

		ACTION	DATE
TO	1. SENIOR ENGINEER, CONTROLLER APPLICATIONS		
	2. RON TRAYNOR, EASTERN PROJECTS		
FROM	ELIZABETH LEE	DATE	20/10/21
SITE	PRINCES HIGHWAY EAST / WILLOWGROVE ROAD / ASHBY STREET	SITE NO.	6697
REGION	EASTERN	MUNICIPALITY	BAW BAW

**GENERAL**

Works Program Job?	Yes	Project Number	48JG101
Classification	COMPLEX	Task Number	679
Description	<input type="checkbox"/> New intersection signals <input type="checkbox"/> New pedestrian operated signals <input checked="" type="checkbox"/> Controller swap. Reason for swap		
	Controller Replacement		

**CONTROLLER DETAILS**

Type	Eclipse	Software Version & Release	V6.1 R20	Lanterns	LED
Number of Signal Groups	Vehicle	11	Pedestrians	2	Total 13
Number of special outputs / Pedestrian Wait State Outputs					
Controller capacity	16				
Number of detectors	Vehicle	15	Pedestrians	2	Total 22
	Tram		Other	5	

**CONTROLLER APPLICATIONS**

Target Date for Draft Opsheet	ASAP
Target Date for completion of Program	ASAP
Prepare Interlocking	

**PERSONALITY CHECKSUMS**

	Hex	Octal
<b>Total</b>	CA	312
<b>Times</b>	72	162
<b>Pers</b>	B8	270
<b>Dispatched</b>	29/10/21	

**EASTERN PROJECTS - SIGNAL INSTALLATION**

If switch-on of a metro site is to occur without a Telstra line, seek approval of the T/L Signal Services

SCATS connection Connection to existing controller must be transferred to the new controller

**PRIOR NOTICE**

A job must be entered into RAI Action database before this switch on will be allowed.

<input checked="" type="checkbox"/>	SCATS data changes - notify	CHRIS EER	Ext	8711
	OR	ELIZABETH LEE	Ext	8062
before 3:00pm on the day before switch on.				

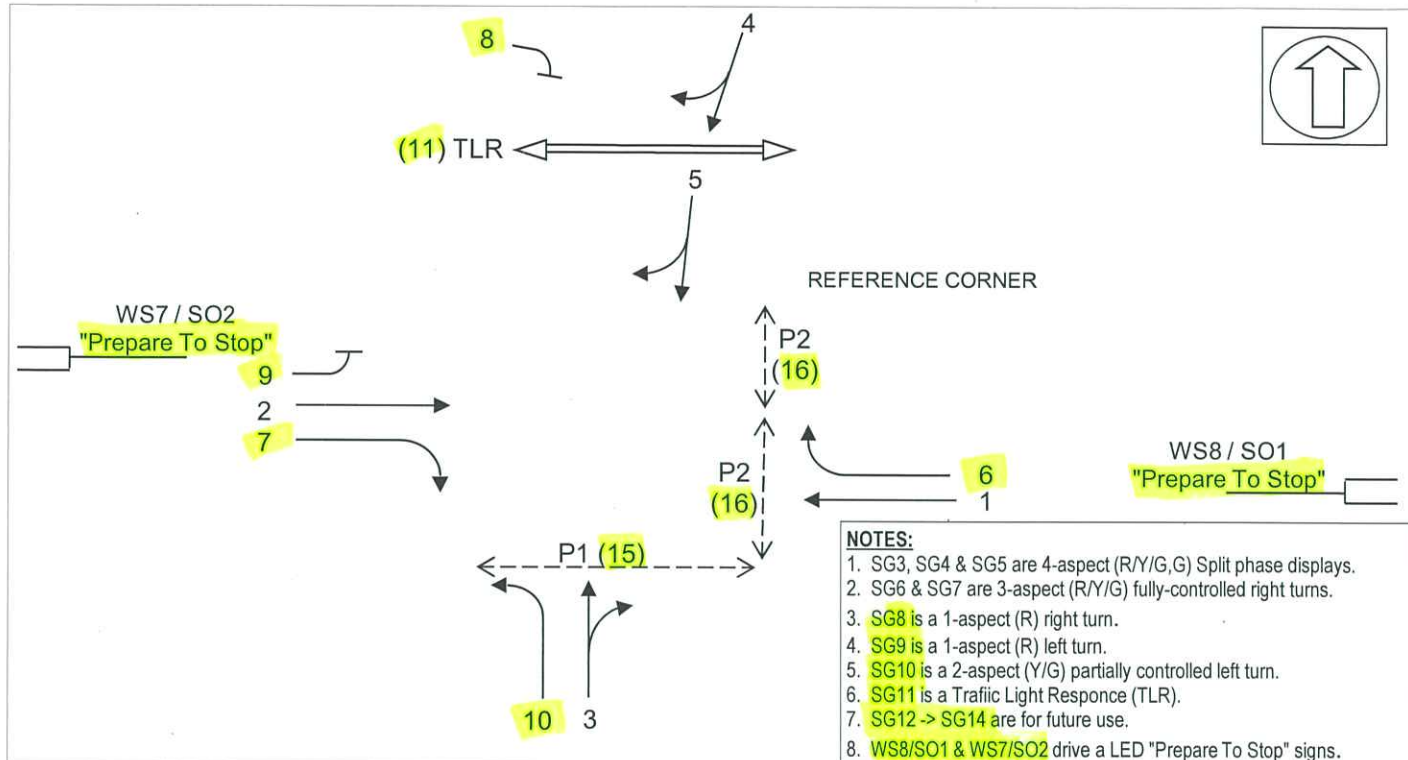
**SCATS Data Changes -**
**TRAFFIC MANAGEMENT CENTRE**

<input checked="" type="checkbox"/>	Please notify CHRIS EER (x8711) on job completion.
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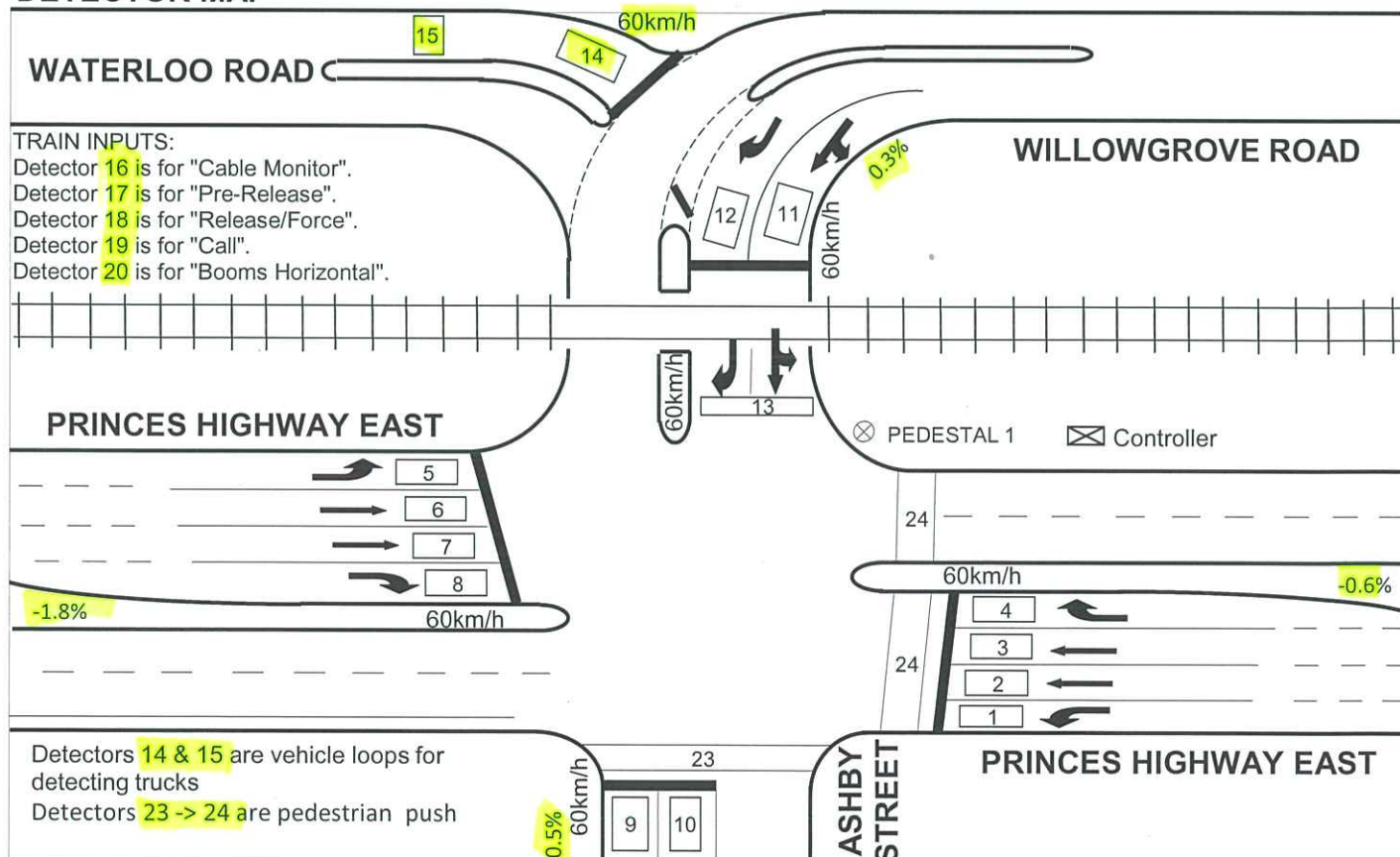
**DATE OF NEW CONTROLLER SWITCH ON**

SITE NAME	<b>PRINCES HIGHWAY EAST / WILLOWGROVE ROAD / ASHBY STREET</b>			SITE NO.	<b>6697</b>
MUNICIPALITY	BAW BAW	DESIGNED BY	ELIZABETH LEE	DATE	22/09/21
PLAN NO.	508863C	DESIGN CHECKED	<i>Chris Lee</i>	DATE	29/9/2021
CONTROLLER TYPE	Eclipse	PROM CHECKED	<i>Chris Lee</i>	DATE	29/10/2021

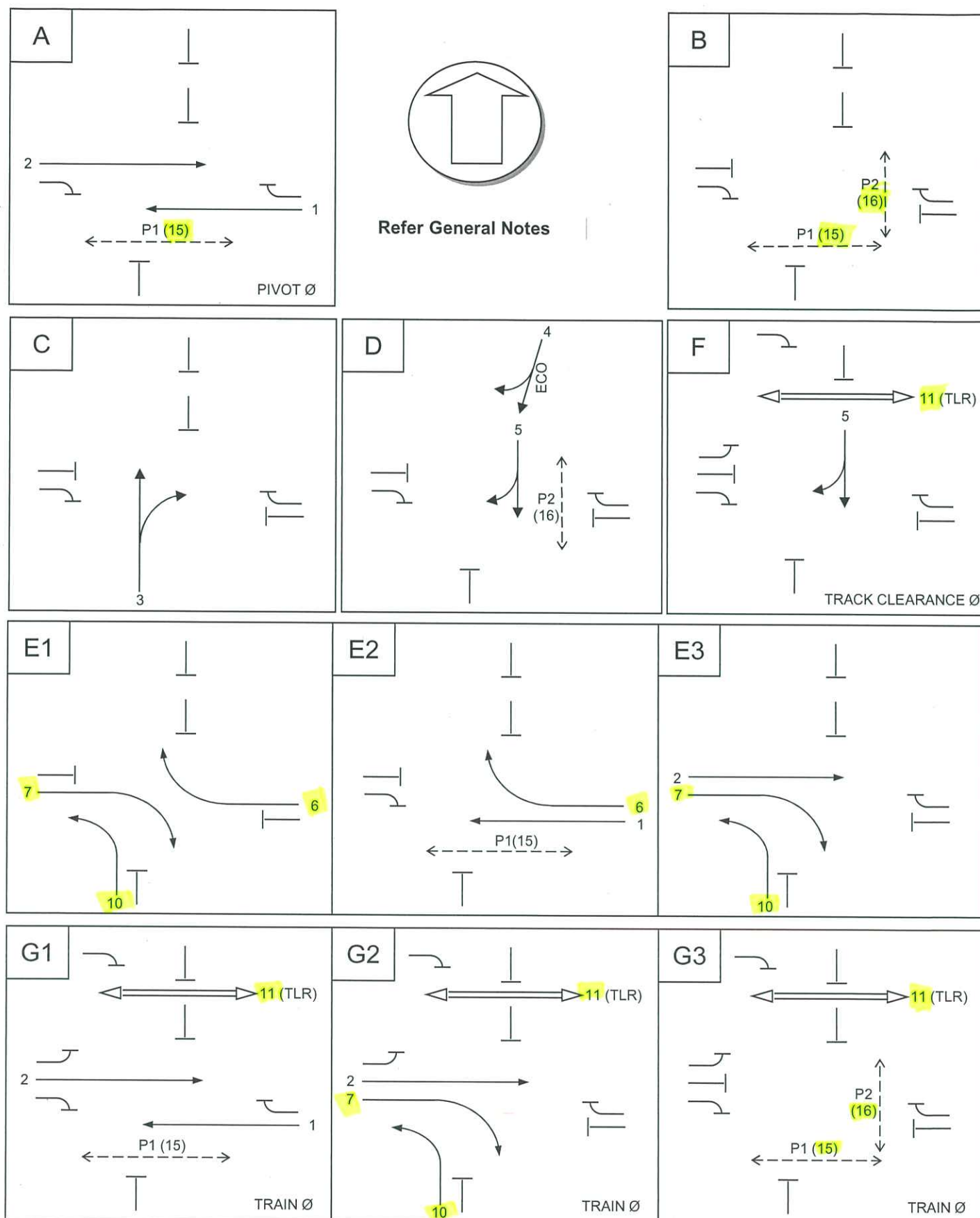
## GROUP ALLOCATION



## DETECTOR MAP



# PHASING DIAGRAM


V.A. SEQUENCE ABCDEF G

DESIGNED BY: ELIZABETH LEE

DATE 22/09/21



# DETECTOR FUNCTIONS

DETECTOR No.	Internal / External	Input Number	CALL PHASE	LOCKING CALL	NON-LOCKING CAL	SET VIG ON PHASE	EXTEND PHASE	SPECIAL FUNCTION			DETECTOR ALARMS						
								Detector Type	Description	Refer Special Notes	DA Category	Disable	DA on S/C only	Fault Simulation			
														Call & Extend	Call Only	Ignore Alarm	Refer Special Notes
1	I	1	A	✓			A				0			✓			
2	I	2	A	✓			A				0			✓			
3	I	3	A	✓			A				0			✓			
4	I	4	E	✓			E				0			✓			
5	I	5	A	✓			A				0			✓			
6	I	6	A	✓			A				0			✓			
7	I	7	A	✓			A				0			✓			
8	I	8	E	✓			E				0			✓			
9	I	9	C	✓			C				0			✓			
10	I	10	C	✓			C				0			✓			
11	I	11	D	✓			D				0			✓			
12	I	12	D	✓			D				0			✓			
13	I	13	D	✓			F				0				D		
14	I	14	-				D			✓	0		✓			✓	
15	I	15	-				-			✓	0		✓				
16	E	3	-				-	RAIL	Cable Monitor	✓	1						
17	E	4	-				-	RAIL	Pre-Release	✓	1						
18	E	5	-				-	RAIL	Release/Force	✓	1						
19	E	6	F,G				-	RAIL	Call	✓	1						
20	E	7					-	RAIL	Booms Horizontal	✓	1						
21											1						
22											1						
23	E	1	A		✓			P1		✓	6		✓				
24	E	2	B		✓			P2		✓	6		✓				
25																	
26																	
27																	
28																	
29																	
30																	
31																	
32																	

DESIGNED BY: ELIZABETH LEE

DATE 22/09/21

## DETECTOR FUNCTIONS

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								Detector Type	Description	Refer Special Notes	DA Category	Disable	DA on S/C only	Fault Simulation			
														Call & Extend	Call Only	Ignore Alarm	Refer Special Notes
33																	
34																	
35																	
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DESIGNED BY: ELIZABETH LEE

DATE 22/09/21

## APPROACH DEFINITIONS

## PHASE APPROACHES

Approach No	EXTENDING DETECTORS	APPROACH TIMER AND TIMESETTING DEFINITION*	SIGNAL GROUP	APPROACH EXPIRY (EXPAP)	Refer Special Notes
1	2,3	A11	1		
2	6,7	A22	2		
3	1	A33	1		
4	5	A44	2		
5	9	C11	3		
6	10	C22	3		
7	11	D11	4		
8	12	D22	4		
9	14	D33	4		✓
10	4	E11	6		
11	8	E22	7		
12	13	F11	5		
13					
14					
15					
16					

\* There are 8 approach timers and 4 approach timesettings available per phase:

- Where there are 4 or fewer approaches per phase, allocate one timesetting to each timer.

For example: A11, A22, A33, B11, C11.

- Where there are more than 4 approaches per phase, two or more timers must have the same timesetting.

For example: A11, A21, A32, A43, A54, B11.

## SPECIAL APPROACHES

Approach No	EXTENDING DETECTORS	APPROACH TIMESETTING	SIGNAL GROUP	DESCRIPTION	Refer Special Notes
1	2,3	G11	1		
2	6,7	G22	2		
3	1	G33	1		
4	8	G44	7		

DESIGNED BY: ELIZABETH LEE

DATE

22/09/21

## APPROACH DEFINITIONS

### PHASE APPROACHES

Approach No	EXTENDING DETECTORS	APPROACH TIMER AND TIMESETTING DEFINITION*	SIGNAL GROUP	APPROACH EXPIRY (EXPAP)	Refer Special Notes
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					

\* There are 8 approach timers and 4 approach timesettings available per phase:

- Where there are 4 or fewer approaches per phase, allocate one timesetting to each timer.

For example: A11. A22, A33, B11, C11.

- Where there are more than 4 approaches per phase, two or more timers must have the same timesetting.

For example: A11. A21, A32, A43, A54, B11.



## GENERAL NOTES

### SUMMARY OF XSF FLAGS

(Communications Operation of XSF flags is required)

- XSF1** - Allows late introduction of P1 in AØ (*Masterlink only*).
- XSF2** - Allows auto introduction of P1 at the start of SG1.
- XSF3** - Allows P2 to call DØ instead of BØ.
- XSF5** - Hold SG8 red until the end of Train phase (GØ).
- XSF6** - Set special maximum time for SG6 in EØ via Special Purpose Timesetting No. 23.
- XSF7** - Set special maximum time for SG7 & SG10 in EØ via Special Purpose Timesetting No. 24.
- XSF8** - Inhibit P1 to introduce anytime in E2Ø and at the start of AØ.
- XSF10** - Allows detector 14 to extend DØ.
- XSF11** - Inhibits detectors 14 & 15 from placing non-locking calls for DØ.

### SUMMARY OF MSS FLAGS

- MSS1** - Set on receipt of CALL – used to force the site to Isolated. MSS1 is cleared by termination conditions.
- MSS2** - Set at the start of train phase (GØ) until start of intergreen of train phase.
- MSS3** - For Abnormal Condition message No. 1 – “Force before TLR”.
- MSS4** - For Abnormal Condition message No. 2 – “Late Release”.
- MSS5** - For Abnormal Condition message No. 3 – “Force without Call”.
- MSS6** - For Abnormal Condition message No. 4 – “Break in Cable Monitor”.
- MSS7** - For Abnormal Condition message No. 5 – “Booms not Horizontal”.
- MSS8** - Set when BOOMS HORIZONTAL input is received until the point at which the PRE-RELEASE input is received.
- MSS14** - Set when FORCE input is received - used to monitor CALL/FORCE interval.
- MSS15** - Set when the PRE-RELEASE input is first terminated – used to monitor the PRE-RELEASE/RELEASE interval.

### GENERAL OPERATION

- REVn. – first scan after start up demands CØ, DØ & E1Ø.
- Clear vehicle demands during associated phase green and yellow.
- Substitute AØ yellow for EØ yellow if transition from E2Ø or E3Ø to phases other than AØ.
- EØ ECO is used to guarantee SG1 or SG2 minimum green when transitioning from E2Ø→FØ, E3Ø→FØ. Expire EØ ECO period when transitioning from EØ -> AØ.
- Expire DØ ECO period when transitioning from DØ -> FØ. SG5 overlaps from DØ -> FØ.
- Expire GØ ECO period when transitioning from GØ -> AØ.
- Use CØ special all red when transitioning from CØ -> DØ with XSF3 set.
- Provide 3.0 seconds solid Don't Walk period for P2 in G3Ø when transitioning from G3Ø -> G1Ø.

### SIGNAL GROUP OPERATION

#### SIGNAL GROUP 6

- SG6 Special Movement uses EØ minimum green for its minimum green, EØ yellow for its yellow and EØ All Red for its all red when it operates in EØ.
- XSF6 is used to set the maximum time for SG6 in EØ. The time is accessible in Special Purpose Timesetting No. 23. When XSF6 is set, SG6 will be forced off after a period equal to the EØ minimum green plus the time stored in Special Purpose Timesetting No. 23.



## **SIGNAL GROUP 7**

- SG7 Special Movement uses EØ minimum green for its minimum green, EØ yellow for its yellow and EØ All Red for its all red when it operates in EØ.
- XSF7 is used to set the maximum time for SG7 & SG10 in EØ. The time is accessible in Special Purpose Timesetting No. 24. When XSF7 is set, SG7 & SG10 will be forced off after a period equal to the EØ minimum green plus the time stored in Special Purpose Timesetting No. 24.

## **SIGNAL GROUP 10**

- SG10 Special Movement uses EØ minimum green for its minimum green, EØ yellow for its yellow and EØ All Red for its all red when it operates in EØ.

## **PEDESTRIAN GROUP OPERATION**

### **Pedestrian 1**

- P1 calls AØ.
- P1 can overlap from E2Ø → AØ.
- If XSF8 is not set:
  - P1 can introduce anytime in E2Ø & at the start of AØ.
  - P1 can introduce anytime in AØ if XSF1 is set (*Masterlink only*).
- If XSF8 is set:
  - P1 can only introduce at the start of SG1.
  - P1 calls away to CØ if controller is resting in AØ.
- P1 auto introduces at the start of BØ when BØ is demanded by P2 (*i.e. no XSF3 set*).
- P1 auto introduces at the start of SG1 when XSF2 is set.
- P1 can introduce at the start of G1Ø if demanded.
- P1 can introduce at the start of G3Ø with P2 if G3Ø is demanded by P2.

### **Pedestrian 2**

- P2 calls BØ (*i.e. no XSF3 set*) and G3Ø.
- P2 can introduce at the start of BØ (*i.e. no XSF3 set*).
- P2 calls DØ instead of BØ if XSF3 is set.
- P2 can introduce at the start of DØ with XSF3 set.
- If P2 is demanded in GØ, P2 introduces at the start of G3Ø.

## **OPERATION OF ADVANCED WARNING SIGNS**

**Waite State 8 (WS8) & Special Output 1 (SO1)** drive the flashing LED “PREPARE TO STOP” sign facing east approach of Princes Highway:

- WS8 / SO1 is switched on at the start of AØ ECO when transitioning AØ → BØ, AØ → CØ, AØ → DØ, AØ → E1 & E3Ø, AØ → FØ.
- WS8 / SO1 is switched on when FØ is demanded if transitioning from E2Ø → FØ.
- WS8 / SO1 is switched on when approach timer for SG1 expires in G1Ø when transitioning from G1Ø → G2Ø or G1Ø → G3Ø. Start Timer 1 (*Special Purpose Timesetting No. 25*) when WS8 / SO1 is switched On. SG1 closes down when Timer 1 expires in G1Ø.
- WS8 / SO1 switches OFF when SG1 turns green in E2Ø, AØ or G1Ø.

**Waite State 7 (WS7) & Special Output 2 (SO2)** drive the flashing LED “PREPARE TO STOP” sign facing west approach of Princes Highway:

- WS7/SO2 is switched on at the start of AØ ECO when transitioning AØ → BØ, AØ → CØ, AØ → DØ, AØ → E1 & E2Ø, AØ → FØ.

**SITE NAME: Princes Highway East / Willowgrove Road / Ashby Street**

- WS7 / SO2 is switched on when FØ is demanded if transitioning from E3Ø -> FØ.
- WS7/SO2 is switched on when approach timer for SG2 expires in G1Ø or G2Ø when transitioning from G1Ø -> G3Ø or G2Ø -> G3Ø. Start Timer 2 (*Special Purpose Timesetting No. 26*) when WS7 / SO2 is switched On. SG2 closes down when Timer 2 expires in G1Ø or G2Ø.
- WS7 / SO2 switches OFF when SG2 turns green in E3Ø, AØ or G1Ø.

**Calculation of AØ ECO period**

ECO = Time to travel from sign to stopline – Yellow + Reaction time  
= 9.3 – 4 + 2 = 7.3 (say 7 seconds)

**TRUCK DETECTOR OPERATION**
**Detectors 14 & 15**

Place a non-locking call for DØ if the following conditions occur:

- Detector 15 is activated prior to detector 14 and;
- Detector 15 remains on during the period between Detector 15 being activated and Detector 14 being activated and;
- Detector 14 is occupied for the duration specified in its presence time setting.
- Detectors 14 and 15 do not place non-locking calls for DØ if XSF11 is set.
- If Detectors 14 and 15 are on continuously do not call DØ (apart from when it is first activated) until they change state.
- Detector 14 extends DØ if XSF10 is set.

**Alarm Status – Detectors 14 & 15**

When the controller is online to SCATS and detector 14 and/or detector 15 are continuously on for period as specified by the SCATS TDA message, then a 'Detector Alarm' (DA) will be generated.

Do not alarm detectors 14 or 15 if in the OFF state.

These 2 conditions mean that a 'DA' will be generated ONLY if a detector is Short Circuit (S/C).



## RAIL LINK NOTES

### 1.0 GENERAL INTERFACING REQUIREMENTS

Electrical interfacing between the TRAFFIC SIGNAL controller and the LEVEL CROSSING controller is provided by a multi-core telephone-type cable having at least 10 pairs, as detailed in the STANDARD RAIL-LINK CABLE TERMINATION CHART.

#### 1.1 RAIL LINK INPUTS

For a standard installation, the following five inputs are generated by the rail crossing control system and fed into detector inputs in the traffic signal controller:

- CABLE MONITOR via Detector 16 (normally ON)
- PRE-RELEASE via Detector 17 (normally ON)
- RELEASE/FORCE (R/F) via Detector 18 (normally ON)
- CALL via Detector 19 (normally OFF)
- BOOMS HORIZONTAL via Detector 20 (normally OFF)

Each of these inputs is generated from a rail level crossing relay. Each can be in the *On* or *Off* state.

#### 1.2 STANDARD RAIL LINK OUTPUTS

The traffic signal controller generates the following output, which is sent to the rail crossing control system through a special signal group:

- TRAFFIC LIGHT RESPONSE (TLR) via SG11

### 2.0 BASIC OPERATING PROCEDURE

The TYPICAL SEQUENCE CHART on page 4/6 shows the sequence of events and the change in state of each input and output.

#### 2.1 CALL

When the presence timer for CALL input (*Detector 19*) expires, the CALL is deemed to be **established** and will force the controller to go into the train operation described below:

- Start the Call delay timer (*Special Purpose Timesetting No. 11*). When the delay timer expires, the controller will clear all phase demands i.e. the controller will remain in the currently running phase.
- If the controller is changing phases when the "CALL" is received, then do not service pedestrian in the phase which is about to run. Run this subsequent phase for minimum green period only.
- If a pedestrian is in WALK when the 'CALL' is received then select *Special Purpose Timesetting No. 9* for the pedestrian walk time.
- Demands for FØ (*Track Clearance Phase*) and GØ (*Train Phase*) are placed and the controller proceeds to FØ immediately without violating the operating phase minimum.
- MSS1 flag is set at the point when the "CALL" is first received. The point at which MSS1 flag is removed is outlined in Section 3.3, which relates to the provision of train compensation operation.
- The controller is forced to isolated mode of operation. When on-line to the regional computer this is achieved via the MSS1 flag using VR30.
- Expire BØ minimum green when transitioning from AØ -> BØ before proceeding to FØ when FØ is demanded.



## 2.2 TRAIN PHASE SEQUENCE

The Train phase sequence is as follows:

- FØ - Track Clearance phase
- GØ - Train Phase

### 2.2.1 Track Clearance Phase (FØ)

- **SG9** (*1-aspect red left turn arrow display*) is activated at the start of AØ, BØ, CØ, DØ & EØ all red when transitioning to FØ. SG9 red remains on until the resumption of NORMAL OPERATION with the commencement of AØ green.
- **SG8** (*1-aspect red right turn arrow display*) is activated at the start of AØ, BØ, CØ, DØ & EØ all red when transitioning to FØ. **SG8** remain on until the booms horizontal input is received or until Force/Release is re-instated whichever comes first except when XSF5 is set (*hold SG8 till end of GØ*).
- Detector 13 can extend FØ.
- Proceed to Train phase (GØ) after Track Clearance Phase.

### 2.2.2 Train Operation (GØ)

- The Train Phase starts in **G1Ø**, P1 introduces at the start of the G1Ø when demanded.
- The controller can cycle from G1Ø → G2Ø → G3Ø on demand and rests in G1Ø if no other demands.
- SG1, SG2 & **SG7** use special approach gap, headway waste timers.
- SG1 & SG2 use GØ minimum green for G1Ø minimum green.
- SG1 & SG2 use the time in *Special Purpose Timesetting 14* for G1Ø extension green.
- G2Ø is demanded via a call from detector 8.
- G2Ø uses EØ minimum green for its minimum green.
- G2Ø uses time in *Special Purpose Timesetting No.15* for G2Ø extension green.
- A call for P2 will demand G3Ø (*P1 also operates in G3Ø*).
- Provide a 3 seconds Solid Don't Walk at the end of P1 & P2 flashing clearance within GØ (*Special Movement Timesetting No. 8*).

## 2.3 TRAFFIC LIGHT RESPONSE (TLR)

The TLR is issued at the start of the "Track Clearance Phase, (FØ)" minimum green. It is maintained until the PRE-RELEASE input is reinstated.

## 2.4 FORCE

The FORCE is indicated by the RELEASE/FORCE input going off. This occurs when the train enters the *control section* causing the red lights at the crossing to flash and bells to ring. If the FORCE is received before the TLR is sent, then the signals will be forced to 'FLASHING-YELLOW'.

## 2.5 BOOMS HORIZONTAL

On receipt of this input is an indication that all the booms have reached horizontal. On receipt of the BOOMS HORIZONTAL input, the **MSS8** flag is set and remains set until the BOOMS HORIZONTAL input turns off. **MSS8** is used to monitor the duration of the booms closure.

## 2.6 PRE-RELEASE

### 2.6.1 Normal operation for one train

The re-activation of the PRE-RELEASE input (*detector 17*) is an indication that the train has cleared the control section of track and that the booms are about to lift. When PRE-RELEASE input is received, the controller initiates a pre-release sequence which directs the controller to terminate all signal groups in the train phase without violating pedestrian or minimum green times. If a pedestrian is in walk when the PRE-RELEASE is received, then select (*Special Purpose Timesetting No. 9*) for the pedestrian walk time, so that normal operation may resume as soon as possible. The controller will then proceed to the train phase All-Red interval and remain there pending reinstatement of the RELEASE input.

### 2.6.2 Second call during train phase

Following receipt of the PRE-RELEASE input, if a second CALL is received prior to the controller being in the train phase intergreen period (*i.e. the booms have moved off the horizontal but the controller is still not in the train phase intergreen*) then the train phase sequence should be recommenced as per 2.1 above.

### 2.6.3 Second call during train phase intergreen

If a second CALL is received during the train phase intergreen period then proceed to the subsequent phase (but do not service pedestrians) and then commence a new train phase sequence as in 2.1 above.

## 2.7 RELEASE (R/F) INPUT

The Release is indicated by the Release/Force input going to the *ON* state. This indication releases the traffic signal controller to resume normal vehicle operation.

## 3.0 SPECIAL PROCEDURES

### 3.1 ABNORMAL CONDITIONS

These conditions should not occur in normal operation. However, when they do, appropriate steps should be taken to register the event and to take action as follows.

#### 3.1.1 Abnormal condition 1 - Force before TLR

Although 35 seconds at least should elapse between receipt of a CALL input and the FORCE (*termination of the R/F input*), there may be occasions when the FORCE occurs prior to the controller issuing the TLR output. This will force a '**FLASHING-YELLOW**' response and generate ABNORMAL CONDITION message No. 1 via **MSS3**. When the full RELEASE is received (*the R/F input is reinstated*) the controller will go through an All Red start-up sequence and resume normal operation.



### 3.1.2 Abnormal condition 2 - Late Release

The RELEASE TIMER (*Special Purpose Timesetting No. 12.*) commences counting from receipt of the PRE-RELEASE. If the R/F is not reinstated before expiry of this timer, then the controller will generate ABNORMAL CONDITION message No. 2 via **MSS4** and go to '**FLASHING-YELLOW**'. When the R/F input is reinstated, the controller will go through an All Red start-up sequence and resume normal operation.

### 3.1.3 Abnormal condition 3 - Force without Call

If the R/F input is terminated without a previous CALL input, the controller will generate ABNORMAL CONDITION message No. 3 via **MSS5** and go to '**FLASHING-YELLOW**'. When the R/F input is reinstated the controller will go through an All Red start-up sequence and resume normal operation.

### 3.1.4 Abnormal condition 4 - Break in Cable Monitor

If there is a break in the CABLE MONITOR input, the controller will generate ABNORMAL CONDITION message No. 4 via **MSS6** and go to '**FLASHING-YELLOW**' until the CABLE MONITOR is reinstated. When this input is reinstated the controller will go through an All Red start-up sequence and resume normal operation.

### 3.1.5 Abnormal condition 5 - Booms not Horizontal

If the BOOMS HORIZONTAL input is not received during the train sequence, the controller will generate ABNORMAL CONDITION message No. 5 via **MSS7**. This flag is set at the start of the first phase following release from the train phase sequence if this condition occurs.

## 3.2 CALL TERMINATION TIMER

When a CALL input terminates prior to the FORCE (in the presence of the R/F input), a CALL TERMINATION TIMER will begin to count down from the timesetting in the *Special Purpose Timesetting No. 13*. Any further CALL inputs will reset the timer. Once the FORCE is received (R/F terminated), the timer is ignored. If the R/F input is not terminated prior to expiry of the timer, then the controller will AUTO-RELEASE from the **TRAIN OPERATION** and resume **NORMAL OPERATION**. The purpose of this facility is to prevent the traffic signal controller from being "locked up" indefinitely by spurious inputs

## 3.3 OPERATING MODES

The operation of the controller is modified as described in section 2.2.2.

### 3.3.1 Isolation conditions

When the CALL input is received, the **MSS1** flag is set and will instruct the regional computer (via VP routine 30) to force the controller into Isolated operation. During this time the **MSS1** flag will remain on until the termination conditions are met, as dictated by the COMPENSATION sequence requirements. The details of the COMPENSATION sequence are described below.

#### Compensation sequence

Following GØ, resume operation in CØ, DØ & EØ (*If CØ is not demanded then resume in DØ or EØ if demanded*).

- Use Special Purpose Timesettings No. 27, 10 & 28 for CØ, DØ or EØ COMPENSATION Timers respectively. Clear **MSS1** flag after the expiry of these timesettings i.e. at start of yellow before going to AØ.

If there is no demand for CØ, DØ or EØ, then resume in AØ when transitioning from GØ. Clear **MSS1** flag at the start of GØ yellow.



### 3.3.2 Resumption of dynamic mode

At the start of the TRAIN PHASE the **MSS2** flag is set and will stay on until the start of the intergreen of the train phase. The termination of the **MSS2** flag is used to determine the moment at which the cycle generator is to be set for Masterlink operation.

### 3.3.3 Flexilink operation

Flexilink is permitted to run.

## 4.0 VARIATION PARAMETER TABLES

### 4.1 ABNORMAL CONDITION MESSAGE NO. 1

"DCL %1 RAIL LINK: FORCE BEFORE TLR

VP = 5 - test MSS  
 VP = 0 - current slot  
 VP = 3 - MSS flag  
 VP = 36 - read Action List  
 VP = - true Action List No.  
 VP = 0 - no action if false

### 4.2 ABNORMAL CONDITION MESSAGE NO. 2

"DCL %1 RAIL LINK: LATE RELEASE

VP = 5 - test MSS  
 VP = 0 - current slot  
 VP = 4 - MSS flag  
 VP = 36 - read Action List  
 VP = - true Action List No.  
 VP = 0 - no action if false

### 4.3 ABNORMAL CONDITION MESSAGE NO. 3

"DCL %1 RAIL LINK: FORCE WITHOUT CALL

VP = 5 - test MSS  
 VP = 0 - current slot  
 VP = 5 - MSS flag  
 VP = 36 - read Action List  
 VP = - true Action List No.  
 VP = 0 - no action if false

### 4.4 ABNORMAL CONDITION MESSAGE NO. 4

"DNC %1 RAIL LINK: BREAK IN CABLE MONITOR

VP = 5 - test MSS  
 VP = 0 - current slot  
 VP = 6 - MSS flag  
 VP = 36 - read Action List  
 VP = - true Action List No.  
 VP = 0 - no action if false

### 4.5 ABNORMAL CONDITION MESSAGE NO. 5

"DCL %1 BOOMS NOT HORIZONTAL

VP = 5 - test MSS  
 VP = 0 - current slot  
 VP = 7 - MSS flag  
 VP = 36 - read Action List  
 VP = - true Action List No.  
 VP = 0 - no action if false

### 4.6 MONITOR DURATION OF BOOMS CLOSURE

VP41 = 5 - test MSS  
 VP42 = 0 - current slot  
 VP43 = 8 - MSS flag 8  
 VP44 = 36 - read Action List  
 VP45 = - true Action List No. "SIL 3419 BOOMS DOWN  
 VP46 = - no TC file No "SIL 3419 BOOMS UP

## **5.0 MSS FLAGS - SUMMARY OF OPERATIONS**

### **5.1 MSS1**

This Flag is SET upon receipt of the CALL and is used to force the site into isolated operation. This Flag is DROPPED to allow the Local Controller to pick up Flexilink or Masterlink operation. (Refer 3.3.1)

### **5.2 MSS2**

This Flag is SET at the start of the TRAIN PHASE green. This Flag is DROPPED at the start of the TRAIN PHASE intergreen and is used to SET the cycle generator in preparation for picking up co-ordination. (Refer 3.3.2)

### **5.3 MSS3 to MSS7**

These are described under ABNORMAL CONDITIONS. (See Sections 3.1.1 to 3.1.5)

### **5.4 MSS8**

MSS8 flag is set on receipt of the BOOMS HORIZONTAL input. MSS8 remains set until the BOOMS HORIZONTAL input is removed. MSS8 is used to monitor the duration of the booms closure. (Refer 2.5)

### **5.5 MSS14**

On receipt of the FORCE input, MSS14 flag is set. MSS14 remains set until the FORCE input is removed (*i.e. the RELEASE/FORCE input is re-instated*). MSS14 is used to monitor the CALL/FORCE interval.

### **5.5 MSS15**

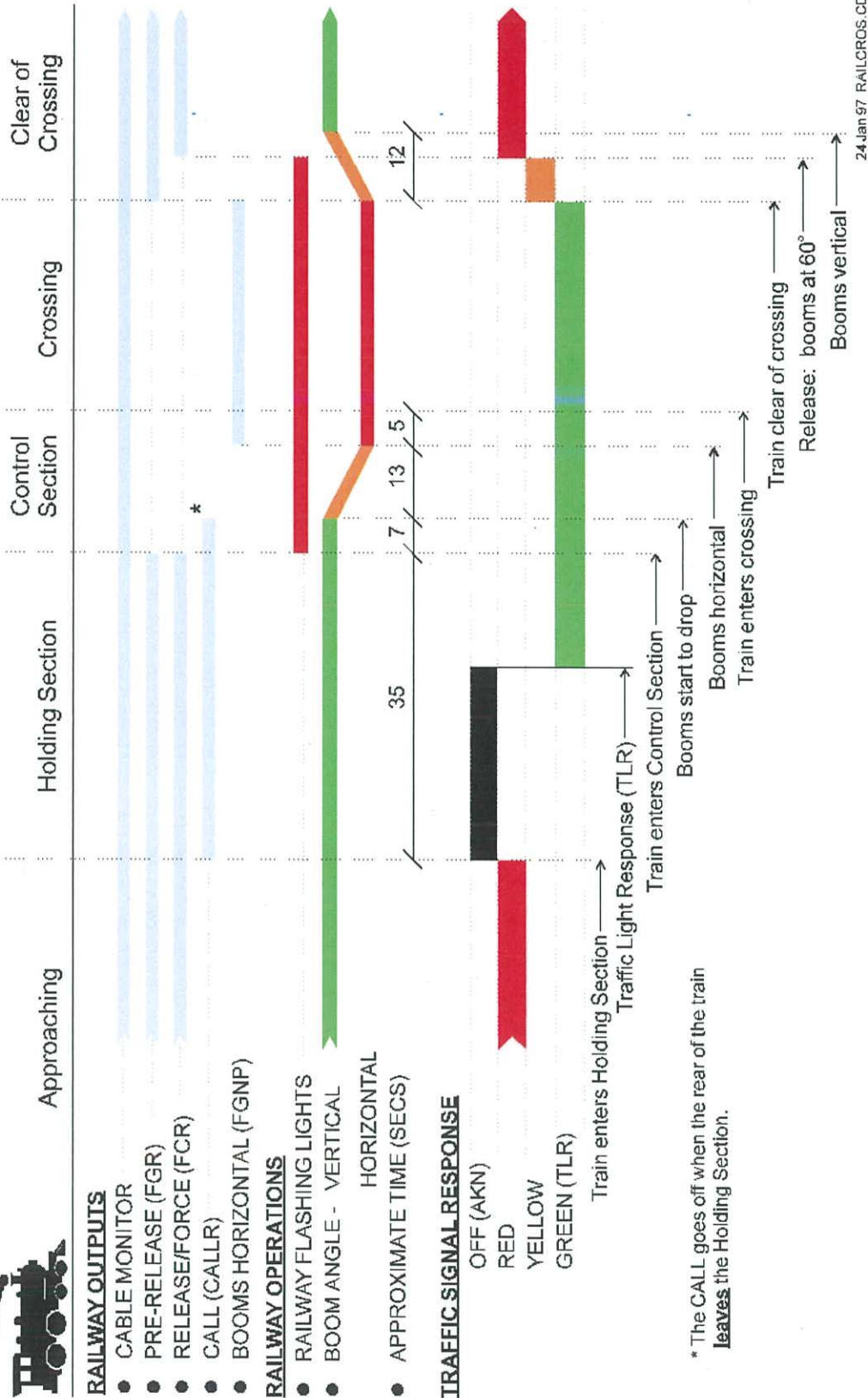
When the PRE-RELEASE input is first terminated, the MSS15 flag is set. MSS15 remains set until the PRE-RELEASE input is reinstated. MSS15 is used to monitor the PRE-RELEASE/RELEASE interval.

MSS14 and MSS15 can be used with MSS1 to monitor the CALL to FORCE interval.






## Appendix 1

# LINKING OF TRAFFIC SIGNALS TO RAILWAY LEVEL CROSSING CONTROLS TYPICAL SEQUENCE CHART

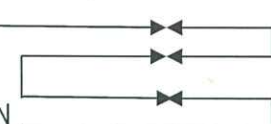



# **STANDARD RAIL LINK CABLE TERMINATION CHART FOR CONTROLLERS WITH RELAY OR SOLID-STATE LOAD SWITCHING**

*\*Delete the inputs and or outputs on this page which are not used.*

RAIL-LINK DESCRIPTION or FUNCTION	NO-TRAIN CIRCUIT STATUS	PAIR REF No.	CONDUCTOR INSULATION COLOUR	TERMINATION DETAILS
Cable Monitor (Continuity)	CLOSED	1 <sup>st</sup>	WHITE BLUE	Det. Return Detector Number: <b>16</b>
Pre-Release (FGR)	CLOSED	2 <sup>nd</sup>	WHITE ORANGE	Det. Return Detector Number: <b>17</b>
Release/Force (R/F or FCR)	CLOSED	3 <sup>rd</sup>	WHITE GREEN	Det. Return Detector Number: <b>18</b>
CALL	OPEN	4 <sup>th</sup>	WHITE BROWN	Det. Return Detector Number: <b>19</b>
BOOMS HORIZONTAL	OPEN	5 <sup>th</sup>	WHITE GREY	Det. Return Detector Number: <b>20</b>
SPARE	OPEN	6 <sup>th</sup>	RED BLUE	Not Terminated Not Terminated
SPARE	OPEN	7 <sup>th</sup>	RED ORANGE	Not Terminated Not Terminated
SIGNALS OFF (FY or BO) Relay	OPEN	8 <sup>th</sup>	RED GREEN	 (N/C) 'FLASH' RLY
ACKNOWLEDGE CALL (AKN)	OPEN	9 <sup>th</sup>	RED BROWN	 (N/O) 'A' RLY (N/C) 'B' RLY
TRAFFIC LIGHT RESPONSE (TLR)	OPEN	10 <sup>th</sup>	RED GREY	 (N/O) 'A' RLY (N/O) 'B' RLY

For solid-state load-switching, suitable termination is as follow:

ACKNOWLEDGE CALL (AKN)	OPEN	9 <sup>th</sup>	RED BROWN	 (N/C) 'RED' RLY (N/C) 'YEL' RLY (N/C) 'GRN' RLY
TRAFFIC LIGHT RESPONSE (TLR)	OPEN	10 <sup>th</sup>	RED GREY	 (N/O) 'GRN' RLY

- 'TLR' (and 'AKN' outputs are driven by SIGNAL GROUP: **11** using the "RED", "OFF", "GRN" and "YEL" logic states as shown in the 'Typical Sequence Chart'.
- The (AKN) output may be required occasionally (for manual operation at signal-box sites) thus requiring installation of the "RED" and "YEL" 240 Volt relays in addition to the "GRN" 240 Volt relay.

## DESIGN OF INTERGREEN AND PEDESTRIAN TIMES

### INTERGREEN TIMES

PHASE	CLEARANCE DETAILS			LEGAL SPEED	DESIGN SPEED		INTERGREEN		
	GROUP TRANSITION	DISTANCE	GRADE (%)*		YELLOW	RED	YELLOW	RED	TOTAL
A	2 → P2	35.5	0.5	60	60	60	4.0	2.5	6.5
B	→						3.0	0.0	3.0
C	3 → 5	27.0	-1.8	60	60	45	4.0	2.5	6.5
D	5 → P1	32.0	0.2	60	60	60	4.0	2.0	6.0
E	7 → P1	33.0	0.4	60	45	45	3.0	3.0	6.0
F	5 → P1	32.0	0.2	60	60	60	4.0	2.0	6.0
G	7 → P1	33.0	0.4	60	60	45	4.0	3.0	7.0

\*Positive grade indicates an uphill approach & negative grade indicates a downhill approach. Specify negative grade values with a "-" prefix

### PHASE SPECIAL ALL REDS AND SPECIAL MOVEMENT ALL REDS

FROM PHASE	TO PHASE	CLEARANCE DETAILS		DESIGN SPEED	ALL RED	PHASE or S.M. No**
		GROUP TRANSITION	DISTANCE			
C	A	3 → 2	32.0	60	2.0	Use CØ red
C	D	3 → P2	34.0	45	3.0	CØ special red
D or F	E	5 → 7	25.0	45	2.0	DØ & FØ all red
D	E	5 → 10	25.0	45	2.0	DØ & FØ all red
E1	E2	6 → 2	33.0	45	3.0	SM6
E1	E3	7 → P1	33.0	45	3.0	SM7

\*\* Specify where the timesetting is stored (the phase special all red or the special movement time setting number)

### PEDESTRIAN TIMES

PEDESTRIAN TIMES									
PED	PHASE(S)	WALK			CLEARANCE				MINIMUM SOLID DON'T WALK
		DISTANCE (m)	TIME		DISTANCE (m)	TIME			
			GRAPH	ADOPTED		GRAPH	CL1	CL2	
P1	A	19.0	8	8	19.0	13	5.0	8.0	5.5
P2	B	17.5	17	15	14.0	9	9.0	0.0	3.0

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## CONTROLLER TIMESETTINGS - 1

### PHASE TIMESETTINGS

Front Panel Command: Phase No.Timesetting No (e.g. 3.2 accesses C phase late start)

DESCRIPTION	Timesetting No	PHASE						
		A (1)	B (2)	C (3)	D (4)	E (5)	F (6)	G (7)
RED / YELLOW	1	-	-	-	-	-	-	-
LATE START	2	-	-	-	-	-	-	-
MINIMUM GREEN	3	10	8	8	8	6	8	10
INCREMENT	4	-	-	-	-	-	-	-
MAXIMUM INITIAL GREEN*	5	-	-	-	-	-	-	-
MAXIMUM EXTENSION GREEN	6	60	0	12	12	15	4	0
EARLY CUT OFF	7	7.0			4.0	7.0		7.0
YELLOW	8	4.0	3.0	4.0	4.0	3.0	4.0	4.0
ALL RED	9	2.5	-	2.5	2.0	3.0	2.0	3.0
SPECIAL ALL RED	10	-	-	3.0				
GAP 1	11	4.0	-	2.5	2.5	2.5	3.0	2.5
GAP 2	12	4.0	-	2.5	2.5	2.5	-	2.5
GAP 3	13	4.0	-	-	2.5	-	-	2.5
GAP 4	14	4.0	-	-	-	-	-	2.5
HEADWAY 1	15	0.6	-	1.2	1.2	1.2	1.2	0.6
HEADWAY 2	16	0.6	-	1.2	1.2	1.2	-	0.6
HEADWAY 3	17	1.2	-	-	1.2	-	-	1.2
HEADWAY 4	18	1.2	-	-	-	-	-	1.2
WASTE 1	19	10	-	7	7	7	7	7
WASTE 2	20	10	-	7	7	7	-	7
WASTE 3	21	10	-	-	7	-	-	7
WASTE 4	22	10	-	-	-	-	-	7

\* Maximum Initial Green = Minimum Green + V.I.G.

### PEDESTRIAN TIMESETTINGS

Front Panel Command: Pedestrian No.Timesetting No (e.g. 18.2 accesses P2 walk)

DESCRIPTION	Timesetting No	PEDESTRIAN							
		P1 (17)	P2 (18)	P3 (19)	P4 (20)	P5 (21)	P6 (22)	P7 (23)	P8 (24)
DELAY	1	-	-	-	-	-	-	-	-
WALK*	2	8.0	15.0						
CLEARANCE 1	3	5.0	9.0						
CLEARANCE 2	4	8.0							

\* Minimum walk time - used in Isolated and Flexilink operation

For walk times in Masterlink operation, refer to slot data.

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## CONTROLLER TIMESETTINGS - 2

### SPECIAL MOVEMENT TIMESETTINGS

Front Panel Command: B.Timesetting No (e.g. B.5 accesses Special Movement Timesetting No 5)

Timesetting No	Timesetting (Range: 0-5)	FUNCTION
1		
2		
3		
4		
5		
6		
7		
8		

### SPECIAL PURPOSE TIMESETTINGS

Front Panel Command: B.Timesetting No (e.g. B.19 accesses Special Movement Timesetting No 19)

Timesetting No	Timesetting (Range: 0-200)	FUNCTION
9	4	Train: Alternate pedestrian walk time for Train sequence operation
10	20	Train: DØ compensation timer (Isolated / Flexilink)
11	1	Train: Call delay Timer
12	14	Train: Release Timer
13	70	Train: Call Termination Timer
14	20	Maximum extension green time for SG1 & SG2 in Train phase (G1Ø) .
15	6	Maximum extension green time for SG7 in Train phase (G2Ø) .
16	8	P1 walk time substitution when Q+ (Flexilink) is set.
17	16	P2 walk time substitution when Q+ (Flexilink) is set.
18	0	LIMIT GREEN WATCHDOG TIMER
19	0	SPECIAL FACILITY CONTROLS ALARM TIMER
20	10	ALL RED START UP INTERVAL
21		
22		
23	3	SG6 special maximum extension green in EØ when XSF6 is set
24	3	SG7 & SG10 special maximum extension green in EØ when XSF7 is set
25	7	Timer 1 : Expiry of this timesetting to close down SG1 when transitioning to G2Ø or G3Ø
26	7	Timer 2 : Expiry of this timesetting to close down SG2 when transitioning G1Ø or G2Ø -> G3Ø
27	20	Train: CØ compensation timer (Isolated / Flexilink)
28	15	Train: EØ compensation timer (Isolated / Flexilink)
29		
30		
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		

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## CONTROLLER TIMESETTINGS - 3

## PRESENCE TIMESETTINGS

Front Panel Command: D.Detector No (e.g. D.7 accesses presence time for detector 7)

DETECTOR No	TIMESETTING (Range: 0-15)	DETECTOR No	TIMESETTING (Range: 0-10)
1		25	
2		26	
3		27	
4		28	
5		29	
6		30	
7		31	
8		32	
9		33	
10		34	
11		35	
12		36	
13		37	
14	1.0	38	
15		39	
16		40	
17		41	
18		42	
19	1.0	43	
20		44	
21		45	
22		46	
23		47	
24		48	

NOTE: Set presence time to zero if the detector is not a presence detector

## DAILY EVENT TIMESETTINGS

FUNCTION	TIMESETTING
Daily start time (Hours)	
Daily start time (Minutes)	
Daily finish time (Hours)	
Daily finish time (Minutes)	

NOTE: No support for presence timesettings for dets 25-48

Use presence timesettings for dets 1 - 24 or  
special movement timesettings for dets 1 - 40

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## CONTROLLER TIMESETTINGS - 4

## SPECIAL MOVEMENT TIMESETTINGS

GROUP No	STAGE 1 TIMESETTINGS (Yellow Timing)	STAGE 2 TIMESETTINGS (Red Timing)
1	4.0	2.5 (GØ all red)
2	4.0	2.5 (GØ all red)
3		
4		
5		
6	3.0	3.0 (EØ all red)
7	3.0	3.0 (EØ all red)
8		
9		
10	3.0	3.0 (EØ all red)
11		
12		
13		
14		
15	3.0 (BØ yellow)	
16	3.0 (BØ yellow)	
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		

## NOTE:

Stage 1: Timesetting (Yellow Time)

Default is zero, uses phase yellow if special movement is activated

Can specify phase timesettings, eg. A phase yellow, or a time value, eg. 3 secs

Stage 2: Timesetting (Red Time)

Default is zero, Traff will use 2 secs red as default if special movement is activated

Can specify phase timesettings or other timesettings, eg. A phase red, or a time value, eg. 2.5 secs

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## FLEXILINK OPERATION

## PHASE SEQUENCES

No	PHASE SEQUENCE
1 (No Y+)	ABCDEFGG
2 (Y+)	

## NOTES:

1. All phases must be specified in the phase sequence
2. Only specify phase sequence 2 if it is different from phase sequence 1.

## LOOK AHEADS &amp; RELEASES

PHASE SEQUENCE 1		
PHASE	LOOK AHEAD*	RELEASE
A	No	R-
B	No	Auto
C	Yes (To D,E,A)	R+
D	Yes (To E,A)	Q-
E	Yes (To A)	Auto
F	Yes (To G)	Auto
G	Yes (To B, A)	Auto

PHASE SEQUENCE 2		
PHASE	LOOK AHEAD*	RELEASE
A		
B		
C		
D		
E		
F		
G		

\* Specify the phases to which look ahead is permitted, e.g. Yes (to E, F, G, A)

## INHIBIT PHASES

The following phases can be inhibited in flexilink by setting the call pulse one step before the call pulse of the next phase in sequence

BØ

## PULSE STEP LENGTH

☐ One Second ☒ Two Second

## MASTERLINK &amp; FLEXILINK SPECIAL FLAGS

FLAG	FUNCTION
Y- Flexi	The site will operate in flexilink mode if the signal is continuously sent (C) or is used as an offset (e.g. 25)
Y- Master	
Y+ Flexi	
Z- Flexi	
Z- Master	
Z+ Flexi	
Z+ Master	
R- Flexi	AØ RELEASE PULSE
R+ Flexi	CØ RELEASE PULSE
Q- Flexi	DØ RELEASE PULSE
Q+ Flexi	P1, P2 walk time substitutions (Refer Special Purpose Timesettings Nos. 16 & 17 respectively)

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## SCATS INTERSECTION DATA

The data shown on this page is typical data that can be used for testing controller operations.  
This data is not necessarily applicable when the site is switched on in the field.

### TYPICAL SLOT DATA

SLOT <i>n</i>		=	7	,	4	,	2
			(phases)		(split plans)		(walks)
INT	=	6697					
VC	=	6					
CS	=						
COM	=	NET					
PK	=	!					
S#	=						
LM	=						
RMN	=	0					
DCL	=	0					
AT	=	14					
BT	=	3					
CT	=	7					
DT	=	10					
ET	=	13					
FT	=	6					
GT	=	14					
W1	=	0A		W1 T	=	19	
W2	=	15		W2 T	=	12	
W3	=			W3 T	=		
W4	=			W4 T	=		
W5	=			W5 T	=		
W6	=			W6 T	=		
W7	=			W7 T	=		
W8	=			W8 T	=		
PP1	=	0,0A					
PP2	=	0,0A					
PP3	=	0,0A					
PP4	=	0,0A					

### TYPICAL SPLIT PLAN DATA

PHASE SEQUENCE 1		PHASE SEQUENCE 2		PHASE SEQUENCE 3	
A	= 0PDNGFGB	A	=	A	=
B	= 27#C				
C	= 15D	C	=	C	=
D	= 15TGE	D	=	D	=
E	= 15TGA	E	=	E	=
F	= 1G	F	=	F	=
G	= 1A	G	=	G	=

### TYPICAL VARIATION PARAMETERS

VP1	=		VP22	=		VP43	=	
VP2	=		VP23	=		VP44	=	
VP3	=		VP24	=		VP45	=	
VP4	=		VP25	=		VP46	=	
VP5	=		VP26	=		VP47	=	
VP6	=		VP27	=		VP48	=	
VP7	=		VP28	=		VP49	=	
VP8	=		VP29	=		VP50	=	
VP9	=		VP30	=		VP51	=	
VP10	=		VP31	=		VP52	=	
VP11	=		VP32	=		VP53	=	
VP12	=		VP33	=		VP54	=	
VP13	=		VP34	=		VP55	=	
VP14	=		VP35	=		VP56	=	
VP15	=		VP36	=		VP57	=	
VP16	=		VP37	=		VP58	=	
VP17	=		VP38	=		VP59	=	
VP18	=		VP39	=		VP60	=	
VP19	=		VP40	=		VP61	=	
VP20	=		VP41	=		VP62	=	
VP21	=		VP42	=				



## GROUP CONFLICT TABLE

PED NO	PED NO																																
PED NO	GROUP NO																																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
	1			X		X		X			X					X																	
	2			X		X	X										X																
	3	X	X			X	X	X								X	X																
	4																																
	5	X	X	X			X	X			X					X																	
	6		X	X		X											X																
	7	X		X		X										X																	
m	8																																
	9																																
m	10	X				X										X																	
TLR	11																																
	12																																
	13																																
	14																																
P1	15			X		X		X			X																						
P2	16	X	X	X			X																										
	17																																
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CHECKED: *Fred Van Grop* DATE: 15/09/21

DESIGNED BY: ELIZABETH LEE

DATE 22/09/21