PHENIX

MUON NORTH ARM HIGH VOLTAGE DISTRIBUTION SYSTEM

The purpose of this report is to fully document the proposed system and provide sufficient detail for a through safety review. The North Arm HV Distribution System is an upgrade of the South Arm System. This document describes the improvements in detail. Technical drawings, schematics and data sheets for all components used are included.

Gregory W Hart

Los Alamos National Laboratory, P-25

23 May 2002

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North Arm HV Distribution System
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Overview:

The purpose of the High Voltage Distribution System (HVDS) is to supply ~1800 volts DC to each of the MUON tacking chambers. There are three sets of chambers for the North Arm, Station 1, 2 and 3. Each set of chambers consists of a sandwiched assembly of cathode plane, anode plane, and cathode plane. At the present time, only the cathode planes are to be read-out. Each plane has eight sections, called octants. The HVDS is used to supply the DC voltage to the anode planes only.

Every anode plane octant has a set of printed circuit boards (PCB's), which provide the interface between the anode and field wires inside the gas volume to the signal output connectors, high voltage connections, and test/calibration inputs (for the last few wires furthest from the vertex of the detector).

All cards, except the one furthest from the vertex, have pads for 32 anode and 32 field wires. There is a single HV filter capacitor (3200 pF), on each card to decouple any noise that may be picked-up externally to the wires inside the chamber. A single, unshielded, twisted pair wire is soldered directly to each PCB. One wire is rated for HV, the other is connected directly to the metal frame of the chamber, and the ground planes of the PCB.

The twisted pair wires are connected to the outputs of the HVDS. The inputs to the HVDS are from the HV power supply that is located at some distance from the chambers. The power supply is a VISyn Series Modular High Voltage System currently manufactured by Universal Voltronics, http://www.voltronics.com/products/VISyN_overview.html.
The output connectors of the power supply are eight channel LeCroy High Voltage (LHV) plastic sockets, manufactured by AMP for LeCroy Research Corp.

For the South Arm chambers, we installed a plastic box near the chambers. Inside the box is a circuit card(s) with screw terminals and bleeder resistors. The twisted wires enter the box on one side through a conduit coupler. The HV inputs to the box are a bundle of red coaxial cables (RG-59) that enter the box through a larger conduit coupler on the adjacent side of the box. At the HV Power Supply (HVPS), each bundle of eight coax cables are soldered to a PCB mounted inside a small plastic box. This PCB contains a filter network. The opposite side of this box holds the mating AMP LHV Plug connector. These connectors are referred to by some as "Blue Meanies".

During installation and subsequent troubleshooting, it became obvious that the design of the South Arm HVDS was technically challenging, time consuming, and difficult to maintain.

Serious discussion of alternatives for the North Arm was started in January 2001. Design goals included:

- A multi-pin plug and socket system
- Move the distribution box from the chamber to the racks where the HVPS is located
- Eliminate the filter /LHV plug box
- Replace the coax cables with a multi-conductor HV cable.

All if these goals have been implemented in the current north arm HVDS.

Technical details:

AMP Inc., a subdivision of Tyco Electronics, manufactures a line of multi-pin "block" connectors that are rated at 2500 VDC. These connectors are referred to as "M Series Special Applications Connectors". They are used by CAEN, a high voltage power supply manufacturer, in their model 1526 High Voltage board. These connectors are also used in the LeCroy Model 1440 High Voltage Power Supply.

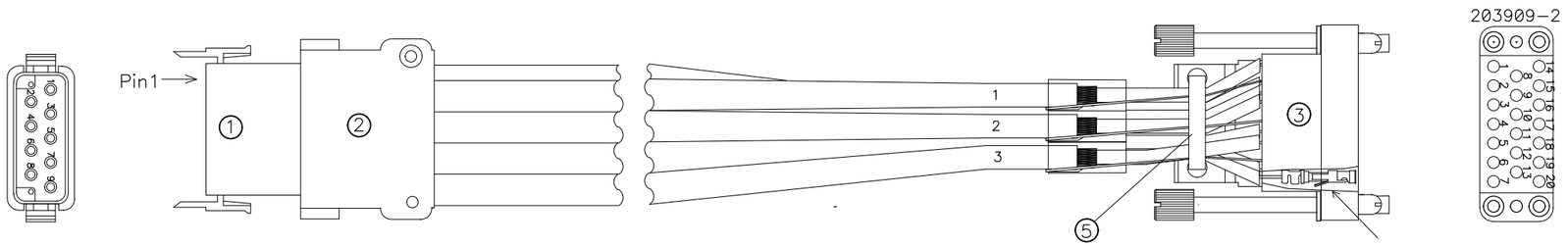
I have tested these connectors, with pins in adjacent holes for 7 days at 5,000 volts DC with no detectable leakage current.

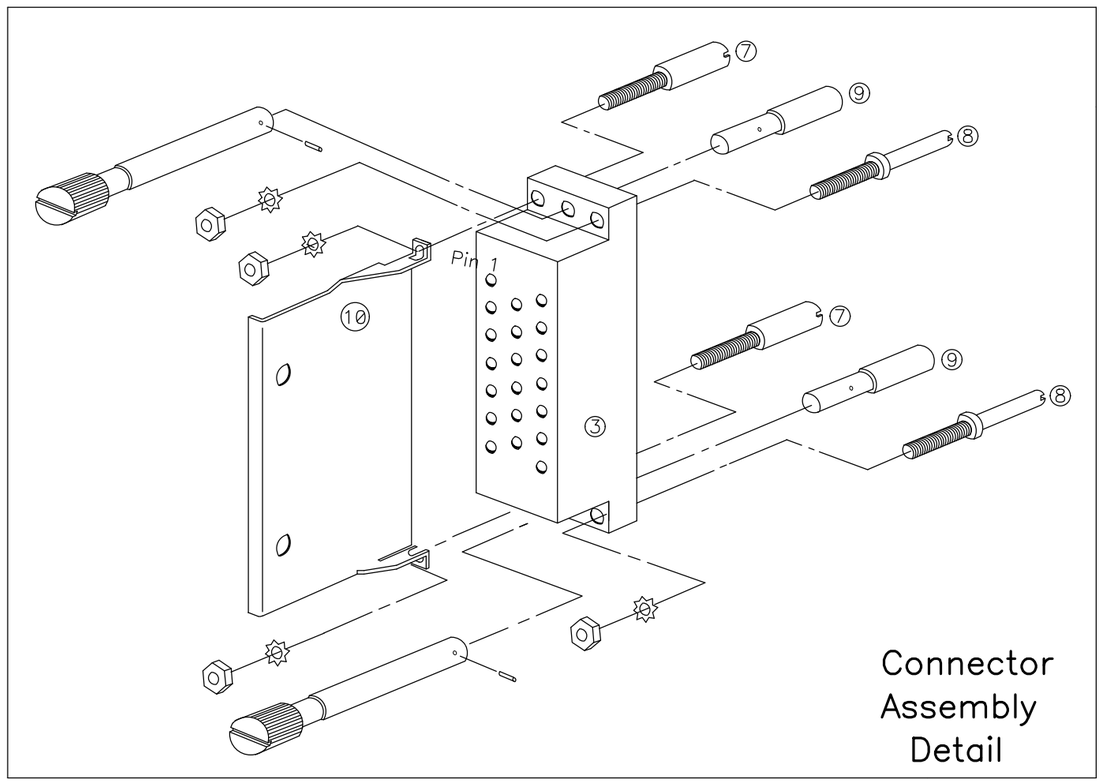
The HV Distribution Box was designed to be a rack mounted aluminum chassis. It will be installed in the racks next to the HV Power Supplies on the elevated platform. A plug-in HV Distribution/filter circuit PCB has been designed for 16 channels. These cards are designed to operate with adjacent channels at 3,500 volts, in the event a wire breaks in the chambers.

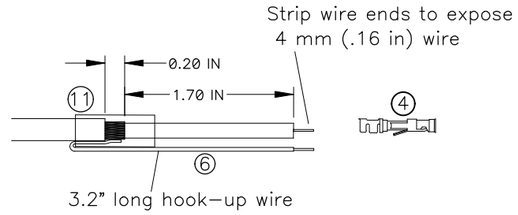
The Coaxial cables will be replaced with an 11 wire multi-conductor, high voltage shielded cable. The 19 wire version of this cable is used a Jefferson Labs. The wires within the shield are Teflon insulated, with a rating of 10 KV DC. The outer jacket is red in color, and rated for plenum use, UL Subjects 13, 910 and 1581.

The small plastic box, used on the South Arm to hold the filter components has been eliminated. The cable that connects the HVPS to the HVDS has a AMP M type connector on one end, and the LHV connector on the other end.

A connector block is mounted to each octant anode plane on the chamber, to hold the twisted pairs from each anode PCB. A single, HV multi-conductor cable with the mating connector plugs into each of these connectors, and is routed to the HVDB in the platform racks.



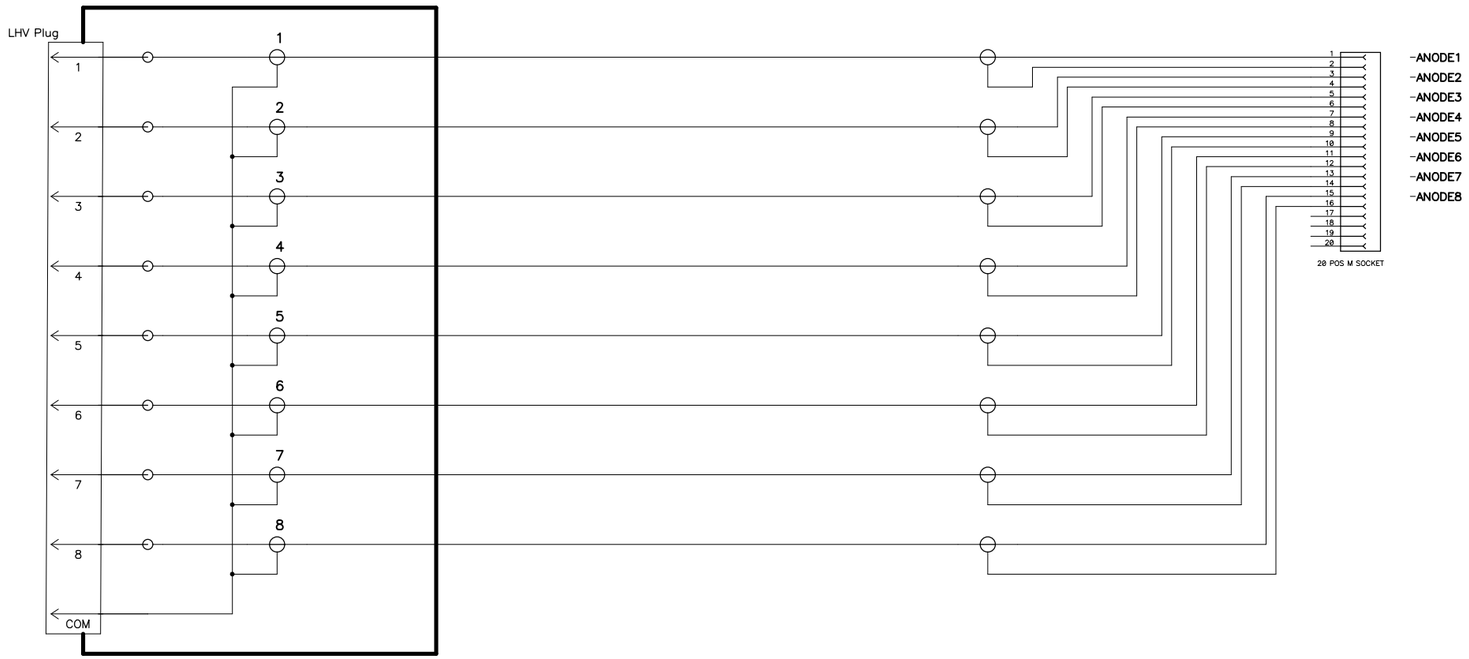




ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	AMP (Div of Tyco)	LGH 9 Pin HV Connector Kit (includes sockets)	443161–1	Discontinued		
2	1	AMP (Div of Tyco)	LGH Strain Relief Kit (Includes hardware)	443162–1	Discontinued		
3	1	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Female	203909–2	Newark Electronics		12.00
4	16	AMP (Div of Tyco)	Socket, Type III, for 20–24 AWG Wire, .071" OD	66105–1	Newark Electronics	50F576	.80
5	1	Panduit	Cable Tie				
6	8	Belden	Hook–up Wire, 22 AWG, Teflon, Green, 3.2 in long	83026–100–5	Newark Electronics	02F5834	.05
7	2	AMP (Div of Tyco)	Guide Socket, for Type M Connectors (Includes washer & nut)	200835–2	Newark Electronics	50F657	1.43
8	2	AMP (Div of Tyco)	Guide Pin, for Type M Connectors (Includes washer & nut)	200833–2	Newark Electronics	50F656	1.00
9	2	AMP (Div of Tyco)	Jackscrew Kit, Female for Type M Conn.	200867–1	Newark Electronics	50F659	2.62
10	1	AMP (Div of Tyco)	Strain Relief, Short, For item 3	201224–1	Digi–Key	201224–1–ND	7.08
11	8	Alpha Wire	Soldering Sleeve for RG–59 Coax (Pkg 100)	FIT–SLV–16	Newark Electronics		

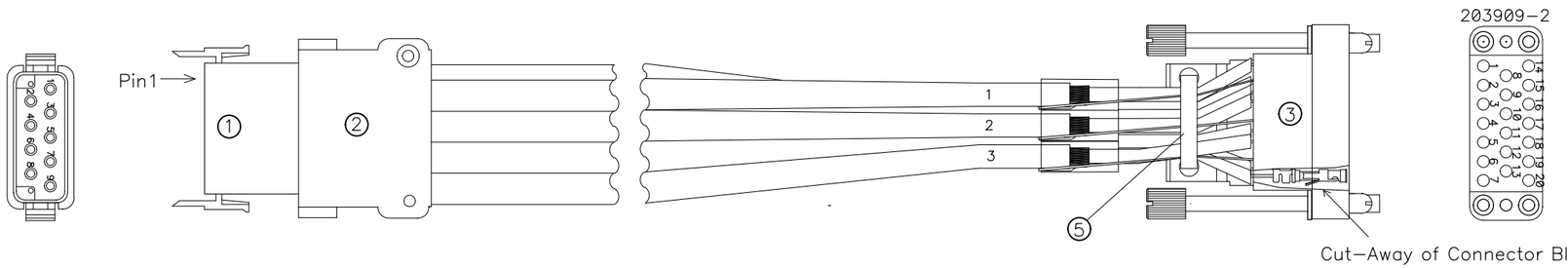
ASSEMBLY DRAWING

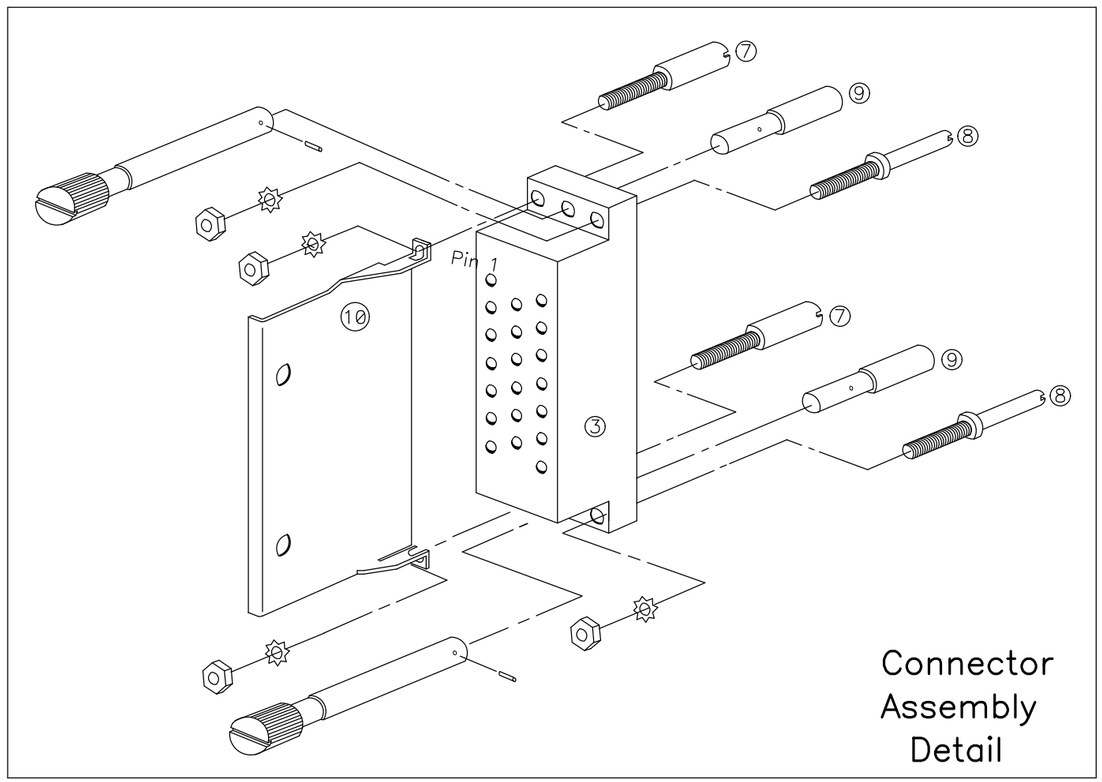
Los Alamos National Laboratory		
Title	MUON TRACKING HV DIST. SYSTEM	
	S1N Test Cable	
Size C	Date Originated: 29 Aug 2001	
	Date Last Revised: 10 Sept 2001	
LANL DWG #		Approved By: W. Sondheim
PHENIX DWG #:		Drawn by: G. Hart
Filename S1N Test Cable.pcb		Sheet 1 of 2

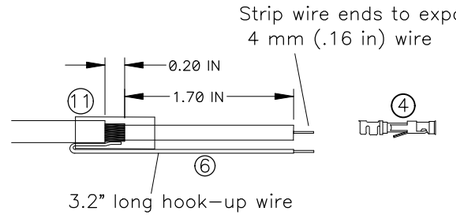


Note: This cable can be used for Station 2 Chambers also. The cables from pins 7 and 8 of the LHV Connector are not used on the Station 2 chamber.

Los Alamos National Laboratory		
Title: St 1 North HV Chamber Test Cable		
SCHEMATIC		
Size	Date Originated: 29 Aug 2001	
	Last Revised: 29 Aug 2001	
LANL DWG #:		Approved By:W. Sondheim
PHENIX #:		Drawn by: G. Hart
Filename: St1N HV Test Cable.sch		Sheet of



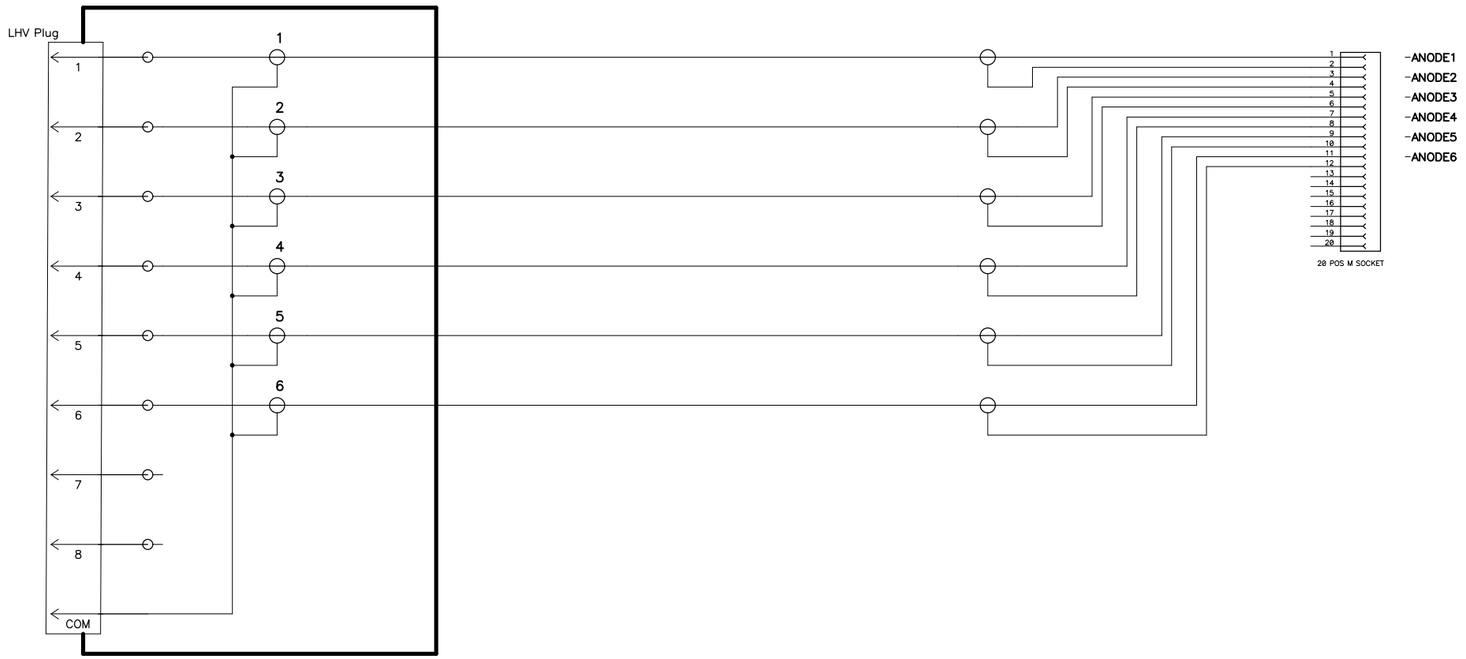




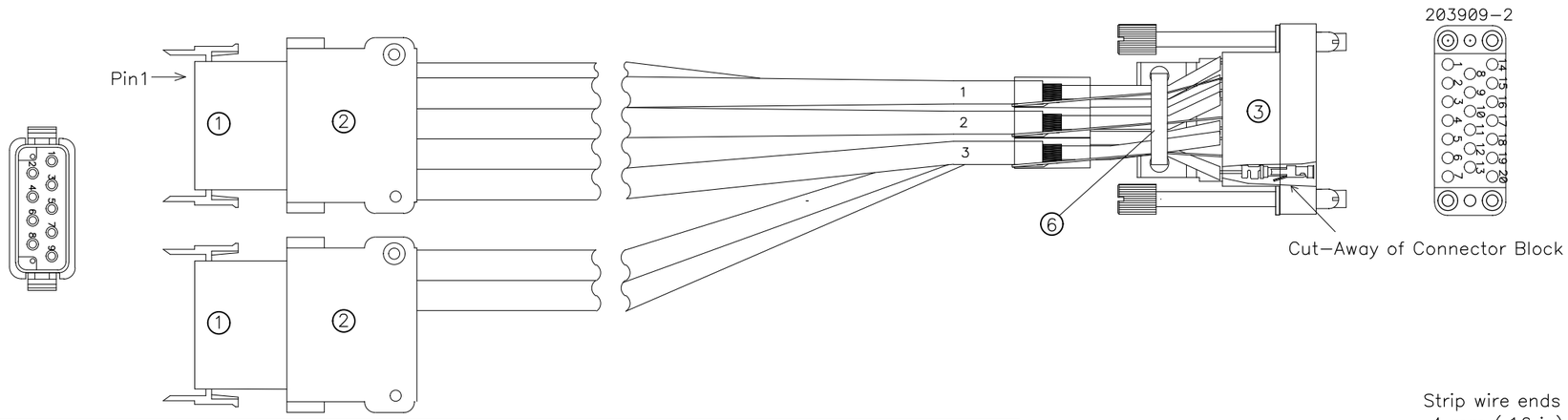
ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	AMP (Div of Tyco)	LGH 9 Pin HV Connector Kit (includes sockets)	443161–1	Discontinued		
2	1	AMP (Div of Tyco)	LGH Strain Relief Kit (Includes hardware)	443162–1	Discontinued		
3	1	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Female	203909–2	Newark Electronics		12.00
4	16	AMP (Div of Tyco)	Socket, Type III, for 20–24 AWG Wire, .071" OD	66105–1	Newark Electronics	50F576	.80
5	1	Panduit	Cable Tie				
6	6	Belden	Hook–up Wire, 22 AWG, Teflon, Green, 3.2 in long	83026–100–5	Newark Electronics	02F5834	.05
7	2	AMP (Div of Tyco)	Guide Socket, for Type M Connectors (Includes washer & nut)	200835–2	Newark Electronics	50F657	1.43
8	2	AMP (Div of Tyco)	Guide Pin, for Type M Connectors (Includes washer & nut)	200833–2	Newark Electronics	50F656	1.00
9	2	AMP (Div of Tyco)	Jackscrew Kit, Female for Type M Conn.	200867–1	Newark Electronics	50F659	2.62
10	1	AMP (Div of Tyco)	Strain Relief, Short, For item 3	201224–1	Digi–Key	201224–1–ND	7.08
11	8	Alpha Wire	Soldering Sleeve for RG–59 Coax (Pkg 100)	FIT–SLV–16	Newark Electronics		

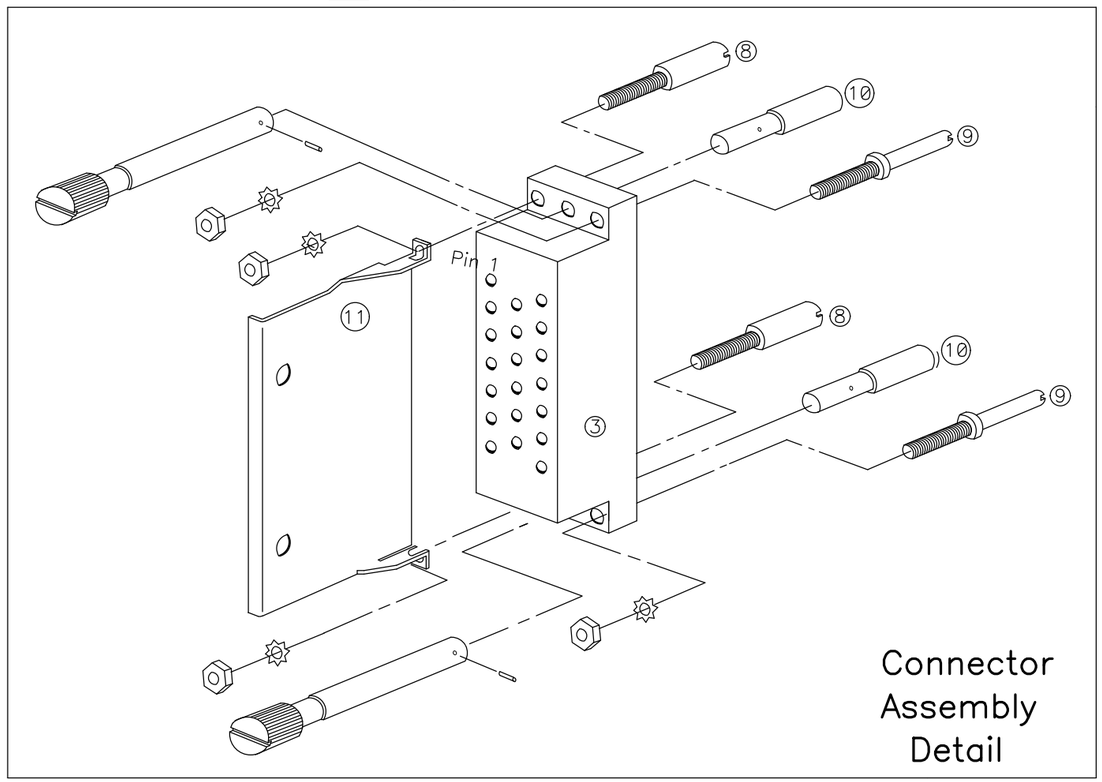
ASSEMBLY DRAWING

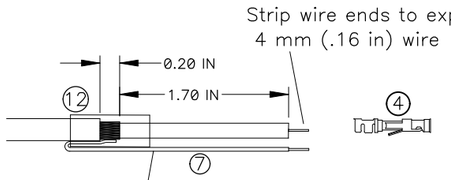
Los Alamos National Laboratory		
Title	MUON TRACKING HV DIST. SYSTEM	
	S2N Test Cable	
Size C	Date Originated: 29 Aug 2001	
	Date Last Revised: 10 Sept 2001	
LANL DWG #		Approved By: W. Sondheim
PHENIX DWG #:		Drawn by: G. Hart
Filename S2N Test Cable.pcb		Sheet 1 of 2



Los Alamos National Laboratory		
Title: St 2 North HV Chamber Test Cable		
SCHEMATIC		
Size	Date Originated: 29 Aug 2001	
	Last Revised: 29 Aug 2001	
LANL DWG #:		Approved By:W. Sondheim
PHENIX #:		Drawn by: G. Hart
Filename: St2N HV Test Cable.sch		Sheet of





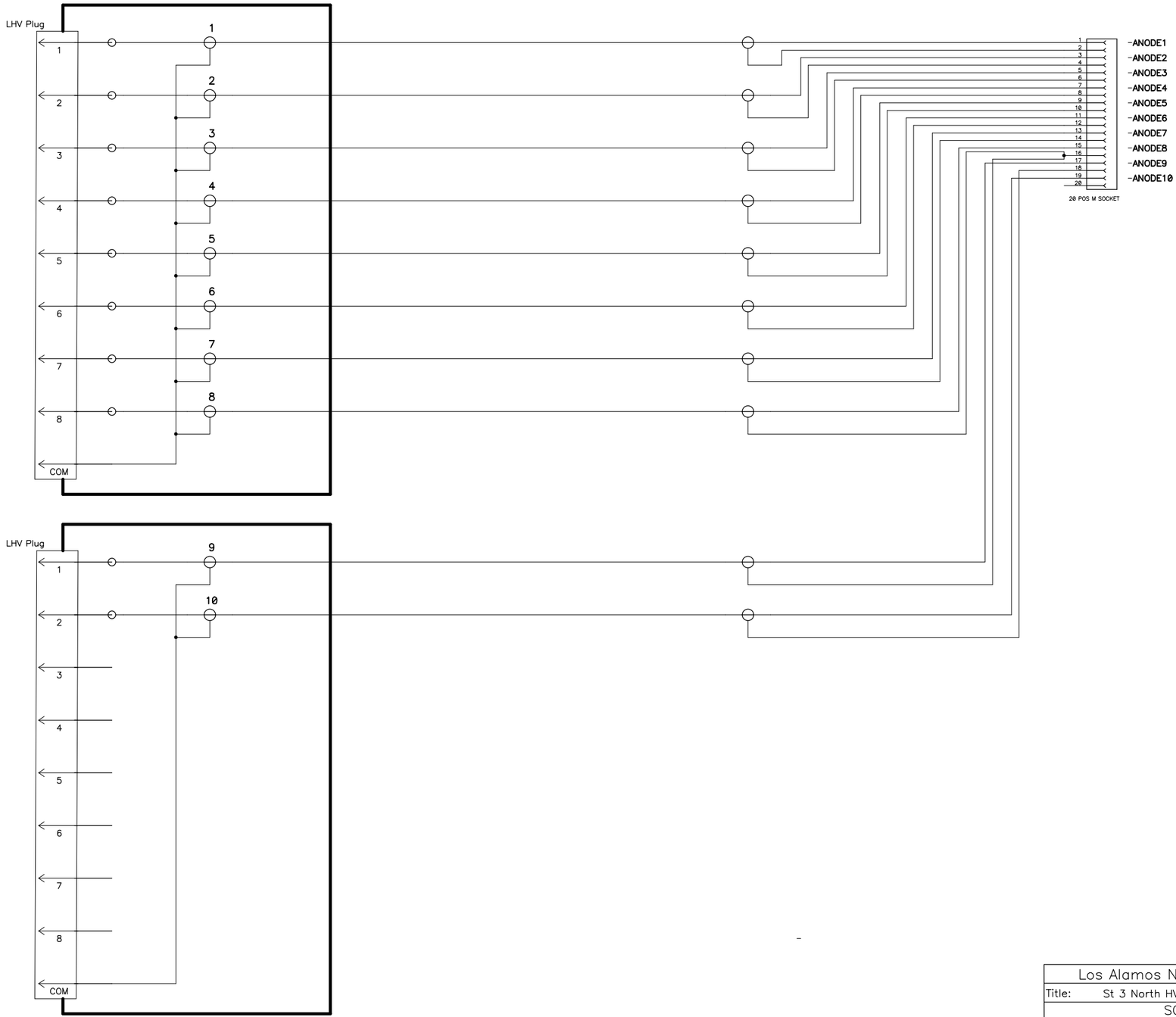


16–18 AWG socket used for pin 16 only, which will have two shield wires crimped together

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	2	AMP (Div of Tyco)	LGH 9 Pin HV Connector Kit (includes sockets)	443161–1	Discontinued		
2	2	AMP (Div of Tyco)	LGH Strain Relief Kit (Includes hardware)	443162–1	Discontinued		
3	1	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Female	203909–2	Newark Electronics		12.00
4	18	AMP (Div of Tyco)	Socket, Type III, for 20–24 AWG Wire, .071" OD	66105–1	Newark Electronics	50F576	.80
5	1	AMP (Div of Tyco)	Socket, Type III, for 16–18 AWG Wire	66101–1	Newark Electronics	50F573	.80
6	1	Panduit	Cable Tie				
7	10	Belden	Hook–up Wire, 22 AWG, Teflon, Green, 3.2 in long	83026–100–5	Newark Electronics	02F5834	.05
8	2	AMP (Div of Tyco)	Guide Socket, for Type M Connectors (Includes washer & nut)	200835–2	Newark Electronics	50F657	1.43
9	2	AMP (Div of Tyco)	Guide Pin, for Type M Connectors (Includes washer & nut)	200833–2	Newark Electronics	50F656	1.00
10	2	AMP (Div of Tyco)	Jackscrew Kit, Female for Type M Conn.	200867–1	Newark Electronics	50F659	2.62
11	1	AMP (Div of Tyco)	Strain Relief, Short, For item 3	201224–1	Digi–Key	201224–1–ND	7.08
12	10	Alpha Wire	Soldering Sleeve for RG–59 Coax (Pkg 100)	FIT–SLV–16	Newark Electronics		

ASSEMBLY DRAWING

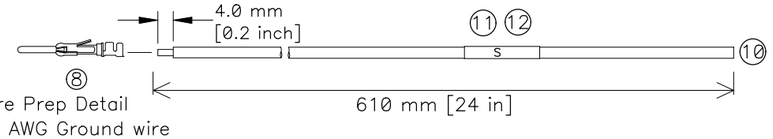
Los Alamos National Laboratory		
Title	MUON TRACKING HV DIST. SYSTEM	
	S3N Test Cable	
Size C	Date Originated: 29 Aug 2001	
	Date Last Revised: 10 Sept 2001	
LANL DWG #		Approved By: W. Sondheim
PHENIX DWG #:		Drawn by: G. Hart
Filename S3N Test Cable.pcb		Sheet 1 of 2



Los Alamos National Laboratory		
Title: St 3 North HV Chamber Test Cable		
SCHEMATIC		
Size	Date Originated: 29 Aug 2001	
	Last Revised: 29 Aug 2001	
LANL DWG #:		Approved By:W. Sondheim
PHENIX #:		Drawn by: G. Hart
Filename: St3N HV Test Cable.sch		Sheet of

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Male	203908–2	Newark Electronics		12.00
2	1	AMP (Div of Tyco)	Pin Hood, Internal, for item 1	202434–4	Newark Electronics		6.00
3	2	AMP (Div of Tyco)	Guide Pin, for Type M Connectors (Includes washer & nut)	200833–2	Newark Electronics	50F656	1.00
4	2	AMP (Div of Tyco)	Guide Socket, for Type M Connectors (Includes washer & nut)	200835–2	Newark Electronics	50F657	1.43
5	2	AMP (Div of Tyco)	Jackscrew Kit, Male, Fixed	200874–1	Newark Electronics	50F661	1.17
6	1		Custom made bracket				
7	17	AMP (Div of Tyco)	Pin, Type III, for 20–24 AWG Wire	66103–1	Newark Electronics	50F575	.60
8	3	AMP (Div of Tyco)	Pin, Type III, for 16–18 AWG Wire	66099–1	Newark Electronics	50F676	.60
9	2	Belden	Hook–up Wire, 22 AWG, Teflon, Green, 38mm (1.5 in) long	83026–100–5	Newark Electronics	02F5834	.03
10	2	Belden	Hook–up Wire, 16 AWG, Teflon, Green, 610mm (24 in) long	83030–100–5	Newark Electronics	02F5420	.88
11	.5"	Panduit	Wire Label, G, supplied on 96" roll	PMDR–G	Newark Electronics	87F4587	.12
12	.5"	Panduit	Wire Label, S, supplied on 96" roll	PMDR–S	Newark Electronics	87F4587	.12

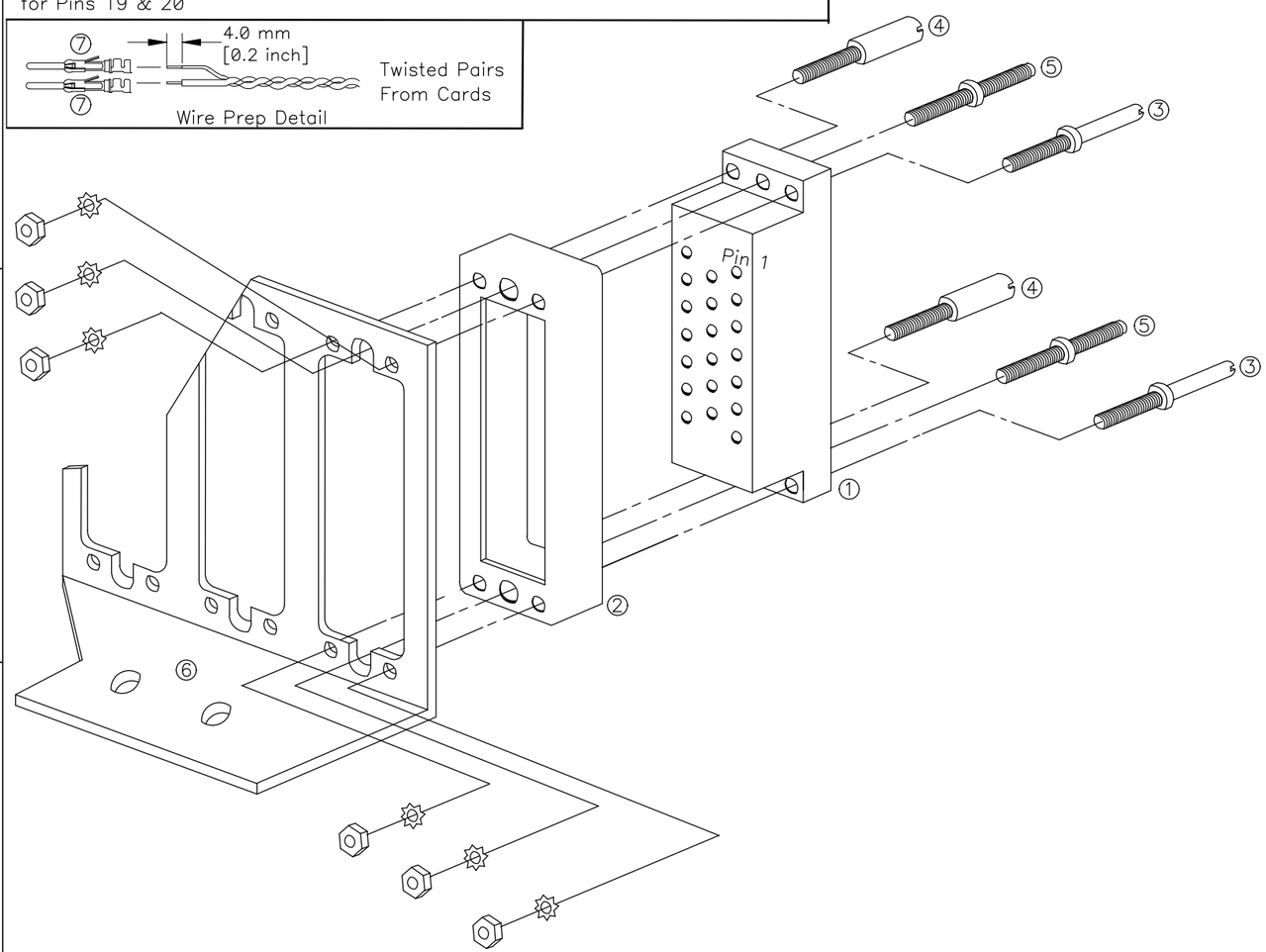
Apply a label in the middle of each pigtail
Pin 19 Label is letter "G" to denote Grounds
Pin 20 Label is letter "S" to denote HV Cable Shield

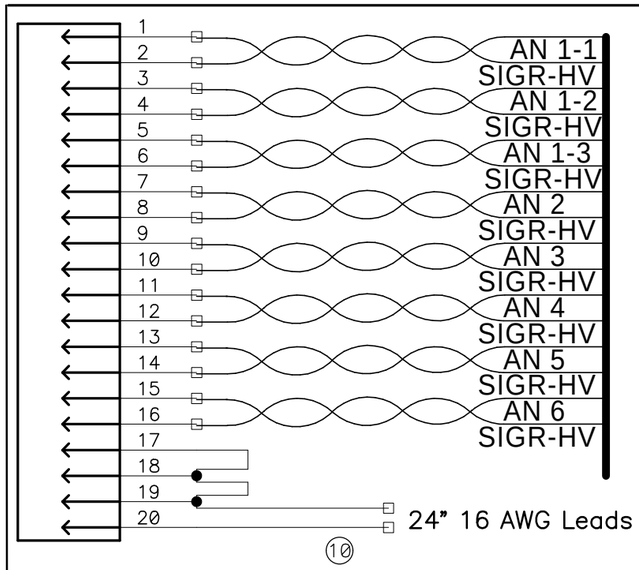


Wire Prep Detail
16 AWG Ground wire
for Pins 19 & 20

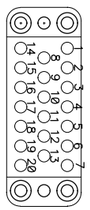
Wire Prep Detail

Twisted Pairs
From Cards





SCHEMATIC of connector wiring



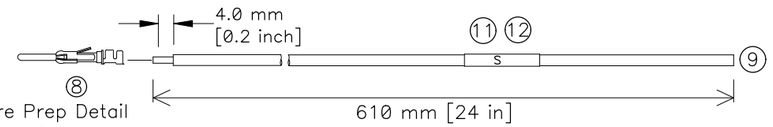
REAR View of 203908–2
Block Connector
(Pins inserted from this end)

Assembly Detail

Los Alamos National Laboratory		
Title	MUON TRACKING HV DIST. SYSTEM	
St 1 North Chamber HV Connector		
Size C	Date Originated: 31 May 2001	
	Date Last Revised: 10 Sept 2001	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002–0312–226		Drawn by: G. Hart
Filename 135Y299083 CH 1.pcb		Sheet 1 of 1

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Male	203908–2	Newark Electronics		12.00
2	1	AMP (Div of Tyco)	Pin Hood, Internal, for item 1	202434–4	Newark Electronics		6.00
3	2	AMP (Div of Tyco)	Guide Pin, for Type M Connectors (Includes washer & nut)	200833–2	Newark Electronics	50F656	1.00
4	2	AMP (Div of Tyco)	Guide Socket, for Type M Connectors (Includes washer & nut)	200835–2	Newark Electronics	50F657	1.43
5	2	AMP (Div of Tyco)	Jackscrew Kit, Male, Fixed	200874–1	Newark Electronics	50F661	1.17
6	1		Custom mounting bracket				
7	13	AMP (Div of Tyco)	Pin, Type III, for 20–24 AWG Wire	66103–1	Newark Electronics	50F575	.60
8	3	AMP (Div of Tyco)	Pin, Type III, for 16–18 AWG Wire	66099–1	Newark Electronics	50F676	.60
9	2	Belden	Hook–up Wire, 16 AWG, Teflon, Green, 610mm (24 in) long	83030–100–5	Newark Electronics	02F5420	.88
10	4	Belden	Hook–up Wire, 22 AWG, Teflon, Green, 31mm (1.2 in) long	83026–100–5	Newark Electronics	02F5834	.03
11	.5"	Panduit	Wire Label, G, supplied on 96" roll	PMDR–G	Newark Electronics	87F4587	.12
12	.5"	Panduit	Wire Label, S, supplied on 96" roll	PMDR–S	Newark Electronics	87F4587	.12

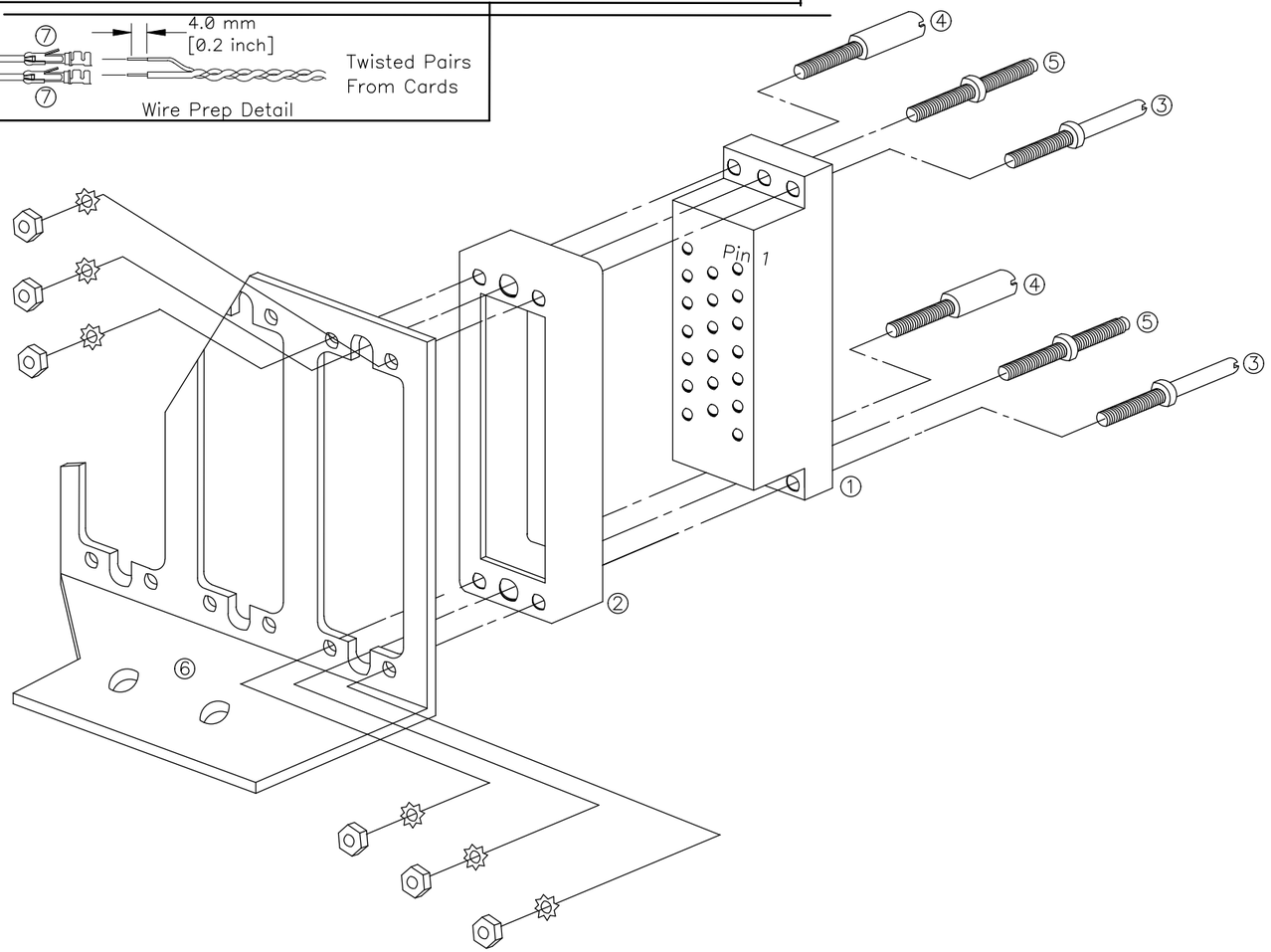
Apply a label in the middle of each pigtail
Pin 19 Label is letter "G" to denote Grounds
Pin 20 Label is letter "S" to denote HV Cable Shield

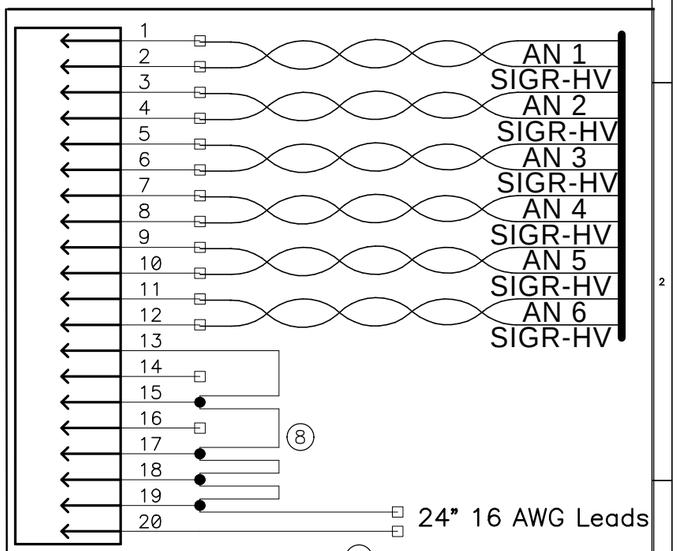


Wire Prep Detail
16 AWG Ground wire
for Pins 19 & 20

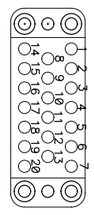
Wire Prep Detail

Twisted Pairs
From Cards





SCHEMATIC of connector wiring



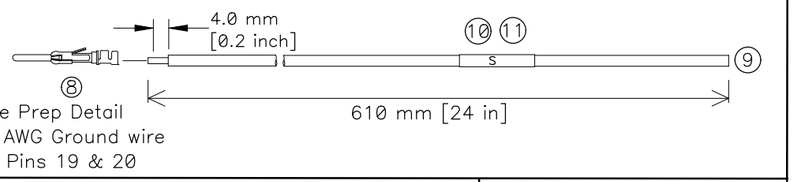
REAR View of 203908–2
Block Connector
(Pins inserted from this end)

Assembly Detail

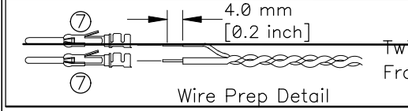
Los Alamos National Laboratory		
Title	MUON TRACKING HV DIST. SYSTEM	
St 2 North Chamber HV Connector		
Size C	Date Originated: 31 May 2001	
	Date Last Revised: 10 Sept 2001	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002–0312–226		Drawn by: G. Hart
Filename 135Y299083 CH 2.pcb		Sheet 1 of 1

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Male	203908–2	Newark Electronics		12.00
2	1	AMP (Div of Tyco)	Pin Hood, Internal, for item 1	202434–4	Newark Electronics		6.00
3	2	AMP (Div of Tyco)	Guide Pin, for Type M Connectors (Includes washer & nut)	200833–2	Newark Electronics	50F656	1.00
4	2	AMP (Div of Tyco)	Guide Socket, for Type M Connectors (Includes washer & nut)	200835–2	Newark Electronics	50F657	1.43
5	2	AMP (Div of Tyco)	Jackscrew Kit, Male, Fixed	200874–1	Newark Electronics	50F661	1.17
6	1		Custom Mounting Bracket				
7	17	AMP (Div of Tyco)	Pin, Type III, for 20–24 AWG Wire	66103–1	Newark Electronics	50F575	.60
8	3	AMP (Div of Tyco)	Pin, Type III, for 16–18 AWG Wire	66099–1	Newark Electronics	50F676	.60
9	2	Belden	Hook–up Wire, 16 AWG, Teflon, Green, 610mm (24 in) long	83030–100–5	Newark Electronics	02F5420	.88
10	.5"	Panduit	Wire Label, G, supplied on 96" roll	PMDR–G	Newark Electronics	87F4587	.12
11	.5"	Panduit	Wire Label, S, supplied on 96" roll	PMDR–S	Newark Electronics	87F4587	.12

Apply a label in the middle of each pigtail
Pin 19 Label is letter "G" to denote Grounds
Pin 20 Label is letter "S" to denote HV Cable Shield

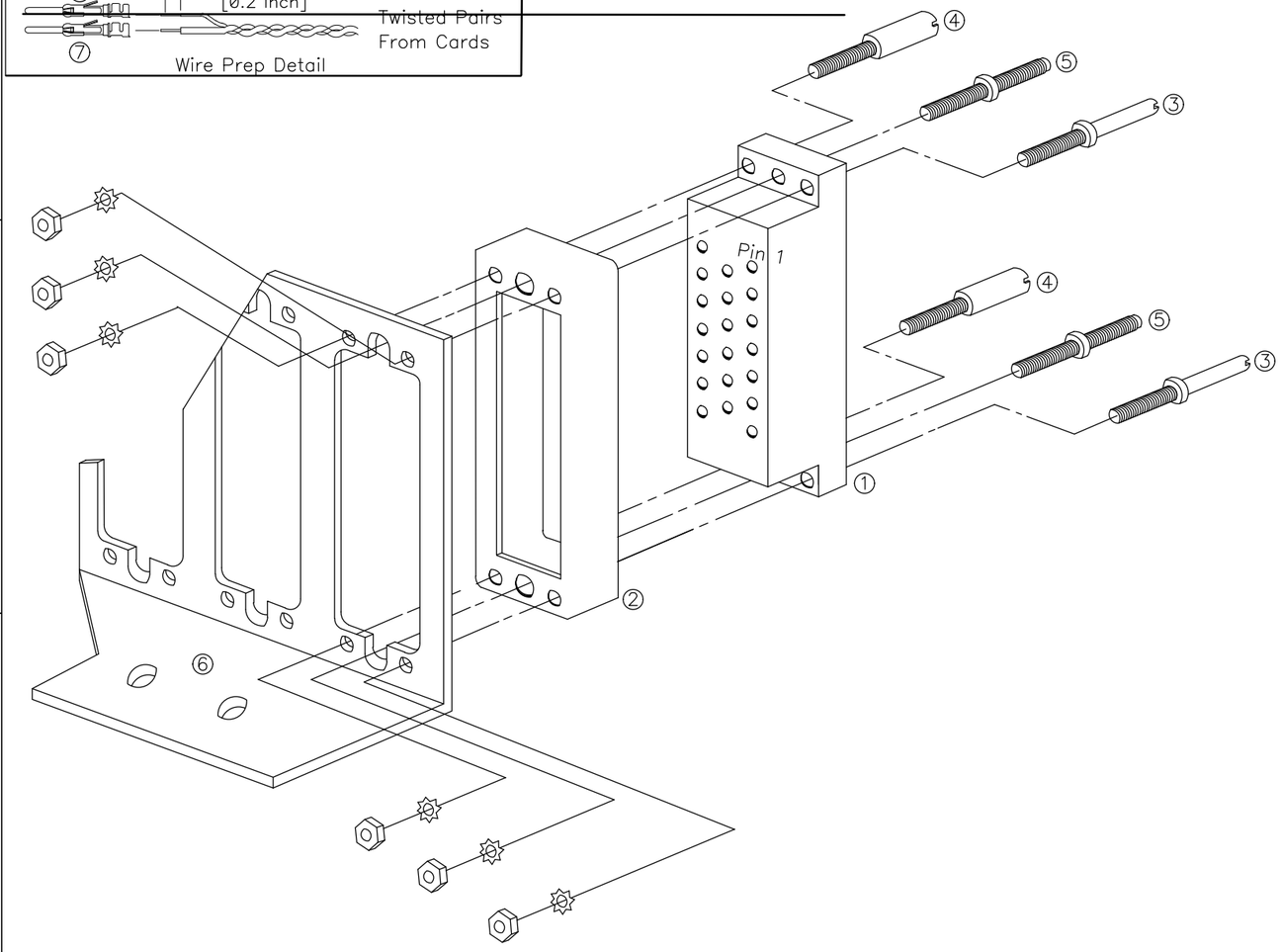


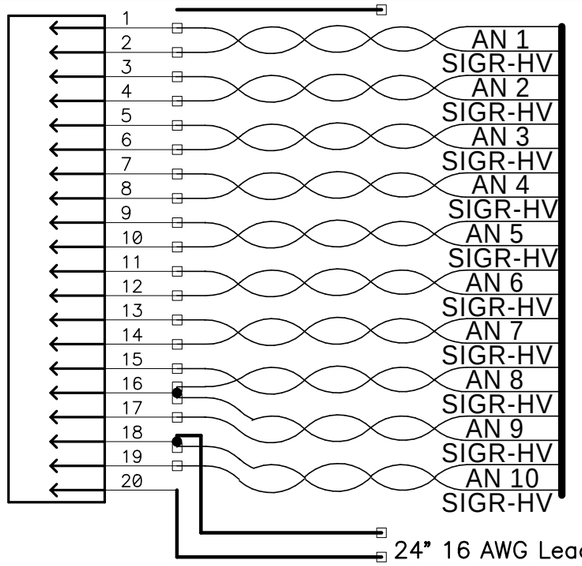
Wire Prep Detail
16 AWG Ground wire
for Pins 19 & 20



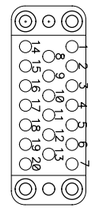
Twisted Pairs
From Cards

Wire Prep Detail





SCHEMATIC of connector wiring

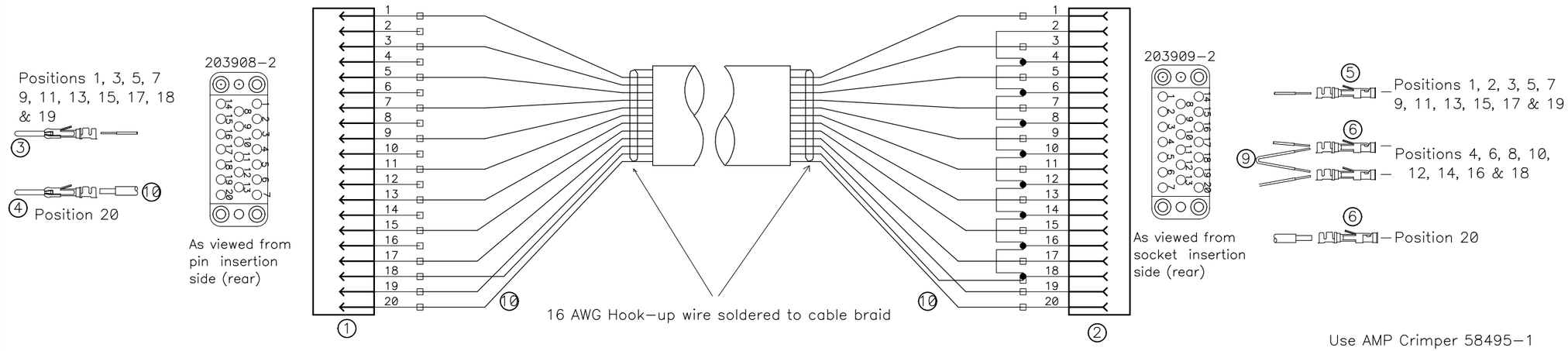


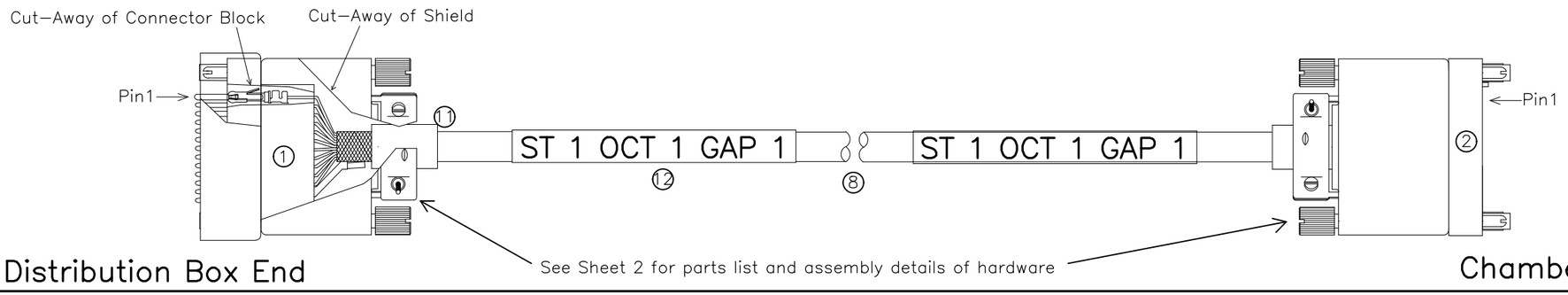
REAR View of 203908–2
Block Connector
(Pins inserted from this end)

Assembly Detail

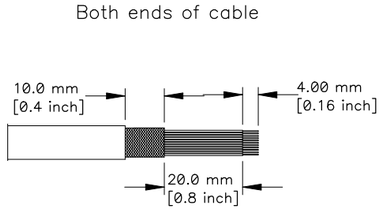
Los Alamos National Laboratory		
Title	MUON TRACKING HV DIST. SYSTEM	
St 3 North Chamber HV Connector		
Size C	Date Originated: 31 May 2001	
	Date Last Revised: 10 Sept 2001	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002–0312–226		Drawn by: G. Hart
Filename 135Y299083 CH 3.pcb		Sheet 1 of 1

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Male	203908–2	Newark Electronics		12.00
2	1	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Female	203909–2	Newark Electronics		12.00
3	11	AMP (Div of Tyco)	Pin, Type III, for 20–24 AWG Wire	66103–1	Newark Electronics	50F575	.60
4	1	AMP (Div of Tyco)	Pin, Type III, for 16–18 AWG Wire	66099–1	Newark Electronics	50F676	.60
5	11	AMP (Div of Tyco)	Socket, Type III, for 20–24 AWG Wire	66105–1	Newark Electronics	50F576	.80
6	9	AMP (Div of Tyco)	Socket, Type III, for 16–18 AWG Wire	66101–1	Newark Electronics	50F573	.80
8	1	General Wire Prod.	Custom 11 Cond. Shielded HV Cable	001–21919 Rev B	Newark Electronics		.45/ft
9	9	Belden	Hook–up Wire, 22 AWG, Treflon, Green, 31mm (1.2 in) long	83026–100–5	Newark Electronics	02F5834	.02
10	2	Belden	Hook–up Wire, 16 AWG, Teflon, Green, 25.4 mm (1 in) long	83030–100–5	Newark Electronics	02F5420	.04
11	2	Nalgene	PVC Tubing, Clear, 19mm (3/4") long, 3/8" ID, 1/2" OD	8000–0120	Fischer Scientific	14–176–36	.02
12	2		Cable Label, see sheet 3 for text				





Connector Position	Color of HV Cable Wires
1	Brown
3	Red
5	Orange
7	Yellow
9	Green
11	Blue
13	Violet
15	Gray
17	Black
18	White
19	White & Blue



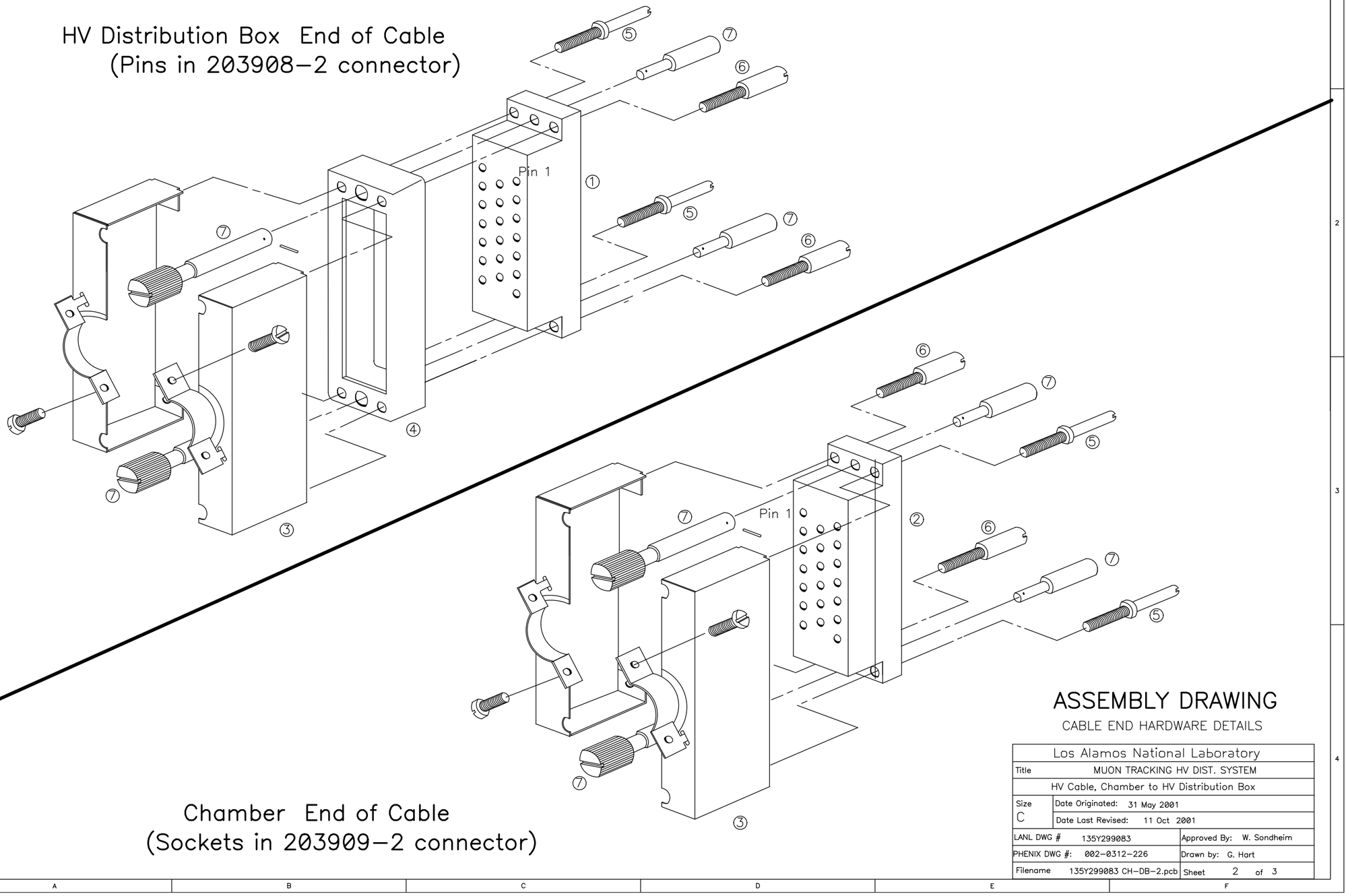
ASSEMBLY DRAWING

SCHEMATIC & CABLE WIRING DETAILS

Los Alamos National Laboratory		
Title	MUON TRACKING HV DIST. SYSTEM	
HV Cable, Chamber to HV Distribution Box		
Size C	Date Originated: 31 May 2001	
	Date Last Revised: 11 Oct 2001	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002–0312–226		Drawn by: G. Hart
Filename 135Y299083 CH–DB–1.pcb		Sheet 1 of 3

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Male	203908-2	See SHEET 1		
2	1	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Female	203909-2	See SHEET 1		
3	2	AMP (Div of Tyco)	Shield Kit, Short, M-Series, Two-Piece, with screws & clamps	200517-2	Digi-Key	200517-2-ND	11.00
4	1	AMP (Div of Tyco)	Pin Hood, Internal, M-Seris	202434-4	Newark Electronics		7.00
5	4	AMP (Div of Tyco)	Guide Pin, for Type M Connectors	200833-2	Newark Electronics	50F656	1.00
6	4	AMP (Div of Tyco)	Guide Socket, for Type M Connectors	200835-2	Newark Electronics	50F657	1.43
7	4	AMP (Div of Tyco)	Jackscrew Kit, Female, For type M connector	200867-1	Newark Electronics	50F659	2.62

HV Distribution Box End of Cable
(Pins in 203908-2 connector)



Chamber End of Cable
(Sockets in 203909-2 connector)

ASSEMBLY DRAWING

CABLE END HARDWARE DETAILS

Los Alamos National Laboratory		
Title	MUON TRACKING HV DIST. SYSTEM	
HV Cable, Chamber to HV Distribution Box		
Size C	Date Originated: 31 May 2001	
	Date Last Revised: 11 Oct 2001	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083 CH-DB-2.pcb		Sheet 2 of 3

Cable Label	Length
ST 1 OC 1 GAP 1	23 M (75.5 Ft)
ST 1 OC 1 GAP 2	23 M (75.5 Ft)
ST 1 OC 1 GAP 3	23 M (75.5 Ft)
ST 1 OC 2 GAP 1	23 M (75.5 Ft)
ST 1 OC 2 GAP 2	23 M (75.5 Ft)
ST 1 OC 2 GAP 3	23 M (75.5 Ft)
ST 1 OC 3 GAP 1	23 M (75.5 Ft)
ST 1 OC 3 GAP 2	23 M (75.5 Ft)
ST 1 OC 3 GAP 3	23 M (75.5 Ft)
ST 1 OC 4 GAP 1	23 M (75.5 Ft)
ST 1 OC 4 GAP 2	23 M (75.5 Ft)
ST 1 OC 4 GAP 3	23 M (75.5 Ft)
ST 1 OC 5 GAP 1	23 M (75.5 Ft)
ST 1 OC 5 GAP 2	23 M (75.5 Ft)
ST 1 OC 5 GAP 3	23 M (75.5 Ft)
ST 1 OC 6 GAP 1	23 M (75.5 Ft)
ST 1 OC 6 GAP 2	23 M (75.5 Ft)
ST 1 OC 6 GAP 3	23 M (75.5 Ft)
ST 1 OC 7 GAP 1	23 M (75.5 Ft)
ST 1 OC 7 GAP 2	23 M (75.5 Ft)
ST 1 OC 7 GAP 3	23 M (75.5 Ft)
ST 1 OC 8 GAP 1	23 M (75.5 Ft)
ST 1 OC 8 GAP 2	23 M (75.5 Ft)
ST 1 OC 8 GAP 3	23 M (75.5 Ft)

Cable Label	Length
ST 2 OC 1 GAP 1	28.5 M (93.5 Ft)
ST 2 OC 1 GAP 2	28.5 M (93.5 Ft)
ST 2 OC 1 GAP 3	28.5 M (93.5 Ft)
ST 2 OC 2 GAP 1	24.5 M (80.4 Ft)
ST 2 OC 2 GAP 2	24.5 M (80.4 Ft)
ST 2 OC 2 GAP 3	24.5 M (80.4 Ft)
ST 2 OC 3 GAP 1	19.5 M (64 Ft)
ST 2 OC 3 GAP 2	19.5 M (64 Ft)
ST 2 OC 3 GAP 3	19.5 M (64 Ft)
ST 2 OC 4 GAP 1	15.5 M (50.9 Ft)
ST 2 OC 4 GAP 2	15.5 M (50.9 Ft)
ST 2 OC 4 GAP 3	15.5 M (50.9 Ft)
ST 2 OC 5 GAP 1	11.5 M (37.7 Ft)
ST 2 OC 5 GAP 2	11.5 M (37.7 Ft)
ST 2 OC 5 GAP 3	11.5 M (37.7 Ft)
ST 2 OC 6 GAP 1	12.5 M (41 Ft)
ST 2 OC 6 GAP 2	12.5 M (41 Ft)
ST 2 OC 6 GAP 3	12.5 M (41 Ft)
ST 2 OC 7 GAP 1	16.5 M (54.1 Ft)
ST 2 OC 7 GAP 2	16.5 M (54.1 Ft)
ST 2 OC 7 GAP 3	16.5 M (54.1 Ft)
ST 2 OC 8 GAP 1	24 M (78.7 Ft)
ST 2 OC 8 GAP 2	24 M (78.7 Ft)
ST 2 OC 8 GAP 3	24 M (78.7 Ft)

Cable Label	Length
ST 3 OC 1 GAP 1	24.2 M (79.4 Ft)
ST 3 OC 1 GAP 3	24.2 M (79.4 Ft)
ST 3 OC 2 GAP 1	20.2 M (66.3 Ft)
ST 3 OC 2 GAP 3	20.2 M (66.3 Ft)
ST 3 OC 3 GAP 1	15.2 M (49.9 Ft)
ST 3 OC 3 GAP 3	15.2 M (49.9 Ft)
ST 3 OC 4 GAP 1	11.2 M (36.7 Ft)
ST 3 OC 4 GAP 3	11.2 M (36.7 Ft)
ST 3 OC 5 GAP 1	7.2 M (23.6 Ft)
ST 3 OC 5 GAP 3	7.2 M (23.6 Ft)
ST 3 OC 6 GAP 1	8.2 M (26.9 Ft)
ST 3 OC 6 GAP 3	8.2 M (26.9 Ft)
ST 3 OC 7 GAP 1	12.2 M (40 Ft)
ST 3 OC 7 GAP 3	12.2 M (40 Ft)
ST 3 OC 8 GAP 1	19.8 M (64.9 Ft)
ST 3 OC 8 GAP 3	19.8 M (64.9 Ft)

Each cable will have two Labels, one on each end.

.

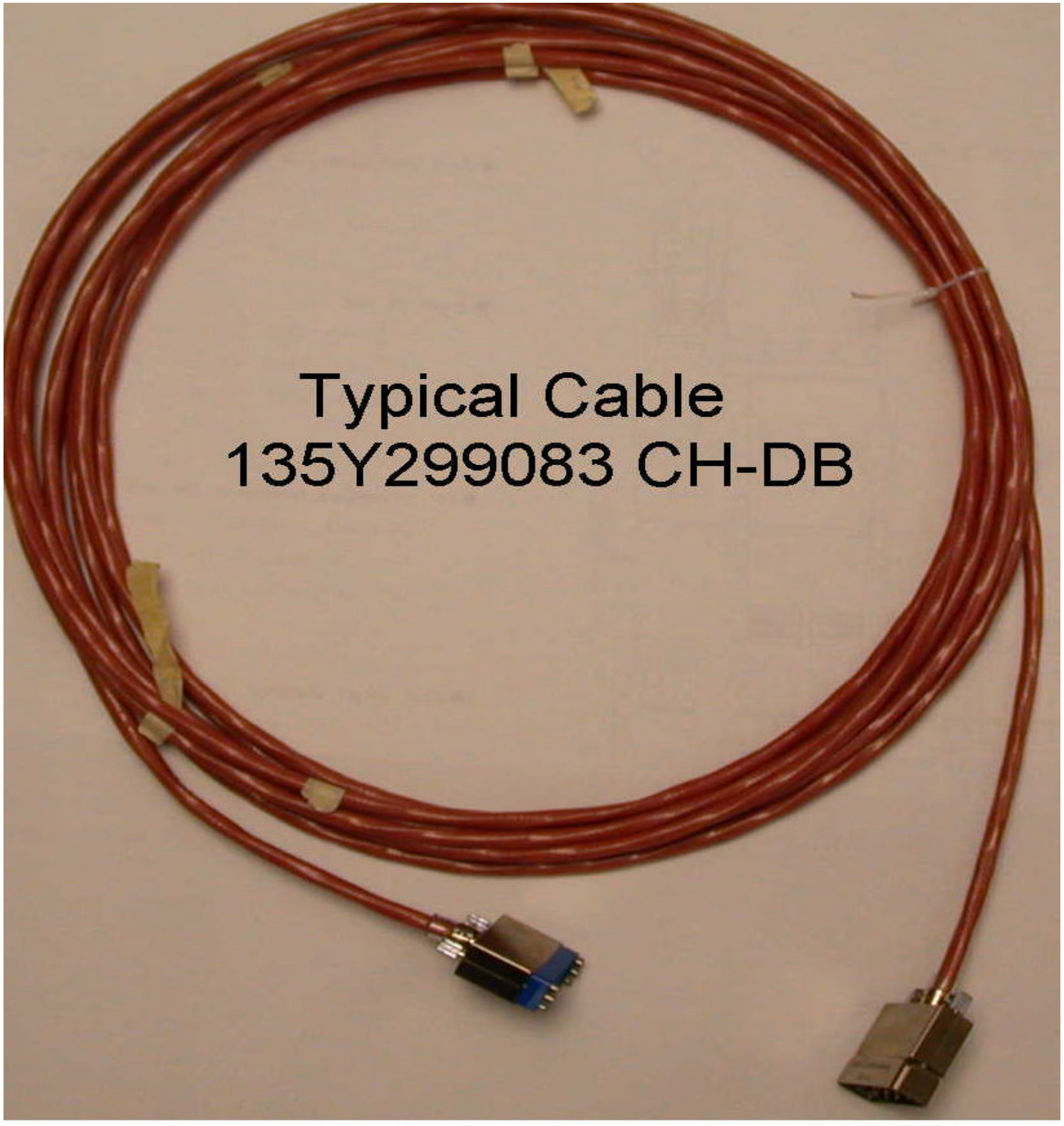
Location shown on Sheet 1

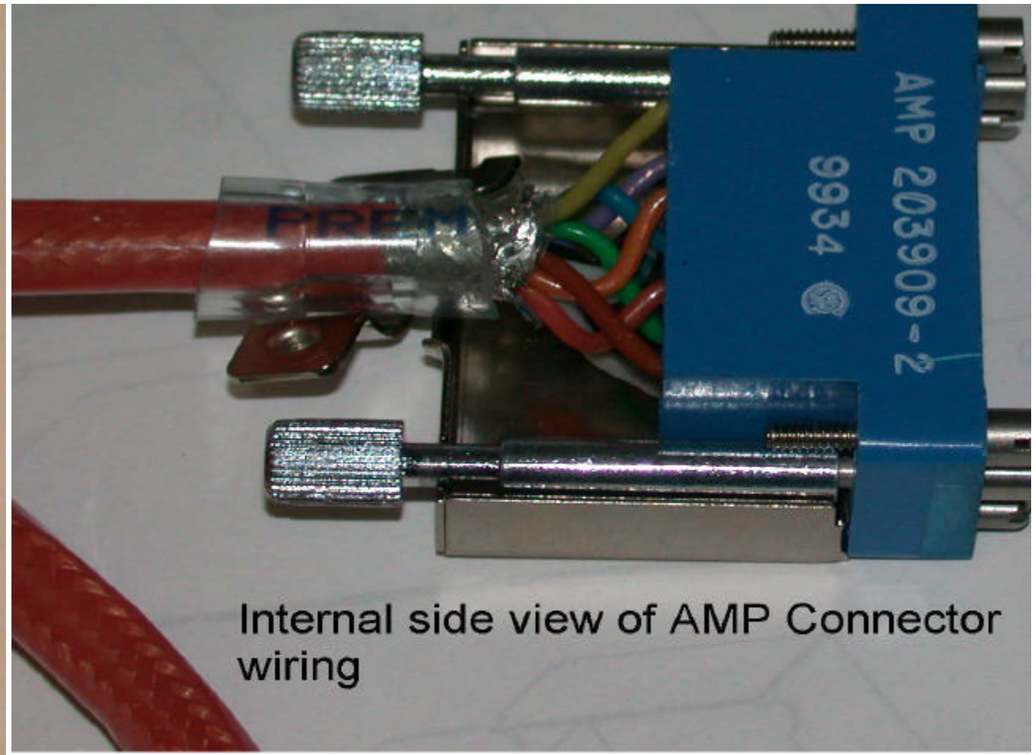
Total number of cables = 64

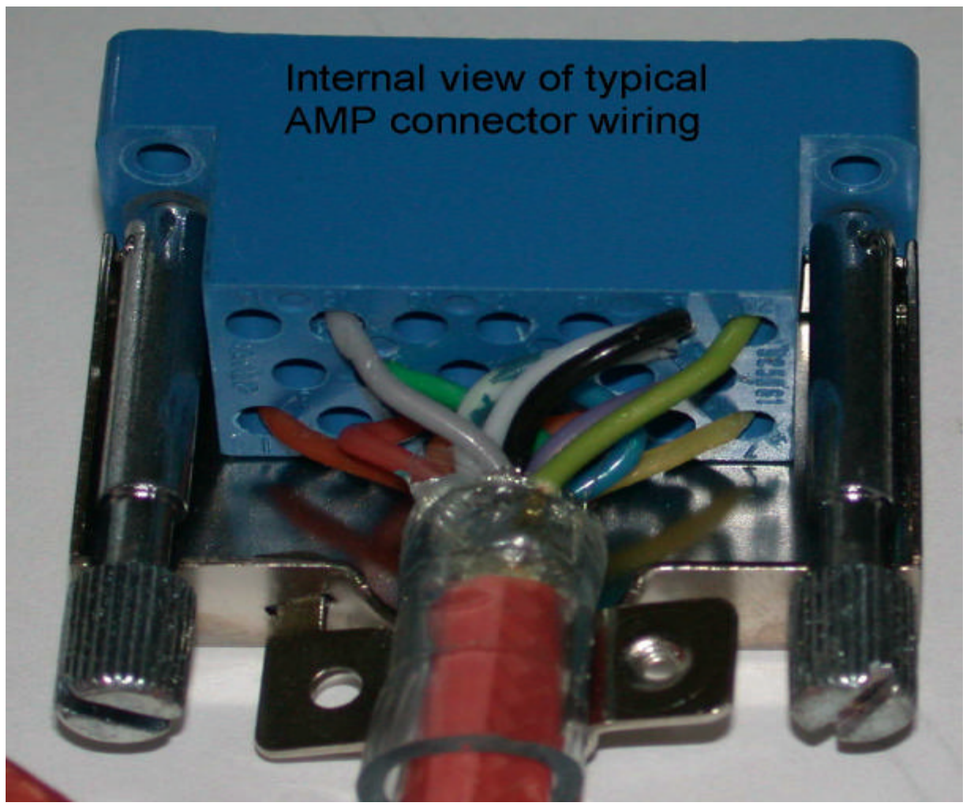
ASSEMBLY DRAWING

Labels & Cable Lengths

Los Alamos National Laboratory		
Title	MUON TRACKING HV DIST. SYSTEM	
HV Cable, Chamber to HV Distribution Box		
Size C	Date Originated: 31 May 2001	
	Date Last Revised: 26 Feb 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083 CH-DB-3.pcb		Sheet 3 of 3

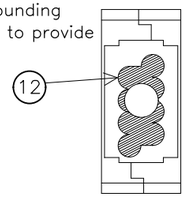

Typical Cable
135Y299083 CH-DB

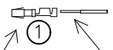

AMP 203909-2
9934
Internal side view of AMP Connector wiring


Internal view of typical
AMP connector wiring

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	AMP (Div of Tyco)	LGH 9 Pin HV Connector Kit (includes sockets)	443161-1	Discontinued		
2	1	AMP (Div of Tyco)	LGH Strain Relief Kit (Includes hardware)	443162-1	Discontinued		
3	1	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Female	203909-2	Newark Electronics		12.00
4	8	AMP (Div of Tyco)	Socket, Type III, for 20-24 AWG Wire, .071" OD	66105-1	Newark Electronics	50F576	.80
6	2	AMP (Div of Tyco)	Socket, Type III, for 16 AWG Wire, .088" Dia	66101-1	Newark Electronics	50F573	.80
7	1	General Wire Prod.	Custom 11 Cond. Shielded HV Cable	001-21919 Rev B	Newark Electronics		.45/ft
8	1	Belden	Hook-up Wire, 22 AWG, Teflon, Green, 70 mm (2.7 in) long	83026-100-5	Newark Electronics	02F5834	.05
9	1	Belden	Hook-up Wire, 16 AWG, Teflon, Green, 35 mm (1.4 in) long	83030-100-5	Newark Electronics	02F5420	.05
10	1	Nalgene	PVC Tubing, Clear, 19mm (3/4") long, 3/8" ID, 1/2" OD	8000-0120	Fischer Scientific	14-176-36	.02
11	2		Cable Label, see sheet 3 for text				
12	1/8 oz	GC Electronics	Silicone Sealant/Adhesive, Electronic Grade, Clear, 3 oz Tube	19-155	Newark Electronics	00Z1554	.30

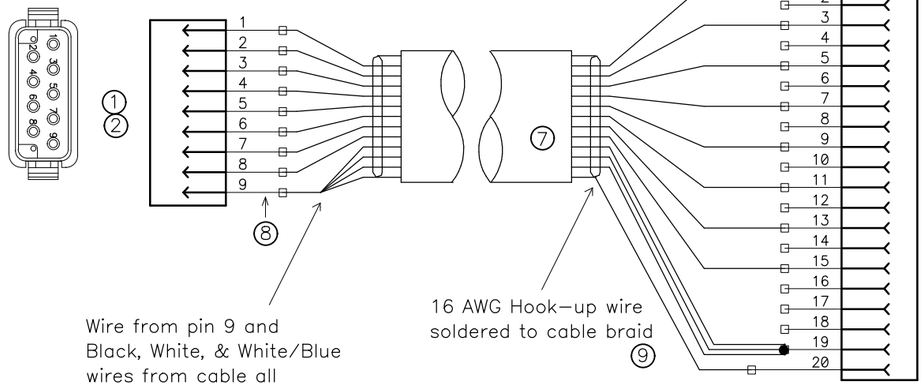
Rear view of assembled connector. Fill voids surrounding cable with Silicone sealant to provide strain releif.





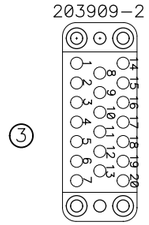
Strip wire ends to expose 3.6 mm (.14 in) wire

Note: The socket contacts supplied in the package of the LHV connectors are AMP Type XI. Part number 203802-6. AMP recommended hand crimp tool is P/N 90260-1. Extration Tool is P/N 91038-3



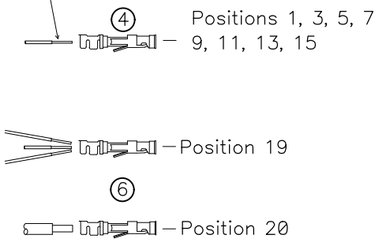
Wire from pin 9 and Black, White, & White/Blue wires from cable all soldered to cable braid

16 AWG Hook-up wire soldered to cable braid

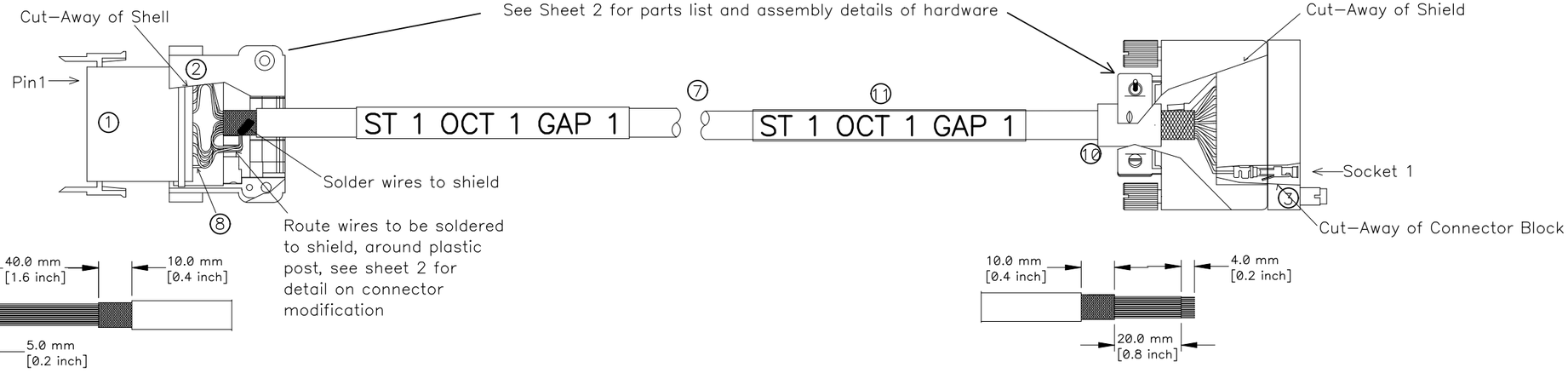


As viewed from socket insertion side (rear)

Strip wire ends to expose 4 mm (.16 in) wire



Use AMP Crimper 58495-1



9 Pin LGH Connector Position	Color of HV Cable Wires
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Gray
9	Black
9	White
9	White & Blue
9	Shield Braid

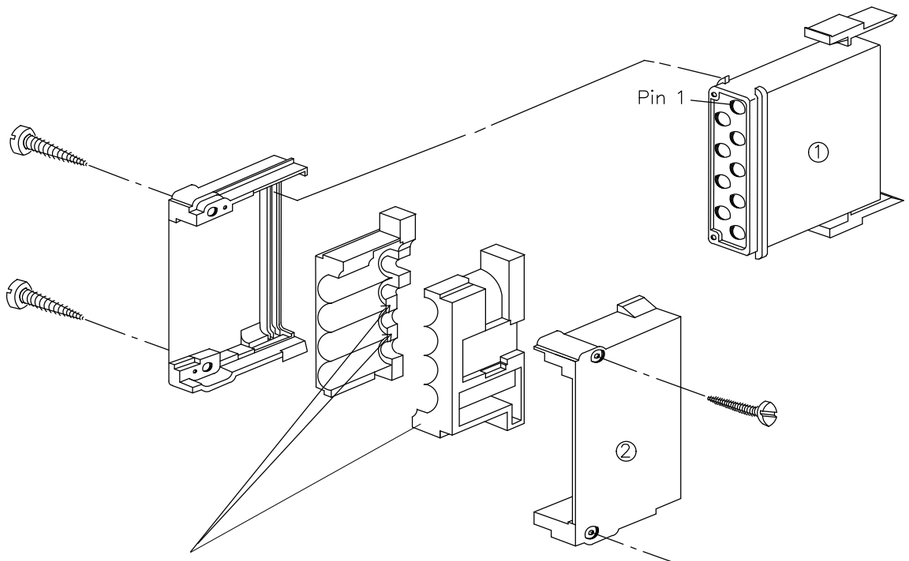
20 PIN Connector Position	Color of HV Cable Wires
1	Brown
3	Red
5	Orange
7	Yellow
9	Green
11	Blue
13	Violet
15	Gray
19	Black
19	White
19	White & Blue

ASSEMBLY DRAWING

SCHEMATIC & CABLE WIRING DETAILS

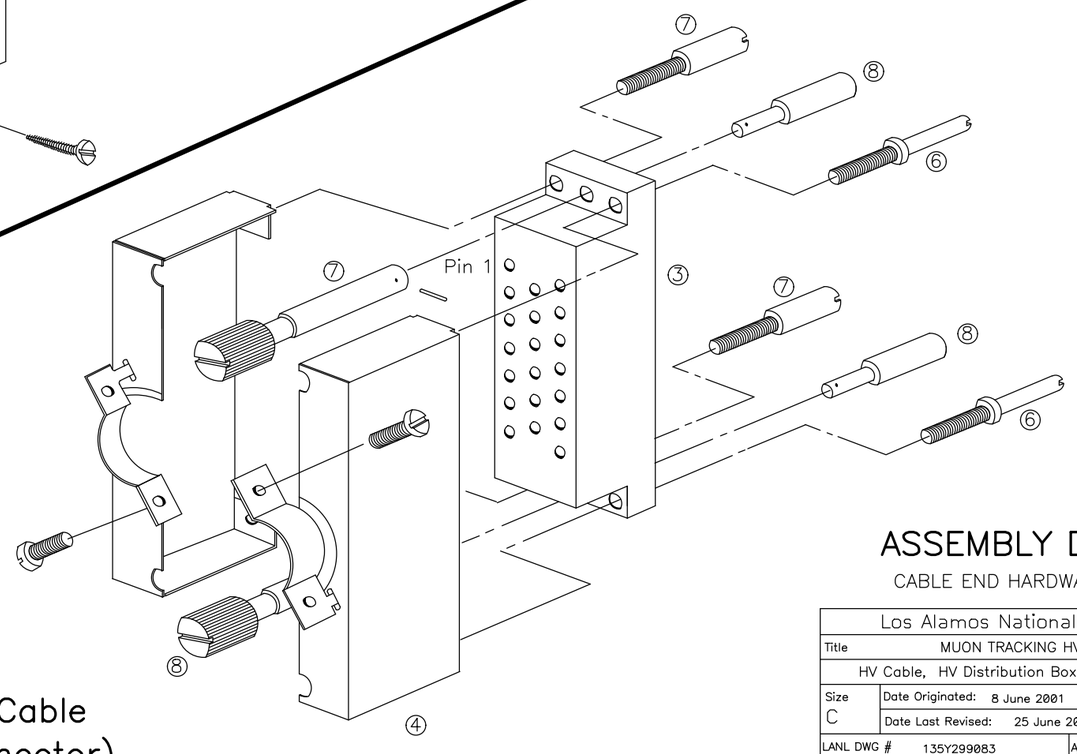
Los Alamos National Laboratory		
Title	MUON TRACKING HV DIST. SYSTEM	
HV Cable, Distribution Box to HV Power Supply		
Size C	Date Originated: 31 May 2001	
	Date Last Revised: 10 Sept 2001	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083 DB-PS-1.pcb		Sheet 1 of 3

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	AMP (Div of Tyco)	LGH 9 Pin Connector Kit	443161-1	See SHEET 1		
2	1	AMP (Div of Tyco)	LGH 9 Pin Strain Relief Kit	443162-1	See SHEET 1		
3	1	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Female	203909-2	See SHEET 1		
4	1	AMP (Div of Tyco)	Shield Kit, Short, M-Series, Two-Piece, with screws & clamps	200517-2	Digi-Key	200517-2-ND	11.00
6	2	AMP (Div of Tyco)	Guide Pin, for Type M Connectors	200833-2	Newark Electronics	50F656	1.00
7	2	AMP (Div of Tyco)	Guide Socket, for Type M Connectors	200835-2	Newark Electronics	50F657	1.43
8	2	AMP (Div of Tyco)	Jackscrew Kit, Female, For type M Connectors	200867-1	Newark Electronics	50F659	2.62



HV Power Supply End of Cable (9 Pin LGH Connector))

Cut off two tabs on both of these inner clamp pieces (to make room for cable)



HV Distribution Box End of Cable (Sockets in 203909-2 connector)

ASSEMBLY DRAWING

CABLE END HARDWARE DETAILS

Los Alamos National Laboratory		
Title	MUON TRACKING HV DIST. SYSTEM	
HV Cable, HV Distribution Box to Power Supply		
Size C	Date Originated: 8 June 2001	
	Date Last Revised: 25 June 2001	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083 DB-PS-2.pcb		Sheet 2 of 3

Cable Label	Length
ST 1 OC 1 GAP 1	1.8 M (71 in)
ST 1 OC 1 GAP 2	1.8 M (71 in)
ST 1 OC 1 GAP 3	1.8 M (71 in)
ST 1 OC 2 GAP 1	1.8 M (71 in)
ST 1 OC 2 GAP 2	1.8 M (71 in)
ST 1 OC 2 GAP 3	1.8 M (71 in)
ST 1 OC 3 GAP 1	1.8 M (71 in)
ST 1 OC 3 GAP 2	1.8 M (71 in)
ST 1 OC 3 GAP 3	1.8 M (71 in)
ST 1 OC 4 GAP 1	1.8 M (71 in)
ST 1 OC 4 GAP 2	1.8 M (71 in)
ST 1 OC 4 GAP 3	1.8 M (71 in)
ST 1 OC 5 GAP 1	1.8 M (71 in)
ST 1 OC 5 GAP 2	1.8 M (71 in)
ST 1 OC 5 GAP 3	1.8 M (71 in)
ST 1 OC 6 GAP 1	1.8 M (71 in)
ST 1 OC 6 GAP 2	1.8 M (71 in)
ST 1 OC 6 GAP 3	1.8 M (71 in)
ST 1 OC 7 GAP 1	1.8 M (71 in)
ST 1 OC 7 GAP 2	1.8 M (71 in)
ST 1 OC 7 GAP 3	1.8 M (71 in)
ST 1 OC 8 GAP 1	1.8 M (71 in)
ST 1 OC 8 GAP 2	1.8 M (71 in)
ST 1 OC 8 GAP 3	1.8 M (71 in)

Cable Label	Length
ST 2 OC 1 GAP 1 & 2	1.8 M (71 in)
ST 2 OC 1 GAP 3 OCT 2 GAP 1	1.8 M (71 in)
ST 2 OC 2 GAP 2 & 3	1.8 M (71 in)
ST 2 OC 3 GAP 1 & 2	1.8 M (71 in)
ST 2 OC 3 GAP 3 OCT 4 GAP 1	1.8 M (71 in)
ST 2 OC 4 GAP 2 & 3	1.8 M (71 in)
ST 2 OC 5 GAP 1 & 2	1.8 M (71 in)
ST 2 OC 5 GAP 3 OCT 6 GAP 1	1.8 M (71 in)
ST 2 OC 6 GAP 2 & 3	1.8 M (71 in)
ST 2 OC 7 GAP 1 & 2	1.8 M (71 in)
ST 2 OC 7 GAP 3 OCT 8 GAP 1	1.8 M (71 in)
ST 2 OC 8 GAP 2 & 3	1.8 M (71 in)

Cable Label	Length
ST 3 OC 1 GAP 1 & 3	1.8 M (71 in)
ST 3 OC 2 GAP 1 & 3	1.8 M (71 in)
ST 3 OC 3 GAP 1 & 3	1.8 M (71 in)
ST 3 OC 4 GAP 1 & 3	1.8 M (71 in)
ST 3 OC 5 GAP 1 & 3	1.8 M (71 in)
ST 3 OC 6 GAP 1 & 3	1.8 M (71 in)
ST 3 OC 7 GAP 1 & 3	1.8 M (71 in)
ST 3 OC 8 GAP 1 & 3	1.8 M (71 in)

Each cable will have two Labels, one on each end.

.

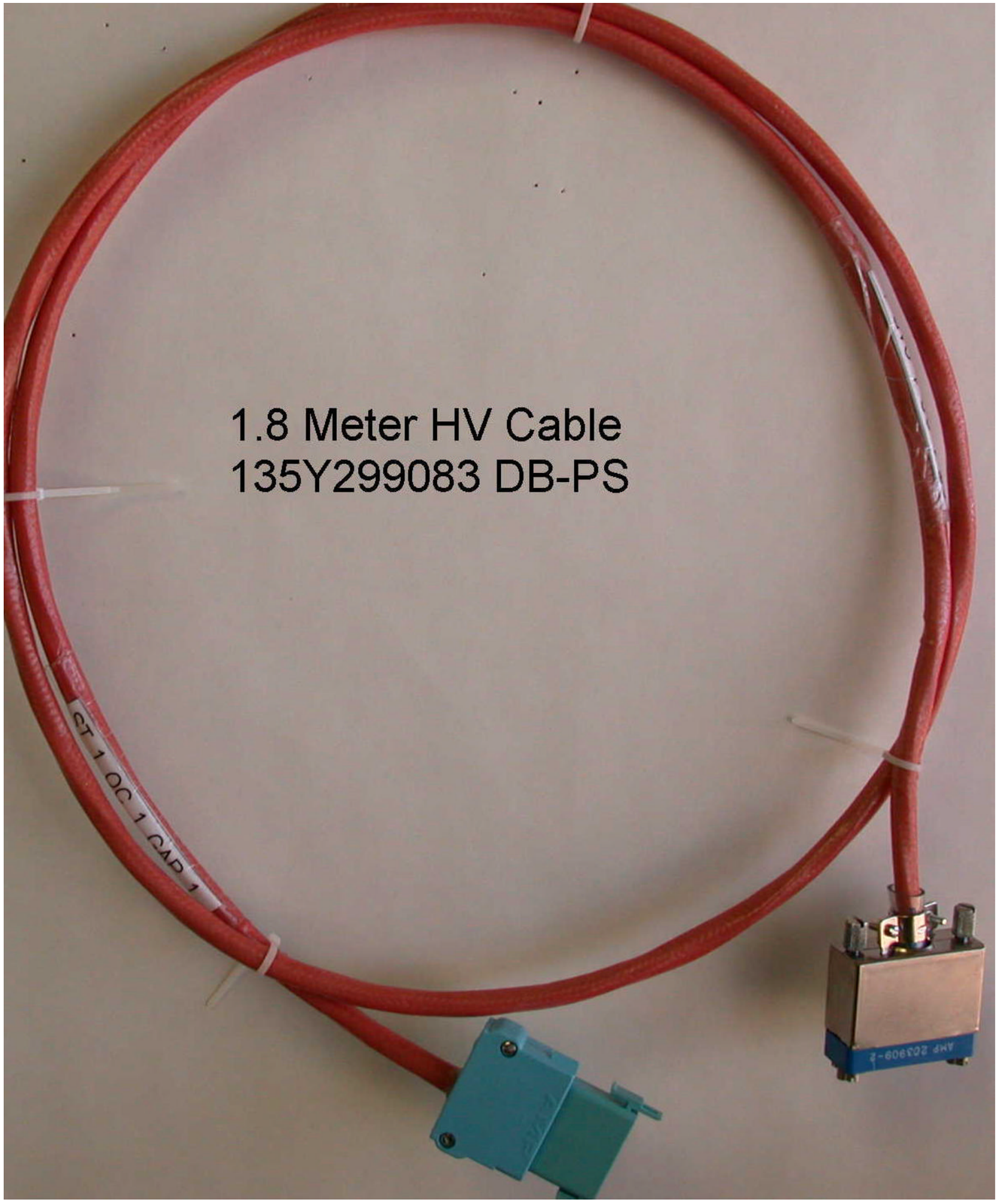
Location shown on Sheet 1

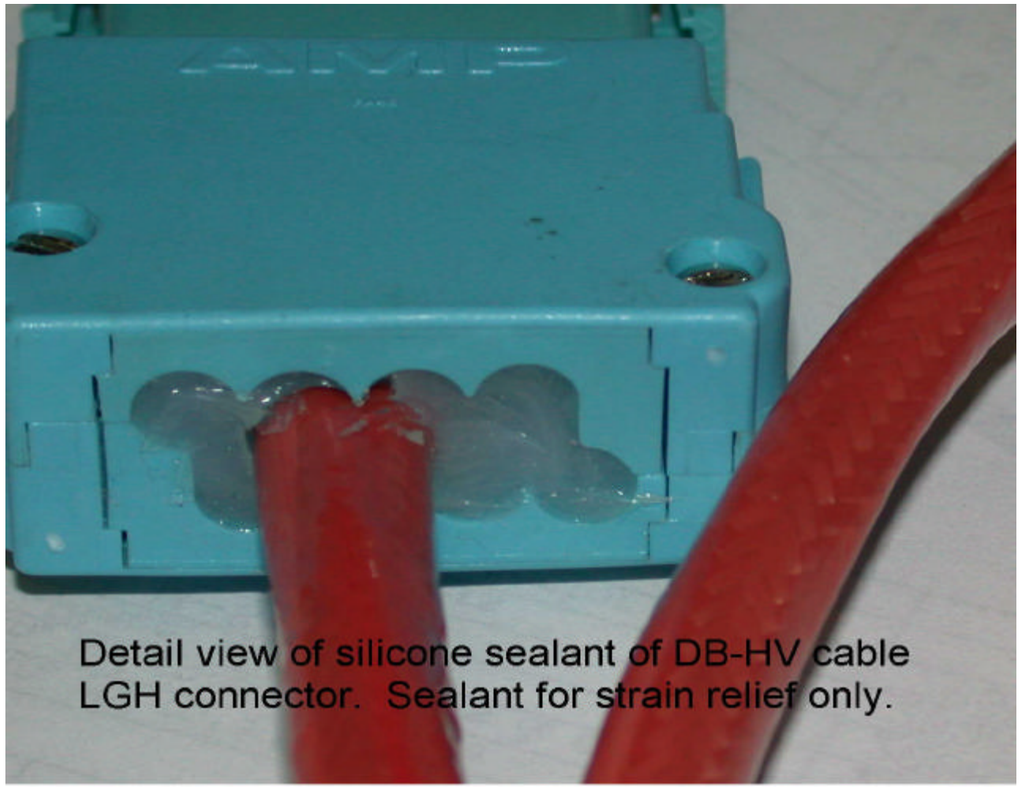
Total number of cables = 44

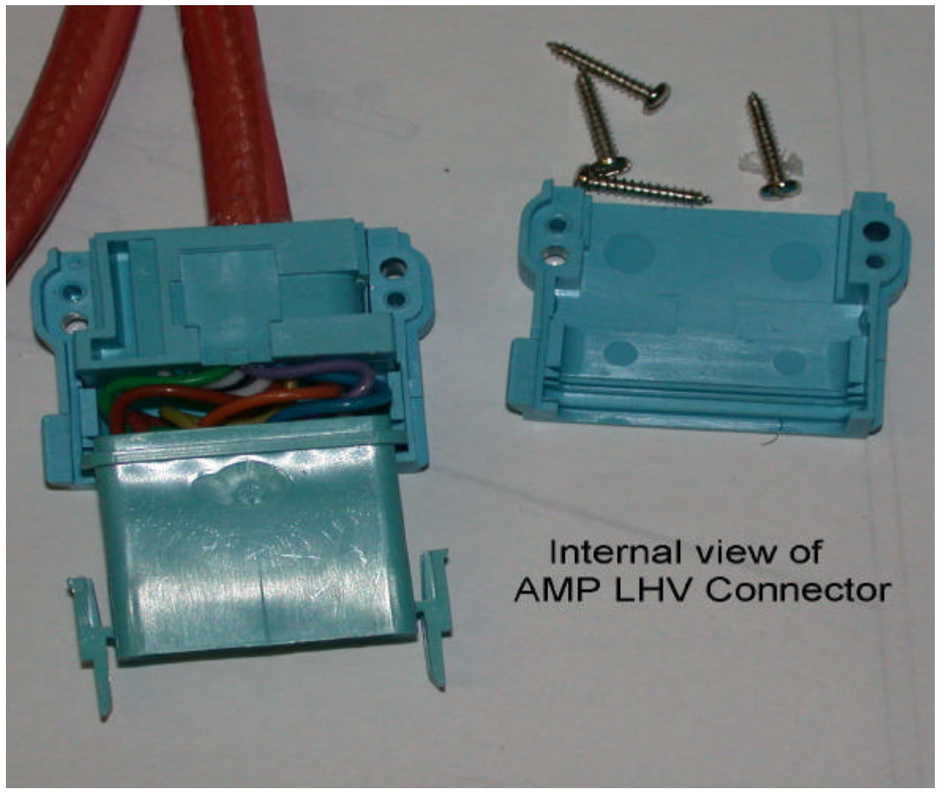
ASSEMBLY DRAWING

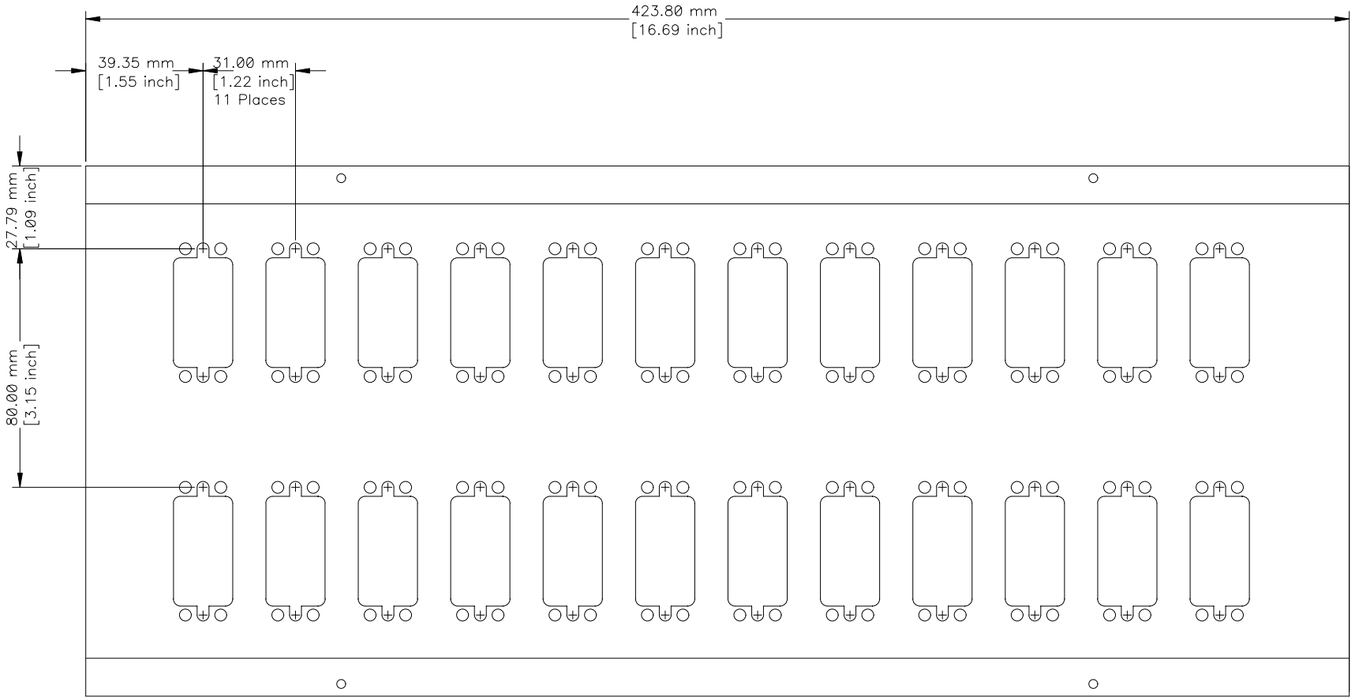
Labels & Cable Lengths

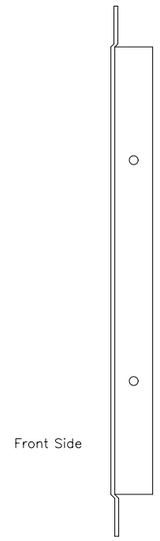
Los Alamos National Laboratory		
Title	MUON TRACKING HV DIST. SYSTEM	
Cable, Distribution Box to HV Power Supply		
Size C	Date Originated: 31 May 2001	
	Date Last Revised: 26 Sept 2001	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083 DB-PS-3.pcb		Sheet 3 of 3


1.8 Meter HV Cable
135Y299083 DB-PS
CT 1 OC 1 CAP 1
AMP 203909-2

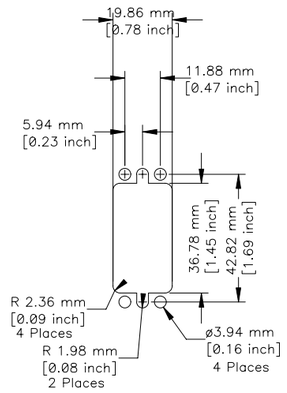

Detail view of silicone sealant of DB-HV cable
LGH connector. Sealant for strain relief only.


Internal view of
AMP LHV Connector





Paint front side Red



Front Panel Fabrication Drawing

Los Alamos National Laboratory		
Title	Front Panel, St 1 North Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001 Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A FP 1.pcb		Sheet 1 of 3

Oct 1 Gap 1 Oct 1 Gap 2 Oct 1 Gap 3 Oct 2 Gap 1 Oct 2 Gap 2 Oct 2 Gap 3 Oct 3 Gap 1 Oct 3 Gap 2 Oct 3 Gap 3 Oct 4 Gap 1 Oct 4 Gap 2 Oct 4 Gap 3

Station 1 North HV Distribution Chamber Inputs

Oct 5 Gap 1 Oct 5 Gap 2 Oct 5 Gap 3 Oct 6 Gap 1 Oct 6 Gap 2 Oct 6 Gap 3 Oct 7 Gap 1 Oct 7 Gap 2 Oct 7 Gap 3 Oct 8 Gap 1 Oct 8 Gap 2 Oct 8 Gap 3

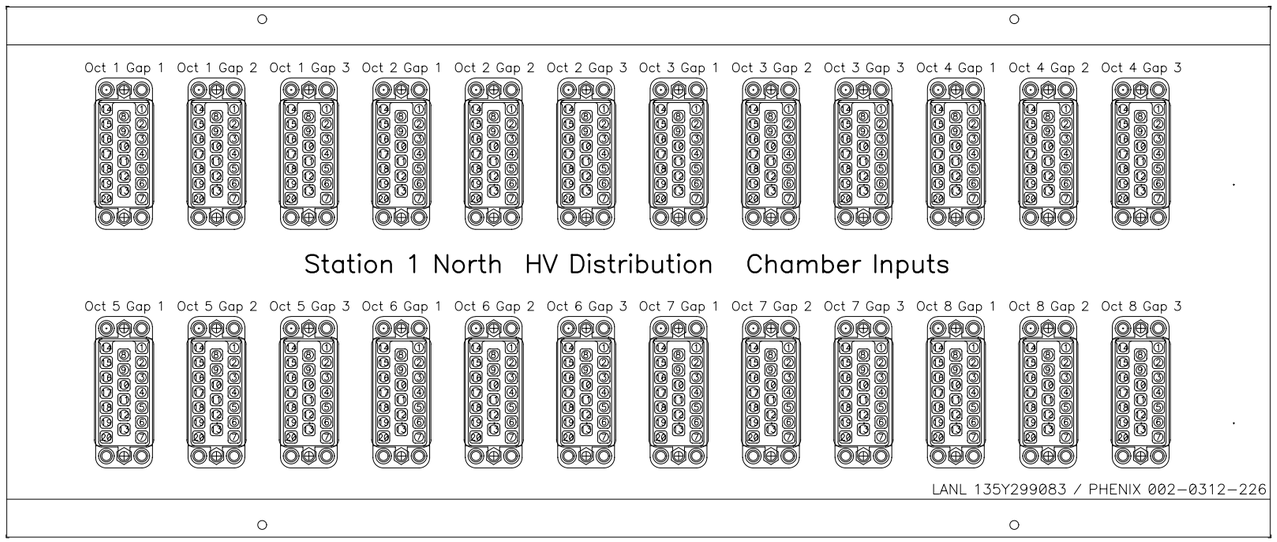
LANL 135Y299083 / PHENIX 002-0312-226

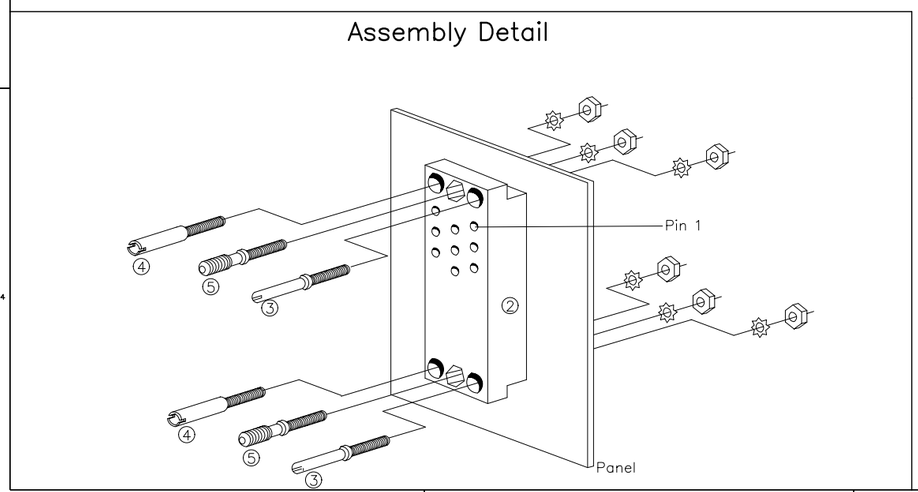
Silkscreen in Black

Front Panel Silkscreen

Los Alamos National Laboratory		
Title	Front Panel, St 1 North	
Noth Arm HV Distribution		
Size D	Date Originated: 30 May 2001	
	Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A FP 1.pcb		Sheet 2 of 3

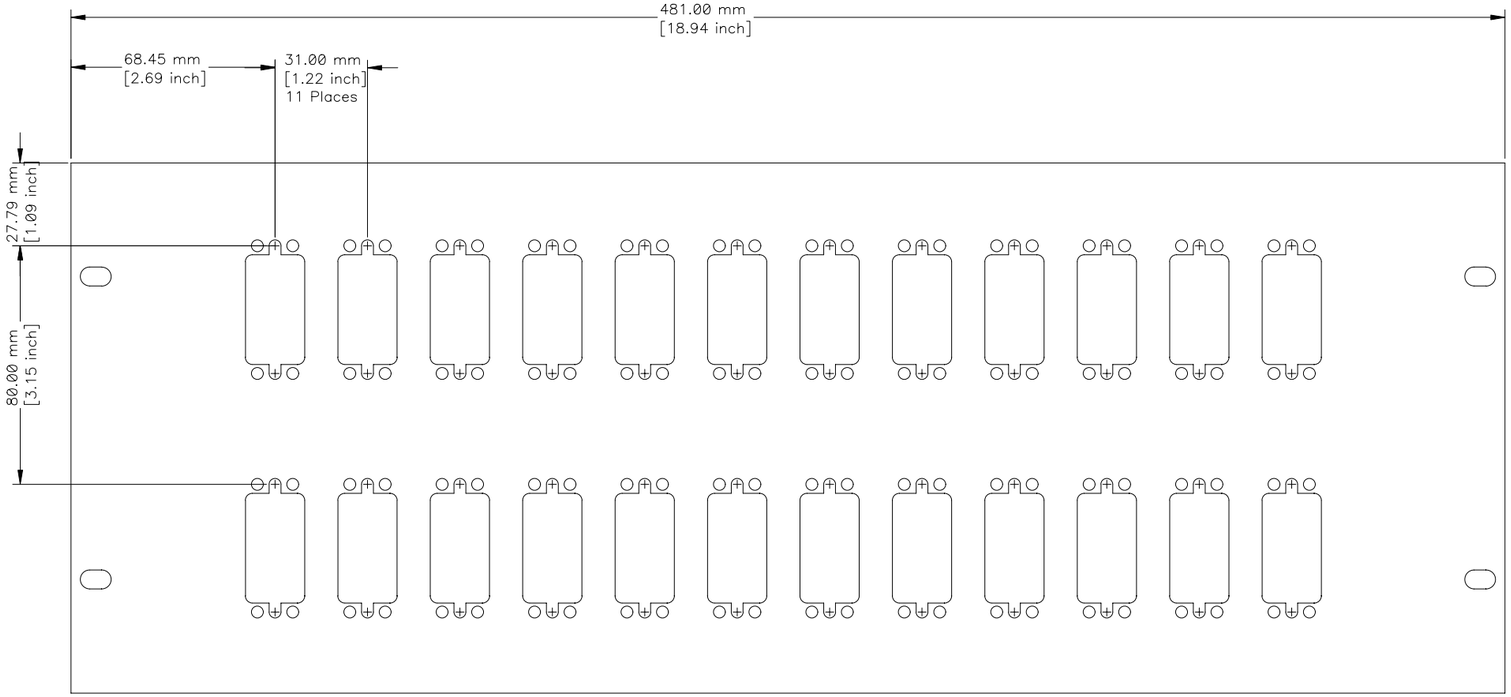
ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	Bud Industries	.060" Aluminum Panel, Part of NHC-14157 Enclosure	SFA-1834	Newark Electronics	91F268	20.00
2	24	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Female	203909-2	Newark Electronics		12.00
3	48	AMP (Div of Tyco)	Guide Pin, for Type M Connectors (Includes washer & nut)	200833-2	Newark Electronics	50F656	1.00
4	48	AMP (Div of Tyco)	Guide Socket, for Type M Connectors (Includes washer & nut)	200835-2	Newark Electronics	50F657	1.43
5	48	AMP (Div of Tyco)	Jackscrew, Male, Fixed, (Includes washer & nut)	200874-1	Newark Electronics	50F661	.81



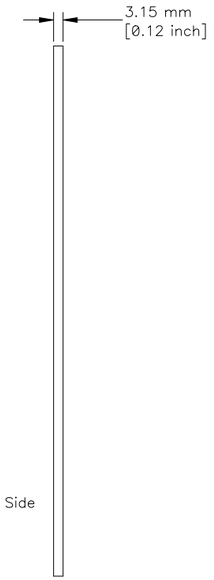


Front Panel Assembly Drawing

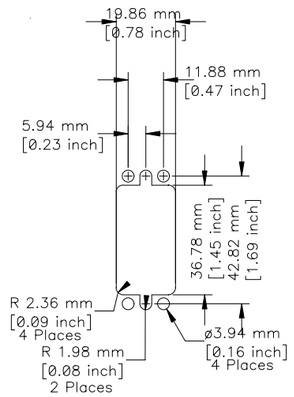
Los Alamos National Laboratory		
Title	Front Panel, St 1 North Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001 Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A FP 1.pcb		Sheet 3 of 3



Front View
(Front side is prepainted white)



Front Side



Rear Panel Fabrication Drawing

Los Alamos National Laboratory		
Title	Rear Panel, St 1 North	
	Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001	
	Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A RP 1.pcb		Sheet 1 of 3

Oct 4 Gap 3 Oct 4 Gap 2 Oct 4 Gap 1 Oct 3 Gap 3 Oct 3 Gap 2 Oct 3 Gap 1 Oct 2 Gap 3 Oct 2 Gap 2 Oct 2 Gap 1 Oct 1 Gap 3 Oct 1 Gap 2 Oct 1 Gap 1

Station 1 North HV Distribution HV Inputs from Power Supply

Oct 8 Gap 3 Oct 8 Gap 2 Oct 8 Gap 1 Oct 7 Gap 3 Oct 7 Gap 2 Oct 7 Gap 1 Oct 6 Gap 3 Oct 6 Gap 2 Oct 6 Gap 1 Oct 5 Gap 3 Oct 5 Gap 2 Oct 5 Gap 1

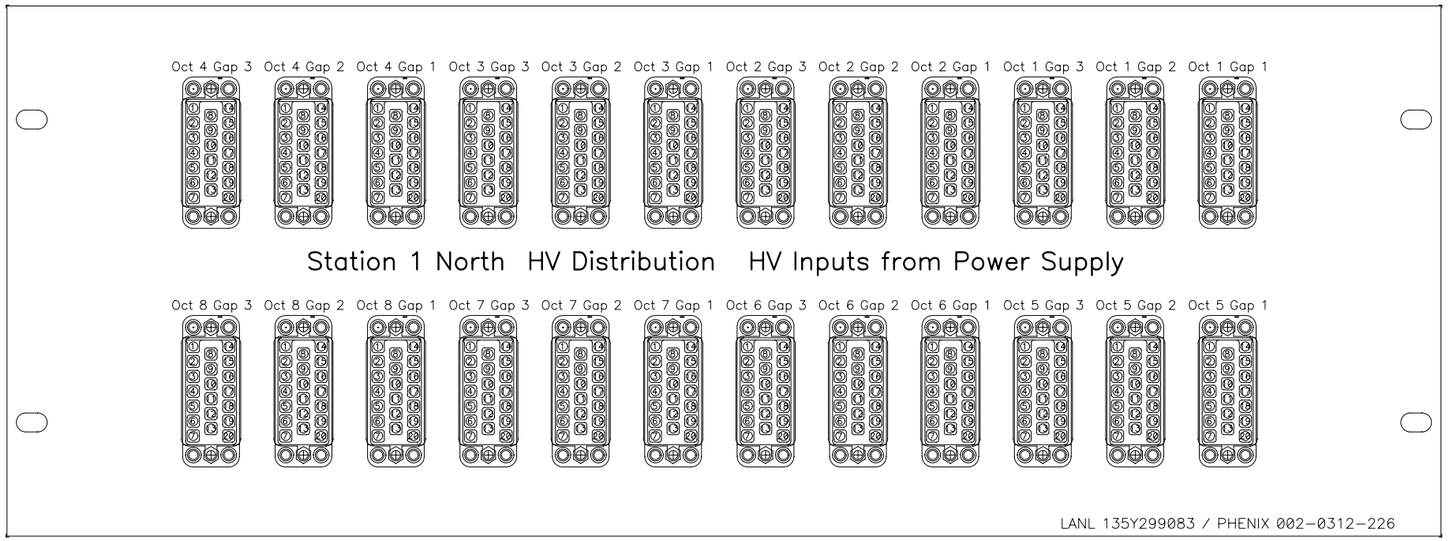
LANL 135Y299083 / PHENIX 002-0312-226

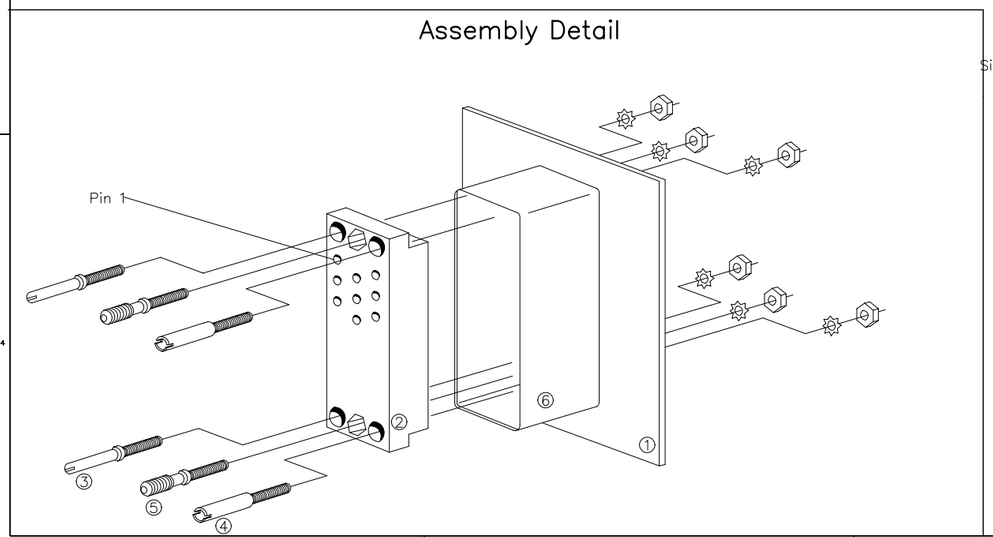
Silkscreen in Black

Rear Panel Silkscreen

Los Alamos National Laboratory		
Title	Rear Panel, St 1 North	
	Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001	
	Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A RP 1.pcb		Sheet 2 of 3

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	Bud Industries	.125" Aluminum Panel, Part of NHC-14157 Enclosure	NHC-14157	Newark Electronics	52F6486	144.00
2	24	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated	203908-2	Newark Electronics		12.00
3	48	AMP (Div of Tyco)	Guide Pin, for Type M Connectors (Includes washer & nut)	200833-2	Newark Electronics	50F656	1.00
4	48	AMP (Div of Tyco)	Guide Socket, for Type M Connectors (Includes washer & nut)	200835-2	Newark Electronics	50F657	1.43
5	48	AMP (Div of Tyco)	Jackscrew, Male, Fixed, (Includes washer & nut)	200874-1	Newark Electronics	50F661	.81
6	24	AMP (Div of Tyco)	Pin Hood, Internal, for type M connector	202434-1	Newark Electronics		6.00



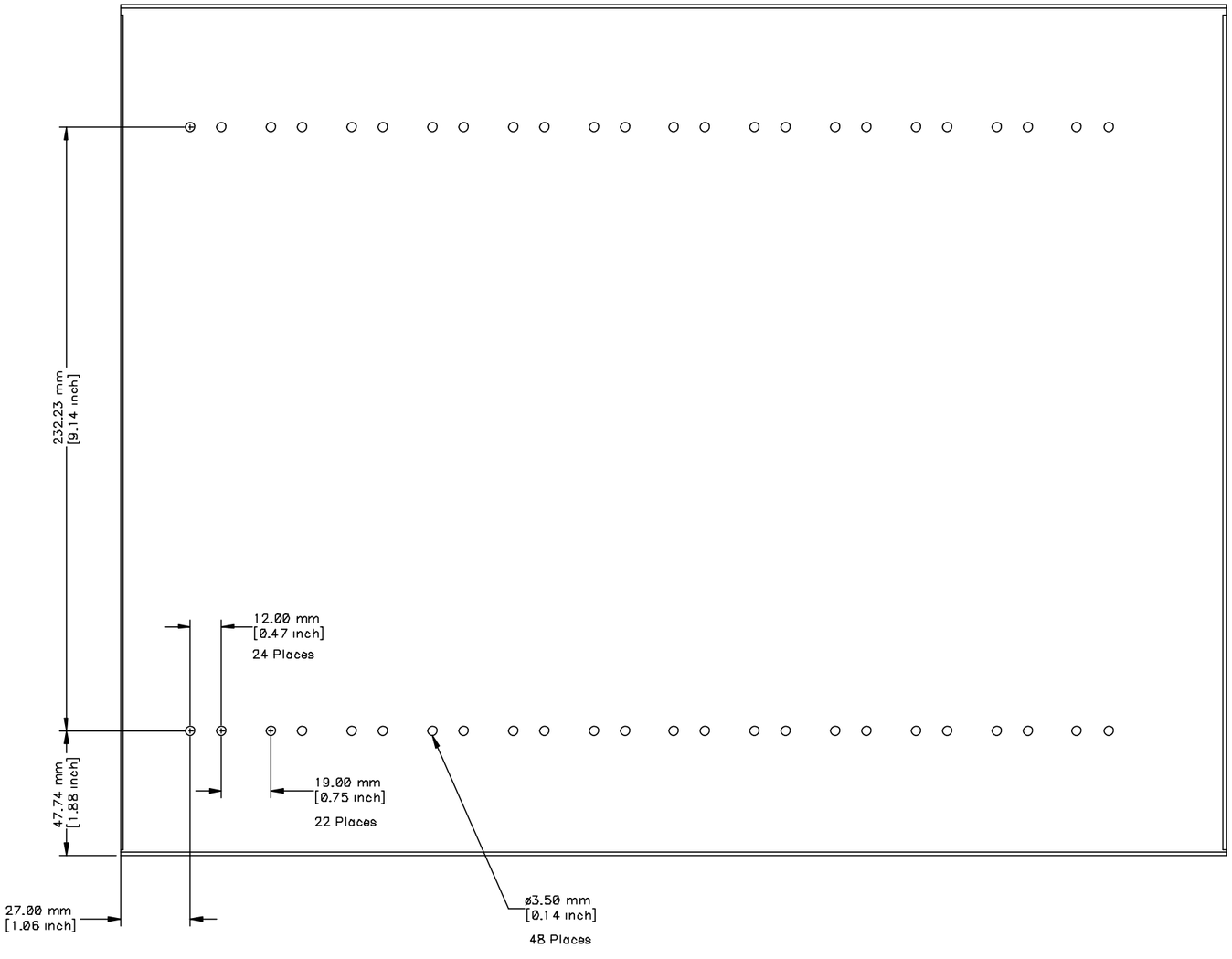


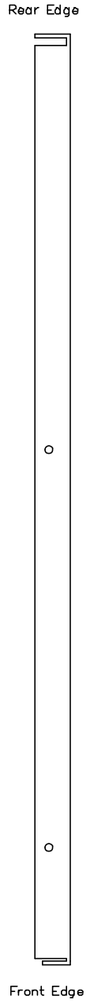
Silkscreen in Black

ST 1 Rear Panel Assembly Drawing

Rear Panel Silkscreen

Los Alamos National Laboratory		
Title	Rear Panel, St 1 North	
	Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001	
	Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A RP 1.pcb		Sheet 3 2 of 3

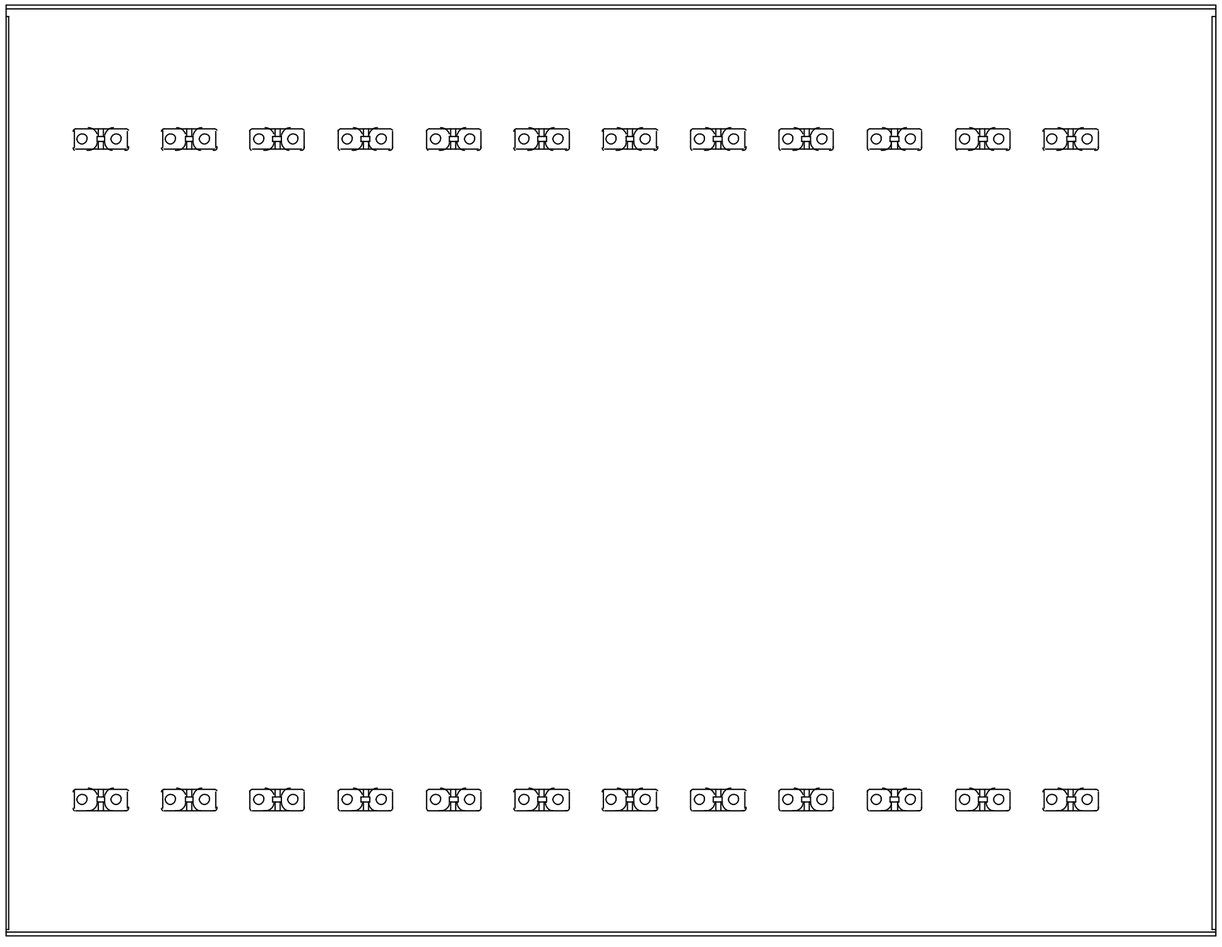


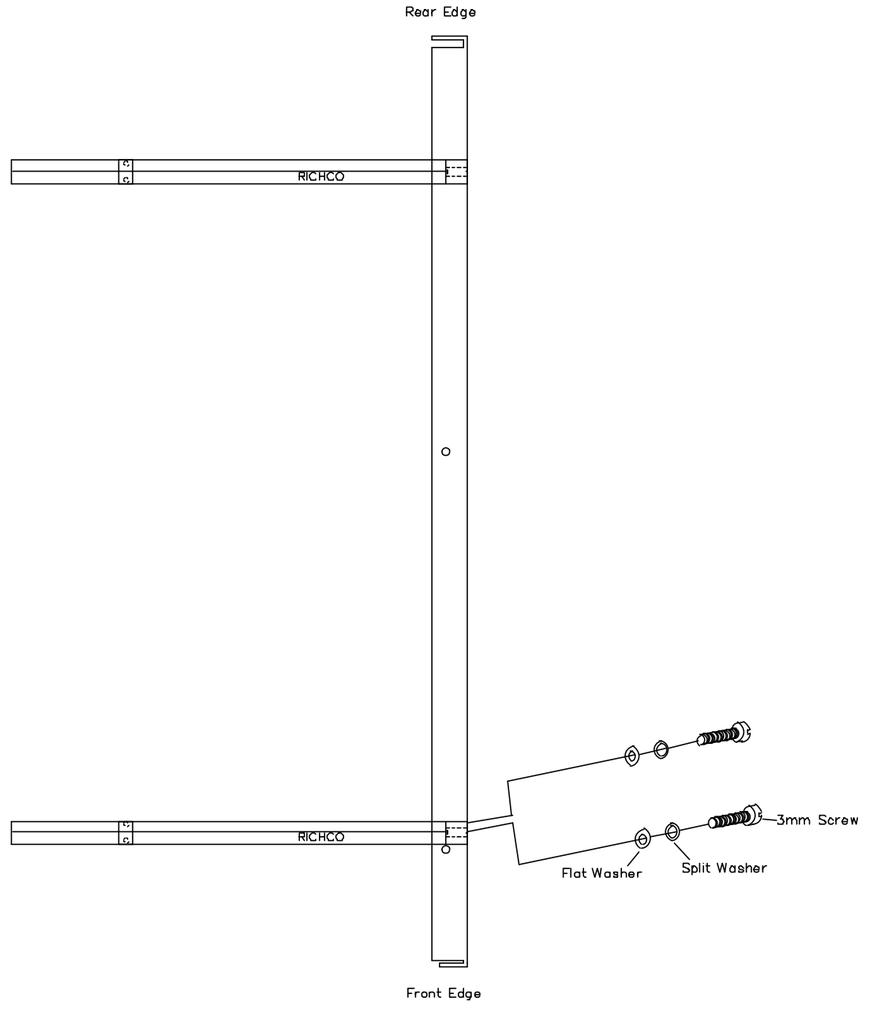


Bottom Panel Fabrication Drawing

Los Alamos National Laboratory		
Title:	Bottom Panel North Arm HV Distribution	
Size: D	Date Originated: 31 May 2021 Date Last Revised: 31 May 2021	
LANL DWG #: 135Y290383		Approved By: W. Sondheim
PHENIX DWG #: 002-8312-226		Drawn by: C. Hart
Filename: 135Y290383 BP 1.pdb		Sheet 1 of 2

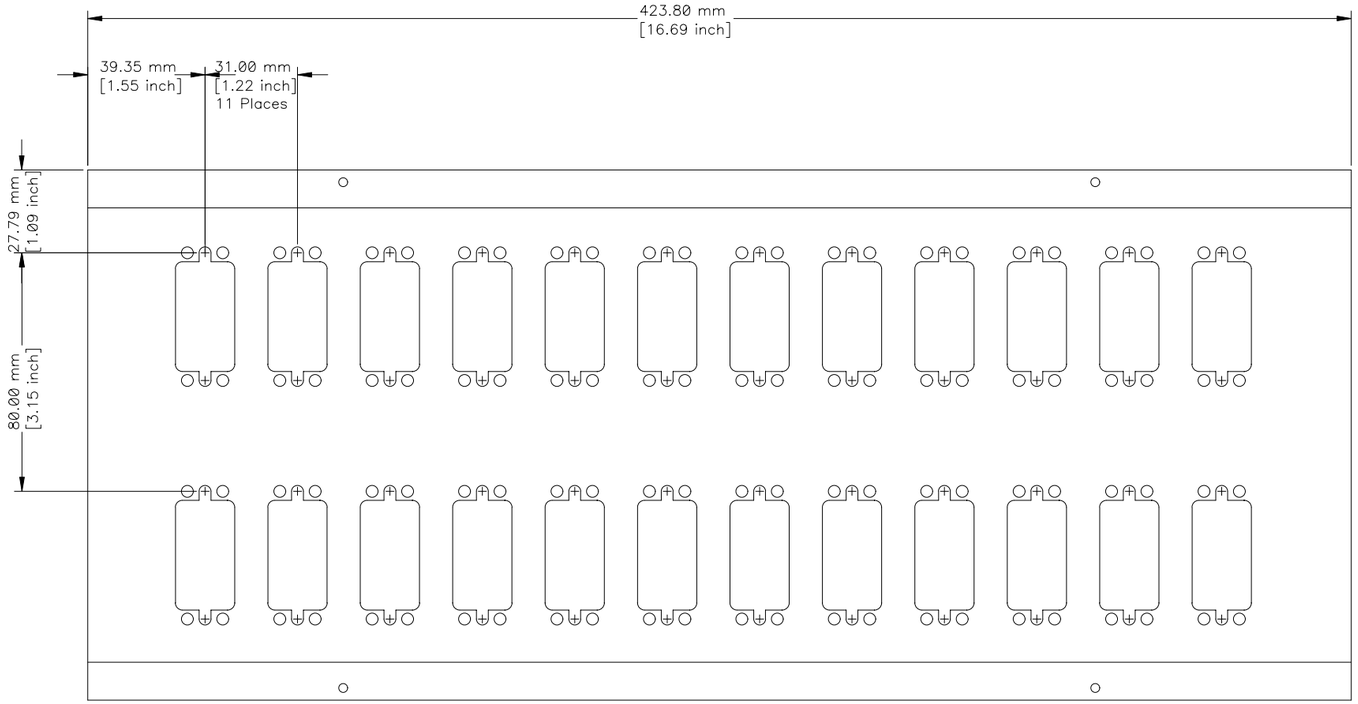
ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	Bud Industries	.050" Aluminum bottom Panel, Part of NHC-14157 Enclosure	NHC-14157	Newark Electronics	56F6486	144.00
2	24	SPC Technology	Vertical Mount Card Guides (with mounting hardware)	2642	Newark Electronics	92N4857	1.00



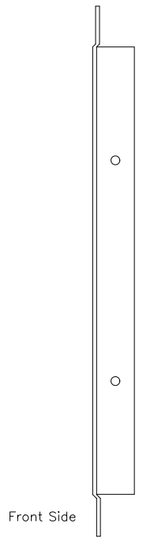


Bottom Panel Assembly Drawing

Los Alamos National Laboratory		
Title: Bottom Panel Nath Arm HV Distribution		
Size: D	Date Originated: 31 May 2001 Date Last Revised: 31 May 2001	
LANL DWG #: 135Y290883		Approved By: W. Sondheim
PHENIX DWG #: 002-8312-226		Drawn by: C. Hart
Filename: 135Y290883 BP 1.pcb		Sheet 2 of 2

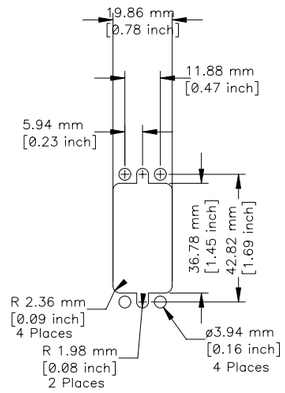


Front View
(Front side is prepainted white)



Front Side

Paint front side in Red



Front Panel Fabrication Drawing

Los Alamos National Laboratory		
Title	Front Panel, ST 2 North Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001	
	Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A FP 2.pcb		Sheet 1 of 3

Oct 1 Gap 1 Oct 1 Gap 2 Oct 1 Gap 3 Oct 2 Gap 1 Oct 2 Gap 2 Oct 2 Gap 3 Oct 3 Gap 1 Oct 3 Gap 2 Oct 3 Gap 3 Oct 4 Gap 1 Oct 4 Gap 2 Oct 4 Gap 3

Station 2 North HV Distribution Chamber Inputs

Oct 5 Gap 1 Oct 5 Gap 2 Oct 5 Gap 3 Oct 6 Gap 1 Oct 6 Gap 2 Oct 6 Gap 3 Oct 7 Gap 1 Oct 7 Gap 2 Oct 7 Gap 3 Oct 8 Gap 1 Oct 8 Gap 2 Oct 8 Gap 3

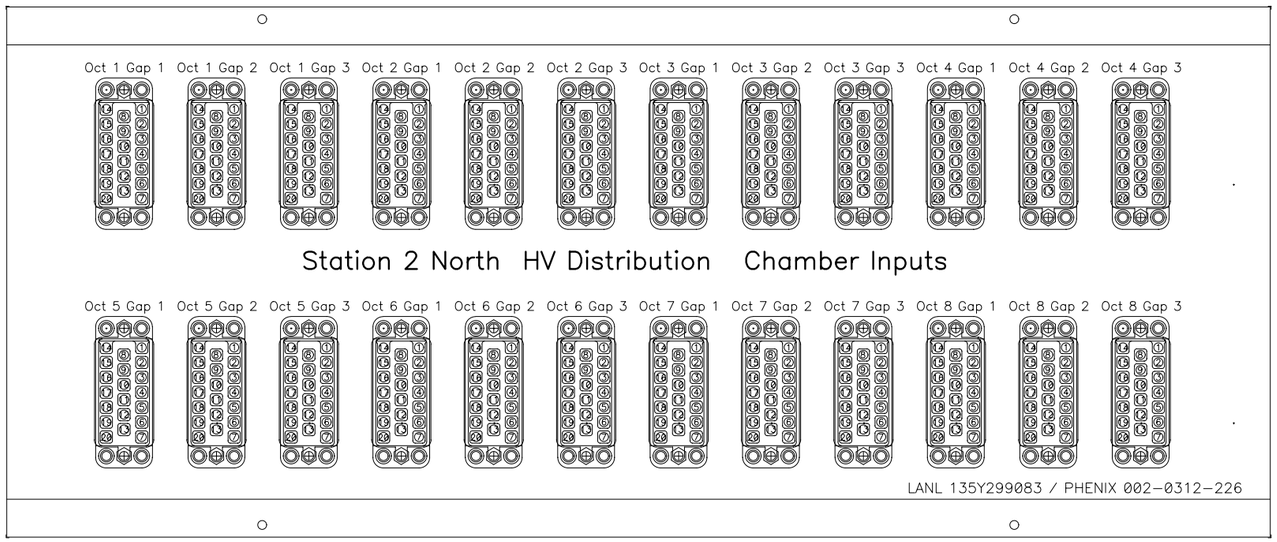
LANL 135Y299083 / PHENIX 002-0312-226

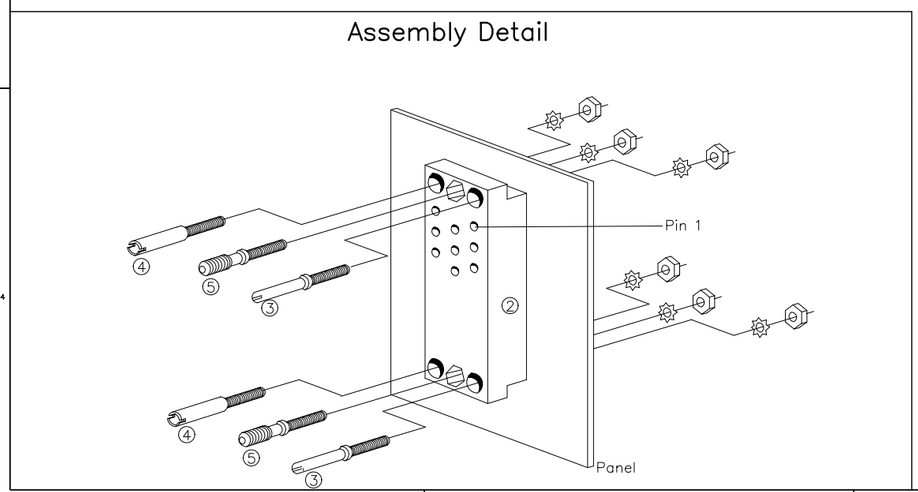
Silkscreen in Black

Front Panel Silkscreen

Los Alamos National Laboratory		
Title	Front Panel, ST 2 North	
	Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001	
	Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A FP 2.pcb		Sheet 2 of 3

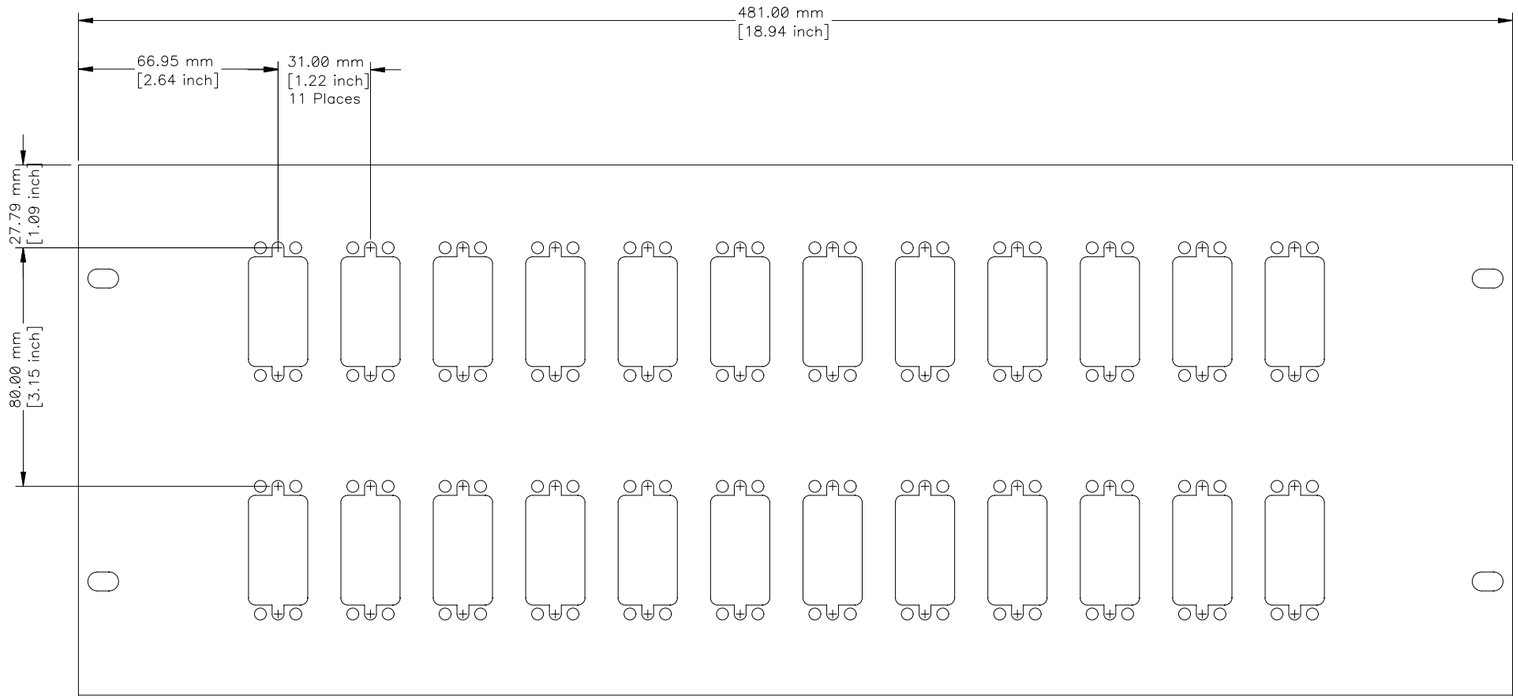
ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	Bud Industries	.060" Aluminum Panel, Part of NHC-14157 Enclosure	SFA-1834	Newark Electronics	91F268	20.00
2	24	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Female	203909-2	Newark Electronics		12.00
3	48	AMP (Div of Tyco)	Guide Pin, for Type M Connectors (Includes washer & nut)	200833-2	Newark Electronics	50F656	1.00
4	48	AMP (Div of Tyco)	Guide Socket, for Type M Connectors (Includes washer & nut)	200835-2	Newark Electronics	50F657	1.43
5	48	AMP (Div of Tyco)	Jackscrew, Male, Fixed, (Includes washer & nut)	200874-1	Newark Electronics	50F661	.81





Front Panel Assembly Drawing

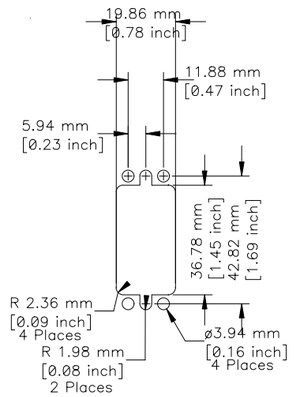
Los Alamos National Laboratory		
Title	Front Panel, ST 2 North	
	Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001	
	Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A FP 2.pcb		Sheet 3 of 3



Front View
(Front Side has peel off film)

Paint Front side RED

Front Side



Rear Panel Fabrication Drawing

Los Alamos National Laboratory		
Title	Rear Panel, St 2 North Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001	
	Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A RP 2.pcb		Sheet 1 of 3

Spare Oct 4 Gap 2 Spare Oct 3 Gap 3 Spare Oct 3 Gap 1 Spare Oct 2 Gap 2 Spare Oct 1 Gap 3 Spare Oct 1 Gap 1

Oct 4 Gap 3 Oct 4 Gap 1 Oct 3 Gap 2 Oct 2 Gap 3 Oct 2 Gap 1 Oct 1 Gap 2

Station 2 North HV Distribution HV Inputs from Power Supply

Spare Oct 8 Gap 2 Spare Oct 7 Gap 3 Spare Oct 7 Gap 1 Spare Oct 6 Gap 2 Spare Oct 5 Gap 3 Spare Oct 5 Gap 1

Oct 8 Gap 3 Oct 8 Gap 1 Oct 7 Gap 2 Oct 6 Gap 3 Oct 6 Gap 1 Oct 5 Gap 2

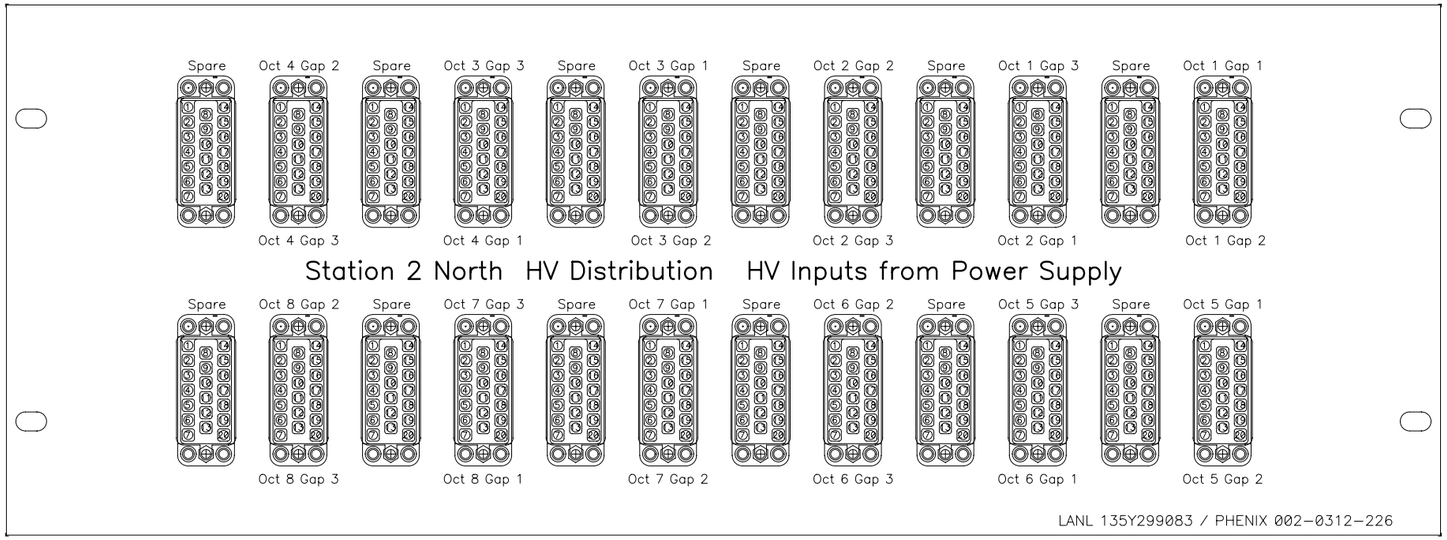
LANL 135Y299083 / PHENIX 002-0312-226

Silkscreen in Black

Rear Panel Silkscreen

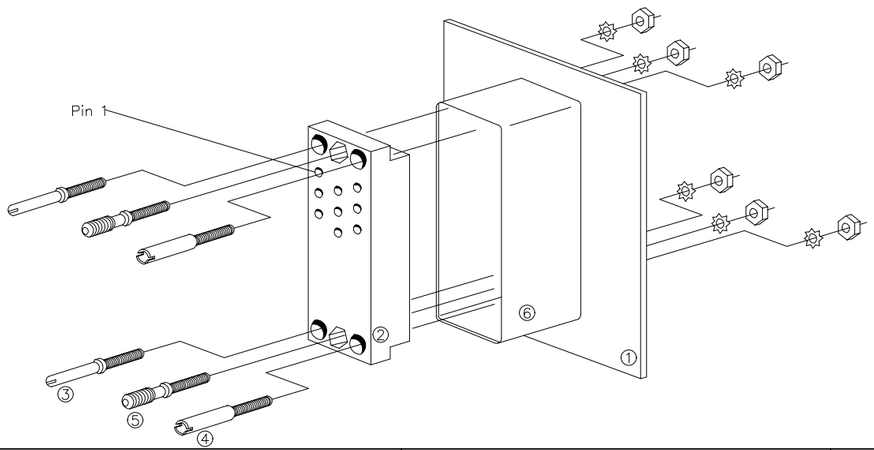
Los Alamos National Laboratory		
Title	Rear Panel, St 2 North	
	Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001	
	Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A RP 2.pcb		Sheet 2 of 3

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	Bud Industries	.125" Aluminum Panel, Part of NHC-14157 Enclosure	NHC-14157	Newark Electronics	52F6486	144.00
2	12	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated	203908-2	Newark Electronics		12.00
3	24	AMP (Div of Tyco)	Guide Pin, for Type M Connectors (Includes washer & nut)	200833-2	Newark Electronics	50F656	1.00
4	24	AMP (Div of Tyco)	Guide Socket, for Type M Connectors (Includes washer & nut)	200835-2	Newark Electronics	50F657	1.43
5	24	AMP (Div of Tyco)	Jackscrew, Male, Fixed, (Includes washer & nut)	200874-1	Newark Electronics	50F661	.81
6	12	AMP (Div of Tyco)	Pin Hood, Internal, for type M connector	202434-1	Newark Electronics		6.00



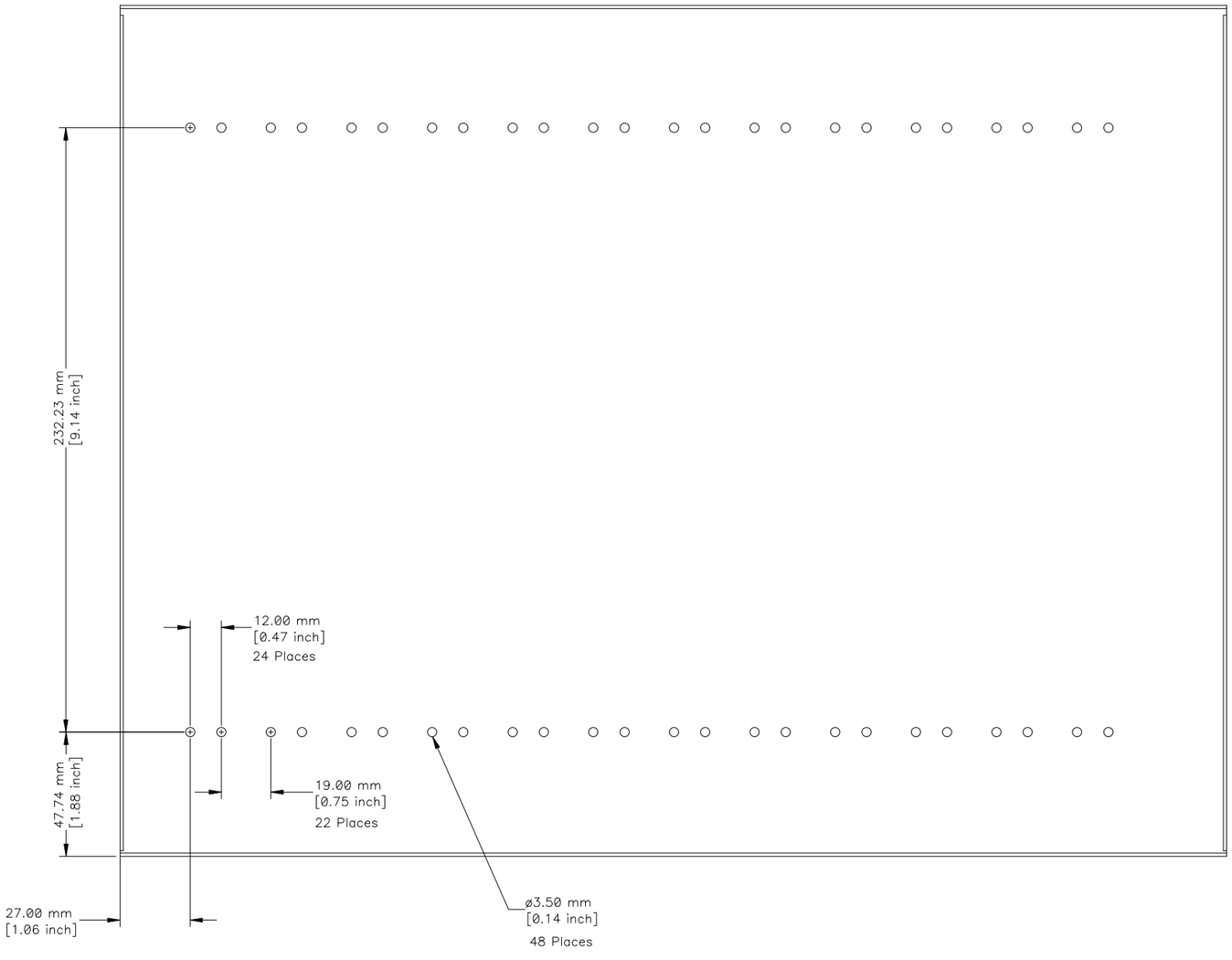
LANL 135Y299083 / PHENIX 002-0312-226

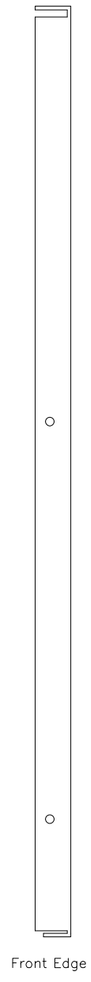
Assembly Detail



St 2 Rear Panel Assembly Drawing

Los Alamos National Laboratory		
Title	Rear Panel, St 2 North Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001 Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A RP 2.pcb		Sheet 3 of 3

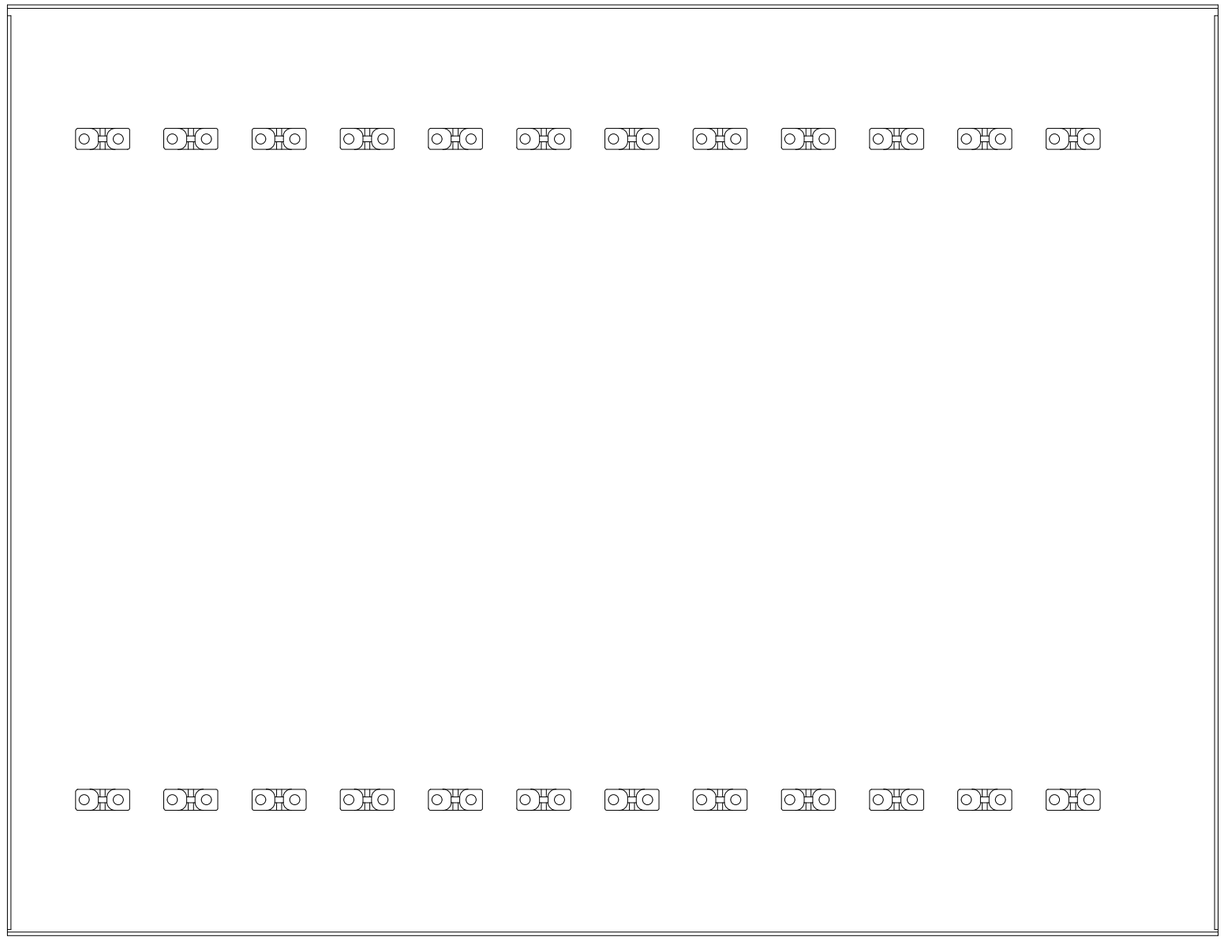


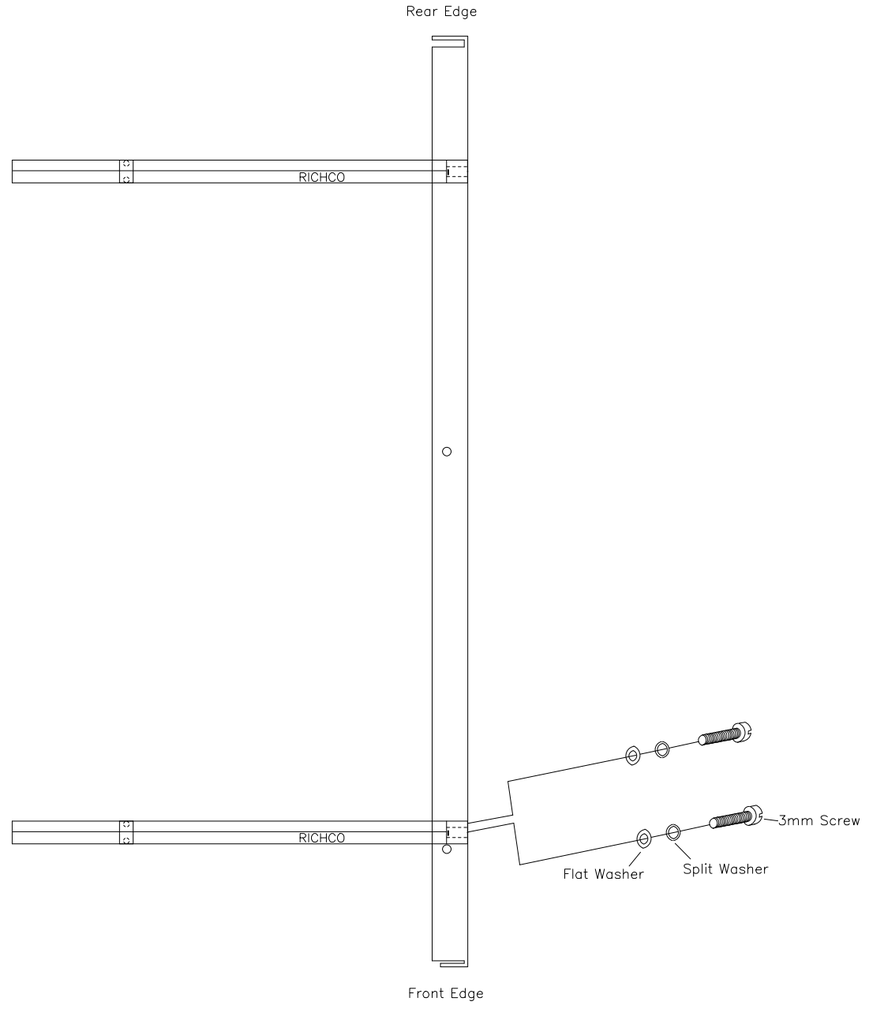


Bottom Panel Fabrication Drawing

Los Alamos National Laboratory		
Title	Bottom Panel, St 2 North	
	Noth Arm HV Distribution	
Size D	Date Originated: 31 May 2001	
	Date Last Revised: 1 Aug 2001	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083 BP 2.pcb		Sheet 1 of 2

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	Bud Industries	.050" Aluminum bottom Panel, Part of NHC-14157 Enclosure	NHC-14157	Newark Electronics	56F6486	144.00
2	24	SPC Technology	Vertical Mount Card Guides (with mounting hardware)	2642	Newark Electronics	92N4857	1.00

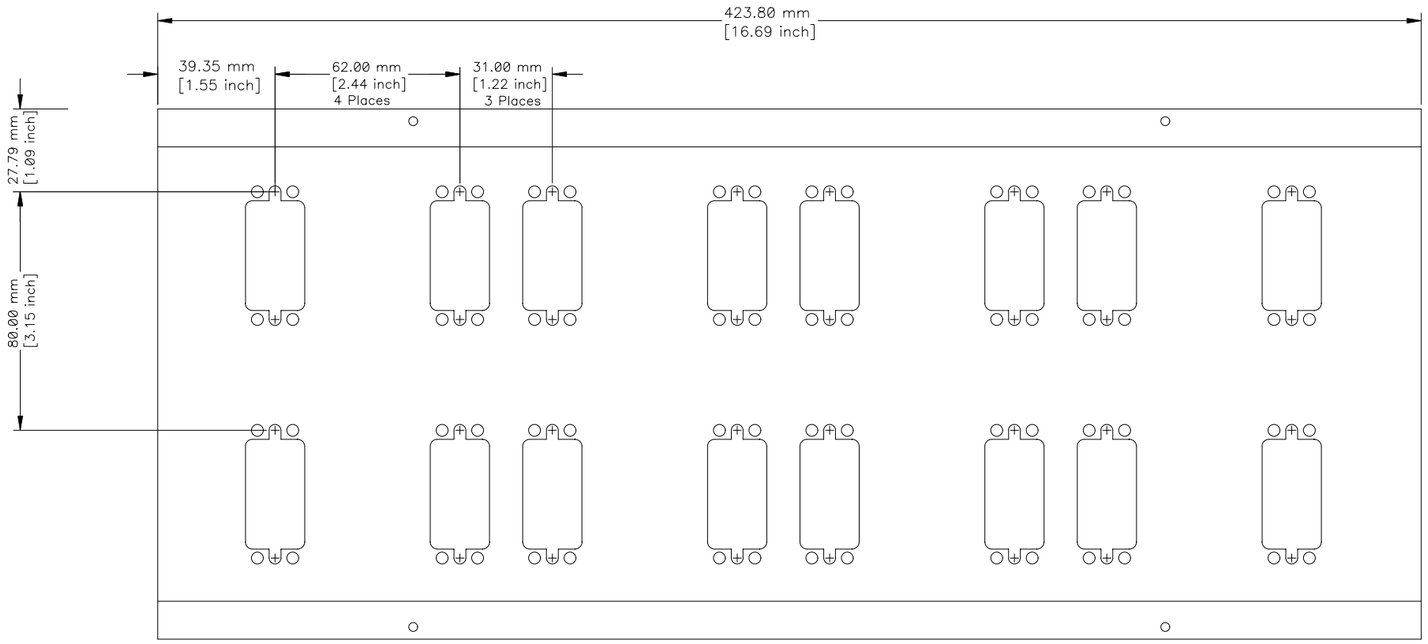




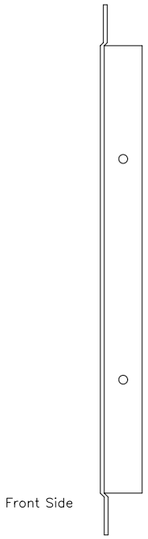
Note: Only 6 cards will be installed. Unused card guides are for possible future upgrade.

Bottom Panel Assembly Drawing

Los Alamos National Laboratory		
Title	Bottom Panel, St 2 North	
	Noth Arm HV Distribution	
Size D	Date Originated: 31 May 2001	
	Date Last Revised: 1 Aug 2001	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083 BP 2.pcb		Sheet 2 of 2

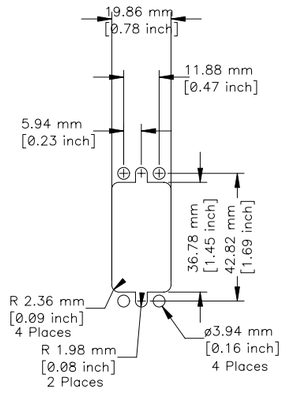


Front View
(Front side is prepainted white)



Front Side

Paint front side in Red



Front Panel Fabrication Drawing

Los Alamos National Laboratory		
Title	Front Panel, ST 3 North	
	Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001	
	Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A FP 3.pcb		Sheet 1 of 3

Oct 1 Gap 1 Oct 1 Gap 3 Oct 2 Gap 1 Oct 2 Gap 3 Oct 3 Gap 1 Oct 3 Gap 3 Oct 4 Gap 1 Oct 4 Gap 3

Station 3 North HV Distribution Chamber Inputs

Oct 5 Gap 1 Oct 5 Gap 3 Oct 6 Gap 1 Oct 6 Gap 3 Oct 7 Gap 1 Oct 7 Gap 3 Oct 8 Gap 1 Oct 8 Gap 3

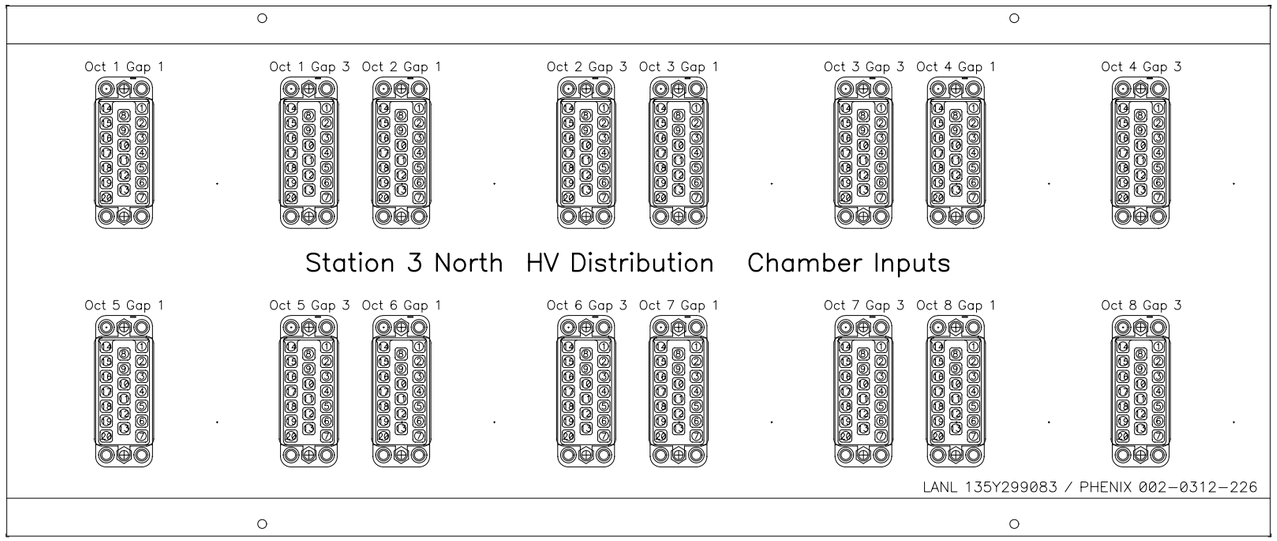
LANL 135Y299083 / PHENIX 002–0312–226

Silkscreen in Black

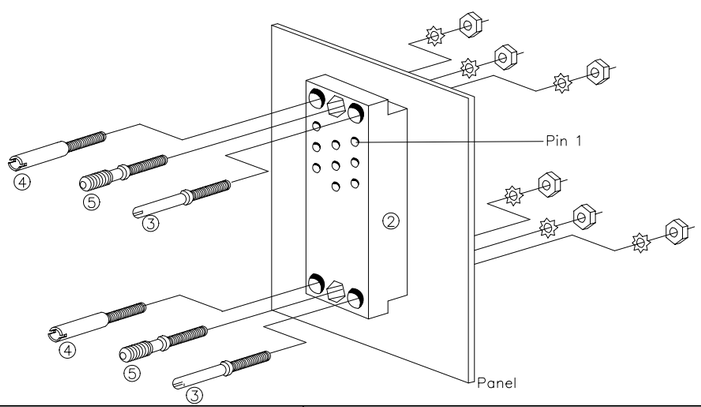
Front Panel Silkscreen

Los Alamos National Laboratory		
Title	Front Panel, ST 3 North	
	Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001	
	Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002–0312–226		Drawn by: G. Hart
Filename 135Y299083A FP 3.pcb		Sheet 2 of 3

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	Bud Industries	.060" Aluminum Panel, Part of NHC-14157 Enclosure	SFA-1834	Newark Electronics	91F268	20.00
2	16	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated, Female	203909-2	Newark Electronics		12.00
3	32	AMP (Div of Tyco)	Guide Pin, for Type M Connectors (Includes washer & nut)	200833-2	Newark Electronics	50F656	1.00
4	32	AMP (Div of Tyco)	Guide Socket, for Type M Connectors (Includes washer & nut)	200835-2	Newark Electronics	50F657	1.43
5	32	AMP (Div of Tyco)	Jackscrew, Male, Fixed, (Includes washer & nut)	200874-1	Newark Electronics	50F661	.81

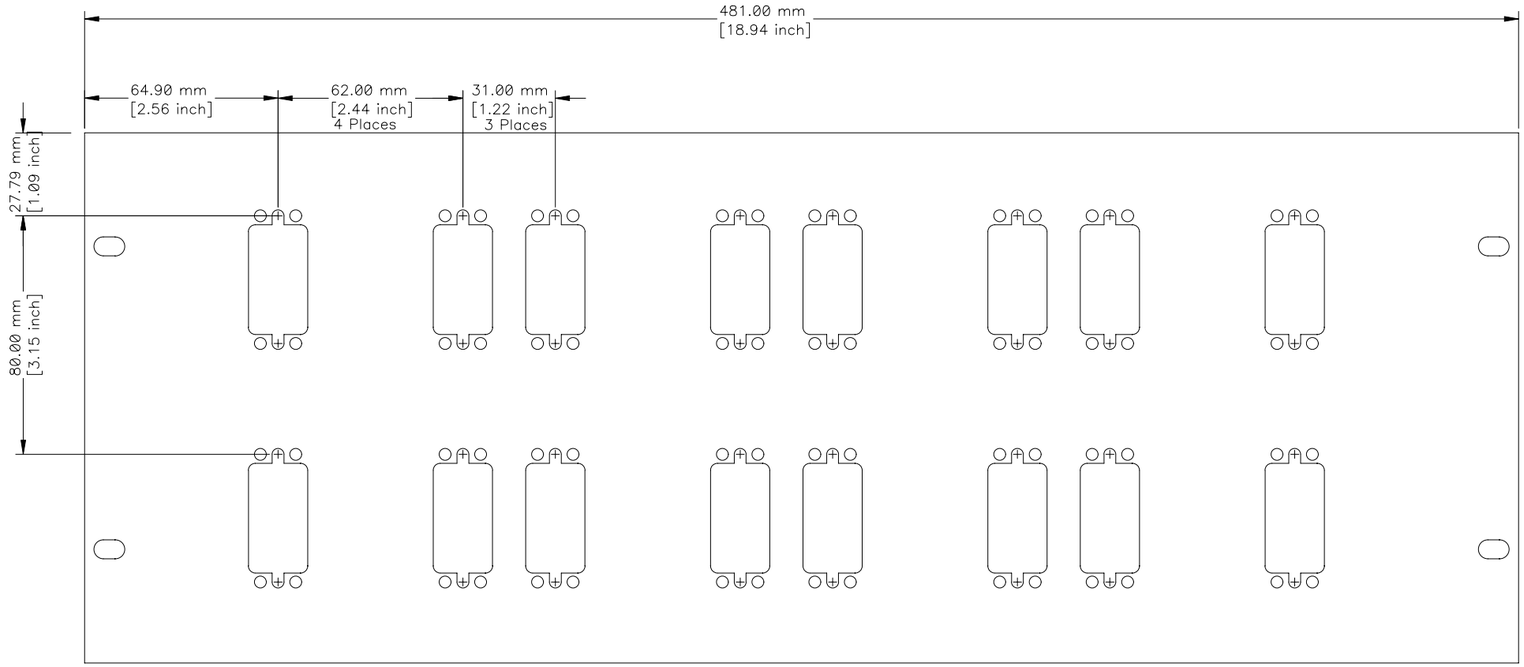


Assembly Detail



Front Panel Assembly Drawing

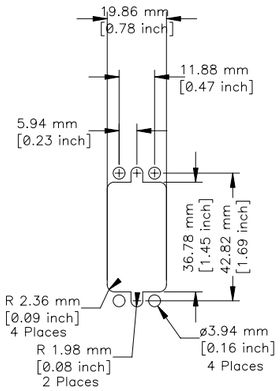
Los Alamos National Laboratory		
Title	Front Panel, ST 3 North Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001 Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A FP 3.pcb		Sheet 3 of 3



Front View
(Front Side has peel off film)

Front Side

Paint front side in Red



Rear Panel Fabrication Drawing

Los Alamos National Laboratory		
Title	Rear Panel, St 3 North	
	Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001	
	Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A RP 3.pcb		Sheet 1 of 3

Spare Oct 4 Spare Oct 3 Spare Oct 2 Spare Oct 1

Station 3 North HV Distribution HV Inputs from Power Supply

Spare Oct 8 Spare Oct 7 Spare Oct 6 Spare Oct 5

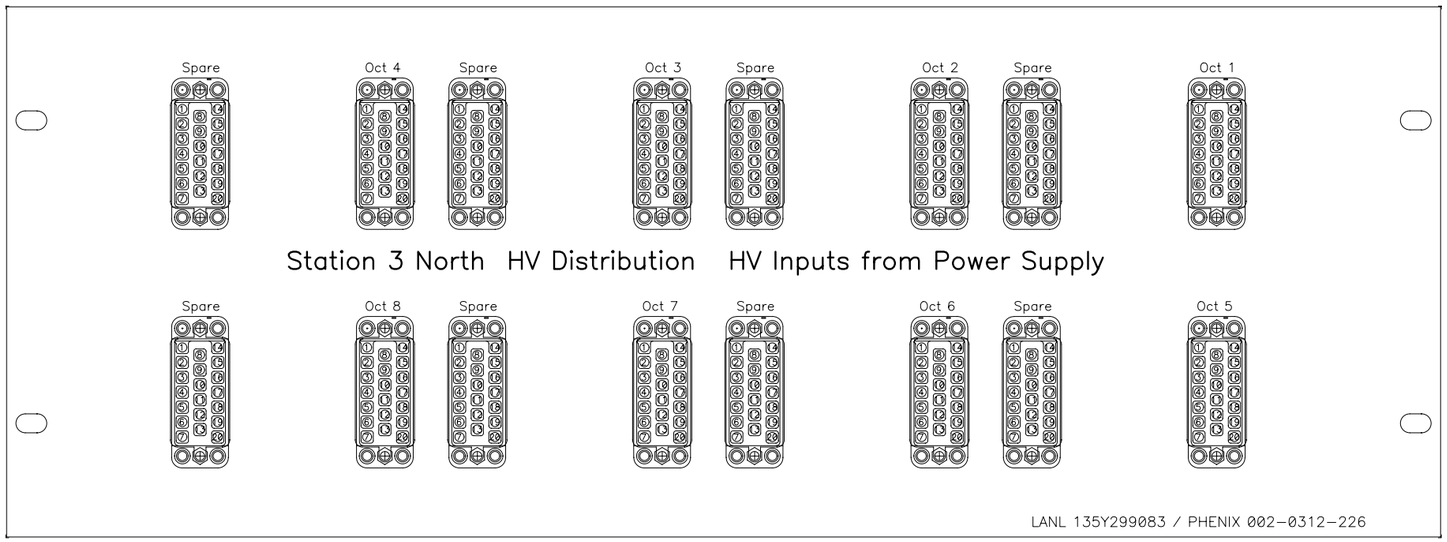
LANL 135Y299083 / PHENIX 002-0312-226

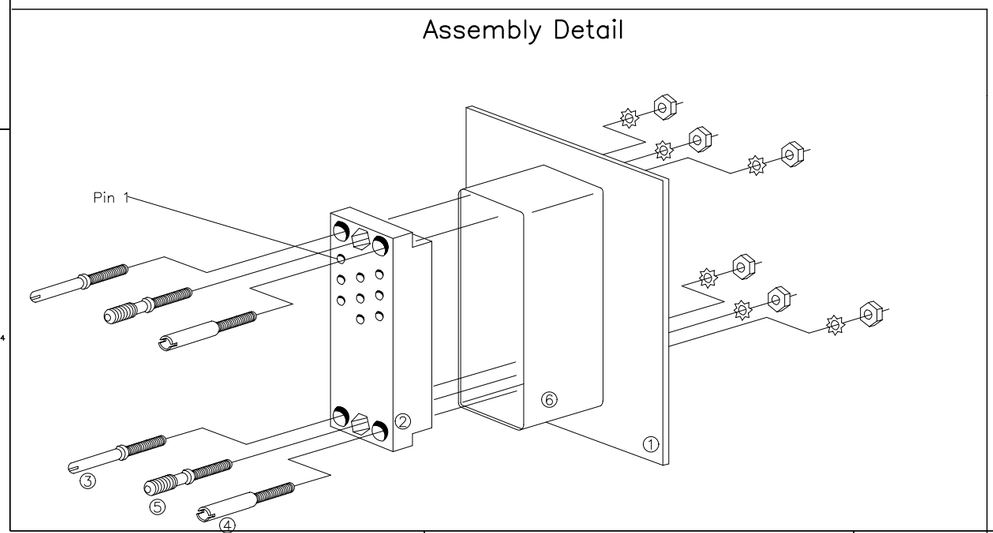
Silkscreen in Black

Rear Panel Silkscreen

Los Alamos National Laboratory		
Title	Rear Panel, St 3 North	
Noth Arm HV Distribution		
Size D	Date Originated: 30 May 2001	
	Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A RP 3.pcb		Sheet 2 of 3

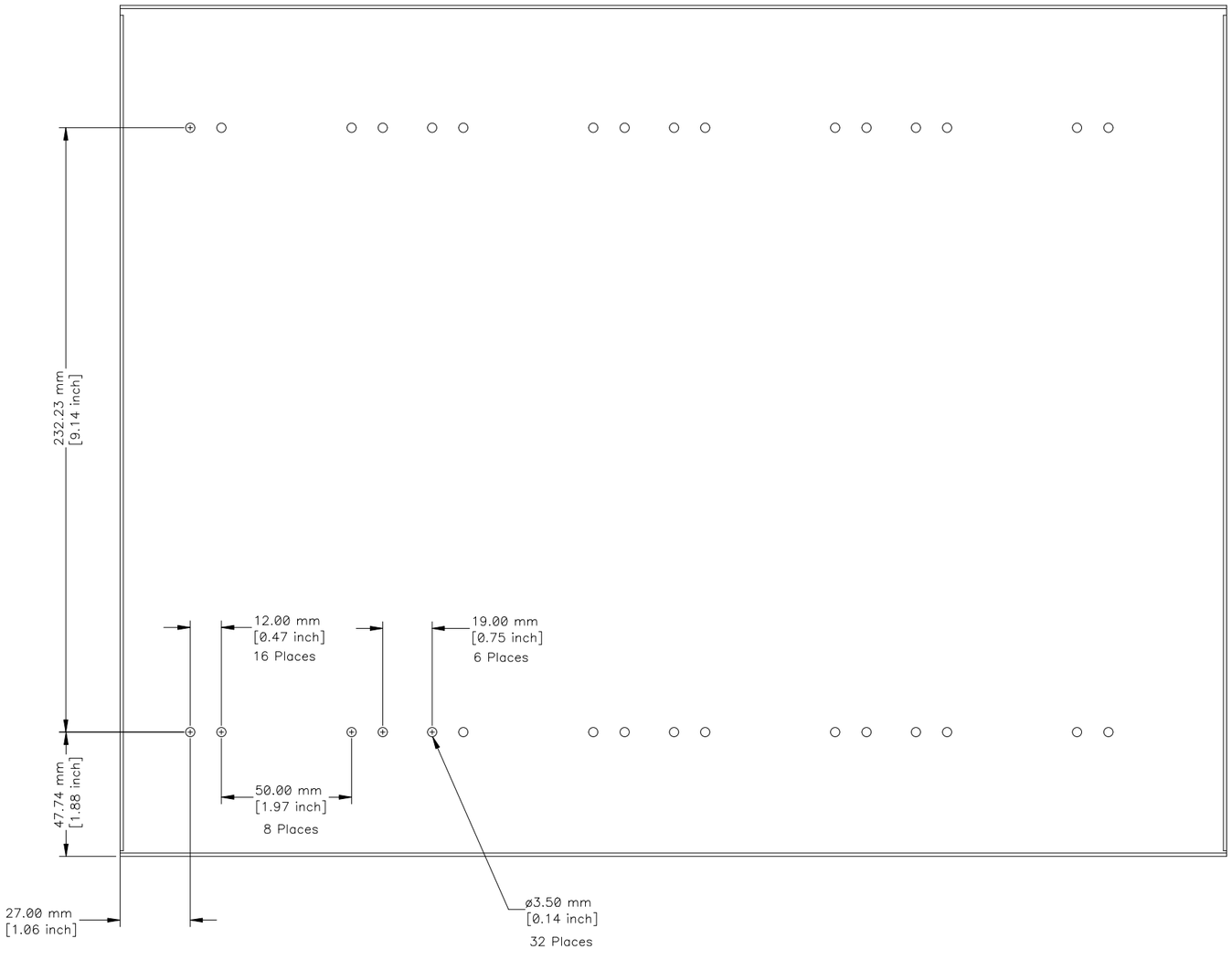
ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	Bud Industries	.125" Aluminum Panel, Part of NHC-14157 Enclosure	NHC-14157	Newark Electronics	56F6486	144.00
2	8	AMP (Div of Tyco)	Block Connector, 20 Pin, HV rated	203908-2	Newark Electronics		12.00
3	16	AMP (Div of Tyco)	Guide Pin, for Type M Connectors (Includes washer & nut)	200833-2	Newark Electronics	50F656	1.00
4	16	AMP (Div of Tyco)	Guide Socket, for Type M Connectors (Includes washer & nut)	200835-2	Newark Electronics	50F657	1.43
5	16	AMP (Div of Tyco)	Jackscrew, Male, Fixed, (Includes washer & nut)	200874-1	Newark Electronics	50F661	.81
6	8	AMP (Div of Tyco)	Pin Hood, Internal, for type M connector	202434-1	Newark Electronics		6.00

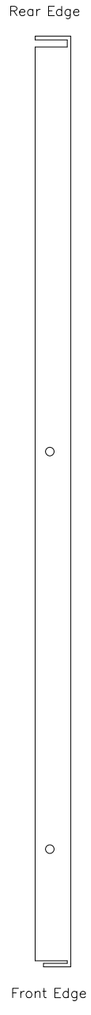




St 3 Rear Panel Assembly Drawing

Los Alamos National Laboratory		
Title	Rear Panel, St 3 North Noth Arm HV Distribution	
Size D	Date Originated: 30 May 2001 Date Last Revised: 23 May 2002	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083A RP 3.pcb		Sheet 3 of 3

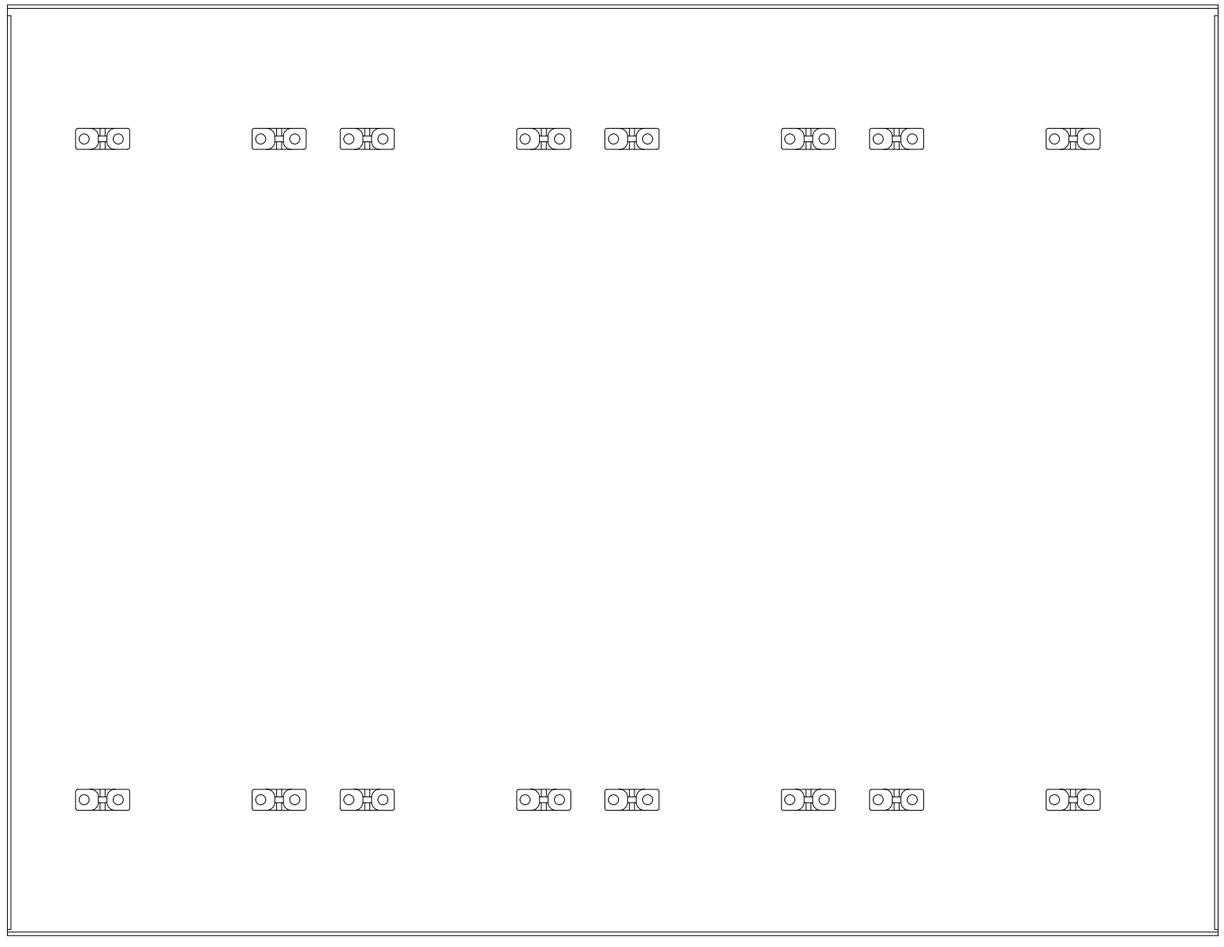


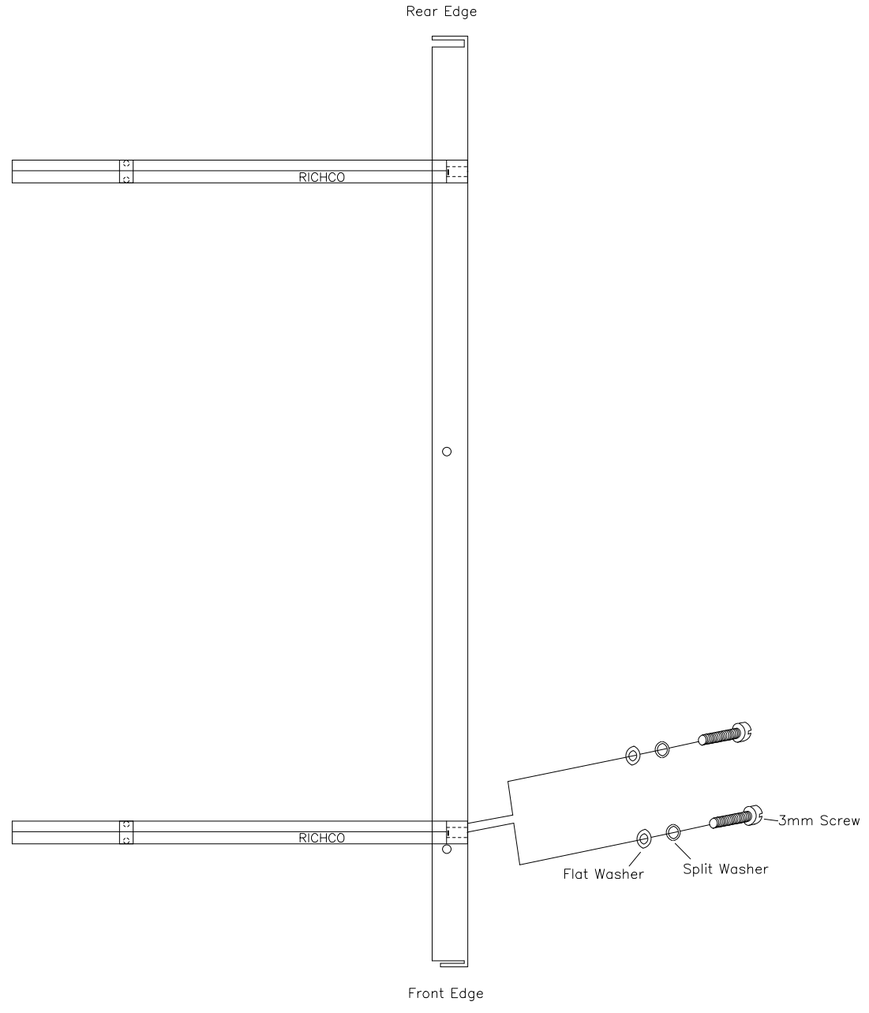


Bottom Panel Fabrication Drawing

Los Alamos National Laboratory		
Title	Bottom Panel, St 3 North	
	Noth Arm HV Distribution	
Size D	Date Originated: 31 May 2001	
	Date Last Revised: 1 Aug 2001	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083 BP 3.pcb		Sheet 1 of 2

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	1	Bud Industries	.050" Aluminum bottom Panel, Part of NHC-14157 Enclosure	NHC-14157	Newark Electronics	56F6486	144.00
2	16	SPC Technology	Vertical Mount Card Guides (with mounting hardware)	2642	Newark Electronics	92N4857	1.00





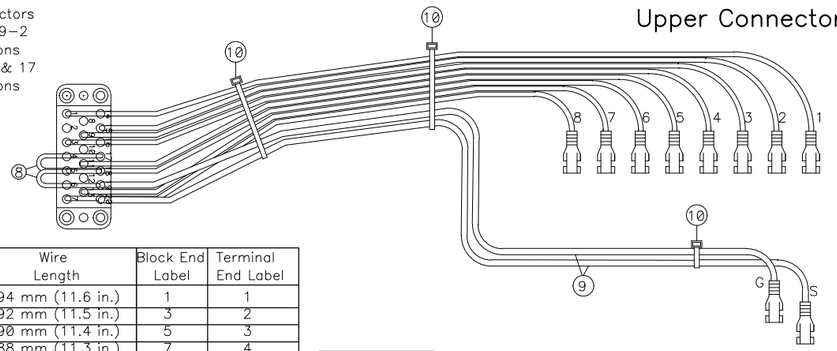
Note: Only 4 cards will be installed. Unused card guides are for possible future upgrade.

Bottom Panel Assembly Drawing

Los Alamos National Laboratory		
Title	Bottom Panel, St 3 North	
	Noth Arm HV Distribution	
Size D	Date Originated: 31 May 2001	
	Date Last Revised: 1 Aug 2001	
LANL DWG #: 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083 BP 3.pcb		Sheet 2 of 2

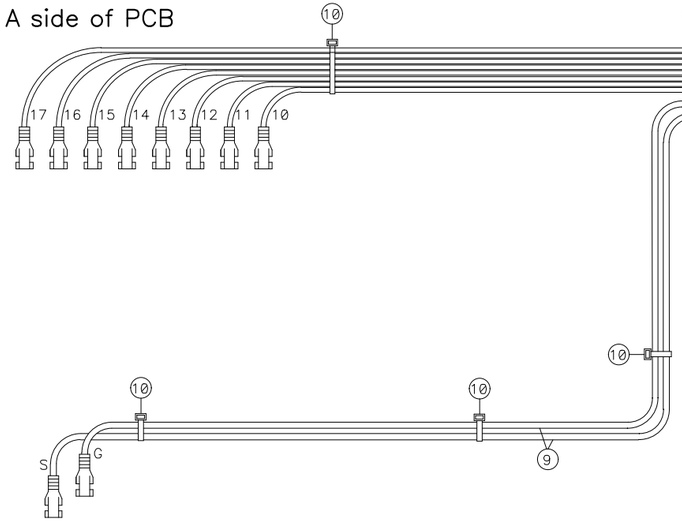
Upper Connector Blocks to A side of PCB

Front Panel Block Connectors
(Rear View) 203909-2
Item 2, sockets in positions
1, 3, 5, 7, 9, 11, 13, 15, & 17
Item 3, sockets in positions
18, 19 & 20

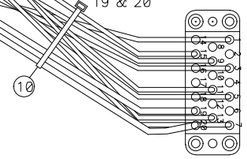


12 SETS

Block Position	Wire Type	Wire Length	Block End Label	Terminal End Label
1	24 AWG HV	294 mm (11.6 in.)	1	1
3	24 AWG HV	292 mm (11.5 in.)	3	2
5	24 AWG HV	290 mm (11.4 in.)	5	3
7	24 AWG HV	288 mm (11.3 in.)	7	4
9	24 AWG HV	248 mm (9.8 in.)	9	5
11	24 AWG HV	246 mm (9.7 in.)	11	6
13	24 AWG HV	244 mm (9.6 in.)	13	7
15	24 AWG HV	201 mm (7.9 in.)	15	8
19	16 AWG H/U	239 mm (9.4 in.)	19	G
20	16 AWG H/U	244 mm (9.6 in.)	20	S
17-18	22 AWG H/U	40 mm (1.6 in.)		
18-19	22 AWG H/U	40 mm (1.6 in.)		



Rear Panel Block Connectors
(Rear View) 203908-2
Item 5, pins in positions
1, 3, 5, 7, 9, 11, 13, & 15
Item 6, pins in positions
19 & 20

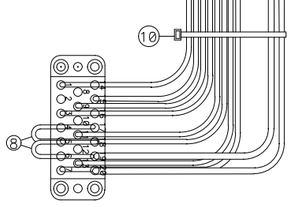


12 SETS

Block Position	Wire Type	Wire Length	Block End Label	Terminal End Label
1	24 AWG HV	386 mm (15.2 in.)	1	10
3	24 AWG HV	408 mm (16 in.)	3	11
5	24 AWG HV	430 mm (16.9 in.)	5	12
7	24 AWG HV	452 mm (17.8 in.)	7	13
9	24 AWG HV	419 mm (16.5 in.)	9	14
11	24 AWG HV	441 mm (17.4 in.)	11	15
13	24 AWG HV	463 mm (18.2 in.)	13	16
15	24 AWG HV	450 mm (17.7 in.)	15	17
19	16 AWG H/U	340 mm (13.4 in.)	19	G
20	16 AWG H/U	346 mm (13.6 in.)	20	S

Lower Connector Blocks to B side of PCB

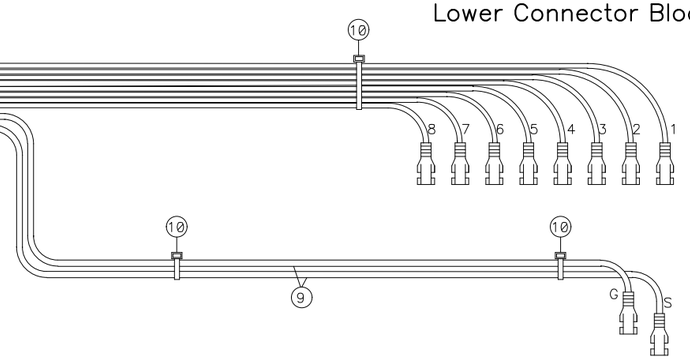
Front Panel Block Connectors
(Rear View) 203909-2
Item 2, sockets in positions
1, 3, 5, 7, 9, 11, 13, 15, & 17
Item 3, sockets in positions
18, 19 & 20

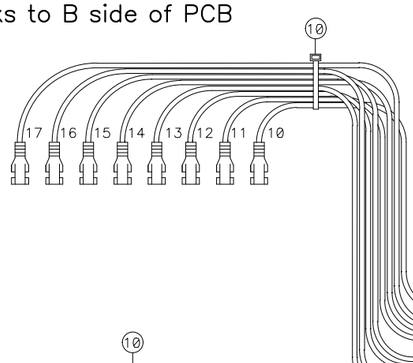


Front Panel Block Connectors
with Socket Contacts
(Rear View)

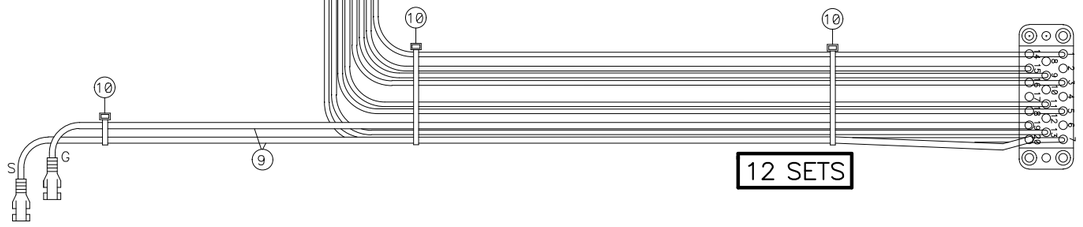
12 SETS

Block Position	Wire Type	Wire Length	Block End Label	Terminal End Label
1	24 AWG HV	484 mm (19.1 in.)	1	1
3	24 AWG HV	482 mm (19 in.)	3	2
5	24 AWG HV	480 mm (18.9 in.)	5	3
7	24 AWG HV	478 mm (18.8 in.)	7	4
9	24 AWG HV	433 mm (17 in.)	9	5
11	24 AWG HV	431 mm (17 in.)	11	6
13	24 AWG HV	429 mm (16.9 in.)	13	7
15	24 AWG HV	393 mm (15.5 in.)	15	8
19	16 AWG H/U	430 mm (16.9 in.)	19	G
20	16 AWG H/U	440 mm (17.3 in.)	20	S
17-18	22 AWG H/U	40 mm (1.6 in.)		
18-19	22 AWG H/U	40 mm (1.6 in.)		





Rear Panel Block Connectors
(Rear View) 203908-2
Item 5, pins in positions
1, 3, 5, 7, 9, 11, 13, & 15
Item 6, pins in positions
19 & 20

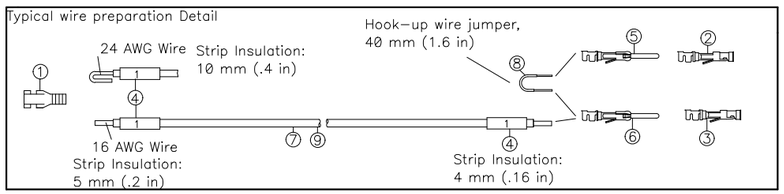


12 SETS

Block Position	Wire Type	Wire Length	Block End Label	Terminal End Label
1	24 AWG HV	355 mm (14 in.)	1	10
3	24 AWG HV	377 mm (14.8 in.)	3	11
5	24 AWG HV	399 mm (15.7 in.)	5	12
7	24 AWG HV	421 mm (16.6 in.)	7	13
9	24 AWG HV	390 mm (15.4 in.)	9	14
11	24 AWG HV	412 mm (16.2 in.)	11	15
13	24 AWG HV	434 mm (17.1 in.)	13	16
15	24 AWG HV	410 mm (16.1 in.)	15	17
19	16 AWG H/U	309 mm (12.2 in.)	19	G
20	16 AWG H/U	315 mm (12.4 in.)	20	S

Note: This drawing does not illistrate finished cable bundles.
Wires are shown to clarify wiring and is not intended to
be to finished scale

Typical wire preparation Detail



ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	480	VOLTREX	Terminal, Solderless (Crimp) Tab, .187", Non-Insulated	CFS-TO-1818	Newark Electronics	31N2875	.08
2	216	AMP (Div of Tyco)	Contact, Socket, Type III, for 20-24 AWG Wire, Crimp	66105-1	Newark Electronics	50F576	.80
3	72	AMP (Div of Tyco)	Contact, Socket, Type III, for 16-18 AWG Wire, Crimp	66101-1	Newark Electronics	50F573	.80
4*	21	Brady	Label, Wire, supplied on Sheet of 36 x 1.5", use .75"	see table A	Newark Electronics		1.60
5	192	AMP (Div of Tyco)	Contact, Pin, Type III, for 20-24 AWG Wire, Crimp	66103-1	Newark Electronics	50F575	.60
6	24	AMP (Div of Tyco)	Contact, Pin, Type III, for 16-18 AWG Wire, Crimp	66099-1	Newark Electronics	50F676	.60
7	203 M	Judd Wire	HV Wire, 24 AWG, 5 KV Rated, Red	V0505003	Summit Electric		.12 / M
8	2 M	Belden	Hook-up Wire, 22 AWG, Green, Teflon	83026-100-5	Newark Electronics	02F5834	.85 / M
9	32 M	Belden	Hook-up Wire, 16 AWG, Green, Teflon	83030-100-5	Newark Electronics	02F5420	1.30 / M
10	216	PANDUIT	Cable Ties, .6" max bundle, Pkg of 1000	PLT.6SM-M	Newark Electronics	84F1314	.03

TABLE A		
Label	Qty needed	Legend TYPE:
1	72	WM-1
2	24	WM-2
3	72	WM-3
4	24	WM-4
5	72	WM-5
6	24	WM-6
7	72	WM-7
8	24	WM-8
9	48	WM-9
10	24	WM-10
11	72	WM-11
12	24	WM-12
13	72	WM-13
14	24	WM-14
15	72	WM-15
16	24	WM-16
17	24	WM-17
19	48	WM-19
20	48	WM-20
S	48	WM-S
G	48	WM-G

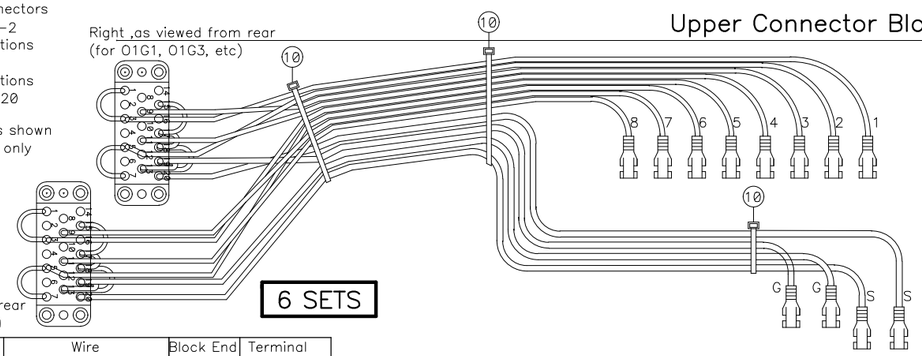
Los Alamos National Laboratory		
Title	St 1 N Panel Connector to PCB Wires Noth Arm HV Distribution	
Size D	Date Originated: 14 June 2001 Date Last Revised: 18 Oct 2001	
LANL DWG # 135Y299883		Approved By: W. Sondheim
PHENIX DWG #: 002-8312-226		Drawn by: G. Hart
Filename 135Y299883 DB WIRE 1.pcb		Sheet 1 of 1

Upper Connector Blocks to A side of PCB

Front Panel Block Connectors
(Rear View) 203909-2
Item 2, sockets in positions
1, 7, 9, 11, & 13
Item 3, sockets in positions
3, 5, 15, 17, 18, 19 & 20

Note: connectors shown offset for clarity only

Right ,as viewed from rear
(for O1G1, O1G3, etc)

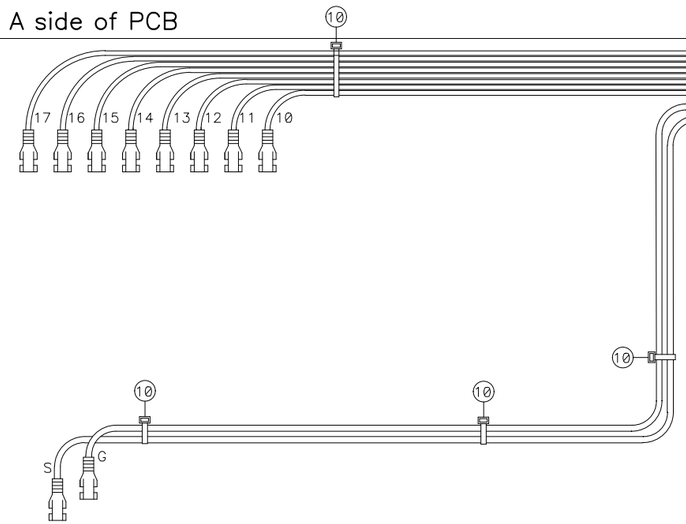


Left ,as viewed from rear
(for O1G2, O2G1, etc)

6 SETS

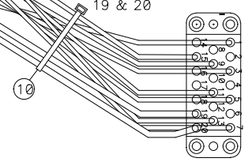
Block Position	Wire Type	Wire Length	Block End Label	Terminal End Label
R 3	24 AWG HV	287 mm (11.3 in.)	3	1
R 5	24 AWG HV	290 mm (11.4 in.)	5	2
R 9	24 AWG HV	248 mm (9.8 in.)	9	3
R 11	24 AWG HV	246 mm (9.7 in.)	11	4
R 19	16 AWG H/U	239 mm (9.4 in.)	19	G
R 20	16 AWG H/U	244 mm (9.6 in.)	20	S
L 3	24 AWG HV	322 mm (12.7 in.)	3	5
L 5	24 AWG HV	320 mm (12.6 in.)	5	6
L 9	24 AWG HV	278 mm (10.9 in.)	9	7
L 11	24 AWG HV	276 mm (10.9 in.)	11	8
L 19	16 AWG H/U	269 mm (10.6 in.)	19	G
L 20	16 AWG H/U	274 mm (10.8 in.)	20	S

Block Position	Wire Type	Wire Length
1-3	24 AWG HV	40 mm (1.6 in.)
5-7	24 AWG HV	40 mm (1.6 in.)
15-17	22 AWG H/U	40 mm (1.6 in.)
17-18	22 AWG H/U	40 mm (1.6 in.)
18-13	22 AWG H/U	40 mm (1.6 in.)
13-19	22 AWG H/U	40 mm (1.6 in.)



Rear Panel Block Connectors
with Pin Contacts
(Rear View)

Rear Panel Block Connectors
(Rear View) 203908-2
Item 5, pins in positions
1, 3, 5, 7, 9, 11, 13, & 15
Item 6, pins in positions
19 & 20



6 SETS

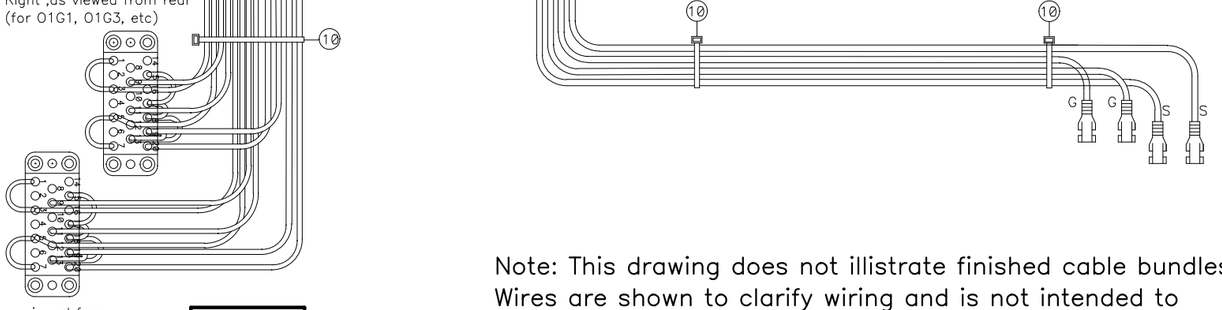
Block Position	Wire Type	Wire Length	Block End Label	Terminal End Label
1	24 AWG HV	386 mm (15.2 in.)	1	10
3	24 AWG HV	408 mm (16.1 in.)	3	11
5	24 AWG HV	430 mm (16.9 in.)	5	12
7	24 AWG HV	452 mm (17.8 in.)	7	13
9	24 AWG HV	424 mm (16.7 in.)	9	14
11	24 AWG HV	446 mm (17.6 in.)	11	15
13	24 AWG HV	468 mm (18.4 in.)	13	16
15	24 AWG HV	450 mm (17.7 in.)	15	17
19	16 AWG H/U	340 mm (13.4 in.)	19	G
20	16 AWG H/U	346 mm (13.6 in.)	20	S

Lower Connector Blocks to B side of PCB

Front Panel Block Connectors
(Rear View) 203909-2
Item 2, sockets in positions
1, 7, 9, 11, & 13
Item 3, sockets in positions
3, 5, 15, 17, 18, 19 & 20

Note: connectors shown offset for clarity only

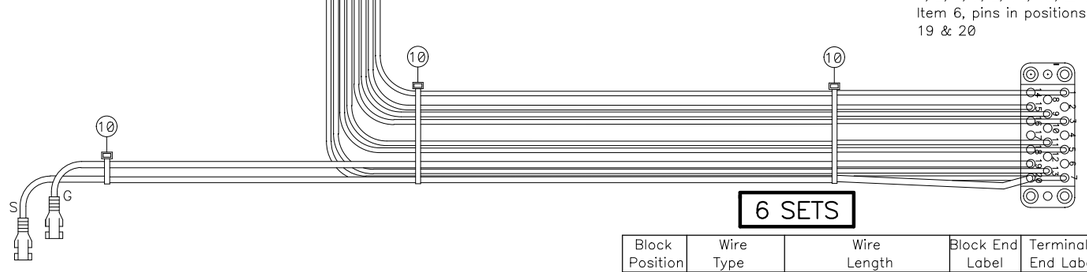
Right ,as viewed from rear
(for O1G1, O1G3, etc)



Left ,as viewed from rear
(for O1G2, O2G1, etc)

6 SETS

Block Position	Wire Type	Wire Length	Block End Label	Terminal End Label
R 3	24 AWG HV	477 mm (18.8 in.)	3	1
R 5	24 AWG HV	475 mm (18.7 in.)	5	2
R 9	24 AWG HV	438 mm (17.2 in.)	9	3
R 11	24 AWG HV	436 mm (17.2 in.)	11	4
R 19	16 AWG H/U	430 mm (16.9 in.)	19	G
R 20	16 AWG H/U	440 mm (17.3 in.)	20	S
L 3	24 AWG HV	512 mm (20.2 in.)	3	5
L 5	24 AWG HV	510 mm (20.1 in.)	5	6
L 9	24 AWG HV	468 mm (18.4 in.)	9	7
L 11	24 AWG HV	466 mm (18.3 in.)	11	8
L 19	16 AWG H/U	460 mm (18.1 in.)	19	G
L 20	16 AWG H/U	470 mm (18.5 in.)	20	S
1-3	24 AWG HV	40 mm (1.6 in.)		
5-7	24 AWG HV	40 mm (1.6 in.)		
15-17	22 AWG H/U	40 mm (1.6 in.)		
17-18	22 AWG H/U	40 mm (1.6 in.)		
18-13	22 AWG H/U	40 mm (1.6 in.)		
13-19	22 AWG H/U	40 mm (1.6 in.)		



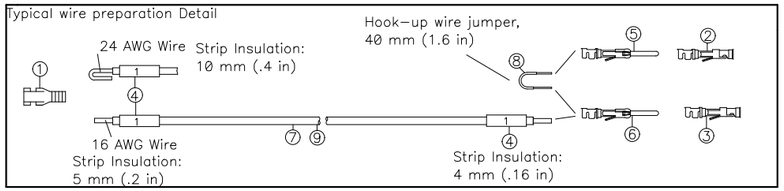
Rear Panel Block Connectors
(Rear View) 203908-2
Item 5, pins in positions
1, 3, 5, 7, 9, 11, 13, & 15
Item 6, pins in positions
19 & 20

6 SETS

Block Position	Wire Type	Wire Length	Block End Label	Terminal End Label
1	24 AWG HV	355 mm (14.0 in.)	1	10
3	24 AWG HV	377 mm (14.8 in.)	3	11
5	24 AWG HV	399 mm (15.7 in.)	5	12
7	24 AWG HV	421 mm (16.6 in.)	7	13
9	24 AWG HV	395 mm (15.6 in.)	9	14
11	24 AWG HV	417 mm (16.4 in.)	11	15
13	24 AWG HV	439 mm (17.3 in.)	13	16
15	24 AWG HV	410 mm (16.1 in.)	15	17
19	16 AWG H/U	309 mm (12.2 in.)	19	G
20	16 AWG H/U	315 mm (12.4 in.)	20	S

Note: This drawing does not illistrate finished cable bundles.
Wires are shown to clarify wiring and is not intended to be to finished scale

Typical wire preparation Detail



ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	264	VOLTREX	Terminal, Solderless (Crimp) Tab, .187", Non-Insulated	CFS-TO-1818	Newark Electronics	31N2875	.08
2	120	AMP (Div of Tyco)	Contact, Socket, Type III, for 20-24 AWG Wire, Crimp	66105-1	Newark Electronics	50F576	.80
3	168	AMP (Div of Tyco)	Contact, Socket, Type III, for 16-18 AWG Wire, Crimp	66101-1	Newark Electronics	50F573	.80
4*	21	Brady	Label, Wire, supplied on Sheet of 36 x 1.5", use .75"	see table A	Newark Electronics		1.60
5	96	AMP (Div of Tyco)	Contact, Pin, Type III, for 20-24 AWG Wire, Crimp	66103-1	Newark Electronics	50F575	.60
6	24	AMP (Div of Tyco)	Contact, Pin, Type III, for 16-18 AWG Wire, Crimp	66099-1	Newark Electronics	50F676	.60
7	75 M	Judd Wire	HV Wire, 24 AWG, 5 KV Rated, Red	V0505003	Summit Electric		.12 / M
8	6 M	Belden	Hook-up Wire, 22 AWG, Green, Teflon	83026-100-5	Newark Electronics	02F5834	.85 / M
9	26 M	Belden	Hook-up Wire, 16 AWG, Green, Teflon	83030-100-5	Newark Electronics	02F5420	1.30 / M
10	108	PANDUIT	Cable Ties, .6" max bundle, Pkg of 1000	PLT.6SM-M	Newark Electronics	84F1314	.03

TABLE A

Label	Qty needed	Legend TYPE:
1	24	WM-1
2	12	WM-2
3	48	WM-3
4	12	WM-4
5	48	WM-5
6	12	WM-6
7	24	WM-7
8	12	WM-8
9	48	WM-9
10	12	WM-10
11	48	WM-11
12	12	WM-12
13	24	WM-13
14	12	WM-14
15	24	WM-15
16	12	WM-16
17	12	WM-17
19	36	WM-19
20	36	WM-20
S	36	WM-S
G	36	WM-G

Los Alamos National Laboratory		
Title	St 2 N Panel Connector to PCB Wires	
	Noth Arm HV Distribution	
Size D	Date Originated: 14 June 2001	
	Date Last Revised: 18 Oct 2001	
LANL DWG #: 135Y299883		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299883 DB WIRE 2.pcb		Sheet 1 of 1

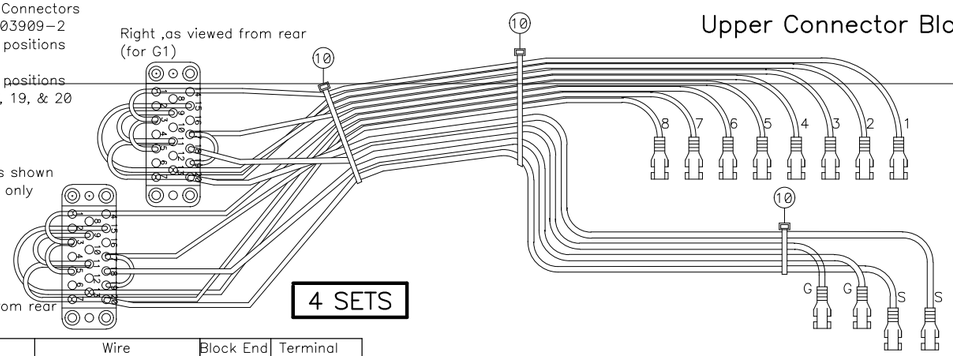
Upper Connector Blocks to A side of PCB

Front Panel Block Connectors
(Rear View) 203909-2
Item 2, sockets in positions
5, 9, 15
Item 3, sockets in positions
1, 3, 7, 11, 13, 17, 19, & 20

Note: connectors shown
offset for clarity only

Right ,as viewed from rear
(for G1)

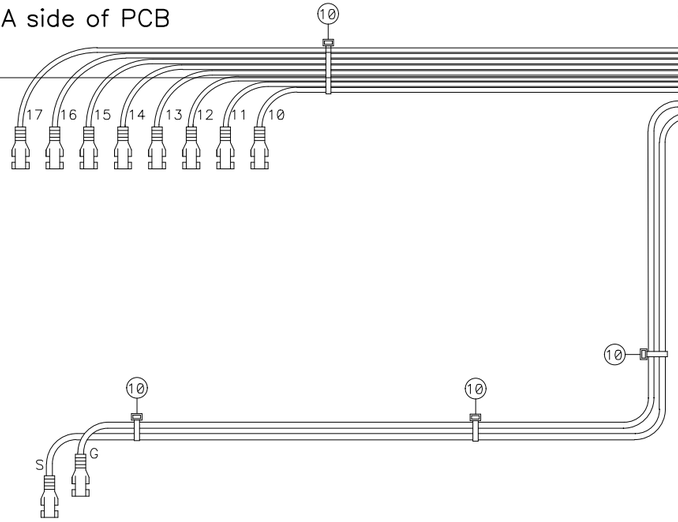
Left ,as viewed from rear
(for G3)



4 SETS

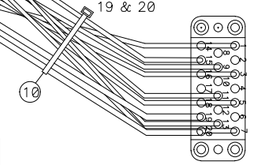
Block Position	Wire Type	Wire Length	Block End Label	Terminal End Label
R 1	24 AWG HV	292 mm (11.5 in.)	1	1
R 7	24 AWG HV	290 mm (11.4 in.)	7	2
R 13	24 AWG HV	248 mm (9.8 in.)	13	3
R 17	24 AWG HV	246 mm (9.7 in.)	17	4
R 18	16 AWG H/U	239 mm (9.4 in.)	18	G
R 20	16 AWG H/U	244 mm (9.6 in.)	20	S
L 1	24 AWG HV	352 mm (13.9 in.)	1	5
L 7	24 AWG HV	350 mm (13.8 in.)	7	6
L 13	24 AWG HV	308 mm (12.1 in.)	13	7
L 17	24 AWG HV	294 mm (11.6 in.)	17	8
L 18	16 AWG H/U	299 mm (11.8 in.)	18	G
L 20	16 AWG H/U	304 mm (12.0 in.)	20	S

Block Position	Wire Type	Wire Length
1-3	24 AWG HV	40 mm (1.6 in.)
3-5	24 AWG HV	40 mm (1.6 in.)
9-11	24 AWG HV	40 mm (1.6 in.)
11-7	24 AWG HV	40 mm (1.6 in.)
13-15	22 AWG H/U	40 mm (1.6 in.)
17-19	22 AWG H/U	40 mm (1.6 in.)



Rear Panel Block Connectors
(Rear View) 203908-2
Item 5, pins in positions
1, 3, 5, 7, 9, 11, 13, & 15
Item 6, pins in positions
19 & 20

Rear Panel Block Connectors
with Pin Contacts
(Rear View)



4 SETS

Block Position	Wire Type	Wire Length	Block End Label	Terminal End Label
1	24 AWG HV	386 mm (15.2 in.)	1	10
3	24 AWG HV	408 mm (16.1 in.)	3	11
5	24 AWG HV	430 mm (16.9 in.)	5	12
7	24 AWG HV	452 mm (17.8 in.)	7	13
9	24 AWG HV	424 mm (16.7 in.)	9	14
11	24 AWG HV	446 mm (17.6 in.)	11	15
13	24 AWG HV	468 mm (18.4 in.)	13	16
15	24 AWG HV	450 mm (17.7 in.)	15	17
19	16 AWG H/U	340 mm (13.4 in.)	19	G
20	16 AWG H/U	346 mm (13.6 in.)	20	S

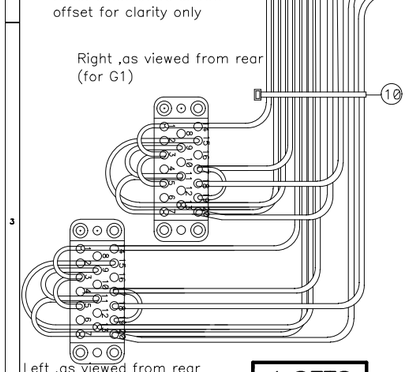
Lower Connector Blocks to B side of PCB

Front Panel Block Connectors
(Rear View) 203909-2
Item 2, sockets in positions
5, 9, 15
Item 3, sockets in positions
1, 3, 7, 11, 13, 17, 19, & 20

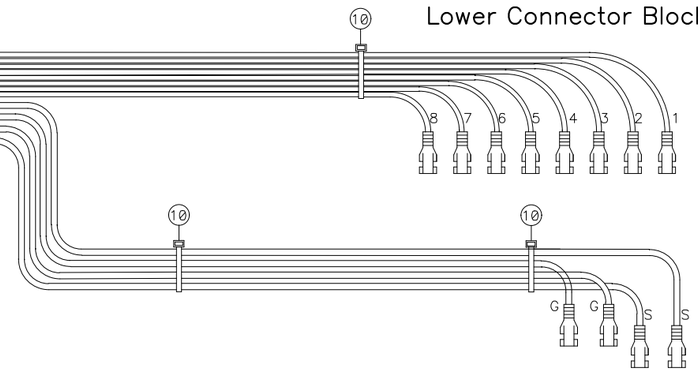
Note: connectors shown
offset for clarity only

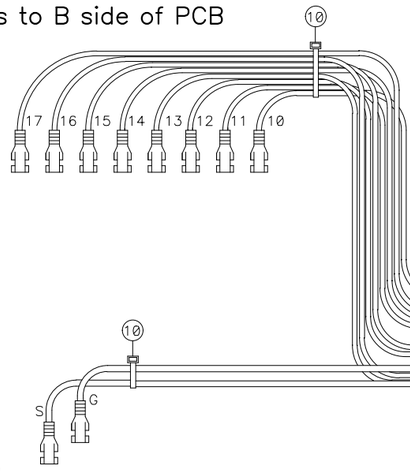
Right ,as viewed from rear
(for G1)

Left ,as viewed from rear
(for G3)



4 SETS





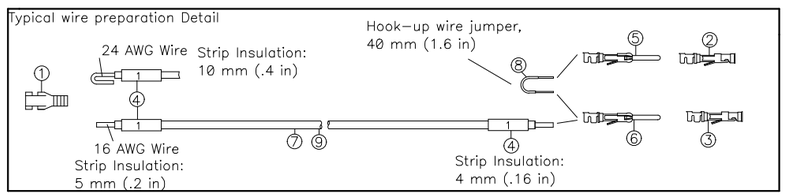
Rear Panel Block Connectors
(Rear View) 203908-2
Item 5, pins in positions
1, 3, 5, 7, 9, 11, 13, & 15
Item 6, pins in positions
19 & 20

4 SETS

Block Position	Wire Type	Wire Length	Block End Label	Terminal End Label
1	24 AWG HV	355 mm (14.0 in.)	1	10
3	24 AWG HV	377 mm (14.8 in.)	3	11
5	24 AWG HV	399 mm (15.7 in.)	5	12
7	24 AWG HV	421 mm (16.6 in.)	7	13
9	24 AWG HV	395 mm (15.6 in.)	9	14
11	24 AWG HV	417 mm (16.4 in.)	11	15
13	24 AWG HV	439 mm (17.3 in.)	13	16
15	24 AWG HV	410 mm (16.1 in.)	15	17
19	16 AWG H/U	309 mm (12.2 in.)	19	G
20	16 AWG H/U	315 mm (12.4 in.)	20	S

Note: This drawing does not illistrate finished cable bundles.
Wires are shown to clarify wiring and is not intended to
be to finished scale

Typical wire preparation Detail

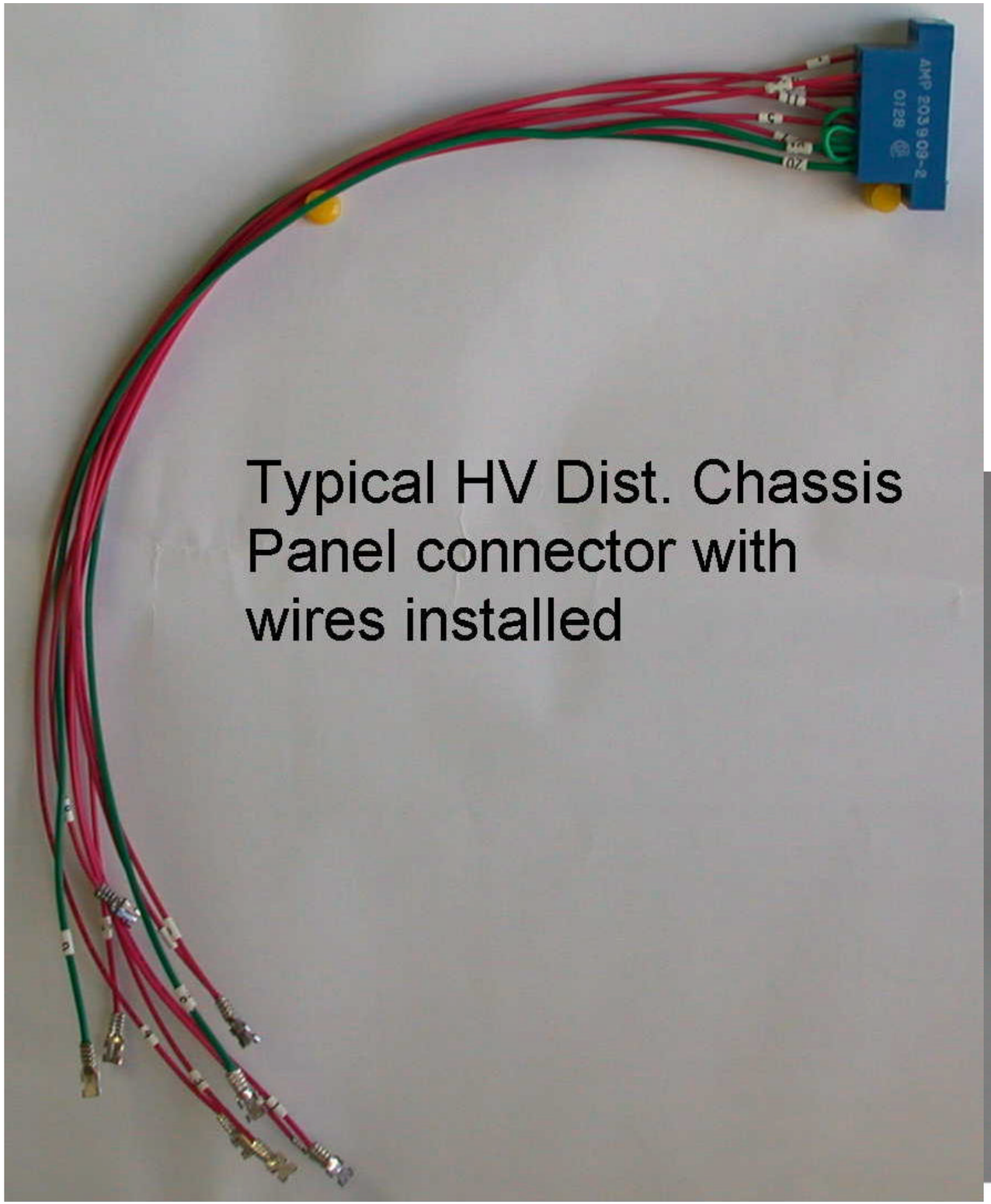


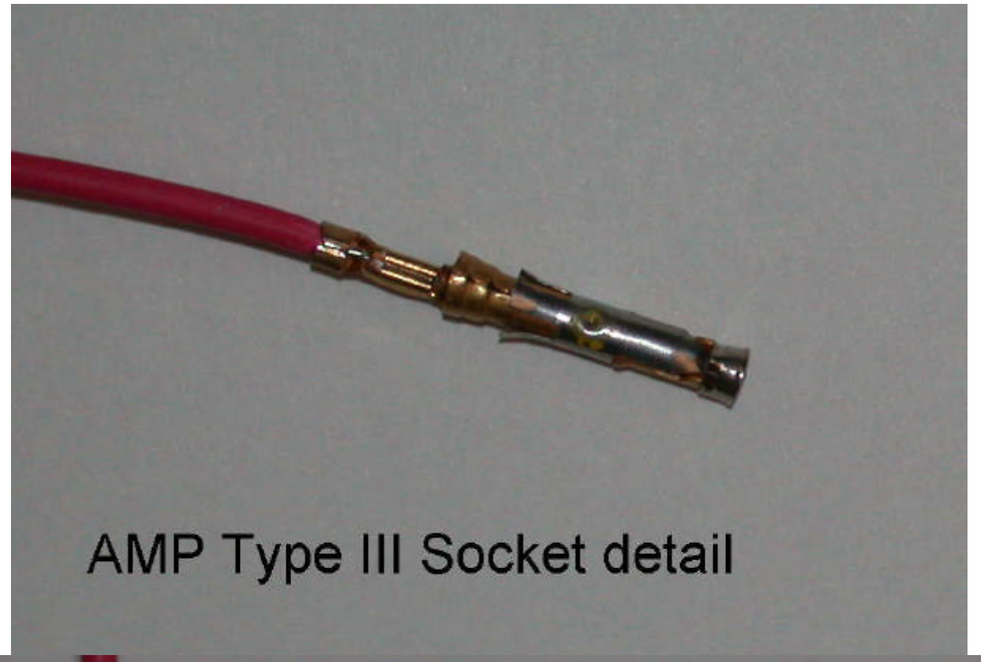
Block Position	Wire Type	Wire Length	Block End Label	Terminal End Label
R 1	24 AWG HV	482 mm (19.0 in.)	1	1
R 7	24 AWG HV	480 mm (18.9 in.)	7	2
R 13	24 AWG HV	438 mm (17.2 in.)	13	3
R 17	24 AWG HV	424 mm (16.7 in.)	17	4
R 18	16 AWG H/U	430 mm (16.9 in.)	18	G
R 20	16 AWG H/U	440 mm (17.3 in.)	20	S
L 1	24 AWG HV	542 mm (21.3 in.)	1	5
L 7	24 AWG HV	540 mm (21.3 in.)	7	6
L 13	24 AWG HV	498 mm (19.6 in.)	13	7
L 17	24 AWG HV	484 mm (19.1 in.)	17	8
L 18	16 AWG H/U	490 mm (19.3 in.)	18	G
L 20	16 AWG H/U	500 mm (19.7 in.)	20	S
1-3	24 AWG HV	40 mm (1.6 in.)		
3-5	24 AWG HV	40 mm (1.6 in.)		
7-9	24 AWG HV	40 mm (1.6 in.)		
9-11	24 AWG HV	40 mm (1.6 in.)		
13-15	22 AWG H/U	40 mm (1.6 in.)		
17-19	22 AWG H/U	40 mm (1.6 in.)		

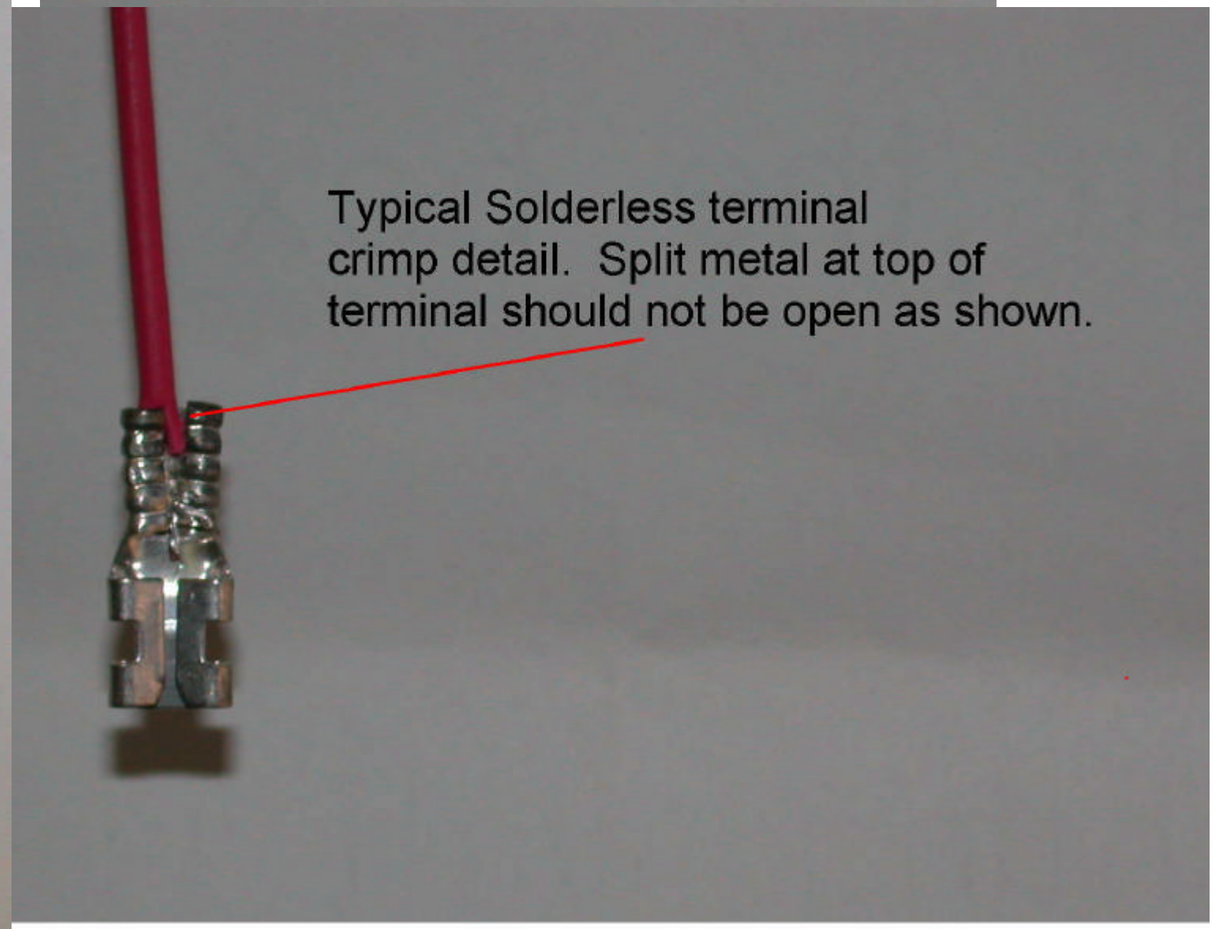
ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	176	VOLTREX	Terminal, Solderless (Crimp) Tab, .187", Non-Insulated	CFS-TO-1818	Newark Electronics	31N2875	.08
2	24	AMP (Div of Tyco)	Contact, Socket, Type III, for 20-24 AWG Wire, Crimp	66105-1	Newark Electronics	50F576	.80
3	64	AMP (Div of Tyco)	Contact, Socket, Type III, for 16-18 AWG Wire, Crimp	66101-1	Newark Electronics	50F573	.80
4*	21	Brady	Label, Wire, supplied on Sheet of 36 x 1.5", use .75"	see table A	Newark Electronics		1.60
5	64	AMP (Div of Tyco)	Contact, Pin, Type III, for 20-24 AWG Wire, Crimp	66103-1	Newark Electronics	50F575	.60
6	16	AMP (Div of Tyco)	Contact, Pin, Type III, for 16-18 AWG Wire, Crimp	66099-1	Newark Electronics	50F676	.60
7	50 M	Judd Wire	HV Wire, 24 AWG, 5 KV Rated, Red	V0505003	Summit Electric		.12 / M
8	4 M	Belden	Hook-up Wire, 22 AWG, Green, Teflon	83026-100-5	Newark Electronics	02F5834	.85 / M
9	18 M	Belden	Hook-up Wire, 16 AWG, Green, Teflon	83036-100-5	Newark Electronics	02F5420	1.30 / M
10	72	PANDUIT	Cable Ties, .6" max bundle, Pkg of 1000	PLT.6SM-M	Newark Electronics	84F1314	.03

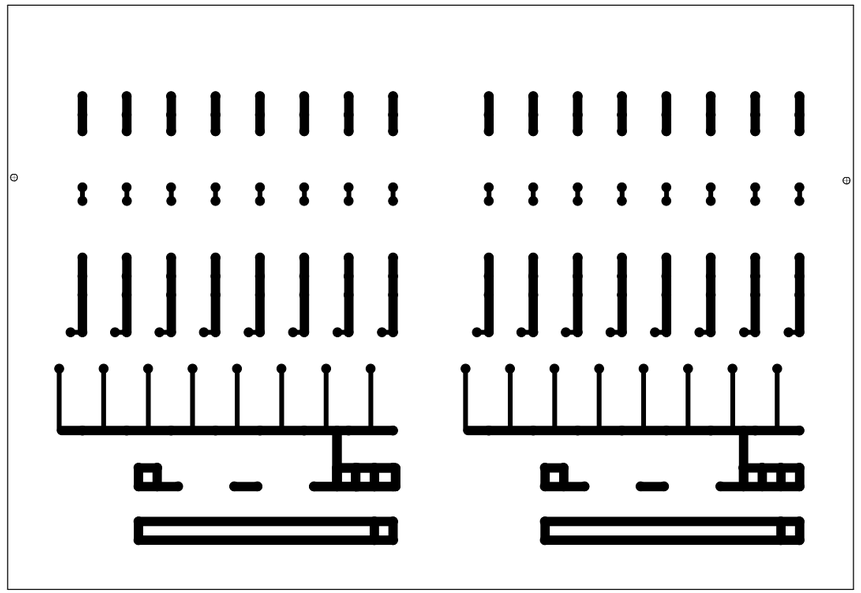
TABLE A		
Label	Qty needed	Legend TYPE:
1	32	WM-1
2	8	WM-2
3	16	WM-3
4	8	WM-4
5	16	WM-5
6	8	WM-6
7	16	WM-7
8	8	WM-8
9	8	WM-9
10	8	WM-10
11	16	WM-11
12	8	WM-12
13	32	WM-13
14	8	WM-14
15	16	WM-15
16	8	WM-16
17	24	WM-17
18	16	WM-18
19	8	WM-19
20	24	WM-20
S	24	WM-S
G	24	WM-G

Los Alamos National Laboratory		
Title	St 3 N Panel Connector to PCB Wires	
	Noth Arm HV Distribution	
Size D	Date Originated: 14 June 2001	
	Date Last Revised: 18 Oct 2001	
LANL DWG # 135Y299883		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299883 DB WIRE 3.pcb		Sheet 1 of 1

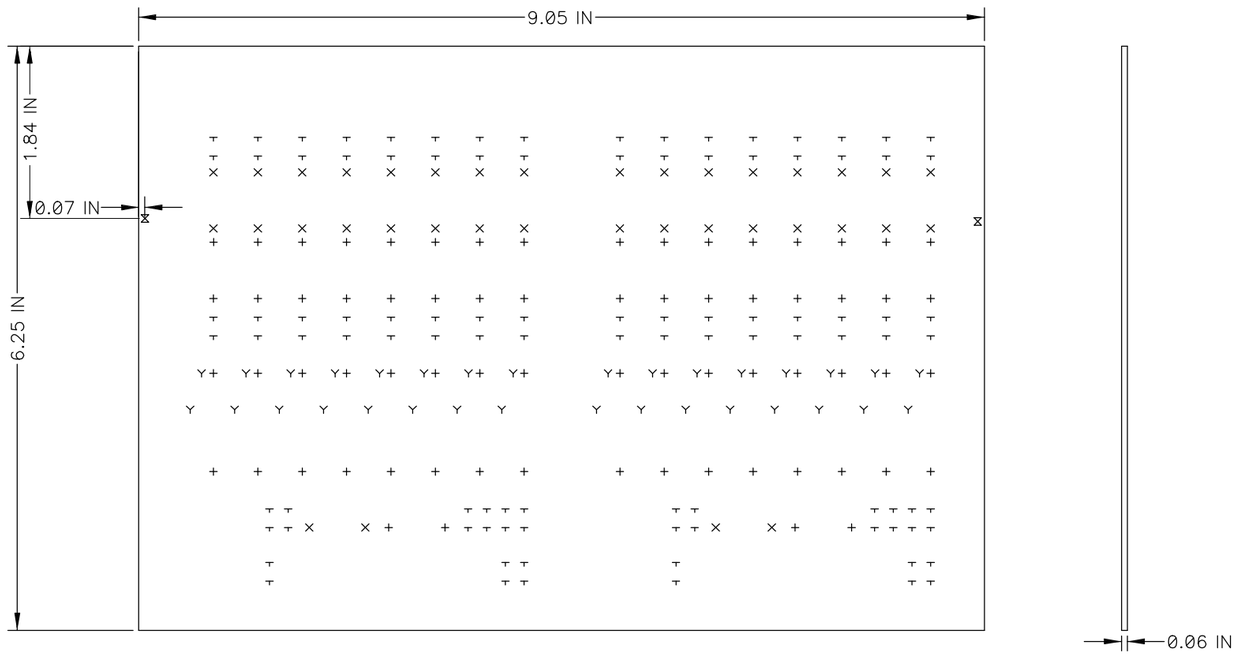

AMP 203903-2
0128
Typical HV Dist. Chassis
Panel connector with
wires installed


AMP Type III Socket detail


Typical Solderless terminal
crimp detail. Split metal at top of
terminal should not be open as shown.



135Y299083 Layer 2 (Bottom)
1 Aug 2001



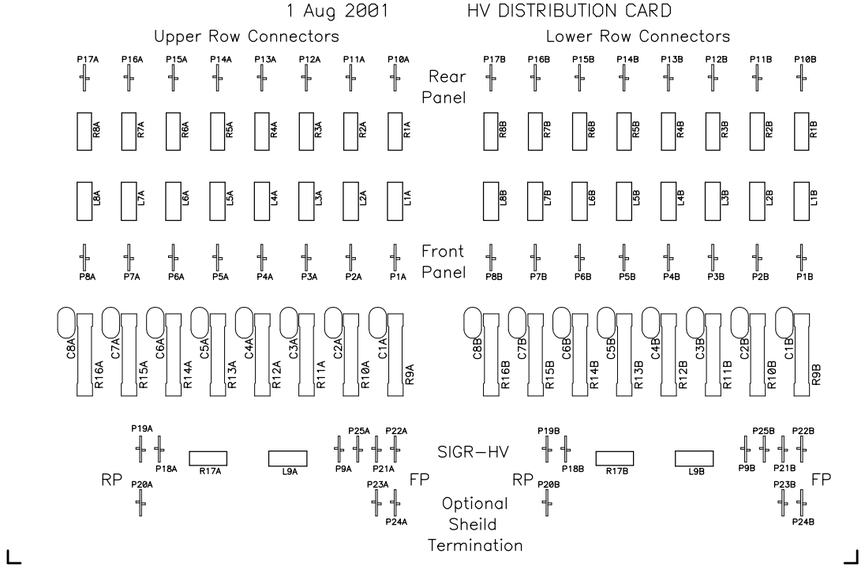
Drill Table			
Hole Dia (mm)	Symbol	Quantity	Plated
0.760	+	68	No
0.860	×	36	No
1.295	Y	32	No
1.300	⊤	100	No
2.200	⧖	2	No

1. Interpret drawings per IPC–D–275, Manufacture Printed Wiring Board (PWB) to best commercial practice per IPC–600, Class 2
2. Material: Fabricate from reinforced FR–4 glass laminate
3. Dimensions shown are finished size
4. All tolerance to be =/– .005" (.127 mm) unless otherwise stated
5. NC Drill and Gerber File formats specified in read me file:135Y299083 readme.txt
6. Silkscreen Layer 1, White Lettering
7. Solder Mask Layer 2, Red color preferred

Los Alamos National Laboratory		
Title	HV Board	
	North Arm HV Dist. System	
Size C	Date Originated: 23 May 2001	
	Date Last Revised: 26 August 2001	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002–0312–226		Drawn by: G. Hart
Filename 135Y299083.pcb		Sheet of 5

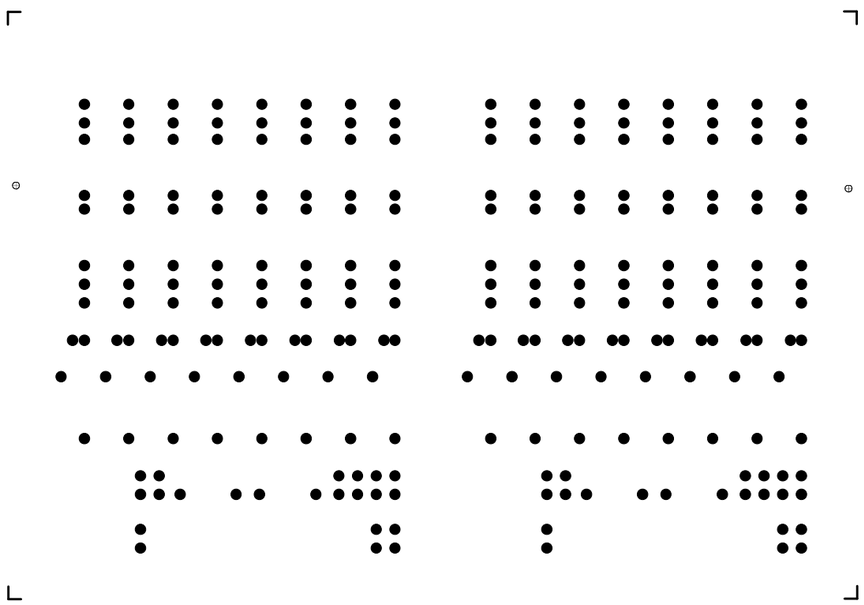
LANL 135Y299083/ PHENIX 002-0312-226

1 Aug 2001 HV DISTRIBUTION CARD



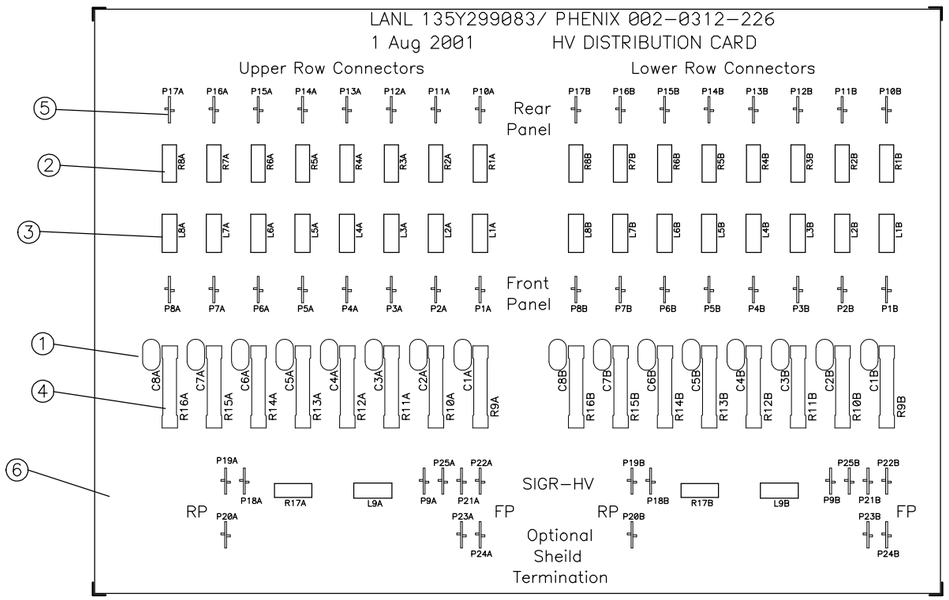
135Y299083 Layer 1 (Top) Silkscreen

1 Aug 2001



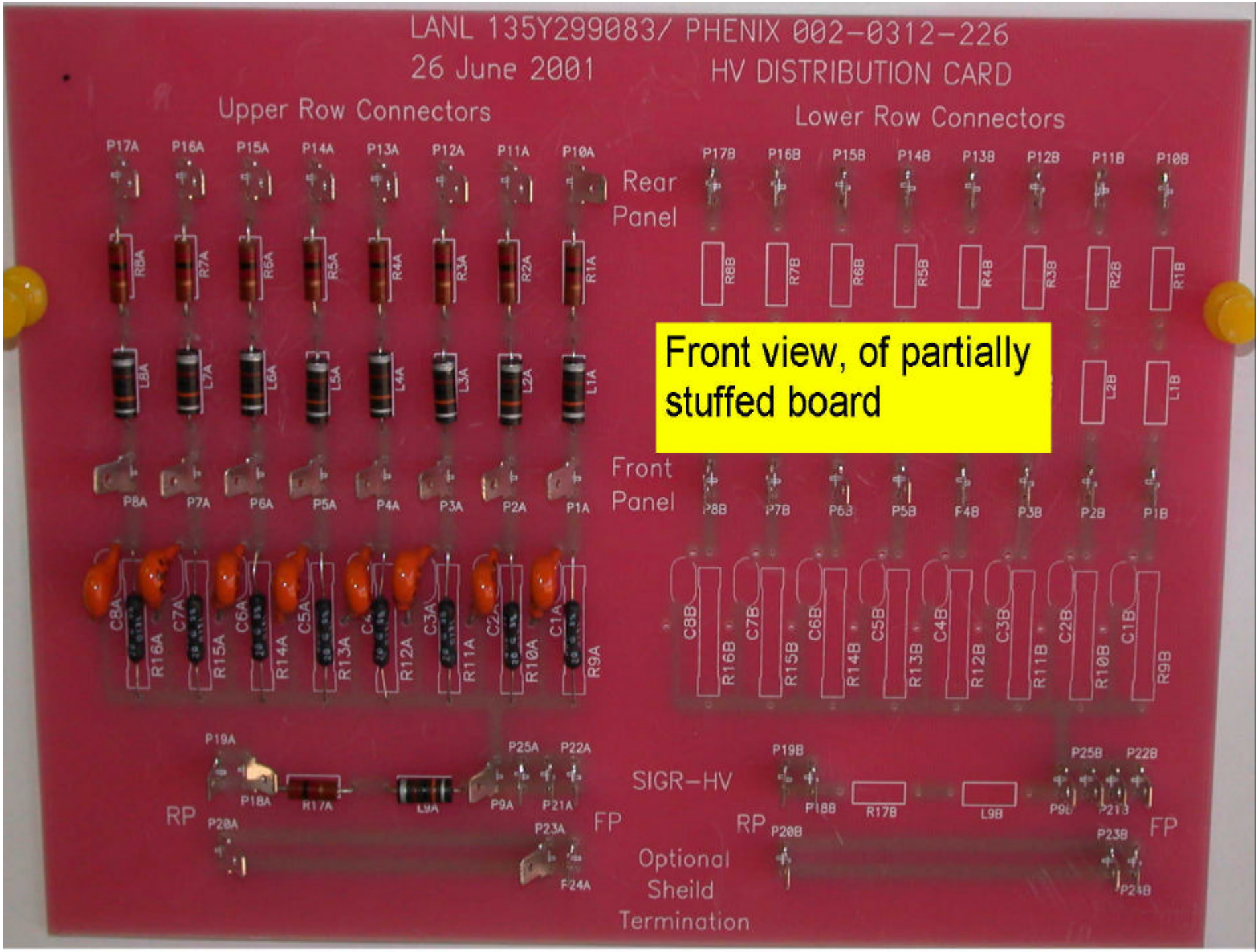
135Y299083 Layer 2 (Bottom) Solder Mask
1 Aug 2001
Red Color

ITEM	QTY	MANUFACTURER	DESCRIPTION	PART #	Source	Cat #	Cost/ea
1	16	Vishay/Sprague	Capacitor, .001 uF @ 3 kV, Ceramic Disk	125LD10	Newark Electronics	46F5219	.43
2	18	SPC/Multicomp	Resistor, 1/2 W, Carbon Comp, 2 K ohm, 5% tol, Pkg 100	RC1/2G202JT	Newark Electronics	10N570	.47
3	18	JW Miller	Inductor, 10 mH, 10 % tol, moulded	9250-106	Newark Electronics	81F3093	6.24
4	16	Ohmite	HV Resistor, 20 G ohm, 20% tol, .35W, 2500 V	MOX-400-22-20,000Meg 20%	Newark Electronics		6.00
5	50	Keystone	Terminal, Vertical, .187 wide, solderless, Male, Pkg 100	1285-ST	Newark Electronics	94F227	3.15
6	1		PC Card	135Y299083	The Circuit Shop		75.00

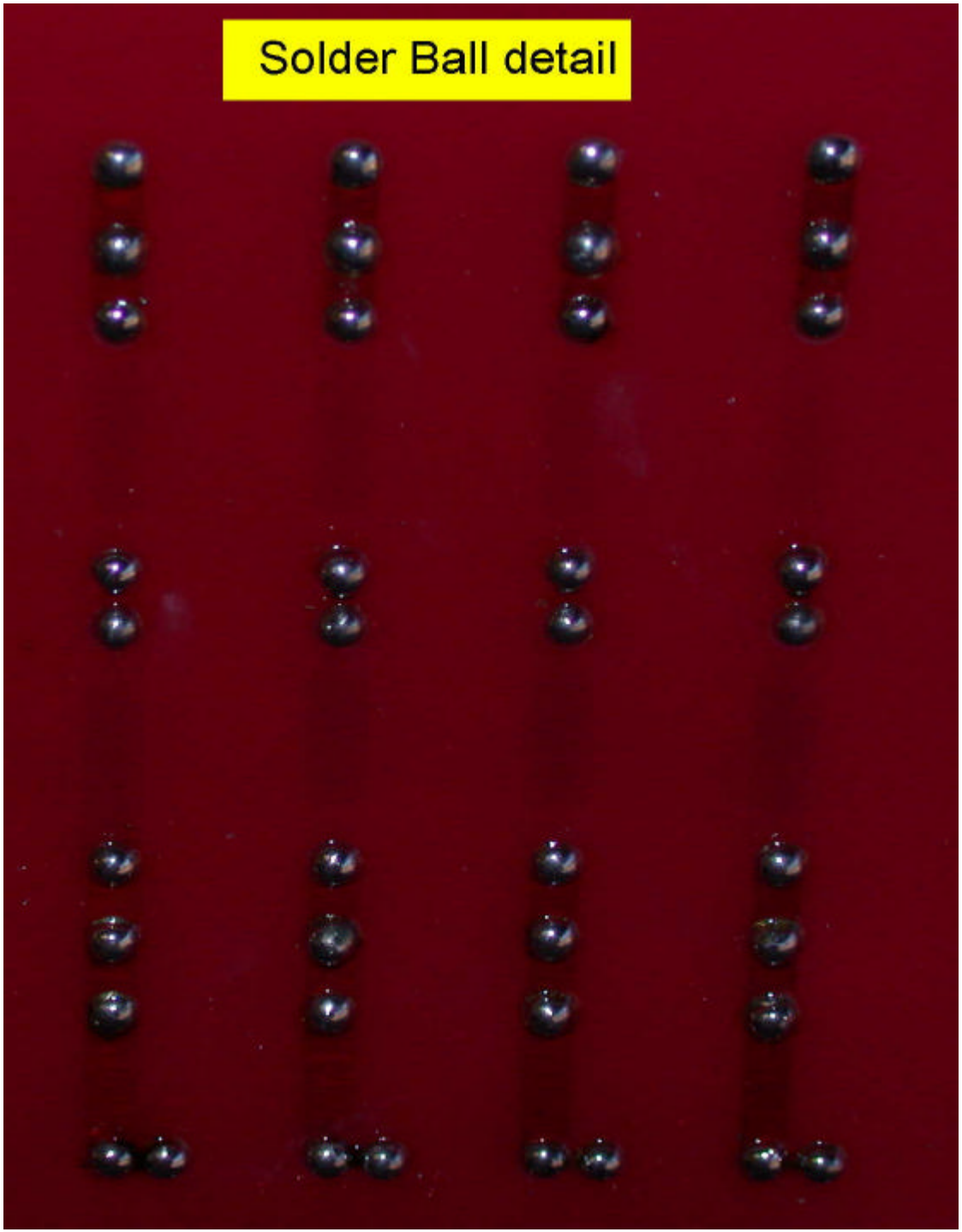


135Y299083 Layer 1 (Top) Silkscreen
1 Aug 2001

Los Alamos National Laboratory		
Title	HV Board	
North Arm HV Dist. System		
Size C	Date Originated: 23 May 2001	
	Date Last Revised: 26 June 2001	
LANL DWG # 135Y299083		Approved By: W. Sondheim
PHENIX DWG #: 002-0312-226		Drawn by: G. Hart
Filename 135Y299083.pcb		Sheet of 5


LANL 135Y299083/ PHENIX 002-0312-226
26 June 2001
HV DISTRIBUTION CARD
Upper Row Connectors
Lower Row Connectors
Rear Panel
Front Panel
Front view, of partially stuffed board
SIGR-HV
RP
FP
Optional Sheild Termination

Solder Ball detail



Octant 2
GAP 3

Octant 2
GAP 2

Octant 2
GAP 1

Octant 1
GAP 3

Octant 1
GAP 2

Octant 1
GAP 1

Blue Meanies
LHV Plugs

HV Multiconductor
Shielded Cables

to HV Power Supply

Card 6
Section A
(sheet 5)

Card 5
Section A
(sheet 5)

Card 4
Section A
(sheet 5)

Card 3
Section A
(sheet 5)

Card 2
Section A
(sheet 5)

Card 1
Section A
(sheet 5)

8 sockets for 24–20 AWG
2 sockets for 16–18 AWG

11 pins for 24–20 AWG
1 pin for 16–18 AWG

HV Multiconductor
Shielded Cables

11 sockets for 24–20 AWG
9 sockets for 18–16 AWG

17 pins for 24–20 AWG
3 pins for 16–18 AWG

AMP "M" Series HV
Block Connectors

AN 1-1
SIGR-HV
AN 1-2
SIGR-HV
AN 1-3
SIGR-HV
AN 2
SIGR-HV
AN 3
SIGR-HV
AN 4
SIGR-HV
AN 5
SIGR-HV
AN 6
SIGR-HV

24" 16 AWG Leads

Anode 1
Anode 2
Anode 3
Anode 4
Anode 5
Anode 6

G 1 G 2 G 3
Octant 1

G 1 G 2 G 3
Octant 2

Tw–Pr
__ ft

Los Alamos National Laboratory		
Title: MUON TRACKING HV DIST. SYSTEM		
Station 1 North		
Size	Date Originated: 21 Jan 2000	
	Last Revised: 25 June 2001	
LANL DWG #: St 1 N HV Dist		Approved By: W. Sondheim
PHENIX #: 105–0312–202		Drawn by: G. Hart P–25
Filename: 135Y299083 1 N.sch		Sheet 1 of 5

Octant 4
GAP 3

Octant 4
GAP 2

Octant 4
GAP 1

Octant 3
GAP 3

Octant 3
GAP 2

Octant 3
GAP 1

Blue Meanies
LHV Plugs

HV Multiconductor
Shielded Cables

Card 12
Section A
(sheet 5)

Card 11
Section A
(sheet 5)

Card 10
Section A
(sheet 5)

Card 9
Section A
(sheet 5)

Card 8
Section A
(sheet 5)

Card 7
Section A
(sheet 5)

HV Multiconductor
Shielded Cables

AN 1-1
SIGR-HV
AN 1-2
SIGR-HV
AN 1-3
SIGR-HV
AN 2
SIGR-HV
AN 3
SIGR-HV
AN 4
SIGR-HV
AN 5
SIGR-HV
AN 6
SIGR-HV

24" 16 AWG Leads

Anode 1
Anode 2
Anode 3
Anode 4
Anode 5
Anode 6

G 1 G 2 G 3
Octant 3

G 1 G 2 G 3
Octant 4

Tw-Pr
__ ft

8 sockets for 24-20 AWG
2 sockets for 16-18 AWG

11 pins for 24-20 AWG
1 pin for 16-18 AWG

11 sockets for 24-20 AWG
9 sockets for 18-16 AWG

17 pins for 24-20 AWG
3 pins for 16-18 AWG

AMP "M" Series HV
Block Connectors

to HV Power Supply

Los Alamos National Laboratory		
Title: MUON TRACKING HV DIST. SYSTEM		
Station 1 North		
Size	Date Originated: 21 Jan 2000	
	Last Revised: 25 June 2001	
LANL DWG #: St 1 N HV Dist		Approved By:W. Sondheim
PHENIX #: 105-0312-202		Drawn by: G. Hart P-25
Filename: 135Y299083 1 N.sch		Sheet 2 of 5

Octant 6
GAP 3

Octant 6
GAP 2

Octant 6
GAP 1

Octant 5
GAP 3

Octant 5
GAP 2

Octant 5
GAP 1

Blue Meanies
LHV Plugs

HV Multiconductor
Shielded Cables

to HV Power Supply

Card 6
Section B
(sheet 5)

Card 5
Section B
(sheet 5)

Card 4
Section B
(sheet 5)

Card 3
Section B
(sheet 5)

Card 2
Section B
(sheet 5)

Card 1
Section B
(sheet 5)

AN 1-1 SIGR-HV
AN 1-2 SIGR-HV
AN 1-3 SIGR-HV
AN 2 SIGR-HV
AN 3 SIGR-HV
AN 4 SIGR-HV
AN 5 SIGR-HV
AN 6 SIGR-HV

24" 16 AWG Leads

HV Multiconductor
Shielded Cables

Anode 1
Anode 2
Anode 3
Anode 4
Anode 5
Anode 6

G 1 G 2 G 3
Octant 5

G 1 G 2 G 3
Octant 6

Tw-Pr
__ ft

8 sockets for 24–20 AWG
2 sockets for 16–18 AWG

11 pins for 24–20 AWG
1 pin for 16–18 AWG

11 sockets for 24–20 AWG
9 sockets for 18–16 AWG

17 pins for 24–20 AWG
3 pins for 16–18 AWG

AMP "M" Series HV
Block Connectors

Los Alamos National Laboratory		
Title: MUON TRACKING HV DIST. SYSTEM		
Station 1 North		
Size	Date Originated: 21 Jan 2000	
	Last Revised: 25 June 2001	
LANL DWG #: St 1 N HV Dist		Approved By: W. Sondheim
PHENIX #: 105-0312-202		Drawn by: G. Hart P-25
Filename: 135Y299083 1 N.sch		Sheet 3 of 5

Octant 8
GAP 3

Card 12
Section B
(sheet 5)

Octant 8
GAP 2

Card 11
Section B
(sheet 5)

Octant 8
GAP 1

Card 10
Section B
(sheet 5)

Octant 7
GAP 3

Card 9
Section B
(sheet 5)

Octant 7
GAP 2

Card 8
Section B
(sheet 5)

Octant 7
GAP 1

Card 7
Section B
(sheet 5)

Blue Meanies
LHV Plugs

HV Multiconductor
Shielded Cables

8 sockets for 24–20 AWG
2 sockets for 16–18 AWG

11 pins for 24–20 AWG
1 pin for 16–18 AWG

HV Multiconductor
Shielded Cables

11 sockets for 24–20 AWG
9 sockets for 18–16 AWG

17 pins for 24–20 AWG
3 pins for 16–18 AWG

AMP "M" Series HV
Block Connectors

AN 1-1
SIGR-HV
AN 1-2
SIGR-HV
AN 1-3
SIGR-HV
AN 2
SIGR-HV
AN 3
SIGR-HV
AN 4
SIGR-HV
AN 5
SIGR-HV
AN 6
SIGR-HV

24" 16 AWG Leads

Anode 1
Anode 2
Anode 3
Anode 4
Anode 5
Anode 6

G 1 G 2 G 3
Octant 7

G 1 G 2 G 3
Octant 8

Tw–Pr
__ ft

Tw–Pr
__ ft

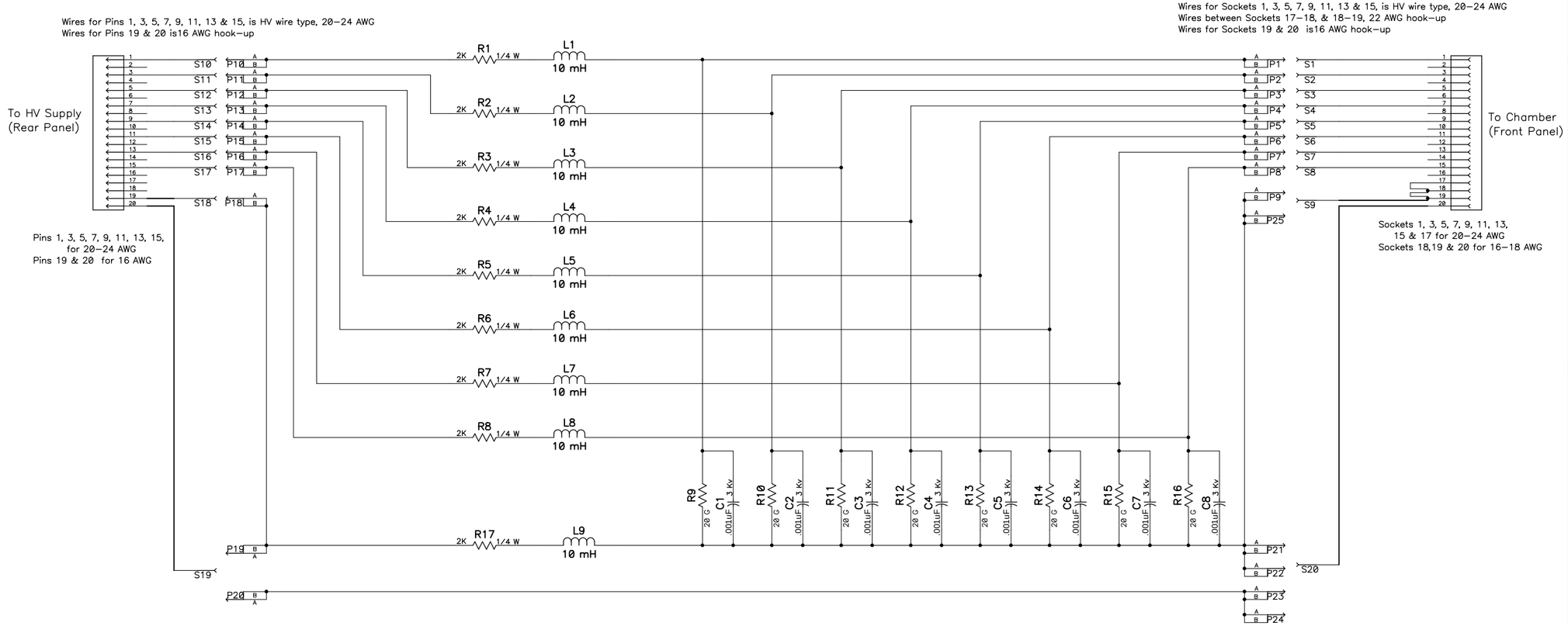
Tw–Pr
__ ft

Tw–Pr
__ ft

Tw–Pr
__ ft

to HV Power Supply

Los Alamos National Laboratory		
Title: MUON TRACKING HV DIST. SYSTEM		
Station 1 North		
Size	Date Originated: 21 Jan 2000	
	Last Revised: 25 June 2001	
LANL DWG #: St 1 N HV Dist		Approved By: W. Sondheim
PHENIX #: 105–0312–202		Drawn by: G. Hart P–25
Filename: 135Y299083 1 N.sch		Sheet 4 of 5



Typical 8 channels of Distribution / Filter Box

Los Alamos National Laboratory		
Title: MUON TRACKING HV DIST. SYSTEM		
Station 1 North		
Size	Date Originated: 21 Jan 2000	
	Last Revised: 25 June 2001	
LANL DWG #: St 1 N HV Dist		Approved By:W. Sondheim
PHENIX #: 105–0312–202		Drawn by: G. Hart P–25
Filename: 135Y299083 1 N.SCH		Sheet 5 of 5

Octant 2
GAPS 2 & 3

Octant 2
GAP 1

Octant 1
GAP 3

Octant 1
GAPS 1 & 2

Blue Meanies
LHV Plugs

HV Multiconductor
Shielded Cables

8 sockets for 24–20 AWG
2 sockets for 16–18 AWG

to HV Power Supply

Card 5
Section A
(sheet 5)

Card 3
Section A
(sheet 5)

Card 1
Section A
(sheet 5)

AN 1
SIGR-HV
AN 2
SIGR-HV
AN 3
SIGR-HV
AN 4
SIGR-HV
AN 5
SIGR-HV
AN 6
SIGR-HV

24" 16 AWG Leads

HV Multiconductor
Shielded Cables

11 pins for 24–20 AWG
1 pin for 16–18 AWG

11 sockets for 24–20 AWG
9 sockets for 18–16 AWG

13 pins for 24–20 AWG
5 pins for 16–18 AWG

AMP "M" Series HV
Block Connectors

Anode 1
Anode 2
Anode 3
Anode 4
Anode 5
Anode 6

G 1 G 2 G 3
Octant 1

G 1 G 2 G 3
Octant 2

Tw–Pr
14 ft

Tw–Pr
16 ft

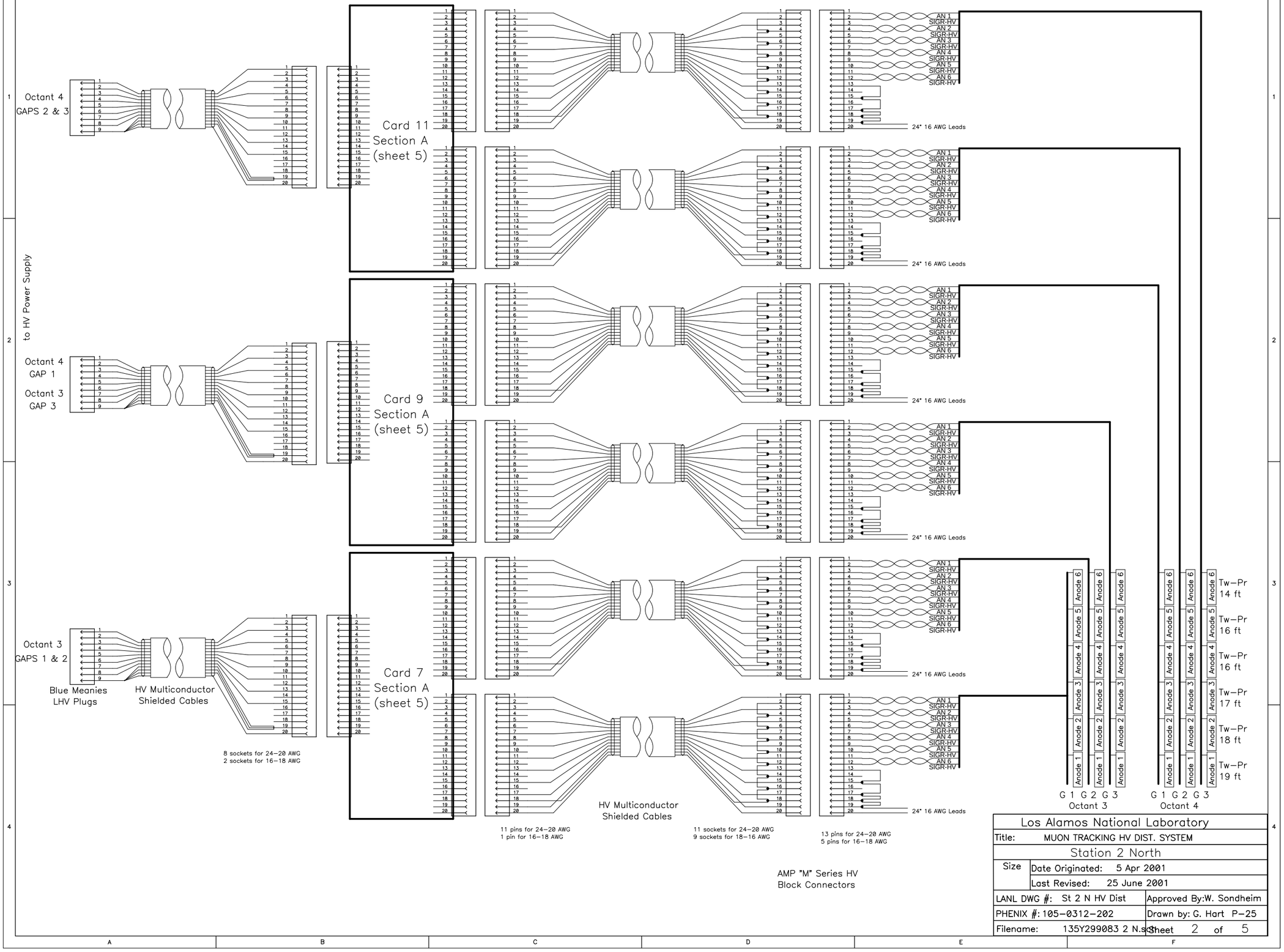
Tw–Pr
16 ft

Tw–Pr
17 ft

Tw–Pr
18 ft

Tw–Pr
19 ft

Los Alamos National Laboratory		
Title:	MUON TRACKING HV DIST. SYSTEM	
	Station 2 North	
Size	Date Originated: 5 Apr 2001	
	Last Revised: 25 June 2001	
LANL DWG #: St 2 N HV Dist		Approved By:W. Sondheim
PHENIX #: 105–0312–202		Drawn by: G. Hart P–25
Filename: 135Y299083 2 N.sch		Sheet 1 of 5



Los Alamos National Laboratory		
Title: MUON TRACKING HV DIST. SYSTEM		
Station 2 North		
Size	Date Originated: 5 Apr 2001	
	Last Revised: 25 June 2001	
LANL DWG #: St 2 N HV Dist		Approved By: W. Sondheim
PHENIX #: 105–0312–202		Drawn by: G. Hart P–25
Filename: 135Y299083 2 N.sch		Sheet 2 of 5

Octant 6
GAPS 2 & 3

Octant 6
GAP 1

Octant 5
GAP 3

Octant 5
GAPS 1 & 2

to HV Power Supply

Blue Meanies
LHV Plugs

HV Multiconductor
Shielded Cables

8 sockets for 24–20 AWG
2 sockets for 16–18 AWG

Card 5
Section B
(sheet 5)

Card 3
Section B
(sheet 5)

Card 1
Section B
(sheet 5)

AN 1 SIGR-HV
AN 2 SIGR-HV
AN 3 SIGR-HV
AN 4 SIGR-HV
AN 5 SIGR-HV
AN 6 SIGR-HV

24" 16 AWG Leads

HV Multiconductor
Shielded Cables

11 pins for 24–20 AWG
1 pin for 16–18 AWG

11 sockets for 24–20 AWG
9 sockets for 18–16 AWG

13 pins for 24–20 AWG
5 pins for 16–18 AWG

AMP "M" Series HV
Block Connectors

Anode 1
Anode 2
Anode 3
Anode 4
Anode 5
Anode 6

G 1 G 2 G 3
Octant 5

G 1 G 2 G 3
Octant 6

Tw–Pr
14 ft

Tw–Pr
16 ft

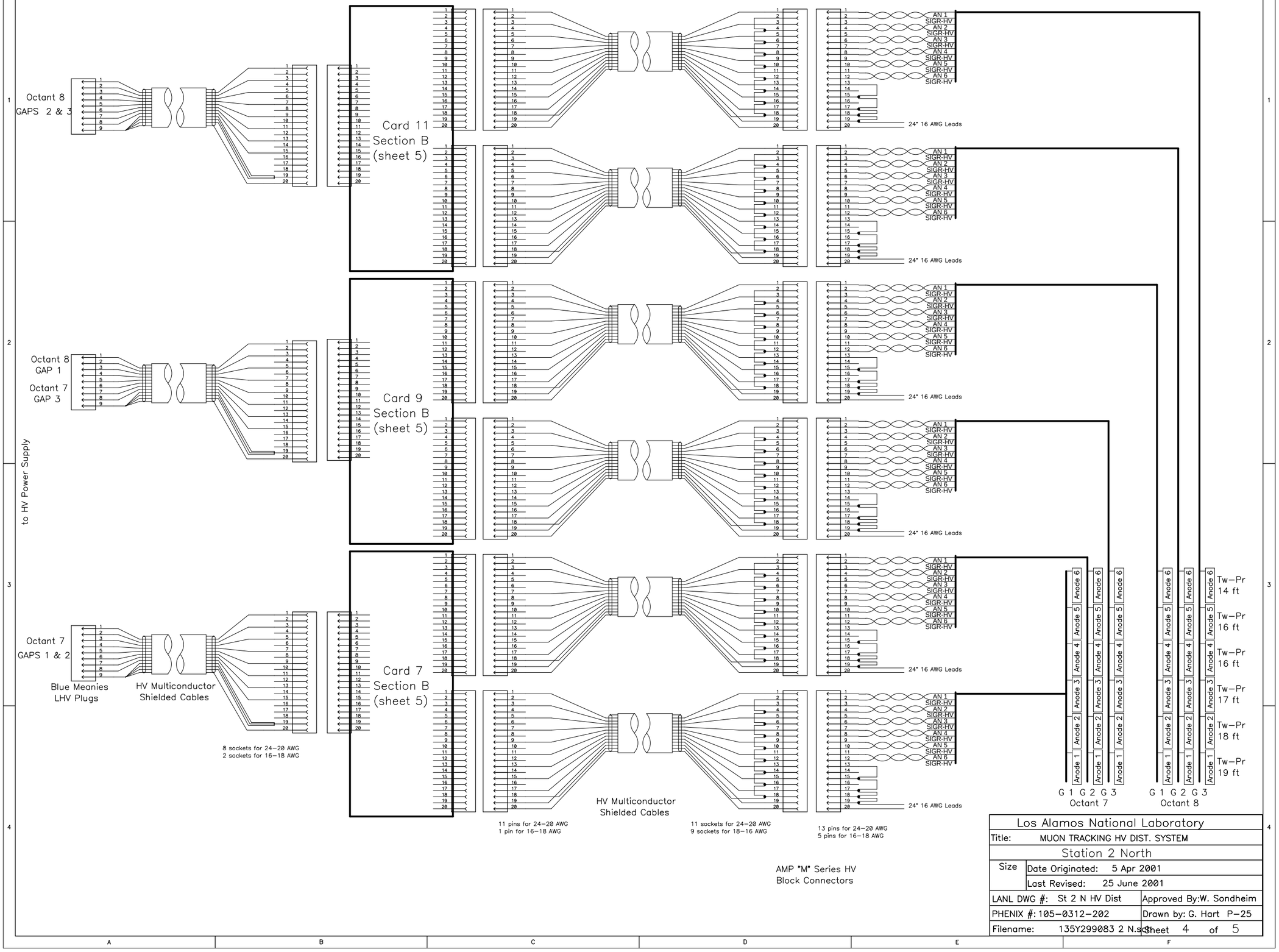
Tw–Pr
16 ft

Tw–Pr
17 ft

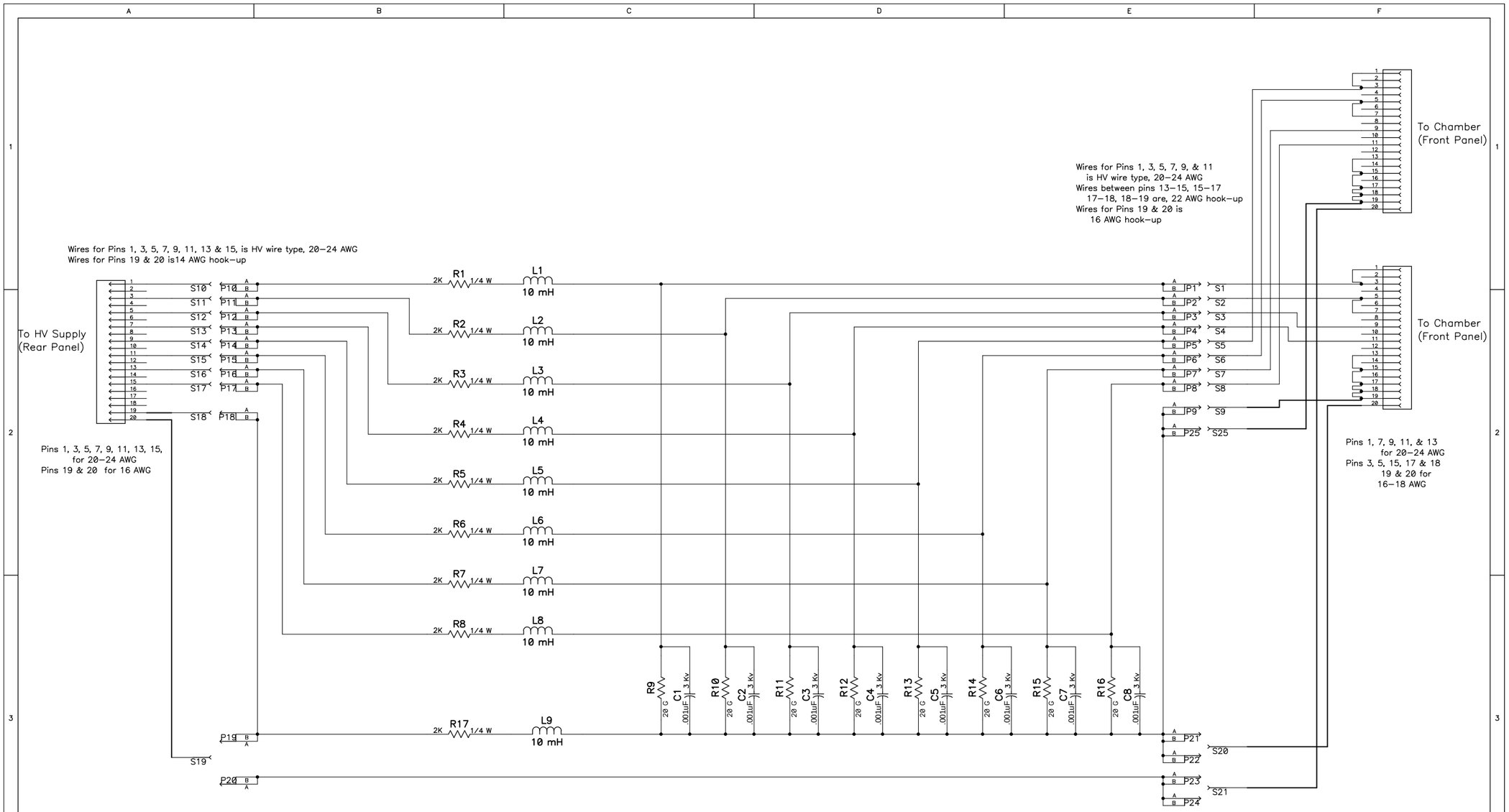
Tw–Pr
18 ft

Tw–Pr
19 ft

Los Alamos National Laboratory		
Title: MUON TRACKING HV DIST. SYSTEM		
Station 2 North		
Size	Date Originated: 5 Apr 2001	
	Last Revised: 25 June 2001	
LANL DWG #: St 2 N HV Dist		Approved By: W. Sondheim
PHENIX #: 105–0312–202		Drawn by: G. Hart P–25
Filename: 135Y299083 2 N.sch		Sheet 3 of 5

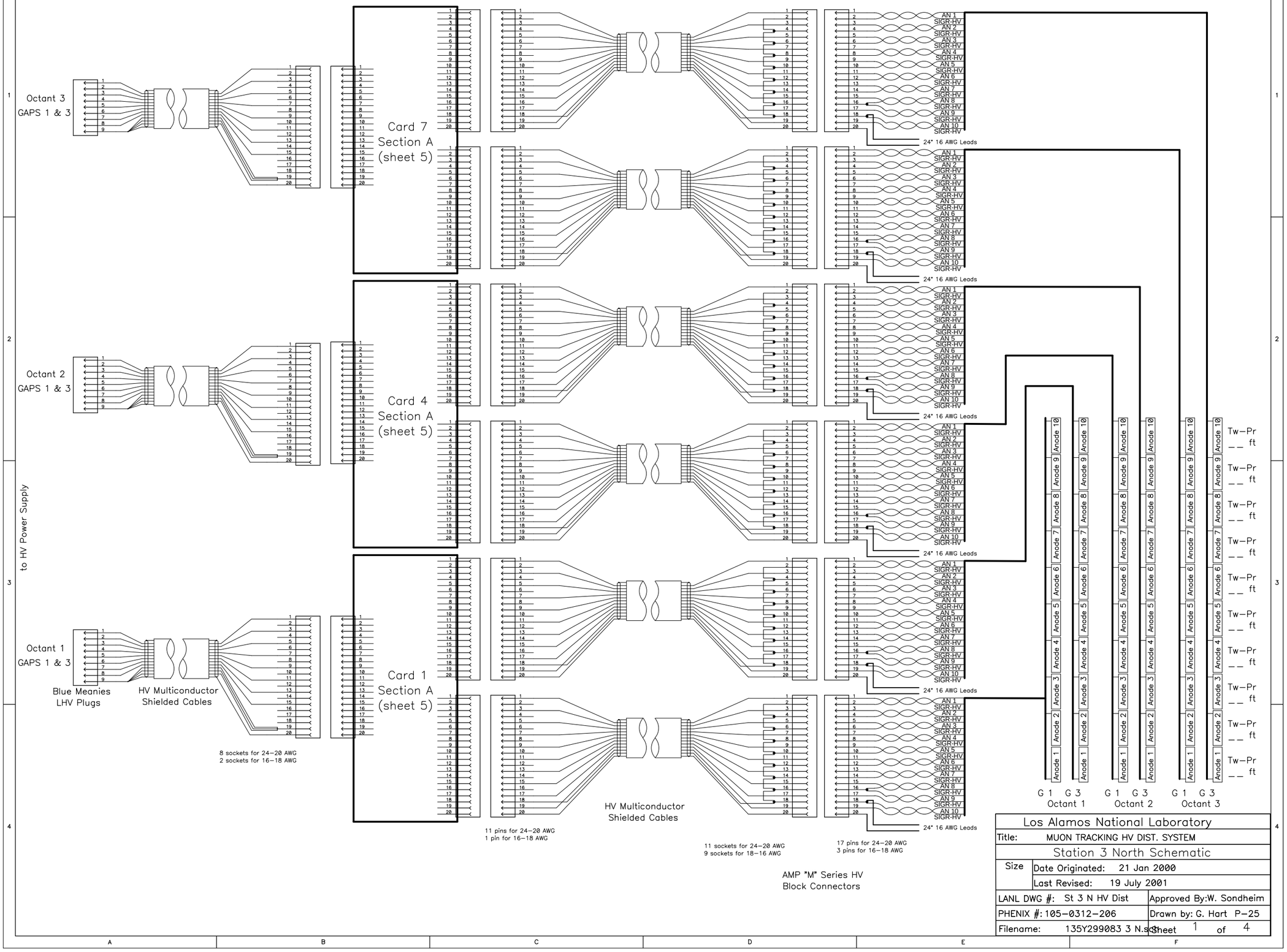


Los Alamos National Laboratory	
Title: MUON TRACKING HV DIST. SYSTEM	
Station 2 North	
Size	Date Originated: 5 Apr 2001
	Last Revised: 25 June 2001
LANL DWG #: St 2 N HV Dist	Approved By: W. Sondheim
PHENIX #: 105–0312–202	Drawn by: G. Hart P–25
Filename: 135Y299083 2 N.sch	Sheet 4 of 5



Typical 8 channels of Distribution / Filter Box

Los Alamos National Laboratory		
Title: MUON TRACKING HV DIST. SYSTEM		
Station 2 North		
Size	Date Originated: 5 Apr 2001	
	Last Revised: 25 June 2001	
LANL DWG #: St 2 N HV Dist		Approved By:W. Sondheim
PHENIX #: 105–0312–202		Drawn by: G. Hart P–25
Filename: 135Y299083 2 N.sch		Sheet 5 of 5



Los Alamos National Laboratory		
Title:	MUON TRACKING HV DIST. SYSTEM	
	Station 3 North Schematic	
Size	Date Originated: 21 Jan 2000	
	Last Revised: 19 July 2001	
LANL DWG #: St 3 N HV Dist		Approved By:W. Sondheim
PHENIX #: 105–0312–206		Drawn by: G. Hart P–25
Filename: 135Y299083 3 N.sch		Sheet 1 of 4

Octant 6
GAPS 1 & 3

Octant 5
GAPS 1 & 3

Octant 4
GAPS 1 & 3

Blue Meanies
LHV Plugs

HV Multiconductor
Shielded Cables

8 sockets for 24–20 AWG
2 sockets for 16–18 AWG

Card 4
Section B
(sheet 5)

Card 1
Section B
(sheet 5)

Card 10
Section A
(sheet 5)

to HV Power Supply

AN 1 SIGR-HV
AN 2 SIGR-HV
AN 3 SIGR-HV
AN 4 SIGR-HV
AN 5 SIGR-HV
AN 6 SIGR-HV
AN 7 SIGR-HV
AN 8 SIGR-HV
AN 9 SIGR-HV
AN 10 SIGR-HV

24" 16 AWG Leads

HV Multiconductor
Shielded Cables

11 pins for 24–20 AWG
1 pin for 16–18 AWG

11 sockets for 24–20 AWG
9 sockets for 18–16 AWG

17 pins for 24–20 AWG
3 pins for 16–18 AWG

AMP "M" Series HV
Block Connectors

Anode 1 | Anode 2 | Anode 3 | Anode 4 | Anode 5 | Anode 6 | Anode 7 | Anode 8 | Anode 9 | Anode 10

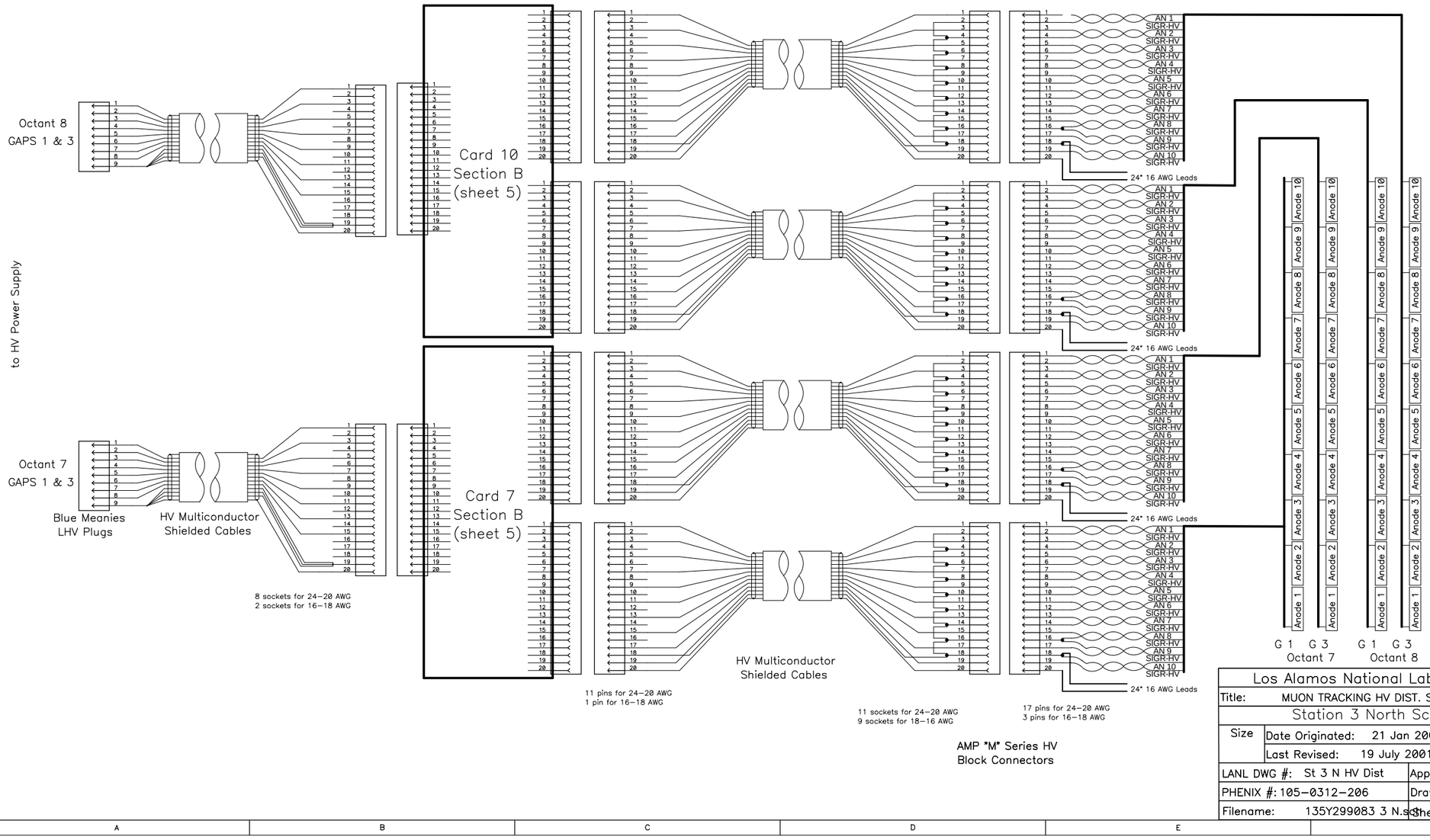
Tw–Pr
__ ft

G 1 G 3
Octant 4

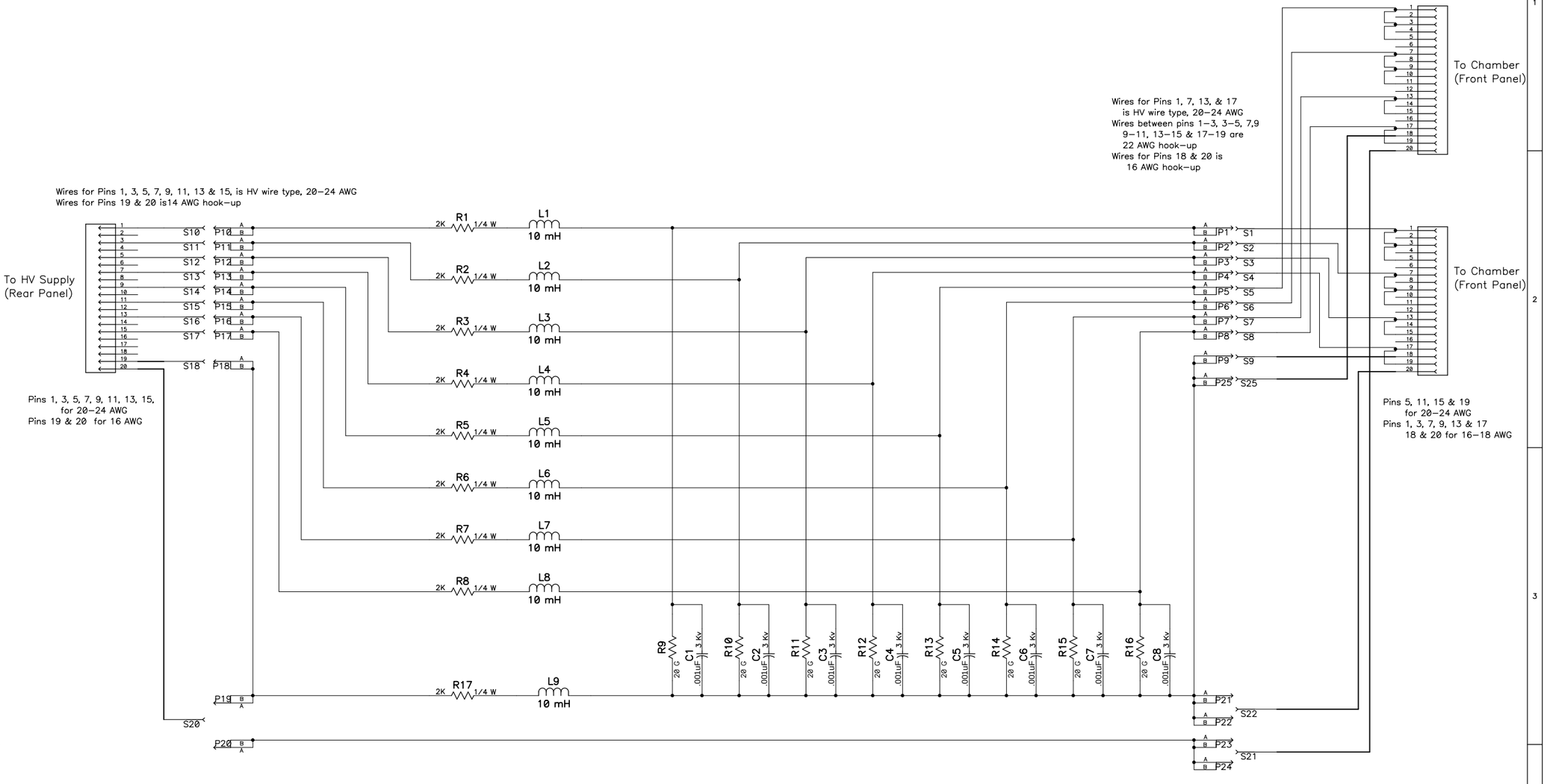
G 1 G 3
Octant 5

G 1 G 3
Octant 6

Los Alamos National Laboratory	
Title: MUON TRACKING HV DIST. SYSTEM	
Station 3 North Schematic	
Size	Date Originated: 21 Jan 2000
	Last Revised: 19 July 2001
LANL DWG #: St 3 N HV Dist	Approved By:W. Sondheim
PHENIX #: 105–0312–206	Drawn by: G. Hart P–25
Filename: 135Y299083 3 N.sch	Sheet 2 of 4



Los Alamos National Laboratory		
Title:	MUON TRACKING HV DIST. SYSTEM	
Station 3 North Schematic		
Size	Date Originated: 21 Jan 2000	
	Last Revised: 19 July 2001	
LANL DWG #: St 3 N HV Dist		Approved By: W. Sondheim
PHENIX #: 105-0312-206		Drawn by: G. Hart P-25
Filename: 135Y299083 3 N.sch		Sheet 3 of 4



Typical 8 channels of Distribution / Filter Box

Los Alamos National Laboratory		
Title: MUON TRACKING HV DIST. SYSTEM		
Station 3 North Schematic		
Size	Date Originated: 21 Jan 2000	
	Last Revised: 19 July 2001	
LANL DWG #: St 3 N HV Dist		Approved By:W. Sondheim
PHENIX #: 105–0312–206		Drawn by: G. Hart P–25
Filename: 135Y299083 3 N.sch		Sheet 4 of 4

North Arm HVDS Components

Amp Type M Block Connector

20 HVC Series M Overview
http://catalog.tycoelectronics.com/TE/docs/pdf/1/37/159731.pdf
Type III Pin, 66099
http://catalog.tycoelectronics.com/TE/docs/pdf/9/07/162709.pdf
Type III Socket, 66101
http://catalog.tycoelectronics.com/TE/docs/pdf/1/17/162711.pdf
Type III Pin, 66103
http://catalog.tycoelectronics.com/TE/docs/pdf/3/85/206583.pdf
Type III Socket, 66105
http://catalog.tycoelectronics.com/TE/docs/pdf/4/85/206584.pdf
Type III Contacts, Application Note
http://catalog.tycoelectronics.com/TE/docs/pdf/0/25/158520.pdf
Block connector, 203908
http://catalog.tycoelectronics.com/TE/docs/pdf/4/02/167204.pdf
Block connector, 203909
http://catalog.tycoelectronics.com/TE/docs/pdf/5/02/167205.pdf
Internal Hood, 202434
http://catalog.tycoelectronics.com/TE/docs/pdf/4/71/167174.pdf
Strain Relief, 201224
http://catalog.tycoelectronics.com/TE/docs/pdf/5/80/167085.pdf
Jackscrew, fixed stud kit. 200874
http://catalog.tycoelectronics.com/TE/docs/pdf/5/60/167065.pdf
Jackscrew, female kit, 200867
http://catalog.tycoelectronics.com/TE/docs/pdf/1/60/167061.pdf
Corner guide pin kit, 200833
http://catalog.tycoelectronics.com/TE/docs/pdf/7/41/198147.pdf
Corner guide socket kit, 200835
http://catalog.tycoelectronics.com/TE/docs/pdf/8/41/198148.pdf
Short shield kit, 200517
http://catalog.tycoelectronics.com/TE/docs/pdf/8/11/186118.pdf

LeCroy 9 Pin Plug Connector

Type XI socket, 203802
http://catalog.tycoelectronics.com/TE/docs/pdf/7/89/181987.pdf
Application sheet, Type XI contacts
http://catalog.tycoelectronics.com/TE/docs/pdf/9/15/158519.pdf
Instruction Sheet for type XI hand crimper 90260
http://catalog.tycoelectronics.com/TE/docs/pdf/9/38/206839.pdf

Wire / Cable

Belden, 83026 hook-up wire
http://ecom.belden.com/static/ZZBLDNTD01FROMCATA.HTM?P0=83026
Belden, 83030 hook-up wire
http://ecom.belden.com/static/ZZBLDNTD01FROMCATA.HTM?P0=83030
General Wire Products, 11 cond. HV cable data sheet
Page 63
Judd, 5KV hook-up wire
http://www.juddwire.com/jwelcome.nsf/flexrad_hv.htm

Hardware

Bud cabinet
http://www.budind.com/pdf/hb14097.pdf
SPC / Multicomp, 2642 Card guide
http://www.newark.com/product-details/datasheet/spc/92n4857.pdf
Keystone, Male PC Tab terminals
http://www.newark.com/product-details/text/cd119/9192.html
Voltrex, Solderless push-on crimp terminals
http://www.newark.com/product-details/text/cd119/5503.html

Electronic Components

Sprague, 125LD10 HV Capacitor
http://www.newark.com/product-details/text/cd119/7093.html
SPC / Multicomp½ watt carbon composition resistors
http://www.newark.com/product-details/text/cd119/17346.html
JW Miller, 9250 molded inductor
http://www.newark.com/product-details/text/cd119/7366.html
Ohmite, MOX high value resistor
http://www.ohmite.com/catalog/pdf/v_minimox.pdf
GC 19-155 Silicone
http://www.newark.com/product-details/text/cd119/7522.html

GENERAL WIRE PRODUCTS INC.
425 SHREWBURY STREET
WORCHESTER, MA. USA 01604
TEL # 508-753-2173
FAX # 508-753-2173

SPECIFICATION ON GWP P/N 001-21919 REVISION B

- -

DESCRIPTION: THE CABLE OUTLINED HERE SHALL MEET OR EXCEED THE PHYSICAL AND ELECTRICAL PERFORMANCE REQUIREMENTS AS OUTLINED IN CEBAF SPECIFICATION 6620-S-01636. ALL MATERIALS AND METHODS USED IN THE MANUFACTURE AND TEST OF THIS PLENUM RATED PRODUCT SHALL COMPLY WITH UL SUBJECTS 13, 910 AND 1581

- -

GWP P/N	001-21919 REVISION B
CONDUCTOR AWG / STRANDING	#22 19/34 TINNED COPPER
CONDUCTOR DIAMETER	.031”
INSULATION MATERIAL / THICKNESS	TEFZEL / .020”
INSULATION DIAMETER	.071”
TYPE OF COMPONENT	SINGLE CONDUCTOR
NUMBER OF COMPONENTS	11
COLOR CODE	BLK, BRN, RED, ORG, YEL, GRN, BLU, VIO, GRY, WHT, WHT/BLU – BAND MARKED
CABLE FABRICATION	1.6 TWISTS FER FOOT
CABLE DIAMETER	.284”
BINDER	.002” CLEAR MYLAR
FIRST SHIELD	100% FOIL FREE ALUMINIUM FOIL OUT
SECOND SHIELD	90% TINNED COPPER BRAID
DIAMETER OVER SHIELD	.308”
JACKET MATEIAL / THICKNESS	TEFZEL / .015”
COLOR:	RED
FINISHED CABLE DIAMTER	.338”
WIEGHT	41.67 g/ft (1.47 oz/ft), (136.71 g/M), (4.82 oz/M)

PRINT: “E102914 CL2P 22 AWG 150 C. (UL)”

- -

MINIMUM ELECTRICAL REQUIREMENTS

SPARK VOLTAGE INLINE	10 KV DC
HI-POT	10 KV DC
INSULATION RESISTANCE	1,000 VOLTS

- -