

# Compact Low Frequency Active Transmit Subsystem (CLTS)

## System Segment Interface Control Specification

12 Oct 2007

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# Compact Low Frequency Active Transmit Subsystem System Segment Interface Control Specification

12 Oct 2007

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<b>Document Revision</b>	<b>Description</b>	<b>Date</b>	<b>Pages Affected</b>
-	Initial Release	14 Nov 06	All
A	Incorporated Gov't Comments and New Section 4.	16 Apr 07	Multiple
B	Updated Impedance Diagrams Due to Selection of the Option B1 (graphite skin and aluminum liner) Projector Configuration and updated WSJB connector details for accuracy.	12 Oct 07	3-1, 3-2

## **CLTS**

### **System Segment Interface Control Specification**

#### **1 SCOPE**

This System Segment Interface Control Specification defines the physical and electrical interfaces between the BAE developed Compact Low Frequency Transmit Subsystem (CLTS) Instruments Inc. developed Amplifiers P/N S16-20 (Units 530-549), their ship's power requirements, and Towbody and Projector Assemblies P/N 8408277-1 (Units 550-567). In addition, this specification defines the Emergency Transmit Shut Down (ETSD) system circuitry. All interfacing functions are described to present an understanding of the interface between these units.

#### **1.1 SYSTEM OVERVIEW**

The Compact Low Frequency Active Transmit Subsystem (CLTS) provides acoustic transmit capability for echo ranging. The CLTS Power Amplifier to Projector Assembly segment comprises a subset of the major component groups included in the CLTS Power Amplifier Group (PAG) and CLTS Transmit Array Group (TAG). Figure 1-1. CLTS Power Amplifier to Projector Assembly Segment Block Diagram describes the components in this segment.

#### **1.2 SEGMENT COMPONENTS**

The CLTS Segment consists of the following components:

- CLTS Projector Assembly (18), BAE SYSTEMS Part No. 8408277-1
- CLTS Transducer to WSJB (Wet Side) Cable Assemblies (18), BAE SYSTEMS Part No. 8411202-1 thru -18
- CLTS Wetside Junction Box (WSJB) (1), NFESC Part No. CL-42-D205
- CLTS Electro-Optical-Mechanical (EOM) Wet Tow Cable (1), NFESC Part No. CL-34-D210
- CLTS Winch Handling System Junction Box (1), NFESC Part No. CL-37-D878
- CLTS Electro-Optical-Mechanical (EOM) Dry Cable (1), BAE SYSTEMS Part No. 8411201-1
- CLTS Topside Junction Box Assembly (TSJB) (1), BAE SYSTEMS Part No. 8411172-1
- CLTS Amplifier to TSJB (Dry Side) Cable Assemblies (20) with 2 as Spares going to Spare CLTS Power Amplifiers, BAE SYSTEMS Part No. 8411200-1 thru -20
- CLTS Power Amplifiers (20) with 2 as Spares, Instruments Inc. Part No. S16-20
- CLTS Emergency Shutdown Subsystem, BAE SYSTEMS Part No. 8411178-1 8411179-1 and 8411179-2

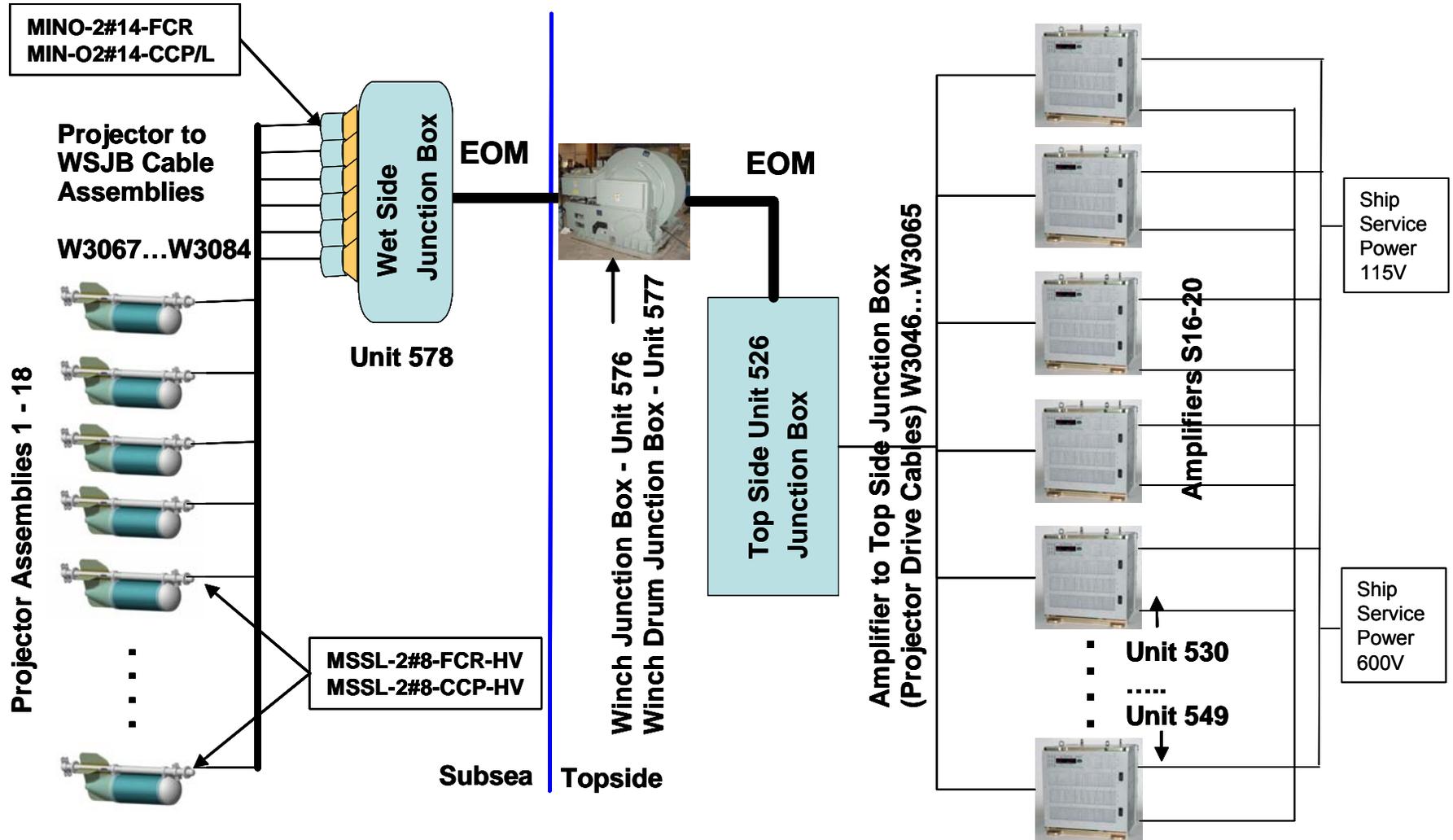


Figure 1-1. CLTS Power Amplifier to Projector Assembly  
Block Diagram

## 2 APPLICABLE DOCUMENTS

The following documents of the exact issue shown form a part of this specification to the extent specified herein. The documents are listed in this specification as reference only and apply to the next higher assembly specification requirements. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

### 2.1 GOVERNMENT DOCUMENTS

The following documents of the exact issue shown form a part of this Interface Control Document (ICD) to the extent specified herein. The documents are listed in this ICD as reference only. In the event of conflict between the documents referenced herein and the contents of this ICD, the contents of this ICD shall be considered a superseding requirement.

Document No. N/A	“Critical Item Functional Specification for the Compact Low Frequency Active Transmit Subsystem (CLTS)” as Applies to Contract N66001-06-D-0037
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### 2.2 NON-GOVERNMENT DOCUMENTS

The following documents of the exact issue shown form a part of ICD to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of ICD, the contents of this ICD shall be considered a superseding requirement.

CL-99-D250	EOM Tow Cable to Winch Junction Box
DO343	Technical Description, EOM for CLFA Array
8408277	Projector Assembly
8411172	Top Side Junction Box Assembly
8411200	Amplifier to TSJB Cable Assembly
8411201	Umbilical Cable Assembly
8411202	Transducer to WSJB Cable Assembly
8411178	Emergency Transmit Shutdown Subsystem – SOC
8411179	Emergency Transmit Shutdown Subsystem – AR/AHR

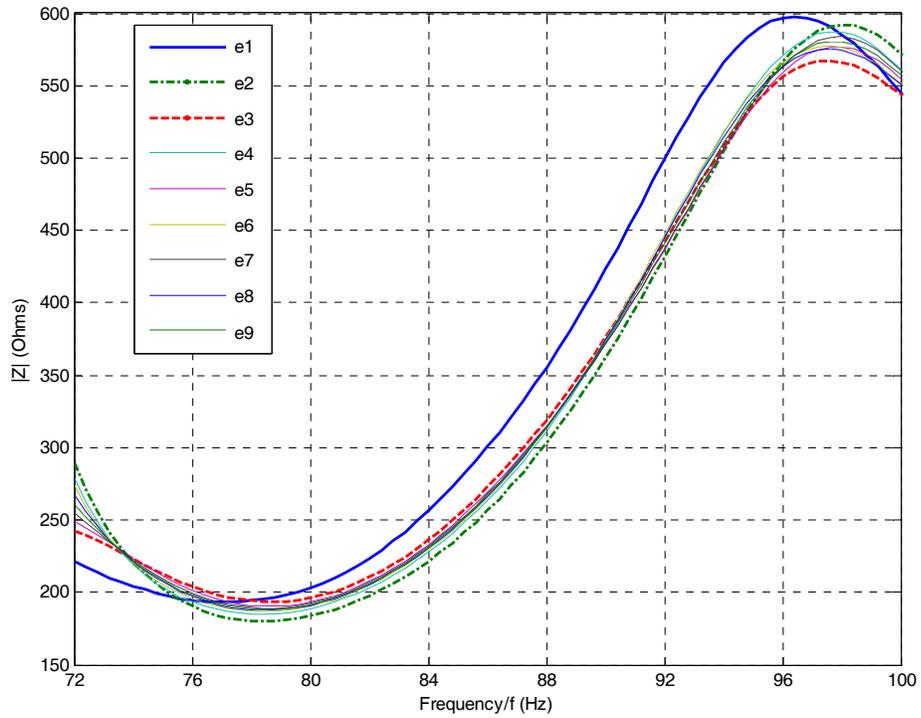
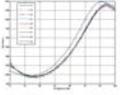
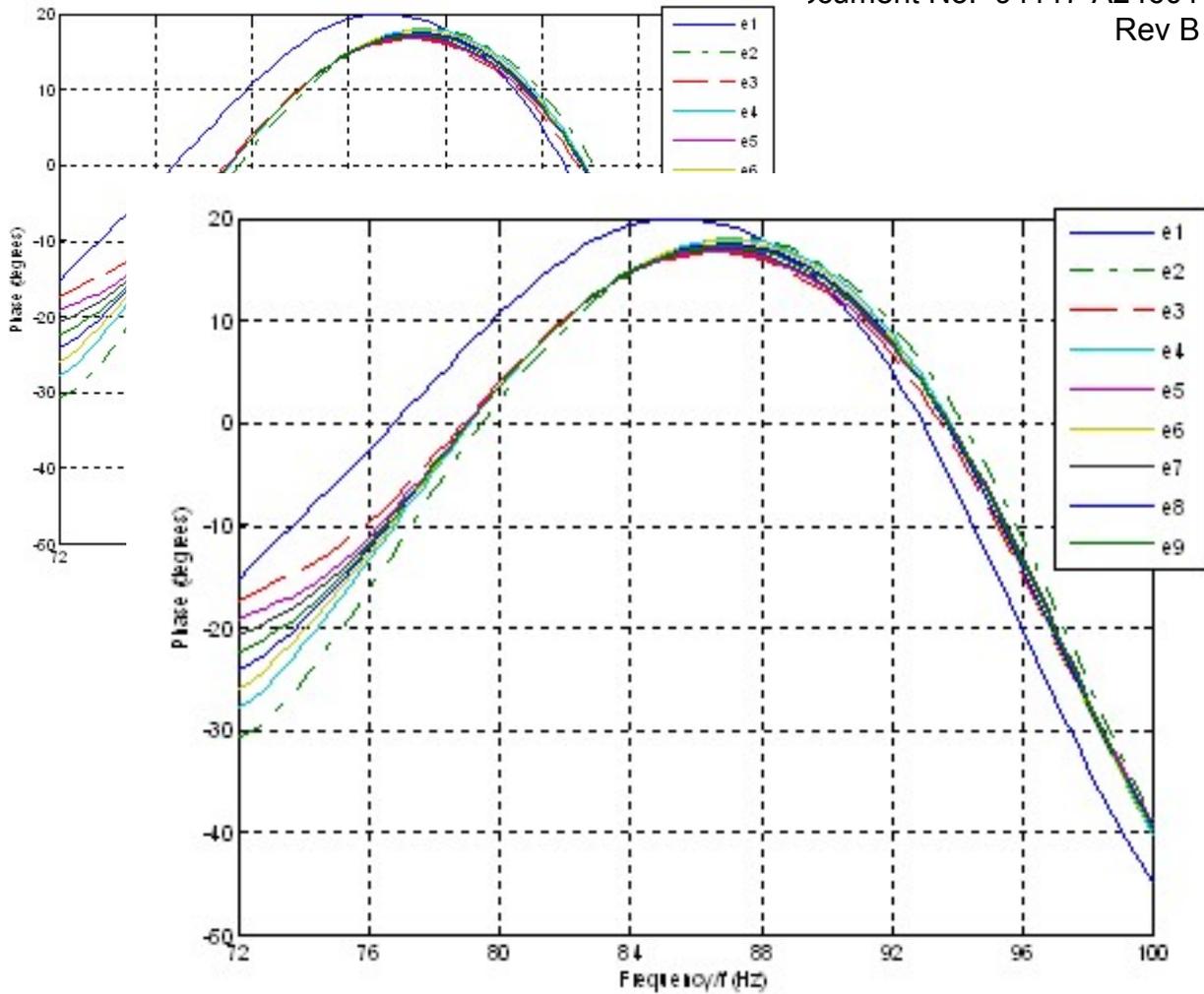


Figure 3-1. Predicted Projector Assembly Impedance Magnitude in Array



**Figure 2.2 Predicted Projector Assembly Phase in Array**

A receptacle, MSSL-2#8-FCR-HV, on each Projector Assembly is connected to a wet side power signal cable (W3067-W3084), with terminations of MSSL-2#8-CCP-HV and MINO-2#14-CCP/L-HV, that connects to a projector receptacle, of type MINO-2#14-BCR, located on the WSJB. The longest of these cables is 118.5 feet to the bottom Projector Assembly.

- Cable ID: W3067-W3084 (8411202-1 through 8411202-18)
- Cables: 2650V, 16A drive signal from Wet Side Junction Box to Projectors  
2-conductor, 14 AWG watertight cable  
South Bay Cable P/N: SB-45237
- Connectors: Ruggedized circular connectors  
SEACON P/N: 18x MINO-2#14-CCP/L-HV & 18x MSSL-2#8-CCP-HV

## **3.2 WETSIDe JUNCTION BOX (WSJB) TO ELECTRO-OPTICAL-MECHANICAL-(EOM) TOW CABLE**

### **3.2.1 Wetside Junction Box (WSJB)**

The WSJB is provided by Naval Facility Engineering Service Center (NFESC). A detailed description of the interfaces to the Wetside Junction Box can be found in NFESC document CL-99-D250.

### **3.2.2 Electro-Optical-Mechanical (EOM) Tow Cable**

The EMO Tow Cable is a torque balanced steel wire armored cable provided by NFESC. A technical description of the EOM Cable is provided in the Nexans Technical Description, Umbilical for CLFA Array, Document No. DO343.

## **3.3 ELECTRO-OPTICAL-MECHANICAL (EOM) TOW CABLE TO WINCH JUNCTION BOX**

### **3.3.1 Circuit Design**

The array handling system is provided by NFESC. The EOM Tow Cable to Winch Junction Box electrical interconnect is described in NFESC document CL-99-D250.

## **3.4 WINCH JUNCTION BOX (WJB) TO TOPSIDE JUNCTION BOX (TSJB)**

### **3.4.1 Winch Junction Box (WJB)**

The Array Handling System and Winch Junction Box are the responsibility of NFESC. The Winch Junction Box electrical interconnects are described in NFESC document CL-37-D878

### **3.4.2 Topside Junction Box (TSJB)**

Physical description of the Topside Junction Box: (See Figure 3-3 for the TSJB Unit 526 CLTS Power Amplifier Drive Signal Cable entry points). For detailed information refer to BAE drawing 8411172 and associated wire list WL8411172.

Hoffman enclosure: A48H36PLD

NEMA Type 4 rated

Size = 51.38" x 41" x 13.24" (48" x 36" x 12" – box only)

Weight = 205 lb approximate (Box and Contents)

Power = 0 W

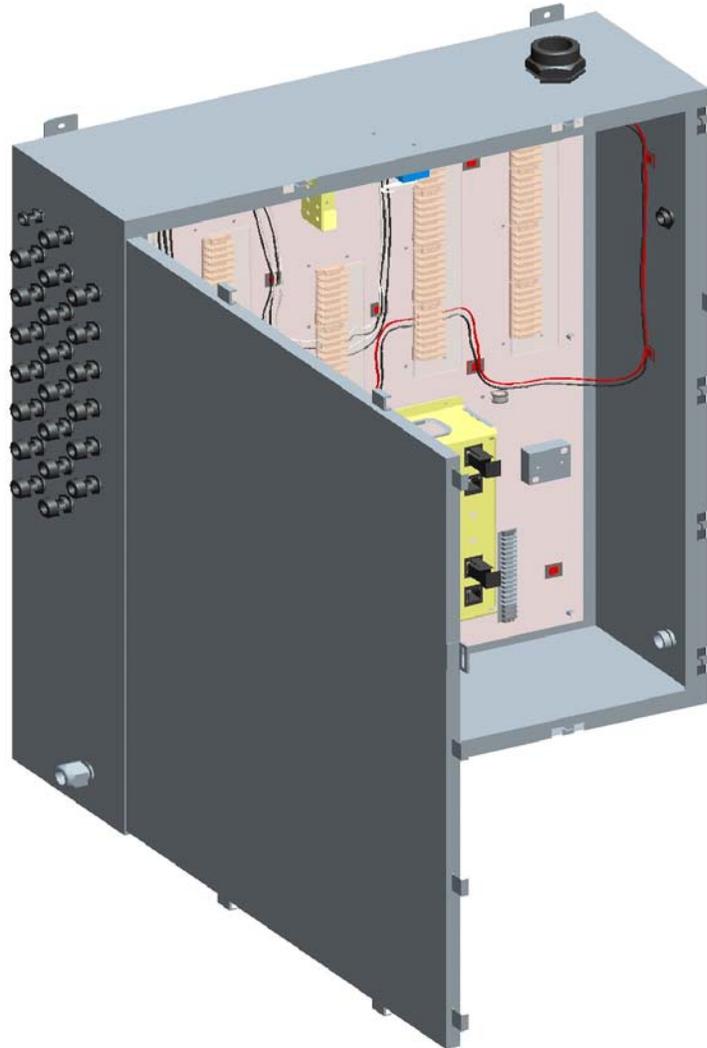
Provides disconnect/pass-thru for:

+2650V (Amplifier Output-Projector Drive)

Quick Disconnect  
5 M-Ohm resistor block, M-Ohmmeter test points & shorting plugs  
+375VDC (HFM3 PWR)  
+48VDC (NAS PWR)  
+12VDC (Emergency Transmit Shutdown)  
FO (NAS & HFM3 Data)

**Unit 526**

20x 2650V Amp Drive  
(W3046 to W3065)



**Figure 3-3. TSJB (Unit 526) CLTS Power Amplifier Drive Signal Cables Entry Points**

Cable W3066 (8411201-1) connects the TSJB (Unit 526) to the WJB in the Array Handling System (See Figure 3-4 for the TSJB to WJB Interconnection Block Diagram).

Cable ID: W3066 (8411201-1)  
 Function: EOM "Umbilical" Cable  
 Connectors: Terminal lugs & FO connectors  
 Cable: CL-34-D215 [NFESC] (Modified Nexans DO343)  
 44x 2mm<sup>2</sup> conductors  
 4x 1.5mm<sup>2</sup> twisted shielded pair  
 12x multimode fibers  
 12x single mode fibers  
 Miscellaneous drain wires and foil shielding  
 Max Length: 145 ft

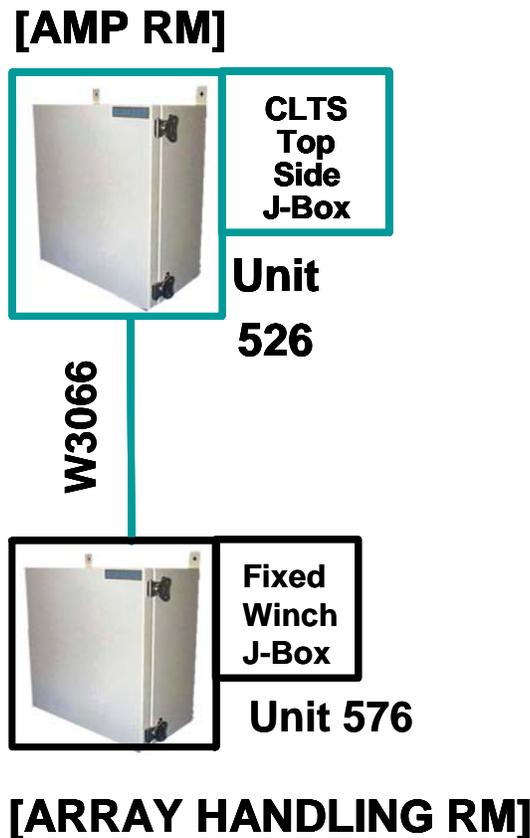


Figure 3-3. TSJB to Fixed WJB Interconnection Block Diagram

### 3.5 CLTS TOPSIDE JUNCTION BOX (TSJB) TO CLTS POWER AMPLIFIERS

Cables W3046-W3065 (8411200-1 through 8411200 -20) connect the CLTS Power Amplifiers (Units 530-549) to the TSJB (Unit 526) (See Figure 3-5 for CLTS Power Amplifiers to TSJB Interconnection Block Diagram).

Cable ID: W3046-W3065 (8411200-1 through 8411200-20)  
 Cable function: Amplifier 2650V Output Signal  
 Connectors: CA3108E22-9P-B, terminal lugs  
 Cable: SB-45695 [South Bay Cable]  
 1 x 12 AWG twisted shielded pair  
 Max Length: 81 ft

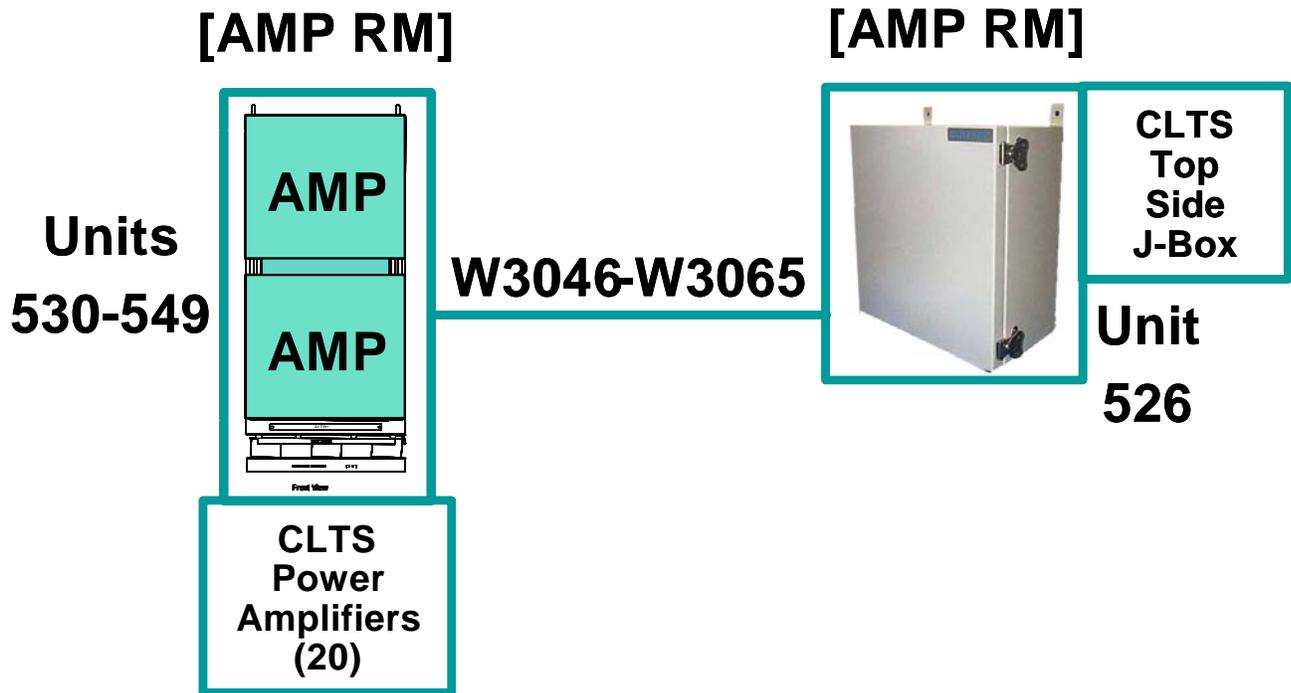


Figure 3-4. CLTS Power Amplifiers to TSJB Interconnection Block Diagram

### 3.6 CLTS EMERGENCY TRANSMIT SHUTDOWN (ETSD) SUBSYSTEM

The Emergency Transmit Shutdown (ETSD) Subsystem is comprised of 4 Junction Boxes; Unit 527 located in the SURTASS Operations Center (SOC), Unit 528 located in the Array Handling Room (AHR), Unit 526 (Topside Junction Box) and Unit 529 located in the Amplifier Room (AR). These junction boxes are interconnected to 20 CLTS Power Amplifiers, Units 530 through 549, located in the Power Amplifier Room. The connection uses the J6 connection point at each CLTS Power Amplifier via associated cabling to Junction Box Unit 527 from the Array Monitoring Cabinet (AMC) and between all ETSD junction boxes.

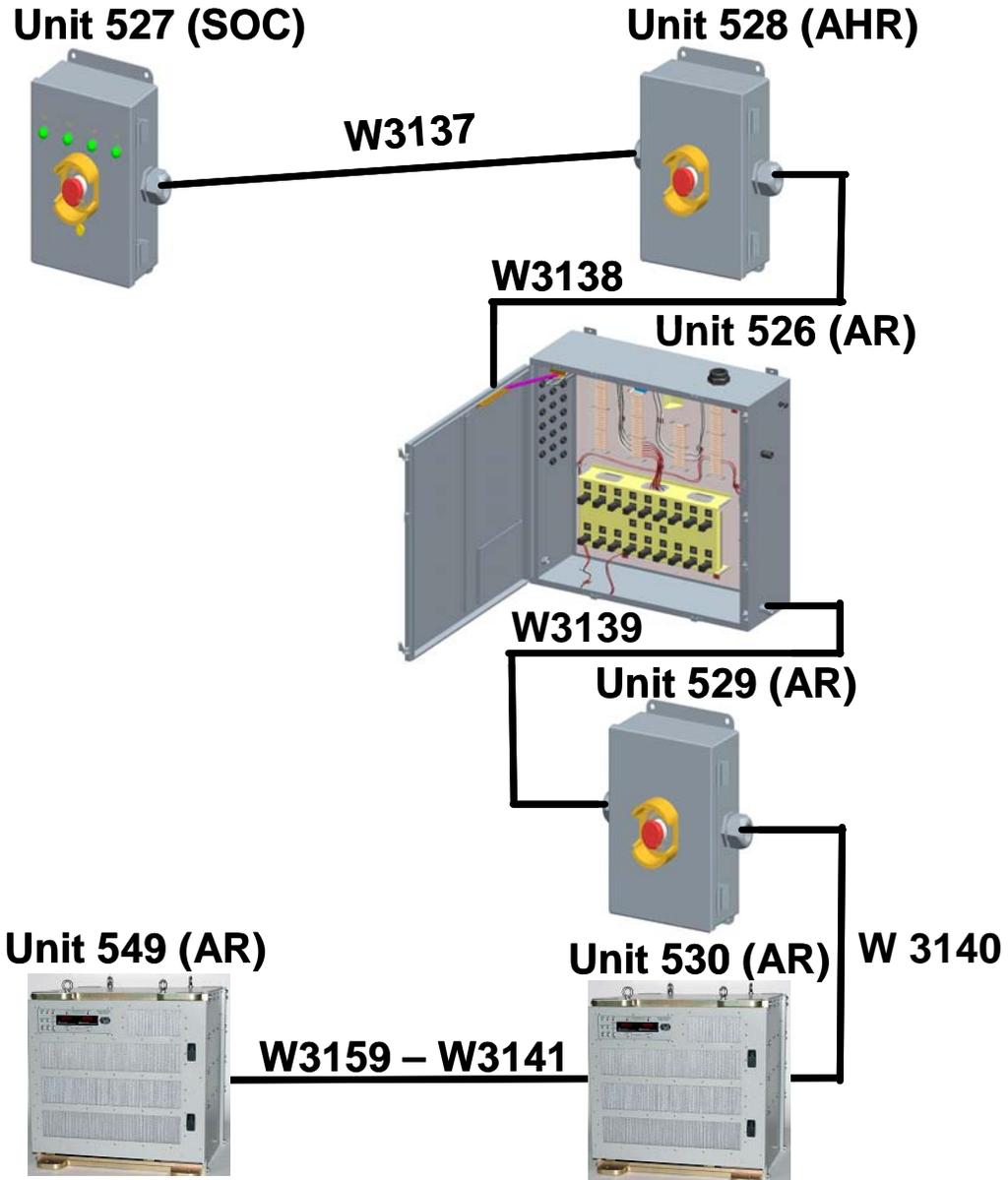
The TSJB Unit 526 has a safety interlock switch, activated when its door is opened, for removing the +15VDC to the CLTS Power Amplifier J6 connector. This will inhibit CLTS Wavetrain Transmissions until the door is shut/secured and the CLTS Power Amplifiers are re-enabled manually.

ETSD Assemblies Unit 527, Unit 528, and Unit 529 have a red push button for removing the +15VDC to the CLTS Power Amplifier J6 connector which will inhibit CLTS Wavetrain Transmissions until the button is reset and the CLTS Power Amplifiers are re-enabled manually.

ETSD Assembly Unit 527 has a 120VAC to +15VDC power converter plugged into a power strip located within the AMC Cabinet, Unit 511. The Power Converter is attached by a power cable (W3136) to Unit 527. Unit 527 has an output power cable (W3137) going to ETSD Assembly Unit 528 near the Winch Controls. Unit 528 has an output power cable (W3138) going to the TSJB Unit 526. The TSJB Unit 526 has an output power cable (W3139) going to ETSD Unit 529. Unit 529 has an output power cable (W3140) going to a t-connector on CLTS Amplifier No. 1, Unit 530 J6 t-connector J1 end.

Output power cable W3141 is connected from CLTS Power Amplifier No. 1 Unit 530 J6 t-connector J2 end to CLTS Power Amplifier No. 2 Unit 531 J6 t-connector J1 end. Eighteen more output power cables W3142 through W3159 are connected between CLTS Power Amplifiers Unit 531 through Unit 549. (See Figure 3-6 - CLTS Emergency Transmit Shutdown Subsystem Interconnection Block Diagram).

In normal operation, Unit 527 in the SOC room will display four lit LEDs. When an inhibit signal is received from any of the four junction boxes, the associated LED will extinguish thus identifying where the inhibit was initiated. To reset the circuitry, the appropriate switch must be reset as well as the reset switch on the front of each amplifier.

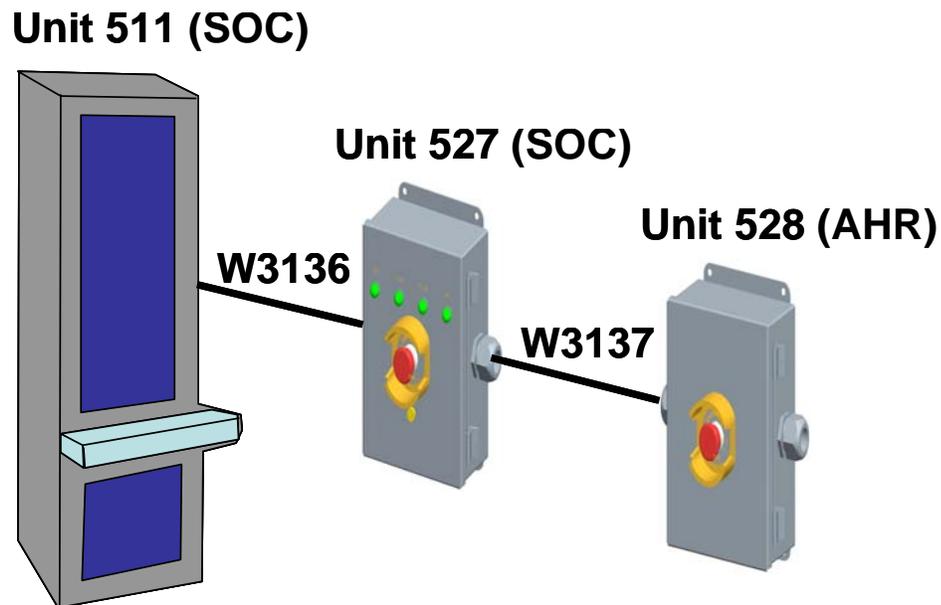


**Figure 3-5. CLTS Emergency Transmit Shutdown (ETSD) Subsystem Interconnection Block Diagram**

**3.6.1 Emergency Transmit Shutdown (ETSD) Assembly Unit 527 and Associated Cabling SURTASS Operations Center (SOC)**

Cables W3136-W3137 (8411200-1 and 8411200 -20) connect the Array Monitoring Cabinet (AMC) Unit 511 Power Strip (SOC) 120VAC to +15VDC converter to Emergency Transmit Shutdown (ETSD) Assembly Unit 527 (SOC) and Emergency Transmit Shutdown (ETSD) Assembly 528 (AHR) (See Figure 3-7 for CLTS Unit 511 – Unit 527 – Unit 528 Interconnection Block Diagram).

- Cable ID: W3136 (8411214-1)
- Cable function: +15VDC CLTS Power Amplifier J6 Emergency Shutdown Signal
- Connectors: From: PSA21R-150-R [Phihong] RPA [Phihong]  
To: 1x MS25036-101 (22 AWG Term. Lug)
- Cable: 9451SB [Belden]  
1 x 22 AWG twisted shielded pair
- Max Length: 100 ft
- Cable ID: W3137 (8411125-1)
- Cable function: +15VDC CLTS Power Amplifier J6 Emergency Shutdown Signal
- Connectors: From: 17x MS25036-101 (22 AWG Term. Lug)  
To: 17x MS25036-101 (22 AWG Term. Lug)
- Cable: M24643/31-02UN [General Cable]  
7 x 22 AWG twisted shielded pair
- Max Length: 207 ft



**Figure 3-6. CLTS Unit 511 – Unit 527 – Unit 528 Interconnection Block Diagram**

### 3.6.2 Emergency Transmit Shutdown (ETSD) Assembly Unit 527 and Associated Cabling Array Handling Room (AHR)

Cables W3137-W3138 (8411125-1 and 8411125-2) connect the Emergency Transmit Shutdown (ETSD) Assembly Unit 527 (SOC) to Emergency Transmit Shutdown (ETSD) Assembly Unit 528 (AHR) and from Unit 528 to Topside Junction Box (TSJB) Unit 526 (AR) (See Figure 3-8 for CLTS Unit 527 – Unit 528 – Unit 526 Interconnection Block Diagram).

- Cable ID: W3137 (8411125-1)
- Cable function: +15VDC CLTS Power Amplifier J6 Allow Enable High Signal
- Connectors: From: 17x MS25036-101 (22 AWG Term. Lug)  
To: 17x MS25036-101 (22 AWG Term. Lug)
- Cable: M24643/31-02UN [General Cable]  
7 x 22 AWG twisted shielded pair
- Max Length: 207 ft
- Cable ID: W3138 (8411125-2)
- Cable function: +15VDC CLTS Power Amplifier J6 Allow Enable High Signal
- Connectors: From: 17x MS25036-101 (22 AWG Term. Lug)  
To: 17x MS25036-101 (22 AWG Term. Lug)
- Cable: M24643/31-02UN [General Cable]  
7 x 22 AWG twisted shielded pair
- Max Length: 145 ft

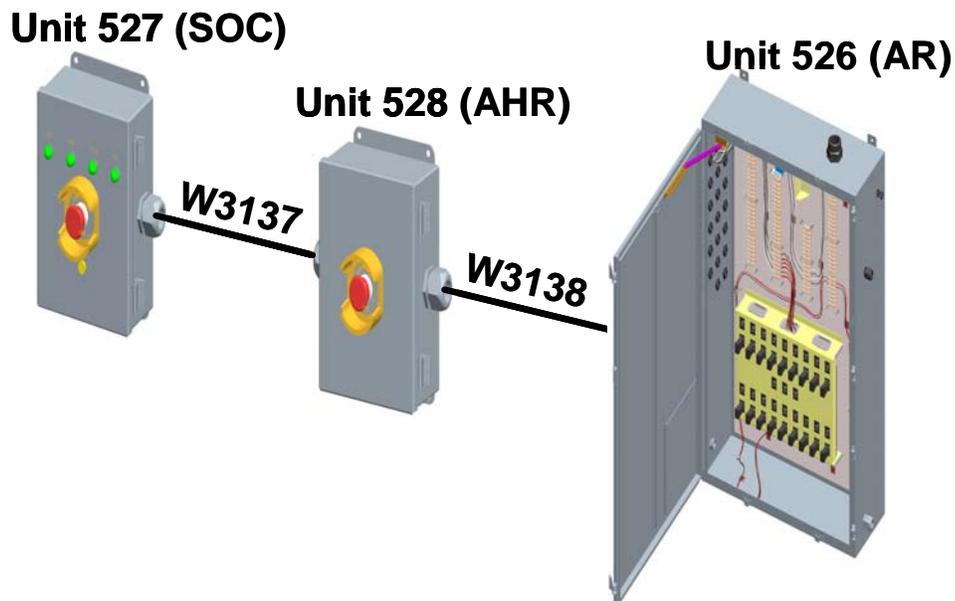


Figure 3-7. CLTS Unit 527 – Unit 528 – Unit 526 Interconnection Block Diagram

### 3.6.3 Topside Junction Box (TSJB) Unit 526 and Associated Cabling Amplifier Room (AR)

Cable W3139 (8411125-3) connects the Topside Junction Box (TSJB) Unit 526 (AR) to Emergency Transmit Shutdown (ETSD) Assembly Unit 529 (AR) (See Figure 3-9 for CLTS Unit 526 – Unit 529 Interconnection Block Diagram).

Cable ID: W3139 (8411125-3)  
 Cable function: +15VDC CLTS Power Amplifier J6 Emergency Shutdown Signal  
 Connectors: From: 17x MS25036-101 (22 AWG Term. Lug)  
 To: 17x MS25036-101 (22 AWG Term. Lug)  
 Cable: M24643/31-02UN [General Cable]  
 7 x 22 AWG twisted shielded pair  
 Max Length: 81 ft

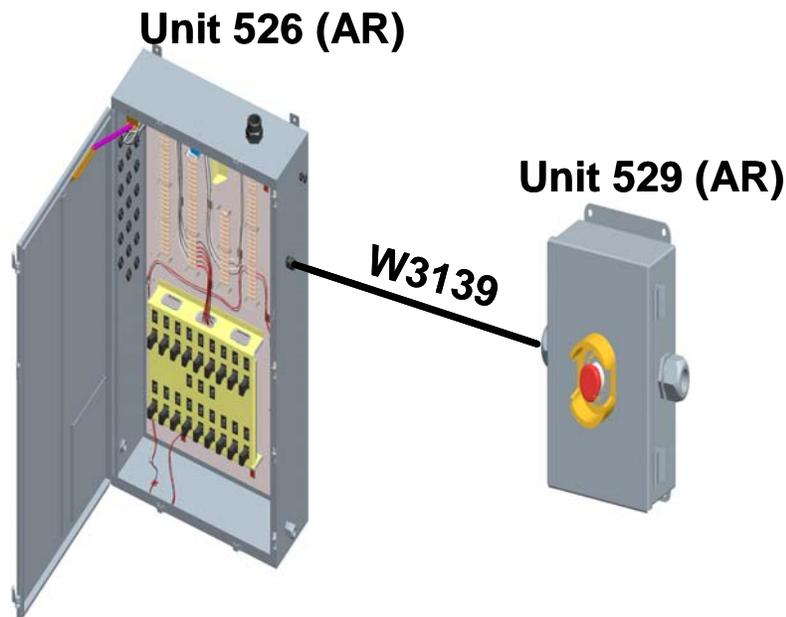


Figure 3-8. CLTS Unit 526 – Unit 529 Interconnection Block Diagram

### 3.6.4 Emergency Transmit Shutdown (ETSD) Assembly Unit 529 and Associated Cabling Amplifier Room (AR)

Cables W3139 (8411125-3) and W3140 (8411219-1) connect the Topside Junction Box (TSJB) Unit 526 (AR) to Emergency Transmit Shutdown (ETSD) Assembly Unit 529 (AR) and Unit 529 to CLTS Power Amplifier Unit 530 J6 t-connector J1 (AR) (See Figure 3-10 for CLTS Unit 526 – Unit 529 – Unit 530 Interconnection Block Diagram).

Cable ID: W3139 (8411125-3)  
 Cable function: +15VDC CLTS Power Amplifier J6 Emergency Shutdown Signal  
 Connectors: From: 17x MS25036-101 (22 AWG Term. Lug)  
 To: 17x MS25036-101 (22 AWG Term. Lug)  
 Cable: M24643/31-02UN [General Cable]  
 7 x 22 AWG twisted shielded pair  
 Max Length: 81 ft

Cable ID: W3140 (8411219-1)  
 Cable function: +15VDC CLTS Power Amplifier J6 Emergency Shutdown Signal  
 Connectors: From: 2917-22/27A-7 [Coaxicom]  
 To: 2917-22/27A-7 [Coaxicom]  
 Cable: SB-45694 [South Bay Cable]  
 Coax Cable [RG-58C/U 50 LSZH]  
 Max Length: 20 ft

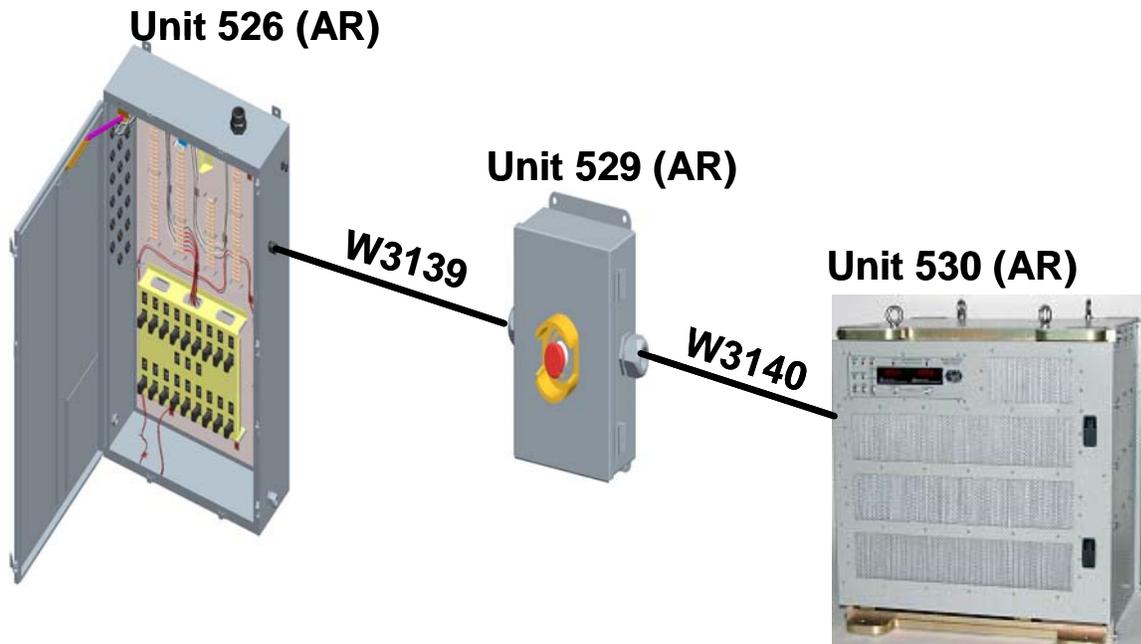


Figure 3-9. CLTS Unit 526 – Unit 529 – Unit 530 Interconnection Block Diagram

### 3.6.5 CLTS Power Amplifier Unit 530 – Unit 549 and Associated Cabling Amplifier Room (AR)

Cables W3140 (8411219-1) through W3159 (8411219-20) connect CLTS Power Amplifier Unit 530 J6 (AR) through CLTS Power Amplifier Unit 549 J6 (AR) (See Figure 3-11 for CLTS Unit 530 – Unit 549 Interconnection Block Diagram).

Cable ID: W3140 (8411219-1) through W3159 (8411219-20)  
Cable function: +15VDC CLTS Power Amplifier J6 Emergency Shutdown Signal  
Connectors: From: 2917-22/27A-7 [Coaxicom]  
To: 2917-22/27A-7 [Coaxicom]  
Cable: SB-45694 [South Bay Cable]  
Coax Cable [RG-58C/U 50 LSZH]  
Max Length: 8 ft

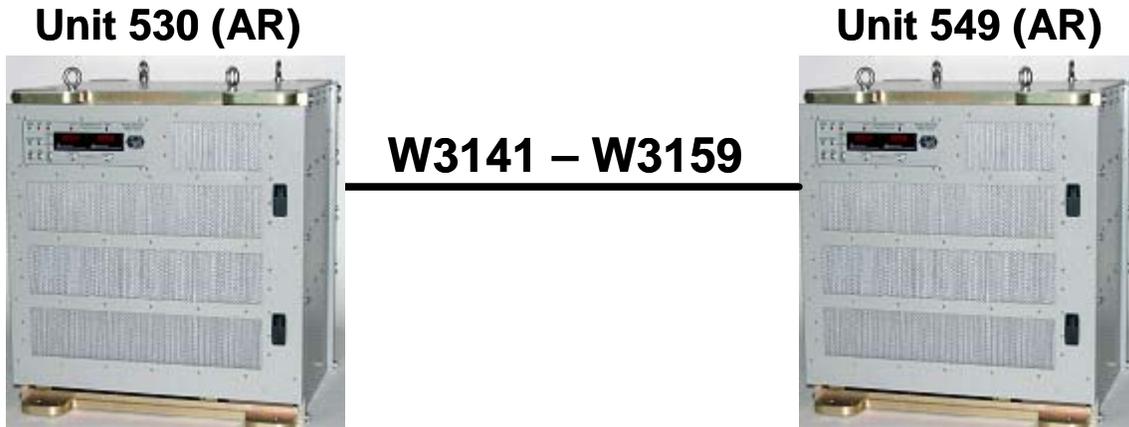


Figure 3-10. CLTS Unit 530 – Unit 549 Interconnection Block Diagram

## 4 CLTS AMPLIFIER INTERFACE SPECIFICATIONS

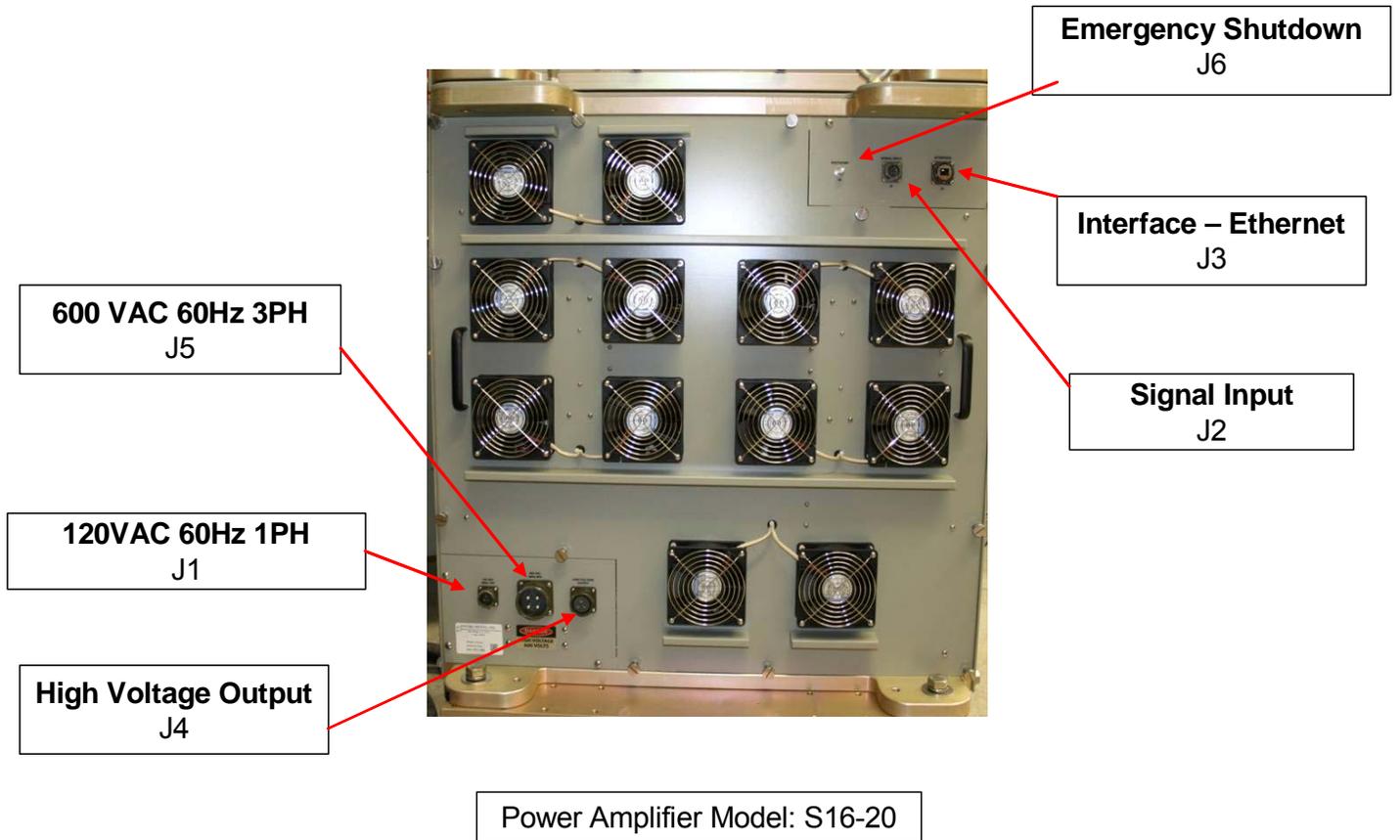
All electrical connections for the CLTS amplifier are made at the rear, see Figure 4-1. Emergency Transmit Shutdown interface to the amplifier is made through Cable W3140 (8411219-1) to connect CLTS Power Amplifier Unit 530 J6 (AR) through Emergency Transmit Shutdown Unit 529 (AR) (See Figure 4-2 Interconnection Block Diagram). Low voltage transmit drive signals interface to the amplifier is made through Cables W3023-W3042 (8411198-1 - 8411198-20) to connect CLTS Power Amplifier Unit 530 - 549 J2 (AR) through the Filter Patch Panel in the Ancillary Equipment Cabinet Unit 512 (AR) (See Figure 4-2 Interconnection Block Diagram). Network connectivity of the CLTS Power Amplifiers Units 530-549 (AR) is made through Cables W3002-W3021 (8411195-1 - 8411195-20) to the Ethernet Switch in the Ancillary Equipment Cabinet Unit 512 (AR) (See Figure 4-2 Interconnection Block Diagram). Hotel power for power amplifiers is supplied through Cables W3105-W3124 (8411205-1 – 8411205-20) to connect CLTS Power Amplifier Units 530-549 J1 (AR) to the ship's 120 V Power Panel (AR) (See Figure 4-3 Interconnection Block Diagram). Primary power for power amplifiers is supplied through Cables W3085-W104 (8411203-1 – 8411203-20) to connect CLTS Power Amplifier Units 530-549 J5 (AR) to the ship's 600 V Power Panel (AR) (See Figure 4-3 Interconnection Block Diagram). Amplified projector drive signals are supplied through Cables W3046-W3065 (8411200-1– 8411200-20) to connect to CLTS Power Amplifier Units 530-549 J4 (AR) to the Topside Junction Box Unit 526 (AR) (See Figure 4-3 Interconnection Block Diagram).

### 4.1 ELECTRICAL INTERFACE

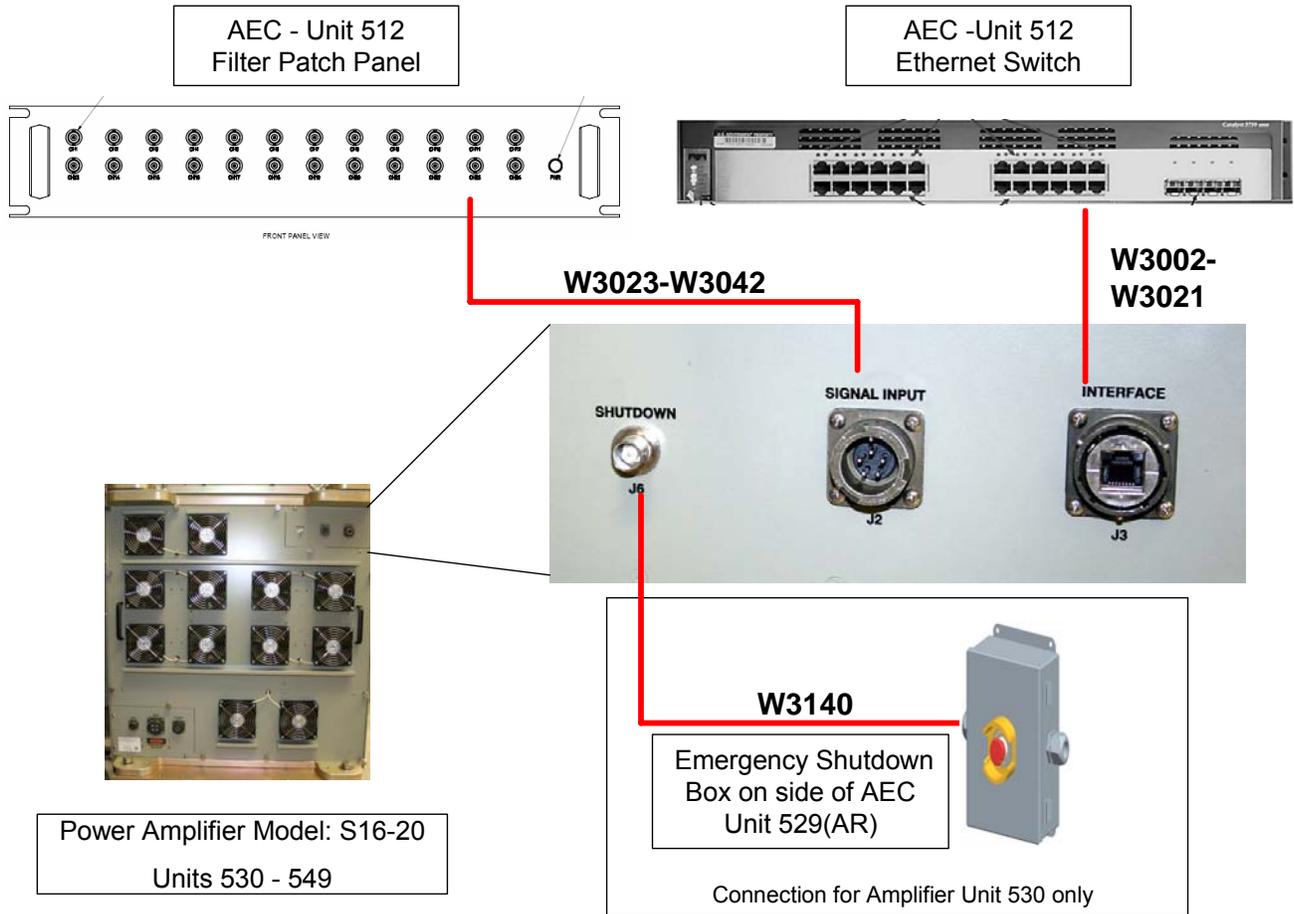
- J1 Hotel Power 120VAC  $\pm$  10%, 2.5A, 1 $\Phi$ , 60Hz  $\pm$  10%
- J2 Signal Input 0-5Vrms, 20k $\Omega$
- J3 Interface Ethernet 10/100 baseT
- J4 High Voltage Output 0-2650Vrms, 0-16A
- J5 Main Power 600VAC  $\pm$  3%, 60A, 60Hz  $\pm$  10%
- J6 Emergency Shutdown 12-15VDC, 2.7k $\Omega$
- J7 Output Voltage Monitor 1mV/V, 50 $\Omega$
- J8 Output Current Monitor 100mV/V, 50 $\Omega$

### 4.2 MECHANICAL INTERFACES

- Cooling: Forced Air
- Heat Load: Up to 5460 BTU's
- Weight: 990 lbs.
- Size: 35.25" H (w/o mounts), 34.5" W, 31.5" D



**Figure 4-1. Rear View of CLTS Power Amp 1**



**Figure 4-2. Low Voltage CLTS Amplifier 1**

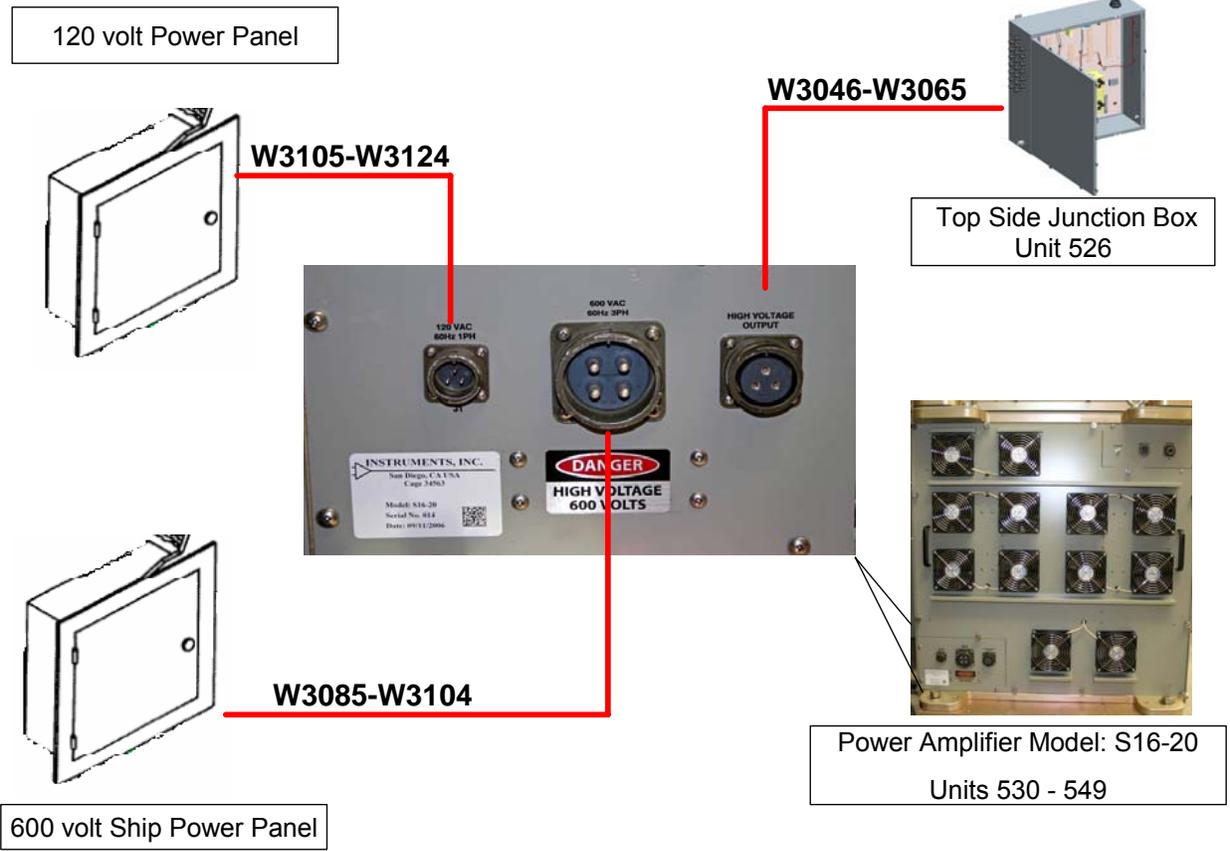


Figure 4-3. High Voltage CLTS Amplifier 1

**5 ACRONYMS**

AHR	Array Handling Room
AR	Amplifier Room
CLTS	Compact Low Frequency Active Transmit Subsystem
CPAG	CLTS Power Amplifier Group
CTAG	CLTS Transmit Array Group
EOM	Electro-Optical-Mechanical
ETSD	Emergency Transmit Shutdown
FO	Fiber Optic
HF/M3	High Frequency Marine Mammal Monitoring
IAW	In Accordance With
ICD	Interface Control Document
NAS	Non Acoustic Sensor
NFESC	Naval Facility Engineering Service Center
PDM	Product Data Manager
SOC	SURTASS Operations Center
TBD	To Be Determined
TSJB	Topside Junction Box
WJB	Winch Junction Box
WSJB	Wetside Junction Box