



Ministry of  
Transportation  
and Infrastructure

TRAFFIC CONTROLLER DESIGN MANUAL

**Section 200**

**TRAFFIC CONTROLLER DESIGN  
AND DOCUMENTATION**

Transportation Systems and Road Safety Engineering

July 2024

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<https://www2.gov.bc.ca/gov/content/transportation/transportation-infrastructure/engineering-standards-guidelines/electrical-engineering>

# 201 TRAFFIC CONTROLLER DOCUMENTATION

## 201.1 INTRODUCTION

- .1 This section describes the policies applicable to the management of a Controller File for each signalized intersection. The purpose of a Controller File is to track signal timing and equipment updates throughout the traffic controller life cycle, from implementation to decommissioning, and to provide records for future developments. Each signalized intersection will have its own individual file.

## 201.2 POLICY

- .1 ITS Operations is responsible for creating and maintaining the Controller File.
  - .1 Any change to the Traffic Controller Cabinet and Unit shall be documented and included in the Controller File.
  - .2 If the signal is decommissioned, the Controller File shall be retained by ITS Operations for an additional 7 years.

## 201.3 CONTENTS

- .1 The Controller File includes all correspondence and documents that are considered material to the signalized intersection. These documents are as follows:
  - .1 **Traffic Engineering Check sheet (TEC):** This document is required in order to install a traffic controller cabinet.
  - .2 **Signal Timing Sheet (STS):** This document is required to program the traffic controller unit before signal commissioning.
  - .2 **Intersection Electrical Design Drawings:** These documents include the intersection site plan (1:250 scale) and the elevation drawings.
  - .3 **Traffic Controller Cabinet Drawings:** These documents detail the electrical designs for the traffic controller cabinet.
  - .4 **Loop Assignment Sheet (LAS):** This document details the field loop input and assignment to the traffic controller cabinet.
  - .5 **Traffic Cabinet Construction Document:** This document records the traffic cabinet configuration and controller unit programming for the signalized intersection operation.
  - .6 **Traffic Controller Unit Programming Data Capture:** This document details the settings and parameters programmed within the Traffic Controller Unit for the signalized intersection operation.

# 202 TRAFFIC CONTROLLER DRAWINGS

## 202.1 INTRODUCTION

- .1 This section describes the policies and standards applicable to traffic controller drawings.

## 202.2 POLICY

- .1 ITS Operations is responsible for managing all traffic controller drawings and records.
- .2 Modifications to the traffic controller drawings must conform to the standards detailed in this manual.
- .3 All proposed updates and modifications to the traffic controller drawings must be submitted to ITS Operations for approval and acceptance.

## 202.3 TYPES OF TRAFFIC CONTROLLER CABINET ASSEMBLIES

### 202.3.1 Four Phase ('M' and 'P6' Cabinet)

- .1 The Ministry utilizes the NEMA TS1, four phase 'M Series' or 'M' cabinet (see Clause 205.10) and the NEMA TS2, Type 1, 'P6' cabinet for intersections with four or less phases.
- .2 'M' Cabinets are no longer installed in new intersection projects. Existing 'M' Cabinets will remain in operation and replaced at the discretion of the Ministry.

### 202.3.2 Eight Phase ('S' and 'P6' Cabinet)

- .1 The Ministry utilizes the NEMA TS1, eight phase 'Sigma Series' or 'S' cabinet (see Section 205.9) and the NEMA TS2, Type 1, 'P6' Cabinet (see Section 205) for intersections with more than four phases.
- .2 'S' Cabinets are no longer installed in new intersection projects. Existing 'S' Cabinets will remain in operation and replaced at the discretion of the Ministry.
- .3 'P6' Cabinets are the Ministry's standard traffic controller cabinet to be installed for all new signalized traffic intersections.

# 203 TRAFFIC CONTROLLER DRAWING STANDARDS

## 203.1 GENERAL

- .1 This section describes the standards applicable to the traffic controller drawings.
- .2 Traffic controller drawings are produced using AutoCAD and are stored in the native format (using '.dwg' filename extension) in the Ministry's electronic database.
- .3 Any changes to that cabinet shall be updated in the current version of the drawing. The latest revision of the traffic controller drawings reflects the current configuration of the Traffic Controller Cabinet in operation. Current drawings shall be kept by the EMC and the ITS Operations.
- .4 Consult ITS Operations for any controller drawing queries.

## 203.2 NAMING CONVENTION FOR TS1 FOUR PHASE 'M' CABINET DRAWINGS

- .1 Drawing sheets for TS1 four phase 'M' cabinets consist of two drawings named as follows:
  - .1 'M' cabinet – Front (#####-#\_FRO.dwg): Drawing sheet details the field terminal blocks, inputs, power supply, flash circuitry, load switches and card racks.
  - .2 'M' cabinet – Harness (#####-#\_HAR.dwg): Drawing sheet details all harness connections, conflict monitor settings, and pre-emption card options.
  - .3 Example: An 'M' cabinet associated with intersection drawing 10123-1.dwg will include drawings: 10123-1\_FRO.dwg and 10123-1\_HAR.dwg

## 203.3 NAMING CONVENTION FOR TS1 EIGHT PHASE 'S' CABINET DRAWINGS

- .1 Drawing sheets for eight phase 'S' cabinets consist of three drawings named as follows:
  - .1 'S' Cabinet – Front (#####-#\_FRO.DWG): Drawing sheet details the field terminal blocks, inputs, power supply, flash circuitry, load switches and card racks.
  - .2 'S' Cabinet – Harness (#####-#\_HAR.DWG): Drawing sheet details all harness connection details, conflict monitor settings, and pre-emption card options.
  - .3 'S' Cabinet – Rear (#####-#\_REA.DWG): Drawing sheet details the field loop connections, power supply assembly and back panel terminal wiring.

- .4 Example: An 'S' cabinet associated with intersection drawing 10123-1.dwg will include drawings: 10123-1\_FRO.dwg, 10123-1\_HAR.dwg, and 10123-1\_REA.dwg.

### **203.4 NAMING CONVENTION FOR TS2 EIGHT PHASE 'P6' CABINET DRAWINGS**

- .1 Drawing sheets for eight phase 'P6' cabinets consist of three drawings named as follows:
  - .1 'P6' Cabinet – Primary (#####-#\_PRI.DWG): Drawing sheet details the field terminal blocks, inputs, power supply, load switches, and BIU pinouts.
  - .2 'P6' Cabinet – Secondary (#####-#\_SEC.DWG): Drawing sheet details the detector racks, pre-emption panel, field loop connections, advance warning circuit, and test switch panel.
  - .3 'P6' Cabinet – Tables (#####-#\_TABLES.DWG): Drawing sheet details the pin connections, MMU options and simulator switch wiring.
  - .4 Example: A 'P6' cabinet associated with intersection drawing 10123-1.dwg will include drawings: 10123-1\_PRI.dwg, 10123-1\_SEC.dwg and 10123-1\_TABLES.dwg.

# 204 DOCUMENTATION PROCESS

## 204.1 INTRODUCTION

- .1 This section describes the procedures involved in the traffic controller documentation process.
- .2 Design documents that will be described in this section include the Traffic Controller Construction Document, Loop Assignment Sheet (LAS), Traffic Engineering Checklist (TEC) and the Traffic Controller Drawings.

## 204.2 ROLES AND RESPONSIBILITIES

- .1 It is the responsibility of the EMC to install and commission the Traffic Controller Cabinet and Unit.
- .2 The Ministry provides guidelines in Section 204.3 on the recommended procedure for the Traffic Controller Construction Document to follow to ensure all necessary quality assurance checks are made. Final versions of these documents shall be sent to the Ministry.

## 204.3 TRAFFIC CONTROLLER CONSTRUCTION DOCUMENT

### 204.3.1 TS1 4 AND 8 PHASE 'M' AND 'S' TRAFFIC CABINET CONSTRUCTION DOCUMENT

- .1 The TS1 Traffic Cabinet Construction Document is used during cabinet construction to record pertinent information and ensure consistency when building TS1 'M' and 'S' cabinets. Each cabinet will have its own unique document.
- .2 The sections and checklists included are:
  - .1 Project Documents and Profile: This section of the document is to record project and equipment details.
  - .2 Cabinet Wiring Modifications: This section of the document provides step-by-step instructions to assemble and modify the Traffic Controller Cabinet.
  - .3 Installed Equipment: This section of the document provides a description of equipment to be installed to complete assembly and modification of the Traffic Controller Cabinet.
  - .4 Drawing Modifications: This section of the document provides a checklist of drawing items. These items should be used as a guide in design.



## DOCUMENTATION PROCESS

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- .5 Special Feature Programming: This section of the document provides notable information on the Traffic Controller Unit programming, or operational requirements of any add-on devices needed for this project.
- .6 Finishing Procedures: This section of the document contains labelling standards or any special considerations relevant to the project.
- .7 Final Test-N-Checkout form: This section of the document contains a checklist to ensure the traffic controller is operating correctly. Each item on the checklist shall be checked; the checklist shall be signed and dated when all checks are complete.
- .8 Quality Control Check List: This section of the document contains a checklist that is a peer review of the traffic controller design. A qualified EMC Technician shall review the Traffic Controller Construction Documentation for accuracy. This quality control process is carried out for each traffic controller design. Each item on the checklist shall be checked by the reviewer; the checklist shall be signed and dated when all tests have been completed.

### **204.3.2 TS2 4 AND 8 PHASE 'P6' TRAFFIC CONTROLLER CONSTRUCTION DOCUMENT**

- .1 The TS2 Traffic Controller Construction Document is used during cabinet construction to record pertinent information and ensure consistency when building TS2 'P6' cabinets. Each cabinet will have its own unique document.
- .2 The sections and checklists included are:
  - .1 Project Information and Scope. Contains the project's drawing number, dates for the applicable Signal Timing Sheet, Traffic Engineering Check sheet and Loop Assignment Sheet, cabinet serial number and controller unit and the scope of work for the project.
    - .1 Drawing: Drawing number (typically starts with TE).
    - .2 STS Date: Signal Timing Sheet issue date by the Ministry.
    - .3 TEC Date: Traffic Engineering Check sheet approval date by the Ministry.
    - .4 LAS Date: Loop Assignment Sheet preparation date.
    - .5 Cabinet Serial: Serial number found on the cabinet.
    - .6 Controller Unit Type & Serial: Controller unit type (typically a Cobalt) and serial number.
  - .2 Signal sequence: Signal phasing diagram from the TEC.
  - .3 Phase to Load Switch Assignments: Table identifying the vehicle and pedestrian phases attributed to its corresponding load switch.
  - .4 MMU Compatibilities and Settings: Summarize the MMU channel numbers with compatible field outputs and the MMU data screen

settings.

- .5 Cabinet wiring changes: Records any modifications to the cabinet.
- .6 Equipment list: Table to record the traffic controller equipment and the manufacturer, model, serial numbers and quantities.
- .7 Special Features: Records any nonstandard programming information, such as extra logic statement requirements, and/or ramp queue information.
- .8 Quality Control Check List: Checklist that is a peer review of the traffic controller design and includes a checklist for the documentation and the cabinet. A qualified EMC Technician shall review the traffic controller construction documentation for accuracy. This quality control process is carried out for each traffic controller design. Each item on the list shall be checked by the reviewer and the checklist signed and dated when all tests have been completed.

### 204.4 LOOP ASSIGNMENT PROCESS

- .1 This section describes the process for assigning loops and is documented in the LAS. The Ministry utilizes inductive loops and radar for vehicle detection. Radar detection is not covered in this manual. The quantity and function of detectors varies at each intersection. Traffic Controller Unit inputs shall be associated with detectors, which are then assigned to loops. This assignment of loops is done for each intersection by means of a LAS. The LAS may or may not be applicable to the project design or traffic controller modification.
- .2 Detectors and detector functions are assigned based on standard NEMA phasing, the electrical site plan for the intersection and the detector card arrangement in the Traffic Controller Unit (TS1 cabinets only).
- .3 The EMC Technician shall provide the following details as outlined in the LAS (see Appendix 200C).
  - .1 Loop Number
  - .2 Detector Unit
  - .3 Controller Unit Input
  - .4 Movement (Designation)
  - .5 Phase
  - .6 Measure of Efficiency (MOE) – Only for LMD-8000
  - .7 Count
  - .8 Mode/Switch – Only for LMD-8000
  - .9 Delay/Stretch
- .4 There are two standard types of LAS that apply to the Ministry's different Traffic Cabinet types:
  - .1 The 4 and 8 Phase TS1 'M' and 'S' Cabinets LAS (see Appendix 200A).

- The standard LAS headings for 'M' and 'S' (TS1) is shown in Figure 6.
- .2 The 4 and 8 Phase TS2 'P6' Cabinet LAS (see Appendix 200B). The standard LAS headings for 'P6' (TS2) is shown in Figure 7.

### 204.5 LOOP ASSIGNMENT EXAMPLE

- .1 To illustrate the loop assignment process, the intersection in Figure 1 will be used as an example.

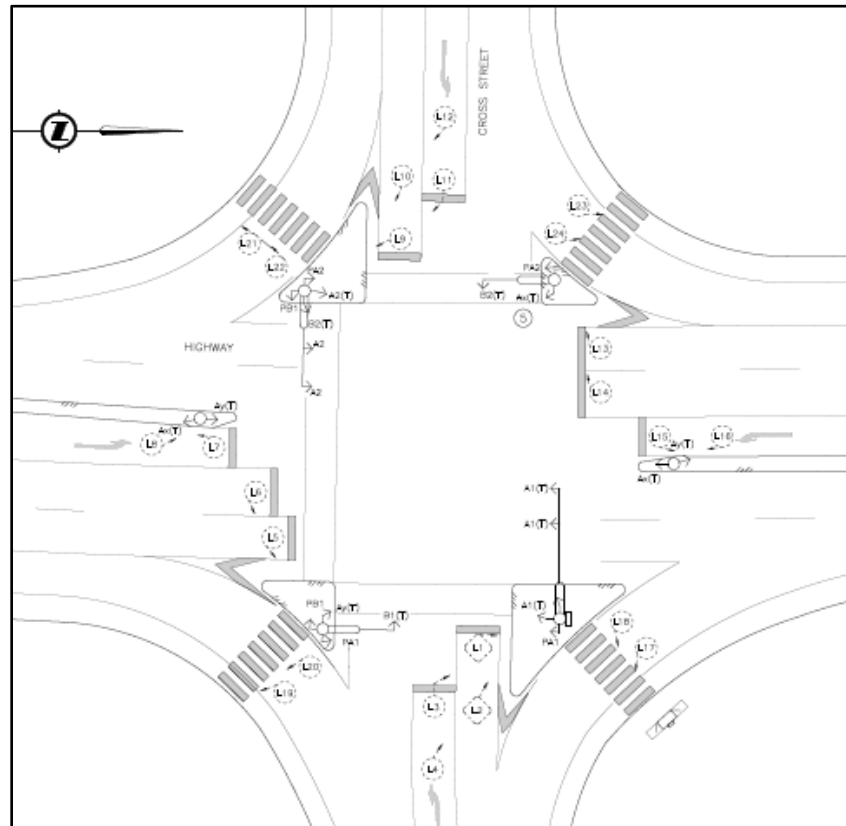


Figure 1. Sample Intersection

- .2 Completing the LAS requires associating each detector loop with the traffic movement label (A1, B1, etc. from site plan) and phase number it affects in the Traffic Controller Unit. The STS associates the traffic movements to controller phase numbers. In 'S' or 'M' cabinets (TS1), the first 8 controller unit detector inputs (1-8) are assigned to loops that call controller unit phases 1-8, respectively. For example, L2 would call movement A1 which is associated with phase 2 and controller unit detector input 2. In 'P6' cabinets (TS2), each loop label is assigned to the same detector input, regardless of the traffic movement or phase it calls. For example, L1, L2 & L3 would be associated with controller unit inputs 1, 2 & 3, respectively.

# DOCUMENTATION PROCESS

<b>UPPER RACK</b>									
Detector 1	Detector 2	Detector 3	Detector 4	Detector 5	Detector 6	Detector 7	Detector 8	Detector 17	Detector 18
Ch A <i>(Mainframe Input 1)</i>	Ch A <i>(Mainframe Input 2)</i>	Ch A <i>(Mainframe Input 3)</i>	Ch A <i>(Mainframe Input 4)</i>	Ch A <i>(Mainframe Input 5)</i>	Ch A <i>(Mainframe Input 6)</i>	Ch A <i>(Mainframe Input 7)</i>	Ch A <i>(Mainframe Input 8)</i>	Ch A <i>(Mainframe Input 21)</i>	Ch A <i>(Mainframe Input 23)</i>
Phase 1 <i>(A2&gt; or Ay)</i>	Phase 2 <i>(A1)</i>	Phase 3 <i>(B2&gt; or By)</i>	Phase 4 <i>(B1)</i>	Phase 5 <i>(A1&gt; or Ax)</i>	Phase 6 <i>(A2)</i>	Phase 7 <i>(B1&gt; or Bx)</i>	Phase 8 <i>(B2)</i>	Phase 2 <i>(A1) Free Right Turn</i>	Phase 4 <i>(B1) Free Right Turn</i>
Ch B <i>(Mainframe Input 9)</i>	Ch B <i>(Mainframe Input 10)</i>	Ch B <i>(Mainframe Input 11)</i>	Ch B <i>(Mainframe Input 12)</i>	Ch B <i>(Mainframe Input 13)</i>	Ch B <i>(Mainframe Input 14)</i>	Ch B <i>(Mainframe Input 15)</i>	Ch B <i>(Mainframe Input 16)</i>	Ch B <i>(Mainframe Input 22)</i>	Ch B <i>(Mainframe Input 24)</i>
Additional Phase 1 <i>(A2&gt; or Ay)</i>	Additional Phase 2 <i>(A1)</i>	Additional Phase 3 <i>(B2&gt; or By)</i>	Additional Phase 4 <i>(B1)</i>	Additional Phase 5 <i>(A1&gt; or Ax)</i>	Additional Phase 6 <i>(A2)</i>	Additional Phase 7 <i>(B1&gt; or Bx)</i>	Additional Phase 8 <i>(B2)</i>	Phase 6 <i>(A2) Free Right Turn</i>	Phase 8 <i>(B2) Free Right Turn</i>

<b>LOWER RACK</b>									
Detector 9	Detector 10	Detector 11	Detector 12	Detector 13	Detector 14	Detector 15	Detector 16	Detector 19	Detector 20
Ch A	Ch A <i>(Mainframe Input 17)</i>	Ch A	Ch A <i>(Mainframe Input 18)</i>	Ch A	Ch A <i>(Mainframe Input 19)</i>	Ch A	Ch A <i>(Mainframe Input 20)</i>	Ch A Spare	Ch A Spare
	Additional Phase		Additional Phase		Additional Phase		Additional Phase		
Ch B	Ch B	Ch B	Ch B	Ch B	Ch B	Ch B	Ch B	Ch B Spare	Ch B Spare

Phase Assignment (Typ.)
Detector and Mainframe Input (Typ.)
Inputs 17 - 20 Assigned As Needed

Figure 2. Eight phase TS1 ‘S’ cabinet detector racks

Detector 1	Detector 2	Detector 3	Detector 4	Detector 5	Detector 6	Detector 7	Detector 8	Detector 9	Detector 10	Detector 11	Detector 12
Ch A <i>(Mainframe Input 1)</i>	Ch A <i>(Mainframe Input 2)</i>	Ch A <i>(Mainframe Input 3)</i>	Ch A <i>(Mainframe Input 4)</i>	Ch A <i>(Mainframe Input 5)</i>	Ch A <i>(Mainframe Input 6)</i>	Ch A <i>(Mainframe Input 7)</i>	Ch A <i>(Mainframe Input 8)</i>	Ch A <i>(Mainframe Input 17)</i>	Ch A <i>(Mainframe Input 19)</i>	Ch A <i>(Mainframe Input 21)</i>	Ch A <i>(Mainframe Input 23)</i>
Phase 1 <i>(A2&gt; or Ay)</i>	Phase 2 <i>(A1)</i>	Phase 3 <i>(B2&gt; or By)</i>	Phase 4 <i>(B1)</i>	Phase 5 <i>(A1&gt; or Ax)</i>	Phase 6 <i>(A2)</i>	Phase 7 <i>(B1&gt; or Bx)</i>	Phase 8 <i>(B2)</i>	Additional Phase	Additional Phase	Phase 2 <i>(A1) Free Right Turn</i>	Phase 4 <i>(B1) Free Right Turn</i>
Ch B <i>(Mainframe Input 9)</i>	Ch B <i>(Mainframe Input 10)</i>	Ch B <i>(Mainframe Input 11)</i>	Ch B <i>(Mainframe Input 12)</i>	Ch B <i>(Mainframe Input 13)</i>	Ch B <i>(Mainframe Input 14)</i>	Ch B <i>(Mainframe Input 15)</i>	Ch B <i>(Mainframe Input 16)</i>	Ch B <i>(Mainframe Input 18)</i>	Ch B <i>(Mainframe Input 20)</i>	Ch B <i>(Mainframe Input 22)</i>	Ch B <i>(Mainframe Input 24)</i>
Additional Phase 1 <i>(A2&gt; or Ay)</i>	Additional Phase 2 <i>(A1)</i>	Additional Phase 3 <i>(B2&gt; or By)</i>	Additional Phase 4 <i>(B1)</i>	Additional Phase 5 <i>(A1&gt; or Ax)</i>	Additional Phase 6 <i>(A2)</i>	Additional Phase 7 <i>(B1&gt; or Bx)</i>	Additional Phase 8 <i>(B2)</i>	Additional Phase	Additional Phase	Phase 6 <i>(A2) Free Right Turn</i>	Phase 8 <i>(B2) Free Right Turn</i>

Phase Assignment (Typ.)
Detector and Mainframe Input (Typ.)
Inputs 17 - 20 Assigned As Needed

Figure 3. Four phase TS1 ‘M’ cabinet detector rack

## DOCUMENTATION PROCESS

LEFT RACK							
DETECTOR 1	DETECTOR 2	DETECTOR 3	DETECTOR 4	DETECTOR 5	DETECTOR 6	DETECTOR 7	DETECTOR 8
CH. A	CH. A	CH. A	CH. A	CH. A	CH. A	CH. A	CH. A
CU INPUT 3 LOOP 3	CU INPUT 1 LOOP 1	CU INPUT 7 LOOP 7	CU INPUT 5 LOOP 5	CU INPUT 11 LOOP 11	CU INPUT 9 LOOP 9	CU INPUT 15 LOOP 15	CU INPUT 13 LOOP 13
CH. B	CH. B	CH. B	CH. B	CH. B	CH. B	CH. B	CH. B
CU INPUT 4 LOOP 4	CU INPUT 2 LOOP 2	CU INPUT 8 LOOP 8	CU INPUT 6 LOOP 6	CU INPUT 12 LOOP 12	CU INPUT 10 LOOP 10	CU INPUT 16 LOOP 16	CU INPUT 14 LOOP 14
RIGHT RACK							
DETECTOR 9	DETECTOR 10	DETECTOR 11	DETECTOR 12	DETECTOR 13	DETECTOR 14	DETECTOR 15	DETECTOR 16
CH. A	CH. A	CH. A	CH. A	CH. A	CH. A	CH. A	CH. A
CU INPUT 19 LOOP 19	CU INPUT 17 LOOP 17	CU INPUT 23 LOOP 23	CU INPUT 21 LOOP 21	CU INPUT 27 LOOP 27	CU INPUT 25 LOOP 25	CU INPUT 31 LOOP 31	CU INPUT 29 LOOP 29
CH. B	CH. B	CH. B	CH. B	CH. B	CH. B	CH. B	CH. B
CU INPUT 20 LOOP 20	CU INPUT 18 LOOP 18	CU INPUT 24 LOOP 24	CU INPUT 22 LOOP 22	CU INPUT 28 LOOP 28	CU INPUT 26 LOOP 26	CU INPUT 32 LOOP 32	CU INPUT 30 LOOP 30

Figure 4. P6 Cabinet Detector Racks (DR) 1 & 2

- .3 In TS1 cabinets where there is more than one loop (for a phase movement) the leftmost lane to rightmost lane would be assigned. For the intersection in Figure 1, L1 and L2 are the loops for phase 2 (A1). The leftmost is the first to be assigned therefore loop 2 would be assigned detector unit 2A (input 2) and loop 1 would be assigned to detector unit 2B (input 10).
  
- .4 In TS1 cabinets where there are multiple loops in a lane, the front loop is assigned to a controller input before the back loop. For example, in Figure 2, loop 3 (front) is assigned to detector unit 5A (input 5) and loop 4 (rear) is assigned to detector unit 5B (input 13).
  
- .5 In TS1 cabinets, if a third loop exists on phase 2, 4, 6 or 8, the loop is assigned to the detector unit in the lower card rack directly below the detector unit for that phase in the upper rack. For example, a third loop on phase 2 would be assigned to detector unit 10A and would be Traffic Controller Unit input number 17 (refer to detector unit

layout – Figure 2).

- .6 In TS1 cabinets, multi-lane left turn bays lanes, additional through lanes and extension (‘set back’) loops are examples where even more detectors may be needed for a traffic phase. If this situation arises, contact ITS Operations for direction on how to handle the extra loops.
- .7 In TS1 cabinets, loops in left turn lanes that are not protected are still connected to the detector assigned for a protected left turn. This allows a future left arrow to be added by simply re-programming the Traffic Controller Unit and not rewiring the detector input.
- .8 In TS1 cabinets, Controller Unit inputs 21, 22, 23 and 24 are reserved for counting loops in free right turn lanes. Assignments for free right turn loops are shown in Table 1.

Loop or Loops	Controller unit Input	Eight phase Detector	Four phase Detector
Phase 2 A1 Free Right Turn	21	17A	11A
Phase 6 A2 Free Right Turn	22	17B	11B
Phase 4 B1 Free Right Turn	23	18A	12A
Phase 8 B2 Free Right Turn	24	18B	12B

Table 1. TS1 Typical Free Right Turn Loop Assignments

## 204.6 NAMING CONVENTIONS

- .1 The file name of the Loop Assignment Sheet is the drawing number followed by LAS and the extension.

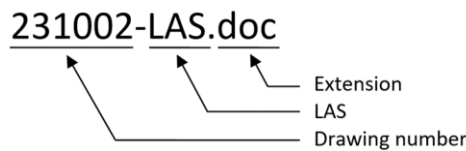


Figure 5. Loop Assignment Sheet File Naming Convention

**204.7 LOOP ASSIGNMENT SHEET HEADER**

- .1 The information for the corresponding intersection of the LAS will match the applicable details in the title block of the corresponding electrical site plan drawing.

<p><b>LOOP ASSIGNMENT SHEET</b>  <b>RTE A @ RTE B</b>  <b>CITY</b>  <b>Site Code 123 TE-99104-11B</b>  <b>Prepared YY/MM/DD for Signal Timing Sheet dated DD-MON-YY</b></p>									
<b>LOOP NUMBER</b>	<b>DETECTOR UNIT</b>	<b>CU INPUT</b>	<b>MOVEMENT</b> (Designation)	<b>CALL</b> (Ø)	<b>EXT.</b> (Ø)	<b>MOE</b> (Ø)	<b>COUNT</b> (ON)	<b>MODE</b> (Ø)	<b>DELAY/STRETCH</b> (SEC)

Figure 6. ‘S’ or ‘M’ (TS1) Cabinet Loop Assignment Sheet Title and Headings

<p><b>LOOP ASSIGNMENT SHEET</b>  <b>xxx @ xxx</b>  <b>City</b>  <b>TE</b>  <b>Prepared for timing sheet dated</b>  <b>(YY/MM/DD) (DD-MON-YY)</b></p>							
<b>LOOP NUMBER</b>	<b>DETECTOR UNIT</b>	<b>CU INPUT</b>	<b>MOVEMENT</b> (Designation)	<b>PHASE</b> (Ø)	<b>COUNT</b> (ON)	<b>DELAY</b> (SEC)	<b>STRETCH</b> (SEC)

Figure 7. ‘P6’ (TS2) Cabinet Loop Assignment Sheet Title and Headings

**204.8 LOOP NUMBER**

- .1 The loop numbers are completed with the loop number labels from the electrical site plans. Loops that are wired in series are entered with a forward slash between them (i.e. L1/L2).

### **204.9 DETECTOR UNIT (DU)**

- .1 The detector unit heading of the LAS is the detector unit card number followed by an A or B to indicate which detection channel on the card is being used.
- .2 TS1 eight phase 'S' cabinets have slots for 20 detector unit cards and four phase 'M' cabinets have slots for 12 detector unit cards.
- .3 TS2 'P6' cabinets have slots for 16 detector unit cards.
- .4 The detector card layout for TS1 eight and four phase cabinets and TS2 'P6' cabinets are shown in Figures 2, 3 & 4.

### **204.10 CONTROLLER UNIT INPUT (CU)**

- .1 The Traffic Controller Unit heading states the input that the detector unit card output is connected to.
- .2 The maximum number of Traffic Controller Unit inputs available for detector loops in the LMD-8000 is 24.
- .3 The Econolite Cobalt has 32 inputs available.
- .4 In TS1 cabinets, the detector unit cards are factory pre-wired to the units input harness.
- .5 The eight phase TS1 cabinet detector unit card numbers and their corresponding Traffic Controller Unit inputs for a standard NEMA dual ring are shown in Figure 2.
- .6 The four phase TS1 cabinet detector unit card numbers and their corresponding Traffic Controller Unit inputs for a standard NEMA dual ring are shown in Figure 3
- .7 The P6 cabinet's default detector unit card number, controller unit's inputs and connected detector loop layout is shown in Figure 4.

### **204.11 MOVEMENT**

- .1 The standard Ministry movement designation is entered in the function column (i.e., A1, A2, B1,  $\overrightarrow{B1}$ , etc.). The symbol  $\overrightarrow{\dots}$  is used to indicate a Protected Permissive Left Turn Movement.

### **204.12 PHASE**

- .1 The traffic phase as per the STS, which is called/extended by each loop is entered in the phase column of the LAS.

### **204.13 MEASURE OF EFFICIENCY (MOE)**

- .1 Measure of efficiency is assigned for every counting loop. The phase number for the loop is assigned to is entered in the MOE column.



- .2 For example, a loop for phase 2 that is a counting loop would have 2 entered in the MOE column. Where phase 2 is the movement to be measured.

### **204.14 COUNT**

- .1 The count function for the individual loops is assigned to use 'ON' or 'OFF' for loops that count. If the loop is required to count, the word 'ON' is placed in the count column. If the loop is not required to count a dash is placed in the column.
- .2 The count function is assigned to 'ON' for highway lanes with single loops for through traffic. In dedicated left turn lanes, there are 2 loops, count is assigned to 'OFF' for the front loop and 'ON' for the back loop.
- .3 The count function is assigned to 'OFF' in the leftmost cross street lane for the front loop and 'ON' for the rear loop. For cross street lanes other than the leftmost lane, count is assigned to 'ON' for the front loop and 'OFF' for the rearloop.

### **204.15 MODE**

- .1 Mode is set to the phase of opposing through traffic for loops that call Protected/ Permissive left-turns adjacent to recall phases.

### **204.16 DELAY**

- .1 If the loop has a delay time, enter the amount of time from the STS in this heading.

### **204.17 STRETCH**

- .1 If the loop has a stretch time, enter the amount of time from the STS in this heading.

# 205 TRAFFIC SIGNAL CONTROL DRAWINGS

## 205.1 INTRODUCTION

- .1 This section describes the information for the traffic controller cabinet drawings.

## 205.2 DRAWING TYPES

- .1 The types of drawings associate with each cabinet types are as follows:
  - .1 TS1 4-Phase, 'M' Cabinet – Front and Harness.
  - .2 TS1 8-Phase, 'S' Cabinet – Front, Rear and Harness.
  - .3 TS2 8-Phase, 'P6' Cabinet – Primary, Secondary and Tables.
- .2 The following sections will detail the components found in each cabinet drawing type.
- .3 Note: All configuration and customization details shall be documented in the corresponding Traffic Cabinet Construction Document. Refer to Appendix 200A for TS1 and Appendix 200B for TS2.

## 205.3 DRAWING TITLE BLOCK

- .1 The illustration in Figure 8 provides a description of the controller AutoCAD title block for a traffic controller drawing. Key elements noted in the drawing title block are as follows:
  - .1 Drawing type – Description of the drawing contents.
  - .2 Location/City – Where the cabinet is located.
  - .3 Drawing Contents – Cabinet type.
  - .4 CAD filename – Auto-generated.
  - .5 Cabinet installation information – Cabinet serial number and date the signal was commissioned.
  - .6 Electrical Service Area and Region – Electrical service area number and region that the cabinet is located.
  - .7 Drawing number – Ministry-generated 5-digit number starting with “TE” and revision letter.
  - .8 Drawing revision history – Revision letter, date the drawing was revised, a description of the revision and the initials of the technician who performed the drawing revision.

# TRAFFIC SIGNAL CONTROLLER DRAWINGS

REV	DATE	REVISIONS	DRAWN	
.	JAN/23	BRIEF PROJECT DESCRIPTION GOES HERE	MOTI	<b>MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE</b>  <b>TRAFFIC SIGNAL CONTROLLER CABINET</b> <b>HIGHWAY 1 AT MAIN STREET</b> <b>CHILLIWACK</b>  <b>P6 – PRIMARY</b>  <small>CAD FILENAME: CONTROLLER_BORDER.DWG</small> <small>CABINET SERIAL NUMBER: 123456789    COMMISSION DATE: MON/YR</small> <small>LAST REVISED BY: XXX    DATE: MON/YR</small> <small>MOTI REVIEW:    DATE:</small>  <small>SHEET NUMBER</small> SHEET <b>X</b> OF <b>X</b> <small>ELEC S.A. REG</small> <small>DRAWING NUMBER</small> <b>X</b> <b>X</b> <b>TE-23089-2</b> <b>A</b>
A	FEB/23	EXAMPLE: NEW TRAFFIC SIGNAL	MOTI	

TECHNICIAN'S INITIALS AND DATE DESIGN WAS LAST REVISED  
 CABINET SERIAL NUMBER AND DATE SIGNAL COMMISSIONED  
 FILE NAME (AUTO-FILLED)  
 DRAWING CONTENTS AND CABINET TYPE  
 DRAWING TYPE

SHEET NUMBER IN SET \_\_\_\_\_  
 TOTAL NUMBER OF SHEETS IN SET \_\_\_\_\_  
 ELECTRICAL SERVICE AREA NUMBER \_\_\_\_\_  
 REGION NUMBER \_\_\_\_\_  
 REVISION LETTER (WHERE APPLICABLE) \_\_\_\_\_

CANCEL PRINTS BEARING PREVIOUS LETTER

Figure 8: Sample Controller CAD Title Block

## 205.4 TS1 ‘M’ AND ‘S’ CABINET DRAWING SHEETS

- .1 The following clauses describe the general layout and organization for TS1 cabinet drawings.

## 205.5 TS1 ‘S’ CABINET DRAWINGS: FRONT DRAWING

- .1 The key components found in ‘S’ Cabinet Front Drawings are as follows:
  1. Field Connection Section: This section details the terminal wiring for the traffic and pedestrian signal heads, unused Reds, intersection flash operation, conflict monitor operation, pre-emption operation and any other field output devices.
  2. Flasher Section: This section details the installation and configuration of the Advance Warning Flasher and the Flash Transfer Relay circuits. Any unused sockets shall be denoted with an "X".
  3. Load Switch Section: This section details the installation and configuration of the load switches installed. Any unused sockets shall be denoted with an "X".
  4. Detector Card Rack Section: This section details the installation and configuration of the Vehicle Detector Cards, Advanced Warning Cards, Pre-emption Cards and the Pedestrian and Vehicle Input Modifier Card. Any unused sockets shall be denoted with an "X".
    - .1 Advance Warning Cards are installed in accordance with the following channel assignments:

## TRAFFIC SIGNAL CONTROLLER DRAWINGS

---

	Channel	Movement
	1	A1
P1	2	A2
	1	B1
P5	2	B2

Table 2 . Advanced warning cards channel assignment

- .2 Unused Advance Warning and Pre-emption cards must be disabled by installing jumpers to the applicable terminals located in the backboard terminals .

Card Number	Disable by installing jumpers between terminals
1	243 to 244
2	244 to 245
3	245 to 246
5	246 to 247
6	247 to 248
7	248 to 249
8	249 to 250

Table 3. Advance Warning and Pre-emption card disabling jumpers.

### 205.6 TS1 'S' CABINET DRAWINGS: REAR DRAWING

- .2 The key components found in 'S' Cabinet Rear Drawings are as follows:
  1. Field Loop Connection Section: This section details the connection from the field loop wires to cabinet input terminals required for the intersection.
  2. Power Distribution Section: This section details the cabinet power distribution components and wiring.
  3. Back Panel Wiring Section: This section details the connections for the pedestrian call input wiring, the Input Modifier (TEC) Card monitor wiring, the Full Operation Point (FOP) system wiring, the Advance Warning system wiring, the Pre-Emption system wiring and the All-Red Time (ART) system wiring.
    - .1 If the signal is required to flash all red, the ART system must be enabled by connecting the "ART EN" terminal (575) to logic ground.

### 205.7 TS1 'S' CABINET DRAWING: HARNESS DRAWING

- .1 The key components in the 'S' Cabinet "Harness" drawing are as follows:
  1. Conflict Monitor Unit (CMU) Options Section: This section details the required switch settings for the applicable CMU operation and the permissive traffic phase pairs in accordance with the signal design.
    - .1 In addition to traffic phases, the pre-emption phases (if applicable) must also be programmed into the CMU in the same manner as the permissive traffic phases. The pre-emption phases will also be included in the permissive traffic phase pairs noted in this section.
  2. Pre-Emption Selection Section: This section details the switch settings for the required Pre-emption operation.
  3. Harness Connection Tables: The tables show the connector pin assignments for the applicable controller connector.

### 205.8 TS1 'M' CABINET DRAWING: FRONT DRAWING

- .1 The key components found in the 'M' Cabinet "Front" drawing are as follows:
  1. Field Connection Section: This section details the terminal wiring for the traffic and pedestrian signal heads, unused Reds, intersection flash operation, conflict monitor operation, pre-emption operation and any other field output devices.
  2. Field Loop Connection Section: This section details the connection from the field loop wires to cabinet input terminals required for the intersection.
  3. Load Switch and Flasher Section: This section details the installation and configuration of the load switches, Advance Warning Flasher and the Flash Transfer Relay circuits installed. Any unused sockets shall be denoted with an "X".
  4. Back Panel Wiring Section: This section details the connections for the pedestrian call input wiring, the Input Modifier Card monitor wiring, the Full Operation Point (FOP) system wiring, the Advance Warning system wiring, the Pre-emption system wiring and the ART system wiring.
  5. Detector Card Rack Section: This section details the installation and configuration of the Vehicle Detector Cards, Advanced Warning Cards, Pre-Emption Cards and the Pedestrian and Vehicle Input Modifier Card. Any unused sockets shall be denoted with an "X".

### 205.9 TS1 'M' CABINET DRAWING: HARNESS DRAWING

- .1 The key components found in the 'M' Cabinet "Harness" drawing are as follows:

## TRAFFIC SIGNAL CONTROLLER DRAWINGS

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1. Conflict Monitor Unit (CMU) Options Section: This section details the switch settings and the permissive phase pairs required for the applicable CMU operation in accordance with the signal design.
  - .1 In addition to traffic phases, the pre-emption phases (if applicable) must also be programmed into the CMU in the same manner as the permissive traffic phases. The pre-emption phases will also be included in the permissive traffic phase pairs noted in this section.
2. Pre-emption Selection Section: This section details the switch settings for the required Pre-emption operation.
3. Harness Connection Tables: The tables show the connector pin assignments for the applicable controller connector.

### 205.10 TS2 'P6' CABINET DRAWING: PRIMARY DRAWING

- .1 The key components found in the P6-Cabinet "Primary" drawing are as follows:
  1. Field Connection Section: This section details the terminal wiring for the traffic and pedestrian signal heads, intersection flash operation, conflict monitor operation and the pedestrian pushbutton wiring.
    - .1 Pedestrian pushbutton conductors from the field are terminated in the cabinet input terminals located above the Field Output Terminals. Only one conductor ("hot") from each pushbutton is terminated in the input terminals, while the neutral conductors are terminated in the cabinet neutral bus.
  2. Flasher Section: This section details the installation and configuration of the Advance Warning Flasher and the Flash Transfer Relay circuits. Any unused sockets shall be denoted with an "X".
    - .1 Each Advance Warning Flasher outputs to two output terminals (i.e. FL2 to AW1, FL3 to AW2, etc.)
    - .2 Advance Warning Flashers have accompanying flash transfer relays, separate from the flash transfer relays for intersection signal display.
    - .3 All flash transfer relays shall be installed in the cabinet regardless of the signal operation design.
  3. Load Switch Section: This section details the installation and configuration of the load switches installed. Any unused sockets shall be denoted with an "X".
    - .1 Load switch sockets 1 to 8 are used for outputs to vehicle phases.
    - .2 Load switch sockets 9 to 12 are used for outputs to pedestrian movement phases 2, 4, 6 and 8.
    - .3 Load switch sockets 13 to 16 are used for outputs to overlap phases.
  4. Malfunction Management Unit (MMU) Setup Section: This section details the required switch settings and the permissive phase pairs required for MMU operation in accordance with the signal design.

**205.11 TS2 'P6' CABINET DRAWING: SECONDARY DRAWING**

- .1 The key components found in the 'P6' Cabinet "Secondary" drawing are as follows:
  1. Field Loop Connection Section: This section details the connection from the field loop wires to cabinet input terminals required for the intersection.
  2. Detector Card Rack Section: This section details the installation and configuration of the Vehicle Detector Cards and Pre-Emption Cards. Any unused sockets shall be denoted with an "X".
  3. Emergency and Low Priority Pre-Emption (PE) Section: This section details the circuit wiring and input terminals for the emergency vehicle Pre-Emption system.
    - .1 Emergency PE field inputs #3 to #6 are terminated to terminals Y1 to Y8 and are isolated from the controller inputs by electromechanical relays (PE3 to PE6).
    - .2 The Emergency PE inputs are normally-closed (N.C.) and will open when a PE call is made. All unused emergency PE inputs shall have a jumper installed.
    - .3 Low priority PE field inputs #1 to #4 are terminated at terminals Y9 to Y16, which are isolated from the controller inputs by optically-isolated solid state relays (TSP1 to TSP4).
    - .4 The Low Priority PE inputs are normally-open (N.O.), and do not require a jumper installed for any unused inputs.
  4. Rail Pre-Emption Connection Section: This section details the circuit wiring and input/output terminals for the Rail Pre-emption system.
    - .1 The standard P6 cabinet is configured to support a 10-wire rail PE interface.
    - .2 Unless a rail kit is connected to rail hut (24VAC input received at Pin 2 and 10, especially for Relay 1), relays must be removed from socket otherwise the cabinet will remain in flash state.
    - .3 Pre-emption control and rail supervisor work in an opposite state.
    - .4 Remove supervisor relay when testing with PMT test switch.
    - .5 Relays are shown in de-energized state.

**205.12 TS2 'P6' CABINET DRAWING: TABLES DRAWING**

- .1 The key components found in the 'P6' Cabinet "Tables" drawing are as follows:
  1. Tables: These show the pin connections for terminal facility, load switch, flasher, port 1, MMU, BIU, police-auxiliary switch panel, adaptor cable, and Connectors A/B/C/D.
  2. Malfunction Management Unit (MMU) Options Section: This section details the switch settings and the permissive phase pairs required for the

## TRAFFIC SIGNAL CONTROLLER DRAWINGS

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applicable MMU operation in accordance with the signal design.

3. Test switch panel: This section illustrates the simulator switch panel and D harness wiring.





Ministry of  
Transportation  
and Infrastructure

TRAFFIC CONTROLLER DESIGN MANUAL

**Appendix 200A**

**TS1 TRAFFIC CABINET CONSTRUCTION  
DOCUMENT**

**For reference only**

Transportation Systems and Road Safety Engineering

July 2024

# TS1 TRAFFIC CABINET CONSTRUCTION DOCUMENT

DELIVERY Date                      TIME Sys NUMBER:  
LOCATION:                              CITY:  
CFS NUMBER:                      PROJECT DESIGNER:                      REGION:

## PROJECT WORK ORDER ISSUED ON:

*Post this order on the outside front cabinet door when the cabinet serial number has been designated.*

CABINET TYPE:                                      CABINET BUILDER:  
MAINFRAME INCLUDED:                              CONFLICT MONITOR INCLUDED:  
MODEM INCLUDED:

## COMMENTS FROM PRIORITY LIST:

### Project's Documents

(List of information)

- Full TE- Rev.
- Controller cabinet used serial #:
- Controller cabinet template drawings used:
- Signal timing sheet date:
- Loop assignment sheet date: YY/MM/DD.
- Engineering checklist date:

### Project Profile

(Specific information, enter the Operational reason(s) for any of the wiring & programming modifications that has to be made to complete the project.)

- Phase Sequence / Operation:  
*Example – Standard single P/P three-phase operation with advance warning.*  
ØA1 =OLA (Ø1+Ø2)  
ØA1 →= Ø1 (set as ØOL1).  
ØA2 = Ø2  
ØB = Ø4

# TS1 TRAFFIC CABINET CONSTRUCTION DOCUMENT

DELIVERY Date: \_\_\_\_\_ TIME Sys NUMBER: \_\_\_\_\_  
LOCATION: \_\_\_\_\_ CITY: \_\_\_\_\_  
CFS NUMBER: \_\_\_\_\_ PROJECT DESIGNER: \_\_\_\_\_ REGION: \_\_\_\_\_

## Cabinet Wiring Modifications Section

(Describe in each of the following items any wiring modification that have to be done or delete if not required)

### Field Inputs

(Wiring changes to cabinet - not field wiring)

#### Detector inputs:

- Describe any changes here or delete if not required.

#### Pedestrian inputs:

- Describe any changes here or delete if not required.

#### Pre-Emption inputs:

- Describe any changes here or delete if not required.

#### Other Inputs:

- Describe any changes here or delete if not required.

### Back Panel

#### TEC Card Monitor jumpers:

- Jumper out all unused card slots:

*Example* -  Install jumpers between the following terminals: #228-229 (P3).

#### Full Operation Point: For first Green Display

- Identify the correct phase(s) and interval needed to achieve the requirements shown on the STS.  
*Example* - As per timing sheet dated XXX, First Green Display will be ØX and ØX Green.
- Install a wire jumper between the following terminals:
  - Install a wire jumper between terminals #444 (FOP SEN 1) - 208 (Ø2 YEL).
  - Install a wire jumper between terminals #445 (FOP SEN 2) - 444 (" ").
  - Install a wire jumper between terminals #446 (FOP SEN 3) - 205 (OLA YEL)
  - Install a wire jumper between terminals #447 (FOP SEN 4) - 446 (" ").

#### Advance Warning:

- Identify what phase(s) and overlap(s) need to have the advance warning treatment done to them and the wiring modifications needed.
- *Example: OLA(ØA1) = A1 Adv Warn to be operated by of Ch2 Flash Driver output*
  - Remove the wire jumper between terminals # 308 (OLA YEL) and terminal # 205 (LS2 IN YEL).
  - Remove the wire jumper between terminals # 309 (OLA GRN) and terminal # 206 (LS2 IN GRN).
  - Install a wire jumper between terminal # 307 (OLA RED) and terminal # 310(AW2 RED IP).
  - Install a wire jumper between terminal # 308 (OLA YEL) and terminal # 311 (AW2 YEL IP).
  - Install a wire jumper between terminal # 309 (OLA GRN) and terminal # 312(AW2 GRN IN).
  - Install a wire jumper between terminal # 313 (AW2 YEL OUT) and terminal # 205 (LS2 IN YEL).
  - Install a wire jumper between terminal # 314(AW2 GRN OUT) and terminal # 206 (LS2 IN GRN).
- *Ø2 (ØA2) = A2 Adv Warn to be operated by Ch1 Flash Driver output.*
  - Remove the wire jumper between terminals # 316 (Ø2 YEL) and terminal # 208 (LS3 IN YEL).
  - Remove the wire jumper between terminals # 317 (Ø2 GRN) and terminal # 209 (LS3 IN GRN).
  - Install a wire jumper between terminal # 315 (Ø2 RED) and terminal # 318 (AW1 RED IP).
  - Install a wire jumper between terminal # 316 (Ø2 YEL) and terminal # 319 (AW1 YEL IP).
  - Install a wire jumper between terminal # 317(Ø2 GRN) and terminal # 320 (AW1 GRN IN).
  - Install a wire jumper between terminal # 321 (AW1 YEL OUT) and terminal # 208 (LS3 IN YEL).
  - Install a wire jumper between terminal # 322 (AW1 GRN OUT) and terminal # 209 (LS3 IN GRN).

#### Pre-Emption:

- Describe the type of Pre-emption and what phase(s) Overlap(s) are to be used.

# TS1 TRAFFIC CABINET CONSTRUCTION DOCUMENT

<b>LOCATION:</b>	<b>DELIVERY Date</b>	<b>TIME Sys NUMBER:</b>
<b>CFS NUMBER:</b>	<b>CITY:</b>	<b>REGION:</b>
	<b>PROJECT DESIGNER:</b>	

**ALL RED TIMER (ART):**

- Describe why it's needed and how to make it operate.
- *Example Required due to all red flash*
  - Install a wire jumper between the terminals # 561 (ART ENABLE) and terminal #560 (LOG GND).

**Harness and other jumpers:**

- Describe any changes here or delete if not required.

**Field Outputs**

**Used Reds to be satisfied:**

- Example*  Install a continuous daisy-chain jumper from terminal #1 to #4 to #13 to #29.

**Intersection flash:**

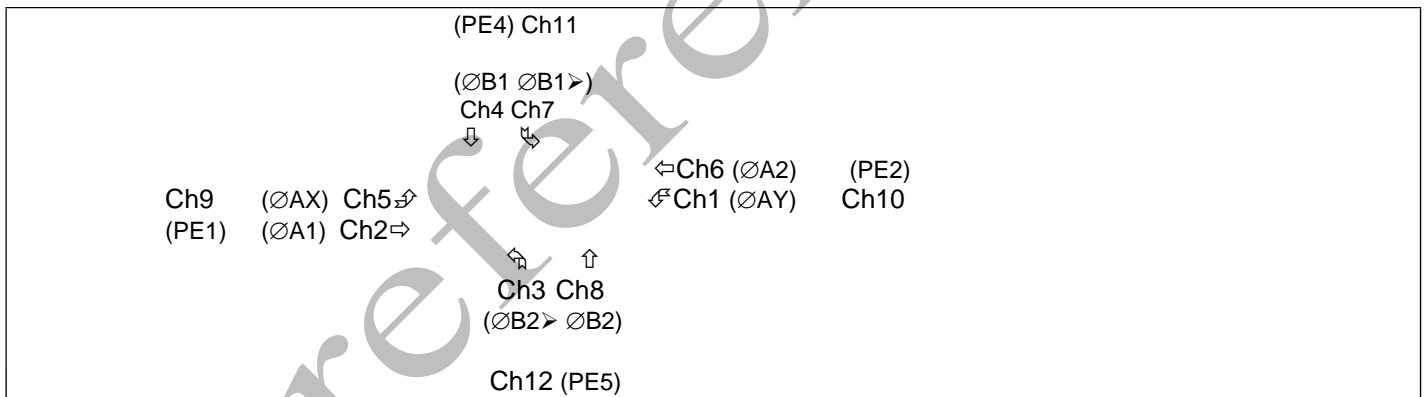
- *Example* Intersection to flash Yellow on the Highway, Red on the Cross St.
  - Describe Flash condition and any changes here.

**Monitor Inhibit Relay (K9):**

- Describe any changes here or delete if not required.

**Conflict Monitor Program:**

- List all movements and their monitoring channel number.



- Solder programming card jumpers as per Harness Drawing.
- Set dipswitch settings as per Harness Drawing.

# TS1 TRAFFIC CABINET CONSTRUCTION DOCUMENT

DELIVERY Date                      TIME Sys NUMBER:  
LOCATION:                              CITY:  
CFS NUMBER:                      PROJECT DESIGNER:                      REGION:

## INSTALLED EQUIPMENT SECTION

*(Indicate in each of the following items if components are required or delete if not required)*

### LOOP DETECTOR CARDS:

- Install loop detector cards in each DET slot not crossed out on the FRONT drawing.

### POWER SUPPLY (TEC-PS):

- Install power supply in slot PS as shown on FRONT drawing.

### ADVANCE WARNING CARD (TEC-AW2):

- Install an advance warning card in slot as per FRONT DWG.
- Set channel one to value from the signal-timing sheet dated DD-MMM-YY.

### PRE-EMPTION CARD (TEC-PE):

- Install a pre-emption card in slot as per FRONT DWG.
- Set dipswitches as per HARNESS DWG.

### PEDESTRIAN/VEHICLE CARD:

- Install a ped/vehicle card in slot P4.

### LOAD SWITCHES:

- Install load switches in each LS socket not crossed out as per FRONT drawing.

### FLASH CONTROL RELAY (K7):

- Install relay as per FRONT DWG

### FLASH TRANSFER RELAYS:

- Install flash transfer relays in each socket not crossed out as per FRONT drawing

### SYSTEM FLASHER:

- Install the flasher (FL1) as shown on the FRONT drawing

### ADVANCE WARNING FLASHER:

- Install the flasher (AWFL) as shown on the FRONT drawing.

### MAINFRAME:

- Install with programming data as per signal timing sheet dated DD-MMM-YY.

### CONFLICT MONITOR:

- Install with dipswitch settings as per the HARNESS DWG.

### CONFLICT MONITOR COMPATIBILITY CARD:

- Install card with soldered jumpers as per the HARNESS DWG.

### COMMUNICATIONS:

- Describe any changes here or delete if not required.

### OTHER:

- Describe any changes here or delete if not required.

# TS1 TRAFFIC CABINET CONSTRUCTION DOCUMENT

DELIVERY Date                      TIME Sys NUMBER:  
LOCATION:                              CITY:  
CFS NUMBER:                      PROJECT DESIGNER:                      REGION:

## Drawing Modifications Section

*(Delete the item if not required)*

- Update title block on all DWGs

### Field Inputs Section

- Loop assignments
- Pedestrian pushbuttons
- Pre-Emption
- Intertie

### Back Panel Section

- Card monitor
- F.O.P.
- Advance Warning
- Pre-Emption
- A.R.T.
- Harness and other jumpers.

### Field output Section

- Field terminals
- Reds to be satisfied
- Conflict Monitor
- Intersection flash
- Flash transfer
- Monitor Inhibit Relay (K9)

### Harness Drawing

- Conflict monitor / Program Card
- Harness Tables



# TS1 TRAFFIC CABINET CONSTRUCTION DOCUMENT

DELIVERY Date                      TIME Sys NUMBER:  
LOCATION:                              CITY:  
CFS NUMBER:                      PROJECT DESIGNER:                      REGION:

## Finishing Procedures

- Cover all unused spaces with blank rack mounted plates attached to rack plate holders.

### Labeling

- Label below each detector with the appropriate phase movement (ØA, A>, etc.) to which the detector is assigned.
- Label below each switch pack with the appropriate phase movement (ØA, A>, etc.) to which the switch pack is assigned.
- Label the door with the intersection name from the timing sheet, municipal name, & TE-#.

### NOTE:

When construction of cabinet is complete, please notify the EEC of any errors or omissions on drawings.

### For additional information contact:

Ministry of  
Transportation and  
Infrastructure

Electrical and ITS Engineering

Mailing Address:  
310-1500 Woolridge St  
Coquitlam BC  
V3K 0B8



# TS1 TRAFFIC CABINET CONSTRUCTION DOCUMENT

**DELIVERY Date**                      **TIME Sys NUMBER:**  
**LOCATION:**                              **CITY:**  
**CFS NUMBER:**                      **PROJECT DESIGNER:**                      **REGION:**

## FINAL TEST - N - CHECKOUT

CABINET TYPE:		CABINET S/N:	
MAINFRAME TYPE:	S/N:	SOFTWARE REV:	
CONFLICT MONITOR:	S/N:	SOFTWARE REV:	
MODEM TYPE:	MODEM (Configuration):		

Ref. to Traffic Controller Design Manual for Items

## OPERATIONAL CHECKLIST

- Check Conflict Monitor Unit dipswitch settings and compatibility card as per DWG's.
- Check intersection flash.
- Check inside flash control switch.
- Check Controller Unit and Conflict Monitor Unit and other equipment for correct operation on power-up.
- Check F.O.P and (A.R.T. operation if needed) as per Signal Timing Sheet.
- Check Police Door Flash Switch.
- Check Controller unit vs. Signal Timing Sheet for programming.
- Check Advance Warning operation as per signal timing sheet.
- Check pedestrian calls to Controller Unit from field terminals.
- Check PED/VEH simulator to Controller Unit inputs.
- Check Interval Advance vs. AUTO & MANUAL setting.
- Check Pre-Emption operation in local / remote modes.
- Check vehicle calls to Controller Unit from loops via Detector Unit channels as per DWG's and LAS.
- Check Conflict Monitor Unit operation for conflict/red failures.
- Check to ensure F.O.P. to control flash control circuit following manual reset of C.M.U.
- Check communications-upload and download Controller Unit via police door to PC.
- Check that components are labeled.
- Check heater and fan operation.

### Document distribution:

- Loop Assignment Sheet. - one copy each to cabinet & intersection file.
- Construction Document. - one copy each to cabinet & intersection file.
- Signal timing sheet - one copy each to cabinet & intersection file.
- Drawings distribution: Regional, two final sets, one final set laminated.
- Controller Unit Data Dump - one copy each to cabinet & intersection file.

Checked and Completed by \_\_\_\_\_

Date \_\_\_\_\_

# TS1 TRAFFIC CABINET CONSTRUCTION DOCUMENT

<b>LOCATION:</b>	DELIVERY Date	TIME Sys NUMBER:	
<b>CFS NUMBER:</b>	CITY:	PROJECT DESIGNER:	REGION:

## QUALITY CONTROL CHECK LIST

### INTERSECTION DRAWINGS

- Compare signal display table to site plan.       Compare loop table to site plan.

### SIGNALTIMING SHEET

- Compare site plan to loop assignment sheet.  
 Compare with signal timing sheet for:

<input type="checkbox"/> Advance Warning	<input type="checkbox"/> Pre-Emption Fire/Railway	<input type="checkbox"/> Intersection Flash
<input type="checkbox"/> Phasing	<input type="checkbox"/> Coordination	Other

### LOOP ASSIGNMENT SHEET

- Loop assignment sheet for accuracy       Compare loops delay on signal timing sheet vs.site plan.

### CABINET DRAWINGS

- Title block for accuracy.

Field wiring for accuracy:	<input type="checkbox"/> Phasing <input type="checkbox"/> Loops	<input type="checkbox"/> Advance warning Other	<input type="checkbox"/> Pre-emption
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Intersection flash wiring correct ID:	<input type="checkbox"/> Flash transfer relays <input type="checkbox"/> Load switches <input type="checkbox"/> TEC cards	<input type="checkbox"/> Field output terminals <input type="checkbox"/> K9 relay <input type="checkbox"/> Power Supply	<input type="checkbox"/> Advance warning flashers <input type="checkbox"/> Flash transfer relays <input type="checkbox"/> Advance Warning	<input type="checkbox"/> Pre-Emption
---------------------------------------	--	---	---	--------------------------------------

Other wiring for accuracy:	<input type="checkbox"/> TEC card monitor wiring <input type="checkbox"/> Pre-Emption wiring	<input type="checkbox"/> F.O.P.wiring <input type="checkbox"/> C.M.U. setup detail	<input type="checkbox"/> A.R.T. wiring <input type="checkbox"/> Communication cables wiring	<input type="checkbox"/> Advance warning wiring
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### DOCUMENTS

- Compare construction document to controller drawings.  
 Compare LMD data-dump to signal timing sheet and loop assignment sheet.

Traffic Controller Construction Document

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

Quality Control completed by: \_\_\_\_\_ Date: \_\_\_\_\_

# TS1 TRAFFIC CABINET CONSTRUCTION DOCUMENT

**LOCATION:** \_\_\_\_\_ **DELIVERY Date** \_\_\_\_\_ **TIME Sys NUMBER:** \_\_\_\_\_  
**CFS NUMBER:** \_\_\_\_\_ **CITY:** \_\_\_\_\_ **PROJECT DESIGNER:** \_\_\_\_\_ **REGION:** \_\_\_\_\_

## WITHDRAWAL

## PREPAID

## OLD CFS #

<i>Manufacturer</i>	<i>Stock Code</i>	<i>Description</i>	<i>Quantity</i>
<b>CABINETS</b>			
SIGMA	S7	8 Phase Base Mounted Cabinet (S7)	
SIGMA	M3	4 Phase Base Mounted Cabinet (M3)	
<b>MAINFRAMES</b>			
TCT	LMD	Controller Unit (LMD 8000)	
TCT	MDM	On Street Master (MDM 100)	
<b>CONFLICT MONITORS</b>			
TCT	LN12E	12 Channel CMU ( With Event Logging)	
TCT	LSM12	12 Channel CMU (No Event Logging)	
TCT		Compatibility program card	
<b>LOOP DETECTORS</b>			
SARA	GP6C	2 Channel rack mounted (222)	
RENO	MOD C	2 Channel rack mounted (LCD 222)	
EDI	ORA2	2 Channel rack mounted (LCD 222)	
<b>INPUT MODIFIER CARDS</b>			
TEC	PS	Power supply (TEC-PS)	
ES	DPE3	Pre-empt Interface Card (TEC-PE)	
ES	AW2	Advance Warning Card (TEC-AW)	
ES	RIC	Relay Interface Card (TEC-RIC)	
ES	PV4	Pedestrian/Vehicle Card (TEC-PV4)	
ES	PV8	Pedestrian/Vehicle Card (TEC-PV8)	
<b>LOAD SWITCHES</b>			
ES	200	NEMA Load Switch Pack	
ES	204	NEMA Double Pole Flasher	
ES	AW-2	Advance Warning Flasher	
<b>RELAYS &amp; TIMERS</b>			
P&B	FCR	Flash Control Relay	
MIDTEX	FTR	Flash Transfer Relay	
P&B	K9	24v DC 4 pole Double Throw Relay	
PHOENIX	TBR1	24v DC 1 pole Double Throw Relay	
PHOENIX	TBR2	24v DC 2 pole Double throw Relay	
GE	LM90M	GE Programmable Logic Controller	
<b>COMMUNICATIONS</b>			
USR	MODEM	33.6k baud Modem	
<b>CABLES</b>			
CAB	TEC 1	Tec 1 (Computer to Mainframe)	
CAB	TEC2	Tec 2 (RS232 - 25' extension)	
CAB	TEC 3	Tec 3 (Detector input)	
CAB	TEC 4	Tec 4 (Police door extension)	
CAB	TEC 5	Tec 5 (Modem to Mainframe)	
CAB	TEC 6	Tec 6 (MDM 100 to Modem)	
CAB	TEC 7	Tec 7 (Conflict Monitor to Mainframe)	
<b>SUNDRIES</b>			
WIHARD	SDINS	8 phase drop-in pack	
WIHARD	MDINS	4 phase drop-in pack	
ASM	CDP	Rack Plate Holders	
ASM	CDP1	Single Rack Plates	
ASM	CDP10	Ten Rack Plate	
ASM	CDP2	Double Rack Plates	
BRUNDY	KPA8C	Field Terminal Screw Lugs	



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TRAFFIC CONTROLLER DESIGN MANUAL

**Appendix 200B**

**TS2 TRAFFIC CABINET CONSTRUCTION  
DOCUMENT**

Transportation Systems and Road Safety Engineering

July 2024

## TS2 TRAFFIC CABINET CONSTRUCTION DOCUMENT

**DELIVERY Date**

**TIME Sys NUMBER:**

**LOCATION: (See STS)**

**CITY: (See STS)**

**DRAWING NUMBER:**

**PROJECT DESIGNER: (initials)**

**Date: (Cabinet assembly date)**

**(TE number, see STS)**

### **Project Information:**

- Drawing: [drawing number, starts with TE]
- STS Date: [Date the Signal Timing Sheet was issued by MOTI, on STS]
- TEC Date: [Date the Traffic Engineering Checksheet was approved/reviewed by MOTI, on TEC]
- LAS Date: [Date the Loop Assignment Sheet was prepared, on LAS]
- Cabinet Serial:
- Controller Unit: [Controller type and serial number]

### **Project Scope:**

- Scope

## TS2 TRAFFIC CABINET CONSTRUCTION DOCUMENT

**DELIVERY Date**                      **TIME Sys NUMBER:**  
**LOCATION:** (See STS)              **CITY:** (See STS)  
**DRAWING NUMBER:**              **PROJECT DESIGNER:** (initials)              **Date:** (Cabinet assembly date)  
 (TE number, see STS)

**Signal Sequence:** (from TEC)

**Phase to Load Switch Assignments:**

$\emptyset A1$ PED	<i>NOT USED</i>	$\emptyset A2$ PED	$\emptyset B2$ PED	<i>NOT USED</i>	<i>NOT USED</i>	<i>NOT USED</i>	<i>NOT USED</i>
LS9 = $\emptyset 2$ PED	LS10 = $\emptyset 4$ PED	LS11 = $\emptyset 6$ PED	LS12 = $\emptyset 8$ PED	L13 = $\emptyset 2$	LS14 = $\emptyset 6$	LS15 = OLC	LS16 = OLD
$\emptyset AY$	$\emptyset A1$	$\emptyset BY$	$\emptyset B1$	$\emptyset AX$	$\emptyset A2$	$\emptyset BX$	$\emptyset B2$
LS1 = $\emptyset 1$	LS2 = OLA	LS3 = $\emptyset 3$	LS4 = $\emptyset 4$	LS5 = $\emptyset 5$	LS6 = OLB	LS7 = $\emptyset 7$	LS8 = $\emptyset 8$

## TS2 TRAFFIC CABINET CONSTRUCTION DOCUMENT

**DELIVERY Date**

**TIME Sys NUMBER:**

**LOCATION:** (See STS)

**CITY:** (See STS)

**DRAWING NUMBER:**

**PROJECT DESIGNER:** (initials)

**Date:** (Cabinet assembly date)

(TE number, see STS)

**MMU Compatibilities:** (Sample table shown)

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

**MMU Settings:** (Custom MMU settings are documented here)

## TS2 TRAFFIC CABINET CONSTRUCTION DOCUMENT

**DELIVERY Date**

**TIME Sys NUMBER:**

**LOCATION:** (See STS)

**CITY:** (See STS)

**DRAWING NUMBER:**

**PROJECT DESIGNER:** (initials)

**Date:** (Cabinet assembly date)

(TE number, see STS)

**Cabinet Wiring Changes:** (Custom wiring changes are documented here)





## TS2 TRAFFIC CABINET CONSTRUCTION DOCUMENT

**DELIVERY Date**

**TIME Sys NUMBER:**

**LOCATION:** (See STS)

**CITY:** (See STS)

**DRAWING NUMBER:**

**PROJECT DESIGNER:** (initials)

**Date:** (Cabinet assembly date)

(TE number, see STS)

### Special Features:

- (Any special features are documented here)

## TS2 TRAFFIC CABINET CONSTRUCTION DOCUMENT

**DELIVERY Date**

**TIME Sys NUMBER:**

**LOCATION:** (See STS)

**CITY:** (See STS)

**DRAWING NUMBER:**

**PROJECT DESIGNER:** (initials)

**Date:** (Cabinet assembly date)

(TE number, see STS)

**Quality Control (Documentation):** (All boxes should be checked off, if applicable, before Traffic Controller is complete)

Intersection Drawings:

- Compare Phase Signal Display Box to Intersection Layout
- Compare Number of Loops in Table to Intersection Layout
- Field Loops Locations

Timing Sheet noted for:

- Phasing
- Advance Warning
- Pre-Emption (Fire/Rail/Queue Detection)
- Intersection Flash
- Coordination

Loop Assignment Sheet:

- Loop Assignment checked for accuracy
- Compare loop delays on timing sheet to intersection drawings

Cabinet Drawings:

- Title Block checked for accuracy
- Field Wiring checked for accuracy (Phasing, Advance Warning, Pre-Emption, Loops, Other)
- Intersection flash wiring checked for accuracy
- Flash Transfer Relays check for correct identification
- Load Switches check for correct identification
- Advance Warning flashers for correct identification
- Advance Warning control wiring checked for accuracy
- Pre-Emption control wiring checked for accuracy
- Malfunction Monitor Unit settings checked for accuracy

Construction Document Prepared by: \_\_\_\_\_

Date: \_\_\_\_\_

Quality Control Completed by: \_\_\_\_\_

Date: \_\_\_\_\_

## TS2 TRAFFIC CABINET CONSTRUCTION DOCUMENT

**DELIVERY Date**

**TIME Sys NUMBER:**

**LOCATION:** (See STS)

**CITY:** (See STS)

**DRAWING NUMBER:**

**PROJECT DESIGNER:** (initials)

**Date:** (Cabinet assembly date)

(TE number, see STS)

### Quality Control (Cabinet):

Ref. to Traffic Controller Design Manual for Items

#### OPERATIONAL CHECKLIST

- Check Malfunction Monitor Unit dipswitch settings and compatibility card as per DWG's.
- Check intersection flash.
- Check inside flash control switch.
- Check Controller Unit and Conflict Monitor Unit and other equipment for correct operation on power -up.
- Check First Green Display and All Red Time as per Signal Timing Sheet.
- Check Police Door Flash Switch.
- Check Controller unit vs. Signal Timing Sheet for programming.
- Check Advance Warning operation as per signal timing sheet.
- Check pedestrian calls to Controller Unit from field terminals.
- Check PED/VEH simulator to Controller Unit inputs.
- Check Interval Advance vs. AUTO & MANUAL setting.
- Check Pre-Emption operation.
- Check vehicle calls to Controller Unit from loops via Detector Unit channels as per DWG's and LAS.
- Check Malfunction Monitor Unit operation for conflict/red failures.
- Check to insure First Green Display to control flash control circuit following manual reset of C.M.U.
- Check that components are labeled.
- Check that field output wiring is clearly labelled.
- Check heater and fan operation.

#### Document distribution:

- Loop Assignment Sheet. - One copy each to cabinet & intersection file.
- Construction Document. - One copy each to cabinet & intersection file.
- Signal timing sheet - One copy each to cabinet, office & intersection file.
- Drawings distribution: One set to cabinet, one set to intersection file

Checked and Completed by \_\_\_\_\_

Date \_\_\_\_\_



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TRAFFIC CONTROLLER DESIGN MANUAL

**Appendix 200C**

**LOOP ASSIGNMENT SHEET**

Transportation Systems and Road Safety Engineering

July 2024

**TS1 4-PHASE LOOP ASSIGNMENT SHEET**

**xxx @**

**xxxCITY**

**Site Code xxx | TE-xxx**

**Prepared YY/MM/DD for timing sheet dated DD-MON-YY**

<b>LOOP NUMBER</b>	<b>DETECTOR UNIT</b>	<b>CU INPUT</b>	<b>MOVEMENT (Designation)</b>	<b>PHASE (Ø)</b>	<b>COUNT (ON)</b>	<b>DELAY/ STRETCH (SEC)</b>
	<b>1A</b>	<b>1</b>				
	<b>1B</b>	<b>9</b>				
	<b>2A</b>	<b>2</b>				
	<b>2B</b>	<b>10</b>				
	<b>3A</b>	<b>3</b>				
	<b>3B</b>	<b>11</b>				
	<b>4A</b>	<b>4</b>				
	<b>4B</b>	<b>12</b>				
	<b>5A</b>	<b>5</b>				
	<b>5B</b>	<b>13</b>				
	<b>6A</b>	<b>6</b>				
	<b>6B</b>	<b>14</b>				
	<b>7A</b>	<b>7</b>				
	<b>7B</b>	<b>15</b>				
	<b>8A</b>	<b>8</b>				
	<b>8B</b>	<b>16</b>				
	<b>9A</b>	<b>17</b>				
	<b>9B</b>	<b>18</b>				
	<b>10A</b>	<b>19</b>				
	<b>10B</b>	<b>20</b>				
	<b>CNT1A</b>	<b>21</b>				
	<b>CNT1B</b>	<b>22</b>				
	<b>CNT2A</b>	<b>23</b>				
	<b>CNT2B</b>	<b>24</b>				

**TS1 8-PHASE LOOP ASSIGNMENT SHEET**

**xxx @**

**xxxCITY**

**Site Code xxx | TE-xxx**

**Prepared YY/MM/DD for timing sheet dated DD-MON-YY**

<b>LOOP NUMBER</b>	<b>DETECTOR UNIT</b>	<b>CU INPUT</b>	<b>MOVEMENT (Designation)</b>	<b>PHASE (Ø)</b>	<b>COUNT (ON)</b>	<b>DELAY/ STRETCH (SEC)</b>
	<b>1A</b>	<b>1</b>				
	<b>1B</b>	<b>9</b>				
	<b>2A</b>	<b>2</b>				
	<b>2B</b>	<b>10</b>				
	<b>3A</b>	<b>3</b>				
	<b>3B</b>	<b>11</b>				
	<b>4A</b>	<b>4</b>				
	<b>4B</b>	<b>12</b>				
	<b>5A</b>	<b>5</b>				
	<b>5B</b>	<b>13</b>				
	<b>6A</b>	<b>6</b>				
	<b>6B</b>	<b>14</b>				
	<b>7A</b>	<b>7</b>				
	<b>7B</b>	<b>15</b>				
	<b>8A</b>	<b>8</b>				
	<b>8B</b>	<b>16</b>				
	<b>9A</b>					
	<b>9B</b>					
	<b>10A</b>	<b>17</b>				
	<b>10B</b>					
	<b>11A</b>					
	<b>11B</b>					
	<b>12A</b>	<b>18</b>				
	<b>12B</b>					

**TS1 8-PHASE LOOP ASSIGNMENT SHEET**

**xxx @**

**xxxCITY**

**Site Code xxx | TE-xxx**

**Prepared YY/MM/DD for timing sheet dated DD-MON-YY**

<b>LOOP NUMBER</b>	<b>DETECTOR UNIT</b>	<b>CU INPUT</b>	<b>MOVEMENT (Designation)</b>	<b>PHASE (Ø)</b>	<b>COUNT (ON)</b>	<b>DELAY/ STRETCH (SEC)</b>
	<b>13A</b>					
	<b>13B</b>					
	<b>14A</b>	<b>19</b>				
	<b>14B</b>					
	<b>15A</b>					
	<b>15B</b>					
	<b>16A</b>	<b>20</b>				
	<b>16B</b>					
	<b>CNT 1A</b>	<b>21</b>				
	<b>CNT 1B</b>	<b>22</b>				
	<b>CNT 2A</b>	<b>23</b>				
	<b>CNT 2B</b>	<b>24</b>				
	<b>CNT 3A</b>					
	<b>CNT 3B</b>					
	<b>CNT 4A</b>					
	<b>CNT 4B</b>					



**TS2 LOOP ASSIGNMENT SHEET**

**xxx @**

**xxxCITY**

**Site Code xxx | TE-xxx**

**Prepared YY/MM/DD for timing sheet dated DD-MON-YY**

<b>LOOP NUMBER</b>	<b>DETECTOR UNIT</b>	<b>CU INPUT</b>	<b>MOVEMENT (Designation)</b>	<b>PHASE (∅)</b>	<b>COUNT (ON)</b>	<b>DELAY/ STRETCH (SEC)</b>
	<b>2A</b>	<b>1</b>				
	<b>2B</b>	<b>2</b>				
	<b>1A</b>	<b>3</b>				
	<b>1B</b>	<b>4</b>				
	<b>4A</b>	<b>5</b>				
	<b>4B</b>	<b>6</b>				
	<b>3A</b>	<b>7</b>				
	<b>3B</b>	<b>8</b>				
	<b>6A</b>	<b>9</b>				
	<b>6B</b>	<b>10</b>				
	<b>5A</b>	<b>11</b>				
	<b>5B</b>	<b>12</b>				
	<b>8A</b>	<b>13</b>				
	<b>8B</b>	<b>14</b>				
	<b>7A</b>	<b>15</b>				
	<b>7B</b>	<b>16</b>				
	<b>10A</b>	<b>17</b>				
	<b>10B</b>	<b>18</b>				
	<b>9A</b>	<b>19</b>				
	<b>9B</b>	<b>20</b>				
	<b>12A</b>	<b>21</b>				
	<b>12B</b>	<b>22</b>				
	<b>11A</b>	<b>23</b>				
	<b>11B</b>	<b>24</b>				

**TS2 LOOP ASSIGNMENT SHEET**

**xxx @**

**xxxCITY**

**Site Code xxx | TE-xxx**

**Prepared YY/MM/DD for timing sheet dated DD-MON-YY**

<b>LOOP NUMBER</b>	<b>DETECTOR UNIT</b>	<b>CU INPUT</b>	<b>MOVEMENT (Designation)</b>	<b>PHASE (Ø)</b>	<b>COUNT (ON)</b>	<b>DELAY/ STRETCH (SEC)</b>
	<b>14A</b>	<b>25</b>				
	<b>14B</b>	<b>26</b>				
	<b>13A</b>	<b>27</b>				
	<b>13B</b>	<b>28</b>				
	<b>16A</b>	<b>29</b>				
	<b>16B</b>	<b>30</b>				
	<b>15A</b>	<b>31</b>				
	<b>15B</b>	<b>32</b>				