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TIP PROJECT: U-5510

CONTRACT: DL00185

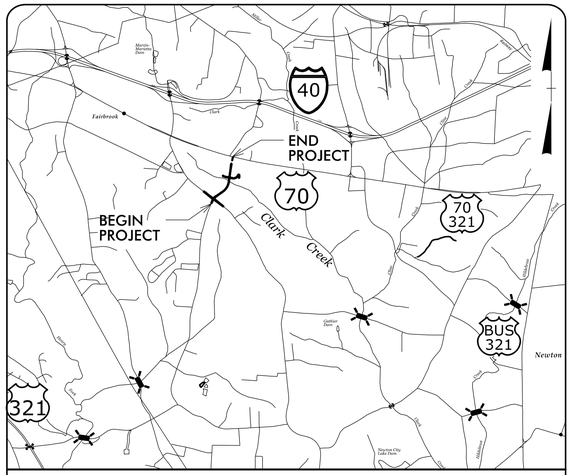
Project No.	Sheet No.
U-5510	Sig. 1.0

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

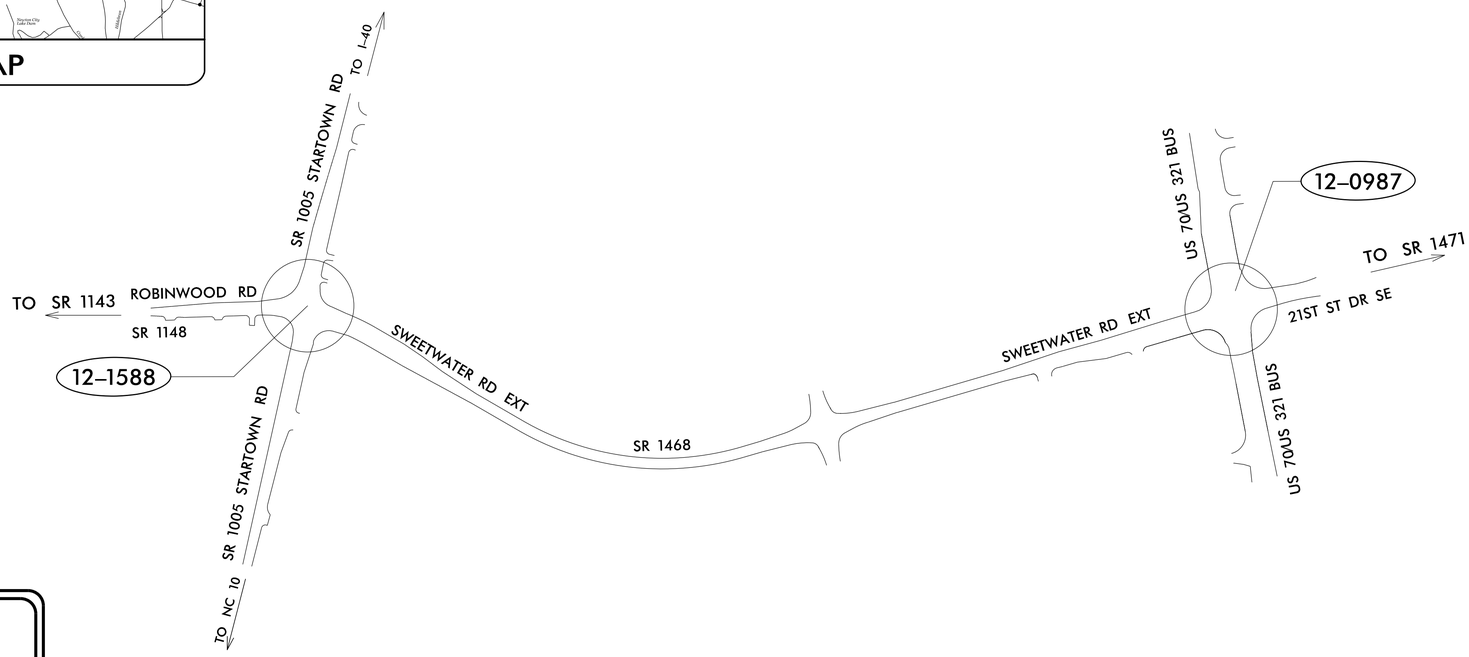
CATAWBA COUNTY

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



VICINITY MAP



PLANS PREPARED BY:

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

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

NORTH CAROLINA PROFESSIONAL SEAL 027696 ENGINEER JOSEPH L. LEWIS

DocuSigned by: Joseph L. Lewis 08/25/2017
E05C5DFC4428476...
SIGNATURE DATE

Prepared in the Office of:
DIVISION OF HIGHWAYS
TRANSPORTATION MOBILITY AND SAFETY DIVISION
Transportation Mobility and Safety Division · ITS and Signals Unit · State of North Carolina · Department of Transportation

750 N. Greenfield Parkway, Garner, NC 27529

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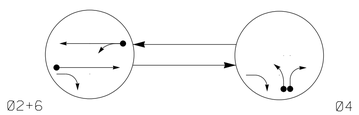
PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig.2.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4	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

INDUCTIVE LOOPS						DETECTOR PROGRAMMING															
							TIMING		OPERATION MODE										STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	ASSIGNED PHASE	DELAY	EXTEND (STRETCH)	0 VEHICLE	1 PEDESTRIAN	2 1 CALL	3 STOP A	4 STOP B	5 PROT/PER LEFT	6 PROT/PER THROUGH	7 AND	SWITCH	SYSTEM LOOPS	NEW	EXISTING
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

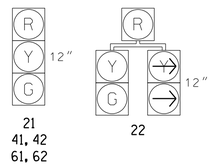
2 Phase
Fully Actuated
Hickory City Signal System

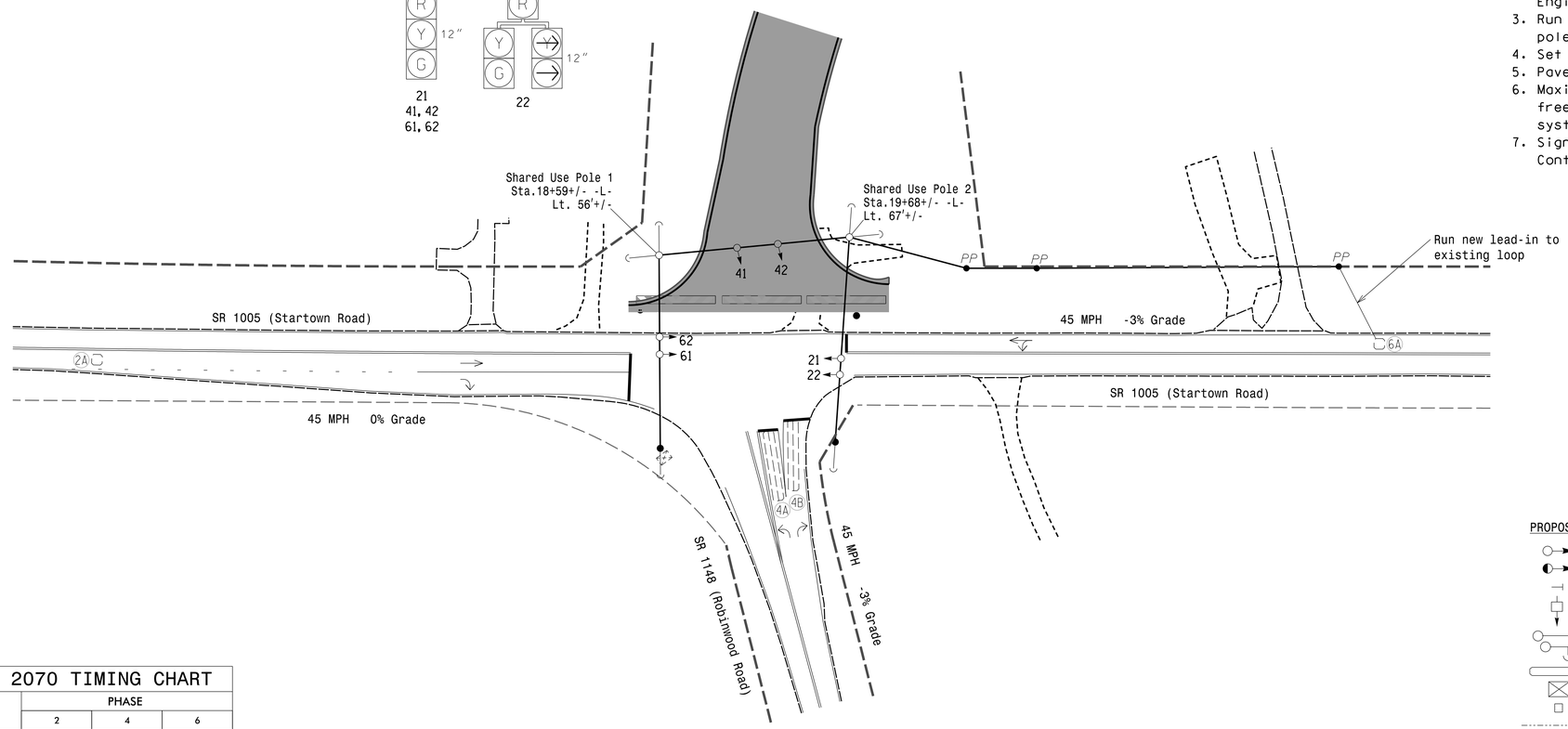
NOTES

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. Run all lead-in overhead on existing utility poles where possible.
4. Set all detector units to presence mode.
5. Pavement markings are existing.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Signalsystem data:
   Controller Asset # 1588.

SIGNAL FACE I.D.

All Heads L.E.D.





LEGEND

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

SE-PAC 2070 TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 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.

VHB PROJECT NO.: 38536.01

NC Dept of Transportation
Division of Highways
Final Drawing Date: 10/19/2017
DocuSigned by: R. N. Linser
F43B8073472248F...
ITS & Signals Unit

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

Signal Upgrade - Temporary Phase 1

Prepared for the Offices of:
Transportation Mobility and Safety Division
Signal Design 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:	P. Alexander	REVIEWED BY:	

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

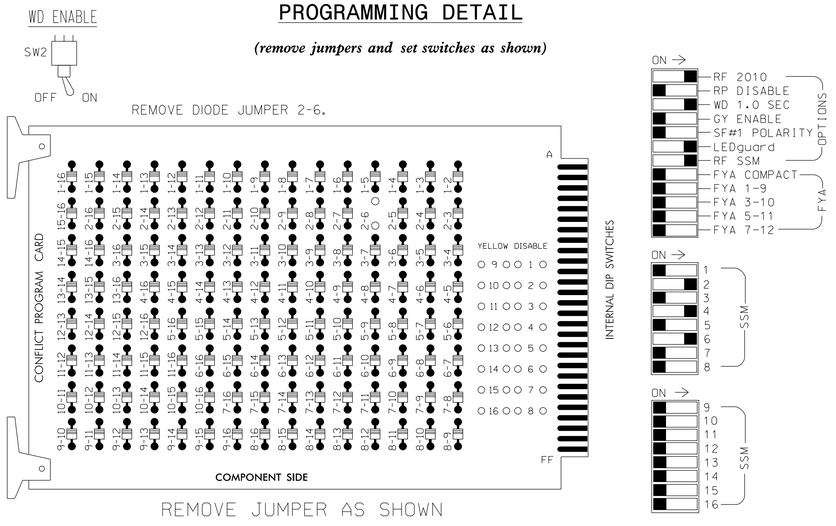
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023489 ENGINEER PAMELA L. ALEXANDER
DocuSigned by: Pamela L. Alexander 10/16/2017
6EF8A4E9B830492...
SIGNATURE DATE
SIG. INVENTORY NO. 12-1588TI

DocuSign Envelope ID: 7A9C988C-A76D-46C4-91CE-88B7F2812C44

PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 2.1

EDI MODEL 2010ECLip CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



■ = DENOTES POSITION OF SWITCH

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. 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

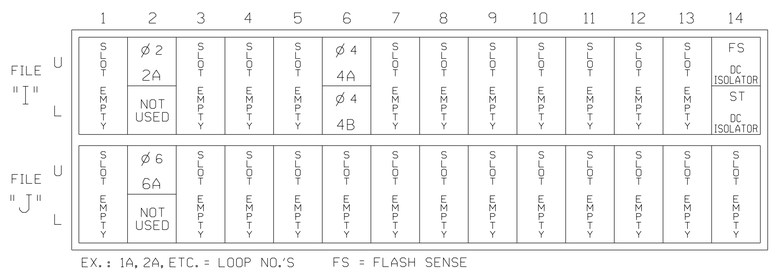
FIELD CONNECTION HOOK-UP CHART

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	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

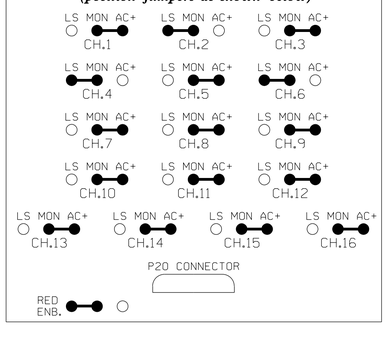
INPUT FILE CONNECTION & PROGRAMMING CHART

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
FILE J
SLOT 2
LOWER

RED MONITOR BOARD PROGRAMMING

(position jumpers as shown below)



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

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical Detail-Temporary Phase 1

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

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

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 033108 ENGINEER JIANXIN MA
DocuSigned by: Jianxin Ma 827E195308144 4F
SIGNATURE DATE 10/17/2017
SIG. INVENTORY NO. 12-1588T1

VHB PROJECT NO.: 38536.01

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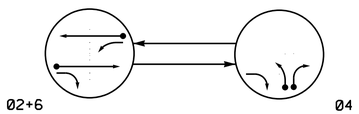
PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig.3.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE 02+6	PHASE 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

INDUCTIVE LOOPS						DETECTOR PROGRAMMING															
							TIMING		OPERATION MODE										STATUS		
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	ASSIGNED PHASE	DELAY	EXTEND (STRETCH)	0 VEHICLE	1 PEDESTRIAN	2 1 CALL	3 STOP A	4 STOP B	5 PROT/PER LEFT	6 PROT/PER THROUGH	7 AND	SWITCH	SYSTEM LOOPS	NEW	EXISTING
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

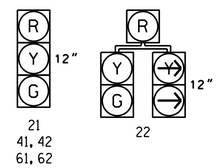
2 Phase
Fully Actuated
Hickory City Signal System

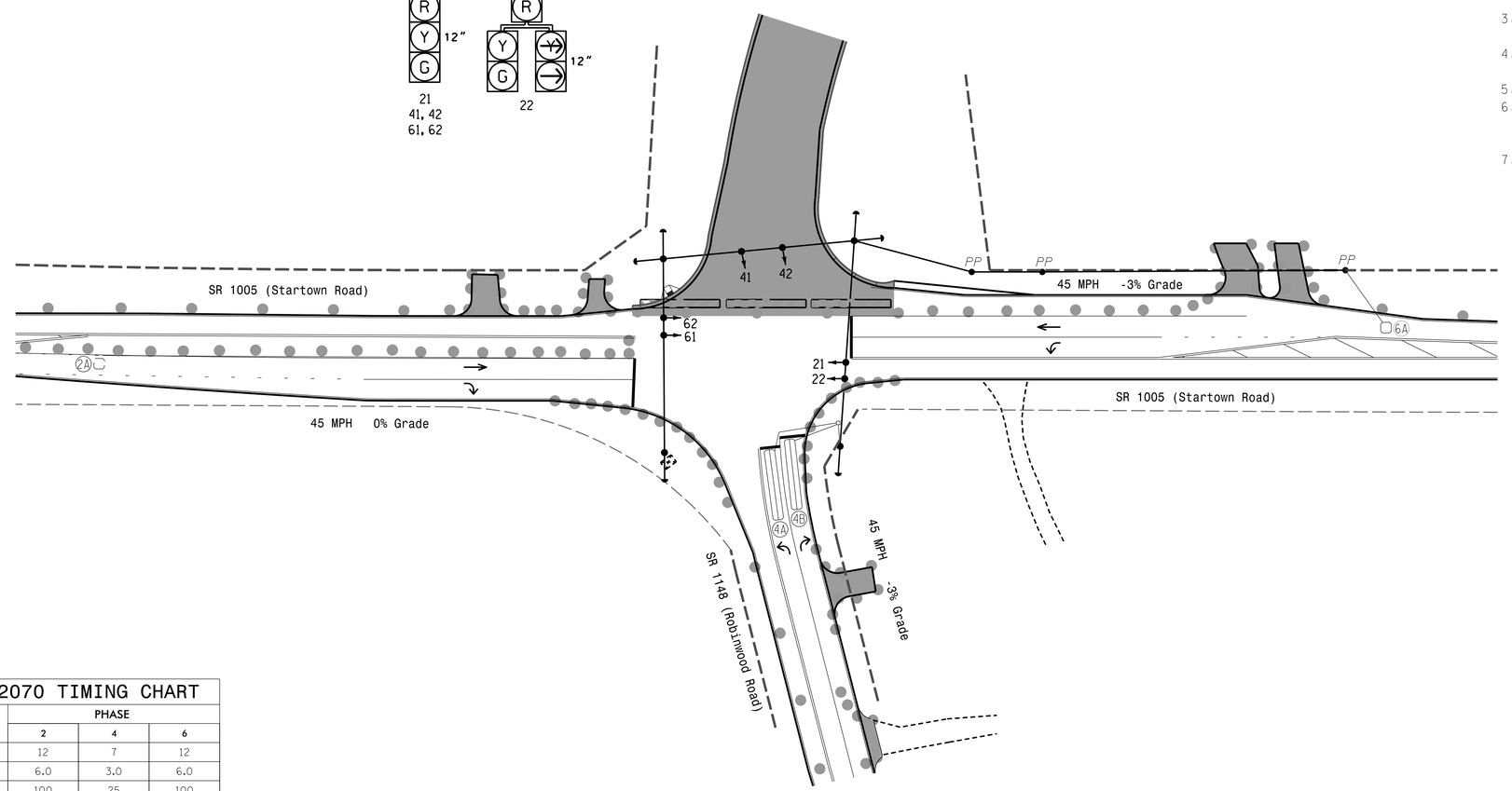
NOTES

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

SIGNAL FACE I.D.

All Heads L.E.D.





SE-PAC 2070 TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 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		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone	N/A
	Drum	N/A

Signal Upgrade - Temporary Phase 2

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

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Raleigh, NC 27606
NC License No. C-3705
919.829.0328

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

SCALE 0 40
1"=40'

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023489 ENGINEER PAMELA L. ALEXANDER
DocuSigned by: Pamela L. Alexander 10/26/2017
SIGNATURE DATE
SIG. INVENTORY NO. 12-1588T2

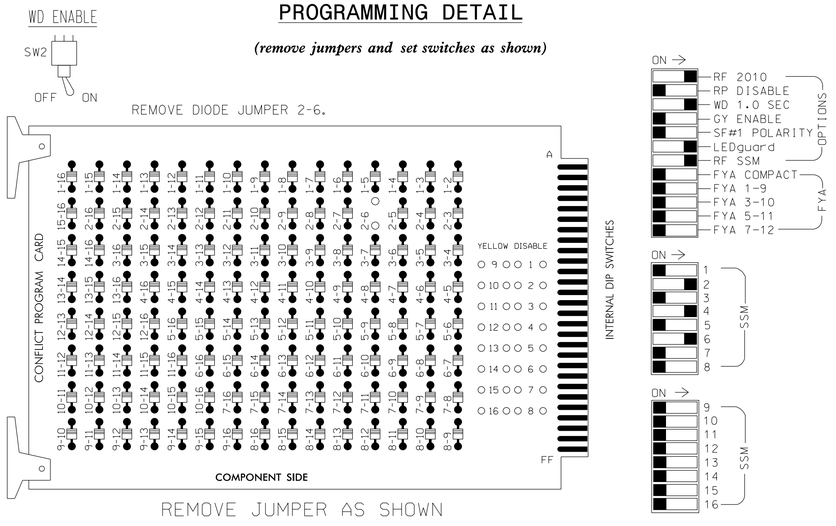
VHB PROJECT NO.: 38536.01

DocuSign Envelope ID: 7A9C988C-A76D-46C4-91CE-88B7F2812C44

PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 3.1

EDI MODEL 2010ECLip CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



■ = DENOTES POSITION OF SWITCH

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. 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	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)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	ø2 2A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L		NOT USED				ø4 4B								ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	ø6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		NOT USED												

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

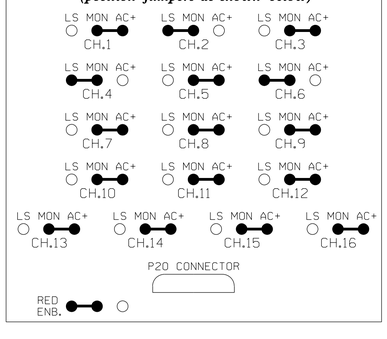
INPUT FILE CONNECTION & PROGRAMMING CHART

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
FILE J
SLOT 2
LOWER

RED MONITOR BOARD PROGRAMMING

(position jumpers as shown below)



NC Dept of Transportation
Division of Highways
Final Drawing Date: 10/19/2017
DocuSigned by: R. N. Zinser
E138B973472248F...
ITS & Signals Unit

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical Detail-Temporary Phase 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

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

vhb
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Raleigh, NC 27606
NC License No. C-3705
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SEAL
NORTH CAROLINA PROFESSIONAL SEAL 033108 ENGINEER JIANXIN MA
DocuSigned by: Jianxin Ma
827E49530614446...
SIGNATURE 10/17/2017 DATE
SIG. INVENTORY NO. 12-1588T2

VHB PROJECT NO.: 38536.01

DocuSign Envelope ID: 7A9C988C-A76D-46C4-91CE-88B7F2812C44

PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig.4.0

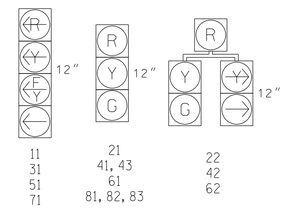
8 Phase
Fully Actuated
Hickory City Signal System

SE-PAC 2070 LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING														
							TIMING		OPERATION MODE										STATUS	
									0	1	2	3	4	5	6	7				
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	ASSIGNED PHASE	DELAY	EXTEND (STRETCH)	VEHICLE	PEDESTRIAN	1 CALL	STOP A	STOP B	PRO/PER	LEF PRO/PER THROUGH	AND	SWITCH	SYSTEM LOOPS	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	-

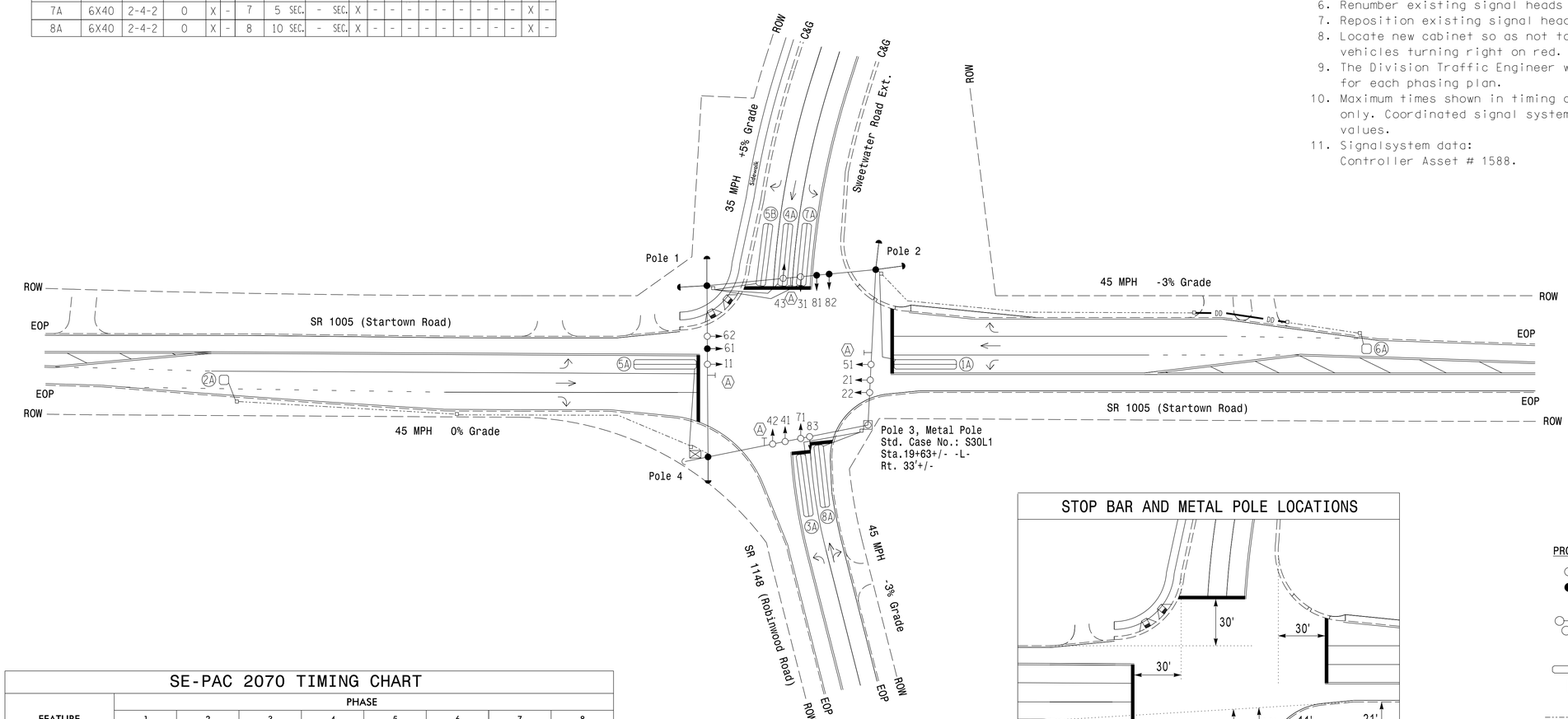
SIGNAL FACE I.D.

All Heads L.E.D.

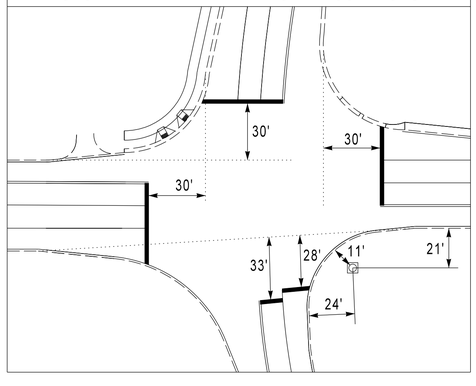


NOTES

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.



STOP BAR AND METAL POLE LOCATIONS



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Metal Strain Pole	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
DD	Directional Drill	N/A
N/A	Right of Way	
	Directional Arrow	
	Street Name Sign (D3-1)	
	Curb Ramp	

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

* 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

Docusigned by: R. N. Zinser
F138897347224BF...

ITS & Signals Unit

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NC License No. C-3705
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Signal Upgrade - Final Design (Sheet 1 of 2)

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

SCALE 0 40 1"=40'

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

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SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
033108
ENGINEER
JIANJUN MA

Docusigned by: Jianjun Ma
827E195308144AF...
10/16/2017

SIGNATURE DATE

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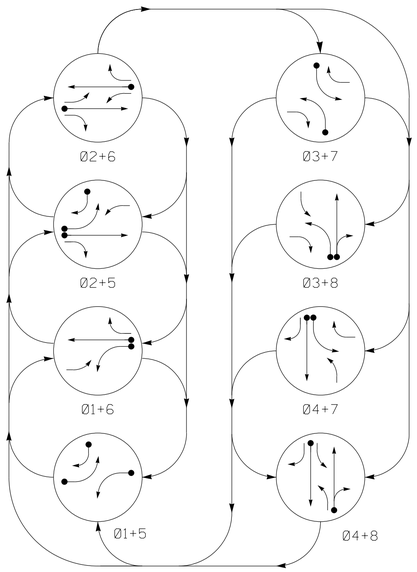
U-5510	Sig 4.1

8 Phase
Fully Actuated
Hickory City Signal System

DEFAULT PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

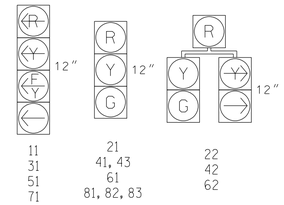
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT

DEFAULT TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	03+7	03+8	04+7	04+8	FLASH
11	↚	↚	F Y	F Y	↚R	↚R	↚R	↚R	↚Y
21	R	R	G	G	R	R	R	R	Y
22	R	R	G	G	R ↘	R ↘	R	R	Y
31	↚R	↚R	↚R	↚R	↚	↚	F Y	F Y	↚R
41, 43	R	R	R	R	R	R	G	G	R
42	R ↘	R	R ↘	R	R	R	G	G	R
51	↚	F Y	↚	F Y	↚R	↚R	↚R	↚R	↚Y
61	R	G	R	G	R	R	R	R	Y
62	R	G	R	G	R ↘	R	R ↘	R	Y
71	↚R	↚R	↚R	↚R	↚	F Y	↚	F Y	↚R
81, 82, 83	R	R	R	R	R	G	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



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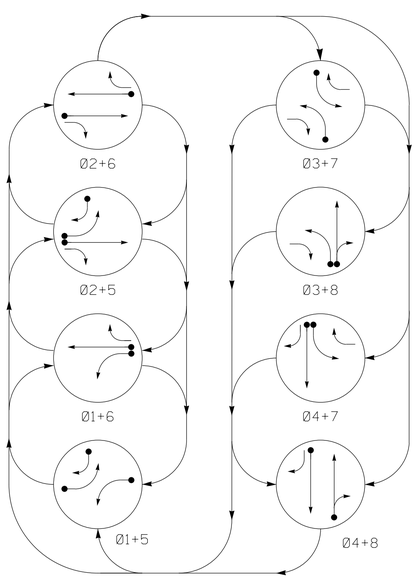
11. Signalsystem data:
    Controller Asset # 1588.

ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

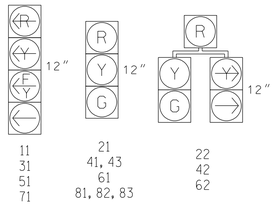
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT

ALTERNATE TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	03+7	03+8	04+7	04+8	FLASH
11	↚	↚	↚R	↚R	↚R	↚R	↚R	↚R	↚Y
21	R	R	G	G	R	R	R	R	Y
22	R	R	G	G	R ↘	R ↘	R	R	Y
31	↚R	↚R	↚R	↚R	↚	↚	↚R	↚R	↚R
41, 43	R	R	R	R	R	R	G	G	R
42	R ↘	R	R ↘	R	R	R	G	G	R
51	↚	↚R	↚	↚R	↚R	↚R	↚R	↚R	↚Y
61	R	G	R	G	R	R	R	R	Y
62	R	G	R	G	R ↘	R	R ↘	R	Y
71	↚R	↚R	↚R	↚R	↚	↚R	↚	↚R	↚R
81, 82, 83	R	R	R	R	R	G	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



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

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Signal Upgrade - Final Design (Sheet 2 of 2)

Prepared for the Offices of:
Transportation Mobility and Safety Division
Signal Design 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
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REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

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SEAL
NORTH CAROLINA PROFESSIONAL SEAL 033108 ENGINEER JIANXIN MA
DocuSigned by: Jianxin Ma 10/16/2017
SIGNATURE DATE
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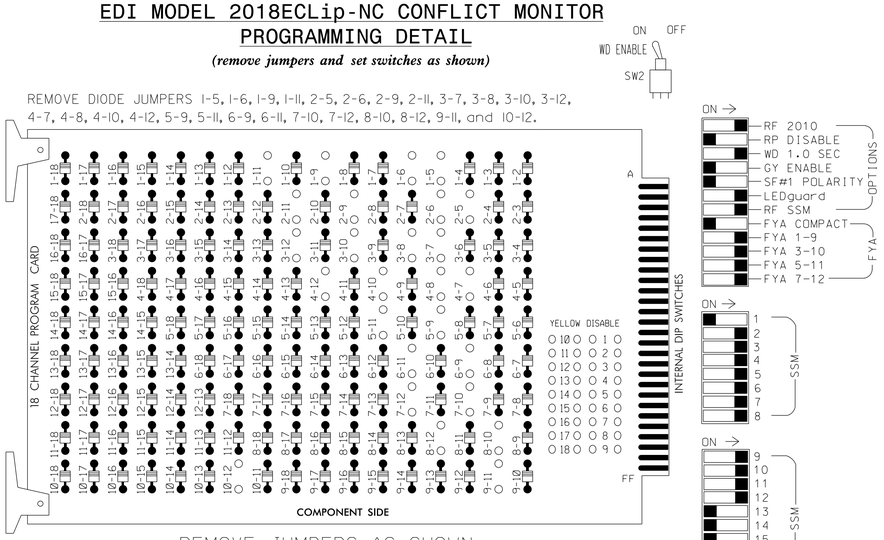
PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 4.2

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.



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. 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 the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Program controller to start up in phases 2 and 6 green.
3. Enable simultaneous gap-out feature, on controller unit, for all phases.
4. Program phases 4 and 8, on controller unit, for dual entry.
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.....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	NU	51★	42	61.62	NU	71★	62	81.82 83	NU	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								

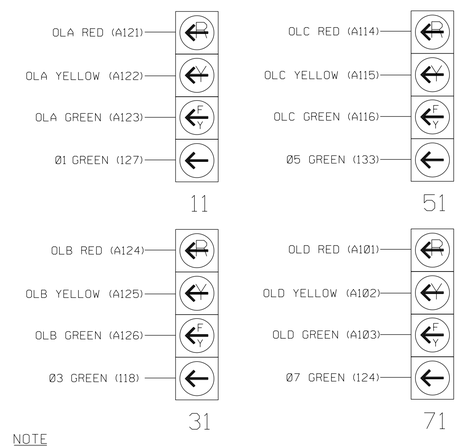
NU = Not Used

* 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)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø 1 1A	SLOT EMPTY	Ø 2 2A	SLOT EMPTY	Ø 3 3A	Ø 4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L	NOT USED		NOT USED		NOT USED	NOT USED								ST DC ISOLATOR
FILE "J"	U	Ø 5 5A	Ø 5 5B	Ø 6 6A	SLOT EMPTY	Ø 7 7A	Ø 8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	NOT USED	NOT USED		NOT USED	NOT USED								

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
FILE J
SLOT 2
LOWER

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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1588
DESIGNED: Oct. 2017
SEALED: 10/16/2017
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Electrical Detail-Final Design-Sheet 1 OF 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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
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REVISIONS	INIT.	DATE

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PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 4.3

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
```

```
SE-PAC OVERLAP - A              (0-NO / 1-YES)

 OVL PHASES:  000000000 0000000
    PHS/CHN:  123456789 0123456789 01234
 OVL CHN(S):  000000000 0001000000 00000

A-UP  B-DN  D-DspChn  E-EDIT  F-PRIOR MENU
```

Do NOT enter any OVL PHASES! →

PRESS 'B'

```
SE-PAC OVERLAP - B              (0-NO / 1-YES)

 OVL PHASES:  000000000 0000000
    PHS/CHN:  123456789 0123456789 01234
 OVL CHN(S):  000000000 0000100000 00000

A-UP  B-DN  D-DspChn  E-EDIT  F-PRIOR MENU
```

Do NOT enter any OVL PHASES! →

PRESS 'B'

```
SE-PAC OVERLAP - C              (0-NO / 1-YES)

 OVL PHASES:  000000000 0000000
    PHS/CHN:  123456789 0123456789 01234
 OVL CHN(S):  000000000 0000010000 00000

A-UP  B-DN  D-DspChn  E-EDIT  F-PRIOR MENU
```

Do NOT enter any OVL PHASES! →

PRESS 'B'

```
SE-PAC OVERLAP - D              (0-NO / 1-YES)

 OVL PHASES:  000000000 0000000
    PHS/CHN:  123456789 0123456789 01234
 OVL CHN(S):  000000000 0000001000 00000

A-UP  B-DN  D-DspChn  E-EDIT  F-PRIOR MENU
```

Do NOT enter any OVL PHASES! →

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 OVLP.A...B...C...D...E...F...G...H.
   TR GRN   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   ← PROTECTED PHASES
   +GRN     2   4   6   8   0   0   0   0   ← PERMITTED PHASES

 (-) #-PH G/Y KILLS OVLP= (+) #-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

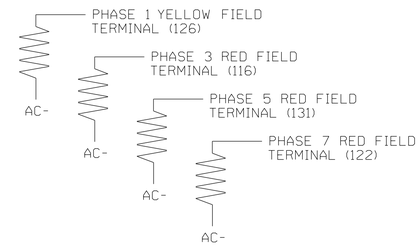
NOTE: THIS PROGRAMMING IS REQUIRED FOR SIGNAL HEADS 11, 31, 51 AND 71 SO THAT THE SOLID GREEN ARROWS TURN ON EXCLUSIVELY DURING PROTECTED GREEN PHASES 1, 3, 5 & 7. AND THE FLASHING YELLOW ARROWS TURN ON EXCLUSIVELY DURING PERMITTED GREEN PHASES 2 4, 6, & 8.

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:

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.

NC Dept of Transportation
Division of Highways
Final Drawing Date: 10/19/2017
DocuSigned by: R. N. Lisson
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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

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

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SEAL
NORTH CAROLINA PROFESSIONAL SEAL 033108 ENGINEER JIANXIN MA
DocuSigned by: Jianxin Ma 10/16/2017
DATE
SIG. INVENTORY NO. 12-1588

VHB PROJECT NO.: 38536.01

DocuSign Envelope ID: 7A9C988C-A76D-46C4-91CE-88B7F2812C44

PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 4.4

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.

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    000000000 0000000
   2  PHS-02 MAX # 2    010000000 0000000
   3  PHS-03 MAX # 2    001000000 0000000
   4  PHS-04 MAX # 2    000100000 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    100000000 0000000
 146  OVERLAP B OMIT    100000000 0000000
 147  OVERLAP C OMIT    100000000 0000000
 148  OVERLAP D OMIT    100000000 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

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. Linser
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 3 OF 3

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

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

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 033108 ENGINEER JIANXIN MA
DocuSigned by: Jianxin Ma 10/16/2017
8276E9D8B4E4E... SIGNATURE DATE
SIG. INVENTORY NO. 12-1588

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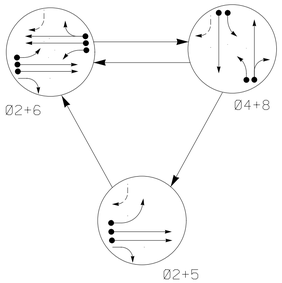
VHB PROJECT NO.: 38536.01

DocuSign Envelope ID: 694194F0-4053-492F-BA11-83E61E25072B

PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 5.0

3 Phase with EVP
Fully Actuated
Hickory City Signal System

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EMERGENCY VEHICLE PREEMPT PHASES

(Medium Priority)

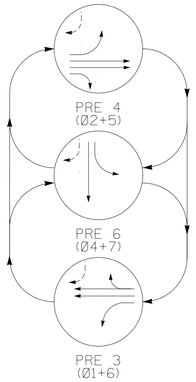


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø4+8	PRE 3	PRE 4	PRE 6	FLASH
21	G	G	R	R	G	R	Y
22	G	G	R	R	G	R	Y
41	R	R	G	R	R	G	R
42	R	R	G	R	R	G	R
61	R	G	R	G	R	R	Y
62	R	G	R	G	R	R	Y
81,82	R	R	G	R	R	R	R

SE-PAC 2070 LOOP & DETECTOR UNIT INSTALLATION CHART

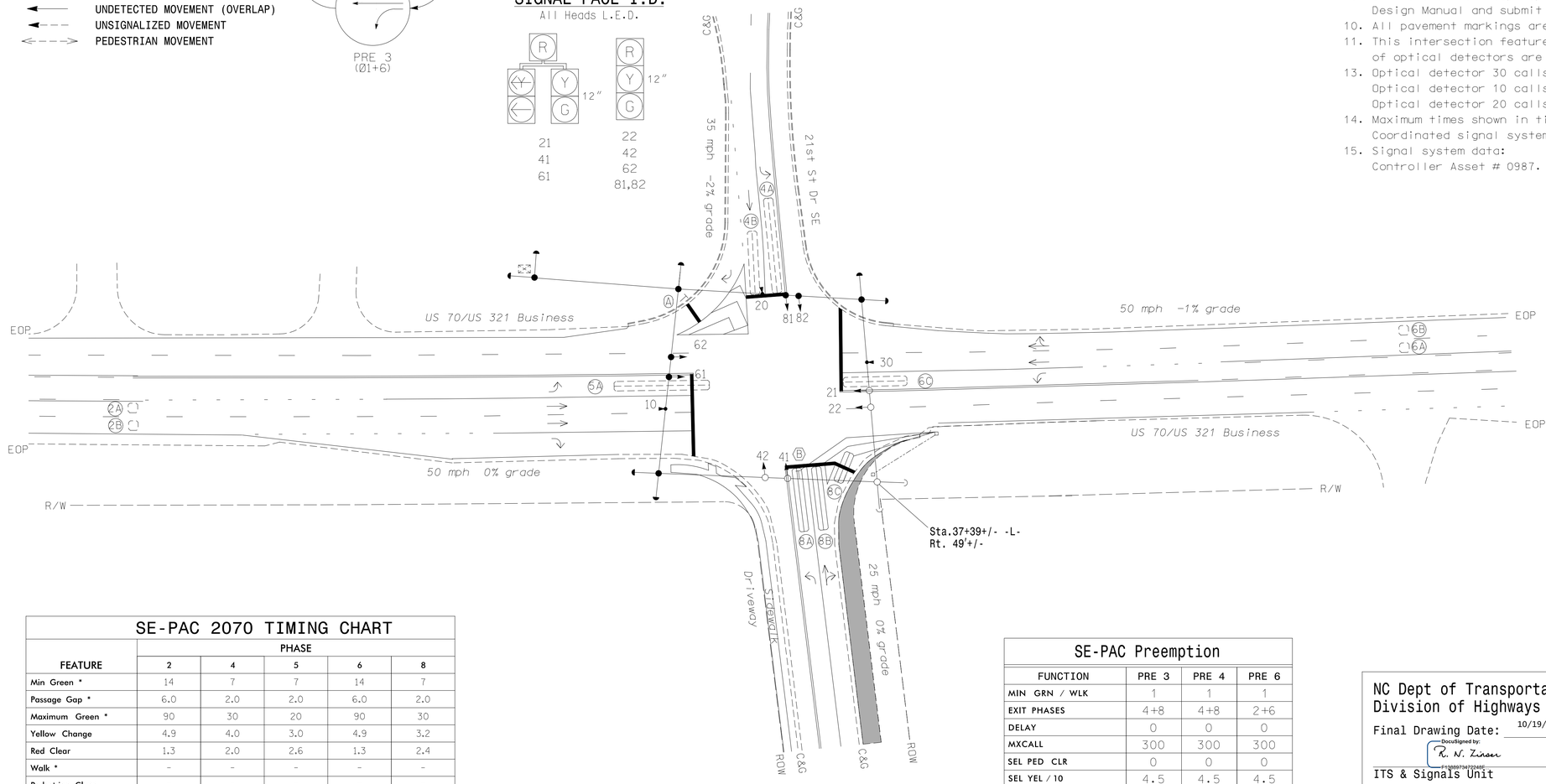
INDUCTIVE LOOPS						DETECTOR PROGRAMMING														
							TIMING		OPERATION MODE									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	ASSIGNED PHASE	DELAY	EXTEND (STRETCH)	0 VEHICLE	1 PEDESTRIAN	2 1 CALL	3 STOP A	4 STOP B	5 PROTPRM LEFT	6 PROTPRM THROUGH	7 AND	SWITCH	SYSTEM LOOPS	NEW	EXISTING
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

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. Program signal heads numbered 21 and 22 to clear to all red before going into preempt.
4. Program signal heads numbered 41 and 42 to clear to all red before going into preempt.
5. Program signal heads numbered 61 and 62 to clear to all red before going into preempt.
6. Program controller to clear from phase 2+6 to phase 2+5 by progressing through phase 4+8.
7. Relocate existing optical detector 10.
8. Set all detector units to presence mode.
9. 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.
10. All pavement markings are existing.
11. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
13. Optical detector 30 calls PRE 3.
    Optical detector 10 calls PRE 4.
    Optical detector 20 calls PRE 6.
14. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
15. Signal system data:
    Controller Asset # 0987.

SIGNAL FACE I.D.

All Heads L.E.D.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
A	"YIELD" Sign (R1-2)	A
B	"LEFT TURN YIELD ON GREEN" Sign (R10-12)	B
	Construction Zone	N/A
	Optical Detector	

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.

NC Dept of Transportation
Division of Highways
Final Drawing Date: 10/19/2017
DocuSigned by: R. N. Linson
F438B9734792485...
ITS & Signals Unit

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Signal Upgrade-Temporary Design

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

US 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

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 033108 ENGINEER JIANXIN MA
DocuSigned by: Jianxin Ma
B2F1B92087B4AE...
10/19/2017
SIGNATURE DATE
SIG. INVENTORY NO. 12-0987T

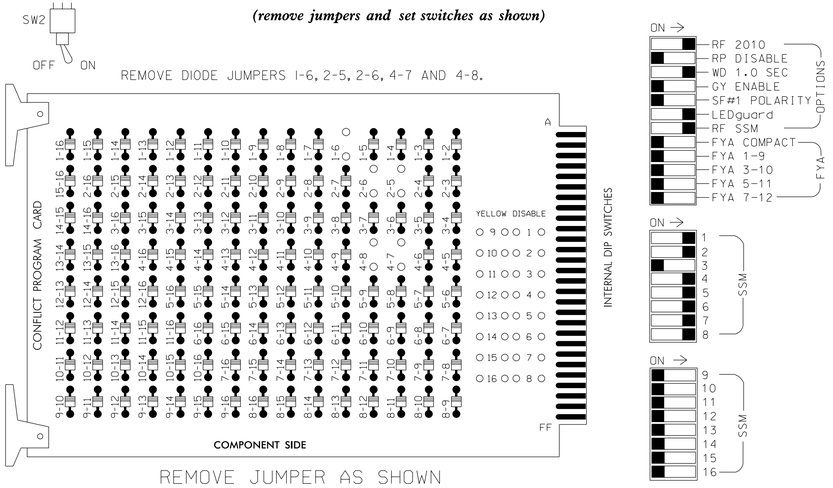
VHB PROJECT NO.: 38536.01

DocuSign Envelope ID: 694194F0-4053-492F-BA11-83E61E25072B

PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 5.1

EDI MODEL 2010ECLip CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPER 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.	61	21,22	NU	NU	41,42	NU	21	61,62	NU	41	81,82	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 "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	SLOT EMPTY	Ø2 2A	SLOT EMPTY	Ø4 4A	Ø5 5A	Ø6 6A	NOT USED	Ø8 8A	SLOT EMPTY	CH. 3 PRE-3	CH. 1 PRE-4	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
L		Ø2 2B		Ø4 4B	Ø6 6C	Ø6 6B	Ø8 8C	Ø8 8B		NOT USED	CH. 2 PRE-6			ST DC ISOLATOR

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 I11

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
FILE I
SLOT 2
LOWER

BACK-UP PROTECTION PROGRAMMING DETAIL

(program controller as shown below)

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

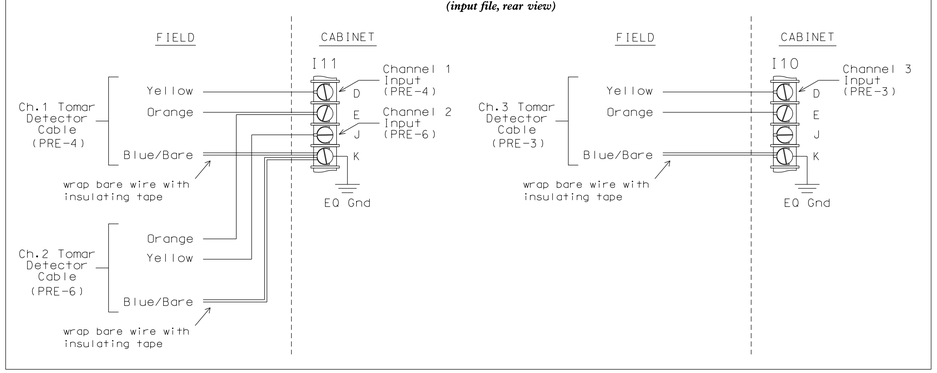
```
EPAC PHASE DATA          PRESS # DESIRED

 1-VEHICLE TIMES         5-V & P RECALLS
 2-DENSITY TIMES         6-N.LOCK & MISC
 3-PEDEST. TIMES         7-SPEC. SEQUENCE
 4-INITIALIZE &          8-SPEC. DETECTOR
   N.A. RESPONSE         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 OMITS THIS PHASE
   -YEL:## PHS YEL OMITS 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.

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

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

Electrical Detail-Temporary Design (Sheet 1 of 2)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering Branch
Signals Management Section
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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 033108 ENGINEER JIANXIN MA
DocuSigned by: Jianxin Ma 10/19/2017
SIGNATURE DATE
SIG. INVENTORY NO. 12-0987T

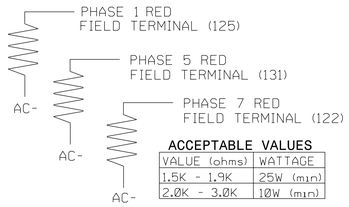
DocuSign Envelope ID: 694194F0-4053-492F-BA11-83E61E25072B

PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 5.2

EMERGENCY VEHICLE PREEMPTION PROGRAMMING DETAIL

(program controller as shown below)

LOAD RESISTOR INSTALLATION DETAIL

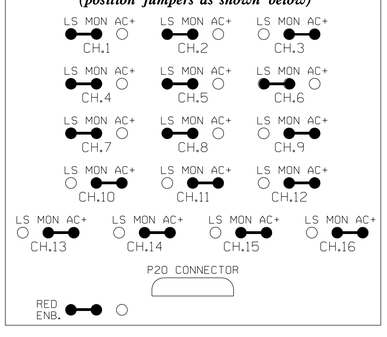


ACCEPTABLE VALUES

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

RED MONITOR BOARD PROGRAMMING

(position jumpers as shown below)



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

- 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
```

```
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

- 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
```

```
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

- 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
```

```
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

DocuSigned by: R. N. Linser
B4B893472248F...
ITS & Signals Unit

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

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

Electrical Detail-Temporary Design (Sheet 2 of 2)

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 033108 ENGINEER JIANXIN MA

DocuSigned by: Jianxin Ma
B2E1B0D0D4E4F...
SIGNATURE 10/19/2017 DATE

SIG. INVENTORY NO. 12-0987T

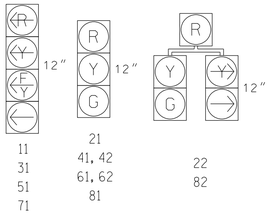
DocuSign Envelope ID: 694194F0-4053-492F-BA11-83E61E25072B

PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 6.0

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

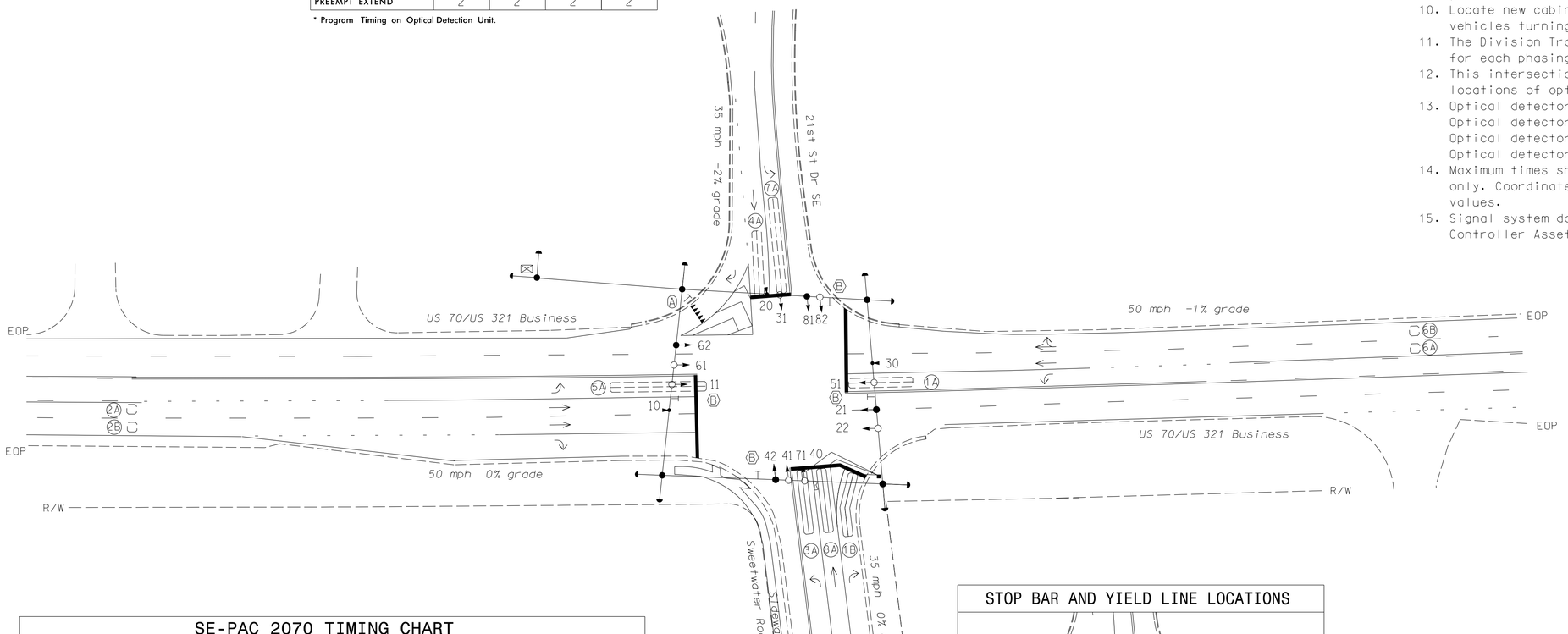
* Program Timing on Optical Detection Unit.

SE-PAC 2070 LOOP & DETECTOR UNIT INSTALLATION CHART

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

NOTES

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



LEGEND

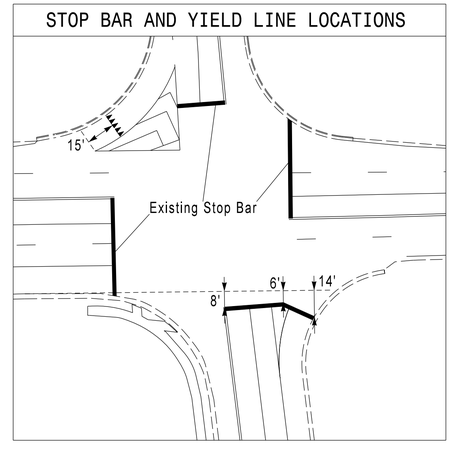
PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Directional Arrow	
	Pavement Marking Arrow	
	Out of Pavement Detector	
A	"YIELD" Sign (R1-2)	A
B	Street Name Sign (D3-1)	B

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.

STOP BAR AND YIELD LINE LOCATIONS



NC Dept of Transportation
Division of Highways

Final Drawing Date: 10/19/2017

DocuSigned by: R. N. Linser
F4B9B7847224BF...

ITS & Signals Unit

vhb
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
NC License No. C-3705
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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Signal Upgrade-Final Design (Sheet 1 of 2)

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

US 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	REVIEWED BY:	M. Stygles

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL NORTH CAROLINA PROFESSIONAL SEAL 033108 ENGINEER JIANXIN MA

DocuSigned by: Jianxin Ma
B2BE1B92D0F4FA0...
SIGNATURE 10/16/2017 DATE

SIG. INVENTORY NO. 12-0987

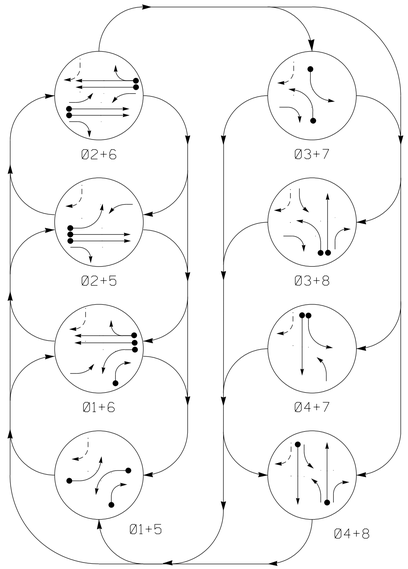
VHB PROJECT NO.: 38536.01

DocuSign Envelope ID: 694194F0-4053-492F-BA11-83E61E25072B

PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 6.1

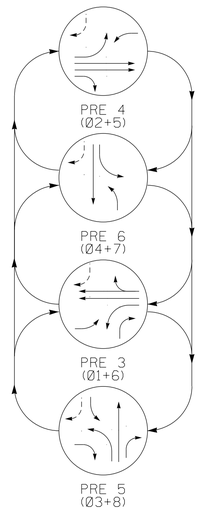
8 Phase with EVP
Fully Actuated
Hickory City Signal System

DEFAULT PHASING DIAGRAM



EMERGENCY VEHICLE PREEMPT PHASES

(Medium Priority)

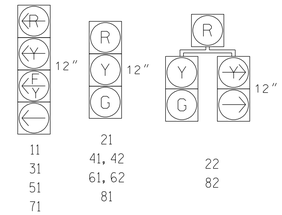


DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	PRE 3	PRE 4	PRE 5	PRE 6	FLASH
11	←—	←—	F/Y	F/Y	~~R~~	~~R~~	~~R~~	~~R~~	←—	F/Y	~~R~~	~~R~~	~~Y~~
21	R	R	G	G	R	R	R	R	R	G	R	R	Y
22	R	R	G	G	R/→	R/→	R	R	R	G	R/→	R	Y
31	~~R~~	~~R~~	~~R~~	~~R~~	←—	←—	F/Y	F/Y	~~R~~	~~R~~	←—	F/Y	~~R~~
41, 42	R	R	R	R	R	R	G	G	R	R	R	G	R
51	←—	F/Y	←—	F/Y	~~R~~	~~R~~	~~R~~	~~R~~	F/Y	←—	~~R~~	~~R~~	~~Y~~
61, 62	R	G	R	G	R	R	R	R	G	R	R	R	Y
71	~~R~~	~~R~~	~~R~~	~~R~~	←—	F/Y	←—	F/Y	~~R~~	~~R~~	F/Y	←—	~~R~~
81	R	R	R	R	R	G	R	G	R	R	G	R	R
82	R/→	R/→	R	R	R	G	R	G	R/→	R	G	R	R

SIGNAL FACE I.D.

All Heads L.E.D.



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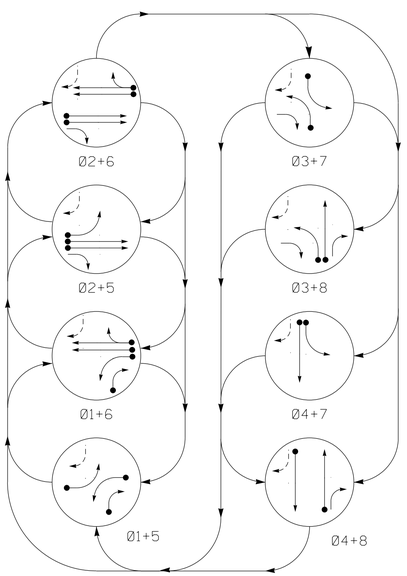
    Optical detector 40 calls PRE 5.
    Optical detector 20 calls PRE 6.
14. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
15. Signal system data:
    Controller Asset # 0987.

ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

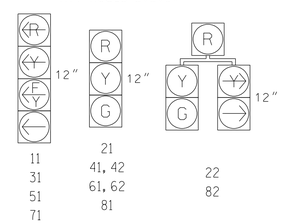
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	PRE 3	PRE 4	PRE 5	PRE 6	FLASH
11	←—	←—	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	←—	~~R~~	~~R~~	~~R~~	~~Y~~
21	R	R	G	G	R	R	R	R	R	G	R	R	Y
22	R	R	G	G	R/→	R/→	R	R	R	G	R/→	R	Y
31	~~R~~	~~R~~	~~R~~	~~R~~	←—	←—	~~R~~	~~R~~	~~R~~	~~R~~	←—	~~R~~	~~R~~
41, 42	R	R	R	R	R	R	G	G	R	R	R	G	R
51	←—	~~R~~	←—	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	←—	~~R~~	~~R~~	~~Y~~
61, 62	R	G	R	G	R	R	R	R	G	R	R	R	Y
71	~~R~~	~~R~~	~~R~~	~~R~~	←—	~~R~~	←—	~~R~~	~~R~~	~~R~~	~~R~~	←—	~~R~~
81	R	R	R	R	R	G	R	G	R	R	G	R	R
82	R/→	R/→	R	R	R	G	R	G	R/→	R	G	R	R

SIGNAL FACE I.D.

All Heads L.E.D.



PHASING DIAGRAM DETECTION LEGEND

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

NC Dept of Transportation
Division of Highways

Final Drawing Date: 10/19/2017

DocuSigned by: R. N. Linsen
E13880734724 8F...

ITS & Signals Unit

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Signal Upgrade-Final Design (Sheet 2 of 2)

Prepared for the Offices of:
Transportation Mobility and Safety Division
Signal Design Section
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	REVIEWED BY:	M. Stygles

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 033108 ENGINEER JIANXIN MA

DocuSigned by: Jianxin Ma
SIGNATURE 10/16/2017
DATE

SIG. INVENTORY NO. 12-0987

VHB PROJECT NO.: 38536.01

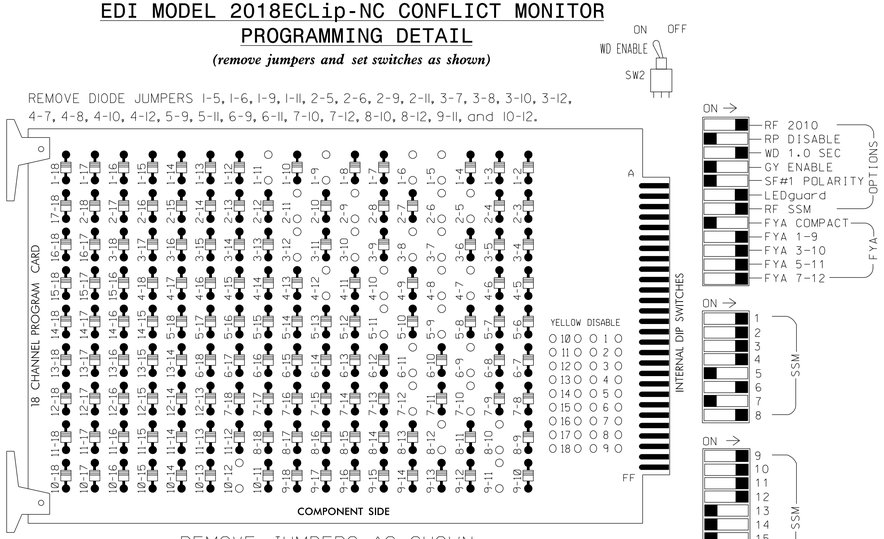
DocuSign Envelope ID: 694194F0-4053-492F-BA11-83E61E25072B

PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 6.2

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:

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. Integrate monitor with Ethernet network in cabinet.

■ = DENOTES POSITION OF SWITCH

NOTES

1. 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.
2. Program controller to start up in phases 2 and 6 green.
3. Enable simultaneous gap-out feature, on controller unit, for all phases.
4. Program phases 4 and 8, on controller unit, for dual entry.
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.....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	NU	31★	22	41,42	NU	51★	61,62	NU	71★	81,82	NU	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.

FYA SIGNAL WIRING DETAIL

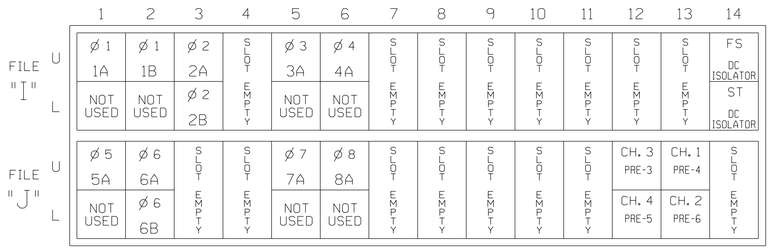
(wire signal heads as shown)

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
PRE3,4,5,6 = EV PREEMPTS

4 CHANNEL TOMAR OSP CARD INSERT CARD INTO SLOT J13

INPUT FILE CONNECTION & PROGRAMMING CHART

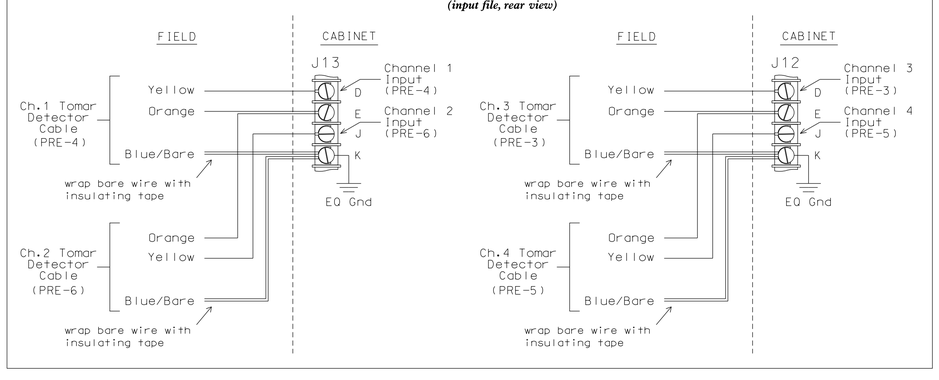
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
1A	TB2-1,2	I1U	56	1	1	5	
1B	TB2-5,6	I2U	39	3	1	15	
2A	TB2-9,10	I3U	63	5	2		
2B	TB2-11,12	I3L	76	6	2		
3A	TB4-5,6	I5U	58	9	3	5	
4A	TB4-9,10	I6U	41	11	4		
5A	TB3-1,2	J1U	55	19	5	5	
6A	TB3-5,6	J2U	40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

FILE J
SLOT 2
LOWER

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



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

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

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Electrical Detail-Final Design (Sheet 1 OF 4)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering Branch
Signal Management Section
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

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

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PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 6.3

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
```

```
SE-PAC OVERLAP - A              (0-NO / 1-YES)

 OVL PHASES:   000000000 0000000
    PHS/CHN:   123456789 0123456789 01234
 OVL CHN(S):   000000000 0001000000 00000

A-UP  B-DN  D-DspChn  E-EDIT  F-PRIOR MENU
```

Do NOT enter any OVL PHASES! →

PRESS 'B'

```
SE-PAC OVERLAP - B              (0-NO / 1-YES)

 OVL PHASES:   000000000 0000000
    PHS/CHN:   123456789 0123456789 01234
 OVL CHN(S):   000000000 0000100000 00000

A-UP  B-DN  D-DspChn  E-EDIT  F-PRIOR MENU
```

Do NOT enter any OVL PHASES! →

PRESS 'B'

```
SE-PAC OVERLAP - C              (0-NO / 1-YES)

 OVL PHASES:   000000000 0000000
    PHS/CHN:   123456789 0123456789 01234
 OVL CHN(S):   000000000 0000010000 00000

A-UP  B-DN  D-DspChn  E-EDIT  F-PRIOR MENU
```

Do NOT enter any OVL PHASES! →

PRESS 'B'

```
SE-PAC OVERLAP - D              (0-NO / 1-YES)

 OVL PHASES:   000000000 0000000
    PHS/CHN:   123456789 0123456789 01234
 OVL CHN(S):   000000000 0000001000 00000

A-UP  B-DN  D-DspChn  E-EDIT  F-PRIOR MENU
```

Do NOT enter any OVL PHASES! →

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 OVLP.A...B...C...D...E...F...G...H.
   TR GRN   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   ← PROTECTED PHASES
   +GRN     2   4   6   8   0   0   0   0   ← PERMITTED PHASES

 (-) #-PH G/Y KILLS OVLP= (+) #-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

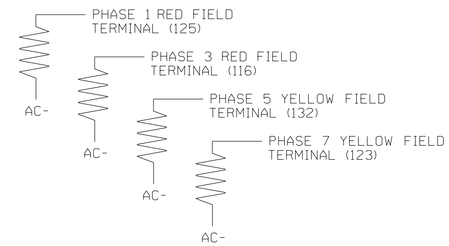
NOTE: THIS PROGRAMMING IS REQUIRED FOR SIGNAL HEADS 11, 31, 51 AND 71 SO THAT THE SOLID GREEN ARROWS TURN ON EXCLUSIVELY DURING PROTECTED GREEN PHASES 1, 3, 5 & 7. AND THE FLASHING YELLOW ARROWS TURN ON EXCLUSIVELY DURING PERMITTED GREEN PHASES 2 4, 6, & 8.

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:

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.

NC Dept of Transportation
Division of Highways
Final Drawing Date: 10/19/2017
DocuSigned by: R. N. Zinser
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)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
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SEAL
NORTH CAROLINA PROFESSIONAL SEAL 033108 ENGINEER JIANXIN MA
DocuSigned by: Jianxin Ma 10/16/2017
DESIGNED BY/LEAD ENGINEER DATE
SIG. INVENTORY NO. 12-0987

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PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 6.4

EMERGENCY VEHICLE PREEMPTION PROGRAMMING DETAIL

(program controller as shown below)

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

- 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
```

```
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:  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

```
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 – return to Preempt 3 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
```

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

- 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
```

```
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:  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 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 – return to Preempt 4 menu, then select 5 – Overlap Status

```
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
```

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

- 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
```

```
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 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
```

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

```
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
```

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

```
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
```

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

```
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
```

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

- 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
```

```
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:  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 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 – return to Preempt 6 menu, then select 5 – Overlap Status

```
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 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
DocuSigned by: R. N. Zinser
F1388973472248F...
ITS & Signals Unit

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

vhb
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: Transportation Mobility and Safety Division, Signals Management Section, State of North Carolina Department of Transportation
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
North Carolina Professional Engineer
SEAL 033108
Jianxin Ma
DocuSigned by: Jianxin Ma 10/16/2017
SIGNATURE DATE

SIG. INVENTORY NO. 12-0987

DocuSign Envelope ID: 694194F0-4053-492F-BA11-83E61E25072B

PROJECT REFERENCE NO.	SHEET NO.
U-5510	Sig 6.5

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.

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    000000000 0000000
   2  PHS-02 MAX # 2    010000000 0000000
   3  PHS-03 MAX # 2    001000000 0000000
   4  PHS-04 MAX # 2    000100000 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    100000000 0000000
 146  OVERLAP B OMIT    100000000 0000000
 147  OVERLAP C OMIT    100000000 0000000
 148  OVERLAP D OMIT    100000000 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

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. Zinser
ITS & Signals Unit

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

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

Electrical Detail-Final Design (Sheet 4 OF 4)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 033108 ENGINEER JIANXIN MA

DocuSigned by: Jianxin Ma
837E1953081444F...
SIGNATURE 10/16/2017
DATE

SIG. INVENTORY NO. 12-0987