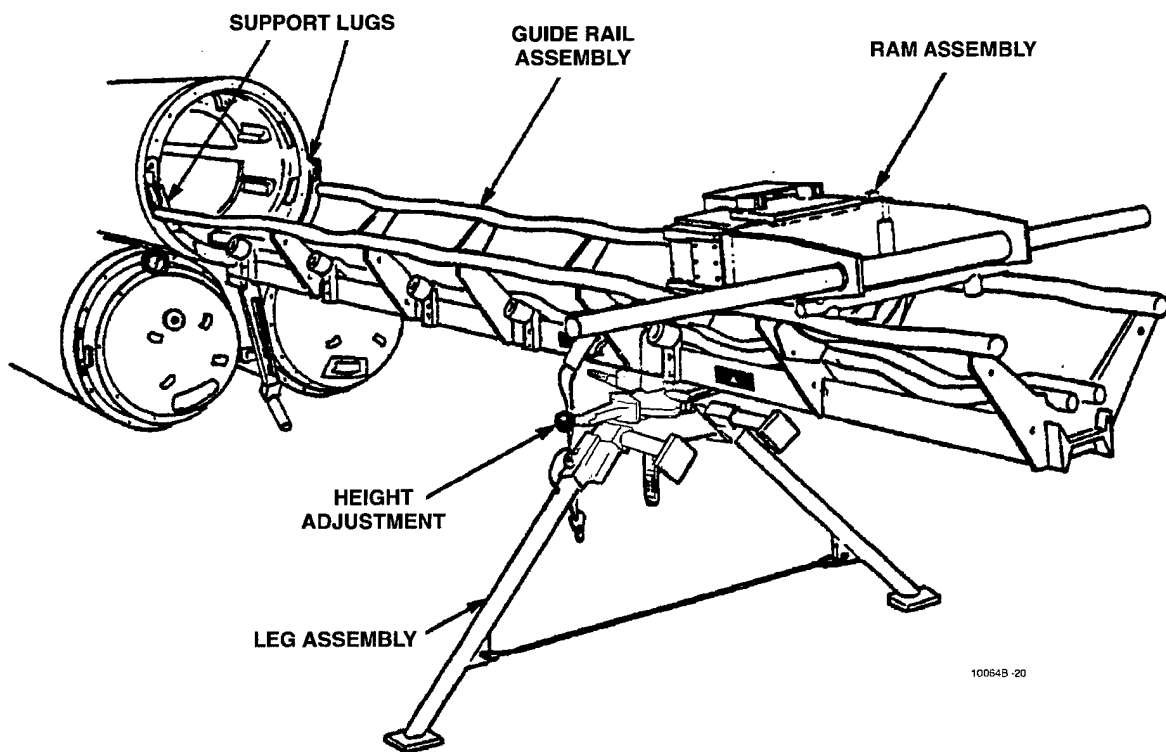


Figure 20. Torpedo Loading Tray Mk 2 Mod 0

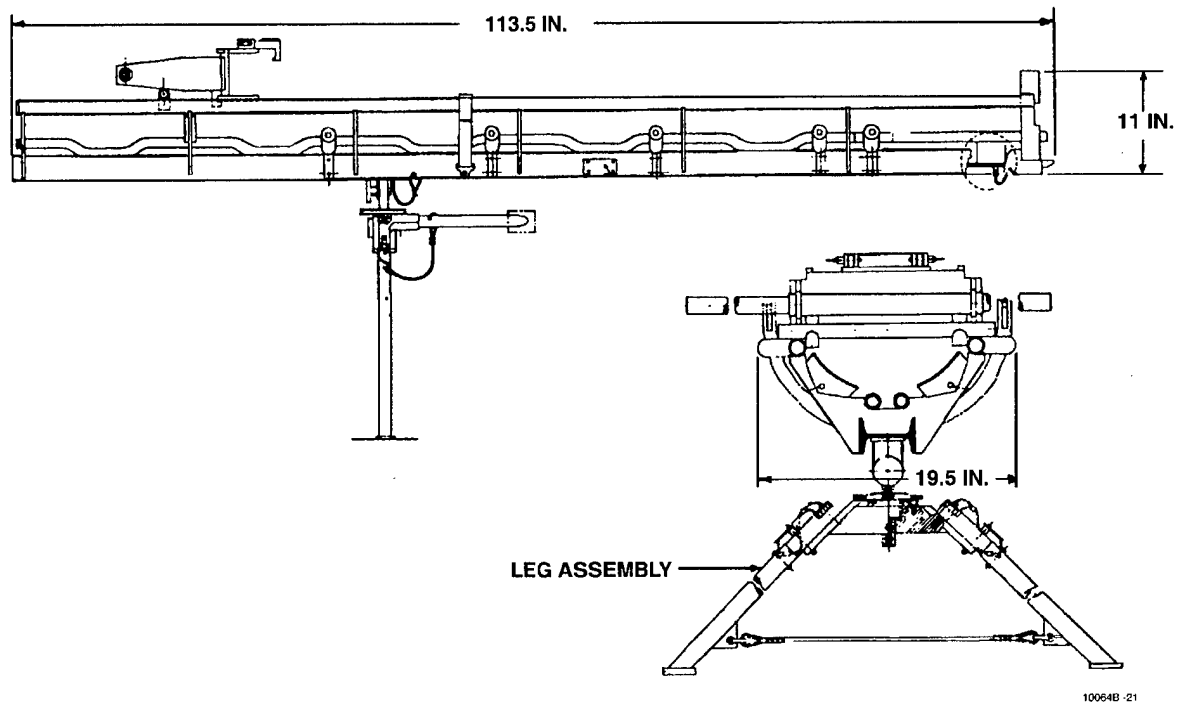


Figure 21. Torpedo Loading Tray Mk 2 Mod 0, Dimensional View

Table 26. Torpedo Loading Tray Mk 2 Mods 0 and 1, Support Documentation (Drawings)

Title	Drawing Numbers	
	Mod 0	Mod 1
Assembly List of Drawings	LD 162165	LD 162165
Tray Assembly	1623836	5206050
Cradle Assembly	5545610	5545961
Leg Assembly	2882859	5206051
Ram Assembly	1623850	1623850

TORPEDO LOADING TRAY MK 3 MODS 0 AND 1

Torpedo Loading Tray Mk 3 Mod 0 is used with SVTT Mk 32 Mod 9 when loading and unloading Torpedoes Mk 44 and Mk 46. The loading tray is illustrated in figure 22; a dimensional view is presented in figure 23.

Torpedo Loading Tray Mk 3 Mod 1 is used with SVTT Mk 32 Mod 9 and serves the same purpose as the Mod 0 tray except for a modified leg assembly that fits the torpedo rooms on different classes of ships.

More detailed information is provided in NAVORD OP 4066, "Description, Installation and Operational Use, Torpedo Loading Tray Mk 3 Mods 0 and 1."

Table 27 is a list of drawings for the Torpedo Loading Tray Mk 3 Mods 0 and 1.

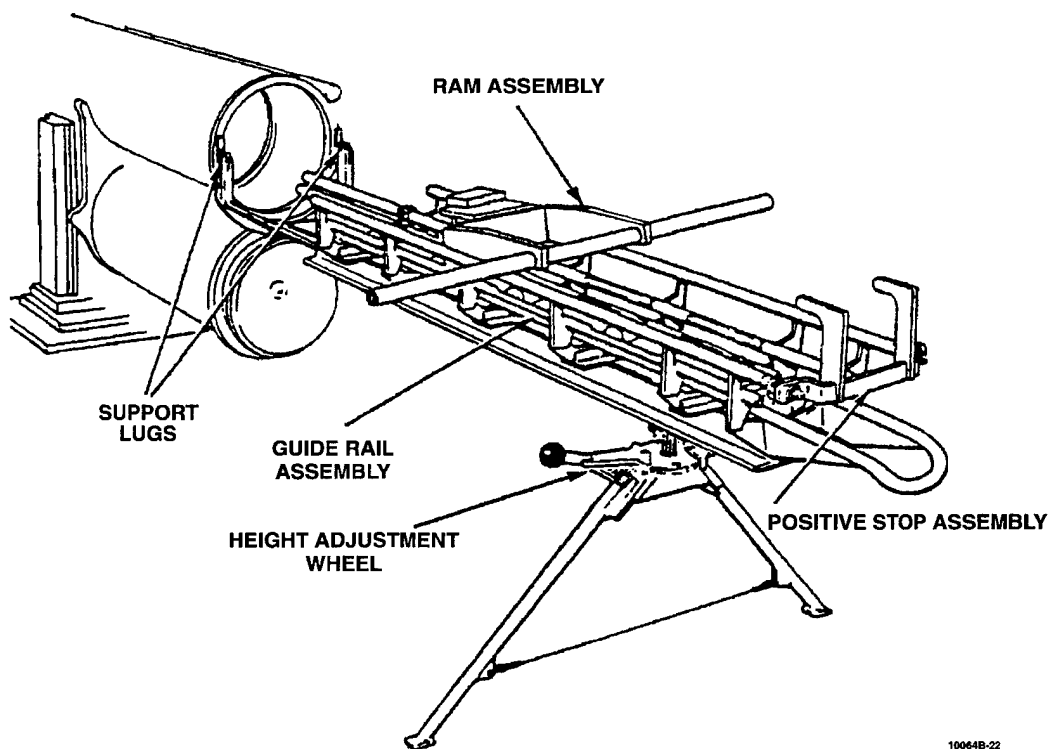


Figure 22. Torpedo Loading Tray Mk 3 Mod 0

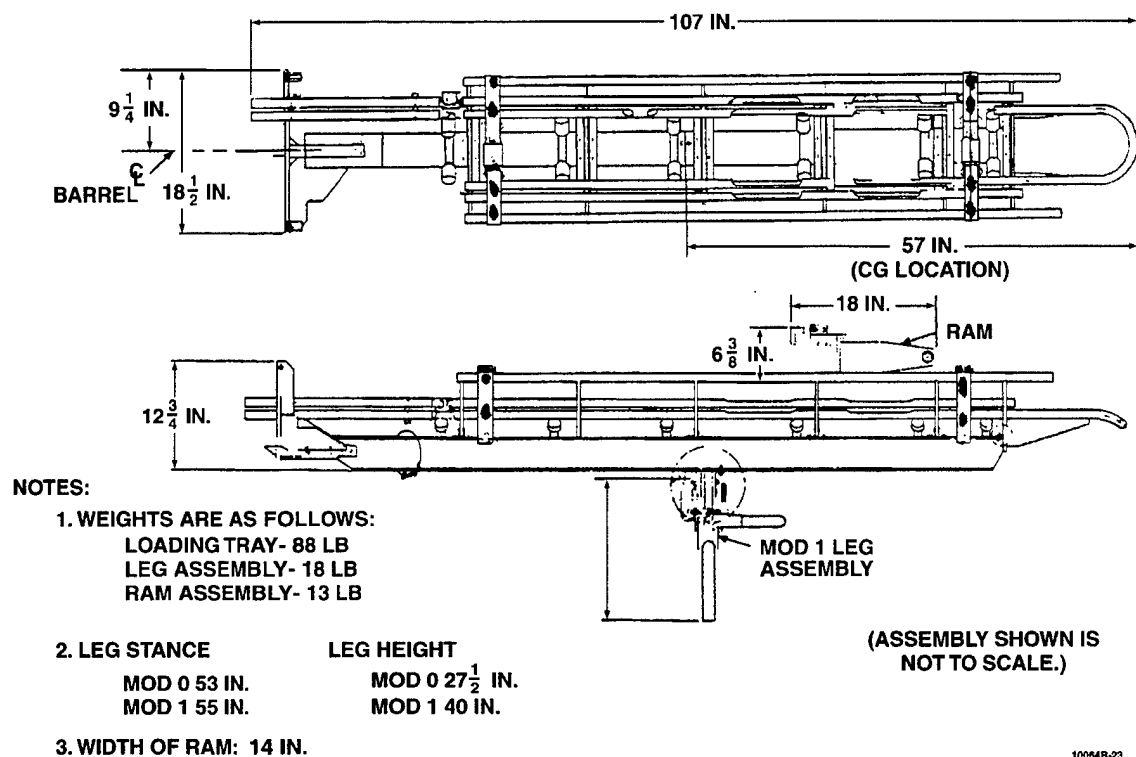


Figure 23. Torpedo Loading Tray Mk 3 Mod 0, Dimensional View

Table 27. Torpedo Loading Tray Mk 3 Mods 0 and 1, Support Documentation (Drawings)

Title	Drawing Numbers	
	Mod 0	Mod 1
Assembly List of Drawings	LD 621171	LD 621171
Tray Assembly	2882757	3029941
Leg Assembly	1623969	3029994
Ram Assembly	1623984	1623984

TORPEDO LOADING TRAYS MK 7 MOD 0 AND MK 8 MOD 0

Torpedo Loading Tray Mk 7 Mod 0 is used with SVTT Mk 32 Mod 14 when loading and unloading the Torpedo Mk 46 in CG 47 class ships (starboard torpedo room no. 1). The loading tray is illustrated in figure 24; a dimensional view is presented in figure 25.

Torpedo Loading Tray Mk 8 Mod 0 is used with SVTT Mk 32 Mod 14 when loading and unloading the Torpedo Mk 46 in CG 47 class ships (port torpedo room no. 2). The loading tray is illustrated in figure 26; a dimensional view is presented in figure 27.

Due to the different configurations of the port and starboard torpedo rooms, two different loading trays are required. The two loading trays use the same leg assembly and ram assembly, but differ in length of the cradle assembly and position of lashing straps. The cradle assemblies are illustrated in figure 28. Support documentation is listed in tables 28 and 29.

Table 28 is a list of drawings for the Mk 7 and Mk 8 loading trays. Table 29 lists the applicable technical manuals.

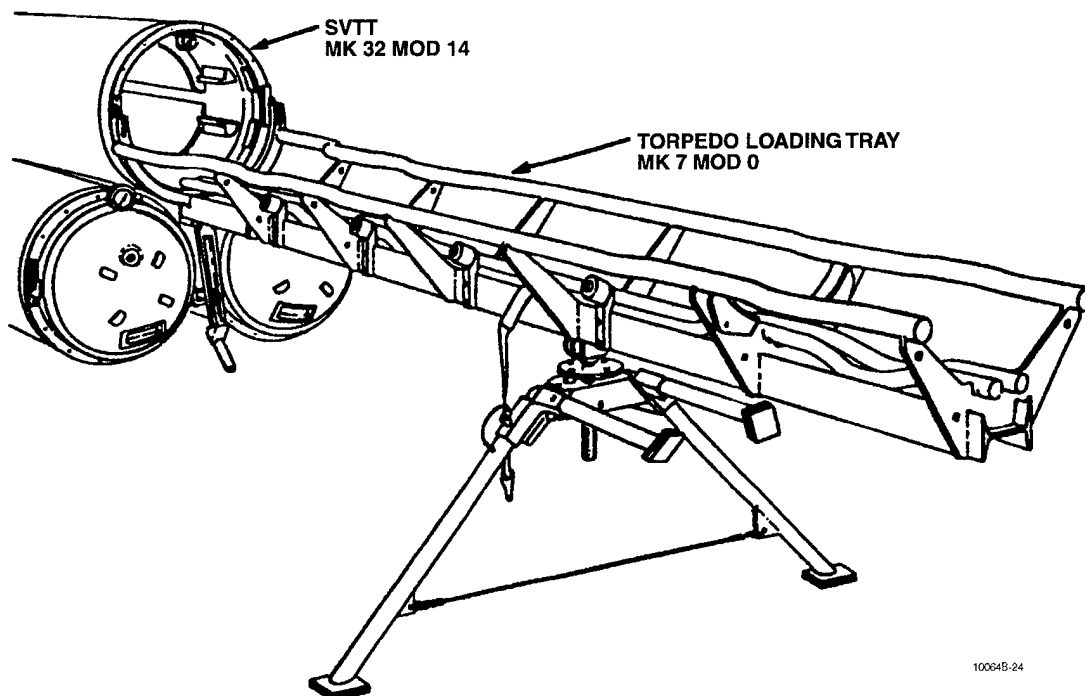


Figure 24. Torpedo Loading Tray Mk 7 Mod 0

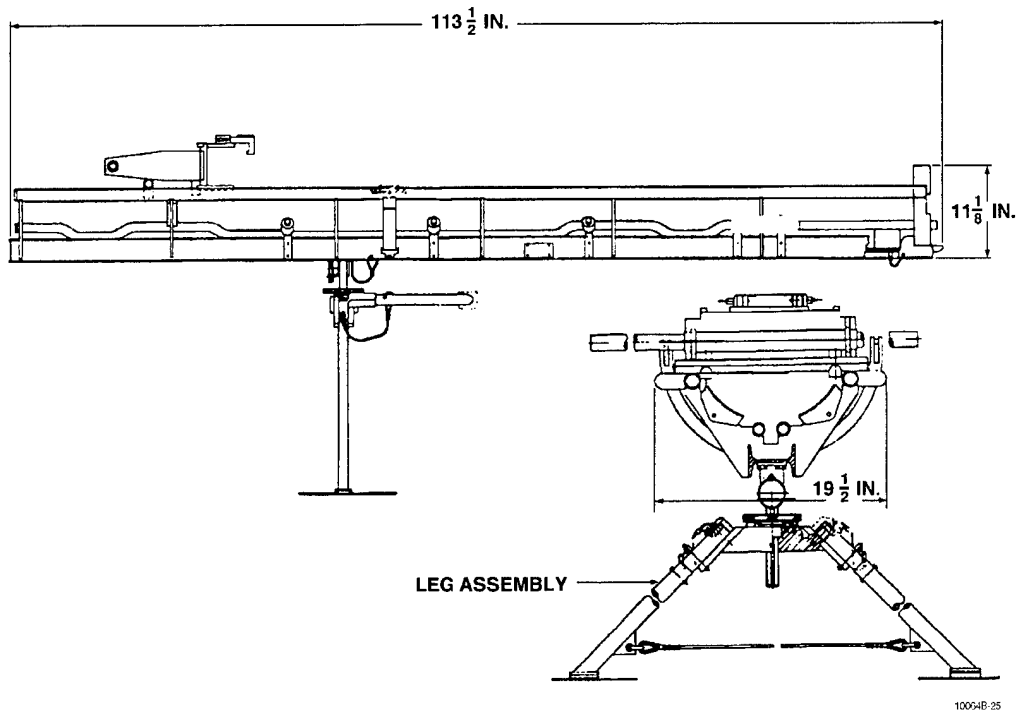


Figure 25. Torpedo Loading Tray Mk 7 Mod 0, Dimensional View

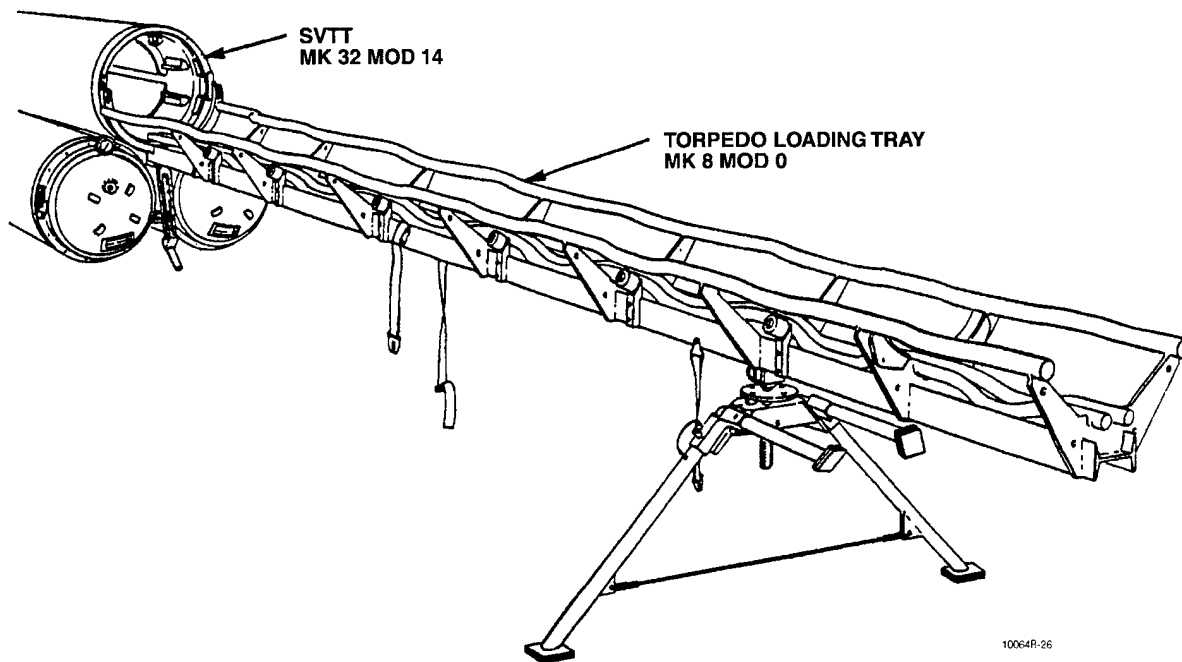


Figure 26. Torpedo Loading Tray Mk 8 Mod 0

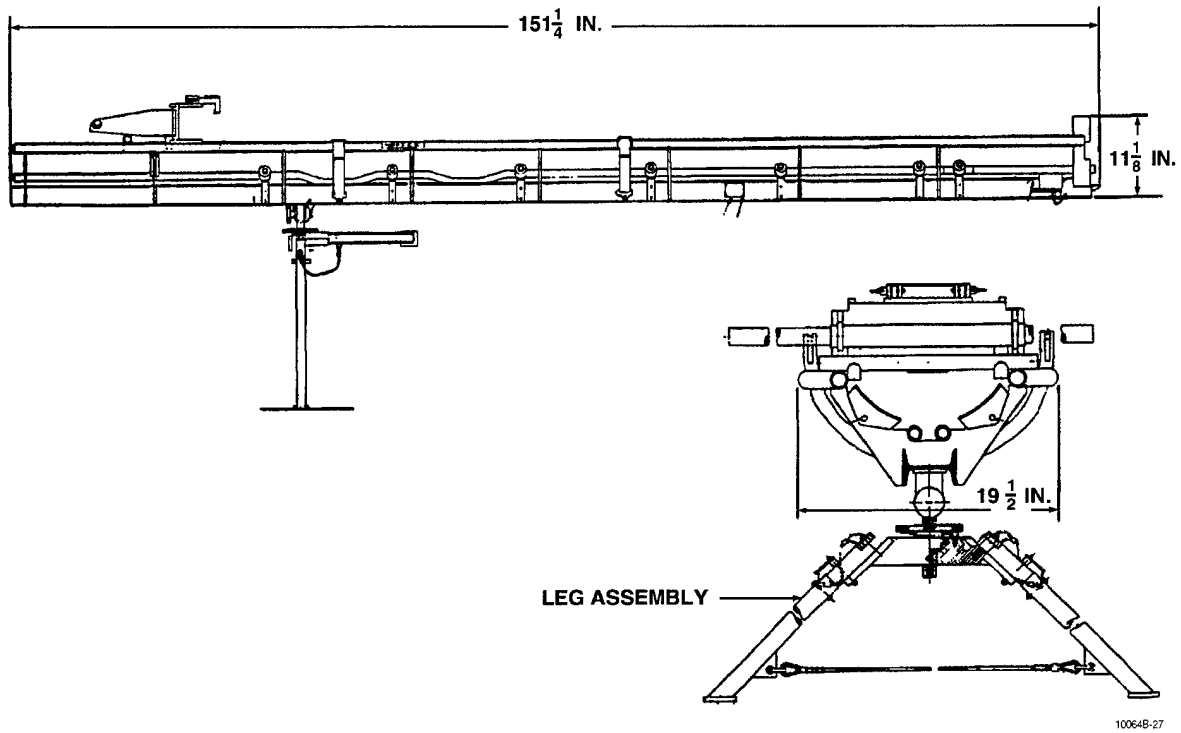
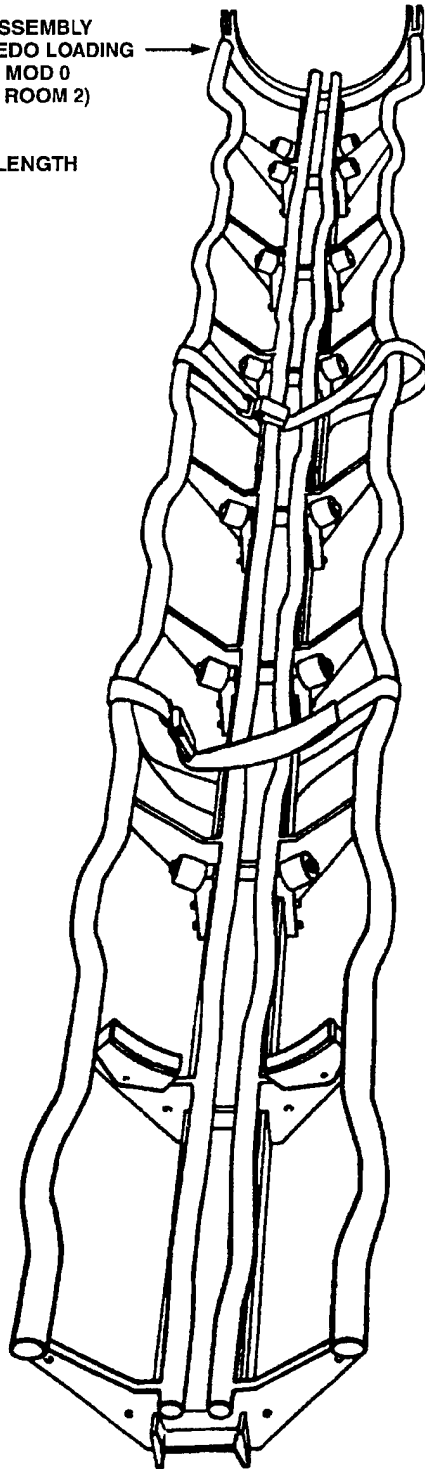


Figure 27. Torpedo Loading Tray Mk 8 Mod 0, Dimensional View

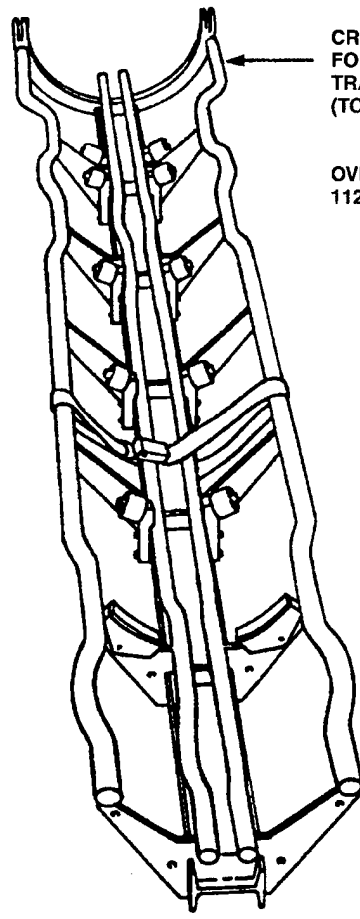
CRADLE ASSEMBLY
FOR TORPEDO LOADING
TRAY MK 8 MOD 0
(TORPEDO ROOM 2)

OVERALL LENGTH
151 IN.



CRADLE ASSEMBLY
FOR TORPEDO LOADING
TRAY MK 7 MOD 0
(TORPEDO ROOM 1)

OVERALL LENGTH
112 IN.



100648-26

Figure 28. Cradle Assemblies for Torpedo Loading Trays Mk 7 and Mk 8

**Table 28. Torpedo Loading Trays Mk 7 and Mk 8,
Support Documentation (Drawings)**

Title	Drawing Number	
	Mod 7 Mod 0	Mk 8 Mod 0
Assembly List of Drawings	LD 632022	LD 632022
Tray Assembly	5545411	5545548
Cradle Assembly	5545609	5545608
Leg Assembly	2882859	2882859
Ram Assembly	1623850	1623850

**Table 29. Torpedo Loading Trays Mk 7 and Mk 8, Support
Documentation (Technical Manuals)**

Type	Number	Title
NAVSEA Technical Manual	SG420-BG-MMO-010	Torpedo Loading Tray Mk 7 Mod 0: Description, Installation, Operational Use, and IPB
NAVSEA Technical Manual	SG420-BH-MMO-010	Torpedo Loading Tray Mk 8 Mod 0: Description, Installation, Operational Use, and IPB

TORPEDO LOADING TRAYS MK 9 MODS 0, 1, 2, AND 3

Torpedo Loading Tray Mk 9 Mod 0 is used with SVTT Mk 32 Mods 15 and 17 when loading and unloading Torpedoes Mk 44, Mk 46, and advanced lightweight torpedoes including the Mk 54. The Mk 9 Mod 0 tray replaces Torpedo Loading tray Mk 2 Mod 1 on advanced lightweight torpedoes capable ships. The loading tray is illustrated in figure 29; a dimensional view is presented in figure 30.

The Torpedo Loading Tray Mk 9 Mod 1 is used with SVTT Mk 32 Mod 19 when loading and unloading torpedoes on CG 47 class ships (starboard torpedo room no. 1). The Torpedo Loading Tray Mk 9 Mod 1 replaces the Torpedo Loading Tray Mk 7 Mod 0 on advanced lightweight torpedo capable ships. The Torpedo Loading Tray Mk 9 Mod 1 is illustrated in figure 31.

The Torpedo Loading Tray Mk 9 Mod 2 is used with SVTT Mk 32 Mod 19 when loading and unloading torpedoes on CG 47 class ships (port torpedo room no. 2). The Torpedo Loading Tray Mk 9 Mod 2 replaces the Torpedo Loading Tray Mk 8 Mod 0 on advanced lightweight torpedo capable ships. The Torpedo Loading Tray Mk 9 Mod 2 is illustrated in figure 32.

The Torpedo Loading Tray Mk 9 Mod 3 is used with SVTT Mk 32 Mod 19 when loading and unloading torpedoes on DD 963 class ships. The Torpedo Loading Tray Mk 9 Mod 3 replaces the Torpedo Loading Tray Mk 2 Mod 0 on advanced lightweight torpedo capable ships. The Torpedo Loading Tray Mk 9 Mod 3 is illustrated in figure 33.

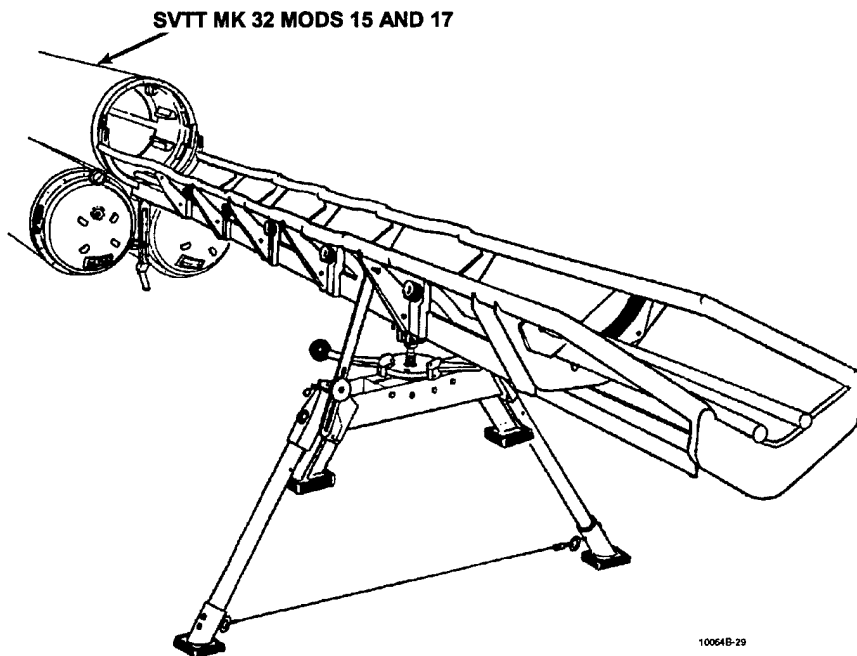
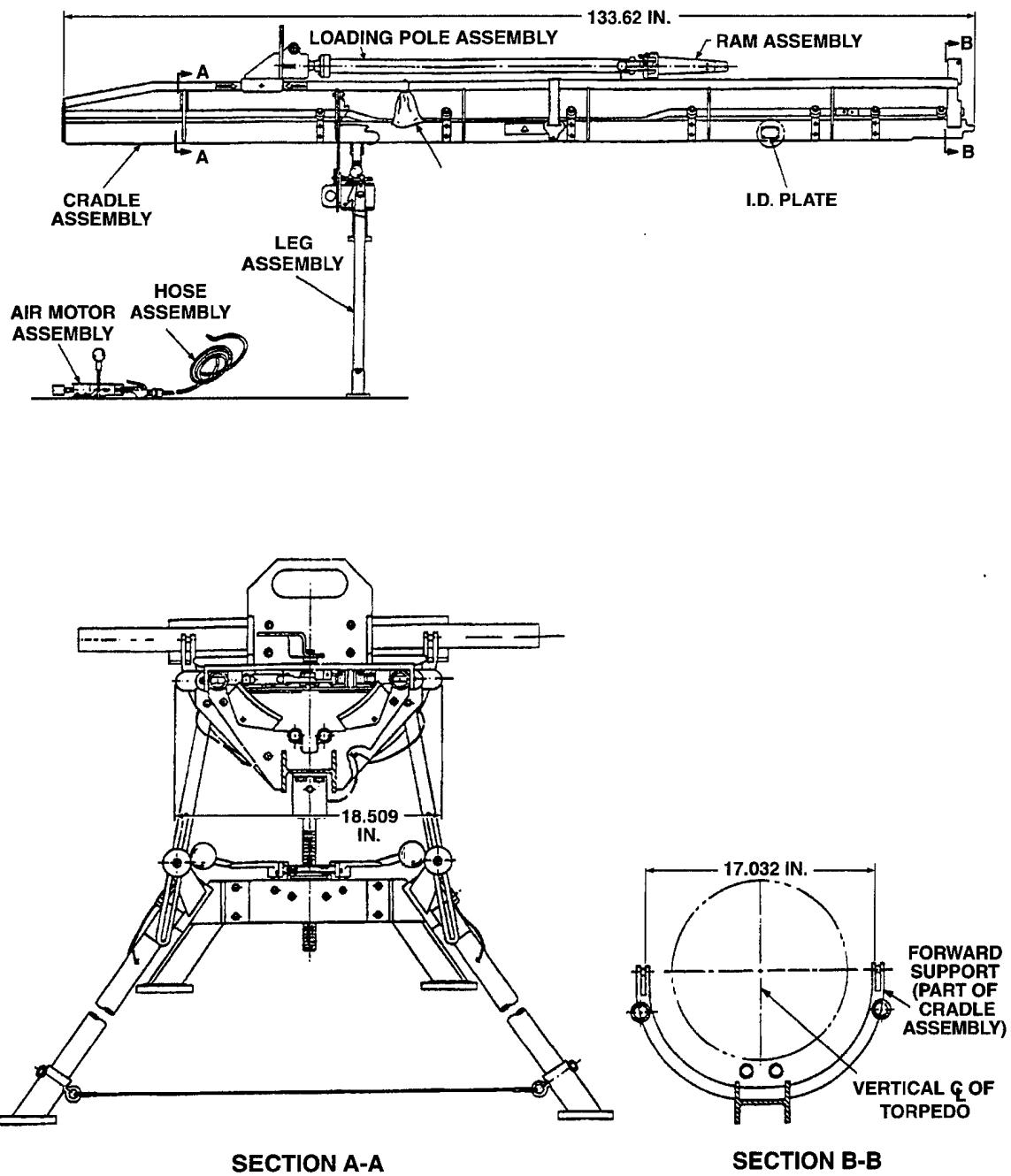


Figure 29. Torpedo Loading Tray Mk 9 Mod 0



10064B-30

Figure 30. Torpedo Loading Tray Mk 9 Mod 0, Dimensional View

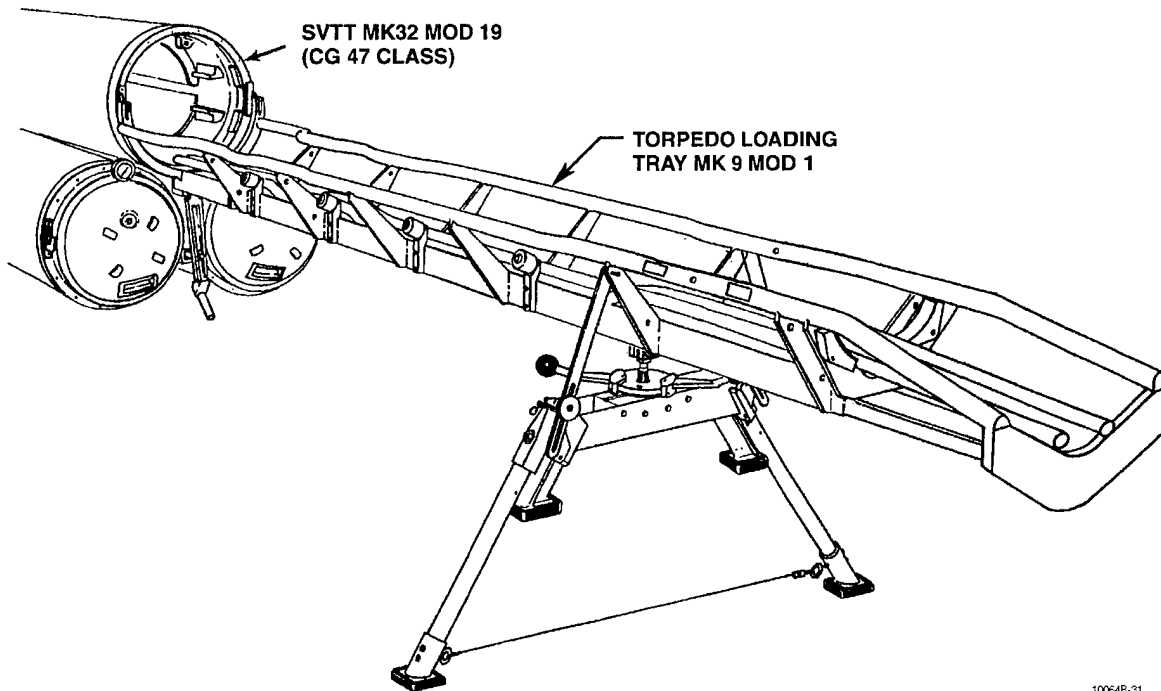


Figure 31. Torpedo Loading Tray Mk 9 Mod 1

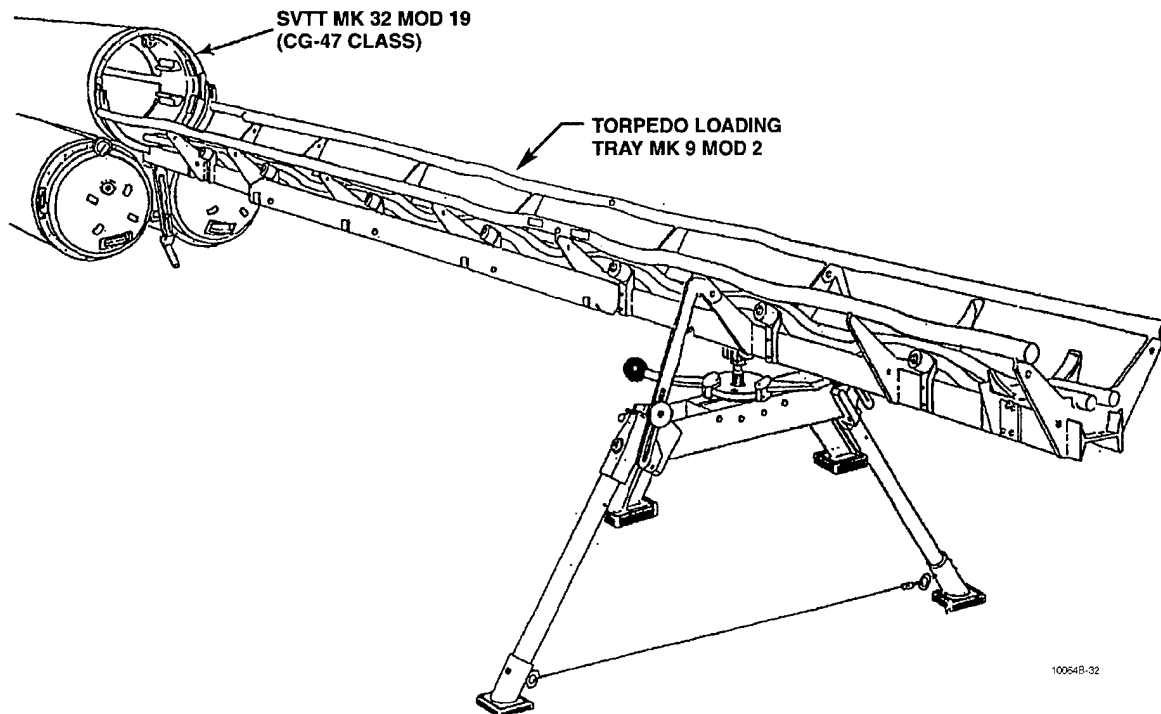
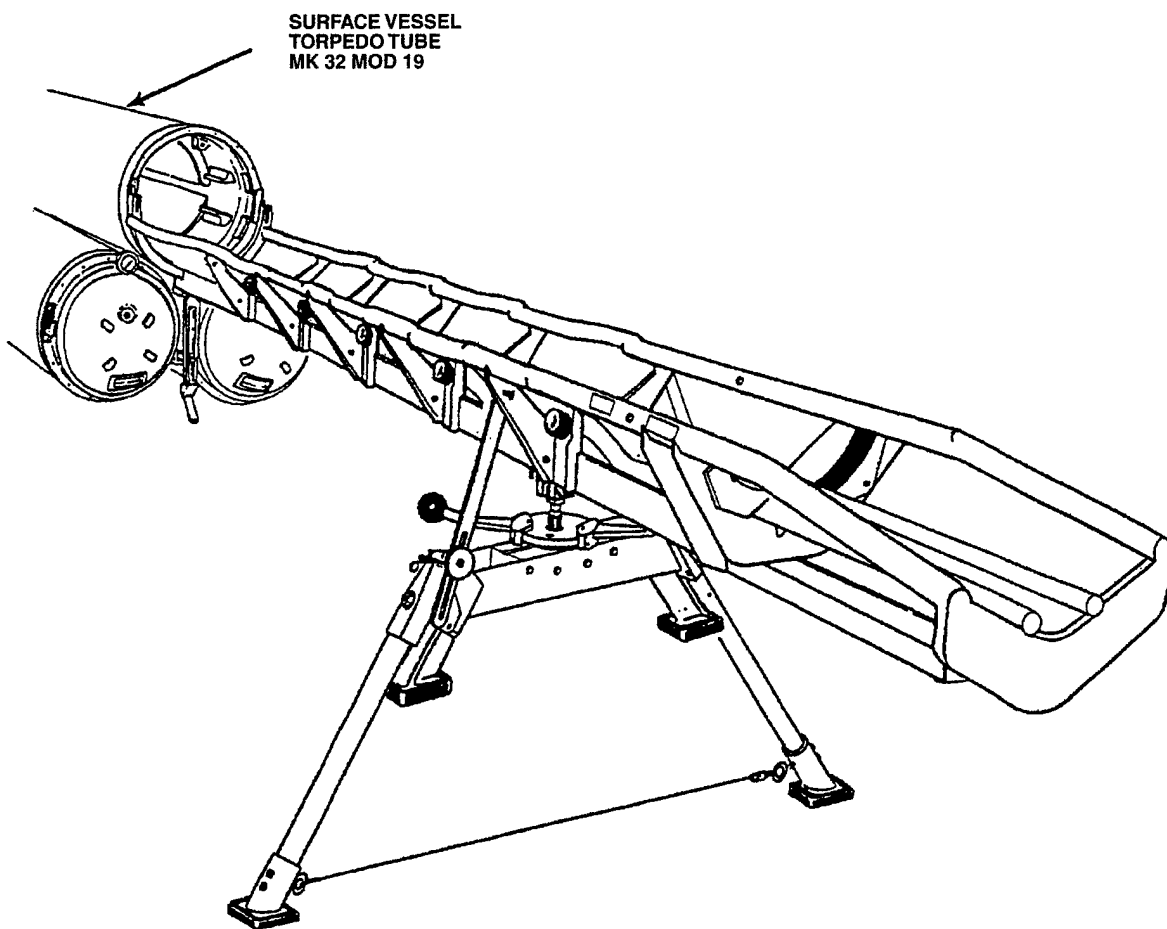


Figure 32. Torpedo Loading Tray Mk 9 Mod 2



10064C-33

Figure 33. Torpedo Loading Tray Mk 9 Mod 3

Table 30 is a list of drawings, and table 31 lists the applicable technical manuals for the Mk 9 loading tray.

**Table 30. Torpedo Loading Tray Mk 9 Mods 0, 1, 2, and 3
Support Documentation (Drawings)**

Title	Drawing Number			
	Mod 0	Mod 1	Mod 2	Mod 3
Loading Tray Assembly	5979700	5978891	5978892	5979689
Cradle Assembly	6688973	6819771	6819752	6688973
Leg Assembly	6657353	6951498	6951498	6951498
Ram Assembly	6657349	6657349	6657349	6659349
Loading Pole Assembly	6657356	6657356	7022432	6657356
Air Motor Assembly	6657359	6657359	6657359	6657359

**Table 31. Torpedo Loading Trays Mk 9 Mods 0, 1, 2, and 3,
Support Documentation (Technical Manuals)**

Type	Number	Title
NAVSEA Technical Manual	SG420-CG-MMO-010/ TLT Mk 9 Mods 0-3	Torpedo Loading Tray Mk 9 Mods 0, 1, 2, and 3: Description, Installation, Operational Use, and IPB
NAVSEA Technical Manual	TG420-CG-MMO-010/ TLT Mk 9 Mods 0-3 (FMS)	Torpedo Loading Tray Mk 9 Mods 0, 1, 2, and 3 for Foreign Military Use: Description, Installation, Operational Use, and IPB

ASSOCIATED EQUIPMENT

PRESSURE GAUGE AND PRESSURE SWITCH CALIBRATION TOOL

The pressure gauge and pressure switch calibration tool (figure 34) is a portable, lightweight calibration tool stored and transported in a lightweight case used to ensure the accuracy of both the breech-mounted pressure gauge and the pressure switch installed within the control box. Table 34 identifies the drawing for the calibration tool.

The breech-mounted pressure gauge requires calibration every 18 months. Previously, it was necessary to remove the gauge and send it to the shore-based calibration lab for calibration. Using the new calibration tool, removal and transport of the pressure gauge is no longer necessary. Calibration of breech-mounted pressure gauges can now be performed at the SVTT Mk 32 mount without removal of the gauges, thereby reducing man-hours to perform calibration as well as eliminating the risk of gauge damage or loss.

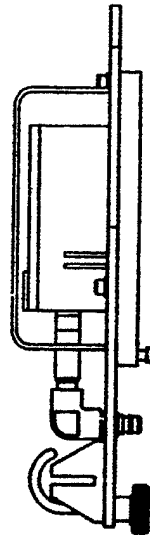
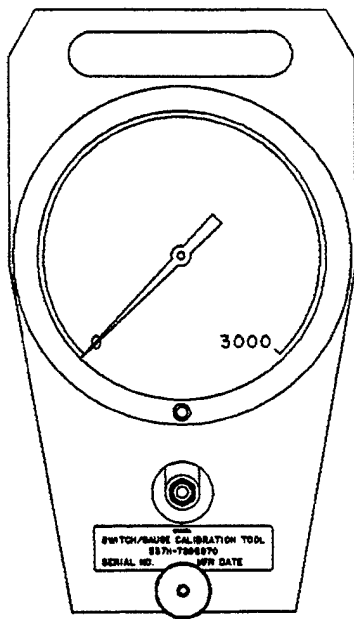
Additionally, the calibration tool is used to ensure the accuracy of the pressure switch within the control box which, in turn, verifies that minimum air pressure is present at the launcher to safely fire the weapon. Previously, the switch was tested by monitoring the ship's fire control system while charging the breech mechanism. This necessitated personnel to be stationed at the fire control system as well as the launcher. Using the new calibration tool, all testing is performed at the launcher simultaneously with the calibration of the breech-mounted pressure gauge, thereby further reducing overall maintenance man-hour requirements.

AIR CHARGING PANEL MK 429 MOD 1

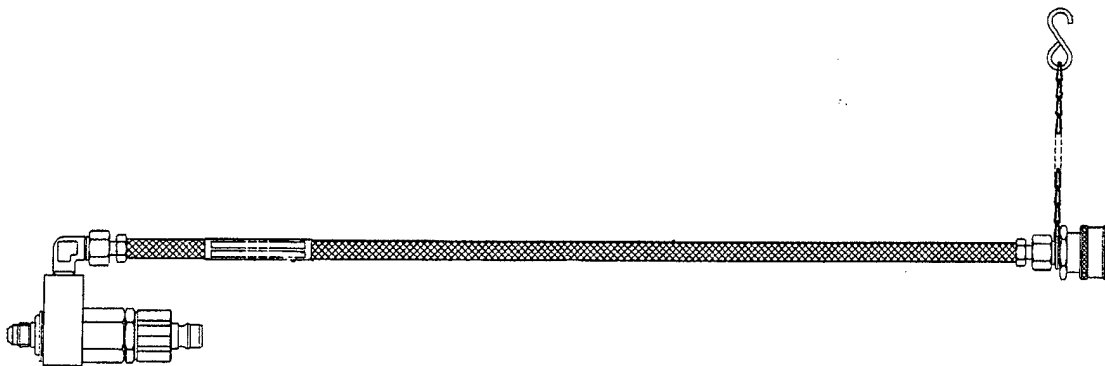
The ACP Mk 429 Mod 1, figure 35, provides a controlled rate of high-pressure air for charging breech mechanisms of the SVTT Mk 32. The ACP provides up to 1850 psig for charging breech mechanisms, and 150 psig for launcher maintenance and operation of the Torpedo Loading Tray Mk 9, all from a ship's high-pressure air supply of up to 5000 psig. Relief valves are provided after the high- and low-pressure regulators to prevent the pressure from exceeding a safe limit. Table 34 identifies the drawing, and table 35 identifies the technical manual for the air charging panel.

HYDROSTATIC TEST SET

The hydrostatic test set, figure 36, is a Sprague Model S-440-35 used to perform hydrostatic tests on the high-pressure air flask. The hydrostatic test set is a portable unit with an approximate pressure ratio of 35 to 1, fluid to air. Three connections are required to initiate operation of the unit: (1) to an air supply, (2) to a fluid source, and (3) to the air flask. The distribution of hydrostatic test sets is limited to tenders, and testing is performed by intermediate maintenance activity (IMA) personnel. Table 34 identifies the drawing for the test set.

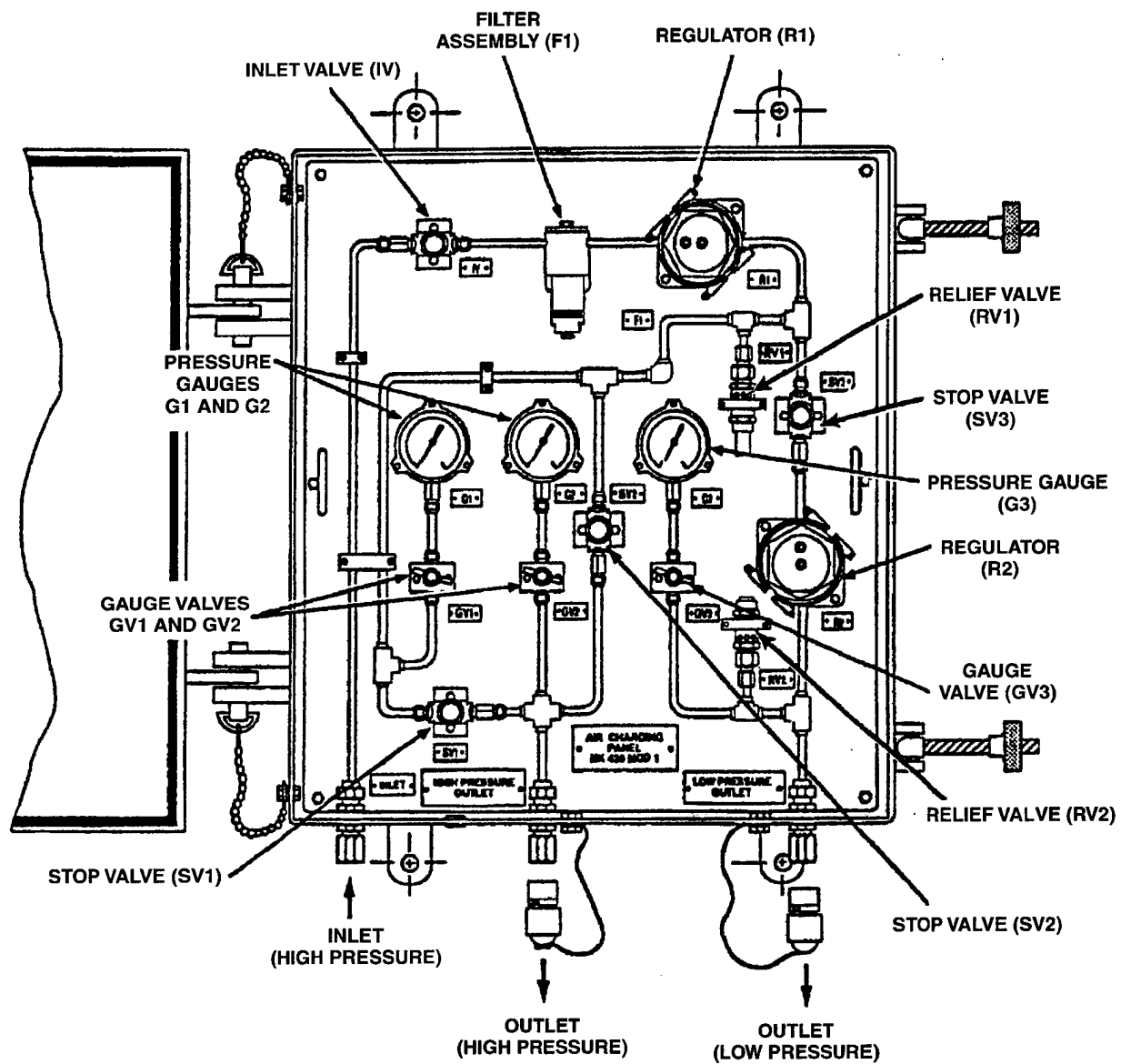


GAUGE AND BRACKET ASSEMBLY



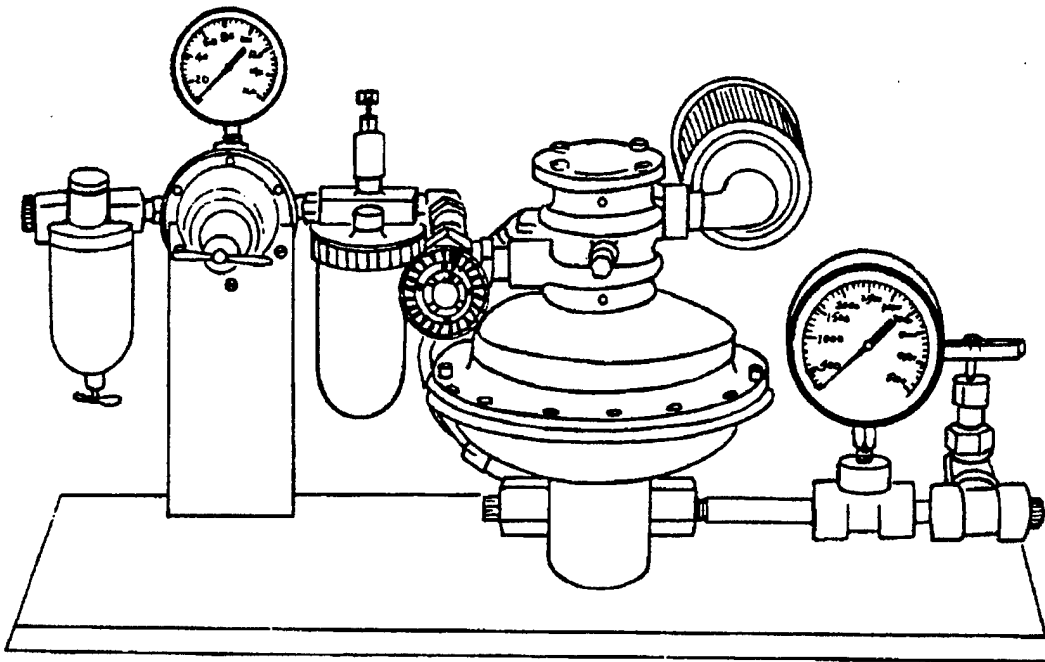
HOSE AND FITTING ASSEMBLY

Figure 34. Pressure Gauge and Pressure Switch Calibration Tool



10064B-34

Figure 35. Air Charging Panel and Cabinet Assembly Mk 429 Mod 1

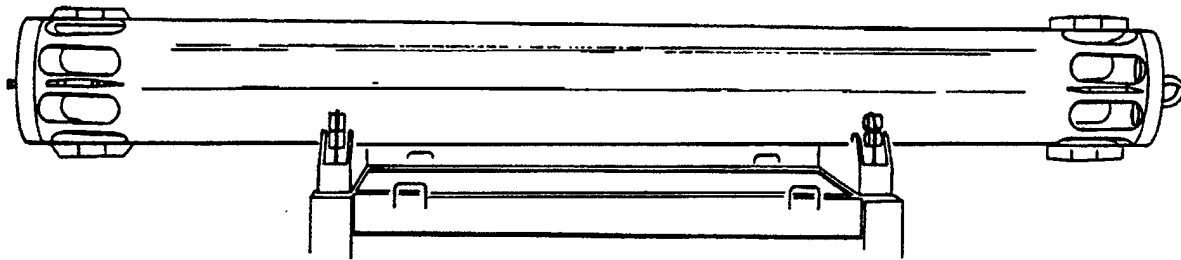


10064B-95

Figure 36. Hydrostatic Test Set

BORE GAUGE

The bore gauge, figure 37, is used to verify concentricity, straightness, and minimum internal diameter of the SVTT Mk 32. The gauge body is a composition of lightweight, noncorrosive fiberglass and aluminum. The exterior coating of the gauge is composed of a graphite-impregnated glass/epoxy resin that is temperature-cured for dimensional stability. A heat-treated alloy steel-end piece is attached to each end of the gauge body. Four fins are attached to each end piece. The aft or breech end has a precisely located spherical ball attachment engaged by the securing mechanism during entry or removal of the gauge. A swivel eyebolt on the forward or muzzle end is used for handling purposes. Handholes in the end pieces are also provided for handling purposes. Table 34 identifies the drawing for the bore gauge.



10064B-36

Figure 37. Bore Gauge

BREECH MECHANISM STOWAGE RACK

The breech mechanism stowage rack is mounted to the bulkhead by hinges and is designed to secure the breech mechanisms during charging or loading operations. The rack is located to facilitate easy use of the 10-foot charging line. The hinged configuration allows the stowage rack to be collapsed and locked when not in use. The stowage rack is illustrated in figure 38. Table 34 identifies the drawing for the stowage rack.

TORPEDO TEST SHAPE (TTS) MK 2 MOD 0 AND SHIPPING AND STORAGE CONTAINER MK 778 MOD 0

The Torpedo Test Shape (TTS), transported and stored in the Shipping and Storage Container Mk 778 Mod 0, figure 39, is designed to provide an accurate weight measurement for rated, dynamic and static testing for all SVTT Mk 32 loading trays. Selected shore activities and shipyards have been provided with a TTS. Weight tests are achieved using various compensation weight configurations. The TTS is marked with color coding to allow for quick and accurate setup. Procedures and color setups are discussed below. Tables 32 through 35 list TTS and container characteristics, load requirements, and reference documentation, respectively.

Torpedo Test Shape Mk 2 Mod 0

The TTS Mk 2 Mod 0 shape is a cylindrical configuration with a 12.75-inch diameter, approximately 98.12 inches long without its tail extension assembly (Torpedo Mk 46 configuration) and 113.42 inches long with the tail extension assembly (advanced lightweight torpedo configurations). The noncompensated shape without the tail extension assembly weighs approximately 521 pounds. Two open compartments are provided, forward and aft, to allow for insertion of compensation weights on the weight runners. The TTS has a keyway cut in the lower aft and that aligns with a key welded to the aft shock mount of the shipping and storage container that prevents forward and aft shifting when transporting the shape. The tail section of the TTS has a hole through to the aft compartment and is used for removing weights from the aft compartment.

There is a forward, mid, and aft bulkhead providing separation of the two compartments and the nose section. The TTS has four color coded bands (red, yellow, white, and green) painted inside the forward compartment and three bands (red, yellow, and white) in the aft compartment to indicate the specific weight test configuration of the shape. Two threaded inserts at the approximate top center of the shape allow an eyebolt to be installed for lifting the shape. The forward insert is used for lifting the Torpedo Mk 46 configuration and the aft insert is used when lifting advanced lightweight torpedo configurations with the tail extension assembly attached. The eyebolt is an optional lift procedure. However, lifting straps or choke straps may be used when it is more convenient.

Shipping and Storage Container Mk 778 Mod 0

The Shipping and Storage Container Mk 778 Mod 0 is used for shipping and storage of the TTS, weight carriages, weights, lift bar, 1-inch lifting eyebolt, 1/4-20 eyebolt (for removal of 75-pound weights from the TTS), and tail extension assembly. The container is approximately 194.5 inches long and is constructed of sheet aluminum. The container lid is held in place by 10 snap clamps. A vent valve on the end of the container allows pressure to be vented from the container prior to opening. The weight carriages (approximately 530 pounds each, fully loaded) are installed on each end of the container. The TTS (approximately 521 pounds) is clamped in place along the center line of the container between the weight carriages. The lift bar and tail extension assembly are stowed in a steel-mesh box attached to the forward port side of the container. The 1-inch lifting eyebolt and the 1/4-20 eyebolt (for removal of 75-pound weights from TTS) are stowed in a steel box attached to the aft port side of the container.

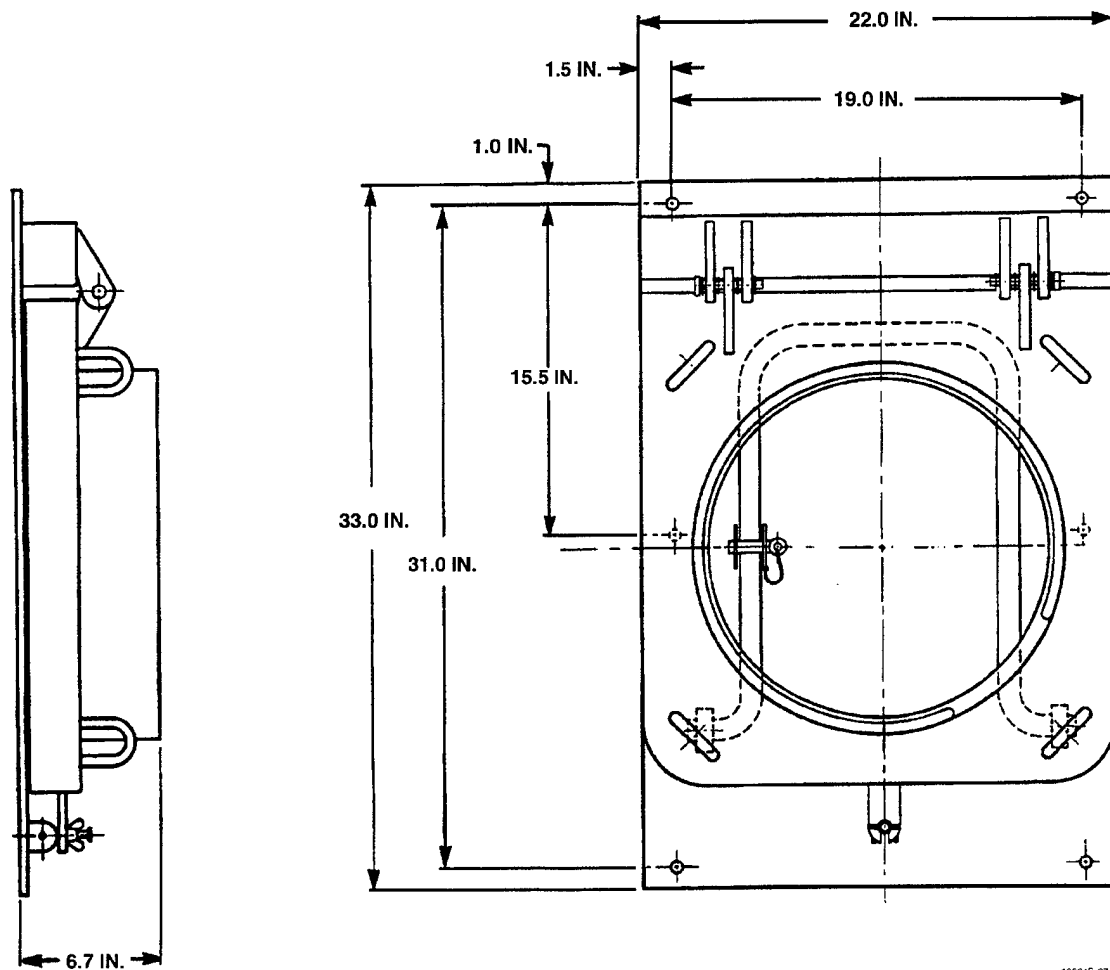


Figure 38. Breech Mechanism Stowage Rack

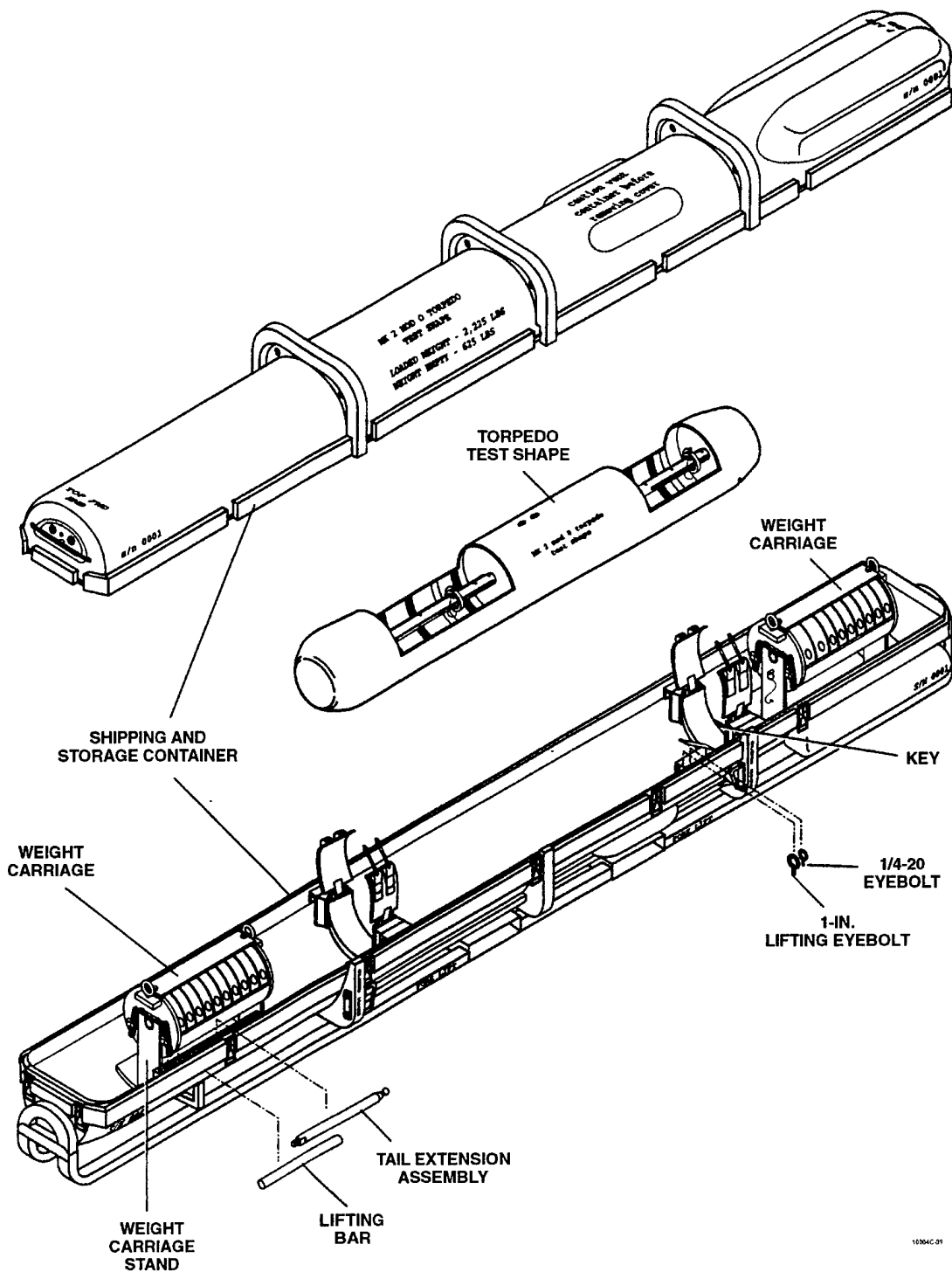


Figure 39. Torpedo Test Shape Mk 2 Mod 0 and Shipping and Storage Container Mk 778 Mod 0

Table 32. TTS Shipping and Storage Container Characteristics

Characteristic	Dimension
Container Height	32 in.
Container Length	190 in.
Container Weight	625 lb
Total Container Weight (with TTS, weight carriages, and weights)	2225 lb
Forward Weight Carriage (with weights)	530 lb
Aft Weight Carriage (with weights)	530 lb

Table 33. TTS/Container Weight Test Load Requirements

Mk	Equipment Working Load	Rated Weight 100% (+5 -0%) (lb)	Dynamic Weight 150% (+5 -0%) (lb)	Static Weight 200% (+5 -0%) (lb)	Total Length (in.)
46	500	500-525	750-787.5	1000-1050	98.12

Table 34. Associated Equipment, Support Documentation (Drawings)

Title	Drawing Number
Pressure Gauge and Pressure Switch Calibration Tool	7082014
Air Charging Panel Mk 429 Mod 1	6303222
Hydrostatic Test Set	1623865
Bore Gauge	2320787
Breech Mechanism Stowage Rack	5979710
Torpedo Test Shape Mk 2 Mod 0	6951518
Shipping and Storage Container Mk 778 Mod 0	7007183

Table 35. Associated Equipment, Support Documentation (Technical Manuals)

Type	Number	Title
NAVSEA Technical Manual	S9086-XG-STM-010/ Chapter 700	Shipboard Ammunition Handling and Storage
NAVSEA Technical Manual	SW515-AL-MMO-010/ TTS	Torpedo Test Shape (TTS) Mk 2 Mod 0 and Shipping and Storage Container Mk 778 Mod 0
NAVSEA Technical Manual	SW395-AL-MMO-010	Air Charging Panel and Cabinet Assembly Mk 429 Mod 1: Description, Installation, Operation, Maintenance and IPB
NAVSEA Ordnance Data	OD 46508	SVTT Mk 32 Mods 5 through 14: Workshop Equipment Use and Maintenance

APPENDIX A

SURFACE VESSEL TORPEDO TUBE MK 32 ORDALTS

Table A-1. Summary of Surface Vessel Torpedo Tube Mk 32 ORDALTS (Cont'd)

SVTT MK 32 MOD APPLICABILITY

O/A#	DATE	CLASS	DESCRIPTION	0	1	2	4	5	6	7	8	9	10	11	14	15	17	19
16375	10/31/94	ROUTINE	REPLACE 85-VDC OVERHEAT ALARM RELAY WITH 28-VDC RELAY													X		
16460	10/31/94	ROUTINE	MODIFICATION TO REDUCE LINE LOSS THROUGH THE DOUBLE COPPERING OF THE CABLES AT THE INTERFACE JUNCTION BOX AND ALLOW INTERFACE BETWEEN THE DIGITAL MULTIPLEXER SYSTEM AND THE LAUNCHER.													X		
16412	11/30/95	ROUTINE	INSTALLATION OF TORPEDO ALIGNMENT GUIDE POSTS TO PREVENT DAMAGE TO TORPEDOES DURING LOADING BY PREVENTING CONTACT BETWEEN THE TORPEDO AND THE SECURING MECHANISM GUIDES.					X							X	X	X	X
16594	12/15/97	ROUTINE	CONVERTS MOD 14 WITH ORDALT 15713/15713A TO MOD 19												X			
16678	1/19/99	EMER	MODIFIES THE SECURING MECHANISM TO PROVIDE A POSITIVE MECHANICAL SAFETY INTERLOCK AND MEANS OF INSPECTION TO ENSURE THE BREECH MECHANISM FIRING VALVE ACTUATOR IS IN A SAFE POSITION PRIOR TO INSTALLING THE BREECH MECHANISM					X							X	X	X	X
16564	5/1/99	ROUTINE	REPLACES BREECH MECHANISM ADAPTER AND PRESSURE GAUGE WITH NEW ADAPTER WITH 9/16-INCH STRAIGHT THREAD O-RING FITTING, O-RING, AND PRESSURE GAUGE MEETING MIL-G-18997 STANDARDS. ALSO REPLACES THE BREECH MECHANISM CHARGING FITTING DUST CAP ASSEMBLY WITH A NEW CAP AND CHAIN ASSEMBLY					X							X	X	X	X
15713B	1/15/00	ROUTINE	INSTALLATION OF TIME DELAYED EMERGENCY FIRE CIRCUIT. PROVIDES COMPATIBILITY WITH ADVANCED LIGHTWEIGHT TORPEDOES INCLUDING THE MK 54.														X	X
16627	TBD	ROUTINE	REPLACES EXISTING ELECTRICALLY OPERATED MUZZLE COVERS ALONG WITH THEIR ASSOCIATED LIMIT SWITCHES, HEATERS AND GEAR BOX ASSEMBLIES WITH LESS COMPLEX AND MORE RELIABLE FLY-AWAY MUZZLE COVERS THAT ARE EJECTED AT LAUNCH BY BARREL BLOW-BY AIR PRESSURE.													X		
16717	TBD	ROUTINE	INCREASE THE DIAMETER OF THE TRAINING GEAR HEATER COIL TO PROVIDE INCREASED HEATING DURING COLD WEATHER OPERATIONS.					X								X	X	
TBD	TBD	TBD	IMPLEMENT ECP 99-031 FOR EMERGENCY FIRE CIRCUIT IMPROVEMENT														X	X
TBD	TBD	TBD	IMPLEMENT ECP 99-032 FOR MOUNT TO DOOR INTEROPERABILITY												X			X
TBD	TBD	TBD	IMPLEMENT ECP 96-027 FOR MODIFICATION TO THE CONTROL BOX					X							X	X	X	X

APPENDIX B

SURFACE VESSEL TORPEDO TUBE MK 32
TORPEDO LOADING TRAY ORDALTS

Table B-1. Summary of Surface Vessel Torpedo Tube Mk 32 Torpedo Loading Tray ORDALTS

O/A #	DATE	CLASS	DESCRIPTION	SVTT TLT MARK/MOD APPLICABILITY											
				2/0	2/1	3/0	3/1	7/0	8/0	9/0	9/1	9/2	9/3		
7673	3/15/72	ROUTINE	SERIAL # 1 THROUGH 450 - PROVIDES CLEARANCE FOR TORPEDO FINS RESULTING IN EASIER TORPEDO LOADING. ADDS NONSLIDING PADS ON LEGS AND IMPROVES ALIGNMENT AND SUPPORT FOR THE RAM ASSEMBLY.	X											
8221	4/1/73	URGENT	SERIAL # 1 THROUGH 65 - MODIFIES RAM ASSEMBLY, RELOCATES SAFETY BELT, RELOCATES O-RING ON COLLAPSING GUIDE RAILS, AND PROVIDES INSTRUCTION FOR FABRICATION OF GO-NO-GO GAUGES FOR PROPER TRAY AND TORPEDO TUBE ALIGNMENT.			X	X								
8476	7/15/74	URGENT	SERIAL # 1 THROUGH 65 - INSTALLS POSITIVE STOP ASSEMBLY IN THE TWO TOP RAILS OF THE TORPEDO LOADING TRAY.			X	X								
9138	7/1/78	ROUTINE	SERIAL # 1 THROUGH 450 - INSTALL A MOVEABLE GUIDE RAIL ASSEMBLY, NYLON ROLLERS, AND A TORPEDO STOP DEVICE	X											
9690	6/1/80	ROUTINE	CONVERT MK 2 MOD 0 TO MK 2 MOD 1 BY PROVIDING A LONGER ADJUSTING SCREW FOR THE LOADING TRAY ASSEMBLY THEREBY ELIMINATING NEED FOR EXTRA SET OF LEGS FOR FFG 7 CLASS SHIP LOADING TRAYS. DESCRIBE PROCEDURES FOR CUTTING THE LONG AND SHORT LEGS.	X											
15096	3/15/85	ROUTINE	ADD COMPONENTS TO LEG ASSEMBLY TO PROVIDE IMPROVED LEVERAGE WHEN ADJUSTING AND ALIGNING THE HEIGHT AND RADIAL POSITIONS OF THE LOADING TRAY. IDENTIFICATION LABELS AFFIXED TO KEEL OF TRAY INDICATE TORPEDO POSITIONING FOR ON/OFF LOADING. FORWARD GUIDE RAIL AREA MODIFICATIONS PROVIDE BETTER TORPEDO SUPPORT AND FIN ALIGNMENT.	X				X	X						
15102	3/15/85	ROUTINE	ADDS COMPONENTS TO THE LEG ASSEMBLY TO PROVIDE IMPROVED LEVERAGE WHEN ADJUSTING AND ALIGNING HEIGHT AND RADIAL POSITIONS OF LOADING TRAY. IDENTIFICATION LABELS AFFIXED TO KEEL OF TRAY INDICATE TORPEDO POSITIONING FOR ON/OFF LOADING.			X	X								
15714B	1/15/00	ROUTINE	CONVERTS LOADING TRAY MK 2 TO MK 9 MOD 0 OR MK 9 MOD 3; MK 7 MOD 0 TO MK 9 MOD 1; AND MK 8 MOD 0 TO MK 9 MOD 2. PROVIDES A NEW, MORE ROBUST LEG ASSEMBLY AND CRADLE SUPPORT STRUCTURE AND EXTENDS THE LENGTH OF THE CRADLE ASSEMBLY FOR COMPATIBILITY WITH ADVANCED LIGHTWEIGHT TORPEDOES INCLUDING THE MK 54.	X	X			X	X						
16413	11/1/95	ROUTINE	MODIFIES FORWARD GUIDE RAIL TO PROVIDE PROPER FIN ALIGNMENT	X	X			X	X	X	X	X	X	X	X

APPENDIX C
SURFACE VESSEL TORPEDO TUBE MK 32
POINTS OF CONTACT

Table C-1. Surface Vessel Torpedo Tube Mk 32 Points of Contact

NAME	TITLE	CODE/ ORGANIZATION	MAILING ADDRESS	COMM PHONE NUMBER DSN PHONE NUMBER FAX NUMBER E-MAIL ADDRESS
RON CARMICHAEL	PROGRAM MANAGER	PEO MINE AND UNDERSEA WARFARE PMS 411E4	PROGRAM EXECUTIVE OFFICE MINE AND UNDERSEA WARFARE 2011 CRYSTAL DRIVE ARLINGTON, VA 22242-5169	COMM - (703) 604-5067 X253 DSN - 664-5067 X253 FAX - (703) 604-5333 E-MAIL - carmichaelrb@navsea.navy.mil
MARK RODRIGUES	PROGRAM MANAGER SURFACE LAUNCHERS	NUWC DIVNPT CODE 8323	COMMANDER NAVUNSEAWARCENDIV 1176 HOWELL STREET NEWPORT, RI 02841-1708	COMM - (401) 832-1372 DSN - 920-1372 FAX - (401) 832-4329 E-MAIL - rodriguesma@npt.nuwc.navy.mil
DANIEL GODFREY	PROJECT ENGINEER	NUWC DIVNPT CODE 8323	COMMANDER NAVUNSEAWARCENDIV 1176 HOWELL STREET NEWPORT, RI 02841-1708	COMM - (401) 832-2124 DSN - 920-3417 FAX - (401) 832-4329 E-MAIL - godfreydm@npt.nuwc.navy.mil
MARK S. MOREIRA	PROJECT ENGINEER SVTT MK 32 LAUNCHER	NUWC DIVNPT CODE 8323	COMMANDER NAVUNSEAWARCENDIV 1176 HOWELL STREET NEWPORT, RI 02841-1708	COMM - (401) 832-2628 DSN - 920-3417 FAX - (401) 832-4329 E-MAIL - moreirams@npt.nuwc.navy.mil
DAVE REISE	PROJECT ENGINEER SVTT MK 32 LAUNCHER	NUWC DIVNPT CODE 8323	COMMANDER NAVUNSEAWARCENDIV 1176 HOWELL STREET NEWPORT, RI 02841-1708	COMM - (401) 832-1816 DSN - 920-3417 FAX - (401) 832-4329 E-MAIL - reisedg@npt.nuwc.navy.mil
ANTHONY TRAVELYN	PROJECT ENGINEER TLT MK 2 & MK 9	NUWC DIVNPT CODE 8323	COMMANDER NAVUNSEAWARCENDIV 1176 HOWELL STREET NEWPORT, RI 02841-1708	COMM - (401) 832-2472 DSN - 920-3417 FAX - (401) 832-4329 E-MAIL - travelynar@npt.nuwc.navy.mil
CONRAD HENSEDLER	ENGINEERING TECHNICIAN SVTT MK 32 PMS	NUWC DIVNPT CODE 8323	COMMANDER NAVUNSEAWARCENDIV 1176 HOWELL STREET NEWPORT, RI 02841-1708	COMM - (401) 832-1326 DSN - 920-1326 FAX - (401) 832-4329 E-MAIL - hensedlerce@npt.nuwc.navy.mil
JIM LYNCH	ITEM MANAGER	NAVICP CODE 05922K	COMMANDER NAVICP P. O. BOX 2020 5450 CARLISLE PIKE MECHANICSBURG, PA 17055-0788	COMM - (717) 790-6696 DSN - 430-6696 FAX - (717) 790-1847 E-MAIL - Jim_Lynch@icpmech.navy.mil
ROBERT DEVON	TECHNICAL REPRESENTATIVE	FTSCPAC CODE 211	COMMANDING OFFICER FTSC PACIFIC 3375 SENN AVE., SUITE 1 SAN DIEGO, CA 92186-5002	COMM - (619) 556-5678 DSN - 526-5678 FAX - (619) 556-5374 E-MAIL - devonr@mailhost.ftscpac.navy.mil
DANNY O'NEAL	TECHNICAL REPRESENTATIVE	FTSCLANT CODE 4336	COMMANDING OFFICER FTSC ATLANTIC 9727 AVIONICS LOOP NORFOLK, VA 23511-2124	COMM - (757) 444-3872 X1603 DSN - 836-3872 FAX - (757) 444-2799 E-MAIL - danny_o'neal@ftsclant.navy.mil

APPENDIX D
BLOCK DIAGRAMS FOR ASW EQUIPMENT CONFIGURATIONS

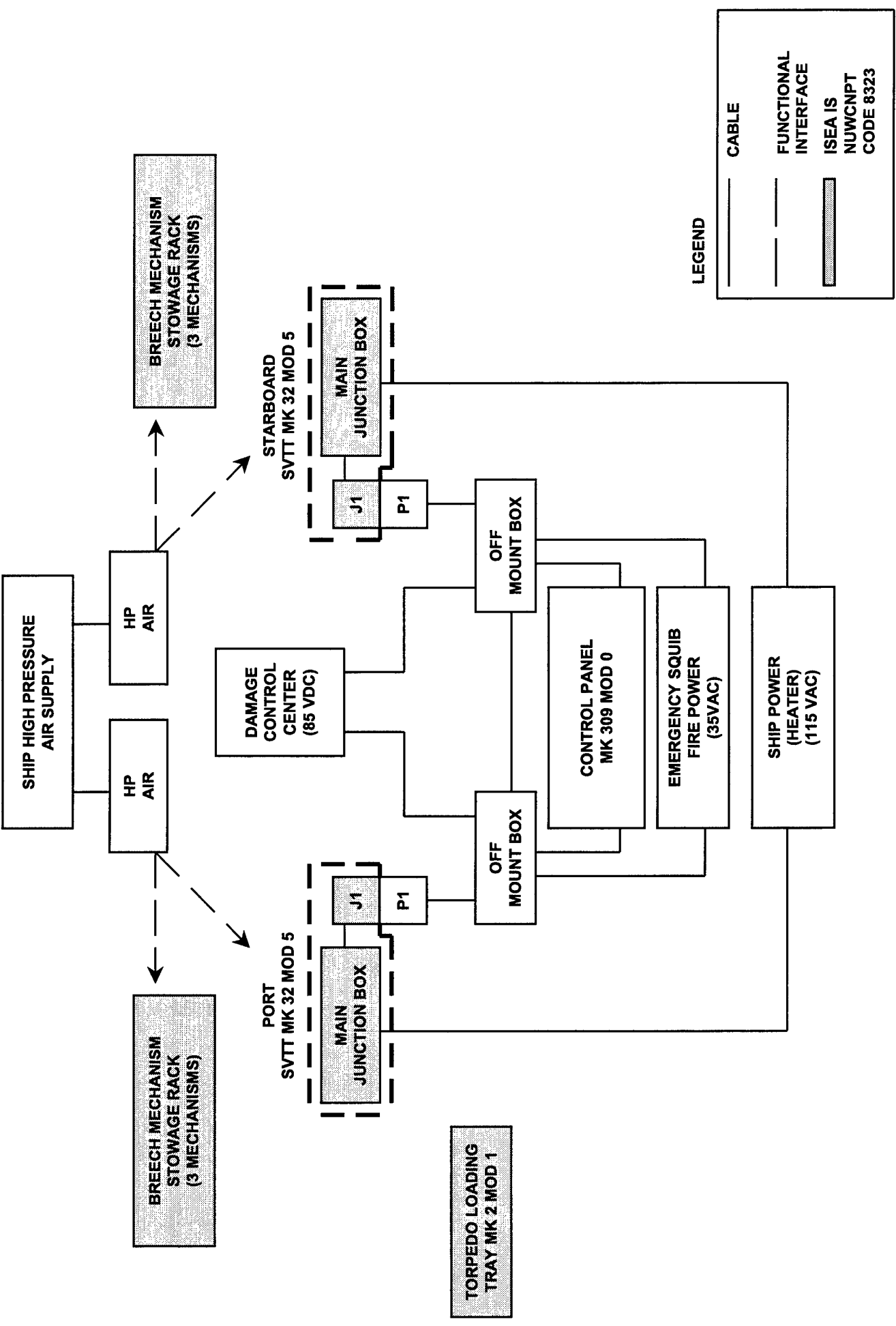


Figure D-1. Block Diagram for ASW Equipment Configuration FFG 7 Class with SVTT Mk 32 Mod 5 (Torpedo Mk 46 Only)

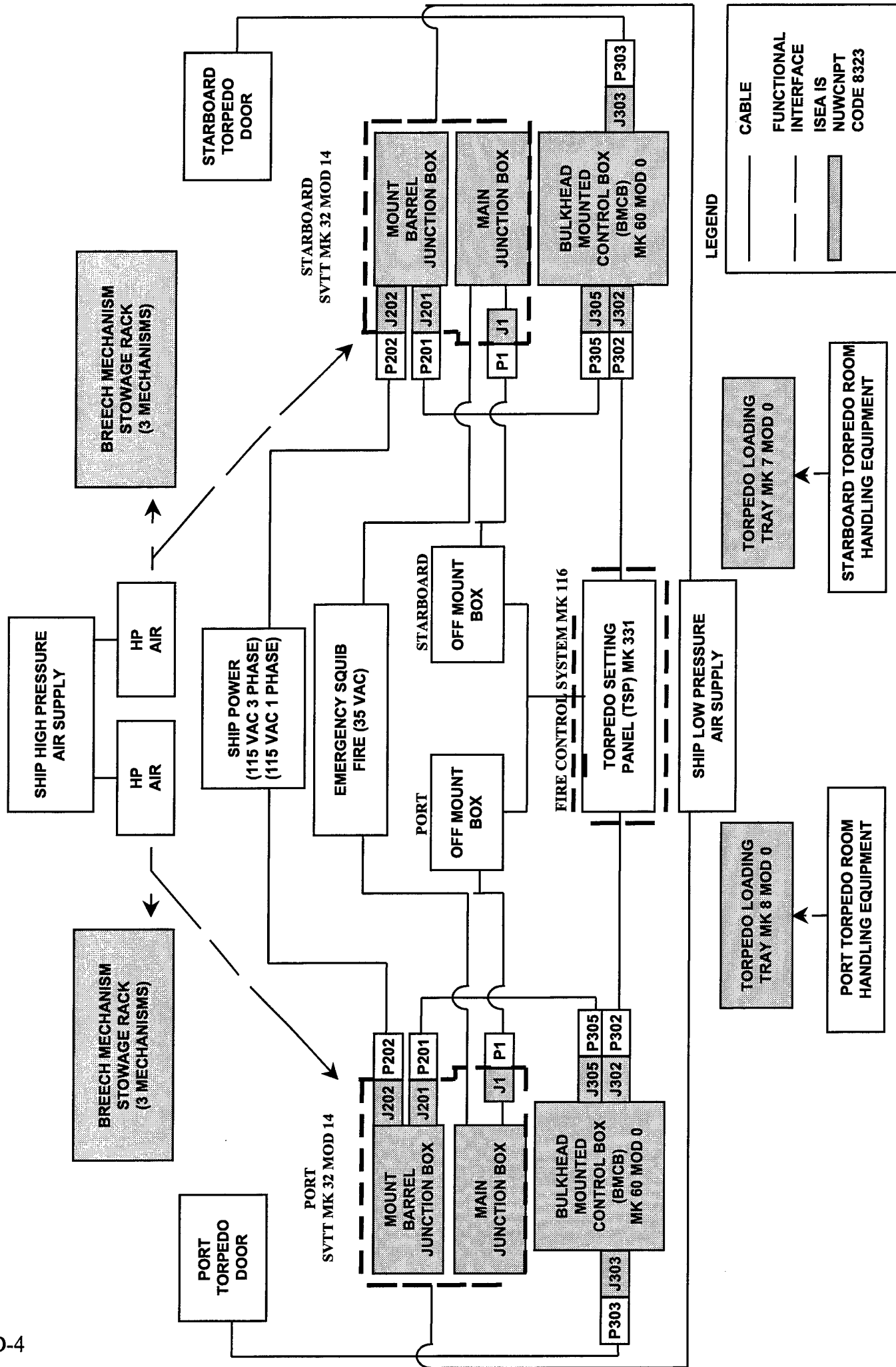


Figure D-2. Block Diagram for ASW Equipment Configuration CG 47 Class with SVTT Mk 32 Mod 14 (Torpedo Mk 46 Only)

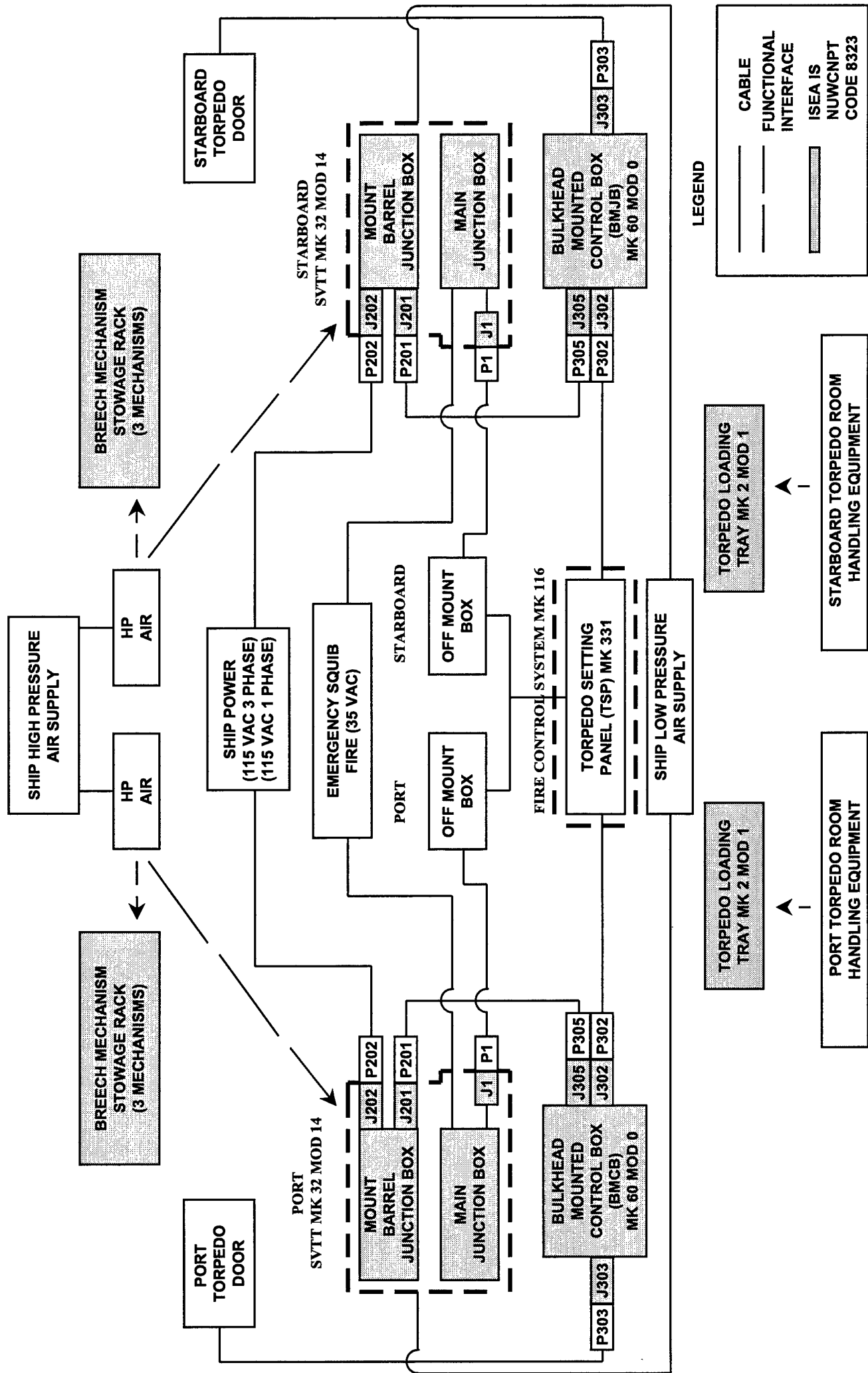
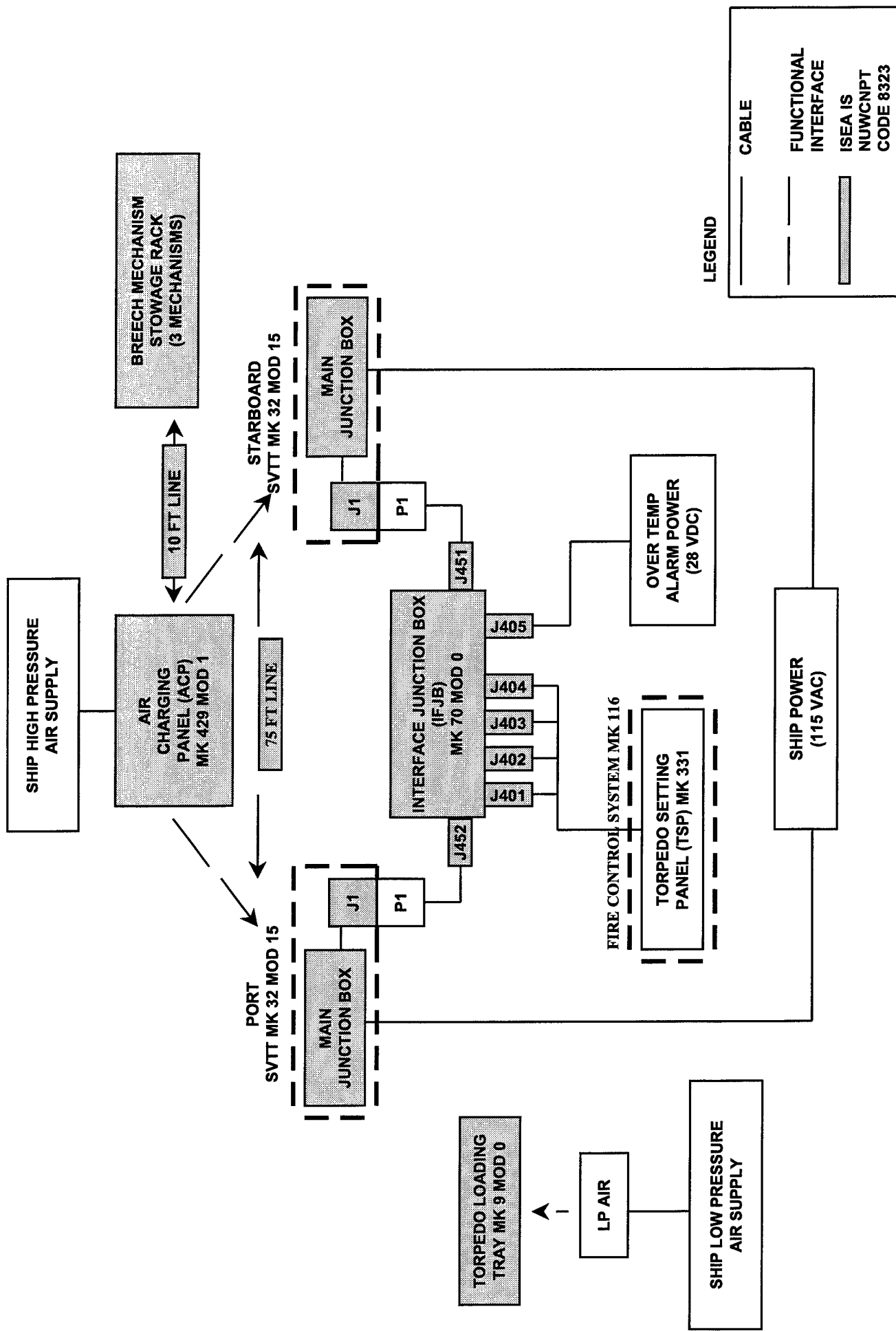


Figure D-3. Block Diagram for ASW Equipment Configuration DD 963 Class with SVTT MK 32 Mod 14 (Torpedo Mk 46 Only)



LEGEND

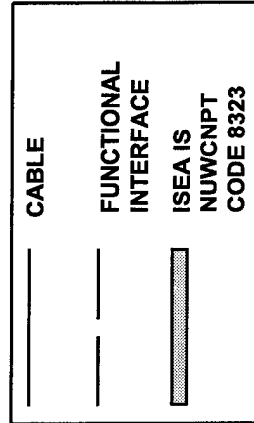


Figure D-4. Block Diagram for ASW Equipment Configuration DDG 51 Class with SVTT Mk 32 Mod 15 (Torpedo MK 46 and Advanced Lightweight Torpedoes)

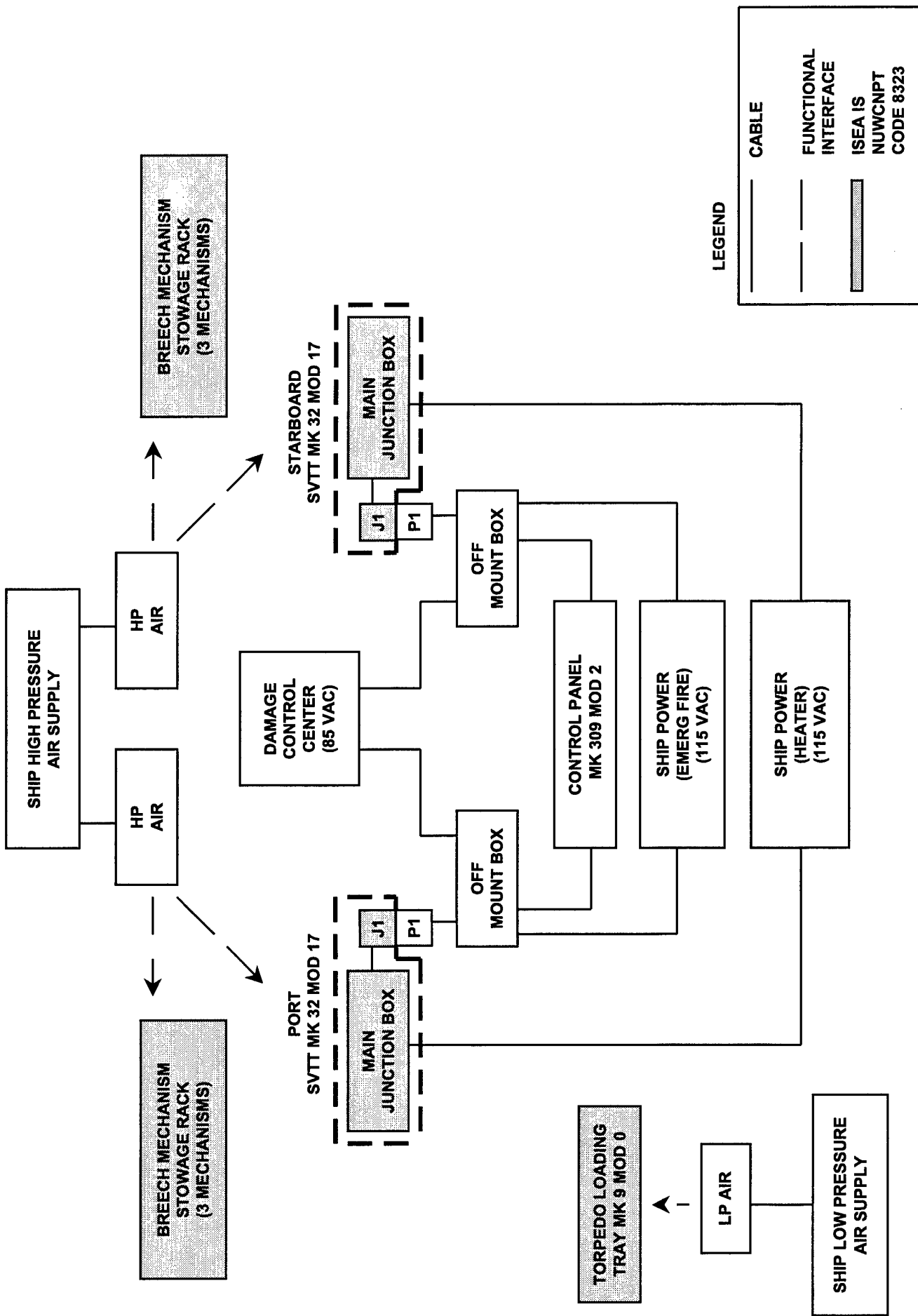


Figure D-5. Block Diagram for ASW Equipment Configuration FFG 7 Class with SVTT Mk 32 Mod 17 (Torpedo Mk 46 and Advanced Lightweight Torpedoes)

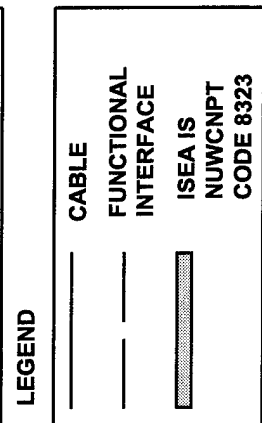
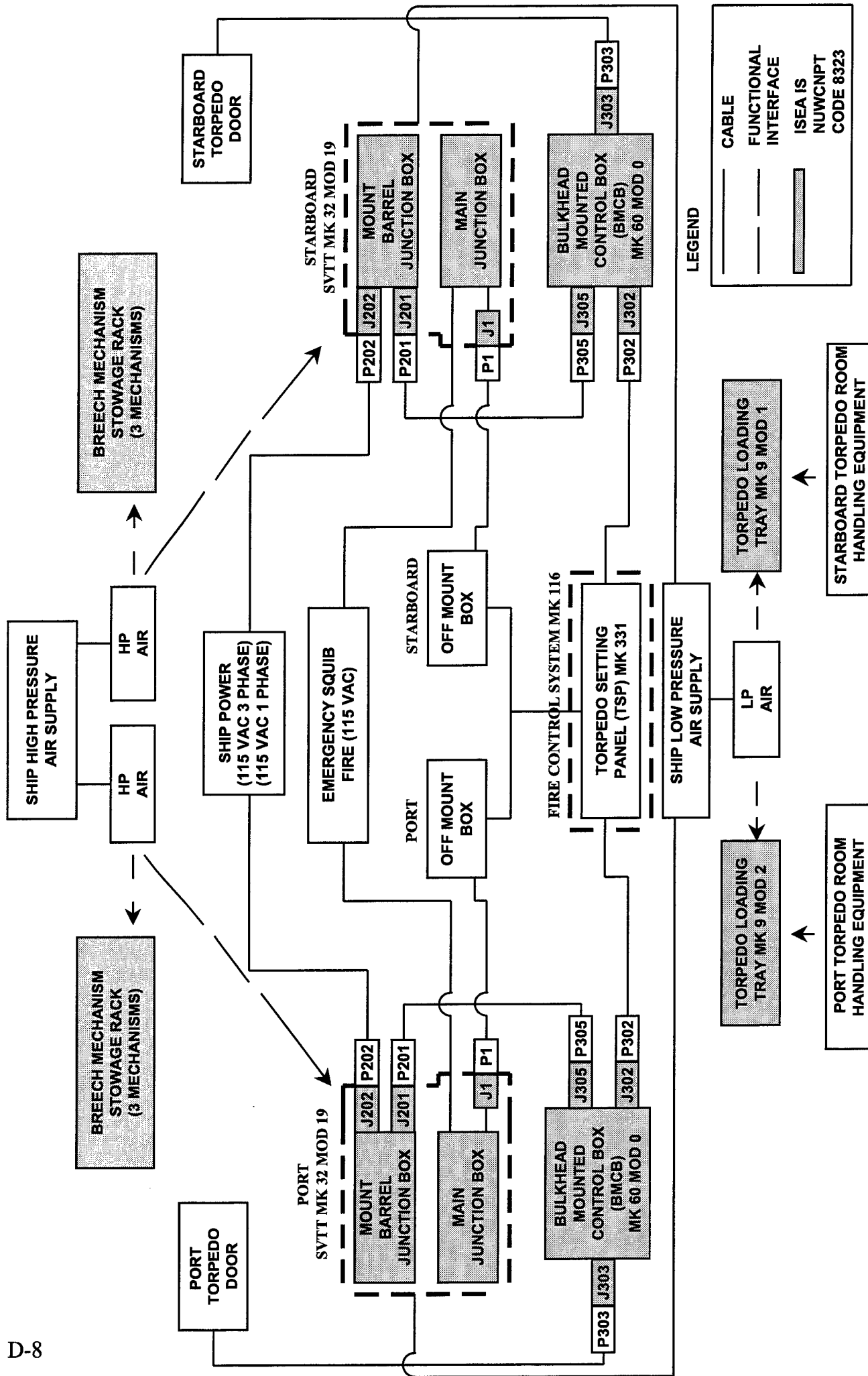


Figure D-6. Block Diagram for ASW Equipment Configuration CG 47 Class with SVTT Mk 32 Mod 19 (Torpedo MK 46 and Advanced Lightweight Torpedoes)

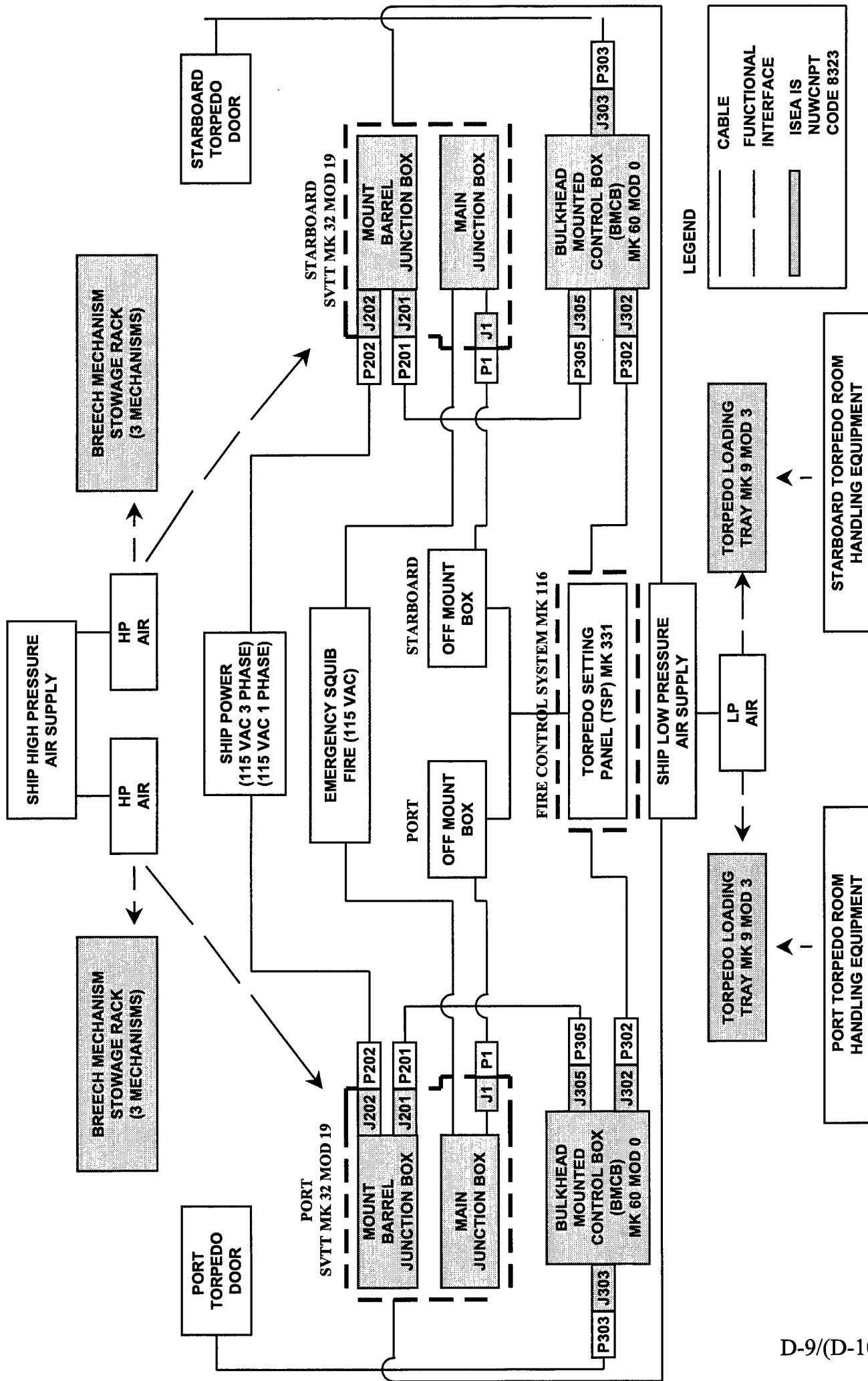


Figure D-7. Block Diagram for ASW Equipment Configuration DD 963 Class with SVTT Mk 32 Mod 19 (Torpedo Mk 46 and Advanced Lightweight Torpedoes)

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Commander, Naval Surface Force, Atlantic	2
Commander, Naval Surface Force, Pacific	2
Commanding Officer, Fleet Training Center, Mayport	2
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