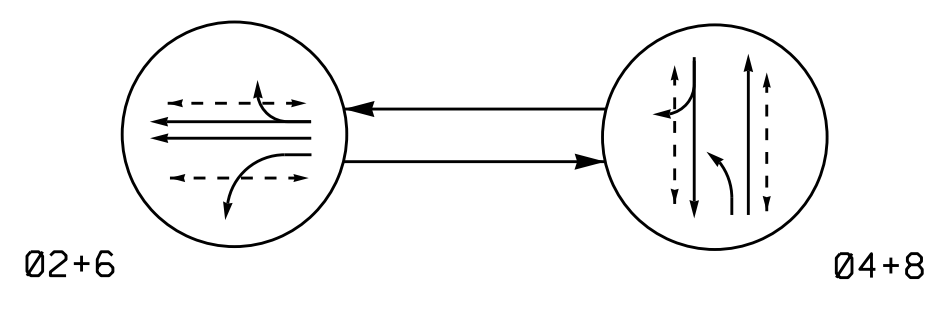
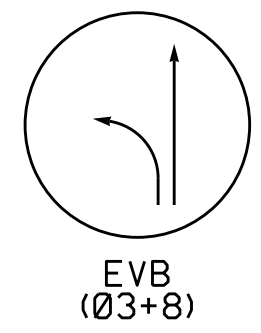


PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND
 ● — DETECTED MOVEMENT
 — — UNDETECTED MOVEMENT (OVERLAP)
 - - - UNSIGNALIZED MOVEMENT
 <- - - - PEDESTRIAN MOVEMENT

EV PREEMPT PHASES



SIGNAL FACE I.D.

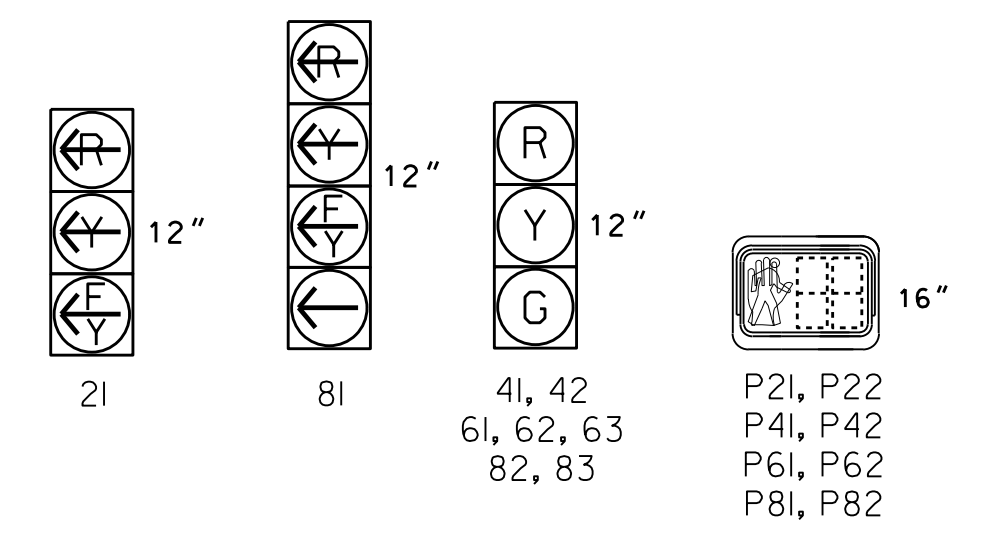


TABLE OF OPERATION

SIGNAL FACE	PHASE			
	02+6	04+8	EVB	FLIGHT
2I	F	F	F	F
4I, 42	R	G	R	R
6I, 62, 63	G	R	R	Y
8I	R	F	-	R
82, 83	R	G	G	R
P2I, P22	W	DW	DW	DRK
P4I, P42	DW	W	DW	DRK
P6I, P62	W	DW	DW	DRK
P8I, P82	DW	W	DW	DRK

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

2033 EMERGENCY PREEMPTION TIMING CHART

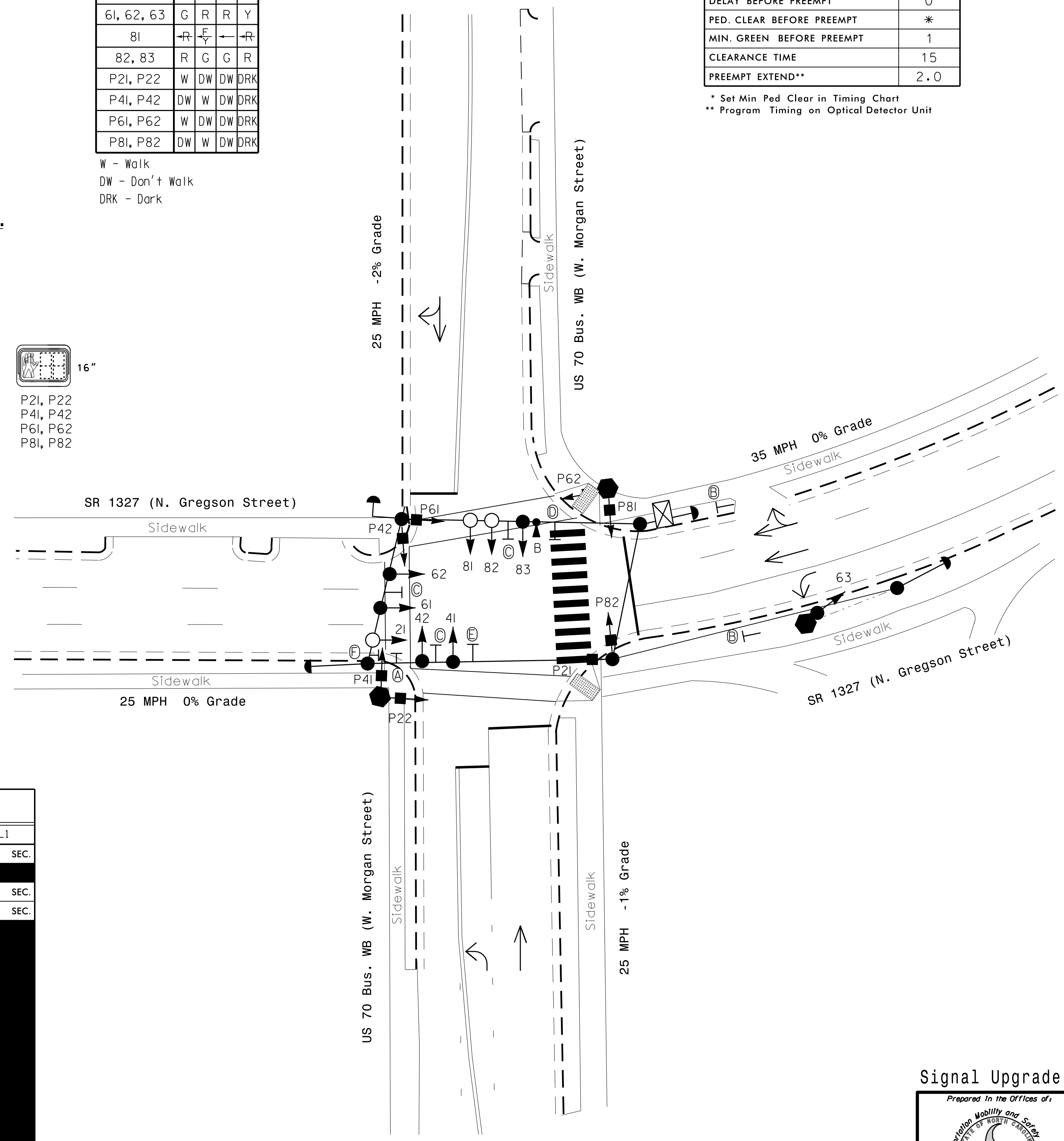
FUNCTION	EVB (3+8) SECONDS
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	*
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	15
PREEMPT EXTEND**	2.0

* Set Min Ped Clear in Timing Chart
 ** Program Timing on Optical Detector Unit

2 Phase Pre-Timed w/ EV Preemption (Durham Signal System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Renumber existing signal heads and phases as shown.
- Reposition existing signal heads numbered 61, 62, 82, and 83.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
- Set phase bank 3 maximum limit to 250 seconds for phases used.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Pavement markings are existing.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
- Upon completion of Emergency Vehicle Preemption, controller returns to normal operation based on vehicle demand.



LEGEND

PROPOSED	EXISTING
○ → Traffic Signal Head	● → N/A
● → Modified Signal Head	— → Sign
□ → Pedestrian Signal Head	■ → Signal Pole with Guy
○ → Signal Pole with Guy	● → Signal Pole with Sidewalk Guy
○ → Signal Pole with Sidewalk Guy	□ → Inductive Loop Detector
□ → Inductive Loop Detector	□ → Controller & Cabinet
□ → Junction Box	□ → Junction Box
--- → 2-in Underground Conduit	--- → Right of Way
→ → Directional Arrow	→ → Directional Arrow
○ → Type II Signal Pedestal	● → Optical Detector
○ → Optical Detector	▲ → Curb Ramp
▲ → Curb Ramp	(A) → "NO TURN ON RED" Sign (R10-11)
(A) → "NO TURN ON RED" Sign (R10-11)	(B) → "DO NOT ENTER" Sign (R5-1)
(B) → "DO NOT ENTER" Sign (R5-1)	(C) → Street Name Sign (D3-1)
(C) → Street Name Sign (D3-1)	(D) → No Right Turn Sign (R3-1)
(D) → No Right Turn Sign (R3-1)	(E) → No Left Turn Sign (R3-2)
(E) → No Left Turn Sign (R3-2)	(F) → Left Arrow "ONLY" Sign (R3-5L)
(F) → Left Arrow "ONLY" Sign (R3-5L)	

TIMING CHART
 2033 SOFTWARE w/ 2070 CONTROLLER

PHASE	02	03	04	06	08	0L1
MINIMUM INITIAL *	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.	10 SEC.
VEHICLE EXTENSION *	0.0 SEC.	0.0 SEC.	0.0 SEC.	0.0 SEC.	0.0 SEC.	
YELLOW CHANGE INT.	3.8 SEC.	3.0 SEC.	3.3 SEC.	3.8 SEC.	3.3 SEC.	3.8 SEC.
RED CLEARANCE	1.3 SEC.	1.9 SEC.	1.8 SEC.	1.3 SEC.	1.8 SEC.	1.3 SEC.
MAXIMUM LIMIT *	60 SEC.	30 SEC.	30 SEC.	60 SEC.	30 SEC.	30 SEC.
RECALL POSITION	MAX/PED RECALL	NONE	MAX/PED RECALL	MAX/PED RECALL	MAX/PED RECALL	
VEHICLE CALL MEMORY	N/A	N/A	N/A	N/A	N/A	
DOUBLE ENTRY	OFF	OFF	ON	OFF	ON	
ADVANCE WALK	5 SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
WALK *	7 SEC.	- SEC.	7 SEC.	7 SEC.	7 SEC.	
MINIMUM PED CLEAR	5 SEC.	- SEC.	5 SEC.	5 SEC.	5 SEC.	
FLASHING DON'T WALK	10 SEC.	- SEC.	6 SEC.	9 SEC.	11 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*	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MINIMUM GAP	- SEC.	- SEC.	- SEC.	- SEC.	- 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.

Signal Upgrade

Prepared In the Offices of:

 TRANSPORTATION MOBILITY AND SAFETY SOLUTIONS, INC.
 ENGINEERS OF TRANSPORTATION SIGNAL DESIGN SECTION
 750 N. Greenfield Pkwy, Garner, NC 27529

SR 1327 (N. Gregson Street) at US 70 Bus. WB (W. Morgan Street)

Division 5 Durham County Durham

PLAN DATE: August 2016 REVIEWED BY: [Signature]
 PREPARED BY: C.E. Carter REVIEWED BY: [Signature]

REVISIONS: [Table]
 INIT. DATE

SCALE: 1"=20'

10/24/2016
 SIG. INVENTORY NO. 05-1005

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

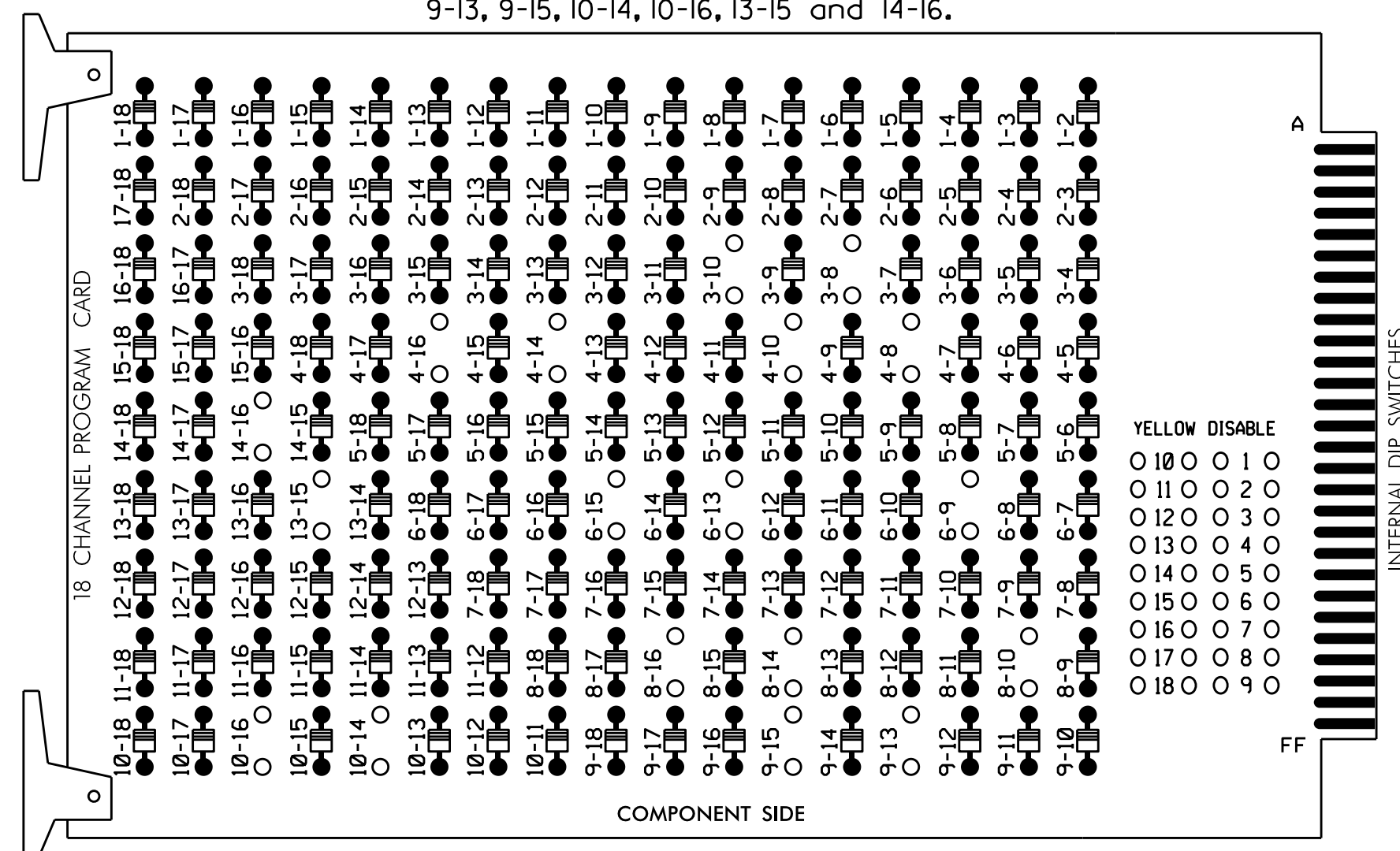
31-001-2016-16-01
 S:\MIS\2016\16-01\SIG\Signal Design\Section\Central Region\01\5405-1005\051005_sig.dgn, 20161024.dgn
 PZT:erob

EDI MODEL 2018ECL-NC CONFLICT MONITOR

PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

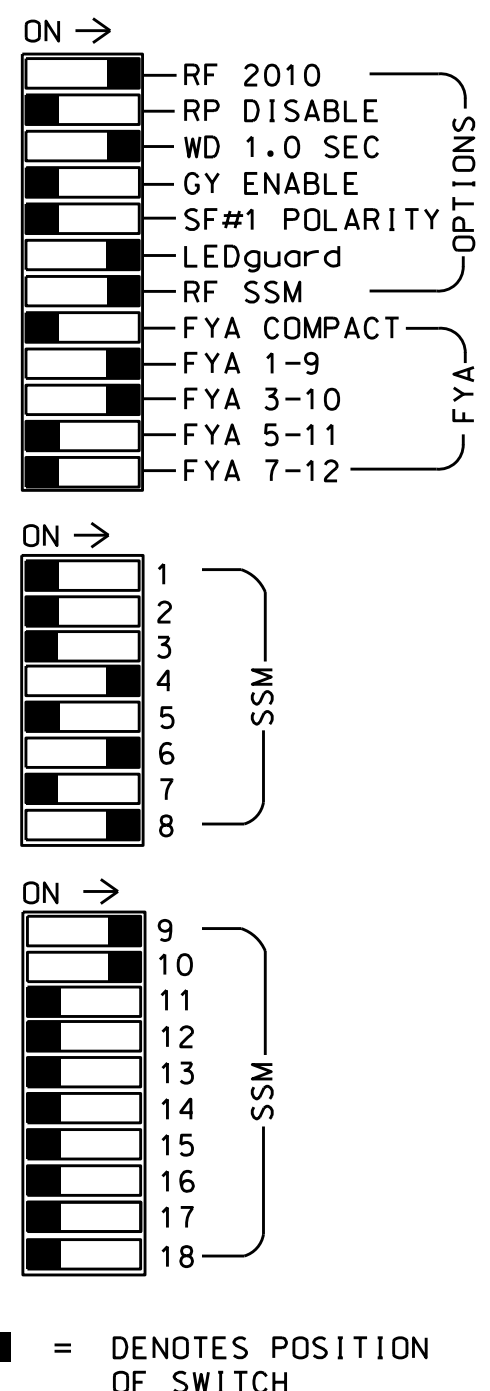
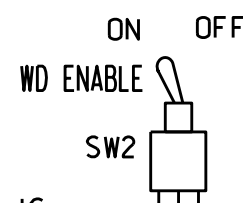
REMOVE DIODE JUMPERS 3-8, 3-10, 4-8, 4-10, 4-14, 4-16, 6-9, 6-13, 6-15, 8-10, 8-14, 8-16, 9-13, 9-15, 10-14, 10-16, 13-15 and 14-16.



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.

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	NC	P21, P22	81	41,42	P41, P42	NU	61,62,63	P61, P62	NU	82,83	P81, P82	21	81	NU	NU	NU	NU				
RED					101			134			107											
YELLOW				*	102			135			108											
GREEN					103			136			109											
RED ARROW														A121	A124							
YELLOW ARROW														A122	A125							
FLASHING YELLOW ARROW														A123	A126							
GREEN ARROW							118															
Hand									113				104			119		110				
Person																		115	106	121		112

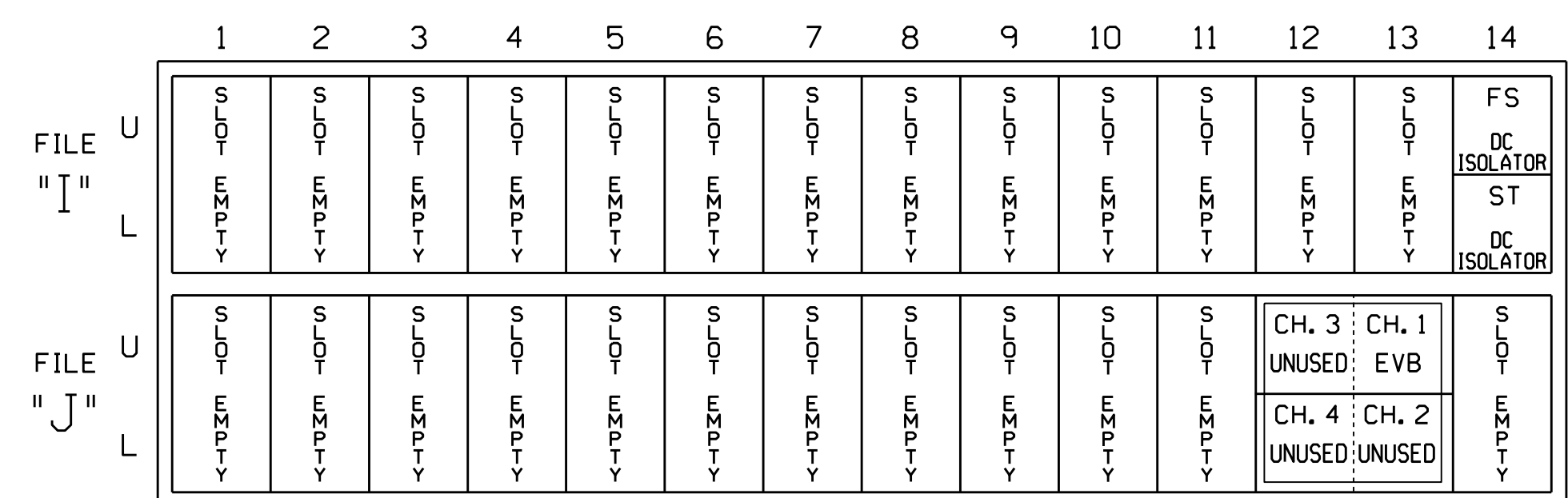
NU = Not Used
 NC = No Connectin
 * Denotes install load resistor. See load resistor installation detail this sheet.
 ★ See pictorial of head wiring in detail this sheet.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
 CABINET.....332 W/ AUX
 SOFTWARE.....McCAIN 2033
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...18 WITH AUX FILE
 LOAD SWITCHES USED.....S3,S4,S5,S6,S8,S9,S11,S12,AUX S1,AUX S2
 PHASES USED.....**2,**3,4,6,8,2 PED,4 PED,6 PED,8 PED
 OVERLAP 1.....2
 OVERLAP 2.....*
 OVERLAP 3.....NOT USED
 OVERLAP 4.....NOT USED
 * SEE FYA PPLT PROGRAMMING DETAIL ON SHEET 2.
 ** USED FOR TIMING PURPOSES ONLY
 *** USED FOR PREEMPTION

INPUT FILE POSITION LAYOUT

(front view)

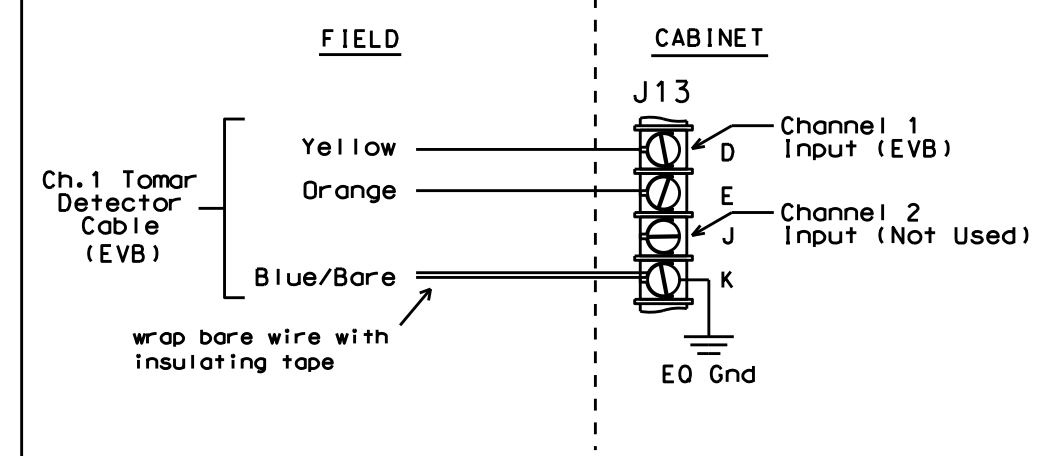


EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
 ST = STOP TIME
 EVB = EMERGENCY VEHICLE PREEMPT
 TOMAR OSP CARD INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)

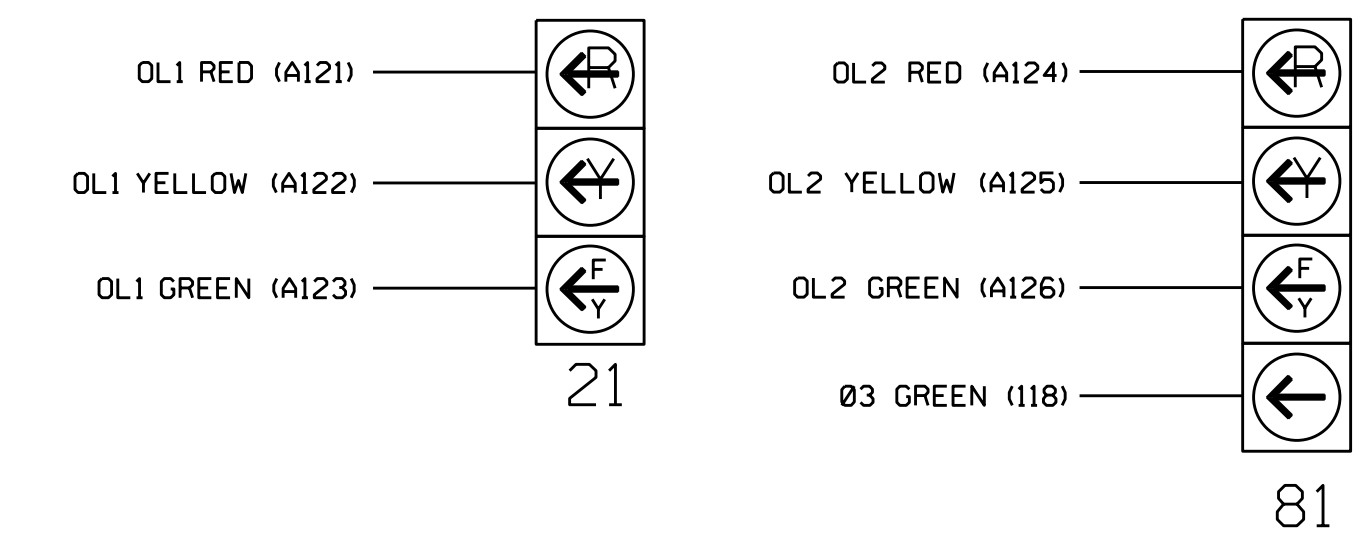


COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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.

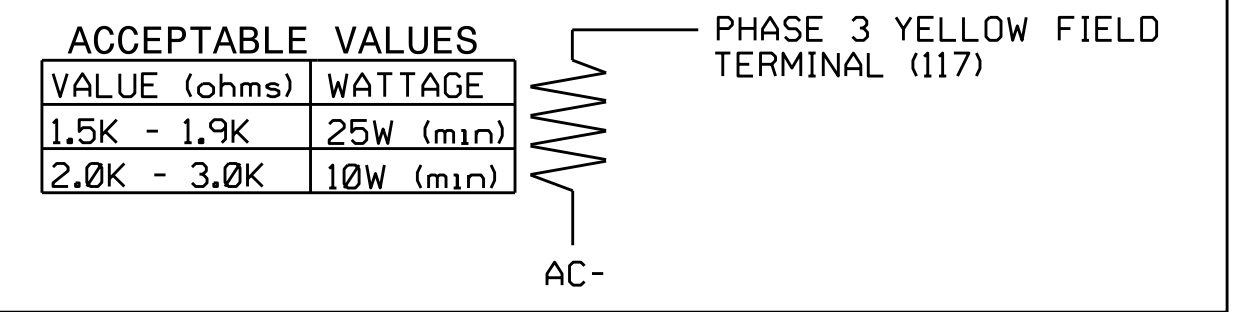
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1005
 DESIGNED: August 2016
 SEALED: 10-24-16
 REVISED: N/A

Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared In the Offices of:
 TRANSPORTATION MOBILITY AND SAFETY DIVISION
 NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 Signal Management Section

750 N. Greenfield Pkwy, Garner, NC 27529

SR 1327 (N. Gregson Street) at US 70 Bus. WB (W. Morgan Street)

Division 5 Durham County Durham

PLAN DATE: October 2016 REVIEWED BY:
 PREPARED BY: James Peterson REVIEWED BY:

REVISIONS	INIT.	DATE

DocuSigned by:
 Keith M. Mims 10/27/2016
 2F8078E8C03445 DATE

SIG. INVENTORY NO. 05-1005

05-1005-2016_07-25
 S:\IT\SSS\15_Signal\work\hgr\docs\sig_Manual\eter\son\051005_smc_e...xxx.dgn
 J.peterson

FYA PPLT PROGRAMMING

1. Program Flashing Yellow Arrow phases as follows:
Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
PPLT FYA = PHASE 3
2. Assign output pin for Flashing Yellow Arrow as follows:
Main Menu - 6) OUTPUTS - F) FYA PPLT
Phase 3 = 96
3. Redirect RED and YELLOW outputs for the left turn phases as follows:
Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
Phase 3 RED = 94, Phase 3 YELLOW = 95

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
EVB Clear = 15
EVB Clearance Phases = 3.8
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 = 5
Phase 6 MIN FDW = 5
Phase 8 MIN FDW = 5

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

**OVERLAP GREEN FLASH PROGRAMMING DETAIL
(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 = 1

MIN WALK DURING PREEMPTION

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:

- Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

OVERLAP [1] PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

- OVERLAP [1]:
- | | |
|------------------------|--------------------------|
| LOADSWITCH = 9 | NOTE: FOR SIGNAL HEAD 21 |
| VEH SET 1 = 2 | |
| YELLOW CLEARANCE = 3.8 | |
| RED CLEARANCE = 1.3 | |

END OF OVERLAP PROGRAMMING

ADVANCE WALK PROGRAMMING

Program Leading PED Interval as follows:

1. Main Menu - 1) PHASE - 1) PHASE FUNCTIONS PAGE ONE
ADVANCE WALK = 2
2. Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
WALK Phase 2 = 7
ADV/DELAY WALK Phase 2 = 5

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

STARTUP CALLS PROGRAMMING

Prevents Veh Call to phase 3 during Startup. Phase 3 used only during Preempt.

- Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,4,6,8
PED CALLS 2,4,6,8

FLASHER CIRCUIT MODIFICATION DETAIL

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


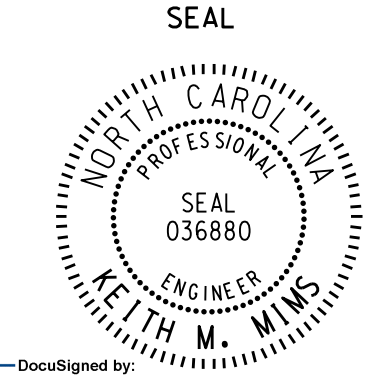
1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1005
DESIGNED: August 2016
SEALED: 10-24-16
REVISED: N/A

Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

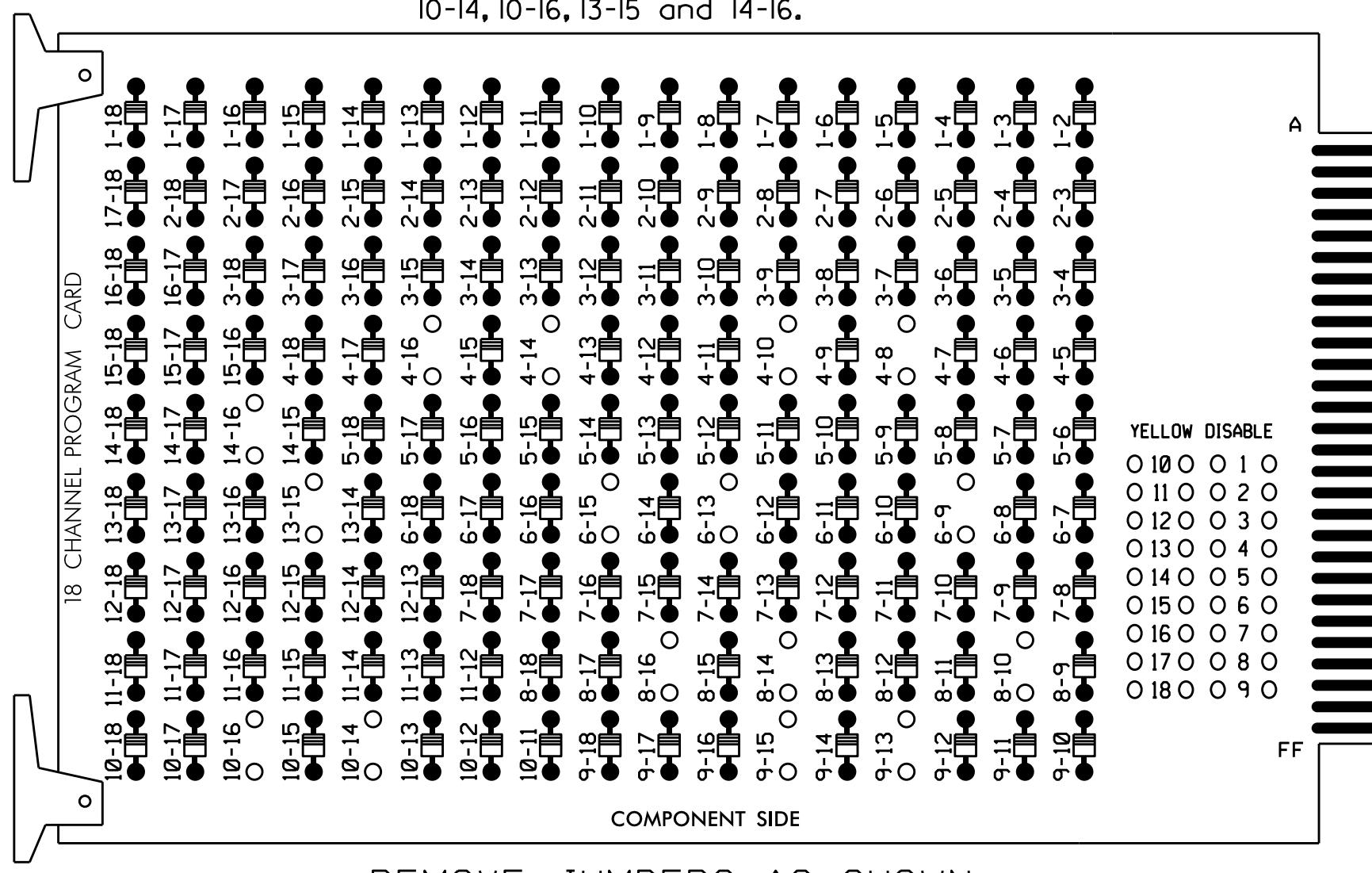
	Prepared In the Offices of: SR 1327 (N. Gregson Street) at US 70 Bus. WB (W. Morgan Street)		
	Division 5 PLAN DATE: October 2016 PREPARED BY: James Peterson	Durham County REVIEWED BY: REVIEWED BY:	
REVISIONS		INIT.	DATE
DocuSigned by: Keith M. Mims		10/27/2016	
SIG. INVENTORY NO. 05-1005		DATE	

27-0037-2016-08-15
 S:\MITS\Signal\work\hgr\05-1005_sml.ele...xxx.dgn
 J. Peterson

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

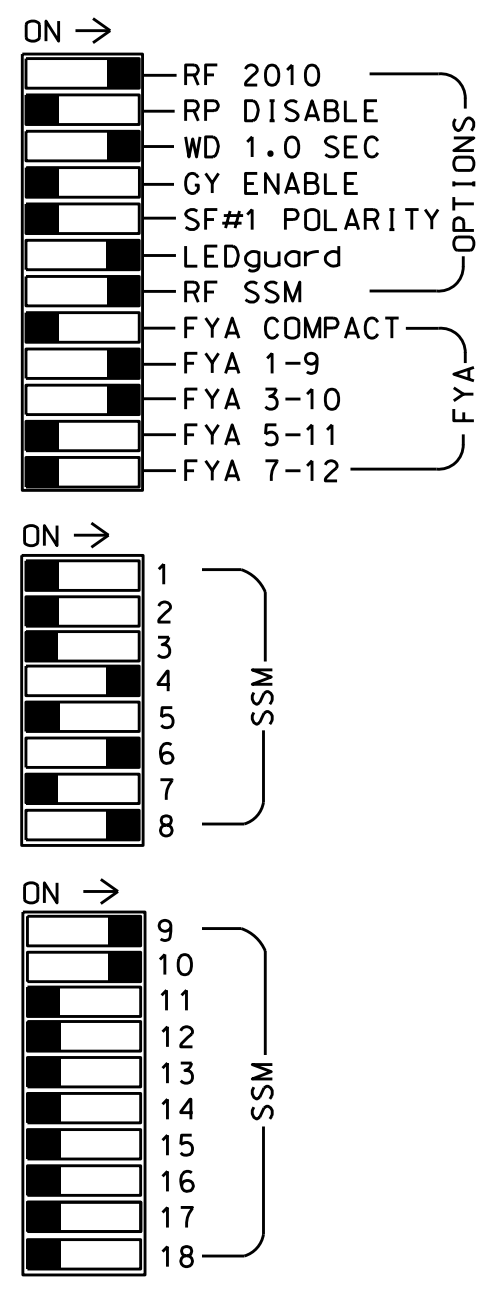
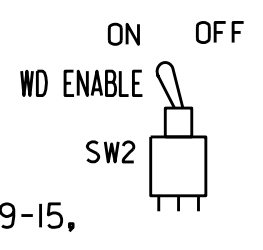
REMOVE DIODE JUMPERS 4-8, 4-10, 4-14, 4-16, 6-9, 6-13, 6-15, 8-10, 8-14, 8-16, 9-13, 9-15, 10-14, 10-16, 13-15 and 14-16.



REMOVE JUMPERS AS SHOWN

NOTES:

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



■ = DENOTES POSITION OF SWITCH

NOTES

- 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.
- Program controller to Start Up in phases 2 and 6 green.
- 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.
- Enable Simultaneous Gap-Out feature for all phases.
- Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
- Set phase bank 3 maximum limit to 250 seconds for phases used.
- Program phases 4 and 8 for Double Entry.
- Ensure start up flash phases are coordinated with flash program block assignments.
- Program Startup Ped Calls for phases 2, 4, 6, and 8.
- Set the Red Revert interval on the controller to 1 second.
- 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.	NU	NC	P21, P22	NU	41,42	P41, P42	NU	61,62	P61, P62	NU	82,83	P81, P82	21	81	NU	NU	NU	NU
RED					101			134			107							
YELLOW					102			135			108							
GREEN					103			136			109							
RED ARROW														A121	A124			
YELLOW ARROW														A122	A125			
FLASHING YELLOW ARROW														A123	A126			
GREEN ARROW																		
Hand				113			104			119			110					
Walking Person				115			106			121			112					

NU = Not Used
NC = No Connection

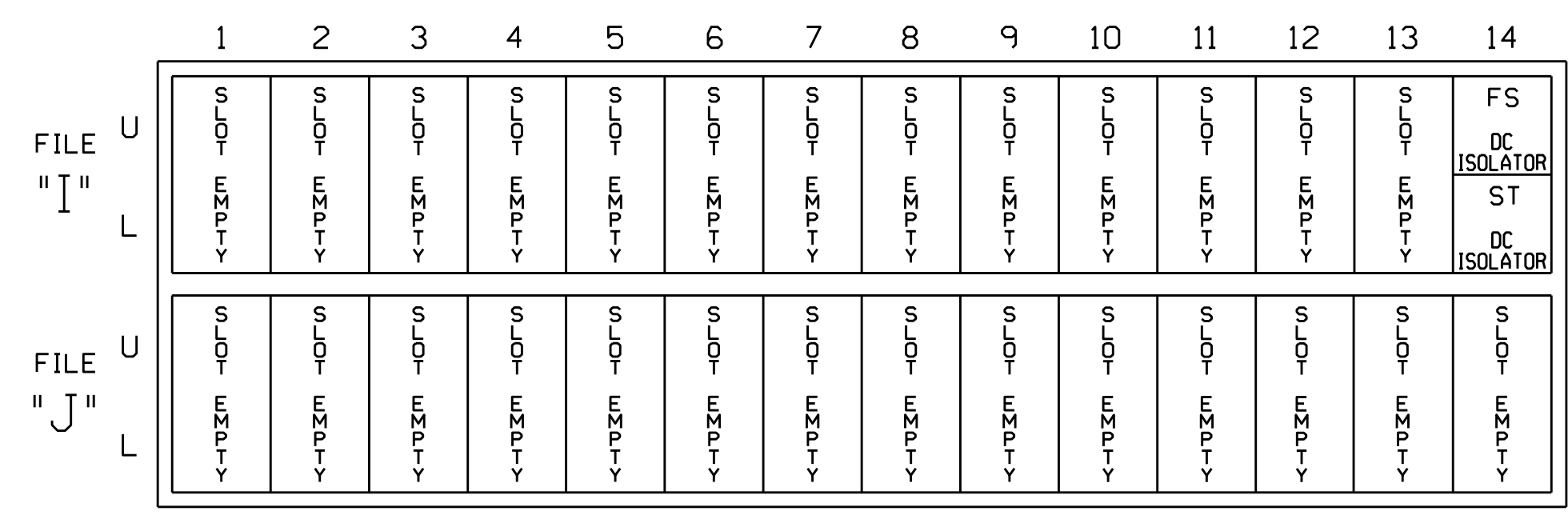
★ See pictorial of head wiring in detail this sheet.

EQUIPMENT INFORMATION

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

INPUT FILE POSITION LAYOUT

(front view)



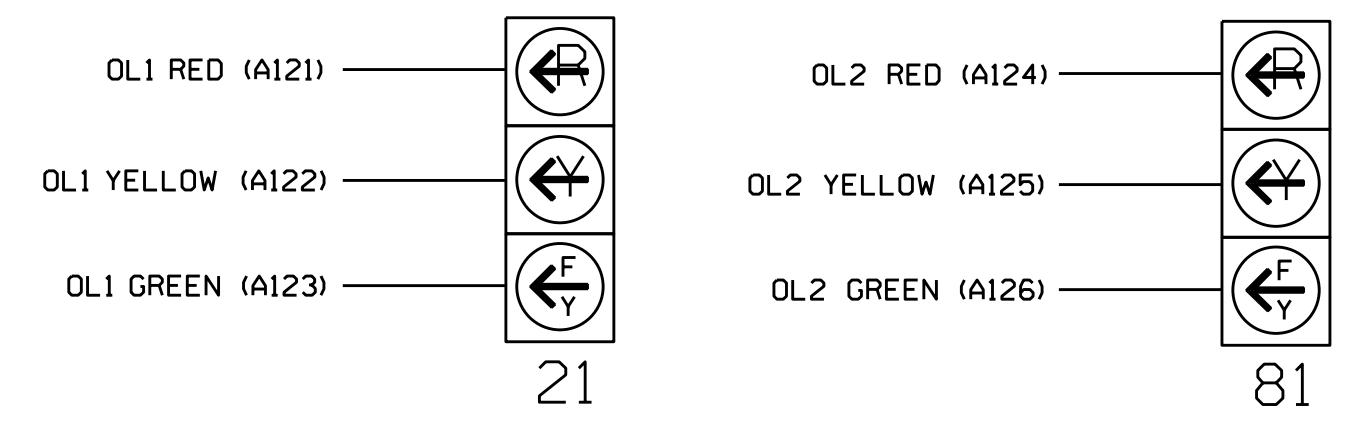
EX.: 1A, 2A, ETC. = LOOP NO.'S
FS = FLASH SENSE
ST = STOP TIME

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.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1007
DESIGNED: August 2016
SEALED: 10-24-16
REVISED: N/A

Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared In the Offices of: 750 N. Greenfield Pkwy, Garner, NC 27529	SR 1327 (Gregson Street) at US 70 Bus. EB (W. Main Street)		SEAL Keith M. Mims 10/27/2016
	Division 5 Durham County Durham	PLAN DATE: October 2016 REVIEWED BY: BAS	
REVISIONS		INIT. DATE	DocuSigned by: Keith M. Mims 10/27/2016 2F8078EBCD3445 DATE
SIG. INVENTORY NO. 05-1007			

05-1007-2016-10-23
S:\115531\115531\SIGNAL\work\hgr\oups\g_m\m\peter\son\051007_smc.e...xxx.dgn
J.peterson

