

**TECHNICAL SPECIFICATIONS  
(TECHNICAL PROVISIONS)**

**SECTION TP14**

**SPECIAL TOOLS AND TEST EQUIPMENT**

August 28, 2009  
Rev. 4 Final

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**SECTION TP14  
SPECIAL TOOLS AND TEST EQUIPMENT**

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**TP14: SPECIAL TOOLS AND TEST EQUIPMENT**

**TP14.01 DIAGNOSTIC TEST EQUIPMENT AND SPECIAL TOOLS**

**A. GENERAL**

The tools and special test equipment requirements for this overhaul effort are limited. However, the Contractor shall be responsible for procurement of all special tools identified throughout these Technical Provisions. Any special tools procured by the Contractor to perform work on this contract shall become the property of SFMTA at the completion of the project. The Contractor shall provide the equipment specified unless otherwise noted as optional, in this Section for comprehensive maintenance and in-service testing of vehicles and bench testing of components and subsystems. All of the special tools and test equipment procured by the Contractor for this program shall be surrendered to SFMTA upon program completion.

Within 120 days of NTP, the Contractor shall submit to the Engineer for review and approval, a comprehensive list of all proposed special tools and test equipment. For each different tool and item of test equipment, the Contractor shall submit a description of the use and operation of the item, and drawings that define equipment envelope, required work space envelope, and utility requirements. The Contractor shall be responsible for revising the list for any design changes to the cars and test equipment that affects the special tools and test equipment. Each special tool and item of test apparatus shall be accompanied by:

- Complete diagrams, schematics, and maintenance and calibration instructions for the device itself;
- Test equipment procedures, maintenance, calibration, and troubleshooting procedures for the associated carborne system, assembly, sub-assembly and sub-components.

The Contractor shall be responsible for acceptance of all special tools and test equipment. It is recommended that the Contractor demonstrate that the tools and test equipment perform their intended function. The Contractor shall make all modifications to tools and test equipment specified herein that are required because of changes and modifications made to the vehicle or any of its subsystems.

The Contractor shall supply manuals and training for all test equipment including custom software applications supplied with test equipment.

**B. OPTIONAL MAINTENANCE FACILITY BENCH TEST EQUIPMENT (MFBTE)**

If the Contractor develops bench test equipment that is unique to a system overhaul and it is determined that SFMTA does not currently possess similar capability, the Contractor shall provide one set of test equipment within 30 days of pilot car acceptance, so that it can be used for training SFMTA staff, and for troubleshooting/maintenance of the LRVs as

## **Special Tools and Test Equipment**

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they are delivered. The Contractor will provide an additional set of MFBTE upon completion of all cars. This may be equipment that was used by the Contractor during overhaul, but shall be in good repair.

### **C. PORTABLE TEST EQUIPMENT (PTE)**

If the Contractor develops PTE that is unique to a system overhaul and it is determined that SFMTA does not currently possess similar capability, the Contractor shall provide one set of test equipment within 30 days of pilot car acceptance, so that it can be used for training SFMTA staff, and for troubleshooting/maintenance of the LRVs as they are delivered. The Contractor will provide an additional set of PTE upon completion of all cars. This may be equipment that was used by the Contractor during overhaul, but shall be in good repair.

The PTE shall include all cables, connectors, and associated equipment required to interface with the test points.

### **D. FUNCTIONAL REQUIREMENTS**

The function of the PTE shall be to produce all of the operating commands and other input signals necessary to fully exercise all functions and components of the particular system or subsystem under test, and to measure or indicate all of the signals, responses, and outputs produced by a system by means of indicators such as lamps, meters, oscilloscopes, gauges, or computer-controlled displays. It shall be acceptable to require a visual check for system response, such as closure of a contactor, provided the responding item of equipment does not require removal of other equipment, or use of hand tools to permit observation of response, and does not require the maintenance technician to move more than 15 feet to make the required observation. When used according to the instructions supplied by the Contractor, each PTE shall enable the maintenance technician to fully check and calibrate the system or subsystem under test and to locate and replace any removable component which has fully or partially failed. The PTE shall also operate in a passive monitoring mode to permit observation of the functions of those systems while the vehicle is being operated at all normal operating speeds. Response indicators and input signal generators shall be built into the PTE to the maximum extent possible and shall have accuracy commensurate with the alignment tolerances specified.

### **E. PHYSICAL REQUIREMENTS**

The test equipment shall perform under the environmental conditions imposed by the activities of the vehicle inspection and repair shop with temperatures ranging from 20 degrees Fahrenheit (-7 degrees Celsius) to 115 degrees Fahrenheit (46 degrees Celsius) in the test areas. The test equipment shall be completely portable and suitable for rough handling during use on the shop floor, pit locations, and in the yard. The test equipment shall be self-protected in the event of an overload, ground, or short-circuit condition.

Response and output indicators and input signal generators shall be industrial grade. Each PTE shall be housed in aluminum or fiberglass suitcase-type enclosure with a removable cover suitable for use in a shop environment and as manufactured by Zero

## **Special Tools and Test Equipment**

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Manufacturing Co., Skydyne, or approved equal. All meters supplied as part of the PTE shall be of a variety capable of withstanding industrial service. The weight for any PTE shall not exceed 30 pounds without the prior approval of the Engineer.

### **F. INTERFACE CONNECTIONS**

Connection of the PTE to the equipment shall be through a test plug conveniently located on the vehicle so that the maintenance technician is able to observe the functioning of the system while it is tested.

Connectors used in the interface between the PTE and the system under test shall have recessed pins to prevent bending and breakage during frequent use. All connections shall be hand-operated, robust, weather-tight, quick-disconnect, multi-pin connectors.

### **G. CABLES AND HOSES**

External hook-up, multi-conductor cables shall be furnished to connect the vehicle systems with the PTE. A minimum number of cable connections shall be used to connect the test equipment to the systems under test. Cables shall be flexible, abrasion-resistant, and oil-resistant. The connecting cables and hoses shall be stored within the PTE case.

The Contractor shall not require connection of external apparatus to the PTE without the prior written approval of the Engineer. In such cases, terminals shall be provided to allow connection of the required apparatus to the PTE. However, such apparatus shall be considered part of the PTE and shall be supplied with it on a one-to-one basis.

If a laptop computer is used as the PTE for two or more systems, and if the connection to these systems is by means of a serial or Ethernet data link, the Contractor shall define a standard cable and connector for use in connecting the laptop computer to any system for which it functions as the PTE. One of each such cable shall be supplied with each laptop computer which functions as a PTE.

### **H. SOFTWARE**

If a computer is used as a test device, a master program software CD shall be provided with the test device.

## Special Tools and Test Equipment

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### TP14.02 SPECIFIC TEST EQUIPMENT REQUIRED

#### A. AUTOMATIC COUPLER

No specific test equipment required, unless used by the Contractor as discussed in TP14.01

#### B. DOORS AND STEPS

The Contractor is required to provide their own portable test unit, cable, and software for working with the door system.

#### C. PSC-2 HARNESS

No specific test equipment required, unless used by the Contractor as discussed in TP14.01

#### D. AIR SUPPLY

No specific test equipment required, unless used by the Contractor as discussed in TP14.01

#### E. ROOF ARTICULATION HARNESS

### TP14.03 CONTRACT DELIVERABLE REQUIREMENTS LIST

CDRL #	Title	Reference Paragraph

End of Section

# **TECHNICAL PROVISIONS**

## **SECTION TP15**

### **DELIVERABLES SUMMARY**

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DELIVERABLES SUMMARY**

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## Deliverables Summary

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### TP15: CONTRACT DELIVERABLES REQUIREMENTS SUMMARY

#### TP15.01 PROGRAM-LEVEL CDRLS – DUE 30 DAYS AFTER NTP

Each of the following CDRLs shall be submitted within 30 days after NTP. These CDRLs shall be resubmitted promptly if revisions are made by the Contractor.

CDRL #	Title	Reference Paragraph	Due Date
1-001	Master Program Schedule	1.04.A	30 days after NTP
1-016	Management Plan	1.07.D	30 days after NTP
1-017	Systems Engineering and Integration Plan	1.07.G	30 days after NTP
1-018	Configuration Management Plan	1.07.H	30 days after NTP
9-001	Project Quality Assurance Program Plan	9.02.A	30 days after NTP
9-002	First Article Inspection Schedule	9.05.F	30 days after NTP
10-002	Pre-Possession Inspection Procedure	10.02	30 days after NTP

## Deliverables Summary

### TP15.02 PROGRAM-LEVEL CDRLS – DUE DURING THE PROJECT

Each of the following CDRLs shall be submitted at the appropriated time during the program and resubmitted promptly if revisions are made by the Contractor, and all CDRLs shall be submitted prior to acceptance of the last LRV or project closeout.

CDRL #	Title	Reference Paragraph	Due Date
1-002	Purchase Orders	1.04.A	Every 30 days
1-010	Approval Drawings	1.05.A	Ongoing
1-011	Drawing Database and Updates	1.05.A	Continuous
1-013	List Of Contract Drawings	1.05.C	60 days after delivery of first car
1-014	Contract Drawings	1.05.C	60 days after delivery of first car
3-004	Coupler Overhaul FAI Package	3.06	After completion of 1st car
4-002	Door and Step Overhaul Procedures	4.03.F	Prior to start of 3rd car
4-004	Door and Step FAI Package	4.08.	After completion of 1st car
5-001	PSC-2 Cable Design Submittal Package	5.03.A	60 days prior to start of 1st car
5-003	Revised PSC-2 Cable Replacement Procedure	5.05.B	Prior to start of 3rd car
5-005	PSC-2 Cable First Article Inspection Package	5.05.D	After completion of 1st car
6-004	ASU Overhaul FAI Package	6.04	After completion of 1st car
7-002	Articulation Cable Design FDR Submittal	7.02.A	30 days prior to start of 1st car
7-003	Articulation Wiring List	7.02.B	60 days prior to start of 1st car
7-005	Articulation Cable Replacement Procedure	7.02.B	Prior to start of 3rd car
7-007	Articulation Cable movement drawings	7.02.E	60 days prior to start of 1st car
7-008	Articulation Cable Installation FAI Package	7.06	After completion of 1st car
10-001	Master Program Test Plan	10.01	180 days after NTP
10-011	Type Test Reports	10.04.E.3	14 days after test
10-014	Pilot Car Test Procedure	10.10	prior to test shipment of 1 <sup>st</sup> car
10-015	Pilot Car Test Report	10.10	prior to test shipment of 2nd car

## Deliverables Summary

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### TP15.03 LRV-LEVEL CDRLS – DUE DURING EXECUTION OF THE PROJECT

One set of the following CDRLs shall be submitted for each LRV at the appropriated time during the program. All CDRLs shall be submitted prior to acceptance of the LRV.

CDRL #	Title	Reference Paragraph	Due Date
1-015	Car History Books	1.06	Acceptance for rev service
1-021	Release for Shipment Certificate	1.08.B	Prior to LRV shipment
3-003	Coupler Sign-off Sheets	3.03	LRV Delivery
4-003	Door and Step Sign-off Sheets	4.07.A	LRV Delivery
5-004	PSC-2 Cable Replacement Sign Off Sheet	5.05.B	LRV Delivery
6-003	ASU Sign-off Sheets	6.02	LRV Delivery
10-003	Pre Possession Inspection Report	10.02	Prior to shipping LRV out
10-013	Acceptance Test Reports	10.04.D.7	5 days after test

## Deliverables Summary

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### TP15.04 CDRLS ONLY REQUIRED IF CONTRACTOR CHOOSES TO USE MATERIALS OR METHODS NOT CURRENTLY ANTICIPATED

The following CDRLs shall only be required if the Contractor chooses to use materials or methods not specifically defined in the work scope sections of these Technical Provisions. This may include the use of new materials, suppliers, construction methods, etc.

CDRL #	Title	Reference Paragraph	Due Date
7-006	Articulation Wiring List Corrections	7.02.D	As needed
14-001	Special Tools and Test Equipment List	14.01.A	As needed
14-002	Master Program Software CD	14.01.H	As needed

**End of Section**

**TECHNICAL SPECIFICATIONS  
(TECHNICAL PROVISIONS)**

**SECTION TP16**

**SUPPLEMENTAL DRAWINGS AND REFERENCE  
DOCUMENTS**

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**SECTION TP16  
SUPPLEMENTAL DRAWINGS AND REFERENCE DOCUMENTS**

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**TP16: SUPPLEMENTAL DRAWINGS & REFERENCE DOCUMENTS**

**TP16.01 DOCUMENTS AND DRAWINGS AVAILABLE ON CD**

The following documentation is available to the Contractor on CDs.

1. LRV2 Conformed Specification (in PDF format)
2. LRV2 Heavy Preventive Maintenance Manual (in PDF format)
3. LRV2 Running Maintenance and Service Manual (in PDF format)
4. LRV2 Running Preventive Maintenance Manual (in PDF format)
5. LRV2 Heavy Repair Workshop Manual (in PDF format)
6. LRV2 Illustrated Parts Catalog (in PDF format)
7. LRV2 Drawing List (in Excel spread sheet format)
8. LRV2 Drawings (in TIFF format)

**TP16.02 DOCUMENTS AND DRAWINGS PROVIDED ON PAPER**

The following documentation is available to the Contractor to copy.

1. LRV2 Drawings (Select drawings not available as TIFF)
2. )

## Supplemental Drawings and Reference Documents

### TP16.03 WIRE LISTS REFERENCED IN SPECIFICATION

#### A. LRV2 ARTICULATED CONNECTION JUMPER

EYP7 35 pin					
Pin	A Side	B Side	AWG	Purpose	Comments
1	ET084	ET084	12	Passenger Intercom T/L	3-conductor
2	ET085	ET085	12	Passenger Intercom T/L	3-conductor
3	TH-31,32,33	TH-31,32,33	12	Shields	3-conductor
5	ET081	ET081	12	PA Audio T/L	3-conductor
14	ET086	ET086	12	PA Audio T/L	3-conductor
15	ET082	ET082	12	Cab to Cab Intercom T/L	3-conductor
16	ET083	ET083	12	Cab to Cab Intercom T/L	3-conductor
4	ET042	ET042	12	PSR T/L +	
6	ET026	ET026	12	Sanding T/L +	
7	ET070	ET070	12	Tow Mode T/L +	
8	ET040	ET040	12	Regen Cutout T/L +	
9	ET066	ET066	12	Zero Speed T/L +	
10	ET041	ET041	12	Cutout Bypass Status T/L +	
11	ET064	ET064	12	Propulsion Fault T/L +	
12	ET045	ET045	12	Derail Sensors T/L +	
13	ET101	ET101	12	Steps High Status Indicator (and ADA chime)	
17	ET054	ET054	12	EB T/L +	3-conductor
18	ET053	ET053	12	EB T/L -	3-conductor
19	TH-65	TH-65	12	Shield	3-conductor
21	ET034-4	ET034	12	Trake Brake On Status T/L	
22	ET033	ET033	12	Track Brake On T/L	
23	ET006-5	ET007-2	12	Right Steps Low/Left Steps Low T/L Control	
24	ET005-5	ET008-2	12	Right Steps High/Left Steps High T/L Control	
25	ET007-4	ET006-4	12	Left Steps Low/Right Steps Low T/L Control	
26	ET008-4	ET005-4	12	Left Steps High/Right Steps High T/L Control	
27	ET029	ET028	12	Turn Signal On Left/Right +	
28	ET028	ET029	12	Turn Signal On Right/Left +	
29	ET018	ET018	12	Head/Tail Lights T/L +	
30	14BB-2	14BH-2	12	Steps Low T/L Status	
31	14CB-2	14BG-2	12	Steps High T/L Status	
32	14BH-2	14BB-2	12	Steps Low T/L Status	
33	14BG-2	14CB-2	12	Steps High T/L Status	
34	43AN-3	43AN-3	12	Local EB loop +	3-conductor
20	43AF-3	43AF-3	12	Local EB loop -	3-conductor
35	TH-74	TH-74	12	Shield	3-conductor

EYP8 35 pin					
Pin	A Side	B Side	AWG	Purpose	Comments
1	ET057	ET057	12	Brk Mode T/L +	
2	ET058	ET058	12	Brk Mode T/L -	



## Supplemental Drawings and Reference Documents

3	ET067	ET067	12	Auto Mode T/L	
4	ET055	ET056	12	Forward T/L +	3-conductor
5	ET056	ET055	12	Reverse T/L +	3-conductor
6	TH-80,83	TH-80,83	12	Shields	3-conductor
7	ET052	ET052	12	P-Wire T/L Out	3-conductor
8	64AA-1	64AA-1	12	P-Wire T/L In	3-conductor
9	18DA-1	18DA-2	12	Left Doors Opn/Rls/Close	
10	18EA-1	18EA-2	12	Left Doors Opn/Rls/Close	
11	18FA-1	18FA-2	12	Left Doors Opn/Rls/Close	
12	18AA-2	18AA-1	12	Right Doors Opn/Rls/Close	
13	18BA-2	18BA-1	12	Right Doors Opn/Rls/Close	
14	18CA-2	18CA-1	12	Right Doors Opn/Rls/Close	
15	36VA-1	36VA-1	12	Radio Wiring	
16	ET065	ET065	12	Cab to Cab Intercom Reset	
17	ET011-8	ET011-20	12	Steps Low Status (Cab Dependant)	
18	ET011-9	ET011-26	12	Steps Low Status (Cab Dependant)	
19	ET063	ET063	12	Pass Emer Stop Indication T/L	
20	ET046	ET046	12	Emer Door Rls Indication T/L	
21	ET059-10	ET059-1	12	ATCS FSB Loop T/L +	
22	ET060	ET060	12	FSB Loop T/L +	
23	ET073	ET073	12	FSB Loop T/L -	
24	ET068	ET068	12	Positive T/L #2	
25	ET048	ET048	10	Negative T/L #2	
26	ET069	ET069	12	Positive T/L #1	
27	ET049	ET049	10	Negative T/L #1	
28	ET071	ET071	12	Aux On T/L +	
29	ET072	ET072	12	Aux Off T/L +	
30	ET062	ET062	12	MC Interlock T/L -	
31	ET061	ET061	12	MC Interlock T/L +	
32	ET037	ET037	12	Frict Brk Fault T/L	
33	ET035	ET035	12	Frict Brk On Status T/L	
34	ET039	ET039	12	Brake Dragging T/L	
35	ET019	ET019	12	Low Air Pressure T/L	

EYP9 35 pin					
Pin	A Side	B Side	AWG	Purpose	Comments
1	ET095-1	ET095	12	ATCS Serial Data Link T/L	3-conductor
2	ET096-1	ET096	12	ATCS Serial Data Link T/L	3-conductor
3	TH-127	TH-127	12	Shield	3-conductor
4	ET089-2	ET089	12	ATCS Active T/L	
5	89HA-1	ET090	12	ATCS Train Integrity T/L	
6	ET038-2	ET038	12	ATCS Power Return T/L	
7	ET036-3	ET036	12	ATCS Cutout T/L	
8					<i>Not Used</i>
9	ET027	ET027	12	Interior Lights T/L +	
10	ET047	ET047	12	Interior Lights T/L -	
11	ET025	ET024	12	Doors Right Summary T/L -	

## Supplemental Drawings and Reference Documents

12	ET024	ET025	12	Doors Left Summary T/L +	
13	ET014-4	ET014	12	Doors Left Closed T/L +	
14	ET013-4	ET013	12	Doors Right Closed T/L -	
15	89FA-1	ET091	12	ATCS Train Integrity T/L	
16	89AC-1	89AC-1	12	ATCS Check Loop T/L	
17	ET093-10	ET093	12	ATCS Check Loop T/L	
18	89BA-1	89BA-1	12	ATCS Transfer Switch Interlock T/L	
19	89CA-1	ET020	12	ATCS Transfer Switch Interlock T/L	
20	ET099-4	ET100	12	Auto Cab Select T/L	
21	ET050-10	ET050-2	12	ATCS EB Loop -	3-conductor
22	ET087-10	ET087-1	12	ATCS EB Loop +	3-conductor
23	TH-68	TH-68	12	Shield	3-conductor
24	ET022	ET022	12	Pan Up T/L	
25	ET023	ET023	12	Pan Down T/L	
26	ET043	ET043	12	Aux PS Fault T/L	
27	ET100-4	ET099	12	Auto Cab Select T/L	
28	ET098-4	ET098	12	VOBC Reset T/L	
29	50AE-2	50AE-2	12	Horn & Gong +	
30	ET075	ET075	12	Zero Speed for Trk Brks T/L +	
31	50AD-2	50AD-2	12	Horn & Gong +	
32	45EA-4	45EA-4	12	Interior Emerg Lights Relay Control	
33	ET071-11	ET071-11	12	Interior Emerg Lights Relay Control	
34	89GA-1	ET092	12	ATCS Train Integrity T/L	
35	ET021	ET021	12	Ventilation Blower Cutout T/L +	

EYP10 60 pin					
Pin	A Side	B Side	AWG	Purpose	Comments
1	36QA-2	36QA-4	16	Passenger Intercom T/L	
2	36RA-2	36RA-4	16	Passenger Intercom T/L	
3	TH-23	TH-23	16	Shield	3-conductor
4	36CA-5	36CA-6	16	Communication Control Amp Wiring	3-conductor
5	36DA-5	36DA-6	16	Communication Control Amp Wiring	3-conductor
6	34AB-2	34AB-3	16	Communication Control Amp Wiring	
7	34BB-2	34BB-3	16	Communication Control Amp Wiring	
8	34CB-2	34CB-3	16	Communication Control Amp Wiring	
9	34DB-2	34DB-3	16	Communication Control Amp Wiring	
10	34EB-2	34EB-3	16	Communication Control Amp Wiring	
11	34FB-2	34FB-3	16	Communication Control Amp Wiring	
12	34GB-2	34GB-3	16	Communication Control Amp Wiring	
13	34HB-2	34HB-3	16	Communication Control Amp Wiring	
14	34JB-2	34JB-3	16	Communication Control Amp Wiring	
15	34YD-4	34YD-3	16	LRV2 Local Radio Control	
16	34YC-6	34YC-5	16	LRV2 Local Radio Control	
17	34KB-2	34KB-3	16	Communication Control Amp Wiring	
18	34LB-2	34LB-3	16	Communication Control Amp Wiring	
19	34MB-2	34MB-3	16	Communication Control Amp Wiring	
20	34NB-2	34NB-3	16	Communication Control Amp Wiring	

## Supplemental Drawings and Reference Documents

21	34PB-2	34PB-3	16	Communication Control Amp Wiring	
22	34QB-2	34QB-3	16	Communication Control Amp Wiring	3-conductor
23	34RB-2	34RB-3	16	Communication Control Amp Wiring	3-conductor
24	TH-30	TH-30	16	Shield	3-conductor
25	34SB-2	34SB-3	16	Communication Control Amp Wiring	
26	34TB-2	34TB-3	16	Communication Control Amp Wiring	
27	34WB-2	34WB-3	16	Communication Control Amp Wiring	
28	36PA-1	36PA-1	16	Radio Wiring	
29	14EC-3	14EC-3	16	Steps Down Control -	
30	35RA-1	35RA-1	16	Radio Wiring	
31	35SA-1	35SA-1	16	Radio Wiring	
32	36NA-4	36NA-6	16	Radio Wiring	
33	36HA-2	36HA-4	16	Radio Wiring	
34	36JA-2	36JA-4	16	Radio Wiring	
35	36KA-2	36KA-4	16	Radio Wiring	
36	36LA-2	36LA-4	16	Radio Wiring	
37	36MA-2	36MA-4	16	Radio Wiring	
38	36GA-4	36GA-5	16	Radio Wiring	2-conductor
42	TH-14	TH-14	16	Shield	2-conductor
39					<i>Not Used</i>
40	35GA-1	35GA-2	16	Radio Wiring	
41	35HA-1	35HA-2	16	Radio Wiring	
43	35DA-9	35DA-10	16	Interior Speakers	3-conductor
44	35CA-9	35CA-10	16	Interior Speakers	3-conductor
45	TH-xx	TH-xx	16	Shield	3-conductor
46	TH-03	TH-03	16	Shield	3-conductor
47	35BA-2	35BA-4	16	Exterior Speakers	3-conductor
48	35AA-2	35AA-4	16	Exterior Speakers	3-conductor
49	35TA-1	35TA-1	16	Radio Wiring	
50	35UA-1	35UA-1	16	Radio Wiring	
51	35VA-1	35VA-1	16	Radio Wiring	
52	35WA-1	35WA-1	16	Radio Wiring	
53	35XA-1	35XA-1	16	Radio Wiring	
54	35YA-1	35YA-1	16	Radio Wiring	
55	35ZA-1	35ZA-1	16	Radio Wiring	
56	36XA-1	36XA-1	16	Radio Wiring	
57	36YA-1	36YA-1	16	Radio Wiring	
58	TH-150	TH-150	16	Shield	2-conductor
59	36BA-4	36BA-4	16	Radio Wiring	2-conductor
60					<i>Not Used</i>

EYP11 85 pin					
Pin	A Side	B Side	AWG	Purpose	Comments
A	NB27-5	NB27-5	16	Destination & Run Number Sign -	
B	X27-7	X27-7	16	Destination & Run Number Sign +	
C	49BA-5	49BA-5	16	Destination & Run Number Sign Network	3-conductor
D	49AA-5	49AA-5	16	Destination & Run Number Sign Network	3-conductor

## Supplemental Drawings and Reference Documents

E	TH-61	TH-61	16	Shield	3-conductor
F	X16-8	X16-8	16	Stop Request Circuit +	
H	47DA-5	47DA-5	16	Stop Request Circuit +	
J	81EB-3	81EB-4	16	Sander Control Cutout	
K	81EA-3	81EA-2	16	Sander Control Cutout	
L	80AA-2	80AA-2	16	Zero Speed Bypass Loop	
M	81SA-2	81SA-2	16	Prop Inverter #2 Cutout	
N	81TA-2	81TA-2	16	Prop Inverter #1 Cutout	
P	44BC-2	44BC-1	16	Emerg Door Rls Bypass & Overspd Aud Cutout	
R	84YA-2	84YA-2	16	Overspeed Indicator and Chime	
S	81UA-2	81UA-2	16	Propulsion Stall Indicator	
T	81VA-2	81VA-2	16	KT panel Prop Fault A	
U	81WA-2	81WA-2	16	KT panel Prop Fault B	
V	54EA-2	54EA-2	16	Friction Brake C Cutout	
W	54FA-2	54FA-2	16	Friction Brake B Cutout	
X	28BA-1	28BA-1	16	Pantograph Control Cutout +	
Y	28CA-1	28CA-1	16	Pantograph Control Cutout +	
Z	28CB-4	28CB-3	16	Pantograph Control Cutout	
a	28BB-4	28BB-3	16	Pantograph Control Cutout	
b	14AF-1	14AF-1	16	B Cab Steps Up Command	
c	46RA-2	46RA-1	16	B Cab Right Turn Button	
d	46SA-2	46SA-1	16	B Cab Left Turn Button	
f	46FA-3	46FA-3	16	B Cab Emergency Flasher Button	
g	58AA-6	58AA-6	14	Turn Signal Lights T/L +	
h	58BA-6	58BA-6	14	Turn Signal Lights T/L +	
i	NB8-4	NB8-4	14	Turn Signal Lights -	
j	46FB-4	46FB-4	16	Emerg Flashers Steps Down Doors Open	
k	14BC-4	14DB-4	16	Stepwell Lights Right Timer Relay +	
m	56FA-1	56FA-1	16	Zero Speed Track Brake Control	
n	14CD-4	14BC-4	16	Stepwell Lights Left Timer Relay +	
p					<i>Not Used</i>
q	18HA-1	18HA-1	16	Door Chime Relay Control	
r	18ZA-26	18ZA-25	16	B Car Right Doors Lock Command	
s	18FB-20	18FB-3	16	B Car Right Doors Lock Command	
t	18GA-1	18GA-1	16	Local Door Control Relay Control	
u	46MB-10	46MB-2	16	Stop Request Circuit +	
v	46MA-10	46MA-2	16	Stop Request Circuit +	
w	46FG-2	46FG-2	16	Emerg Flashers Steps Down Doors Open	
x	14EA-2	14EA-2	16	Steps Up Control -	
y	17EA-11	17EA-11	16	Door Operator Zero Speed B+	
z	26LB-2	26LB-2	16	RTX Time Out Control Loop	
AA	26GA-2	26GA-2	16	Aux On +	
AB	17LA-2	17LA-3	16	Right Doors Closed Relay Control	
AC	17MA-2	17MA-3	16	Left Doors Closed Relay Control	
AD	17LD-2	17LD-1	16	Right Doors Closed Loop	
AE	17ME-2	17ME-1	16	Left Doors Closed Loop	
AF	17KA-3	17KA-3	16	Local Doors Closed Indicator	

## Supplemental Drawings and Reference Documents

AH	41CD-5	41CD-6	16	LVPS Fault Indication	
AJ	41CC-5	41CC-6	16	Aux PS Fault Indication	
AK	34YB-1	34YB-2	16	LRV2 Local Radio Control	
AL	26BA-4	26BA-4	16	Aux On +	
AN	55SC-2	55SC-1	16	B17 Valve Cutout Status	
AP	X29-36	X29-34	16	Friction Brake Control CB	
AR	43AD-4	43AD-4	16	Emerg Brake Indicator	
AS	66BF-10	66BF-1	16	Emerg Door Release and Pass Emerg Loop	
AT	34ZA-1	34ZA-1	16	Sound Powered Telephone Circuit	
AU	34XA-1	34XA-1	16	Sound Powered Telephone Circuit	
AV	42KA-3	42KA-3	16	Speedometer -	3-conductor
AW	42FB-2	42FB-2	16	Speedometer +	3-conductor
AM	TH-130	TH-130	16	Shield	3-conductor
AX	54DA-2	54DA-1	16	Friction Brake Fault C Indicator	
AY	54CA-2	54CA-1	16	Friction Brake Fault B Indicator	
AZ	56AA-3	56AA-3	14	Track Brake Cutout	
BA	88JA-3	88JA-3	16	VOBC Overspeed Chime	
BB	56AC-3	56AC-3	14	Track Brake Cutout	
BC	ET019-6	ET019-5	16	Low Air Pressure T/L	
BD	54GA-2	54GA-2	16	Friction Brake A Cutout	
BE	55EA-3	55EA-3	16	Friction Brake On Indicator	
BF	44BC-39	44BC-39	16	A Car Trouble Lights (Knorr ECU) +	
BH	54BA-2	54BA-1	16	Friction Brake Fault A Indicator	
BJ	26LA-2	26LA-2	16	RTX Time Out Control Loop	
BK	46DA-3	46DA-3	16	B Car Car Cleaner Switch	
BL	46DB-3	46DB-3	16	B Car Car Cleaner Switch	
BM	36ZA-1	36ZA-1	16	Radio Wiring	
BN	46CB-3	46CB-3	16	Interior Lights Timer Relay Control	
BP	46CA-3	46CA-3	16	Interior Lights Timer Relay Control	
BR	48BA-12	48BA-11	16	Stepwell Lights and DC Ballasts +	
BS	48BD-2	48BD-3	16	Stepwell Lights and DC Ballasts +	
BT	48BE-3	48BE-3	16	Stepwell Lights and DC Ballasts +	
BU	C11-3	C11-10	16	Cab and Destination Sign Lights +	
BV	51AA-1	51AA-10	16	Cab and Destination Sign Lights +	

EYP12 85 pin					
Pin	A Side	B Side	AWG	Purpose	Comments
A	42NA-10	42NA-3	16	B Cab ATCS DDU	3-conductor
B	42PA-10	42PA-3	16	B Cab ATCS DDU	3-conductor
C	TH-138	TH-138	16	Shield	3-conductor
D	42QA-10	42QA-3	16	B Cab ATCS DDU	3-conductor
E	42RA-10	42RA-3	16	B Cab ATCS DDU	3-conductor
F	TH-141	TH-141	16	Shield	3-conductor
H	89DA-1	89DA-1	16	ATCS Check Loop T/L	
J	75GA-10	75GA-5	16	VOBC Coupler Loop (B end)	
K	75GB-10	75GB-2	16	Uncoupling Control (B end)	
L	75JA-10	75JA-3	16	Coupler Isolate/Connect (B end)	

## Supplemental Drawings and Reference Documents

M	18DA-22	18DA-14	16	VOBC Left Doors Opn/Close	
N	18EA-20	18EA-12	16	VOBC Left Doors Opn/Rls/Close	
P	18BA-20	18BA-12	16	VOBC Right Doors Opn/Rls/Close	
R	18AA-20	18AA-12	16	VOBC Right Doors Opn/Rls/Close	
S	26AA-10	26AA-7	16	B End VOBC Cab Relay Control	
T	75BA-10	75BA-2	16	End Train Control (coupling)	
U					<i>Not Used</i>
V					<i>Not Used</i>
W	ET062-20	ET062-8	16	VOBC MC Interlock T/L -	
X					<i>Not Used</i>
Y					<i>Not Used</i>
Z	88MA-11	88MA-12	16	B End VOBC Transfer Switch Interlock	
a	56DC-3	56DC-4	16	Track Brake Sonalert (VOBC)	
b	95TA-30	95TA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
c	64BA-11	64BA-3	16	Brk Mode	
d	56AD-13	56AD-13	16	Zero Speed Track Brake Control	
f	X19-4	X19-4	16	Track Brake Control CB +	
g	46MC-25	46MC-25	16	Stop Request Circuit (HSR) +	
h	55KA-5	55KA-6	16	Friction Brake On Status	
i	SPARE38	SPARE38			<i>Not Used</i>
j	SPARE39	SPARE39			<i>Not Used</i>
k	SPARE40	SPARE40			<i>Not Used</i>
m	94TA-30	94TA-2	16	VOBC to B end DU	
n	94SA-30	94SA-2	16	VOBC to B end DU	
p	94RA-30	94RA-2	16	VOBC to B end DU	
q	94QA-30	94QA-2	16	VOBC to B end DU	
r	94PA-30	94PA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
s	94NA-30	94NA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
t	94MA-30	94MA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
u	94LA-30	94LA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
v	95GA-30	95GA-2	16	VOBC to B end DU	
w	95HA-30	95HA-2	16	VOBC to B end DU	
x	95JA-30	95JA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
y	95KA-30	95KA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
z	95LA-30	95LA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
AA	95MA-30	95MA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
AB	95NA-30	95NA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
AC	95PA-30	95PA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
AD	95QA-30	95QA-2	16	VOBC to B end DU	1400, 1401, 1403, &

## Supplemental Drawings and Reference Documents

					1449 only
AE	95RA-30	95RA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
AF	95SA-30	95SA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
AH					<i>Not Used</i>
AJ	95UA-30	95UA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
AK	95VA-30	95VA-2	16	VOBC to B end DU	1400, 1401, 1403, & 1449 only
AL	92HA-30	92HA-2	16	VOBC to B end DCB, and DCB to DCB	
AM	92JA-30	92JA-2	16	VOBC to B end DCB, and DCB to DCB	
AN	92KA-30	92KA-2	16	VOBC to B end DCB, and DCB to DCB	
AP	92LA-30	92LA-2	16	VOBC to B end DCB, and DCB to DCB	
AR	92MA-30	92MA-2	16	VOBC to B end DCB, and DCB to DCB	
AS	92NA-30	92NA-2	16	VOBC to B end DCB, and DCB to DCB	
AT	91TA-4	91TA-2	16	VOBC to B end DCB, and DCB to DCB	
AU	91MA-3	91MA-2	16	VOBC to B end DCB, and DCB to DCB	
AV	91LA-3	91LA-2	16	VOBC to B end DCB, and DCB to DCB	
AW	91KA-3	91KA-2	16	VOBC to B end DCB, and DCB to DCB	
AX	91JA-3	91JA-2	16	VOBC to B end DCB, and DCB to DCB	
AY	91HA-3	91HA-2	16	VOBC to B end DCB, and DCB to DCB	
AZ	91GA-3	91GA-2	16	VOBC to B end DCB, and DCB to DCB	
BA	91FA-3	91FA-2	16	VOBC to B end DCB, and DCB to DCB	
BB	91EA-3	91EA-2	16	VOBC to B end DCB, and DCB to DCB	
BC	91DA-3	91DA-2	16	VOBC to B end DCB, and DCB to DCB	
BD	91CA-3	91CA-2	16	VOBC to B end DCB, and DCB to DCB	
BE	91BA-3	91BA-2	16	VOBC to B end DCB, and DCB to DCB	
BF	91AA-3	91AA-2	16	VOBC to B end DCB, and DCB to DCB	
BH	93AA-2	93AA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BJ	93BA-2	93BA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BK	93CA-2	93CA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BL	93DA-2	93DA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BM	93EA-2	93EA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BN	93FA-2	93FA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BP	93GA-2	93GA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BR	93HA-2	93HA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BS	93JA-2	93JA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BT	93KA-2	93KA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BU	93LA-2	93LA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BV	93MA-2	93MA-1	16	VOBC to Train ID Thumbwheel (A and B)	

<b>EYP13 36 pin</b>					
<b>Pin</b>	<b>A Side</b>	<b>B Side</b>	<b>AWG</b>	<b>Purpose</b>	<b>Comments</b>
A	X47-8	X47-3	16	ADA Door Chime +	
B	NB47-1	NB47	16	ADA Door Chime -	
C	33GG-3	33GG-2	16	ADA Door Chime Control (Steps Up)	
D					<i>Not Used</i>

## Supplemental Drawings and Reference Documents

E					<i>Not Used</i>
F					<i>Not Used</i>
G					<i>Not Used</i>
H					<i>Not Used</i>
I					<i>Not Used</i>
J					<i>Not Used</i>
K					<i>Not Used</i>
L					<i>Not Used</i>
M					<i>Not Used</i>
N					<i>Not Used</i>
P					<i>Not Used</i>
R					<i>Not Used</i>
S					<i>Not Used</i>
T					<i>Not Used</i>
U					<i>Not Used</i>
V					<i>Not Used</i>
W					<i>Not Used</i>
X					<i>Not Used</i>
Y					<i>Not Used</i>
Z					<i>Not Used</i>
a					<i>Not Used</i>
b					<i>Not Used</i>
c					<i>Not Used</i>
d					<i>Not Used</i>
e					<i>Not Used</i>
f					<i>Not Used</i>
g					<i>Not Used</i>
h					<i>Not Used</i>
i					<i>Not Used</i>
j					<i>Not Used</i>
m					<i>Not Used</i>
n					<i>Not Used</i>



**Supplemental Drawings and Reference Documents**

**B. LRV2 ARTICULATED CONNECTION JUMPER**

EYP7 35 pin					
Pin	A Side	B Side	AWG	Purpose	Comments
1	ET084	ET084	12	Passenger Intercom T/L	3- Conductor
2	ET085	ET085	12	Passenger Intercom T/L	3- Conductor
3	TH- 31,32,33	TH- 31,32,33	12	Shields (x3)	3- Conductor
5	ET081	ET081	12	PA Audio T/L	3- Conductor
14	ET086	ET086	12	PA Audio T/L	3- Conductor
15	ET082	ET082	12	Cab to Cab Intercom T/L	3- Conductor
16	ET083	ET083	12	Cab to Cab Intercom T/L	3- Conductor
4	ET042	ET042	12	PSR T/L +	
6	ET026	ET026	12	Sanding T/L +	
7	ET070	ET070	12	Tow Mode T/L +	
8	ET040	ET040	12	Regen Cutout T/L +	
9	ET066	ET066	12	Zero Speed T/L +	
10	ET041	ET041	12	Cutout Bypass Status T/L +	
11	ET064	ET064	12	Propulsion Fault T/L +	
12	ET045	ET045	12	Derail Sensors T/L +	
13	ET101	ET101	12	Steps High Status Indicator (and ADA chime)	
17	ET054	ET054	12	EB T/L +	3- Conductor
18	ET053	ET053	12	EB T/L -	3- Conductor
19	TH-65	TH-65	12	Shield	3- Conductor
21	ET034	ET034	12	Trake Brake On Status T/L	
22	ET033	ET033	12	Track Brake On T/L	
23	ET006-5	ET007-2	12	Right Steps Low/Left Steps Low T/L Control	
24	ET005-5	ET008-2	12	Right Steps High/Left Steps High T/L Control	
25	ET007-4	ET006-4	12	Left Steps Low/Right Steps Low T/L Control	
26	ET008-4	ET005-4	12	Left Steps High/Right Steps High T/L Control	
27	ET029	ET028	12	Turn Signal On Left/Right +	
28	ET028	ET029	12	Turn Signal On Right/Left +	
29	ET018	ET018	12	Head/Tail Lights T/L +	
30	14BB-2	14BH-2	12	Steps Low T/L Status	
31	14CB-2	14BG-2	12	Steps High T/L Status	
32	14BH-2	14BB-2	12	Steps Low T/L Status	
33	14BG-2	14CB-2	12	Steps High T/L Status	
34	43AN-3	43AN-3	12	Local EB loop +	3- Conductor

## Supplemental Drawings and Reference Documents

20	43AF-3	43AF-3	12	Local EB loop -	3- Conductor
35	TH-74	TH-74	12	Shield	3- Conductor

EYP8 35 pin					
Pin	A Side	B Side	AWG	Purpose	Comments
1	ET057	ET057	12	Brk Mode +	
2	ET058	ET058	12	Brk Mode -	
3	ET067	ET067	12	Auto Mode T/L	
4	ET055	ET056	12	Forward T/L +	3- Conductor
5	ET056	ET055	12	Reverse T/L +	3- Conductor
6	TH-80,83	TH-80,83	12	Shields	3- Conductor
7	ET052	ET052	12	P-Wire T/L Out	3- Conductor
8	64AA-1	64AA-1	12	P-Wire T/L In	3- Conductor
9	18DA-1	18DA-2	12	Left Doors Opn/Rls/Close	
10	18EA-1	18EA-2	12	Left Doors Opn/Rls/Close	
11	18FA-1	18FA-2	12	Left Doors Opn/Rls/Close	
12	18AA-2	18AA-1	12	Right Doors Opn/Rls/Close	
13	18BA-2	18BA-1	12	Right Doors Opn/Rls/Close	
14	18CA-2	18CA-1	12	Right Doors Opn/Rls/Close	
15					<i>Not Used</i>
16	ET065	ET065	12	Cab to Cab Intercom Reset	
17	ET011-8	ET011-20	12	Steps Low Status (Cab Dependant)	
18	ET011-9	ET011-26	12	Steps Low Status (Cab Dependant)	
19	ET063	ET063	12	Pass Emer Stop Indication T/L	
20	ET046	ET046	12	Emer Door Rls Indication T/L	
21	ET059-10	ET059-1	12	ATCS FSB Loop T/L +	
22	ET060	ET060	12	FSB Loop T/L +	
23	ET073	ET073	12	FSB Loop T/L -	
24	ET068	ET068	12	Positive T/L #2	
25	ET048	ET048	10	Negative T/L #2	
26	ET069	ET069	12	Positive T/L #1	
27	ET049	ET049	10	Negative T/L #1	
28	ET078	ET078	12	Aux On T/L +	
29	ET072	ET072	12	Aux Off T/L +	
30	ET062	ET062	12	MC Interlock T/L -	
31	ET061	ET061	12	MC Interlock T/L +	
32	ET037	ET037	12	Frict Brk Fault T/L	
33	ET035	ET035	12	Frict Brk On Status T/L	
34	ET039	ET039	12	Brake Dragging T/L	
35	ET019	ET019	12	Low Air Pressure T/L	

EYP9 35 pin					
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## Supplemental Drawings and Reference Documents

Pin	A Side	B Side	AWG	Purpose	Comments
1	ET095-1	ET095	12	ATCS Serial Data Link T/L	3-conductor
2	ET096-1	ET096	12	ATCS Serial Data Link T/L	3-conductor
3	TH-127	TH-127	12	Shield	3-conductor
4	ET089-2	ET089	12	ATCS Active T/L	
5	89HA-1	ET090	12	ATCS Train Integrity T/L	
6	ET038-2	ET038	12	ATCS Power Return T/L	
7	ET036-3	ET036	12	ATCS Cutout T/L	
8					<i>Not Used</i>
9	ET027	ET027	12	Interior Lights T/L +	
10	ET047	ET047	12	Interior Lights T/L -	
11	ET025	ET024	12	Doors Summary T/L -	
12	ET024	ET025	12	Doors Summary T/L +	
13	ET014-4	ET014	12	Doors Closed T/L +	
14	ET013-4	ET013	12	Doors Closed T/L -	
15	89FA-1	ET091	12	ATCS Train Integrity T/L	
16	89AC-1	89AC-1	12	ATCS Check Loop T/L	
17	ET093-10	ET093	12	ATCS Check Loop T/L	
18	89BA-1	89BA-1	12	ATCS Transfer Switch Interlock T/L	
19	89CA-1	ET020	12	ATCS Transfer Switch Interlock T/L	
20	ET099-4	ET100	12	Auto Cab Select T/L	
21	ET050-10	ET050-2	12	ATCS EB Loop -	3-Conductor
22	ET087-10	ET087-1	12	ATCS EB Loop +	3-Conductor
23	TH-68	TH-68	12	Shield	3-Conductor
24	ET022	ET022	12	Pan Up T/L	
25	ET023	ET023	12	Pan Down T/L	
26	ET043	ET043	12	Aux PS Fault T/L	
27	ET100-4	ET099	12	Auto Cab Select T/L	
28	ET098-4	ET098	12	VOBC Reset T/L	
29	50AE-2	50AE-2	12	Horn & Gong +	
30	ET075	ET075	12	Zero Speed for Trk Brks T/L +	
31	50AD-2	50AD-2	12	Horn & Gong +	
32	45EA-4	45EA-4	12	Interior Emerg Lights Relay Control	
33	ET071-11	ET071-11	12	Interior Emerg Lights Relay Control	
34	89GA-1	ET092	12	ATCS Train Integrity T/L	
35	ET021	ET021	12	Ventilation Blower Cutout T/L +	

EYP10 60 pin					
Pin	A Side	B Side	AWG	Purpose	Comments
1	36QA-2	36QA-4	16	Passenger Intercom T/L	
2	36RA-2	36RA-4	16	Passenger Intercom T/L	
3					<i>Not Used</i>
4					<i>Not Used</i>

## Supplemental Drawings and Reference Documents

5					<i>Not Used</i>
6	34AB-2	34AB-3	16	Communication Control Amp Wiring	
7	34BB-2	34BB-3	16	Communication Control Amp Wiring	
8	34CB-2	34CB-3	16	Communication Control Amp Wiring	
9	34DB-2	34DB-3	16	Communication Control Amp Wiring	
10	34EB-2	34EB-3	16	Communication Control Amp Wiring	
11	34FB-2	34FB-3	16	Communication Control Amp Wiring	
12	34GB-2	34GB-3	16	Communication Control Amp Wiring	
13	34HB-2	34HB-3	16	Communication Control Amp Wiring	
14	34JB-2	34JB-3	16	Communication Control Amp Wiring	
15					<i>Not Used</i>
16					<i>Not Used</i>
17	34KB-2	34KB-3	16	Communication Control Amp Wiring	
18	34LB-2	34LB-3	16	Communication Control Amp Wiring	
19	34MB-2	34MB-3	16	Communication Control Amp Wiring	
20	34NB-2	34NB-3	16	Communication Control Amp Wiring	
21	34PB-2	34PB-3	16	Communication Control Amp Wiring	
22	34QB-2	34QB-3	16	Communication Control Amp Wiring	3- Conductor
23	34RB-2	34RB-3	16	Communication Control Amp Wiring	3- Conductor
24	TH-30	TH-30	16	Shield	3- Conductor
25	34SB-2	34SB-3	16	Communication Control Amp Wiring	
26	34TB-2	34TB-3	16	Communication Control Amp Wiring	
27	34WB-2	34WB-3	16	Communication Control Amp Wiring	
28					<i>Not Used</i>
29	14EC-3	14EC-3	16	Steps Down Control -	
30					<i>Not Used</i>
31					<i>Not Used</i>
32					<i>Not Used</i>
33					<i>Not Used</i>
34					<i>Not Used</i>
35					<i>Not Used</i>
36					<i>Not Used</i>
37					<i>Not Used</i>
38					<i>Not Used</i>
39					<i>Not Used</i>
40					<i>Not Used</i>
41					<i>Not Used</i>
42					<i>Not Used</i>
43	35DA-9	35DA-10	16	Interior Speakers	3- Conductor
44	35CA-9	35CA-10	16	Interior Speakers	3- Conductor
45	TH-xx	TH-xx	16	Shield	3- Conductor
46	TH-03	TH-03	16	Shield	3- Conductor

## Supplemental Drawings and Reference Documents

47	35BA-2	35BA-4	16	Exterior Speakers	3- Conductor
48	35AA-2	35AA-4	16	Exterior Speakers	3- Conductor
49					<i>Not Used</i>
50					<i>Not Used</i>
51					<i>Not Used</i>
52					<i>Not Used</i>
53					<i>Not Used</i>
54					<i>Not Used</i>
55					<i>Not Used</i>
56					<i>Not Used</i>
57					<i>Not Used</i>
58					<i>Not Used</i>
59					<i>Not Used</i>
60					<i>Not Used</i>

EYP11 85 pin					
Pin	A Side	B Side	AWG	Purpose	Comments
A	NB27-5	NB27-5	16	Destination and Run Number Sign -	
B	X27-7	X27-7	16	Destination and Run Number Sign +	
C	49BA-5	49BA-5	16	Destination and Run Number Sign Network	3- Conductor
D	49AA-5	49AA-5	16	Destination and Run Number Sign Network	3- Conductor
E	TH-61	TH-61	16	Shield	3- Conductor
F	X16-8	X16-8	16	Stop Request Circuit +	
H	47DA-5	47DA-5	16	Stop Request Circuit +	
J	81EB-3	81EB-4	16	Sander Control Cutout	
K	81EA-3	81EA-2	16	Sander Control Cutout	
L	80AA-2	80AA-2	16	Zero Speed Bypass Loop	
M	81SA-2	81SA-2	16	Prop Inverter #2 Cutout	
N	81TA-2	81TA-2	16	Prop Inverter #1 Cutout	
P	44BC-2	44BC-1	16	Emerg Door Rls Bypass & Overspd Aud Cutout	
R	84YA-2	84YA-2	16	Overspeed Indicator and Chime	
S	81UA-2	81UA-2	16	Propulsion Stall Indicator	
T	81VA-2	81VA-2	16	KT panel Prop Fault A	
U	81WA-2	81WA-2	16	KT panel Prop Fault B	
V	54EA-2	54EA-2	16	Friction Brake C Cutout	
W	54FA-2	54FA-2	16	Friction Brake B Cutout	
X	28BA-1	28BA-1	16	Pantograph Control Cutout +	
Y	28CA-1	28CA-1	16	Pantograph Control Cutout +	
Z	28CB-4	28CB-3	16	Pantograph Control Cutout	
a	28BB-4	28BB-3	16	Pantograph Control Cutout	
b	14AF-1	14AF-1	16	B Cab Steps Up Command	
c	46RA-2	46RA-1	16	B Cab Right Turn Button	
d	46SA-2	46SA-1	16	B Cab Left Turn Button	

## Supplemental Drawings and Reference Documents

f	46FA-3	46FA-3	16	B Cab Emergency Flasher Button	
g	58AA-6	58AA-6	14	Turn Signal Lights T/L +	
h	58BA-6	58BA-6	14	Turn Signal Lights T/L +	
i	NB8-4	NB8-4	14	Turn Signal Lights -	
j	46FB-4	46FB-4	16	Emerg Flashers Steps Down Doors Open	
k	14BC-4	14DB-4	16	Stepwell Lights Right Timer Relay +	
m	56FA-1	56FA-1	16	Zero Speed Track Brake Control	
n	14CD-4	14BC-4	16	Stepwell Lights Left Timer Relay +	
p					<i>Not Used</i>
q	18HA-1	18HA-1	16	Door Chime Relay Control	
r	18ZA-26	18ZA-25	16	B Car Right Doors Lock Command	
s	18FB-20	18FB-3	16	B Car Right Doors Lock Command	
t	18GA-1	18GA-1	16	Local Door Control Relay Control	
u	46MB-10	46MB-2	16	Stop Request Circuit +	
v	46MA-10	46MA-2	16	Stop Request Circuit +	
w	46FG-2	46FG-2	16	Emerg Flashers Steps Down Doors Open	
x	14EA-2	14EA-2	16	Steps Up Control -	
y	17EA-11	17EA-11	16	Door Operator Zero Speed B+	
z	26LB-2	26LB-2	16	RTX Time Out Control Loop	
AA	26GA-2	26GA-2	16	Aux On +	
AB	17LA-2	17LA-3	16	Right Doors Closed Relay Control	
AC	17MA-2	17MA-3	16	Left Doors Closed Relay Control	
AD	17LD-2	17LD-1	16	Right Doors Closed Loop	
AE	17ME-2	17ME-1	16	Left Doors Closed Loop	
AF	17KA-3	17KA-3	16	Local Doors Closed Indicator	
AH	41CD-5	41CD-6	16	LVPS Fault Indication	
AJ	41CC-5	41CC-6	16	Aux PS Fault Indication	
AK					<i>Not Used</i>
AL	26BA-4	26BA-4	16	Aux On +	
AN	55SC-2	55SC-1	16	B17 Valve Cutout Status	
AP	X29-36	X29-34	16	Friction Brake Control CB	
AR	43AD-4	43AD-4	16	Emerg Brake Indicator	
AS	66BF-10	66BF-1	16	Emerg Door Release and Pass Emerg Loop	
AT	34ZA-1	34ZA-1	16	Sound Powered Telephone Circuit	
AU	34XA-1	34XA-1	16	Sound Powered Telephone Circuit	
AV	42KA-3	42KA-3	16	Speedometer -	3-conductor
AW	42FB-2	42FB-2	16	Speedometer +	3-conductor
AM	TH-130	TH-130	16	Shield	3-conductor
AX	54DA-2	54DA-1	16	Friction Brake Fault C Indicator	
AY	54CA-2	54CA-1	16	Friction Brake Fault B Indicator	
AZ	56AA-3	56AA-3	14	Track Brake Cutout	
BA	88JA-3	88JA-3	16	VOBC Overspeed Chime	
BB	56AC-3	56AC-3	14	Track Brake Cutout	
BC	ET019-6	ET019-5	16	Low Air Pressure T/L	
BD	54GA-2	54GA-2	16	Friction Brake A Cutout	

## Supplemental Drawings and Reference Documents

BE	55EA-3	55EA-3	16	Friction Brake On Indicator	
BF	44BC-39	44BC-39	16	A Car Trouble Lights (Knorr ECU) +	
BH	54BA-2	54BA-1	16	Friction Brake Fault A Indicator	
BJ	26LA-2	26LA-2	16	RTX Time Out Control Loop	
BK	46DA-3	46DA-3	16	B Car Car Cleaner Switch	
BL	46DB-3	46DB-3	16	B Car Car Cleaner Switch	
BM					<i>Not Used</i>
BN	46CB-3	46CB-3	16	Interior Lights Timer Relay Control	
BP	46CA-3	46CA-3	16	Interior Lights Timer Relay Control	
BR	48BA-12	48BA-11	16	Stepwell Lights and DC Ballasts +	
BS	48BD-2	48BD-3	16	Stepwell Lights and DC Ballasts +	
BT	48BE-2	48BE-3	16	Stepwell Lights and DC Ballasts +	
BU	C11-3	C11-10	16	Cab and Destination Sign Lights +	
BV	51AA-1	51AA-10	16	Cab and Destination Sign Lights +	

EYP12 85 pin					
Pin	A Side	B Side	AWG	Purpose	Comments
A	42NA-10	42NA-3	16	B Cab ATCS DDU	3- Conductor
B	42PA-10	42PA-3	16	B Cab ATCS DDU	3- Conductor
C	TH-138	TH-138	16	Shield	3- Conductor
D	42QA-10	42QA-3	16	B Cab ATCS DDU	3- Conductor
E	42RA-10	42RA-3	16	B Cab ATCS DDU	3- Conductor
F	TH-141	TH-141	16	Shield	3- Conductor
H	89DA-1	89DA-1	16	ATCS Check Loop T/L	
J	75GA-10	75GA-3	16	VOBC Coupler Loop (B end)	
K	75GB-10	75GB-2	16	Uncoupling Control (B end)	
L	75JA-10	75JA-3	16	Coupler Isolate/Connect (B end)	
M	18DA-22	18DA-14	16	VOBC Left Doors Opn/Close	
N	18EA-20	18EA-12	16	VOBC Left Doors Opn/Rls/Close	
P	18BA-20	18BA-12	16	VOBC Right Doors Opn/Rls/Close	
R	18AA-20	18AA-12	16	VOBC Right Doors Opn/Rls/Close	
S	26AA-10	26AA-7	16	B End VOBC Cab Relay Control	
T	75BA-10	75BA-2	16	End Train Control (coupling)	
U					<i>Not Used</i>
V					<i>Not Used</i>
W	ET062-20	ET062-8	16	VOBC MC Interlock T/L -	
X					<i>Not Used</i>
Y					<i>Not Used</i>
Z	88MA-11	88MA-12	16	B End VOBC Transfer Switch Interlock	
a	56DC-3	56DC-4	16	Track Brake Sonalert (VOBC)	
b					<i>Not Used</i>
c	64BA-11	64BA-3	16	Brk Mode	
d	56AD-13	56AD-13	16	Zero Speed Track Brake Control	

## Supplemental Drawings and Reference Documents

f	X19-4	X19-4	16	Track Brake Control CB +	
g	46MC-25	46MC-25	16	Stop Request Circuit (HSR) +	
h	55KA-5	55KA-6	16	Friction Brake On Status	
i	SPARE38	SPARE38			<i>Not Used</i>
j	SPARE39	SPARE39			<i>Not Used</i>
k	SPARE40	SPARE40			<i>Not Used</i>
m	94TA-30	94TA-2	16	VOBC to B end DU	
n	94SA-30	94SA-2	16	VOBC to B end DU	
p	94RA-30	94RA-2	16	VOBC to B end DU	
q	94QA-30	94QA-2	16	VOBC to B end DU	
r					<i>Not Used</i>
s					<i>Not Used</i>
t					<i>Not Used</i>
u					<i>Not Used</i>
v	95GA-30	95GA-2	16	VOBC to B end DU	
w	95HA-30	95HA-2	16	VOBC to B end DU	
x					<i>Not Used</i>
y					<i>Not Used</i>
z					<i>Not Used</i>
AA					<i>Not Used</i>
AB					<i>Not Used</i>
AC					<i>Not Used</i>
AD					<i>Not Used</i>
AE					<i>Not Used</i>
AF					<i>Not Used</i>
AH					<i>Not Used</i>
AJ					<i>Not Used</i>
AK					<i>Not Used</i>
AL	92HA-30	92HA-2	16	VOBC to B end DCB, and DCB to DCB	
AM	92JA-30	92JA-2	16	VOBC to B end DCB, and DCB to DCB	
AN	92KA-30	92KA-2	16	VOBC to B end DCB, and DCB to DCB	
AP	92LA-30	92LA-2	16	VOBC to B end DCB, and DCB to DCB	
AR	92MA-30	92MA-2	16	VOBC to B end DCB, and DCB to DCB	
AS	92NA-30	92NA-2	16	VOBC to B end DCB, and DCB to DCB	
AT	91TA-4	91TA-2	16	VOBC to B end DCB, and DCB to DCB	
AU	91MA-3	91MA-2	16	VOBC to B end DCB, and DCB to DCB	
AV	91LA-3	91LA-2	16	VOBC to B end DCB, and DCB to DCB	
AW	91KA-3	91KA-2	16	VOBC to B end DCB, and DCB to DCB	
AX	91JA-3	91JA-2	16	VOBC to B end DCB, and DCB to DCB	
AY	91HA-3	91HA-2	16	VOBC to B end DCB, and DCB to DCB	
AZ	91GA-3	91GA-2	16	VOBC to B end DCB, and DCB to DCB	
BA	91FA-3	91FA-2	16	VOBC to B end DCB, and DCB to DCB	
BB	91EA-3	91EA-2	16	VOBC to B end DCB, and DCB to DCB	
BC	91DA-3	91DA-2	16	VOBC to B end DCB, and DCB to DCB	
BD	91CA-3	91CA-2	16	VOBC to B end DCB, and DCB to DCB	
BE	91BA-3	91BA-2	16	VOBC to B end DCB, and DCB to DCB	
BF	91AA-3	91AA-2	16	VOBC to B end DCB, and DCB to DCB	
BH	93AA-2	93AA-1	16	VOBC to Train ID Thumbwheel (A and B)	



## Supplemental Drawings and Reference Documents

BJ	93BA-2	93BA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BK	93CA-2	93CA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BL	93DA-2	93DA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BM	93EA-2	93EA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BN	93FA-2	93FA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BP	93GA-2	93GA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BR	93HA-2	93HA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BS	93JA-2	93JA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BT	93KA-2	93KA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BU	93LA-2	93LA-1	16	VOBC to Train ID Thumbwheel (A and B)	
BV	93MA-2	93MA-1	16	VOBC to Train ID Thumbwheel (A and B)	

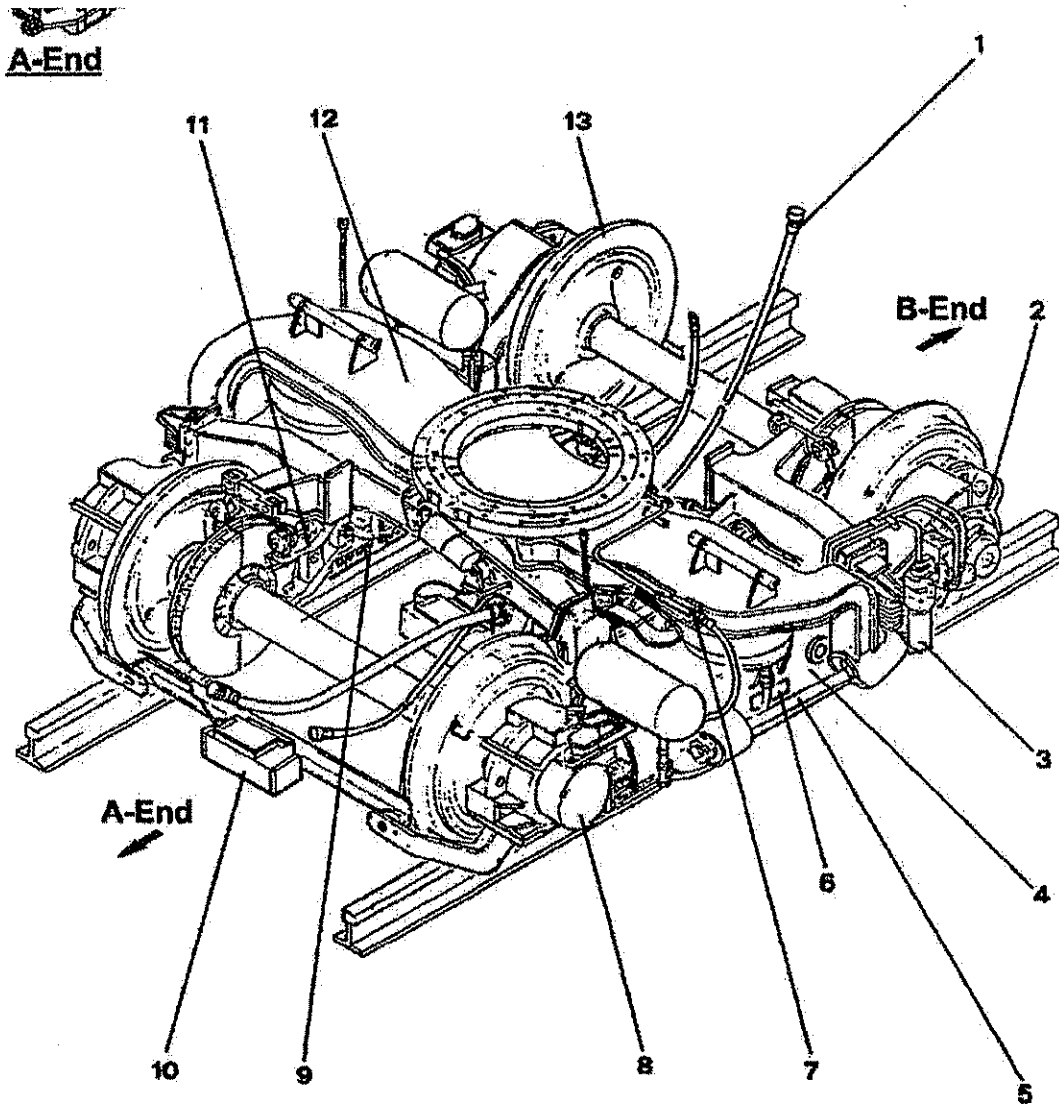
EYP13 36 pin					
Pin	A Side	B Side	AWG	Purpose	Comments
A	X47-8	X47-3	16	ADA Door Chime +	
B	NB47-1	NB47	16	ADA Door Chime -	
C	33GG-3	33GG-2	16	ADA Door Chime Control (Steps Up)	
D					<i>Not Used</i>
E					<i>Not Used</i>
F					<i>Not Used</i>
G					<i>Not Used</i>
H					<i>Not Used</i>
I					<i>Not Used</i>
J					<i>Not Used</i>
K					<i>Not Used</i>
L					<i>Not Used</i>
M					<i>Not Used</i>
N					<i>Not Used</i>
P					<i>Not Used</i>
R					<i>Not Used</i>
S					<i>Not Used</i>
T					<i>Not Used</i>
U					<i>Not Used</i>
V					<i>Not Used</i>
W					<i>Not Used</i>
X					<i>Not Used</i>
Y					<i>Not Used</i>
Z					<i>Not Used</i>
a					<i>Not Used</i>
b					<i>Not Used</i>
c					<i>Not Used</i>
d					<i>Not Used</i>
e					<i>Not Used</i>
f					<i>Not Used</i>
g					<i>Not Used</i>
h					<i>Not Used</i>
i					<i>Not Used</i>

## Supplemental Drawings and Reference Documents

j					<i>Not Used</i>
m					<i>Not Used</i>
n					<i>Not Used</i>

**TP16.04 PSC-2 CABLE DATA**

A construction drawing of this cable does not exist. A cable will be made available for reverse engineering upon request. Schematics 136787 and 167298 provide signal details and 1455888 provides some installation detail. They will be provided upon request. Additional data is available in the OEM manuals and illustrated parts catalog. General arrangement drawings are provided here for reference.



**Figure 3-17 Trailer Truck Assy**

## Supplemental Drawings and Reference Documents

Breda Costruzioni Ferroviarie

SAN FRANCISCO MUNI - LRV2  
Illustrated Parts Catalog - Section 3

### Trailer Truck Assy (Fig. 3-17)

Section Figure Item	P/N	MFR P/N	MFR Code	Description	MUNI Code	U/M	Qty per Assy	v s c
03-17-	J20200000		A0185	TRAILER TRUCK ASSY - SEE FIG. 03-01 FOR NHA		EA	1	
1	J20291000	1-A 0008K	A0185	TRAILER TRUCK, ELECTRIC SYSTEM, CABLE ASSY - SEE FIG.05-49 FOR DETAIL		EA	1	
2	J20255000		A0185	PRIMARY SUSPENSION, TRAILER TRUCK - SEE FIG.03-20 FOR DETAIL		EA	4	
3	J20290500		A0185	FRAME PNEUMATIC SYSTEM, TRAILER TRUCK - SEE FIG.03-25 FOR DETAIL		EA	1	
4	J20251000		A0185	FRAME ASSY, TRAILER TRUCK - SEE FIG.03-19 FOR DETAIL		EA	1	
5	J20252000		A0185	SECONDARY SUSPENSION, TRAILER TRUCK - SEE FIG.03-18 FOR DETAIL		EA	1	
6	J20256900		A0185	LABELS, TRAILER TRUCK - SEE FIG.03-23 FOR DETAIL		EA	1	
7	J20290100		A0185	BOLSTER BEAM PNEUMATIC SYSTEM, TRAILER TRUCK - SEE FIG.03-24 FOR DETAIL		EA	1	
8	J20255500		A0185	JOURNAL BOXES, TRAILER TRUCK - SEE FIG.03-22 FOR DETAIL		EA	1	
9	J19253600	390050	34922	TRACK BRAKE ASSY - SEE FIG.16-66 FOR DETAIL		EA	2	
10	J20256800		A0185	TRAILER TRUCK, ATCS ANTENNAS INSTL - SEE FIG.17-02 FOR DETAIL		EA	1	
11	J20253000		A0185	TRAILER TRUCK, BRAKE CALIPER UNIT, INSTL - SEE FIG.16-13 FOR DETAIL		EA	1	
12	J20252100		A0185	BOLSTER BEAM ASSY		EA	1	
13	J20254010		A0185	WHEEL-SET ASSY, TRAILER TRUCK - SEE FIG.03-21 FOR DETAIL		EA	2	

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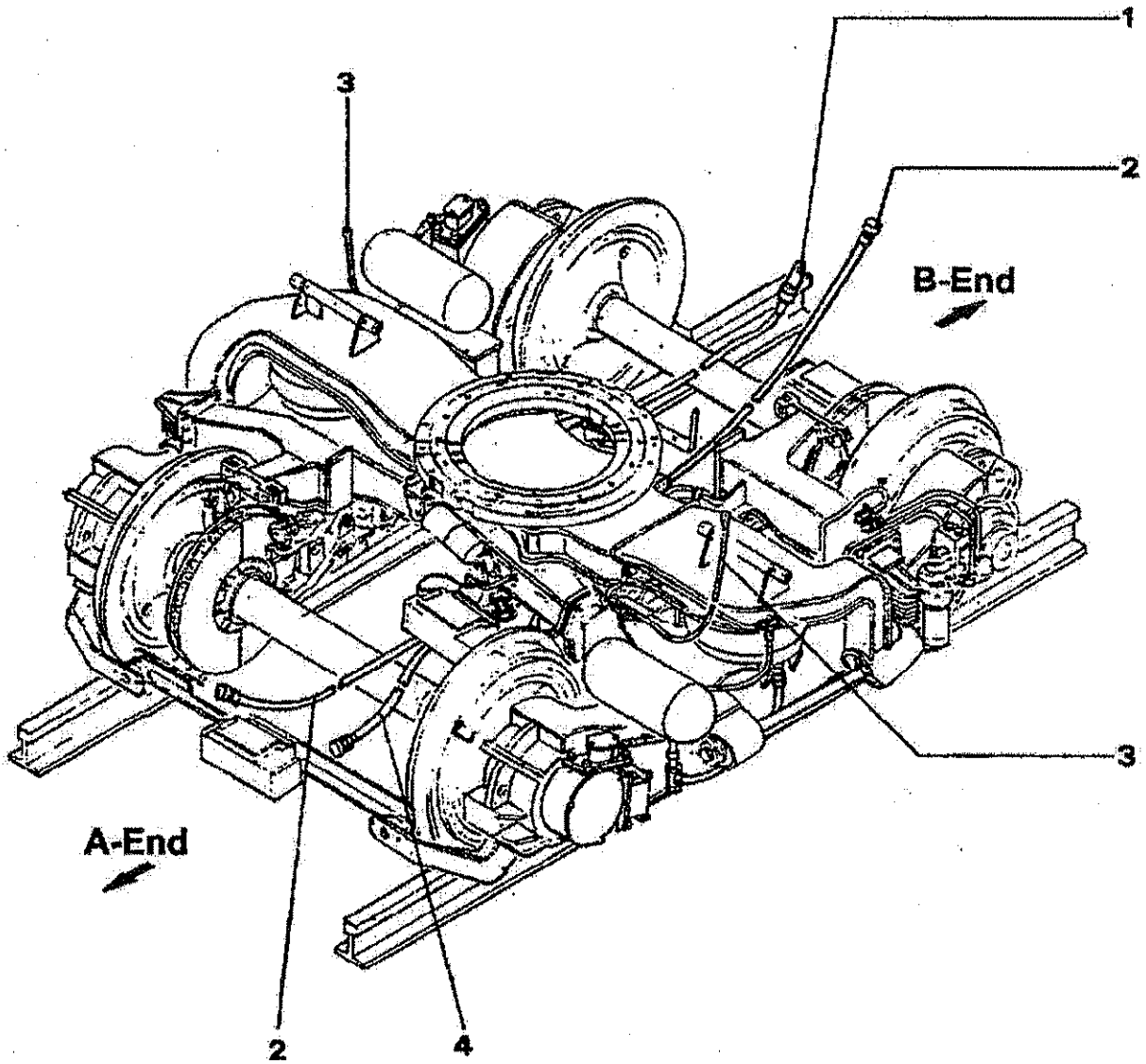


Figure 5-49 Trailer Truck, Electric System, Cable Assy

## Supplemental Drawings and Reference Documents

Breda Costruzioni Ferroviarie

SAN FRANCISCO MUNI - LRV2

Illustrated Parts Catalog - Section 5

### Trailer Truck, Electric System, Cable Assy (Fig. 5-49)

Section Figure Item	P/N	MFR P/N	MFR Code	Description	MUNI Code	U/M	Qty per Assy	v s c
05-49-	J20291000		A0185	TRAILER TRUCK, ELECTRIC SYSTEM, CABLE ASSY - SEE FIG. 03-17 FOR NHA		EA	1	
1	J20291800		A0185	TRAILER TRUCK, RETURN CURRENT CABLE, INSTL - SEE FIG.05-50 FOR DETAIL		EA	1	
2	J20291400		A0185	TRAILER TRUCK, SIGNAL RECEIVER, ELECTRICAL CONNECTIONS, INSTL - SEE FIG.17-04 FOR DETAIL		EA	1	
3	J20291850		A0185	TRAILER TRUCK, GROUND CABLE, INSTL - SEE FIG.05-51 FOR DETAIL		EA	1	
4	J20291300		A0185	TRAILER TRUCK, TRACK BRAKE CONNECTION - SEE FIG.16-70 FOR DETAIL		EA	1	

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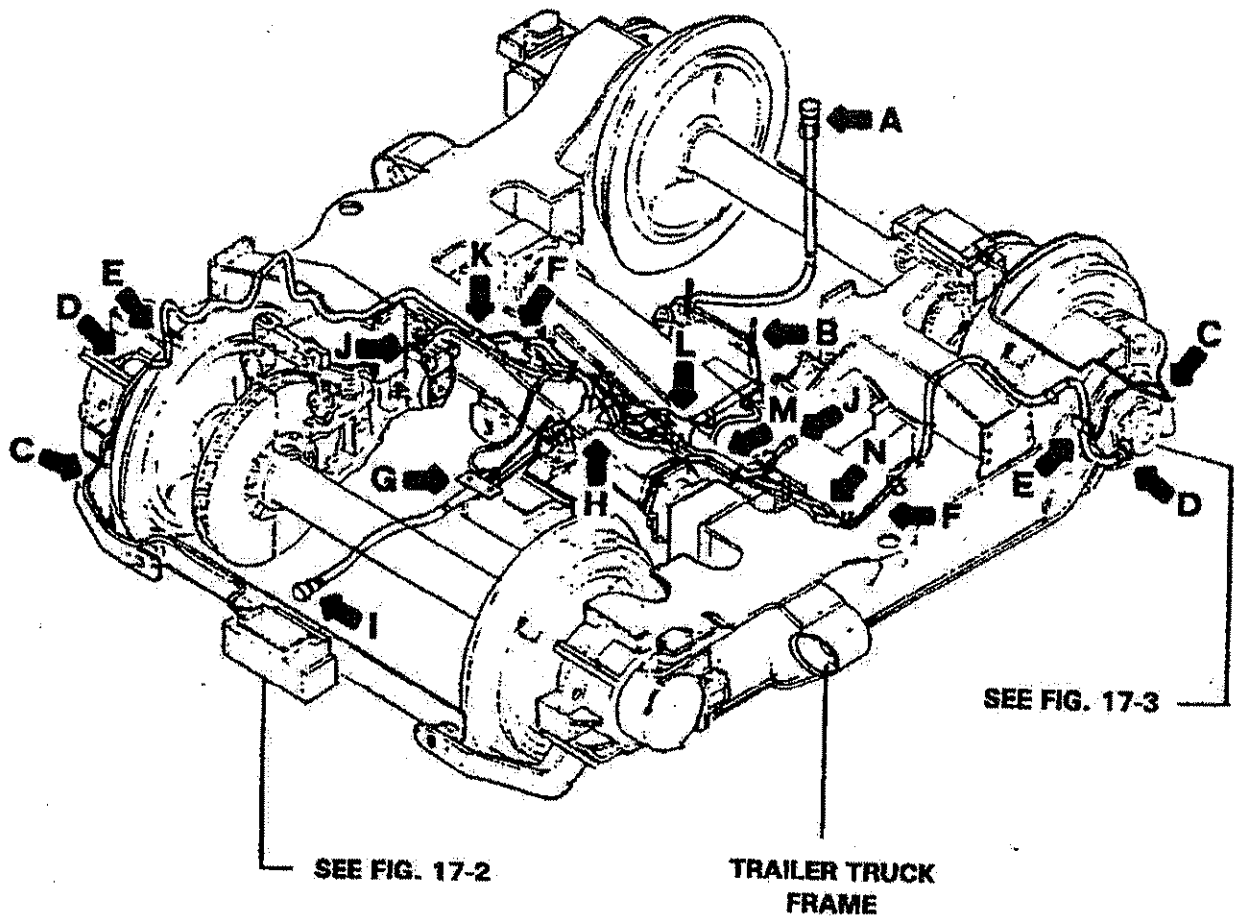


Figure 17-4 Trailer Truck, Signal Receiver, Electrical Connections, Instl (Sheet 1 of 3)

# Supplemental Drawings and Reference Documents

Breda Costruzioni Ferroviarie

SAN FRANCISCO MUNI - LRV2  
 Illustrated Parts Catalog - Section 17

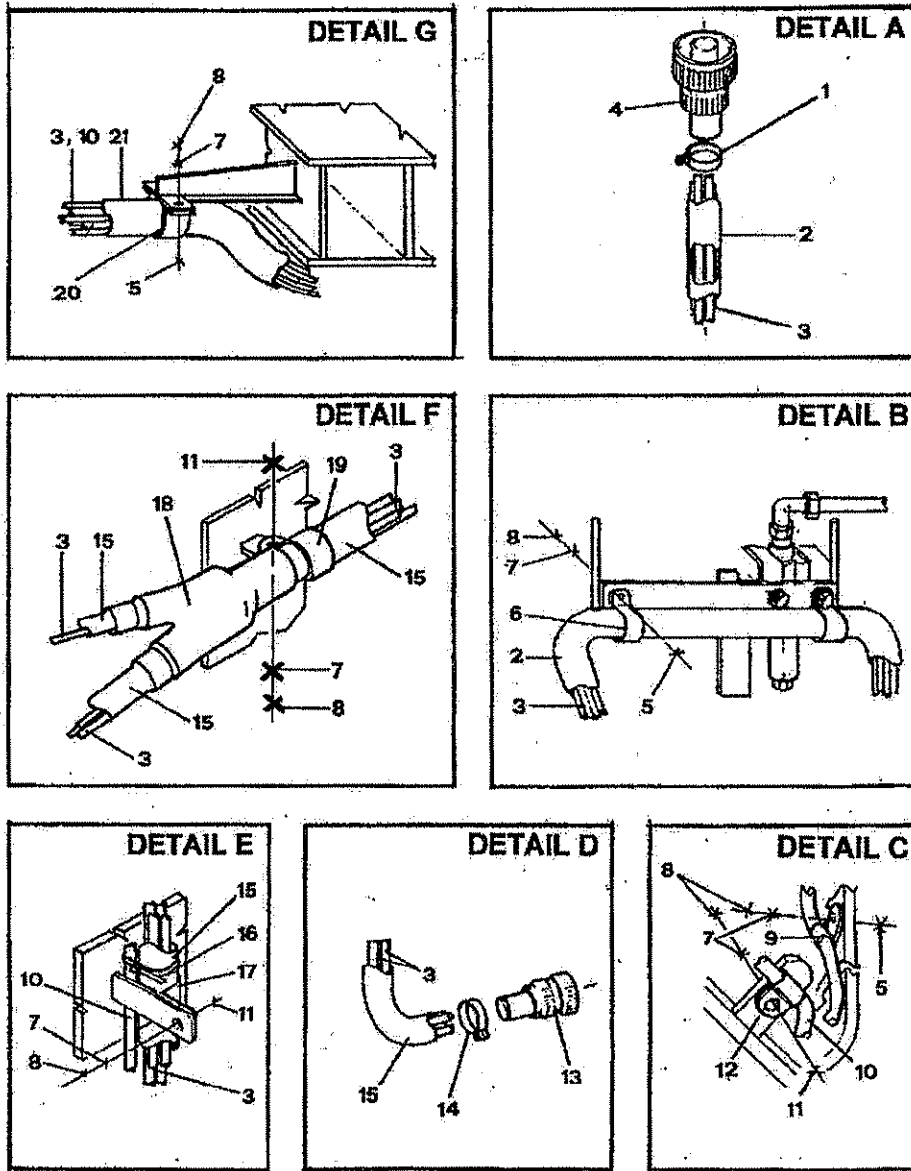


Figure 17-4 Trailing Truck, Signal Receiver, Electrical Connections, Instl (Sheet 2 of 3)

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 Final Version



# Supplemental Drawings and Reference Documents

SAN FRANCISCO MUNI - LRV2  
Illustrated Parts Catalog - Section 17

Breda Costruzioni Ferroviarie

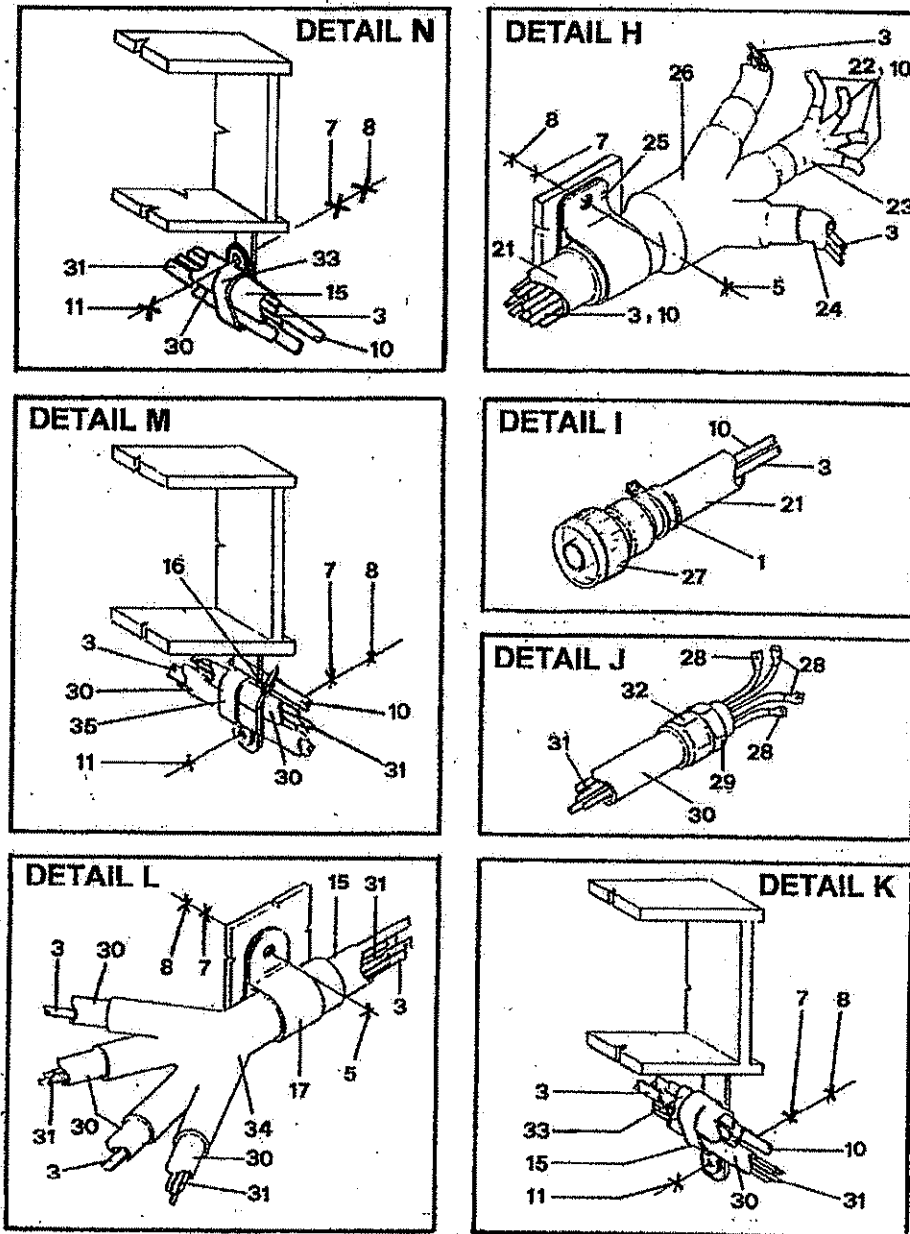


Figure 17-4 Trailer Truck, Signal Receiver, Electrical Connections, Instl (Sheet 3 of 3)

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## Supplemental Drawings and Reference Documents

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**End of Section**

**End of Technical Provisions**