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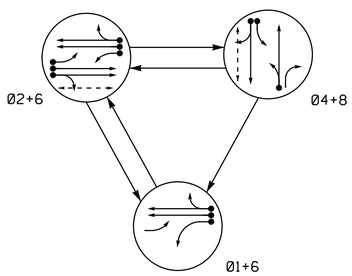
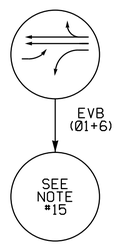
PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 1.0

3 Phase
Fully Actuated
w/ EV Preemption
(Durham Signal System)

PHASING DIAGRAM



EV PREEMPT PHASES



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

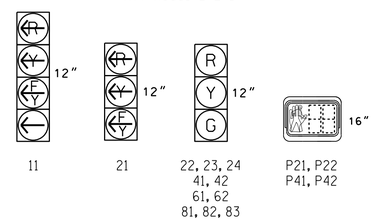
TABLE OF OPERATION

SIGNAL FACE	PHASE 01+6	02+6	04+8	EVB	FLASH
11	←	F Y	R	←	Y
21	F Y	F Y	R	F Y	Y
22, 23, 24	R	G	R	R	Y
41, 42	R	R	G	R	R
61, 62	G	G	R	G	Y
81, 82, 83	R	R	G	R	R
P21, P22	DW	W	DW	DW	DRK
P41, P42	DW	DW	W	DW	DRK

W - Walk
DW - Don't Walk
DRK - Dark

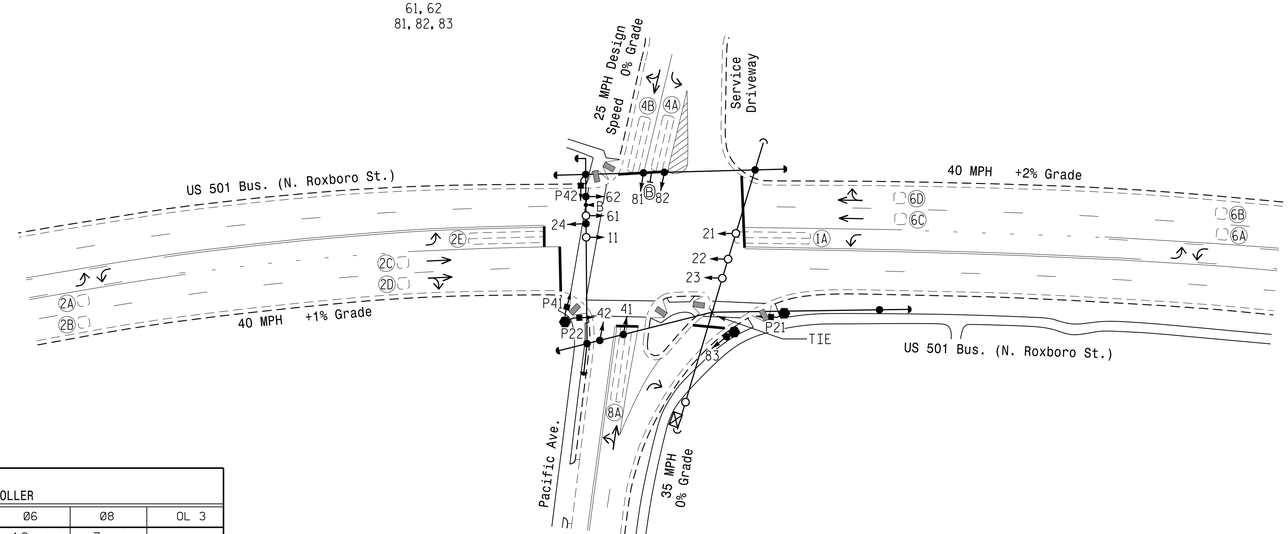
SIGNAL FACE I.D.

All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING														
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME PEDESTRIAN CALL	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
1A	6X40	2-4-2	+5	-	X	1	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2A	6X6	EXIST	250	-	X	2	- SEC.	1.3 SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6X6	EXIST	250	-	X	2	- SEC.	1.3 SEC.	-	-	-	-	X	-	X	-	-	X	-
2C	6X6	EXIST	80	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2D	6X6	EXIST	80	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2E	6X40	2-4-2	0	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6X30	2-4-2	0	-	X	4	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4B	6X30	2-4-2	0	-	X	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6X6	EXIST	250	-	X	6	- SEC.	1.3 SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6X6	EXIST	250	-	X	6	- SEC.	1.3 SEC.	-	-	-	-	X	-	X	-	-	X	-
6C	6X6	EXIST	80	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6D	6X6	EXIST	80	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6X40	2-4-2	0	-	X	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
PEDESTRIAN DETECTION																			
P21, P22	N/A	N/A	N/A	-	X	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P41, P42	N/A	N/A	N/A	-	X	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-



NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 may be lagged.
4. Reposition existing signal head number 62.
5. Set all detector units to presence mode.
6. In the event of loop replacement, refer to the current ITS and Signals Design Manual and submit a Plan of Record to the Signal Design Section.
7. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
8. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
9. Set phase bank 3 maximum limit to 250 seconds for phases used.
10. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
11. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
12. Remove existing Left Arrow "ONLY" Signs (R3-5L).
13. Pavement markings are existing.
14. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
15. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation based on vehicle demand.
16. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Optical Detector	
	Type II Signal Pedestal	
N/A	Wheelchair Ramp	
	Combined Through and Left Arrow Sign (R3-6L)	

TIMING CHART
2033 SOFTWARE w/ 2070 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø6	Ø8	OL 3
MINIMUM INITIAL *	7 SEC.	12 SEC.	7 SEC.	12 SEC.	7 SEC.	– SEC.
VEHICLE EXTENSION *	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	– SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.1 SEC.	3.2 SEC.	4.1 SEC.	3.8 SEC.	4.1 SEC.
RED CLEARANCE	2.8 SEC.	1.8 SEC.	2.0 SEC.	1.8 SEC.	1.7 SEC.	1.8 SEC.
MAXIMUM LIMIT *	20 SEC.	60 SEC.	30 SEC.	60 SEC.	30 SEC.	
RECALL POSITION	NONE	VEH. RECALL	NONE	VEH. RECALL	NONE	
VEHICLE CALL MEMORY	NONLOCK	YELLOW LOCK	NONLOCK	YELLOW LOCK	NONLOCK	
DOUBLE ENTRY	OFF	OFF	ON	OFF	ON	
WALK *	– SEC.	7 SEC.	7 SEC.	– SEC.	– SEC.	
FLASHING DON'T WALK	– SEC.	21 SEC.	14 SEC.	– SEC.	– SEC.	
PED CLEAR BEFORE PREEMPT	– SEC.	11 SEC.	7 SEC.	– SEC.	– SEC.	
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM GAP*	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MINIMUM GAP	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what ismshown. Min Green for all other phases should not be lower than 4 seconds.

2033 EV PREEMPTION TIMING CHART

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	#
MIN. GREEN BEFORE PREEMPT	1.0
CLEARANCE TIME	2.0
PREEMPT EXTEND***	2.0

\# See Timing Chart this sheet
*** Program Timing on Optical Detector Unit

This plan supersedes the plan signed and sealed on 3/2/2015

Signal Upgrade

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.) at Pacific Ave./ Service Driveway

Division 5 Durham County Durham

PLAN DATE: September 2015 REVIEWED BY:
PREPARED BY: R. W. Hough REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 12/14/2015
43020FAA2664C3 DATE

SIG. INVENTORY NO. 05-0889

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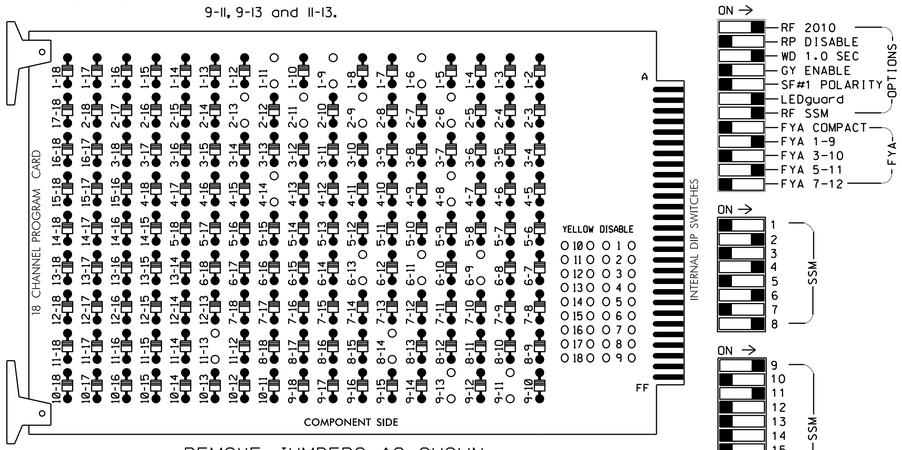
rwhough

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 1.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-6, 1-9, 1-11, 2-6, 2-9, 2-11, 2-13, 4-8, 4-14, 6-9, 6-11, 6-13, 8-14, 9-11, 9-13 and 11-13.



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Calls for phases 2 and 4.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S3,S5,S6,S8,S11, AUX S1,AUX S4
PHASES USED.....1,2,2 PED,4,4 PED,6,8
OVERLAP 1.....*
OVERLAP 2.....NOT USED
OVERLAP 3.....6
OVERLAP 4.....NOT USED

* See FYA PPLT Programming Detail on Sheet 2.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11★	22,23 24	P21, P22	NU	41,42	P41, P42	NU	61,62	NU	NU	81,82 83	NU	11★	NU	NU	21★	NU	NU
RED		128			101			134			107							
YELLOW	*	129			102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121			A114		
YELLOW ARROW													A122			A115		
FLASHING YELLOW ARROW													A123			A116		
GREEN ARROW	127																	
✋			113			104												
🚶			115			106												

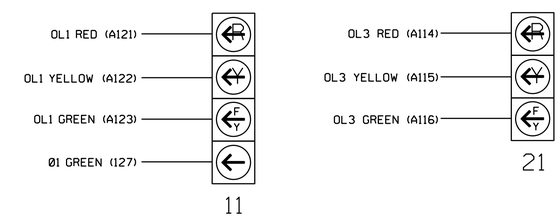
NU = Not Used

* Denotes install load resistor. See load resistor installation detail this sheet.

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø1 1A	Ø2 2A	Ø2 2C	Ø2 2E	SLOT EMPTY	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø2 PED DC ISOLATOR	SLOT EMPTY	FS DC ISOLATOR
	L	NOT USED	Ø2 2B	Ø2 2D	NOT USED		Ø4 4B						Ø4 PED DC ISOLATOR		ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	Ø6 6A	Ø6 6C	SLOT EMPTY	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	CH. 3 UNUSED	CH. 1 EVB	SLOT EMPTY
	L		Ø6 6B	Ø6 6D			NOT USED						CH. 4 UNUSED	CH. 2 UNUSED	

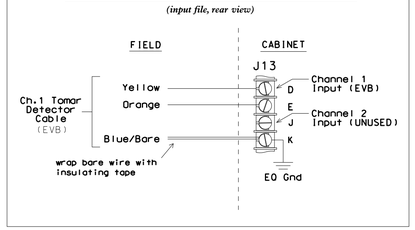
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
			10	56	5 7	6
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
2C	TB2-9,10	I3U	21	63	5 7	2
2D	TB2-11,12	I3L	29	76	5 7	2
2E	TB4-1,2	I4U	9	47	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
4B	TB4-11,12	I6L	7	45	5 7	4
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
6C	TB3-9,10	J3U	22	64	5 7	6
6D	TB3-11,12	J3L	30	77	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
PED PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED

NOTE: INSTALL DC ISOLATOR IN INPUT FILE SLOT I12.

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

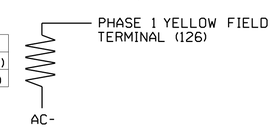
INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0889
DESIGNED: September 2015
SEALED: 12-14-15
REVISED: N/A

This Electrical Detail supersedes the detail sealed on 3-17-15.

Electrical Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 501 Bus. (N. Roxboro St.) at Pacific Ave./ Service Driveway

Division 5 Durham County Durham

PLAN DATE: December 2015 REVIEWED BY: DTJ
PREPARED BY: James Peterson REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of: Transportation Mobility and Safety Division, Traffic Engineering Branch, Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MIMS

DocuSigned by: Keith M. Mims 1/21/2016
DATE
SIG. INVENTORY NO. 05-0889

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jtpeterson

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 1.2

OVERLAP [3] PROGRAMMING DETAIL

Program overlap as follows:
Main Menu - 4) OVERLAP

PRESS '+' TWICE

OVERLAP [3]:

```
          LOADSWITCH = 11
          VEH SET 1  = 6
   YELLOW CLEARANCE = 4.1
      RED CLEARANCE = 1.8
```

NOTE: FOR SIGNAL HEAD 21

END OF OVERLAP PROGRAMMING

FYA PPLT PROGRAMMING (SIGNAL HEAD 11)

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1
2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99
3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 1,6
2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1
3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 11
   PHASE 4 MIN FDW = 7

Program extend time on optical detector units for 2.0 sec for EVB.

OVERLAP GREEN FLASH PROGRAMMING SIGNAL HEAD 21

The following will cause the overlap green output to flash, which is wired to the flashing yellow arrow. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 3

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

This Electrical Detail supersedes the detail sealed on 3-17-15.

Electrical Detail - Sheet 2 of 2

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0889
DESIGNED: September 2015
SEALED: 12-14-15
REVISED: N/A

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.)
at
Pacific Ave./
Service Driveway

Division 5 Durham County Durham

PLAN DATE: December 2015	REVIEWED BY: DTJ		
PREPARED BY: James Peterson	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MIMS
DocuSigned by: Keith M. Mims 1/21/2016
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DATE
SIG. INVENTORY NO. 05-0889

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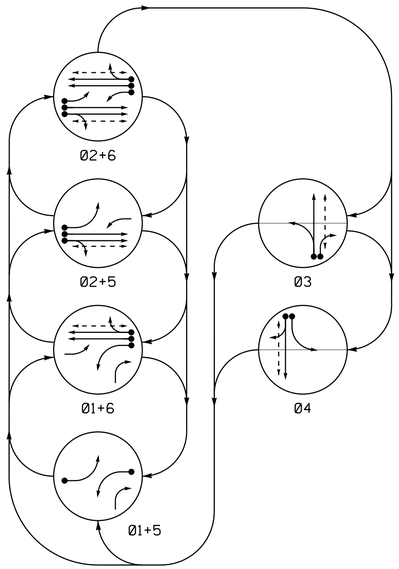
jtpeterson

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 2.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

EV PREEMPT PHASE

** See Note 16

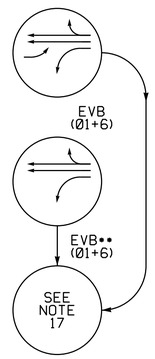


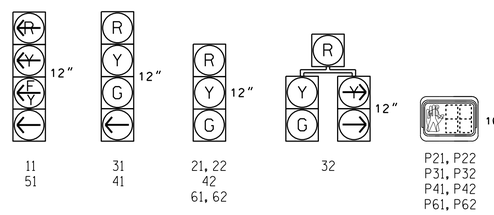
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3	Ø4	EVB	FLASH
11	←	←	F Y	F Y	R	R	←	Y
21, 22	R	R	G	G	R	R	R	Y
31	R	R	R	R	G	R	R	R
32	R	R	R	R	G	R	R	R
41	R	R	R	R	G	R	R	R
42	R	R	R	R	G	R	R	R
51	←	F Y	←	F Y	R	R	F Y	Y
61, 62	R	G	R	G	R	R	G	Y
P21, P22	DW	DW	W	W	DW	DW	DW	DRK
P31, P32	DW	DW	DW	DW	W	DW	DW	DRK
P41, P42	DW	DW	DW	DW	DW	W	DW	DRK
P61, P62	DW	W	DW	W	DW	DW	DW	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

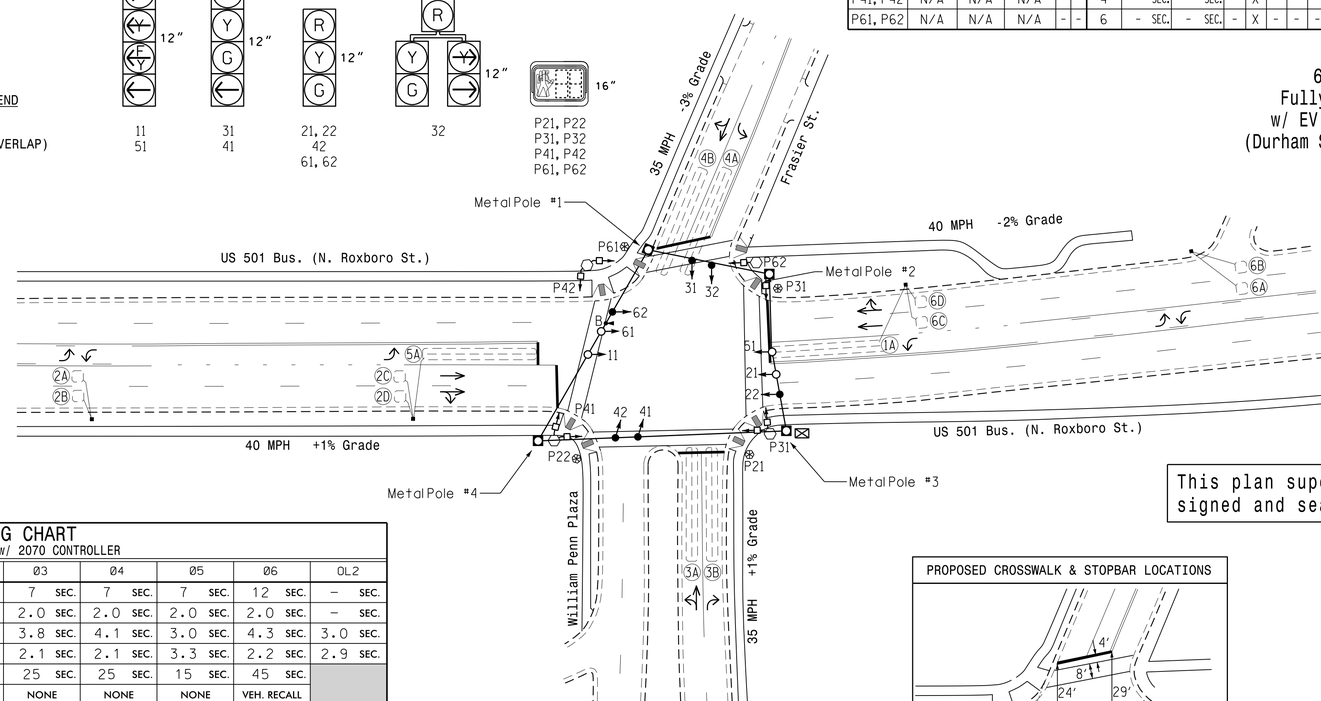
All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULTIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
1A	6X60	2-4-2	0	-	X	1	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2A	6X6	EXIST	250	-	X	2	- SEC.	1.3 SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6X6	EXIST	250	-	X	2	- SEC.	1.3 SEC.	-	-	-	-	X	-	X	-	-	X	-
2C	6X6	EXIST	80	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2D	6X6	EXIST	80	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
3A	6X60	2-4-2	+5	-	X	3	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
3B	6X60	2-4-2	+5	-	X	3	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6X60	2-4-2	+20	-	X	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4B	6X60	2-4-2	+15	-	X	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
5A	6X60	2-4-2	0	-	X	5	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6X6	EXIST	250	-	X	6	- SEC.	1.3 SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6X6	EXIST	250	-	X	6	- SEC.	1.3 SEC.	-	-	-	-	X	-	X	-	-	X	-
6C	6X6	EXIST	80	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6D	6X6	EXIST	80	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
PEDESTRIAN DETECTORS																			
P21, P22	N/A	N/A	N/A	-	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P31, P32	N/A	N/A	N/A	-	-	3	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P41, P42	N/A	N/A	N/A	-	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P61, P62	N/A	N/A	N/A	-	-	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-

6 Phase
Fully Actuated
w/ EV Preemption
(Durham Signal System)



NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Reposition existing signal heads numbered 22 and 62.
6. Set all detector units to presence mode.
7. In the event of loop replacement, refer to the current ITS and Signals Design Manual and submit a Plan of Record to the Signal Design Section.
8. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
9. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
10. Set phase bank 3 maximum limit to 250 seconds for phases used.
11. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
12. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
13. Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for pushbutton location details.
14. Pavement markings are existing unless otherwise shown.
15. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
16. If preeempt phasing resides in the barrier being serviced then the opposing 4-section FYA will flash continuously. If preempt phase requires crossing the barrier, then the opposing 4-section FYA will display a red arrow.
17. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation based on vehicle demand.
18. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Metal Strain Pole	
	Optical Detector	
	Type I Pushbutton Post	
	Type II Signal Pedestal	
N/A	Wheelchair Ramp	

This plan supersedes the plan signed and sealed on 3/2/2015.

TIMING CHART

2033 SOFTWARE w/ 2070 CONTROLLER

PHASE	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	OL2
MINIMUM INITIAL *	7 SEC.	12 SEC.	7 SEC.	7 SEC.	7 SEC.	12 SEC.	– SEC.
VEHICLE EXTENSION *	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	– SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.3 SEC.	3.8 SEC.	4.1 SEC.	3.0 SEC.	4.3 SEC.	3.0 SEC.
RED CLEARANCE	2.9 SEC.	2.2 SEC.	2.1 SEC.	2.1 SEC.	3.3 SEC.	2.2 SEC.	2.9 SEC.
MAXIMUM LIMIT *	15 SEC.	45 SEC.	25 SEC.	25 SEC.	15 SEC.	45 SEC.	
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL	
VEHICLE CALL MEMORY	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK	NONLOCK	YELLOW LOCK	
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF	OFF	
WALK *	– SEC.	7 SEC.	7 SEC.	7 SEC.	– SEC.	7 SEC.	
FLASHING DON'T WALK	– SEC.	16 SEC.	15 SEC.	15 SEC.	– SEC.	9 SEC.	
PED CLEAR BEFORE PREEMPT	– SEC.	8 SEC.	8 SEC.	8 SEC.	– SEC.	5 SEC.	
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM GAP*	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MINIMUM GAP	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	

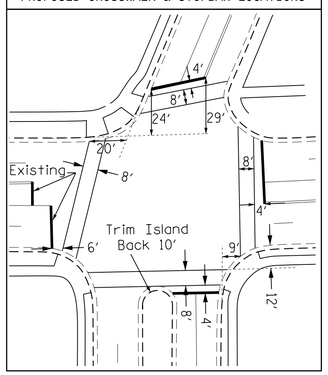
* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

2033 EV PREEMPTION TIMING CHART

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	#
MIN. GREEN BEFORE PREEMPT	1.0
CLEARANCE TIME	2.0
PREEMPT EXTEND***	2.0

See Timing Chart this sheet
*** Program Timing on Optical Detector Unit

PROPOSED CROSSWALK & STOPBAR LOCATIONS



Signal Upgrade

Prepared in the Offices of:
Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 40
1"=40'

US 501 Bus. (N. Roxboro St.) at William Penn Plaza/ Frasier St.

Division 5 Durham County Durham

PLAN DATE: September 2015 REVIEWED BY:
PREPARED BY: R. N. Zinser REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 12/14/2015
430320FAA2654C3 DATE

SIG. INVENTORY NO. 05-2006

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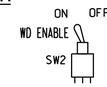
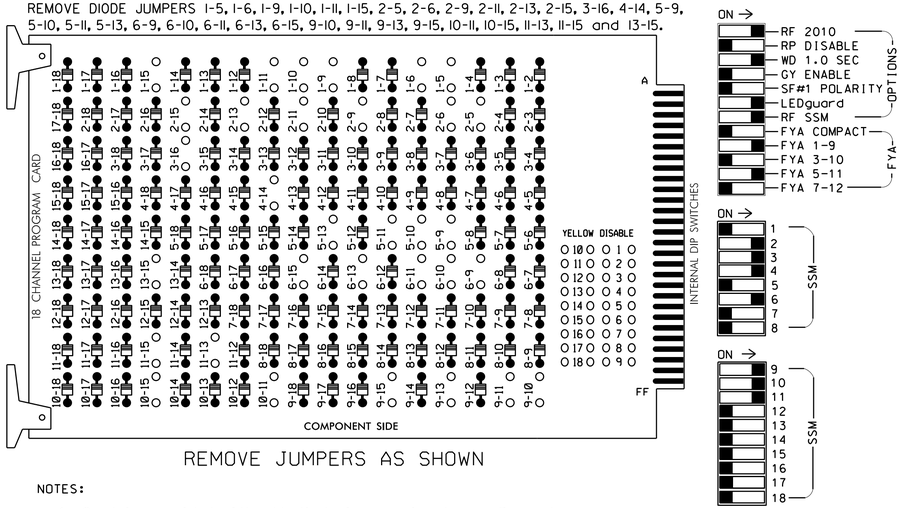
PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 2.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-10, 1-11, 1-15, 2-5, 2-6, 2-9, 2-11, 2-13, 2-15, 3-16, 4-14, 5-9, 5-10, 5-11, 5-13, 6-9, 6-10, 6-11, 6-13, 6-15, 9-10, 9-11, 9-13, 9-15, 10-11, 10-15, 11-13, 11-15 and 13-15.



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. Program Startup Ped Calls for phases 2, 3, 4, and 6.
9. Set the Red Revert interval on the controller to 1 second.
10. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S3,S4,S5,S6,S7,S8,S9,S12,
,AUX S1,AUX S2,AUX S4
PHASES USED.....1,2,3,4,5,6,2 PED,3 PED,4 PED,6 PED
OVERLAP 1.....*
OVERLAP 2.....1
OVERLAP 3.....*
OVERLAP 4.....NOT USED
*See FYA PPLT programming - Sheet 2.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4		S5		S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3		4		14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3		4		4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11★	21,22	P21, P22	31	32	41	42	P41, P42	51★	61,62	P61, P62	NU	NU	P31, P32	11★	32	NU	51★	NU	NU
RED		128		116	116	101	101			134						*				
YELLOW	*	129		117	117	102	102		*	135										
GREEN		130		118	118	103	103			136										
RED ARROW															A121			A114		
YELLOW ARROW															A122	A125		A115		
FLASHING YELLOW ARROW															A123			A116		
GREEN ARROW	127			118		103			133							A126				
✋			113					104			119			110						
🚶			115					106			121			112						

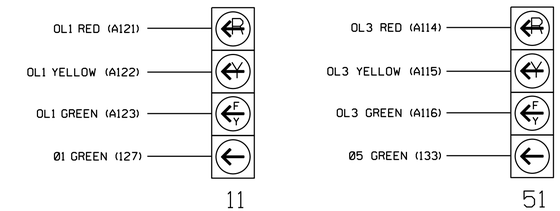
NU = Not Used

* Denotes install load resistor. See load resistor installation detail on sheet 2.

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø1 1A	Ø2 2A	Ø2 2C	RESERVED 5A	Ø3 3A	Ø3 3B	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø2 PED DC ISOLATOR	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L	NOT USED	Ø2 2B	Ø2 2D		NOT USED	NOT USED	Ø4 4B					Ø4 PED DC ISOLATOR	Ø3 PED DC ISOLATOR	ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø6 6A	Ø6 6C	RESERVED 1A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	CH. 3 UNUSED	CH. 1 EVB	SLOT EMPTY
	L	NOT USED	Ø6 6B	Ø6 6D									CH. 4 UNUSED	CH. 2 UNUSED	

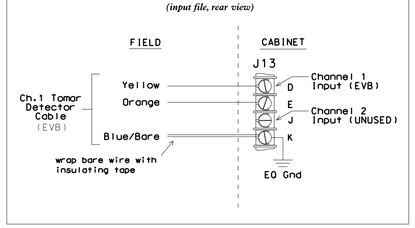
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD
INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
			10	56	5 7	6
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
2C	TB2-9,10	I3U	21	63	5 7	2
2D	TB2-11,12	I3L	29	76	5 7	2
3A	TB4-5,6	I5U	16	58	5 7	3
3B	TB4-9,10	I6U	3	41	5 7	3
4A	TB6-1,2	I7U	23	65	5 7	4
4B	TB6-3,4	I7L	31	78	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
			9	55	5 7	2
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
6C	TB3-9,10	J3U	22	64	5 7	6
6D	TB3-11,12	J3L	30	77	5 7	6
PED PUSH BUTTONS	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED
P61,P62	TB8-7,9	I13U	26	68	2	6 PED
P31,P32	TB8-8,9	I13L	28	70	2	3 PED

NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOTS I12 AND I13

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-2006
DESIGNED: September 2015
SEALED: 12-14-15
REVISED: N/A

This Electrical Detail supersedes the detail sealed on 3-04-15.

Electrical Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.)
at
William Penn Plaza/
Frasier St.

Division 5 Durham County Durham

PLAN DATE: December 2015	REVIEWED BY: DTJ
PREPARED BY: James Peterson	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MINS

DocuSigned by: Keith M. Mins 1/20/2016
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SIG. INVENTORY NO. 05-2006

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jipeterson

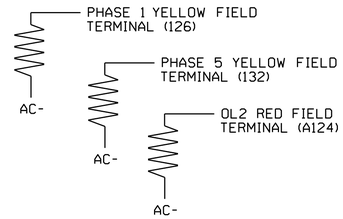
PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 2.2

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)

ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



FYA PPLT PROGRAMMING

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1,5

2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99
   Phase 5 = 90

3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98
   Phase 5 RED = 88, Phase 5 YELLOW = 89

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 1,6

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 8
   PHASE 3 MIN FDW = 8
   PHASE 4 MIN FDW = 8
   PHASE 6 MIN FDW = 5

Program extend time on optical detector units for 2.0 sec for EVB.

OVERLAP (2) PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

Press "+"

OVERLAP [2]:
LOADSWITCH = 10
VEH SET 1 = 1
VEH SET 2 =
YELLOW CLEARANCE = 3.0
RED CLEARANCE = 2.9

END OF OVERLAP PROGRAMMING

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

HEAD 32 ARROWS (OL2) OPERATION DURING PREEMPTION

In Order for EV Preemption B to operate as phase 1+6 without signal head 32 right-turn arrows. The following programming must be in place:

1. Main Menu - 6) OUTPUTS - 4) PREEMPT
   EVB ON = 200

2. Main Menu - 5) INPUTS - 5) BANK & SET INPUTS
   OVERLAP VEHICLE SET 2 = 200

   200 = Assignable Pseudo Pin

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

PEDESTRIAN PHASE PROGRAMMING

Program pedestrian outputs 2P, 4P, 6P and 8P as follows:

Main Menu - 6) OUTPUTS - 7) PEDS

PED 2P = Ø2
PED 4P = Ø4
PED 6P = Ø6
PED 8P = Ø3

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-2006
DESIGNED: September 2015
SEALED: 12-14-15
REVISED: N/A

This Electrical Detail supersedes the detail sealed on 3-04-15.

Electrical Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.)
at
William Penn Plaza/
Frasier St.

Division 5 Durham County Durham

PLAN DATE: December 2015	REVIEWED BY:	DTJ	
PREPARED BY: James Peterson	REVIEWED BY:		

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MINS

DocuSigned by:
Keith M. Mins 1/20/2016
-2F8D7A6EBCD4A8... DATE

SIG. INVENTORY NO. 05-2006

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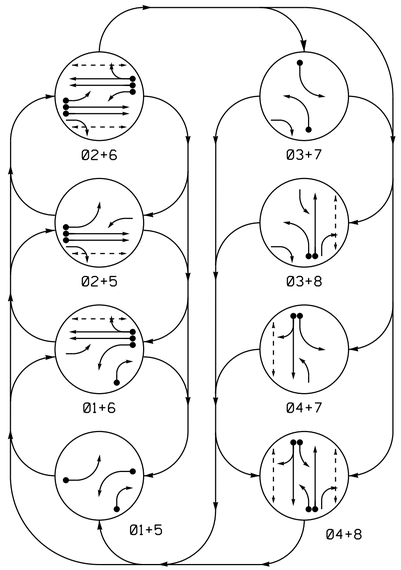
jinterson

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 3.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

EV PREEMPT PHASE

** See Note 14

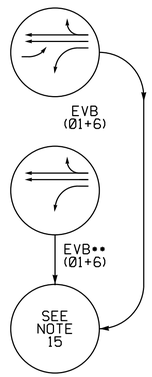


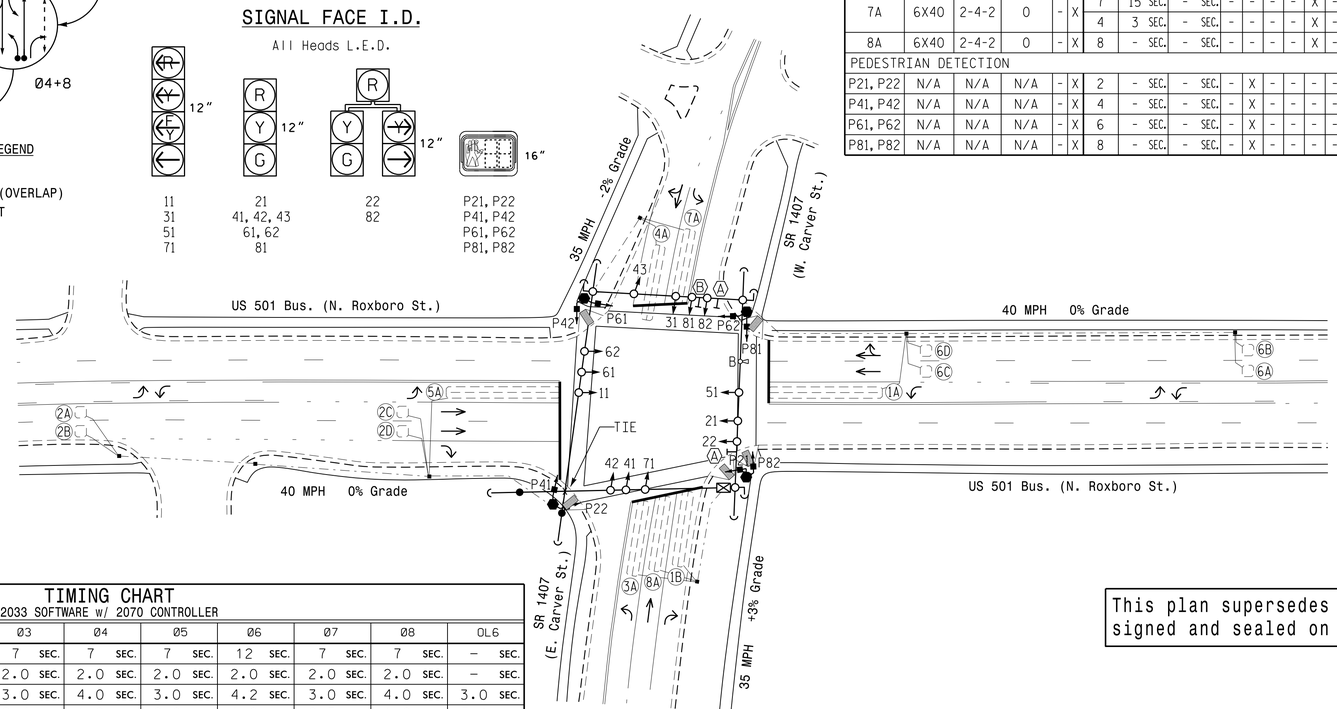
TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	03+7	03+8	04+7	04+8	EVB	FLASH
11	←	←	F Y	F Y	R	R	R	R	←	Y
21	R	R	G	G	R	R	R	R	R	Y
22	R	R	G	G	R	R	R	R	R	Y
31	R	R	R	R	←	←	F Y	F Y	R	R
41, 42, 43	R	R	R	R	R	R	G	G	R	R
51	←	F Y	←	F Y	R	R	R	R	F Y	Y
61, 62	R	G	R	G	R	R	R	R	G	Y
71	R	R	R	R	←	F Y	←	F Y	R	R
81	R	R	R	R	R	G	R	G	R	R
82	R	R	R	R	R	G	R	G	R	R
P21, P22	DW	DW	W	W	DW	DW	DW	DW	DW	DRK
P41, P42	DW	DW	DW	DW	DW	DW	W	W	DW	DRK
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DW	DRK
P81, P82	DW	DW	DW	DW	DW	W	DW	W	DW	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS: LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	DETECTOR PROGRAMMING: NEMA PHASE	TIMING: DELAY	TIMING: CARRY (STRETCH)	ATTRIBUTES 1: FULL TIME (DISTANCE)	2: PEDESTRIAN CALL	3: RESERVED	4: COUNT	5: EXTENSION	6: TYPE 3	7: CALLING	8: ALTERNATE	SYSTEM LOOPS	STATUS: NEW	EXISTING
1A	6X60	2-4-2	0	-	X	1	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
1B	6X40	2-4-2	0	-	X	1	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2A	6X6	EXIST	250	-	X	2	- SEC.	1.8 SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6X6	EXIST	250	-	X	2	- SEC.	1.8 SEC.	-	-	-	-	X	-	X	-	-	X	-
2C	6X6	EXIST	80	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2D	6X6	EXIST	80	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
3A	6X40	2-4-2	0	-	X	3	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6X40	2-4-2	+8	-	X	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
5A	6X60	2-4-2	0	-	X	5	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6X6	EXIST	250	-	X	6	- SEC.	1.8 SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6X6	EXIST	250	-	X	6	- SEC.	1.8 SEC.	-	-	-	-	X	-	X	-	-	X	-
6C	6X6	EXIST	80	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6D	6X6	EXIST	80	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
7A	6X40	2-4-2	0	-	X	7	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6X40	2-4-2	0	-	X	8	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
PEDESTRIAN DETECTION																			
P21, P22	N/A	N/A	N/A	-	X	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P41, P42	N/A	N/A	N/A	-	X	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P61, P62	N/A	N/A	N/A	-	X	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P81, P82	N/A	N/A	N/A	-	X	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-

8 Phase Fully Actuated w/ EV Preemption (Durham Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Set all detector units to presence mode.
6. In the event of loop replacement, refer to the current ITS and Signals Design Manual and submit a Plan of Record to the Signal Design Section.
7. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
8. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
9. Set phase bank 3 maximum limit to 250 seconds for phases used.
10. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
11. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
12. Pavement markings are existing.
13. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
14. If preempt phasing resides in the barrier being serviced then the opposing 4-section FYA will flash continuously. If the preempt phase requires crossing the barrier then the opposing 4-section FYA will display a red arrow.
15. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation based on vehicle demand.
16. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Type II Signal Pedestal	
	Optical Detector	
(A)	Right Arrow "ONLY" Sign (R3-5R)	(A)
(B)	Through Arrow "ONLY" Sign (R3-5A)	(B)

TIMING CHART
2033 SOFTWARE w/ 2070 CONTROLLER

PHASE	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	OL6
MINIMUM INITIAL *	7 SEC.	12 SEC.	7 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.	7 SEC.	- SEC.
VEHICLE EXTENSION *	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	- SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.2 SEC.	3.0 SEC.	4.0 SEC.	3.0 SEC.	4.2 SEC.	3.0 SEC.	4.0 SEC.	3.0 SEC.
RED CLEARANCE	3.1 SEC.	1.9 SEC.	2.4 SEC.	1.9 SEC.	2.8 SEC.	1.9 SEC.	2.3 SEC.	1.9 SEC.	3.1 SEC.
MAXIMUM LIMIT *	20 SEC.	50 SEC.	15 SEC.	25 SEC.	20 SEC.	50 SEC.	15 SEC.	25 SEC.	
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL	NONE	NONE	
VEHICLE CALL MEMORY	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK	
DOUBLE ENTRY	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	
WALK *	- SEC.	7 SEC.	- SEC.	7 SEC.	- SEC.	7 SEC.	- SEC.	7 SEC.	
FLASHING DON'T WALK	- SEC.	17 SEC.	- SEC.	21 SEC.	- SEC.	17 SEC.	- SEC.	14 SEC.	
PED CLEAR BEFORE PREEMPT	- SEC.	9 SEC.	- SEC.	11 SEC.	- SEC.	9 SEC.	- SEC.	7 SEC.	
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MAXIMUM GAP*	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MINIMUM GAP	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

2033 EMERGENCY PREEMPTION TIMING CHART

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	#
MIN. GREEN BEFORE PREEMPT	1.0
CLEARANCE TIME	2.0
PREEMPT EXTEND***	2.0

See Timing Chart this sheet
*** Program Timing on Optical Detector Unit

This plan supersedes the plan signed and sealed on 3/3/2015

Signal Upgrade

Prepared in the Offices of:
Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.) at SR 1407 (Carver St.)

Division 5 Durham County Durham

PLAN DATE: September 2015 REVIEWED BY:
PREPARED BY: R. W. Hough REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

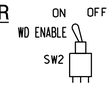
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH
DocuSigned by: Ryan W. Hough 1/29/2016
43020DFAA2664C3 DATE
SIG. INVENTORY NO. 05-1433

29-JAN-2016 08:46
S:\TMS\SU\TIS\Signals\Signal Design Section\Central Region\Div 5\05-1433\05-1433_sig_dsn_20160129.dgn
rwhough

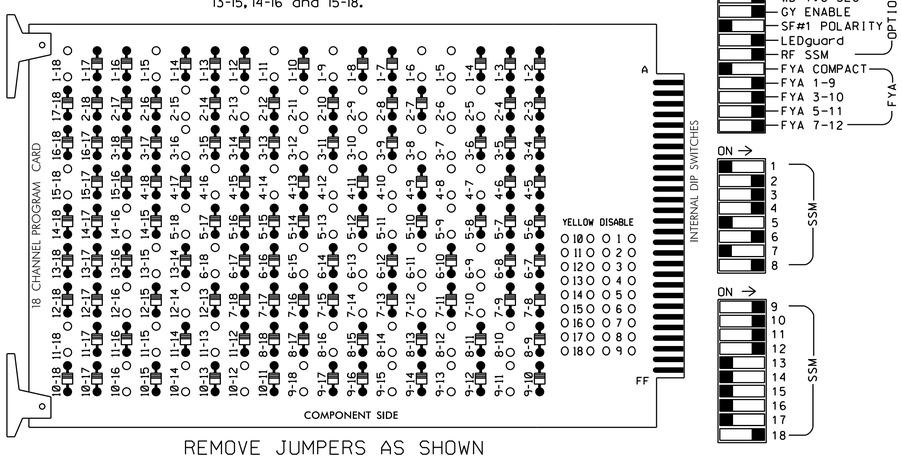
PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 3.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 1-15, 1-18, 2-5, 2-6, 2-9, 2-11, 2-13, 2-15, 3-7, 3-8, 3-10, 3-12, 3-16, 4-7, 4-8, 4-10, 4-12, 4-14, 4-16, 5-9, 5-11, 5-13, 5-18 6-9, 6-11, 6-13, 6-15, 6-18, 7-10, 7-12, 7-14, 8-10, 8-12, 8-14, 8-16 9-11, 9-13, 9-15, 9-18, 10-12, 10-14, 10-16, 11-13, 11-15, 11-18, 12-14, 12-16, 13-15, 14-16 and 15-18.



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Ensure conflict monitor communicates with 2070.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø 1,6	Ø 2	Ø 2	SLOT EMPTY	Ø 3,8	Ø 4	SLOT EMPTY	SLOT EMPTY	Ø 1	SLOT EMPTY	SLOT EMPTY	Ø2 PED DC ISOLATOR	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
		1A	2A	2C		3A	4A			1B					
	L	NOT USED	Ø 2	Ø 2		NOT USED	NOT USED			NOT USED			Ø4 PED DC ISOLATOR	Ø8 PED DC ISOLATOR	ST DC ISOLATOR
			2B	2D											
FILE "J"	U	Ø 5,2	Ø 6	Ø 6	SLOT EMPTY	Ø 7,4	Ø 8	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	CH. 3 UNUSED	CH. 1 EVB	SLOT EMPTY
		5A	6A	6C		7A	8A								
	L	NOT USED	Ø 6	Ø 6		NOT USED	NOT USED						CH. 4 UNUSED	CH. 2 UNUSED	
			6B	6D											

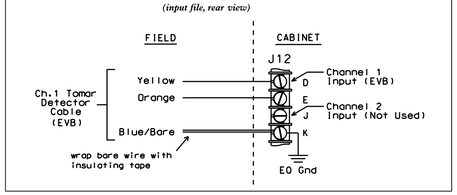
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVB = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Calls for phases 2, 4, 6 and 8.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S3,S4,S5,S6,S7,S8,S9,S10,S11,S12
AUX S1,AUX S2,AUX S4,AUX S5,AUX S6
PHASES USED.....1,2,2 PED,3,4,4 PED,5,6,6 PED,7,8,8 PED
OVERLAP 1.....**
OVERLAP 2.....**
OVERLAP 3.....**
OVERLAP 4.....**
OVERLAP 5.....NOT USED
OVERLAP 6.....1
** See FYA PPLT Programming - Sheet 2

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
			10	56	5 7	6
1B	TB6-9,10	I9U	18	60	5 7	1
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
2C	TB2-9,10	I3U	21	63	5 7	2
2D	TB2-11,12	I3L	29	76	5 7	2
3A	TB4-5,6	I5U	16	58	5 7	3
			12	58	5 7	8
4A	TB4-9,10	I6U	3	41	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
			9	55	5 7	2
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
6C	TB3-9,10	J3U	22	64	5 7	6
6D	TB3-11,12	J3L	30	77	5 7	6
7A	TB5-5,6	J5U	15	57	5 7	7
			11	57	5 7	4
8A	TB5-9,10	J6U	4	42	5 7	8
PED PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED
P61,P62	TB8-7,9	I13U	26	68	2	6 PED
P81,P82	TB8-8,9	I13L	28	70	2	8 PED

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

NOTE:
INSTALL DC ISOLATOR IN INPUT FILE SLOT I12 AND I13.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	OL6
SIGNAL HEAD NO.	11 ★	21,22	P21, P22	31 ★	22	41,42 43	P41, P42	51 ★	61,62	P61, P62	71 ★	81,82	P81, P82	11 ★	31 ★	NU	51 ★	71 ★	82
RED		128			*	101			134			107							*
YELLOW	*	129				102		*	135		*	108							
GREEN		130				103			136			109							
RED ARROW													A121	A124		A114	A101	
YELLOW ARROW					117								A122	A125		A115	A102	A105
FLASHING YELLOW ARROW													A123	A126		A116	A103	
GREEN ARROW	127			118	118			133			124							A106
✋			113			104			119			110						
🚶			115			106			121			112						

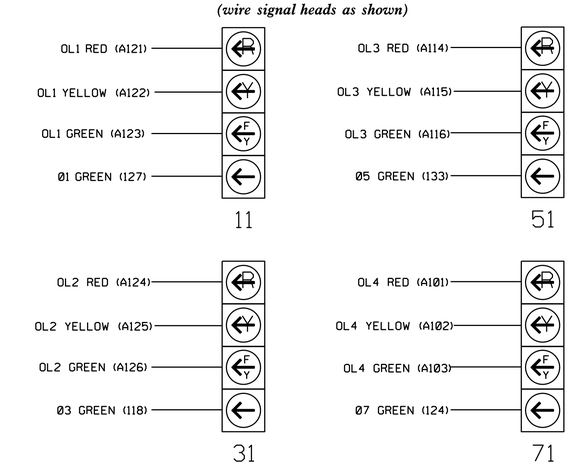
NU = Not Used

* Denotes install load resistor. See load resistor installation detail on sheet 2.

★ See pictorial of head wiring in detail below.

4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1433
DESIGNED: September 2015
SEALED: 1/29/2016
REVISED: N/A

THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 03/13/15

Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.) at SR 1407 (Carver St.)

Division 5 Durham County Durham

PLAN DATE: December 2015	REVIEWED BY: KMM
PREPARED BY: B. Simmons	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MIMS

DocuSigned by: Keith M. Mims 2/2/2016
DATE
SIG. INVENTORY NO. 05-1433

09-FEB-2016 09:09
S:\TISSAL\PE\Signals\Workgroups\Sig Mon\Strickland\051433_sm.ele.xxx.dgn
cestrickland

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 3.2

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2.0
   EVB Clearance Phases = 1,6

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 9
   PHASE 4 MIN FDW = 11
   PHASE 6 MIN FDW = 9
   PHASE 8 MIN FDW = 7

Program extend time on optical detector units for 2.0 sec.

FYA PPLT PROGRAMMING

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASES 1,3,5,7

2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99
   Phase 3 = 96
   Phase 5 = 90
   Phase 7 = 87

3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98
   Phase 3 RED = 94, Phase 3 YELLOW = 95
   Phase 5 RED = 88, Phase 5 YELLOW = 89
   Phase 7 RED = 85, Phase 7 YELLOW = 86

SPECIAL NOTE EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

OMIT HEAD 82 RIGHT-TURN ARROW (OL6) DURING EVB

1. In order for EVB Preemption to operate without head 82 right-turn arrows, the following programming must be in place:
   Main Menu - 5) INPUTS - 5) BANKS & SETS

   OVERLAP VEHICLE SET 2 = 200 NOTE: 200 = Assignable Pseudo Pin

2. Assign EVB Preemption Output as follows:
   Main Menu - 6) OUTPUTS - 4) PREEMPT

   EVB ON = 200

END OF PSEUDO PIN PROGRAMMING

FLASHER CIRCUIT MODIFICATION DETAIL

In order to ensure that signals flash concurrently on the same approach, make the following flasher circuit changes:

1. On rear of PDA - Remove wire from Term. T2-4 and Terminate on T2-2.
2. On rear of PDA - Remove wire from Term. T2-5 and Terminate on T2-3.
3. Remove Flasher Unit 2.

The changes listed above ties all Phases and Overlaps to Flasher Unit 1.

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

OVERLAP (6) PROGRAMMING DETAIL

1. Redirect Phase Outputs for OL6 as follows:
   Main Menu - 6) OUTPUTS - 9) REDIRECT OLAPS

   OVERLAP 6 RED = 83
   OVERLAP 6 YELLOW = 100
   OVERLAP 6 GREEN = 84

2. Program OL6 as follows:
   Main Menu - 4) OVERLAP

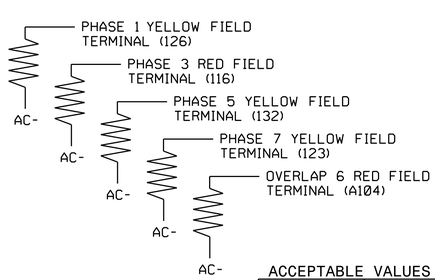
   PRESS '+' key to advance to Overlap 6

   OVERLAP [6] :

   LOADSWITCH = 0
   VEH SET 1 = 1
   VEH SET 2 = No programming required
   YELLOW CLEARANCE = 3.0
   RED CLEARANCE = 3.1

END OF OVERLAP PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL



ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1433
DESIGNED: September 2015
SEALED: 1/29/2016
REVISED: N/A

THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 03/13/15

Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.)
at
SR 1407 (Carver St.)

Division 5 Durham County Durham

PLAN DATE: December 2015		REVIEWED BY:	
PREPARED BY: B. Simmons		REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MIMS

DocuSigned by:
Keith M. Mims 2/2/2016
SIGNATURE DATE

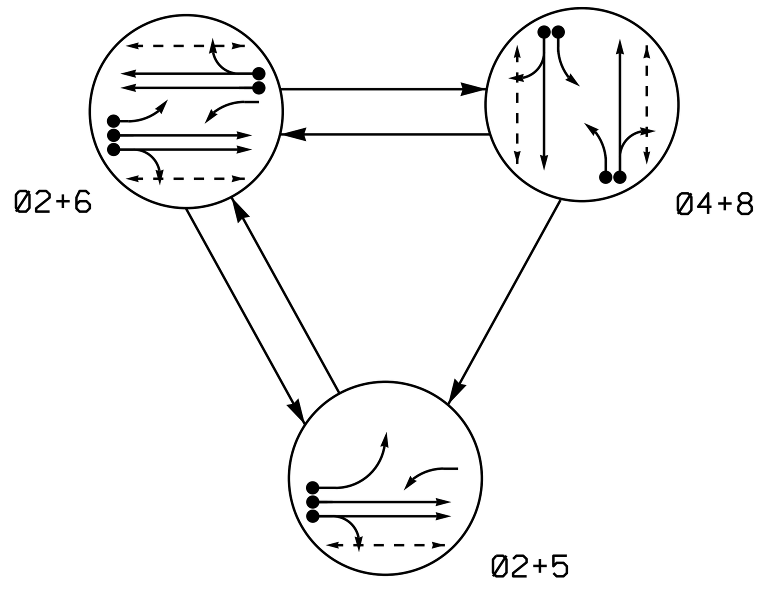
STD. INVENTORY NO. 05-1433

02-FEB-2016 09:01
S:\TSSGPM\TS Signals\Workgroups\Sig Man\Strickland\051433_sm_ele_xxx.dgn
cestrickland

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 4.0

3 Phase
Fully Actuated
w/ EV Preemption
(Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

EV PREEMPT PHASES

** See Note 15

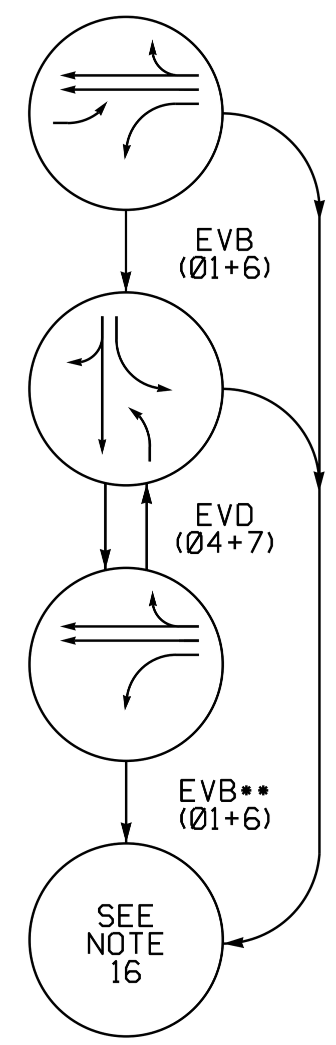


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø4+8	EVB	EVD	FLASH
11	←F/Y	←F/Y	←R	←	←R	←Y
22, 23	G	G	R	R	R	Y
41, 42	R	R	G	R	G	R
51	←	←F/Y	←R	←F/Y	←R	←Y
61, 62	R	G	R	G	R	Y
71	←R	←R	←F/Y	←R	←	←R
81	←R	←R	←F/Y	←R	←F/Y	←R
82, 83	R	R	G	R	R	R
P21, P22	W	W	DW	DW	DW	DRK
P41, P42	DW	DW	W	DW	DW	DRK
P61, P62	DW	W	DW	DW	DW	DRK
P81, P82	DW	DW	W	DW	DW	DRK

W - Walk
DW - Don't Walk
DRK - Dark

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	TIMING: DELAY	TIMING: CARRY (STRETCH)	ATTRIBUTES 1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	STATUS: NEW	STATUS: EXISTING
2A	6X6	EXIST	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6X6	EXIST	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6X40	2-4-2	0	-	X	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4B	6X40	2-4-2	0	-	X	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
5A	6X40	2-4-2	0	-	X	5	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6X6	EXIST	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6X6	EXIST	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6X40	2-4-2	0	-	X	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8B	6X40	2-4-2	0	-	X	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
S80	6X6	EXIST	+660	-	X	N/A	- SEC.	- SEC.	-	-	-	X	-	-	-	-	X	X	-
S81	6X6	EXIST	+660	-	X	N/A	- SEC.	- SEC.	-	-	-	X	-	-	-	-	X	X	-
S82	6X6	EXIST	570	-	X	N/A	- SEC.	- SEC.	-	-	-	X	-	-	-	-	X	X	-
S83	6X6	EXIST	570	-	X	N/A	- SEC.	- SEC.	-	-	-	X	-	-	-	-	X	X	-
PEDESTRIAN DETECTION																			
P21, P22	N/A	N/A	N/A	-	X	2	15 SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P41, P42	N/A	N/A	N/A	-	X	4	15 SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P61, P62	N/A	N/A	N/A	-	X	6	15 SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P81, P82	N/A	N/A	N/A	-	X	8	15 SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-

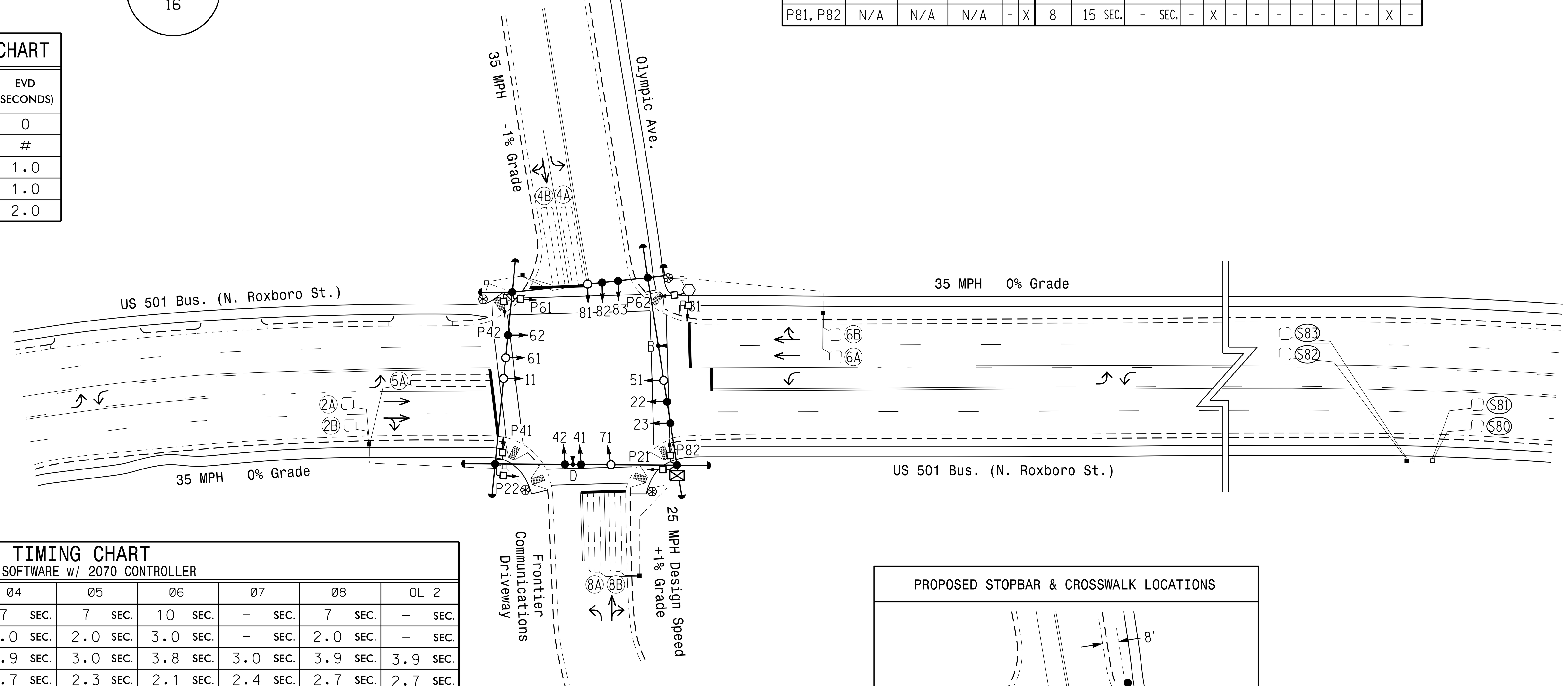
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 5 may be lagged.
4. Reposition all existing signal heads.
5. Set all detector units to presence mode.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
7. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
8. Set phase bank 3 maximum limit to 250 seconds for phases used.
9. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
10. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
11. Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for pushbutton location details.
12. Remove existing "LEFT TURN YIELD ON GREEN" Ball Sign (R10-12), and Left Arrow "ONLY" Signs (R3-5L).
13. Pavement markings are existing unless otherwise shown.
14. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
15. If preempt phasing resides in the barrier being serviced then the opposing 4-section FYA will flash continuously. If the preempt phase requires crossing the barrier then the opposing 4-section FYA will display a red arrow.
16. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation based on vehicle demand.
17. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

2033 EV PREEMPTION TIMING CHART

FUNCTION	EVB (SECONDS)	EVD (SECONDS)
DELAY BEFORE PREEMPT	0	0
PED. CLEAR BEFORE PREEMPT	#	#
MIN. GREEN BEFORE PREEMPT	1.0	1.0
CLEARANCE TIME	2.0	1.0
PREEMPT EXTEND***	2.0	2.0

\# See Timing Chart this sheet
*** Program Timing on Optical Detector Unit



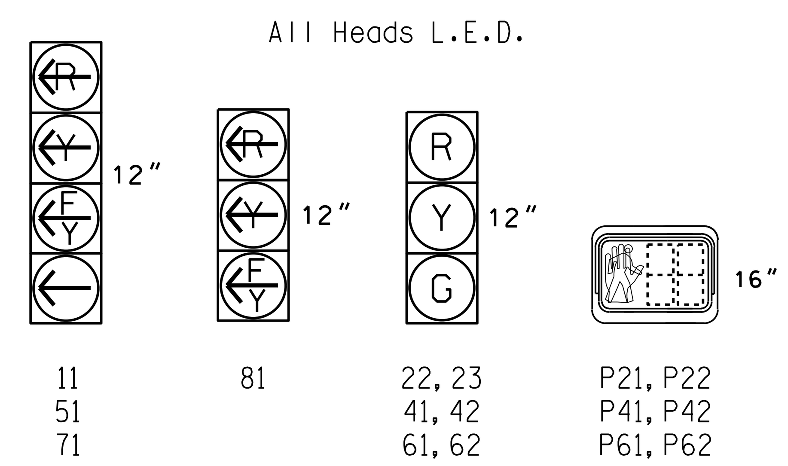
TIMING CHART
2033 SOFTWARE w/ 2070 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6	Ø7	Ø8	OL 2
MINIMUM INITIAL *	– SEC.	10 SEC.	7 SEC.	7 SEC.	10 SEC.	– SEC.	7 SEC.	– SEC.
VEHICLE EXTENSION *	– SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	– SEC.	2.0 SEC.	– SEC.
YELLOW CHANGE INT.	3.0 SEC.	3.8 SEC.	3.9 SEC.	3.0 SEC.	3.8 SEC.	3.0 SEC.	3.9 SEC.	3.9 SEC.
RED CLEARANCE	2.9 SEC.	2.1 SEC.	2.7 SEC.	2.3 SEC.	2.1 SEC.	2.4 SEC.	2.7 SEC.	2.7 SEC.
MAXIMUM LIMIT *	– SEC.	45 SEC.	20 SEC.	15 SEC.	45 SEC.	– SEC.	20 SEC.	
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE	NONE	
VEHICLE CALL MEMORY	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK	
DOUBLE ENTRY	OFF	OFF	ON	OFF	OFF	OFF	ON	
WALK *	– SEC.	7 SEC.	7 SEC.	– SEC.	7 SEC.	– SEC.	7 SEC.	
FLASHING DON'T WALK	– SEC.	8 SEC.	14 SEC.	– SEC.	16 SEC.	– SEC.	16 SEC.	
PED CLEAR BEFORE PREEMPT	– SEC.	7 SEC.	7 SEC.	– SEC.	8 SEC.	– SEC.	8 SEC.	
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM GAP*	– SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	– SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MINIMUM GAP	– SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	– SEC.	2.0 SEC.	

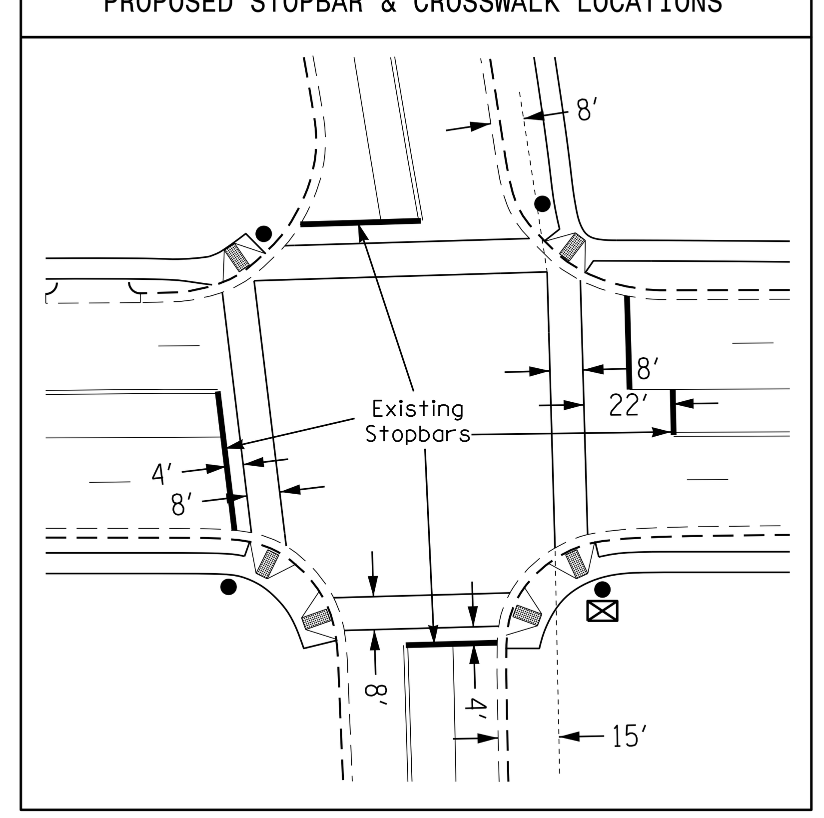
* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 2 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

SIGNAL FACE I.D.

All Heads L.E.D.



PROPOSED STOPBAR & CROSSWALK LOCATIONS



This plan superseded the plan signed and sealed on 3/3/2015

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Wheelchair Ramp	
	Type I Pushbutton Post	
	Type II Signal Pedestal	
	Optical Detector	

Signal Upgrade

Prepared in the Offices of: Transportation Mobility and Safety Division, Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.)
at
Olympic Ave./Frontier
Communications Driveway

Division 5 Durham County Durham

PLAN DATE:	September 2015	REVIEWED BY:
PREPARED BY:	R. W. Hough	REVIEWED BY:

SCALE 0 40
1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 036833 RYAN W. HOUGH

Ryan W. Hough 1/29/2016
DATE

SIG. INVENTORY NO. 05-0398

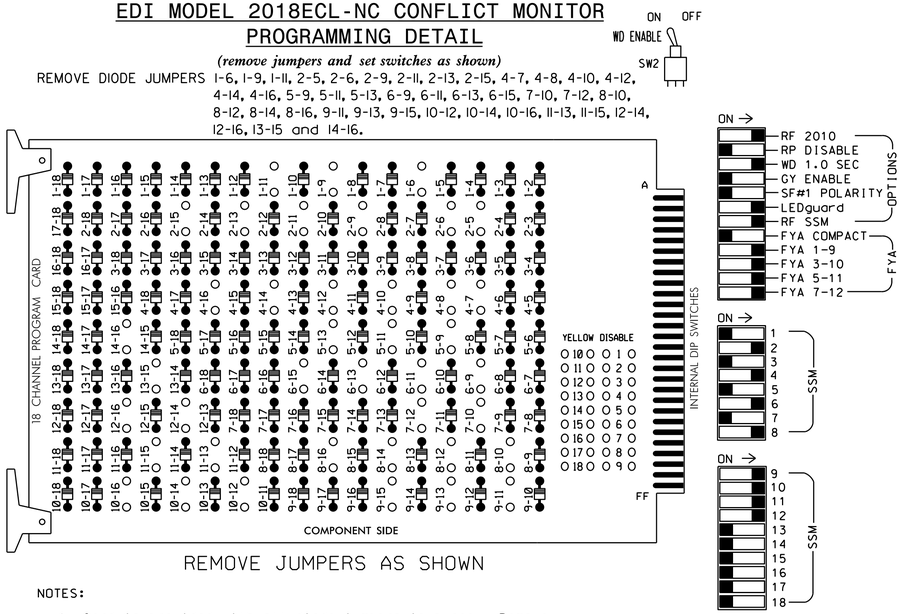
29-JAN-2016 08:46
S:*ITS&SU*ITS Signals*Signal Design Section*Central Region*Div 5*05-0398*050398_sig_dsn_20160129.dgn
rwhough

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 4.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-6, 1-9, 1-11, 2-5, 2-6, 2-9, 2-11, 2-13, 2-15, 4-7, 4-8, 4-10, 4-12, 4-14, 4-16, 5-9, 5-11, 5-13, 6-9, 6-11, 6-13, 6-15, 7-10, 7-12, 8-10, 8-12, 8-14, 8-16, 9-11, 9-13, 9-15, 10-12, 10-14, 10-16, 11-13, 11-15, 12-14, 12-16, 13-15 and 14-16.



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Calls for phases 2, 4, 6 and 8.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	★ 11	22,23	P21, P22	NU	41,42	P41, P42	★ 51	61,62	P61, P62	★ 71	82,83	P81, P82	★ 11	★ 81	NU	★ 51	★ 71	NU
RED		128			101			134			107							
YELLOW	✱	129			102		✱	135		✱	108							
GREEN		130			103			136			109							
RED ARROW													A121	A124		A114	A101	
YELLOW ARROW													A122	A125		A115	A102	
FLASHING YELLOW ARROW													A123	A126		A116	A103	
GREEN ARROW	127						133			124								
✋			113			104			119			110						
🚶			115			106			121			112						

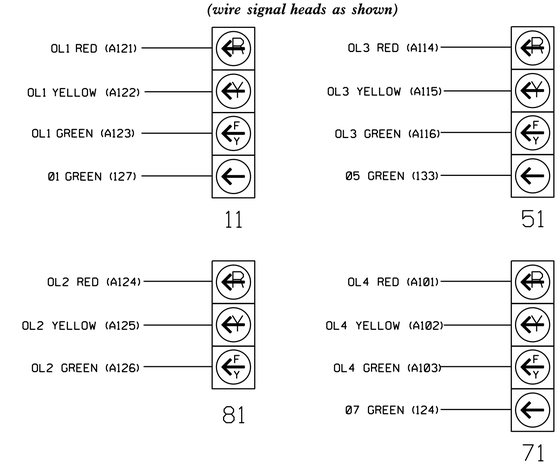
NU = Not Used

✱ Denotes install load resistor. See load resistor installation detail on sheet 2.

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



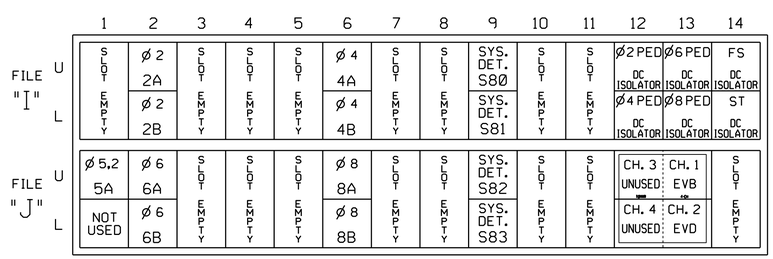
EQUIPMENT INFORMATION

```
CONTROLLER..............2070E
CABINET.................332 W/ AUX
SOFTWARE................McCAIN 2033
CABINET MOUNT...........BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED......S1,S2,S3,S5,S6,S7,S8,S9,S10,S11,S12
                        AUX S1,AUX S2,AUX S4,AUX S5
PHASES USED.............1✱,2,2 PED,4,4 PED,5,6,6 PED,7✱,8,8 PED
OVERLAP 1...............✱✱
OVERLAP 2...............4+8
OVERLAP 3...............✱✱
OVERLAP 4...............✱✱
```

✱ Phases 1 and 7 used only during Preempt.
✱✱ See FYA PPLT Programming - Sheet 2.

INPUT FILE POSITION LAYOUT

(front view)



EX.: 1A, 2A, ETC. = LOOP NO.'S

✱ Slot Reserved

FS = FLASH SENSE
ST = STOP TIME
EVB = EMERGENCY VEHICLE PREEMPT
EVD = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD
INSERT CARD INTO SLOT J13

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
4B	TB4-11,12	I6L	7	45	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
			9	55	5 7	2
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
8B	TB5-11,12	J6L	8	46	5 7	8
S80	TB6-9,10	I9U	18	60	4	SYS
S81	TB6-11,12	I9L	20	62	4	SYS
S82	TB7-9,10	J9U	17	59	4	SYS
S83	TB7-11,12	J9L	19	61	4	SYS
PEDESTRIAN PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED
P61,P62	TB8-7,9	I13U	26	68	2	6 PED
P81,P82	TB8-8,9	I13L	28	70	2	8 PED

NOTE:
INSTALL DC ISOLATOR IN INPUT FILE SLOT I12 AND I13.

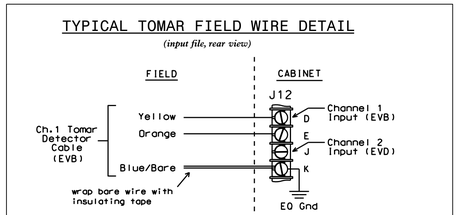
DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0398
DESIGNED: September 2015
SEALED: 1/29/2016
REVISED: N/A

THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 03/17/2015

Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.)
at
Olympic Ave./Frontier Communications Driveway

Division 5 Durham County Durham

PLAN DATE: December 2015	REVIEWED BY:
PREPARED BY: B. Simmons	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MIMS

DocuSigned by:
Keith M. Mims
2/2/2016
DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SIG. INVENTORY NO. 05-0398

02-FEB-2016 08:45
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casstrickland

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 4.2

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2.0
   EVB Clearance Phases = 1,6

2. Program EVD preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVD Clear = 1.0
   EVD Clearance Phases = 4,7

4. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 7
   PHASE 4 MIN FDW = 7
   PHASE 6 MIN FDW = 8
   PHASE 8 MIN FDW = 8

Program extend time on optical detector units for 2.0 sec.

FYA PPLT PROGRAMMING

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1,5,7

2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99
   Phase 5 = 90
   Phase 7 = 87

3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98
   Phase 5 RED = 88, Phase 5 YELLOW = 89
   Phase 7 RED = 85, Phase 7 YELLOW = 86

SPECIAL NOTE EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

OVERLAP PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

Press "+" Once

OVERLAP [2]:
LOADSWITCH = 10
VEH SET 1 = 4+8
YELLOW CLEARANCE = 3.9
RED CLEARANCE = 2.7

END OF OVERLAP PROGRAMMING

FLASHER CIRCUIT MODIFICATION DETAIL

In order to insure that signals flash concurrently on the same approach, make the following flasher circuit changes:

1. On rear of PDA - Remove wire from Term. T2-4 and Terminate on T2-2.
2. On rear of PDA - Remove wire from Term. T2-5 and Terminate on T2-3.
3. Remove Flasher Unit 2.

The changes listed above ties all Phases and Overlaps to Flasher Unit 1.

STARTUP CALLS PROGRAMMING

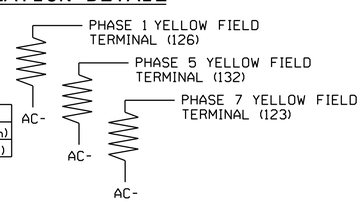
Prevents Veh Call to phase 1 and 7 during Startup. Phases 1,7 used only during Preempt.
Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,4,5,6,8

OVERLAP GREEN FLASH PROGRAMMING

The following will cause the overlap green output to flash, which is wired to the FYA. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 2

LOAD RESISTOR INSTALLATION DETAIL



ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0398
DESIGNED: September 2015
SEALED: 1/29/2016
REVISED: N/A

THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 03/17/2015

Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.)
at
Olympic Ave./Frontier Communications Driveway

Division 5 Durham County Durham

PLAN DATE: December 2015	REVIEWED BY:
PREPARED BY: B. Simmons	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MINS

DocuSigned by:
Keith M. Mins 2/2/2016
SIGNATURE DATE

STC. INVENTORY NO. 05-0398

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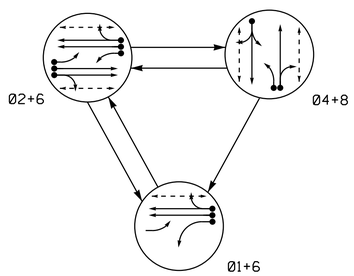
S:\TSCAD\TSS_Signals\Workgroups\Sig Mark\Strickland\050398_sm_ele_xxx.dgn
cestrickland

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 5.0

3 Phase Fully Actuated w/ EV Preemption (Durham Signal System)

PHASING DIAGRAM



EV PREEMPT PHASE

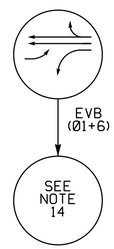


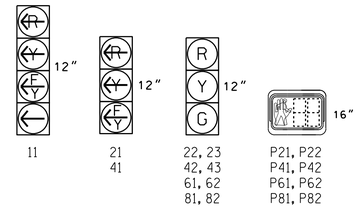
TABLE OF OPERATION

SIGNAL FACE	PHASE 01+6	02+6	04+8	EVB	FLASH
11	–	F Y	R	–	Y
21	F Y	F Y	R	F Y	Y
22, 23	R	G	R	R	Y
41	R	R	F Y	R	R
42, 43	R	R	G	R	R
61, 62	G	G	R	G	Y
81, 82	R	R	G	R	R
P21, P22	DW	W	DW	DW	DRK
P41, P42	DW	DW	W	DW	DRK
P61, P62	W	W	DW	DW	DRK
P81, P82	DW	DW	W	DW	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING														
							TIMING		ATTRIBUTES								STATUS			
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
1A	6X15	EXIST	50	-	X	1	15 SEC.	- SEC.	DISCONNECT											
1B	6X40	2-4-2	0	X	-	1	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2A	6X6	EXIST	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6X6	EXIST	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2C	6X40	2-4-2	0	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6X40	2-4-2	0	X	-	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4B	6X40	2-4-2	0	X	-	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6X6	EXIST	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6X6	EXIST	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6X40	2-4-2	0	X	-	8	5 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
PEDESTRIAN DETECTION																				
P21, P22	N/A	N/A	N/A	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P41, P42	N/A	N/A	N/A	X	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P61, P62	N/A	N/A	N/A	X	-	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P81, P82	N/A	N/A	N/A	X	-	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-

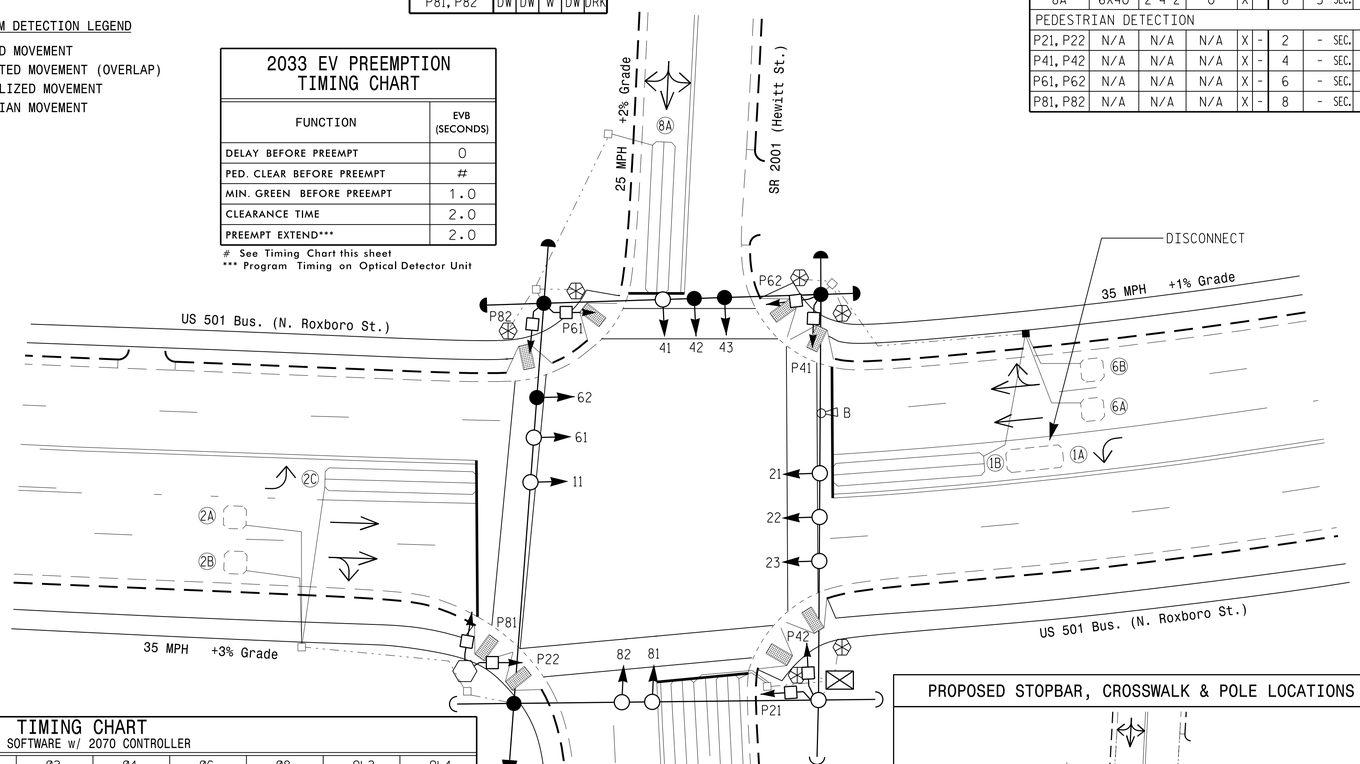
PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

2033 EV PREEMPTION TIMING CHART

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	#
MIN. GREEN BEFORE PREEMPT	1.0
CLEARANCE TIME	2.0
PREEMPT EXTEND***	2.0

See Timing Chart this sheet
*** Program Timing on Optical Detector Unit

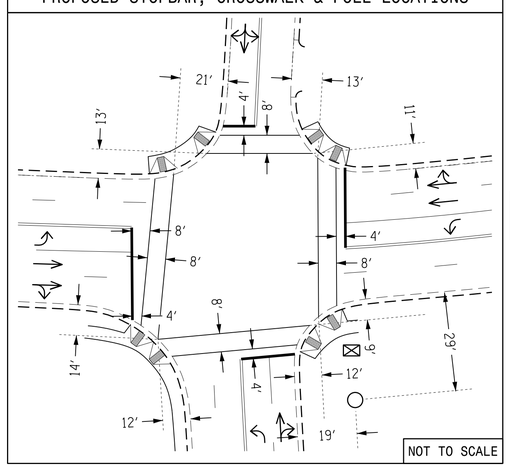


TIMING CHART
2033 SOFTWARE w/ 2070 CONTROLLER

PHASE	01	02	04	06	08	OL3	OL4
MINIMUM INITIAL *	7 SEC.	10 SEC.	7 SEC.	10 SEC.	7 SEC.	– SEC.	– SEC.
VEHICLE EXTENSION *	2.0 SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	– SEC.	– SEC.
YELLOW CHANGE INT.	3.0 SEC.	3.8 SEC.	3.1 SEC.	3.8 SEC.	3.1 SEC.	3.8 SEC.	3.1 SEC.
RED CLEARANCE	2.4 SEC.	1.7 SEC.	2.6 SEC.	1.7 SEC.	2.6 SEC.	1.7 SEC.	2.6 SEC.
MAXIMUM LIMIT *	15 SEC.	45 SEC.	20 SEC.	45 SEC.	20 SEC.		
RECALL POSITION	NONE	VEH. RECALL	NONE	VEH. RECALL	NONE		
VEHICLE CALL MEMORY	NONLOCK	YELLOW LOCK	NONLOCK	YELLOW LOCK	NONLOCK		
DOUBLE ENTRY	OFF	OFF	ON	OFF	ON		
WALK *	– SEC.	7 SEC.	7 SEC.	7 SEC.	7 SEC.		
FLASHING DON'T WALK	– SEC.	14 SEC.	16 SEC.	8 SEC.	17 SEC.		
PED CLEAR BEFORE PREEMPT	– SEC.	7 SEC.	8 SEC.	7 SEC.	9 SEC.		
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.		
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.		
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.		
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.		
MAXIMUM GAP*	2.0 SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.		
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.		
MINIMUM GAP	2.0 SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.		

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

PROPOSED STOPBAR, CROSSWALK & POLE LOCATIONS



NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 may be lagged.
4. Set all detector units to presence mode.
5. In the event of loop replacement, refer to the current ITS and Signals Design Manual and submit a Plan of Record to the Signal Design Section.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
7. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
8. Set phase bank 3 maximum limit to 250 seconds for phases used.
9. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
10. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
11. Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for pushbutton location details.
12. Pavement markings are existing unless otherwise shown.
13. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
14. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation based on vehicle demand.
15. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Optical Detector	
	Type I Pushbutton Post	
	Type II Signal Pedestal	
N/A	Wheelchair Ramp	

This plan supersedes the plan signed and sealed on 3/2/2015.

Signal Upgrade

Prepared in the Offices of: Transportation Mobility and Safety Division, Signal Design Section

US 501 Bus. (N Roxboro St.) at SR 2001 (Hewitt St.)/ Oxford Commons Shopping Center

Division 5 Durham County Durham

PLAN DATE: September 2015 REVIEWED BY:

PREPARED BY: R. W. Hough REVIEWED BY:

750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 20 1"=20'

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 2/1/2016
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SIG. INVENTORY NO. 05-1509

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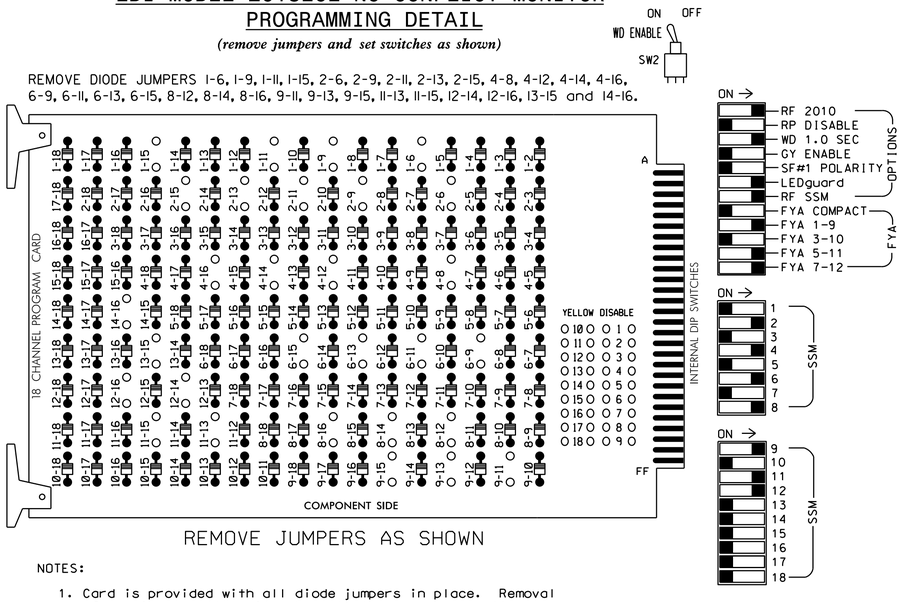
PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 5.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-6, 1-9, 1-11, 1-15, 2-6, 2-9, 2-11, 2-13, 2-15, 4-8, 4-12, 4-14, 4-16, 6-9, 6-11, 6-13, 6-15, 8-12, 8-14, 8-16, 9-11, 9-13, 9-15, 11-13, 11-15, 12-14, 12-16, 13-15 and 14-16.



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Calls for phases 2, 4, 6, and 8.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S3,S5,S6,S8,S9,S11,S12, AUX S1,AUX S4,AUX S5
PHASES USED.....1,2,2 PED,4,4 PED,6,6 PED,8,8 PED
OVERLAP 1.....✳
OVERLAP 2.....NOT USED
OVERLAP 3.....2+6
OVERLAP 4.....4+8

✳ See FYA PPLT Programming Detail on Sheet 2.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11★	22,23	P21, P22	NU	42,43	P41, P42	NU	61,62	P61, P62	NU	81,82	P81, P82	11★	NU	NU	21★	41★	NU
RED		128			101			134			107							
YELLOW	✳	129			102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121			A114	A101	
YELLOW ARROW													A122			A115	A102	
FLASHING YELLOW ARROW													A123			A116	A103	
GREEN ARROW	127																	
✋			113			104			119			110						
🚶			115			106			121			112						

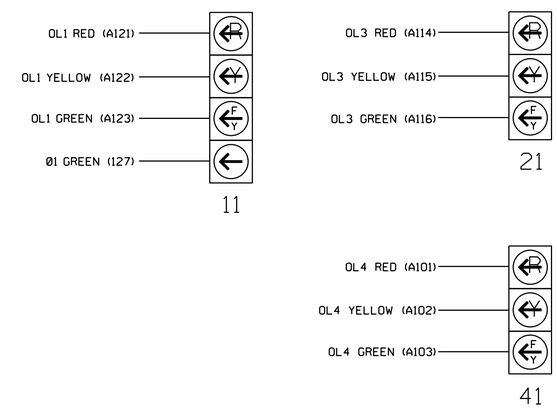
NU = Not Used

✳ Denotes install load resistor. See load resistor installation detail this sheet.

★ See pictorial of head wiring in detail below.

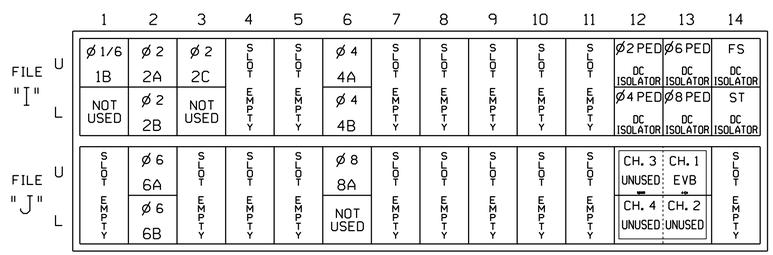
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



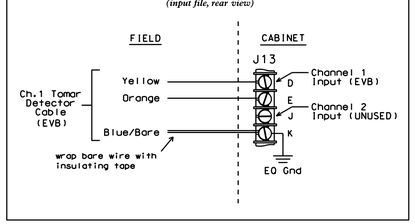
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1B	TB2-1,2	I1U	14	56	5 7	1
			10	56	5 7	6
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
2C	TB2-9,10	I3U	21	63	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
4B	TB4-11,12	I6L	7	45	5 7	4
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
PED PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED
P61,P62	TB8-7,9	I13U	26	68	2	6 PED
P81,P82	TB8-8,9	I13L	28	70	2	8 PED

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

NOTE: INSTALL DC ISOLATORS IN INPUT FILE SLOTS I12 AND I13.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

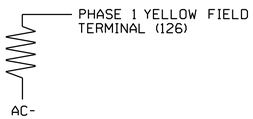
INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 03/11/15

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1509
DESIGNED: September 2015
SEALED: 2/1/2016
REVISED: N/A

Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 501 Bus. (N Roxboro St.) at SR 2001 (Hewitt St.)/ Oxford Commons Shopping Center

Division 5 Durham County Durham

PLAN DATE: December 2015 REVIEWED BY:

PREPARED BY: C. Strickland REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of: Transportation Mobility and Safety Division, Traffic Management Section, Department of Transportation, State of North Carolina

750 N.Greenfield Pkwy,Garner,NC 27529

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MIMS

DocuSigned by: Keith M. Mims 2/4/2016
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DATE

SIG. INVENTORY NO. 05-1509

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cestrickland

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 5.2

OVERLAPS [3 & 4] PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

PRESS '+' TWICE

OVERLAP [3]:
LOADSWITCH = 11 NOTE: FOR SIGNAL HEAD 21
VEH SET 1 = 2,6
YELLOW CLEARANCE = 3.8
RED CLEARANCE = 1.7

PRESS '+'

OVERLAP [4]:
LOADSWITCH = 12 NOTE: FOR SIGNAL HEAD 41
VEH SET 1 = 4,8
YELLOW CLEARANCE = 3.1
RED CLEARANCE = 2.6

END OF OVERLAP PROGRAMMING

OVERLAP GREEN FLASH PROGRAMMING FOR 3 SECTION FYA

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrow. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 3, 4

FYA PPLT PROGRAMMING (SIGNAL HEAD 11)

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1
2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99
3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO ENSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 1,6
2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1
3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 7
   PHASE 4 MIN FDW = 8
   PHASE 6 MIN FDW = 7
   PHASE 8 MIN FDW = 9

Program extend time on optical detector units for 2.0 sec for EVB.

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 03/11/15

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1509
DESIGNED: September 2015
SEALED: 2/1/2016
REVISED: N/A

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N Roxboro St.)
at
SR 2001 (Hewitt St.)/
Oxford Commons Shopping Center

Division 5 Durham County Durham

PLAN DATE: December 2015 REVIEWED BY:
PREPARED BY: C. Strickland REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MIMS

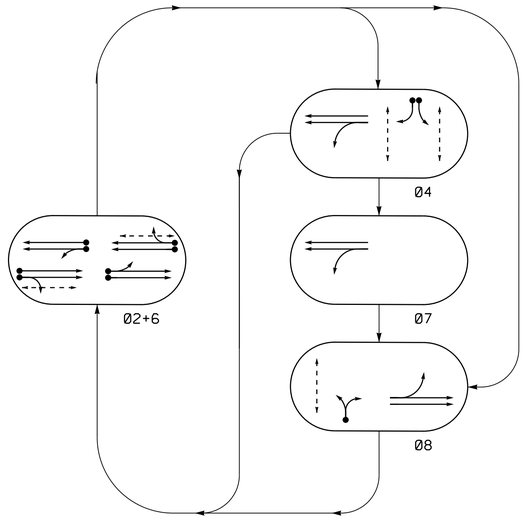
DocuSigned by: Keith M. Mims 2/4/2016
2F80786E8CD34A5 DATE

SIG. INVENTORY NO. 05-1509

04-FEB-2016 14:44
S:\TTSSGN\TTS Signals\Workgroups\Sig Mgmt\Strickland\M01509_sm_ele_xxx.dgn
castrickland

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 6.0

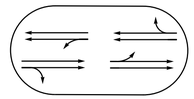
PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

EV PREEMPT PHASE



EVB
(Ø2+6)

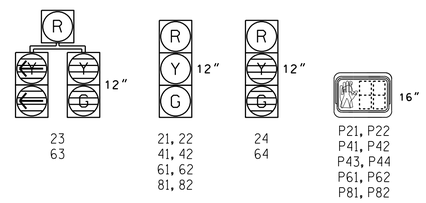
W - Walk
DW - Don't Walk
DRK - Dark

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø4	Ø7	Ø8	EVB	FLASH
21, 22	G	R	R	R	G	Y
23	G	R	R	G	G	Y
24	G	R	R	G	G	Y
41, 42	R	G	R	R	R	R
61, 62	G	R	R	R	G	Y
63	G	G	G	R	G	Y
64	G	G	G	R	G	Y
81, 82	R	R	R	G	R	R
P21, P22	W	DW	DW	DW	DW	DRK
P41, P42	DW	W	DW	DW	DW	DRK
P43, P44	DW	W	DW	DW	DW	DRK
P61, P62	W	DW	DW	DW	DW	DRK
P81, P82	DW	DW	DW	W	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.
Louvered Section



2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES								STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6X6	5	70	X	-	2	- SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-
2B	6X6	5	70	X	-	2	- SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-
2C	6X6	3	70	X	-	2	- SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-
2D	6X6	3	70	X	-	2	10 SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-
4A	6X40	2-4-2	0	X	-	4	3 SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-
4B	6X40	2-4-2	0	X	-	4	15 SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-
6A	6X6	5	70	X	-	6	- SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-
6B	6X6	5	70	X	-	6	- SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-
6C	6X6	5	70	X	-	6	- SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-
6D	6X6	5	70	X	-	6	10 SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-
8A	6X40	2-4-2	0	X	-	8	5 SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-
PEDESTRIAN DETECTION																		
P21, P22	N/A	N/A	N/A	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X	-
P41, P42	N/A	N/A	N/A	X	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X	-
P43, P44	N/A	N/A	N/A	X	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X	-
P61, P62	N/A	N/A	N/A	X	-	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X	-
P81, P82	N/A	N/A	N/A	X	-	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X	-

3 Phase
Fully Actuated
w/ EV Preemption
(Durham Signal System)

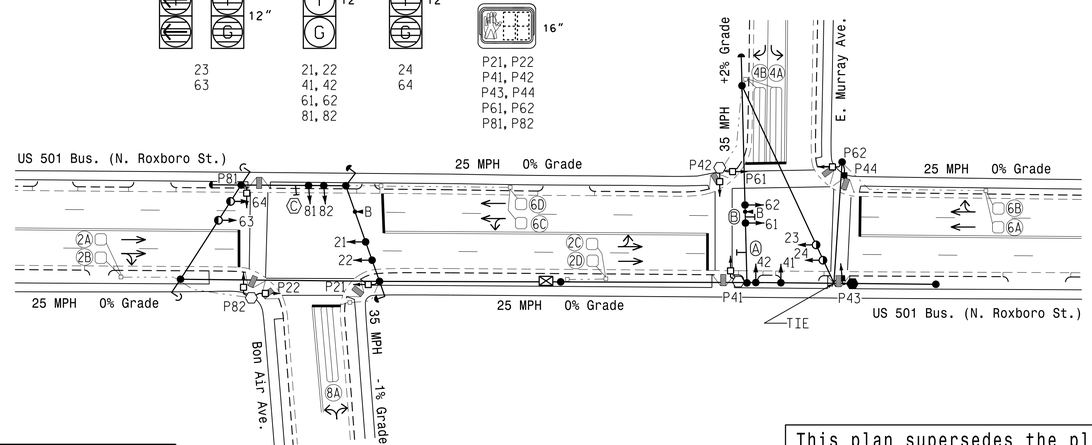
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
9. Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for pushbutton location details.
10. Pavement markings are existing unless otherwise shown.
11. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
12. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation based on vehicle demand.
13. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

2033 EV PREEMPTION TIMING CHART

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	#
MIN. GREEN BEFORE PREEMPT	1.0
CLEARANCE TIME	2.0
PREEMPT EXTEND**	2.0

\# See Timing Chart this sheet
** Program Timing on Optical Detector Unit



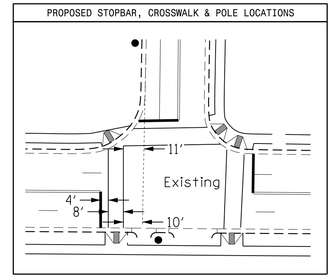
This plan supersedes the plan signed and sealed on 3/10/2015

TIMING CHART
2033 SOFTWARE w/ 2070 CONTROLLER

PHASE	02	04	06	07	08	OL 1	OL 2	OL 3
MINIMUM INITIAL *	10 SEC.	7 SEC.	10 SEC.	1 SEC.	7 SEC.	- SEC.	- SEC.	- SEC.
VEHICLE EXTENSION *	2.0 SEC.	2.0 SEC.	2.0 SEC.	- SEC.	2.0 SEC.	- SEC.	- SEC.	- SEC.
YELLOW CHANGE INT.	3.2 SEC.	3.0 SEC.	3.2 SEC.	3.2 SEC.	3.0 SEC.	3.2 SEC.	3.2 SEC.	3.2 SEC.
RED CLEARANCE	2.0 SEC.	1.9 SEC.	2.0 SEC.	2.0 SEC.	2.1 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.
MAXIMUM LIMIT *	45 SEC.	20 SEC.	45 SEC.	- SEC.	20 SEC.			
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL	NONE	NONE			
VEHICLE CALL MEMORY	YELLOW LOCK	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK			
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF			
WALK *	7 SEC.	1 SEC.	7 SEC.	- SEC.	7 SEC.			
FLASHING DON'T WALK	9 SEC.	11 SEC.	9 SEC.	- SEC.	13 SEC.			
ADVANCE WALK	- SEC.	7 SEC.	- SEC.	- SEC.	- SEC.			
PED CLEAR BEFORE PREEMPT	5 SEC.	6 SEC.	5 SEC.	- SEC.	7 SEC.			
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM GAP*	2.0 SEC.	2.0 SEC.	2.0 SEC.	- SEC.	2.0 SEC.			
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MINIMUM GAP	2.0 SEC.	2.0 SEC.	2.0 SEC.	- SEC.	2.0 SEC.			

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

PROPOSED STOPBAR, CROSSWALK & POLE LOCATIONS



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Optical Detector	
	Type I Pushbutton Post	
	Type II Signal Pedestal	
N/A	Wheelchair Ramp	
Ⓐ	Museum Left Arrow Sign	Ⓐ
Ⓑ	Museum Right Arrow Sign	Ⓑ
Ⓒ	"TURNING VEHICLES YIELD TO PEDESTRIANS" Sign (R10-15)	Ⓒ

Signal Upgrade

Prepared in the Offices of:
Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.) at E. Murray Ave./Bon Air Ave.

Division 5 Durham County Durham

PLAN DATE: September 2015 REVIEWED BY:
PREPARED BY: R. N. Zinser REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH
DocuSigned by: Ryan W. Hough 2/12/2016
430320FA62654C3... DATE
SIG. INVENTORY NO. 05-0304

12-FEB-2016 07:45
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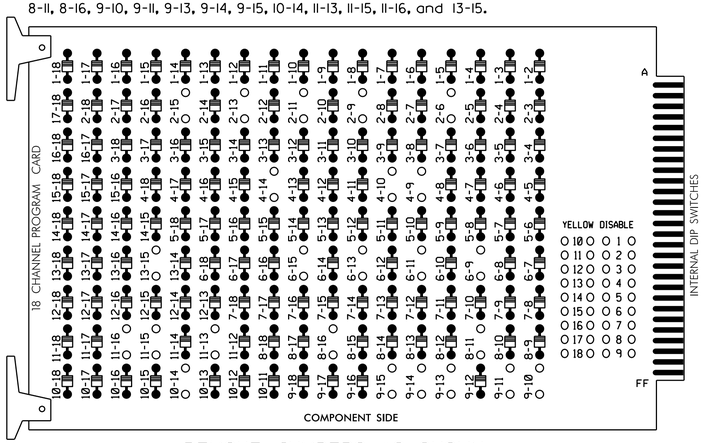
rwhough

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 6.1

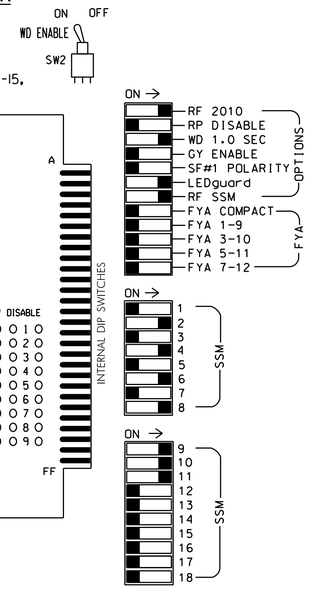
EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-6, 2-9, 2-11, 2-13, 2-15, 4-9, 4-10, 4-14, 6-9, 6-11, 6-13, 6-15, 8-11, 8-16, 9-10, 9-11, 9-13, 9-14, 9-15, 10-14, 11-13, 11-15, 11-16, and 13-15.



REMOVE JUMPERS AS SHOWN



NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. Program Startup Ped Calls for phases 2, 4, 6, and 8.
9. Set the Red Revert interval on the controller to 1 second.
10. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S3,S5,S6,S8,S9,S11,S12, AUX S1,AUX S2,AUX S4
PHASES USED.....2,2 PED,4,4 PED,6,6 PED,*7,8,8 PED
OVERLAP 1.....2+4+6+7
OVERLAP 2.....4+7
OVERLAP 3.....2+6+8
OVERLAP 4.....NOT USED

* Phase used only for Dummy Green Extend

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11		S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8		16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8		8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	P21, P22	NU	41,42	P41,P42, P43,P44	NU	61,62	P61, P62	NC	23	81,82	P81, P82	63,64	63	NU	23,24	NU	NU
RED		128			101			134				107		A121	*		A114		
YELLOW		129			102			135				108		A122			A115		
GREEN		130			103			136				109		A123			A116		
RED ARROW																			
YELLOW ARROW											108				A125				
GREEN ARROW											109				A126				
✋			113			104			119				110						
🚶			115			106			121				112						

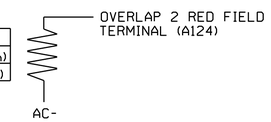
NU = Not Used
NC = No Connection
* Denotes install load resistor. See load resistor installation detail on this sheet.

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

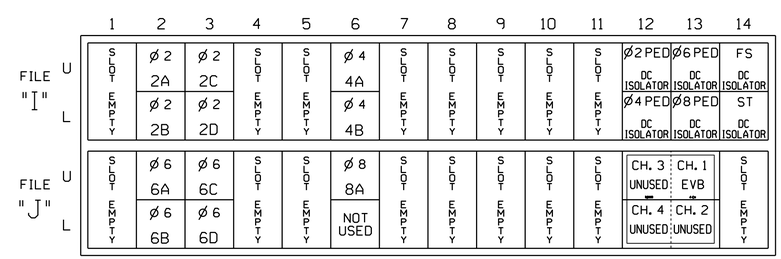
ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



INPUT FILE POSITION LAYOUT

(front view)



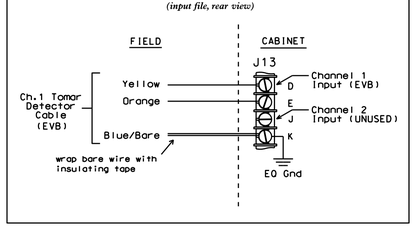
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
2C	TB2-9,10	I3U	21	63	5 7	2
2D	TB2-11,12	I3L	29	76	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
4B	TB4-11,12	I6L	7	45	5 7	4
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
6C	TB3-9,10	J3U	22	64	5 7	6
6D	TB3-11,12	J3L	30	77	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
PED PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42, P43,P44	TB8-5,6	I12L	27	69	2	4 PED
P61,P62	TB8-7,9	I13U	26	68	2	6 PED
P81,P82	TB8-8,9	I13L	28	70	2	8 PED

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

NOTE: INSTALL DC ISOLATORS IN INPUT FILE SLOTS I12 AND I13.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

ADVANCE WALK PROGRAMMING

Program Leading PED Interval as follows:
1. Main Menu - 1) PHASE - 1) PHASE FUNCTIONS PAGE ONE
   ADVANCE WALK = 4
2. Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   WALK Phase 4 = 1
   ADV/DELAY WALK Phase 4 = 7

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0304
DESIGNED: September 2015
SEALED: 2/12/2016
REVISED:

THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 03/19/15

Electrical Detail - Sheet 1 of 3

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 501 Bus. (N. Roxboro St.)
at
E. Murray Ave./Bon Air Ave.

Division 5 Durham County Durham

PLAN DATE: December 2015 REVIEWED BY:
PREPARED BY: C. Strickland REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of: Transportation Mobility and Safety Division, Traffic Engineering Branch, Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MINS
DocuSigned by: Keith M. Mins 2/12/2016
2F80786E8CD34A5...
DATE
SIG. INVENTORY NO. 05-0304

12-FEB-2016 08:16
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castrickland

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 6.2

OVERLAPS [1-3] PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

OVERLAP [1]:
LOADSWITCH = 9 NOTE: FOR SIGNAL HEADS 63,64
VEH SET 1 = 2,4,6,7
GREEN CLEARANCE = 0.0
YELLOW CLEARANCE = 3.2
RED CLEARANCE = 2.0

PRESS '+'

OVERLAP [2]:
LOADSWITCH = 10 NOTE: FOR SIGNAL HEAD 63
VEH SET 1 = 4,7
GREEN CLEARANCE = 0.0
YELLOW CLEARANCE = 3.2
RED CLEARANCE = 2.0

PRESS '+'

OVERLAP [3]:
LOADSWITCH = 11 NOTE: FOR SIGNAL HEADS 23,24
VEH SET 1 = 2,6,8
GREEN CLEARANCE = 0.0
YELLOW CLEARANCE = 3.2
RED CLEARANCE = 2.0

END OF OVERLAP PROGRAMMING

STARTUP CALLS PROGRAMMING

Prevents Veh Call to phase 3 during Startup. Phase 3 used only to enable Dummy Phase 7.
Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,4,6,7,8

PHASE SEQUENCE PROGRAMMING

To designate EXCLUSIVE phases, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXCLUSIVE = 3,4,7,8
PERMIT = 2,3,4,6,7,8

NOTE: PHASE 3 MUST BE PERMITTED FOR PHASE 7 TO RUN. OMIT PHASE 3 AT STARTUP

NOT USED	Ø2	Ø4	Ø7	Ø8
NOT USED	Ø6			

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 2,6

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 5
   PHASE 4 MIN FDW = 6
   PHASE 6 MIN FDW = 5
   PHASE 8 MIN FDW = 7

Program extend time on optical detector units for 2.0 sec for EVB.

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0304
DESIGNED: September 2015
SEALED: 2/12/2016
REVISED:

THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 03/19/15

Electrical Detail - Sheet 2 of 3

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.)
at
E. Murray Ave./Bon Air Ave.

Division 5 Durham County Durham

PLAN DATE: December 2015 REVIEWED BY:
PREPARED BY: C. Strickland REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MIMS

DocuSigned by: Keith M. Mims 2/12/2016
2F8D7B6BEBCD3A45...
DATE

SIG. INVENTORY NO. 05-0304

12-FEB-2016 09:17
S:\TISSGMS\TS Signals\Workgroups\Sig Mon\Strickland\050304_sm_ele_xxx.dgn
cestrickland

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 6.3

DUMMY PHASE 7 I/O LOGIC PROGRAMMING DETAIL

To implement Green Extend using Dummy Phase 7, program the controller as follows:
Main Menu - 8) IN/OUT LOGIC - 1) AND

GATE AND1
INPUT 203
INPUT 204
OUTPUT 201

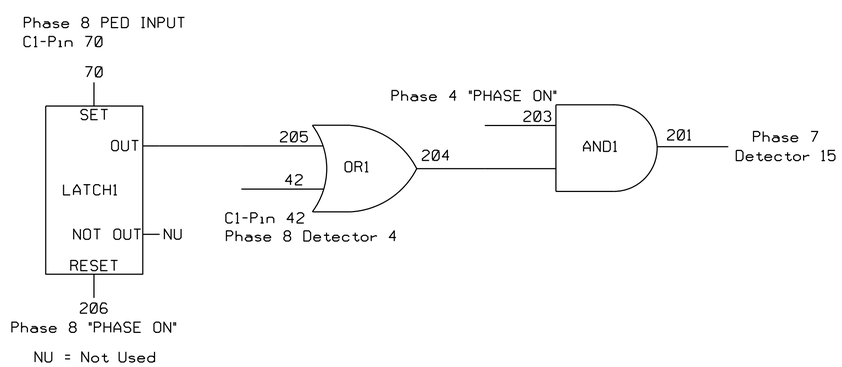
Main Menu - 8) IN/OUT LOGIC - 3) TWO INPUT OR

OR GATES
OR1
INPUT 205
INPUT 42
OUTPUT 204

Main Menu - 8) IN/OUT LOGIC - 7) LATCH

LOGIC LATCH
LATCH 1
SET 70
RESET 206
OUT 205
NOT OUT 0

END OF I/O LOGIC PROGRAMMING



YELLOW LOCK PROGRAMMING DETAIL

Ensure to enable YELLOW LOCK for phases 2 and 6 only.
Program the controller as follows:
Main Menu - 1) PHASE - 1) PHASE FUNCTIONS PAGE ONE
YELLOW LOCK = 2,6

ASSIGN PSEUDO PINS TO DETECTOR [12] AND DETECTOR [15] PROGRAMMING DETAIL

Program Detectors as follows:
Main Menu - 5) INPUTS - 1) DETECTOR ASSIGNMENTS

PRESS '+' key to advance to Detector 12

DETECTOR [12] ASSIGNMENT

C1 PIN 202 NOTE: CALLS PHASE 8

PRESS '+' key to advance to Detector 15

DETECTOR [15] ASSIGNMENT

C1 PIN 201 NOTE: CALLS PHASE 7

END OF DETECTOR PROGRAMMING

DUMMY PHASE 7 PSEUDO PIN PROGRAMMING

To create the Pseudo Pins necessary for Dummy Phase 7 I/O Logic programming, program the controller as follows:
Main Menu - 6) OUTPUTS - C) PHASE CHECK/ON

PHASE CHECK and ON OUTPUTS

	1	2	3	4	5	6	7	8
CHECK	0	0	0	0	0	0	0	0
ON	0	0	0	203	0	0	202	206

OUTPUT PHASE 7 "PHASE ON" ENSURES CALL TO PHASE 8 DURING PHASE 7

END OF PSEUDO PIN PROGRAMMING

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0304
DESIGNED: September 2015
SEALED: 2/12/2016
REVISED:

THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 03/19/15

Electrical Detail - Sheet 3 of 3

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.)
at
E. Murray Ave./Bon Air Ave.

Division 5 Durham County Durham

PLAN DATE: December 2015 REVIEWED BY:
PREPARED BY: C. Strickland REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MINS

DocuSigned by: Keith M. Mins 2/12/2016
2F8078EE8CD344A... DATE

SIG. INVENTORY NO. 05-0304

12-FEB-2016 09:20
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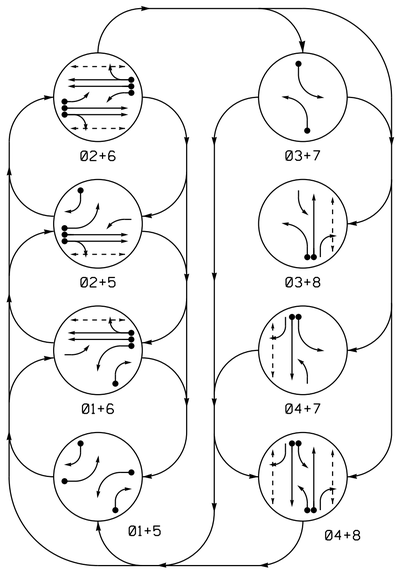
cestrickland

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 7.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

EV PREEMPT PHASES

**See Note 15

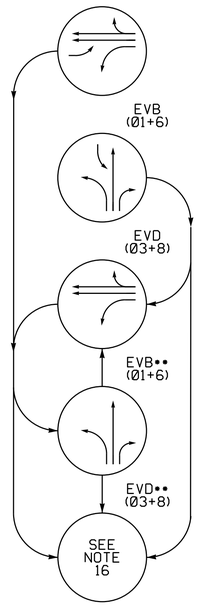


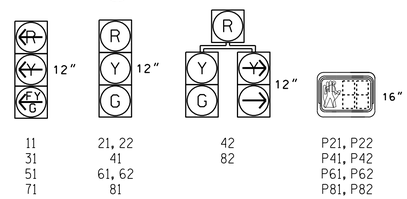
TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	03+7	03+8	04+7	04+8	EVB	EVD	FLASH
11	←●	←●	F/Y	F/Y	~~R~~	~~R~~	~~R~~	~~R~~	←●	~~R~~	~~Y~~
21, 22	R	R	G	G	R	R	R	R	R	R	Y
31	~~R~~	~~R~~	~~R~~	~~R~~	←●	←●	F/Y	F/Y	~~R~~	←●	~~R~~
41	R	R	R	R	R	R	G	G	R	R	R
42	R/←	R	R/←	R	R	R	G	G	R	R	R
51	←●	F/Y	←●	F/Y	~~R~~	~~R~~	~~R~~	~~R~~	F/Y	~~R~~	~~Y~~
61, 62	R	G	R	G	R	R	R	R	G	R	Y
71	~~R~~	~~R~~	~~R~~	~~R~~	←●	F/Y	←●	F/Y	~~R~~	~~R~~	~~R~~
81	R	R	R	R	R	G	R	G	R	G	R
82	R/←	R	R/←	R	R	R	G	R	G	R	G
P21, P22	DW	DW	W	W	DW	DW	DW	DW	DW	DW	DRK
P41, P42	DW	DW	DW	DW	DW	DW	W	W	DW	DW	DRK
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DW	DW	DRK
P81, P82	DW	DW	DW	DW	DW	W	DW	W	DW	DW	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.
F/Y/G = Bimodal Section



2033 EV PREEMPTION TIMING CHART

FUNCTION	EVB (SECONDS)	EVD (SECONDS)
DELAY BEFORE PREEMPT	0	0
PED. CLEAR BEFORE PREEMPT	#	#
MIN. GREEN BEFORE PREEMPT	1.0	1.0
CLEARANCE TIME	2.0	2.0
PREEMPT EXTEND***	2.0	2.0

See Timing Chart this sheet
*** Program Timing on Optical Detector Unit

TIMING CHART

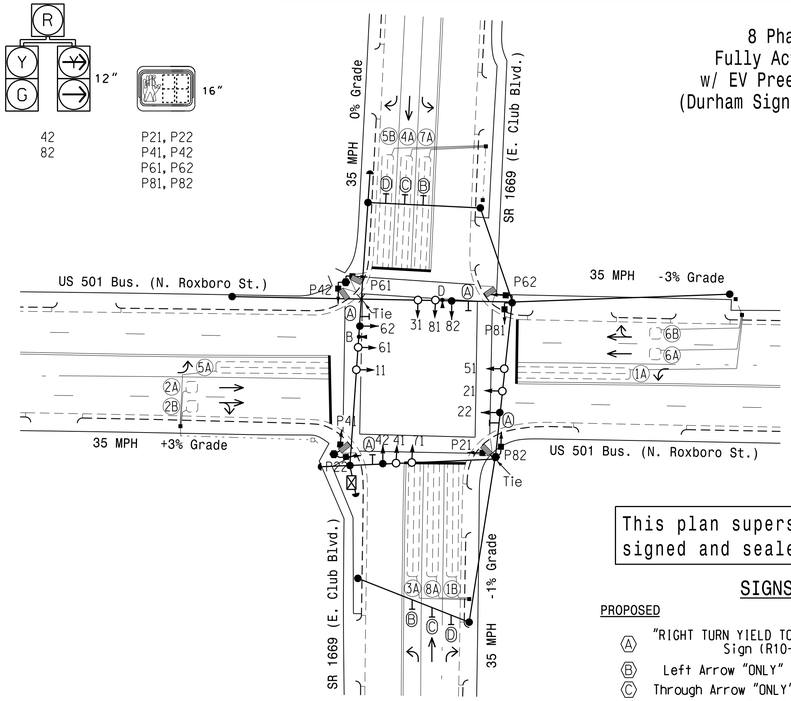
2033 SOFTWARE w/ 2070 CONTROLLER

PHASE	01	02	03	04	05	06	07	08	OL 6
MINIMUM INITIAL *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.	7 SEC.	– SEC.
VEHICLE EXTENSION *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	– SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.1 SEC.	3.0 SEC.	3.9 SEC.	3.0 SEC.	4.1 SEC.	3.0 SEC.	3.9 SEC.	3.0 SEC.
RED CLEARANCE	2.6 SEC.	1.7 SEC.	2.4 SEC.	1.8 SEC.	2.4 SEC.	1.7 SEC.	2.4 SEC.	1.8 SEC.	2.6 SEC.
MAXIMUM LIMIT *	25 SEC.	60 SEC.	15 SEC.	30 SEC.	20 SEC.	60 SEC.	15 SEC.	30 SEC.	
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL	NONE	NONE	
VEHICLE CALL MEMORY	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK	
DOUBLE ENTRY	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	
WALK *	– SEC.	7 SEC.	– SEC.	7 SEC.	– SEC.	7 SEC.	– SEC.	7 SEC.	
FLASHING DON'T WALK	– SEC.	15 SEC.	– SEC.	18 SEC.	– SEC.	14 SEC.	– SEC.	17 SEC.	
PED CLEAR BEFORE PREEMPT	– SEC.	8 SEC.	– SEC.	9 SEC.	– SEC.	7 SEC.	– SEC.	9 SEC.	
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM GAP*	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MINIMUM GAP	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING														
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DETECTION	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
1A	6X60	2-4-2	0	-	X	1	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
1B	6X60	2-4-2	0	-	X	1	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2A	6X6	EXIST	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6X6	EXIST	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
3A	6X60	2-4-2	0	-	X	3	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6X60	2-4-2	0	-	X	4	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
5A	6X60	2-4-2	0	-	X	5	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
5B	6X60	2-4-2	0	-	X	5	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6X6	EXIST	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6X6	EXIST	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
7A	6X60	2-4-2	0	-	X	7	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6X60	2-4-2	0	-	X	8	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
PEDESTRIAN DETECTION																			
P21, P22	N/A	N/A	N/A	-	X	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P41, P42	N/A	N/A	N/A	-	X	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P61, P62	N/A	N/A	N/A	-	X	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P81, P82	N/A	N/A	N/A	-	X	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-



8 Phase
Fully Actuated
w/ EV Preemptions
(Durham Signal System)

This plan supersedes the plan signed and sealed on 3/10/15.

SIGNS

PROPOSED		EXISTING
Ⓐ	"RIGHT TURN YIELD TO PEDESTRIANS" Sign (R10-15)	Ⓐ
Ⓑ	Left Arrow "ONLY" Sign (R3-5L)	Ⓑ
Ⓒ	Through Arrow "ONLY" Sign (R3-5A)	Ⓒ
Ⓓ	Right Arrow "ONLY" Sign (R3-5R)	Ⓓ

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Set all detector units to presence mode.
6. In the event of loop replacement, refer to the current ITS and Signals Design Manual and submit a Plan of Record to the Signal Design Section.
7. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
8. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
9. Set phase bank 3 maximum limit to 250 seconds for phases used.
10. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
11. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
12. Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for pushbutton location details.
13. Pavement markings are existing.
14. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
15. If preempt phasing resides in the barrier being serviced then the opposing 4-section FYA will flash continuously. If the preempt phase requires crossing the barrier then the opposing 4-section FYA will display a red arrow.
16. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation based on vehicle demand.
17. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Directional Arrow	
	Metal Strain Pole	
	Optical Detector	
	Type I Pushbutton Post	
	Type II Signal Pedestal	
N/A	Wheelchair Ramp	

Signal Upgrade

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.) at SR 1669 (E. Club Blvd.)

Division 5 Durham County Durham

PLAN DATE: September 2015 REVIEWED BY:
PREPARED BY: R. W. Hough REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH
DocuSigned by: Ryan W. Hough E30320FAA2654C0... 2/1/2016
DATE
SIG. INVENTORY NO. 05-0307

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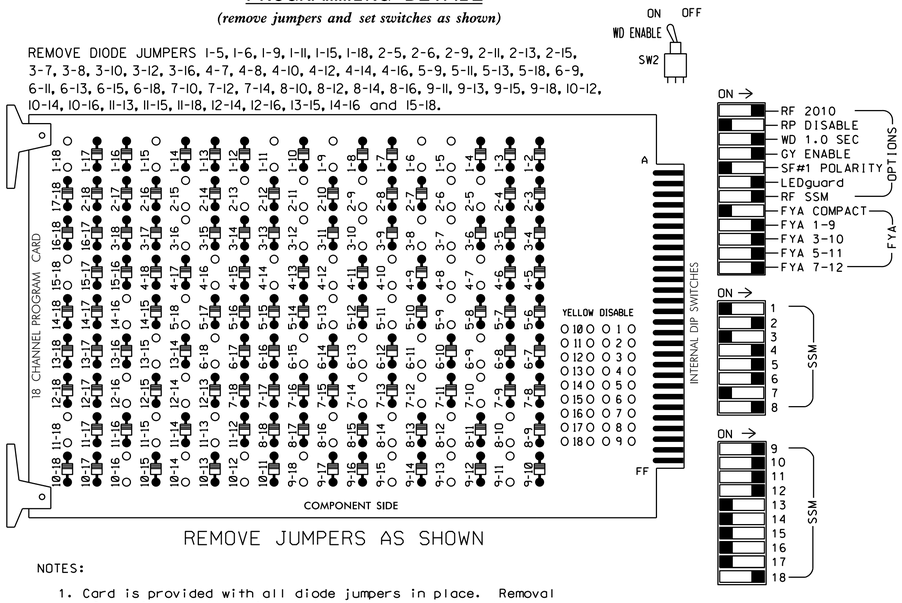
PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 7.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 1-15, 1-18, 2-5, 2-6, 2-9, 2-11, 2-13, 2-15, 3-7, 3-8, 3-10, 3-12, 3-16, 4-7, 4-8, 4-10, 4-12, 4-14, 4-16, 5-9, 5-11, 5-13, 5-18, 6-9, 6-11, 6-13, 6-15, 6-18, 7-10, 7-12, 7-14, 8-10, 8-12, 8-14, 8-16, 9-11, 9-13, 9-15, 9-18, 10-12, 10-14, 10-16, 11-13, 11-15, 11-18, 12-14, 12-16, 13-15, 14-16 and 15-18.



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø 1/6 1A	Ø 1 1B	Ø 2 2A	SLOT EMPTY	Ø 3/8 3A	Ø 4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø2 PED DC ISOLATOR	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L	NOT USED	NOT USED	Ø 2 2B		NOT USED	NOT USED						Ø4 PED DC ISOLATOR	Ø8 PED DC ISOLATOR	ST DC ISOLATOR
FILE "J"	U	Ø 5/2 5A	Ø 5 5B	Ø 6 6A	SLOT EMPTY	Ø 7/4 7A	Ø 8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	CH. 3 UNUSED	CH. 1 EVB	SLOT EMPTY
	L	NOT USED	NOT USED	Ø 6 6B		NOT USED	NOT USED						CH. 4 UNUSED	CH. 2 EVD	

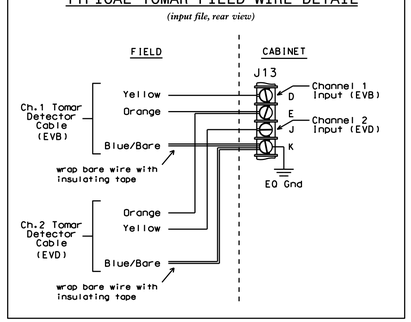
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

TOMAR OSP CARD INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Calls for phases 2, 4, 6, and 8.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S3,S4,S5,S6,S7,S8,S9,S10,S11, S12,AUX S1,AUX S2,AUX S4,AUX S5,AUX S6
PHASES USED.....1,2,2 PED,3,4,4 PED,5,6,6 PED,7,8,8 PED
OVERLAP 1.....*
OVERLAP 2.....*
OVERLAP 3.....*
OVERLAP 4.....*
OVERLAP 5.....NOT USED
OVERLAP 6.....1

* See FYA PPLT Programming Detail on Sheet 2.

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
			10	56	5 7	6
1B	TB2-5,6	I2U	1	39	5 7	1
2A	TB2-9,10	I3U	21	63	5 7	2
2B	TB2-11,12	I3L	29	76	5 7	2
3A	TB4-5,6	I5U	16	58	5 7	3
			12	58	5 7	8
4A	TB4-9,10	I6U	3	41	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
			9	55	5 7	2
5B	TB3-5,6	J2U	2	40	5 7	5
6A	TB3-9,10	J3U	22	64	5 7	6
6B	TB3-11,12	J3L	30	77	5 7	6
7A	TB5-5,6	J5U	15	57	5 7	7
			11	57	5 7	4
8A	TB5-9,10	J6U	4	42	5 7	8
PED PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED
P61,P62	TB8-7,9	I13U	26	68	2	6 PED
P81,P82	TB8-8,9	I13L	28	70	2	8 PED

NOTE: INSTALL DC ISOLATORS IN INPUT FILE SLOTS I12 AND I13.

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

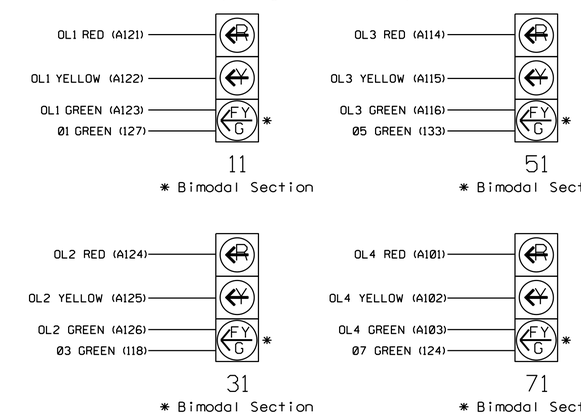
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7		S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5		6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5		6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	OL6
SIGNAL HEAD NO.	11★	21,22	P21, P22	31★	41,42	P41, P42	42	51★	61,62	P61, P62	71★	81,82	P81, P82	11★	31★	NU	51★	71★	82
RED		128			101		*		134			107							*
YELLOW	*	129		*	102				135		*	108							
GREEN		130			103				136			109							
RED ARROW														A121	A124		A114	A101	
YELLOW ARROW							132							A122	A125		A115	A102	A105
FLASHING YELLOW ARROW														A123	A126		A116	A103	
GREEN ARROW	127			118			133	133			124								A106
✋			113			104				119			110						
🚶			115			106				121			112						

NU = Not Used
* Denotes install load resistor. See load resistor installation detail sheet 2.
★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0307
DESIGNED: September 2015
SEALED: 2/1/2016
REVISED: N/A

THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 03/11/15

Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 501 Bus. (N. Roxboro St.) at SR 1669 (E. Club Blvd.)

Division 5 Durham County Durham

PLAN DATE: February 2015 REVIEWED BY: T. Joyce
PREPARED BY: C. Strickland REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of: Transportation Mobility and Safety Division, Signals Management Section, State of North Carolina Department of Transportation
750 N.Greenfield Pkwy,Garner,NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MINS

DocuSigned by: Keith M. Mins 2/4/2016
2F807A9EBCD34A5... DATE

SIG. INVENTORY NO. 05-0307

04-FEB-2016 12:03
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cestrickland

PROJECT REFERENCE NO.	SHEET NO.
SS-4905CK	Sig. 7.2

FYA PPLT PROGRAMMING

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1,3,5,7

2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99
   Phase 3 = 96
   Phase 5 = 90
   Phase 7 = 87

3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98
   Phase 3 RED = 94, Phase 3 YELLOW = 95
   Phase 5 RED = 88, Phase 5 YELLOW = 89
   Phase 7 RED = 85, Phase 7 YELLOW = 86

OVERLAP [6] PROGRAMMING DETAIL

1. Redirect Phase Outputs for OL6 as follows:
   Main Menu - 6) OUTPUTS - 9) REDIRECT OLAPS

   OVERLAP 6 RED = 83 NOTE: FOR SIGNAL HEAD 82
   OVERLAP 6 YELLOW = 100
   OVERLAP 6 GREEN = 84

2. Program OL6 as follows:
   Main Menu - 4) OVERLAP

   PRESS '+' key to advance to Overlap 6

   OVERLAP [6]:
   LOADSWITCH = 0
   VEH SET 1 = 1
   VEH SET 2 = No programming required
   YELLOW CLEARANCE = 3.0
   RED CLEARANCE = 2.6

   END OF OVERLAP PROGRAMMING

OMIT HEAD 82 RIGHT-TURN ARROW (OL6) DURING EVB

1. In order for EVB Preemption to operate without head 82 right-turn arrows, the following programming must be in place:
   Main Menu - 5) INPUTS - 5) BANKS & SETS

   OVERLAP VEHICLE SET-2 = 200 NOTE: 200 = Assignable Pseudo Pin

2. Assign EVB Preemption Output as follows:
   Main Menu - 6) OUTPUTS - 4) PREEMPT

   EVB ON = 200

   END OF PSEUDO PIN PROGRAMMING

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 1,6

2. Program EVD preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVD Clear = 2
   EVD Clearance Phases = 3,8

3. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

4. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 8
   PHASE 4 MIN FDW = 9
   PHASE 6 MIN FDW = 7
   PHASE 8 MIN FDW = 9

Program Preempt Extend time on optical detector units for 2.0 sec.

MIN WALK DURING PREEMPTION PROGRAMMING

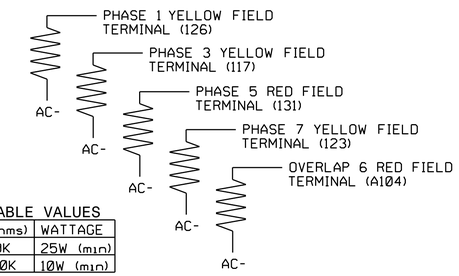
To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)



ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO ENSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0307
DESIGNED: September 2015
SEALED: 2/1/2016
REVISED: N/A

THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 03/11/15

Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 501 Bus. (N. Roxboro St.)
at
SR 1669 (E. Club Blvd.)

Division 5 Durham County Durham

PLAN DATE: February 2015	REVIEWED BY:	T. Joyce	
PREPARED BY: C. Strickland	REVIEWED BY:		

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MINS

DocuSigned by: Keith M. Mins 2/4/2016
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DATE

SIG. INVENTORY NO. 05-0307

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cestrickland

PROJECT NO.	SHEET NO.
	Sig. P1

STATE OF
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DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

06-14

ENGLISH DETAIL DRAWING FOR

PEDESTRIAN PUSHBUTTON LOCATIONS

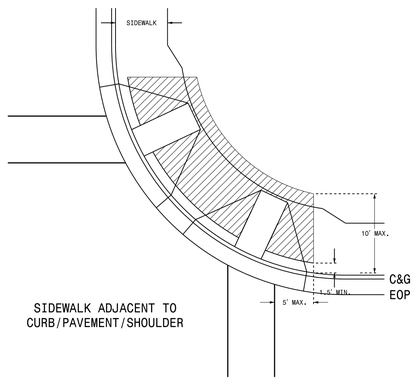
PLACEMENT DETAIL

SHEET 1 OF 3

1705D01

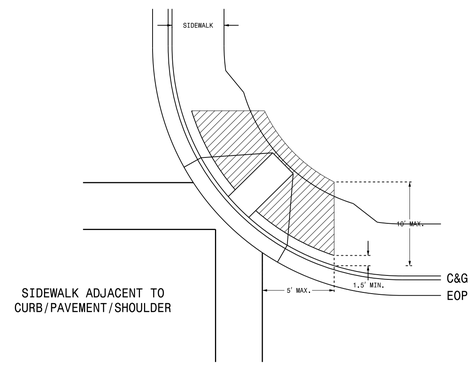
PUSHBUTTON PLACEMENT

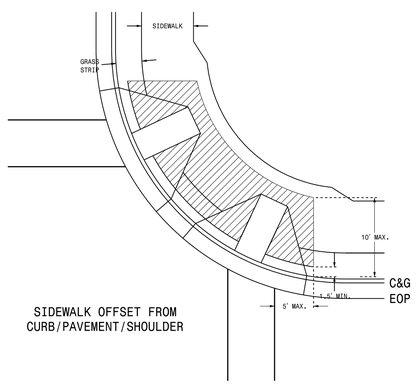
SEPARATE CURB RAMPS

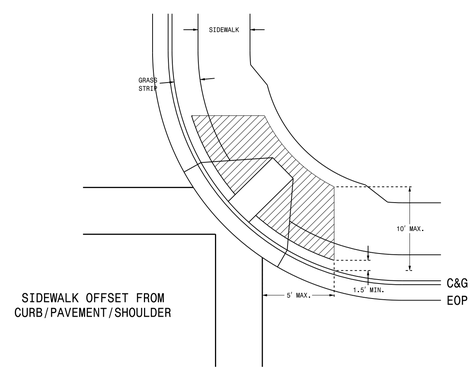


PUSHBUTTON PLACEMENT

SHARED CURB RAMP







NOTES

1. Pushbutton pedestals should not be located further than 10 feet from the edge of curb, shoulder, or pavement.
2. The face of the pushbutton should be parallel to the applicable crosswalk.
3. Separate pushbuttons used on the same corner should be separated by a distance of at least 10 feet.
4. Pushbuttons shall be installed adjacent to a level surface with a maximum reach distance of 10 inches.
5. Maintain 4 feet of clearance around pedestal if located in sidewalk.
6. Refer to section 1705 of the 2012 NCDOT Roadway Standard Drawings for Pushbutton Assembly details.
7. Refer to section 1743 of the 2012 NCDOT Roadway Standard Drawings for Pedestal details.
8. Contact Division Traffic Engineer for pushbutton location approval prior to installation.
9. Curb ramps are for symbolic use only and may not reflect actual design or field conditions.

LEGEND

PROPOSED

- Signal Pole
- Type I Pushbutton Post
- Type II Signal Pedestal
- Pushbutton & Sign
- Pedestrian Signal Head
- Curb Ramp
- Pushbutton Location Area

STATE OF
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RALEIGH, N.C.

06-14

ENGLISH DETAIL DRAWING FOR

PEDESTRIAN PUSHBUTTON LOCATIONS

PLACEMENT DETAIL

SHEET 1 OF 3

1705D01

See Plate for Title

Prepared in the Offices of:

Transportation Mobility and Safety Division
Signal Design Section
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

750 N. Greenfield Parkway
Garner, NC 27529

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA

DocuSigned by: 1B9B4B9B27A4494 SIGNATURE

6/17/2014 DATE

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rziemba

PROJECT NO.	SHEET NO.
	Sig. P2

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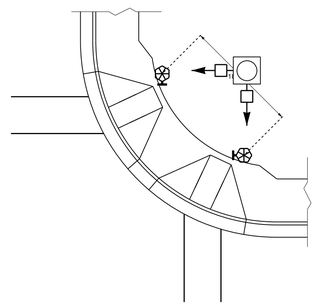
ENGLISH DETAIL DRAWING FOR
PEDESTRIAN PUSHBUTTON LOCATIONS
PLACEMENT DETAIL

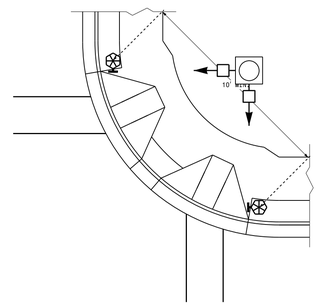
SHEET 2 OF 3
1705D01

TYPICAL PUSHBUTTON LOCATIONS (CASE I)

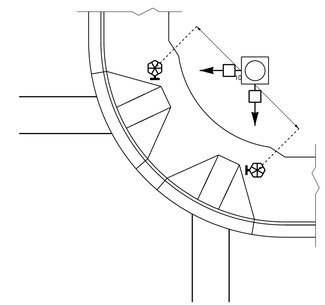
SEPARATE CURB RAMPS W/ TYPE I PEDESTALS



BACK OF SIDEWALK IS WITHIN 10'
OF CURB OR PAVEMENT/SHOULDER



GRASS STRIP PLACEMENT IF BACK
OF SIDEWALK EXCEEDS 10' FROM
CURB OR PAVEMENT/SHOUDLER



PUSHBUTTON PLACEMENT
IN WIDE SIDEWALK

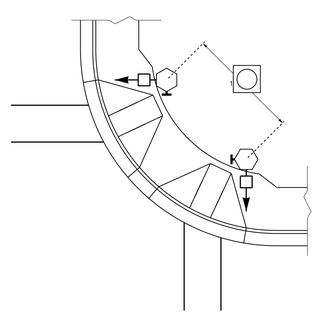
PROPOSED

LEGEND

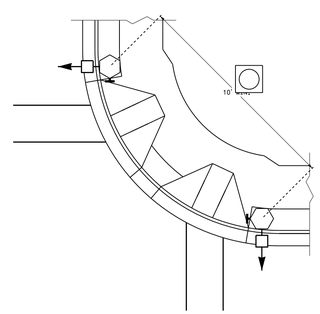
- Signal Pole
- Type I Pushbutton Post
- Type II Signal Pedestal
- Pushbutton & Sign
- Pedestrian Signal Head
- Curb Ramp
- Pushbutton Location Area

TYPICAL PUSHBUTTON LOCATIONS (CASE II)

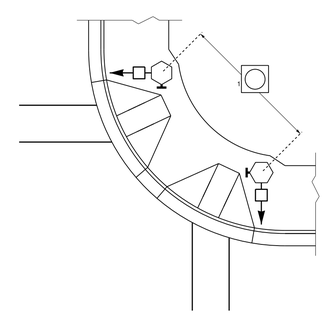
SEPARATE CURB RAMPS W/ TYPE II PEDESTALS



BACK OF SIDEWALK IS WITHIN 10'
OF CURB OR PAVEMENT/SHOULDER



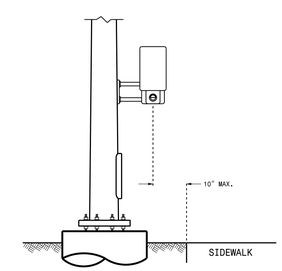
GRASS STRIP PLACEMENT IF BACK
OF SIDEWALK EXCEEDS 10' FROM
CURB OR PAVEMENT/SHOULDER



PUSHBUTTON PLACEMENT
IN WIDE SIDEWALK

OPTIONAL PUSHBUTTON EXTENSION

FACE OF PUSHBUTTON PARALLEL TO
APPLICABLE CROSSWALK



STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

06-14

ENGLISH DETAIL DRAWING FOR
PEDESTRIAN PUSHBUTTON LOCATIONS
PLACEMENT DETAIL

SHEET 2 OF 3
1705D01

See Plate for Title

Prepared in the Offices of:

Transportation Mobility and Safety Division
Signal Design Section

750 N. Greenfield Parkway
Garner, NC 27529

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA

DocuSigned by: 1B9D4B6274A4B4...

SIGNATURE

6/17/2014

DATE

26-AUG-2014 16:38
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rziemba

PROJECT NO.	SHEET NO.
	Sig. P3

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RALEIGH, N.C.

06-14

ENGLISH DETAIL DRAWING FOR

PEDESTRIAN PUSHBUTTON LOCATIONS

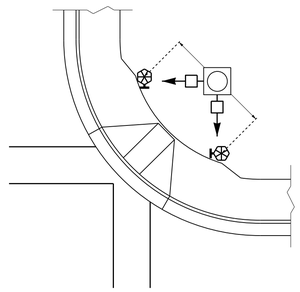
PLACEMENT DETAIL

SHEET 3 OF 3

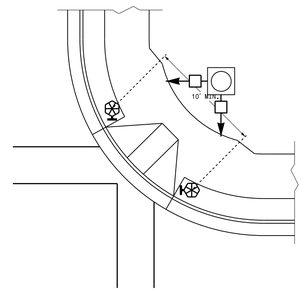
1705D01

TYPICAL PUSHBUTTON LOCATIONS (CASE III)

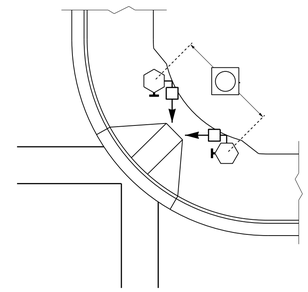
SHARED CURB RAMPS



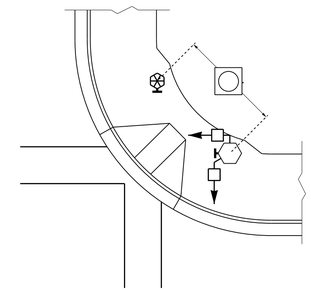
BACK OF SIDEWALK IS WITHIN 10′ OF CURB OR PAVEMENT/SHOULDER



GRASS STRIP PLACEMENT IF BACK OF SIDEWALK EXCEEDS 10′ FROM CURB OR PAVEMENT/SHOULDER

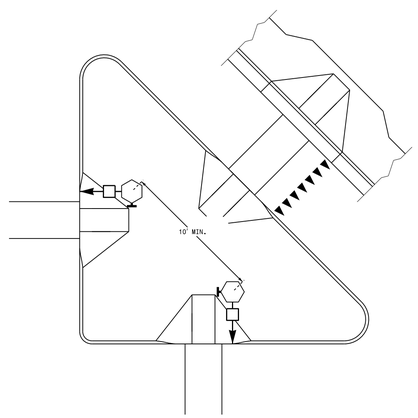


PUSHBUTTON PLACEMENT IN WIDE SIDEWALK (CORRESPONDING PUSHBUTTONS AND SIGNAL HEADS ON DIFFERENT PEDESTALS)

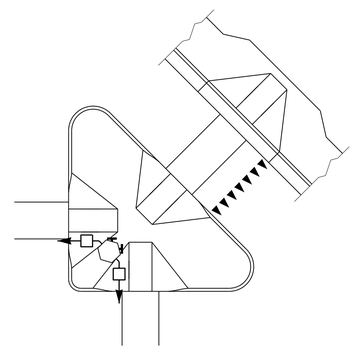


PUSHBUTTON PLACEMENT WITH SHARED TYPE II SIGNAL PEDESTAL AND TYPE I PUSHBUTTON POST

TRAFFIC ISLAND PUSHBUTTON LOCATIONS

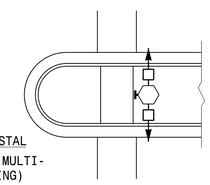


PUSHBUTTON PLACEMENT IN LARGE "PORK CHOP ISLAND" WITH SEPARATE PEDESTALS



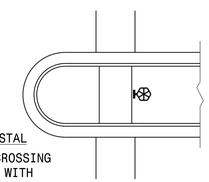
PUSHBUTTON PLACEMENT IN SMALL "PORK CHOP ISLAND" WITH SHARED PEDESTAL

PUSHBUTTON PLACEMENT IN MEDIAN



TYPE II PEDESTAL

(FOR STAGED OR MULTI-PHASE CROSSING)



TYPE I PEDESTAL

(FOR COMPLETE CROSSING CURB TO CURB WITH OPTIONAL REFUGE)

LEGEND

PROPOSED

- Signal Pole
- Type I Pushbutton Post
- Type II Signal Pedestal
- Pushbutton & Sign
- Pedestrian Signal Head
- Curb Ramp
- Pushbutton Location Area

STATE OF
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RALEIGH, N.C.

06-14

ENGLISH DETAIL DRAWING FOR

PEDESTRIAN PUSHBUTTON LOCATIONS

PLACEMENT DETAIL

SHEET 3 OF 3

1705D01

See Plate for Title

Prepared in the Offices of:

Transportation Mobility and Safety Division
Signal Design Section
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

750 N. Greenfield Parkway
Garner, NC 27529

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA

DocuSigned by: 1B9B4B9D274A4b8 — SIGNATURE

6/17/2014 — DATE

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