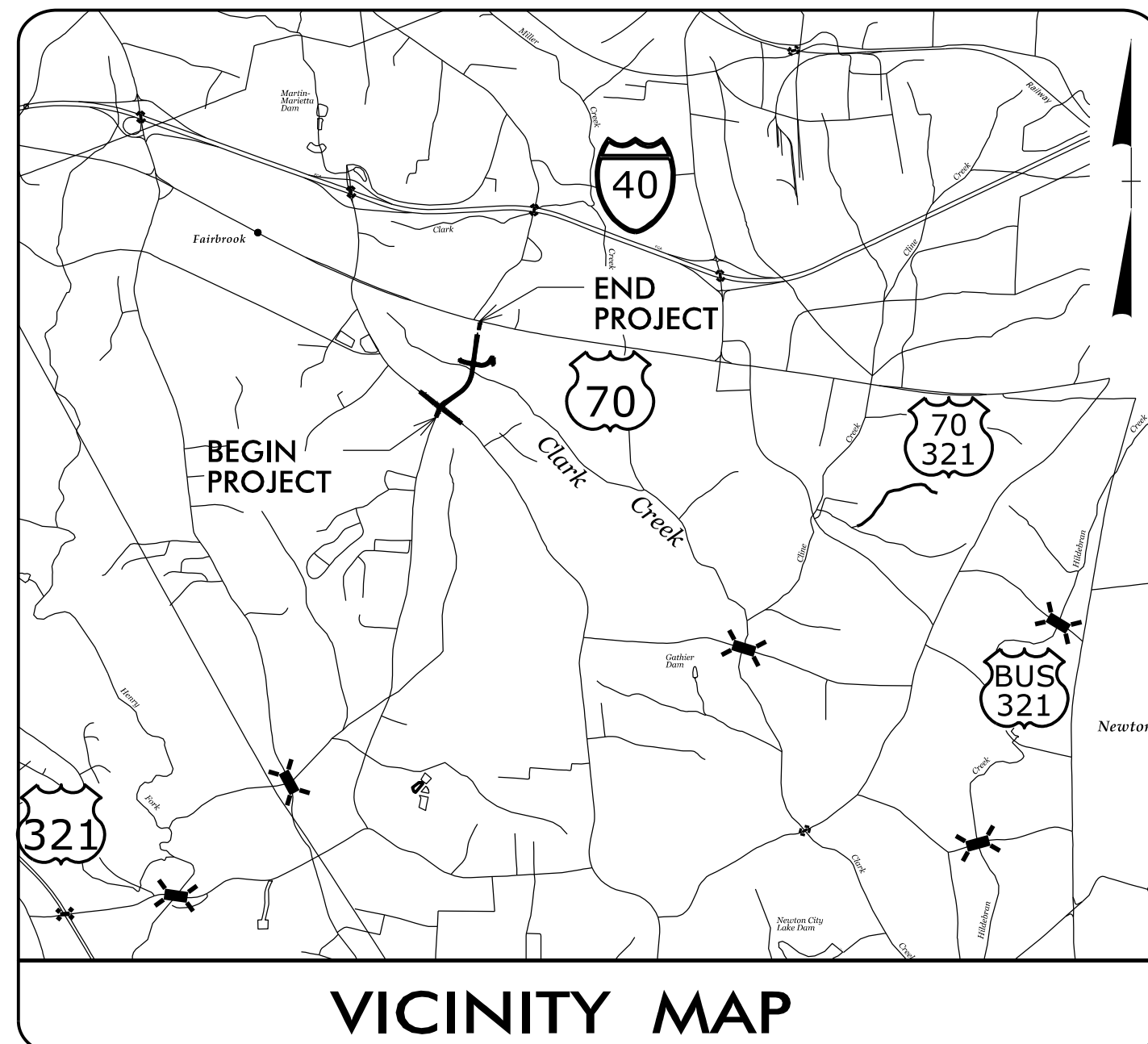


CONTRACT: DL00160

TIP PROJECT: U-5510

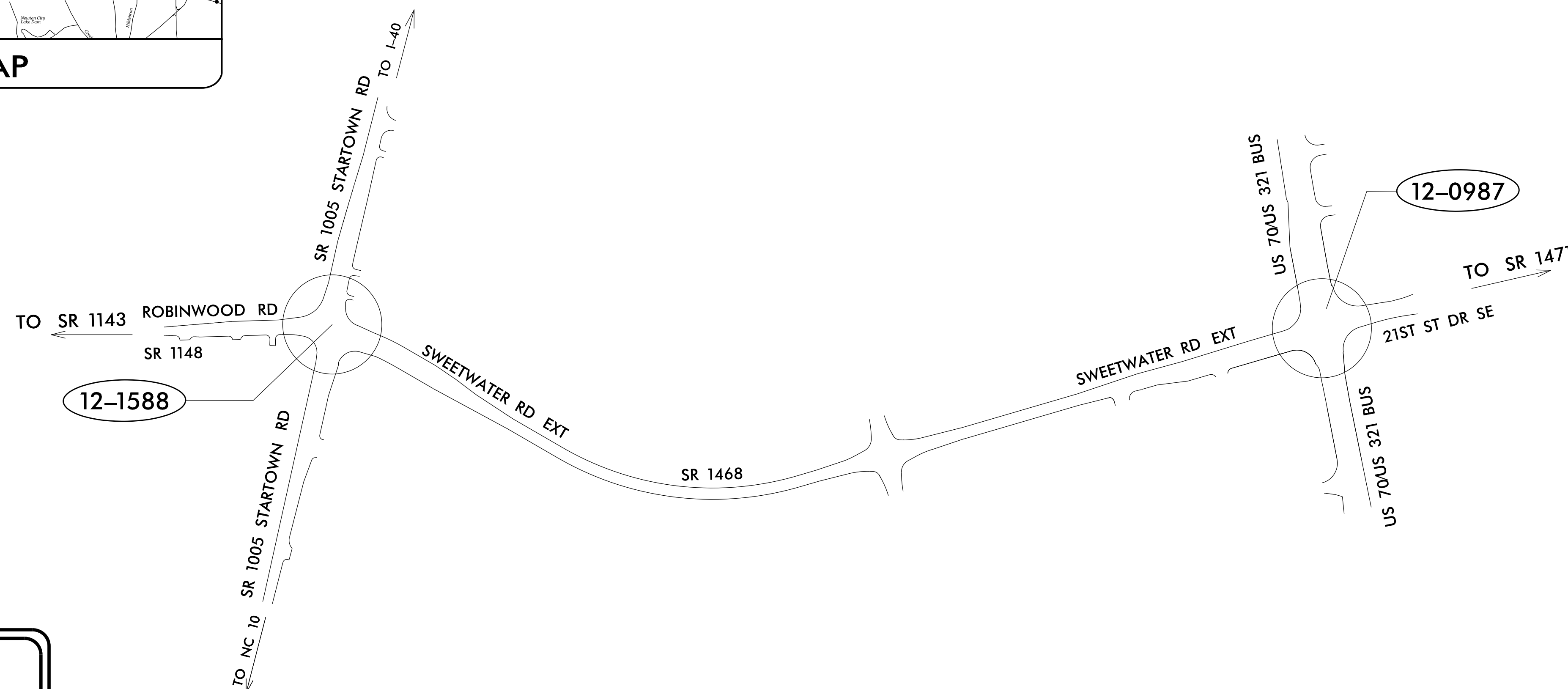
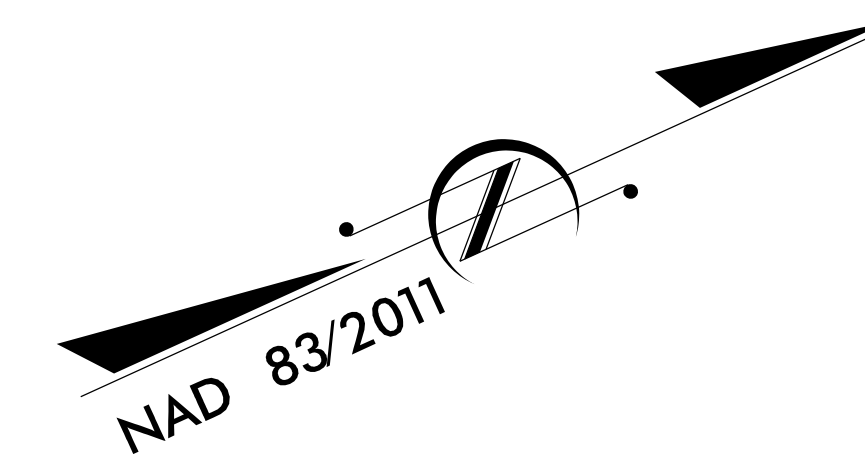


STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CATAWBA COUNTY

LOCATION: SR 1468 (SWEETWATER RD) EXTENSION FROM US 70 TO SR 1005 (STARTOWN RD)

TYPE OF WORK: TRAFFIC SIGNALS AND FIBER OPTIC COMMUNICATION CABLE ROUTING



PLANS PREPARED BY:



Joseph L. Lewis, PE - Project Manager
Pamela L. Alexander, PE - Project Engineer
Jianxin Ma, PE, PTOE - Project Engineer

Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.

INDEX OF PLANS

Sheet #	Reference #	Location /Description
Sig. 1.0	-----	Title Sheet
Sig. 2.0-2.1	12-1588T1	SR 1005 (Startown Rd.) at SR 1148 (Robinwood Rd.)/Sweetwater Rd. Ext. Phase I Temporary
Sig. 3.0-3.1	12-1588T2	SR 1005 (Startown Rd.) at SR 1148 (Robinwood Rd.)/Sweetwater Rd. Ext. Phase II Temporary
Sig. 4.0-4.4	12-1588	SR 1005 (Startown Rd.) at SR 1148 (Robinwood Rd.)/Sweetwater Rd. Ext. Final
Sig. 5.0-5.2	12-0987T	US 70 /US 321 BUS. at SR 1468 (Sweetwater Rd.) Temporary
Sig. 6.0-6.5	12-0987	US 70 /US 321 BUS. at Sweetwater Rd. Ext./21st St Dr. SE Final
SCP. 1-3	-----	Signal Communication Plans

LEGEND

- #### SIGNAL INVENTORY NUMBER

INTELLIGENT TRANSPORTATION AND SIGNALS UNIT

Contacts:

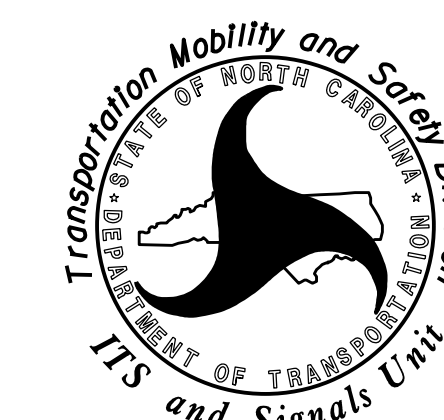
Tim Williams, PE - Western Region Signals Engineer
Todd Joyce, PE - Signal Equipment Design Engineer
Neil Avery - Intelligent Transportation Systems Engineer

SEAL



DocuSigned by:
Joseph L. Lewis
06/25/2017
ES565DF0428476
SIGNATURE DATE

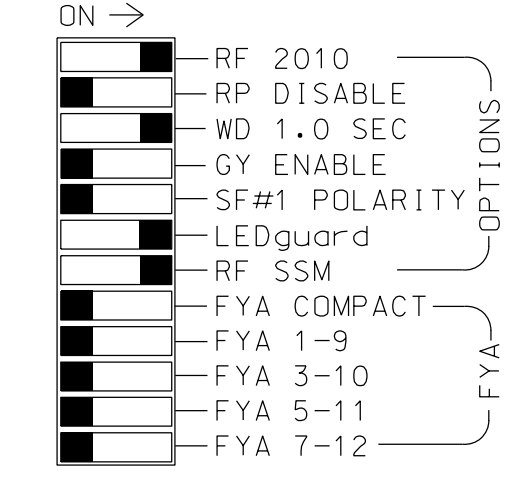
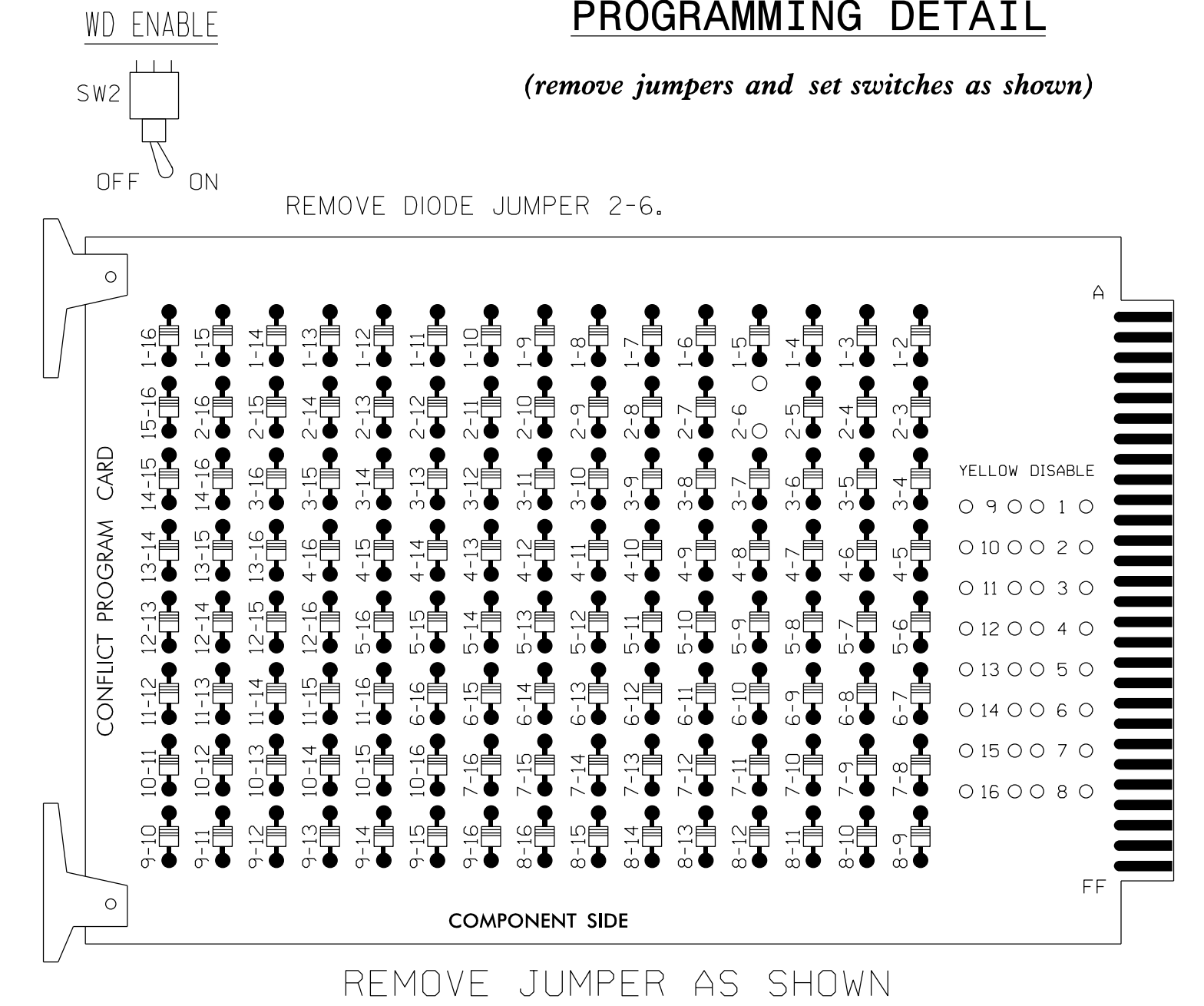
Prepared In the Office of:
DIVISION OF HIGHWAYS
TRANSPORTATION MOBILITY AND SAFETY
DIVISION



EDI MODEL 2010ECLIP CONFLICT MONITOR

PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Make sure jumpers SEL2-SEL5 are present on the monitor board.
3. Integrate monitor with Ethernet network in cabinet.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. To prevent red failures on unused monitor channels, see red monitor board programming detail this sheet.
3. Program controller to start up in phases 2 and 6 green.
4. Enable simultaneous gap-out feature, on controller unit, for all phases.
5. Program phases 2 and 6, on controller unit, for volume density operation.
6. The cabinet and controller are part of the Hickory City Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....SIEMENS 2070
 CABINET.....MCCAIN TRAFFIC MODEL 332 (DWG.NO.MDR3280)
 SOFTWARE.....SE-PAC2070
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S2,S4,S6
 PHASES USED.....2,4,6
 PEDS USED.....NONE
 OVERLAPS.....NONE

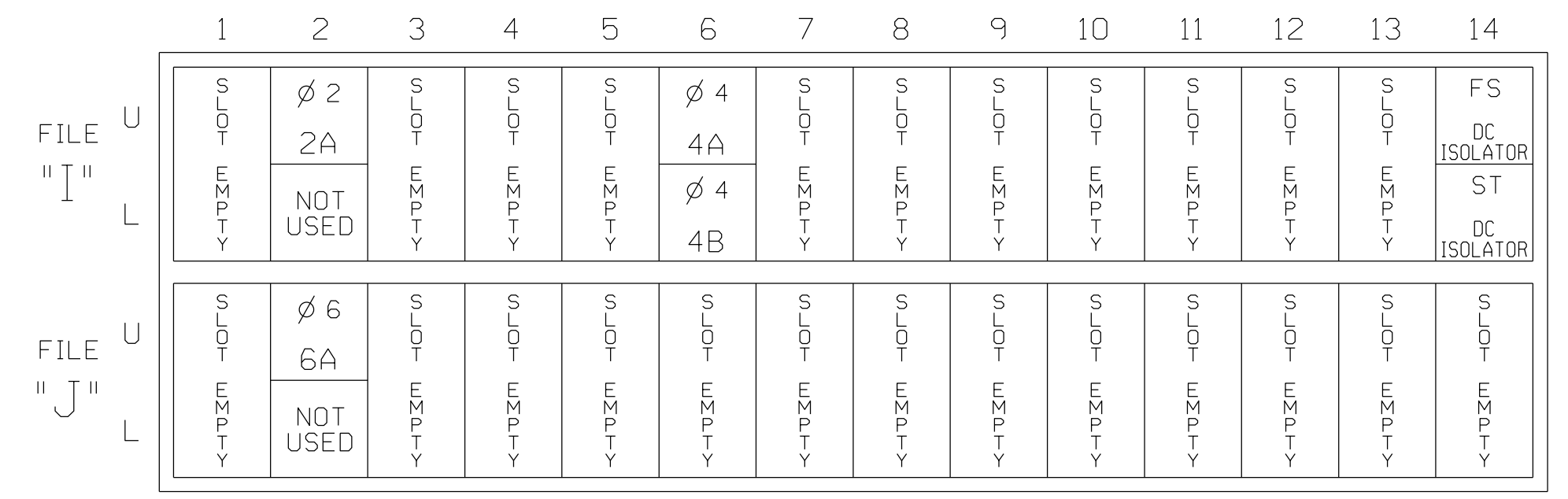
FIELD CONNECTION HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	22	NU	NU	61,62	NU	NU	NU
RED		128			101				134			
YELLOW		129			102				135			
GREEN		130			103				136			
RED ARROW												
YELLOW ARROW					102							
GREEN ARROW					103							

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)

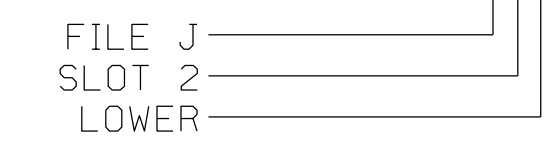


EX. : 1A, 2A, ETC. = LOOP NO.'S
 FS = FLASH SENSE
 ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

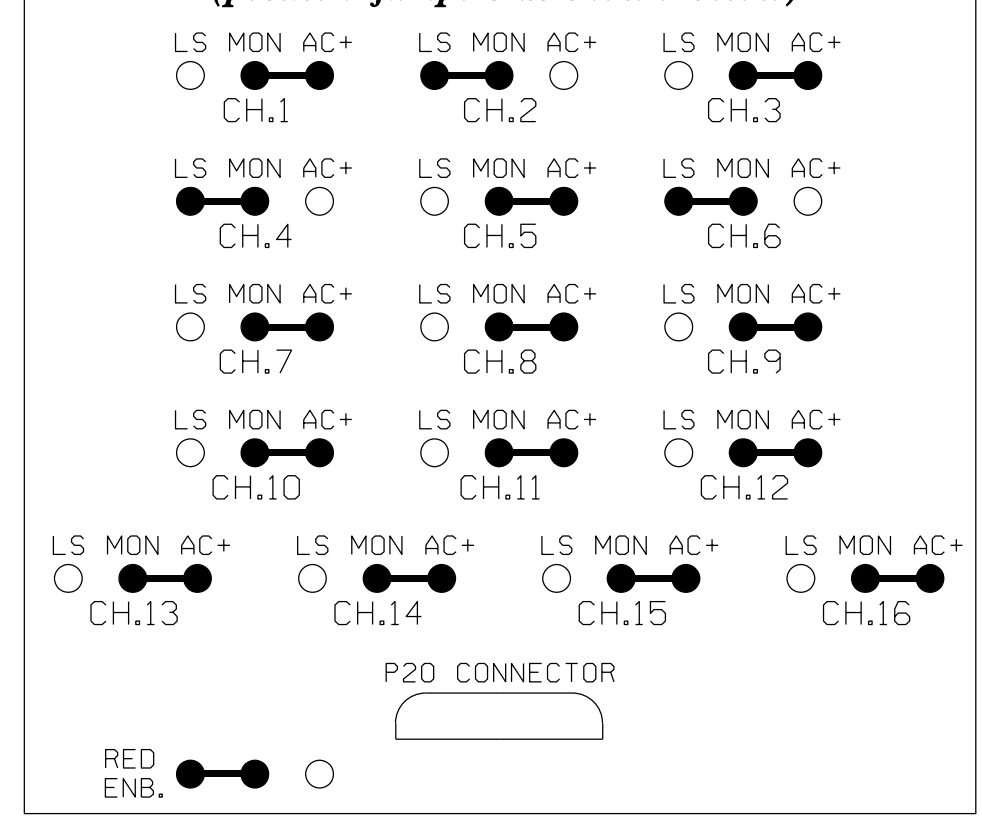
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
2A	TB2-5,6	I2U	39	3	2		
4A	TB4-9,10	I6U	41	11	4	3	
4B	TB4-11,12	I6L	45	12	4	15	
6A	TB3-5,6	J2U	40	21	6		

INPUT FILE POSITION LEGEND: J2L



RED MONITOR BOARD PROGRAMMING

(position jumpers as shown below)



NC Dept of Transportation
 Division of Highways
 Final Drawing Date: 10/19/2017
 Declassified by: R. N. Zinner
 ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1588T1
 DESIGNED: Oct. 2017
 SEALED: 10/16/2017
 REVISED: N/A

Electrical Detail-Temporary Phase 1

Electrical AND PROGRAMMING DETAILS FOR:
 Prepared for the Offices of:

 750 N. Greenfield Pkwy, Garner, NC 27529

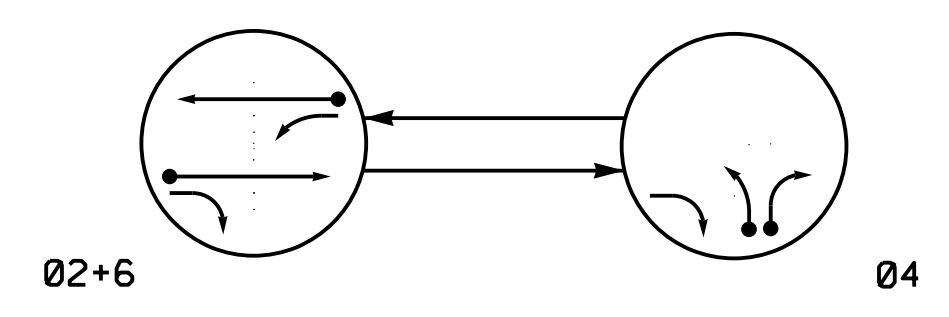
SR 1005 (Startown Road)
 at SR 1148 (Robinwood Road)/
 Sweetwater Road Ext.
 Division 12 Catawba County Hickory
 PLAN DATE: Oct. 2017 REVIEWED BY: J.L. Lewis
 PREPARED BY: P. Alexander REVIEWED BY: J. Ma
 REVISIONS INIT. DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
 SEAL

 SEAL 033108
 J. Ma
 10/17/2017
 SIGNATURE DATE
 SIG. INVENTORY NO. 12-1588T1

 940 Main Campus Drive, Suite 500
 Raleigh, NC 27606
 NC License No. C-3705
 919.829.0328

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- ←● DETECTED MOVEMENT
- ← UNDETECTED MOVEMENT (OVERLAP)
- ←- UN SIGNALIZED MOVEMENT
- ←- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE		
	02+6	04	FLASH
21	G	R	Y
22	G	R	Y
41, 42	R	G	R
61, 62	G	R	Y

SE-PAC 2070 LOOP & DETECTOR UNIT INSTALLATION CHART

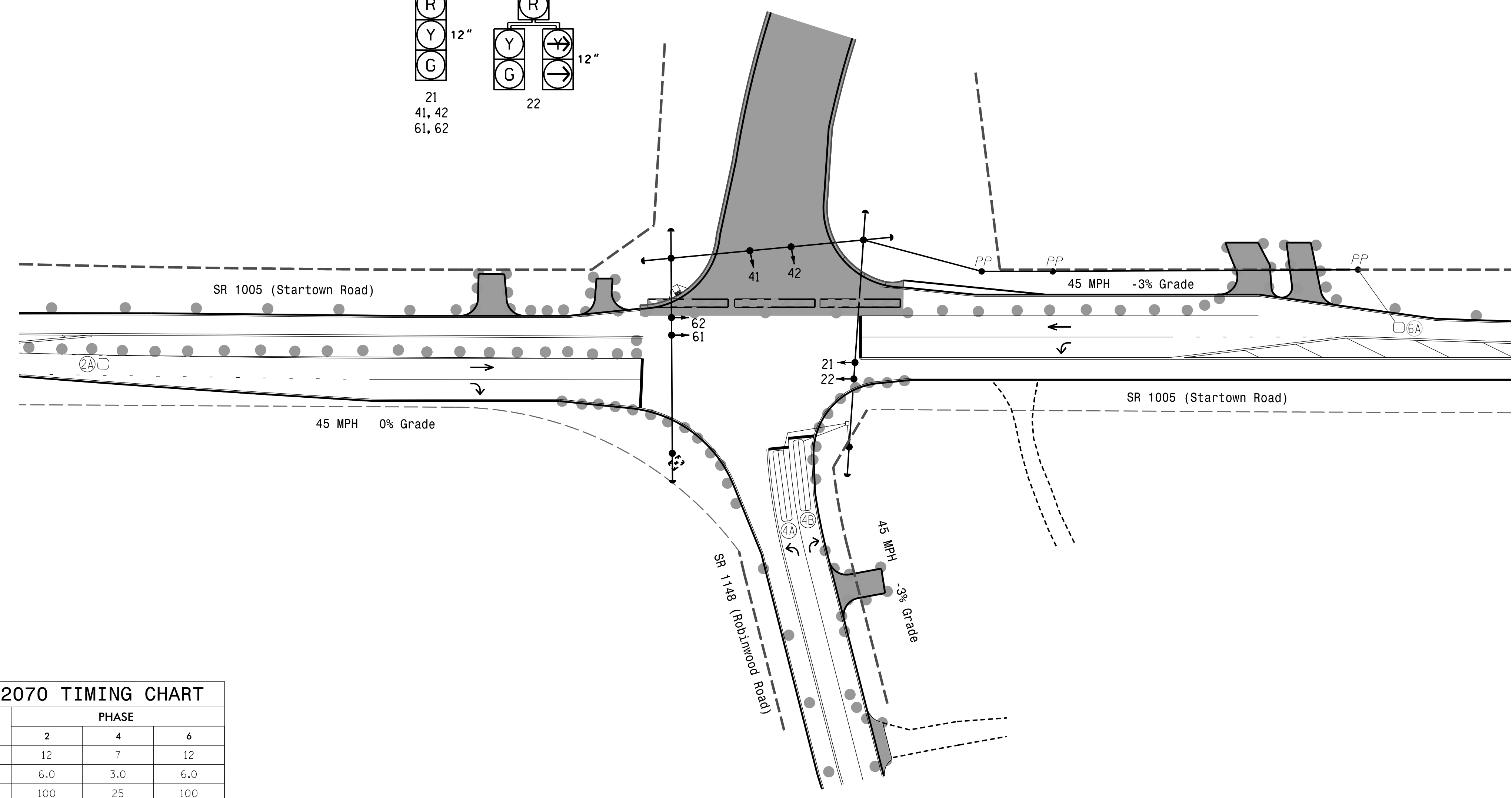
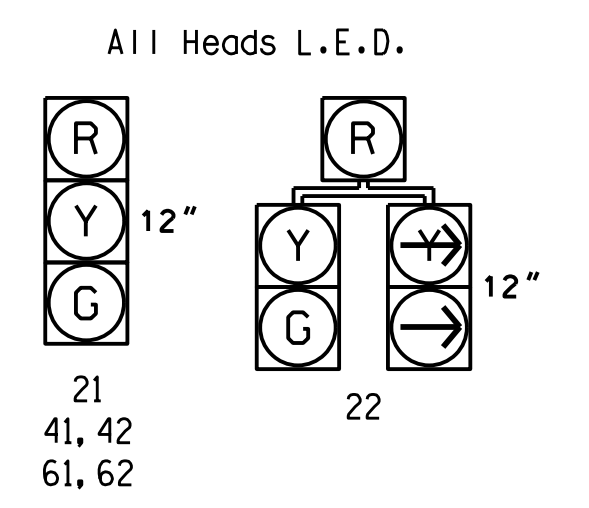
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	ASSIGNED PHASE	DETECTOR PROGRAMMING											STATUS					
							TIMING		OPERATION MODE							SWITCH	SYSTEM LOOPS		NEW	EXISTING			
							DELAY	EXTEND (STRETCH)	VEHICLE	PEDESTRIAN	1 CALL	STOP A	STOP B	PROTECTOR LEFT	PROTECTOR THROUGH						AND		
2A	6X6	5	300	-	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X
4A	6X40	2-4-2	0	X	-	4	3 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X
4B	6X40	2-4-2	0	X	-	4	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X
6A	6X6	5	300	X	-	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X

2 Phase Fully Actuated Hickory City 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.
- Reposition existing signal heads numbered 61 and 62.
- Run all lead-in overhead on existing utility poles where possible.
- Set all detector units to presence mode.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Signalsystem data: Controller Asset # 1588.

SIGNAL FACE I.D.



SE-PAC 2070 TIMING CHART

FEATURE	PHASE		
	2	4	6
Min Green *	12	7	12
Passage Gap *	6.0	3.0	6.0
Maximum Green *	100	25	100
Yellow Change	4.8	3.0	4.8
Red Clear	1.6	2.1	1.6
Walk *	-	-	-
Pedestrian Clear	-	-	-
Added Initial *	2.5	-	2.5
Maximum Initial *	34	-	34
Time Before Reduction *	15	-	15
Time To Reduce *	30	-	30
Minimum Gap	3.0	-	3.0
Recall Mode	MIN RECALL	-	MIN RECALL
Vehicle Call Memory	LOCK	NON-LOCK	LOCK
Dual Entry	-	-	-
Simultaneous Gap	ON	ON	ON

* 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.

LEGEND

	PROPOSED Traffic Signal Head		EXISTING Traffic Signal Head
	PROPOSED Modified Signal Head		EXISTING N/A
	PROPOSED Sign		EXISTING N/A
	PROPOSED Pedestrian Signal Head With Push Button & Sign		EXISTING N/A
	PROPOSED Signal Pole with Guy		EXISTING N/A
	PROPOSED Signal Pole with Sidewalk Guy		EXISTING N/A
	PROPOSED Inductive Loop Detector		EXISTING N/A
	PROPOSED Controller & Cabinet		EXISTING N/A
	PROPOSED Junction Box		EXISTING N/A
	PROPOSED 2-in Underground Conduit		EXISTING N/A
	PROPOSED Right of Way		EXISTING N/A
	PROPOSED Directional Arrow		EXISTING N/A
	PROPOSED Construction Zone		EXISTING N/A
	PROPOSED Drum		EXISTING N/A

VHB PROJECT NO.: 38536-01

NC Dept of Transportation
Division of Highways
Final Drawing Date: 10/19/2017
DocuSigned by:
R. N. Zinn
ITS & Signals Unit



Signal Upgrade - Temporary Phase 2

SR 1005 (Startown Road) at SR 1148 (Robinwood Road) / Sweetwater Road Ext.

Division 12 Catawba County Hickory

PLAN DATE: Oct. 2017 REVIEWED BY: J.L. Lewis

PREPARED BY: P. Alexander REVIEWED BY:

REVISIONS	INIT.	DATE

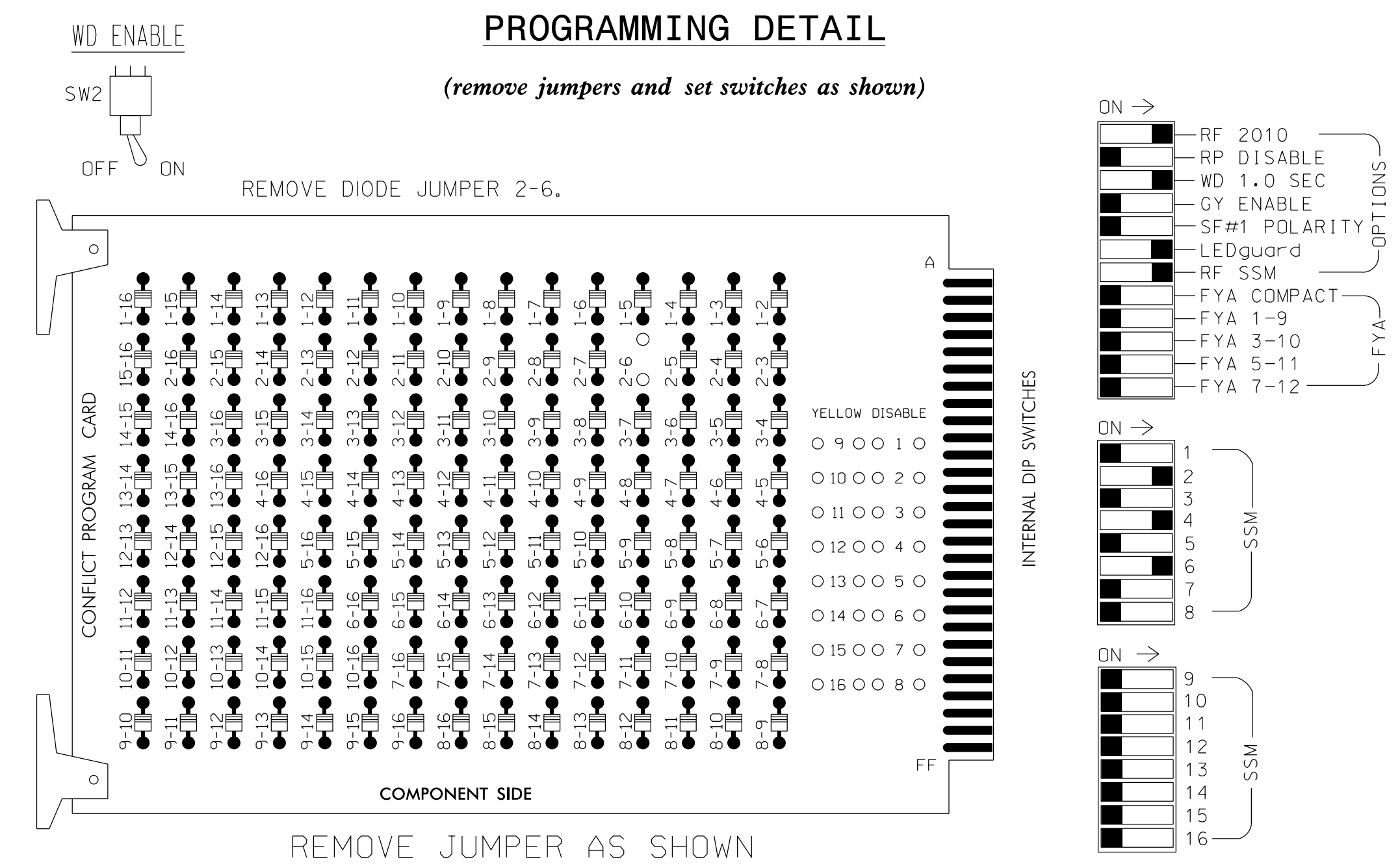
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SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER
SEAL 023489
PAMELA L. ALEXANDER
Pamela L. Alexander/2017
SIGNATURE DATE
SIG. INVENTORY NO. 12-1588T2

EDI MODEL 2010ECLIP CONFLICT MONITOR

PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



NOTES:

- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
- Make sure jumpers SEL2-SEL5 are present on the monitor board.
- Integrate monitor with Ethernet network in cabinet.

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- To prevent red failures on unused monitor channels, see red monitor board programming detail this sheet.
- Program controller to start up in phases 2 and 6 green.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- Program phases 2 and 6, on controller unit, for volume density operation.
- The cabinet and controller are part of the Hickory City Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....SIEMENS 2070
 CABINET.....MCCAIN TRAFFIC MODEL 332 (DWG.NO.MDR3280)
 SOFTWARE.....SE-PAC2070
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S2,S4,S6
 PHASES USED.....2,4,6
 PEDS USED.....NONE
 OVERLAPS.....NONE

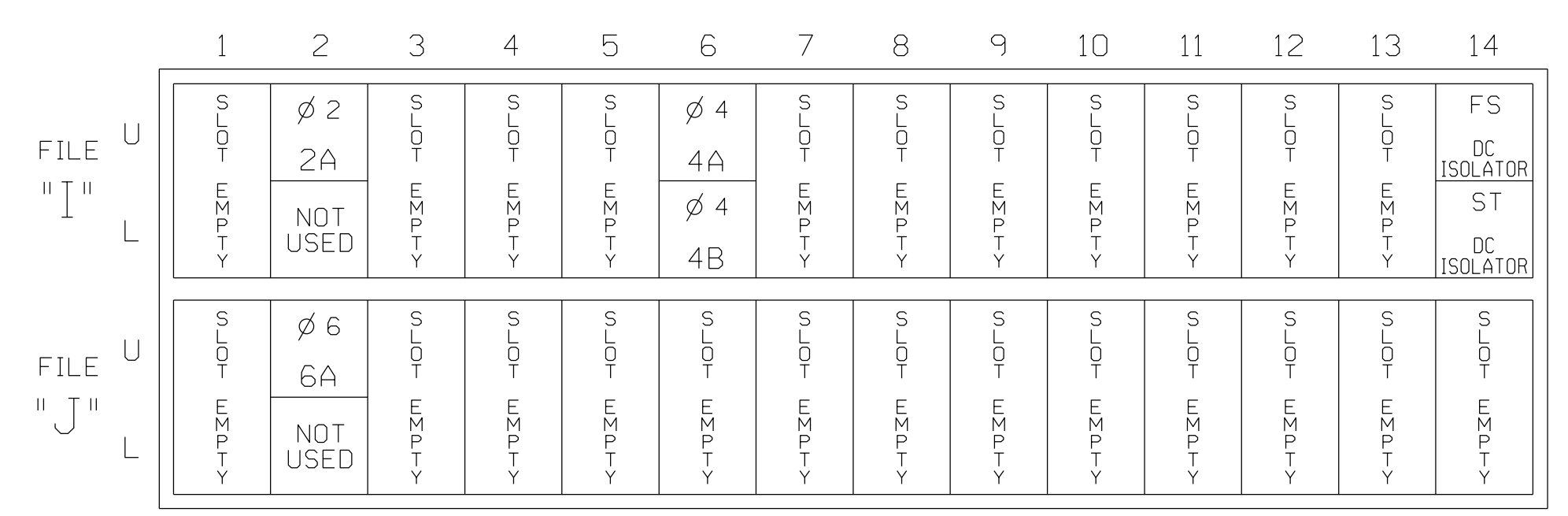
FIELD CONNECTION HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	22	NU	NU	61,62	NU	NU	NU
RED		128			101				134			
YELLOW		129			102				135			
GREEN		130			103				136			
RED ARROW												
YELLOW ARROW						102						
GREEN ARROW						103						

NU = Not Used

INPUT FILE POSITION LAYOUT

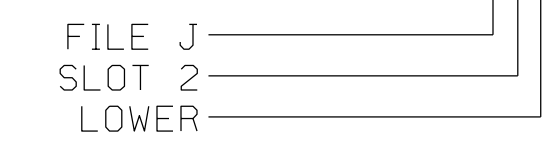
(front view)



INPUT FILE CONNECTION & PROGRAMMING CHART

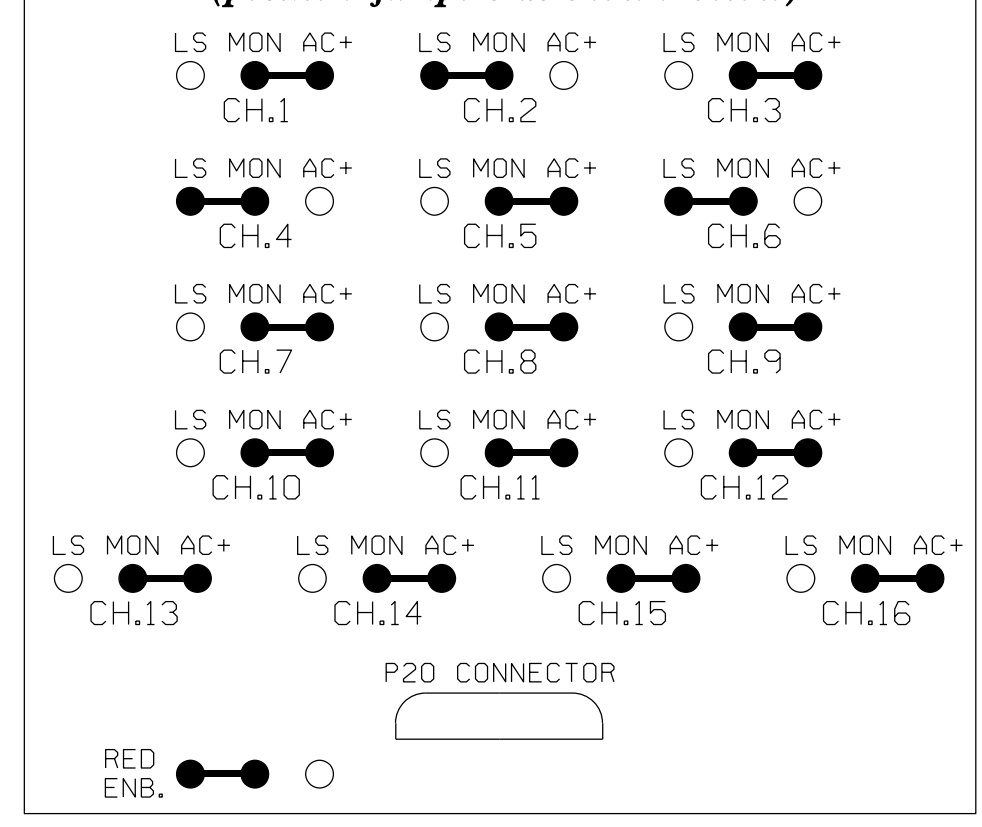
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
2A	TB2-5,6	I2U	39	3	2		
4A	TB4-9,10	I6U	41	11	4	3	
4B	TB4-11,12	I6L	45	12	4	15	
6A	TB3-5,6	J2U	40	21	6		

INPUT FILE POSITION LEGEND: J2L



RED MONITOR BOARD PROGRAMMING

(position jumpers as shown below)



NC Dept of Transportation
 Division of Highways
 Final Drawing Date: 10/19/2017
 Prepared by: R. N. Zenser
 ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1588T2
 DESIGNED: Oct. 2017
 SEALED: 10/16/2017
 REVISED: N/A

Electrical Detail-Temporary Phase 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
 NORTH CAROLINA PROFESSIONAL ENGINEERS
 SEAL 033108
 J. L. Lewis
 10/17/2017

Division 12 Catawba County Hickory
 PLAN DATE: Oct. 2017 REVIEWED BY: J.L. Lewis
 PREPARED BY: P. Alexander REVIEWED BY: J. Ma

940 Main Campus Drive, Suite 500
 Raleigh, NC 27606
 NC License No. C-3705
 919.829.0328

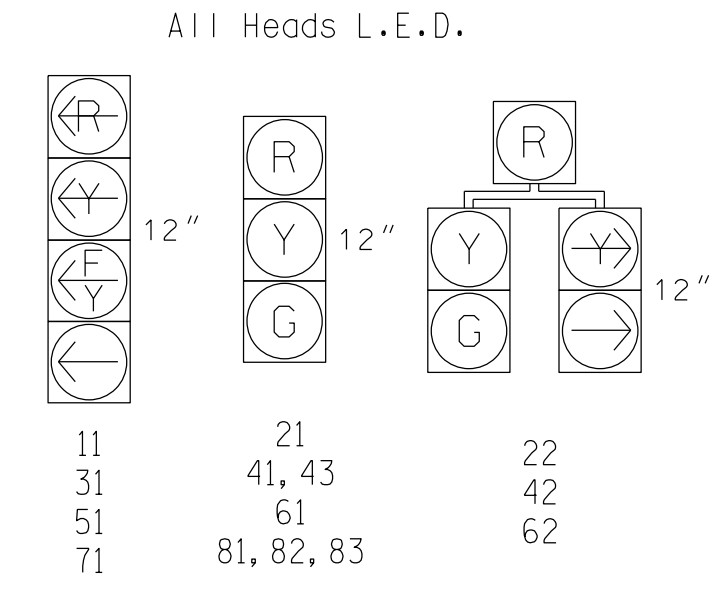
Prepared for the Offices of:
 Transportation Mobility and Safety Division
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 Signal Management Section
 750 N. Greenfield Pkwy, Garner, NC 27529

Sig. Inventory No. 12-1588T2

SE-PAC 2070 LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING														
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	ASSIGNED PHASE	TIMING		OPERATION MODE							SYSTEM LOOPS		STATUS	
							DELAY	EXTEND (STRETCH)	VEHICLE	PEDESTRIAN	T. CALL	STOP A	STOP B	PAID/PER. THROUGH	LEFT THROUGH	AND	SWITCH	NEW	EXISTING
1A	6X40	2-4-2	0	X	-	1	5 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
2A	6X6	4	300	X	-	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
3A	6X40	2-4-2	0	X	-	3	5 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
4A	6X40	2-4-2	0	X	-	4	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
5A	6X40	2-4-2	0	X	-	5	5 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
5B	6X6	2-4-2	0	X	-	5	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
6A	6X6	6	300	X	-	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
7A	6X40	2-4-2	0	X	-	7	5 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
8A	6X40	2-4-2	0	X	-	8	10 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-

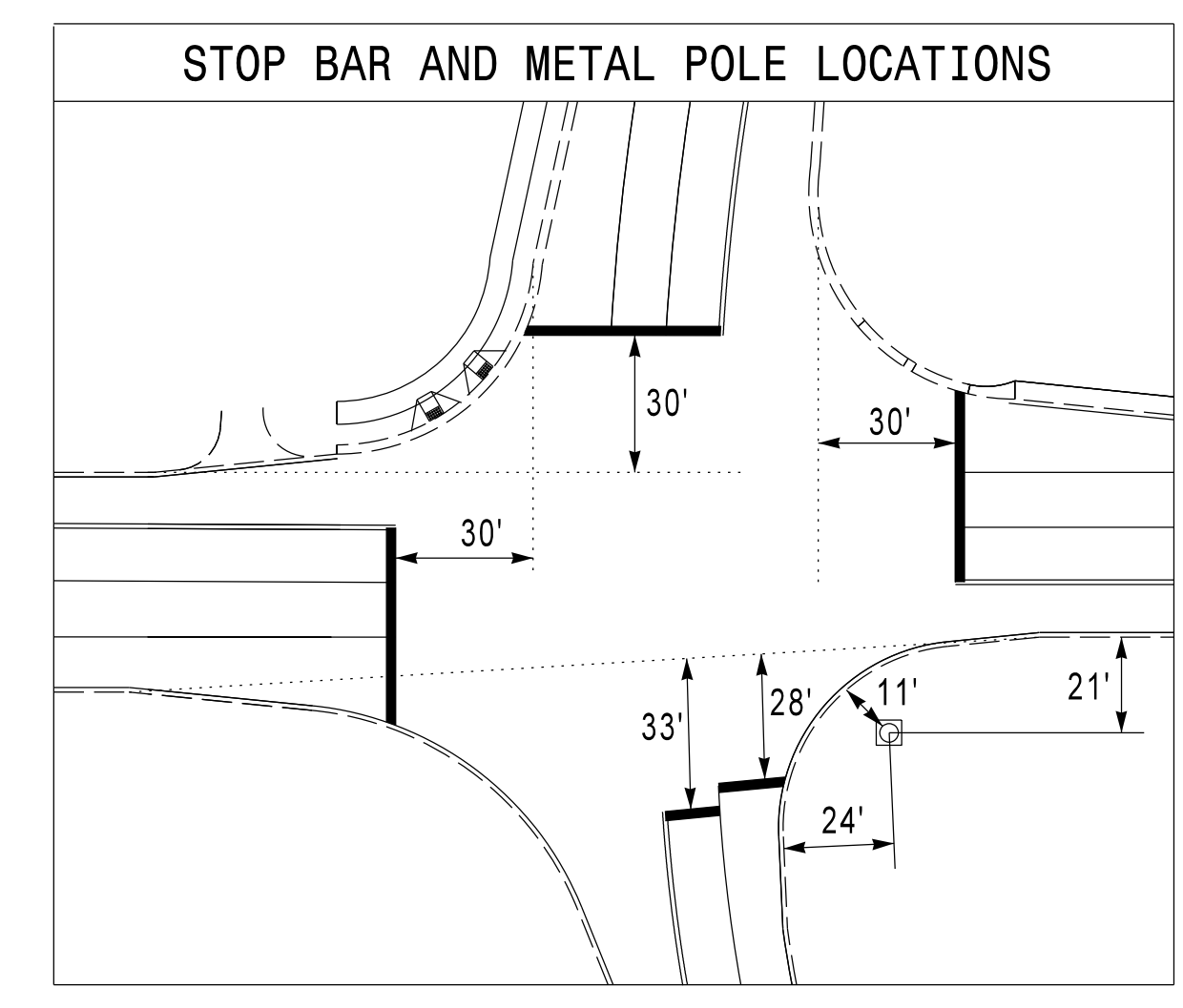
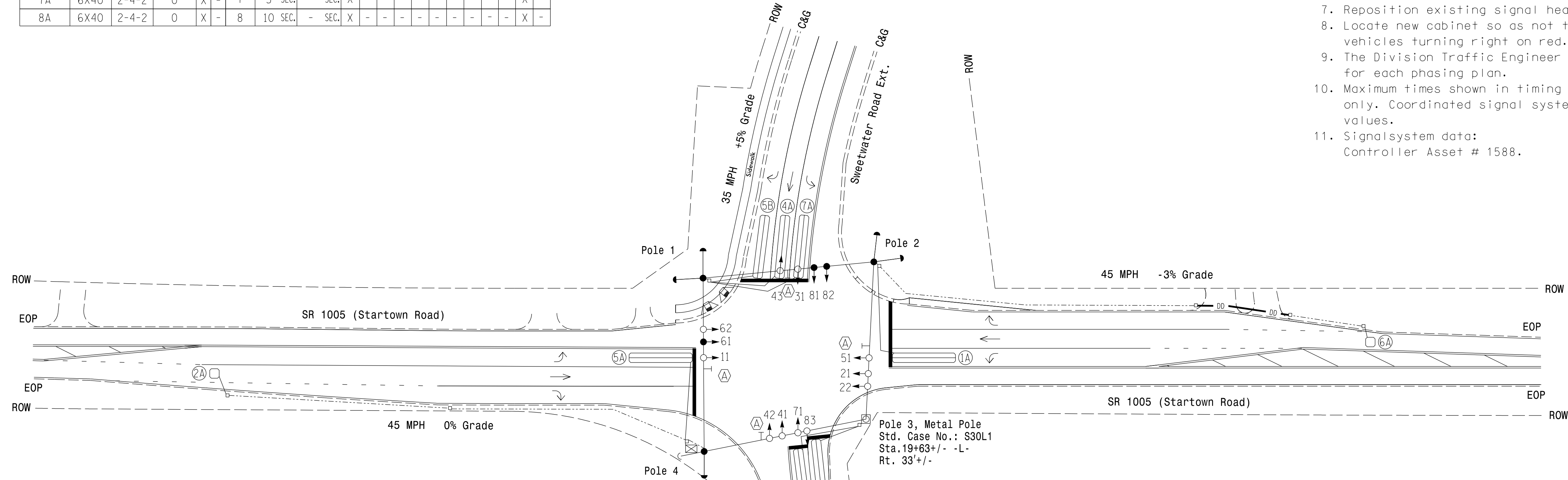
SIGNAL FACE I.D.



8 Phase Fully Actuated Hickory City 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. Renumber existing signal heads 41, 42 as 81, 82.
7. Reposition existing signal heads 61, 81 and 82.
8. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
9. The Division Traffic Engineer will determine the hours of use for each phasing plan.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
11. Signalsystem data: Controller Asset # 1588.



SE-PAC 2070 TIMING CHART

FEATURE	PHASE							
	1	2	3	4	5	6	7	8
Min Green *	7	12	7	7	7	12	7	7
Passage Gap *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Maximum Green *	20	90	15	30	20	90	15	30
Yellow Change	3.0	4.8	3.0	4.8	3.0	4.8	3.0	4.8
Red Clear	2.8	1.5	2.6	1.7	2.9	1.5	2.3	1.7
Walk *	-	-	-	-	-	-	-	-
Pedestrian Clear	-	-	-	-	-	-	-	-
Added Initial *	-	2.5	-	-	-	2.5	-	-
Maximum Initial *	-	34	-	-	-	34	-	-
Time Before Reduction *	-	15	-	-	-	15	-	-
Time To Reduce *	-	30	-	-	-	30	-	-
Minimum Gap	-	3.0	-	-	-	3.0	-	-
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Vehicle Call Memory	NON-LOCK	LOCK	NON-LOCK	NON-LOCK	NON-LOCK	LOCK	NON-LOCK	NON-LOCK
Dual Entry	-	-	-	ON	-	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON	ON	ON	ON

LEGEND

PROPOSED	EXISTING

* 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.

NC Dept of Transportation
Division of Highways
Final Drawing Date: 10/19/2017
R. N. Zinner
ITS & Signals Unit

940 Main Campus Drive, Suite 500
Raleigh, NC 27606
NC License No. C-3705
919.829.0328

Signal Upgrade - Final Design (Sheet 1 of 2)

SR 1005 (Startown Road) at SR 1148 (Robinwood Road)/ Sweetwater Road Ext.

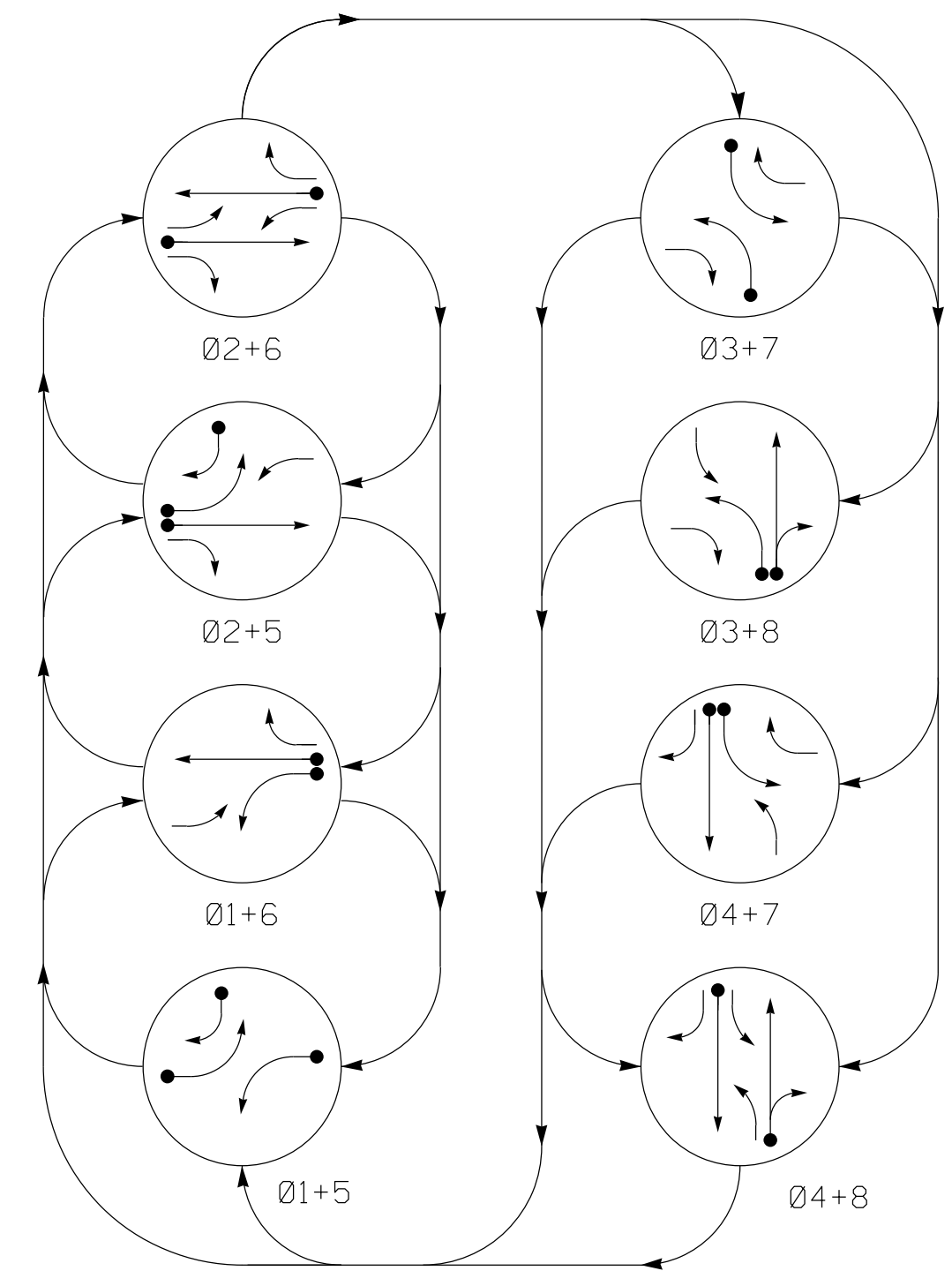
Division 12	Catawba County	Hickory
PLAN DATE: Oct. 2017	REVIEWED BY: J.L. Lewis	
PREPARED BY: J. Ma	REVIEWED BY: M. Styles	
REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SIGNATURE: J. L. Lewis DATE: 10/16/2017
SIG. INVENTORY NO. 12-1588

**8 Phase
Fully Actuated
Hickory City Signal System**

DEFAULT PHASING DIAGRAM

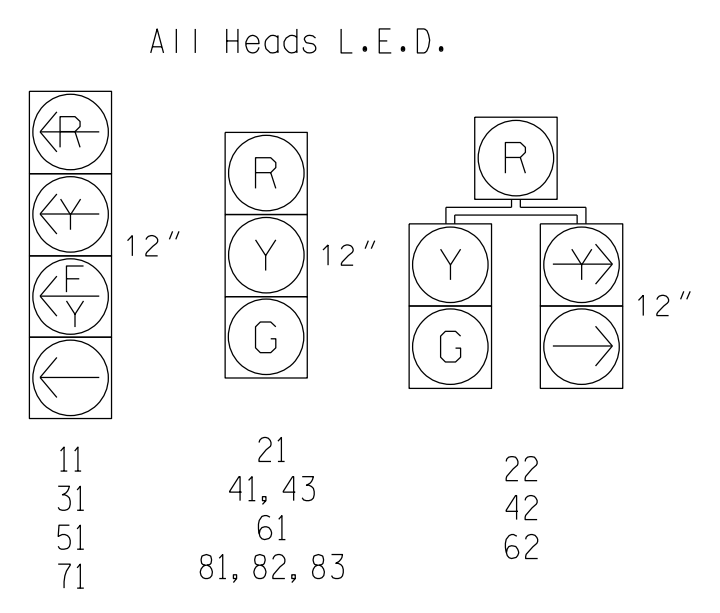


PHASING DIAGRAM DETECTION LEGEND
 ● DETECTED MOVEMENT
 — UNDETECTED MOVEMENT (OVERLAP)
 - - - UNSIGNALIZED MOVEMENT

DEFAULT TABLE OF OPERATION

SIGNAL FACE	PHASE								
	Ø 1 + 5	Ø 1 + 6	Ø 2 + 5	Ø 2 + 6	Ø 3 + 7	Ø 3 + 8	Ø 4 + 7	Ø 4 + 8	FLASH
11	←	←	←	←	←	←	←	←	Y
21	R	R	G	G	R	R	R	R	Y
22	R	R	G	G	R	R	R	R	Y
31	←	←	←	←	←	←	←	←	Y
41, 43	R	R	R	R	R	R	G	G	R
42	R	R	R	R	R	R	G	G	R
51	←	←	←	←	←	←	←	←	Y
61	R	G	R	G	R	R	R	R	Y
62	R	G	R	G	R	R	R	R	Y
71	←	←	←	←	←	←	←	←	Y
81, 82, 83	R	R	R	R	R	G	R	G	R

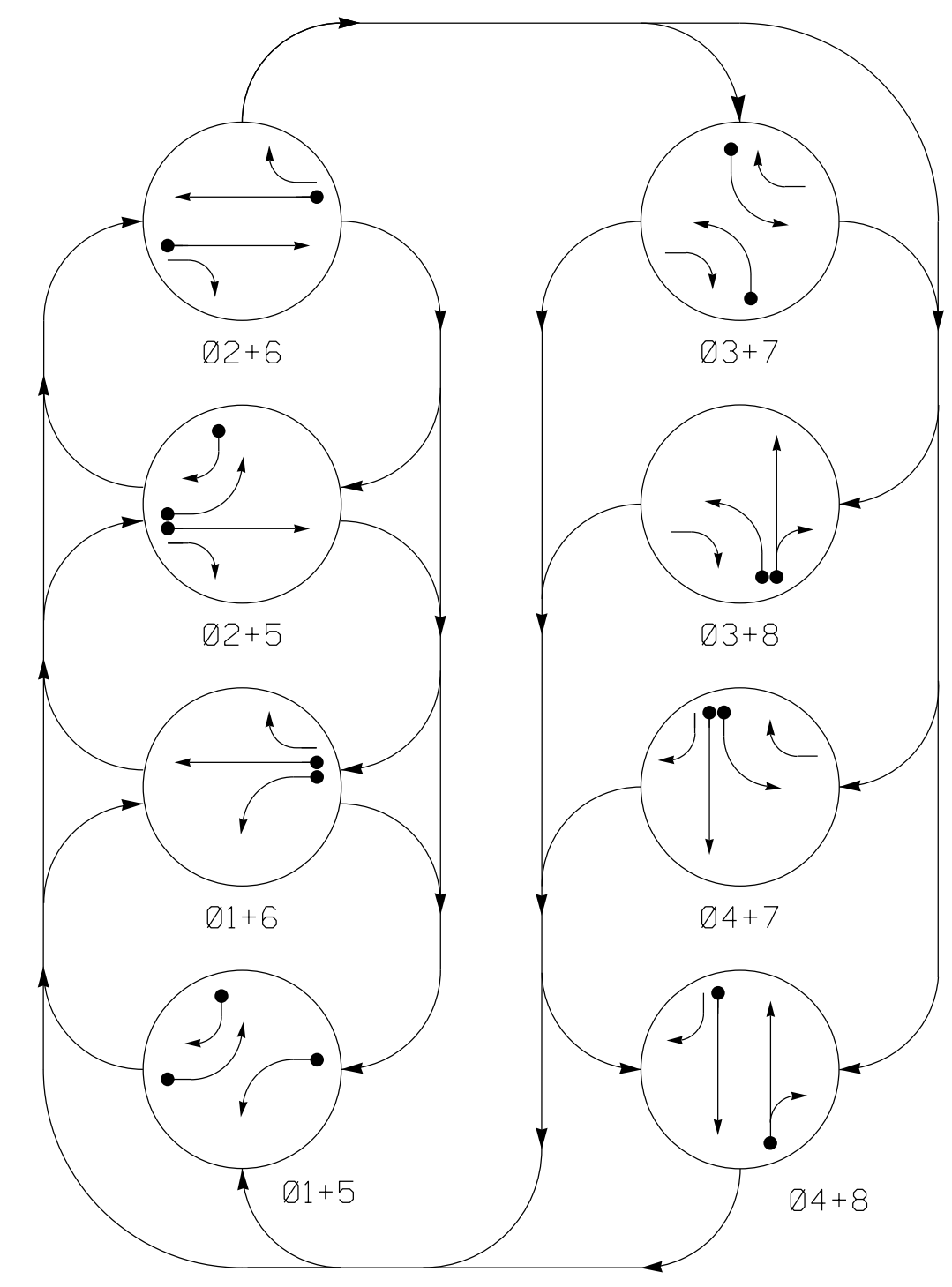
SIGNAL FACE I.D.



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.
- Phase 1 and/or phase 5 may be lagged.
- Phase 3 and/or phase 7 may be lagged.
- Set all detector units to presence mode.
- Renumber existing signal heads 41, 42 as 81, 82.
- Reposition existing signal heads 21, 22, 61, 81 and 82.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- The Division Traffic Engineer will determine the hours of use for each phasing plan.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Signalsystem data:
Controller Asset # 1588.

ALTERNATE PHASING DIAGRAM

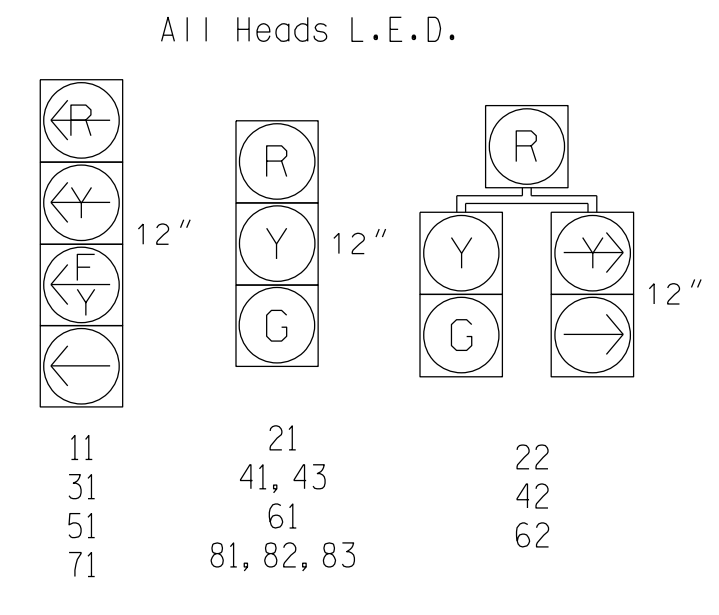


PHASING DIAGRAM DETECTION LEGEND
 ● DETECTED MOVEMENT
 — UNDETECTED MOVEMENT (OVERLAP)
 - - - UNSIGNALIZED MOVEMENT

ALTERNATE TABLE OF OPERATION

SIGNAL FACE	PHASE								
	Ø 1 + 5	Ø 1 + 6	Ø 2 + 5	Ø 2 + 6	Ø 3 + 7	Ø 3 + 8	Ø 4 + 7	Ø 4 + 8	FLASH
11	←	←	←	←	←	←	←	←	Y
21	R	R	G	G	R	R	R	R	Y
22	R	R	G	G	R	R	R	R	Y
31	←	←	←	←	←	←	←	←	Y
41, 43	R	R	R	R	R	R	G	G	R
42	R	R	R	R	R	R	G	G	R
51	←	←	←	←	←	←	←	←	Y
61	R	G	R	G	R	R	R	R	Y
62	R	G	R	G	R	R	R	R	Y
71	←	←	←	←	←	←	←	←	Y
81, 82, 83	R	R	R	R	R	G	R	G	R

SIGNAL FACE I.D.



M&E PROJECT NO.: 38536-01

NC Dept of Transportation
Division of Highways
Final Drawing Date: 10/19/2017
DocuSigned by: R. N. Zinner
ITS & Signals Unit

940 Main Campus Drive, Suite 500
Raleigh, NC 27606
NC License No. C-3705
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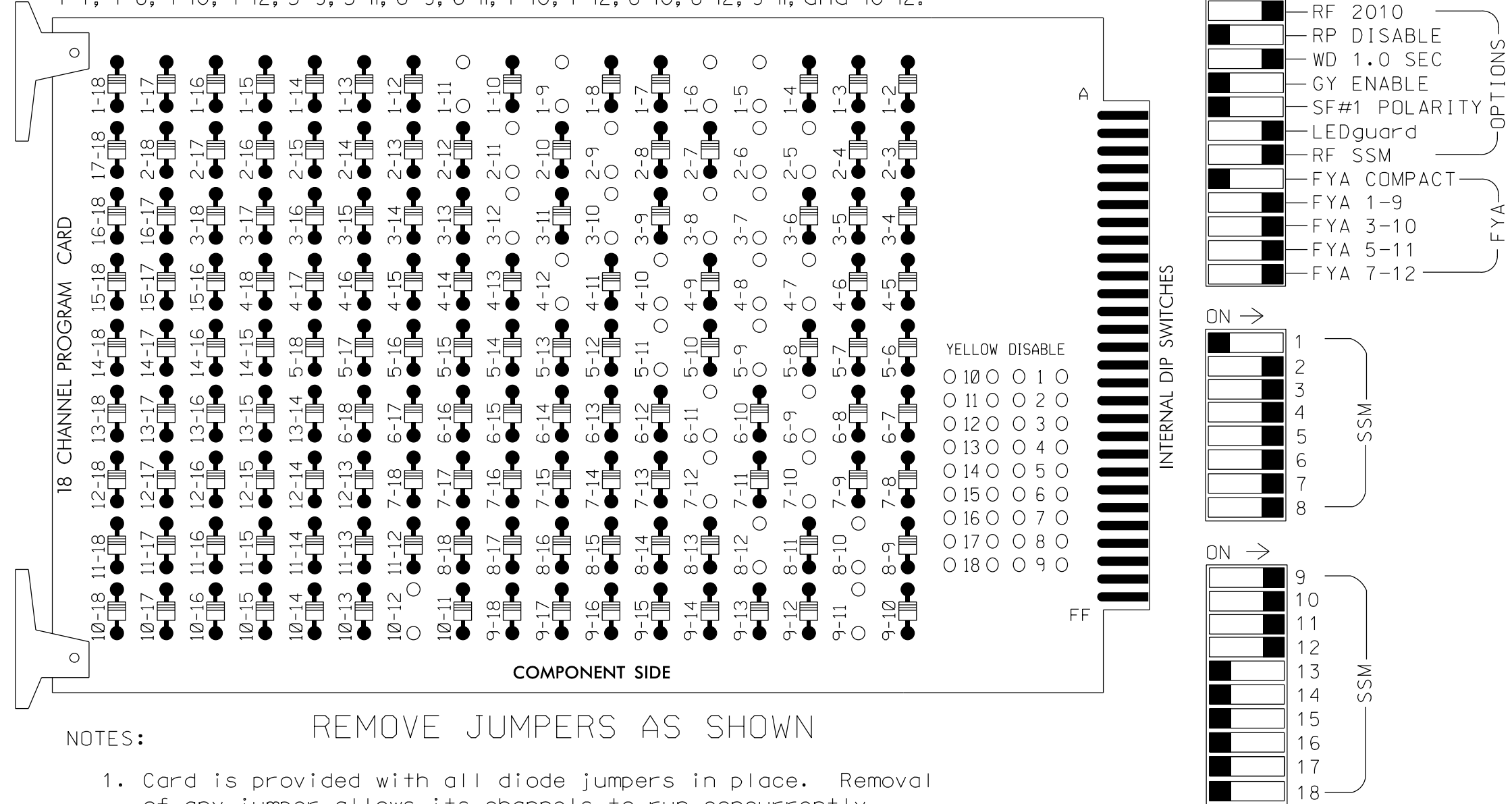
Signal Upgrade - Final Design (Sheet 2 of 2)

Prepared for the Offices of: 		SR 1005 (Startown Road) at SR 1148 (Robinwood Road)/ Sweetwater Road Ext.		DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED SEAL JIANXIN MA 10/16/2017 DATE	
Division 12	Catawba County	Hickory	REVIEWED BY: J.L. Lewis		
PLAN DATE: Oct. 2017	REVIEWED BY: J. Ma	REVIEWED BY: M. Stygles	REVISIONS	INIT.	DATE
750 N. Greenfield Pkwy, Garner, NC 27529		SCALE: 0 40 1" = 40'		SIG. INVENTORY NO. 12-1588	

EDI MODEL 2018ECLIP-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 2-5, 2-6, 2-9, 2-11, 3-7, 3-8, 3-10, 3-12, 4-7, 4-8, 4-10, 4-12, 5-9, 5-11, 6-9, 6-11, 7-10, 7-12, 8-10, 8-12, 9-11, and 10-12.



- NOTES: REMOVE JUMPERS AS SHOWN
- 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.
 - Integrate monitor with Ethernet network in cabinet.

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Program controller to start up in phases 2 and 6 green.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- Program phases 4 and 8, on controller unit, for dual entry.
- Program phases 2 and 6, on controller unit, for volume density operation.
- The cabinet and controller are part of the Hickory City Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070
 CABINET.....332
 SOFTWARE.....SE-PAC2070
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...18 (12-STD; 6-AUX)
 LOAD SWITCHES USED.....S1,S2,S4,S5,S7,S8,S10,S11
 AUX S1,AUX S2,AUX S4,AUX S5

PHASES USED.....1,2,3,4,5,6,7,8

OVERLAP "A".....*
 OVERLAP "B".....*
 OVERLAP "C".....*
 OVERLAP "D".....*

* See sheet 2 of 3 for Overlap and Protected & Permissive Phases programming.

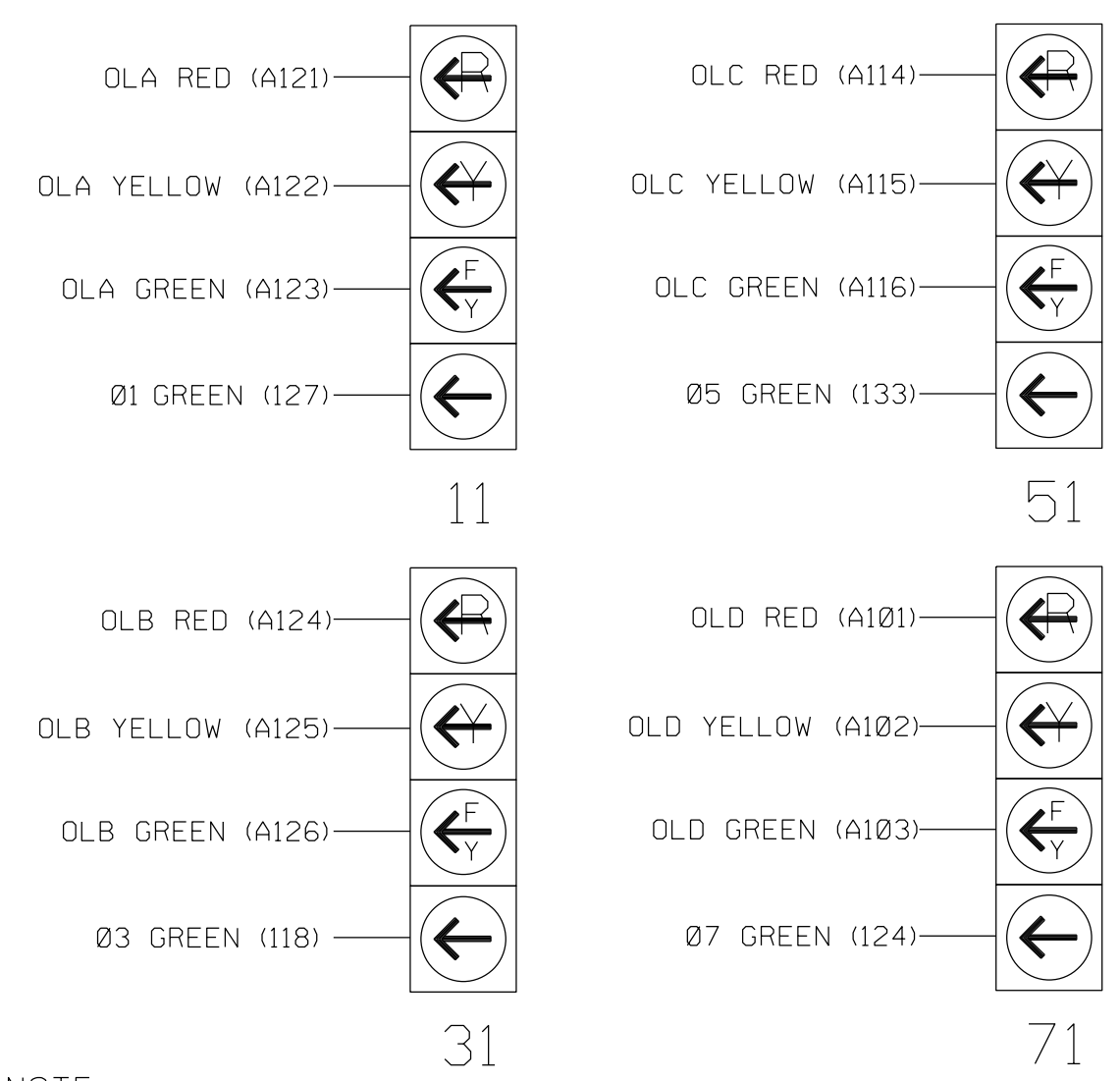
SIGNAL HEAD HOOK-UP CHART

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	OLA	OLB	SPARE	OLC	OLD	SPARE	
SIGNAL HEAD NO.	11	21,22	NU	31	22	41,42 43	51	42	61,62	71	62	81,82 83	11	31	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						117			132			123			A122	A125		A115	A102
FLASHING YELLOW ARROW															A123	A126		A116	A103
GREEN ARROW	127					118	118		133	133		124	124						

NU = Not Used
 * Denotes install load resistor. See load resistor installation detail on sheet 2 of 3.
 See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

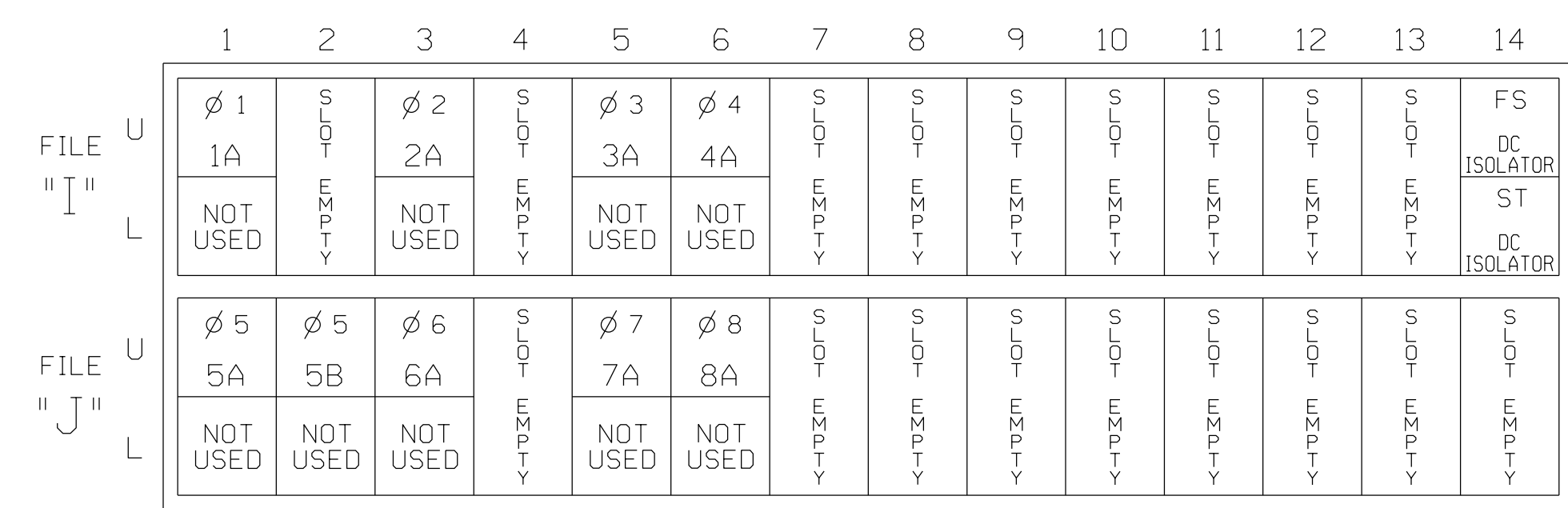
(wire signal heads as shown)



NOTE: See sheet 2 for Protected and Permitted phases programming.

INPUT FILE POSITION LAYOUT

(front view)

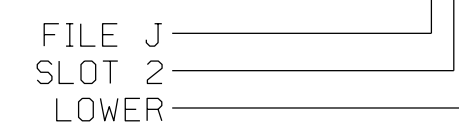


EX.: 1A, 2A, ETC. = LOOP NO.'S
 FS = FLASH SENSE
 ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
1A	TB2-1,2	I1U	56	1	1	5	
2A	TB2-9,10	I3U	63	5	2		
3A	TB4-5,6	I5U	58	9	3	5	
4A	TB4-9,10	I6U	41	11	4		
5A	TB3-1,2	J1U	55	19	5	5	
5B	TB3-5,6	J2U	40	21	5	15	
6A	TB3-9,10	J3U	64	23	6		
7A	TB5-5,6	J5U	57	29	7	5	
8A	TB5-9,10	J6U	42	31	8	10	

INPUT FILE POSITION LEGEND: J2L



NC Dept of Transportation
 Division of Highways
 Final Drawing Date: 10/19/2017
 Prepared by: R. N. Zinner
 ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1588
 DESIGNED: Oct. 2017
 SEALED: 10/16/2017
 REVISED: N/A

Electrical Detail-Final Design-Sheet 1 OF 3

Electrical and Programming Details For:

Prepared for the Offices of:

SR 1005 (Startown Road) at SR 1148 (Robinwood Road)/ Sweetwater Road Ext.

Division 12 Catawba County Hickory

PLAN DATE: Oct. 2017 REVIEWED BY: J.L. Lewis

PREPARED BY: J. Ma REVIEWED BY: M. Stygles

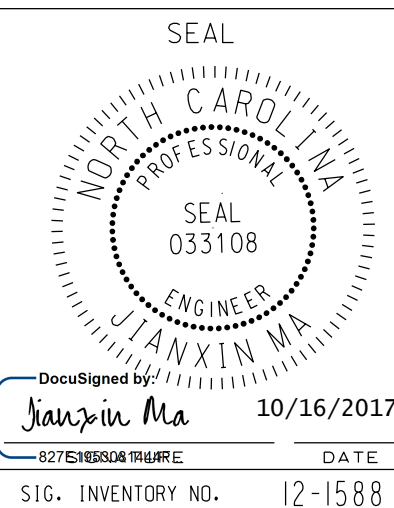
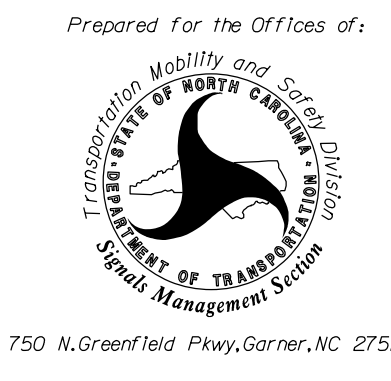
REVISIONS INIT. DATE

INIT. DATE

10/16/2017

82758804 THEP&E

Sig. INVENTORY NO. 12-1588



SE-PAC2070 OVERLAP PROGRAMMING DETAIL (program controller as shown below)

FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1- STARTUP & MISC	6- ALT SEQUENCES
2- REMOTE FLASH	7- PORT 1 DATA
3- OVERLAP STANDARD	8- I/O MISC
4- OVERLAP SPECIAL	9- SIG DRV OUT
5- RING STRUCTURE	
	F- PRIOR MENU

Do NOT enter any OVL PHASES! →

SE-PAC OVERLAP - A	(0-NO / 1-YES)
OVL PHASES:	00000000 0000000
PHS/CHN:	123456789 0123456789 01234
OVL CHN(S):	000000000 0001000000 00000
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	
	PRESS 'B'

Do NOT enter any OVL PHASES! →

SE-PAC OVERLAP - B	(0-NO / 1-YES)
OVL PHASES:	00000000 0000000
PHS/CHN:	123456789 0123456789 01234
OVL CHN(S):	000000000 0000100000 00000
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	
	PRESS 'B'

Do NOT enter any OVL PHASES! →

SE-PAC OVERLAP - C	(0-NO / 1-YES)
OVL PHASES:	00000000 0000000
PHS/CHN:	123456789 0123456789 01234
OVL CHN(S):	000000000 0000010000 00000
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	
	PRESS 'B'

Do NOT enter any OVL PHASES! →

SE-PAC OVERLAP - D	(0-NO / 1-YES)
OVL PHASES:	00000000 0000000
PHS/CHN:	123456789 0123456789 01234
OVL CHN(S):	000000000 0000001000 00000
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	

OVERLAP PROGRAMMING COMPLETE
PRESS 'F' TO RETURN TO UNIT DATA

PROTECTED AND PERMISSIVE PHASES FOR FLASHING YELLOW ARROW (program controller as shown below)

FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1- STARTUP & MISC	6- ALT SEQUENCES
2- REMOTE FLASH	7- PORT 1 DATA
3- OVERLAP STANDARD	8- I/O MISC
4- OVERLAP SPECIAL	9- SIG DRV OUT
5- RING STRUCTURE	
	F- PRIOR MENU

SE-PAC OVL P.A...B...C...D...E...F...G...H.
TR GRN 0 0 0 0 0 0 0 0 0
YEL/10 40 40 40 40 40 40 40 40
RED/10 20 20 20 20 20 20 20 20
-G/Y 1 3 5 7 0 0 0 0 0
+GRN 2 4 6 8 0 0 0 0 0
(-) #-PH G/Y KILLS OVL P= (+) #-PH G STRT
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

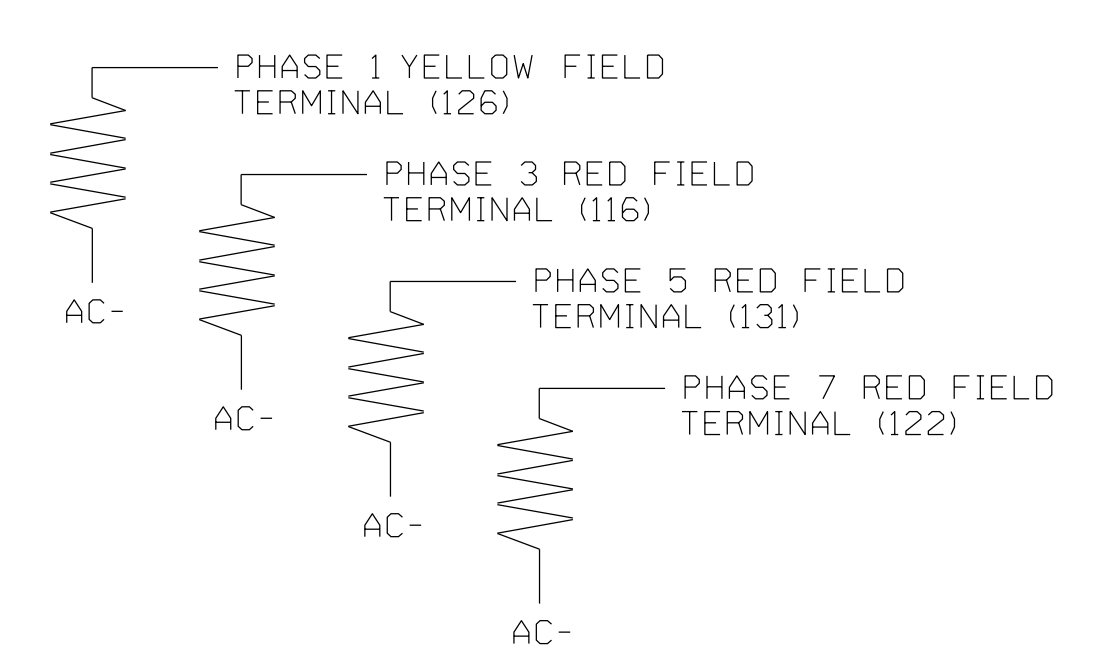
PPLT DEFINITION PROGRAMMING COMPLETE
PRESS 'F' TO RETURN TO UNIT DATA

NOTE: THIS PROGRAMMING IS REQUIRED FOR SIGNAL HEADS 11, 31, 51 AND 71 SO THAT THE SOLID GREEN ARROWS TURN ON EXCLUSIVELY DURING PROTECTED GREEN PHASES 1, 3, 5 & 7. AND THE FLASHING YELLOW ARROWS TURN ON EXCLUSIVELY DURING PERMITTED GREEN PHASES 2, 4, 6, & 8.

← PROTECTED PHASES
← PERMITTED PHASES

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)



FLASHER CIRCUIT MODIFICATION DETAIL

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

- ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
 - ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
 - REMOVE FLASHER UNIT 2.
- THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

NC Dept of Transportation
Division of Highways
Final Drawing Date: 10/19/2017
Designed by: R. N. Zinner
SEALED: 10/16/2017
ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1588
DESIGNED: Oct. 2017
SEALED: 10/16/2017
REVISED: N/A

Electrical Detail-Final Design-Sheet 2 OF 3

 940 Main Campus Drive, Suite 500 Raleigh, NC 27606 NC License No. C-3705 919.829.0328	Prepared for 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	SR 1005 (Startown Road) at SR 1148 (Robinwood Road)/ Sweetwater Road Ext. Division 12 Catawba County Hickory PLAN DATE: Oct. 2017 REVIEWED BY: J.L. Lewis PREPARED BY: J. Ma REVIEWED BY: M. Stygles	DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED SEAL SEAL 033108 JIANXIN MA ENGINEER DocuSign 10/16/2017 DATE SIG. INVENTORY NO. 12-1588
	REVISIONS INIT. DATE	REVISIONS INIT. DATE	REVISIONS INIT. DATE

TOD EVENT SCHEDULING PROGRAMMING DETAIL TO CALL ALTERNATE PHASING OPERATION DURING COORDINATION

(program controller as shown below)

* DENOTES TO BE DETERMINED BY THE DIVISION TRAFFIC ENGINEER.

NOTES

1. Phase Functions can be called by Time of Day (TOD) in Traffic Events, but not during coordination.
2. Special Functions can be called by Time of Day using Aux Events, and can run in conjunction with Coordination.
3. Special Functions can be used to call a Phase Function. In doing this a Phase function can run while a Coordination pattern is running.

4. If Alternate Phasing is used during FREE-RUN Phase Function 1 must be turned on with a Traffic Event.

PROGRAM AUX EVENT TO CALL SPECIAL FUNCTION

(program controller as shown below)

Step 3 - An Auxiliary event will be used to call the Special Function. This is done in Time Base Data under Aux Event. Add Auxiliary events as needed remembering to use one event to turn the Special Function on and one event to turn the Special Function off. If these are to be used in conjunction with the Traffic Events during Coordination then the On/Off times should be identical.

FROM MAIN MENU PRESS 6 (TIME BASE DATA)

EPAC TIME BASE DATA	PRESS # DESIRED
1-VIEW CURRENT	6-EQUATE/TRANSFER
2-SET TIME/DATE	7-CLEAR MEMORY
3-TRAFFIC EVENTS	8-DIMMING
4-AUX EVENTS	9-PHS FUNC MAPPING
5-TOY EVENTS	0-SPC FUNC MAPPING
	F-PRIOR MENU

EPAC TIME BASE - AUXILIARY EVENTS							
DD	HH	MM	A123	D123	DIM	S12345678	
*	*	*	000	000	0	10000000	← SF 1 "ON"
*	*	*	000	000	0	00000000	← SF 1 "OFF"
*	*	*	000	000	0	00000000	

CODES.....0-OFF....1-ON.....
OVERWRITE ">" W/ 1-ADD 2-DELETE 3-EDIT
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

AUX EVENT PROGRAMMING COMPLETE
PRESS 'F' TO RETURN TO TIME BASE DATA

! AUX EVENT MUST BE SCHEDULED TO RUN CONCURRENT WITH A TRAFFIC EVENT SCHEDULED COORDINATION PATTERN.

**NC Dept of Transportation
Division of Highways**

Final Drawing Date: 10/19/2017

DocuSigned by:
R. N. Zinner
10/19/2017 11:22:00 AM

ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1588

DESIGNED: Oct. 2017
SEALED: 10/16/2017
REVISED: N/A

PHASE FUNCTION MAPPING PROGRAMMING DETAIL

(program controller as shown below)

Step 1 - Assign OMIT OVERLAP "A", "B", "C", AND "D" to Phase Function 1.

FROM MAIN MENU PRESS 6 (TIME BASE DATA)

EPAC TIME BASE DATA	PRESS # DESIRED
1-VIEW CURRENT	6-EQUATE/TRANSFER
2-SET TIME/DATE	7-CLEAR MEMORY
3-TRAFFIC EVENTS	8-DIMMING
4-AUX EVENTS	9-PHS FUNC MAPPING
5-TOY EVENTS	0-SPC FUNC MAPPING
	F-PRIOR MENU

EPAC TIME BASE PHS FUNC MAPPING			
NUM..	P-FUNCT NAME.....	123456789	0123456
1	PHS-01 MAX # 2	00000000	0000000
2	PHS-02 MAX # 2	01000000	0000000
3	PHS-03 MAX # 2	00100000	0000000
4	PHS-04 MAX # 2	00010000	0000000

A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

← REMOVE
PHASE
FUNCTION
NUM 1
DEFAULT
VALUE

HIT "A" KEY UNTIL POSITIONED ON NUM 145

EPAC TIME BASE PHS FUNC MAPPING			
NUM..	P-FUNCT NAME.....	123456789	0123456
145	OVERLAP A OMIT	10000000	0000000
146	OVERLAP B OMIT	10000000	0000000
147	OVERLAP C OMIT	10000000	0000000
148	OVERLAP D OMIT	10000000	0000000

A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

← SET SWITCH 1
"ON" FOR
← OVERLAPS
A, B, C & D

PHASE FUNCTION PROGRAMMING COMPLETE
PRESS 'F' TO RETURN TO TIME BASE DATA

SPECIAL FUNCTION MAPPING PROGRAMMING DETAIL

(program controller as shown below)

Step 2 - Assign Special Function 1 to call Phase Function 1.

FROM MAIN MENU PRESS 6 (TIME BASE DATA)

EPAC TIME BASE DATA	PRESS # DESIRED
1-VIEW CURRENT	6-EQUATE/TRANSFER
2-SET TIME/DATE	7-CLEAR MEMORY
3-TRAFFIC EVENTS	8-DIMMING
4-AUX EVENTS	9-PHS FUNC MAPPING
5-TOY EVENTS	0-SPC FUNC MAPPING
	F-PRIOR MENU

EPAC TIME BASE SPC FUNC MAPPING	
	SPC FUNC
S-FUNCTION NAME	12345678
SPC 1-8 AS PHS FUNC 1- 8	10000000
SPC 1-8 AS PHS FUNC 9-16	00000000
SPEC FUNCTION 1	10000000

CODES.....0-OFF....1-ON.....
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

← PHASE
FUNCTION 1
WILL BE
CALLED WHEN
SPECIAL
FUNCTION 1
IS SELECTED

SPECIAL FUNCTION PROGRAMMING COMPLETE
PRESS 'F' TO RETURN TO TIME BASE DATA



Electrical Detail-Final Design-Sheet 3 Of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

**SR 1005 (Startown Road)
at SR 1148 (Robinwood Road)/
Sweetwater Road Ext.**

Division 12 Catawba County Hickory

PLAN DATE: Oct. 2017 REVIEWED BY: J.L. Lewis

PREPARED BY: J. Ma REVIEWED BY: M. Stygles

REVISIONS	INIT.	DATE

DocuSigned by: *Xianxin Ma* 10/16/2017

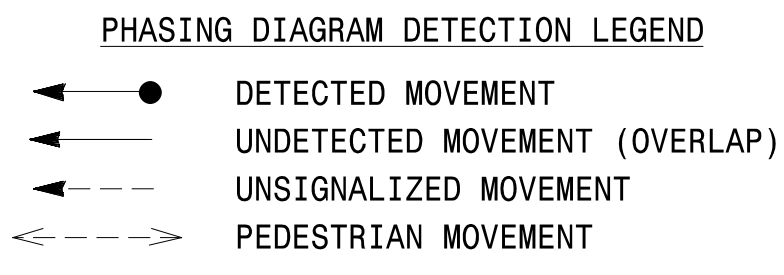
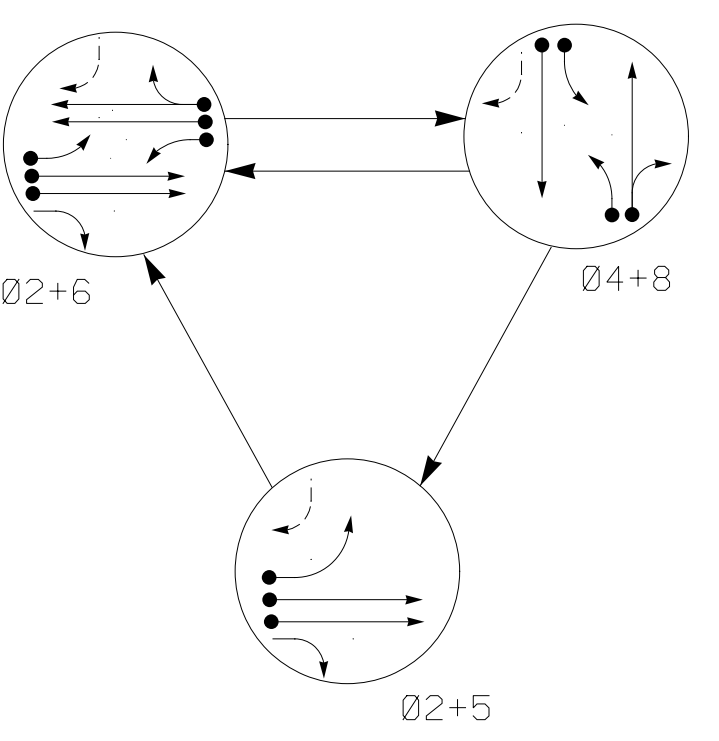
SIG. INVENTORY NO. 12-1588

3 Phase with EVP Fully Actuated Hickory City 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.
- Program signal heads numbered 21 and 22 to clear to all red before going into preempt.
- Program signal heads numbered 41 and 42 to clear to all red before going into preempt.
- Program signal heads numbered 61 and 62 to clear to all red before going into preempt.
- Program controller to clear from phase 2+6 to phase 2+5 by progressing through phase 4+8.
- Relocate existing optical detector 10.
- Set all detector units to presence mode.
- In the event of loop replacement, refer to the current ITS and Signals Design Manual and submit a Plan of Record to the Signals Design Section.
- All pavement markings are existing.
- This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
- Optical detector 30 calls PRE 3.
- Optical detector 10 calls PRE 4.
- Optical detector 20 calls PRE 6.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Signal system data: Controller Asset # 0987.

PHASING DIAGRAM



EMERGENCY VEHICLE PREEMPT PHASES (Medium Priority)

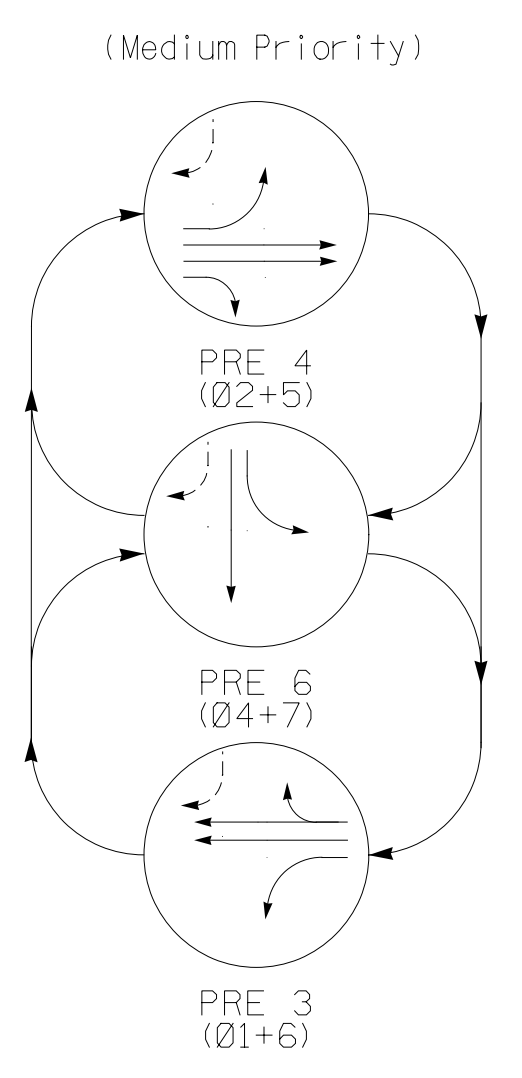


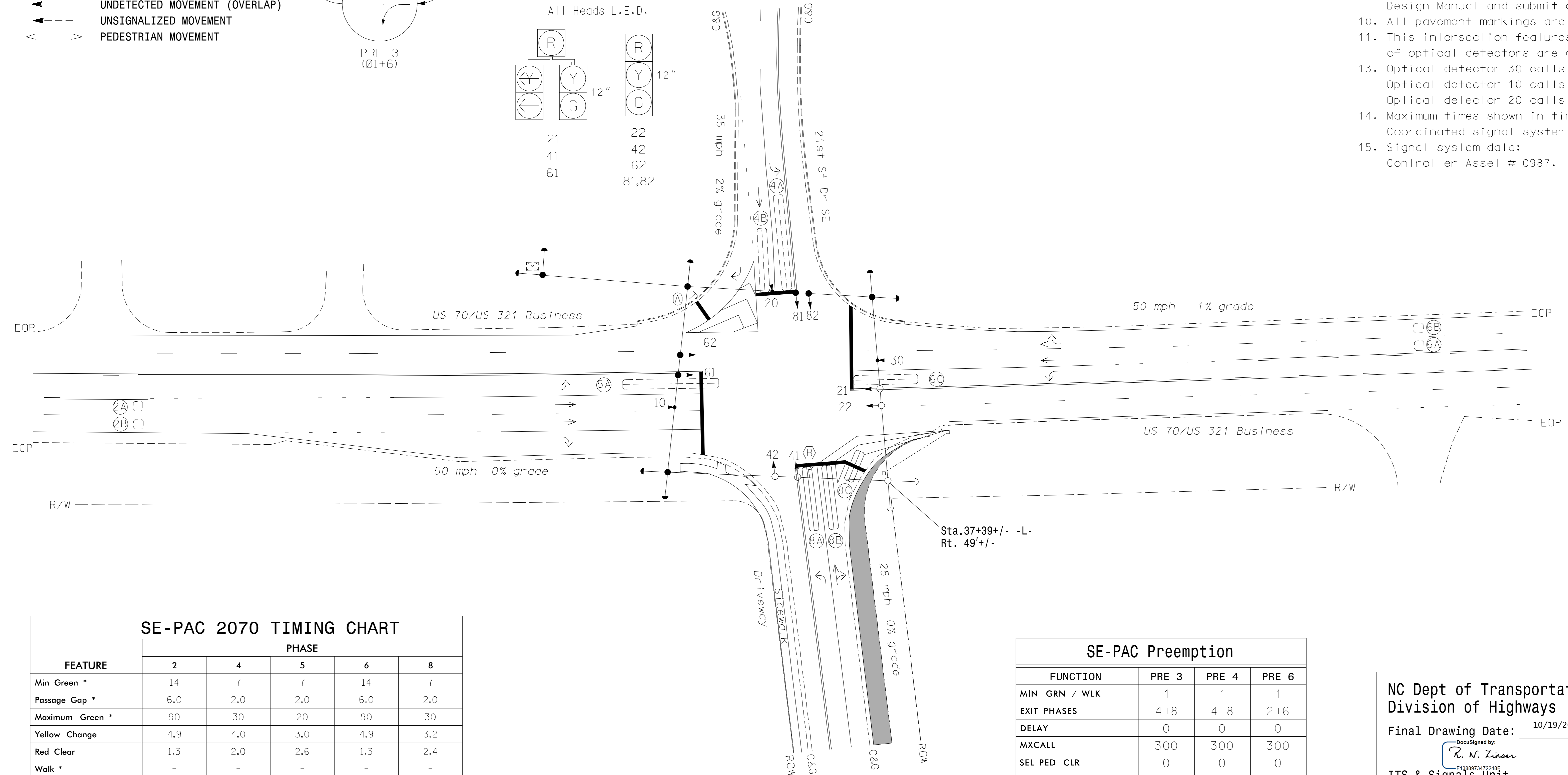
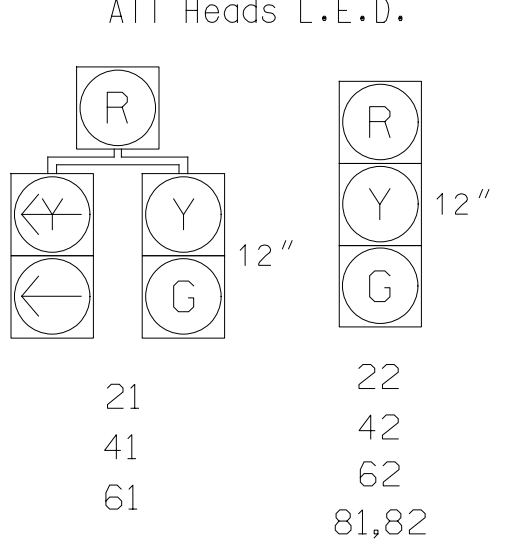
TABLE OF OPERATION

SIGNAL FACE	PHASE							
	02+5	04+8	PRE 3	PRE 4	PRE 6	PRE 8	PRE 10	PRE 12
21	G	R	R	R	R	R	R	Y
22	G	R	R	R	R	R	R	Y
41	R	R	G	R	R	R	R	Y
42	R	R	G	R	R	R	R	Y
61	R	R	G	R	R	R	R	Y
62	R	R	G	R	R	R	R	Y
81,82	R	R	G	R	R	R	R	Y

SE-PAC 2070 LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW/EXISTING	ASSIGNED PHASE	DETECTOR PROGRAMMING														STATUS
						TIMING		OPERATION MODE							SWITCH	SYSTEM LOOPS	NEW	EXISTING		
						DELAY	EXTEND (STRETCH)	VEHICLE	PEDESTRIAN	1 CALL	STOP A	STOP B	PROPER PROFFER THROUGH	AND						
2A	6X6	EXIST	350	- X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X
2B	6X6	EXIST	350	- X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X
4A	6X40	2-4-2	0	- X	4	3 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X
4B	6X40	2-4-2	0	- X	4	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X
5A	6X60	2-4-2	+5	- X	5	3 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X
6A	6X6	EXIST	350	- X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X
6B	6X6	EXIST	350	- X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X
6C	6X6	2-4-2	0	- X	6	3 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X
8A	6X60	2-4-2	0	X	-	8	3 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
8B	6X40	2-4-2	0	X	-	8	10 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
8C	6X20	2-4-2	+10	X	-	8	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X

SIGNAL FACE I.D.



SE-PAC 2070 TIMING CHART

FEATURE	PHASE				
	2	4	5	6	8
Min Green *	14	7	7	14	7
Passage Gap *	6.0	2.0	2.0	6.0	2.0
Maximum Green *	90	30	20	90	30
Yellow Change	4.9	4.0	3.0	4.9	3.2
Red Clear	1.3	2.0	2.6	1.3	2.4
Walk *	-	-	-	-	-
Pedestrian Clear	-	-	-	-	-
Added Initial *	1.8	-	-	1.8	-
Maximum Initial *	39	-	-	39	-
Time Before Reduction *	15	-	-	15	-
Time To Reduce *	30	-	-	30	-
Minimum Gap	3.0	-	-	3.0	-
Recall Mode	MIN RECALL	-	-	MIN RECALL	-
Vehicle Call Memory	LOCK	NON-LOCK	NON-LOCK	LOCK	NON-LOCK
Dual Entry	-	ON	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON

* 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.

SE-PAC Preemption

FUNCTION	PRE 3	PRE 4	PRE 6
MIN GRN / WLK	1	1	1
EXIT PHASES	4+8	4+8	2+6
DELAY	0	0	0
MXCALL	300	300	300
SEL PED CLR	0	0	0
SEL YEL / 10	4.5	4.5	4.5
SEL RED / 10	2.3	2.3	2.3
TRACK GREEN	1	1	1
TRK PED CLR	0	0	0
TRK YEL / 10	0	0	0
TRK RED / 10	0	0	0
DWELL GRN	10	10	10
RET PED CLR	0	0	0
RET YEL / 10	4.5	4.5	4.5
RET RED / 10	2.3	2.3	2.3
PREEMPT EXTEND *	2	2	2

* Program Timing on Optical Detection Unit.

LEGEND



NC Dept of Transportation
Division of Highways
Final Drawing Date: 10/19/2017
DocuSigned by: R. N. Zinner
ITS & Signals Unit

940 Main Campus Drive, Suite 500
Raleigh, NC 27606
NC License No. C-3705
919.829.0328

Signal Upgrade-Temporary Design

US 70 / US 321 Business at SR 1468 (Sweetwater Road)

Division 12 Catawba County Hickory

PLAN DATE: Oct. 2017 REVIEWED BY: J.L. Lewis

PREPARED BY: J. Ma REVIEWED BY: M. Stygles

10/19/2017

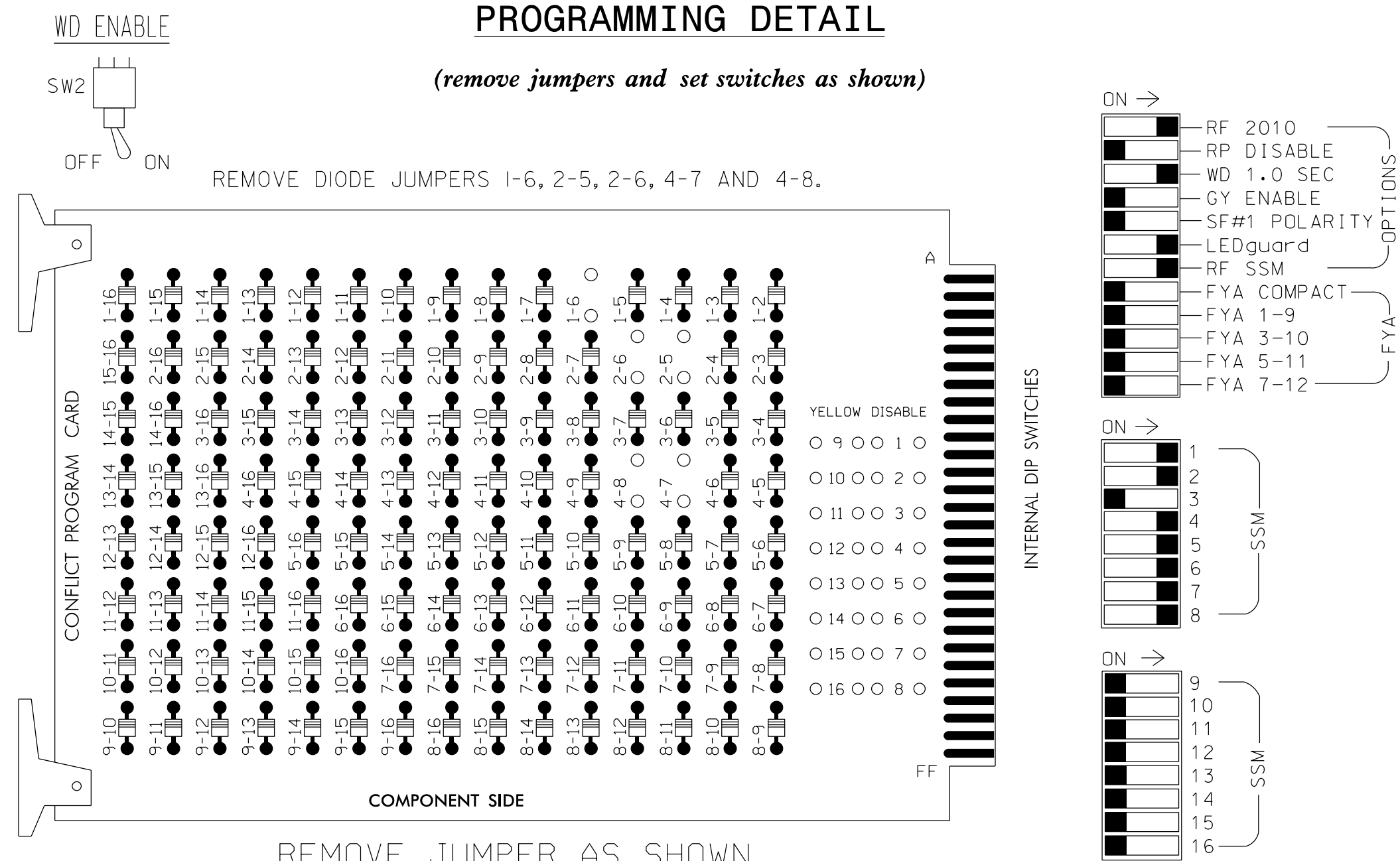
SCALE: 1" = 40'

SIG. INVENTORY NO. 12-0987T

EDI MODEL 2010ECLip CONFLICT MONITOR

PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Make sure jumpers SEL2-SEL5 are present on the monitor board.
3. Integrate monitor with Ethernet network in cabinet.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. To prevent red failures on unused monitor channels, see red monitor board programming detail this sheet.
3. Program controller to start up in phases 2 and 6 green.
4. Enable simultaneous gap-out feature, on controller unit, for all phases.
5. Program phases 4 and 8, on controller unit, for dual entry.
6. Program phases 2 and 6, on controller unit, for volume density operation.
7. The cabinet and controller are part of the Hickory City Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....SIEMENS 2070
 CABINET.....MCCAIN TRAFFIC MODEL 336
 SOFTWARE.....SE-PAC2070
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S1,S2,S4,S5,S6,S7,S8
 PHASES USED.....1*,2,4,5,6,7*,8
 PEDS USED.....NONE
 OVERLAPS.....NONE

* USED FOR EMERGENCY VEHICLE PREEMPTION ONLY.

FIELD CONNECTION HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	6I	2I,22	NU	NU	4I,42	NU	2I	6I,62	NU	4I	8I,82	NU
RED	*	128			101		*	134		*	107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW	126							132			123	
GREEN ARROW	127							133			124	

NU = Not Used
 * Denotes install load resistor. See load resistor installation detail in sheet 2 of 2.

INPUT FILE POSITION LAYOUT

(front view)

FILE	U	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
U	S	∅ 2	∅ 2	∅ 4	∅ 5	∅ 6	NOT USED	∅ 8	∅ 8	CH. 3 PRE-3	CH. 1 PRE-4	∅ 8	∅ 8	∅ 8	FS	
		2A	2A	4A	5A	6A	8A	8A	8A	8A	NOT USED	CH. 2 PRE-6	∅ 8	∅ 8	∅ 8	DC ISOLATOR
L	S	∅ 2	∅ 2	∅ 4	∅ 6	∅ 6	∅ 8	∅ 8	∅ 8	∅ 8	∅ 8	∅ 8	∅ 8	∅ 8	∅ 8	DC ISOLATOR
		2B	2B	4B	6C	6B	8C	8B	8B	8B	8B	8B	8B	8B	8B	8B

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

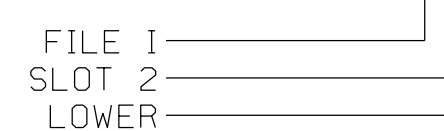
FS = FLASH SENSE
 ST = STOP TIME
 PRE4,5,6 = EV PREEMPTS

↑
 4 CHANNEL TOMAR OSP CARD
 INSERT CARD INTO
 SLOT 111

INPUT FILE CONNECTION & PROGRAMMING CHART

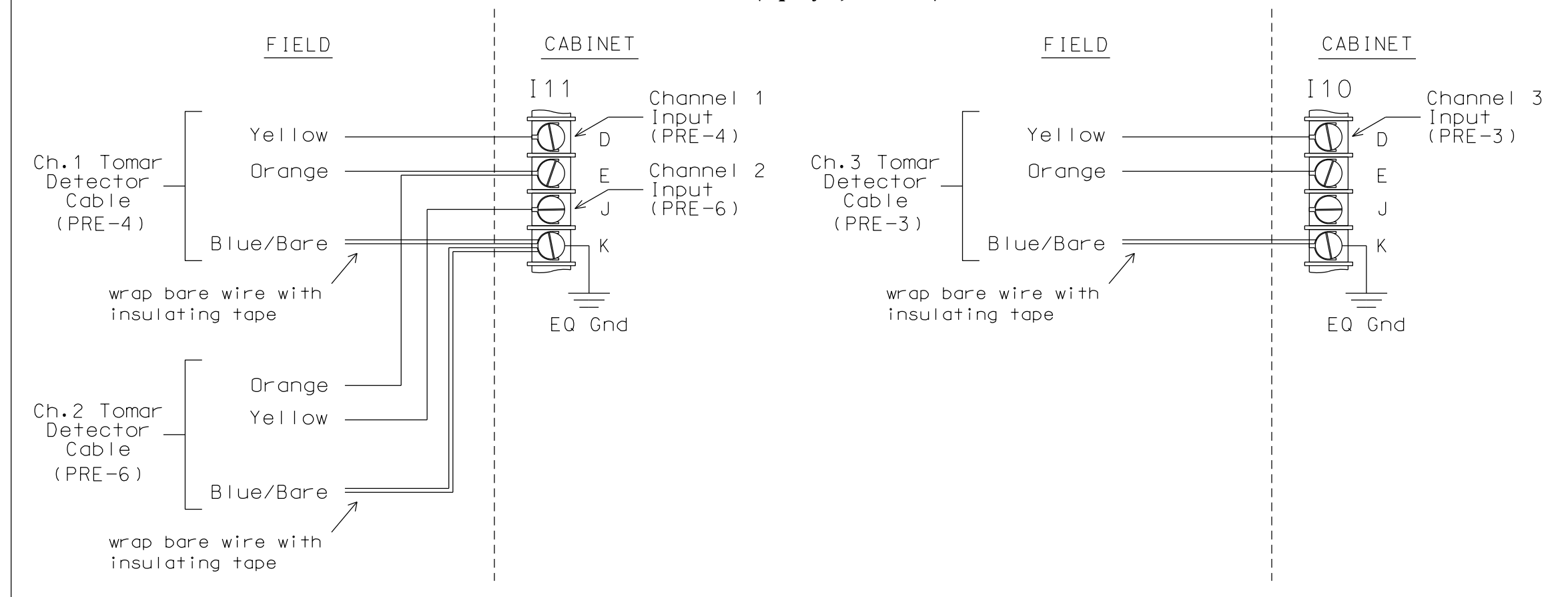
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
2A	TB21-3,4	I2U	39	3	2		
2B	TB23-3,4	I2L	43	4	2		
4A	TB21-7,8	I4U	41	11	4	3	
4B	TB23-7,8	I4L	45	12	4		
5A	TB21-9,10	I5U	55	19	5	3	
6A	TB21-11,12	I6U	40	21	6		
6B	TB23-11,12	I6L	44	22	6		
6C	TB23-9,10	I5L	48	25	6	3	
8A	TB22-1,2	I8U	42	31	8	3	
8B	TB24-1,2	I8L	46	32	8	10	
8C	TB23-13,14	I7L	50	35	8	15	

INPUT FILE POSITION LEGEND: I2L



TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



THIS ELECTRICAL DETAIL IS FOR
 THE SIGNAL DESIGN: 12-0987T
 DESIGNED: Oct. 2017
 SEALED: 10/19/2017
 REVISED: N/A

NC Dept of Transportation
 Division of Highways
 Final Drawing Date: 10/19/2017
 R. N. Ziron
 ITS & Signals Unit



BACK-UP PROTECTION PROGRAMMING DETAIL

(program controller as shown below)

From Main Menu, press '3' (Phase Data)

EPAC PHASE DATA	PRESS # DESIRED
1-VEHICLE TIMES	5-V & P RECALLS
2-DENSITY TIMES	6-N.LOCK & MISC
3-PEDEST. TIMES	7-SPEC. SEQUENCE
4-INITIALIZE & N.A. RESPONSE	8-SPEC. DETECTOR
	9-PHASE COPY

F-PRIOR MENU

PHASE	1	2	3	4	5	6	7	8
OMIT	0	0	0	0	6	0	0	0
-YEL	0	0	0	0	0	0	0	0
OCAL	0	0	0	0	4	0	0	0

OMIT:## PHS ON OMITTS THIS PHASE
 -YEL:## PHS YEL OMITTS THIS PHS YEL
 OCAL: WHEN OMIT, DETS CALL## PHS

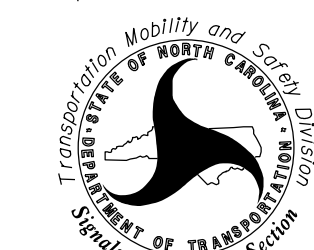
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

Special Sequence programming complete.

Electrical Detail-Temporary Design (Sheet 1 of 2)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:



750 N. Greenfield Pkwy, Garner, NC 27529

US 70 / US 321 Business
 at
 SR 1468 (Sweetwater Road)

Division 12 Catawba County Hickory
 PLAN DATE: Oct. 2017 REVIEWED BY: M.L. Stygles
 PREPARED BY: J. Ma REVIEWED BY: J.L. Lewis

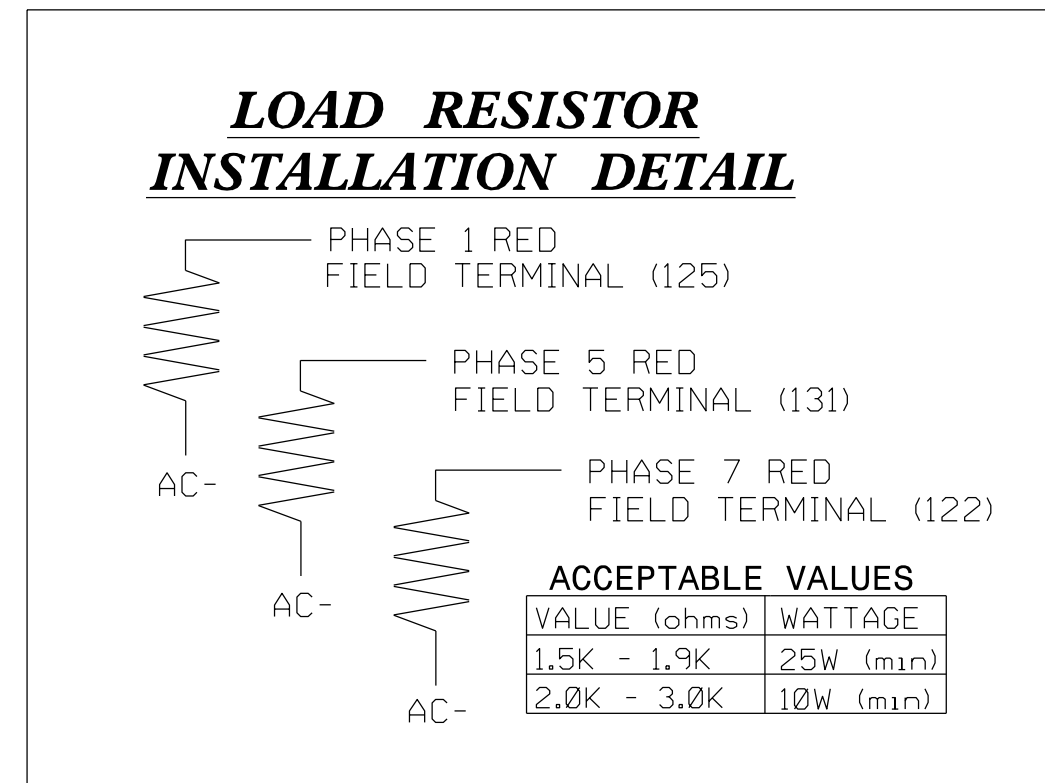
REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
 NORTH CAROLINA
 PROFESSIONAL ENGINEER
 SEAL 033108
 J. L. Lewis
 10/19/2017
 DATE
 SIG. INVENTORY NO. 12-0987T

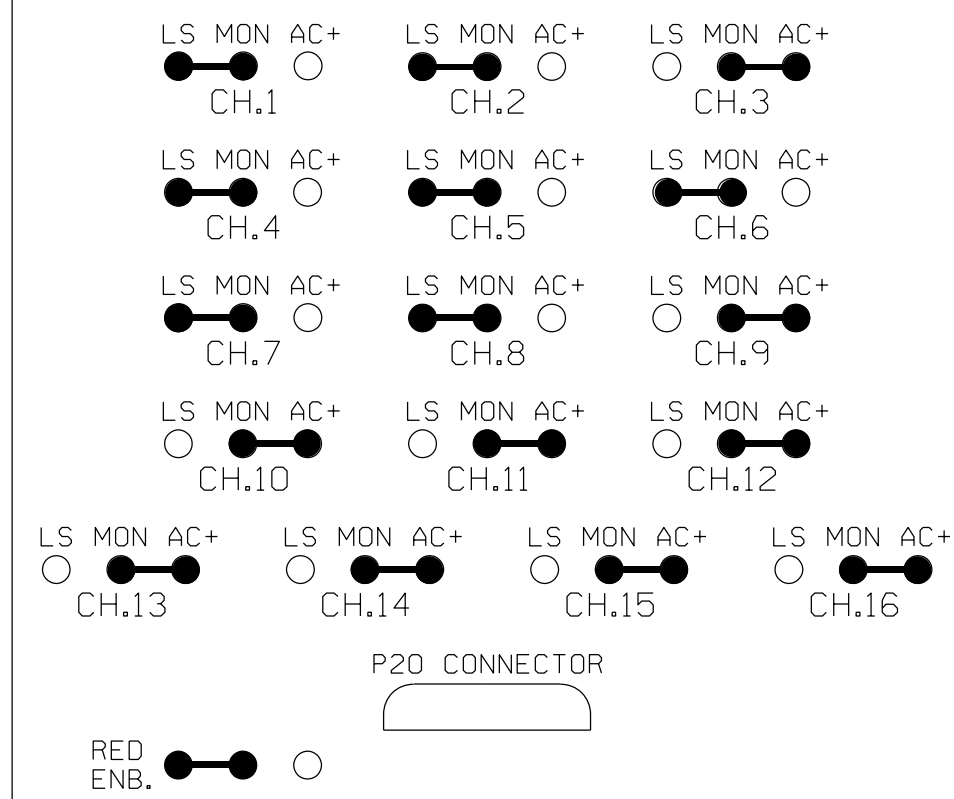
EMERGENCY VEHICLE PREEMPTION PROGRAMMING DETAIL

(program controller as shown below)



RED MONITOR BOARD PROGRAMMING

(position jumpers as shown below)



- PREEMPT 3 -

SE-PAC PREEMPT DATA	PRESS # DESIRED
1-ALL PREEMPTS	5-PREEMPT 4
2-PREEMPT 1	6-PREEMPT 5
3-PREEMPT 2	7-PREEMPT 6
4-PREEMPT 3	8-LOAD DEFAULT

- PREEMPT 4 -

SE-PAC PREEMPT DATA	PRESS # DESIRED
1-ALL PREEMPTS	5-PREEMPT 4
2-PREEMPT 1	6-PREEMPT 5
3-PREEMPT 2	7-PREEMPT 6
4-PREEMPT 3	8-LOAD DEFAULT

- PREEMPT 6 -

SE-PAC PREEMPT DATA	PRESS # DESIRED
1-ALL PREEMPTS	5-PREEMPT 4
2-PREEMPT 1	6-PREEMPT 5
3-PREEMPT 2	7-PREEMPT 6
4-PREEMPT 3	8-LOAD DEFAULT

FROM MAIN MENU PRESS "7" (PREEMPT DATA)

- ALL PREEMPTS -

SE-PAC PREEMPT DATA	PRESS # DESIRED
1-ALL PREEMPTS	5-PREEMPT 4
2-PREEMPT 1	6-PREEMPT 5
3-PREEMPT 2	7-PREEMPT 6
4-PREEMPT 3	8-LOAD DEFAULT

SE-PAC ALL PREEMPTS DATA
RING TIMES.....1.....2.....3.....4
MIN GRN/WLK 1 1 0 0
PRIORITY...FL...1/2..2/3..3/4..4/5..5/6.
STATUS 1 1 1 1 1 1
CODES.....0-NO...1-YES.....
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

select F - return to Preempt data menu

SE-PAC PREEMPT 3	PRESS # DESIRED
1-MISCELLANEOUS	4-PEDEST. STATUS
2-INTERVAL TIMES	5-OVERLAP STATUS
3-VEHICLE STATUS	6-LOW PRIORITY
F-PRIOR MENU	

SE-PAC PREEMPT 3 MISC DATA (0-NO & 1-YES)
TEST.: 0 N-LOCK: 0 LINK PE#: 0
DELAY: 0 EXTEND: 0 DURATION: 000
MXCALL: 300 LOCK OUT: 000
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
EXIT 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0
CALLS 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

select F - return to Preempt 3 menu, then select 2 - Interval Times

SE-PAC PREEMPT 3 INTERVAL TIMES
SEL PED CLR: 00 TRK YEL/10 : 00
SEL YEL/10 : 45 TRK RED/10 : 00
SEL RED/10 : 23 DWELL GREEN: 10
TRACK GREEN: 01* RET PED CLR: 00
TRK PED CLR: 00 RET YEL/10 : 45
RET RED/10 : 23
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

select F - return to Preempt 3 menu, then select 3 - Vehicle Status

SE-PAC PREEMPT 3 VEHICLE STATUS
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
TRK GRN 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
DWELL 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
(0-RED.1-GRN.2-FLR.3-FLY.4-DARK.5-FLG)
CYCLE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(0-NO..1-ACT..2-MIN REC..3-MX REC)
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

select F as needed to return to SE-PAC preempt data menu

NOTE: options 4, 5 and 6 not used for Preempt 3. Be sure values are set at default = 0

SE-PAC PREEMPT 4	PRESS # DESIRED
1-MISCELLANEOUS	4-PEDEST. STATUS
2-INTERVAL TIMES	5-OVERLAP STATUS
3-VEHICLE STATUS	6-LOW PRIORITY
F-PRIOR MENU	

SE-PAC PREEMPT 4 MISC DATA (0-NO & 1-YES)
TEST.: 0 N-LOCK: 0 LINK PE#: 0
DELAY: 0 EXTEND: 0 DURATION: 000
MXCALL: 300 LOCK OUT: 000
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
EXIT 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0
CALLS 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

select F - return to Preempt 4 menu, then select 2 - Interval Times

SE-PAC PREEMPT 4 INTERVAL TIMES
SEL PED CLR: 00 TRK YEL/10 : 00
SEL YEL/10 : 45 TRK RED/10 : 00
SEL RED/10 : 23 DWELL GREEN: 10
TRACK GREEN: 01* RET PED CLR: 00
TRK PED CLR: 00 RET YEL/10 : 45
RET RED/10 : 23
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

select F - return to Preempt 4 menu, then select 3 - Vehicle Status

SE-PAC PREEMPT 4 VEHICLE STATUS
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
TRK GRN 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
DWELL 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0
(0-RED.1-GRN.2-FLR.3-FLY.4-DARK.5-FLG)
CYCLE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(0-NO..1-ACT..2-MIN REC..3-MX REC)
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

select F as needed to return to SE-PAC preempt data menu

NOTE: options 4, 5 and 6 not used for Preempt 4. Be sure values are set at default = 0

SE-PAC PREEMPT 6	PRESS # DESIRED
1-MISCELLANEOUS	4-PEDEST. STATUS
2-INTERVAL TIMES	5-OVERLAP STATUS
3-VEHICLE STATUS	6-LOW PRIORITY
F-PRIOR MENU	

SE-PAC PREEMPT 6 MISC DATA (0-NO & 1-YES)
TEST.: 0 N-LOCK: 0 LINK PE#: 0
DELAY: 0 EXTEND: 0 DURATION: 000
MXCALL: 300 LOCK OUT: 000
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
EXIT 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0
CALLS 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

select F - return to Preempt 6 menu, then select 2 - Interval Times

SE-PAC PREEMPT 6 INTERVAL TIMES
SEL PED CLR: 00 TRK YEL/10 : 00
SEL YEL/10 : 45 TRK RED/10 : 00
SEL RED/10 : 23 DWELL GREEN: 10
TRACK GREEN: 01* RET PED CLR: 00
TRK PED CLR: 00 RET YEL/10 : 45
RET RED/10 : 23
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

select F - return to Preempt 6 menu, then select 3 - Vehicle Status

SE-PAC PREEMPT 6 VEHICLE STATUS
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
TRK GRN 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
DWELL 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0
(0-RED.1-GRN.2-FLR.3-FLY.4-DARK.5-FLG)
CYCLE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(0-NO..1-ACT..2-MIN REC..3-MX REC)
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

select F as needed to return to SE-PAC preempt data menu

NOTE: options 4, 5 and 6 not used for Preempt 6. Be sure values are set at default = 0

* A TRACK GREEN time of 1 second will ensure that an all-red clearance will occur before going from any phase to preempt dwell.

Program extend time on optical detector units for 2.0 sec for PRE3, PRE4, and PRE6.

NC Dept of Transportation
Division of Highways
Final Drawing Date: 10/19/2017
Signed by: R. N. Zinan
ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-0987T
DESIGNED: Oct. 2017
SEALED: 10/19/2017
REVISED: N/A



Electrical Detail-Temporary Design (Sheet 2 of 2)

Electrical and Programming Details For:
Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
Signal Management Section

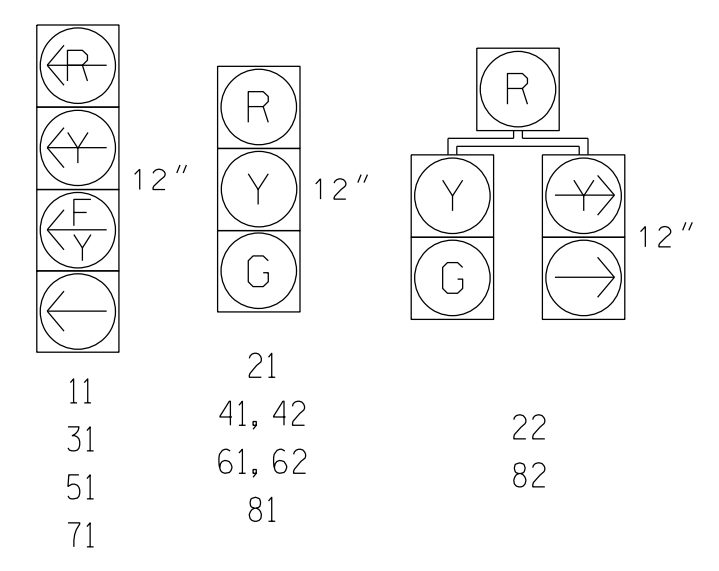
US 70 / US 321 Business at SR 1468 (Sweetwater Road)

Division 12 Catawba County Hickory
PLAN DATE: Oct. 2017 REVIEWED BY: J.L. Lewis
PREPARED BY: J. Ma VHB PROJECT NO.: 38536.01
REVISIONS INIT. DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER
SEAL 033108
JIANXIN MA
10/19/2017
SIG. INVENTORY NO. 12-0987T

8 Phase with EVP Fully Actuated Hickory City Signal System

SIGNAL FACE I.D. All Heads L.E.D.



SE-PAC Preemption				
FUNCTION	PRE 3	PRE 4	PRE 5	PRE 6
MIN GRN / WLK	1	1	1	1
EXIT PHASES	4+8	4+8	2+6	2+6
DELAY	0	0	0	0
MXCALL	300	300	300	300
SEL PED CLR	0	0	0	0
SEL YEL / 10	4.5	4.5	4.5	4.5
SEL RED / 10	2.3	2.3	2.3	2.3
TRACK GREEN	0	0	0	0
TRK PED CLR	0	0	0	0
TRK YEL / 10	0	0	0	0
TRK RED / 10	0	0	0	0
DWELL GRN	10	10	10	10
RET PED CLR	0	0	0	0
RET YEL / 10	4.5	4.5	4.5	4.5
RET RED / 10	2.3	2.3	2.3	2.3
PREEMPT EXTEND*	2	2	2	2

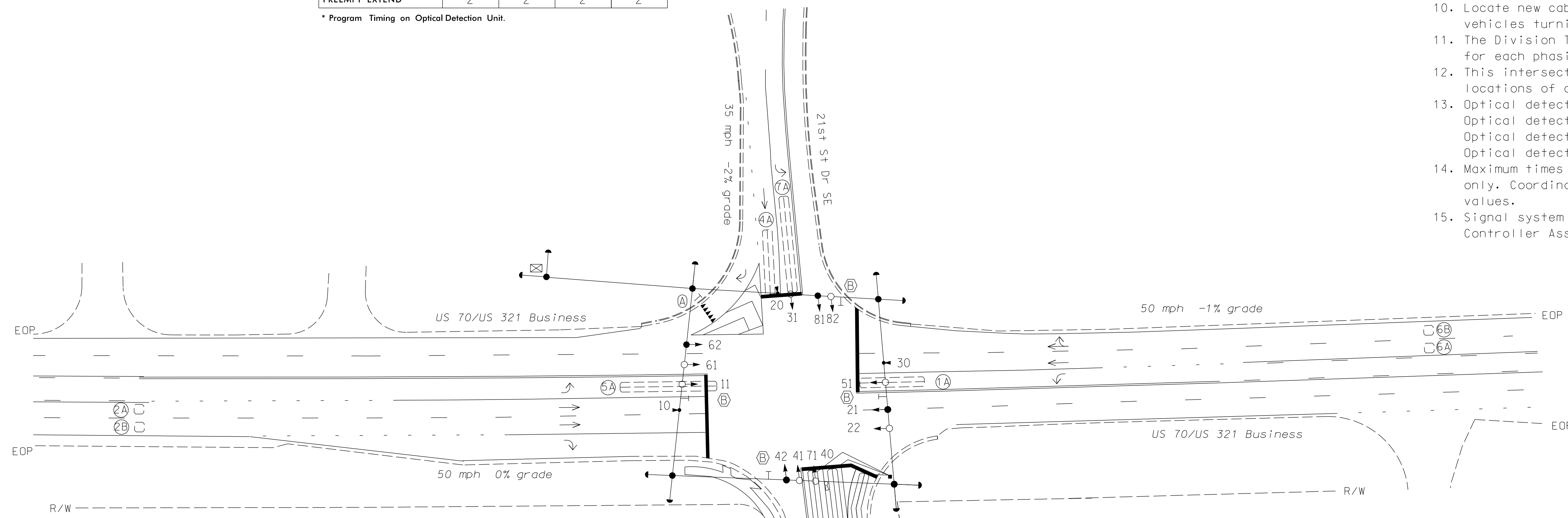
* Program Timing on Optical Detection Unit.

SE-PAC 2070 LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING														
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW EXISTING	ASSIGNED PHASE	TIMING		OPERATION MODE							SYSTEM LOOPS		STATUS		
						DELAY	EXTEND (STRETCH)	VEHICLE	PEDESTRIAN	1 CALL	STOP A	STOP B	PROTECTOR	PLATE	THROUGH	AND		SWITCH	NEW
1A	6X40	EXIST	0	X	1	5 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
1B	6X40	2-4-2	0	X	1	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
2A	6X6	EXIST	350	-	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
2B	6X6	EXIST	350	-	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
3A	6X40	2-4-2	0	X	3	5 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
4A	6X40	EXIST	0	-	4	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
5A	6X60	EXIST	+5	-	5	5 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
6A	6X6	EXIST	350	-	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
6B	6X6	EXIST	350	-	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
7A	6X60	EXIST	0	-	7	5 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
8A	6X40	2-4-2	0	X	8	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-

NOTES

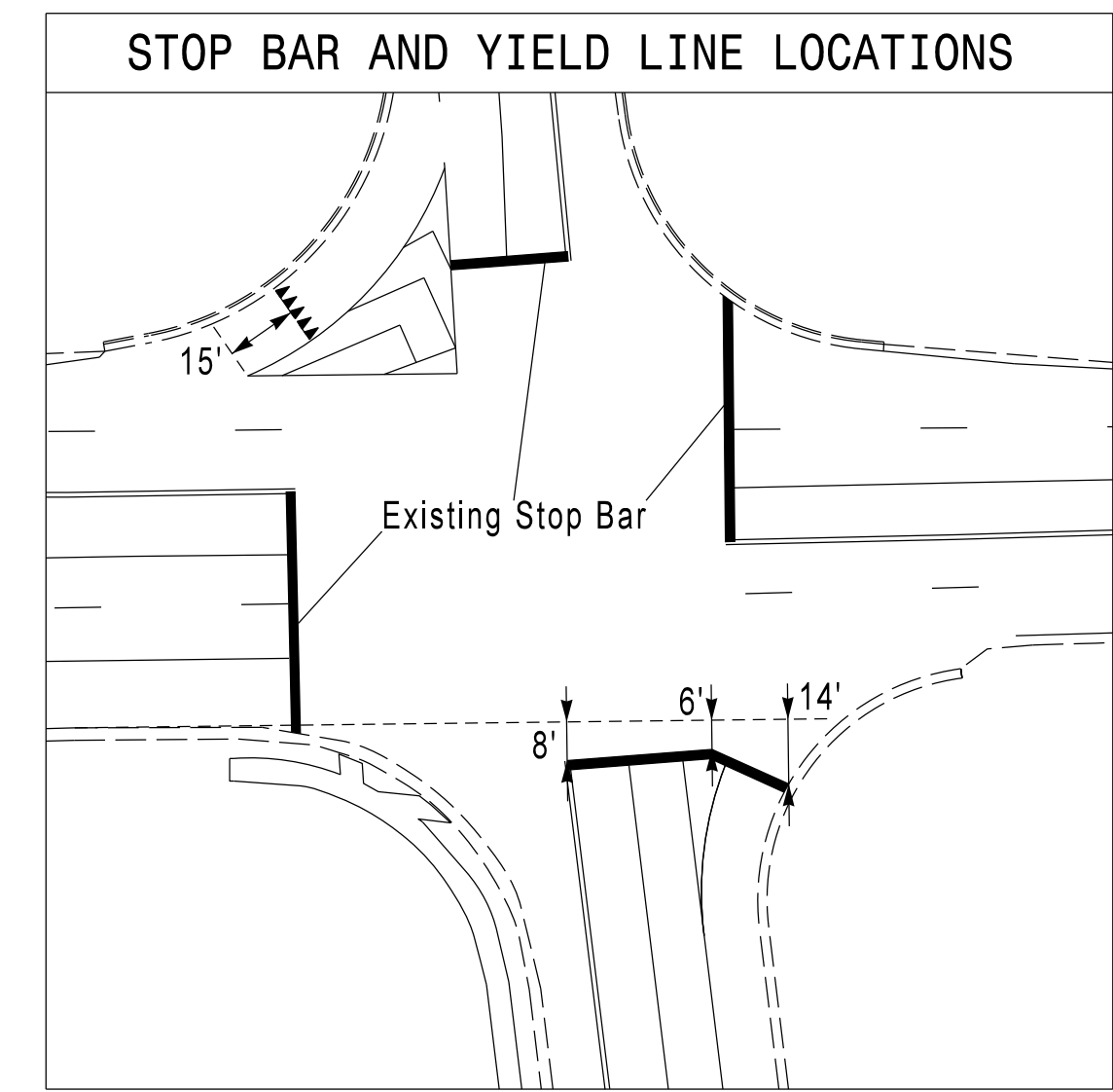
- Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 and/or phase 5 may be lagged.
- Phase 3 and/or phase 7 may be lagged.
- Reposition existing signal heads numbered 21, 42, 62 and 81.
- Set all detector units to presence mode.
- 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.
- Remove Existing "Left Turn Yield on Green" ball signs (R10-12).
- Repaint the existing stop bar for southbound right turn with yield line.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- The Division Traffic Engineer will determine the hours of use for each phasing plan.
- This intersection features an optical detection system. Shown locations of optical detectors are conceptual only.
- Optical detector 30 calls PRE 3.
Optical detector 10 calls PRE 4.
Optical detector 40 calls PRE 5.
Optical detector 20 calls PRE 6.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Signal system data:
Controller Asset # 0987.



PROPOSED	EXISTING

SE-PAC 2070 TIMING CHART								
FEATURE	PHASE							
	1	2	3	4	5	6	7	8
Min Green *	7	14	7	7	7	14	7	7
Passage Gap *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Maximum Green *	20	90	15	30	20	90	15	30
Yellow Change	3.0	4.9	3.0	4.0	3.0	4.9	3.0	4.0
Red Clear	2.3	1.3	2.4	2.0	2.6	1.3	2.6	2.0
Walk *	-	-	-	-	-	-	-	-
Pedestrian Clear	-	-	-	-	-	-	-	-
Added Initial *	-	1.8	-	-	-	1.8	-	-
Maximum Initial *	-	39	-	-	-	39	-	-
Time Before Reduction *	-	15	-	-	-	15	-	-
Time To Reduce *	-	30	-	-	-	30	-	-
Minimum Gap	-	3.0	-	-	-	3.0	-	-
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Vehicle Call Memory	NON-LOCK	LOCK	NON-LOCK	NON-LOCK	NON-LOCK	LOCK	NON-LOCK	NON-LOCK
Dual Entry	-	-	-	ON	-	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON	ON	ON	ON

* 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.



NC Dept of Transportation
Division of Highways
Final Drawing Date: 10/19/2017
R. N. Zinan
ITS & Signals Unit



Signal Upgrade-Final Design (Sheet 1 of 2)

	<p>US 70/US 321 BUS. at Sweetwater Rd. Ext./ 21st St Dr. SE</p>		
	<p>Division 12 Catawba County Hickory</p>	<p>PLN DATE: Oct. 2017 REVIEWED BY: J.L. Lewis</p>	
<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>SCALE 0 40 1"=40'</p>	<p>REVISIONS</p>	<p>INIT. DATE</p>

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

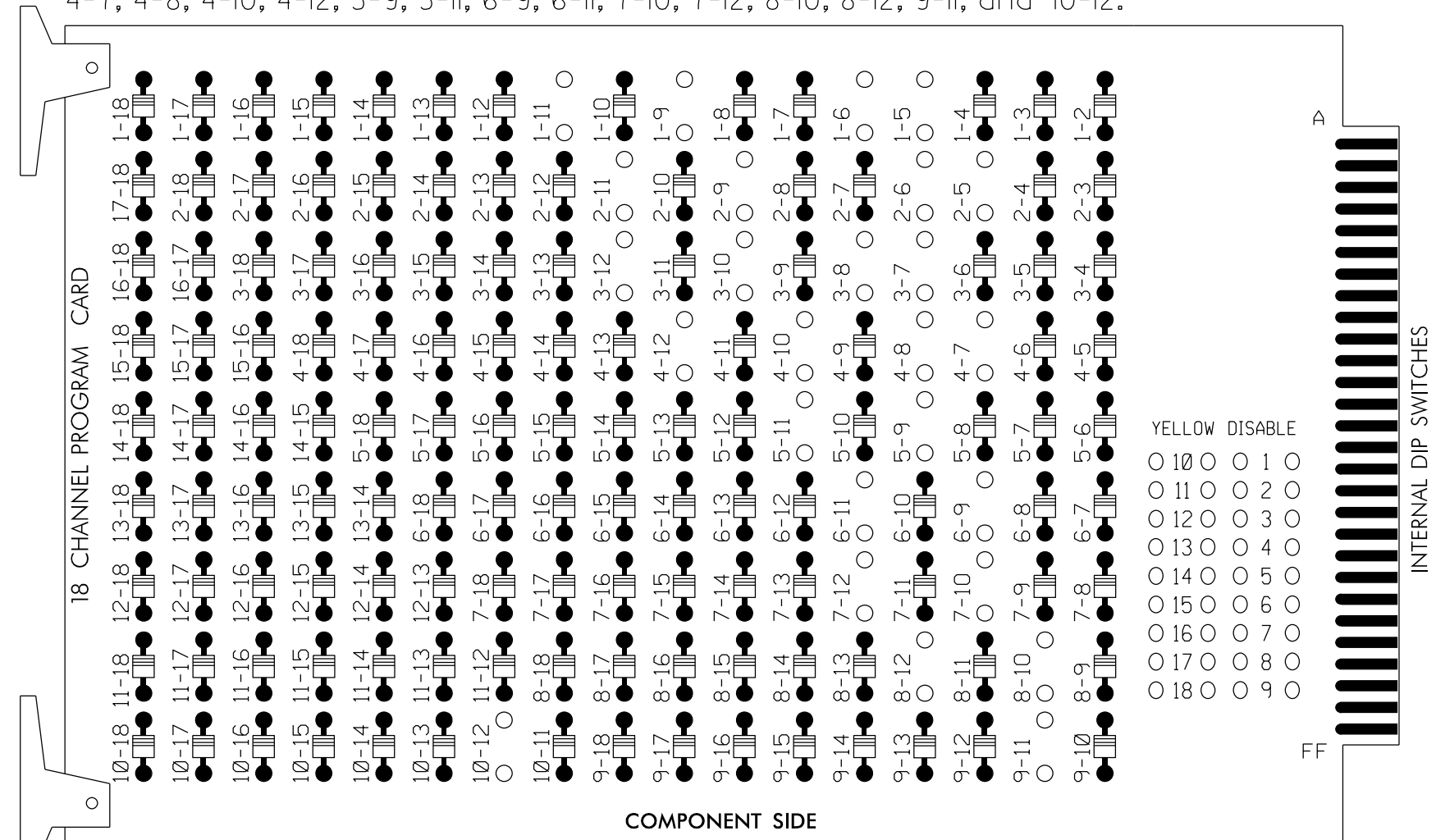
SEAL
NORTH CAROLINA
PROFESSIONAL ENGINEER
JANUIN MA
10/16/2017
SIG. INVENTORY NO. 12-0987

VIB PROJECT NO.: 38536-01

EDI MODEL 2018ECLIP-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 2-5, 2-6, 2-9, 2-11, 3-7, 3-8, 3-10, 3-12, 4-7, 4-8, 4-10, 4-12, 5-9, 5-11, 6-9, 6-11, 7-10, 7-12, 8-10, 8-12, 9-11, and 10-12.



NOTES:

REMOVE JUMPERS AS SHOWN

- 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.
- Integrate monitor with Ethernet network in cabinet.

■ = 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. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Program controller to start up in phases 2 and 6 green.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- Program phases 4 and 8, on controller unit, for dual entry.
- Program phases 2 and 6, on controller unit, for volume density operation.
- The cabinet and controller are part of the Hickory City Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070
 CABINET.....332
 SOFTWARE.....SE-PAC2070
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...18 (12-STD; 6-AUX)
 LOAD SWITCHES USED.....S1,S2,S4,S5,S7,S8,S10,S11
 AUX S1,AUX S2,AUX S4,AUX S5
 PHASES USED.....1,2,3,4,5,6,7,8
 OVERLAP "A".....*
 OVERLAP "B".....*
 OVERLAP "C".....*
 OVERLAP "D".....*

* See sheet 2 of 4 for Overlap and Protected & Permissive Phases programming.

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	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	11	82	21,22	31	22	41,42	51	61,62	71	81,82	91	101	11	31	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	126				117								A122	A125		A115	A102	
FLASHING YELLOW ARROW													A123	A126		A116	A103	
GREEN ARROW	127	127		118	118		133		124									

NU = Not Used
 * Denotes install load resistor. See load resistor installation detail in sheet 2 of 4.
 ★ See pictorial of head wiring in detail below.

INPUT FILE POSITION LAYOUT

(front view)

FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	∅ 1 1A	∅ 1 1B	∅ 2 2A	∅ 2 2B	∅ 3 3A	∅ 4 4A	∅ 5 5A	∅ 6 6A	∅ 7 7A	∅ 8 8A	CH. 3 PRE-3	CH. 1 PRE-4	FS DC ISOLATOR	ST DC ISOLATOR
L	NOT USED	NOT USED	∅ 2	∅ 2	NOT USED	NOT USED	∅ 5	∅ 6	∅ 7	∅ 8	CH. 4 PRE-5	CH. 2 PRE-6		
U														
L														

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

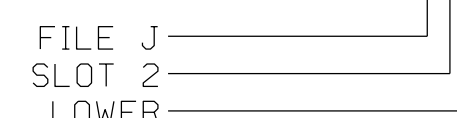
FS = FLASH SENSE
 ST = STOP TIME
 PRE3,4,5,6 = EV PREEMPTS

↑
 4 CHANNEL TOMAR OSP CARD
 INSERT CARD INTO
 SLOT J13

INPUT FILE CONNECTION & PROGRAMMING CHART

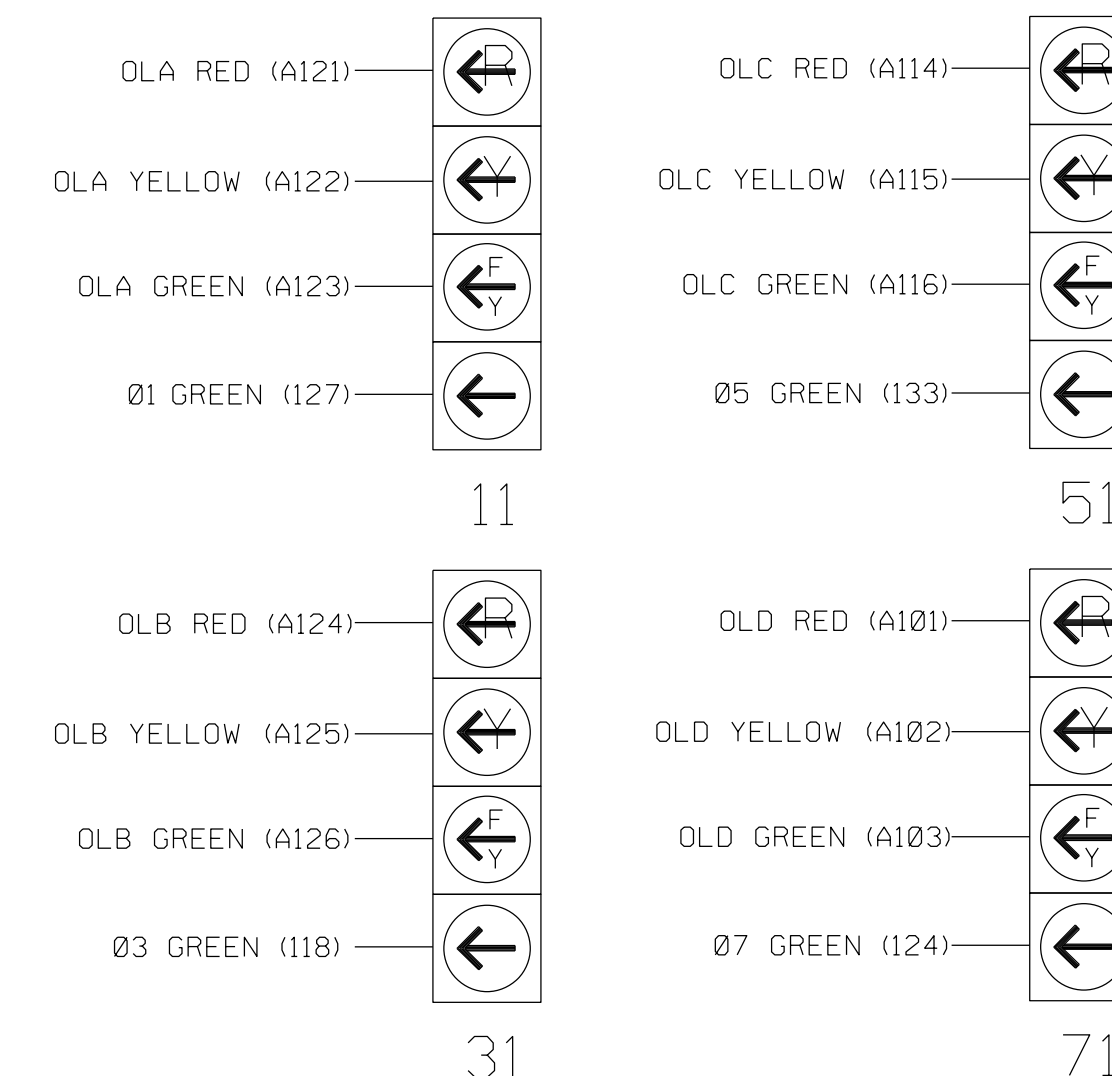
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
1A	TB2-1,2	I1U	56	1	1	5	
1B	TB2-5,6	I2U	39	3	1	15	
2A	TB2-9,10	I3U	63	5	2		
2B	TB2-11,12	I3L	76	6	2		
3A	TB4-5,6	I5U	58	9	3	5	
4A	TB4-9,10	I6U	41	11	4		
5A	TB3-1,2	J1U	55	19	5	5	
6A	TB3-5,6	J2U	40	21	6		
6B	TB3-7,8	J2L	44	22	6		
7A	TB5-5,6	J5U	57	29	7	5	
8A	TB5-9,10	J6U	42	31	8		

INPUT FILE POSITION LEGEND: J2L



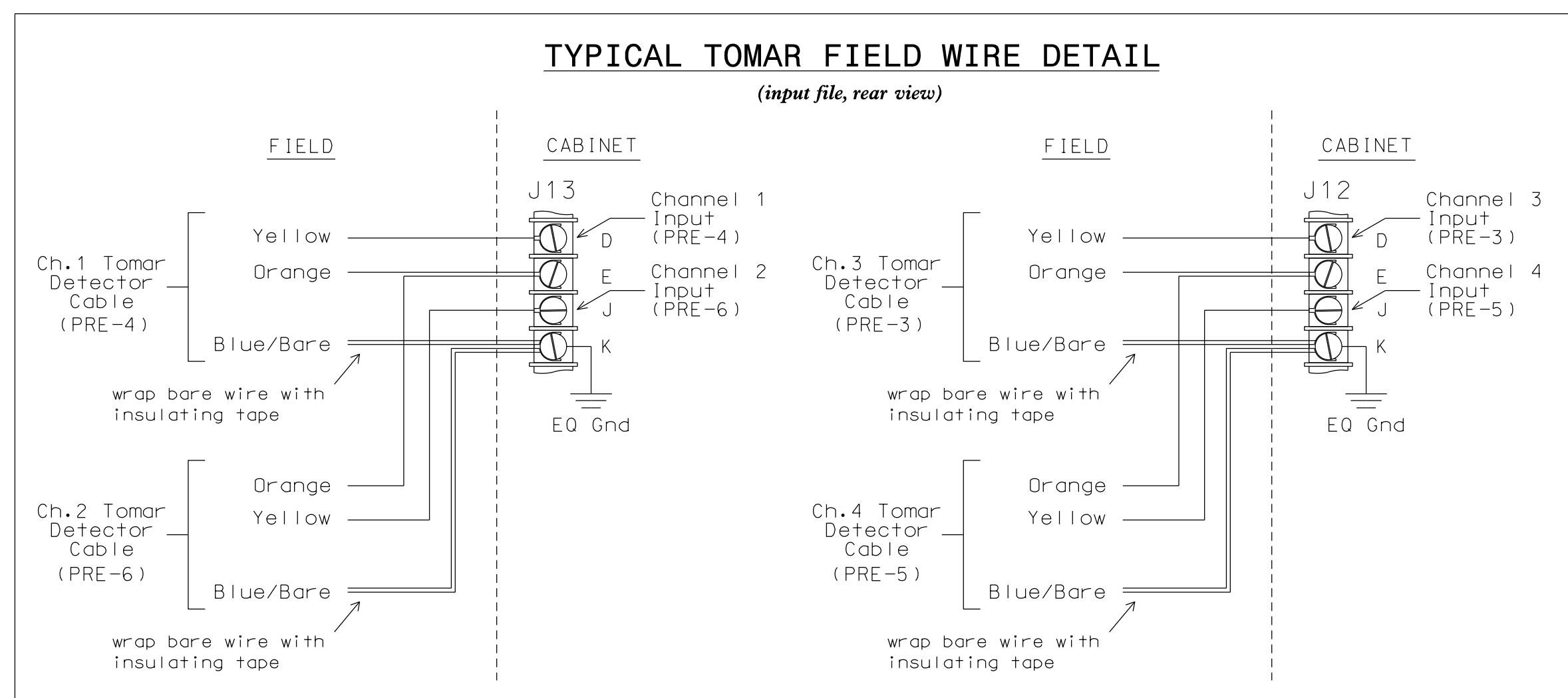
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

See sheet 2 for Protected and Permitted phases programming.



NC Dept of Transportation
 Division of Highways
 Final Drawing Date: 10/19/2017
 DocuSigned by: R. N. Linsen
 ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR
 THE SIGNAL DESIGN: 12-0987
 DESIGNED: Oct. 2017
 SEALED: 10/16/2017
 REVISED: N/A

Electrical Detail-Final Design (Sheet 1 OF 4)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 70/US 321 BUS.

at
 Sweetwater Rd. Ext./
 21st St Dr. SE

Division 12 Catawba County Hickory

PLAN DATE: Oct. 2017 REVIEWED BY: J.L. Lewis

PREPARED BY: J. Ma VHB PROJECT NO.: 38536.01

REVISIONS INIT. DATE

940 Main Campus Drive, Suite 500
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 919.829.0328

Prepared for 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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

DocuSigned by: J. Ma
 10/16/2017
 DATE
 SIG. INVENTORY NO. 12-0987

SE-PAC2070 OVERLAP PROGRAMMING DETAIL (program controller as shown below)

FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1- STARTUP & MISC	6- ALT SEQUENCES
2- REMOTE FLASH	7- PORT 1 DATA
3- OVERLAP STANDARD	8- I/O MISC
4- OVERLAP SPECIAL	9- SIG DRV OUT
5- RING STRUCTURE	
	F- PRIOR MENU

Do NOT enter any OVL PHASES! →

SE-PAC OVERLAP - A	(0-NO / 1-YES)
OVL PHASES: 00000000 00000000	
PHS/CHN: 123456789 0123456789 01234	
OVL CHN(S): 000000000 0001000000 00000	
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	
	PRESS 'B'

Do NOT enter any OVL PHASES! →

SE-PAC OVERLAP - B	(0-NO / 1-YES)
OVL PHASES: 00000000 00000000	
PHS/CHN: 123456789 0123456789 01234	
OVL CHN(S): 000000000 0000100000 00000	
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	
	PRESS 'B'

Do NOT enter any OVL PHASES! →

SE-PAC OVERLAP - C	(0-NO / 1-YES)
OVL PHASES: 000000000 00000000	
PHS/CHN: 123456789 0123456789 01234	
OVL CHN(S): 000000000 0000010000 00000	
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	
	PRESS 'B'

Do NOT enter any OVL PHASES! →

SE-PAC OVERLAP - D	(0-NO / 1-YES)
OVL PHASES: 000000000 00000000	
PHS/CHN: 123456789 0123456789 01234	
OVL CHN(S): 000000000 0000001000 00000	
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	

OVERLAP PROGRAMMING COMPLETE
PRESS 'F' TO RETURN TO UNIT DATA

PROTECTED AND PERMISSIVE PHASES FOR FLASHING YELLOW ARROW (program controller as shown below)

FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1- STARTUP & MISC	6- ALT SEQUENCES
2- REMOTE FLASH	7- PORT 1 DATA
3- OVERLAP STANDARD	8- I/O MISC
4- OVERLAP SPECIAL	9- SIG DRV OUT
5- RING STRUCTURE	
	F- PRIOR MENU

SE-PAC OVL P.A...B...C...D...E...F...G...H.
TR GRN 0 0 0 0 0 0 0 0 0
YEL/10 40 40 40 40 40 40 40 40
RED/10 20 20 20 20 20 20 20 20
-G/Y 1 3 5 7 0 0 0 0 0
+GRN 2 4 6 8 0 0 0 0 0
(-) #-PH G/Y KILLS OVL P= (+) #-PH G STRT
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

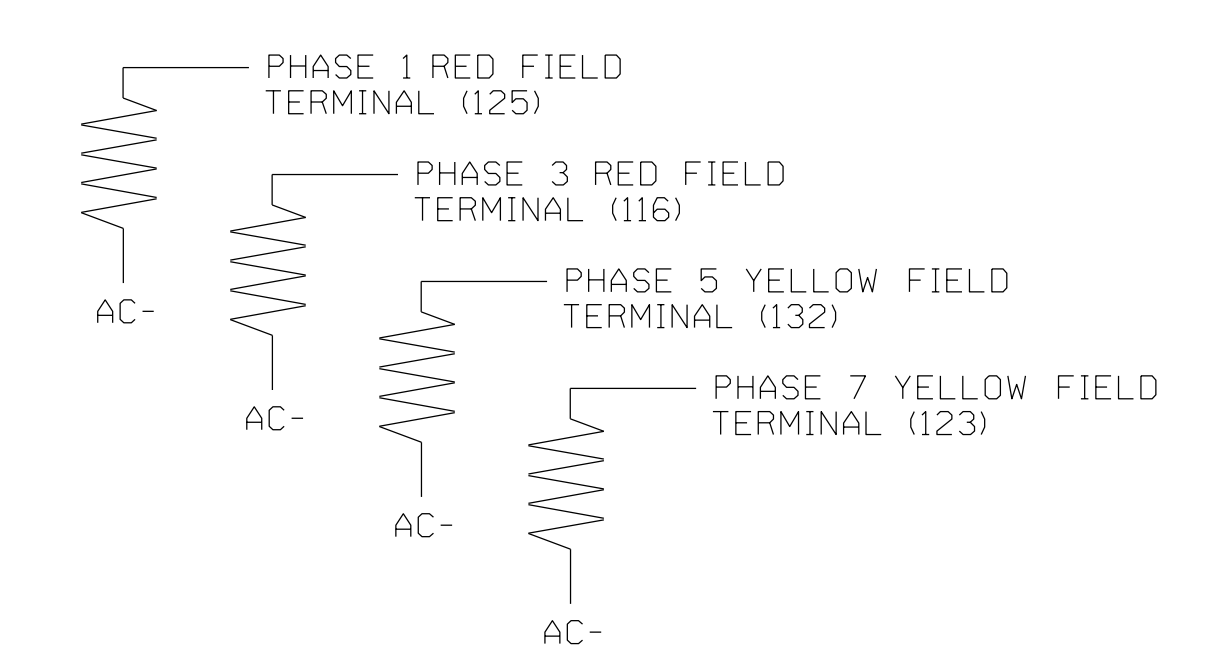
PPLT DEFINITION PROGRAMMING COMPLETE
PRESS 'F' TO RETURN TO UNIT DATA

NOTE: THIS PROGRAMMING IS REQUIRED FOR SIGNAL HEADS 11, 31, 51 AND 71 SO THAT THE SOLID GREEN ARROWS TURN ON EXCLUSIVELY DURING PROTECTED GREEN PHASES 1, 3, 5 & 7. AND THE FLASHING YELLOW ARROWS TURN ON EXCLUSIVELY DURING PERMITTED GREEN PHASES 2, 4, 6, & 8.

← PROTECTED PHASES
← PERMITTED PHASES

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)



FLASHER CIRCUIT MODIFICATION DETAIL

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

- ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
 - ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
 - REMOVE FLASHER UNIT 2.
- THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

NC Dept of Transportation
Division of Highways
Final Drawing Date: 10/19/2017
DocuSigned by:
R. N. Zinsen
ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-0987
DESIGNED: Oct. 2017
SEALED: 10/16/2017
REVISED: N/A



Electrical Detail-Final Design (Sheet 2 OF 4)

ELECTRICAL AND PROGRAMMING DETAILS FOR:		US 70/US 321 BUS.	
Prepared for the Offices of:		at	
		Sweetwater Rd. Ext./	
		21st St Dr. SE	
Division 12	Catawba County	Hickory	
PLAN DATE: Oct. 2017	REVIEWED BY: J.L. Lewis		
PREPARED BY: J. Ma	VHB PROJECT NO.: 38536.01		
REVISIONS	INIT.	DATE	

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER
SEAL 033108
JANXIN MA
DocuSigned by:
Jansen Ma
10/16/2017
DATE
SIG. INVENTORY NO. 12-0987

EMERGENCY VEHICLE PREEMPTION PROGRAMMING DETAIL

(program controller as shown below)

- PREEMPT 3 -

SE-PAC PREEMPT DATA	PRESS # DESIRED
1-ALL PREEMPTS	5-PREEMPT 4
2-PREEMPT 1	6-PREEMPT 5
3-PREEMPT 2	7-PREEMPT 6
4-PREEMPT 3	8-LOAD DEFAULT

- PREEMPT 4 -

SE-PAC PREEMPT DATA	PRESS # DESIRED
1-ALL PREEMPTS	5-PREEMPT 4
2-PREEMPT 1	6-PREEMPT 5
3-PREEMPT 2	7-PREEMPT 6
4-PREEMPT 3	8-LOAD DEFAULT

- PREEMPT 5 -

SE-PAC PREEMPT DATA	PRESS # DESIRED
1-ALL PREEMPTS	5-PREEMPT 4
2-PREEMPT 1	6-PREEMPT 5
3-PREEMPT 2	7-PREEMPT 6
4-PREEMPT 3	8-LOAD DEFAULT

- PREEMPT 6 -

SE-PAC PREEMPT DATA	PRESS # DESIRED
1-ALL PREEMPTS	5-PREEMPT 4
2-PREEMPT 1	6-PREEMPT 5
3-PREEMPT 2	7-PREEMPT 6
4-PREEMPT 3	8-LOAD DEFAULT

FROM MAIN MENU PRESS "7" (PREEMPT DATA)

- ALL PREEMPTS -

SE-PAC PREEMPT DATA	PRESS # DESIRED
1-ALL PREEMPTS	5-PREEMPT 4
2-PREEMPT 1	6-PREEMPT 5
3-PREEMPT 2	7-PREEMPT 6
4-PREEMPT 3	8-LOAD DEFAULT

SE-PAC PREEMPT 3	PRESS # DESIRED
1-MISCELLANEOUS	4-PEDEST. STATUS
2-INTERVAL TIMES	5-OVERLAP STATUS
3-VEHICLE STATUS	6-LOW PRIORITY
F-PRIOR MENU	

SE-PAC PREEMPT 4	PRESS # DESIRED
1-MISCELLANEOUS	4-PEDEST. STATUS
2-INTERVAL TIMES	5-OVERLAP STATUS
3-VEHICLE STATUS	6-LOW PRIORITY
F-PRIOR MENU	

SE-PAC PREEMPT 5	PRESS # DESIRED
1-MISCELLANEOUS	4-PEDEST. STATUS
2-INTERVAL TIMES	5-OVERLAP STATUS
3-VEHICLE STATUS	6-LOW PRIORITY
F-PRIOR MENU	

SE-PAC PREEMPT 6	PRESS # DESIRED
1-MISCELLANEOUS	4-PEDEST. STATUS
2-INTERVAL TIMES	5-OVERLAP STATUS
3-VEHICLE STATUS	6-LOW PRIORITY
F-PRIOR MENU	

SE-PAC ALL PREEMPTS DATA
RING TIMES.....1.....2.....3.....4
MIN GRN/WLK 1 1 0 0
PRIORITY...FL...1/2..2/3..3/4..4/5..5/6.
STATUS 1 1 1 1 1 1
CODES.....0-NO...1-YES.....
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

SE-PAC PREEMPT 3 MISC DATA (0-NO & 1-YES)
TEST.: 0 N-LOCK: 0 LINK PE#: 0
DELAY: 0 EXTEND: 0 DURATION: 000
MXCALL: 300 LOCK OUT: 000
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
EXIT 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0
CALLS 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

SE-PAC PREEMPT 4 MISC DATA (0-NO & 1-YES)
TEST.: 0 N-LOCK: 0 LINK PE#: 0
DELAY: 0 EXTEND: 0 DURATION: 000
MXCALL: 300 LOCK OUT: 000
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
EXIT 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0
CALLS 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

SE-PAC PREEMPT 5 MISC DATA (0-NO & 1-YES)
TEST.: 0 N-LOCK: 0 LINK PE#: 0
DELAY: 0 EXTEND: 0 DURATION: 000
MXCALL: 300 LOCK OUT: 000
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
EXIT 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0
CALLS 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

SE-PAC PREEMPT 6 MISC DATA (0-NO & 1-YES)
TEST.: 0 N-LOCK: 0 LINK PE#: 0
DELAY: 0 EXTEND: 0 DURATION: 000
MXCALL: 300 LOCK OUT: 000
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
EXIT 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0
CALLS 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

select F - return to Preempt data menu

select F - return to Preempt 3 menu, then select 2 - Interval Times

select F - return to Preempt 4 menu, then select 2 - Interval Times

select F - return to Preempt 5 menu, then select 2 - Interval Times

select F - return to Preempt 6 menu, then select 2 - Interval Times

SE-PAC PREEMPT 3 INTERVAL TIMES
SEL PED CLR: 00 TRK YEL/10 : 00
SEL YEL/10 : 45 TRK RED/10 : 00
SEL RED/10 : 23 DWELL GREEN: 10
TRACK GREEN: 00 RET PED CLR: 00
TRK PED CLR: 00 RET YEL/10 : 45
RET RED/10 : 23
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

SE-PAC PREEMPT 4 INTERVAL TIMES
SEL PED CLR: 00 TRK YEL/10 : 00
SEL YEL/10 : 45 TRK RED/10 : 00
SEL RED/10 : 23 DWELL GREEN: 10
TRACK GREEN: 00 RET PED CLR: 00
TRK PED CLR: 00 RET YEL/10 : 45
RET RED/10 : 23
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

SE-PAC PREEMPT 5 INTERVAL TIMES
SEL PED CLR: 00 TRK YEL/10 : 00
SEL YEL/10 : 45 TRK RED/10 : 00
SEL RED/10 : 23 DWELL GREEN: 10
TRACK GREEN: 00 RET PED CLR: 00
TRK PED CLR: 00 RET YEL/10 : 45
RET RED/10 : 23
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

SE-PAC PREEMPT 6 INTERVAL TIMES
SEL PED CLR: 00 TRK YEL/10 : 00
SEL YEL/10 : 45 TRK RED/10 : 00
SEL RED/10 : 23 DWELL GREEN: 10
TRACK GREEN: 00 RET PED CLR: 00
TRK PED CLR: 00 RET YEL/10 : 45
RET RED/10 : 23
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

select F - return to Preempt 3 menu, then select 3 - Vehicle Status

select F - return to Preempt 4 menu, then select 3 - Vehicle Status

select F - return to Preempt 5 menu, then select 3 - Vehicle Status

select F - return to Preempt 6 menu, then select 3 - Vehicle Status

SE-PAC PREEMPT 3 VEHICLE STATUS
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
TRK GRN 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
DWELL 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
(0-RED.1-GRN.2-FLR.3-FLY.4-DARK.5-FLG)
CYCLE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(0-NO..1-ACT..2-MIN REC..3-MX REC)
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

SE-PAC PREEMPT 4 VEHICLE STATUS
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
TRK GRN 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
DWELL 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0
(0-RED.1-GRN.2-FLR.3-FLY.4-DARK.5-FLG)
CYCLE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(0-NO..1-ACT..2-MIN REC..3-MX REC)
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

SE-PAC PREEMPT 5 VEHICLE STATUS
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
TRK GRN 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
DWELL 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0
(0-RED.1-GRN.2-FLR.3-FLY.4-DARK.5-FLG)
CYCLE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(0-NO..1-ACT..2-MIN REC..3-MX REC)
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

SE-PAC PREEMPT 6 VEHICLE STATUS
PHASE....1.2.3.4.5.6.7.8.9.0.1.2.3.4.5.6
TRK GRN 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
DWELL 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0
(0-RED.1-GRN.2-FLR.3-FLY.4-DARK.5-FLG)
CYCLE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(0-NO..1-ACT..2-MIN REC..3-MX REC)
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

select F - return to Preempt 3 menu, then select 5 - Overlap Status

select F - return to Preempt 4 menu, then select 5 - Overlap Status

select F - return to Preempt 5 menu, then select 5 - Overlap Status

select F - return to Preempt 6 menu, then select 5 - Overlap Status

SE-PAC PREEMPT 3 OVERLAP STATUS
PHASE....A.B.C.D.E.F.G.H.I.J.K.L.M.N.O.P
TRK GRN 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
DWELL 5 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0
(0-RED.1-GRN.2-FLR.3-FLY.4-DARK.5-FLG)
CYCLE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(0-NO..1-ACT..2-MIN REC..3-MX REC)
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

SE-PAC PREEMPT 4 OVERLAP STATUS
PHASE....A.B.C.D.E.F.G.H.I.J.K.L.M.N.O.P
TRK GRN 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
DWELL 5 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0
(0-RED.1-GRN.2-FLR.3-FLY.4-DARK.5-FLG)
CYCLE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(0-NO..1-ACT..2-MIN REC..3-MX REC)
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

SE-PAC PREEMPT 5 OVERLAP STATUS
PHASE....A.B.C.D.E.F.G.H.I.J.K.L.M.N.O.P
TRK GRN 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
DWELL 0 5 0 5 0 0 0 0 0 0 0 0 0 0 0 0
(0-RED.1-GRN.2-FLR.3-FLY.4-DARK.5-FLG)
CYCLE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(0-NO..1-ACT..2-MIN REC..3-MX REC)
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

SE-PAC PREEMPT 6 OVERLAP STATUS
PHASE....A.B.C.D.E.F.G.H.I.J.K.L.M.N.O.P
TRK GRN 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
DWELL 0 5 0 5 0 0 0 0 0 0 0 0 0 0 0 0
(0-RED.1-GRN.2-FLR.3-FLY.4-DARK.5-FLG)
CYCLE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(0-NO..1-ACT..2-MIN REC..3-MX REC)
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

NOTE: options 4 and 6 not used for Preempt 3. Be sure values are set at default = 0

NOTE: options 4 and 6 not used for Preempt 4. Be sure values are set at default = 0

NOTE: options 4 and 6 not used for Preempt 5. Be sure values are set at default = 0

NOTE: options 4 and 6 not used for Preempt 6. Be sure values are set at default = 0

Program extend time on optical detector units for 2.0 sec for PRE3, PRE4, PRE5, and PRE6.

NC Dept of Transportation
Division of Highways

Final Drawing Date: 10/19/2017

Designed by: *R. N. Ziron*

ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-0987

DESIGNED: Oct. 2017

SEALED: 10/16/2017

REVISED: N/A

940 Main Campus Drive, Suite 500
Raleigh, NC 27606
NC License No. C-3705
919.829.0328

Electrical Detail-Final Design (Sheet 3 OF 4)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

US 70/US 321 BUS.
at
Sweetwater Rd. Ext./
21st St Dr. SE

Division 12 Catawba County Hickory

PLAN DATE: Oct. 2017 REVIEWED BY: J.L. Lewis

PREPARED BY: J. Ma VHB PROJECT NO.: 38536.01

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

SEAL 033108

ENGINEER

DocuSign
10/16/2017

DATE

SIG. INVENTORY NO. 12-0987

TOD EVENT SCHEDULING PROGRAMMING DETAIL TO CALL ALTERNATE PHASING OPERATION DURING COORDINATION

(program controller as shown below)

* DENOTES TO BE DETERMINED BY THE DIVISION TRAFFIC ENGINEER.

NOTES

- Phase Functions can be called by Time of Day (TOD) in Traffic Events, but not during coordination.
- Special Functions can be called by Time of Day using Aux Events, and can run in conjunction with Coordination.
- Special Functions can be used to call a Phase Function. In doing this a Phase function can run while a Coordination pattern is running.

4. If Alternate Phasing is used during FREE-RUN Phase Function 1 must be turned on with a Traffic Event.

PHASE FUNCTION MAPPING PROGRAMMING DETAIL

(program controller as shown below)

Step 1 - Assign OMIT OVERLAP "A", "B", "C", AND "D" to Phase Function 1.

FROM MAIN MENU PRESS 6 (TIME BASE DATA)

EPAC TIME BASE DATA	PRESS # DESIRED
1-VIEW CURRENT	6-EQUATE/TRANSFER
2-SET TIME/DATE	7-CLEAR MEMORY
3-TRAFFIC EVENTS	8-DIMMING
4-AUX EVENTS	9- PHS FUNC MAPPING
5-TOY EVENTS	0-SPC FUNC MAPPING
F-PRIOR MENU	

EPAC TIME BASE PHS FUNC MAPPING	PHS FUNC SEL (0-OFF/1-ON)
NUM..P-FUNCT NAME.....123456789 0123456	
1 PHS-01 MAX # 2 00000000 0000000	
2 PHS-02 MAX # 2 01000000 0000000	
3 PHS-03 MAX # 2 00100000 0000000	
4 PHS-04 MAX # 2 00010000 0000000	
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU	

← REMOVE PHASE FUNCTION NUM 1 DEFAULT VALUE

HIT "A" KEY UNTIL POSITIONED ON NUM 145

EPAC TIME BASE PHS FUNC MAPPING	PHS FUNC SEL (0-OFF/1-ON)
NUM..P-FUNCT NAME.....123456789 0123456	
145 OVERLAP A OMIT 10000000 0000000	
146 OVERLAP B OMIT 10000000 0000000	
147 OVERLAP C OMIT 10000000 0000000	
148 OVERLAP D OMIT 10000000 0000000	
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU	

← SET SWITCH 1 "ON" FOR OVERLAPS A, B, C & D

PHASE FUNCTION PROGRAMMING COMPLETE
PRESS 'F' TO RETURN TO TIME BASE DATA

SPECIAL FUNCTION MAPPING PROGRAMMING DETAIL

(program controller as shown below)

Step 2 - Assign Special Function 1 to call Phase Function 1.

FROM MAIN MENU PRESS 6 (TIME BASE DATA)

EPAC TIME BASE DATA	PRESS # DESIRED
1-VIEW CURRENT	6-EQUATE/TRANSFER
2-SET TIME/DATE	7-CLEAR MEMORY
3-TRAFFIC EVENTS	8-DIMMING
4-AUX EVENTS	9- PHS FUNC MAPPING
5-TOY EVENTS	0- SPC FUNC MAPPING
F-PRIOR MENU	

← PHASE FUNCTION 1 WILL BE CALLED WHEN SPECIAL FUNCTION 1 IS SELECTED

EPAC TIME BASE SPC FUNC MAPPING	SPC FUNC
S-FUNCTION NAME	12345678
SPC 1-8 AS PHS FUNC 1- 8	10000000
SPC 1-8 AS PHS FUNC 9-16	00000000
SPEC FUNCTION 1	10000000
CODES.....0-OFF....1-ON.....	
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU	

SPECIAL FUNCTION PROGRAMMING COMPLETE
PRESS 'F' TO RETURN TO TIME BASE DATA

PROGRAM AUX EVENT TO CALL SPECIAL FUNCTION

(program controller as shown below)

Step 3 - An Auxiliary event will be used to call the Special Function. This is done in Time Base Data under Aux Event. Add Auxiliary events as needed remembering to use one event to turn the Special Function on and one event to turn the Special Function off. If these are to be used in conjunction with the Traffic Events during Coordination then the On/Off times should be identical.

FROM MAIN MENU PRESS 6 (TIME BASE DATA)

EPAC TIME BASE DATA	PRESS # DESIRED
1-VIEW CURRENT	6-EQUATE/TRANSFER
2-SET TIME/DATE	7-CLEAR MEMORY
3-TRAFFIC EVENTS	8-DIMMING
4- AUX EVENTS	9- PHS FUNC MAPPING
5-TOY EVENTS	0-SPC FUNC MAPPING
F-PRIOR MENU	

EPAC TIME BASE - AUXILIARY EVENTS							
DD	HH	MM	A123	D123	DIM	S12345678	
*	*	*	000	000	0	10000000	
*	*	*	000	000	0	00000000	
*	*	*	000	000	0	00000000	
CODES.....0-OFF....1-ON.....							
OVERWRITE ">" W/ 1-ADD 2-DELETE 3-EDIT							
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU							

← Special Function (SF)
← SF 1 "ON"
← SF 1 "OFF"

AUX EVENT PROGRAMMING COMPLETE
PRESS 'F' TO RETURN TO TIME BASE DATA

! AUX EVENT MUST BE SCHEDULED TO RUN CONCURRENT WITH A TRAFFIC EVENT SCHEDULED COORDINATION PATTERN.

**NC Dept of Transportation
Division of Highways**

Final Drawing Date: 10/19/2017

DocuSigned by:
R. N. Zinner
ITS & Signals Unit

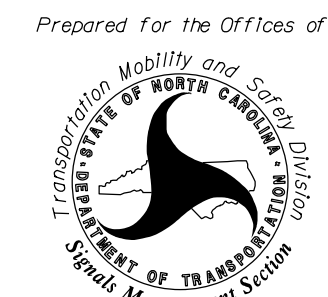
THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-0987

DESIGNED: Oct. 2017
SEALED: 10/16/2017
REVISED: N/A

Electrical Detail-Final Design (Sheet 4 OF 4)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:

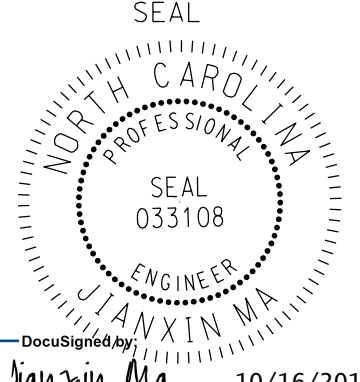


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PLAN DATE:	Oct. 2017	REVIEWED BY:	J.L. Lewis
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REVISIONS	INIT.	DATE	

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL



DocuSigned by:
J. Lewis
827E19E5081444E
SIGNATURE

DATE: 10/16/2017

SIG. INVENTORY NO. 12-0987