Technical notes for No traffic CU and Caltrans type traffic light cabinet interfaces

Scope

Scope of this document is to demonstrate the connection between Notraffic CU and Caltrans Traffic light cabinet in cases where there is no SDLC communication or other communication channel available in the Traffic Light Controller. In these cases, CU connectivity requires a special harness to interact with traffic light cabinet elements.

Safety Notice

Output file and other locations in the cabinet are powered by 110VAC and touching any exposed metal that is electrified is dangerous.Make sure you verify absence of voltage (less than 50V) before touching exposed metal you are not sure about.

CU connection to cabinet does not require handling any 110VAC wires

Points of Interest in Caltrans Traffic light cabinet

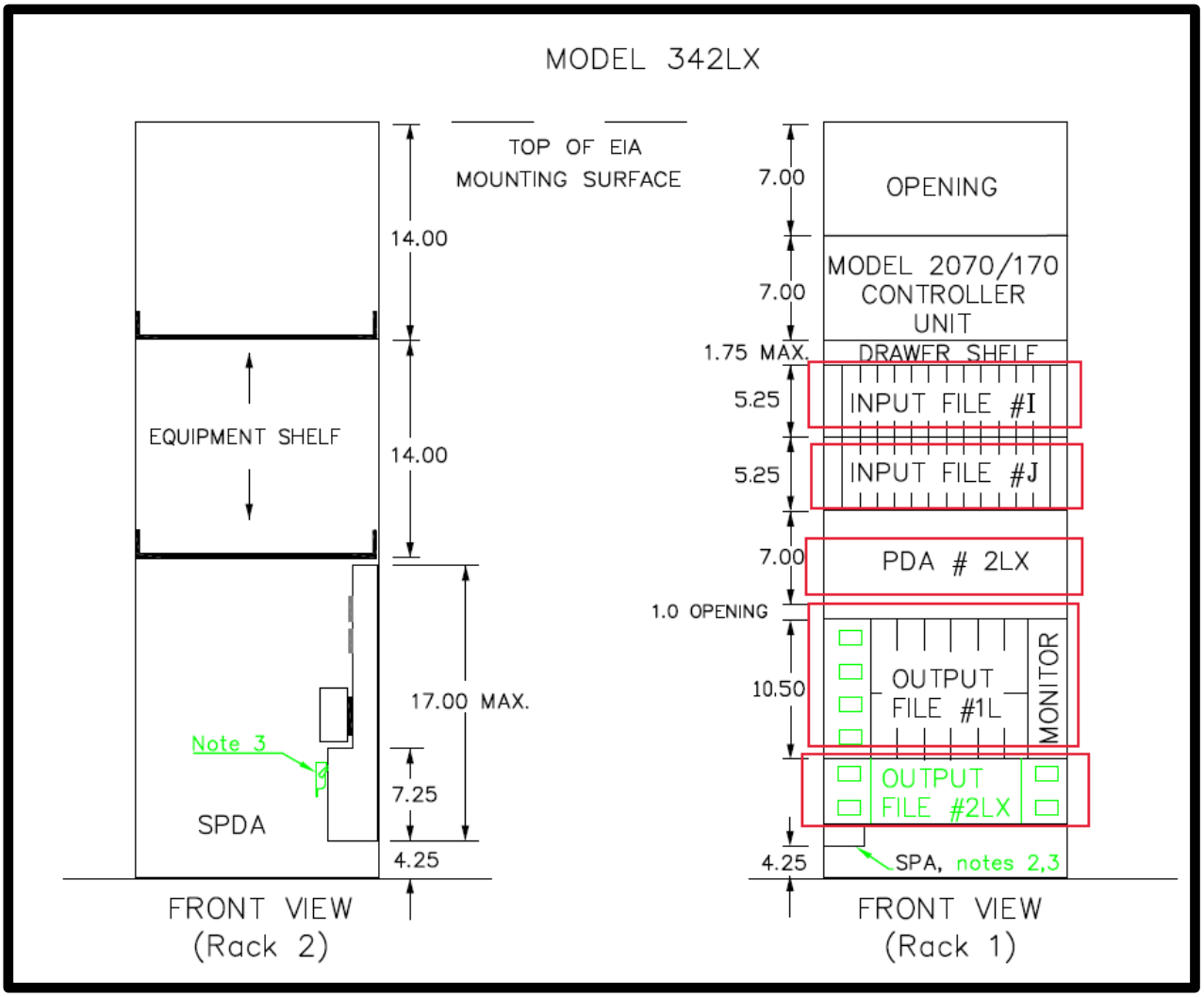
There are four points of interest in traffic light cabinet that are important for CU connectivity

- **C1 harness** - This harness is the mechanical and electrical interface between traffic light controller (2070) and input/output files
- **Input Files** - This is the part in the cabinet holding the loop detector control modules, there are two of them, Input File I and J.
- **Output files** - This is the part in the cabinet housing the load switch that turns ON/OFF the traffic light signal according to traffic light controller command. There are one or two output files in the cabinet (#1L and #2LX), depending on the number of traffic light signals that are in the controlled junction.
- **VREF DC power** - All control interfaces in the cabinet use a local 24VDC power supply that is wired inside the cabinet providing power to various elements. CU uses this power for sensing and operating cabinet elements.

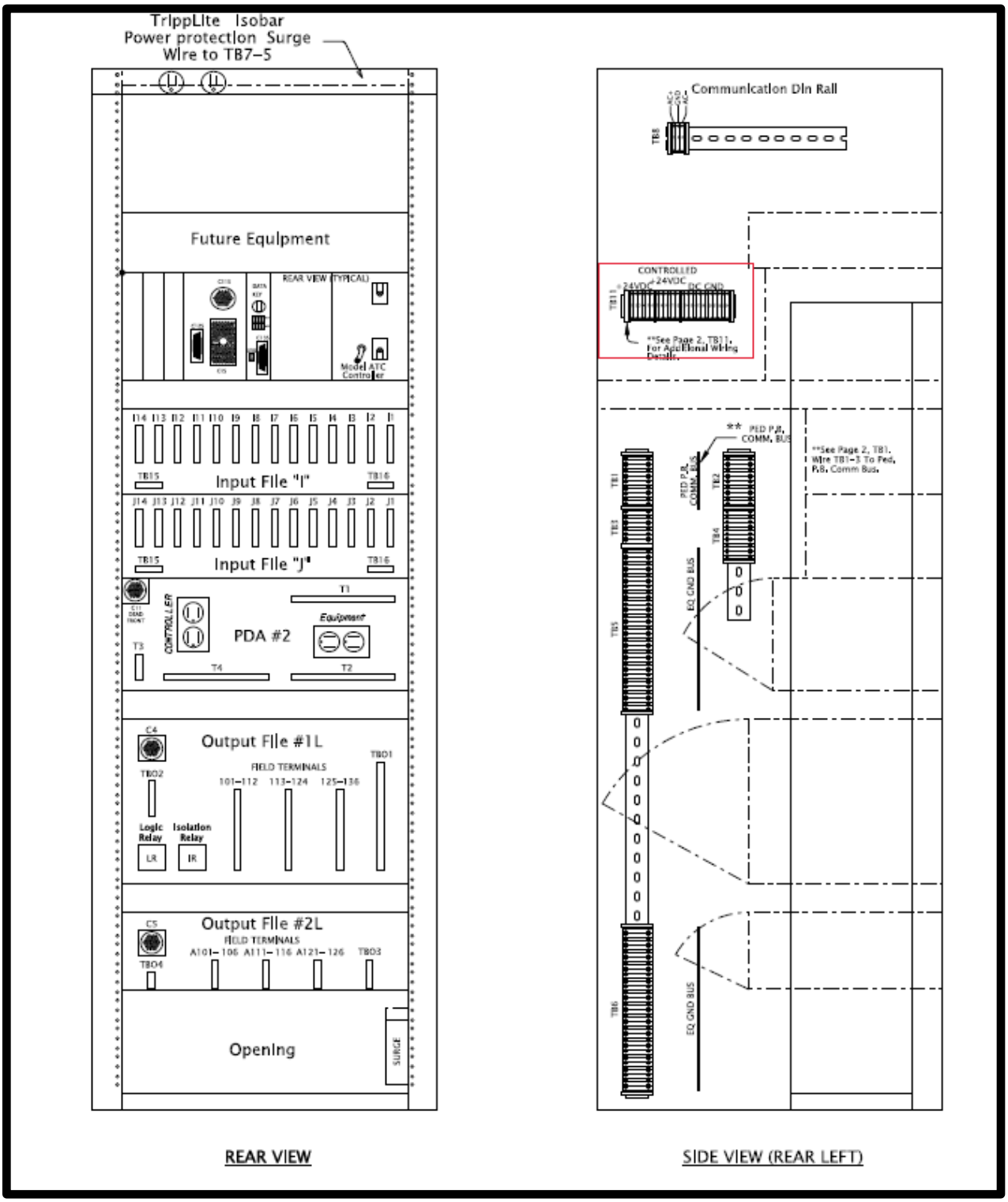
Diagrams of points of interest in next pages

Caltrans Traffic light cabinet points of interest diagram (taken from TEES2020 page 372)

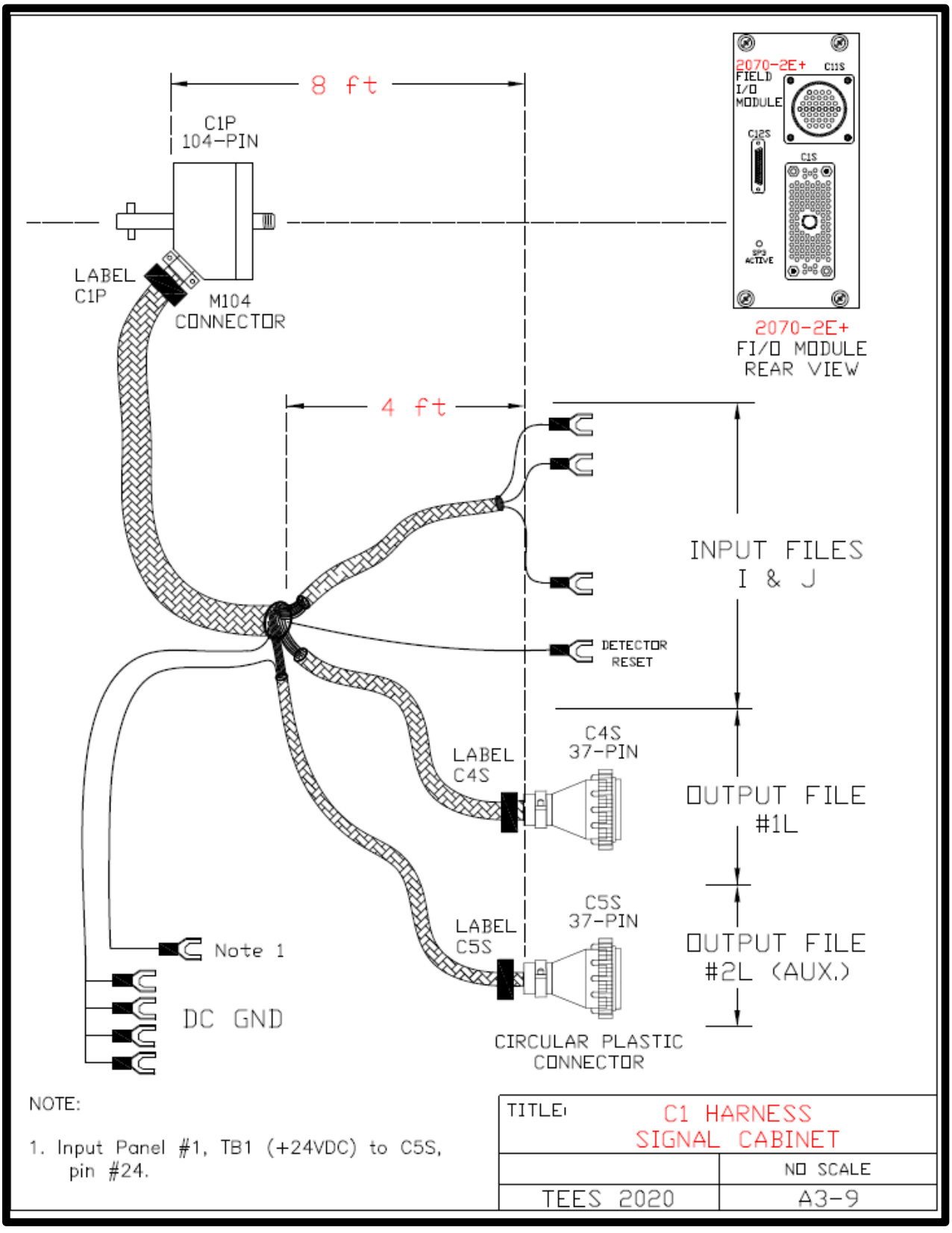
- Input and Output files
- 24 VDC power supply (PDA = Power Distribution Assembly)



24VDC internal bus bar on cabinet wall



C1 Harness and connection points in cabinet



Control Unit (CU) Points of Interest

General

No traffic Control Unit uses dedicated hardware ports to connect to Traffic light cabinet elements to detect the current traffic light condition (Output file/s) and to emulate the loop detectors (Input File/s) to the traffic light controller (2070).

The method for connecting CU to the traffic light cabinet is a sniffing or “man in the middle” mode. And will be explained in detail in the following pages

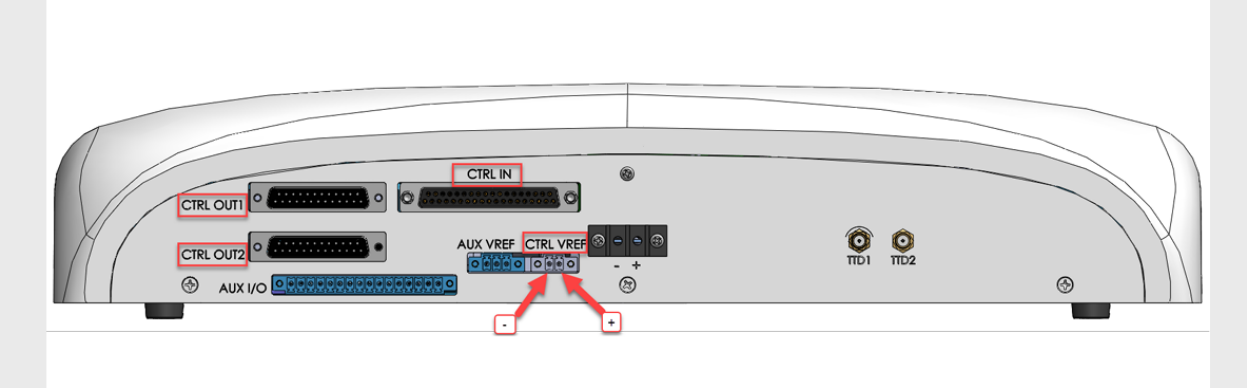
CU ports

CU uses the following ports to connect to Caltrans cabinet elements. The connection is done by dedicated harnesses. Except 24 VDC which requires black/red 20 AWG wire

- **24VDC power por**t - connects to traffic light cabinet 24VDC bus bar. Total two contacts 24VDC and DC-GND
  Blue female 2 positions, fixed polarity

- **Input File port** - Connects to C1 harness and lets CU generate electrical signals to the traffic light controller indicating a vehicle is in position of the loop. (the actual loops are dissables)
  D type 37 position marked CNTRL IN and harness CBL-AC000004-00

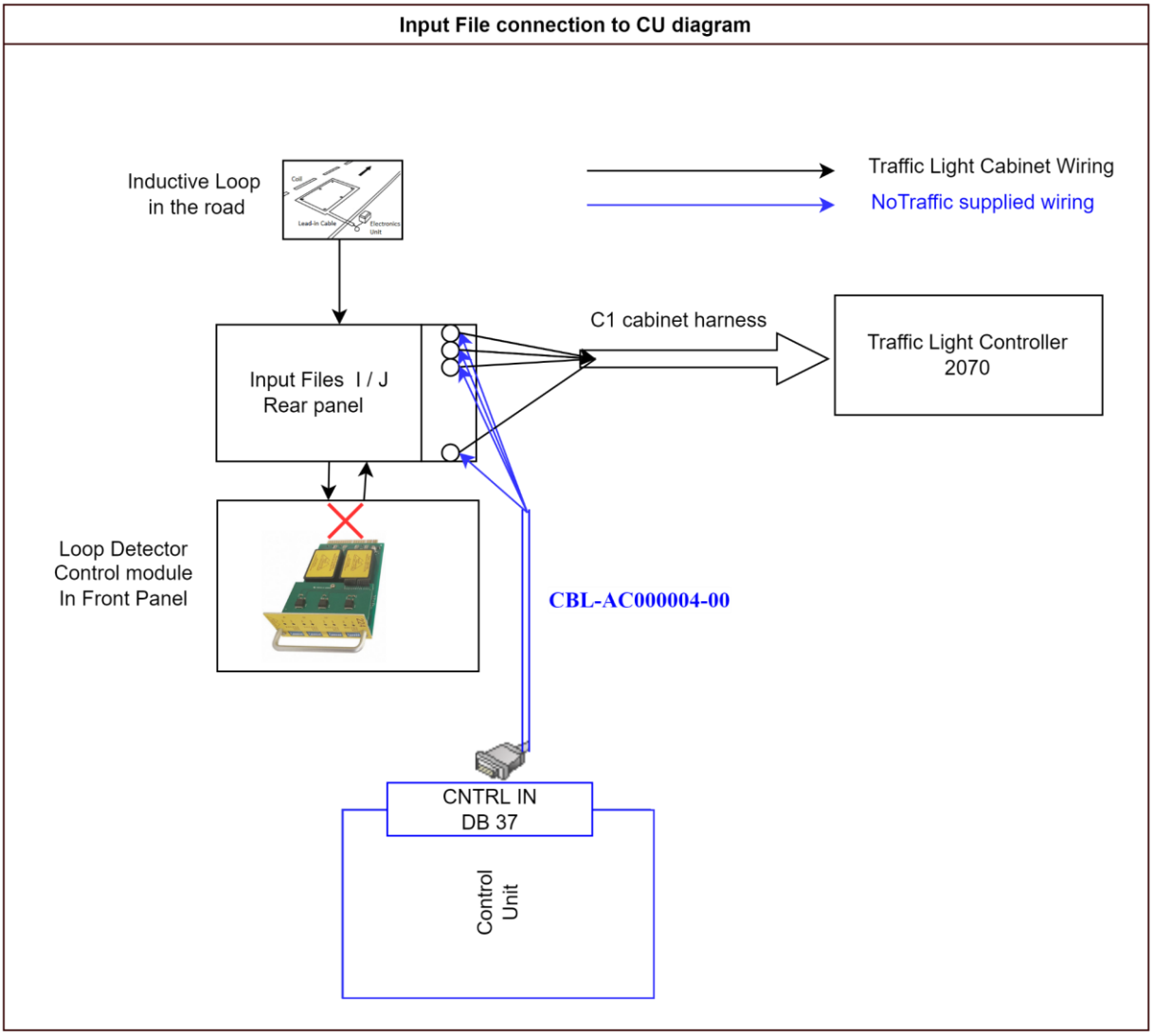
- **Output File ports -** Connects to C1 harness and enables CU to sense the voltage indicating what is the current state of each traffic light
  Two D type 25 position marked CNTRL OUT 1 and 2 on the rear side of CU



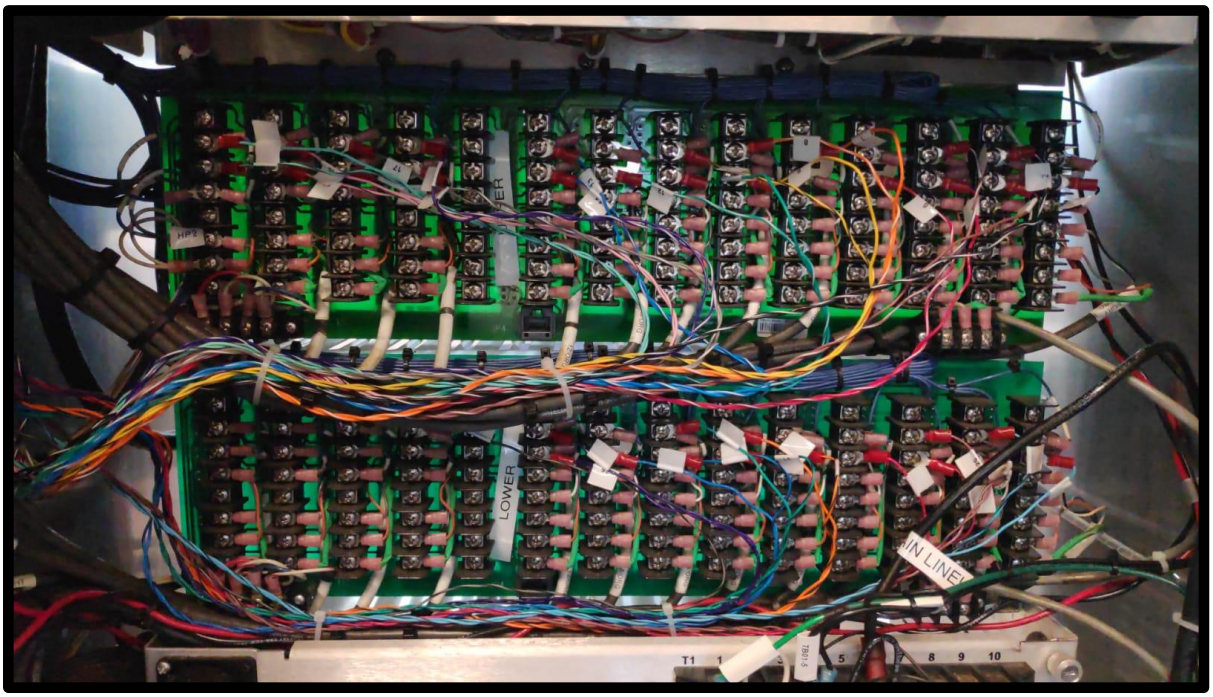
CU connection to Traffic light cabinet input files

- CU overrides the loop detector indications and generates the electrical signal to the Traffic light controller instead of the actual loop detector in the road.
- Before connecting the CU to Input file, the Loop Detector control modules should be pulled out of the front panel of the input file.
- CU is connected to terminal block with NoTraffic harness PN CBL-AC000004-00

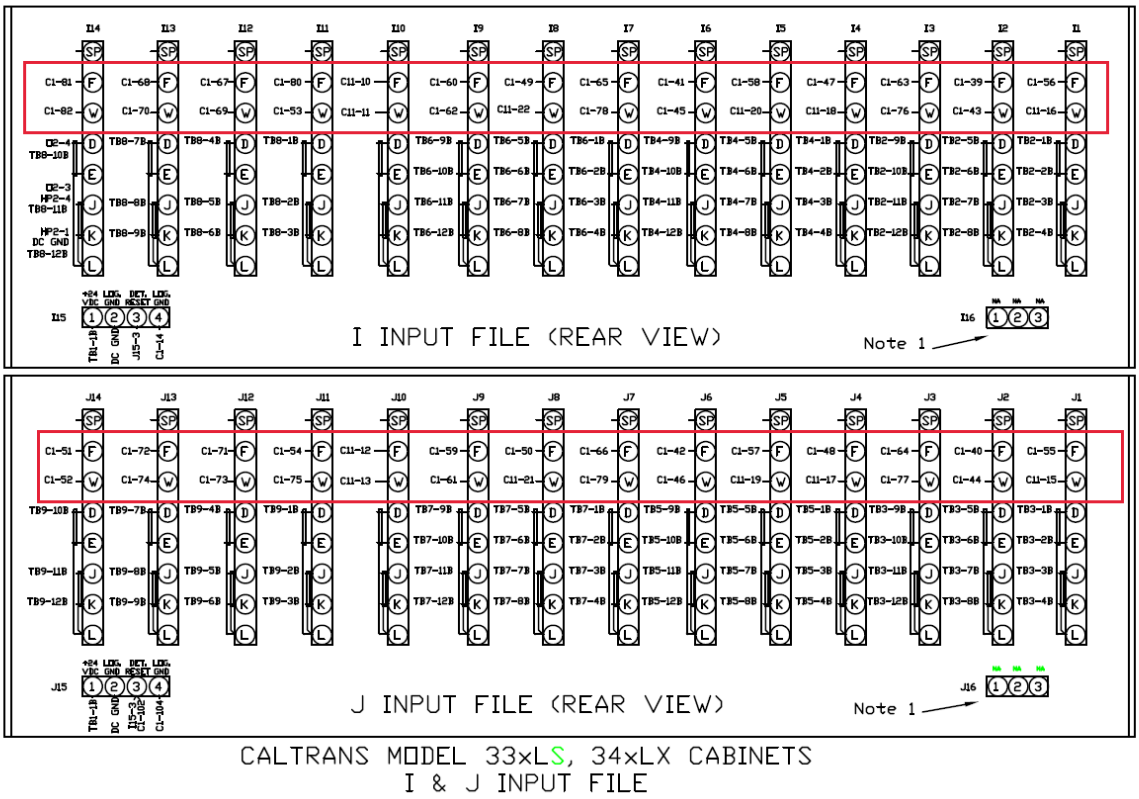
Input File connection to CU diagram



Input FIle I/J, rear panel view with CBL-AC000004-00 spades connected.



Input File rear panel pin mapping - CBL-AC000004-00 spades connect to F and W screws



CALTRANS MODEL 33xLS, 34xLX CABINETS
I & J INPUT FILE

Input File Pin mapping

Behind every vertical terminal block in the rear panel of Input file there is a loop detector control module which is physically connected to the loop in the road and translates the loop signal into a digital signal fed into the traffic light controller.

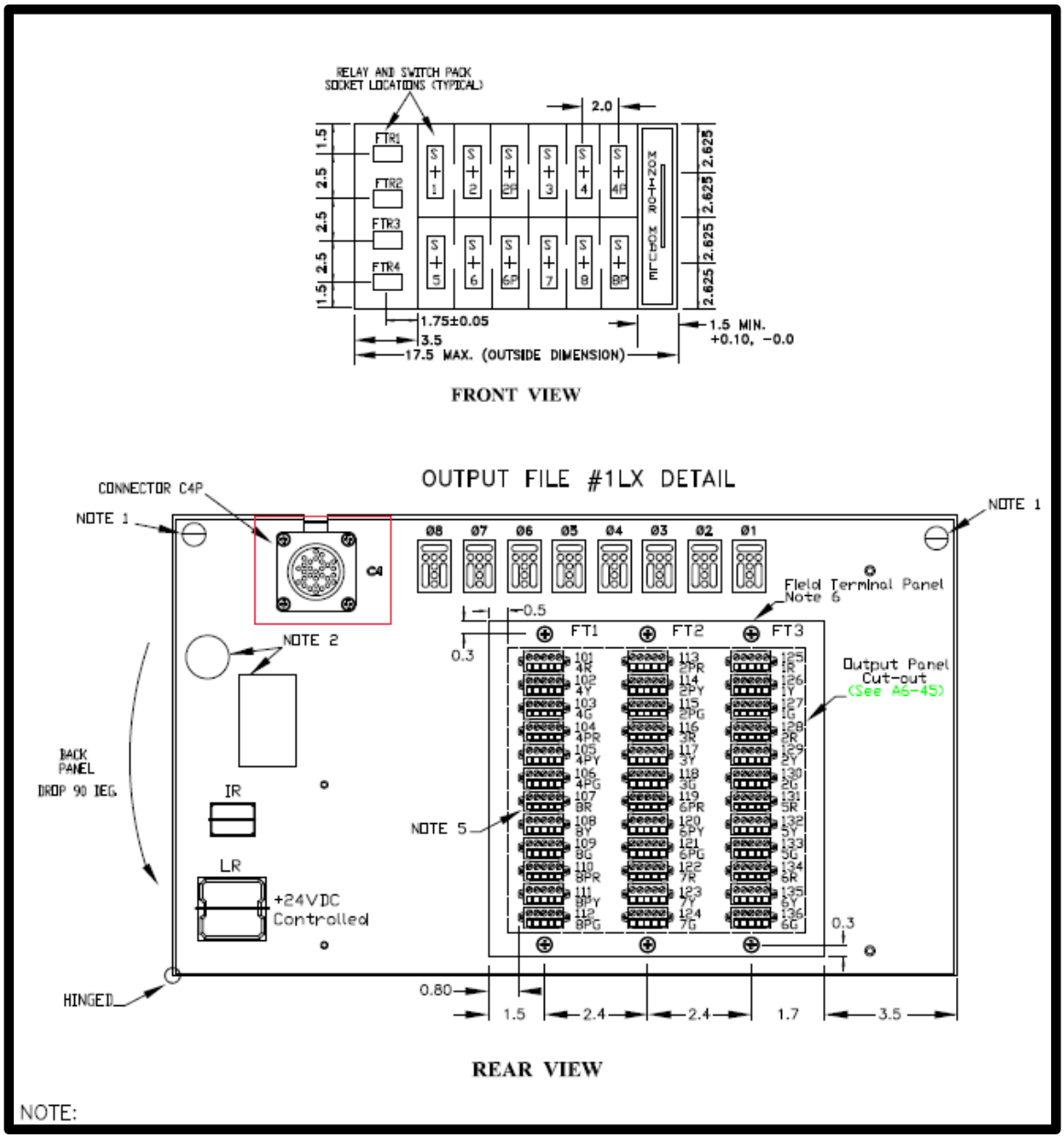
Each Vertical terminal block in the rear panel of Input file has two detector signals (screws F and W). Near each screw there is a pin number (example C1-81) meaning that this loop detector signal is connected to traffic light controller C1 input pin number 81 (C1 connector has 104 signals).

CU harness - CBL-AC000004-00 has 37 spades marked from 1 to 37. Each spade is connected to a pin in the DB 37 connector. When connecting a specific spade to a specific loop detector screw (F / W) the matching is created, and has to be entered into CU Intersection manager.

Output File #1LX - connection to CU

Output file #1L has up to 12 load switches that operate up to 36 traffic light signals. Each load switch controls R/G/Y lights or WK/D-WK pedestrian lights. Connection port is the C4P port.

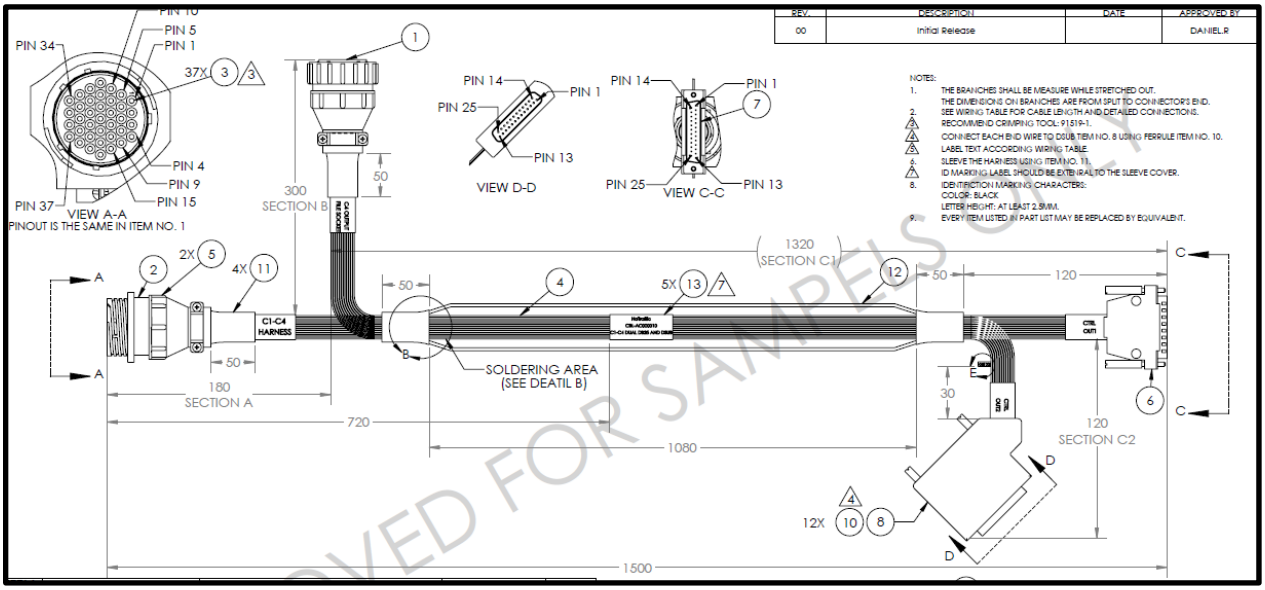
To connect CU to cabinet remove (disconnect) C1 harness from C4P in the rear port of #1LX. Then follow the wiring diagram in next pages



CU connection instructions

Control Connection

In cabinets with one output file (#1L), NoTraffic harness CBL-AC000010-00 is used to connect the CU to traffic light cabinet modules. CBL-AC000010-00 has a ‘Y’ type side with 2 CPC (Circular Plastic Connectors) that connect to Output file C4P port and to C1 harness (C4S port). The other end of the harness has 2 DB25 connectors that connect to the CU back panel.

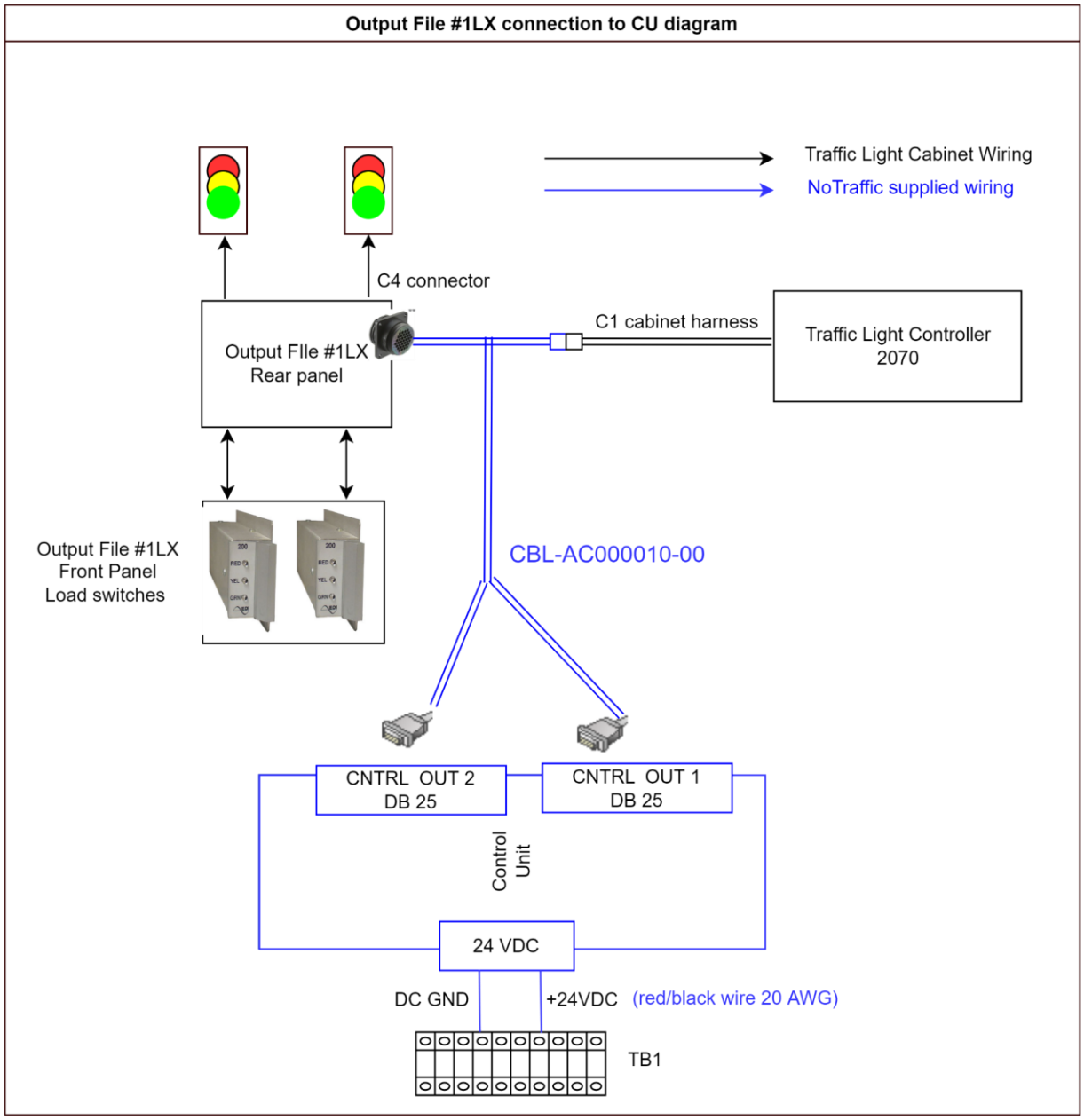


*CBL-AC000010-00

VREF DC connection

Since the traffic light controller uses a 24VDC power supply to control the load switches, it is needed to connect the CU to this power rail. The DC power supply is routed inside the cabinet to several modules and terminal blocks. Terminal block TB1 is the most common and accessible for connecting to CU. Connection wires should be prepared on site, with general wire (Red/Black 20 AWG) according to actual length. CU back panel has a 2 pin, blue terminal block for the 24VDC and DC GND ports

Output File - CU connection and wiring diagram



Output File #1LX Pin mapping notes

Intersection manager

- **PIN Number** - Intersection manager PIN NUMBER is the same as C4 pin number
- PIN 1 to PIN 25 are routed to CNTRL 1 port of CU,
- PIN 26 to PIN 37 are routed to CNTRL 2 port of CU
- **Note** - PIN 37 is not a traffic light control signal but the WatchDog signal (WD-MU) that is generated by module 208 (monitors AC and DC voltages in cabinet and triggers alarm when voltages are out of specs)

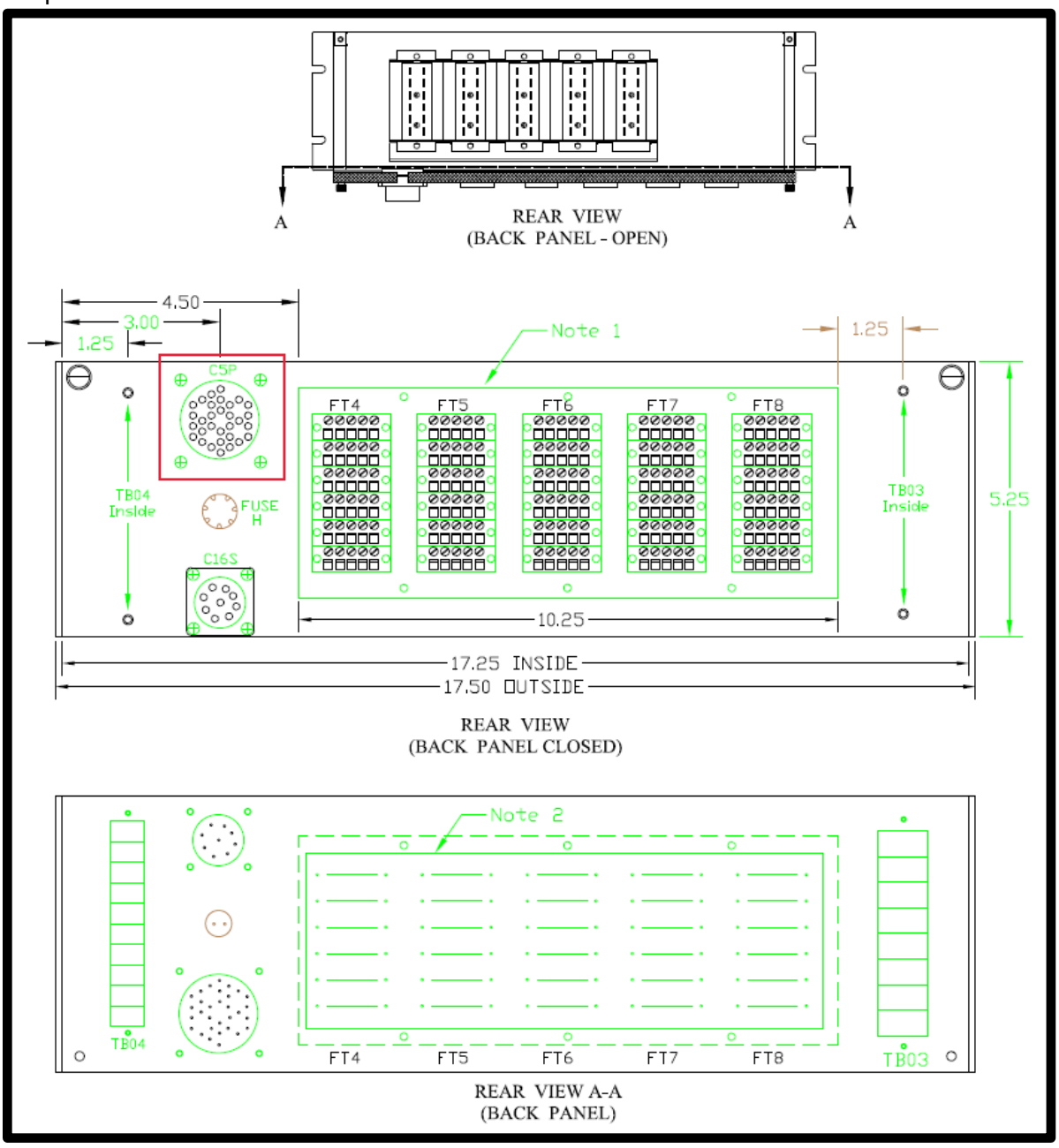
C4 HARNESS WIRING LIST #1 AND #3

PIN	SOURCE	DESTINATION
1	C1-2	SWPK 4P-RED
2	C1-3	SWPK 4P-GRN
3	C1-4	SWPK 4-RED
4	C1-5	SWPK 4-YEL
5	C1-6	SWPK 4-GRN
6	C1-7	SWPK 3-RED
7	C1-8	SWPK 3-YEL
8	C1-9	SWPK 3-GRN
9	C1-10	SWPK 2P-RED
10	C1-11	SWPK 2P-GRN
11	C1-12	SWPK 2-RED
12	C1-13	SWPK 2-YEL
13	C1-15	SWPK 2-GRN
14	C1-16	SWPK 1-RED
15	C1-17	SWPK 1-YEL
16	C1-18	SWPK 1-GRN
17	C1-19	SWPK 8P-RED
18	C1-20	SWPK 8P-GRN
19	C1-21	SWPK 8-RED
20	C1-22	SWPK 8-YEL
21	C1-23	SWPK 8-GRN
22	C1-24	SWPK 7-RED
23	C1-25	SWPK 7-YEL
24	C1-26	SWPK 7-GRN
25	C1-27	SWPK 6P-RED
26	C1-28	SWPK 6P-GRN
27	C1-29	SWPK 6-RED
28	C1-30	SWPK 6-YEL
29	C1-31	SWPK 6-GRN
30	C1-32	SWPK 5-RED
31	C1-33	SWPK 5-YEL
32	C1-34	SWPK 5-GRN
33	C1-35	SWPK 2P-YEL
34	C1-36	SWPK 6P-YEL
35	C1-37	SWPK 4P-YEL
36	C1-38	SWPK 8P-YEL
37	C1-103	SWPK WDT-MU

Output File #1LX and #2LX - connection to CU

In traffic light cabinets with 2 output files there are more Traffic light signals to monitor and the harness below (CBL-AC000008-00) is used to connect between output files and CU. Before connecting CU, disconnect cabinet C1 harness from #1LX output file C4 port and from #2LX output file C5P port.

Output file #2LX



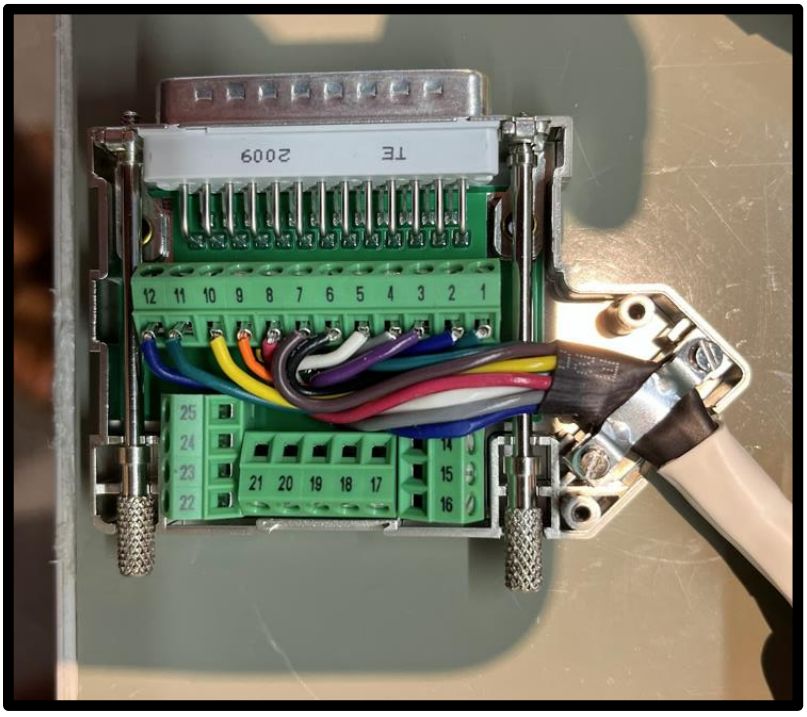
Output File #2LX Pin mapping notes

Output file #2LX controls 18 traffic light signals (6 load switches with 3 lights each load)
The signals from #2LX are routed to DB 25 marked CNTRL OUT2 and indicate the below traffic signals.

Intersection manager mapping

- PIN 38 to 48 are mapped to C5.1 to C5.12
- C5 pins 12 to 18 (7 signals) are not routed to CU. if these signals are needed for intersection then they can be swapped with other signals that are routed to CNTRL 2 BD 25 connector.
- The DB 25 connector has an internal terminal block to enable this swap.

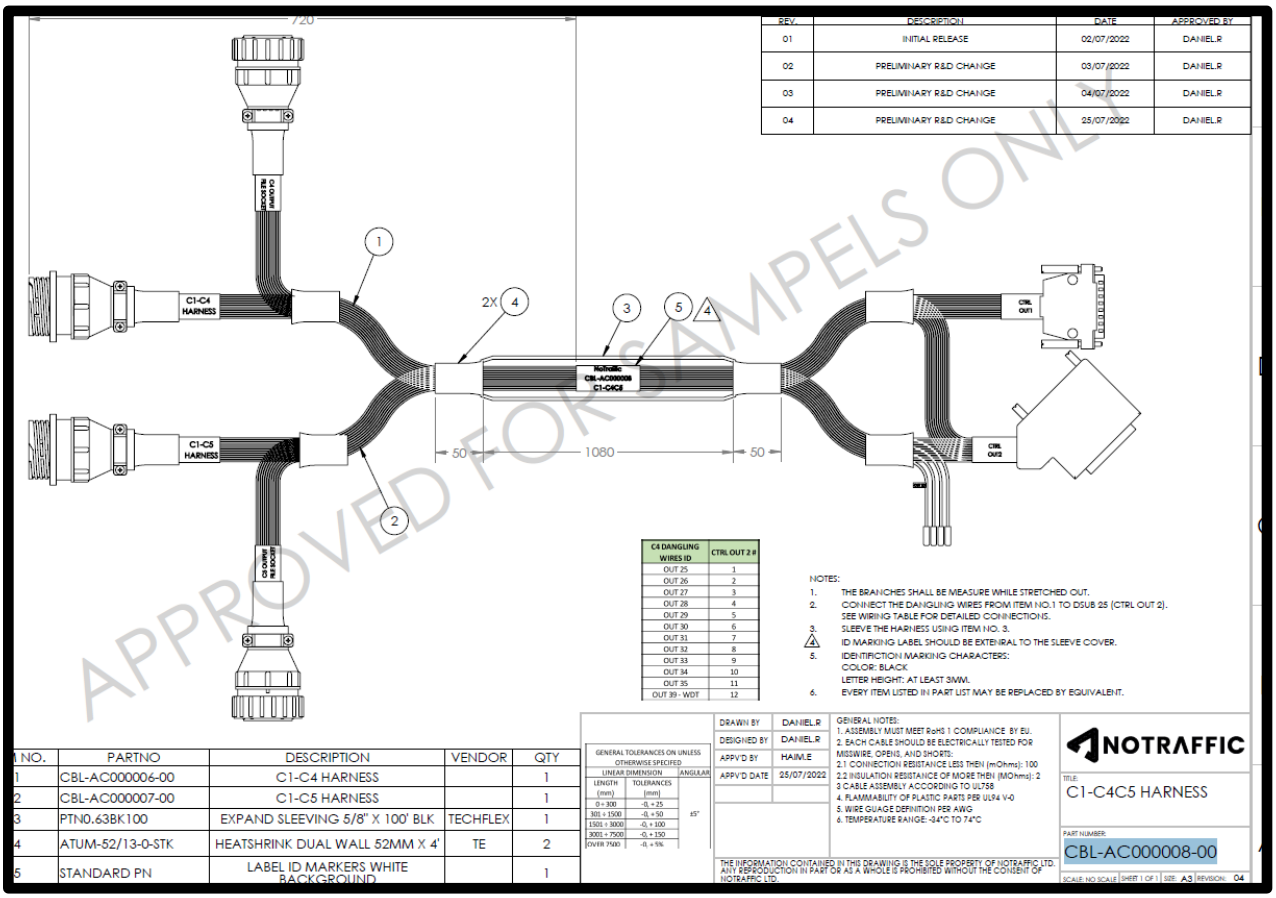
CNTRL-2 internal interface



C5 HARNESS WIRING LIST #1 AND #2

PIN	SOURCE	DESTINATION
1	C1-83	SWPK 14-RED N/A
2	C1-84	SWPK 14-GRN N/A
3	C1-85	SWPK 13-RED
4	C1-86	SWPK 13-YEL
5	C1-87	SWPK 13-GRN
6	C1-88	SWPK 12-RED
7	C1-89	SWPK 12-YEL
8	C1-90	SWPK 12-GRN
9	C1-91	SWPK 11-RED HS
10	C1-93	SWPK 11-GRN GPO2
11	C1-94	SWPK 10-RED
12	C1-95	SWPK 10-YEL
13	C1-96	SWPK 10-GRN
14	C1-97	SWPK 9-RED
15	C1-98	SWPK 9-YEL
16	C1-99	SWPK 9-GRN
17	C1-100	SWPK 14-YEL N/A
18	C1-101	SWPK 11-YEL GPO1
19	NA	NA
20	NA	NA
21	NA	NA
22	NA	NA
23	NA	NA
24	+24 VDC	PIN 9, ALL SOCKETS

C1-C4C5 harness



REV.	DESCRIPTION	DATE	APPROVED BY
01	INITIAL RELEASE	02/07/2022	DANIEL.R
02	PRELIMINARY R&D CHANGE	03/07/2022	DANIEL.R
03	PRELIMINARY R&D CHANGE	04/07/2022	DANIEL.R
04	PRELIMINARY R&D CHANGE	25/07/2022	DANIEL.R

C4 DANGLING WIRES ID	CTRL OUT 2 #
OUT 25	1
OUT 26	2
OUT 27	3
OUT 28	4
OUT 29	5
OUT 30	6
OUT 31	7
OUT 32	8
OUT 33	9
OUT 34	10
OUT 35	11
OUT 39 - WDT	12

NOTES:
1. THE BRANCHES SHALL BE MEASURE WHILE STRETCHED OUT.
2. CONNECT THE DANGLING WIRES FROM ITEM NO.1 TO DSUB 25 (CTRL OUT 2). SEE WIRING TABLE FOR DETAILED CONNECTIONS.
3. SLEEVE THE HARNESS USING ITEM NO. 3.
4. ID MARKING LABEL SHOULD BE EXTERNAL TO THE SLEEVE COVER.
5. IDENTIFICTION MARKING CHARACTERS:
   COLOR: BLACK
   LETTER HEIGHT: AT LEAST 3MM.
6. EVERY ITEM LISTED IN PART LIST MAY BE REPLACED BY EQUIVALENT.

NO.	PARTNO	DESCRIPTION	VENDOR	QTY
1	CBL-AC000006-00	C1-C4 HARNESS		1
2	CBL-AC000007-00	C1-C5 HARNESS		1
3	PTN0.63BK100	EXPAND SLEEVING 5/8" X 100' BLK	TECHFLEX	1
4	ATUM-52/13-0-STK	HEATSHRINK DUAL WALL 52MM X 4'	TE	2
5	STANDARD PN	LABEL ID MARKERS WHITE BACKGROUND		1

GENERAL TOLERANCES ON UNLESS OTHERWISE SPECIFIED

LINEAR DIMENSION LENGTH (mm)	TOLERANCES (mm)	ANGULAR
0 ÷ 300	-0, +25	±5°
301 ÷ 1500	-0, +50	
1501 ÷ 3000	-0, +100	
3001 ÷ 7500	-0, +150	
OVER 7500	-0, +5%	

DRAWN BY	DANIEL.R
DESIGNED BY	DANIEL.R
APPV'D BY	HAIM.E
APPV'D DATE	25/07/2022

GENERAL NOTES:
1. ASSEMBLY MUST MEET RoHS 1 COMPLIANCE BY EU.
2. EACH CABLE SHOULD BE ELECTRICALLY TESTED FOR MISSWIRE, OPENS, AND SHORTS:
2.1 CONNECTION RESISTANCE LESS THEN (mOhms): 100
2.2 INSULATION RESISTANCE OF MORE THEN (MOhms): 2
3 CABLE ASSEMBLY ACCORDING TO UL758
4. FLAMMABILITY OF PLASTIC PARTS PER UL94 V-0
5. WIRE GUAGE DEFINITION PER AWG
6. TEMPERATURE RANGE: -34°C TO 74°C

NOTRAFFIC

TITLE: C1-C4C5 HARNESS

PART NUMBER: CBL-AC000008-00

SCALE: NO SCALE | SHEET 1 OF 1 | SIZE: A3 | REVISION: 04

Output File #1LX and #2LX connection to CU diagram