

Chapter 20

CABINET PRINT

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20 CABINET PRINT

The cabinet print is a schematic representation of the components that are inside the controller cabinet. This schematic is used mainly by TSSU, Region Electrical Crew, and Region signal timers.

A hard copy of the cabinet print is required to be in the controller cabinet at all times.

20.1 When is a Cabinet Print Required?

A Cabinet print is required for all new signals, the first stage for temporary signals, and any modification to an existing traffic signal that will require a change (addition, deletion, or modification) to the components inside the controller cabinet.. The cabinet print must be accurate for proper maintenance and timing of the intersection.

20.2 Who is Responsible for Creating a Cabinet Print?

The signal designer is responsible for creating the initial cabinet print(s) during the construction phase (for new signals).

The Traffic Signal Standards Unit is responsible for creating the final version of the cabinet print from the red-line as-builts provided by TSSU after installation.

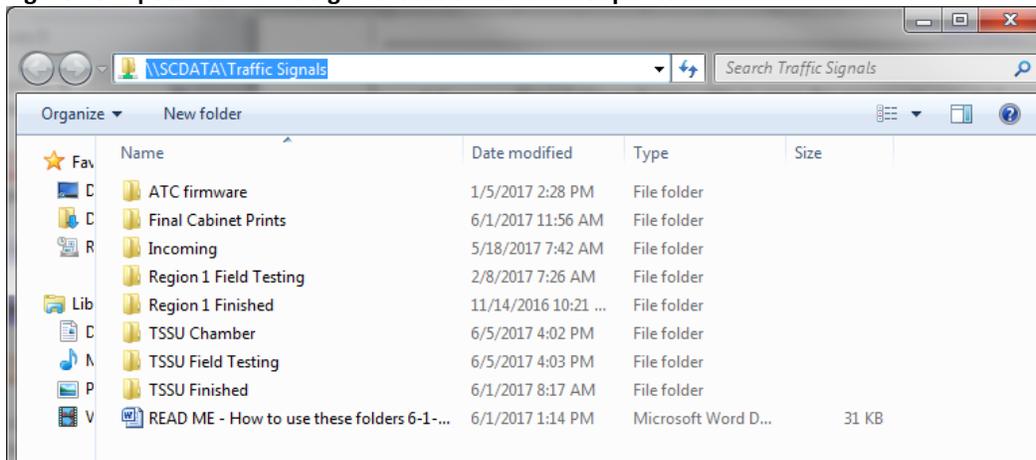
A Cabinet print reflects the conditions shown in the sealed plan sheets and therefore does NOT require a P.E. Stamp.

20.3 Procedure for Producing Cabinet Prints

An internal ODOT folder has been set up to process the various stages of the cabinet print (from start to final version). The location is: [\\scdata\Traffic Signals](#). Within this server folder there are seven subfolders, listed in the order they are used in the process. The process for using the subfolders is explained in the READ ME document. See Figure 20-1:

1. **Incoming** – This is open to anyone: read, write, delete, etc.
2. **TSSU Chamber** – This is open to anyone to see and copy files, but only TSSU can write, delete, etc.
3. **TSSU Field Testing & Region 1 Field Testing** – these are open for anyone to see and copy files, but only TSSU can write, delete, etc.
4. **TSSU Finished & Region 1 Finished** – these are open for anyone to see and copy files, but only TSSU can write, delete, etc.
5. **Final Cabinet Prints** – this is open for anyone to see and copy files, but only Traffic Standards can write, delete, etc.

Figure 20-1 | Scdata Traffic Signals location for cabinet prints



Key information for the Traffic Signal Designer:

1. The cabinet print files (both DGN and PDF) are required in the appropriate INCOMING subfolder **BEFORE** the equipment arrives at TSSU for testing. This is typically 2 to 6 months after the project plans are approved. However, a fast track project may reduce that time to 4 to 8 weeks. Non-ODOT designers should e-mail the files to the Traffic Signal Engineer who will then place the files in the subfolder. Plan accordingly, as failure to produce the cabinet prints in a timely manner may impact the construction schedule.
2. The Traffic Signal Designer must contact the Region Signal Timer and request they place the signal timing files within the appropriate INCOMING subfolder. The same time frame described above applies.

If modifications to the cabinet print DO NOT match the conditions shown on the most current, sealed plan sheet(s) for the intersection, a new plan sheet is required (as-built).

20.4 Creating the Cabinet Print

Each intersection should have its own cabinet print file. The file name should begin with the TSSU ID number and abbreviated intersection name using the highway route number, for example “04023_99W_LewisburgRd”.

The cabinet prints are created in microstation. There are five different types of cabinet print base files available on the Traffic Signal Standards website depending on what type of cabinet is used. Select the correct base file for each intersection on the project.

- 332S cabinet print
- 332 cabinet print
- 336 cabinet print
- 334 ramp meter cabinet print
- 334 count (ATR) cabinet print

The base files are available at: <http://www.oregon.gov/ODOT/Engineering/Pages/Signals.aspx> under “MicroStation cabinet prints”

The Signal Designer should also look in the FINAL CABINET PRINTS folder for existing information before starting a new cabinet print file: <\\scdata\Traffic Signals\Final Cabinet Prints>. For signal Designers outside of ODOT, contact the Traffic Signal Standards Unit to obtain existing cabinet print information.

In the microstation base files, the areas that can be modified are typically shown in red. They are populated with the standard phase layout. There are different levels that can be turned on or off depending on the equipment that is installed (see the additional instructions for using the DGN files on the website). The typical areas that require modification include:

- The title block identifying information (i.e. intersection name, City, Hwy, MP, TSSU ID number, date and revision remarks)The input file (front view and side view)
- The Input and Output file (front view and back view)
- The intersection drawing

The cabinet print needs to show what is actually used and its intended function. If an area is unused, it should be blank. The other information contained in the cabinet print shows standard electrical schematics that apply to each type of cabinet and are generally not modified.

Cabinet prints are formatted for printing on 11x17 paper.

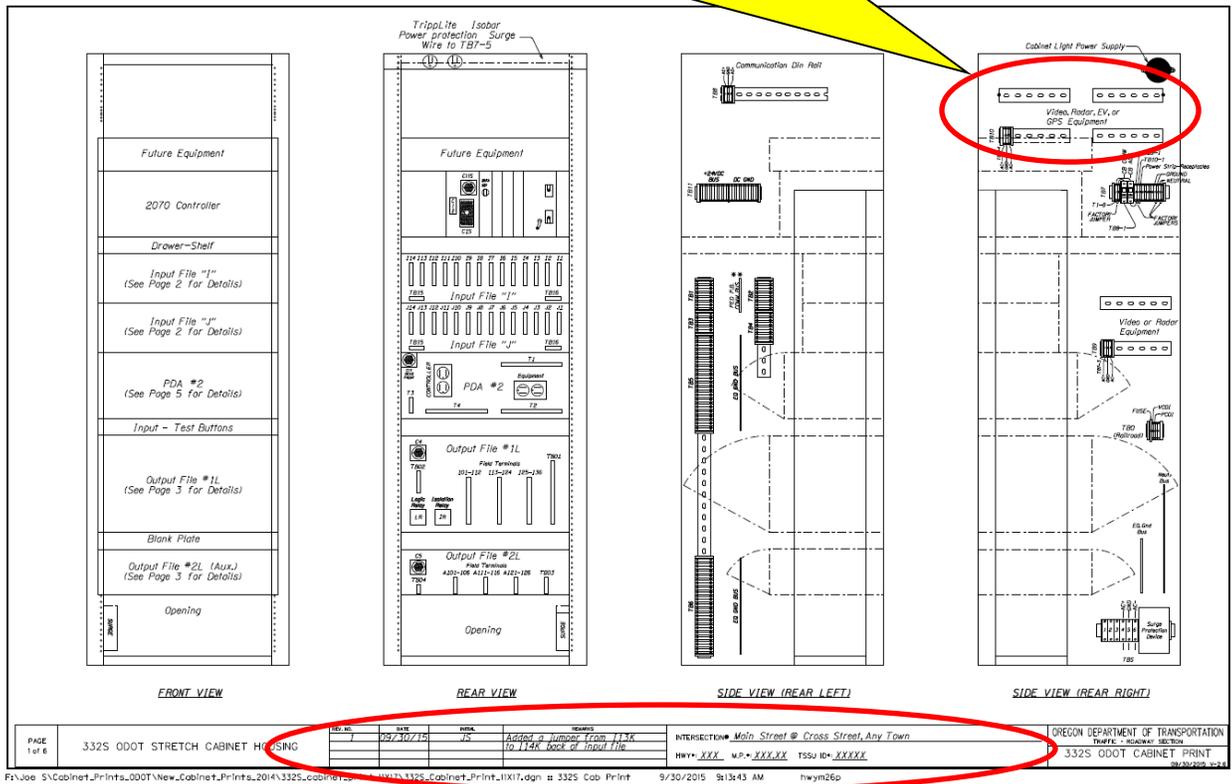
NOTE! All figures in this manual show a 332S cabinet with a C11 connector. The cabinet print layout for the 332 without a C11 connector, 336, and 334 cabinet will be slightly different, but all contain similar elements. The basic information in this manual can be used in conjunction with the appropriate base file.

20.5 332S Cabinet Print (Page 1 – cabinet layout)

Page 1 of the 332S cabinet print shows the front, rear, and both side views of the cabinet. There is not a lot to modify on this sheet, but certain levels and/or references will need to be turned-on or off to show the correct site specific equipment, (i.e. communication equipment, battery back-up, etc.). See Figure 20-2.

Figure 20-2 | 332S Cabinet Print (page 1)

Various equipment on (different levels) can be turned on and off based on site specifics (video detection, communication equipment, etc.). Generally, the info on these levels does not be to be further modified.



Title block area needs to be filled out as directed

20.5.1 332S Cabinet Print (Page 2 – Input File)

Page 2 of the 332S cabinet print shows the input file. This sheet requires filling in the information for all the input equipment used. The basic input equipment (i.e. loop amplifiers, video rack cards, radar rack cards, DC isolators, AC isolators, fire preemption, etc.) that needs to be filled in is shown in Figure 20-3. Each bubble note in Figure 20-3 is numbered and described in more detail in the next sections. **Important additional information about the input file is in section 20.5.9.**

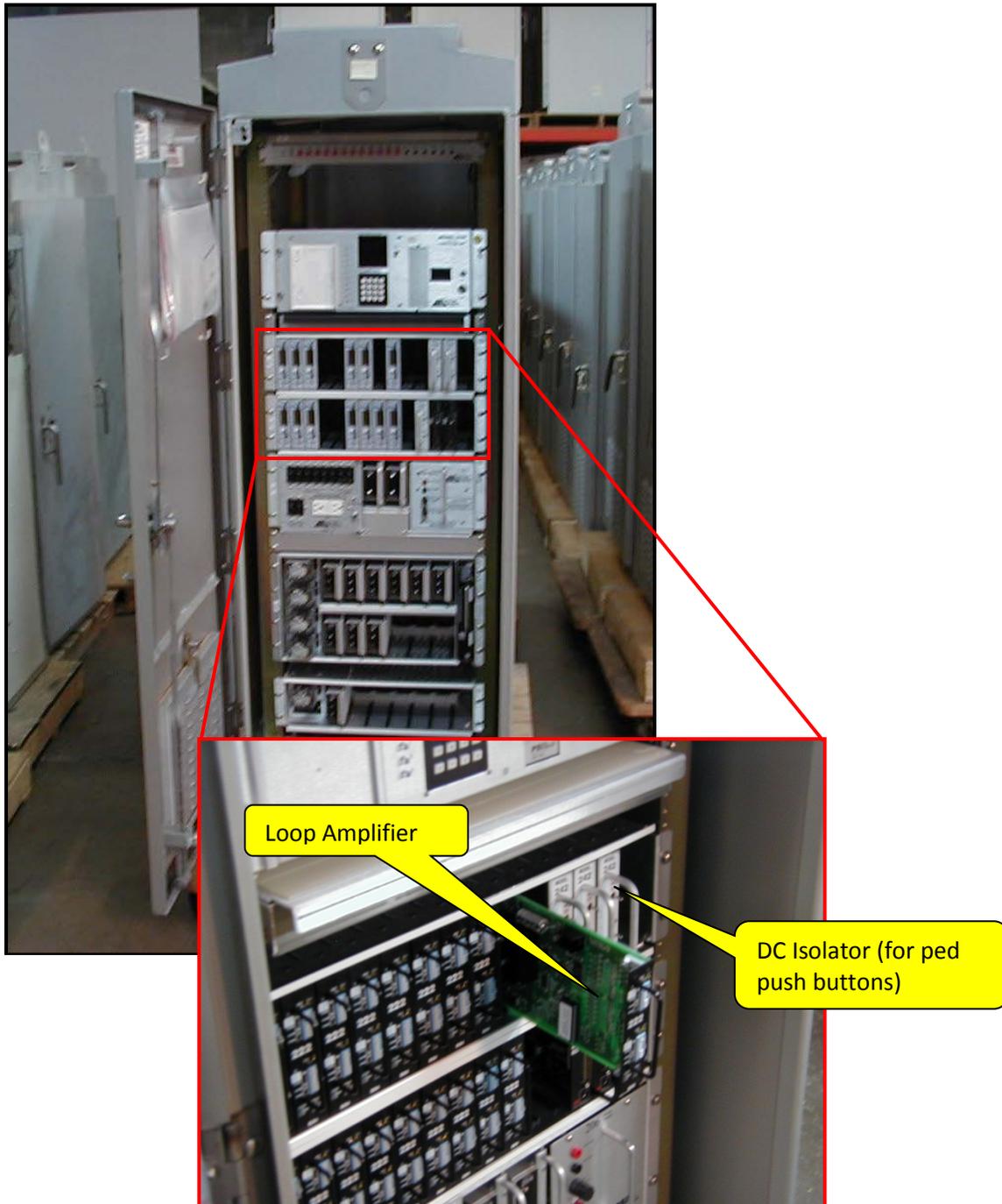
Figure 20-3 | 332S Cabinet Print (page 2 – Input File)

The figure shows a technical drawing of a 332S cabinet print input file. It includes several tables and diagrams. The main table is a grid of terminals labeled 1 through 110. To the right, there are tables for terminal block definitions (TB0 through TB11) and wiring details. The callout boxes are as follows:

- 1.) Detector input location (fill in equipment and modify phase if necessary):** Points to a section of the terminal grid (terminals 1-10).
- 2.) AC Isolator location (for RxR preemption):** Points to a section of the terminal grid (terminals 11-20).
- 3.) DC Isolator location (for pedestrian detectors):** Points to a section of the terminal grid (terminals 21-30).
- 4.) Ped detector termination (fill in phase):** Points to a section of the terminal grid (terminals 31-40).
- 5.) Fire Preemption detectors:** Points to a section of the terminal grid (terminals 41-50).
- 6.) Fire Preemption detector termination (fill):** Points to a section of the terminal grid (terminals 51-60).
- 7.) Detector input termination (fill out phase and loop detector number):** Points to a section of the terminal grid (terminals 61-70).

For reference, Figure 20-4 shows the actual front view of the input file in a 332 cabinet.

Figure 20-4 | 332 Cabinet – Input File (Front View) Actual View



20.5.3 AC Isolator Location

This is located in slot J12 (J12U is the for the PCOI input and J12L is for the VCOI Input). This location is used for railroad preemption. The equipment module number is 255 (a 252 is used in 332 cabinets). The example below shows where you fill in the equipment.

Equipment goes in the first row below the slot location. The AC isolator for a 332S cabinet is 255

| | | | | | | | | | | | | | |
|--|--|--|--|---|--|--|--|--|---|---|-------------------------------------|-------------------------------------|-------------------------------------|
| I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 | I10 | I11 | | I13 | I14 |
| 4 I/O :C | | VIP :B & F | | | | 4 I/O :D | | VIP :A | | | | 242 | 242 |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| φ 1 C1-56 VD1 VD2 C1-60 φ 1 | φ 1 C11-16 VD29 VD30 C11-20 φ 1 | φ 2 C1-39 VD9 VD10 C1-43 φ 2 | φ 2 C1-63 VD11 VD12 C1-76 φ 2 | φ 2 C1-47 VD13 VD31 C11-10 φ 2 | φ 3 C1-58 VD3 VD4 C1-62 φ 3 | φ 3 C11-18 VD32 VD33 C11-22 φ 3 | φ 4 C1-41 VD14 VD15 C1-45 φ 4 | φ 4 C1-65 VD16 VD17 C1-78 φ 4 | φ 4 C1-49 VD18 VD34 C11-12 φ 4 | SPARE C11-23 — C11-25 SPARE | — — — — SPARE | 2 PED C1-24 — — 4 PED | 6 PED C1-67 — — 8 PED |
| J1 | J2 | J3 | J4 | J5 | J6 | J7 | J8 | J9 | J10 | J11 | J12 | J13 | J14 |
| 4 I/O :F | | VIP :C & E | | 2 I/O :C | 4 I/O :A | | VIP :D | | | | 255 | 752 | 752 |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| φ 5 C1-55 VD5 VD6 C1-59 φ 5 | φ 5 C11-15 VD35 VD36 C11-19 φ 5 | φ 6 C1-40 VD19 VD20 C1-44 φ 6 | φ 6 C1-64 VD21 VD22 C1-77 φ 6 | φ 6 C1-48 VD23 VD37 C11-11 φ 6 | φ 7 C1-57 VD7 VD8 C1-61 φ 7 | φ 7 C11-17 VD38 VD39 C11-21 φ 7 | φ 8 C1-42 VD24 VD25 C1-46 φ 8 | φ 8 C1-66 VD26 VD27 C1-79 φ 8 | φ 8 C1-50 VD28 VD40 C11-13 φ 8 | SPARE C1-54 — GPS | PCOI C1-51 — VCOI | EVA C1-71 — EVC | EVB C1-72 — EVD |

INPUT FILE I & J (FRONT VIEW)

(NOT TO SCALE)

Check mark the box if the slot/channel is being used. Both the PCOI and VCOI inputs are being used

20.5.4 DC Isolator Location

This is located in slots I13 and I14 and is used for push button detection. The standard phasing is shown in the diagram. The equipment module number is 242.

Equipment goes in the first row below the slot location. The DC isolator equipment number is 242

| | | | | | | | | | | | | | |
|--|--|--|--|---|--|--|--|--|---|-----------------|-----------------|-------------------------------------|-------------------------------------|
| I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 | I10 | I11 | I12 | I13 | I14 |
| 4 I/O :C | | VIP :B & F | | | 4 I/O :D | | | VIP :A | | | | 242 | 242 |
| <input checked="" type="checkbox"/> | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | <input checked="" type="checkbox"/> | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| φ 1 C1-56 VD1 VD2 C1-60 φ 1 | φ 1 C11-16 VD29 VD30 C11-20 φ 1 | φ 2 C1-39 VD9 VD10 C1-43 φ 2 | φ 2 C1-63 VD11 VD12 C1-76 φ 2 | φ 2 C1-47 VD13 VD31 C11-10 φ 2 | φ 3 C1-58 VD3 VD4 C1-62 φ 3 | φ 3 C11-18 VD32 VD33 C11-22 φ 3 | φ 4 C1-41 VD14 VD15 C1-45 φ 4 | φ 4 C1-65 VD16 VD17 C1-78 φ 4 | φ 4 C1-49 VD18 VD34 C11-12 φ 4 | SPARE C11-23 | SPARE C11-24 | 2 PED C1-67 | 6 PED C1-68 |
| <input checked="" type="checkbox"/> | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | <input checked="" type="checkbox"/> | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| J1 | J2 | J3 | J4 | J5 | J6 | J7 | J8 | J9 | J10 | J11 | J12 | J13 | J14 |
| 4 I/O :F | | VIP :C & E | | 2I/O:C | 4 I/O :A | | VIP :D | | | | | 752 | 752 |
| <input checked="" type="checkbox"/> | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| φ 5 C1-55 VD5 VD6 C1-59 φ 5 | φ 5 C11-15 VD35 VD36 C11-19 φ 5 | φ 6 C1-40 VD19 VD20 C1-44 φ 6 | φ 6 C1-64 VD21 VD22 C1-77 φ 6 | φ 6 C1-48 VD23 VD37 C11-11 φ 6 | φ 7 C1-57 VD7 VD8 C1-61 φ 7 | φ 7 C11-17 VD38 VD39 C11-21 φ 7 | φ 8 C1-42 VD24 VD25 C1-46 φ 8 | φ 8 C1-66 VD26 VD27 C1-79 φ 8 | φ 8 C1-50 VD28 VD40 C11-13 φ 8 | SPARE C1-54 | PCOI C1-51 | EVB C1-72 | EVB C1-74 EVD |
| <input checked="" type="checkbox"/> | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | <input checked="" type="checkbox"/> | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |

INPUT FILE I & J (FRONT VIEW)

(NOT TO SCALE)

Check mark the box if the slot/channel is being used. All 4 ped phases are used in this example.

20.5.5 Pedestrian Detector Termination

This shows the terminal block where the pedestrian detectors are wired. Fill in the phase for the pedestrian pushbuttons being used.

Fill the box with the phase. Standard phases are shown here. Leave blank if ped phase is not used.

NOTE
 USE PED P.B.COMM.BUS FOR MORE
 THAN 2 PED P.B.COMM.WIRES.(SEE
 PAGE 1 SIDE VIEW REAR LEFT FOR

| | |
|---|-------|
| | I14 |
| ? | 242 |
| ◊ | ◊ |
| D | 6 PED |
| 7 | C1-68 |
| - | — |
| 9 | C1-70 |
| D | 8 PED |
| ◊ | ◊ |
| | J14 |
| ? | 752 |
| ◊ | ◊ |

| | | TB1 | |
|----|--------------------------------|---------------|-------------------|
| Ph | <input type="text" value="2"/> | Ped PB | 1 — I13-D |
| Ph | <input type="text" value="4"/> | Ped PB | 2 — I13-J |
| | | PB Common | 3 — I13-K |
| Ph | <input type="text" value="6"/> | Ped PB | 4 — I14-D |
| Ph | <input type="text" value="8"/> | Ped PB | 5 — I14-J |
| | | PB Common | 6 — I14-K |
| | | Flash Sense | 7 — C1-81, TB02-4 |
| | | Stop Time | 8 — C1-82, TB02-3 |
| | | Monitor Reset | 9 — TB02-5 |
| | | Advance | 10 — C1-80 |
| | | Adv. Enable | 11 — C1-53 |
| | | NC | 12 — NC |

20.5.6 Fire Preemption Detectors

This is located in slots J13 and J14 and is used to provide the input for fire preemption. The equipment modules for fire preemption detectors are 752 (opticom phase selector) and 2140 (Tomar Stobecom II O.S.P.).

Equipment goes in the first row below the slot location. The equipment number is either 752 or 2140

| | | | | | | | | | | | | | |
|--|--|--|--|---|--|--|--|--|---|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|
| I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 | I10 | I11 | I12 | I13 | I14 |
| 4 I/O :C | | VIP :B & F | | | 4 I/O :D | | | VIP :A | | | | 242 | 242 |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| φ 1 C1-56 VD1 VD2 C1-60 φ 1 | φ 1 C11-16 VD29 VD30 C11-20 φ 1 | φ 2 C1-39 VD9 VD10 C1-43 φ 2 | φ 2 C1-63 VD11 VD12 C1-76 φ 2 | φ 2 C1-47 VD13 VD31 C11-10 φ 2 | φ 3 C1-58 VD3 VD4 C1-62 φ 3 | φ 3 C11-18 VD32 VD33 C11-22 φ 3 | φ 4 C1-41 VD14 VD15 C1-45 φ 4 | φ 4 C1-65 VD16 VD17 C1-78 φ 4 | φ 4 C1-49 VD18 VD34 C11-12 φ 4 | SPARE C11-23 C11-25 SPARE | SPARE C11-24 C11-26 SPARE | 2 PED C1-67 C1-69 PED | 6 PED C1-68 C1-70 8 PED |
| J1 | J2 | J3 | J4 | J5 | J6 | J7 | J8 | J9 | J10 | J11 | J12 | J13 | J14 |
| 4 I/O :F | | VIP :C & E | | 2 I/O :C | 4 I/O :A | | VIP :D | | | | | 752 | 752 |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| φ 5 C1-55 VD5 VD6 C1-59 φ 5 | φ 5 C11-15 VD35 VD36 C11-19 φ 5 | φ 6 C1-40 VD19 VD20 C1-44 φ 6 | φ 6 C1-64 VD21 VD22 C1-77 φ 6 | φ 6 C1-48 VD23 VD37 C11-11 φ 6 | φ 7 C1-57 VD7 VD8 C1-61 φ 7 | φ 7 C11-17 VD38 VD39 C11-21 φ 7 | φ 8 C1-42 VD24 VD25 C1-46 φ 8 | φ 8 C1-66 VD26 VD27 C1-79 φ 8 | φ 8 C1-50 VD28 VD40 C11-13 φ 8 | SPARE C1-54 C1-75 GPS | PCOI C1-51 C1-52 VCOI | EVA C1-71 C1-73 EVC | EVB C1-72 C1-74 EVD |

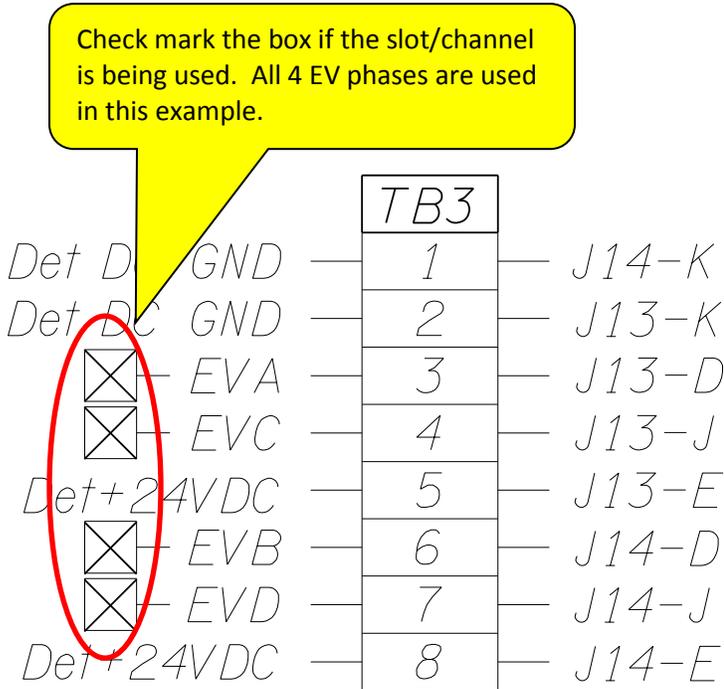
INPUT FILE I & J (FRONT VIEW)

(NOT TO SCALE)

Check mark the box if the slot/channel is being used. All 4 EV phases are used in this example.

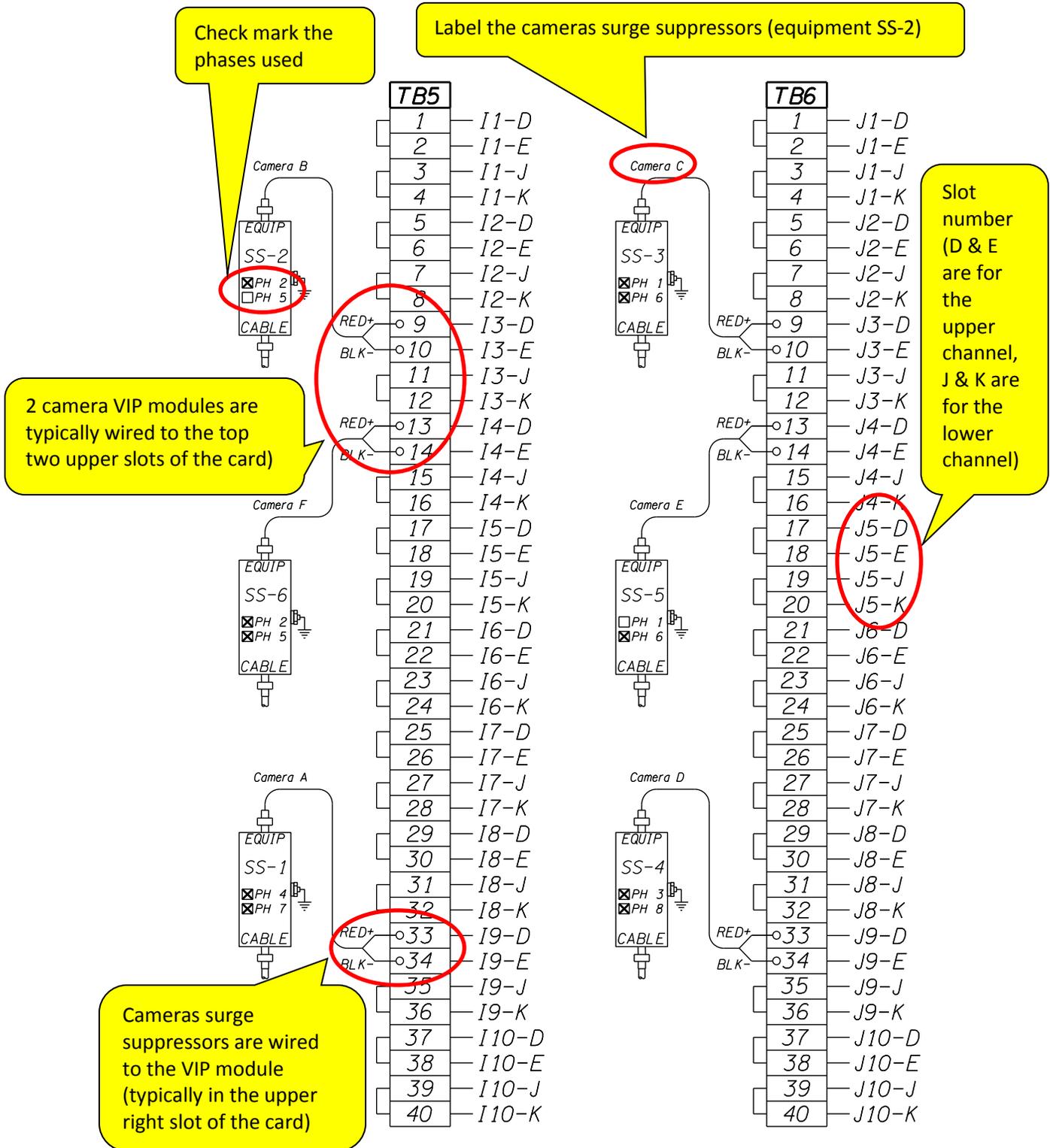
20.5.7 Fire Preemption Detection Termination

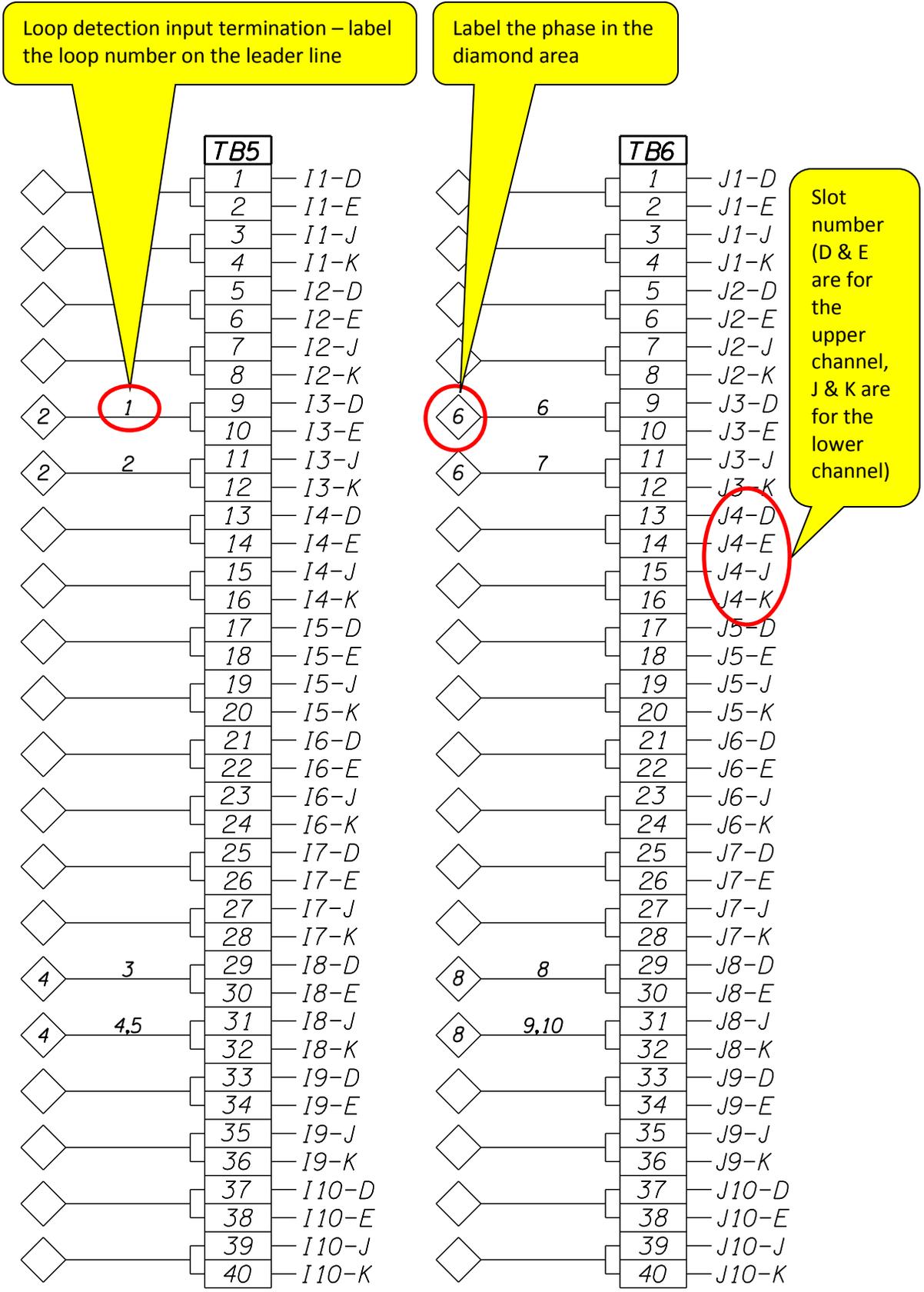
This shows the terminal block where the fire preemption is wired. Mark the check box if the EV channel is being used.



20.5.8 Detector Input Termination

This shows the terminal block where the vehicle detection is wired (TB5 and TB6). The first example shows video detection (Turn on the proper levels as per the microstation base file instructions). The second example shows loop detection.





20.5.9 Additional Information about the Input File

1. The 332 cabinet without a C11 connector has 28 vehicle inputs using 9 slots and 2 input files that is wired to accommodate:
 - 2 vehicle detection inputs to the controller for each odd numbered phase
 - 5 vehicle detection inputs to the controller for each even numbered phase
 - 4 pedestrian detection inputs (Slot I12 and I13)
 - 4 emergency preemption inputs (Slot J12 and J13)
 - 2 railroad preemption inputs (Slot J11: indirect via 4 C1 pins using a 252 AC Isolator)
 - 0 spares

Each input file slot has (2) channels associated with it, the upper and the lower. The slot may have one or two controller inputs wired to it. Slots 1, 4, 5, and 8 have one controller input. Slots 2, 3, 6, 7, 9, 12, and 13 have two controller inputs. Slot 10, I11 and 14 have no inputs and are not used (i.e. no C1 pin).

If a viewcom module is used, it will go in slot I10 and I11.

2. The 332S cabinet with a C11 connector uses has 40 vehicle inputs using 10 slots and 2 input files that is wired to accommodate:
 - 4 vehicle detection inputs to the controller for each odd numbered phase
 - 6 vehicle detection inputs to the controller for each even numbered phase
 - 4 pedestrian detection inputs (Slot I13 and I14)
 - 4 emergency preemption inputs (Slot J13 and J14)
 - 2 railroad preemption inputs (Slot J12: direct via inverting a 255 AC isolator)
 - 1 GPS (J11L)
 - 5 spares (Slot I11U, I11L, J11U, J12U, and J12L)

Each input file slot has (2) channels associated with it, the upper and the lower. All slots have two controller inputs wired to it (assigned to the C1 or C11 connector).

If a viewcom module is used, it will go in slot I11 and I12. The C11 pins need to be disconnected for the viewcom module to function.

20.6 332S Cabinet Print (Page 3 – Output File)

Page 3 of the 332S cabinet print shows the output file and conflict monitor. This sheet requires filling in the information for all the output equipment used. The basic output equipment (i.e. load switches, flash transfer relays, flash plugs, etc.) that needs to be filled in is shown in Figure 20-3. Each bubble note in Figure 20-3 is numbered and described in more detail in the next sections. **Important additional information about the output file is in section 20.6.5.**

Figure 20-5 | 332S Cabinet Print (page 3 – Output File)

1.) Main Output File (front view) - check mark boxes that are used, label phase and flash plug color

2.) Main Output File (back view) - label phases

3.) Conflict Monitor Diode Card

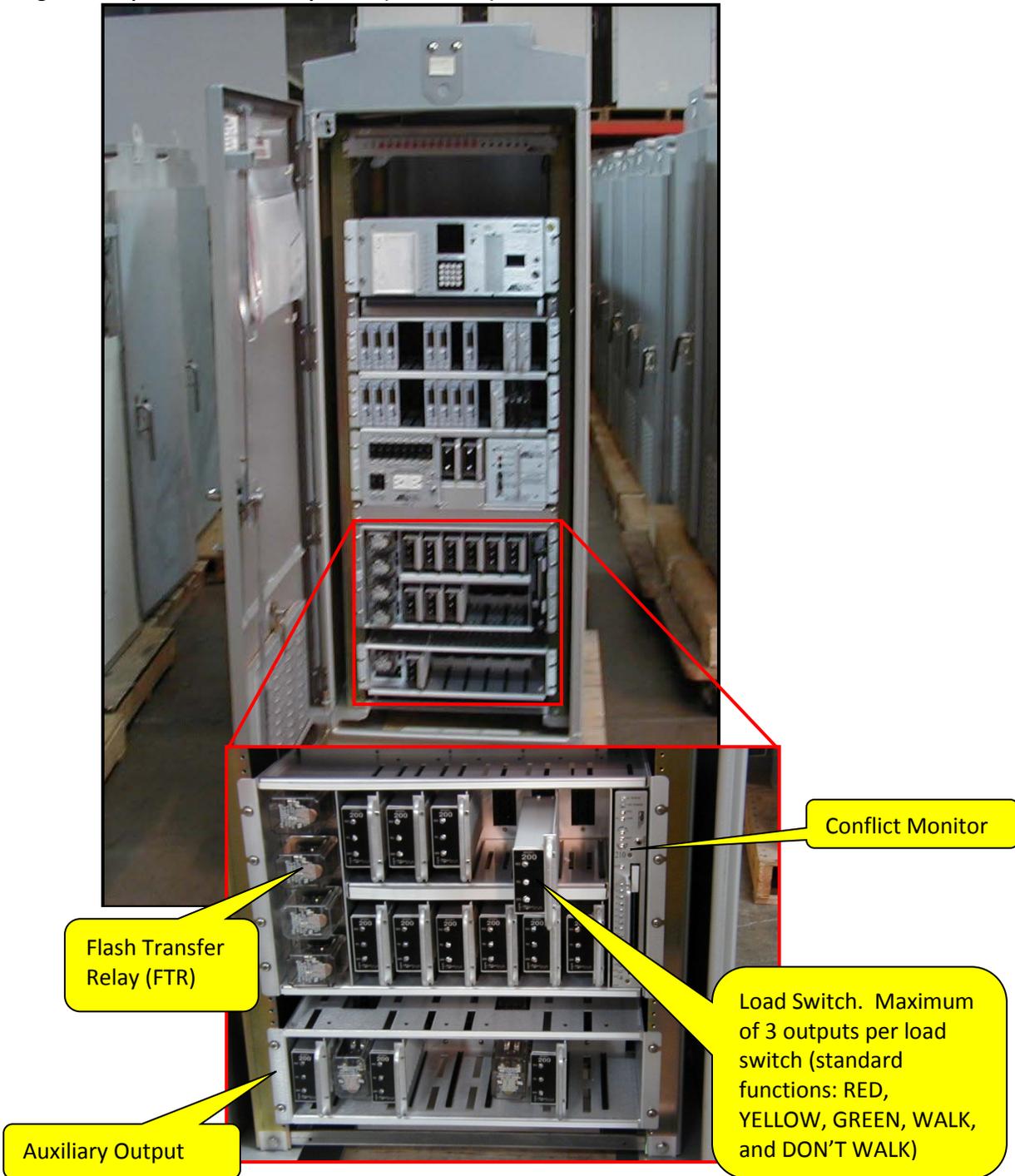
4.) Auxiliary Output File (front and back) – If used, mark and label the same as Main Output File front and back (Use level 8 to turn this on).

The drawing includes the following components:

- CONFLICT MONITOR - TYPICAL CONNECTOR PIN ASSIGNMENTS:** A table mapping connector pins to channels and functions.
- MONITOR DIODE CARD:** A table for channel assignment and yellow inhibit jumpers.
- OUTPUT FILE 1L (FRONT VIEW):** A table for phase and flash plug assignments.
- OUTPUT FILE 1L (REAR VIEW):** A table for phase and flash plug assignments from the back.
- CONFLICT MONITOR - TYPICAL WIRING:** A diagram showing the connection of flash transfer relays (FFR) to conflict monitor diodes.
- OUTPUT FILE 2L (BACK VIEW):** A table for phase and flash plug assignments.
- FIELD OUTPUTS - TYPICAL WIRING:** A diagram showing the connection of load switches and flash plugs to the cabinet.

For reference, Figure 20-6 shows the actual front view of the output file in a 332 cabinet (which is very similar to the 332S).

Figure 20-6 | 332 Cabinet – Output File (Front View) Actual View

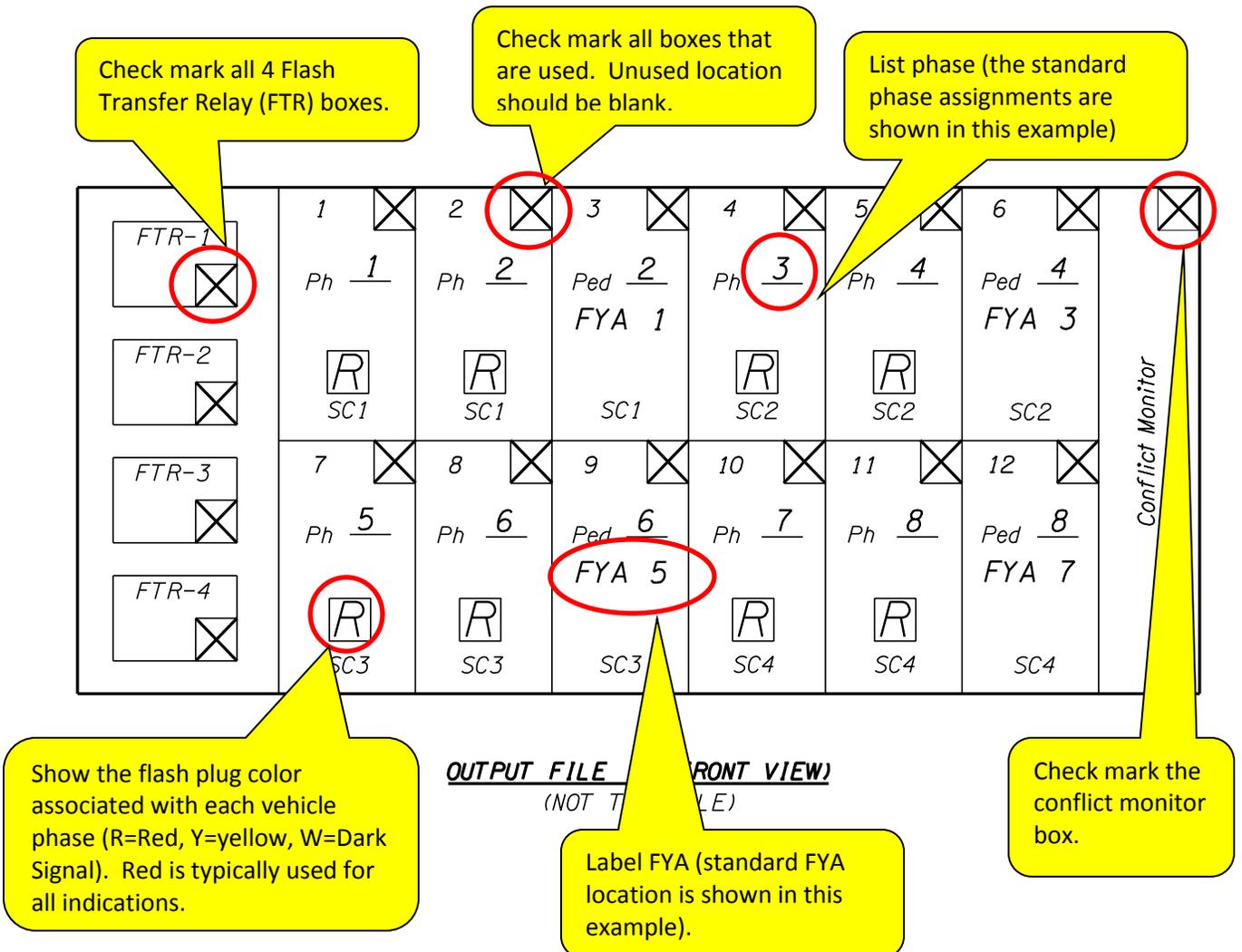


20.6.1 Main Output File (Front View):

This location shows the load switches that are used to power the field indications (vehicle signals: RED, YELLOW, GREEN and pedestrian signals: WALK, FLASHING DON'T WALK). Other types of powered indications, such as PTR signs or advance flashing beacons may be wired to a load switch. Each load switch that corresponds to a vehicle phase will have a flash plug (RED, YELLOW, or WHITE).

The flash transfer relays (FTR) are used to switch power from the load switches to the flasher units during cabinet flash. All four flash transfer relays should be included.

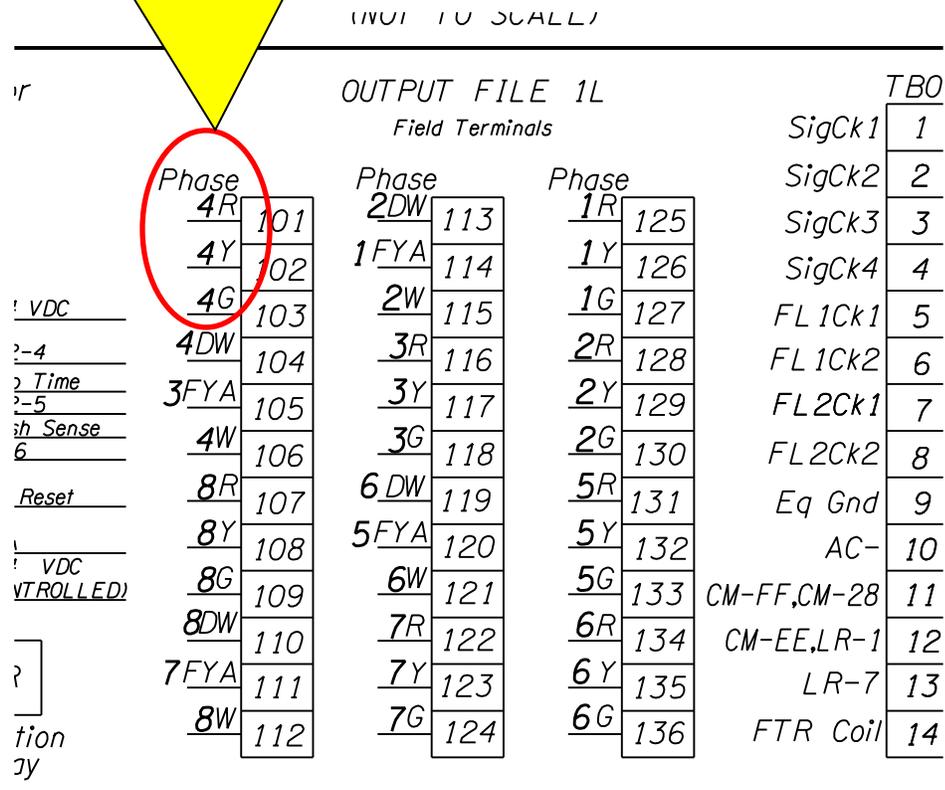
The conflict monitor checks the green indications, Flashing Yellow Arrow and WALK indications (and a few other items, such as voltage, connection to the controller, etc.) and causes the signal to go into cabinet flash if any conflicting indications come up together.



20.6.2 Main Output File (Back View)

This shows the terminal blocks for the output file. Fill in the phase for the pedestrian pushbuttons being used.

Fill in the phase for the Red (R), Yellow (Y), Green (G), Walk (W), Flashing Don't Walk (DW), and Flashing Yellow Arrow (FYA) indications. Standard phasing is shown in the example.



OUTPUT FILE 1L (REAR VIEW)
(NOT TO SCALE)

20.6.3 Conflict Monitor Diode Card

The signal designer will complete the conflict monitor diode card. It will be reviewed and approved by TSSU and/or Traffic Standards. By default, the conflict monitor is configured such that ALL phases are conflicting (all diodes are intact). The diodes for non-conflicting phases will be removed, leaving the diodes for conflicting phases intact. Only the phases that are actually used will determine the monitor configuration (i.e. if phase 3 and 7 are not used, those diodes will remain intact, even though phase 3 and phase 7 are typically non-conflicting phases).

CONFLICT MONITOR DIODE CARD

CHANNEL ASSIGNMENT

| | | | |
|------------------|------------------|-----------------|---------------------------------|
| Ch.1 <u>Ph 1</u> | Ch.5 <u>Ph 5</u> | Ch.9 <u>NU</u> | Ch.13 <u>Ped2 & Ph1 FYA</u> |
| Ch.2 <u>Ph 2</u> | Ch.6 <u>Ph 6</u> | Ch.10 <u>NU</u> | Ch.14 <u>Ped4 & Ph3 FYA</u> |
| Ch.3 <u>Ph 3</u> | Ch.7 <u>Ph 7</u> | Ch.11 <u>NU</u> | Ch.15 <u>Ped6 & Ph5 FYA</u> |
| Ch.4 <u>Ph 4</u> | Ch.8 <u>Ph 8</u> | Ch.12 <u>NU</u> | Ch.16 <u>Ped8 & Ph7 FYA</u> |

YELLOW INHIBIT JUMPERS

| | | | | | | | |
|---|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

DIODES - Diode Removed Makes Movement Allowable (Diode IN4148)

| | | | | | | | |
|------|-------|-------|-------|-------|-------|-------|------|
| 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 |
| 2-3 | 2-4 | 3-5 | 4-6 | 5-7 | 6-8 | 7-9 | 8-10 |
| 1-4 | 2-5 | 3-6 | 4-7 | 5-8 | 6-9 | 7-10 | 8-11 |
| 1-5 | 2-6 | 3-7 | 4-8 | 5-9 | 6-10 | 7-11 | 8-12 |
| 1-6 | 2-7 | 3-8 | 4-9 | 5-10 | 6-11 | 7-12 | 8-13 |
| 1-7 | 2-8 | 3-9 | 4-10 | 5-11 | 6-12 | 7-13 | 8-14 |
| 1-8 | 2-9 | 3-10 | 4-11 | 5-12 | 6-13 | 7-14 | 8-15 |
| 1-9 | 2-10 | 3-11 | 4-12 | 5-13 | 6-14 | 7-15 | 8-16 |
| 1-10 | 2-11 | 3-12 | 4-13 | 5-14 | 6-15 | 7-16 | 9-16 |
| 1-11 | 2-12 | 3-13 | 4-14 | 5-15 | 6-16 | 10-16 | 9-15 |
| 1-12 | 2-13 | 3-14 | 4-15 | 5-16 | 11-16 | 10-15 | 9-14 |
| 1-13 | 2-14 | 3-15 | 4-16 | 12-16 | 11-15 | 10-14 | 9-13 |
| 1-14 | 2-15 | 3-16 | 13-16 | 12-15 | 11-14 | 10-13 | 9-12 |
| 1-15 | 2-16 | 14-16 | 13-15 | 12-14 | 11-13 | 10-12 | 9-11 |
| 1-16 | 15-16 | 14-15 | 13-14 | 12-13 | 11-12 | 10-11 | 9-10 |

CONFLICT MONITOR DIODE CARD CUTOUT
(NOT TO SCALE)

These are the channels that are used (channels that are not used are marked "NU")

Yellow inhibit jumpers allow the yellow indication to be monitored when removed (normally these are only removed to allow for monitoring of the FYA)

All of the phase combinations that are possible each have a diode. If the diode is removed, then the two phases can run concurrently.

Channel 2 (assigned to phase 2) and Channel 6 (assigned to phase 6) are shown as non-conflicting phases (the diode line string has been deleted)

Channel 7 (assigned to phase 7) and Channel 8 (assigned to phase 8) are shown as conflicting phases (the diode line string is still intact)

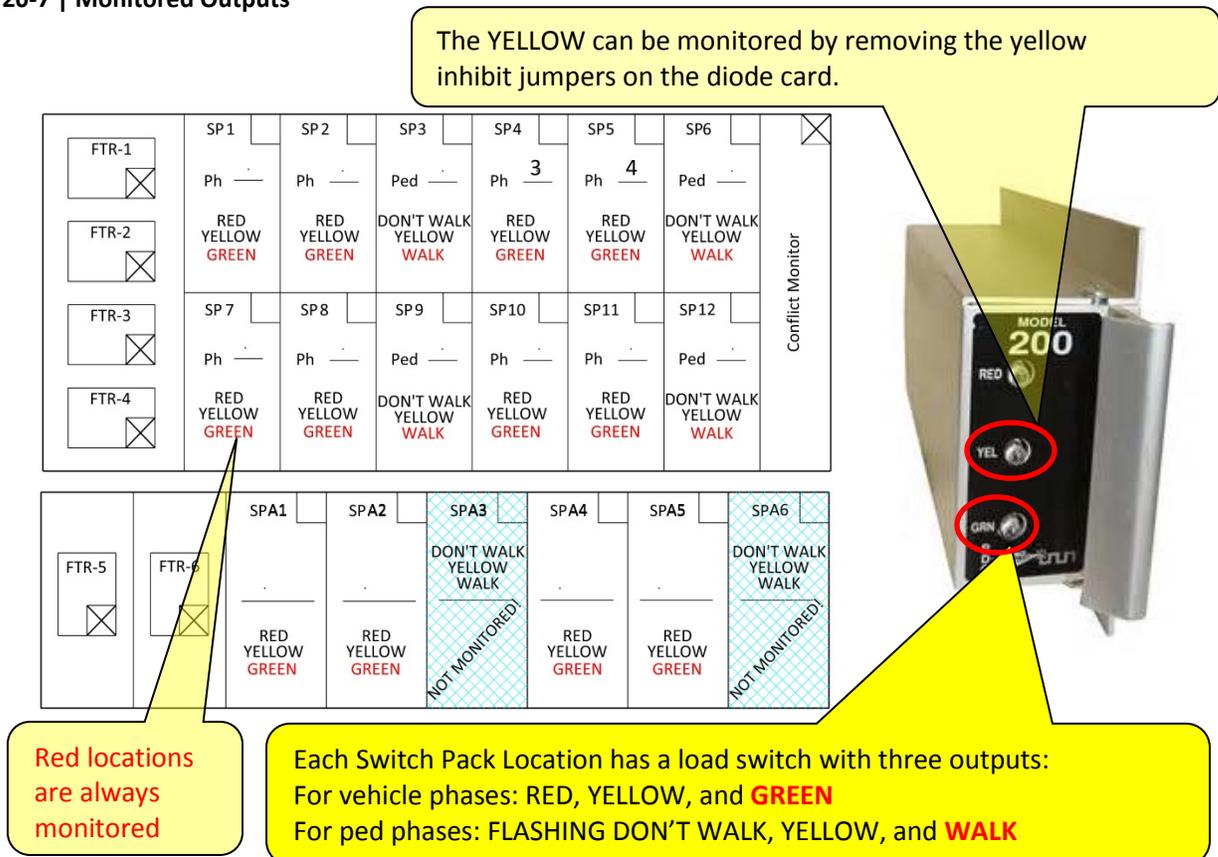
Outputs That Are Monitored

All GREEN, WALK and FLASHING YELLOW ARROW outputs for each phase shall be monitored by the conflict monitor. These are critical indications for each phase because they inform the driver or pedestrian when it is OK to enter or precede through the intersection. Monitoring these outputs for conflict ensures that a driver or pedestrian will never be incorrectly informed when it is OK to enter the intersection.

The GREEN and WALK outputs are always wired to the conflict monitor by the manufacturer as per the Standard Specification for Microcomputer Signal Controller. See Figure 20-7 with the monitored channels shown in red. **ANY OUTPUT ASSIGNED TO ONE OF THESE LOCATIONS WILL BE MONITORED. Do NOT reassign an output that shouldn't be monitored to one of these locations.**

The YELLOW indication can be monitored by removing the Yellow Inhibit Jumpers on the diode card (this is typically only used for monitoring Flashing Yellow Arrows), but it does not operate independently of the GREEN indication on the same load switch. For example, if ped phase 2 YELLOW is monitored by removing the yellow inhibit jumpers, it will have the exact same conflicts as ped phase 2 WALK. This is advantageous for monitoring the Flashing Yellow Arrow, as the opposing pedestrian phase has the same conflicts (e.g. Ped phase 2 WALK has the same conflicts as Ph. 1 Flashing Yellow Arrow), but it cannot be used to monitor phases that do not have the exact same conflicts.

Figure 20-7 | Monitored Outputs



Not all outputs require conflict monitoring as they are not as critical to eliminating the crash potential associated with being incorrectly informed. For example the YELLOW and RED outputs for each phase inform the driver or pedestrian that they must stop. If a driver is shown one of these indications erroneously, the action the driver is informed to take (stop) should not result in a crash with a conflicting vehicle that has been informed by a GREEN indication.

Outputs that are not monitored include:

- RED outputs
- YELLOW outputs
- FLASHING DON'T WALK outputs
- PTR sign outputs*
- Fire signal confirmation indication outputs* (this does not apply to tattle-tail lights which are not assigned to an output and are directly wired to the RED signal indication)

*It is important to note that PTR sign output and Fire signal confirmation indication outputs always require an output reassignment (as they do not have a standard output location). Do not reassign these outputs to a load switch location that is monitored (See Figure 20-7. e.g. GREEN or WALK).

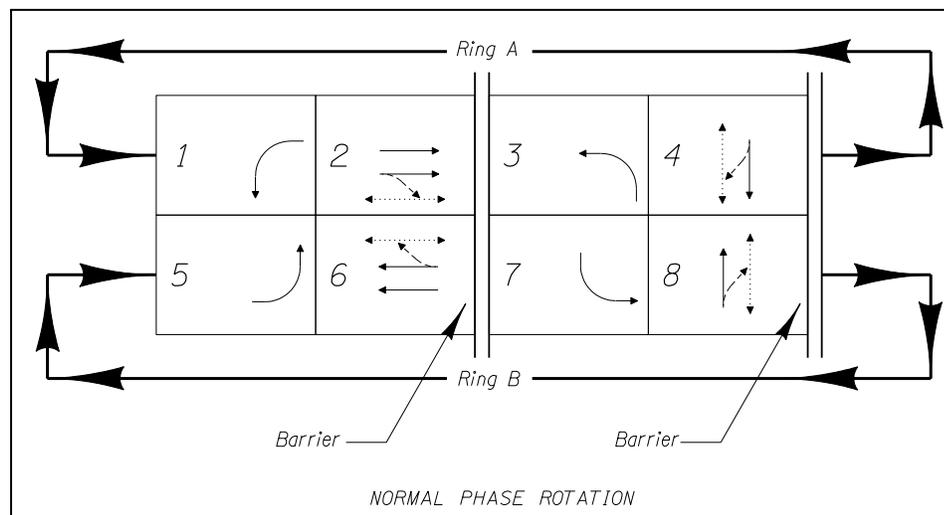
The conflict monitor also monitors other critical aspects of the how the traffic signal is functioning (watchdog, voltages, etc.) as per the Standard Specification for Microcomputer Signal Controller. Unlike the Diode Card, these aspects do NOT require a custom configuration for each intersection.

Rules for Standard Signal Timing Configurations

When using a standard ring and barrier configuration (see Figure 20-8 and Chapter 3 for more information on ring and barrier configuration), the following rules apply:

- An active phase is defined as a movement whose GREEN, WALK, or FLASHING YELLOW ARROW intervals are being timed by the controller.
- Only ONE active phase per ring at a time
- A phase can be active with the phase vertically opposite or diagonal from it as long as it exists on the same side of the barrier. These are called compatible phases (i.e. Phase 1 and Phase 5, Phase 1 and Phase 6)
- Both rings must cross the barrier at the same time

Figure 20-8 | Standard 8 Phase Ring and Barrier Diagram



When using overlap phases the following rules apply:

- An overlap phase may be assigned with any phase or number of phases. These are called the parent phase(s).
- An overlap phase will be permitted by every phase compatible with the assigned parent phase. For example, if Figure 20-8 had an OLA = phase 2, then OLA will also be permitted with ped phase 2, phase 5, phase 6, ped phase 6.
- Any phase can have a pedestrian phase assigned to it, limited by the available outputs from the controller.

When using flashing yellow arrow the following rules apply:

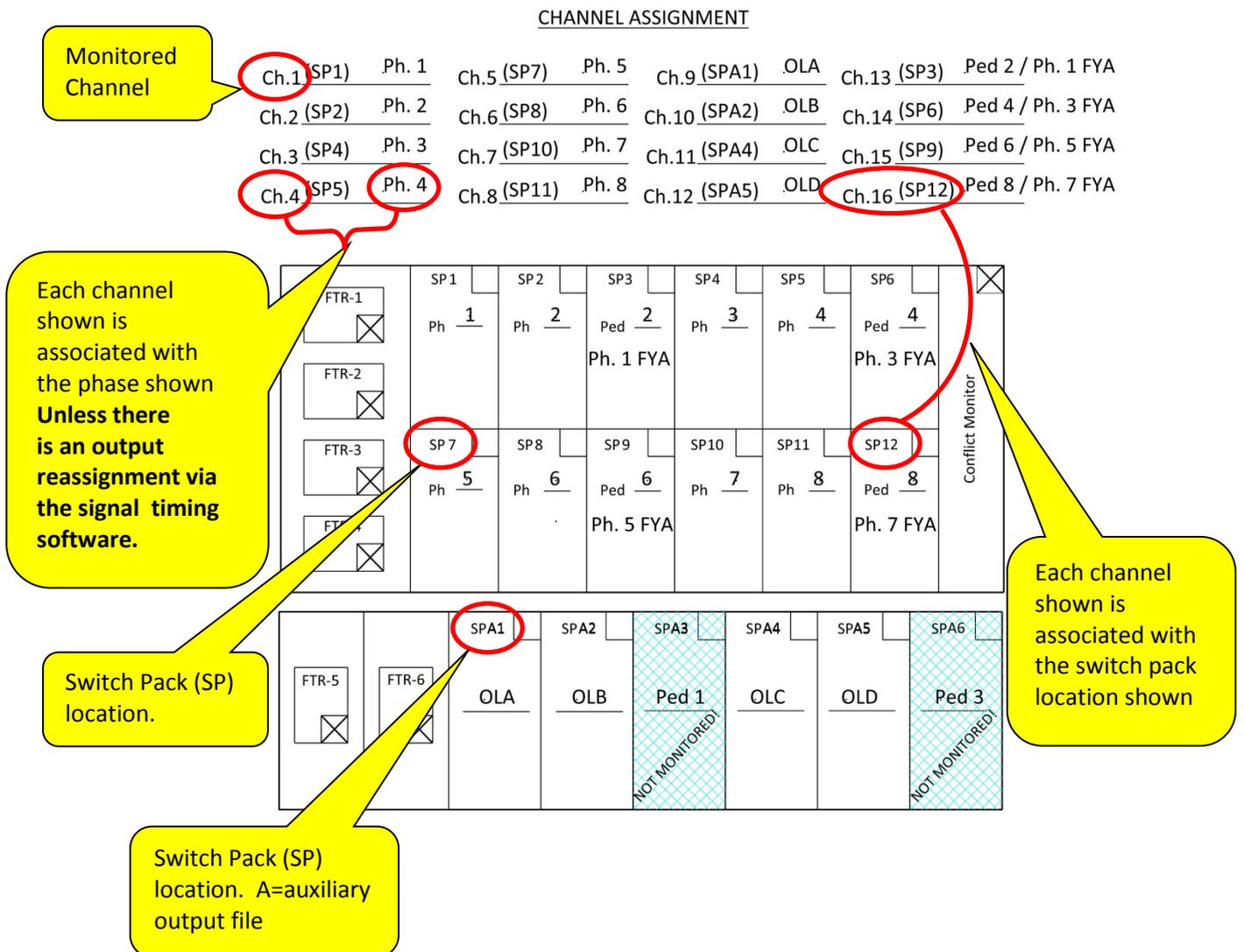
- The flashing yellow arrow phase output is reassigned to the compatible pedestrian yellow phase*. The pedestrian yellow phase has the same compatible phases as the pedestrian WALK phase. It is monitored via removal of the appropriate “yellow inhibit jumper”:
- | | |
|------------------------|------------------------|
| • 1 FYA = ped 2 yellow | • 5 FYA = ped 6 yellow |
| • 3 FYA = ped 4 yellow | • 7 FYA = ped 8 yellow |

*If the compatible ped phase is not existent (due to a crosswalk closure) then the flashing yellow arrow output needs to be reassigned to the unused compatible ped WALK output (rather than the ped YELLOW output). The conflict monitor will not work correctly if a YELLOW output is monitored without a wire terminated at the GREEN/WALK output (the conflict monitor treats the GREEN/WALK output like “parent” phase for the YELLOW output).

Channel Assignment - Standard

On a standard Model 210 conflict monitor, there are 16 channels that can be monitored. Each active phase (GREEN, WALK, or flashing yellow) shall be assigned to a channel on the conflict monitor. The standard channel and phase assignment is shown in Figure 20-9. Switch Packs A3 and A6 are NOT wired to the conflict monitor. Each monitored channel is ALWAYS directly wired to Switch Pack location as shown in Figure 20-9. For example, Channel 1 (regardless of what phase channel 1 is associated with) is ALWAYS wired to Switch Pack 1. Each channel is associated with phase shown in Figure 20-9, unless there are output reassignments (done via the signal software).

Figure 20-9 | Standard Channel Assignment



Channel Assignment – Output Reassignments

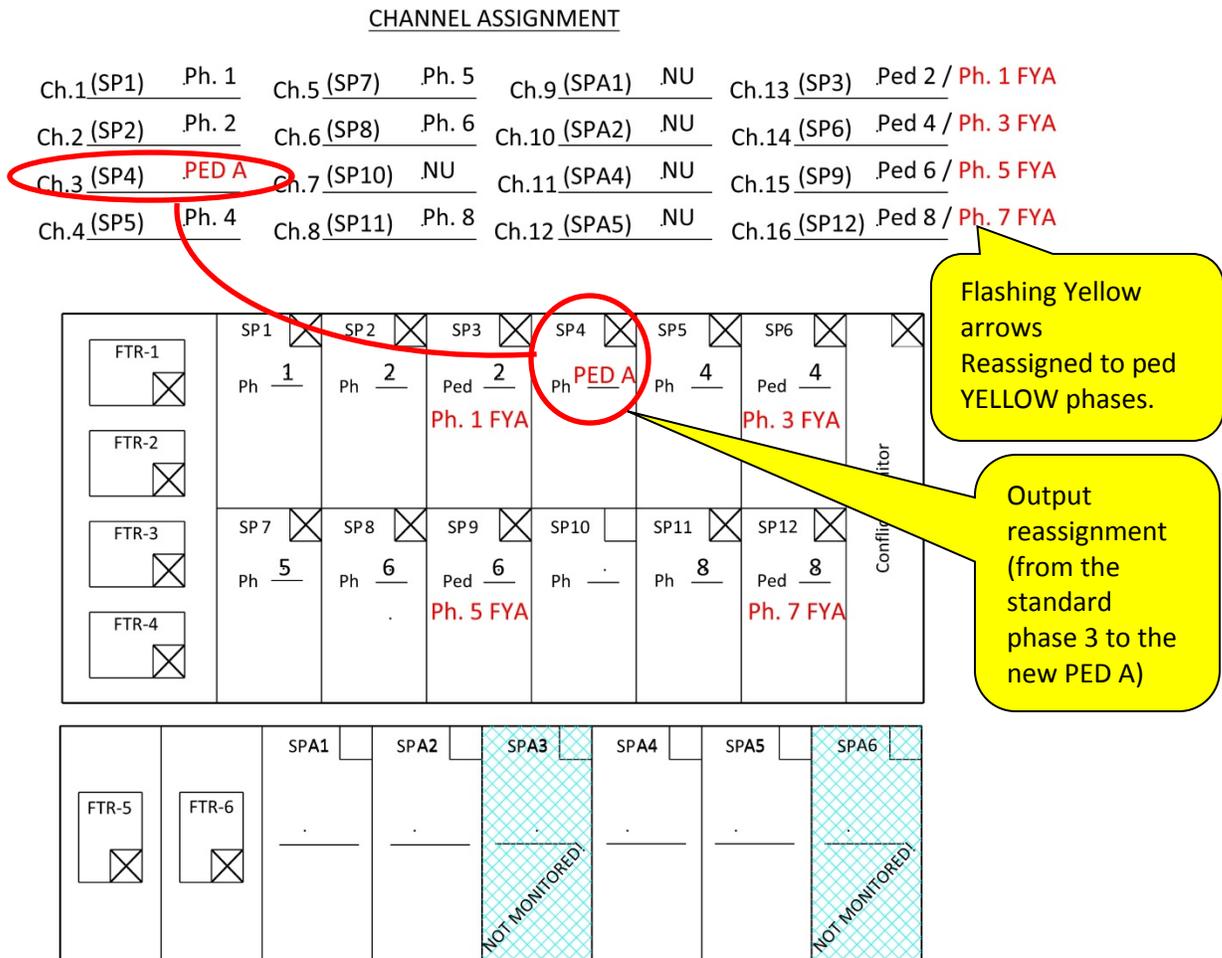
There are cases where it is necessary to reassign the output because a standard designation does not exist in the output file, such as:

- an odd numbered ped phase
- a flashing yellow arrow
- a ped overlap phase

In the past, output reassignments for vehicle overlap phases were commonly done to avoid installing an auxiliary output file. Auxiliary output files are now installed standard in 332S cabinets so this practice is no longer required for new installations.

Output reassignments are done via the signal timing software. **Always verify with the Signal Timer any output reassignments.** Figure 20-10 shows an example where the Channel 3, switch pack location SP4 has been reassigned to Ped A. Flashing yellow arrows have been reassigned to the unused ped YELLOW phases.

Figure 20-10 | Channel Assignment – Output Reassignments



Determining Compatible Phases for the Diode Card

Collect all information about the intersection that will be needed in order to determine the compatible phases, such as:

- Vehicle phases in use
- Pedestrian phases in use
- Parent phase assignments of overlaps
- Exclusive phase assignments
- Output reassignments from signal timing
- Load switches in use
- Existing cabinets: verify cabinet is wired as per standard with TSSU

Step 1: Assign phases to the channels. If a channel is not used, write “NU” next to it.

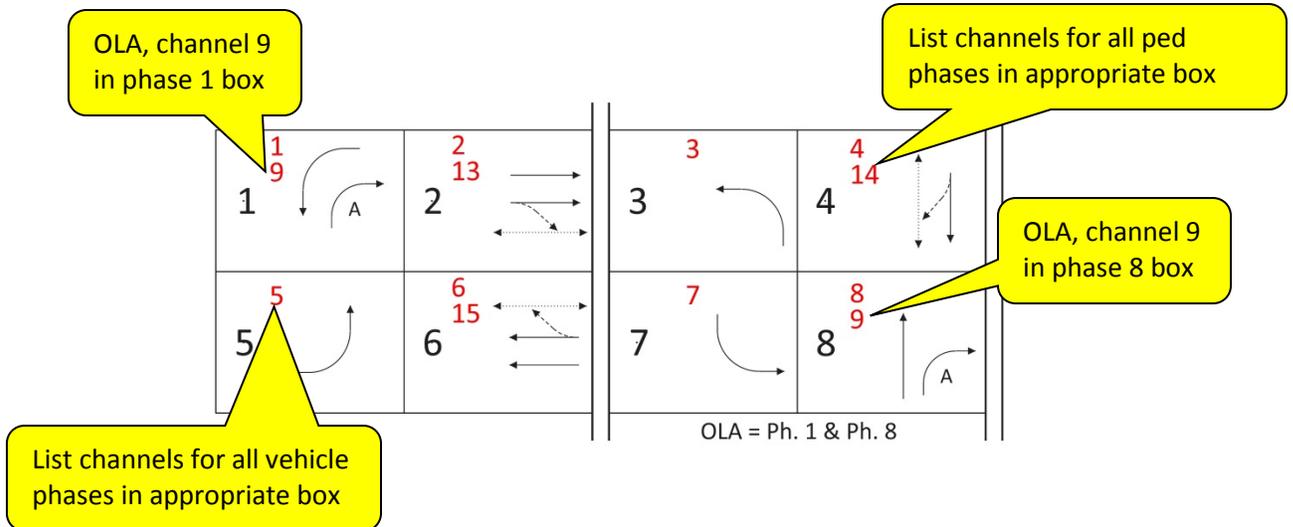
Based on intersection info, assign each phase used to a monitor channel

CHANNEL ASSIGNMENT

| | | | |
|------------------|-------------------|-----------------|-------------------|
| Ch.1 (SP1) Ph. 1 | Ch.5 (SP7) Ph. 5 | Ch.9 (SPA1) OLA | Ch.13 (SP3) Ped 2 |
| Ch.2 (SP2) Ph. 2 | Ch.6 (SP8) Ph. 6 | Ch.10 (SPA2) NU | Ch.14 (SP6) Ped 4 |
| Ch.3 (SP4) Ph. 3 | Ch.7 (SP10) Ph. 7 | Ch.11 (SPA4) NU | Ch.15 (SP9) Ped 6 |
| Ch.4 (SP5) Ph. 4 | Ch.8 (SP11) Ph. 8 | Ch.12 (SPA5) NU | Ch.16 (SP12) NU |

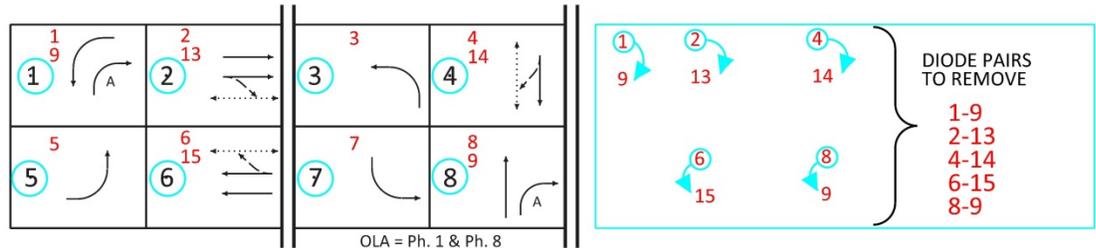
Step 2: Write the monitor channels in the ring and barrier diagram for (pay close attention to outputs that have been reassigned):

- Each vehicle phase used.
- Each pedestrian phase used.
- Each parent phase assigned to an overlap. For example, if OLA = ph. 1 and ph. 8, and OLA is assigned to channel 9, then write 9 in the phase 1 box and 9 in the phase 8 box of the ring and barrier diagram.

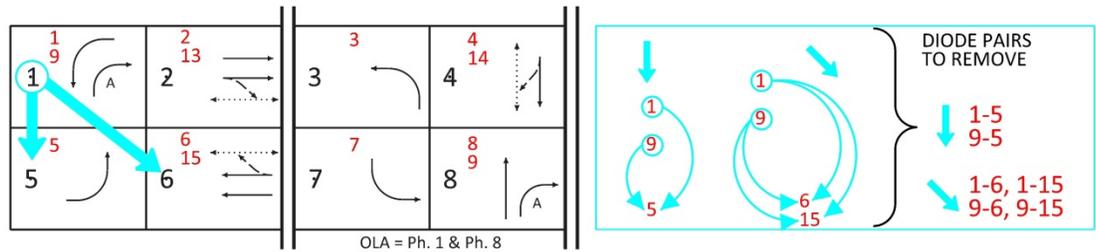


Step 3: Determine the compatible phases (diode pairs that need to be removed). The following procedure will ensure that all correct diodes are removed. There are likely to be a few duplicate diode pairs for phases with overlaps. This is OK, since a diode can only be removed once.

STEP 3A: LIST ALL DIODE PAIRS FOR EACH MONITOR CHANNEL IN THE SAME BOX



STEP 3B: START IN UPPER LEFT BOX OF THE DIAGRAM. LIST ALL DIODE PAIRS FOR EACH MONITOR CHANNEL THAT IS VERTICALLY OR DIAGONALLY OPPOSITE THE BOX (EXCEPT ANY EXCLUSIVE PHASES).



STEP 3C: REPEAT STEP 3B FOR EACH BOX ON THE UPPER ROW OF THE DIAGRAM.

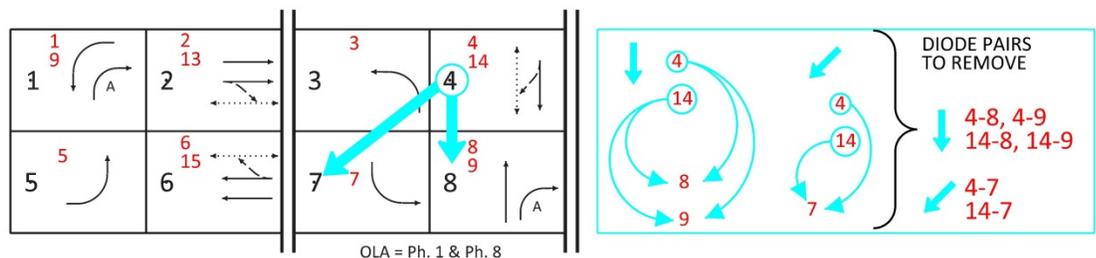
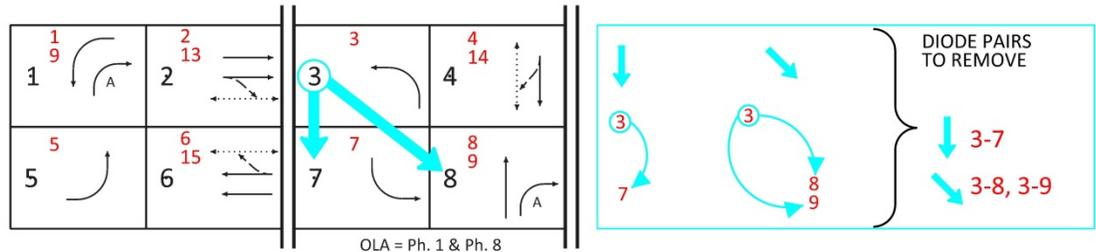
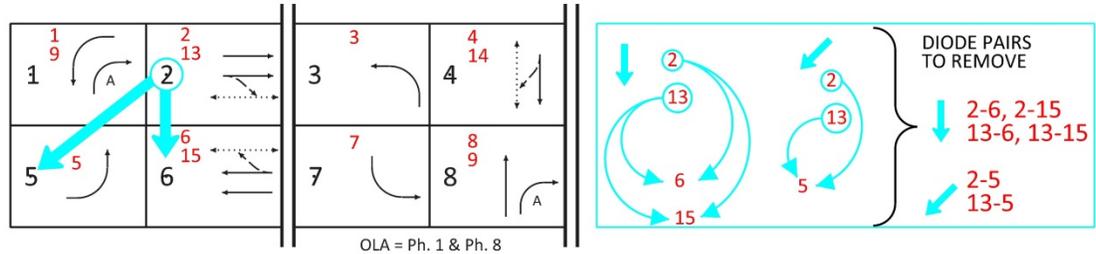
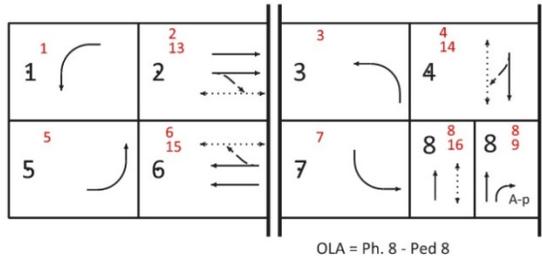


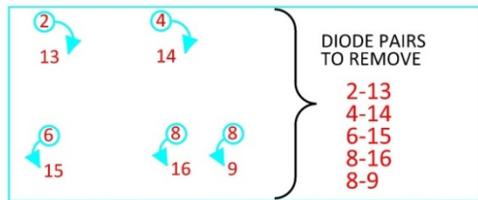
Figure 20-11 thru Figure 20-14 show common examples of determining compatible phases.

Figure 20-11 | Determining Compatible Phases – Example 1: Not-Ped Overlap

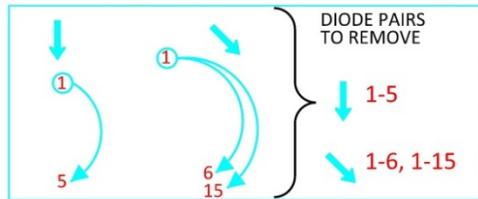
| CHANNEL ASSIGNMENT | | | | | | | |
|--------------------|-------|-------------|-------|--------------|------|--------------|-------|
| Ch.1 (SP1) | Ph. 1 | Ch.5 (SP7) | Ph. 5 | Ch.9 (SPA1) | .OLA | Ch.13 (SP3) | Ped 2 |
| Ch.2 (SP2) | Ph. 2 | Ch.6 (SP8) | Ph. 6 | Ch.10 (SPA2) | NU | Ch.14 (SP6) | Ped 4 |
| Ch.3 (SP4) | Ph. 3 | Ch.7 (SP10) | Ph. 7 | Ch.11 (SPA4) | NU | Ch.15 (SP9) | Ped 6 |
| Ch.4 (SP5) | Ph. 4 | Ch.8 (SP11) | Ph. 8 | Ch.12 (SPA5) | NU | Ch.16 (SP12) | Ped 8 |



STEP 3A: LIST ALL DIODE PAIRS FOR EACH MONITOR CHANNEL IN THE SAME BOX



STEP 3B: START IN UPPER LEFT BOX OF THE DIAGRAM. LIST ALL DIODE PAIRS FOR EACH MONITOR CHANNEL THAT IS VERTICALLY OR DIAGONALLY OPPOSITE THE BOX (EXCEPT ANY EXCLUSIVE PHASES).



STEP 3C: REPEAT STEP 3B FOR EACH BOX ON THE UPPER ROW OF THE DIAGRAM.

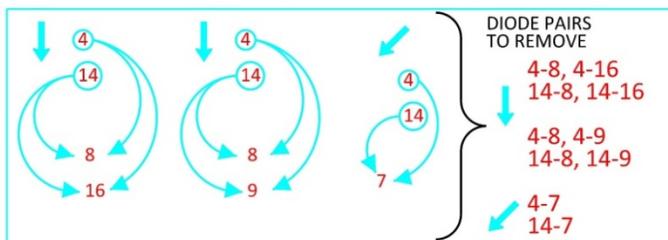
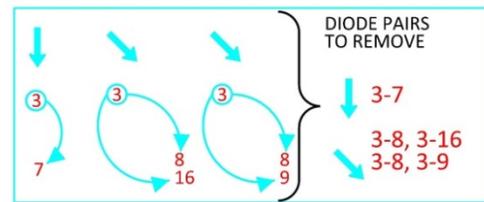
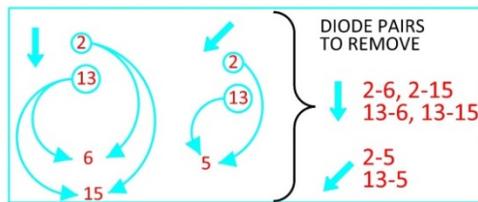
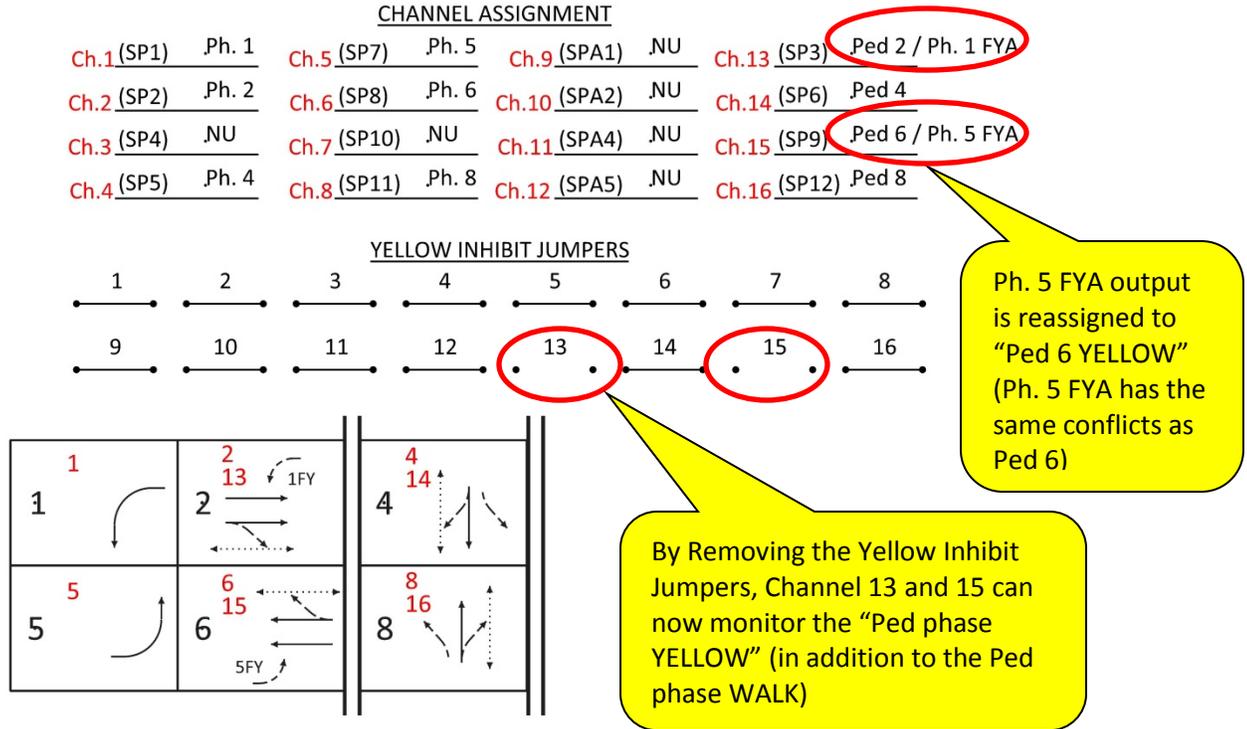
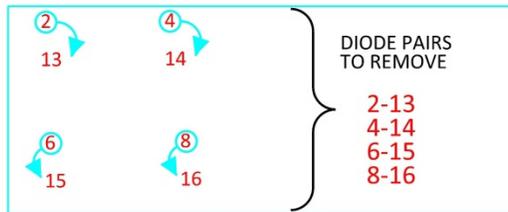


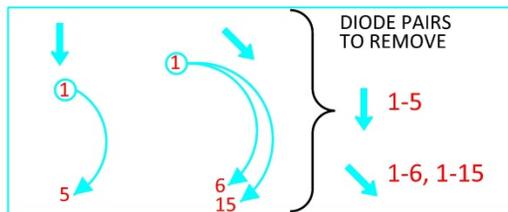
Figure 20-12 | Determining Compatible Phases – Example 2: Flashing Yellow Arrow



STEP 3A: LIST ALL DIODE PAIRS FOR EACH MONITOR CHANNEL IN THE SAME BOX



STEP 3B: START IN UPPER LEFT BOX OF THE DIAGRAM. LIST ALL DIODE PAIRS FOR EACH MONITOR CHANNEL THAT IS VERTICALLY OR DIAGONALLY OPPOSITE THE BOX (EXCEPT ANY EXCLUSIVE PHASES).



STEP 3C: REPEAT STEP 3B FOR EACH BOX ON THE UPPER ROW OF THE DIAGRAM.

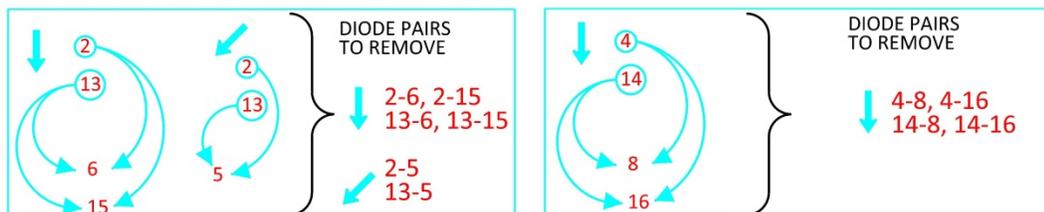
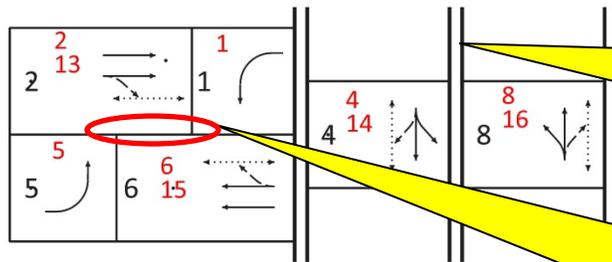


Figure 20-13 | Determining Compatible Phases – Example 3: Exclusive Phases

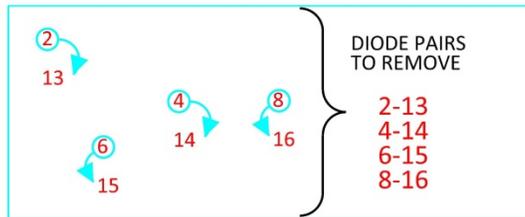
| CHANNEL ASSIGNMENT | | | | | | | |
|--------------------|-------|-------------|-------|--------------|-----|--------------|-------|
| Ch.1 (SP1) | Ph. 1 | Ch.5 (SP7) | Ph. 5 | Ch.9 (SPA1) | .NU | Ch.13 (SP3) | Ped 2 |
| Ch.2 (SP2) | Ph. 2 | Ch.6 (SP8) | Ph. 6 | Ch.10 (SPA2) | .NU | Ch.14 (SP6) | Ped 4 |
| Ch.3 (SP4) | .NU | Ch.7 (SP10) | .NU | Ch.11 (SPA4) | .NU | Ch.15 (SP9) | Ped 6 |
| Ch.4 (SP5) | Ph. 4 | Ch.8 (SP11) | Ph. 8 | Ch.12 (SPA5) | .NU | Ch.16 (SP12) | Ped 8 |



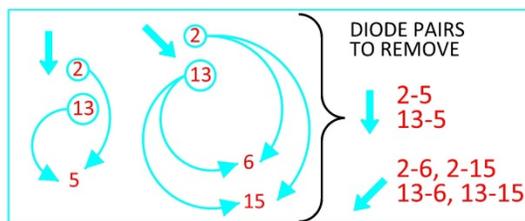
Phase 4 and phase 8 are exclusive phases (There are no compatible phases located vertically or diagonally on the same side of the barrier).

Phase 1 and 5 are NOT compatible as drawn (a diagonal line would not go directly from phase 1 to 5 without passing thru the phase 2 or phase 6 boxes). See Chapter 3 for more info.

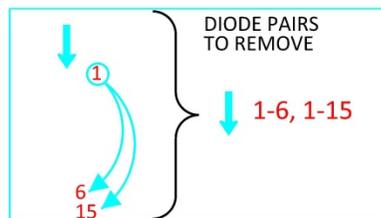
STEP 3A: LIST ALL DIODE PAIRS FOR EACH MONITOR CHANNEL IN THE SAME BOX



STEP 3B: START IN UPPER LEFT BOX OF THE DIAGRAM. LIST ALL DIODE PAIRS FOR EACH MONITOR CHANNEL THAT IS VERTICALLY OR DIAGONALLY OPPOSITE THE BOX (EXCEPT ANY EXCLUSIVE PHASES).



STEP 3C: REPEAT STEP 3B FOR EACH BOX ON THE UPPER ROW OF THE DIAGRAM.

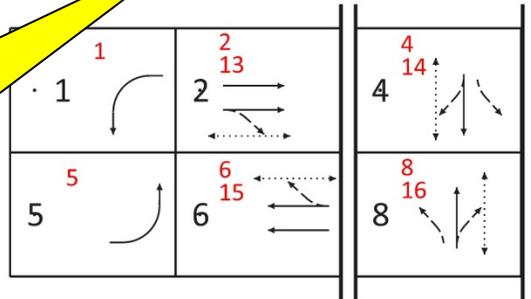


Phase 4 and phase 8 are exclusive phases (no other phases are compatible).

Figure 20-14 | Determining Compatible Phases – Example 4: Railroad Preemption Type 7 Signal Head

| CHANNEL ASSIGNMENT | | | | | |
|--------------------|--------------------------|-----------------|--------------------|--|--|
| Ch.1 (SP1) Ph. 1 | Ch.5 (SP7) Ph. 5 | Ch.9 (SPA1) NU | Ch.13 (SP3) Ped 2 | | |
| Ch.2 (SP2) Ph. 2 | Ch.6 (SP8) Ph. 6 | Ch.10 (SPA2) NU | Ch.14 (SP6) Ped 4 | | |
| Ch.3 (SP4) NU | Ch.7 (SP10) Ph. 7 | Ch.11 (SPA4) NU | Ch.15 (SP9) Ped 6 | | |
| Ch.4 (SP5) Ph. 4 | Ch.8 (SP11) Ph. 8 | Ch.12 (SPA5) NU | Ch.16 (SP12) Ped 8 | | |

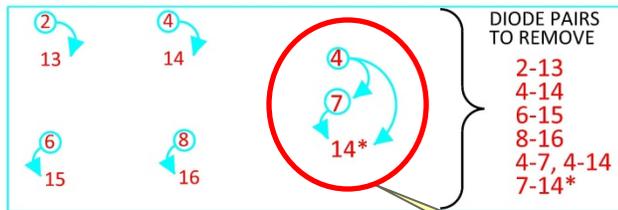
Don't Forget to include the phase that is only active during the VCOI!



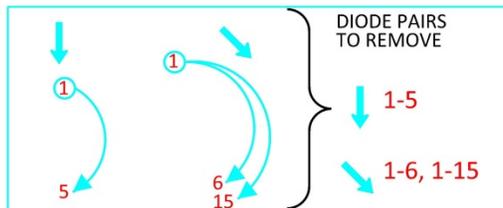
Railroad Preemption (VCOI) Only (Type 7 Signal Head for phase 7 left turn arrow indication)

***NOTE:** During the VCOI, Ped 4 should not be active with phase 7. However, the compatible ped phase diode pair is removed (7-14 diode pair in this case) because it is not a true conflict and it is safer to allow these phases to be active during the VCOI than to conflict the monitor and place the signal into flash.

STEP 3A: LIST ALL DIODE PAIRS FOR EACH MONITOR CHANNEL IN THE SAME BOX

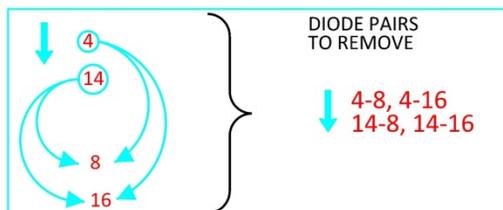
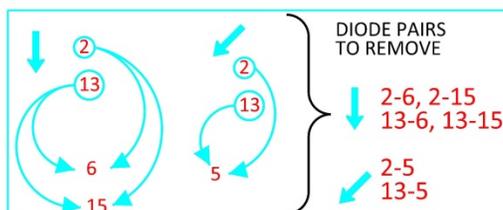


STEP 3B: START IN UPPER LEFT BOX OF THE DIAGRAM. LIST ALL DIODE PAIRS FOR EACH MONITOR CHANNEL THAT IS VERTICALLY OR DIAGONALLY OPPOSITE THE BOX (EXCEPT ANY EXCLUSIVE PHASES).



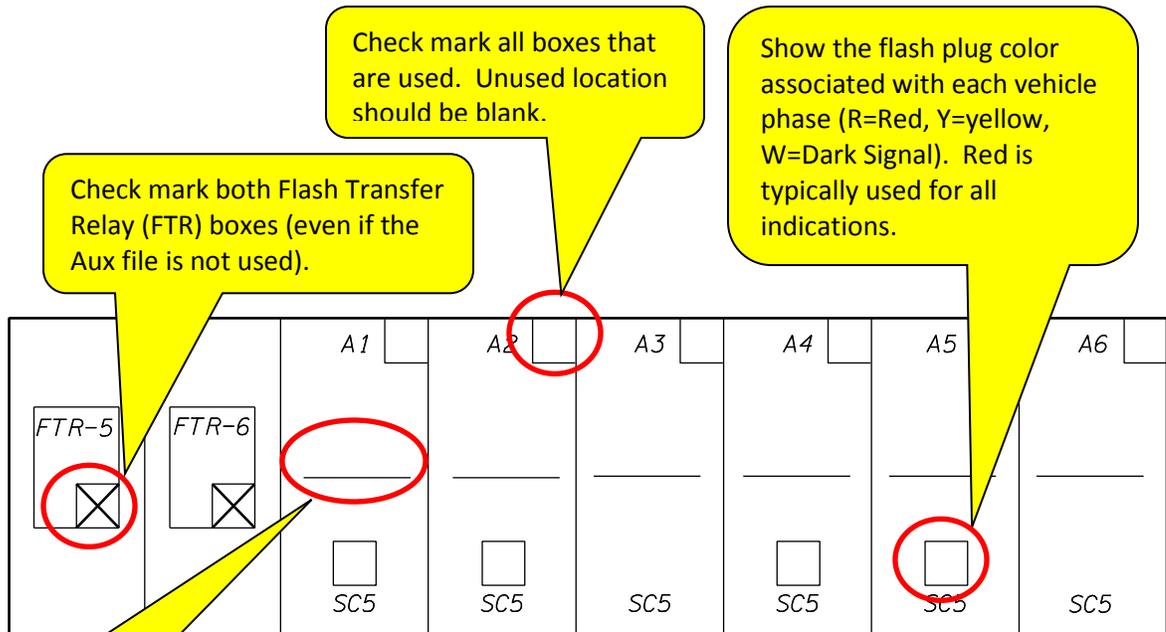
Don't Forget to include the phase that is only active during the VCOI!

STEP 3C: REPEAT STEP 3B FOR EACH BOX ON THE UPPER ROW OF THE DIAGRAM.



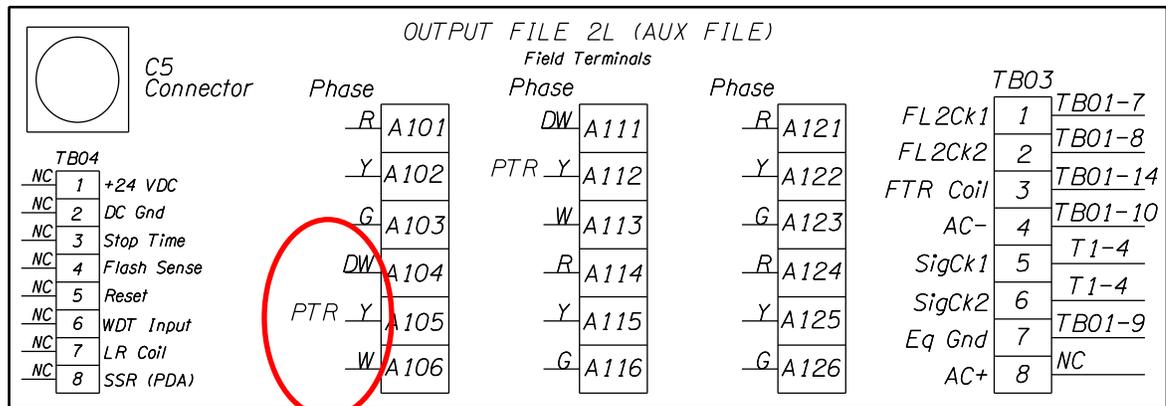
20.6.4 Auxiliary Output File (Front and Back View)

This location comes standard in 332S cabinets (optional in 332 cabinets) and provides additional outputs if more are needed. Unused locations should be left blank. It is filled out the same way as the main output file.



List phase (the standard phase assignments are shown in this example)

OUTPUT FILE 2L (AUX FILE)
FRONT VIEW - (NOT TO SCALE)



OUTPUT FILE 2L (AUX FILE)
REAR VIEW - (NOT TO SCALE)

Fill in the phase for the Red (R), Yellow (Y), Green (G), Walk (W), Flashing Don't Walk (DW), and Part Time Restriction signal (PTR) indications. Standard indications are shown in the example.

20.6.5 Additional Information for the Output File

- The standard 332S (and 332 and 336) cabinets can accommodate 8 vehicle phases and 4 pedestrian phases (a total of 12 load switches). An additional 4 vehicle phase and 2 pedestrian phases (a total of 6 additional load switches) are available if needed in the auxiliary output file of the 332S and 332 cabinet (The auxiliary output file comes standard in the 332S cabinet, and is optional in the 332 cabinet). There is a standard phase layout for the output file. However, most intersection software programs allow the flexibility to assign any phase, pedestrian phase, overlap or special use output to any output location in the output files.
- Sixteen (of the 18 total) load switches are conflict monitored. The load switches in the auxiliary file slot A3 and A6 are not monitored.
- Pedestrian output locations will always be in load switch location 3, 6, 9, and 12 of the main output file and A3 and A6 of an auxiliary output file. The reason for this is that the flash power is not routed to these load switch locations, which allows the pedestrian signal indications to remain dark while the signal is operating in emergency flash mode. Vehicle signal indication should not be reassigned to these slots as they should not remain dark in flashing mode.
- Flashing yellow left turn arrow indications started to be used in the early 2000's and output file was not created with this operation in mind. In the past, the flashing yellow output was assigned to various locations. The following was developed to create a standard for the cabinet termination of the FYA display which makes use of standard outputs that are normally never used and enables a simplified method for conflict monitoring:
 - Phase 1 FYA: terminates at phase 2 ped yellow (load switch slot 3)
 - Phase 5 FYA: terminates at phase 6 ped yellow (load switch slot 9)
 - Phase 3 FYA: terminates at phase 4 ped yellow (load switch slot 6)
 - Phase 7 FYA: terminates at phase 8 ped yellow (load switch slot 12)
- PTR signs should terminate on the phase 1 ped yellow output of the auxiliary output file, switch pack location A3. In the past, PTR signs for rail preemption (the typical installation) were normally terminated on the phase 4 ped yellow output (or any other unused ped yellow output if the phase 4 ped didn't exist). Because the ped yellow outputs for ped phases 2 thru 8 are now reserved for the flashing yellow arrow indications, they should no longer be used for PTR signs in new installations.

- Flash plugs are used with the output file to enable the correct indication to flash while the signal is operating in emergency flash mode (i.e. cabinet flash). RED flash plugs enable the red indication to flash, and YELLOW flash plugs enable the yellow indication to flash. WHITE flash plugs shall be used to bypass the flash power if a standard vehicle phase output (Switch pack locations 1, 2, 4, 5, 7, 8, 10, 11, A1, A2, A4, and A5) has been reassigned to a pedestrian phase so that the pedestrian indications will remain dark while the signal is operating in emergency flash mode. The default standard is to use RED flash plugs for all load switch locations that serve vehicle phases; standard pedestrian phase load switch locations do not use flash plugs and are already wired to bypass the flash power. The major through phase may have YELLOW flash plugs under certain conditions (See the Traffic Signal Policy and Guidelines, Chapter 9 for more information). The Region Traffic Signal Operations Engineer is responsible for making this determination. If something other than RED flash plugs are required, it shall be noted on the switch pack location as “Y” (for yellow) or “W” (for no-flash).

20.7 332S Cabinet Print (Page 4 – C1 Pin Assignments & Test Switch)

Page 4 of the cabinet print shows the C1 pin assignments and test switch details. This sheet generally doesn't require any modification. See Figure 20-15.

Figure 20-15 | 332S Cabinet Print (page 4 – C1 pin assignments & test switch)

| Program Assigned Functions | C1 Connector | | C4 Connector | | | Field Term. |
|----------------------------|--------------|-------------|--------------|-------------|-------|-------------|
| | Pin | Termination | Pin | In Position | Out | |
| DC Gnd | 1 | DC Gnd Bus | - | - | - | - |
| Ø 2 DWALK | 2 | C4-1 | 1 | 6 | 6-DW | 3 104 |
| Ø 4 WALK | 3 | C4-2 | 2 | 10 | 6-W | 7 106 |
| Ø 4 RED | 4 | C4-3 | 3 | 6 | 5-R | 3 101 |
| Ø 4 YELLOW | 5 | C4-4 | 4 | 8 | 5-Y | 5 102 |
| Ø 4 GREEN | 6 | C4-5 | 5 | 10 | 5-G | 7 103 |
| Ø 3 RED | 7 | C4-6 | 6 | 6 | 4-R | 3 116 |
| Ø 3 YELLOW | 8 | C4-7 | 7 | 8 | 4-Y | 5 117 |
| Ø 3 GREEN | 9 | C4-8 | 8 | 10 | 4-G | 7 118 |
| Ø 2 DWALK | 10 | C4-9 | 9 | 6 | 3-DW | 3 113 |
| Ø 2 WALK | 11 | C4-10 | 10 | 10 | 3-W | 7 115 |
| Ø 2 RED | 12 | C4-11 | 11 | 6 | 2-R | 3 128 |
| Ø 2 YELLOW | 13 | C4-12 | 12 | 8 | 2-Y | 5 129 |
| Input Gnd | 14 | T015-4"1" | - | - | - | - |
| Ø 2 GREEN | 15 | C4-13 | 13 | 10 | 2-G | 7 130 |
| Ø 1 RED | 16 | C4-14 | 14 | 6 | 1-R | 3 125 |
| Ø 1 YELLOW | 17 | C4-15 | 15 | 8 | 1-Y | 5 126 |
| Ø 1 GREEN | 18 | C4-16 | 16 | 10 | 1-G | 7 127 |
| Ø 0 DWALK | 19 | C4-17 | 17 | 6 | 10-DW | 3 110 |
| Ø 0 WALK | 20 | C4-18 | 18 | 10 | 12-W | 7 112 |
| Ø 0 RED | 21 | C4-19 | 19 | 6 | 11-R | 3 107 |
| Ø 0 YELLOW | 22 | C4-20 | 20 | 8 | 11-Y | 5 108 |
| Ø 0 GREEN | 23 | C4-21 | 21 | 10 | 11-G | 7 109 |
| Ø 7 RED | 24 | C4-22 | 22 | 6 | 10-R | 3 122 |
| Ø 7 GREEN | 25 | C4-23 | 23 | 8 | 10-Y | 5 123 |
| Ø 7 YELLOW | 26 | C4-24 | 24 | 10 | 10-G | 7 124 |
| Ø 6 DWALK | 27 | C4-25 | 25 | 6 | 9-DW | 3 119 |
| Ø 6 WALK | 28 | C4-26 | 26 | 10 | 9-W | 7 121 |
| Ø 6 RED | 29 | C4-27 | 27 | 6 | 8-R | 3 134 |
| Ø 6 YELLOW | 30 | C4-28 | 28 | 8 | 8-Y | 5 135 |
| Ø 6 GREEN | 31 | C4-29 | 29 | 10 | 8-G | 7 136 |
| Ø 5 RED | 32 | C4-30 | 30 | 6 | 7-R | 3 131 |
| Ø 5 YELLOW | 33 | C4-31 | 31 | 8 | 7-Y | 5 132 |
| Ø 5 GREEN | 34 | C4-32 | 32 | 10 | 7-G | 7 133 |
| Ø 3 FLT YA | 35 | C4-33 | 33 | 8 | 3-Y | 5 114 |
| Ø 3 FLT YB | 36 | C4-34 | 34 | 8 | 3-Y | 5 120 |
| Ø 3 FLT YA | 37 | C4-35 | 35 | 8 | 6-Y | 5 105 |
| Ø 3 FLT YB | 38 | C4-36 | 36 | 8 | 12-Y | 5 111 |

| Program Assigned Functions | Pin | Termination | Input Files | | Field Term. |
|----------------------------|-----|-------------|-------------|-----|-------------|
| | | | Out | In | |
| Ø 2 DET | 39 | 13-1 | F | DME | T85-9810 |
| Ø 6 DET | 40 | 23-1 | F | DME | T85-9810 |
| Ø 4 DET | 41 | 18-1 | F | DME | T85-29830 |
| Ø 8 DET | 42 | Ø-1 | F | DME | T85-29830 |
| Ø 2 DET | 43 | 13-2 | W | JMK | T85-11812 |
| Ø 6 DET | 44 | Ø-2 | W | JMK | T85-11812 |
| Ø 4 DET | 45 | 18-2 | W | JMK | T85-31832 |
| Ø 8 DET | 46 | Ø-2 | W | JMK | T85-31832 |
| Ø 2 DET | 47 | 15-1 | F | DME | T85-17818 |
| Ø 6 DET | 48 | Ø-1 | F | DME | T85-17818 |
| Ø 4 DET | 49 | 110-1 | F | DME | T85-37838 |
| Ø 8 DET | 50 | 110-1 | F | DME | T85-37838 |
| VOG1 | 51 | 118-1 | F | D | T80-3 |
| ADV ENABLE | 53 | - | - | - | T81-11 |
| SPARE | 54 | 111-1 | F | DME | T85-9810 |
| Ø 5 DET | 55 | 11-1 | F | DME | T85-182 |
| Ø 1 DET | 56 | 11-1 | F | DME | T85-182 |
| Ø 7 DET | 57 | Ø-1 | F | DME | T85-21822 |
| Ø 3 DET | 58 | 16-1 | F | DME | T85-21822 |
| Ø 5 DET | 59 | 11-2 | W | JMK | T85-384 |
| Ø 1 DET | 60 | 11-2 | W | JMK | T85-384 |
| Ø 7 DET | 61 | Ø-2 | W | JMK | T85-23824 |
| Ø 3 DET | 62 | 16-2 | W | JMK | T85-23824 |
| Ø 2 DET | 63 | 14-1 | F | DME | T85-13814 |
| Ø 6 DET | 64 | 14-1 | F | DME | T85-13814 |
| Ø 4 DET | 65 | 19-1 | F | DME | T85-33834 |
| Ø 8 DET | 66 | Ø-1 | F | DME | T85-33834 |
| Pin 2 Ped | 67 | 113-1 | F | D | T81-1 |
| Pin 6 Ped | 68 | 114-1 | F | D | T81-4 |
| Pin 4 Ped | 69 | 113-2 | W | J | T81-2 |
| Pin 8 Ped | 70 | 114-2 | W | J | T81-5 |
| EVA | 71 | 113-1 | F | D | T83-3 |
| EV8 | 72 | 114-1 | F | D | T83-6 |
| EV3 | 73 | 113-2 | W | J | T83-4 |
| EV9 | 74 | 114-2 | W | J | T83-7 |
| Ø 2 DET | 76 | 14-2 | W | JMK | T85-15816 |
| Ø 6 DET | 77 | 14-2 | W | JMK | T85-15816 |
| Ø 4 DET | 78 | 19-2 | W | JMK | T85-35836 |
| Ø 8 DET | 79 | 19-2 | W | JMK | T85-35836 |
| Flash Sense | 80 | - | - | - | T81-10 |
| Stop Time | 82 | - | - | - | T81-8 |

| Program Assigned Functions | Pin | Termination | CS Connector | | Field Term. | |
|----------------------------|-----|-------------|--------------|-------------|-------------|--------|
| | | | Pin | Switch Pack | | |
| Ø 3 DWALK | 83 | CS-1 | 1 | 6 | A6-DW | 3 A104 |
| Ø 3 WALK | 84 | CS-2 | 2 | 10 | A6-W | 7 A106 |
| Ø 3 RED | 85 | CS-3 | 3 | 6 | A5-R | 3 A101 |
| Ø 3 YELLOW | 86 | CS-4 | 4 | 8 | A5-Y | 5 A102 |
| Ø 3 GREEN | 87 | CS-5 | 5 | 10 | A5-G | 7 A103 |
| Ø 3 RED | 88 | CS-6 | 6 | 6 | A4-R | 3 A114 |
| Ø 3 YELLOW | 89 | CS-7 | 7 | 8 | A4-Y | 5 A115 |
| Ø 3 GREEN | 90 | CS-8 | 8 | 10 | A4-G | 7 A116 |
| Ø 1 DWALK | 91 | CS-9 | 9 | 6 | A3-DW | 3 A111 |
| DC Gnd | 92 | DC Gnd Bus | - | - | - | - |
| Ø 1 WALK | 93 | CS-10 | 10 | 10 | A3-W | 7 A113 |
| Ø 1 RED | 94 | CS-11 | 11 | 6 | A2-R | 3 A124 |
| Ø 1 YELLOW | 95 | CS-12 | 12 | 8 | A2-Y | 5 A125 |
| Ø 1 GREEN | 96 | CS-13 | 13 | 10 | A2-G | 7 A126 |
| Ø 1 RED | 97 | CS-14 | 14 | 6 | A1-R | 3 A121 |
| Ø 1 YELLOW | 98 | CS-15 | 15 | 8 | A1-Y | 5 A122 |
| Ø 1 GREEN | 99 | CS-16 | 16 | 10 | A1-G | 7 A123 |
| PRF SIGN | 100 | CS-17 | 17 | 8 | A6-Y | 5 A105 |
| PRF SIGN | 101 | CS-18 | 18 | 8 | A3-Y | 5 A112 |
| FLASH OUT | 102 | T815-3"1" | - | - | - | - |
| Monitoring | 103 | C4-37 | - | - | - | - |
| Input Gnd | 104 | T815-4"1" | - | - | - | - |

| Program Assigned Functions | Pin | Termination | C11 Connector | | Field Term. |
|----------------------------|-------|-------------|---------------|-------------|-------------|
| | | | Pin | Termination | |
| NOT ASSIGN | 1,8 | T&B | - | - | - |
| DC Gnd | 9 | DC Gnd Bus | - | - | - |
| Ø 2 DET | 10 | 15-2 | W | JMK | T85-19820 |
| Ø 6 DET | 11 | Ø-2 | W | JMK | T85-19820 |
| Ø 4 DET | 12 | 110-2 | W | JMK | T85-39840 |
| Ø 8 DET | 13 | 110-2 | W | JMK | T85-39840 |
| DC Gnd | 14 | DC Gnd Bus | - | - | - |
| Ø 5 DET | 15 | 12-1 | F | DME | T85-586 |
| Ø 1 DET | 16 | 12-1 | F | DME | T85-586 |
| Ø 7 DET | 17 | 17-1 | F | DME | T85-25826 |
| Ø 3 DET | 18 | 17-1 | F | DME | T85-25826 |
| Ø 5 DET | 19 | Ø-2 | W | JMK | T85-788 |
| Ø 1 DET | 20 | 12-2 | W | JMK | T85-788 |
| Ø 7 DET | 21 | 17-2 | W | JMK | T85-27828 |
| Ø 3 DET | 22 | 17-2 | W | JMK | T85-27828 |
| SPARE | 23 | 111-1 | F | DME | T82-182 |
| SPARE | 24 | 112-1 | F | DME | T82-586 |
| SPARE | 25 | 111-2 | W | JMK | T82-384 |
| SPARE | 26 | 112-2 | W | JMK | T82-788 |
| NOT ASSIGN | 27,30 | T&B | - | - | - |
| DC Gnd | 31 | DC Gnd Bus | - | - | - |
| NOT ASSIGN | 32,36 | T&B | - | - | - |
| DC Gnd | 37 | DC Gnd Bus | - | - | - |

C11 PLUG PINOUT

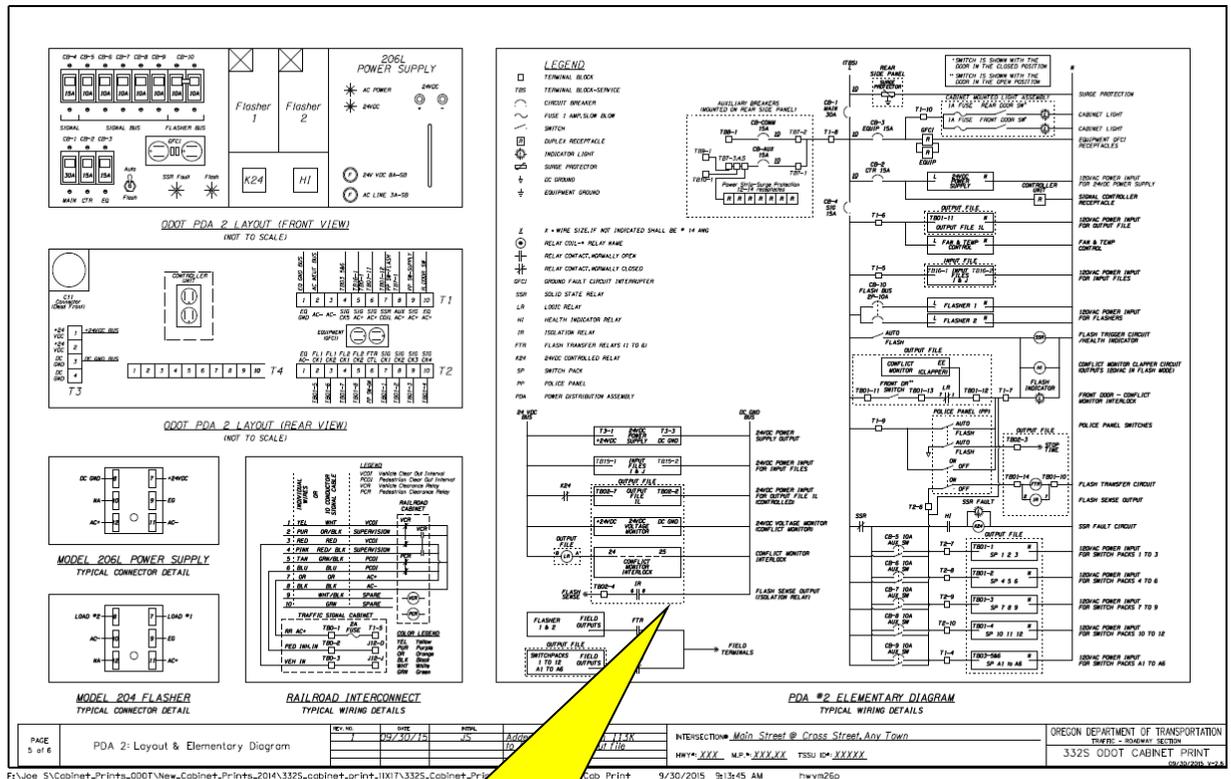
Detector Test Panel Wiring
Typical Wiring Diagram

This sheet should not be modified

20.8 332S Cabinet Print (Page 5 – Electrical Diagrams)

Page 5 of the cabinet print shows the electrical diagram details. This sheet generally doesn't require any modification. See Figure 20-16.

Figure 20-16 | 332S Cabinet Print (page 5 – electrical diagrams)



This sheet should not be modified

20.9 332S Cabinet Print (Page 6 – Intersection Drawing)

Page 6 of the cabinet print shows the intersection drawing. The intersection drawing is created from the design file and placed in the cabinet print file. This is to allow for easy future modification and archiving of the cabinet print without having to reference other files. Include the following:

- North arrow
- Lanes and lane use arrows
- Phasing labeled per lane
- Crosswalks being used and labeled per crosswalk
- Signal poles with mast arms/span wires showing locations of the signal heads
- Labeled detection zones (show and label cameras/radar if using video detection or radar detection)
- Phase rotation diagram
- Fire preemption diagram
- Reference to signal plan sheets related to the intersection (include outdated plan sheets for historical information)
- Railroad preemption site specific constraints

Bubble notes are typically not used in the intersection drawing. One exception is for video or radar detection; the bubble notes are the best way to define the label the zones on the plan view. See Figure 20-17.

Figure 20-17 | 332S Cabinet Print (page 6 – Intersection Drawing)

