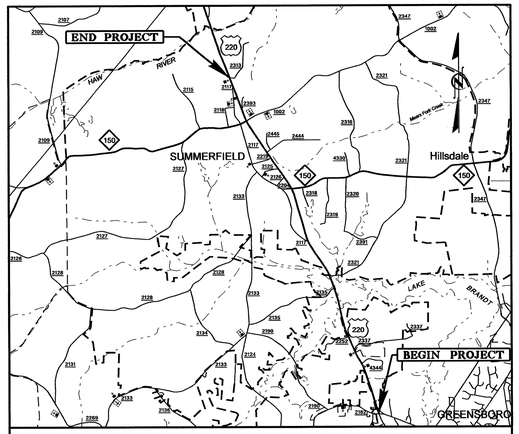
Project No.	Sheet No.
R-2309AB/R-2413C	Sig. 1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

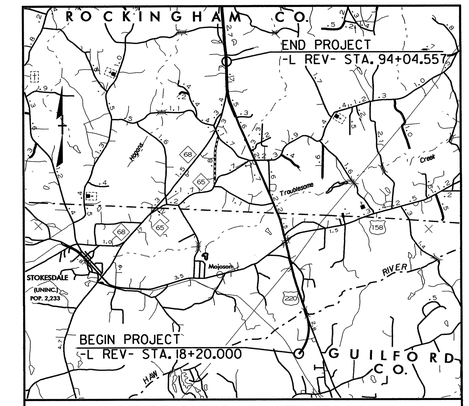
GUILFORD & ROCKINGHAM COUNTIES

LOCATION: US 220 FROM SR 2182 (HORSEPEN CREEK RD.) TO NC 68

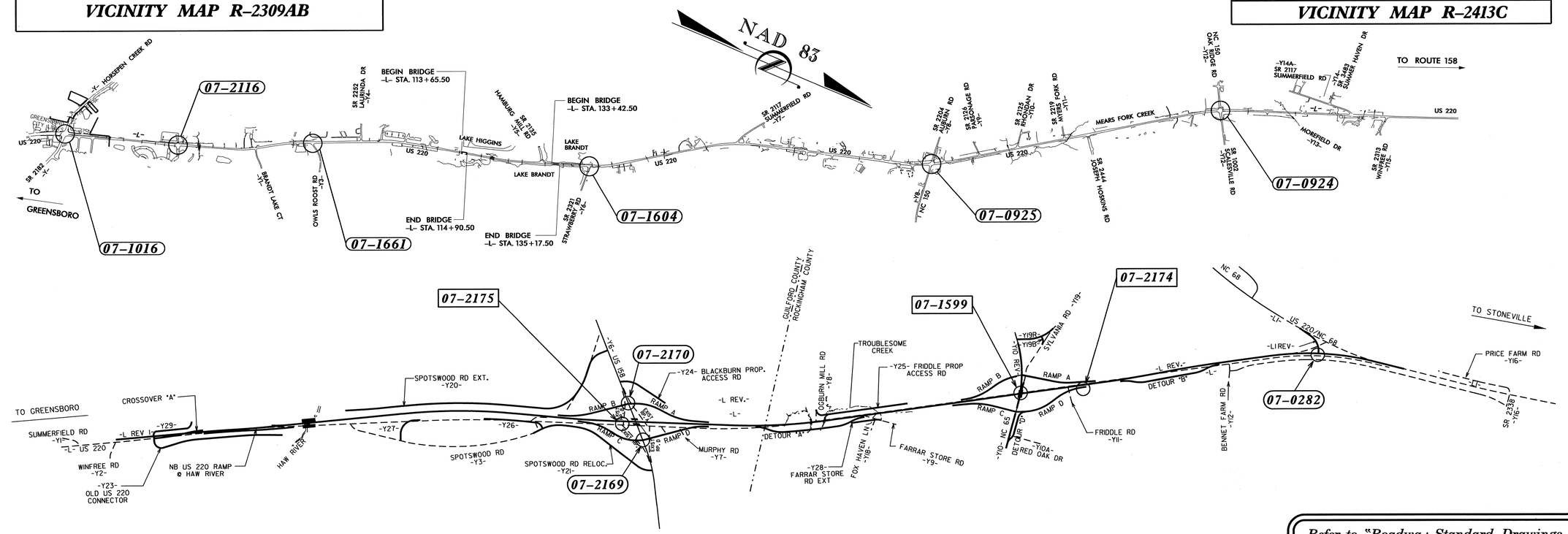
TYPE OF WORK: TRAFFIC SIGNALS, SIGNAL COMMUNICATIONS CABLE, AND WIRELESS RADIO



VICINITY MAP R-2309AB



VICINITY MAP R-2413C



- Temp Signals To Be Removed
- Final Signals

Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.

Index of Plans

Part	TIP Project	Sheet #
Part 1	R-2309AB	Sig. 1-90
Part 2	R-2413C	Sig. 1-52

INTELLIGENT TRANSPORTATION AND SIGNALS UNIT

Contacts:

Robert J. Ziemba, PE - Central Region Signals Project Engineer
John T. Rowe, Jr., PE - Signal Equipment Design Engineer
I. Neil Avery - Signal Communications Project Engineer

Prepared in the Office of:
DIVISION OF HIGHWAYS
TRANSPORTATION MOBILITY AND SAFETY DIVISION
Intelligent Transportation Systems & Signals Unit
750 N. Greenfield Parkway, Garner, NC 27529

WBS: 34418.1.1 /34482.1.1

Project: R-2309AB/R-2413C

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P:\TIPProjects-R\R2413c\Traffic\Signals\Design\Titlesheet\Combined_Titlesheet.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.1A

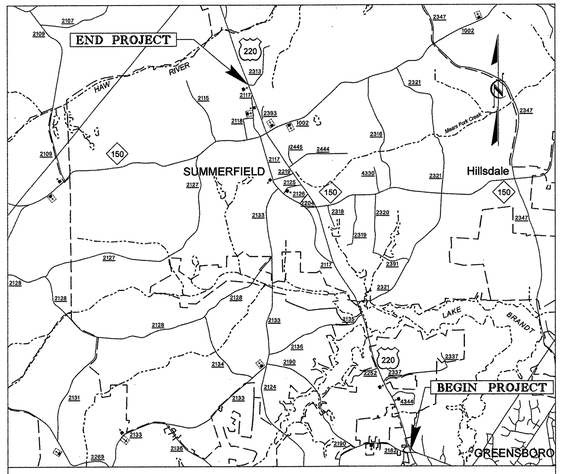
PART 1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

GUILFORD COUNTY

LOCATION: US 220 FROM SR 2182 (HORSEPEN CREEK RD.) TO 0.2 MILES NORTH OF SR 2313 (WINFREE RD.) IN GREENSBORO

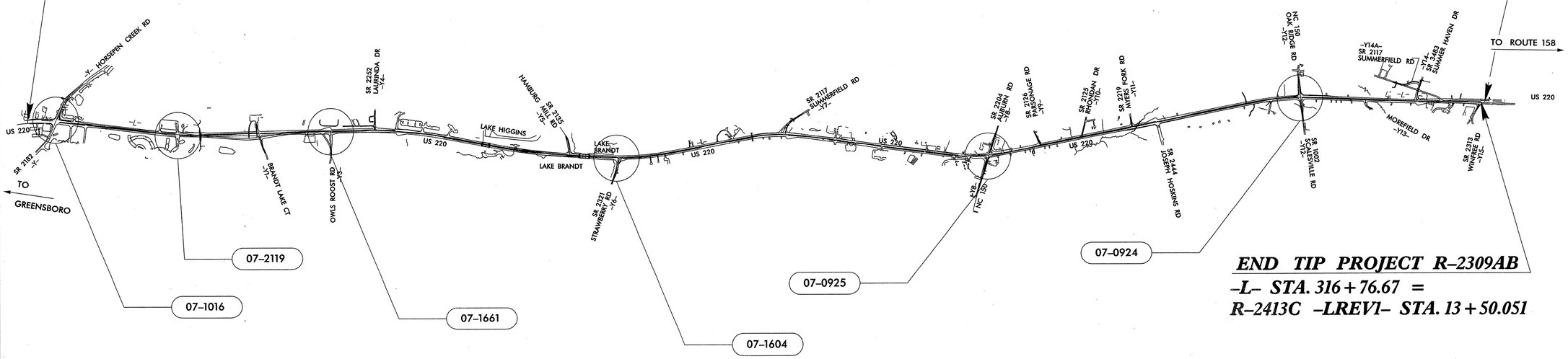
TYPE OF WORK: TRAFFIC SIGNALS & COMMUNICATIONS CABLE



VICINITY MAP

BEGIN TIP PROJECT R-2309AB
-L- STA. 21+50.00

END CONSTRUCTION
-L- PT STA. 317+51.85
(TIE TO TIP PROJECT R-2413C)



END TIP PROJECT R-2309AB
-L- STA. 316+76.67 =
R-2413C -LREV1- STA. 13+50.051

TIP PROJECT: R-2309AB

CONTRACT:

$$$$SYSTIME$$$$
$$$$USERNAME$$$$ $$$$DGN$$$$

02/29/08

PLANS PREPARED BY:

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

JEFFREY HOCHANADEL, P.E. - PROJECT MANAGER
MATTHEW COPPLE, P.E. - PROJECT ENGINEER
CLIFTON LAWSON, E.I. - DESIGN ENGINEER

INDEX OF PLANS

SHEET NUMBER	SIGNAL INV. NUMBER	LOCATION / DESCRIPTION
1	-	TITLE SHEET
2 - 7	07-1016	US 220 (BATTLEGROUND AVE) AT SR 2182 (HORSE PEN CR RD)
8 - 19	07-2119	US 220 (BATTLEGROUND AVE) AT GREENSBORO ACADEMY
20 - 32	07-1661	US 220 (BATTLEGROUND AVE) AT OWLS ROOST RD
33 - 42	07-1604	US 220 (BATTLEGROUND AVE) AT SR 2321 (STRAWBERRY RD)
43 - 56	07-0925	US 220 / US 220-NC 150 AT NC 150 / SR 2204 (AUBURN RD)
57 - 66	07-0924	US 220 AT NC 150 (OAK RIDGE RD) / SR 1002 (SCALESVILLE RD)
67 - 72	-	STANDARD METAL STRAIN POLE DESIGN PLANS
73 - 75	-	INDUCTIVE DETECTION LOOPS DETAILS
76 - 86	-	COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS
87 - 90	-	SPLICE DETAILS

LEGEND

##-#### SIGNAL INVENTORY NUMBER

PLANS PREPARED FOR:

TRAFFIC MOBILITY AND SAFETY / ITS & SIGNALS UNIT
ROBERT J. ZIEMBA, P.E. - CENTRAL REGION SIGNALS PROJECT ENGINEER
GEORGE C. BROWN, P.E. - SIGNAL EQUIPMENT DESIGN ENGINEER
I. NEIL AVERY - SIGNAL COMMUNICATIONS PROJECT ENGINEER

ENGLISH

ALL DIMENSIONS IN THESE PLANS ARE IN FEET UNLESS OTHERWISE NOTED

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY L. HOCHANADEL

SIGNATURE 8/23/11 DATE

JR-2309AB Title.dgn 8/31/2011 2:18:04 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 2

PHASING DIAGRAM

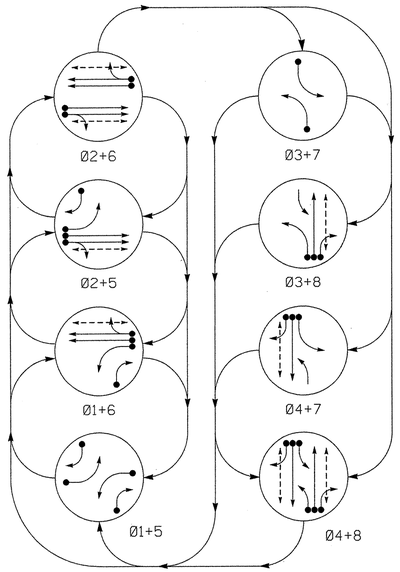


TABLE OF OPERATION

SIGNAL FACE	PHASE 01+05	01+06	02+05	02+06	03+07	03+08	04+07	04+08	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21, 22	R	R	G	G	R	R	R	R	Y
31	~~R~~	~~R~~	~~R~~	~~R~~	←	←	F	F	~~R~~
41	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~~	~~R~~
61, 62	R	G	R	G	R	R	R	R	Y
71	~~R~~	~~R~~	~~R~~	~~R~~	←	F	←	F	~~R~~
81	R	R	R	R	R	G	R	G	R
82	R/↗	R/↗	R	R	R	G	R	G	R
P21, P22	DW	DW	W	W	DW	DW	DW	DW	DRK
P41, P42	DW	DW	DW	DW	DW	DW	W	W	DRK
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DRK
P81, P82	DW	DW	DW	DW	DW	W	DW	W	DRK

F = FLASHING YELLOW ARROW
W - WALK
DW - DON'T WALK
DRK - DARK

SIGNAL FACE I.D.

All Heads L.E.D.

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM \ TO	←	F	~~R~~
	1 2	1 2	1 2
←	← ←	~~F~~ ~~R~~	~~F~~ ~~R~~
F	F F	F F	~~F~~ ~~R~~
~~R~~	~~R~~ ~~R~~	~~R~~ ~~R~~	~~R~~ ~~R~~

F = FLASHING YELLOW ARROW

8 Phase
Fully Acutated
(Greensboro Signal System)

LOOP & DETECTOR UNIT INSTALLATION CHART

NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

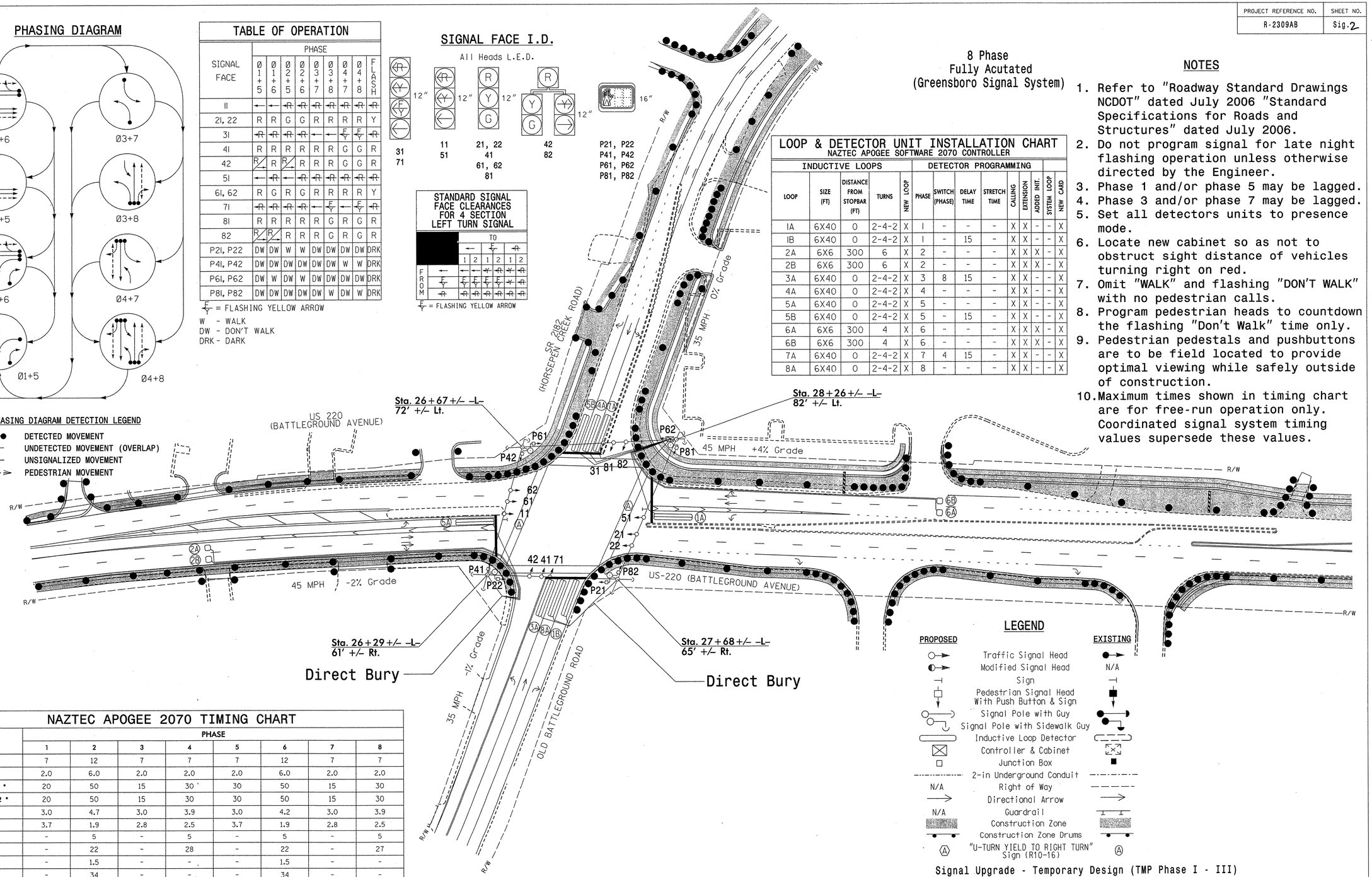
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION	ADDED INIT.	SYSTEM LOOP NEW CARD
IA	6X40	0	2-4-2	X	1	-	-	-	X	X	-	- X
IB	6X40	0	2-4-2	X	1	-	15	-	X	X	-	- X
2A	6X6	300	6	X	2	-	-	-	X	X	X	- X
2B	6X6	300	6	X	2	-	-	-	X	X	X	- X
3A	6X40	0	2-4-2	X	3	8	15	-	X	X	-	- X
4A	6X40	0	2-4-2	X	4	-	-	-	X	X	-	- X
5A	6X40	0	2-4-2	X	5	-	-	-	X	X	-	- X
5B	6X40	0	2-4-2	X	5	-	15	-	X	X	-	- X
6A	6X6	300	4	X	6	-	-	-	X	X	X	- X
6B	6X6	300	4	X	6	-	-	-	X	X	X	- X
7A	6X40	0	2-4-2	X	7	4	15	-	X	X	-	- X
8A	6X40	0	2-4-2	X	8	-	-	-	X	X	-	- X

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
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 detectors units to presence mode.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
9. Pedestrian pedestals and pushbuttons are to be field located to provide optimal viewing while safely outside of construction.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

PHASING DIAGRAM DETECTION LEGEND

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



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Guardrail	
	Construction Zone	
	Construction Zone Drums	
	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	

Signal Upgrade - Temporary Design (TMP Phase I - III)

NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Min Green *	7	12	7	7	7	12	7	7
Gap, Extension *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Maximum Green 1 *	20	50	15	30	30	50	15	30
Maximum Green 2 *	20	50	15	30	30	50	15	30
Yellow Clear	3.0	4.7	3.0	3.9	3.0	4.2	3.0	3.9
Red Clear	3.7	1.9	2.8	2.5	3.7	1.9	2.8	2.5
Walk *	-	5	-	5	-	5	-	5
Pedestrian Clear	-	22	-	28	-	22	-	27
Added Initial *	-	1.5	-	-	-	1.5	-	-
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	-	-
Lock Calls	NO	YES	NO	NO	NO	YES	NO	NO
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.

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

SCALE 0 50 1"=50'

US 220 (Battleground Avenue) at SR 2182 (Horsepen Creek Road)/ Old Battleground Road

Division 7 Guilford County Greensboro

PLAN DATE: September 2011 | REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/23/11 DATE

SIG. INVENTORY NO. 07-1016T

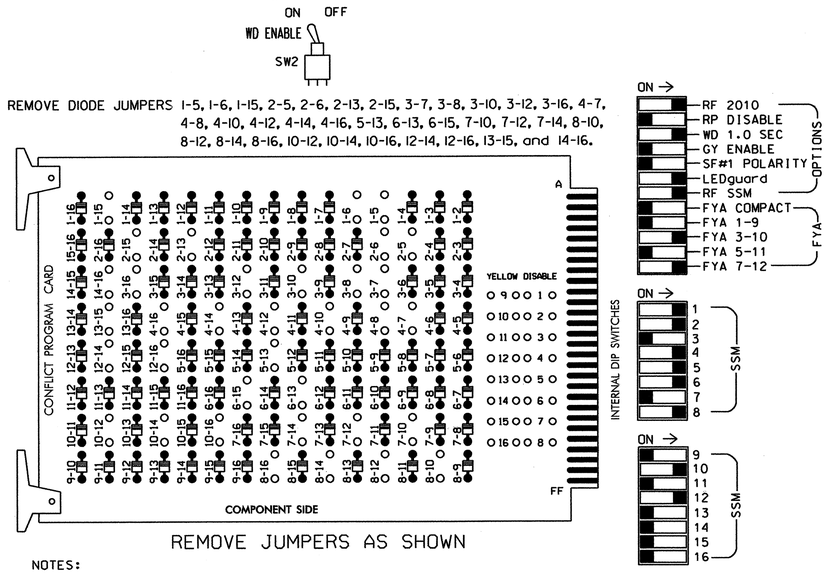
$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$USERNAME$$$

\Signal Design\07-1016T1.dgn 8/31/2011 1:59:10 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.3

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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

REMOVE JUMPERS AS SHOWN

NOTES:

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

■ = DENOTES POSITION OF SWITCH

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	Ø1 1A	Ø2 2A	SLOT EMPTY	Ø3 3A	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø2 PED DC ISOLATOR	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L		Ø1 1B	Ø2 2B		NOT USED	NOT USED						Ø4 PED DC ISOLATOR	Ø8 PED DC ISOLATOR	ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø5 5B	Ø6 6A	SLOT EMPTY	SLOT EMPTY	Ø7 7A	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	NOT USED	Ø6 6B			NOT USED		NOT USED						

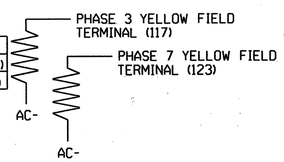
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 3,7, 9,11,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Initialize database in Naztec 2070 local software (Apogee) as FULL-MODE 5. This initialization should be done prior to programming controller.
4. Program phases 2 and 6 for Start Up In Walk.
5. Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
6. Ensure "Local Flash Start" feature is set to "ON".
7. Program phases 4 and 8 for Dual Entry.
8. The cabinet and controller are part of the City of Greensboro Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX OUTPUT FILE
SOFTWARE.....NAZTEC APOGEE
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S1,S2,S2P,S3,S4,S4P,S5,S6,S6P,S7,S8, S8P,S10,S13
PHASES USED.....1,2,2 PED,3,4,4 PED,5,6,6 PED,7,8,8 PED
OVERLAP B.....3+4
OVERLAP D.....7+8

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
1A	TB2-5,6	I2U	39	2	1				X	X	
1B	TB2-7,8	I2L	43	3	1		15		X	X	
2A	TB2-9,10	I3U	63	4	2				X	X	X
2B	TB2-11,12	I3L	76	5	2				X	X	X
3A	TB4-5,6	I5U	58	7	3	8	15		X	X	
4A	TB4-9,10	I6U	41	8	4				X	X	
5A	TB3-1,2	J1U	55	15	5				X	X	
5B	TB3-5,6	J2U	40	16	5		15		X	X	
6A	TB3-9,10	J3U	64	18	6				X	X	X
6B	TB3-11,12	J3L	77	19	6				X	X	X
7A	TB5-9,10	J6U	42	22	7	4	15		X	X	
8A	TB7-5,6	J8U	50	26	8				X	X	
PED PUSH BUTTONS											
P21,P22	TB8-4,6	I12U	67	PED 2	2 PED						
P41,P42	TB8-5,6	I12L	69	PED 4	4 PED						
P61,P62	TB8-7,9	I13U	68	PED 6	6 PED						
P81,P82	TB8-8,9	I13L	70	PED 8	8 PED						

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

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

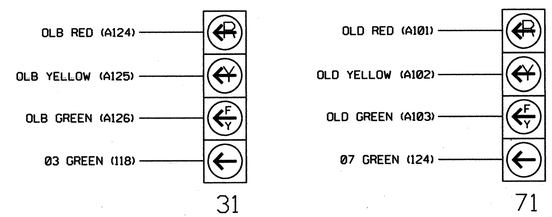
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S2P	S3	S4	S4P	S5		S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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	P21, P22	31★	41,42	P41, P42	42	51	61,62	P61, P62	71★	81,82	P81, P82	NU	31★	NU	NU	71★	NU
RED			128			101				134			107							
YELLOW			129		*	102				135		*	108							
GREEN			130			103				136			109							
RED ARROW	125								131							A124			A101	
YELLOW ARROW	126	126						132	132							A125			A102	
FLASHING YELLOW ARROW																A126			A103	
GREEN ARROW	127	127			118			133	133			124								
✋				113			104				119			110						
🚶				115			106				121			112						

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

4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1016T
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design (TMP Phases 1-3) - Sheet 1 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue) at SR 2182 (Horsepen Creek Rd)/ Old Battleground Road

Division 7 Guilford County Greensboro

PLAN DATE: August 2011 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

John T. Rowe 8-29-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-1016T

24-AUG-2011 08:33
S:*ITSASU*ITS Signals*Workgroups*Sig Mon*Armstrong*071016_sm_ele_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 4

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS "1" CONTROLLER
AND THEN "5" OVERLAPS

```
Overlaps
1.General Parms
2.Program
3.Status
```

```
General Overlap Parameters
      Lock Inhibit OFF
   Confl Lock Enable OFF
     Parent P Clrncs ON
Extra Included Phases OFF
```

PRESS "ESC"

```
Overlaps
1.General Parms
2.Program
3.Status
```

```
Enter Overlap #  2
  then press Enter
```

```
Overlap B-2
1.Program Parms
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp B-2    Ps....................
Included Ps    3  0  0  0  0  0  0  0
Modifier Ps    4  0  0  0  0  0  0  0
Type:FYA-4    Grn:  0  Yel: 3.5  Red: 1.5
```

Notice type FYA-4 →

PRESS "ESC"

```
Overlap B-2
1.Program Parms
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp B-2    Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap B-2
1.Program Parms
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp B-2
LeadGreen  OFF  Transit 0
GreenExtInh     0  0  0  0  0  0  0  0
```

PRESS "ESC TWICE"

```
Overlaps
1.General Parms
2.Program
3.Status
```

```
Enter Overlap #  4
  then press Enter
```

```
Overlap D-4
1.Program Parms
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp D-4    Ps....................
Included Ps    7  0  0  0  0  0  0  0
Modifier Ps    8  0  0  0  0  0  0  0
Type:FYA-4    Grn:  0  Yel: 3.5  Red: 1.5
```

Notice type FYA-4 →

PRESS "ESC"

```
Overlap D-4
1.Program Parms
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp D-4    Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap D-4
1.Program Parms
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp D-4
LeadGreen  OFF  Transit 0
GreenExtInh     0  0  0  0  0  0  0  0
```

OVERLAP PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1016T
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design (TMP Phases 1-3) - Sheet 2 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue)
at
SR 2182 (Horsepen Creek Rd)/
Old Battleground Road

Division 7 | Guilford County | Greensboro

PLAN DATE:	August 2011	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE | DATE 8-29-11

SIG. INVENTORY NO. 07-1016T

24-AUG-2011 08:35
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samstrong

4-SECTION PPLT FYA OUTPUT PROGRAMMING DETAIL

(program controller as shown below)

1. Before proceeding with output programming, be sure to switch the "RUN ENABLE STATUS" to "OFF". The "RUN ENABLE STATUS" setting is located from Main Menu, key strokes 1-7.
2. The Flashing Yellow Arrow in a 4-section PPLT FYA head is controlled by a normally unused PED Yellow output. This programming takes a specific PED Yellow output and remaps it to the appropriate Overlap Green output.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

SELECT USER MODE →

```
I/O Parameters
C1-C11-ABC IO Mode: USER
     D Conn Mapping: NONE
        T&F Biu Map: DEFAULT
 Invert Rail Inputs: OFF
    EVP Ped Confirm: OFF
```

PRESS "ESC"

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

```
User I/O Maps
1. Inputs
2. Outputs
3. Init Map
```

SELECT MODE 5 →

```
Initialize User I/O Maps
   Init ABC with: NONE
     Init D with: NONE
    Init 2A with: MODE 5
 Init TF BIUs with: NONE
```

PRESS "ESC"

```
User I/O Maps
1. Inputs
2. Outputs
3. Init Map
```

```
User Output Maps
1.NEMA A    4.NEMA D
2.NEMA B    5.FIO 2A
3.NEMA C                9.TS2 IO
```

PRESS "+" KEY TWICE

Pin	Fcn	Description	Pin	Fcn	Description
4-5	54	Ch6 Green	4-6	5	Ch5 Red
4-7	29	Ch5 Yellow	4-8	53	Ch5 Green
5-1	37	Ch13 Yellow	5-2		Ch15 Yellow
5-3	0	Unused	5-4	0	Unused
5-5	115	Not Used	5-6	124	LdSwtchFlsh
5-7	115	Not Used	5-8	114	Watchdog
6-1	115	Not Used	6-2	115	Not Used

Programming notes:

Pin	Default Fcn	Description	Change To: Fcn	Description
5-3	38	Ch14 Yellow....	0	Unused
5-4	40	Ch16 Yellow....	0	Unused

PRESS "+" KEY ONCE

Pin	Fcn	Description	Pin	Fcn	Description
6-3	12	Ch12 Red	6-4	36	Ch12 Yellow
6-5	40	Ch16 Yellow	6-6	11	Ch11 Red
6-7	35	Ch11 Yellow	6-8	59	Ch11 Green
7-1	17	Ch17 Red	7-2	65	Ch17 Green
7-3	10	Ch10 Red	7-4	34	Ch10 Yellow
7-5	38	Ch14 Yellow	7-6	9	Ch9 Red
7-7	33	Ch9 Yellow	7-8	57	Ch9 Green

Programming notes:

Pin	Default Fcn	Description	Change To: Fcn	Description
7-5	58	Ch10 Green	38	Ch14 Yellow
6-5	60	Ch12 Green	40	Ch16 Yellow

OUTPUT PROGRAMMING COMPLETE

Pin 5-3 (C1 pin 37) = Load Switch S4P-Y
Pin 5-4 (C1 pin 38) = Load Switch S8P-Y
Pin 7-5 (C1 pin 96) = Load Switch S10-G
Pin 6-5 (C1 pin 60) = Load Switch S13-G

! Press the "*" key to return to Main Menu. Now go back to "RUN-ENABLE STATUS" and switch to "ON".

NOTE

I/O re-programming is necessary for proper FYA operation. See Channel & I/O Programming Detail For FYA Operation on this sheet.

CHANNEL & I/O PROGRAMMING DETAIL FOR FYA OPERATION

(program controller as shown below)

This programming takes the output that drives a Flashing Yellow Arrow and makes it flash. It also specifies which overlap is to be overridden for the FYA to display properly.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

PRESS THE RIGHT ARROW KEY UNTIL THE SCREEN AT RIGHT APPEARS

```
      Chan.1...2...3...4...5...6...7...8 >
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   .   .   .
Flash Grn .   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   0   0
```

→

```
      Chan.9..10..11..12..13..14..15..16
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   X   .   X  ←
Flash Grn .   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   2   0   4  ←
```

CHANNEL & I/O PROGRAMMING COMPLETE

NOTE

Output re-mapping is necessary for proper FYA operation. See the 4-Section PPLT FYA Output Programming Detail on this sheet.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1016T
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design (TMP Phases 1-3) - Sheet 3 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

750 N.Greenfield Pkwy,Garner,NC 27529

US 220 (Battleground Avenue) at SR 2182 (Horsepen Creek Rd)/ Old Battleground Road

Division 7 | Guilford County | Greensboro

PLAN DATE: August 2011 | REVIEWED BY: JTR
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE | DATE 8-29-11

SIG. INVENTORY NO. 07-1016T

24-AUG-2011 08:36
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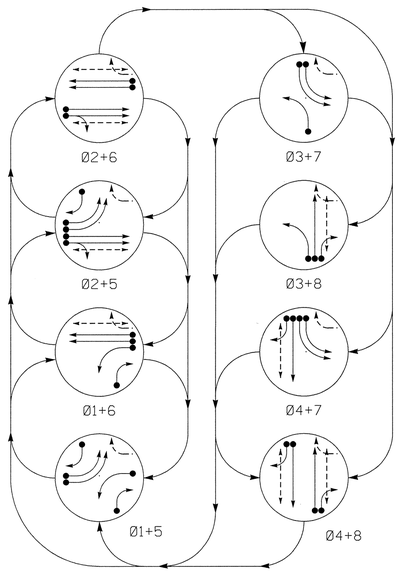
armstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 6

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

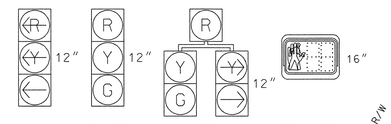
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21, 22	R	R	G	G	R	R	R	R	Y
31	~~R~~	~~R~~	~~R~~	~~R~~	←	←	~~R~~	~~R~~	~~R~~
41	R	R	R	R	R	R	G	G	R
42	R/	R	R/	R	R	R	G	G	R
51, 52	←	~~R~~	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
61, 62	R	G	R	G	R	R	R	R	Y
71, 72	~~R~~	~~R~~	~~R~~	~~R~~	←	~~R~~	←	~~R~~	~~R~~
81	R	R	R	R	R	G	R	G	R
82	R/	R/	R	R	R	G	R	G	R
P21, P22	DW	DW	W	W	DW	DW	DW	DW	DRK
P41, P42	DW	DW	DW	DW	DW	DW	W	W	DRK
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DRK
P81, P82	DW	DW	DW	DW	DW	W	DW	W	DRK

W - WALK
DW - DON'T WALK
DRK - DARK

SIGNAL FACE I.D.

All Heads L.E.D.



11
31
51, 52
71, 72

21, 22
41
61, 62
81

42
82

P21, P22
P41, P42
P61, P62
P81, P82

LOOP & DETECTOR UNIT INSTALLATION CHART

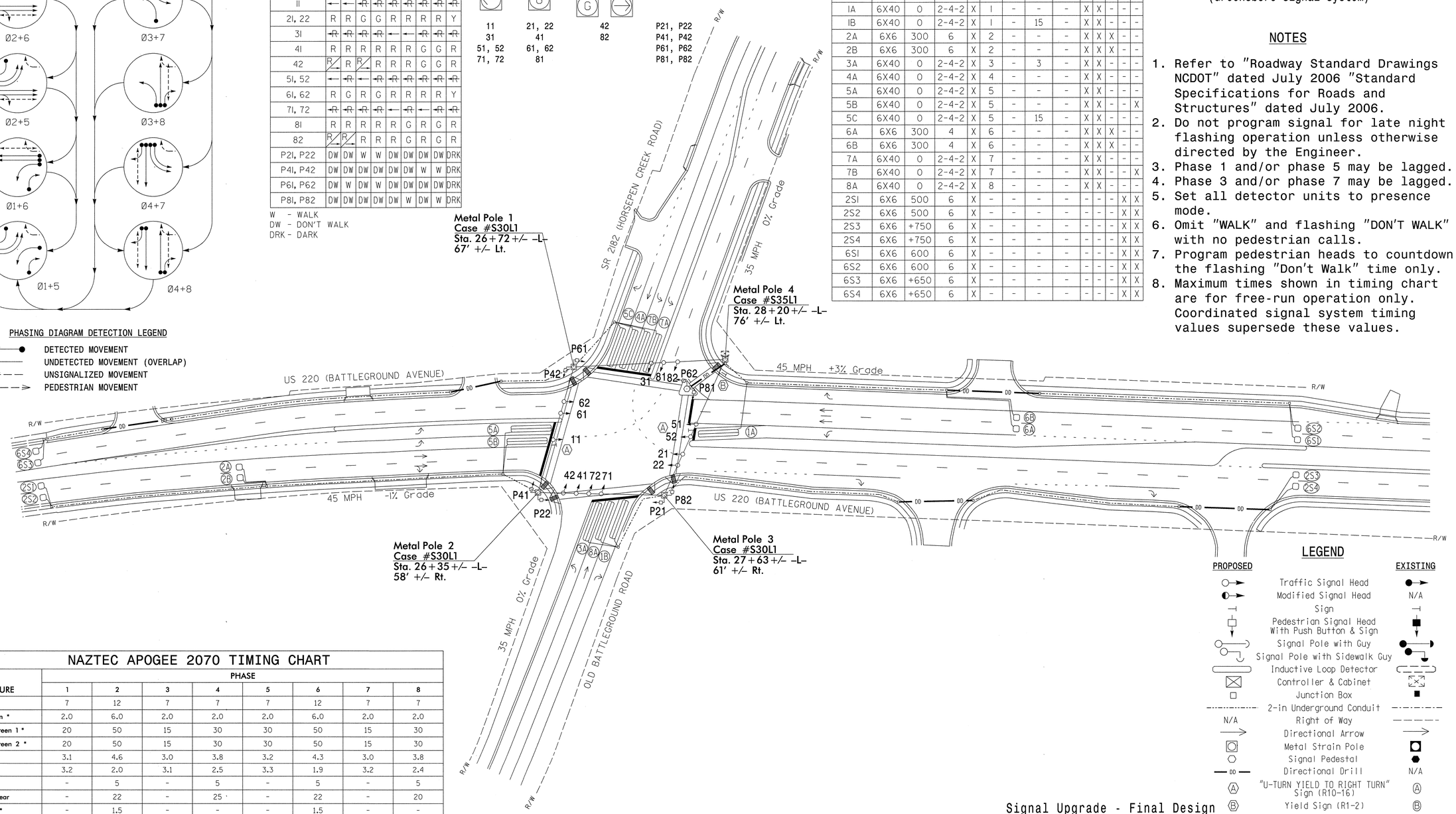
NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

INDUCTIVE LOOPS					DETECTOR PROGRAMMING								
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION	ADDED INIT.	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	X	1	-	-	-	X	X	-	-	-
1B	6X40	0	2-4-2	X	1	-	15	-	X	X	-	-	-
2A	6X6	300	6	X	2	-	-	-	X	X	X	-	-
2B	6X6	300	6	X	2	-	-	-	X	X	X	-	-
3A	6X40	0	2-4-2	X	3	-	3	-	X	X	-	-	-
4A	6X40	0	2-4-2	X	4	-	-	-	X	X	-	-	-
5A	6X40	0	2-4-2	X	5	-	-	-	X	X	-	-	-
5B	6X40	0	2-4-2	X	5	-	-	-	X	X	-	-	X
5C	6X40	0	2-4-2	X	5	-	15	-	X	X	-	-	-
6A	6X6	300	4	X	6	-	-	-	X	X	X	-	-
6B	6X6	300	4	X	6	-	-	-	X	X	X	-	-
7A	6X40	0	2-4-2	X	7	-	-	-	X	X	-	-	-
7B	6X40	0	2-4-2	X	7	-	-	-	X	X	-	-	X
8A	6X40	0	2-4-2	X	8	-	-	-	X	X	-	-	-
2S1	6X6	500	6	X	-	-	-	-	-	-	-	X	X
2S2	6X6	500	6	X	-	-	-	-	-	-	-	X	X
2S3	6X6	+750	6	X	-	-	-	-	-	-	-	X	X
2S4	6X6	+750	6	X	-	-	-	-	-	-	-	X	X
6S1	6X6	600	6	X	-	-	-	-	-	-	-	X	X
6S2	6X6	600	6	X	-	-	-	-	-	-	-	X	X
6S3	6X6	+650	6	X	-	-	-	-	-	-	-	X	X
6S4	6X6	+650	6	X	-	-	-	-	-	-	-	X	X

8 Phase
Fully Acutated
(Greensboro Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
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. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Metal Strain Pole	
	Signal Pedestal	
DD	Directional Drill	N/A
A	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	A
B	Yield Sign (R1-2)	B

NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Min Green *	7	12	7	7	7	12	7	7
Gap, Extension *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Maximum Green 1 *	20	50	15	30	30	50	15	30
Maximum Green 2 *	20	50	15	30	30	50	15	30
Yellow Clear	3.1	4.6	3.0	3.8	3.2	4.3	3.0	3.8
Red Clear	3.2	2.0	3.1	2.5	3.3	1.9	3.2	2.4
Walk *	-	5	-	5	-	5	-	5
Pedestrian Clear	-	22	-	25	-	22	-	20
Added Initial *	-	1.5	-	-	-	1.5	-	-
Maximum Initial *	-	36	-	-	-	34	-	-
Time Before Reduction *	-	15	-	-	-	15	-	-
Time To Reduce *	-	30	-	-	-	30	-	-
Minimum Gap	-	3.0	-	-	-	3.0	-	-
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Lock Calls	NO	YES	NO	NO	NO	YES	NO	NO
Dual Entry	-	-	-	-	-	-	-	-
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.

$$$$SYSTIME$$$$
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
$$$$USCNAME$$$$

Signal Upgrade - Final Design

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220 (Battleground Avenue)
at
SR 2182 (Horsepen Creek Road)/
Old Battleground Road

Division 7 Guilford County Greensboro

PLAN DATE: September 2011 REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/23/11 DATE

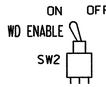
SIG. INVENTORY NO. 07-1016

...\Signal Design\07-1016.dgn 9/6/2011 2:29:49 PM

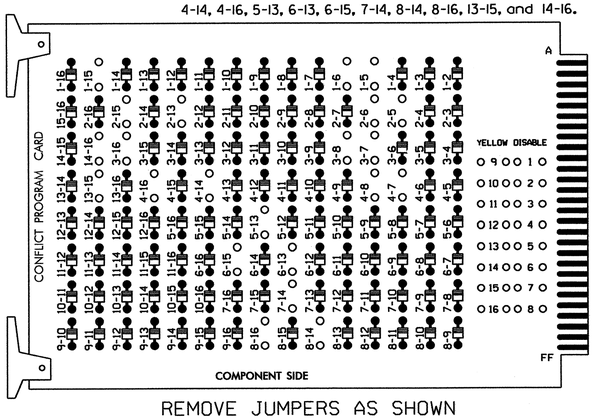
PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 7

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

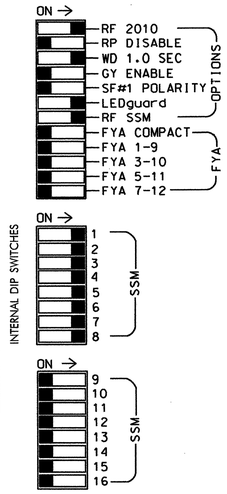
(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 1-5, 1-6, 1-15, 2-5, 2-6, 2-13, 2-15, 3-7, 3-8, 3-16, 4-7, 4-8, 4-14, 4-16, 5-13, 6-13, 6-15, 7-14, 8-14, 8-16, 13-15, and 14-16.



REMOVE JUMPERS AS SHOWN



NOTES:

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

■ = 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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 9,10, 11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Initialize database in Naztec 2070 local software (Apogee) as FULL-MODE 5. This initialization should be done prior to programming controller.
4. Program phases 2 and 6 for Start Up In Walk.
5. Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
6. Ensure "Local Flash Start" feature is set to "ON".
7. The cabinet and controller are part of the City of Greensboro Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S2P	S3	S4	S4P	S5		S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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	P21, P22	31	41,42	P41, P42	42	51,52	61,62	P61, P62	71,72	81,82	P81, P82	NU	NU	NU	NU	NU	NU
RED			128			101				134			107							
YELLOW			129			102				135			108							
GREEN			130			103				136			109							
RED ARROW	125				116				131			122								
YELLOW ARROW	126	126			117			132	132			123								
GREEN ARROW	127	127			118			133	133			124								
✋				113			104				119			110						
🚶				115			106				121			112						

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX OUTPUT FILE
SOFTWARE.....NAZTEC APOGEE
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S1,S2,S2P,S3,S4,S4P,S5,S6,S6P,S7,S8,S8P
PHASES USED.....1,2,2 PED,3,4,4 PED,5,6,6 PED,7,8,8 PED
OVERLAPS.....NONE

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

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	Ø1 1A	Ø2 2A	SLOT EMPTY	Ø3 3A	Ø4 4A	SYS. DET. 2S1	SLOT EMPTY	SYS. DET. 2S3	SLOT EMPTY	SLOT EMPTY	Ø2 PED DC ISOLATOR	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L		Ø1 1B	Ø2 2B		NOT USED	NOT USED	SYS. DET. 2S2		SYS. DET. 2S4			Ø4 PED DC ISOLATOR	Ø8 PED DC ISOLATOR	ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø5 5B	Ø6 6A	SLOT EMPTY	SLOT EMPTY	Ø7 7A	SYS. DET. 6S1	Ø8 8A	SYS. DET. 6S3	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	Ø5 5C	Ø6 6B			Ø7 7B	SYS. DET. 6S2	NOT USED	SYS. DET. 6S4					

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.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
1A	TB2-5,6	I2U	39	2	1				X	X	
1B	TB2-7,8	I2L	43	3	1		15		X	X	
2A	TB2-9,10	I3U	63	4	2				X	X	X
2B	TB2-11,12	I3L	76	5	2				X	X	X
3A	TB4-5,6	I5U	58	7	3		3		X	X	
4A	TB4-9,10	I6U	41	8	4				X	X	
5A	TB3-1,2	J1U	55	15	5				X	X	
5B	TB3-5,6	J2U	40	16	5				X	X	
5C	TB3-7,8	J2L	44	17	5		15		X	X	
6A	TB3-9,10	J3U	64	18	6				X	X	X
6B	TB3-11,12	J3L	77	19	6				X	X	X
7A	TB5-9,10	J6U	42	22	7				X	X	
7B	TB5-11,12	J6L	46	23	7				X	X	
8A	TB7-5,6	J8U	50	26	8				X	X	
* 2S1	TB6-1,2	I7U	65	10	SYS						
* 2S2	TB6-3,4	I7L	78	11	SYS						
* 2S3	TB6-9,10	I9U	60	13	SYS						
* 2S4	TB6-11,12	I9L	62	14	SYS						
* 6S1	TB7-1,2	J7U	66	24	SYS						
* 6S2	TB7-3,4	J7L	79	25	SYS						
* 6S3	TB7-9,10	J9U	59	27	SYS						
* 6S4	TB7-11,12	J9L	61	28	SYS						
PED PUSH BUTTONS											
P21,P22	TB8-4,6	I12U	67	PED 2	2 PED						
P41,P42	TB8-5,6	I12L	69	PED 4	4 PED						
P61,P62	TB8-7,9	I13U	68	PED 6	6 PED						
P81,P82	TB8-8,9	I13L	70	PED 8	8 PED						

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

* System detector only. Remove the vehicle phase assigned to this detector in the default programming.

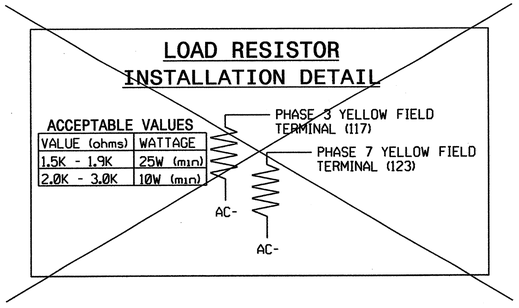
INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1016
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



REMOVE LOAD RESISTORS, IF PRESENT.

Signal Upgrade - Final Design

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 220 (Battleground Avenue) at SR 2182 (Horsepen Creek Rd)/ Old Battleground Road

Division 7 Guilford County Greensboro

PLAN DATE: August 2011 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS | INIT. | DATE

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

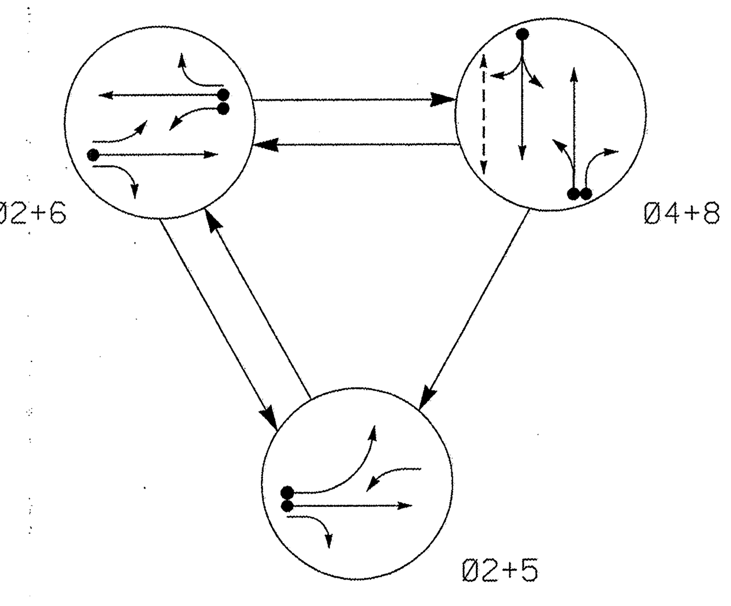
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE DATE 8-29-11
SIG. INVENTORY NO. 07-1016

24-AUG-2011 08:40
S:#ITS&SU#ITS Signals#workgroups#Sig Man#armstrong#071016_sm_ela_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.8

3 Phase
Fully Acutated
(Greensboro Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø4+8	FLASH
21, 22	G	G	R	Y
41, 42	R	R	G	R
51	←	←F/Y	←R	←Y
61	←F/Y	←F/Y	←R	←Y
62, 63	R	G	R	Y
81, 82	R	R	G	R
P41, P42	DW	DW	W	DRK

←F/Y = FLASHING YELLOW ARROW
W - WALK
DW - DON'T WALK
DRK - DARK

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM \ TO	← 1	← 2	←F/Y 1	←F/Y 2	←R 1	←R 2
←	←	←	←Y	←R	←Y	←R
←F/Y	←F/Y	←F/Y	←F/Y	←F/Y	←Y	←R
←R	←R	←R	←R	←R	←R	←R

←F/Y = FLASHING YELLOW ARROW

LOOP & DETECTOR UNIT INSTALLATION CHART
NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

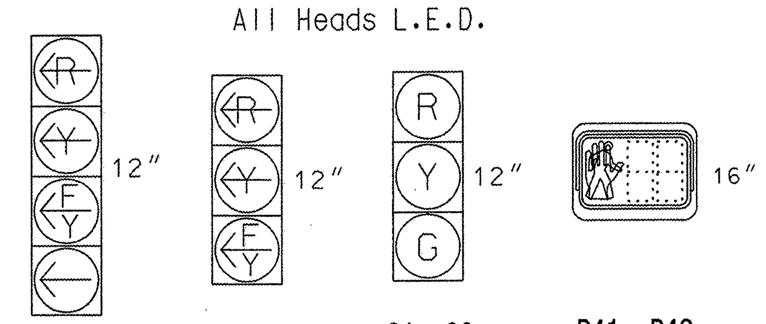
INDUCTIVE LOOPS					DETECTOR PROGRAMMING								
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION	ADDED INIT.	SYSTEM LOOP	NEW CARD
2A	6X6	300	5	X	2	-	-	-	X	X	X	-	X
4A	6X40	0	2-4-2	X	4	-	10	-	X	X	-	-	X
5A	6X40	0	2-4-2	X	5	-	15	-	X	X	-	-	X
6A	6X6	300	5	X	6	-	-	-	X	X	X	-	X
6B	6X40	0	2-4-2	X	6	-	-	-	X	X	-	-	X
8A	6X40	0	2-4-2	X	8	-	3	-	X	X	-	-	X
8B	6X40	0	2-4-2	X	8	-	15	-	X	X	-	-	X

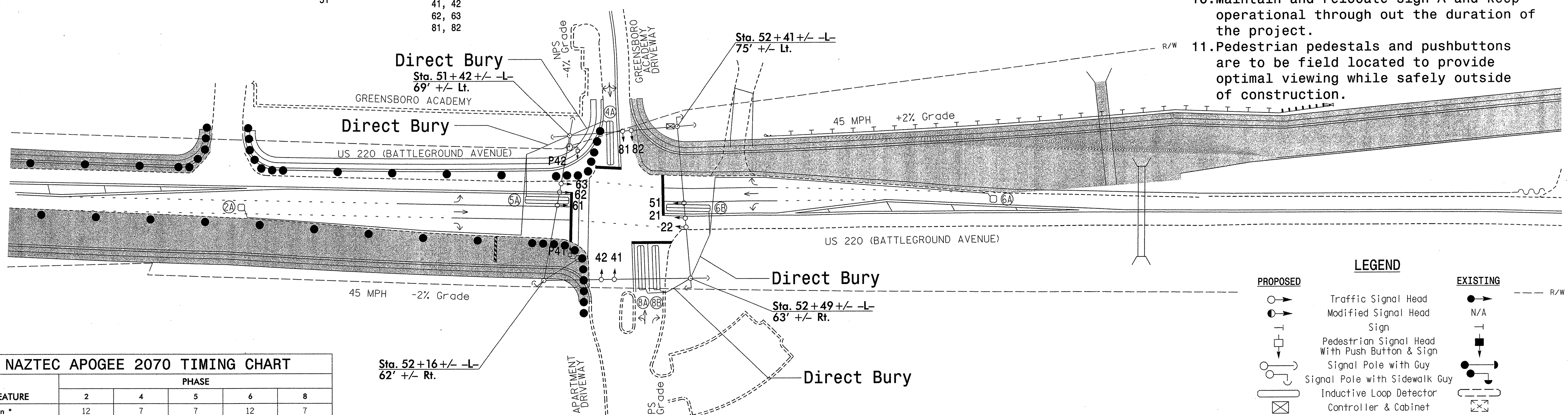
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 5 may be lagged.
4. Set all detectors units to presence mode.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
8. Pavement markings are existing.
9. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
10. Maintain and relocate sign A and keep operational through out the duration of the project.
11. Pedestrian pedestals and pushbuttons are to be field located to provide optimal viewing while safely outside of construction.

SIGNAL FACE I.D.

All Heads L.E.D.





NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE 2	4	5	6	8
Min Green *	12	7	7	12	7
Gap, Extension *	6.0	2.0	2.0	6.0	2.0
Maximum Green 1 *	70	20	20	70	20
Maximum Green 2 *	70	20	20	70	20
Yellow Clear	4.7	3.4	3.0	4.7	3.1
Red Clear	1.1	1.5	1.8	1.1	2.3
Walk *	-	5	-	-	-
Pedestrian Clear	-	16	-	-	-
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	-
Lock Calls	YES	NO	NO	YES	NO
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.

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 Drums	
	Construction Zone	
N/A	Guardrail	
	Signal Pedestal	

R/W

Signal Upgrade - Temporary Design 1 (TMP Phase I)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220 (Battleground Avenue) at Greensboro Academy

Division 7 Guilford County Greensboro

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/23/11 DATE

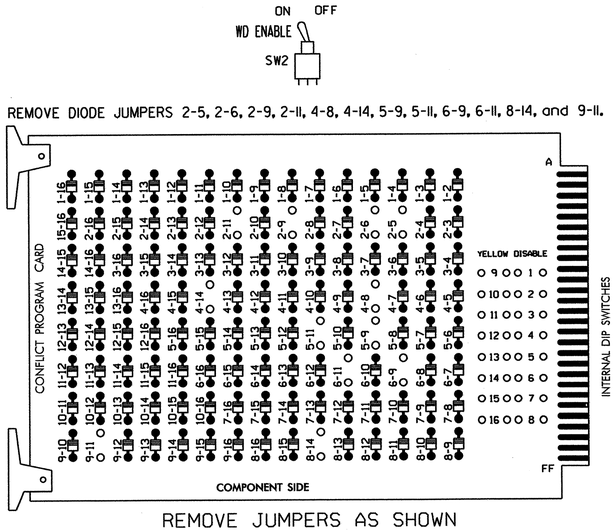
SIG. INVENTORY NO. 07-2119T1

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 9

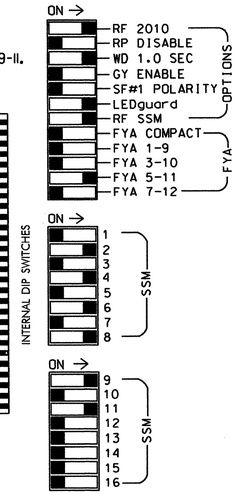
EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 2-5, 2-6, 2-9, 2-11, 4-8, 4-14, 5-9, 5-11, 6-9, 6-11, 8-14, and 9-11.

REMOVE JUMPERS AS SHOWN



■ = DENOTES POSITION OF SWITCH

NOTES:

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

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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3, 5,7,10,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Initialize database in Naztec 2070 local software (Apogee) as FULL-MODE 5. This initialization should be done prior to programming controller.
4. Program phases 2 and 6 for Start Up In Green.
5. Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
6. Ensure "Local Flash Start" feature is set to "ON".
7. Program phases 4 and 8 for Dual Entry.
8. The cabinet and controller are part of the City of Greensboro Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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.	NU	21,22	NU	NU	41,42	P41, P42	51 ★	62,63	NU	NU	81,82	NU	61 ★	NU	NU	51 ★	NU	NU
RED		128			101			134			107							
YELLOW		129			102		*	135			108							
GREEN		130			103			136			109							
RED ARROW													A121			A114		
YELLOW ARROW													A122			A115		
FLASHING YELLOW ARROW													A123			A116		
GREEN ARROW							133											
✋						104												
🚶						106												

NU = Not Used

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

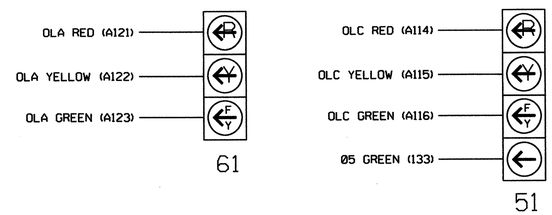
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX OUTPUT FILE
SOFTWARE.....NAZTEC APOGEE
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S2,S4,S4P,S5,S6,S8,S9,S12
PHASES USED.....2,4,4 PED,5,6,8
OVERLAP A.....2
OVERLAP C.....5+6

3 & 4 SECTION FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	Ø2 2A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	NOT USED	SLOT EMPTY	FS DC ISOLATOR
	L		NOT USED				NOT USED						Ø4 PED DC ISOLATOR		ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		NOT USED		Ø6 6B		Ø8 8B								

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.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
2A	TB2-5,6	I2U	39	2	2				X	X	X
4A	TB4-9,10	I6U	41	8	4		10		X	X	
5A	TB3-1,2	J1U	55	15	5		15		X	X	
6A	TB3-5,6	J2U	40	16	6				X	X	X
6B	TB3-7,8	J2L	44	17	6				X	X	
8A	TB5-9,10	J6U	42	22	8		3		X	X	
8B	TB5-11,12	J6L	46	23	8		15		X	X	
PED PUSH BUTTONS											
P41,P42	TB8-5,6	I12L	69	PED 4	4 PED						

NOTE:
INSTALL DC ISOLATOR IN INPUT FILE SLOT I12.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

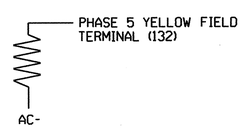
COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-2119T1
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 1 (TMP Phase 1) - Sheet 1 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue) at Greensboro Academy

Division 7 | Guilford County | Greensboro

PLAN DATE: August 2011 | REVIEWED BY: JTR
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE | DATE 8-29-11

SIG. INVENTORY NO. 07-2119T1

24-AUG-2011 10:32
S:#ITSGSU#ITS Signals#workgroups#Sig Mgmt#armstrong#07219_sm_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 10

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS "1" CONTROLLER AND THEN "5" OVERLAPS

```
Overlaps
[1.General Parms]
2.Program
3.Status
```

```
General Overlap Parameters
Lock Inhibit OFF
Confl Lock Enable OFF
Parent P Clrncs ON
Extra Included Phases OFF
```

PRESS "ESC"

```
Overlaps
1.General Parms
[2.Program]
3.Status
```

```
Enter Overlap #  1
then press Enter
```

```
Overlap A-1
[1.Program Parms]
2.Confl Prog+
3.Program Parms+
```

```
Ovrlp A-1   Ps....................
Included Ps    2  0  0  0  0  0  0  0
Modifier Ps    0  0  0  0  0  0  0  0
Type:NORMAL  Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
[2.Confl Prog+]
3.Program Parms+
```

```
Ovrlp A-1   Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
2.Confl Prog+
[3.Program Parms+]
```

```
Ovrlp A-1
LeadGreen  OFF  Transit 0
GreenExtInh     0  0  0  0  0  0  0  0
```

PRESS "ESC TWICE

Notice type FYA-4 →

```
Overlaps
1.General Parms
[2.Program]
3.Status
```

```
Enter Overlap #  3
then press Enter
```

```
Overlap C-3
[1.Program Parms]
2.Confl Prog+
3.Program Parms+
```

```
Ovrlp C-3   Ps....................
Included Ps    5  0  0  0  0  0  0  0
Modifier Ps    6  0  0  0  0  0  0  0
Type:FYA-4   Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap C-3
1.Program Parms
[2.Confl Prog+]
3.Program Parms+
```

```
Ovrlp C-3   Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap C-3
1.Program Parms
2.Confl Prog+
[3.Program Parms+]
```

```
Ovrlp C-3
LeadGreen  OFF  Transit 0
GreenExtInh     0  0  0  0  0  0  0  0
```

OVERLAP PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-2119T1
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 1 (TMP Phase 1) - Sheet 2 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:

Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section

750 N.Greenfield Pkwy,Garner,NC 27529

US 220 (Battleground Avenue) at Greensboro Academy

Division 7 | Guilford County | Greensboro

PLAN DATE: August 2011 | REVIEWED BY: JTR

PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

John T. Rowe Jr. 8-29-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-2119T1

24-AUG-2011 10:33
S:#ITS&SU#ITS Signals#Workgroups#Sig Mom#Armstrong#07211 9.sm.ele.xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. J1

4-SECTION PPLT FYA OUTPUT PROGRAMMING DETAIL

(program controller as shown below)

1. Before proceeding with output programming, be sure to switch the "RUN ENABLE STATUS" to "OFF". The "RUN ENABLE STATUS" setting is located from Main Menu, key strokes 1-7.
2. The Flashing Yellow Arrow in a 4-section PPLT FYA head is controlled by a normally unused PED Yellow output. This programming takes a specific PED Yellow output and remaps it to the appropriate Overlap Green output.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

SELECT USER MODE →

```
I/O Parameters
C1-C11-ABC IO Mode: USER
     D Conn Mapping: NONE
        T&F Biu Map: DEFAULT
 Invert Rail Inputs: OFF
    EVP Ped Confirm: OFF
```

PRESS "ESC"

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

```
User I/O Maps
1. Inputs
2. Outputs
3. Init Map
```

```
Initialize User I/O Maps
     Init ABC with: NONE
       Init D with: NONE
      Init 2A with: MODE 5
 Init TF BIUs with: NONE
```

SELECT MODE 5 →

PRESS "ESC"

```
User I/O Maps
1. Inputs
2. Outputs
3. Init Map
```

```
User Output Maps
1.NEMA A    4.NEMA D
2.NEMA B    5.FIO 2A
3.NEMA C                9.TS2 IO
```

PRESS "+" KEY TWICE

Pin	Fcn	Description	Pin	Fcn	Description
4-5	54	Ch6 Green	4-6	5	Ch5 Red
4-7	29	Ch5 Yellow	4-8	53	Ch5 Green
5-1	37	Ch13 Yellow	5-2	0	Unused
5-3	38	Ch14 Yellow	5-4	40	Ch16 Yellow
5-5	115	Not Used	5-6	124	LdSwtchFlsh
5-7	115	Not Used	5-8	114	Watchdog
6-1	115	Not Used	6-2	115	Not Used

Programming notes:

Pin	Default Fcn	Description	Change To: Fcn	Description
5-2	39	Ch15 Yellow....	0	Unused

PRESS "+" KEY ONCE

Pin	Fcn	Description	Pin	Fcn	Description
6-3	12	Ch12 Red	6-4	36	Ch12 Yellow
6-5	60	Ch12 Green	6-6	11	Ch11 Red
6-7	35	Ch11 Yellow	6-8	39	Ch15 Yellow
7-1	17	Ch17 Red	7-2	65	Ch17 Green
7-3	10	Ch10 Red	7-4	34	Ch10 Yellow
7-5	58	Ch10 Green	7-6	9	Ch9 Red
7-7	33	Ch9 Yellow	7-8	57	Ch9 Green

Programming notes:

Pin	Default Fcn	Description	Change To: Fcn	Description
6-8	59	Ch11 Green	39	Ch15 Yellow

OUTPUT PROGRAMMING COMPLETE

Pin 5-2 (C1 pin 36) = Load Switch S6P-Y
Pin 6-8 (C1 pin 87) = Load Switch S12-G

! Press the "*" key to return to Main Menu. Now go back to "RUN-ENABLE STATUS" and switch to "ON".

NOTE

I/O re-programming is necessary for proper FYA operation. See Channel & I/O Programming Detail For FYA Operation on this sheet.

CHANNEL & I/O PROGRAMMING DETAIL FOR FYA OPERATION

(program controller as shown below)

This programming takes the output that drives a Flashing Yellow Arrow and makes it flash. It also specifies which overlap is to be overridden for the FYA to display properly.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

PRESS THE RIGHT ARROW KEY UNTIL THE SCREEN AT RIGHT APPEARS

```
     Chan.1...2...3...4...5...6...7...8 >
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   .   .   .
Flash Grn .   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   0   0
```

```
     Chan.9..10..11..12..13..14..15..16
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   .   X   .
Flash Grn X   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   3   0
```

CHANNEL & I/O PROGRAMMING COMPLETE

NOTE

Output re-mapping is necessary for proper FYA operation. See the 4-Section PPLT FYA Output Programming Detail on this sheet.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-2119T1
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 1 (TMP Phase 1) - Sheet 3 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

750 N.Greenfield Pkwy,Garner,NC 27529

US 220 (Battleground Avenue) at Greensboro Academy

Division 7 | Guilford County | Greensboro

PLAN DATE:	August 2011	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

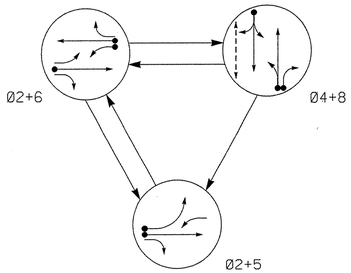
John T. Rowe 8-29-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-2119T1

24-AUG-2011 10:34
S:*ITS&S\ITS Signals\Workgroups\Sig Mgmt\Armstrong\072119_smu_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 12

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø4+8	FLASH
21, 22	G	G	R	Y
41, 42	R	R	G	R
51	←	F Y	R	Y
61	F Y	F Y	R	Y
62, 63	R	G	R	Y
81, 82	R	R	G	R
P41, P42	DW	DW	W	DRK

F Y = FLASHING YELLOW ARROW
W - WALK
DW - DON'T WALK
DRK - DARK

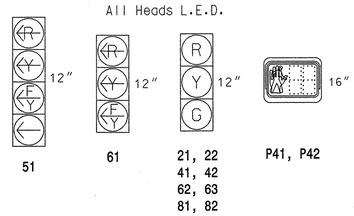
STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM	TO ← 1	← 2	F Y 1	F Y 2	R 1	R 2
←			Y	R	Y	R
F Y	F Y	F Y	F Y	F Y	Y	R
R	R	R	R	R	R	R

F Y = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR UNIT INSTALLATION CHART

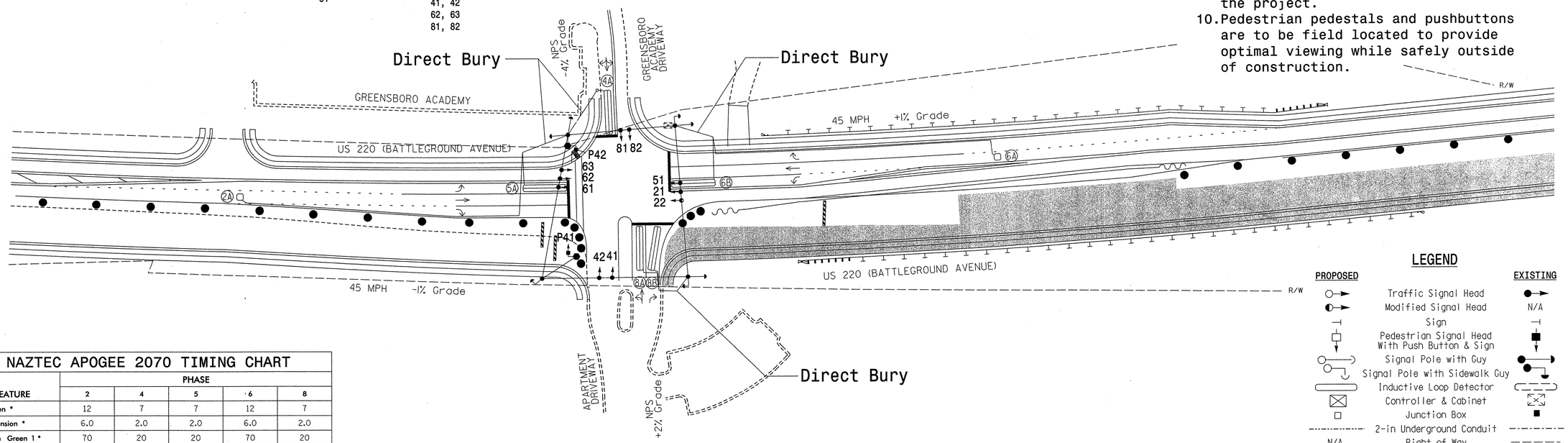
NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

INDUCTIVE LOOPS					DETECTOR PROGRAMMING								
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION	ADDED INIT.	SYSTEM LOOP	NEW CARD
2A	6X6	300	5	X	2	-	-	-	X	X	X	-	-
4A	6X40	0	2-4-2	X	4	-	10	-	X	X	-	-	-
5A	6X40	0	2-4-2	X	5	-	15	-	X	X	-	-	-
6A	6X6	300	4	X	6	-	-	-	X	X	X	-	-
6B	6X40	0	2-4-2	X	6	-	-	-	X	X	-	-	-
8A	6X40	0	2-4-2	X	8	-	-	-	X	X	-	-	-
8B	6X40	0	2-4-2	X	8	-	15	-	X	X	-	-	-

3 Phase
Fully Acutated
(Greensboro Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 5 may be lagged.
4. Reposition existing signal heads numbered: 21, 22, 51, 61, 62, and 63.
5. Set all detectors units to presence mode.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Maintain and relocate sign A and keep operational throughout the duration of the project.
10. Pedestrian pedestals and pushbuttons are to be field located to provide optimal viewing while safely outside of construction.



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 Drums	
	Construction Zone	
N/A	Guardrail	
	Signal Pedestal	

NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE 2	4	5	6	8
Min Green *	12	7	7	12	7
Gap, Extension *	6.0	2.0	2.0	6.0	2.0
Maximum Green 1 *	70	20	20	70	20
Maximum Green 2 *	70	20	20	70	20
Yellow Clear	4.6	3.4	3.2	4.6	3.1
Red Clear	1.1	1.9	1.5	1.1	2.3
Walk *	-	5	-	-	-
Pedestrian Clear	-	16	-	-	-
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	-
Lock Calls	YES	NO	NO	YES	NO
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.

Signal Upgrade - Temporary Design 2 (TMP Phase II)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220 (Battleground Avenue) at Greensboro Academy

Division 7 Guilford County Greensboro

PLAN DATE: September 2011 | REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/22/11 DATE

SIG. INVENTORY NO. 07-2119T2

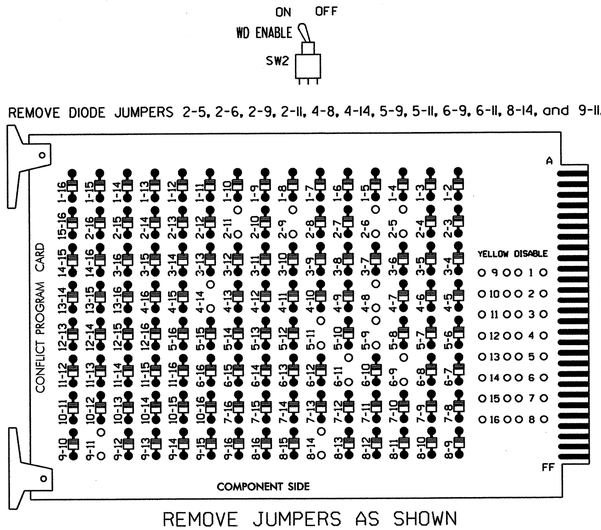
$$$$$SYSTIME$$$$$
$$$$$USERNAME$$$$$

...\Signal Design\07-2119T2.dgn 8/22/2011 2:55:25 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 13

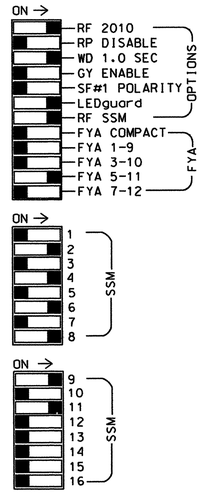
EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 2-5, 2-6, 2-9, 2-11, 4-8, 4-14, 5-9, 5-11, 6-9, 6-11, 8-14, and 9-11.

REMOVE JUMPERS AS SHOWN



■ = DENOTES POSITION OF SWITCH

NOTES:

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

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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3, 5,7,10,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Initialize database in Naztec 2070 local software (Apogee) as FULL-MODE 5. This initialization should be done prior to programming controller.
4. Program phases 2 and 6 for Start Up In Green.
5. Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
6. Ensure "Local Flash Start" feature is set to "ON".
7. Program phases 4 and 8 for Dual Entry.
8. The cabinet and controller are part of the City of Greensboro Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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.	NU	21,22	NU	NU	41,42	P41, P42	51★	62,63	NU	NU	81,82	NU	61★	NU	NU	51★	NU	NU
RED		128			101			134			107							
YELLOW		129			102		✳	135			108							
GREEN		130			103			136			109							
RED ARROW													A121			A114		
YELLOW ARROW													A122			A115		
FLASHING YELLOW ARROW													A123			A116		
GREEN ARROW							133											
✋						104												
🚶						106												

NU = Not Used

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

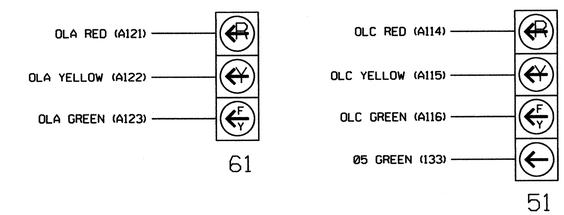
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX OUTPUT FILE
SOFTWARE.....NAZTEC APOGEE
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S2,S4,S4P,S5,S6,S8,S9,S12
PHASES USED.....2,4,4 PED,5,6,8
OVERLAP A.....2
OVERLAP C.....5+6

3 & 4 SECTION FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	ø2 2A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	NOT USED	SLOT EMPTY	FS DC ISOLATOR
	L		NOT USED				NOT USED						ø4 PED DC ISOLATOR		ST DC ISOLATOR
FILE "J"	U	ø5 5A	ø6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	ø6 6B				ø8 8B								

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.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
2A	TB2-5,6	I2U	39	2	2				X	X	X
4A	TB4-9,10	I6U	41	8	4		10		X	X	
5A	TB3-1,2	J1U	55	15	5		15		X	X	
6A	TB3-5,6	J2U	40	16	6				X	X	X
6B	TB3-7,8	J2L	44	17	6				X	X	
8A	TB5-9,10	J6U	42	22	8				X	X	
8B	TB5-11,12	J6L	46	23	8		15		X	X	
PED PUSH BUTTONS											
P41,P42	TB8-5,6	I12L	69	PED 4	4 PED						

NOTE:
INSTALL DC ISOLATOR IN INPUT FILE SLOT I12.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

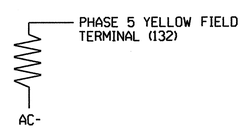
COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-2119T2
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 2 (TMP Phase 2) - Sheet 1 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 220 (Battleground Avenue) at Greensboro Academy

Division 7 Guilford County Greensboro

PLAN DATE: August 2011 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
John T. Rowe Jr. 8-29-11
SIGNATURE DATE
SIG. INVENTORY NO. 07-2119T2

24-AUG-2011 10:37
S:\ITSASU\ITS Signals\workgroups\sig Mon\armstrong\07219_sm_ele_xxx.dgn
armstrong

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS "1" CONTROLLER AND THEN "5" OVERLAPS

```
Overlaps
[1.General Parms]
2.Program
3.Status
```

```
General Overlap Parameters
      Lock Inhibit OFF
   Confl Lock Enable OFF
     Parent P Clrncs ON
Extra Included Phases OFF
```

PRESS "ESC"

```
Overlaps
1.General Parms
[2.Program]
3.Status
```

```
Enter Overlap #  1
  then press Enter
```

```
Overlap A-1
[1.Program Parms]
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp A-1    Ps....................
Included Ps    2  0  0  0  0  0  0  0
Modifier Ps    0  0  0  0  0  0  0  0
Type:NORMAL   Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
[2.Confl Prog+]
3.Program Parms+
```

```
 Ovrlp A-1    Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
2.Confl Prog+
[3.Program Parms+]
```

```
 Ovrlp A-1
LeadGreen  OFF  Transit 0
GreenExtInh     0  0  0  0  0  0  0  0
```

PRESS "ESC TWICE

Notice type FYA-4 →

```
Overlaps
1.General Parms
[2.Program]
3.Status
```

```
Enter Overlap #  3
  then press Enter
```

```
Overlap C-3
[1.Program Parms]
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp C-3    Ps....................
Included Ps    5  0  0  0  0  0  0  0
Modifier Ps    6  0  0  0  0  0  0  0
Type:FYA-4    Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap C-3
1.Program Parms
[2.Confl Prog+]
3.Program Parms+
```

```
 Ovrlp C-3    Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap C-3
1.Program Parms
2.Confl Prog+
[3.Program Parms+]
```

```
 Ovrlp C-3
LeadGreen  OFF  Transit 0
GreenExtInh     0  0  0  0  0  0  0  0
```

OVERLAP PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-2119T2
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 2 (TMP Phase 2) - Sheet 2 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue)
at
Greensboro Academy

Division 7 | Guilford County | Greensboro

PLAN DATE: August 2011 | REVIEWED BY: JTR
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

John T. Rowe Jr. 8-29-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-2119T2

24-AUG-2011 10:38
S:*ITS&SU*ITS Signals*Workgroups*Sig Mom*Armstrong*07211 9_smu_e10_xxx.dgn
armstrong

4-SECTION PPLT FYA OUTPUT PROGRAMMING DETAIL

(program controller as shown below)

1. Before proceeding with output programming, be sure to switch the "RUN ENABLE STATUS" to "OFF". The "RUN ENABLE STATUS" setting is located from Main Menu, key strokes 1-7.
2. The Flashing Yellow Arrow in a 4-section PPLT FYA head is controlled by a normally unused PED Yellow output. This programming takes a specific PED Yellow output and remaps it to the appropriate Overlap Green output.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16   4.Chan+  1-16 7.IO Logic
2.chan 17-24   5.chan+ 17-24 8.IO Viewer
3.Chan Parms   6.IO Parms    9.IO UserMap
```

```
I/O Parameters
C1-C11-ABC IO Mode: USER
     D Conn Mapping: NONE
        T&F Biu Map: DEFAULT
 Invert Rail Inputs: OFF
    EVP Ped Confirm: OFF
```

SELECT USER MODE →

PRESS "ESC"

```
Channel & I/O
1.Chan  1-16   4.Chan+  1-16 7.IO Logic
2.chan 17-24   5.chan+ 17-24 8.IO Viewer
3.Chan Parms   6.IO Parms    9.IO UserMap
```

```
User I/O Maps
1. Inputs
2. Outputs
3. Init Map
```

```
Initialize User I/O Maps
     Init ABC with: NONE
       Init D with: NONE
      Init 2A with: MODE 5
 Init TF BIUs with: NONE
```

SELECT MODE 5 →

PRESS "ESC"

```
User I/O Maps
1. Inputs
2. Outputs
3. Init Map
```

```
User Output Maps
1.NEMA A    4.NEMA D
2.NEMA B    5.FIO 2A
3.NEMA C                 9.TS2 IO
```

PRESS "+" KEY TWICE

Pin	Fcn	Description	Pin	Fcn	Description
4-5	54	Ch6 Green	4-6	5	Ch5 Red
4-7	29	Ch5 Yellow	4-8	53	Ch5 Green
5-1	37	Ch13 Yellow	5-2	0	Unused
5-3	38	Ch14 Yellow	5-4	40	Ch16 Yellow
5-5	115	Not Used	5-6	124	LdSwtchFlsh
5-7	115	Not Used	5-8	114	Watchdog
6-1	115	Not Used	6-2	115	Not Used

Programming notes:

Pin	Default Fcn	Description	Change To: Fcn	Description
5-2	39	Ch15 Yellow....	0	Unused

PRESS "+" KEY ONCE

Pin	Fcn	Description	Pin	Fcn	Description
6-3	12	Ch12 Red	6-4	36	Ch12 Yellow
6-5	60	Ch12 Green	6-6	11	Ch11 Red
6-7	35	Ch11 Yellow	6-8	39	Ch15 Yellow
7-1	17	Ch17 Red	7-2	65	Ch17 Green
7-3	10	Ch10 Red	7-4	34	Ch10 Yellow
7-5	58	Ch10 Green	7-6	9	Ch9 Red
7-7	33	Ch9 Yellow	7-8	57	Ch9 Green

Programming notes:

Pin	Default Fcn	Description	Change To: Fcn	Description
6-8	59	Ch11 Green	39	Ch15 Yellow

OUTPUT PROGRAMMING COMPLETE

Pin 5-2 (C1 pin 36) = Load Switch S6P-Y
Pin 6-8 (C1 pin 87) = Load Switch S12-G

! Press the "*" key to return to Main Menu. Now go back to "RUN-ENABLE STATUS" and switch to "ON".

NOTE

I/O re-programming is necessary for proper FYA operation. See Channel & I/O Programming Detail For FYA Operation on this sheet.

CHANNEL & I/O PROGRAMMING DETAIL FOR FYA OPERATION

(program controller as shown below)

This programming takes the output that drives a Flashing Yellow Arrow and makes it flash. It also specifies which overlap is to be overridden for the FYA to display properly.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16   4.Chan+  1-16 7.IO Logic
2.chan 17-24   5.chan+ 17-24 8.IO Viewer
3.Chan Parms   6.IO Parms    9.IO UserMap
```

PRESS THE RIGHT ARROW KEY UNTIL THE SCREEN AT RIGHT APPEARS

```
      Chan.1...2...3...4...5...6...7...8 >
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   .   .   .
Flash Grn .   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   0   0
```

```
      Chan.9..10..11..12..13..14..15..16
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   .   X   .
Flash Grn X   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   3   0
```

CHANNEL & I/O PROGRAMMING COMPLETE

NOTE

Output re-mapping is necessary for proper FYA operation. See the 4-Section PPLT FYA Output Programming Detail on this sheet.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-2119T2
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 2 (TMP Phase 2) - Sheet 3 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

750 N.Greenfield Pkwy,Garner,NC 27529

US 220 (Battleground Avenue) at Greensboro Academy

Division 7 | Guilford County | Greensboro

PLAN DATE: August 2011 | REVIEWED BY: JTR

PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE | DATE 8-29-11

SIG. INVENTORY NO. 07-2119T2

24-AUG-2011 10:38
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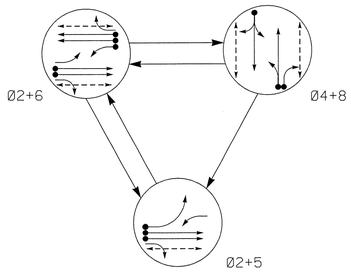
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 16

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø4+8	FLASH
21, 22	G	G	R	Y
41, 42	R	R	G	R
51	←	F.Y.	~~R~~	~~Y~~
61	~~F.Y.~~	~~F.Y.~~	~~R~~	~~Y~~
62, 63	R	G	R	Y
81, 82	R	R	G	R
P21, P22	W	W	DW	DRK
P41, P42	DW	DW	W	DRK
P61, P62	DW	W	DW	DRK
P81, P82	DW	DW	W	DRK

F.Y. = FLASHING YELLOW ARROW

W - WALK
DW - DON'T WALK
DRK - DARK

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM	TO ← 1	TO ← 2	TO F.Y. 1	TO F.Y. 2	TO ~~R~~ 1	TO ~~R~~ 2
←	←	←	~~Y~~	~~R~~	~~Y~~	~~R~~
F.Y.	F.Y.	F.Y.	F.Y.	F.Y.	~~Y~~	~~R~~
~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~

F.Y. = FLASHING YELLOW ARROW

LOOP & DETECTOR UNIT INSTALLATION CHART

NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

INDUCTIVE LOOPS					DETECTOR PROGRAMMING								
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION	ADDED INIT.	SYSTEM LOOP	NEW CARD
2A	6X6	300	6	X	2	-	-	-	X	X	X	-	-
2B	6X6	300	6	X	2	-	-	-	X	X	X	-	X
4A	6X40	0	2-4-2	-	4	-	10	-	X	X	-	-	-
5A	6X40	0	2-4-2	X	5	-	15	-	X	X	-	-	-
6A	6X6	300	4	X	6	-	-	-	X	X	X	-	-
6B	6X6	300	4	X	6	-	-	-	X	X	X	-	X
6C	6X40	0	2-4-2	X	6	-	-	-	X	X	-	-	-
8A	6X40	0	2-4-2	X	8	-	-	-	X	X	-	-	-
8B	6X40	0	2-4-2	X	8	-	15	-	X	X	-	-	-

3 Phase
Fully Acutated
(Greensboro Signal System)

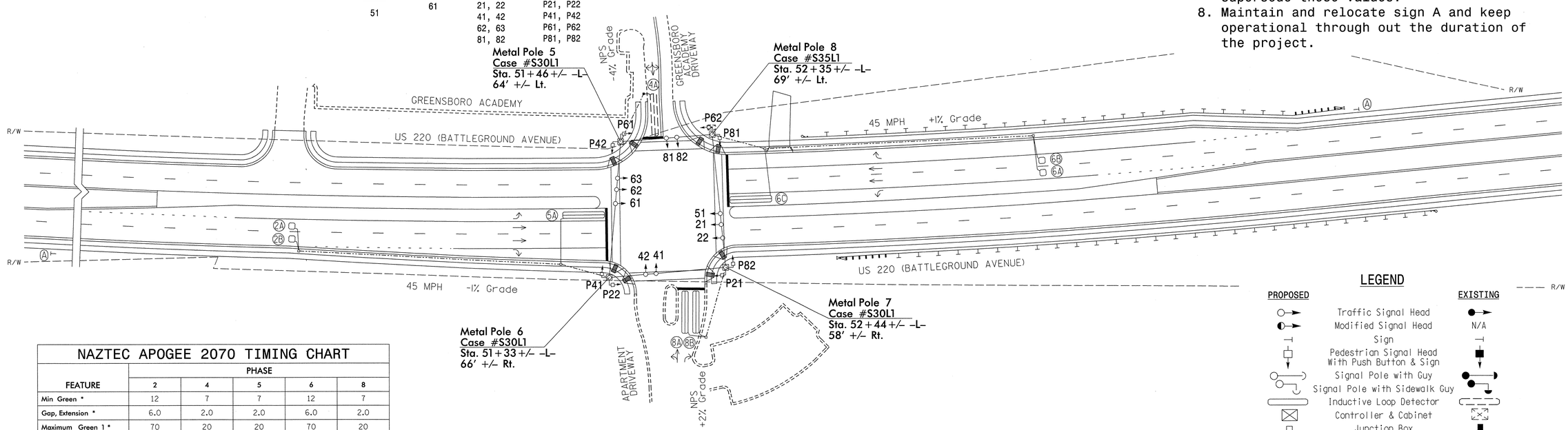
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 5 may be lagged.
4. Set all detector units to presence mode.
5. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
6. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
8. Maintain and relocate sign A and keep operational through out the duration of the project.

SIGNAL FACE I.D.

All Heads L.E.D.

51 — 61 — 21, 22 / 41, 42 / 62, 63 / 81, 82 — P21, P22 / P41, P42 / P61, P62 / P81, P82



NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 5	PHASE 6	PHASE 8
Min Green *	12	7	7	12	7
Gap, Extension *	6.0	2.0	2.0	6.0	2.0
Maximum Green 1 *	70	20	20	70	20
Maximum Green 2 *	70	20	20	70	20
Yellow Clear	4.6	3.4	3.2	4.6	3.1
Red Clear	1.7	3.3	2.9	1.7	3.4
Walk *	5	5	-	5	5
Pedestrian Clear	16	24	-	13	25
Added Initial *	1.5	-	-	1.5	-
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	-
Lock Calls	YES	NO	NO	YES	NO
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.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Guardrail	
	Metal Strain Pole	
	"35 MPH WHEN FLASHING"	

Signal Upgrade - Final Design

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220 (Battleground Avenue) at Greensboro Academy

Division 7 Guilford County Greensboro

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE DATE 8/23/11

SIG. INVENTORY NO. 07-2119

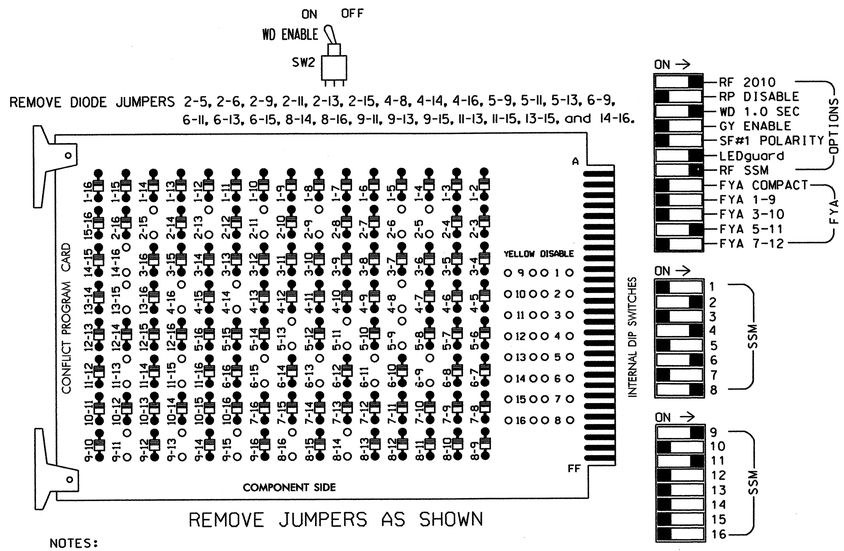
$$$$USERNAME$$$$

...\Signal Design\07-2119.dgn 9/6/2011 2:33:27 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 17

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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

REMOVE JUMPERS AS SHOWN

NOTES:

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

■ = 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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3, 5,7,10,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Initialize database in Naztec 2070 local software (Apogee) as FULL-MODE 5. This initialization should be done prior to programming controller.
4. Program phases 2 and 6 for Start Up In Walk.
5. Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
6. Ensure "Local Flash Start" feature is set to "ON".
7. Program phases 4 and 8 for Dual Entry.
8. The cabinet and controller are part of the City of Greensboro Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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.	NU	21,22	P21, P22	NU	41,42	P41, P42	51★	62,63	P61, P62	NU	81,82	P81, P82	61★	NU	NU	51★	NU	NU
RED		128			101			134			107							
YELLOW		129			102		*	135			108							
GREEN		130			103			136			109							
RED ARROW													A121			A114		
YELLOW ARROW													A122			A115		
FLASHING YELLOW ARROW													A123			A116		
GREEN ARROW							133											
✋			113			104			119			110						
🚶			115			106			121			112						

NU = Not Used

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

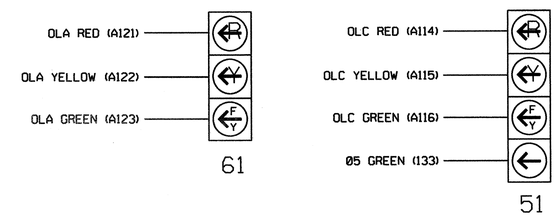
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX OUTPUT FILE
SOFTWARE.....NAZTEC APOGEE
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S2,S2P,S4,S4P,S5,S6,S6P,S8,S8P,S9,S12
PHASES USED.....2,2 PED,4,4 PED,5,6,6 PED,8,8 PED
OVERLAP A.....2
OVERLAP C.....5+6

3 & 4 SECTION FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	Ø2 2A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø2 PED DC ISOLATOR	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L		Ø2 2B				NOT USED						Ø4 PED DC ISOLATOR	Ø8 PED DC ISOLATOR	ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø6 6A	Ø6 6C	SLOT EMPTY	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	Ø6 6B	NOT USED			Ø8 8B								

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.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
2A	TB2-5,6	I2U	39	2	2				X	X	X
2B	TB2-7,8	I2L	43	3	2				X	X	X
4A	TB4-9,10	I6U	41	8	4		10		X	X	
5A	TB3-1,2	J1U	55	15	5		15		X	X	
6A	TB3-5,6	J2U	40	16	6				X	X	X
6B	TB3-7,8	J2L	44	17	6				X	X	X
6C	TB3-9,10	J3U	64	18	6				X	X	
8A	TB5-9,10	J6U	42	22	8				X	X	
8B	TB5-11,12	J6L	46	23	8		15		X	X	
PED PUSH BUTTONS											
P21,P22	TB8-4,6	I12U	67	PED 2	2 PED						
P41,P42	TB8-5,6	I12L	69	PED 4	4 PED						
P61,P62	TB8-7,9	I13U	68	PED 6	6 PED						
P81,P82	TB8-8,9	I13L	70	PED 8	8 PED						

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

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

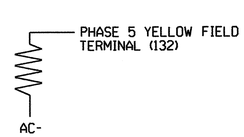
COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-2119
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Final Design - Sheet 1 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 220 (Battleground Avenue) at Greensboro Academy

Division 7 Guilford County Greensboro

PLAN DATE: August 2011 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS | INIT. | DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE DATE 8-29-11
SIG. INVENTORY NO. 07-2119

24-AUG-2011 10:42
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armstrong

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS "1" CONTROLLER AND THEN "5" OVERLAPS

```
Overlaps
[1.General Parms]
2.Program
3.Status
```

```
General Overlap Parameters
      Lock Inhibit OFF
   Confl Lock Enable OFF
     Parent P Clrncs ON
Extra Included Phases OFF
```

PRESS "ESC"

```
Overlaps
1.General Parms
[2.Program]
3.Status
```

```
Enter Overlap #  1
  then press Enter
```

```
Overlap A-1
[1.Program Parms]
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp A-1    Ps....................
Included Ps    2  0  0  0  0  0  0  0
Modifier Ps    0  0  0  0  0  0  0  0
Type:NORMAL   Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
[2.Confl Prog+]
3.Program Parms+
```

```
 Ovrlp A-1    Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
2.Confl Prog+
[3.Program Parms+]
```

```
 Ovrlp A-1
LeadGreen  OFF  Transit 0
GreenExtInh     0  0  0  0  0  0  0  0
```

PRESS "ESC TWICE

Notice type FYA-4 →

```
Overlaps
1.General Parms
[2.Program]
3.Status
```

```
Enter Overlap #  3
  then press Enter
```

```
Overlap C-3
[1.Program Parms]
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp C-3    Ps....................
Included Ps    5  0  0  0  0  0  0  0
Modifier Ps    6  0  0  0  0  0  0  0
Type:FYA-4    Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap C-3
1.Program Parms
[2.Confl Prog+]
3.Program Parms+
```

```
 Ovrlp C-3    Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap C-3
1.Program Parms
2.Confl Prog+
[3.Program Parms+]
```

```
 Ovrlp C-3
LeadGreen  OFF  Transit 0
GreenExtInh     0  0  0  0  0  0  0  0
```

OVERLAP PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-2119
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Final Design - Sheet 2 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue) at Greensboro Academy

Division 7 | Guilford County | Greensboro

PLAN DATE: August 2011	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE | DATE 8-29-11
SIG. INVENTORY NO. 07-2119

24-AUG-2011 10:42
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sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.19

4-SECTION PPLT FYA OUTPUT PROGRAMMING DETAIL

(program controller as shown below)

1. Before proceeding with output programming, be sure to switch the "RUN ENABLE STATUS" to "OFF". The "RUN ENABLE STATUS" setting is located from Main Menu, key strokes 1-7.
2. The Flashing Yellow Arrow in a 4-section PPLT FYA head is controlled by a normally unused PED Yellow output. This programming takes a specific PED Yellow output and remaps it to the appropriate Overlap Green output.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

```
I/O Parameters
C1-C11-ABC IO Mode: USER
     D Conn Mapping: NONE
        T&F Biu Map: DEFAULT
 Invert Rail Inputs: OFF
    EVP Ped Confirm: OFF
```

SELECT USER MODE

PRESS "ESC"

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

```
User I/O Maps
1. Inputs
2. Outputs
3. Init Map
```

```
Initialize User I/O Maps
     Init ABC with: NONE
       Init D with: NONE
      Init 2A with: MODE 5
 Init TF BIUs with: NONE
```

SELECT MODE 5

PRESS "ESC"

```
User I/O Maps
1. Inputs
2. Outputs
3. Init Map
```

```
User Output Maps
1.NEMA A    4.NEMA D
2.NEMA B    5.FIO 2A
3.NEMA C                9.TS2 IO
```

PRESS "+" KEY TWICE

Pin	Fcn	Description	Pin	Fcn	Description
4-5	54	Ch6 Green	4-6	5	Ch5 Red
4-7	29	Ch5 Yellow	4-8	53	Ch5 Green
5-1	37	Ch13 Yellow	5-2	0	Unused
5-3	38	Ch14 Yellow	5-4	40	Ch16 Yellow
5-5	115	Not Used	5-6	124	LdSwtchFlsh
5-7	115	Not Used	5-8	114	Watchdog
6-1	115	Not Used	6-2	115	Not Used

Programming notes:

Pin	Default Fcn	Description	Change To: Fcn	Description
5-2	39	Ch15 Yellow....	0	Unused

PRESS "+" KEY ONCE

Pin	Fcn	Description	Pin	Fcn	Description
6-3	12	Ch12 Red	6-4	36	Ch12 Yellow
6-5	60	Ch12 Green	6-6	11	Ch11 Red
6-7	35	Ch11 Yellow	6-8	39	Ch15 Yellow
7-1	17	Ch17 Red	7-2	65	Ch17 Green
7-3	10	Ch10 Red	7-4	34	Ch10 Yellow
7-5	58	Ch10 Green	7-6	9	Ch9 Red
7-7	33	Ch9 Yellow	7-8	57	Ch9 Green

Programming notes:

Pin	Default Fcn	Description	Change To: Fcn	Description
6-8	59	Ch11 Green	39	Ch15 Yellow

OUTPUT PROGRAMMING COMPLETE

Pin 5-2 (C1 pin 36) = Load Switch S6P-Y
Pin 6-8 (C1 pin 87) = Load Switch S12-G

! Press the "*" key to return to Main Menu. Now go back to "RUN-ENABLE STATUS" and switch to "ON".

NOTE

I/O re-programming is necessary for proper FYA operation. See Channel & I/O Programming Detail For FYA Operation on this sheet.

CHANNEL & I/O PROGRAMMING DETAIL FOR FYA OPERATION

(program controller as shown below)

This programming takes the output that drives a Flashing Yellow Arrow and makes it flash. It also specifies which overlap is to be overridden for the FYA to display properly.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

PRESS THE RIGHT ARROW KEY UNTIL THE SCREEN AT RIGHT APPEARS

```
      Chan.1...2...3...4...5...6...7...8 >
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   .   .   .
Flash Grn .   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   0   0
```

```
      Chan.9..10..11..12..13..14..15..16
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   .   X   .
Flash Grn X   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   3   0
```

CHANNEL & I/O PROGRAMMING COMPLETE

NOTE

Output re-mapping is necessary for proper FYA operation. See the 4-Section PPLT FYA Output Programming Detail on this sheet.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-2119
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Final Design - Sheet 3 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 220 (Battleground Avenue) at Greensboro Academy

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

750 N.Greenfield Pkwy,Garner,NC 27529

Division 7 | Guilford County | Greensboro

PLAN DATE: August 2011 | REVIEWED BY: JTR

PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

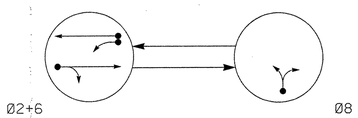
SIGNATURE John T. Rowe Jr. DATE 8-29-11

SIG. INVENTORY NO. 07-2119

24-AUG-2011 10:43
S:\ITS&SU\ITS Signals\Workgroups\Sig Man\armstrong\07219_smele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 20

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

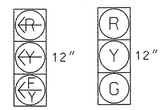
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø8	FLASH
21, 22	G	R	Y
61	FY	R	Y
62, 63	G	R	Y
81, 82	R	G	R

FY = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



61 — 21, 22, 62, 63, 81, 82

LOOP & DETECTOR UNIT INSTALLATION CHART

NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

INDUCTIVE LOOPS					DETECTOR PROGRAMMING								
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION	ADDED INIT.	SYSTEM LOOP	NEW CARD
2A	6X6	355	6	X	2	-	-	-	X	X	X	-	X
6A	6X6	355	4	X	6	-	-	-	X	X	X	-	X
6B	6X40	0	2-4-2	X	6	-	-	-	X	X	-	-	X
8A	6X40	0	2-4-2	X	8	-	3	-	X	X	-	-	X
8B	6X15	0	4	X	8	-	15	-	X	X	-	-	X

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

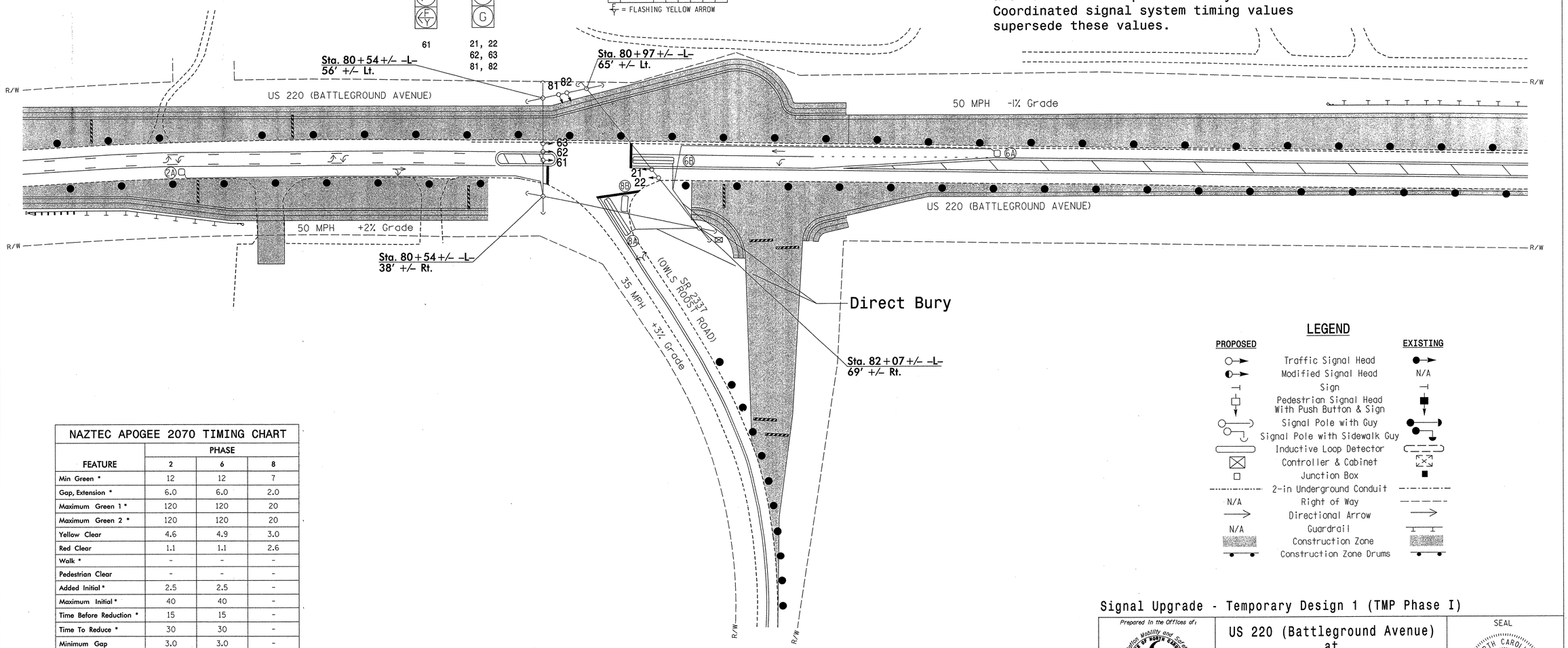
FROM \ TO	→ 1	→ 2	FY 1	FY 2	R 1	R 2
→	→	→	Y	R	Y	R
FY	FY	FY	FY	FY	Y	R
R	R	R	R	R	R	R

FY = FLASHING YELLOW ARROW

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detectors units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
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.

2 Phase
Fully Acutated
(Greensboro Signal System)



NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE 2	PHASE 6	PHASE 8
Min Green *	12	12	7
Gap, Extension *	6.0	6.0	2.0
Maximum Green 1 *	120	120	20
Maximum Green 2 *	120	120	20
Yellow Clear	4.6	4.9	3.0
Red Clear	1.1	1.1	2.6
Walk *	-	-	-
Pedestrian Clear	-	-	-
Added Initial *	2.5	2.5	-
Maximum Initial *	40	40	-
Time Before Reduction *	15	15	-
Time To Reduce *	30	30	-
Minimum Gap	3.0	3.0	-
Recall Mode	MIN RECALL	MIN RECALL	-
Lock Calls	YES	YES	NO
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	
N/A	Guardrail	
	Construction Zone	
	Construction Zone Drums	

Signal Upgrade - Temporary Design 1 (TMP Phase I)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220 (Battleground Avenue) at SR 2337 (Owls Roost Road)

Division 7 Guilford County Greensboro

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/23/11 DATE

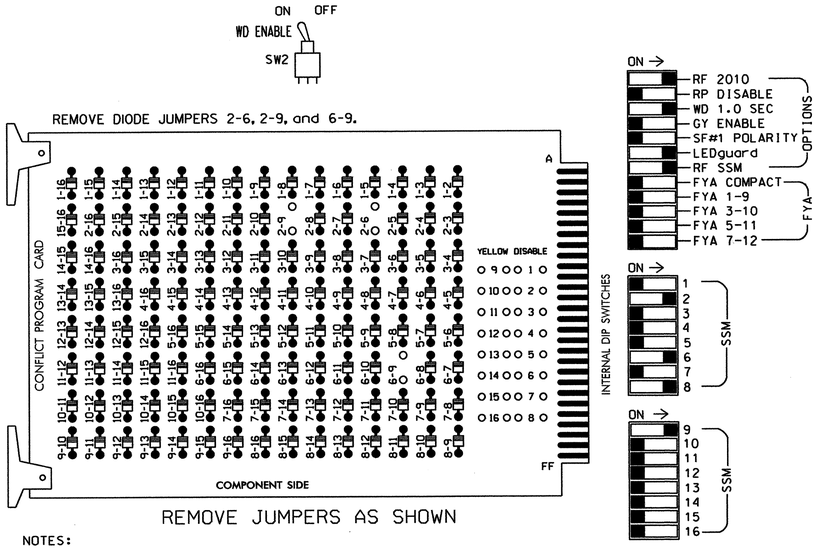
SIG. INVENTORY NO. 07-1661T1

$$$$$$$$$$STILE$$$$$
$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

...\Signal Design\07-1661T1.dgn 8/22/2011 2:56:20 PM

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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. Make sure jumpers SEL2-SEL5 are present on the monitor board.

■ = 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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3, 4,5,7,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Initialize database in Naztec 2070 local software (Apogee) as FULL-MODE 5. This initialization should be done prior to programming controller.
4. Program phases 2 and 6 for Start Up In Green.
5. Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
6. Ensure "Local Flash Start" feature is set to "ON".
7. The cabinet and controller are part of the City of Greensboro Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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.	NU	21,22	NU	NU	NU	NU	NU	62,63	NU	NU	81,82	NU	61 ★	NU	NU	NU	NU	NU
RED		128						134			107							
YELLOW		129						135			108							
GREEN		130						136			109							
RED ARROW													A121					
YELLOW ARROW													A122					
FLASHING YELLOW ARROW													A123					
GREEN ARROW																		
✋																		
🚶																		

NU = Not Used

★ See pictorial of head wiring in detail below.

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	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS / DC ISOLATOR
	L		NOT USED												ST / DC ISOLATOR
FILE "J"	U	SLOT EMPTY	Ø6 / 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø8 / 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		Ø6 / 6B				Ø8 / 8B								

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

FS = FLASH SENSE
ST = STOP TIME

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX OUTPUT FILE
SOFTWARE.....NAZTEC APOGEE
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S2,S6,S8,S9
PHASES USED.....2,6,8
OVERLAP A.....2

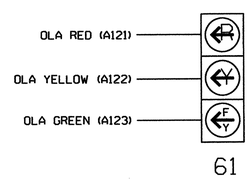
INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
2A	TB2-5,6	I2U	39	2	2				X	X	X
6A	TB3-5,6	J2U	40	16	6				X	X	X
6B	TB3-7,8	J2L	44	17	6				X	X	
8A	TB5-9,10	J6U	42	22	8		3		X	X	
8B	TB5-11,12	J6L	46	23	8		15		X	X	

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

3 SECTION FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1661T1
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 1 (TMP Phase 1) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue)
at
SR 2337 (Owls Roost Road)

Division 7 Guilford County Greensboro

PLAN DATE:	August 2011	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE 8-30-11 DATE
SIG. INVENTORY NO. 07-1661T1

24-AUG-2011 11:00
S:*ITSSSU*ITS Signals*Workgroups*Sig Man*Armstrong*071661_smuele_xxx.dgn
sarmstrong

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS "1" CONTROLLER AND THEN "5" OVERLAPS

```
Overlaps
[1.General Parms]
2.Program
3.Status
```

```
General Overlap Parameters
Lock Inhibit OFF
Confl Lock Enable OFF
Parent P Clrncs ON
Extra Included Phases OFF
```

PRESS "ESC"

```
Overlaps
1.General Parms
[2.Program]
3.Status
```

```
Enter Overlap #  1
then press Enter
```

```
Overlap A-1
[1.Program Parms]
2.Confl Prog+
3.Program Parms+
```

```
Ovrlp A-1    Ps....................
Included Ps    2  0  0  0  0  0  0  0
Modifier Ps    0  0  0  0  0  0  0  0
Type:NORMAL   Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
[2.Confl Prog+]
3.Program Parms+
```

```
Ovrlp A-1    Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
2.Confl Prog+
[3.Program Parms+]
```

```
Ovrlp A-1
LeadGreen  OFF   Transit 0
GreenExtInh      0  0  0  0  0  0  0  0
```

OVERLAP PROGRAMMING COMPLETE

CHANNEL & I/O PROGRAMMING DETAIL FOR FYA OPERATION

(program controller as shown below)

This programming takes the output that drives a Flashing Yellow Arrow and makes it flash. It also specifies which overlap is to be overridden for the FYA to display properly.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16  [4.Chan+  1-16] 7.IO Logic
2.chan 17-24   5.chan+ 17-24  8.IO Viewer
3.Chan Parms   6.IO Parms     9.IO UserMap
```

PRESS THE RIGHT ARROW KEY UNTIL THE SCREEN AT RIGHT APPEARS

```
      Chan.1...2...3...4...5...6...7...8 >
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   .   .   .
Flash Grn .   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   0   0
```

```
      Chan.9..10..11..12..13..14..15..16
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   .   .   .
Flash Grn X   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   0   0
```

CHANNEL & I/O PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1661T1
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 1 (TMP Phase 1) - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:

Transportation Mobility and Safety Division, Signal Management Section, Department of Transportation, State of North Carolina

750 N.Greenfield Pkwy.Garner,NC 27529

US 220 (Battleground Avenue) at SR 2337 (Owls Roost Road)

Division 7 Guilford County Greensboro

PLAN DATE:	August 2011	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

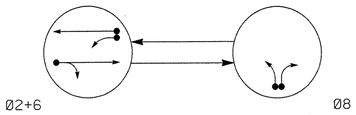
John T. Rowe, Jr. 8-30-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-1661T1

24-AUG-2011 11:00
S:*#ITS&SU*ITS Signals*Workgroups*Sig Mgmt*Armstrong*07166l_sm_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.23

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

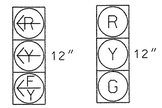
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø8	FLASH
21, 22	G	R	Y
61	FY	R	Y
62, 63	G	R	Y
81, 82	R	G	R

FY = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



61 — 21, 22, 62, 63, 81, 82

LOOP & DETECTOR UNIT INSTALLATION CHART

NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

INDUCTIVE LOOPS					DETECTOR PROGRAMMING								
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION	ADDED INIT.	SYSTEM LOOP	NEW CARD
2A	6X6	355	4	X	2	-	-	-	X	X	X	-	-
6A	6X6	355	6	X	6	-	-	-	X	X	X	-	-
6B	6X40	0	2-4-2	X	6	-	-	-	X	X	-	-	-
8A	6X40	0	2-4-2	X	8	-	-	-	X	X	-	-	-
8B	6X40	0	2-4-2	X	8	-	15	-	X	X	-	-	-

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

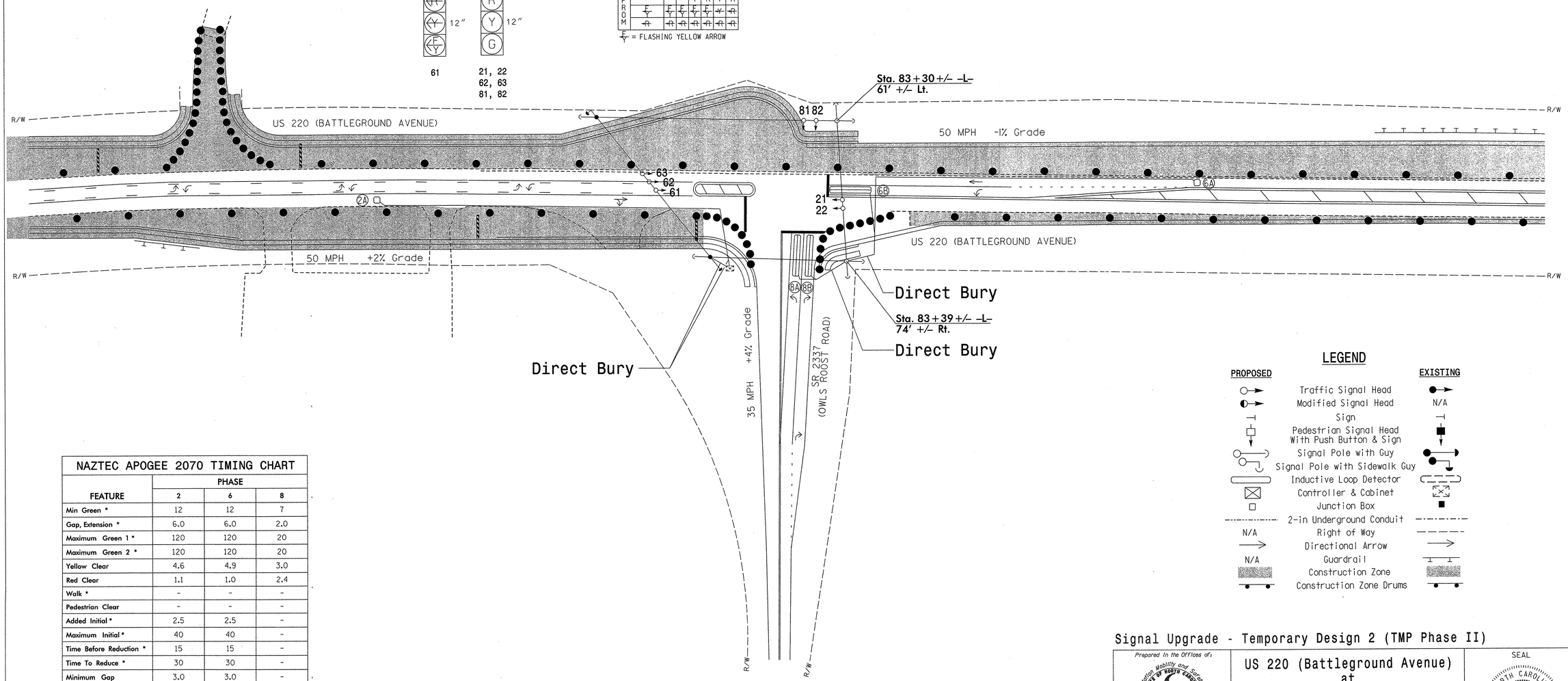
FROM \ TO	→ 1	→ 2	FY 1	FY 2	R 1	R 2
→	→	→	Y	R	Y	R
FY	FY	FY	FY	FY	Y	R
R	R	R	R	R	R	R

FY = FLASHING YELLOW ARROW

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detectors units to presence mode.
4. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

2 Phase
Fully Acutated
(Greensboro Signal System)



LEGEND

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

NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE 2	PHASE 6	PHASE 8
Min Green *	12	12	7
Gap, Extension *	6.0	6.0	2.0
Maximum Green 1 *	120	120	20
Maximum Green 2 *	120	120	20
Yellow Clear	4.6	4.9	3.0
Red Clear	1.1	1.0	2.4
Walk *	-	-	-
Pedestrian Clear	-	-	-
Added Initial *	2.5	2.5	-
Maximum Initial *	40	40	-
Time Before Reduction *	15	15	-
Time To Reduce *	30	30	-
Minimum Gap	3.0	3.0	-
Recall Mode	MIN RECALL	MIN RECALL	-
Lock Calls	YES	YES	NO
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.

$$$$SYSTIME$$$$
$$$$SIGNAME$$$$
$$$$USERNAME$$$$

Signal Upgrade - Temporary Design 2 (TMP Phase II)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220 (Battleground Avenue) at SR 2337 (Owls Roost Road)

Division 7 Guilford County Greensboro

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE DATE 8/23/11

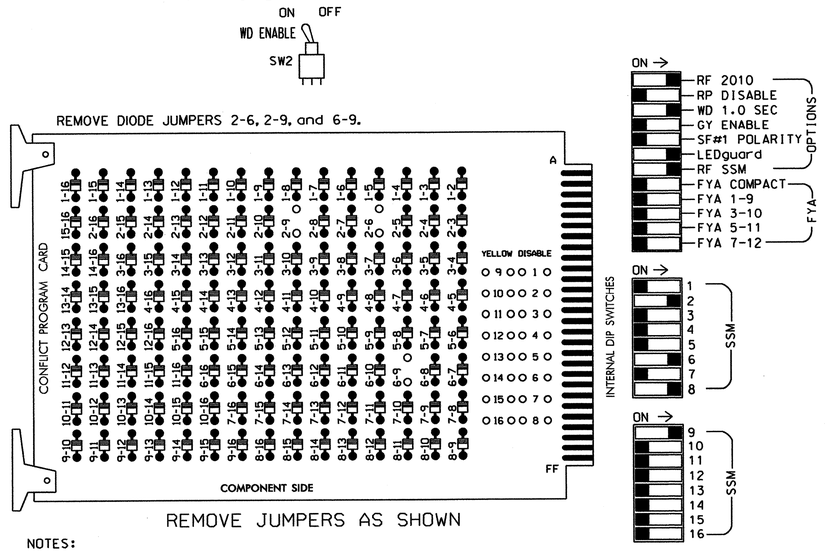
SIG. INVENTORY NO. 07-1661T2

...\Signal Design\07-1661T2.dgn 8/22/2011 2:56:49 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 24

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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. Make sure jumpers SEL2-SEL5 are present on the monitor board.

■ = DENOTES POSITION OF SWITCH

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	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS / DC ISOLATOR
	L		NOT USED												ST / DC ISOLATOR
FILE "J"	U	SLOT EMPTY	Ø6 / 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø8 / 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		Ø6 / 6B				Ø8 / 8B								

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

FS = FLASH SENSE
ST = STOP TIME

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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3, 4,5,7,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Initialize database in Naztec 2070 local software (Apogee) as FULL-MODE 5. This initialization should be done prior to programming controller.
4. Program phases 2 and 6 for Start Up In Green.
5. Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
6. Ensure "Local Flash Start" feature is set to "ON".
7. The cabinet and controller are part of the City of Greensboro Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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.	NU	21,22	NU	NU	NU	NU	NU	62,63	NU	NU	81,82	NU	61 ★	NU	NU	NU	NU	NU
RED		128						134			107							
YELLOW		129						135			108							
GREEN		130						136			109							
RED ARROW													A121					
YELLOW ARROW													A122					
FLASHING YELLOW ARROW													A123					
GREEN ARROW																		
✋																		
🚶																		

NU = Not Used

★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX OUTPUT FILE
SOFTWARE.....NAZTEC APOGEE
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S2,S6,S8,S9
PHASES USED.....2,6,8
OVERLAP A.....2

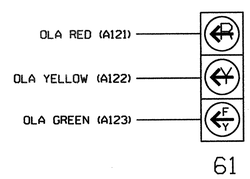
INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
2A	TB2-5,6	I2U	39	2	2				X	X	X
6A	TB3-5,6	J2U	40	16	6				X	X	X
6B	TB3-7,8	J2L	44	17	6				X	X	
8A	TB5-9,10	J6U	42	22	8				X	X	
8B	TB5-11,12	J6L	46	23	8		15		X	X	

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

3 SECTION FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 07-1661T2
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 2 (TMP Phase 2) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue) at SR 2337 (Owls Roost Road)

Division 7 | Guilford County | Greensboro

PLAN DATE: August 2011 | REVIEWED BY: JTR
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

John T. Rowe 8-30-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-1661T2

24-AUG-2011 11:03
S:#ITS&SS\#ITS Signals#workgroups#Sig Mgmt#armstrong#07T661_sm_ele_xxx.dgn
armstrong

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS "1" CONTROLLER AND THEN "5" OVERLAPS

```
Overlaps
[1.General Parms]
2.Program
3.Status
```

```
General Overlap Parameters
Lock Inhibit OFF
Confl Lock Enable OFF
Parent P Clrncs ON
Extra Included Phases OFF
```

PRESS "ESC"

```
Overlaps
1.General Parms
[2.Program]
3.Status
```

```
Enter Overlap #  1
then press Enter
```

```
Overlap A-1
[1.Program Parms]
2.Confl Prog+
3.Program Parms+
```

```
Ovrlp A-1   Ps.....................
Included Ps    2  0  0  0  0  0  0  0
Modifier Ps    0  0  0  0  0  0  0  0
Type:NORMAL  Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
[2.Confl Prog+]
3.Program Parms+
```

```
Ovrlp A-1   Ps.....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
2.Confl Prog+
[3.Program Parms+]
```

```
Ovrlp A-1
LeadGreen  OFF  Transit 0
GreenExtInh     0  0  0  0  0  0  0  0
```

OVERLAP PROGRAMMING COMPLETE

CHANNEL & I/O PROGRAMMING DETAIL FOR FYA OPERATION

(program controller as shown below)

This programming takes the output that drives a Flashing Yellow Arrow and makes it flash. It also specifies which overlap is to be overridden for the FYA to display properly.

FROM MAIN MENU. KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16  [4.Chan+  1-16] 7.IO Logic
2.chan 17-24   5.chan+ 17-24  8.IO Viewer
3.Chan Parms   6.IO Parms     9.IO UserMap
```

PRESS THE RIGHT ARROW KEY UNTIL THE SCREEN AT RIGHT APPEARS

```
Chan.1...2...3...4...5...6...7...8 >
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   .   .   .
Flash Grn .   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   0   0
```

```
Chan.9..10..11..12..13..14..15..16
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   .   .   .
Flash Grn X   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   0   0
```

CHANNEL & I/O PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 07-1661T2
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 2 (TMP Phase 2) - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue) at SR 2337 (Owls Roost Road)

Division 7 | Guilford County | Greensboro

PLAN DATE:	August 2011	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

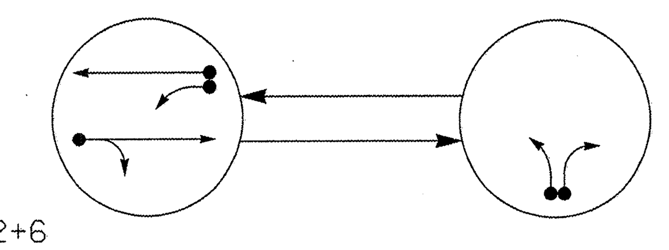
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR

John T. Rowe Jr. 8-30-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-1661T2

24-AUG-2011 11:03
S:\MTS&SU\MTS Signals\Workgroups\Sig Mon\Armstrong\071661_smu01a_xxx.dgn
sarmstrong

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

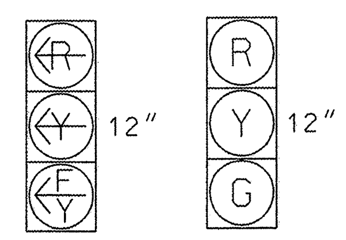
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø8	PHASE FLASH
21, 22	G	R	Y
61	←FY	←R	←Y
62, 63, 64	G	R	Y
81, 82	R	G	R

←FY = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



61

21, 22
62, 63, 64
81, 82

LOOP & DETECTOR UNIT INSTALLATION CHART
NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

INDUCTIVE LOOPS					DETECTOR PROGRAMMING								
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION	ADDED INIT.	SYSTEM LOOP	NEW CARD
2A	6X6	355	6	X	2	-	-	-	X	X	X	-	-
6A	6X6	355	6	X	6	-	-	-	X	X	X	-	-
6B	6X40	0	2-4-2	X	6	-	-	-	X	X	-	-	-
8A	6X40	0	2-4-2	X	8	-	-	-	X	X	-	-	-
8B	6X40	0	2-4-2	X	8	-	15	-	X	X	-	-	-

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

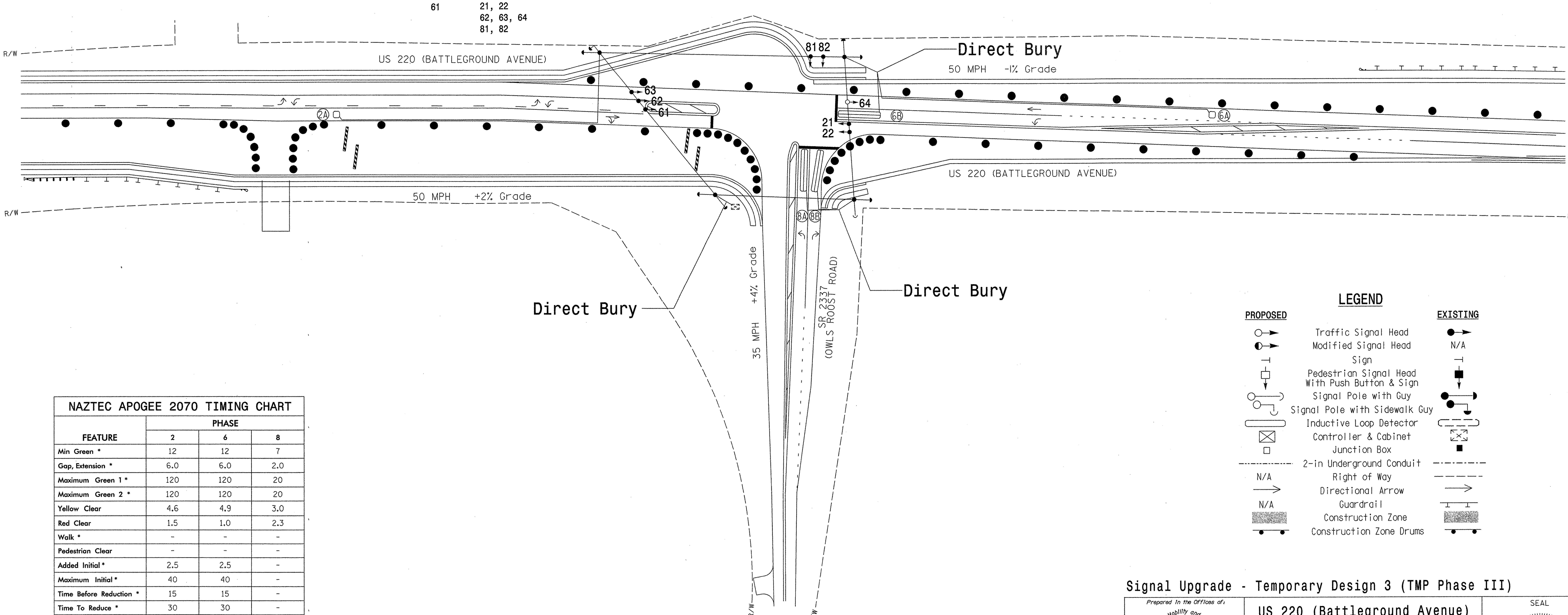
FROM \ TO	← 1	← 2	←FY 1	←FY 2	←R 1	←R 2
←	←	←	←Y	←R	←Y	←R
←FY	←FY	←FY	←FY	←FY	←Y	←R
←R	←R	←R	←R	←R	←R	←R

←FY = FLASHING YELLOW ARROW

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Reposition existing signal heads numbered: 21, 22, 61, 62, and 63.
4. Set all detectors units to presence mode.

2 Phase
Fully Acutated
(Greensboro Signal System)



NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE 2	PHASE 6	PHASE 8
Min Green *	12	12	7
Gap, Extension *	6.0	6.0	2.0
Maximum Green 1 *	120	120	20
Maximum Green 2 *	120	120	20
Yellow Clear	4.6	4.9	3.0
Red Clear	1.5	1.0	2.3
Walk *	-	-	-
Pedestrian Clear	-	-	-
Added Initial *	2.5	2.5	-
Maximum Initial *	40	40	-
Time Before Reduction *	15	15	-
Time To Reduce *	30	30	-
Minimum Gap	3.0	3.0	-
Recall Mode	MIN RECALL	MIN RECALL	-
Lock Calls	YES	YES	NO
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	
N/A	Guardrail	
	Construction Zone	
	Construction Zone Drums	

Signal Upgrade - Temporary Design 3 (TMP Phase III)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220 (Battleground Avenue) at SR 2337 (Owls Roost Road)

Division 7 Guilford County Greensboro

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/23/11 DATE

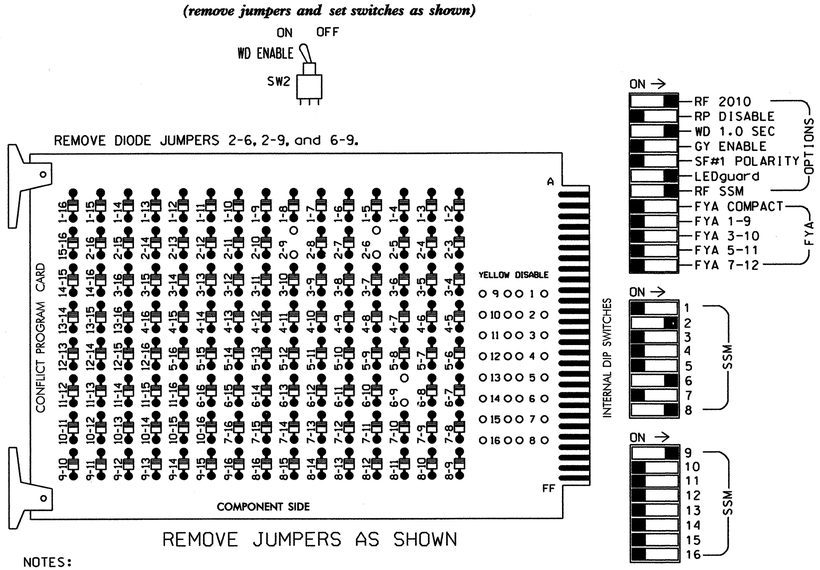
SIG. INVENTORY NO. 07-1661T3

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 27

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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. Make sure jumpers SEL2-SEL5 are present on the monitor board.

■ = 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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3, 4,5,7,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Initialize database in Naztec 2070 local software (Apogee) as FULL-MODE 5. This initialization should be done prior to programming controller.
4. Program phases 2 and 6 for Start Up In Green.
5. Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
6. Ensure "Local Flash Start" feature is set to "ON".
7. The cabinet and controller are part of the City of Greensboro Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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.	NU	21,22	NU	NU	NU	NU	NU	62,63 64	NU	NU	81,82	NU	61★	NU	NU	NU	NU	NU
RED		128						134			107							
YELLOW		129						135			108							
GREEN		130						136			109							
RED ARROW													A121					
YELLOW ARROW													A122					
FLASHING YELLOW ARROW													A123					
GREEN ARROW																		
✋																		
🚶																		

NU = Not Used

★ See pictorial of head wiring in detail below.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT	ø2 2A	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	ø6 6A	SLOT	SLOT	SLOT	ø8 8A	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	ø6 6B	EMPTY	EMPTY	EMPTY	ø8 8B	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX OUTPUT FILE
SOFTWARE.....NAZTEC APOGEE
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S2,S6,S8,S9
PHASES USED.....2,6,8
OVERLAP A.....2

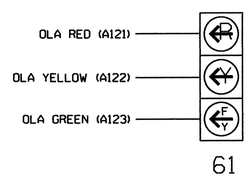
INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
2A	TB2-5,6	I2U	39	2	2				X	X	X
6A	TB3-5,6	J2U	40	16	6				X	X	X
6B	TB3-7,8	J2L	44	17	6				X	X	
8A	TB5-9,10	J6U	42	22	8				X	X	
8B	TB5-11,12	J6L	46	23	8		15		X	X	

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

3 SECTION FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 07-1661T3
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 3 (TMP Phase 3) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue) at SR 2337 (Owls Roost Road)

Division 7 Guilford County Greensboro

PLAN DATE: August 2011	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE John T. Rowe Jr. DATE 8-30-11
SIG. INVENTORY NO. 07-1661T3

24-AUG-2011 11:06
S:\ITS&SU\ITS Signals\Workgroups\Sig Mon\Armstrong\07166I_smLele_xxx.dgn
sarmstrong

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS "1" CONTROLLER AND THEN "5" OVERLAPS

```
Overlaps
[1.General Parms]
2.Program
3.Status
```

```
General Overlap Parameters
        Lock Inhibit OFF
     Confl Lock Enable OFF
       Parent P Clrncs ON
  Extra Included Phases OFF
```

PRESS "ESC"

```
Overlaps
1.General Parms
[2.Program]
3.Status
```

```
Enter Overlap #  1

  then press Enter
```

```
Overlap A-1
[1.Program Parms]
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp A-1    Ps....................
Included Ps    2  0  0  0  0  0  0  0
Modifier Ps    0  0  0  0  0  0  0  0
Type:NORMAL   Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
[2.Confl Prog+]
3.Program Parms+
```

```
 Ovrlp A-1    Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
2.Confl Prog+
[3.Program Parms+]
```

```
 Ovrlp A-1
LeadGreen  OFF   Transit 0
GreenExtInh      0  0  0  0  0  0  0  0
```

OVERLAP PROGRAMMING COMPLETE

CHANNEL & I/O PROGRAMMING DETAIL FOR FYA OPERATION

(program controller as shown below)

This programming takes the output that drives a Flashing Yellow Arrow and makes it flash. It also specifies which overlap is to be overridden for the FYA to display properly.

FROM MAIN MENU, KEYSTROKES 1-8

```
              Channel & I/O
1.Chan  1-16  [4.Chan+  1-16] 7.IO Logic
2.chan 17-24   5.chan+ 17-24  8.IO Viewer
3.Chan Parms   6.IO Parms     9.IO UserMap
```

PRESS THE RIGHT ARROW KEY UNTIL THE SCREEN AT RIGHT APPEARS

```
      Chan.1...2...3...4...5...6...7...8 >
 Flash Red .   .   .   .   .   .   .   .
 Flash Yel .   .   .   .   .   .   .   .
 Flash Grn .   .   .   .   .   .   .   .
 Inhibit Red Flash In
   Preempt .   .   .   .   .   .   .   .
 Olap Ovrd 0   0   0   0   0   0   0   0
```

```
      Chan.9..10..11..12..13..14..15..16
 Flash Red .   .   .   .   .   .   .   .
 Flash Yel .   .   .   .   .   .   .   .
 Flash Grn X   .   .   .   .   .   .   .
 Inhibit Red Flash In
   Preempt .   .   .   .   .   .   .   .
 Olap Ovrd 0   0   0   0   0   0   0   0
```

CHANNEL & I/O PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1661T3
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 3 (TMP Phase 3) - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:

Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section

750 N.Greenfield Pkwy,Garner,NC 27529

US 220 (Battleground Avenue)
at
SR 2337 (Owls Roost Road)

Division 7 | Guilford County | Greensboro

PLAN DATE: August 2011 | REVIEWED BY: JTR
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

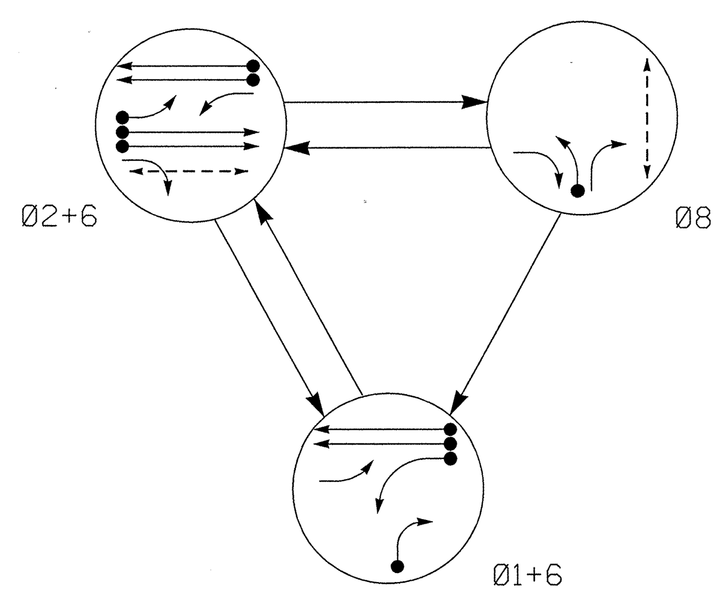
John T. Rowe, Jr. 8-30-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-1661T3

24-AUG-2011 11:06
S:\#TISASGN\ITS Signals\Workgroups\Sig Mom\Armstrong\07166I_sm_ele_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.29

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+6	Ø2+6	Ø8	FLASH
11	←	F/Y	←R	←Y
21	F/Y	F/Y	←R	←Y
22	R	G	R	Y
23	R	G	R/→	Y
61, 62	G	G	R	Y
81	R	R	G	R
82	R/→	R	G	R
P21, P22	DW	W	DW	DRK
P81, P82	DW	DW	W	DRK

F/Y = FLASHING YELLOW ARROW

W - WALK
DW - DON'T WALK
DRK - DARK

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM \ TO	← 1	← 2	F/Y 1	F/Y 2	←R 1	←R 2
←	←	←	←Y	←R	←Y	←R
F/Y	F/Y	F/Y	F/Y	F/Y	←Y	←R
←R	←R	←R	←R	←R	←R	←R

F/Y = FLASHING YELLOW ARROW

LOOP & DETECTOR UNIT INSTALLATION CHART
NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION	ADDED INIT.	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	X	1	-	15	-	X	X	-	-	X
1B	6X40	0	2-4-2	X	1	-	15	-	X	X	-	-	-
2A	6X6	355	5	X	2	-	-	-	X	X	X	-	-
2B	6X6	355	5	X	2	-	-	-	X	X	X	-	X
2C	6X40	0	2-4-2	X	2	-	-	-	X	X	-	-	X
6A	6X6	355	6	X	6	-	-	-	X	X	X	-	-
6B	6X6	355	6	X	6	-	-	-	X	X	X	-	-
8A	6X40	0	2-4-2	X	8	-	-	-	X	X	-	-	-

(INDUCTIVE LOOPS: LOOP through NEW LOOP; DETECTOR PROGRAMMING: PHASE through NEW CARD)

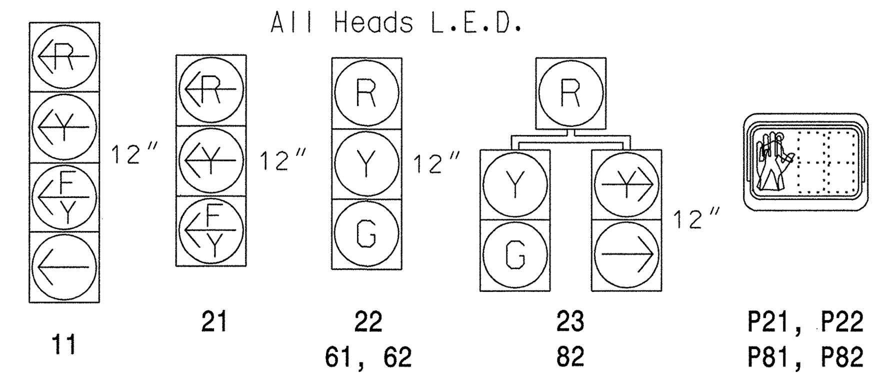
3 Phase
Fully Acutated
(Greensboro Signal System)

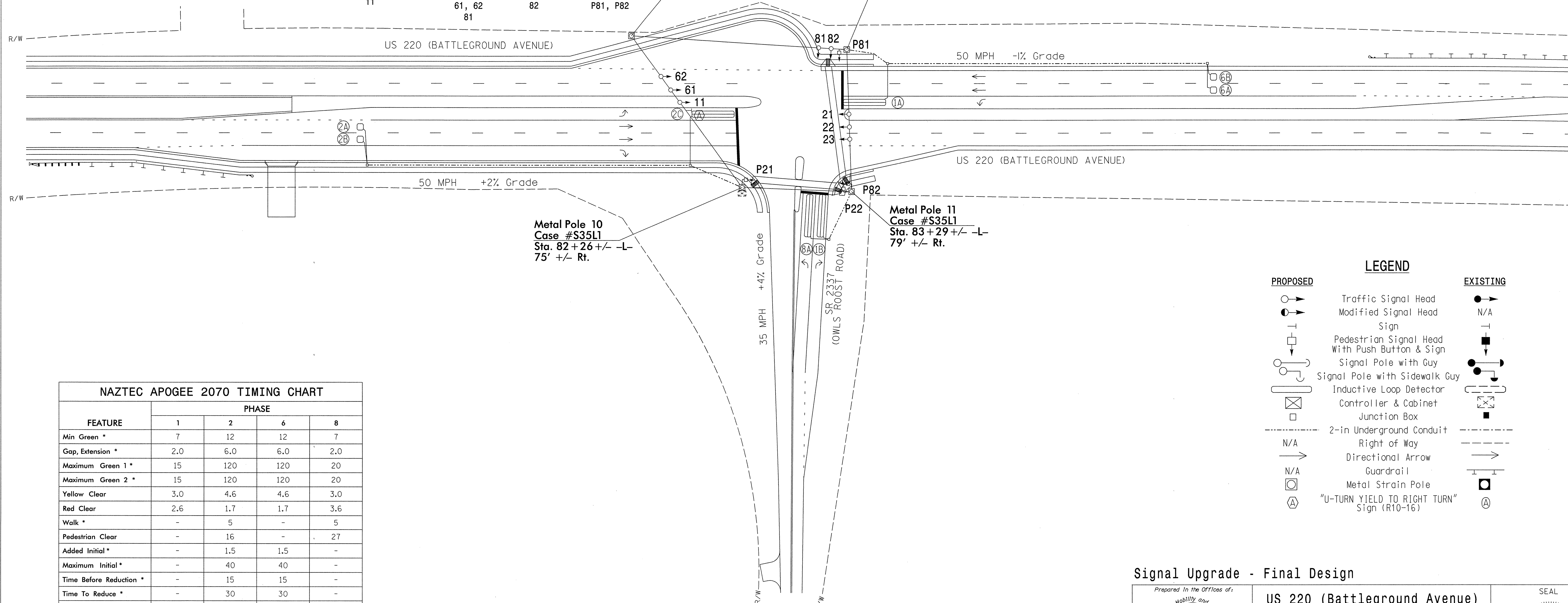
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 may be lagged.
4. Set all detector units to presence mode.
5. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
6. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

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	
N/A	Guardrail	
	Metal Strain Pole	
(A)	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	(A)

NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE 1	2	6	8
Min Green *	7	12	12	7
Gap, Extension *	2.0	6.0	6.0	2.0
Maximum Green 1 *	15	120	120	20
Maximum Green 2 *	15	120	120	20
Yellow Clear	3.0	4.6	4.6	3.0
Red Clear	2.6	1.7	1.7	3.6
Walk *	-	5	-	5
Pedestrian Clear	-	16	-	27
Added Initial *	-	1.5	1.5	-
Maximum Initial *	-	40	40	-
Time Before Reduction *	-	15	15	-
Time To Reduce *	-	30	30	-
Minimum Gap	-	3.0	3.0	-
Recall Mode	-	MIN RECALL	MIN RECALL	-
Lock Calls	NO	YES	YES	NO
Dual Entry	-	-	-	-
Simultaneous Gap	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.

$$$$$SYSTIME$$$$$
$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

Signal Upgrade - Final Design

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220 (Battleground Avenue) at SR 2337 (Owls Roost Road)

Division 7 Guilford County Greensboro

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE DATE 8/23/11

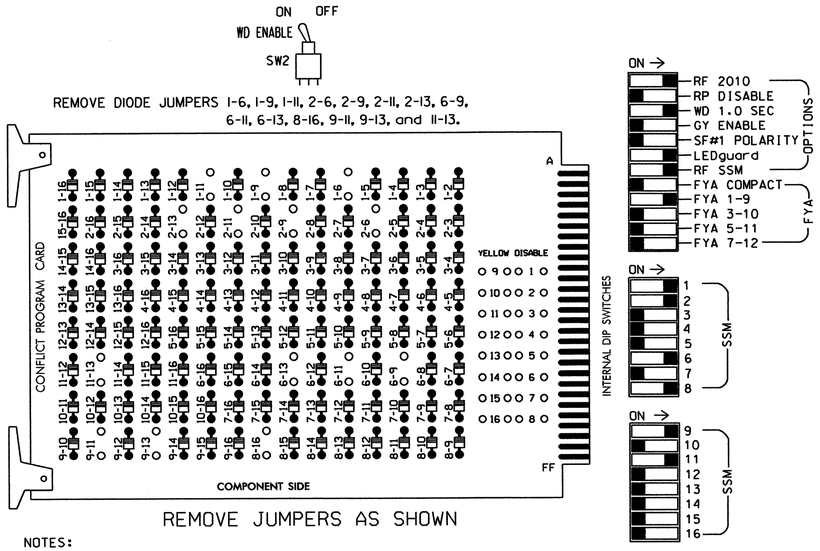
SIG. INVENTORY NO. 07-1661

...\Signal Design\07-1661.dgn 9/6/2011 2:32:15 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 30

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 1-6, 1-9, 1-11, 2-6, 2-9, 2-11, 2-13, 6-9, 6-11, 6-13, 8-16, 9-11, 9-13, and 11-13.

REMOVE JUMPERS AS SHOWN

NOTES:

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

■ = 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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 3,4, 5,7,10,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Initialize database in Naztec 2070 local software (Apogee) as FULL-MODE 5. This initialization should be done prior to programming controller.
4. Program phase 2 for Start Up In Walk, and phase 6 for Start Up In Green.
5. Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
6. Ensure "Local Flash Start" feature is set to "ON".
7. The cabinet and controller are part of the City of Greensboro Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8		S8P	S9	S10	S11	S12	S13	S14
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	22,23	P21, P22	NU	NU	NU	NU	61,62	NU	NU	23	81,82	P81, P82	11★	NU	NU	21★	NU	NU
RED		✱	128						134				107							
YELLOW			129						135				108							
GREEN			130						136				109							
RED ARROW															A121			A114		
YELLOW ARROW		126										108			A122			A115		
FLASHING YELLOW ARROW															A123			A116		
GREEN ARROW	127	127										109								
✋				113										110						
🚶				115										112						

NU = Not Used

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

★ See pictorial of head wiring in detail below.

INPUT FILE POSITION LAYOUT

(front view)

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

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

FS = FLASH SENSE
ST = STOP TIME

EQUIPMENT INFORMATION

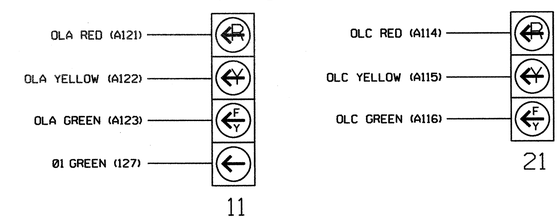
CONTROLLER.....2070L
CABINET.....332 W/ AUX OUTPUT FILE
SOFTWARE.....NAZTEC APOGEE
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S1,S2,S2P,S6,S8,S8P,S9,S11
PHASES USED.....1,2,2 PED,6,8,8 PED
OVERLAP A.....1+2
OVERLAP C.....6

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

3 & 4 SECTION FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
1A	TB2-1,2	I1U	56	1	1		15		X	X	
1B	TB2-3,4	I1L	56	1	1		15		X	X	
2A	TB2-5,6	I2U	39	2	2				X	X	X
2B	TB2-7,8	I2L	43	3	2				X	X	X
2C	TB2-9,10	I3U	63	4	2				X	X	
6A	TB3-5,6	J2U	40	16	6				X	X	X
6B	TB3-7,8	J2L	44	17	6				X	X	X
8A	TB5-9,10	J6U	42	22	8				X	X	
PED PUSH BUTTONS											
P21,P22	TB8-4,6	I12U	67	PED 2	2 PED						
P81,P82	TB8-8,9	I13L	70	PED 8	8 PED						

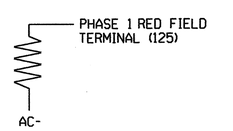
NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOTS I12 AND I13.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 07-1661
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Final Design - Sheet 1 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 220 (Battleground Avenue) at SR 2337 (Owls Roost Road)

Division 7 Guilford County Greensboro

PLAN DATE: August 2011 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL: North Carolina Professional Seal 008453 Engineer John T. Rowe, Jr.

John T. Rowe, Jr. 8-30-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-1661

24-AUG-2011 11:09
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sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.31

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS "1" CONTROLLER AND THEN "5" OVERLAPS

```
Overlaps
[1.General Parms]
2.Program
3.Status
```

```
General Overlap Parameters
      Lock Inhibit OFF
   Confl Lock Enable OFF
     Parent P Clrncs ON
Extra Included Phases OFF
```

PRESS "ESC"

```
Overlaps
1.General Parms
[2.Program]
3.Status
```

```
Enter Overlap #  1
  then press Enter
```

```
Overlap A-1
[1.Program Parms]
2.Confl Prog+
3.Program Parms+
```

Notice type FYA-4 →

```
 Ovrlp A-1   Ps....................
Included Ps    1  0  0  0  0  0  0  0
Modifier Ps    2  0  0  0  0  0  0  0
Type:FYA-4   Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
[2.Confl Prog+]
3.Program Parms+
```

```
 Ovrlp A-1   Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
2.Confl Prog+
[3.Program Parms+]
```

```
 Ovrlp A-1
LeadGreen  OFF  Transit 0
GreenExtInh     0  0  0  0  0  0  0  0
```

PRESS "ESC TWICE

```
Overlaps
1.General Parms
[2.Program]
3.Status
```

```
Enter Overlap #  3
  then press Enter
```

```
Overlap C-3
[1.Program Parms]
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp C-3   Ps....................
Included Ps    6  0  0  0  0  0  0  0
Modifier Ps    0  0  0  0  0  0  0  0
Type:NORMAL  Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap C-3
1.Program Parms
[2.Confl Prog+]
3.Program Parms+
```

```
 Ovrlp C-3   Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap C-3
1.Program Parms
2.Confl Prog+
[3.Program Parms+]
```

```
 Ovrlp C-3
LeadGreen  OFF  Transit 0
GreenExtInh     0  0  0  0  0  0  0  0
```

OVERLAP PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1661
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Final Design - Sheet 2 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue)
at
SR 2337 (Owls Roost Road)

Division 7 Guilford County Greensboro

PLAN DATE: August 2011	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE 8-30-11 DATE
SIG. INVENTORY NO. 07-1661

24-AUG-2011 11:10
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sarmstrong

4-SECTION PPLT FYA OUTPUT PROGRAMMING DETAIL

(program controller as shown below)

1. Before proceeding with output programming, be sure to switch the "RUN ENABLE STATUS" to "OFF". The "RUN ENABLE STATUS" setting is located from Main Menu, key strokes 1-7.
2. The Flashing Yellow Arrow in a 4-section PPLT FYA head is controlled by a normally unused PED Yellow output. This programming takes a specific PED Yellow output and remaps it to the appropriate Overlap Green output.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

SELECT USER MODE →

```
I/O Parameters
C1-C11-ABC IO Mode: USER
     D Conn Mapping: NONE
        T&F Biu Map: DEFAULT
 Invert Rail Inputs: OFF
    EVP Ped Confirm: OFF
```

PRESS "ESC"

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

```
User I/O Maps
1. Inputs
2. Outputs
3. Init Map
```

SELECT MODE 5 →

```
Initialize User I/O Maps
     Init ABC with: NONE
       Init D with: NONE
      Init 2A with: MODE 5
 Init TF BIUs with: NONE
```

PRESS "ESC"

```
User I/O Maps
1. Inputs
2. Outputs
3. Init Map
```

```
User Output Maps
1.NEMA A    4.NEMA D
2.NEMA B    5.FIO 2A
3.NEMA C                9.TS2 IO
```

PRESS "+" KEY TWICE

Pin	Fcn	Description	Pin	Fcn	Description
4-5	54	Ch6 Green	4-6	5	Ch5 Red
4-7	29	Ch5 Yellow	4-8	53	Ch5 Green
5-1	0	Unused	5-2	39	Ch15 Yellow
5-3	38	Ch14 Yellow	5-4	40	Ch16 Yellow
5-5	115	Not Used	5-6	124	LdSwtchFlsh
5-7	115	Not Used	5-8	114	Watchdog
6-1	115	Not Used	6-2	115	Not Used

Programming notes:

Pin	Default Fcn	Description	Change To: Fcn	Description
5-1	37	Ch13 Yellow....	0	Unused

PRESS "+" KEY ONCE

Pin	Fcn	Description	Pin	Fcn	Description
6-3	12	Ch12 Red	6-4	36	Ch12 Yellow
6-5	60	Ch12 Green	6-6	11	Ch11 Red
6-7	35	Ch11 Yellow	6-8	59	Ch11 Green
7-1	17	Ch17 Red	7-2	65	Ch17 Green
7-3	10	Ch10 Red	7-4	34	Ch10 Yellow
7-5	58	Ch10 Green	7-6	9	Ch9 Red
7-7	33	Ch9 Yellow	7-8	37	Ch13 Yellow

Programming notes:

Pin	Default Fcn	Description	Change To: Fcn	Description
7-8	57	Ch9 Green	37	Ch13 Yellow

OUTPUT PROGRAMMING COMPLETE

Pin 5-1 (C1 pin 35) = Load Switch S2P-Y
Pin 7-8 (C1 pin 99) = Load Switch S9-G

! Press the "*" key to return to Main Menu. Now go back to "RUN-ENABLE STATUS" and switch to "ON".

NOTE

I/O re-programming is necessary for proper FYA operation. See Channel & I/O Programming Detail For FYA Operation on this sheet.

CHANNEL & I/O PROGRAMMING DETAIL FOR FYA OPERATION

(program controller as shown below)

This programming takes the output that drives a Flashing Yellow Arrow and makes it flash. It also specifies which overlap is to be overridden for the FYA to display properly.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

PRESS THE RIGHT ARROW KEY UNTIL THE SCREEN AT RIGHT APPEARS

```
     Chan.1...2...3...4...5...6...7...8 >
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   .   .   .
Flash Grn .   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   0   0
```

```
     Chan.9..10..11..12..13..14..15..16
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   X   .   .   .
Flash Grn .   .   X   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   1   0   0   0
```

CHANNEL & I/O PROGRAMMING COMPLETE

NOTE

Output re-mapping is necessary for proper FYA operation. See the 4-Section PPLT FYA Output Programming Detail on this sheet.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1661
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Final Design - Sheet 3 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of: Transportation Mobility and Safety Division, Signals Management Section, NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

750 N.Greenfield Pkwy,Garner,NC 27529

US 220 (Battleground Avenue) at SR 2337 (Owls Roost Road)

Division 7 | Guilford County | Greensboro

PLAN DATE:	August 2011	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

John T. Rowe Jr. 8-30-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-1661

24-AUG-2011 11:10
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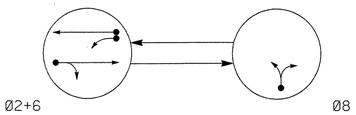
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.33

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø8	FLASH
21, 22	G	R	Y
61	FY	R	Y
62, 63	G	R	Y
81, 82	R	G	R

FY = FLASHING YELLOW ARROW

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM	TO ← 1	TO ← 2	TO FY 1	TO FY 2	TO → 1	TO → 2
←	←	←	Y	R	Y	R
FY	FY	FY	FY	FY	Y	R
→	R	R	R	R	R	R

FY = FLASHING YELLOW ARROW

LOOP & DETECTOR UNIT INSTALLATION CHART

NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

INDUCTIVE LOOPS					DETECTOR PROGRAMMING								
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION	ADDED INIT.	SYSTEM LOOP	NEW CARD
2A	6X6	355	6	X	2	-	-	-	X	X	X	-	X
6A	6X6	355	4	X	6	-	-	-	X	X	X	-	X
6B	6X40	0	2-4-2	X	6	-	-	-	X	X	-	-	X
8A	6X40	0	2-4-2	X	8	-	10	-	X	X	-	-	X

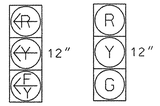
2 Phase
Fully Acutated
(Greensboro Signal System)

NOTES

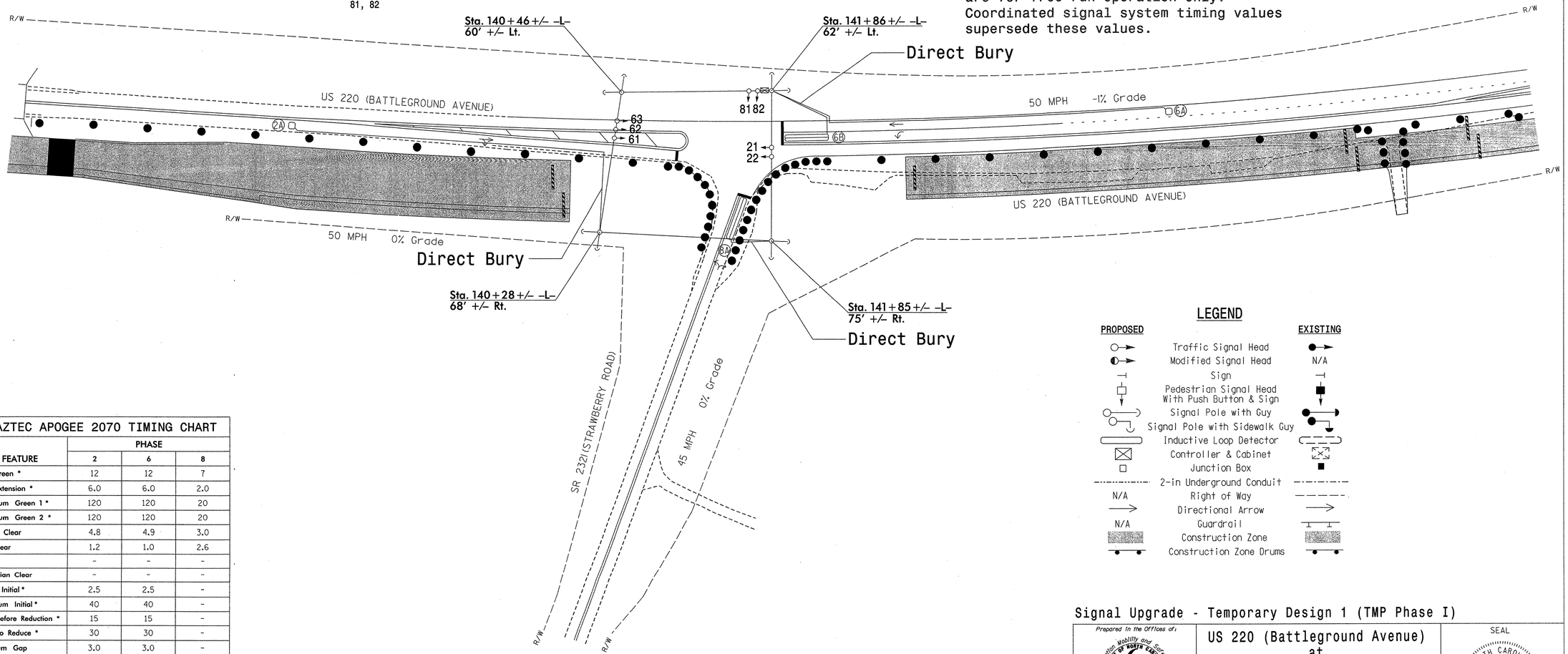
1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detectors units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. Pavement markings are existing.
6. During TMP phase II, set signal on flashing operation.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

SIGNAL FACE I.D.

All Heads L.E.D.



61 — 21, 22, 62, 63, 81, 82



LEGEND

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

NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE 2	PHASE 6	PHASE 8
Min Green *	12	12	7
Gap, Extension *	6.0	6.0	2.0
Maximum Green 1 *	120	120	20
Maximum Green 2 *	120	120	20
Yellow Clear	4.8	4.9	3.0
Red Clear	1.2	1.0	2.6
Walk *	-	-	-
Pedestrian Clear	-	-	-
Added Initial *	2.5	2.5	-
Maximum Initial *	40	40	-
Time Before Reduction *	15	15	-
Time To Reduce *	30	30	-
Minimum Gap	3.0	3.0	-
Recall Mode	MIN RECALL	MIN RECALL	-
Lock Calls	YES	YES	NO
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.

$$$$$$$SYSTIME$$$$
$$$$$$$$$$$$$$$$$$SECTION$$$$$$$$$$$$$$$$$$
$$$$$$$USERNAME$$$$

Signal Upgrade - Temporary Design 1 (TMP Phase I)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 1"=50' (0 — 50)

US 220 (Battleground Avenue) at SR 2321 (Strawberry Road)

Division 7 Guilford County Greensboro

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

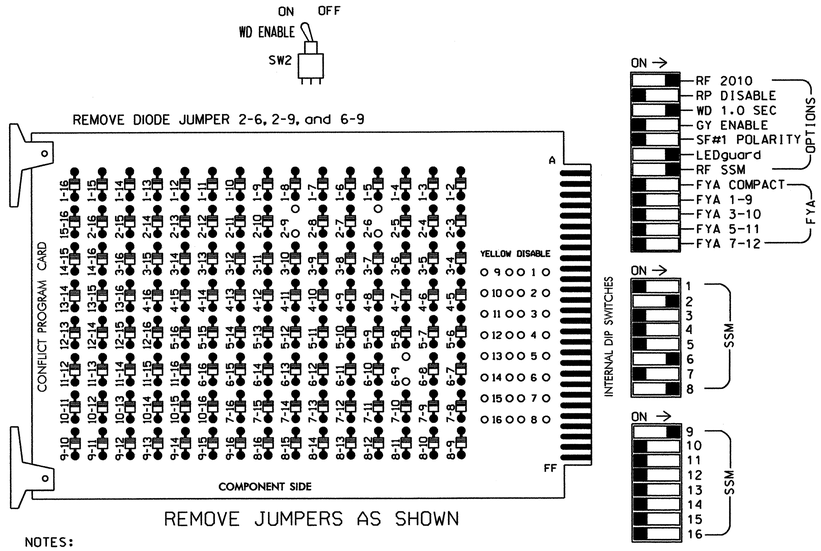
SIGNATURE — DATE 8/23/11

SIG. INVENTORY NO. 07-1604TI

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.34

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



NOTES:

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

■ = 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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3, 4,5,7,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Initialize database in Naztec 2070 local software (Apogee) as FULL-MODE 5. This initialization should be done prior to programming controller.
4. Program phases 2 and 6 for Start Up In Green.
5. Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
6. Ensure "Local Flash Start" feature is set to "ON".
7. The cabinet and controller are part of the City of Greensboro Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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.	NU	21,22	NU	NU	NU	NU	NU	62,63	NU	NU	81,82	NU	61★	NU	NU	NU	NU	NU
RED		128						134			107							
YELLOW		129						135			108							
GREEN		130						136			109							
RED ARROW													A121					
YELLOW ARROW													A122					
FLASHING YELLOW ARROW													A123					
GREEN ARROW																		

NU = Not Used

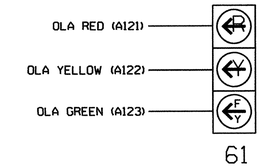
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX OUTPUT FILE
SOFTWARE.....NAZTEC APOGEE
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S2,S6,S8,S9
PHASES USED.....2,6,8
OVERLAP A.....2

3 SECTION FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT	SLOT	ø2 2A	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	ø6 6A	SLOT	SLOT	SLOT	ø8 8A	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	ø6 6B	EMPTY	EMPTY	EMPTY	NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
2A	TB2-9,10	I3U	63	4	2				X	X	X
6A	TB3-5,6	J2U	40	16	6				X	X	X
6B	TB3-7,8	J2L	44	17	6				X	X	
8A	TB5-9,10	J6U	42	22	8		10		X	X	

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1604T1
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 1 (TMP Phase 1) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue)
at
SR 2321 (Strawberry Road)

Division 7 Guilford County Greensboro

PLAN DATE: August 2011 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
John T. Rowe Jr 8-30-11
SIGNATURE DATE
SIG. INVENTORY NO. 07-1604T1

24-AUG-2011 11:37
S:\TSS&S\WTS Signals\workgroups\Sig Man\armstrong\07160 4_sm_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.35

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS "1" CONTROLLER AND THEN "5" OVERLAPS

```
Overlaps
1.General Parms
2.Program
3.Status
```

```
General Overlap Parameters
      Lock Inhibit OFF
   Confl Lock Enable OFF
     Parent P Clrncs ON
Extra Included Phases OFF
```

PRESS "ESC"

```
Overlaps
1.General Parms
2.Program
3.Status
```

```
Enter Overlap #  1
  then press Enter
```

```
Overlap A-1
1.Program Parms
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp A-1   Ps....................
Included Ps    2  0  0  0  0  0  0  0
Modifier Ps    0  0  0  0  0  0  0  0
Type:NORMAL  Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp A-1   Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp A-1
LeadGreen  OFF   Transit 0
GreenExtInh      0  0  0  0  0  0  0  0
```

OVERLAP PROGRAMMING COMPLETE

CHANNEL & I/O PROGRAMMING DETAIL FOR FYA OPERATION

(program controller as shown below)

This programming takes the output that drives a Flashing Yellow Arrow and makes it flash.

FROM MAIN MENU, KEYSTROKES 1-8

```
          Channel & I/O
1.Chan  1-16  4.Chan+  1-16  7.IO Logic
2.chan 17-24  5.chan+ 17-24  8.IO Viewer
3.Chan Parms  6.IO Parms     9.IO UserMap
```

PRESS THE RIGHT ARROW KEY UNTIL THE SCREEN AT RIGHT APPEARS

```
      Chan.1...2...3...4...5...6...7...8 >
 Flash Red .   .   .   .   .   .   .   .
 Flash Yel .   .   .   .   .   .   .   .
 Flash Grn .   .   .   .   .   .   .   .
 Inhibit Red Flash In
   Preempt .   .   .   .   .   .   .   .
 Olap Ovrd 0   0   0   0   0   0   0   0
```

```
      Chan.9..10..11..12..13..14..15..16
 Flash Red .   .   .   .   .   .   .   .
 Flash Yel .   .   .   .   .   .   .   .
 Flash Grn X   .   .   .   .   .   .   .
 Inhibit Red Flash In
   Preempt .   .   .   .   .   .   .   .
 Olap Ovrd 0   0   0   0   0   0   0   0
```

CHANNEL & I/O PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1604T1
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 1 (TMP Phase 1) - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue)
at
SR 2321 (Strawberry Road)

Division 7 | Guilford County | Greensboro

PLAN DATE:	August 2011	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

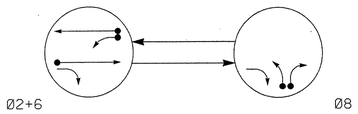
John T Rowe 8-30-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-1604T1

24-AUG-2011 11:38
S:\TTSASU\TS Signals\Workgroups\Sig Mon\Armstrong\07160 4_sm_ele_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.36

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø8	FLASH
21	G	R	Y
22	G	R	Y
61	FY	R	Y
62, 63	G	R	Y
81, 82	R	G	R

FY = FLASHING YELLOW ARROW

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM \ TO	1	2	1	2	1	2
	←		FY		R	
←	←	←	Y	R	Y	R
FY	FY	FY	FY	FY	Y	R
R	R	R	R	R	R	R

FY = FLASHING YELLOW ARROW

LOOP & DETECTOR UNIT INSTALLATION CHART

NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

INDUCTIVE LOOPS					DETECTOR PROGRAMMING								
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION	ADDED INIT.	SYSTEM LOOP	NEW CARD
2A	6X6	355	6	X	2	-	-	-	X	X	X	-	-
6A	6X6	355	5	X	6	-	-	-	X	X	X	-	-
6B	6X40	0	2-4-2	X	6	-	-	-	X	X	-	-	-
8A	6X40	0	2-4-2	X	8	-	3	-	X	X	-	-	-
8B	6X40	0	2-4-2	X	8	-	10	-	X	X	-	-	X

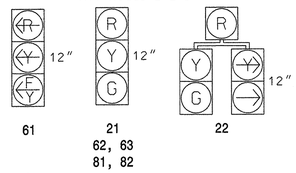
2 Phase
Fully Acutated
(Greensboro Signal System)

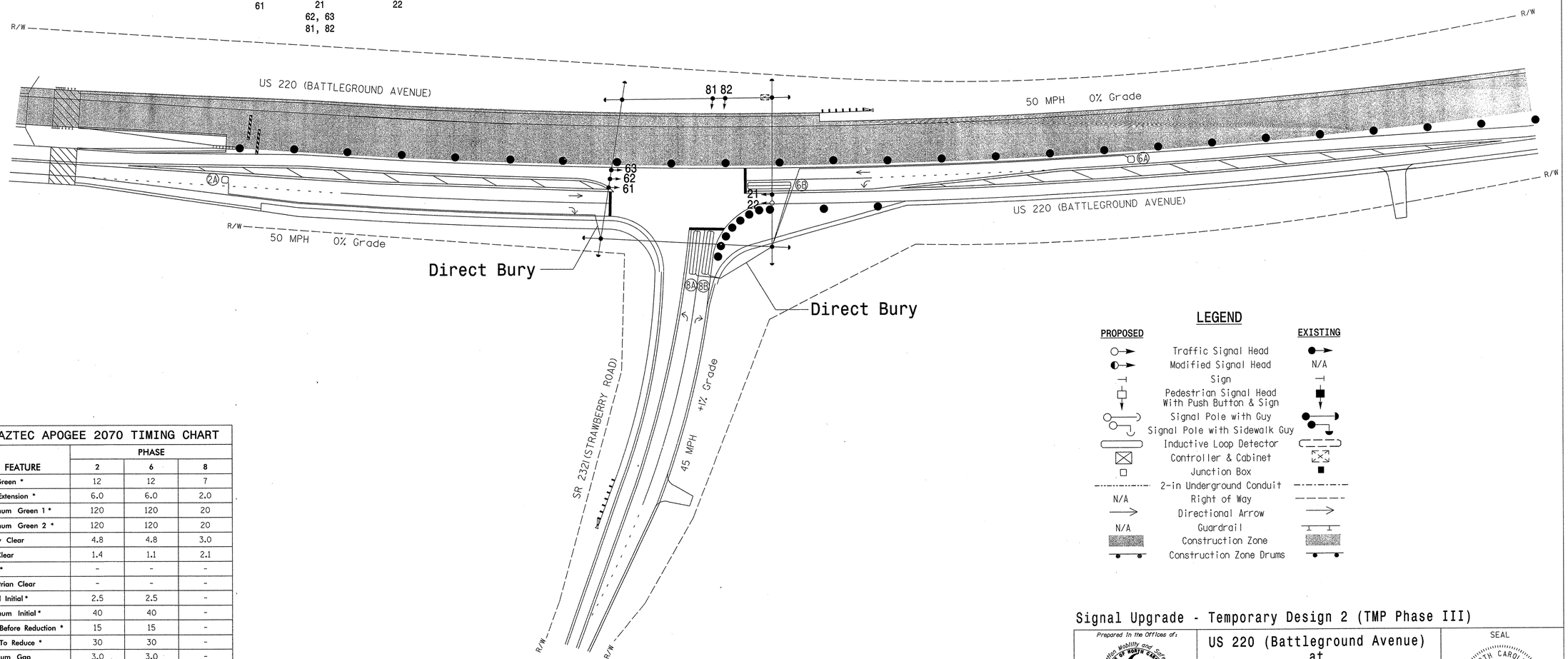
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Reposition existing signal heads numbered #21, 61, 62, 63, 81, and 82.
4. Set all detectors units to presence mode.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

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	
N/A	Guardrail	
	Construction Zone	
	Construction Zone Drums	

NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE 2	PHASE 6	PHASE 8
Min Green *	12	12	7
Gap, Extension *	6.0	6.0	2.0
Maximum Green 1 *	120	120	20
Maximum Green 2 *	120	120	20
Yellow Clear	4.8	4.8	3.0
Red Clear	1.4	1.1	2.1
Walk *	-	-	-
Pedestrian Clear	-	-	-
Added Initial *	2.5	2.5	-
Maximum Initial *	40	40	-
Time Before Reduction *	15	15	-
Time To Reduce *	30	30	-
Minimum Gap	3.0	3.0	-
Recall Mode	MIN RECALL	MIN RECALL	-
Lock Calls	YES	YES	NO
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.

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

Signal Upgrade - Temporary Design 2 (TMP Phase III)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220 (Battleground Avenue) at SR 2321 (Strawberry Road)

Division 7 Guilford County Greensboro

PLAN DATE: September 2011 | REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton | REVIEWED BY:

REVISIONS	INIT.	DATE

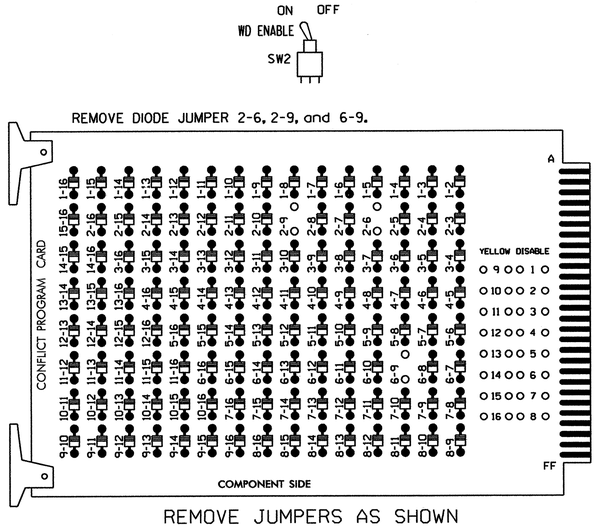
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE DATE 8/23/11
SIG. INVENTORY NO. 07-1604T2

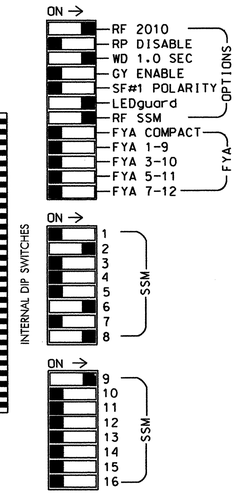
PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.37

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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. Make sure jumpers SEL2-SEL5 are present on the monitor board.

■ = 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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3, 4,5,7,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Initialize database in Naztec 2070 local software (Apogee) as FULL-MODE 5. This initialization should be done prior to programming controller.
4. Program phases 2 and 6 for Start Up In Green.
5. Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
6. Ensure "Local Flash Start" feature is set to "ON".
7. The cabinet and controller are part of the City of Greensboro Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8		S8P	S9	S10	S11	S12	S13	S14
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.	NU	21,22	NU	NU	NU	NU	NU	62,63	NU	NU	22	81,82	NU	61★	NU	NU	NU	NU	NU
RED		128						134				107							
YELLOW		129						135				108							
GREEN		130						136				109							
RED ARROW														A121					
YELLOW ARROW											108			A122					
FLASHING YELLOW ARROW														A123					
GREEN ARROW											109								

NU = Not Used

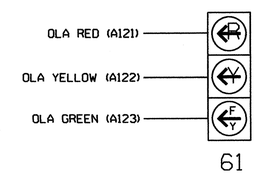
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX OUTPUT FILE
SOFTWARE.....NAZTEC APOGEE
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S2,S6,S8,S9
PHASES USED.....2,6,8
OVERLAP A.....2

3 SECTION FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT	SLOT	Ø2	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS
				2A											DC ISOLATOR
	L	EMPTY	EMPTY	NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST
															DC ISOLATOR
FILE "J"	U	SLOT	Ø6	SLOT	SLOT	SLOT	Ø8	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
			6A				8A								
	L	EMPTY	Ø6	EMPTY	EMPTY	EMPTY	Ø8	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
			6B				8B								

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.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
2A	TB2-9,10	I3U	63	4	2				X	X	X
6A	TB3-5,6	J2U	40	16	6				X	X	X
6B	TB3-7,8	J2L	44	17	6				X	X	
8A	TB5-9,10	J6U	42	22	8		3		X	X	
8B	TB5-11,12	J6L	46	23	8		10		X	X	

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 07-1604T2
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 2 (TMP Phase 3) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 220 (Battleground Avenue) at SR 2321 (Strawberry Road)

Division 7 Guilford County Greensboro

PLAN DATE: August 2011 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
John T. Rowe 8-30-11
SIGNATURE DATE
SIG. INVENTORY NO. 07-1604T2

24-AUG-2011 11:41
S:#TTSASU#ITS Signals#Workgroups#Sig Man#armstrong#071604_sm_ele_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.38

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS "1" CONTROLLER AND THEN "5" OVERLAPS

```
Overlaps
1.General Parms
2.Program
3.Status
```

```
General Overlap Parameters
     Lock Inhibit OFF
  Confl Lock Enable OFF
     Parent P Clrncs ON
Extra Included Phases OFF
```

PRESS "ESC"

```
Overlaps
1.General Parms
2.Program
3.Status
```

```
Enter Overlap #  1
  then press Enter
```

```
Overlap A-1
1.Program Parms
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp A-1   Ps....................
Included Ps    2  0  0  0  0  0  0  0
Modifier Ps    0  0  0  0  0  0  0  0
Type:NORMAL  Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp A-1   Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp A-1
LeadGreen  OFF   Transit 0
GreenExtInh      0  0  0  0  0  0  0  0
```

OVERLAP PROGRAMMING COMPLETE

CHANNEL & I/O PROGRAMMING DETAIL FOR FYA OPERATION

(program controller as shown below)

This programming takes the output that drives a Flashing Yellow Arrow and makes it flash.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16  7.IO Logic
2.chan 17-24  5.chan+ 17-24  8.IO Viewer
3.Chan Parms  6.IO Parms     9.IO UserMap
```

PRESS THE RIGHT ARROW KEY UNTIL THE SCREEN AT RIGHT APPEARS

```
     Chan.1...2...3...4...5...6...7...8 >
 Flash Red .   .   .   .   .   .   .   .
 Flash Yel .   .   .   .   .   .   .   .
 Flash Grn .   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   0   0
```

```
     Chan.9..10..11..12..13..14..15..16
 Flash Red .   .   .   .   .   .   .   .
 Flash Yel .   .   .   .   .   .   .   .
 Flash Grn X   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   0   0
```

CHANNEL & I/O PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1604T2
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 2 (TMP Phase 3) - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue)
at
SR 2321 (Strawberry Road)

Division 7 | Guilford County | Greensboro

PLAN DATE:	August 2011	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

John T Rowe Jr 8-30-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-1604T2

24-AUG-2011 11:41
S:#ITS&SU#ITS Signals#Workgroups#Sig Man#Armstrong#071604_smuele_xxx.dgn
samstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.39

PHASING DIAGRAM

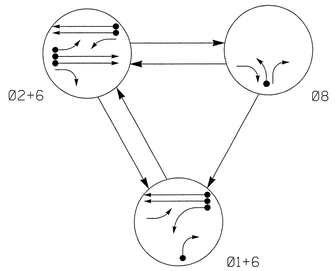


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+6	PHASE Ø2+6	PHASE Ø8	FLASH
11	←	F	R	Y
21	F	F	R	Y
22	R	G	R	Y
23	R	G	R/←	Y
61, 62	G	G	R	Y
81	R	R	G	R
82	R/←	R	G	R

F = FLASHING YELLOW ARROW

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM	TO ← 1	TO ← 2	TO F 1	TO F 2	TO R 1	TO R 2
←	←	←	Y	R	Y	R
F	F	F	F	F	Y	R
R	R	R	R	R	R	R

F = FLASHING YELLOW ARROW

LOOP & DETECTOR UNIT INSTALLATION CHART

NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

INDUCTIVE LOOPS					DETECTOR PROGRAMMING								
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION	ADDED INIT.	SYSTEM LOOP	NEW CARD
IA	6X40	0	2-4-2	X	1	-	15	-	X	X	-	-	X
IB	6X40	0	2-4-2	X	1	-	15	-	X	X	-	-	-
2A	6X6	355	6	X	2	-	-	-	X	X	X	-	-
2B	6X6	355	6	X	2	-	-	-	X	X	X	-	X
2C	6X40	0	2-4-2	X	2	-	-	-	X	X	-	-	X
6A	6X6	355	4	X	6	-	-	-	X	X	X	-	-
6B	6X6	355	4	X	6	-	-	-	X	X	X	-	-
8A	6X40	0	2-4-2	X	8	-	-	-	X	X	-	-	X

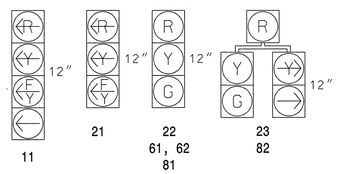
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 may be lagged.
4. Set all detector units to presence mode.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

3 Phase
Fully Acutated
(Greensboro Signal System)

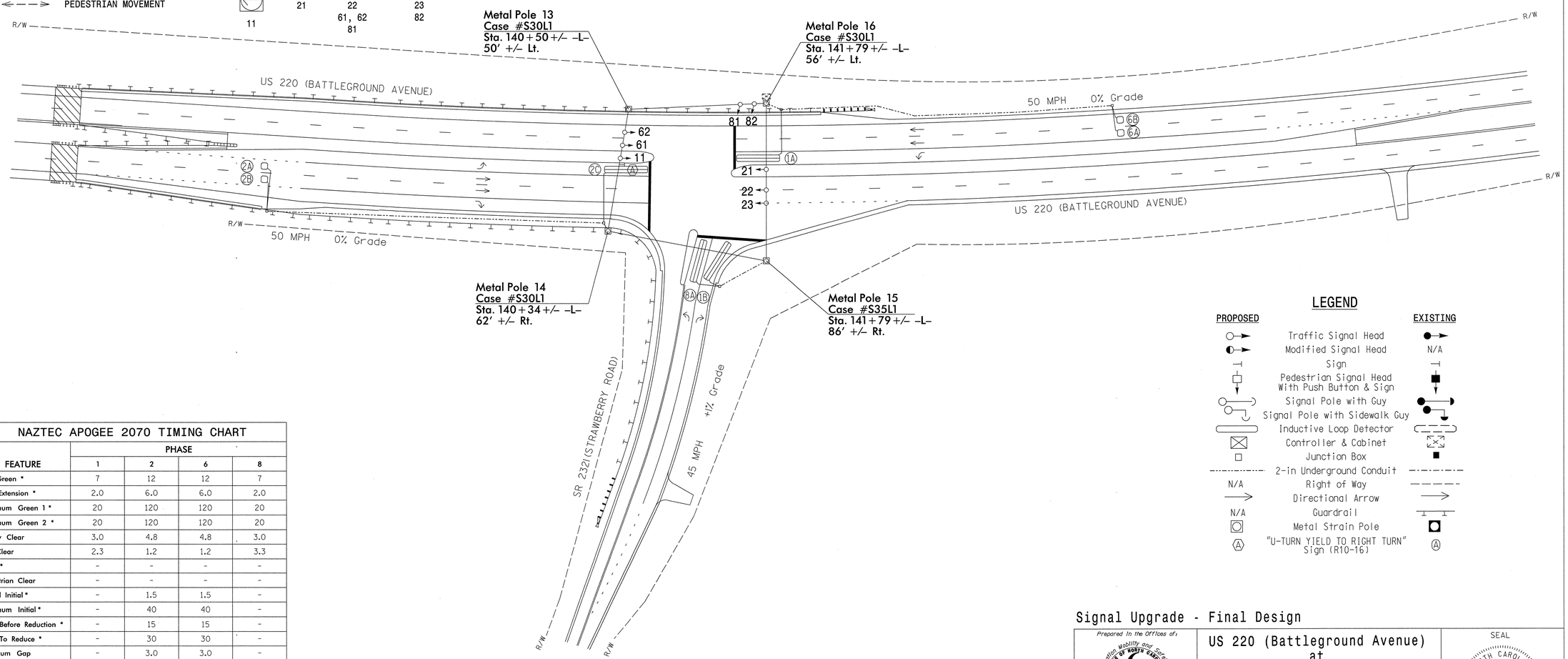
SIGNAL FACE I.D.

All Heads L.E.D.



PHASING DIAGRAM DETECTION LEGEND

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



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Guardrail	
	Metal Strain Pole	
	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	

NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE 1	PHASE 2	PHASE 6	PHASE 8
Min Green *	7	12	12	7
Gap, Extension *	2.0	6.0	6.0	2.0
Maximum Green 1 *	20	120	120	20
Maximum Green 2 *	20	120	120	20
Yellow Clear	3.0	4.8	4.8	3.0
Red Clear	2.3	1.2	1.2	3.3
Walk *	-	-	-	-
Pedestrian Clear	-	-	-	-
Added Initial *	-	1.5	1.5	-
Maximum Initial *	-	40	40	-
Time Before Reduction *	-	15	15	-
Time To Reduce *	-	30	30	-
Minimum Gap	-	3.0	3.0	-
Recall Mode	-	MIN RECALL	MIN RECALL	-
Lock Calls	NO	YES	YES	NO
Dual Entry	-	-	-	-
Simultaneous Gap	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.

$$$$STIME$$$$
$$$$TIME$$$$
$$$$USERNAME$$$$

Signal Upgrade - Final Design

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

US 220 (Battleground Avenue) at SR 2321 (Strawberry Road)

Division 7 Guilford County Greensboro

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

SCALE 0 50 1"=50'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/23/11 DATE

SIG. INVENTORY NO. 07-1604

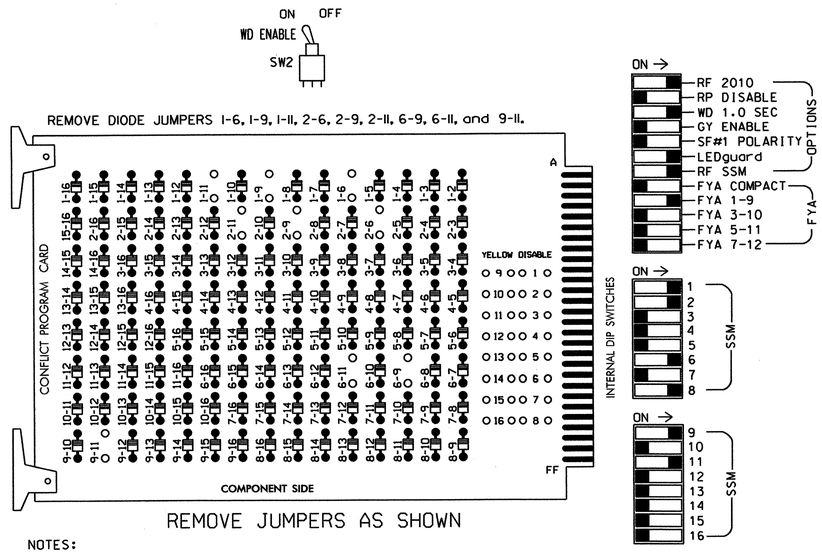
SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

...\Signal Design\07-1604.dgn 9/6/2011 2:31:01 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.40

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



NOTES:

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

■ = 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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 3,4, 5,7,10,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Initialize database in Naztec 2070 local software (Apogee) as FULL-MODE 5. This initialization should be done prior to programming controller.
4. Program phases 2 and 6 for Start Up In Green.
5. Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
6. Ensure "Local Flash Start" feature is set to "ON".
7. The cabinet and controller are part of the City of Greensboro Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8		S8P	S9	S10	S11	S12	S13	S14
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	22,23	NU	NU	NU	NU	NU	61,62	NU	NU	23	81,82	NU	11★	NU	NU	21★	NU	NU
RED		✱	128						134				107							
YELLOW			129						135				108							
GREEN			130						136				109							
RED ARROW															A121			A114		
YELLOW ARROW		126										108			A122			A115		
FLASHING YELLOW ARROW															A123			A116		
GREEN ARROW	127	127										109								
✋																				
🚶																				

NU = Not Used

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

★ See pictorial of head wiring in detail below.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT	ø1 1A	ø2 2A	ø2 2C	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	ø1 1B	ø2 2B	NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	ø6 6A	SLOT	SLOT	SLOT	ø8 8A	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	ø6 6B	EMPTY	EMPTY	EMPTY	NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX OUTPUT FILE
SOFTWARE.....NAZTEC APOGEE
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S1,S2,S6,S8,S9,S11
PHASES USED.....1,2,6,8
OVERLAP A.....1+2
OVERLAP C.....6

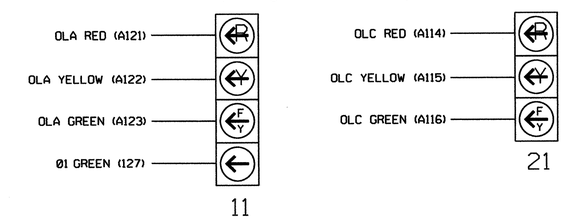
INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
1A	TB2-5,6	I2U	39	2	1		15		X	X	
1B	TB2-7,8	I2L	43	3	1		15		X	X	
2A	TB2-9,10	I3U	63	4	2				X	X	X
2B	TB2-11,12	I3L	76	5	2				X	X	X
2C	TB4-1,2	I4U	47	6	2				X	X	
6A	TB3-5,6	J2U	40	16	6				X	X	X
6B	TB3-7,8	J2L	44	17	6				X	X	X
8A	TB5-9,10	J6U	42	22	8				X	X	

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

3 & 4 SECTION FYA SIGNAL WIRING DETAIL

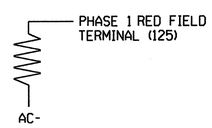
(wire signal heads as shown)



LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1604
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Final Design - Sheet 1 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue) at SR 2321 (Strawberry Road)

Division 7 Guilford County Greensboro

PLAN DATE: August 2011	REVIEWED BY: JTR
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE John T Rowe Jr. DATE 8-30-11
SIG. INVENTORY NO. 07-1604

24-AUG-2011 11:44
S:\#ITSSGUNITS\Signals\Workgroups\Sig Mom\Armstrong\07160A_sample_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.41

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS "1" CONTROLLER
AND THEN "5" OVERLAPS

```
Overlaps
[1.General Parms]
2.Program
3.Status
```

```
General Overlap Parameters
      Lock Inhibit OFF
   Confl Lock Enable OFF
     Parent P Clrncs ON
Extra Included Phases OFF
```

PRESS "ESC"

```
Overlaps
1.General Parms
[2.Program]
3.Status
```

```
Enter Overlap #  1
  then press Enter
```

```
Overlap A-1
[1.Program Parms]
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp A-1    Ps....................
Included Ps    1  0  0  0  0  0  0  0
Modifier Ps    2  0  0  0  0  0  0  0
Type:FYA-4   Grn:  0  Yel: 3.5  Red: 1.5
```

Notice type FYA-4 →

PRESS "ESC"

```
Overlap A-1
1.Program Parms
[2.Confl Prog+]
3.Program Parms+
```

```
 Ovrlp A-1    Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap A-1
1.Program Parms
2.Confl Prog+
[3.Program Parms+]
```

```
 Ovrlp A-1
LeadGreen  OFF  Transit 0
GreenExtInh     0  0  0  0  0  0  0  0
```

PRESS "ESC TWICE

```
Overlaps
1.General Parms
[2.Program]
3.Status
```

```
Enter Overlap #  3
  then press Enter
```

```
Overlap C-3
[1.Program Parms]
2.Confl Prog+
3.Program Parms+
```

```
 Ovrlp C-3    Ps....................
Included Ps    6  0  0  0  0  0  0  0
Modifier Ps    0  0  0  0  0  0  0  0
Type:NORMAL  Grn:  0  Yel: 3.5  Red: 1.5
```

PRESS "ESC"

```
Overlap C-3
1.Program Parms
[2.Confl Prog+]
3.Program Parms+
```

```
 Ovrlp C-3    Ps....................
Confl Ps       0  0  0  0  0  0  0  0
Confl Ovrlps   0  0  0  0  0  0  0  0
Confl Peds     0  0  0  0  0  0  0  0
```

PRESS "ESC"

```
Overlap C-3
1.Program Parms
2.Confl Prog+
[3.Program Parms+]
```

```
 Ovrlp C-3
LeadGreen  OFF  Transit 0
GreenExtInh     0  0  0  0  0  0  0  0
```

OVERLAP PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1604
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Final Design - Sheet 2 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220 (Battleground Avenue)
at
SR 2321 (Strawberry Road)

Division 7 Guilford County Greensboro

PLAN DATE:	August 2011	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

John T. Rowe, Jr. 8-30-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-1604

24-AUG-2011 11:45
S:*ITS&SU*ITS Signals*Workgroups*Sig Mon*Armstrong*07160A_smuele_xxx.dgn
SArmstrong

4-SECTION PPLT FYA OUTPUT PROGRAMMING DETAIL

(program controller as shown below)

1. Before proceeding with output programming, be sure to switch the "RUN ENABLE STATUS" to "OFF". The "RUN ENABLE STATUS" setting is located from Main Menu, key strokes 1-7.
2. The Flashing Yellow Arrow in a 4-section PPLT FYA head is controlled by a normally unused PED Yellow output. This programming takes a specific PED Yellow output and remaps it to the appropriate Overlap Green output.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

SELECT USER MODE →

```
I/O Parameters
C1-C11-ABC IO Mode: USER
     D Conn Mapping: NONE
         T&F Biu Map: DEFAULT
 Invert Rail Inputs: OFF
    EVP Ped Confirm: OFF
```

PRESS "ESC"

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

```
User I/O Maps
1. Inputs
2. Outputs
3. Init Map
```

SELECT MODE 5 →

```
Initialize User I/O Maps
     Init ABC with: NONE
       Init D with: NONE
      Init 2A with: MODE 5
 Init TF BIUs with: NONE
```

PRESS "ESC"

```
User I/O Maps
1. Inputs
2. Outputs
3. Init Map
```

```
User Output Maps
1.NEMA A    4.NEMA D
2.NEMA B    5.FIO 2A
3.NEMA C                9.TS2 IO
```

PRESS "+" KEY TWICE

Pin	Fcn	Description	Pin	Fcn	Description
4-5	54	Ch6 Green	4-6	5	Ch5 Red
4-7	29	Ch5 Yellow	4-8	53	Ch5 Green
5-1	0	Unused	5-2	39	Ch15 Yellow
5-3	38	Ch14 Yellow	5-4	40	Ch16 Yellow
5-5	115	Not Used	5-6	124	LdSwtchFlsh
5-7	115	Not Used	5-8	114	Watchdog
6-1	115	Not Used	6-2	115	Not Used

Programming notes:

Pin	Default Fcn	Description	Change To: Fcn	Description
5-1	37	Ch13 Yellow....	0	Unused

PRESS "+" KEY ONCE

Pin	Fcn	Description	Pin	Fcn	Description
6-3	12	Ch12 Red	6-4	36	Ch12 Yellow
6-5	60	Ch12 Green	6-6	11	Ch11 Red
6-7	35	Ch11 Yellow	6-8	59	Ch11 Green
7-1	17	Ch17 Red	7-2	65	Ch17 Green
7-3	10	Ch10 Red	7-4	34	Ch10 Yellow
7-5	58	Ch10 Green	7-6	9	Ch9 Red
7-7	33	Ch9 Yellow	7-8	37	Ch13 Yellow

Programming notes:

Pin	Default Fcn	Description	Change To: Fcn	Description
7-8	57	Ch9 Green	37	Ch13 Yellow

OUTPUT PROGRAMMING COMPLETE

Pin 5-1 (C1 pin 35) = Load Switch S2P-Y
Pin 7-8 (C1 pin 99) = Load Switch S9-G

! Press the "*" key to return to Main Menu. Now go back to "RUN-ENABLE STATUS" and switch to "ON".

NOTE

I/O re-programming is necessary for proper FYA operation. See Channel & I/O Programming Detail For FYA Operation on this sheet.

CHANNEL & I/O PROGRAMMING DETAIL FOR FYA OPERATION

(program controller as shown below)

This programming takes the output that drives a Flashing Yellow Arrow and makes it flash. It also specifies which overlap is to be overridden for the FYA to display properly.

FROM MAIN MENU, KEYSTROKES 1-8

```
Channel & I/O
1.Chan  1-16  4.Chan+  1-16 7.IO Logic
2.chan 17-24  5.chan+ 17-24 8.IO Viewer
3.Chan Parms  6.IO Parms    9.IO UserMap
```

PRESS THE RIGHT ARROW KEY UNTIL THE SCREEN AT RIGHT APPEARS

```
      Chan.1...2...3...4...5...6...7...8 >
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   .   .   .   .
Flash Grn .   .   .   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   0   0   0   0
```

```
      Chan.9..10..11..12..13..14..15..16
Flash Red .   .   .   .   .   .   .   .
Flash Yel .   .   .   .   X   .   .   .
Flash Grn .   .   X   .   .   .   .   .
Inhibit Red Flash In
  Preempt .   .   .   .   .   .   .   .
Olap Ovrd 0   0   0   0   1   0   0   0
```

CHANNEL & I/O PROGRAMMING COMPLETE

NOTE

Output re-mapping is necessary for proper FYA operation. See the 4-Section PPLT FYA Output Programming Detail on this sheet.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-1604
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Final Design - Sheet 3 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of: Transportation Mobility and Safety Division, Traffic Engineering Branch, Signal Management Section, NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

750 N.Greenfield Pkwy,Garner,NC 27529

US 220 (Battleground Avenue) at SR 2321 (Strawberry Road)

Division 7 | Guilford County | Greensboro

PLAN DATE: August 2011 | REVIEWED BY: JTR
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

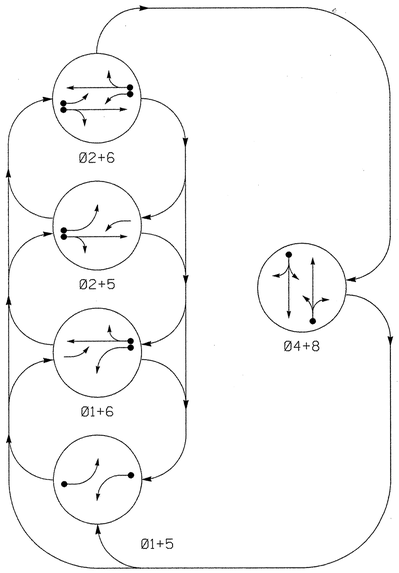
John T. Rowe 8-30-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-1604

24-AUG-2011 11:45
S:#ITSASU#ITS Signals#Workgroups#Sig Man#Armstrong#071604_sm_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 43

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	PHASE 01+6	PHASE 02+5	PHASE 02+6	PHASE 04+8	FLASH
11	←	←	FY	FY	R	Y
21, 22	R	R	G	G	R	Y
41, 42	R	R	R	R	G	R
51	←	FY	←	FY	R	Y
61, 62	R	G	R	G	R	Y
81, 82	R	R	R	R	G	R

FY = FLASHING YELLOW ARROW

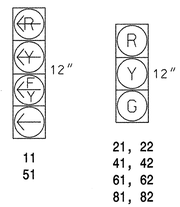
STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM	TO ← 1	TO ← 2	TO FY 1	TO FY 2	TO R 1	TO R 2
←	←	←	Y	R	Y	R
FY	FY	FY	FY	FY	Y	R
R	R	R	R	R	R	R

FY = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



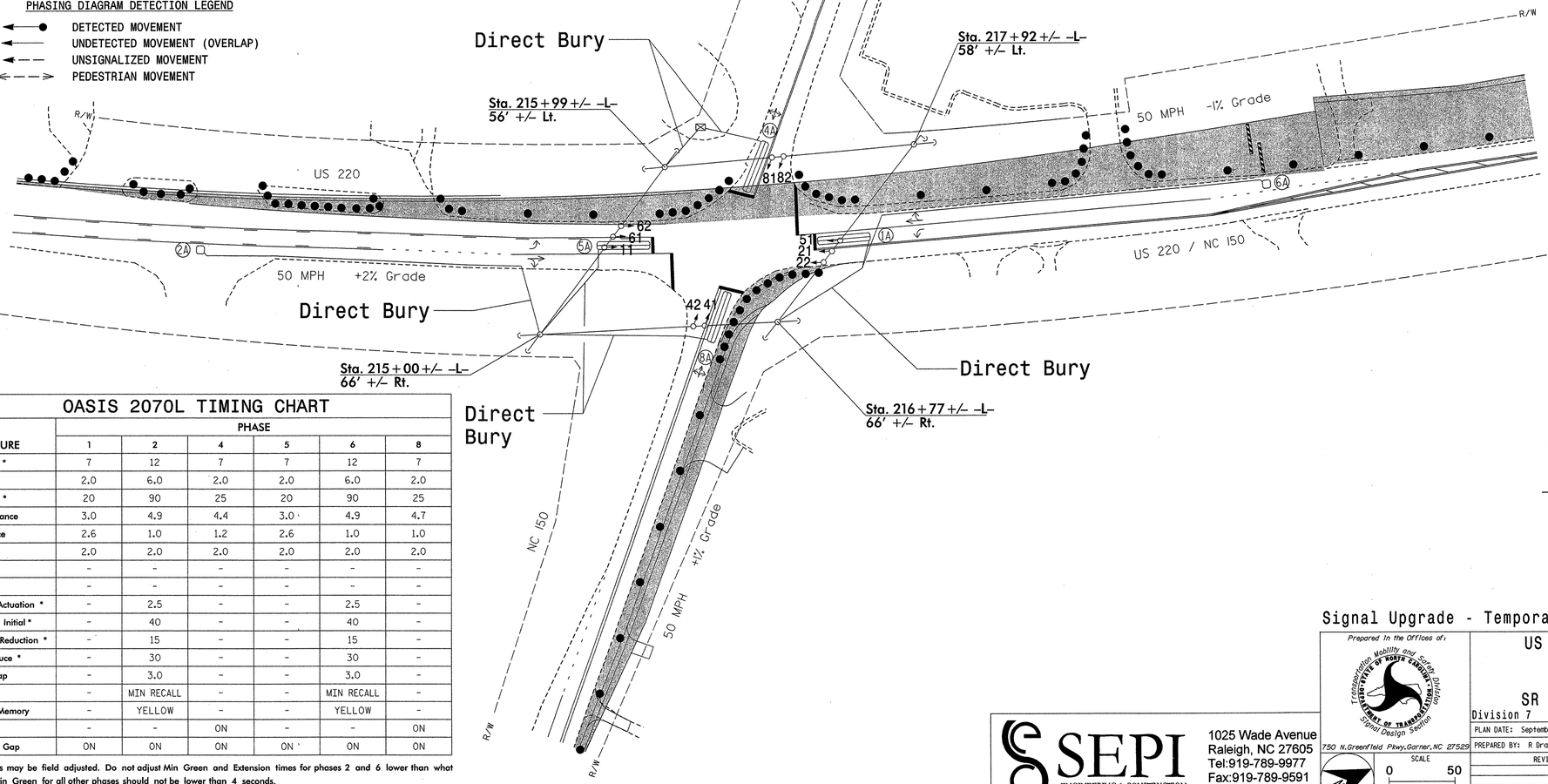
OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	Y
					6	Y	Y	Y	-	3	-	Y
2A	6X6	355	6	Y	2	Y	Y	-	-	-	-	Y
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	10	-	Y
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
					2	Y	Y	Y	-	3	-	Y
6A	6X6	355	6	Y	6	Y	Y	-	-	-	-	Y
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	10	-	Y

5 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
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. Set all detectors units to presence mode.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Pavement markings are existing.



LEGEND

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

OASIS 2070L TIMING CHART

FEATURE	PHASE 1	PHASE 2	PHASE 4	PHASE 5	PHASE 6	PHASE 8
Min Green 1 *	7	12	7	7	12	7
Extension 1 *	2.0	6.0	2.0	2.0	6.0	2.0
Max Green 1 *	20	90	25	20	90	25
Yellow Clearance	3.0	4.9	4.4	3.0	4.9	4.7
Red Clearance	2.6	1.0	1.2	2.6	1.0	1.0
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	2.5	-	-	2.5	-
Max Variable Initial *	-	40	-	-	40	-
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	-	YELLOW	-	-	YELLOW	-
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	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.

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$DGN
$$$$$$USERNAME$$$$

Signal Upgrade - Temporary Design 1 - (TMP Phase I)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220/US 220-NC 150 at NC 150 / SR 2204 (Auburn Road)

Division 7 Guilford County Summerfield

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE DATE 8/23/11

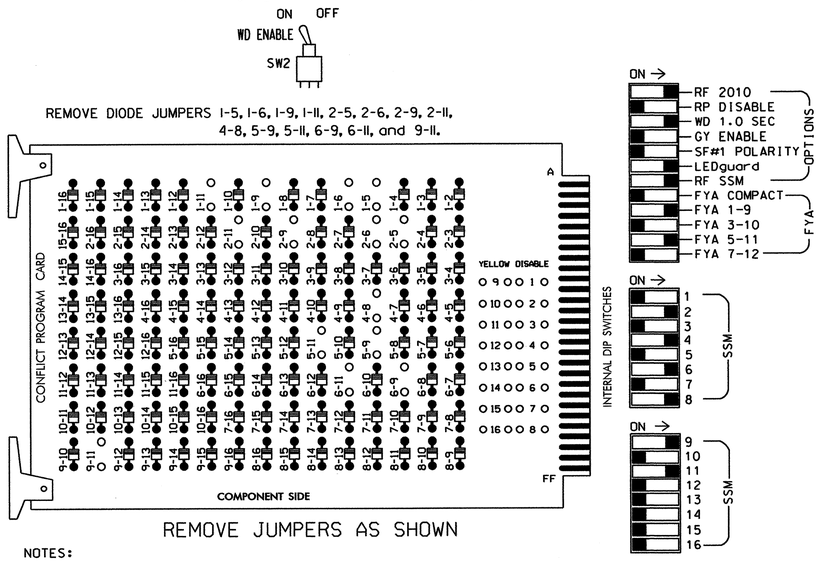
SIG. INVENTORY NO. 07-0925T1

\Signal Design\07-0925T1.dgn 8/22/2011 3:04:22 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.44

EDI MODEL 2010ECL-NC 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.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø1 1A	SLOT EMPTY	Ø2 2A	WIRED INPUT ⊗	SLOT EMPTY	Ø4 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								ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø6 6A	SLOT EMPTY	WIRED INPUT ⊗	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	NOT USED				NOT USED								

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

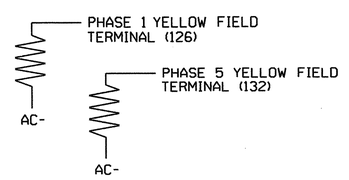
FS = FLASH SENSE
ST = STOP TIME

⊗ Wired Input - Do not populate slot with detector card

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)



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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3, 5,7,10,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 4 and 8 for Dual Entry.
4. Enable Simultaneous Gap-Out for all phases.
5. Program phases 2 and 6 for Variable Initial and Gap Reduction.
6. Program phases 2 and 6 for Start Up In Green.
7. Program phases 2 and 6 for Yellow Flash, and overlap 1 as Wag Overlaps.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S4,S5,S6,S8,S9,S12
PHASES USED.....1,2,4,5,6,8
OVERLAP "A".....1+2
OVERLAP "B".....NOT USED
OVERLAP "C".....5+6
OVERLAP "D".....NOT USED

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A[1]	TB2-1,2	I1U	56	18	1	1	Y	Y			15
	-	J4U	48	10	26	6	Y	Y	Y		3
2A	TB2-9,10	I3U	63	25	32	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			10
5A[2]	TB3-1,2	J1U	55	17	5	5	Y	Y			15
	-	I4U	47	9	22	2	Y	Y	Y		3
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			10

[1] Add jumper from I1-W to J4-W, on rear of input file.

[2] Add jumper from J1-W to I4-W, on rear of input file.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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	NU	41,42	NU	51★	61,62	NU	NU	81,82	NU	11★	NU	NU	51★	NU	NU
RED		128			101			134			107							
YELLOW	*	129			102		*	135			108							
GREEN		130			103			136			109							
RED ARROW													A121			A114		
YELLOW ARROW													A122			A115		
FLASHING YELLOW ARROW													A123			A116		
GREEN ARROW	127						133											

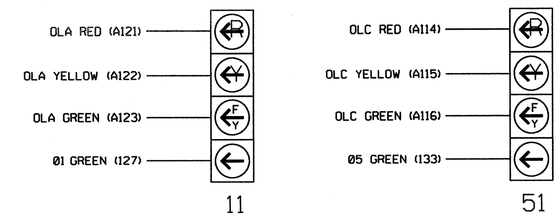
NU = Not Used

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

★ See pictorial of head wiring in detail below.

4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

The sequence display for signal heads 11 and 51 requires special logic programming. See sheet 2 of 2 for programming instructions.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGNS: 07-0925T1
07-0925T2
07-0925T3

DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Designs 1,2,3 (TMP Phases 1 & 2) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150
at
NC 150/
SR 2204 (Auburn Road)

Division 7 Guilford County Summerfield

PLAN DATE: August 2011	REVIEWED BY: JTR
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

John T. Rowe, Jr. 8-30-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-0925T1-T3

24-AUG-2011 12:09
S:\ITSS&S\WITS Signals\WorkGroups\Sig MonArmstrong\07D925_sml_ele_xxx.dgn
sarmstrong

LOGICAL I/O PROCESSOR PROGRAMMING DETAIL
TO PRODUCE SPECIAL FYA-PPLT SIGNAL SEQUENCE

(program controller as shown below)

1. FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, 3, 4, 5 AND 6.

2. FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).

```
LOGICAL I/O COMMAND #1  (+/-COMMAND#)
IF  ACTIVE PHASE        #1  IS ON
AND RED CLEAR ON PHASE  #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #50 ON
SET OUTPUT  ASSIGNMENT #51 OFF
```

NOTE: LOGIC FOR PHASE 1 RED CLEAR WHEN TRANSITIONING FROM PHASE 1 TO PHASE 2 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #2  (+/-COMMAND#)
IF  ACTIVE PHASE        #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #52 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 1 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #3  (+/-COMMAND#)
IF  YELLOW ON PHASE     #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #51 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 1 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #4  (+/-COMMAND#)
IF  ACTIVE PHASE        #5  IS ON
AND RED CLEAR ON PHASE  #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #42 ON
SET OUTPUT  ASSIGNMENT #43 OFF
```

NOTE: LOGIC FOR PHASE 5 RED CLEAR WHEN TRANSITIONING FROM PHASE 5 TO PHASE 6 (HEAD 51).

PRESS '+'

```
LOGICAL I/O COMMAND #5  (+/-COMMAND#)
IF  ACTIVE PHASE        #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #44 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 5 (HEAD 51).

PRESS '+'

```
LOGICAL I/O COMMAND #6  (+/-COMMAND#)
IF  YELLOW ON PHASE     #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #43 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 5 (HEAD 51).

LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

OUTPUT REFERENCE SCHEDULE

OUTPUT 42 = Overlap C Red
OUTPUT 43 = Overlap C Yellow
OUTPUT 44 = Overlap C Green
OUTPUT 50 = Overlap A Red
OUTPUT 51 = Overlap A Yellow
OUTPUT 52 = Overlap A Green

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

```
PAGE 1: VEHICLE OVERLAP 'A' SETTINGS
PHASE:          |123456789101112131415 16
VEH OVL PARENTS:|XX
VEH OVL NOT VEH:|
VEH OVL NOT PED:|
VEH OVL GRN EXT:|
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+' TWICE

```
PAGE 1: VEHICLE OVERLAP 'C' SETTINGS
PHASE:          |123456789101112131415 16
VEH OVL PARENTS:|   XX
VEH OVL NOT VEH:|
VEH OVL NOT PED:|
VEH OVL GRN EXT:|
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGNS: 07-0925T1
07-0925T2
07-0925T3

DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Designs 1,2,3 (TMP Phases 1 & 2) - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150
at
NC 150/
SR 2204 (Auburn Road)

Division 7 Guilford County Summerfield

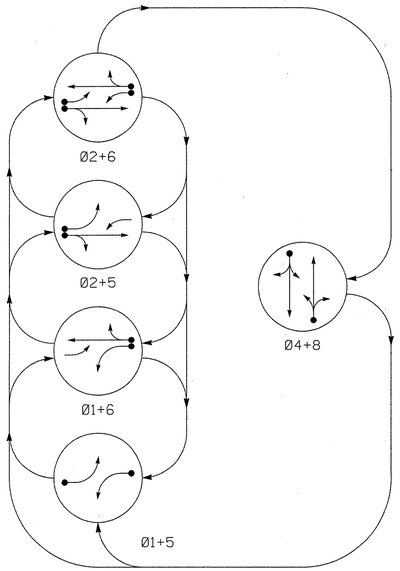
PLAN DATE: August 2011	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
John T. Rowe Jr 8-30-11
SIGNATURE DATE
SIG. INVENTORY NO. 07-0925T1-T3

24-AUG-2011 12:10
s:\ITS&SUM\ITS Signals\workgroups\Sig Mom\Armstrong\07092S_smule_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 46

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	04+8	FLASH
11	←	←	F	F	R	Y
21, 22	R	R	G	G	R	Y
41, 42	R	R	R	R	G	R
51	←	F	←	F	R	Y
61, 62	R	G	R	G	R	Y
81, 82	R	R	R	R	G	R

F = FLASHING YELLOW ARROW

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM	TO ← 1	TO ← 2	TO F 1	TO F 2	TO R 1	TO R 2
←	←	←	Y	Y	R	R
F	F	F	F	F	Y	R
R	R	R	R	R	R	R

F = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.

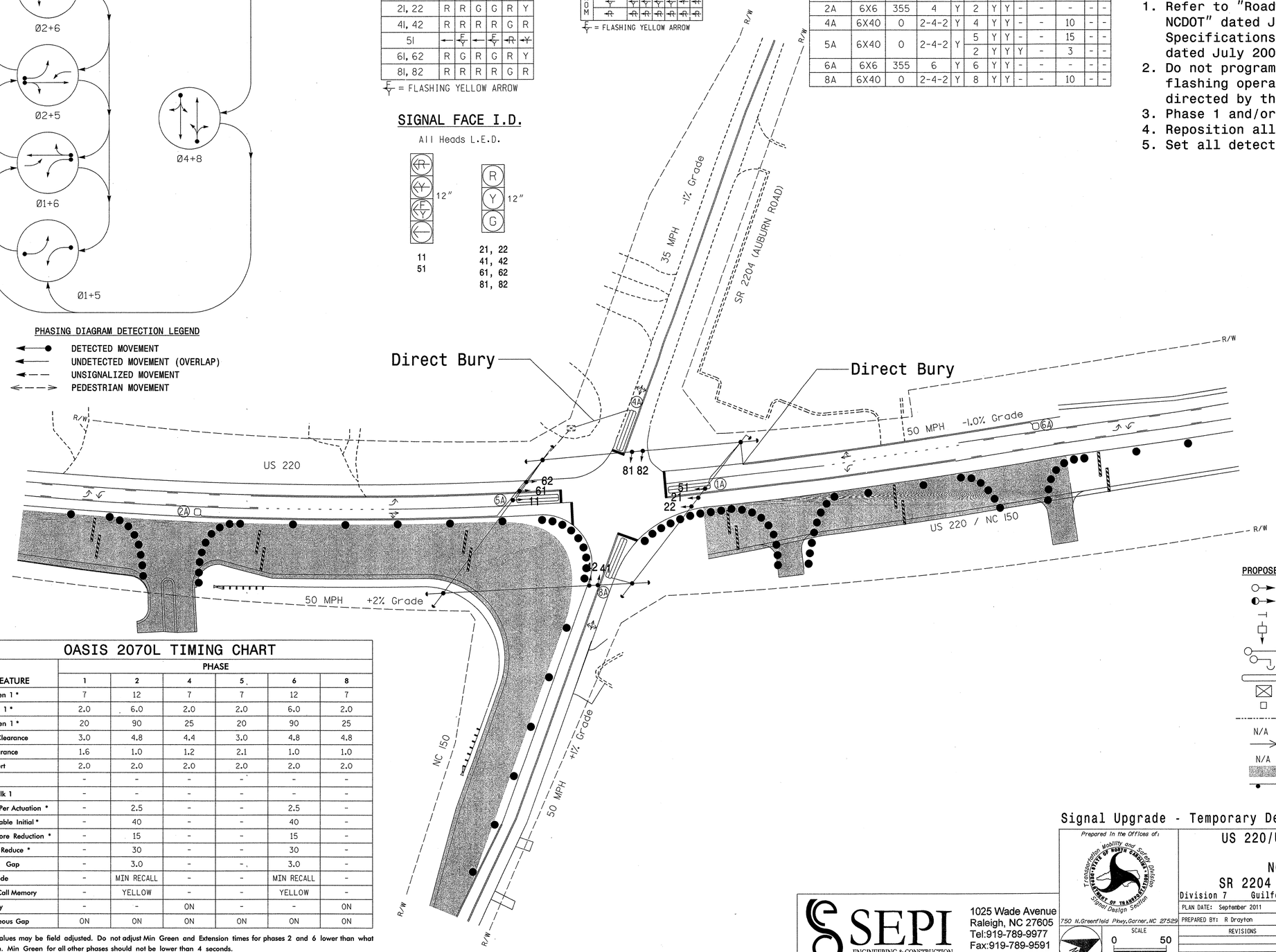
OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	-
					6	Y	Y	Y	-	3	-	-
2A	6X6	355	4	Y	2	Y	Y	-	-	-	-	-
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	10	-	-
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	-
					2	Y	Y	Y	-	3	-	-
6A	6X6	355	6	Y	6	Y	Y	-	-	-	-	-
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	10	-	-

5 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
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. Reposition all existing signal heads.
5. Set all detectors units to presence mode.



OASIS 2070L TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Min Green 1 *	7	12	7	7	12	7
Extension 1 *	2.0	6.0	2.0	2.0	6.0	2.0
Max Green 1 *	20	90	25	20	90	25
Yellow Clearance	3.0	4.8	4.4	3.0	4.8	4.8
Red Clearance	1.6	1.0	1.2	2.1	1.0	1.0
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	2.5	-	-	2.5	-
Max Variable Initial *	-	40	-	-	40	-
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	-	YELLOW	-	-	YELLOW	-
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	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.

LEGEND

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

Signal Upgrade - Temporary Design 2 (TMP Phase II, Step 1)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220/US 220-NC 150
at
NC 150 /
SR 2204 (Auburn Road)

Division 7 Guilford County Summerfield

PLAN DATE: September 2011
PREPARED BY: R Drayton
REVIEWED BY: J Hochanadel
REVIEWED BY:

REVISIONS	INIT.	DATE

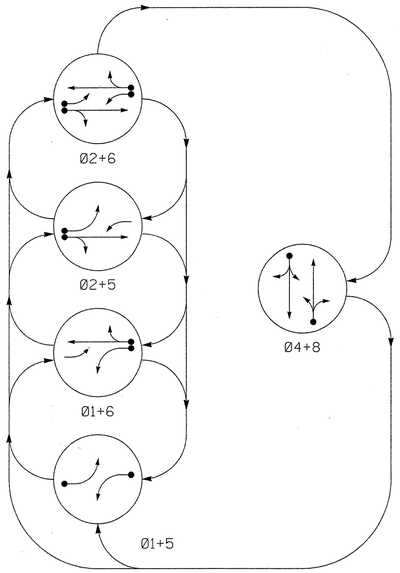
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 8/23/11 DATE
SIG. INVENTORY NO. 07-0925T2

$$$$SYSTIME$$$$
$$$$DGN$$$$
$$$$USERNAME$$$$

\Signal Design\07-0925T2.dgn 8/22/2011 3:04:51 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 47

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	F Y	F Y	R	Y
21, 22	R	R	G	G	R	Y
41, 42	R	R	R	R	G	R
51	←	F Y	←	F Y	R	Y
61, 62	R	G	R	G	R	Y
81, 82	R	R	R	R	G	R

F Y = FLASHING YELLOW ARROW

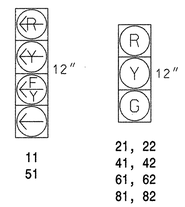
STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM	TO ← 1	← 2	F Y 1	F Y 2	R 1	R 2
←	←	←	Y	R	Y	R
F Y	F Y	F Y	F Y	F Y	Y	R
R	R	R	R	R	R	R

F Y = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



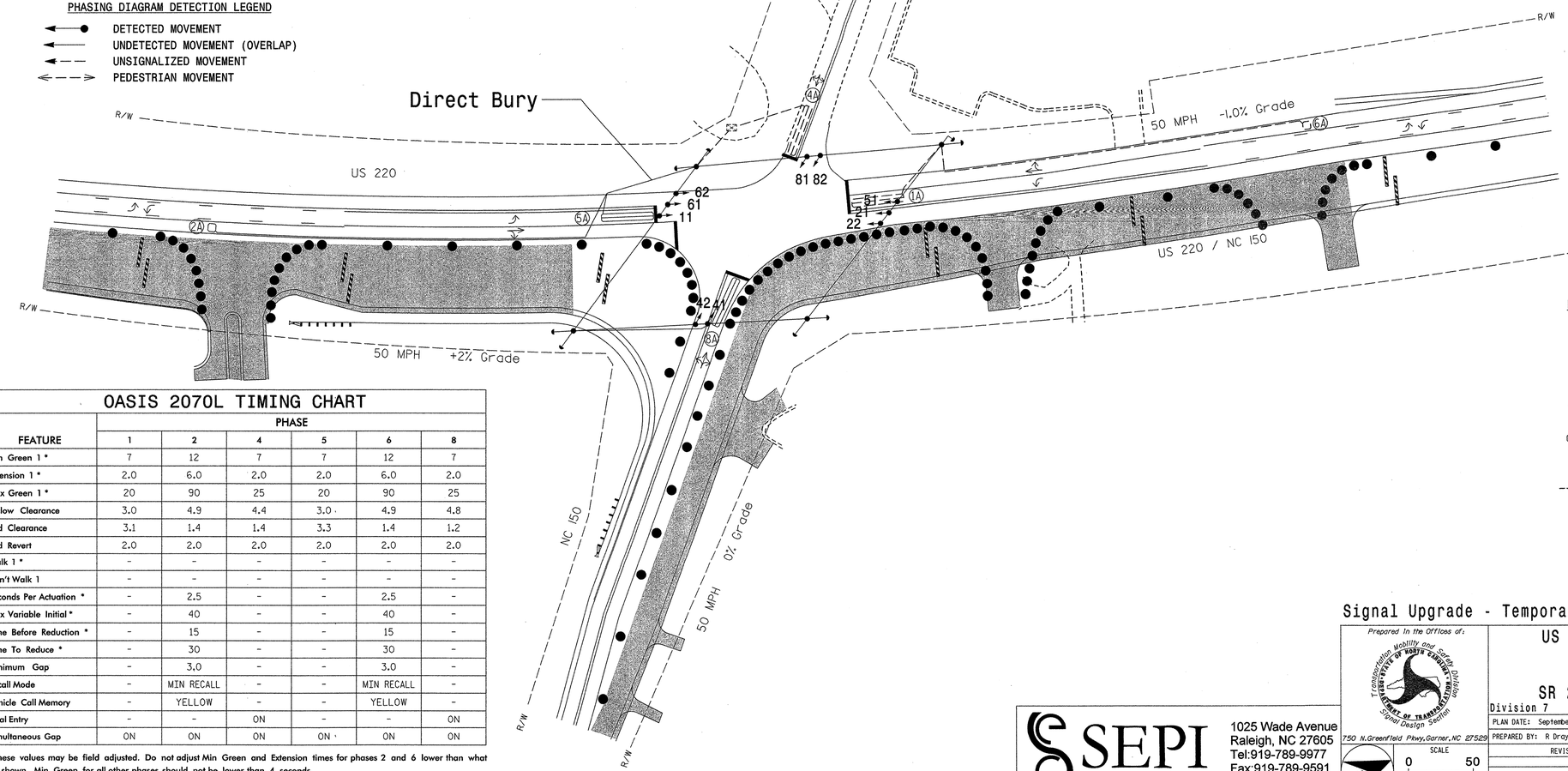
OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	-	1	Y	Y	-	-	15	-	-
					6	Y	Y	Y	-	3	-	-
2A	6X6	355	4	Y	2	Y	Y	-	-	-	-	-
4A	6X40	0	2-4-2	-	4	Y	Y	-	-	10	-	-
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	-
					2	Y	Y	Y	-	3	-	-
6A	6X6	355	5	-	6	Y	Y	-	-	-	-	-
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	10	-	-

5 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
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. Reposition existing signal heads numbered: 41, 42, 81, and 82.
5. Set all detectors units to presence mode.



LEGEND

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

OASIS 2070L TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Min Green 1 *	7	12	7	7	12	7
Extension 1 *	2.0	6.0	2.0	2.0	6.0	2.0
Max Green 1 *	20	90	25	20	90	25
Yellow Clearance	3.0	4.9	4.4	3.0	4.9	4.8
Red Clearance	3.1	1.4	1.4	3.3	1.4	1.2
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	2.5	-	-	2.5	-
Max Variable Initial *	-	40	-	-	40	-
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	-	YELLOW	-	-	YELLOW	-
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	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.

Signal Upgrade - Temporary Design 3 (TMP Phase II, Step 2)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
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Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220/US 220-NC 150 at NC 150 / SR 2204 (Auburn Road)

Division 7 Guilford County Summerfield

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 8/23/11 DATE
SIG. INVENTORY NO. 07-0925T3

$$$$SYSTIME$$$$
$$$$USERNAME$$$$

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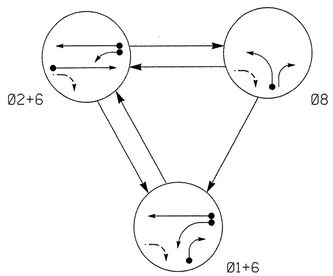
PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.48

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+6	PHASE Ø2+6	PHASE Ø8	FLASH
11	←	F↓	R	Y
21, 22	R	G	R	Y
61, 62	G	G	R	Y
81	R	R	G	R
82	R↘	R	G	R

F↓ = FLASHING YELLOW ARROW

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM	TO ←	TO F↓	TO R	TO ←	TO F↓	TO R
	1	2	1	2	1	2
←	~~←~~	~~←~~	~~Y~~	~~R~~	~~Y~~	~~R~~
F↓	~~F↓~~	~~F↓~~	~~F↓~~	~~F↓~~	~~Y~~	~~R~~
R	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~

F↓ = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.

*SEE NOTE 6

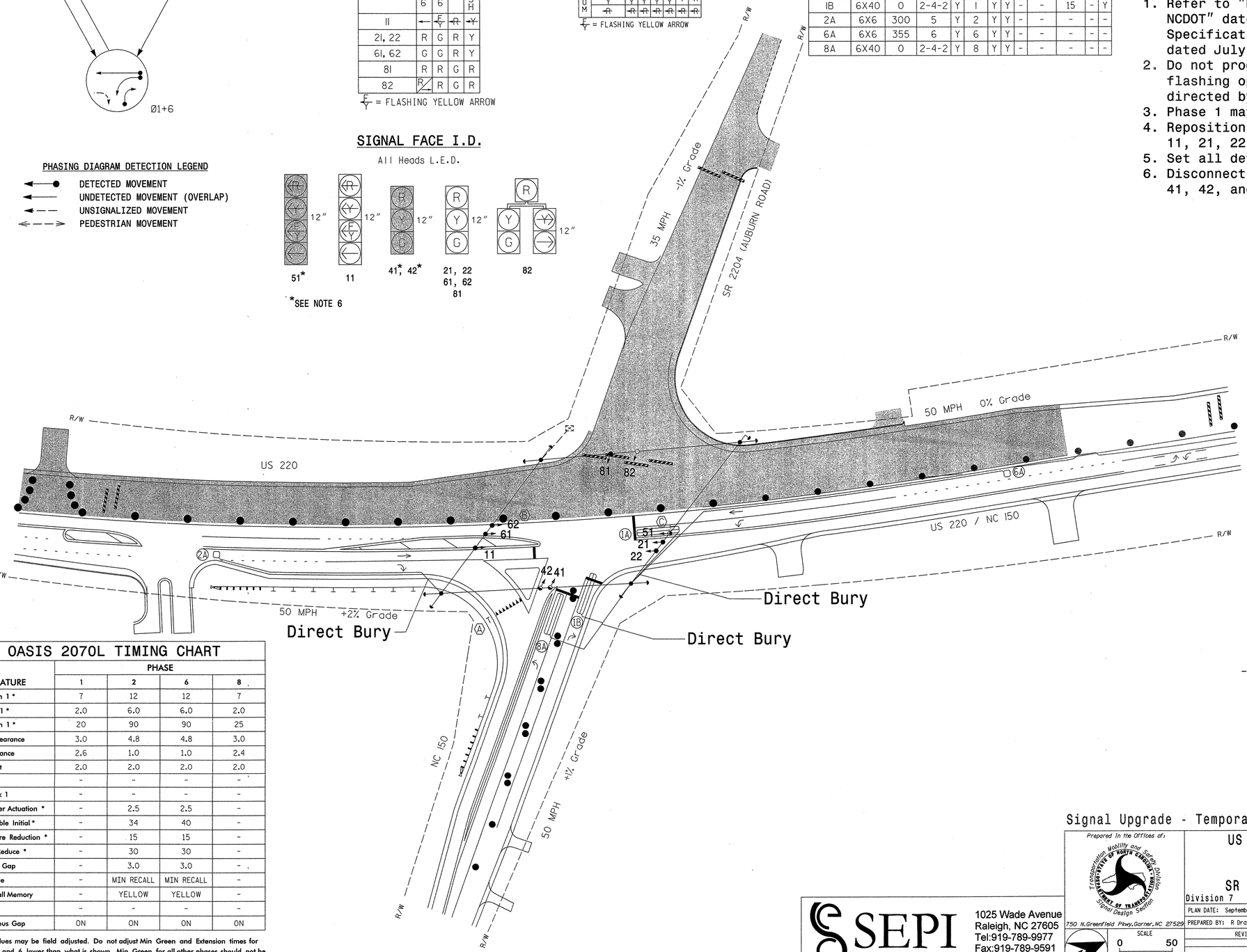
OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	-
					6	Y	Y	Y	-	3	-	-
1B	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	Y
2A	6X6	300	5	Y	2	Y	Y	-	-	-	-	-
6A	6X6	355	6	Y	6	Y	Y	-	-	-	-	-
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	-

3 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 may be lagged.
4. Reposition existing signal heads numbered: 11, 21, 22, 61, 62, and 81.
5. Set all detectors units to presence mode.
6. Disconnect and bag signal heads numbered: 41, 42, and 51.



OASIS 2070L TIMING CHART

FEATURE	PHASE 1	PHASE 2	PHASE 6	PHASE 8
Min Green 1 *	7	12	12	7
Extension 1 *	2.0	6.0	6.0	2.0
Max Green 1 *	20	90	90	25
Yellow Clearance	3.0	4.8	4.8	3.0
Red Clearance	2.6	1.0	1.0	2.4
Red Revert	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	2.5	2.5	-
Max Variable Initial *	-	34	40	-
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	-	YELLOW	YELLOW	-
Dual Entry	-	-	-	-
Simultaneous Gap	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.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Guardrail	
Ⓐ	Yield Sign (R1-2)	Ⓐ
Ⓑ	No Right Turn Sign (R3-1)	Ⓑ
Ⓒ	No Left Turn Sign (R3-2)	Ⓒ
	Construction Zone	
	Construction Zone Drums	

Signal Upgrade - Temporary Design 4 (TMP Phase III, Step 1)

SEPI ENGINEERING & CONSTRUCTION
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Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220/US 220-NC 150
at
NC 150 /
SR 2204 (Auburn Road)
Division 7 Guilford County Summerfield

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/23/11 DATE

SIG. INVENTORY NO. 07-0925T4

$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$$$DGNNAME$$$$$$

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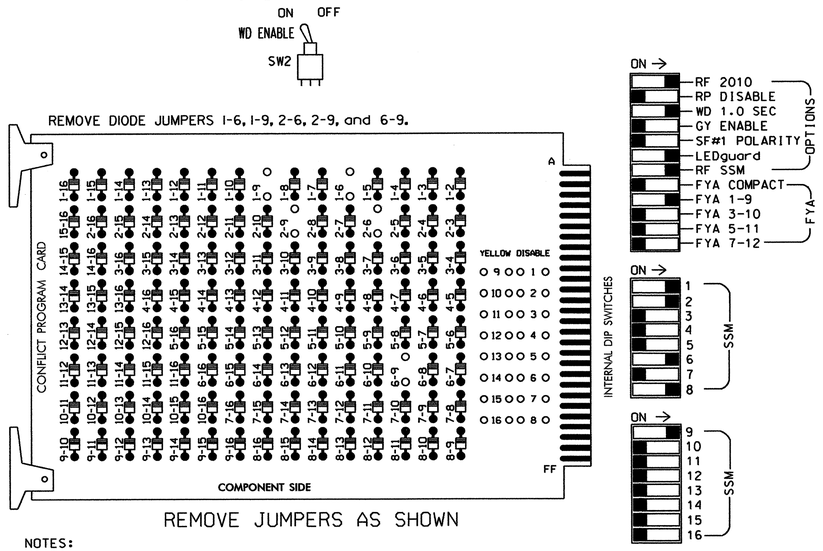
PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.49

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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. Make sure jumpers SEL2-SEL5 are present on the monitor board.

■ = 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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 3,4, 5,7,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Enable Simultaneous Gap-Out for all phases.
4. Program phases 2 and 6 for Variable Initial and Gap Reduction.
5. Program phases 2 and 6 for Start Up In Green.
6. Program phases 2 and 6 for Yellow Flash, and overlap 1 as Wag Overlaps.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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	NU	NU	NU	NU	61,62	NU	NU	81,82	NU	11★	NU	NU	NU	NU	NU
RED		✳	128						134			107							
YELLOW			129						135			108							
GREEN			130						136			109							
RED ARROW														A121					
YELLOW ARROW		126												A122					
FLASHING YELLOW ARROW														A123					
GREEN ARROW	127	127																	

NU = Not Used

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

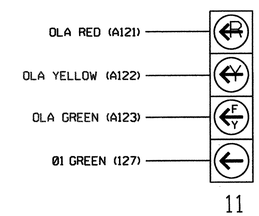
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S6,S8,S9
PHASES USED.....1,2,6,8
OVERLAP "A".....1+2
OVERLAP "B".....NOT USED
OVERLAP "C".....NOT USED
OVERLAP "D".....NOT USED

4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal head as shown)



NOTE

The sequence display for signal head 11 requires special logic programming. See sheet 2 of 2 for programming instructions.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø1 1A	Ø1 1B	Ø2 2A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L	NOT USED	NOT USED	NOT USED											ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	Ø6 6A	SLOT EMPTY	WIRED INPUT ⊗	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		NOT USED				NOT USED								

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

⊗ Wired Input - Do not populate slot with detector card

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A[1]	TB2-1,2	I1U	56	18	1	1	Y	Y			15
	-	J4U	48	10	26	6	Y	Y	Y		3
1B	TB2-5,6	I2U	39	1	2	1	Y	Y			15
2A	TB2-9,10	I3U	63	25	32	2	Y	Y			
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			

[1]Add jumper from I1-W to J4-W. on rear of input file.

! IMPORTANT! Remove jumper from J1-W to I4-W on rear of input file.

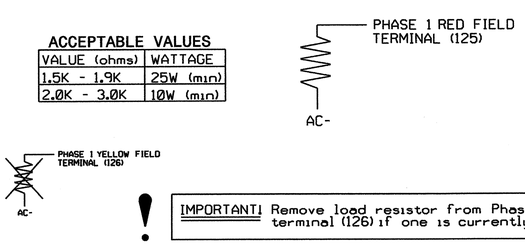
INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

ACCEPTABLE VALUES

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



! IMPORTANT! Remove load resistor from Phase 1 Yellow field terminal (126) if one is currently installed.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGNS: 07-0925T4
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 4 (TMP Phase 3, Step 1) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150
at
NC 150/
SR 2204 (Auburn Road)

Division 7 Guilford County Summerfield

PLAN DATE:	August 2011	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE DATE 8-30-11
SIG. INVENTORY NO. 07-0925T4

24-AUG-2011 12:13
S:\ITSSSU\ITS Signals\workgroups\SIG MonWarmstrong\07T0925_smlele_xxx.dgn
samstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 50

LOGICAL I/O PROCESSOR PROGRAMMING DETAIL
TO PRODUCE SPECIAL FYA-PPLT SIGNAL SEQUENCE

(program controller as shown below)

1. FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, AND 3.

2. FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).

```
  LOGICAL I/O COMMAND #1  (+/-COMMAND#)
IF  ACTIVE PHASE       #1  IS ON
AND RED CLEAR ON PHASE #1  IS ON

                SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #50 ON
SET OUTPUT  ASSIGNMENT #51 OFF
```

NOTE: LOGIC FOR PHASE 1 RED CLEAR WHEN TRANSITIONING FROM PHASE 1 TO PHASE 2 (HEAD 11).

PRESS '+'

```
  LOGICAL I/O COMMAND #2  (+/-COMMAND#)
IF  ACTIVE PHASE       #1  IS ON

                SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #52 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 1 (HEAD 11).

PRESS '+'

```
  LOGICAL I/O COMMAND #3  (+/-COMMAND#)
IF  YELLOW ON PHASE    #1  IS ON

                SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #51 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 1 (HEAD 11).

LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

OUTPUT REFERENCE SCHEDULE

OUTPUT 50 = Overlap A Red
OUTPUT 51 = Overlap A Yellow
OUTPUT 52 = Overlap A Green

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

```
 PAGE 1: VEHICLE OVERLAP 'A' SETTINGS
 PHASE:          |123456789101121314151 6
VEH OVL PARENTS: |XX
VEH OVL NOT VEH: |
VEH OVL NOT PED: |
VEH OVL GRN EXT: |
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+' TWICE

DELETE OVERLAP C PROGRAMMING

```
 PAGE 1: VEHICLE OVERLAP 'C' SETTINGS
 PHASE:          |123456789101121314151 6
VEH OVL PARENTS: |    XX
VEH OVL NOT VEH: |
VEH OVL NOT PED: |
VEH OVL GRN EXT: |
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGNS: 07-0925T4
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 4 (TMP Phase 3, Step 1) - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150
at
NC 150/
SR 2204 (Auburn Road)

Division 7 | Guilford County | Summerfield

PLAN DATE: August 2011	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

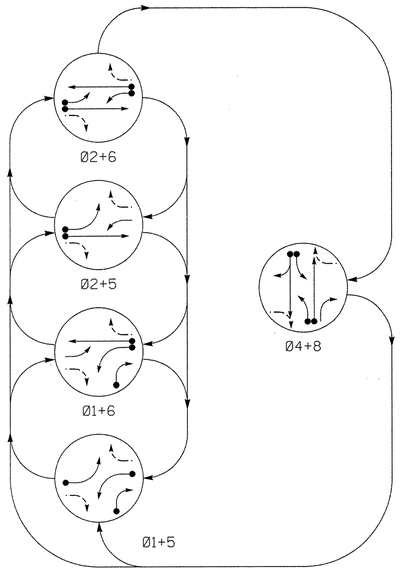
SIGNATURE | DATE: 8-30-11

SIG. INVENTORY NO. 07-0925T4

24-AUG-2011 12:14
S:#ITSSU#ITS Signals#Workgroups#Sig Mon#Armstrong#070925_sm_ele_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.51

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+05	01+06	02+05	02+06	04+08	FLASH
11	←	←	F	F	R	Y
21, 22	R	R	G	G	R	Y
41, 42	R	R	R	R	G	R
43	R	R	R	R	F	R
51	←	F	←	F	R	Y
61, 62	R	G	R	G	R	Y
81	R	R	R	R	G	R
82	R / R →		R	R	G	R
83	R	R	R	R	F	R

F = FLASHING YELLOW ARROW

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM	TO ← 1	TO ← 2	TO F 1	TO F 2	TO R 1	TO R 2
←	←	←	Y	R	Y	R
F	F	F	F	F	Y	R
R	R	R	R	R	R	R

F = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.

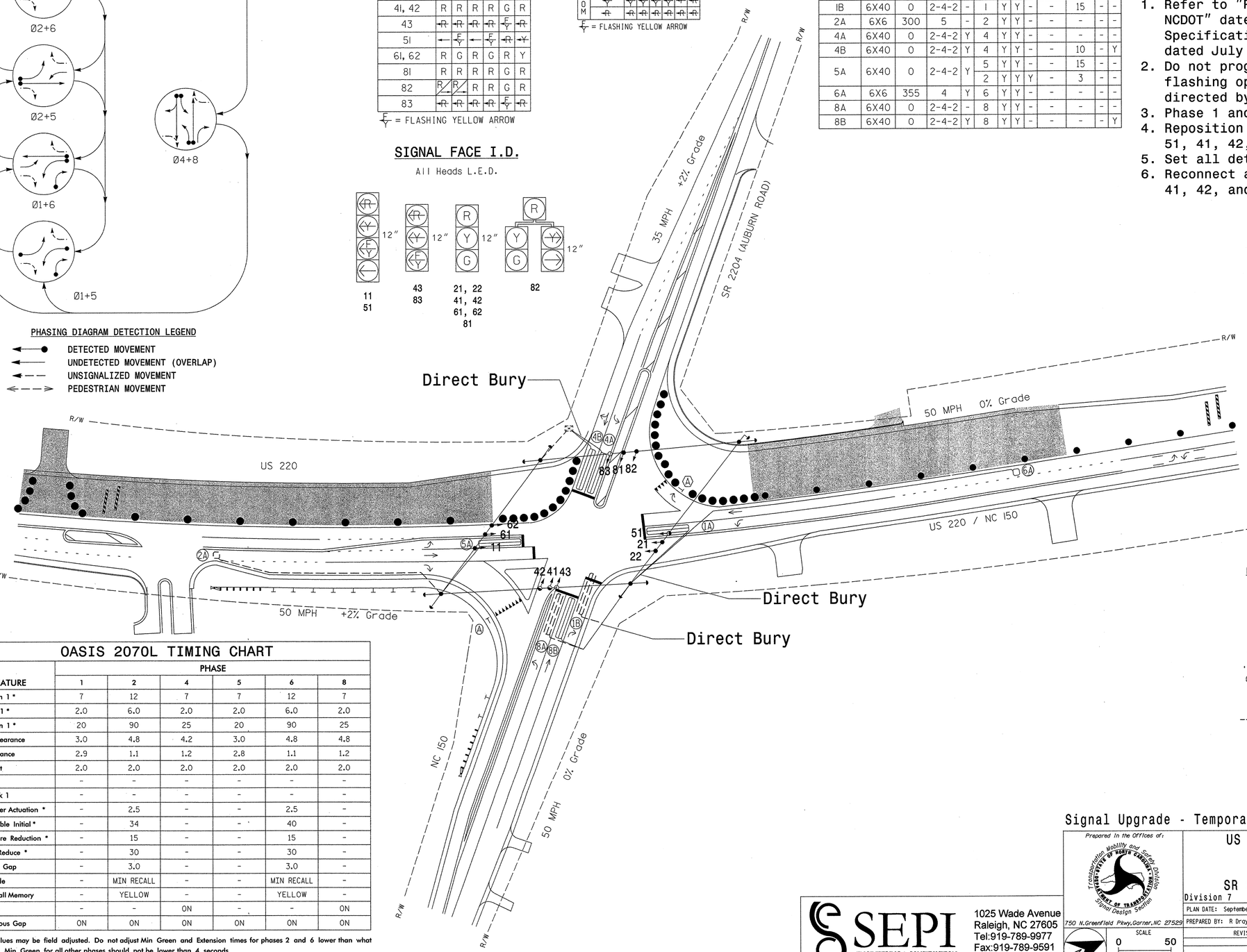
OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	-
					6	Y	Y	Y	-	3	-	-
1B	6X40	0	2-4-2	-	1	Y	Y	-	-	15	-	-
2A	6X6	300	5	-	2	Y	Y	-	-	-	-	-
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	-	-	-
4B	6X40	0	2-4-2	Y	4	Y	Y	-	-	10	-	Y
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	-
					2	Y	Y	Y	-	3	-	-
6A	6X6	355	4	Y	6	Y	Y	-	-	-	-	-
8A	6X40	0	2-4-2	-	8	Y	Y	-	-	-	-	-
8B	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	Y

5 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
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. Reposition existing signal heads numbered: 51, 41, 42, 81, and 82.
5. Set all detectors units to presence mode.
6. Reconnect and unbag signal heads numbered: 41, 42, and 51.



OASIS 2070L TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Min Green 1 *	7	12	7	7	12	7
Extension 1 *	2.0	6.0	2.0	2.0	6.0	2.0
Max Green 1 *	20	90	25	20	90	25
Yellow Clearance	3.0	4.8	4.2	3.0	4.8	4.8
Red Clearance	2.9	1.1	1.2	2.8	1.1	1.2
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	2.5	-	-	2.5	-
Max Variable Initial *	-	34	-	-	40	-
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	-	YELLOW	-	-	YELLOW	-
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	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.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Guardrail	
	Construction Zone	
	Construction Zone Drums	
	Yield Sign (R1-2)	

Signal Upgrade - Temporary Design 5 (TMP Phase III, Step 2)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220/US 220-NC 150
at
NC 150 /
SR 2204 (Auburn Road)
Division 7 Guilford County Summerfield

PLAN DATE: September 2011 | REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

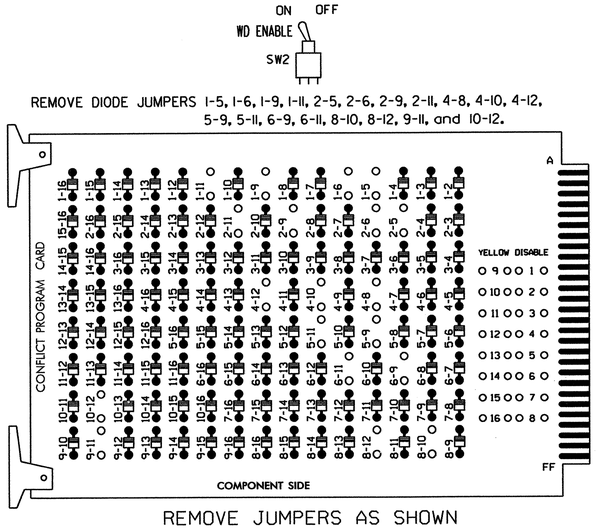
SIGNATURE 8/23/11 DATE
SIG. INVENTORY NO. 07-0925T5

$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.52

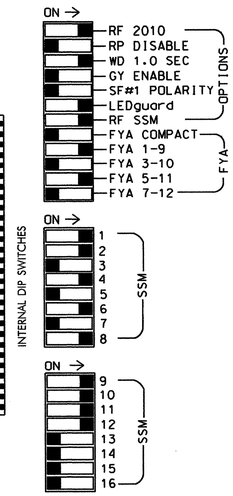
EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(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, 4-8, 4-10, 4-12, 5-9, 5-11, 6-9, 6-11, 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. Make sure jumpers SEL2-SEL5 are present on the monitor board.

■ = 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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 3,5, 7,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 4 and 8 for Dual Entry.
4. Enable Simultaneous Gap-Out for all phases.
5. Program phases 2 and 6 for Variable Initial and Gap Reduction.
6. Program phases 2 and 6 for Start Up In Green.
7. Program phases 2 and 6 for Yellow Flash, and overlaps 1 and 2 as Wag Overlaps.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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	NU	41,42	NU	51★	61,62	NU	NU	81,82	NU	11★	83★	NU	51★	43★	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												A122	A125		A115	A102	
FLASHING YELLOW ARROW														A123	A126		A116	A103	
GREEN ARROW	127	127						133											

NU = Not Used

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

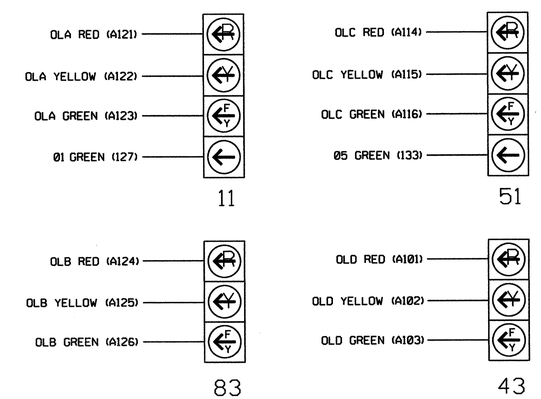
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S4,S5,S6,S8,S9,S10,S12,S13
PHASES USED.....1,2,4,5,6,8
OVERLAP "A".....1+2
OVERLAP "B".....4
OVERLAP "C".....5+6
OVERLAP "D".....8

3 & 4 SECTION FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

The sequence display for signal heads 11 and 51 requires special logic programming. See sheet 2 of 2 for programming instructions.

INPUT FILE POSITION LAYOUT

(front view)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I" U	Ø1 1A	Ø1 1B	Ø2 2A	WIRED INPUT ⊗	SLOT EMPTY	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
FILE "I" L	NOT USED	NOT USED	NOT USED			Ø4 4B								ST DC ISOLATOR
FILE "J" U	Ø5 5A	Ø6 6A	SLOT EMPTY	WIRED INPUT ⊗	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
FILE "J" L	NOT USED	NOT USED				Ø8 8B								

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

FS = FLASH SENSE
ST = STOP TIME

⊗ Wired Input - Do not populate slot with detector card

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A[1]	TB2-1,2	I1U	56	18	1	1	Y	Y			15
	-	J4U	48	10	26	6	Y	Y	Y		3
1B	TB2-5,6	I2U	39	1	2	1	Y	Y			15
2A	TB2-9,10	I3U	63	25	32	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			10
5A[2]	TB3-1,2	J1U	55	17	5	5	Y	Y			15
	-	I4U	47	9	22	2	Y	Y	Y		3
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			
8B	TB5-11,12	J6L	46	8	18	8	Y	Y			

[1] Add jumper from I1-W to J4-W, on rear of input file.

[2] Add jumper from J1-W to I4-W, on rear of input file.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

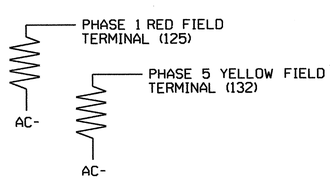
THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGNS: 07-0925T5
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

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)



Signal Upgrade - Temporary Design 5 (TMP Phase 3, Step 2) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150
at
NC 150/
SR 2204 (Auburn Road)

Division 7 | Guilford County | Summerfield

PLAN DATE: August 2011 | REVIEWED BY: JTR
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE | DATE 8-30-11

SIG. INVENTORY NO. 07-0925T5

24-AUG-2011 12:16
S:*TTSASU*ITS Signals*Workgroups*Sig Man*Armstrong*070925_sm_sele_xxx.dgn
armstrong

LOGICAL I/O PROCESSOR PROGRAMMING DETAIL
TO PRODUCE SPECIAL FYA-PPLT SIGNAL SEQUENCE

(program controller as shown below)

1. FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, 3, 4, 5 AND 6.
2. FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).

```
LOGICAL I/O COMMAND #1  (+/-COMMAND#)
IF  ACTIVE PHASE        #1  IS ON
AND RED CLEAR ON PHASE  #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #50 ON
SET OUTPUT  ASSIGNMENT #51 OFF
```

NOTE: LOGIC FOR PHASE 1 RED CLEAR WHEN TRANSITIONING FROM PHASE 1 TO PHASE 2 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #2  (+/-COMMAND#)
IF  ACTIVE PHASE        #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #52 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 1 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #3  (+/-COMMAND#)
IF  YELLOW ON PHASE     #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #51 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 1 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #4  (+/-COMMAND#)
IF  ACTIVE PHASE        #5  IS ON
AND RED CLEAR ON PHASE  #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #42 ON
SET OUTPUT  ASSIGNMENT #43 OFF
```

NOTE: LOGIC FOR PHASE 5 RED CLEAR WHEN TRANSITIONING FROM PHASE 5 TO PHASE 6 (HEAD 51).

PRESS '+'

```
LOGICAL I/O COMMAND #5  (+/-COMMAND#)
IF  ACTIVE PHASE        #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #44 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 5 (HEAD 51).

PRESS '+'

```
LOGICAL I/O COMMAND #6  (+/-COMMAND#)
IF  YELLOW ON PHASE     #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #43 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 5 (HEAD 51).

LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

OUTPUT REFERENCE SCHEDULE

OUTPUT 42 = Overlap C Red
OUTPUT 43 = Overlap C Yellow
OUTPUT 44 = Overlap C Green
OUTPUT 50 = Overlap A Red
OUTPUT 51 = Overlap A Yellow
OUTPUT 52 = Overlap A Green

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGNS: 07-0925T5
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

```
PAGE 1: VEHICLE OVERLAP 'A' SETTINGS
PHASE:          ¦1234567891011121314151 6
VEH OVL PARENTS:¦XX
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

← NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'B' SETTINGS
PHASE:          ¦1234567891011121314151 6
VEH OVL PARENTS:¦   X
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...N
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

← NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'C' SETTINGS
PHASE:          ¦1234567891011121314151 6
VEH OVL PARENTS:¦    XX
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

← NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'D' SETTINGS
PHASE:          ¦1234567891011121314151 6
VEH OVL PARENTS:¦        X
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...N
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

← NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

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.

Signal Upgrade - Temporary Design 5 (TMP Phase 3, Step 2) - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150
at
NC 150/
SR 2204 (Auburn Road)

Division 7 | Guilford County | Summerfield

PLAN DATE: August 2011	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

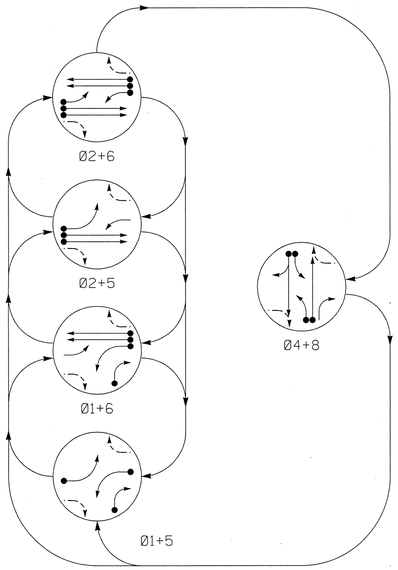
SIGNATURE: John T. Rowe, Jr. DATE: 8-30-11

SIG. INVENTORY NO. 07-0925T5

24-AUG-2011 12:17
S:\#ITS&SEM\ITS Signals\Workgroups\Sig Mgmt\Armstrong\070925_smu_e1a_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.54

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

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

F = FLASHING YELLOW ARROW

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM	TO ← 1	TO ← 2	TO F 1	TO F 2	TO R 1	TO R 2
←	←	←	Y	R	Y	R
F	F	F	F	F	Y	R
R	R	R	R	R	R	R

F = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.

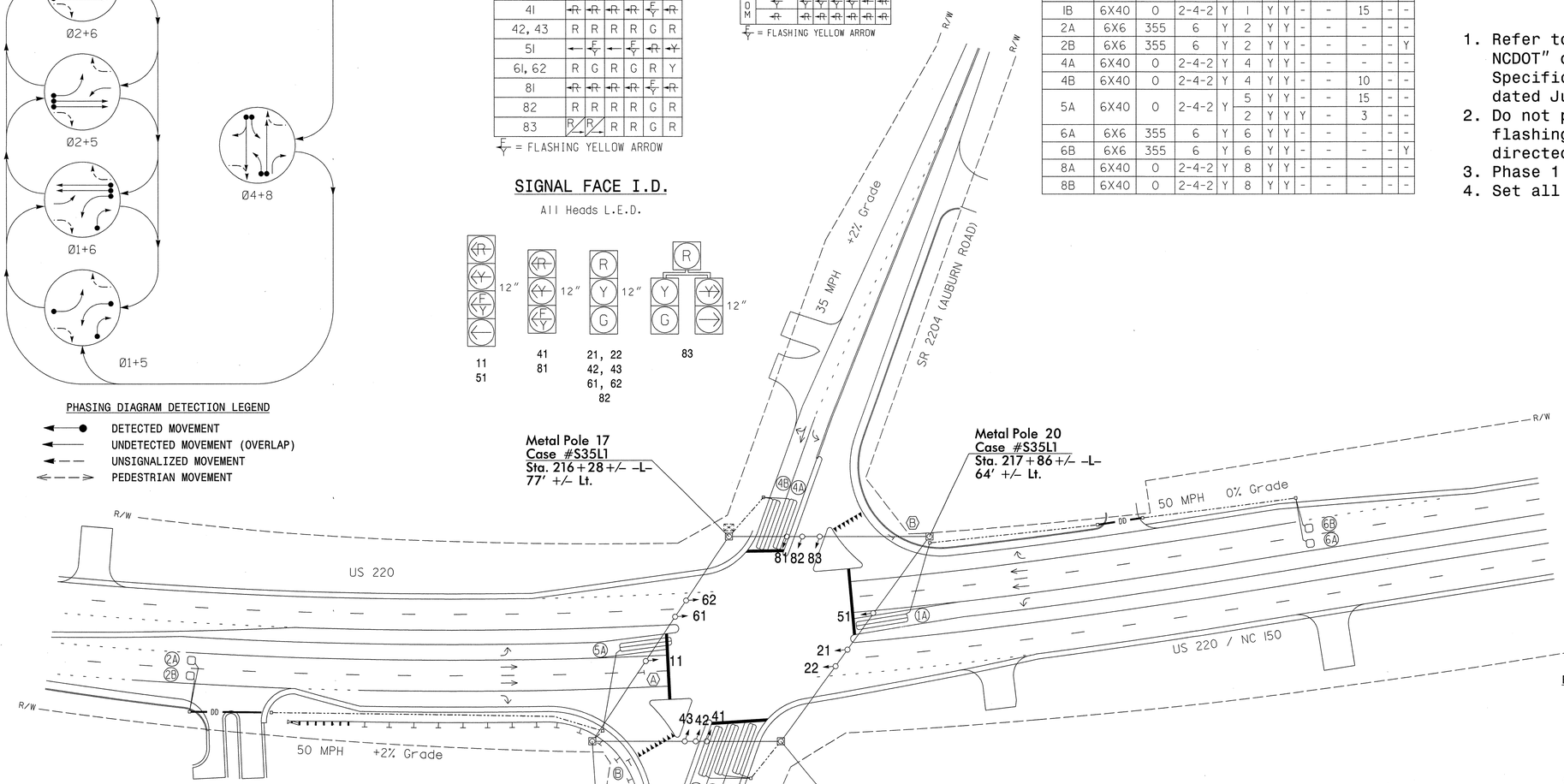
OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	-
					6	Y	Y	Y	-	3	-	-
1B	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	-
2A	6X6	355	6	Y	2	Y	Y	-	-	-	-	-
2B	6X6	355	6	Y	2	Y	Y	-	-	-	-	Y
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	-	-	-
4B	6X40	0	2-4-2	Y	4	Y	Y	-	-	10	-	-
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	-
					2	Y	Y	Y	-	3	-	-
6A	6X6	355	6	Y	6	Y	Y	-	-	-	-	-
6B	6X6	355	6	Y	6	Y	Y	-	-	-	-	Y
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	-
8B	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	-

5 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
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. Set all detector units to presence mode.



OASIS 2070L TIMING CHART

FEATURE	PHASE 1	PHASE 2	PHASE 4	PHASE 5	PHASE 6	PHASE 8
Min Green 1 *	7	12	7	7	12	7
Extension 1 *	2.0	6.0	2.0	2.0	6.0	2.0
Max Green 1 *	20	90	25	20	90	25
Yellow Clearance	3.2	4.8	4.2	3.1	4.8	4.8
Red Clearance	3.1	1.5	1.7	2.8	1.5	1.5
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	1.5	-	-	1.5	-
Max Variable Initial *	-	40	-	-	40	-
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	-	YELLOW	-	-	YELLOW	-
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	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.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Guardrail	
	Metal Strain Pole	
DD	Directional Drill	N/A
A	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	A
B	Yield Sign (R1-2)	B

Signal Upgrade - Final Design

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

US 220/US 220-NC 150
at
NC 150 /
SR 2204 (Auburn Road)
Division 7 Guilford County Summerfield

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

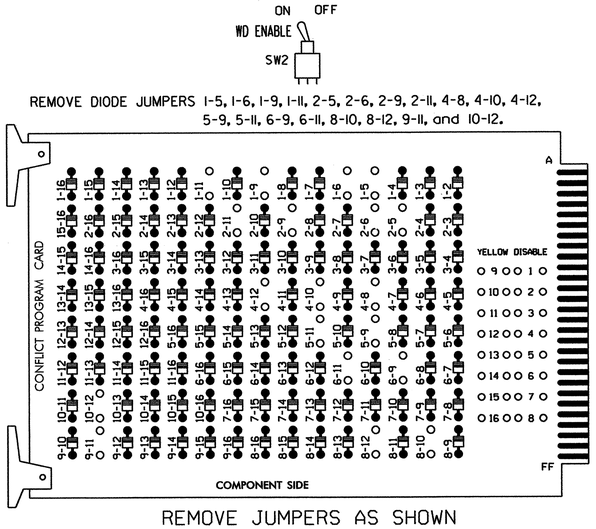
SIGNATURE DATE 8/23/11
SIG. INVENTORY NO. 07-0925

$$$$SYSTIME$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.55

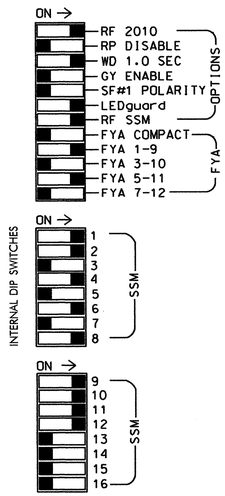
EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(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, 4-8, 4-10, 4-12, 5-9, 5-11, 6-9, 6-11, 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. Make sure jumpers SEL2-SEL5 are present on the monitor board.

■ = 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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 3,5, 7,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 4 and 8 for Dual Entry.
4. Enable Simultaneous Gap-Out for all phases.
5. Program phases 2 and 6 for Variable Initial and Gap Reduction.
6. Program phases 2 and 6 for Start Up In Green.
7. Program phases 2 and 6 for Yellow Flash, and overlaps 1 and 2 as Wag Overlaps.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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★	83	21,22	NU	NU	42,43	NU	51★	61,62	NU	NU	82,83	NU	11★	81★	NU	51★	41★	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												A122	A125		A115	A102	
FLASHING YELLOW ARROW														A123	A126		A116	A103	
GREEN ARROW	127	127						133											

NU = Not Used

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

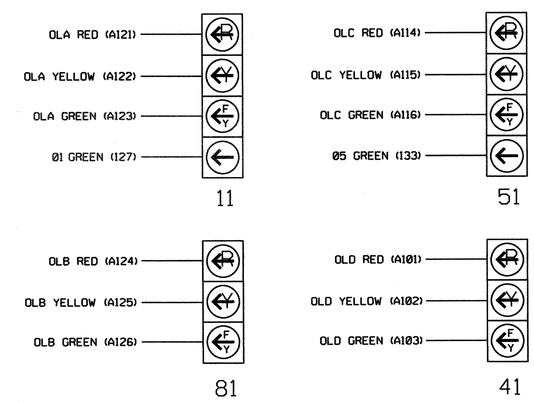
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S4,S5,S6,S8,S9,S10,S12,S13
PHASES USED.....1,2,4,5,6,8
OVERLAP "A".....1+2
OVERLAP "B".....4
OVERLAP "C".....5+6
OVERLAP "D".....8

3 & 4 SECTION FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

The sequence display for signal heads 11 and 51 requires special logic programming. See sheet 2 of 2 for programming instructions.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø1 1A	Ø1 1B	Ø2 2A	WIRED INPUT ⊗	SLOT EMPTY	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L	NOT USED	NOT USED	Ø2 2B			Ø4 4B								ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø6 6A	SLOT EMPTY	WIRED INPUT ⊗	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	Ø6 6B				Ø8 8B								

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

⊗ Wired Input - Do not populate slot with detector card

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A[1]	TB2-1,2	I1U	56	18	1	1	Y	Y			15
	-	J4U	48	10	26	6	Y	Y	Y		3
1B	TB2-5,6	I2U	39	1	2	1	Y	Y			15
2A	TB2-9,10	I3U	63	25	32	2	Y	Y			
2B	TB2-11,12	I3L	76	38	42	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			10
5A[2]	TB3-1,2	J1U	55	17	5	5	Y	Y			15
	-	I4U	47	9	22	2	Y	Y	Y		3
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			
6B	TB3-7,8	J2L	44	6	16	6	Y	Y			
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			
8B	TB5-11,12	J6L	46	8	18	8	Y	Y			

[1] Add jumper from I1-W to J4-W, on rear of input file.

[2] Add jumper from J1-W to I4-W, on rear of input file.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

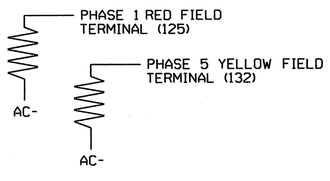
THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGNS: 07-0925
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

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)



Signal Upgrade - Final Design - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150
at
NC 150/
SR 2204 (Auburn Road)

Division 7 Guilford County Summerfield

PLAN DATE: August 2011	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
John T. Rowe 8-30-11
SIGNATURE DATE
SIG. INVENTORY NO. 07-0925

24-AUG-2011 12:20
S:*ITSASU*ITS Signals*Workgroups*Sig Man*Armstrong*070925_smuele_xxx.dgn
armstrong

LOGICAL I/O PROCESSOR PROGRAMMING DETAIL
TO PRODUCE SPECIAL FYA-PPLT SIGNAL SEQUENCE

(program controller as shown below)

1. FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, 3, 4, 5 AND 6.

2. FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).

```
LOGICAL I/O COMMAND #1  (+/-COMMAND#)
IF  ACTIVE PHASE        #1  IS ON
AND RED CLEAR ON PHASE  #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #50 ON
SET OUTPUT  ASSIGNMENT #51 OFF
```

NOTE: LOGIC FOR PHASE 1 RED CLEAR WHEN TRANSITIONING FROM PHASE 1 TO PHASE 2 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #2  (+/-COMMAND#)
IF  ACTIVE PHASE        #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #52 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 1 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #3  (+/-COMMAND#)
IF  YELLOW ON PHASE     #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #51 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 1 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #4  (+/-COMMAND#)
IF  ACTIVE PHASE        #5  IS ON
AND RED CLEAR ON PHASE  #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #42 ON
SET OUTPUT  ASSIGNMENT #43 OFF
```

NOTE: LOGIC FOR PHASE 5 RED CLEAR WHEN TRANSITIONING FROM PHASE 5 TO PHASE 6 (HEAD 51).

PRESS '+'

```
LOGICAL I/O COMMAND #5  (+/-COMMAND#)
IF  ACTIVE PHASE        #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #44 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 5 (HEAD 51).

PRESS '+'

```
LOGICAL I/O COMMAND #6  (+/-COMMAND#)
IF  YELLOW ON PHASE     #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #43 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 5 (HEAD 51).

LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

OUTPUT REFERENCE SCHEDULE

OUTPUT 42 = Overlap C Red
OUTPUT 43 = Overlap C Yellow
OUTPUT 44 = Overlap C Green
OUTPUT 50 = Overlap A Red
OUTPUT 51 = Overlap A Yellow
OUTPUT 52 = Overlap A Green

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGNS: 07-0925
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

```
PAGE 1: VEHICLE OVERLAP 'A' SETTINGS
PHASE:          |123456789101112131415 16
VEH OVL PARENTS:|XX
VEH OVL NOT VEH:|
VEH OVL NOT PED:|
VEH OVL GRN EXT:|
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'B' SETTINGS
PHASE:          |123456789101112131415 16
VEH OVL PARENTS:|  X
VEH OVL NOT VEH:|
VEH OVL NOT PED:|
VEH OVL GRN EXT:|
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...N
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'C' SETTINGS
PHASE:          |123456789101112131415 16
VEH OVL PARENTS:|    XX
VEH OVL NOT VEH:|
VEH OVL NOT PED:|
VEH OVL GRN EXT:|
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'D' SETTINGS
PHASE:          |123456789101112131415 16
VEH OVL PARENTS:|       X
VEH OVL NOT VEH:|
VEH OVL NOT PED:|
VEH OVL GRN EXT:|
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...N
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

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.

Signal Upgrade - Final Design - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150
at
NC 150/
SR 2204 (Auburn Road)

Division 7 | Guilford County | Summerfield

PLAN DATE: August 2011	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

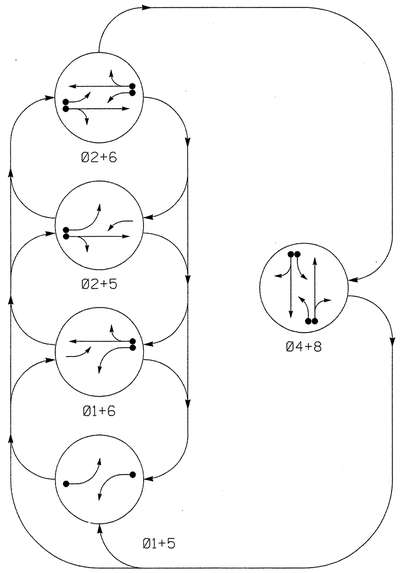
SIGNATURE | DATE 8-30-11

SIG. INVENTORY NO. 07-0925

24-AUG-2011 12:21
S:#ITS&SU#ITS Signals#Workgroups#Sig Mon#Armstrong#070925_smu01_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 57

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

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

F = FLASHING YELLOW ARROW

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM \ TO	← 1	F 2	← 1	F 2	R 1	R 2
←	←	←	Y	R	Y	R
F	F	F	F	F	Y	R
R	R	R	R	R	R	R

F = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.

11
51

41
81

21, 22
42, 43
61, 62
82, 83

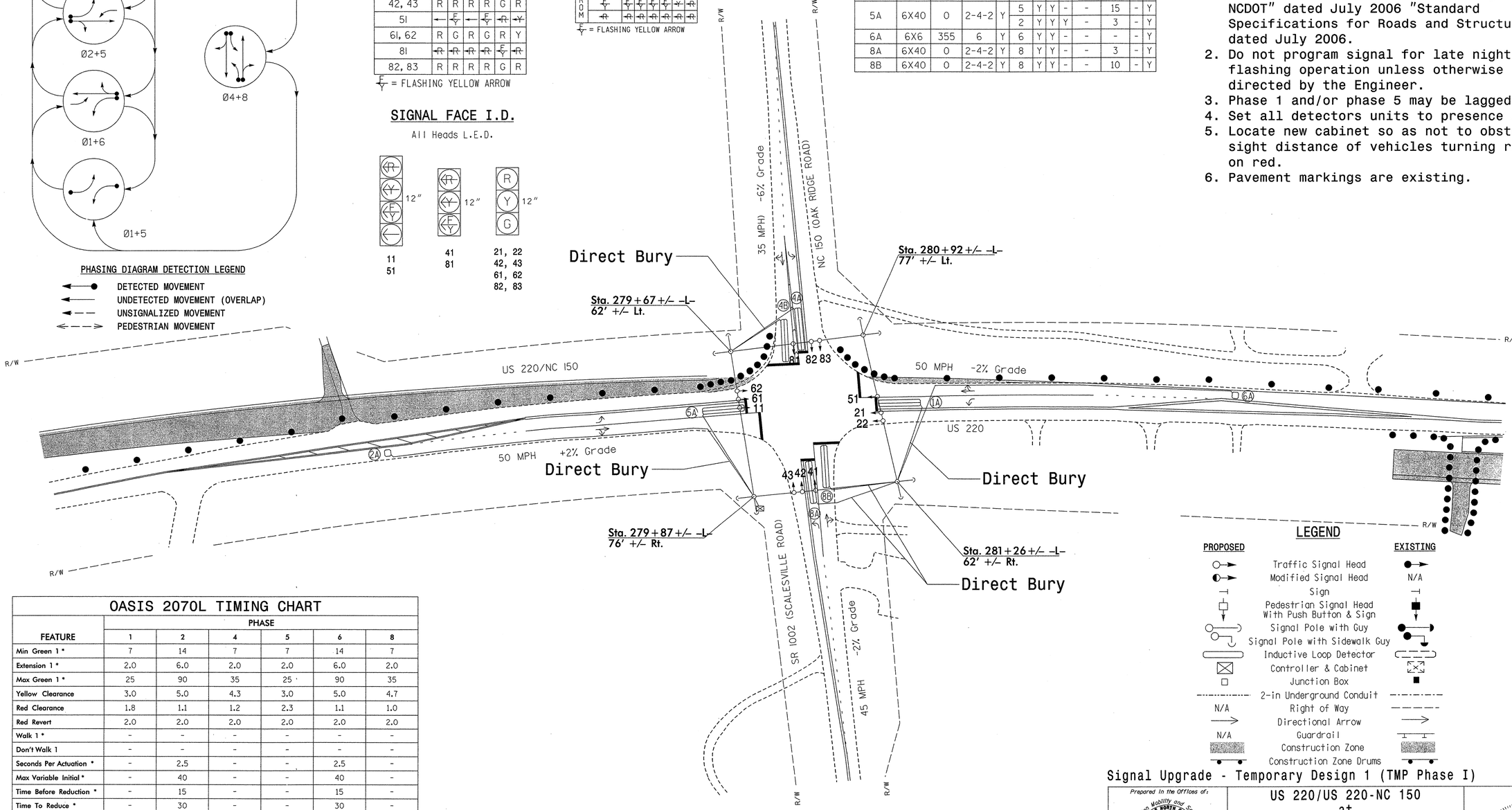
OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	Y
					6	Y	Y	Y	-	3	-	Y
2A	6X6	355	6	Y	2	Y	Y	-	-	-	-	Y
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	3	-	Y
4B	6X40	0	2-4-2	Y	4	Y	Y	-	-	10	-	Y
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
					2	Y	Y	Y	-	3	-	Y
6A	6X6	355	6	Y	6	Y	Y	-	-	-	-	Y
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	3	-	Y
8B	6X40	0	2-4-2	Y	8	Y	Y	-	-	10	-	Y

5 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
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. Set all detectors units to presence mode.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Pavement markings are existing.



LEGEND

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

OASIS 2070L TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Min Green 1 *	7	14	7	7	14	7
Extension 1 *	2.0	6.0	2.0	2.0	6.0	2.0
Max Green 1 *	25	90	35	25	90	35
Yellow Clearance	3.0	5.0	4.3	3.0	5.0	4.7
Red Clearance	1.8	1.1	1.2	2.3	1.1	1.0
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	2.5	-	-	2.5	-
Max Variable Initial *	-	40	-	-	40	-
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	-	YELLOW	-	-	YELLOW	-
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON	ON

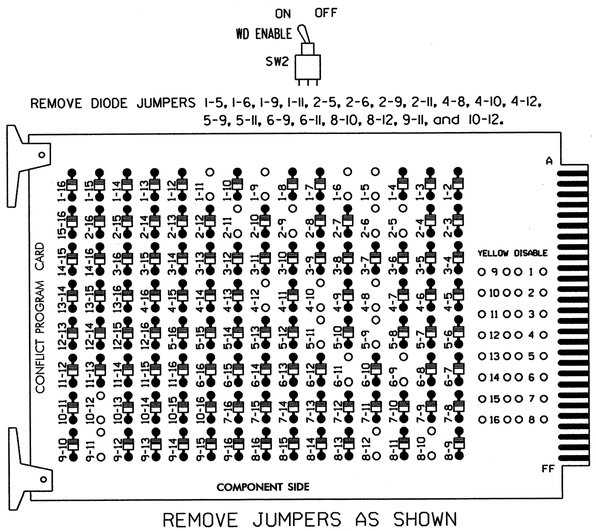
* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

$$$$$$$SYSTIME$$$$$
$$$$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.58

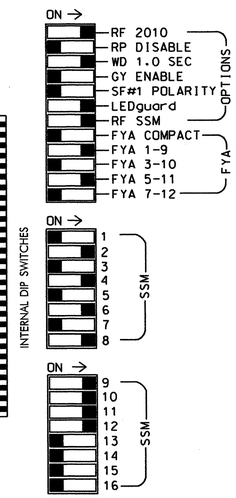
EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(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, 4-8, 4-10, 4-12, 5-9, 5-11, 6-9, 6-11, 8-10, 8-12, 9-11, and 10-12.

REMOVE JUMPERS AS SHOWN



■ = DENOTES POSITION OF SWITCH

NOTES:

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

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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3, 5,7,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 4 and 8 for Dual Entry.
4. Enable Simultaneous Gap-Out for all phases.
5. Program phases 2 and 6 for Variable Initial and Gap Reduction.
6. Program phases 2 and 6 for Start Up In Green.
7. Program phases 2 and 6 for Yellow Flash, and overlaps 1 and 2 as Wag Overlaps.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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	NU	42,43	NU	51★	61,62	NU	NU	82,83	NU	11★	81★	NU	51★	41★	NU
RED		128			101			134			107							
YELLOW	✳	129			102		✳	135			108							
GREEN		130			103			136			109							
RED ARROW													A121	A124		A114	A101	
YELLOW ARROW													A122	A125		A115	A102	
FLASHING YELLOW ARROW													A123	A126		A116	A103	
GREEN ARROW	127						133											

NU = Not Used

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

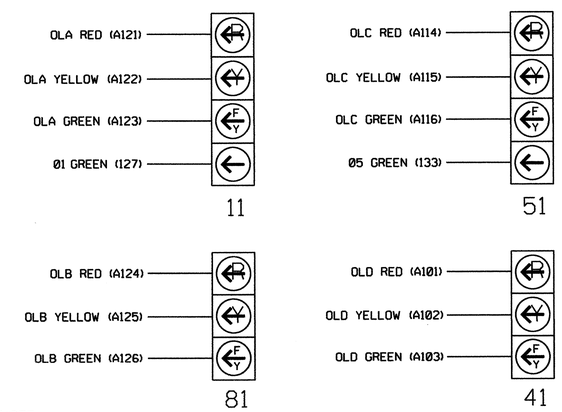
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S4,S5,S6,S8,S9,S10,S12,S13
PHASES USED.....1,2,4,5,6,8
OVERLAP "A".....1+2
OVERLAP "B".....4
OVERLAP "C".....5+6
OVERLAP "D".....8

3 & 4 SECTION FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

The sequence display for signal heads 11 and 51 requires special logic programming. See sheet 2 of 2 for programming instructions.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø1	SLOT	Ø2	WIRED ⊗ INPUT	SLOT	Ø4	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS
		1A	EMPTY	2A		EMPTY	4A	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	DC ISOLATOR
	L	NOT USED		NOT USED			Ø4 4B								ST DC ISOLATOR
FILE "J"	U	Ø5	SLOT	Ø6	WIRED ⊗ INPUT	SLOT	Ø8	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
		5A	EMPTY	6A		EMPTY	8A	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
	L	NOT USED		NOT USED			Ø8 8B								

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

FS = FLASH SENSE
ST = STOP TIME

⊗ Wired Input - Do not populate slot with detector card

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A[1]	TB2-1,2	I1U	56	18	1	1	Y	Y			15
	-	J4U	48	10	26	6	Y	Y	Y		3
2A	TB2-9,10	I3U	63	25	32	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			3
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			10
5A[2]	TB3-1,2	J1U	55	17	5	5	Y	Y			15
	-	I4U	47	9	22	2	Y	Y	Y		3
6A	TB3-9,10	J3U	64	26	36	6	Y	Y			
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			3
8B	TB5-11,12	J6L	46	8	18	8	Y	Y			10

[1] Add jumper from I1-W to J4-W, on rear of input file.

[2] Add jumper from J1-W to I4-W, on rear of input file.

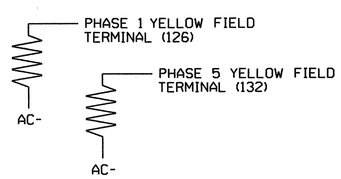
INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

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)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGNS: 07-0924T1
07-0924T2
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Designs 1,2 (TMP Phases 1,2) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150 at NC 150 (Oak Ridge Road)/ SR 1002 (Scalesville Road)

Division 7 | Guilford County | Summerfield

PLAN DATE: August 2011 | REVIEWED BY: JTR
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE | DATE 8-30-11

SIG. INVENTORY NO. 07-0924T1,T2

24-AUG-2011 13:10
S:\Mission\Projects\Sig Mon\Armstrong\07924_smple_xxx.dgn
Armstrong

LOGICAL I/O PROCESSOR PROGRAMMING DETAIL
TO PRODUCE SPECIAL FYA-PPLT SIGNAL SEQUENCE

(program controller as shown below)

1. FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, 3, 4, 5 AND 6.
2. FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).

```
LOGICAL I/O COMMAND #1  (+/-COMMAND#)
IF  ACTIVE PHASE        #1  IS ON
AND RED CLEAR ON PHASE  #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #50 ON
SET OUTPUT  ASSIGNMENT #51 OFF
```

NOTE: LOGIC FOR PHASE 1 RED CLEAR WHEN TRANSITIONING FROM PHASE 1 TO PHASE 2 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #2  (+/-COMMAND#)
IF  ACTIVE PHASE        #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #52 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 1 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #3  (+/-COMMAND#)
IF  YELLOW ON PHASE     #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #51 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 1 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #4  (+/-COMMAND#)
IF  ACTIVE PHASE        #5  IS ON
AND RED CLEAR ON PHASE  #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #42 ON
SET OUTPUT  ASSIGNMENT #43 OFF
```

NOTE: LOGIC FOR PHASE 5 RED CLEAR WHEN TRANSITIONING FROM PHASE 5 TO PHASE 6 (HEAD 51).

PRESS '+'

```
LOGICAL I/O COMMAND #5  (+/-COMMAND#)
IF  ACTIVE PHASE        #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #44 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 5 (HEAD 51).

PRESS '+'

```
LOGICAL I/O COMMAND #6  (+/-COMMAND#)
IF  YELLOW ON PHASE     #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #43 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 5 (HEAD 51).

LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

OUTPUT REFERENCE SCHEDULE

OUTPUT 42 = Overlap C Red
OUTPUT 43 = Overlap C Yellow
OUTPUT 44 = Overlap C Green
OUTPUT 50 = Overlap A Red
OUTPUT 51 = Overlap A Yellow
OUTPUT 52 = Overlap A Green

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-0924T1
07-0924T2
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

```
PAGE 1: VEHICLE OVERLAP 'A' SETTINGS
PHASE:              |123456789101112131415 16
VEH OVL PARENTS:    |XX
VEH OVL NOT VEH:    |
VEH OVL NOT PED:    |
VEH OVL GRN EXT:    |
STARTUP COLOR:  _ RED  _ YELLOW  _ GREEN
FLASH COLORS:   _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'B' SETTINGS
PHASE:              |123456789101112131415 16
VEH OVL PARENTS:    |  X
VEH OVL NOT VEH:    |
VEH OVL NOT PED:    |
VEH OVL GRN EXT:    |
STARTUP COLOR:  _ RED  _ YELLOW  _ GREEN
FLASH COLORS:   _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...N
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'C' SETTINGS
PHASE:              |123456789101112131415 16
VEH OVL PARENTS:    |    XX
VEH OVL NOT VEH:    |
VEH OVL NOT PED:    |
VEH OVL GRN EXT:    |
STARTUP COLOR:  _ RED  _ YELLOW  _ GREEN
FLASH COLORS:   _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'D' SETTINGS
PHASE:              |123456789101112131415 16
VEH OVL PARENTS:    |        X
VEH OVL NOT VEH:    |
VEH OVL NOT PED:    |
VEH OVL GRN EXT:    |
STARTUP COLOR:  _ RED  _ YELLOW  _ GREEN
FLASH COLORS:   _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...N
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

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.

Signal Upgrade - Temporary Designs 1,2 (TMP Phases 1,2) - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150
at
NC 150 (Oak Ridge Road)/
SR 1002 (Scalesville Road)

Division 7 | Guilford County | Summerfield

PLAN DATE: August 2011 | REVIEWED BY: JTR
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

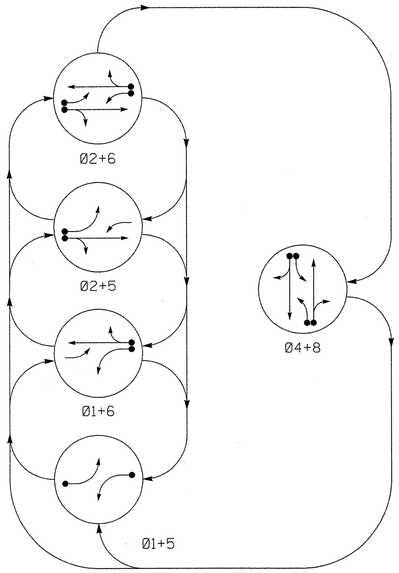
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE | DATE 8-30-11
SIG. INVENTORY NO. 07-0924T1,T2

24-AUG-2011 13:10
S:\TTSS3\MTS Signals\Workgroups\Sig Mom\Armstrong\070924_smu_ele_xxx.dgn
samstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.60

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

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

FY = FLASHING YELLOW ARROW

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM \ TO	←	FY	↱		
	1	2	1	2	1	2
←	←	←	Y	↱	Y	↱
FY	FY	FY	FY	FY	Y	↱
↱	↱	↱	↱	↱	↱	↱

FY = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.

11
51

41
81

21, 22
42, 43
61, 62
82, 83

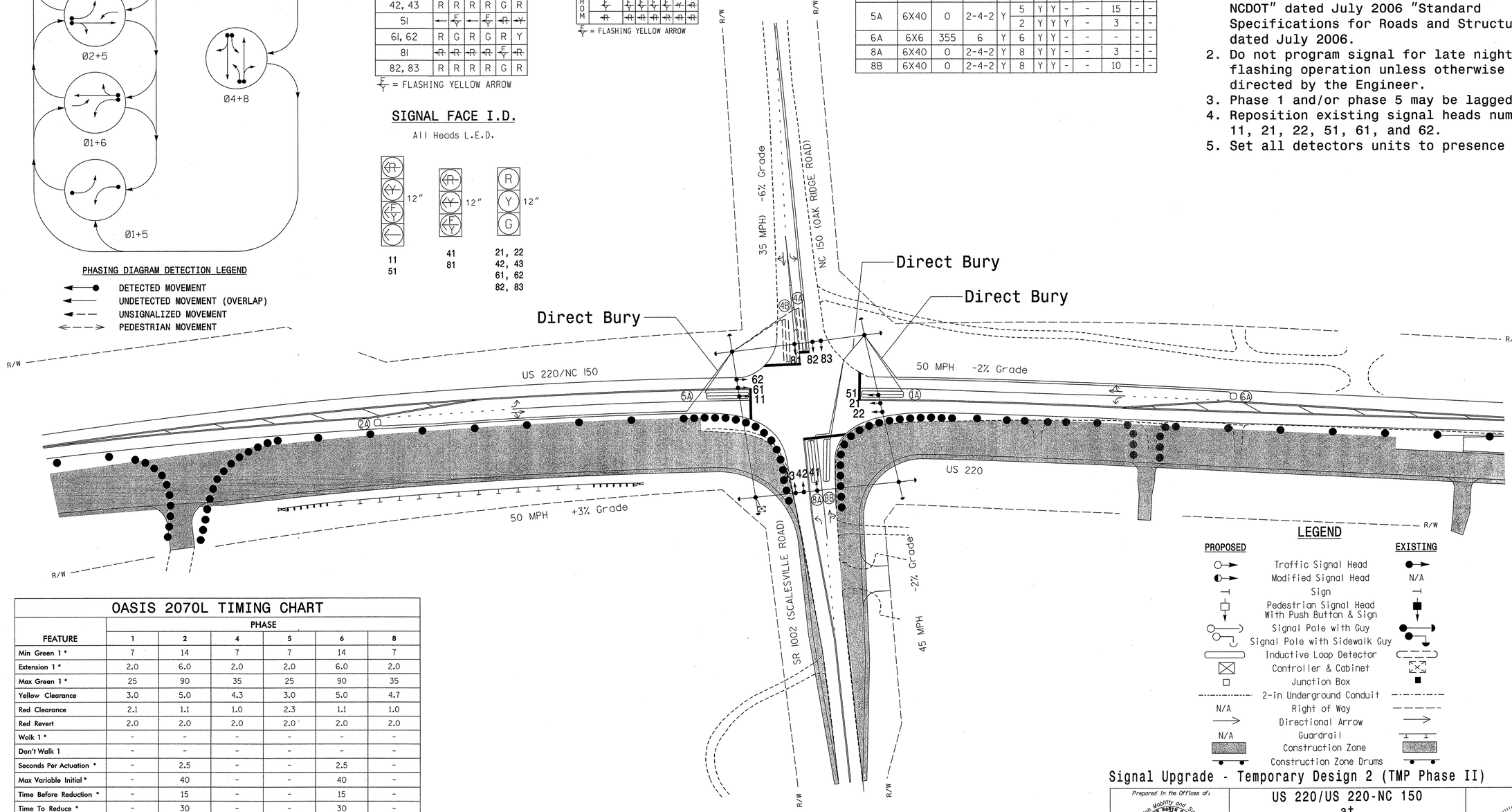
OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	-
					6	Y	Y	Y	-	3	-	-
2A	6X6	355	6	Y	2	Y	Y	-	-	-	-	-
4A	6X40	0	2-4-2	-	4	Y	Y	-	-	3	-	-
4B	6X40	0	2-4-2	-	4	Y	Y	-	-	10	-	-
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	-
					2	Y	Y	Y	-	3	-	-
6A	6X6	355	6	Y	6	Y	Y	-	-	-	-	-
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	3	-	-
8B	6X40	0	2-4-2	Y	8	Y	Y	-	-	10	-	-

5 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
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. Reposition existing signal heads numbered: 11, 21, 22, 51, 61, and 62.
5. Set all detectors units to presence mode.



LEGEND

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

OASIS 2070L TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Min Green 1 *	7	14	7	7	14	7
Extension 1 *	2.0	6.0	2.0	2.0	6.0	2.0
Max Green 1 *	25	90	35	25	90	35
Yellow Clearance	3.0	5.0	4.3	3.0	5.0	4.7
Red Clearance	2.1	1.1	1.0	2.3	1.1	1.0
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	2.5	-	-	2.5	-
Max Variable Initial *	-	40	-	-	40	-
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	-	YELLOW	-	-	YELLOW	-
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	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.

$$$$$SYSTIME$$$$$
$$$$$USERNAME$$$$$

Signal Upgrade - Temporary Design 2 (TMP Phase II)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
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License #: C-2197

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

SCALE 0 50 1"=50'

US 220/US 220-NC 150 at NC 150 (Oak Ridge Road)/ SR 1002 (Scalesville Road)

Division 7 Guilford County Summerfield

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

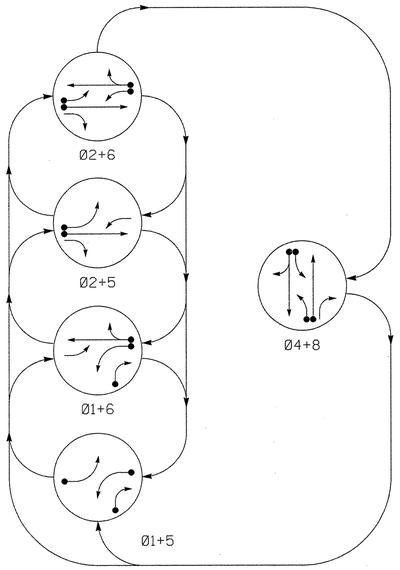
SIGNATURE 8/23/11 DATE

SIG. INVENTORY NO. 07-0924T2

...\Signal Design\07-0924T2.dgn 8/22/2011 3:07:37 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.61

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

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

F = FLASHING YELLOW ARROW

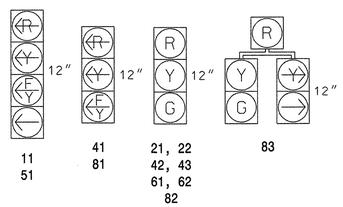
STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM \ TO	← 1	← 2	F 1	F 2	R 1	R 2
←	←	←	Y	R	Y	R
F	F	F	F	F	Y	R
R	R	R	R	R	R	R

F = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



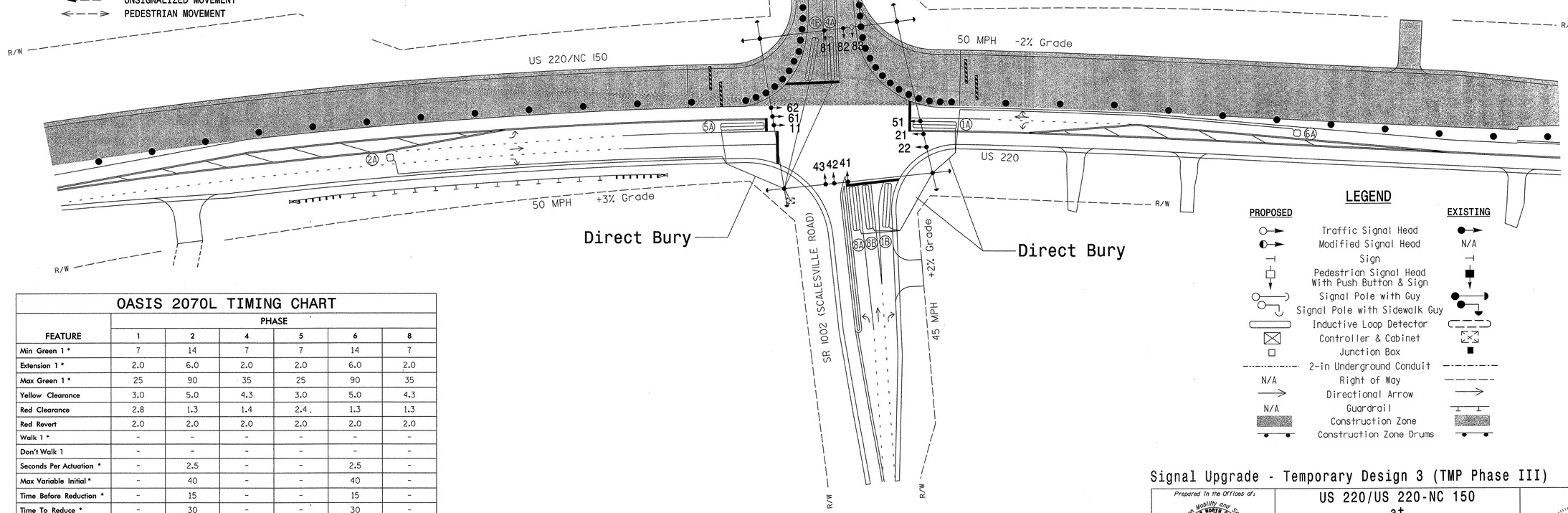
OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	-
					6	Y	Y	Y	-	3	-	-
1B	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	Y
2A	6X6	355	6	Y	2	Y	Y	-	-	-	-	-
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	3	-	-
4B	6X40	0	2-4-2	Y	4	Y	Y	-	-	10	-	-
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	-
					2	Y	Y	Y	-	3	-	-
6A	6X6	355	6	Y	6	Y	Y	-	-	-	-	-
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	-
8B	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	-

5 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
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. Reposition existing signal heads numbered: 11, 21, 22, 51, 61, and 62.
5. Set all detectors units to presence mode.



LEGEND

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

OASIS 2070L TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Min Green 1 *	7	14	7	7	14	7
Extension 1 *	2.0	6.0	2.0	2.0	6.0	2.0
Max Green 1 *	25	90	35	25	90	35
Yellow Clearance	3.0	5.0	4.3	3.0	5.0	4.3
Red Clearance	2.8	1.3	1.4	2.4	1.3	1.3
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	2.5	-	-	2.5	-
Max Variable Initial *	-	40	-	-	40	-
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	-	YELLOW	-	-	YELLOW	-
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	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.

$$$$SYSTIME$$$$
$$$$DGN$$$$
$$$$USERNAME$$$$

Signal Upgrade - Temporary Design 3 (TMP Phase III)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
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Prepared In the Offices of:
Transportation Mobility and Safety Division
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Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

US 220/US 220-NC 150
at
NC 150 (Oak Ridge Road)/
SR 1002 (Scalesville Road)
Division 7 Guilford County Summerfield

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/23/11 DATE

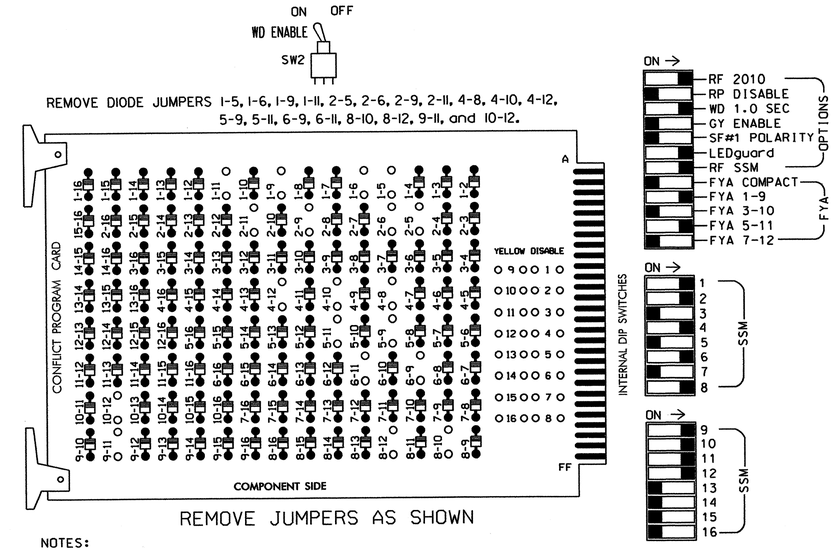
SIG. INVENTORY NO. 07-0924T3

...\Signal Design\07-0924T3.dgn 8/22/2011 3:08:04 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.62

EDI MODEL 2010ECL-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, 4-8, 4-10, 4-12, 5-9, 5-11, 6-9, 6-11, 8-10, 8-12, 9-11, and 10-12.

REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

NOTES:

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

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø1 1A	Ø1 1B	Ø2 2A	WIRED INPUT ⊗	SLOT EMPTY	Ø4 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			Ø4 4B								ST DC ISOLATOR
FILE "J"	U	Ø5 5A	SLOT EMPTY	Ø6 6A	WIRED INPUT ⊗	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED		NOT USED			Ø8 8B								

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

FS = FLASH SENSE
ST = STOP TIME

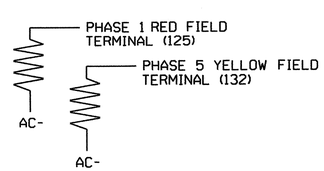
⊗ Wired Input - Do not populate slot with detector card

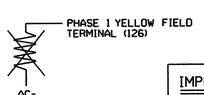
LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)

ACCEPTABLE VALUES

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





IMPORTANT! Remove load resistor from Phase 1 Yellow field field terminal (126) if one is installed.

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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 3,5, 7,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 4 and 8 for Dual Entry.
4. Enable Simultaneous Gap-Out for all phases.
5. Program phases 2 and 6 for Variable Initial and Gap Reduction.
6. Program phases 2 and 6 for Start Up In Green.
7. Program phases 2 and 6 for Yellow Flash, and overlaps 1 and 2 as Wag Overlaps.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S4,S5,S6,S8,S9,S10,S12,S13
PHASES USED.....1,2,4,5,6,8
OVERLAP "A".....1+2
OVERLAP "B".....4
OVERLAP "C".....5+6
OVERLAP "D".....8

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A[1]	TB2-1,2	I1U	56	18	1	1	Y	Y			15
	-	J4U	48	10	26	6	Y	Y	Y		3
1B	TB2-5,6	I2U	39	1	2	1	Y	Y			15
2A	TB2-9,10	I3U	63	25	32	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			3
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			10
5A[2]	TB3-1,2	J1U	55	17	5	5	Y	Y			15
	-	I4U	47	9	22	2	Y	Y	Y		3
6A	TB3-9,10	J3U	64	26	36	6	Y	Y			
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			
8B	TB5-11,12	J6L	46	8	18	8	Y	Y			

[1] Add jumper from I1-W to J4-W, on rear of input file.

[2] Add jumper from J1-W to I4-W, on rear of input file.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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★	83	21,22	NU	NU	42,43	NU	51★	61,62	NU	NU	82,83	NU	11★	81★	NU	51★	41★	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												A122	A125		A115	A102	
FLASHING YELLOW ARROW														A123	A126		A116	A103	
GREEN ARROW	127	127						133											

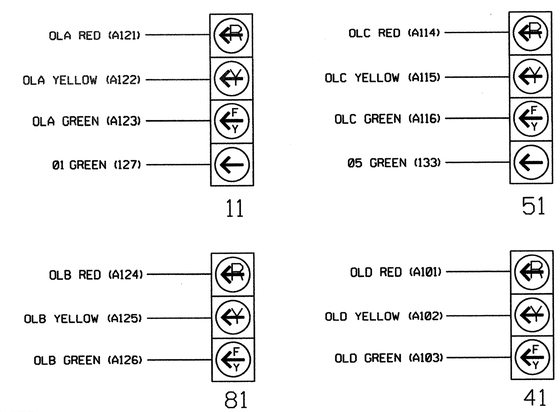
NU = Not Used

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

★ See pictorial of head wiring in detail below.

3 & 4 SECTION FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

The sequence display for signal heads 11 and 51 requires special logic programming. See sheet 2 of 2 for programming instructions.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-0924T3
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Temporary Design 3 (TMP Phase 3) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150
at
NC 150 (Oak Ridge Road)/
SR 1002 (Scalesville Road)

Division 7 | Guilford County | Summerfield

PLAN DATE: August 2011 | REVIEWED BY: JTK
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE | DATE 8-30-11

SIG. INVENTORY NO. 07-0924T3

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armstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.63

LOGICAL I/O PROCESSOR PROGRAMMING DETAIL
TO PRODUCE SPECIAL FYA-PPLT SIGNAL SEQUENCE

(program controller as shown below)

1. FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, 3, 4, 5 AND 6.
2. FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).

```
LOGICAL I/O COMMAND #1  (+/-COMMAND#)
IF  ACTIVE PHASE        #1  IS ON
AND RED CLEAR ON PHASE  #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #50 ON
SET OUTPUT  ASSIGNMENT #51 OFF
```

NOTE: LOGIC FOR PHASE 1 RED CLEAR WHEN TRANSITIONING FROM PHASE 1 TO PHASE 2 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #2  (+/-COMMAND#)
IF  ACTIVE PHASE        #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #52 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 1 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #3  (+/-COMMAND#)
IF  YELLOW ON PHASE     #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #51 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 1 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #4  (+/-COMMAND#)
IF  ACTIVE PHASE        #5  IS ON
AND RED CLEAR ON PHASE  #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #42 ON
SET OUTPUT  ASSIGNMENT #43 OFF
```

NOTE: LOGIC FOR PHASE 5 RED CLEAR WHEN TRANSITIONING FROM PHASE 5 TO PHASE 6 (HEAD 51).

PRESS '+'

```
LOGICAL I/O COMMAND #5  (+/-COMMAND#)
IF  ACTIVE PHASE        #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #44 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 5 (HEAD 51).

PRESS '+'

```
LOGICAL I/O COMMAND #6  (+/-COMMAND#)
IF  YELLOW ON PHASE     #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #43 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 5 (HEAD 51).

LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

OUTPUT REFERENCE SCHEDULE

OUTPUT 42 = Overlap C Red
OUTPUT 43 = Overlap C Yellow
OUTPUT 44 = Overlap C Green
OUTPUT 50 = Overlap A Red
OUTPUT 51 = Overlap A Yellow
OUTPUT 52 = Overlap A Green

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-0924T3
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

```
PAGE 1: VEHICLE OVERLAP 'A' SETTINGS
PHASE:          ¦123456789101112131415 16
VEH OVL PARENTS:¦XX
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'B' SETTINGS
PHASE:          ¦123456789101112131415 16
VEH OVL PARENTS:¦   X
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...N
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'C' SETTINGS
PHASE:          ¦123456789101112131415 16
VEH OVL PARENTS:¦    XX
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'D' SETTINGS
PHASE:          ¦123456789101112131415 16
VEH OVL PARENTS:¦       X
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...N
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

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.

Signal Upgrade - Temporary Design 3 (TMP Phase 3) - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150
at
NC 150 (Oak Ridge Road)/
SR 1002 (Scalesville Road)

Division 7 | Guilford County | Summerfield

PLAN DATE: August 2011	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR

John T. Rowe 8-30-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-0924T3

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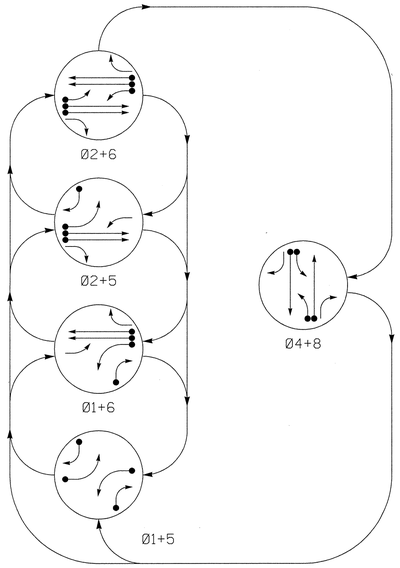
PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.64

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	F	F	R	Y
21, 22	R	R	G	G	R	Y
41	R	R	R	F	R	R
42	R	R	R	R	G	R
43	R	R	R	R	G	R
51	←	F	←	F	R	Y
61, 62	R	G	R	G	R	Y
81	R	R	R	F	R	R
82	R	R	R	R	G	R
83	R	R	R	R	G	R

F = FLASHING YELLOW ARROW

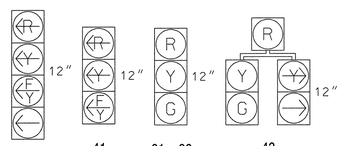
STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM \ TO	←	F	R
	1 2	1 2	1 2
←	← ←	Y R	Y R
F	F F	F F	Y R
R	R R	R R	R R

F = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



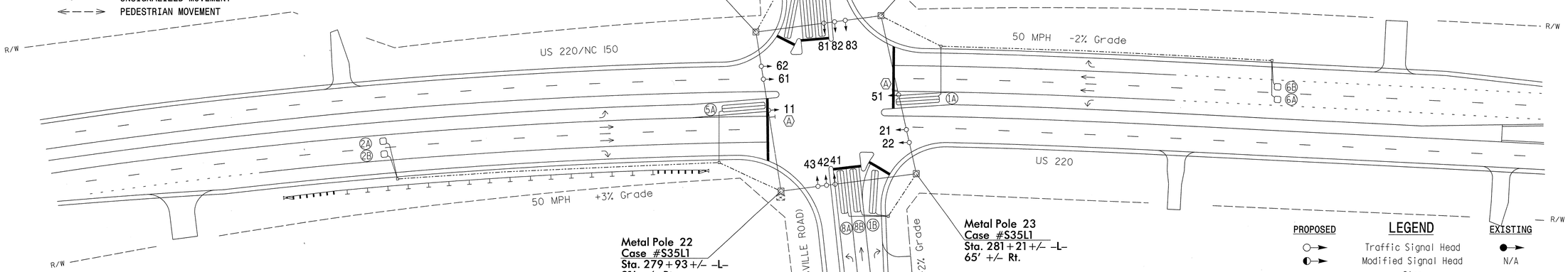
OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	-
					6	Y	Y	Y	-	3	-	-
1B	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	-
2A	6X6	355	6	Y	2	Y	Y	-	-	-	-	-
2B	6X6	355	6	Y	2	Y	Y	-	-	-	-	Y
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	-	-	-
4B	6X40	0	2-4-2	Y	4	Y	Y	-	-	-	-	-
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	-
					2	Y	Y	Y	-	3	-	-
5B	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
6A	6X6	355	6	Y	6	Y	Y	-	-	-	-	-
6B	6X6	355	6	Y	6	Y	Y	-	-	-	-	Y
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	-
8B	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	-

5 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 "Standard Specifications for Roads and Structures" dated July 2006.
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. Set all detector units to presence mode.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Guardrail	
	Metal Strain Pole	
	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	

OASIS 2070L TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Min Green 1 *	7	14	7	7	14	7
Extension 1 *	2.0	6.0	2.0	2.0	6.0	2.0
Max Green 1 *	25	90	35	25	90	35
Yellow Clearance	3.0	5.0	4.1	3.0	5.0	4.3
Red Clearance	3.1	1.3	2.2	3.1	1.3	1.8
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	1.5	-	-	1.5	-
Max Variable Initial *	-	40	-	-	40	-
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	-	YELLOW	-	-	YELLOW	-
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	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.

$$$$SYSTIME$$$$
$$$$SYSTIME$$$$
$$$$USERNAME$$$$

Signal Upgrade - Final Design

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

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

SCALE 0 50 1"=50'

US 220/US 220-NC 150 at NC 150 (Oak Ridge Road)/ SR 1002 (Scalesville Road)

Division 7 Guilford County Summerfield

PLAN DATE: September 2011 REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

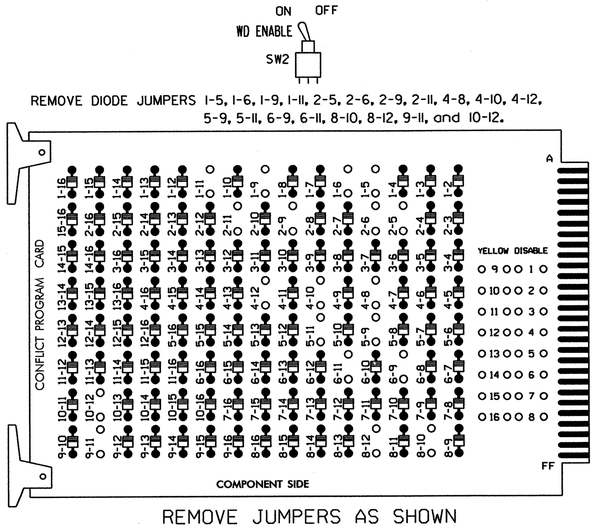
SIGNATURE 8/23/11 DATE
SIG. INVENTORY NO. 07-0924

...\Signal Design\07-0924.dgn 9/6/2011 2:21:22 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 65

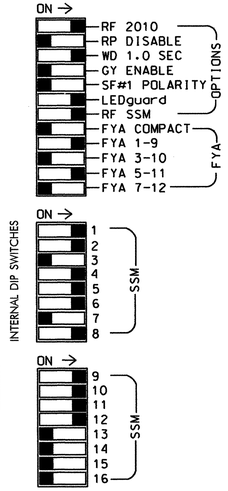
EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(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, 4-8, 4-10, 4-12, 5-9, 5-11, 6-9, 6-11, 8-10, 8-12, 9-11, and 10-12.

REMOVE JUMPERS AS SHOWN



■ = DENOTES POSITION OF SWITCH

NOTES:

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

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. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 3,7, 13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 4 and 8 for Dual Entry.
4. Enable Simultaneous Gap-Out for all phases.
5. Program phases 2 and 6 for Variable Initial and Gap Reduction.
6. Program phases 2 and 6 for Start Up In Green.
7. Program phases 2 and 6 for Yellow Flash, and overlaps 1 and 2 as Wag Overlaps.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S2P	S3	S4	S4P	S5		S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
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★	83	21,22	NU	NU	42,43	NU	43	51★	61,62	NU	NU	82,83	NU	11★	81★	NU	51★	41★	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						132							A122	A125		A115	A102	
FLASHING YELLOW ARROW															A123	A126		A116	A103	
GREEN ARROW	127	127						133	133											

NU = Not Used

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

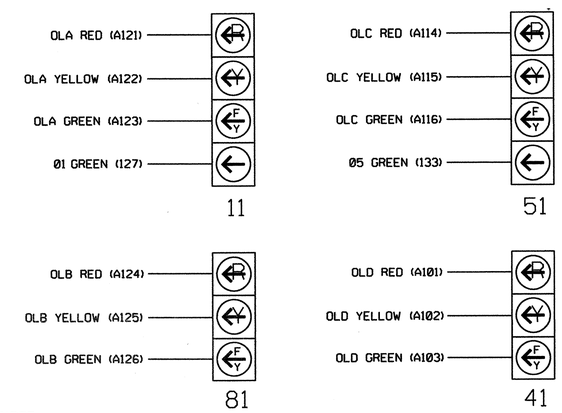
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET.....332 W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S4,S5,S6,S8,S9,S10,S12,S13
PHASES USED.....1,2,4,5,6,8
OVERLAP "A".....1+2
OVERLAP "B".....4
OVERLAP "C".....5+6
OVERLAP "D".....8

3 & 4 SECTION FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

The sequence display for signal heads 11 and 51 requires special logic programming. See sheet 2 of 2 for programming instructions.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø1 1A	Ø1 1B	Ø2 2A	WIRED INPUT ⊗	SLOT EMPTY	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L	NOT USED	NOT USED	Ø2 2B			Ø4 4B								ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø5 5B	Ø6 6A	WIRED INPUT ⊗	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	NOT USED	Ø6 6B			Ø8 8B								

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

⊗ Wired Input - Do not populate slot with detector card

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A[1]	TB2-1,2	I1U	56	18	1	1	Y	Y			15
	-	J4U	48	10	26	6	Y	Y	Y		3
1B	TB2-5,6	I2U	39	1	2	1	Y	Y			15
2A	TB2-9,10	I3U	63	25	32	2	Y	Y			
2B	TB2-11,12	I3L	76	38	42	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			
5A[2]	TB3-1,2	J1U	55	17	5	5	Y	Y			15
	-	I4U	47	9	22	2	Y	Y	Y		3
5B	TB3-5,6	J2U	40	2	6	5	Y	Y			15
6A	TB3-9,10	J3U	64	26	36	6	Y	Y			
6B	TB3-11,12	J3L	77	39	46	6	Y	Y			
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			
8B	TB5-11,12	J6L	46	8	18	8	Y	Y			

[1] Add jumper from I1-W to J4-W, on rear of input file.

[2] Add jumper from J1-W to I4-W, on rear of input file.

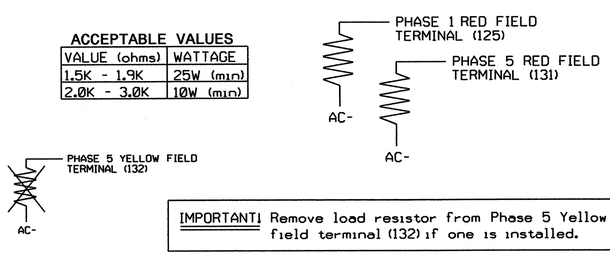
INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

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)



IMPORTANT! Remove load resistor from Phase 5 Yellow field field terminal (132) if one is installed.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-0924
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

Signal Upgrade - Final Design - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150
at
NC 150 (Oak Ridge Road)/
SR 1002 (Scalesville Road)

Division 7 | Guilford County | Summerfield

PLAN DATE: August 2011 | REVIEWED BY: JTR
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE | DATE 8-30-11
SIG. INVENTORY NO. 07-0924

24-AUG-2011 13:16
S:\#ITSSIGNALS\Signals\#Workgroups\#Sig Mgmt\#StrongW070924_smlate_xxx.dgn
Sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.66

LOGICAL I/O PROCESSOR PROGRAMMING DETAIL
TO PRODUCE SPECIAL FYA-PPLT SIGNAL SEQUENCE

(program controller as shown below)

1. FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, 3, 4, 5 AND 6.
2. FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).

```
LOGICAL I/O COMMAND #1  (+/-COMMAND#)
IF  ACTIVE PHASE       #1  IS ON
AND RED CLEAR ON PHASE #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #50 ON
SET OUTPUT  ASSIGNMENT #51 OFF
```

NOTE: LOGIC FOR PHASE 1 RED CLEAR WHEN TRANSITIONING FROM PHASE 1 TO PHASE 2 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #2  (+/-COMMAND#)
IF  ACTIVE PHASE       #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #52 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 1 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #3  (+/-COMMAND#)
IF  YELLOW ON PHASE    #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #51 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 1 (HEAD 11).

PRESS '+'

```
LOGICAL I/O COMMAND #4  (+/-COMMAND#)
IF  ACTIVE PHASE       #5  IS ON
AND RED CLEAR ON PHASE #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #42 ON
SET OUTPUT  ASSIGNMENT #43 OFF
```

NOTE: LOGIC FOR PHASE 5 RED CLEAR WHEN TRANSITIONING FROM PHASE 5 TO PHASE 6 (HEAD 51).

PRESS '+'

```
LOGICAL I/O COMMAND #5  (+/-COMMAND#)
IF  ACTIVE PHASE       #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #44 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 5 (HEAD 51).

PRESS '+'

```
LOGICAL I/O COMMAND #6  (+/-COMMAND#)
IF  YELLOW ON PHASE    #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #43 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 5 (HEAD 51).

LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

OUTPUT REFERENCE SCHEDULE

OUTPUT 42 = Overlap C Red
OUTPUT 43 = Overlap C Yellow
OUTPUT 44 = Overlap C Green
OUTPUT 50 = Overlap A Red
OUTPUT 51 = Overlap A Yellow
OUTPUT 52 = Overlap A Green

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-0924
DESIGNED: September 2011
SEALED: 8/23/11
REVISED: N/A

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

```
PAGE 1: VEHICLE OVERLAP 'A' SETTINGS
PHASE:              ¦123456789101112131415 16
VEH OVL PARENTS:¦XX
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'B' SETTINGS
PHASE:              ¦123456789101112131415 16
VEH OVL PARENTS:¦   X
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...N
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'C' SETTINGS
PHASE:              ¦123456789101112131415 16
VEH OVL PARENTS:¦    XX
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'D' SETTINGS
PHASE:              ¦123456789101112131415 16
VEH OVL PARENTS:¦        X
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...N
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

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.

Signal Upgrade - Final Design - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 220/US 220-NC 150
at
NC 150 (Oak Ridge Road)/
SR 1002 (Scalesville Road)

Division 7 | Guilford County | Summerfield

PLAN DATE: August 2011 | REVIEWED BY: JTR
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

John T Rowe 8-30-11
SIGNATURE DATE

SIG. INVENTORY NO. 07-0924

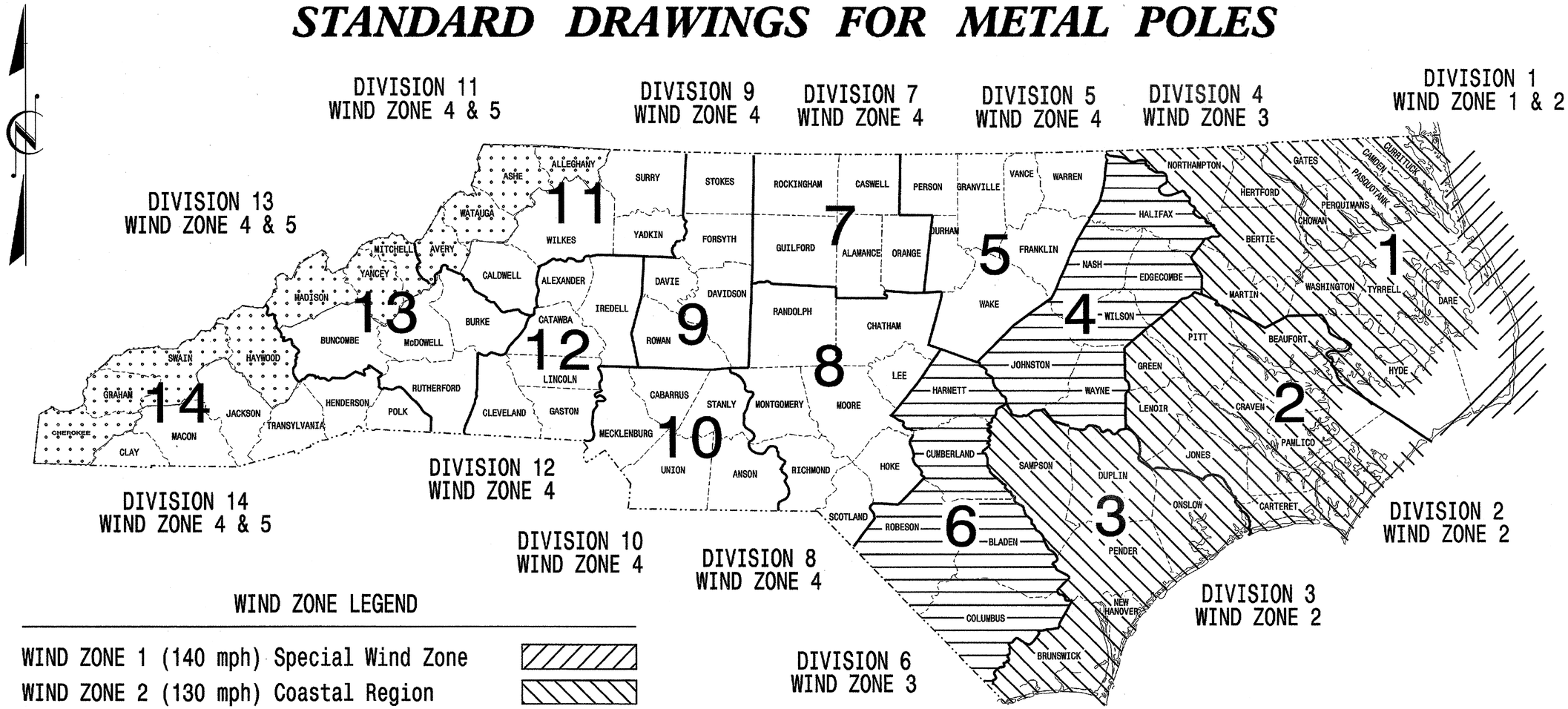
24-AUG-2011 13:17
S:\TSS\Shts\Signals\Workgroups\Sig Mgmt\armstrong\07092 4_smu_ele_xxx.dgn
armstrong

STATE	PROJECT NO.	SHEET NO.
N.C.	R-2309AB	Sig. 67
F. A. PROJ. NO.		M 1
PROJECT ID. NO.		

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR METAL POLES

NCDOT METAL POLE STANDARDS



WIND ZONE LEGEND

WIND ZONE 1 (140 mph) Special Wind Zone	
WIND ZONE 2 (130 mph) Coastal Region	
WIND ZONE 3 (110 mph) Eastern Region	
WIND ZONE 4 (90 mph) Central & Mtn. Region	
WIND ZONE 5 (120 mph) Special Wind Zone	

http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html

Prepared In the Offices of:

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

750 N.Greenfield Pkwy,Garner,NC 27529

Designed in conformance with the 2002 Interim to the 4th Edition 2001

AASHTO

Standard Specifications for Structural Supports for Highway Signs, Luminares, and Traffic Signals

INDEX OF PLANS

DRAWING NUMBER	DESCRIPTION
M 1	Title Sheet
M 2	Fabrication Details – All Poles
M 3	Fabrication Details – Strain Poles
M 4,5	Fabrication Details – Mast Arm Poles
M 6	Construction Details – Strain Poles
M 7	Construction Details – Foundations
M 8	Standard Strain Poles

NCDOT CONTACTS:

MOBILITY AND SAFETY DIVISION – ITS and SIGNALS UNIT

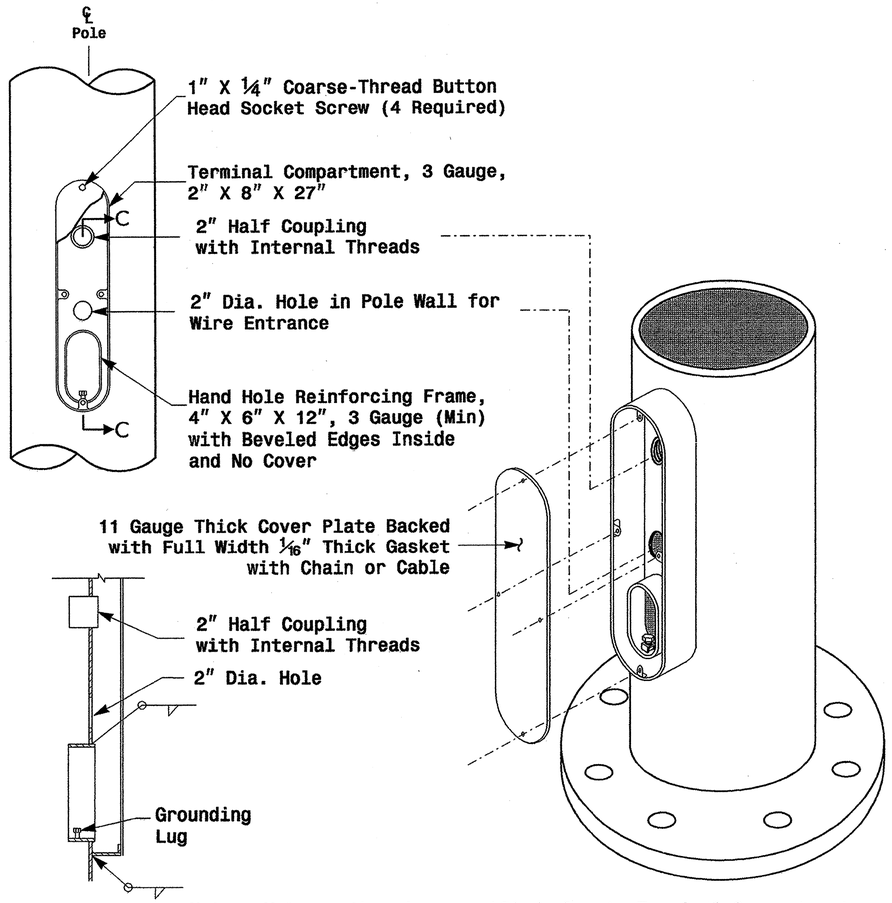
G. A. Fuller, P.E. – State ITS and Signals Engineer
G. G. Murr, Jr., P.E. – State Signals Engineer
D. C. Sarkar, P.E. – ITS and Signals Senior Structural Engineer
C. F. Andrews, Jr. – ITS and Signals Structural Project Engineer
M. Aslam – ITS and Signals Structural Project Engineer
N. Bitting, P.E. – ITS and Signals Structural Project Engineer

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

D. Sarkar 7-21-2009
SIGNATURE DATE

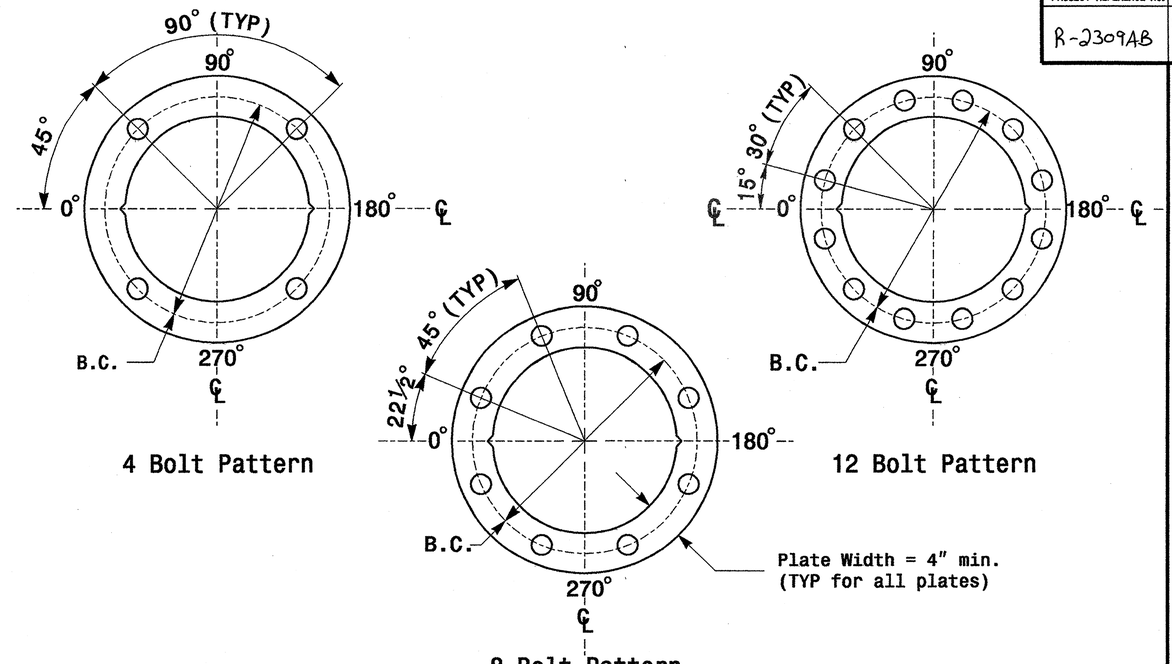
PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 68 M 2



Section C-C

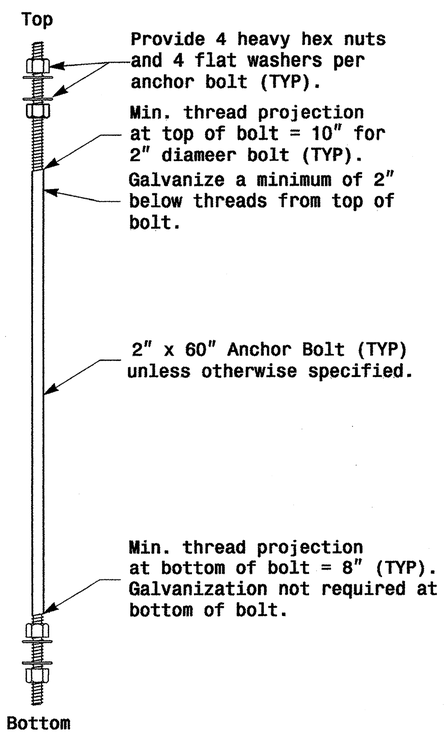
Note: Unless otherwise specified, locate Terminal Compartment 1 foot above the pole base plate at 180 degrees on the pole's radial index.

Terminal Compartment Detail



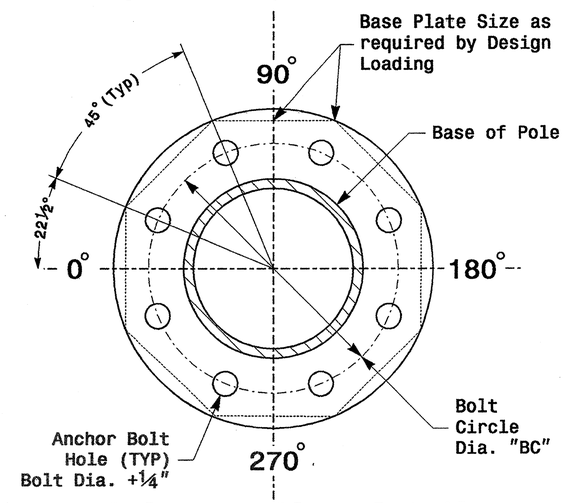
Construct Templates and Plates from ¼" min. thick Steel. Galvanizing is not required.

Base Plate Template and Anchor Bolt Lock Plate Details



Anchor Bolt Detail

Note: See Strain Pole drawing M3 and Mast arm drawing M4 for base plate weld details.



8 Bolt Base Plate Detail

MFG _____ MFG. DATE: MM/YY
SHAFT D/T/L/Y ----/----/----/----
ARM-A D/T/L/Y ----/----/----/----
----/----/----/----
ARM-B D/T/L/Y ----/----/----/----
----/----/----/----
A.B. DIA./B.C./L/Y ----/----/----/----
NCDOT STANDARD ----------

Shaft I.D. Tag
(Provide on Strain Poles and Mast Arm Poles)

MFG _____ MFG. DATE: MM/YY
SECTION D/T/L/Y ----/----/----/----
NCDOT STANDARD ----------

Arm I.D. Tag
(Provide on each section of a multi-section mast arm)

Notes:
1) D= Diameter, T= Thickness, L= Length, Y= Yield Strength
2) A.B. = Anchor Bolt
3) B.C. = Bolt Circle of Anchor Bolts
4) If Custom Design, use "NCDOT STANDARD" line for plan pole I.D.
5) See drawing M4 for mounting positions of I.D. tags.

Identification Tag Details

Fabrication Details – All Poles

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section, Division of Highways, Department of Transportation, 122 N. McDowell St., Raleigh, NC 27603

SCALE: 0 NA — NONE

Typical Fabrication Details Common To All Metal Poles

PLAN DATE:	May 2005	REVIEWED BY:	C.F. Andrews
PREPARED BY:	P.L. Alexander	REVIEWED BY:	A.M. Esposito

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEEPESH C. SARKAR

D. Sarkar 9.2.2005
SIGNATURE DATE

SIG. INVENTORY NO.

01-SEP-2005 18:22
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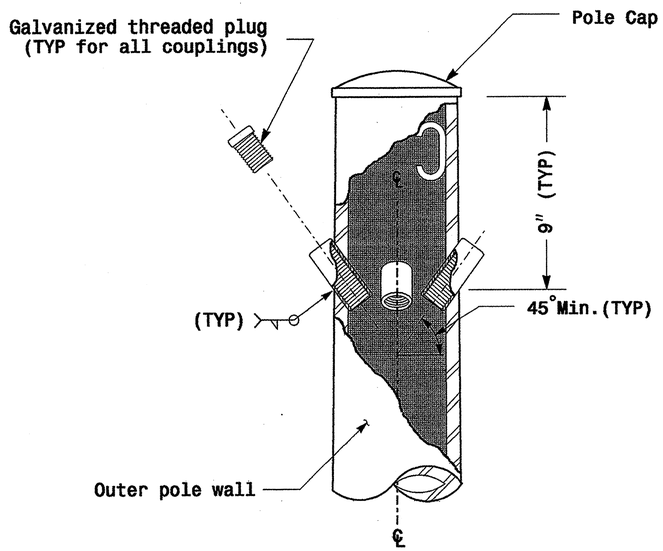
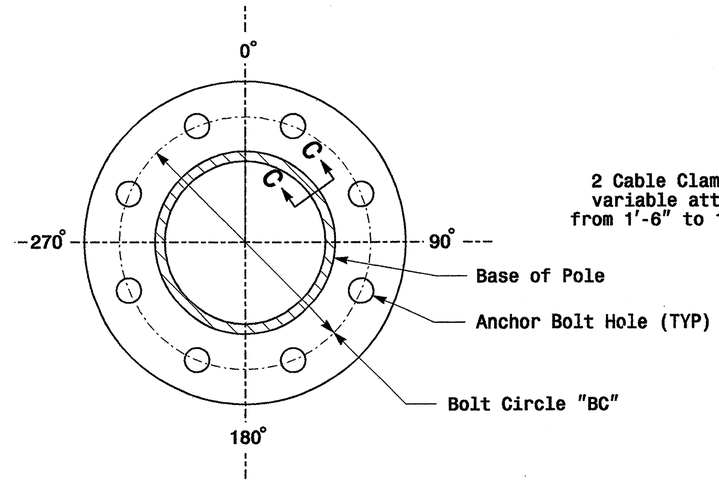
cardrews

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 69 M 3

Fabrication Details – Strain Poles



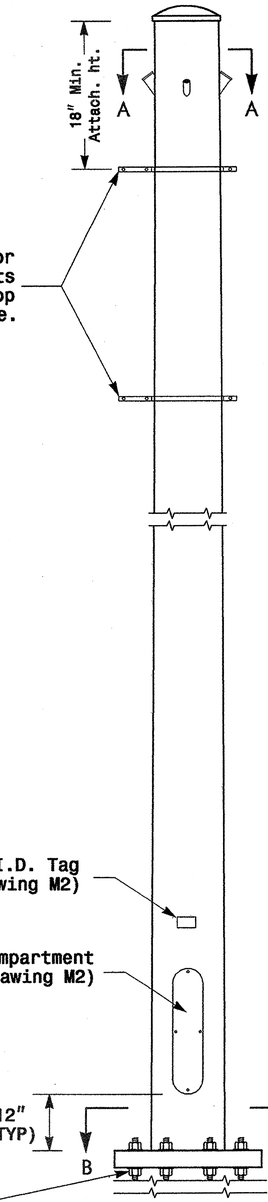
Cable Entrances at Top of Pole



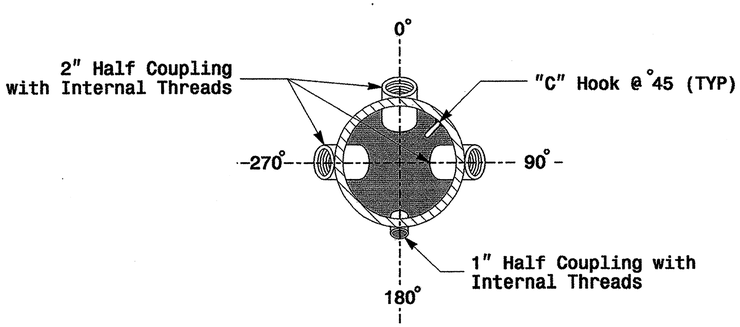
Section B-B

(See drawing M2)

Pole Base Plate

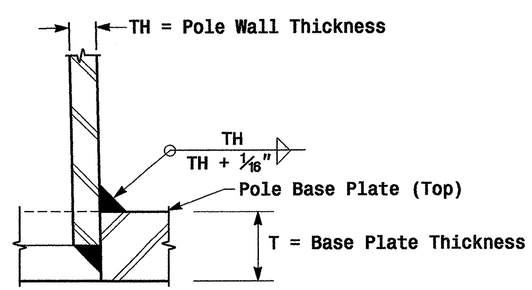


Monotube Strain Pole
(.14"/Foot Taper)



Section A-A

Radial Orientation for Factory Installed Accessories at Top of Pole



Section C-C

Socket Connection Weld Detail

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Transportation Mobility and Safety Division, Department of Transportation, State of North Carolina, Structure Design and Geometrics Section, 122 N. McDowell St., Raleigh, NC 27603

Typical Fabrication Details For Strain Poles

PLAN DATE: May 2005	REVIEWED BY: C.F. Andrews
PREPARED BY: P.L. Alexander	REVIEWED BY: A.W. Esposito

REVISIONS	INIT.	DATE

SCALE: 0 NA — NONE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

D. Sarkar 9.2.2005
SIGNATURE DATE

SIG. INVENTORY NO.

01-SEP-2005 14:07
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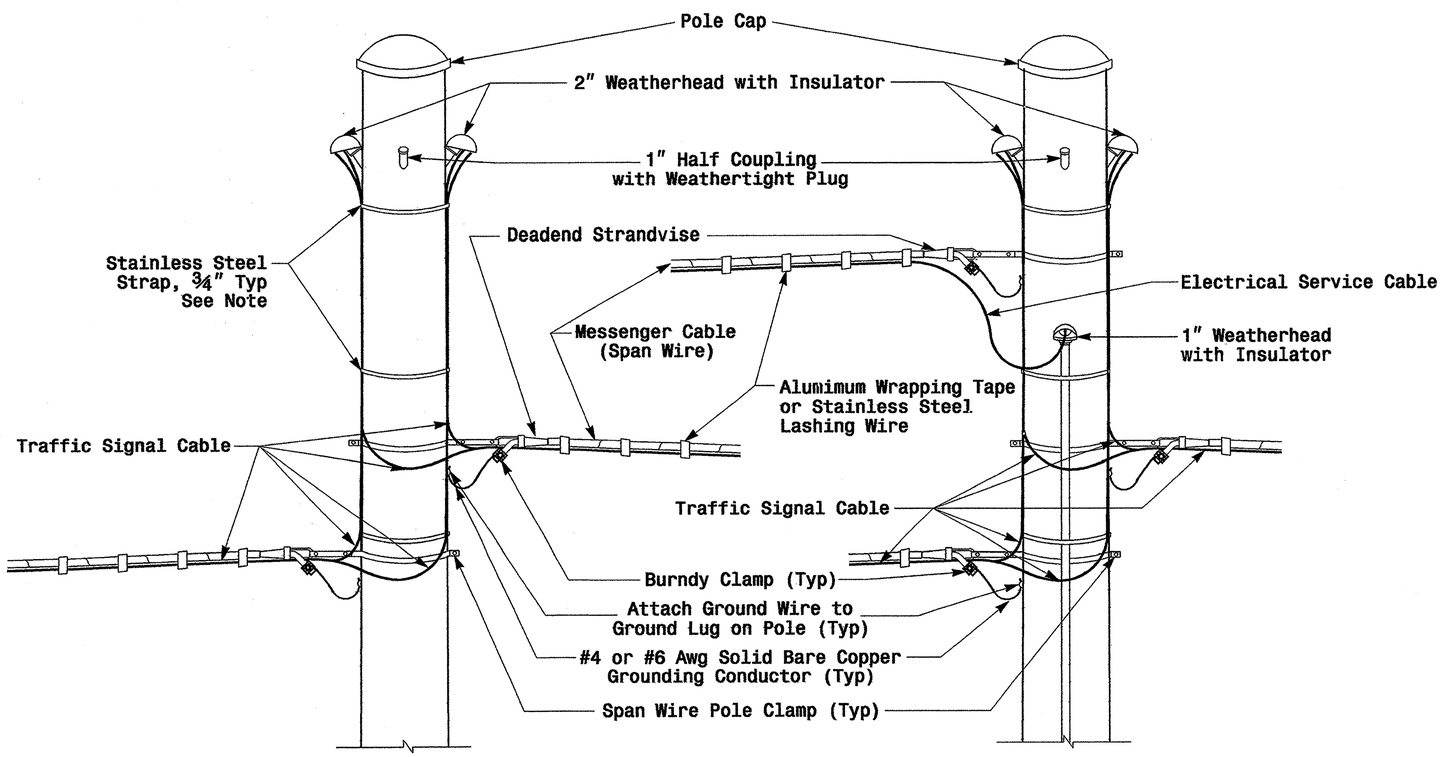
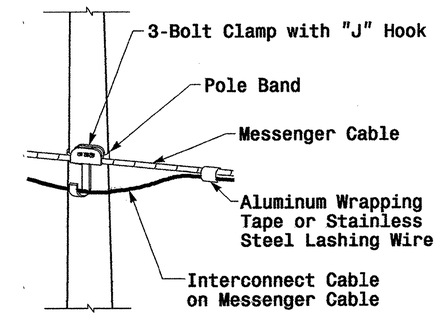
pslexander

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.70 M 6

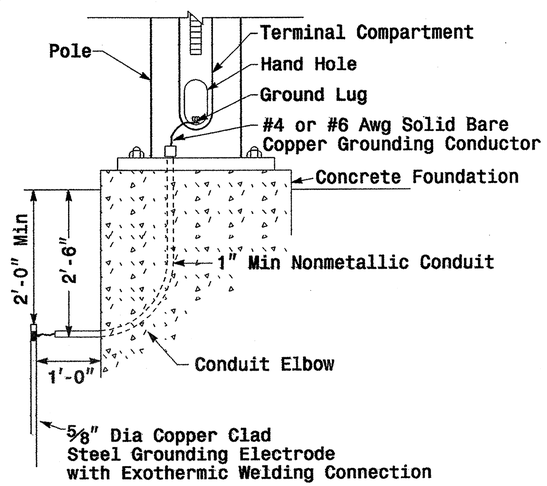


Note: Strap all signal cables to the side of the pole with 3/4" stainless steel straps when the distance between the spanwire attachment clamp and the weatherheads exceeds 36"

Strain Pole Attachments



Attachment of Cable to Intermediate Metal Pole



Metal Pole Grounding Detail

Construction Details — Strain Poles

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section, Division of Highways, Department of Transportation, 122 N. McDowell St., Raleigh, NC 27603

Construction Details
Strain Poles

PLAN DATE:	May 2005	REVIEWED BY:	P.L. ALEXANDER
PREPARED BY:	C.F. ANDREWS	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

SCALE 0 NA NONE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 016286 ENGINEER MILTON L. DEAN

SIGNATURE: Milton L. Dean DATE: 9-1-05

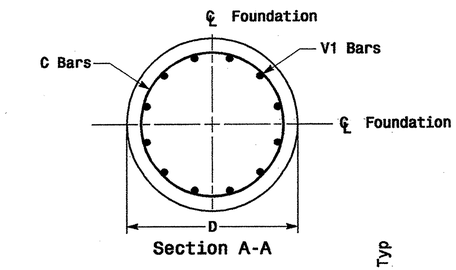
SIG. INVENTORY NO.

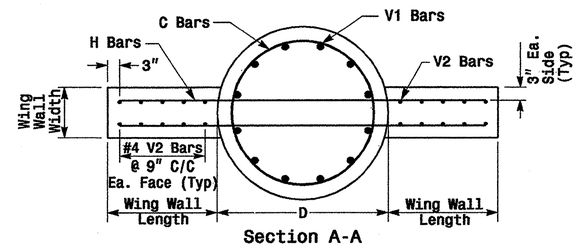
01-SEP-2005 16:33
w:\traffic\signals\workgroups\2004 metal pole standards\2004 m6.dgn
pdlaxander

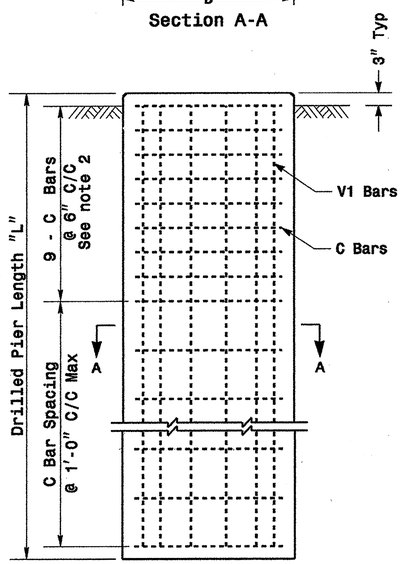
PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 71 M 7

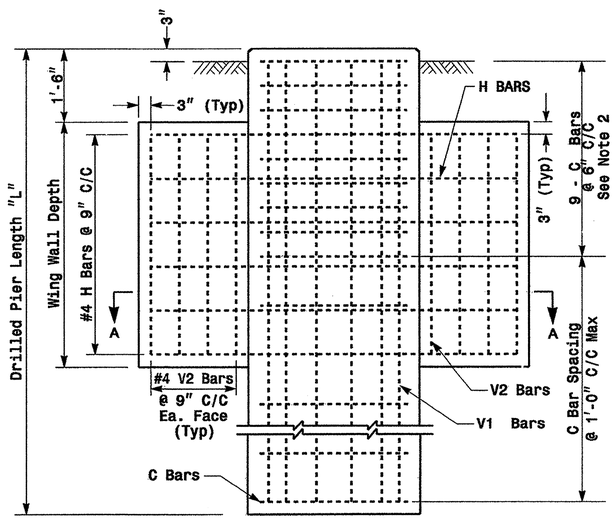
Construction Details – Foundations

Reinforcing Steel Bars







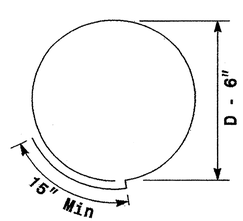


REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (42" & 48" DIAMETER)						
Shaft Dia (in.)	Conc. Volume (cu. yds.)	Bar Name	No.	Size	Type	Length
42"	.356 x L	V1	9	#8	STR.	**
		C	*	#4	CIR.	10'-9"
48"	.465 x L	V1	12	#8	STR.	**
		C	*	#4	CIR.	12'-6"

* See Note No. 1
** See Note No. 3

REINFORCING STEEL TABLE FOR STANDARD 42" and 48" DRILL PIER SHAFT WITH TYPE 1 AND TYPE 2 WING WALLS						
Wing Wall Type	Drill Pier Shaft Dia. (in.)	Reinforcing Steel				
		Bar Name	No.	Size	Type	Length
TYPE 1	42"	V1	9	#8	STR.	**
		V2	12	#4	STR.	2'-6"
		H	8	#4	STR.	6'-0"
		C	*	#4	CIR.	10'-9"
TYPE 2	42"	V1	9	#8	STR.	**
		V2	16	#4	STR.	4'-6"
		H	12	#4	STR.	9'-0"
		C	*	#4	CIR.	10'-9"
TYPE 2	48"	V1	12	#8	STR.	**
		V2	16	#4	STR.	4'-6"
		H	12	#4	STR.	9'-6"
		C	*	#4	CIR.	12'-6"

* See Note No. 1
** See Note No. 3



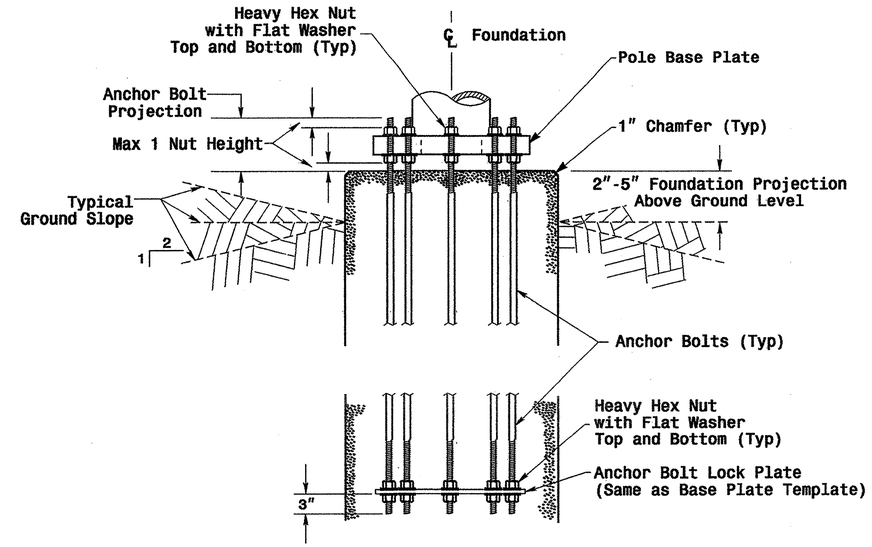
Typical "C" Bars

WING WALL DETAILS				
Wing Wall Type	Wing Wall Length (Ft.)	Wing Wall Width (Ft.)	Wing Wall Depth (Ft.)	Concrete Volume (Cu. Yds.)
TYPE 1	1'-6"	1'-0"	3'-0"	.4
TYPE 2	3'-0"	1'-0"	5'-0"	1.2

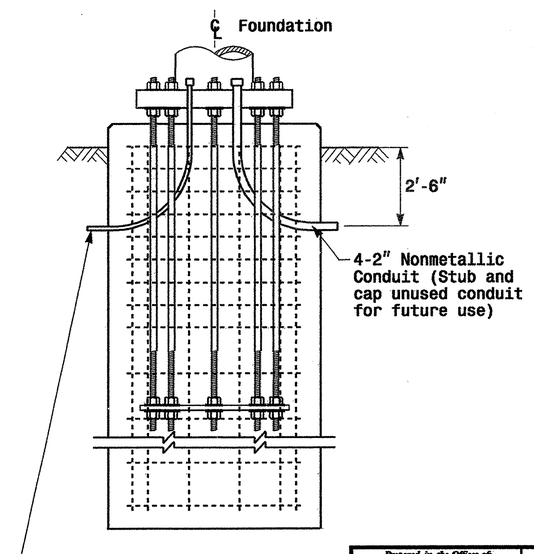
See Note No. 4

Typical Foundation Anchor Bolt Details

(Reinforcing Cage Not Shown for Clarity)



Typical Foundation Conduit Details



Notes

1. The number of C-bars is based on foundation depth. For standard foundations, see sheet M 8.
2. Circular tie reinforcing rings may be vertically adjusted by +/- 3" at a depth between 2'-0" and 3'-0" to facilitate the installation of electrical conduit entering in the cage.
3. The length of V1-bars is based on foundation depth. For standard foundations, see sheet M 8.
4. The quantities for steel and concrete shown in the Wing Wall Details Chart reflect the amount of material for 1 pair of wing walls (2 wing walls per drilled pier shaft.)

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section, Division of Highways, State of North Carolina, Department of Transportation
122 N. McDowell St., Raleigh, NC 27603

Construction Details
Foundations

PLAN DATE:	May 2005	REVIEWED BY:	P.L. ALEXANDER
PREPARED BY:	C.F. ANDREWS	REVIEWED BY:	A.M. ESPOSITO

REVISIONS	INIT.	DATE

SCALE: 0 NA — NONE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

D. Sarkar 9.2.2005
SIGNATURE DATE

SIG. INVENTORY NO.

01-SEP-2005 11:48
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pollexander

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.72 M 8

		STANDARD STRAIN POLES				STANDARD FOUNDATIONS 42" Diameter Drilled Pier Length (L) – Feet						
						Clay				Sand		
		Case No.	Pole Height (Ft.)	Base Plate BC (In.)	Moment at the Pole Base (ft-kp)	Medium N-Value 4-8	Stiff N-Value 9-15	Very Stiff N-Value 16-30	Hard N-Value >30	Loose N-Value 4-10	Medium N-Value 11-30	Dense N-Value >30
WIND ZONE 1	LIGHT	S26L3	26	25	280	20.5	14.0	11.5	9.5	18.0	16.0	14.0
		S30L3	30	25	310	21.0	14.5	11.5	9.5	18.5	16.5	14.5
		S35L3	35	25	350	22.5	15.0	12.0	10.0	19.5	17.5	15.5
	HEAVY	S30H3	30	29	450	25.5	16.5	13.0	11.0	21.0	18.5	16.5
		S35H3	35	29	540	26.0	17.0	13.5	11.5	22.0	19.5	17.0
WIND ZONE 2	LIGHT	S26L2	26	23	250	19.5	13.5	11.0	9.0	18.0	15.5	14.0
		S30L2	30	23	290	20.0	14.0	11.5	9.5	18.5	16.0	14.0
		S35L2	35	23	315	21.0	14.5	11.5	9.5	19.0	16.5	14.5
	HEAVY	S30H2	30	29	415	24.5	16.0	13.0	10.5	21.0	18.5	16.0
		S35H2	35	29	485	25.5	16.5	13.5	11.0	21.5	19.0	16.5
WIND ZONE 3	LIGHT	S26L2	26	23	250	18.5	13.0	10.5	9.0	17.5	15.0	13.5
		S30L2	30	23	290	19.5	13.5	11.0	9.0	18.0	15.5	14.0
		S35L2	35	23	315	20.0	14.0	11.5	9.5	18.5	16.0	14.5
	HEAVY	S30H2	30	29	415	23.0	15.5	12.5	10.0	20.5	17.5	16.0
		S35H2	35	29	485	24.0	16.0	13.0	10.5	21.0	18.0	16.5
WIND ZONE 4	LIGHT	S26L1	26	22	195	18.0	13.0	10.5	9.0	16.5	14.5	13.0
		S30L1	30	22	225	18.5	13.0	10.5	9.0	17.0	15.0	13.5
		S35L1	35	22	255	19.0	13.5	11.0	9.0	17.5	15.5	14.0
	HEAVY	S30H1	30	25	330	22.0	15.0	12.0	9.5	19.5	17.0	15.0
		S35H1	35	25	385	23.0	15.5	12.5	10.0	20.0	17.5	15.5
WIND ZONE 5	LIGHT	S26L2	26	23	250	19.0	13.5	10.5	9.0	17.5	15.5	13.5
		S30L2	30	23	290	20.0	14.0	11.0	9.5	18.0	16.0	14.0
		S35L2	35	23	315	21.0	14.5	11.5	10.0	19.0	16.5	14.5
	HEAVY	S30H2	30	29	415	23.5	15.5	12.5	10.5	21.0	18.0	16.0
		S35H2	35	29	485	25.0	16.5	13.0	11.0	21.5	18.5	16.5

Concrete Volume (cubic yards)=.356 X L

Fabrication Design Notes:

1. Values shown in "Moment at the Pole Base" column represents the minimum acceptable capacity allowable for design using a design CSR of 1.
2. Base plate thickness (T) is 2.0 inches.

Foundation Selection:

1. Perform a standard penetration test at each proposed foundation site to determine "N" value.
2. Select the appropriate wind zone from sheet M 1.
3. Select the soil type (Clay or Sand) that best describes the soil characteristics.
4. Get the appropriate pole case load number from the plans or from the Engineer.
5. Select the appropriate column in the chart based on soil type and "N" value. Select the appropriate row based on the pole load case. The foundation depth is the value where the column and the row intersect.

Standard Strain Poles

Prepared in the Offices of:
Geotechnical Engineering Unit
Structure Design Unit
Bridge and Geotechnical Section
122 N. McDowell St., Raleigh, NC 27603

SCALE: 0 NA — None

Standard Strain Poles and Standard Foundations

PLAN DATE: May 2005	REVIEWED BY: C.F. Andrews
PREPARED BY: P.L. Alexander	REVIEWED BY: A.W. Esposito

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

D. Sarkar 9.2.2005
SIGNATURE DATE

02-SEP-2005 12:42
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pdlexander

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig-73

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

11-08

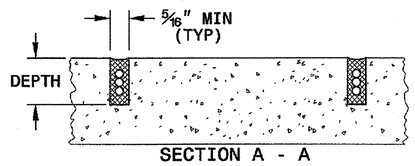
ENGLISH DETAIL DRAWING FOR

INDUCTIVE DETECTION LOOPS

CONVENTIONAL 4-SIDED LOOP

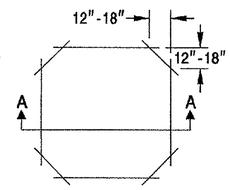
SAW SLOT DEPTH CHART

DEPTH (IN)	NO. OF WIRE TURNS				
	2	3	4	5	6
CONCRETE	2.0	2.0	2.5	2.5	3.0
ASPHALT	2.0	2.5	3.0	3.0	3.0

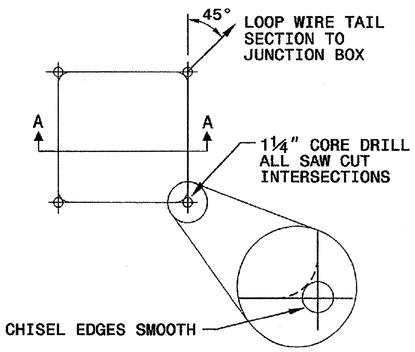


SAW CUT OPTIONS

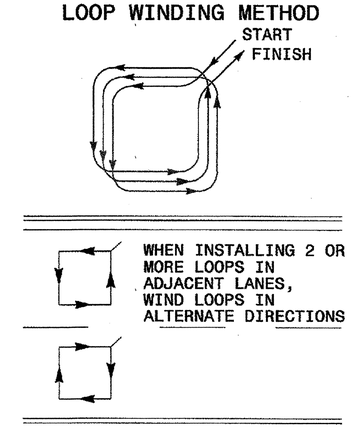
OPTION 1



OPTION 2
(POOR PAVEMENT)

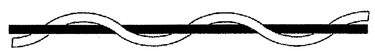


LOOP WINDING METHOD



LOOP WIRE TWISTING METHOD

INCORRECT WAY TO TWIST WIRE



CORRECT WAY TO TWIST WIRE

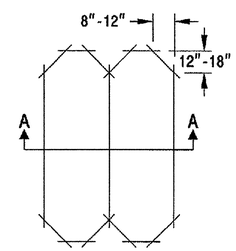
NOTES

1. OVERLAP SAW CUTS AT CORNERS AND INTERSECTION POINTS TO ENSURE UNIFORM SAW SLOT DEPTH.
2. MAINTAIN 12" SPACING BETWEEN LOOP WIRE TAIL SECTIONS.
3. WIRE LOOPS CONNECTED TO THE SAME DETECTOR CHANNEL IN SERIES.
4. LOCATE LOOPS IN CENTER OF LANES UNLESS OTHERWISE SHOWN ON PLANS OR APPROVED BY ENGINEER.

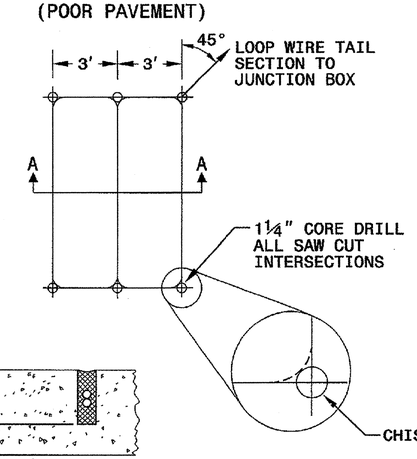
QUADRUPOLE LOOP

SAW CUT OPTIONS

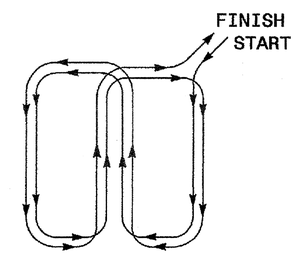
OPTION 1

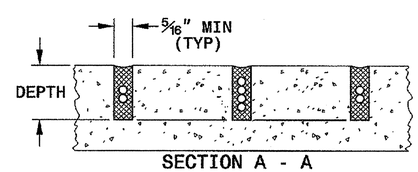


OPTION 2
(POOR PAVEMENT)



LOOP WINDING METHOD





DEPTH IS 2.5" FOR CONCRETE AND 3.0" FOR ASPHALT

SHEET 1 OF 3

1725D01

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

11-08

ENGLISH DETAIL DRAWING FOR

INDUCTIVE DETECTION LOOPS

SHEET 1 OF 3

1725D01

See Plate for Title

Prepared in the Offices of:

Intelligent Transportation Systems & Signals Unit
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

750 N. Greenfield Parkway
Garner, NC 27529

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 16286 ENGINEER HILTON L. DEAN

SIGNATURE

11/24/08
DATE

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zmillis

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.74

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

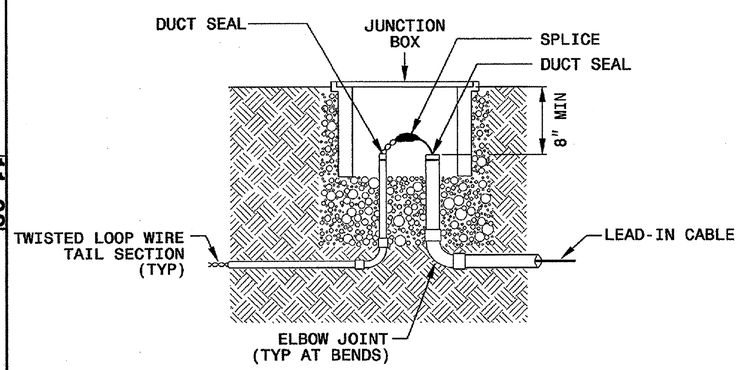
11-08

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

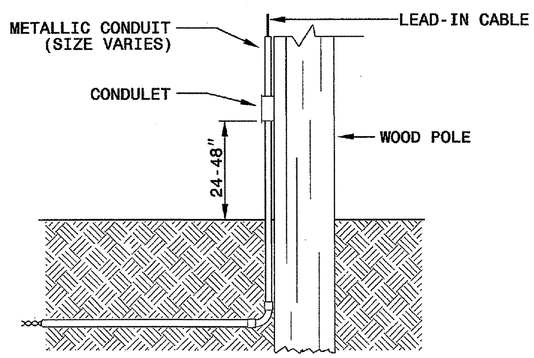
SHEET 2 OF 3
1725D01

LOOP WIRE SPLICE POINT DETAILS

LOOP WIRE AT JUNCTION BOX



LOOP WIRE AT POLE

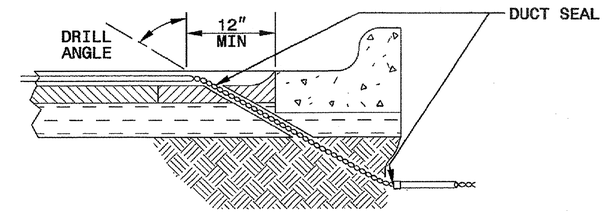


NOTE

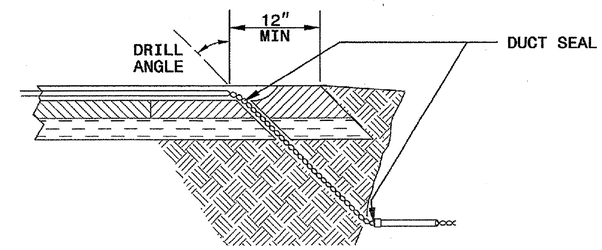
SPLICE ALL LOOP WIRE TAIL SECTIONS/LEAD-IN CABLE IN JUNCTION BOXES OR APPROVED CONDULETS.

LOOP WIRE PAVEMENT EDGE DETAILS

LOOP WIRE AT CURB & GUTTER SECTION



LOOP WIRE AT PAVEMENT SECTION



NOTES

1. DO NOT EXCAVATE UNDER CURB AND GUTTER SECTIONS FOR CONDUIT INSTALLATION.
2. TWIST LOOP WIRE TAIL SECTIONS FROM WHERE LOOP WIRE TAIL LEAVES SAW CUT TO JUNCTION BOX, INCLUDING THROUGH CONDUIT.
3. BEFORE SEALING LOOPS, INSTALL DUCT SEAL WHERE LOOP WIRE TAIL SECTION LEAVES SAW CUT IN PAVEMENT AND AT ENTRANCE OF CONDUIT TO JUNCTION BOX.

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

11-08

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

SHEET 2 OF 3
1725D01

See Plate for Title

Prepared in the Offices of:
Intelligent Transportation Systems & Signals Unit
750 N. Greenfield Parkway
Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 16286 ENGINEER BILLION T. DEAN

Billion T. Dean 11/24/08
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PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 75

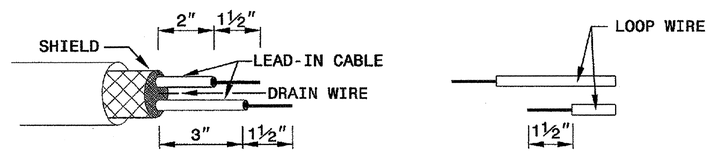
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

11-08

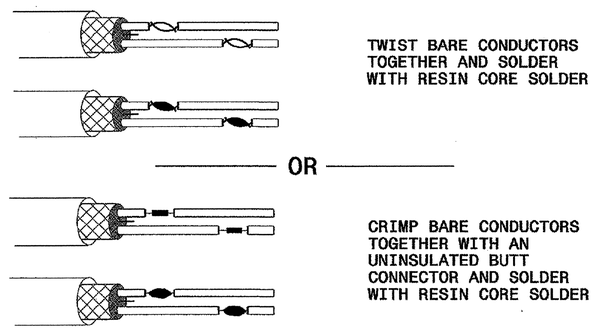
ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

SHEET 3 OF 3
1725D01

STEP 1. STRIP LOOP WIRE AND LEAD-IN CABLE



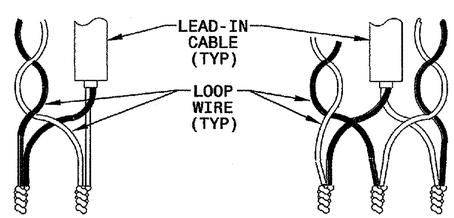
STEP 2. CONNECT AND SOLDER



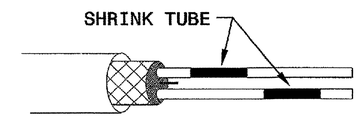
BOND SHIELD DRAIN WIRE AT SPLICE SECTIONS (DO NOT GROUND)

LOOP WIRE AND LEAD-IN CABLE CONNECTION DETAILS

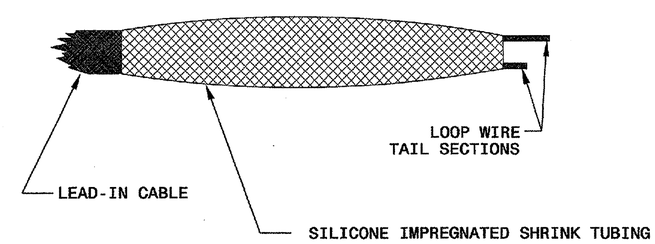
SINGLE CONNECTION SERIES CONNECTION



STEP 3. INSULATE EACH SOLDER JOINT SEPARATELY



STEP 4. ENVIRONMENTALLY PROTECT SPLICE



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

11-08

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

SHEET 3 OF 3
1725D01

See Plate for Title

Prepared in the Offices of:

Intelligent Transportation Systems & Signals Unit
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

750 N. Greenfield Parkway
Garner, NC 27529

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 16286 ENGINEER MILTON I. DEAN

Milton I. Dean 11/24/08
SIGNATURE DATE

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mdi818

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.76

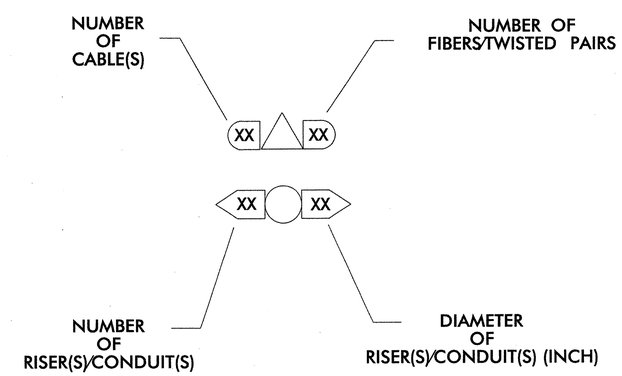
1. INSTALL REA, PE – 22, SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
2. INSTALL REA, PE – 38, (FIGURE – 8) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
3. INSTALL REA, PE – 39, (UNDERGROUND) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
4. INSTALL SMFO CABLE
5. INSTALL MMFO CABLE
6. INSTALL FIBER OPTIC DROP CABLE
7. INSTALL TRACER WIRE
8. TRENCH
9. INSTALL PVC CONDUIT
10. INSTALL RIGID, GALVANIZED STEEL CONDUIT
11. INSTALL RIGID, GALVANIZED STEEL RISER WITH WEATHERHEAD
12. INSTALL RIGID, GALVANIZED STEEL RISER WITH FIBER OPTIC CABLE SEAL
13. INSTALL OUTER–DUCT POLYETHYLENE CONDUIT
14. INSTALL POLYETHYLENE CONDUIT
15. DIRECTIONAL DRILL CONDUIT
16. BORE AND JACK CONDUIT
17. INSTALL CABLE(S) IN EXISTING CONDUIT
18. INSTALL CABLE(S) IN NEW CONDUIT
19. INSTALL CABLE(S) IN EXISTING RISER
20. INSTALL CABLE(S) IN NEW RISER
21. INSTALL CABLE(S) IN EXISTING CONDUIT STUBOUTS
22. INSTALL NEW CONDUIT INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB–OUTS WHEN AVAILABLE)
23. INSTALL NEW RISER INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB–OUTS WHEN AVAILABLE)
24. INSTALL NEW CONDUIT INTO EXISTING POLE MOUNTED CABINET
25. INSTALL NEW RISER INTO EXISTING POLE MOUNTED CABINET
26. TERMINATE COMMUNICATIONS CABLE ON EXISTING TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
27. INSTALL NEW TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
28. INSTALL INTERCONNECT CENTER, PATCH PANEL, JUMPERS, AND FUSION SPLICE CABLE IN CABINET
29. INSTALL UNDERGROUND SPLICE ENCLOSURE
30. INSTALL AERIAL SPLICE ENCLOSURE
31. INSTALL POLE MOUNTED SPLICE CABINET
32. INSTALL BASE MOUNTED SPLICE CABINET
33. REMOVE EXISTING SPLICE CABINET
34. INSTALL CABINET FOUNDATION
35. REMOVE EXISTING CABINET FOUNDATION
36. INSTALL CCTV CAMERA ASSEMBLY
37. INSTALL CCTV CAMERA WOOD POLE
38. INSTALL CCTV CAMERA METAL POLE AND FOUNDATION
39. INSTALL JUNCTION BOX
40. INSTALL OVERSIZED JUNCTION BOX
41. REMOVE EXISTING JUNCTION BOX
42. INSTALL WOOD POLE
43. REMOVE EXISTING WOOD POLE
44. INSTALL AERIAL GUY ASSEMBLY
45. INSTALL STANDARD GUY ASSEMBLY
46. INSTALL SIDEWALK GUY ASSEMBLY
47. INSTALL MESSENGER CABLE
48. REMOVE EXISTING COMMUNICATIONS CABLE AND MESSENGER CABLE
49. REMOVE EXISTING COMMUNICATIONS CABLE
50. INSTALL TELEPHONE SERVICE
51. INSTALL CABLE STORAGE RACKS (SNOW SHOES) AND STORE 100 FEET OF CABLE
52. INSTALL DELINEATOR MARKER
53. STORE 20 FEET OF COMMUNICATIONS CABLE
54. LASH CABLE(S) TO EXISTING SIGNAL/COMMUNICATIONS CABLE
55. LASH CABLE(S) TO EXISTING MESSENGER CABLE
56. LASH CABLE(S) TO NEW MESSENGER CABLE
57. MODIFY EXISTING ELECTRICAL SERVICE
58. INSTALL NEW ELECTRICAL SERVICE
59. REUSE EXISTING ETHERNET TRANSCEIVER

LEGEND

- F. O. — NEW FIBER OPTIC COMMUNICATIONS CABLE
- TWIST. PR. — NEW TWISTED PAIR COMMUNICATIONS CABLE
- EXIST. — EXISTING COMMUNICATIONS CABLE
- REM. — EXISTING COMMUNICATIONS CABLE TO BE REMOVED
- NEW AERIAL GUY ASSEMBLY
- NEW CONDUIT
- EXISTING CONDUIT
- D D — NEW DIRECTIONAL DRILLED CONDUIT
- B & J — NEW BORED AND JACKED CONDUIT
- NEW JUNCTION BOX
- EXISTING JUNCTION BOX
- EXISTING WOOD POLE (TO REMAIN)
- EXISTING WOOD POLE
- S — NEW AERIAL SPLICE ENCLOSURE
- NEW METAL POLE
- EXISTING METAL POLE
- NEW CCTV CAMERA ASSEMBLY
- NEW STANDARD GUY ASSEMBLY
- NEW SIDEWALK GUY ASSEMBLY
- NEW CABLE STORAGE RACKS (SNOW SHOES)
- EXISTING CONTROLLER AND CABINET
- S — EXISTING SPLICE CABINET
- S — NEW SPLICE CABINET
- SP — SIGNAL POLE
- XX–XXXX — SIGNAL INVENTORY NUMBER

CONSTRUCTION NOTE SYMBOLOGY KEY

- XX — INDICATES NUMBER OF CABLES, LOOPS, ETC.
- XX — INDICATES NUMBER OF FIBERS PER CABLE, TWISTED PAIRS PER CABLE, ETC.
- XX — INDICATES NUMBER OF RISER(S)/CONDUIT(S)
- XX — INDICATES DIAMETER OF RISER(S)/CONDUIT(S) (INCH)



SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE: 0 N/A

CONSTRUCTION NOTES

Division 07 Guilford County Greensboro

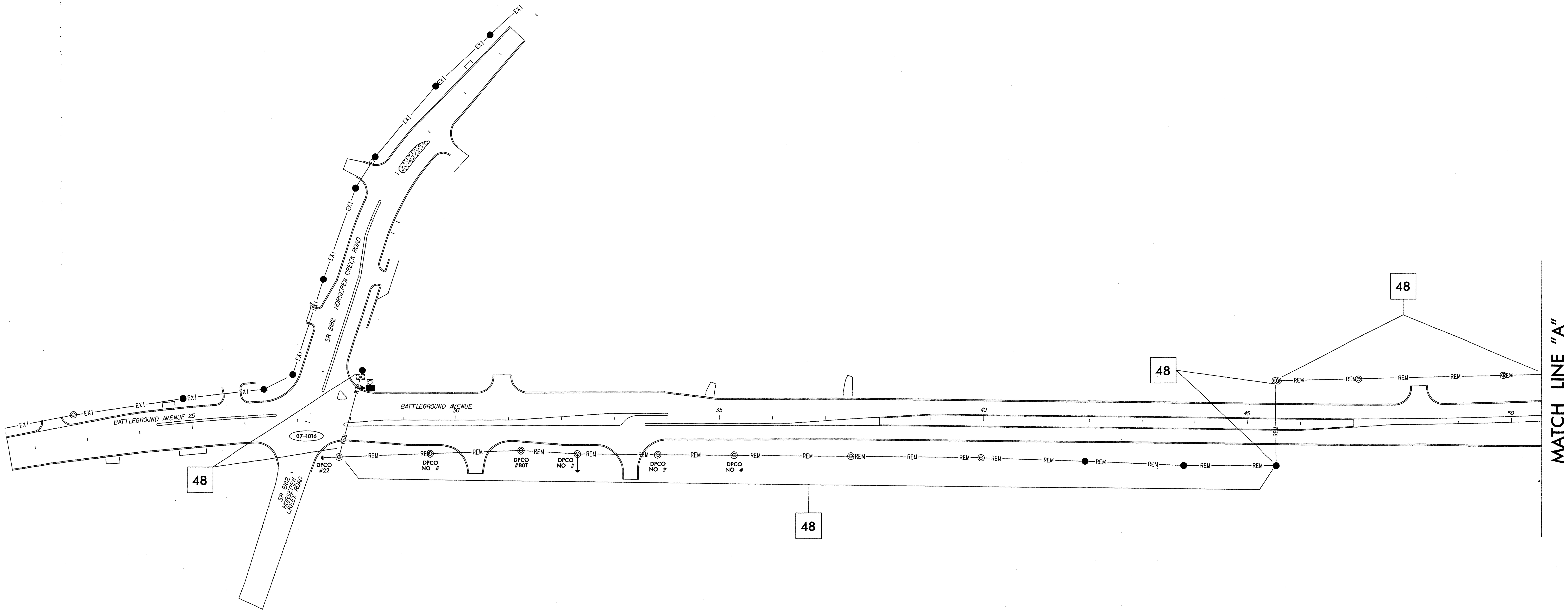
PLAN DATE: September 2011	REVIEWED BY: J Hochanadel	
PREPARED BY: R Drayton	REVIEWED BY:	
	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/31/11 DATE

CADD FILE NAME

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.77



NOTE:

1.IF GREENSBORO SIGNAL SYSTEM (U-4711) HAS REMOVED THIS CABLE, THEN THIS WORK WILL BE ELIMINATED FROM THE CONTRACT

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
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License #: C-2197

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

SCALE 0 100 1"=100'

TMP PHASE I
COMMUNICATIONS CABLE
AND CONDUIT ROUTING PLAN

Division 7 Guilford County Greensboro

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

8/31/11
SIGNATURE DATE
SIG. INVENTORY NO.

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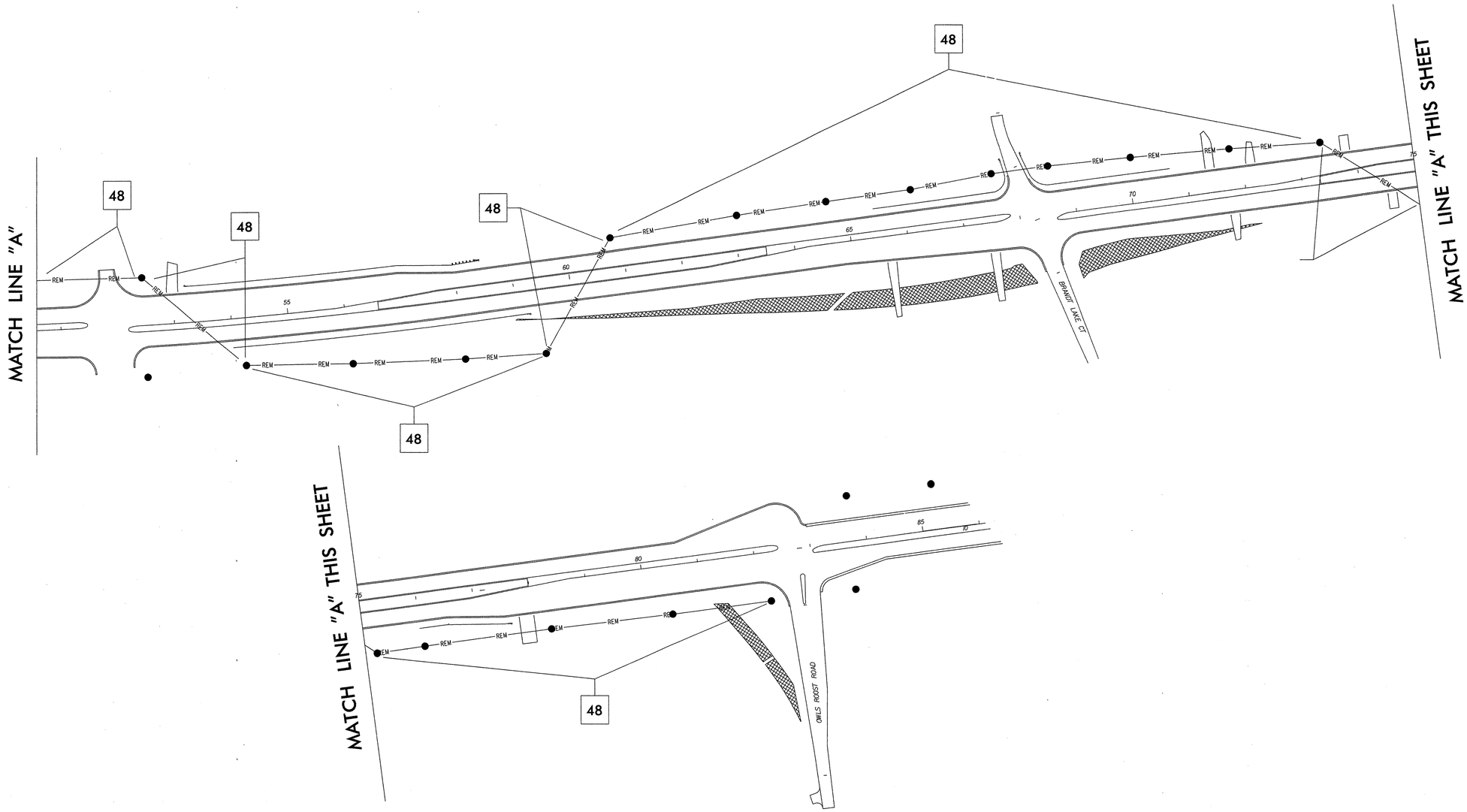
PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 78



NOTE:

1.IF GREENSBORO SIGNAL SYSTEM (U-4711) HAS REMOVED THIS CABLE, THEN THIS WORK WILL BE ELIMINATED FROM THE CONTRACT

$$$$SYSTIME$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

SEPI
ENGINEERING & CONSTRUCTION

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Raleigh, NC 27605
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Fax:919-789-9591
License #: C-2197

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

SCALE 0 100 1"=100'

TMP PHASE I
COMMUNICATIONS CABLE
AND CONDUIT ROUTING PLAN

Division 7 Guilford County Greensboro

PLAN DATE:	September 2011	REVIEWED BY:	J Hochanadel
PREPARED BY:	R Drayton	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/31/11 DATE

SIG. INVENTORY NO.

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PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.79

GENERAL NOTES FOR FIBER OPTIC CABLE *BDMISB*:

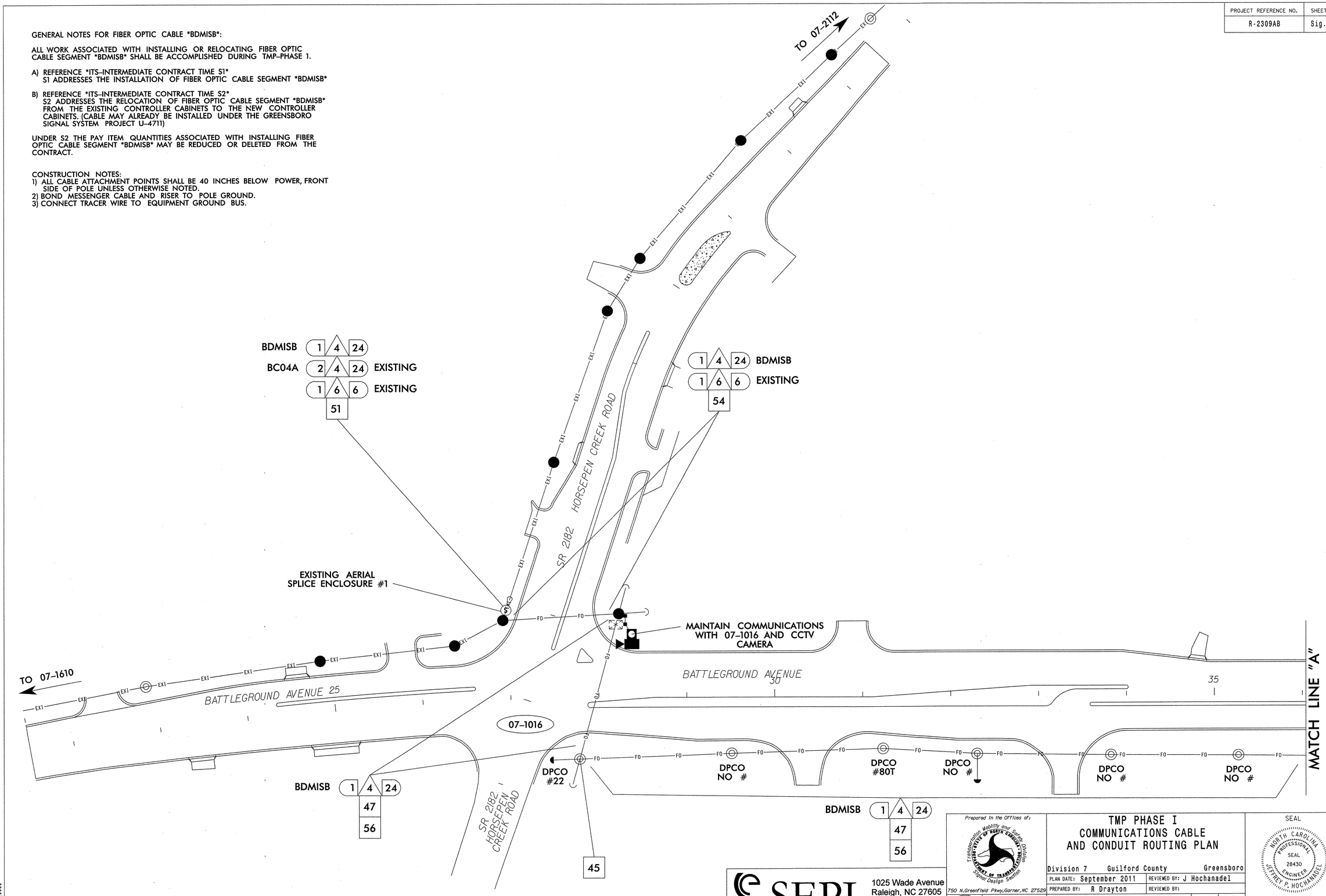
ALL WORK ASSOCIATED WITH INSTALLING OR RELOCATING FIBER OPTIC CABLE SEGMENT *BDMISB* SHALL BE ACCOMPLISHED DURING TMP-PHASE 1.

A) REFERENCE *ITS-INTERMEDIATE CONTRACT TIME S1*
S1 ADDRESSES THE INSTALLATION OF FIBER OPTIC CABLE SEGMENT *BDMISB*

B) REFERENCE *ITS-INTERMEDIATE CONTRACT TIME S2*
S2 ADDRESSES THE RELOCATION OF FIBER OPTIC CABLE SEGMENT *BDMISB* FROM THE EXISTING CONTROLLER CABINETS TO THE NEW CONTROLLER CABINETS. (CABLE MAY ALREADY BE INSTALLED UNDER THE GREENSBORO SIGNAL SYSTEM PROJECT U-4711)

UNDER S2 THE PAY ITEM QUANTITIES ASSOCIATED WITH INSTALLING FIBER OPTIC CABLE SEGMENT *BDMISB* MAY BE REDUCED OR DELETED FROM THE CONTRACT.

CONSTRUCTION NOTES:
1) ALL CABLE ATTACHMENT POINTS SHALL BE 40 INCHES BELOW POWER, FRONT SIDE OF POLE UNLESS OTHERWISE NOTED.
2) BOND MESSENGER CABLE AND RISER TO POLE GROUND.
3) CONNECT TRACER WIRE TO EQUIPMENT GROUND BUS.



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Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

TMP PHASE I COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 7 Guilford County Greensboro

PLAN DATE: September 2011 REVIEWED BY: J Hochanadel

PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/31/11 DATE

SIG. INVENTORY NO.

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

GENERAL NOTES FOR FIBER OPTIC CABLE *BDMISB*:

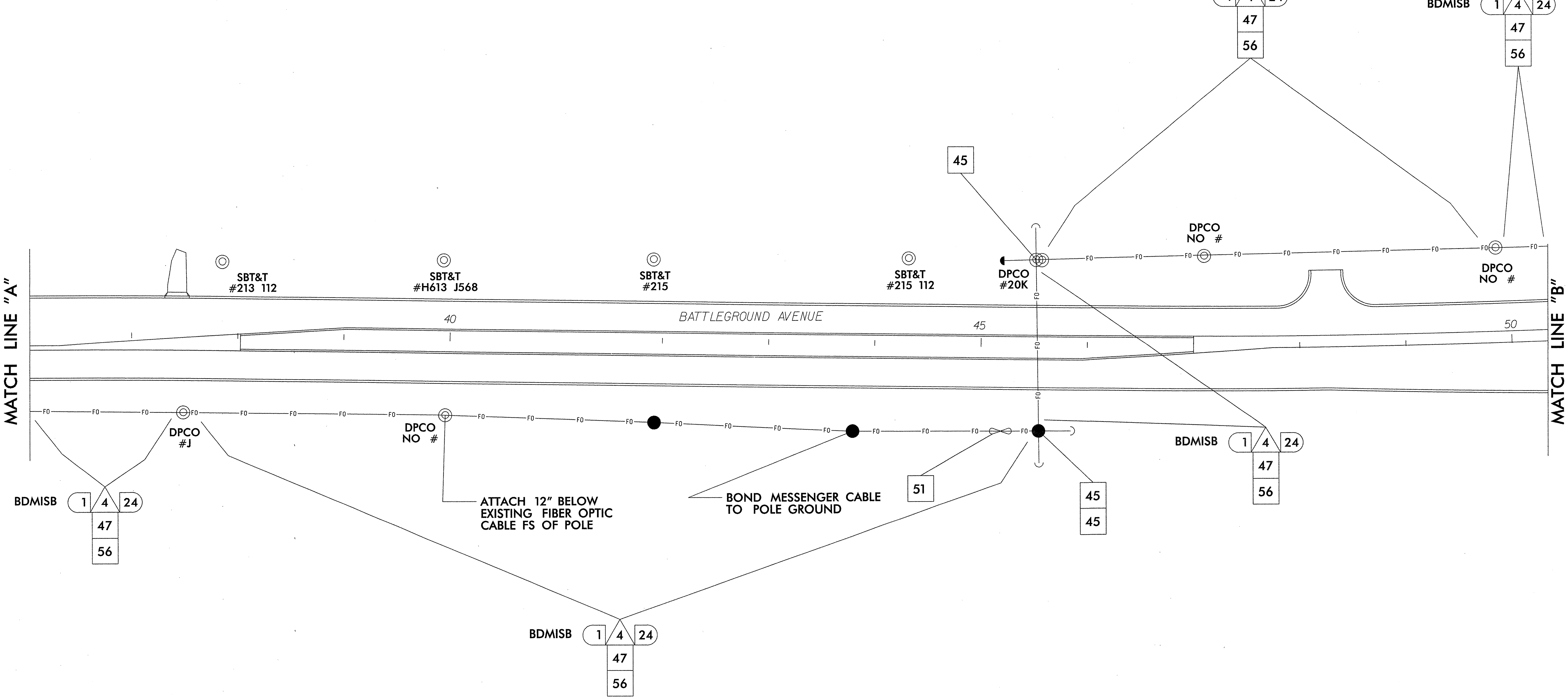
ALL WORK ASSOCIATED WITH INSTALLING OR RELOCATING FIBER OPTIC CABLE SEGMENT *BDMISB* SHALL BE ACCOMPLISHED DURING TMP–PHASE 1.

A) REFERENCE *ITS–INTERMEDIATE CONTRACT TIME S1*
S1 ADDRESSES THE INSTALLATION OF FIBER OPTIC CABLE SEGMENT *BDMISB*

B) REFERENCE *ITS–INTERMEDIATE CONTRACT TIME S2*
S2 ADDRESSES THE RELOCATION OF FIBER OPTIC CABLE SEGMENT *BDMISB* FROM THE EXISTING CONTROLLER CABINETS TO THE NEW CONTROLLER CABINETS. (CABLE MAY ALREADY BE INSTALLED UNDER THE GREENSBORO SIGNAL SYSTEM PROJECT U–4711)

UNDER S2 THE PAY ITEM QUANTITIES ASSOCIATED WITH INSTALLING FIBER OPTIC CABLE SEGMENT *BDMISB* MAY BE REDUCED OR DELETED FROM THE CONTRACT.

CONSTRUCTION NOTES:
1) ALL CABLE ATTACHMENT POINTS SHALL BE 40 INCHES BELOW POWER, FRONT SIDE OF POLE UNLESS OTHERWISE NOTED.
2) BOND MESSENGER CABLE AND RISER TO POLE GROUND.
3) CONNECT TRACER WIRE TO EQUIPMENT GROUND BUS.



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

SCALE 0 50, 1"=50'

TMP PHASE I
COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 7 Guilford County Greensboro

PLAN DATE: September 2011	REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/31/11 DATE

SIG. INVENTORY NO.

$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

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PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.81

GENERAL NOTES FOR FIBER OPTIC CABLE *BDMISB*:

ALL WORK ASSOCIATED WITH INSTALLING OR RELOCATING FIBER OPTIC CABLE SEGMENT *BDMISB* SHALL BE ACCOMPLISHED DURING TCP-PHASE 1.

A) REFERENCE *ITS-INTERMEDIATE CONTRACT TIME S1*
S1 ADDRESSES THE INSTALLATION OF FIBER OPTIC CABLE SEGMENT *BDMISB*

B) REFERENCE *ITS-INTERMEDIATE CONTRACT TIME S2*
S2 ADDRESSES THE RELOCATION OF FIBER OPTIC CABLE SEGMENT *BDMISB* FROM THE EXISTING CONTROLLER CABINETS TO THE NEW CONTROLLER CABINETS. (CABLE MAY ALREADY BE INSTALLED UNDER THE GREENSBORO SIGNAL SYSTEM PROJECT U-4711)

UNDER S2 THE PAY ITEM QUANTITIES ASSOCIATED WITH INSTALLING FIBER OPTIC CABLE SEGMENT *BDMISB* MAY BE REDUCED OR DELETED FROM THE CONTRACT.

CONSTRUCTION NOTES:
1) ALL CABLE ATTACHMENT POINTS SHALL BE 40 INCHES BELOW POWER, FRONT SIDE OF POLE UNLESS OTHERWISE NOTED.
2) BOND MESSENGER CABLE AND RISER TO POLE GROUND.
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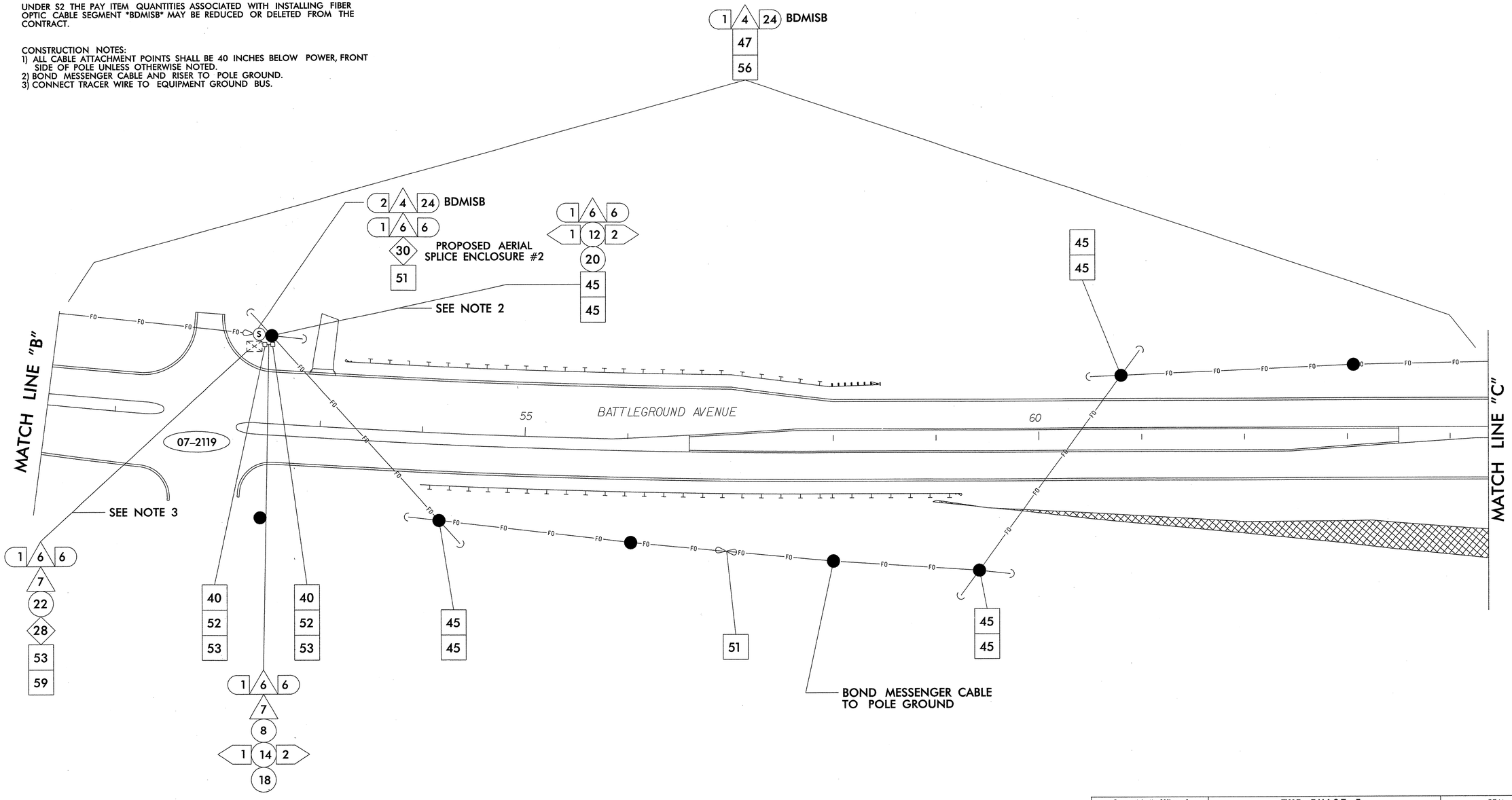

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

Prepared in the Offices of:
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Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SEPI ENGINEERING & CONSTRUCTION
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Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

SCALE 0 50 1"=50'

TMP PHASE I COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 7 Guilford County Greensboro

PLAN DATE: September 2011 REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/31/11 DATE
SIG. INVENTORY NO.

\Cable Routing\CR-3.dgn 8/31/2011 1:50:30 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.82

GENERAL NOTES FOR FIBER OPTIC CABLE *BDMISB*:

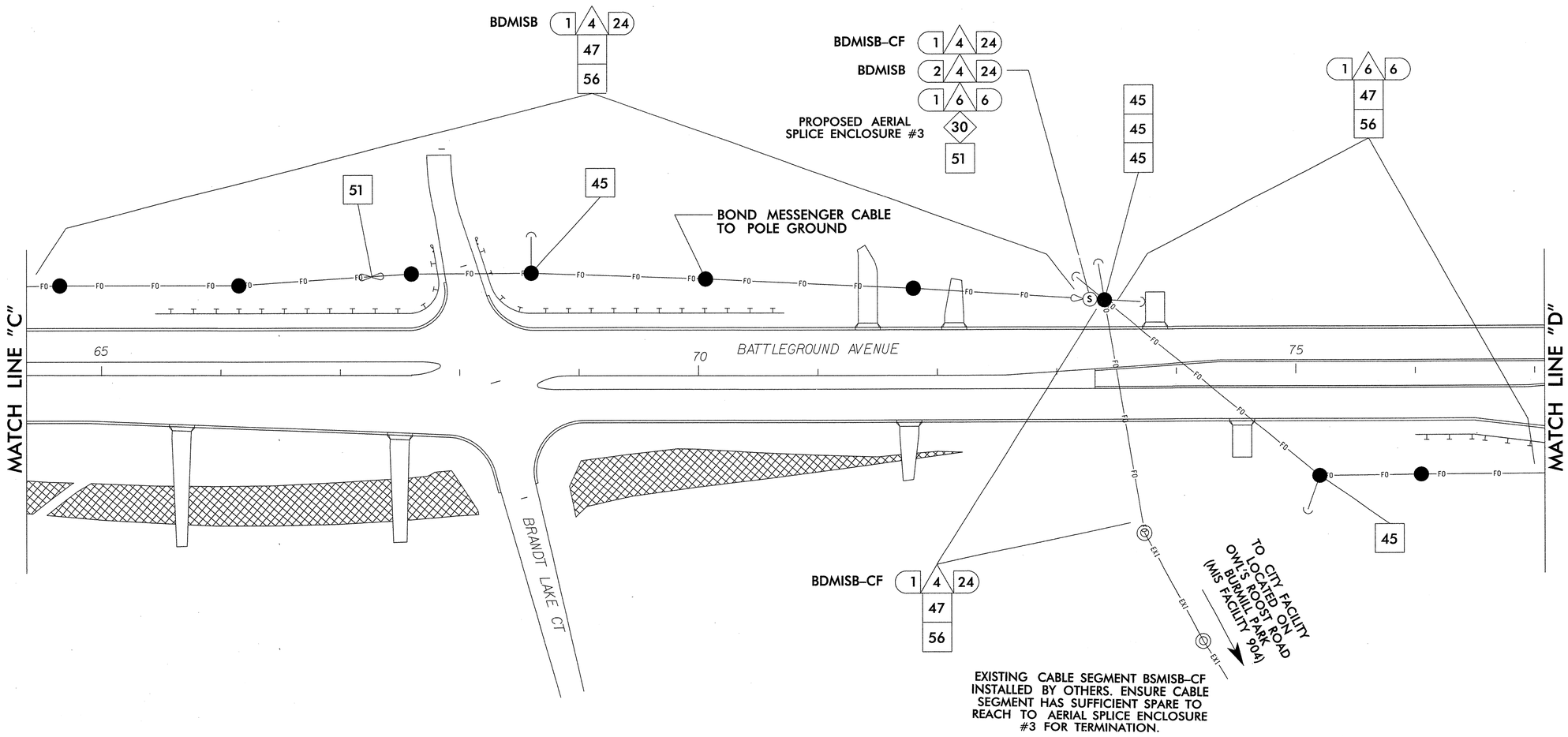
ALL WORK ASSOCIATED WITH INSTALLING OR RELOCATING FIBER OPTIC CABLE SEGMENT *BDMISB* SHALL BE ACCOMPLISHED DURING TCP-PHASE 1.

A) REFERENCE *ITS-INTERMEDIATE CONTRACT TIME S1*
S1 ADDRESSES THE INSTALLATION OF FIBER OPTIC CABLE SEGMENT *BDMISB*

B) REFERENCE *ITS-INTERMEDIATE CONTRACT TIME S2*
S2 ADDRESSES THE RELOCATION OF FIBER OPTIC CABLE SEGMENT *BDMISB* FROM THE EXISTING CONTROLLER CABINETS TO THE NEW CONTROLLER CABINETS. (CABLE MAY ALREADY BE INSTALLED UNDER THE GREENSBORO SIGNAL SYSTEM PROJECT U-4711)

UNDER S2 THE PAY ITEM QUANTITIES ASSOCIATED WITH INSTALLING FIBER OPTIC CABLE SEGMENT *BDMISB* MAY BE REDUCED OR DELETED FROM THE CONTRACT.

CONSTRUCTION NOTES:
1) ALL CABLE ATTACHMENT POINTS SHALL BE 40 INCHES BELOW POWER, FRONT SIDE OF POLE UNLESS OTHERWISE NOTED.
2) BOND MESSENGER CABLE AND RISER TO POLE GROUND.
3) CONNECT TRACER WIRE TO EQUIPMENT GROUND BUS.



CONSTRUCTION NOTE FOR AERIAL SPLICE ENCLOSURE #3:
A) IF CABLE SEGMENT *BDMISB* AND *BDMISB-CF* HAVE ALREADY BEEN INSTALLED UNDER THE GREENSBORO SIGNAL SYSTEM PROJECT U-4711 THEN NO WORK WILL BE REQUIRED AT THIS LOCATION.

B) IF CABLE SEGMENT *BDMISB* HAS NOT BEEN INSTALLED THEN LOCATE CABLE SEGMENT *BDMISB-CF* AND EXTEND TO AERIAL SPLICE ENCLOSURE #3 AND SPLICE ACCORDING TO SPLICE PLANS.

$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$$$USERNAME$$$$$$

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

TMP PHASE I
COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 7 Guilford County Greensboro

PLAN DATE: September 2011 REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 8/31/11 DATE
SIG. INVENTORY NO.

\Cable Routing\CD-4.dgn 8/31/2011 4:54:35 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.83

NOTES FOR WIRELESS COMMUNICATIONS:

1. INSTALL COAXIAL CABLE:
   A. ON WOOD POLES, REQUIRING A NEW RISER, INSTALL A 2" RISER WITH WEATHERHEAD TO ROUTE THE COAXIAL CABLE TO THE ANTENNA. ON POLES WITH EXISTING RISERS WITH WEATHER HEADS REUSE THE RISER ASSEMBLY.
   B. ON METAL POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE MAST ARM; FIELD DRILL 1/2" HOLE WITH GROMMET THROUGH BOTTOM OF MAST ARM FOR INSTALLATION OF THE COAXIAL CABLE TO THE ANTENNA.
   C. ON METAL STRAIN POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND REPLACE THE WEATHERHEAD WITH HEAT SHRINK TUBING AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
   D. BETWEEN THE POINT OF EXITING THE METAL POLE OR MAST ARM AND THE ANTENNA, SECURE THE COAXIAL CABLE TO THE STRUCTURE USING 3/4" STAINLESS STEEL STRAPS EVERY 12".
2. IF EXISTING SPARE RISER IS AVAILABLE, REMOVE WEATHERHEAD AND INSTALL COAXIAL CABLES. RESEAL WITH HEAT SHRINK TUBING.
3. INSTALL WIRELESS ANTENNA ON POLE WITH RF WARNING SIGN AND AIM TOWARDS MASTER. (NOTE: RF WARNING SIGN NOT REQUIRED WHEN ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
4. MAINTAIN PROPER CLEARANCE FROM ALL UTILITIES PER THE NATIONAL ELECTRICAL SAFETY CODE.
5. INSTALL WIRELESS SERIAL RADIO MODEM WITH EXTERIOR DISCONNECT SWITCH LOCATED ON CABINET. (NOTE: RF ANTENNA DISCONNECT SWITCH AND DECAL ARE NOT REQUIRED WHEN THE ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
6. REFERENCE "WIRELESS RADIO ANTENNA TYPICAL DETAILS."
7. PROJECT MAY BE ABLE TO BE CONSTRUCTED USING ONLY ONE REPEATER RADIO. TO BE DETERMINED BY THE CONTRACTOR FOLLOWING RADIO TESTING AND SUBMITTED TO THE NCDOT FOR APPROVAL. FINAL REPEATER LOCATION(S) TO BE DETERMINED.

GENERAL NOTES FOR FIBER OPTIC CABLE *BDMISB*:

ALL WORK ASSOCIATED WITH INSTALLING OR RELOCATING FIBER OPTIC CABLE SEGMENT *BDMISB* SHALL BE ACCOMPLISHED DURING TCP-PHASE 1.

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S1 ADDRESSES THE INSTALLATION OF FIBER OPTIC CABLE SEGMENT *BDMISB*

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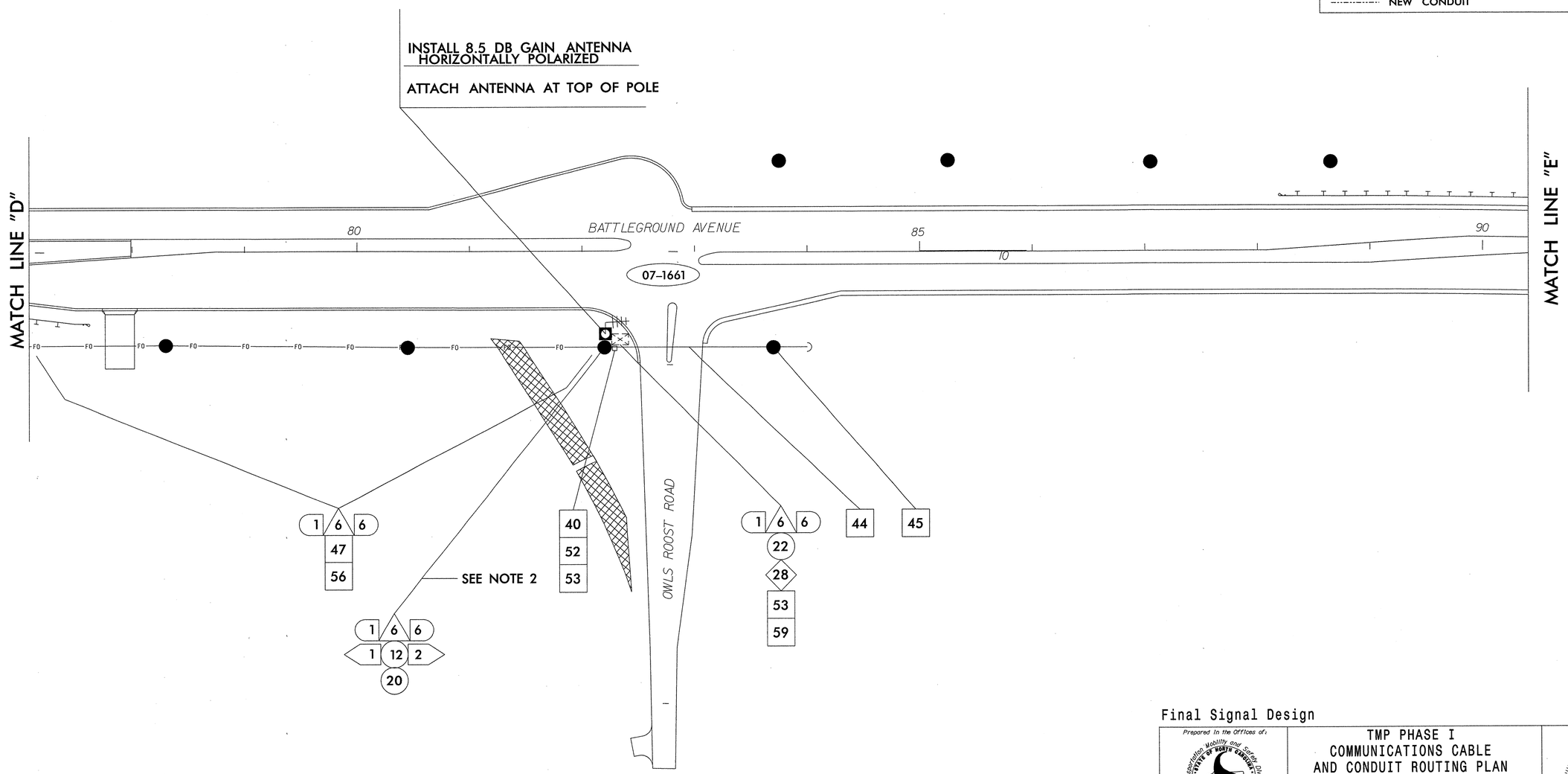
S2 ADDRESSES THE RELOCATION OF FIBER OPTIC CABLE SEGMENT *BDMISB* FROM THE EXISTING CONTROLLER CABINETS TO THE NEW CONTROLLER CABINETS. (CABLE MAY ALREADY BE INSTALLED UNDER THE GREENSBORO SIGNAL SYSTEM PROJECT U-4711)

UNDER S2 THE PAY ITEM QUANTITIES ASSOCIATED WITH INSTALLING FIBER OPTIC CABLE SEGMENT *BDMISB* MAY BE REDUCED OR DELETED FROM THE CONTRACT.

CONSTRUCTION NOTES:
1) ALL CABLE ATTACHMENT POINTS SHALL BE 40 INCHES BELOW POWER, FRONT SIDE OF POLE UNLESS OTHERWISE NOTED.
2) BOND MESSENGER CABLE AND RISER TO POLE GROUND.
3) CONNECT TRACER WIRE TO EQUIPMENT GROUND BUS.

LEGEND

- YAGI ANTENNA (DOUBLE) FOR REPEATER OPERATION
- YAGI ANTENNA (SINGLE)
- OMNI ANTENNA
- EXISTING CONTROLLER AND CABINET
- EXISTING MASTER CONTROLLER AND CABINET
- XX-XXXX SIGNAL INVENTORY NUMBER
- EXISTING METAL POLE W/MAST ARM
- EXISTING WOOD POLE
- NEW METAL POLE
- NEW WOOD POLE
- SP SIGNAL POLE
- EXISTING METAL POLE
- NEW OVERSIZED JUNCTION BOX
- EXISTING OVERSIZED JUNCTION BOX
- EXISTING CONDUIT
- EXI EXISTING COMMUNICATIONS CABLE
- NEW CONDUIT



Final Signal Design

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

SEPI ENGINEERING & CONSTRUCTION
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License #: C-2197

SCALE 0 50 1"=50'

TMP PHASE I
COMMUNICATIONS CABLE
AND CONDUIT ROUTING PLAN

Division 7 Guilford County Greensboro

PLAN DATE: September 2011 REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/31/11 DATE
SIG. INVENTORY NO.

$$$$$SYSTIME$$$$$
$$$$$USERNAME$$$$$

\Cable Routing\CR-5.dgn 8/31/2011 1:52:27 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.84

NOTES FOR WIRELESS COMMUNICATIONS:

1. INSTALL COAXIAL CABLE:
   A. ON WOOD POLES, REQUIRING A NEW RISER, INSTALL A 2" RISER WITH WEATHERHEAD TO ROUTE THE COAXIAL CABLE TO THE ANTENNA. ON POLES WITH EXISTING RISERS WITH WEATHER HEADS REUSE THE RISER ASSEMBLY.
   B. ON METAL POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE MAST ARM; FIELD DRILL 1/2" HOLE WITH GROMMET THROUGH BOTTOM OF MAST ARM FOR INSTALLATION OF THE COAXIAL CABLE TO THE ANTENNA.
   C. ON METAL STRAIN POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND REPLACE THE WEATHERHEAD WITH HEAT SHRINK TUBING AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
   D. BETWEEN THE POINT OF EXITING THE METAL POLE OR MAST ARM AND THE ANTENNA, SECURE THE COAXIAL CABLE TO THE STRUCTURE USING 3/4" STAINLESS STEEL STRAPS EVERY 12".
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3. INSTALL WIRELESS ANTENNA ON POLE WITH RF WARNING SIGN AND AIM TOWARDS MASTER. (NOTE: RF WARNING SIGN NOT REQUIRED WHEN ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
4. MAINTAIN PROPER CLEARANCE FROM ALL UTILITIES PER THE NATIONAL ELECTRICAL SAFETY CODE.
5. INSTALL WIRELESS SERIAL RADIO MODEM WITH EXTERIOR DISCONNECT SWITCH LOCATED ON CABINET. (NOTE: RF ANTENNA DISCONNECT SWITCH AND DECAL ARE NOT REQUIRED WHEN THE ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
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- YAGI ANTENNA (SINGLE)
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- EXISTING METAL POLE W/MAST ARM
- EXISTING WOOD POLE
- NEW METAL POLE
- NEW WOOD POLE
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- EXISTING OVERSIZED JUNCTION BOX
- EXISTING CONDUIT
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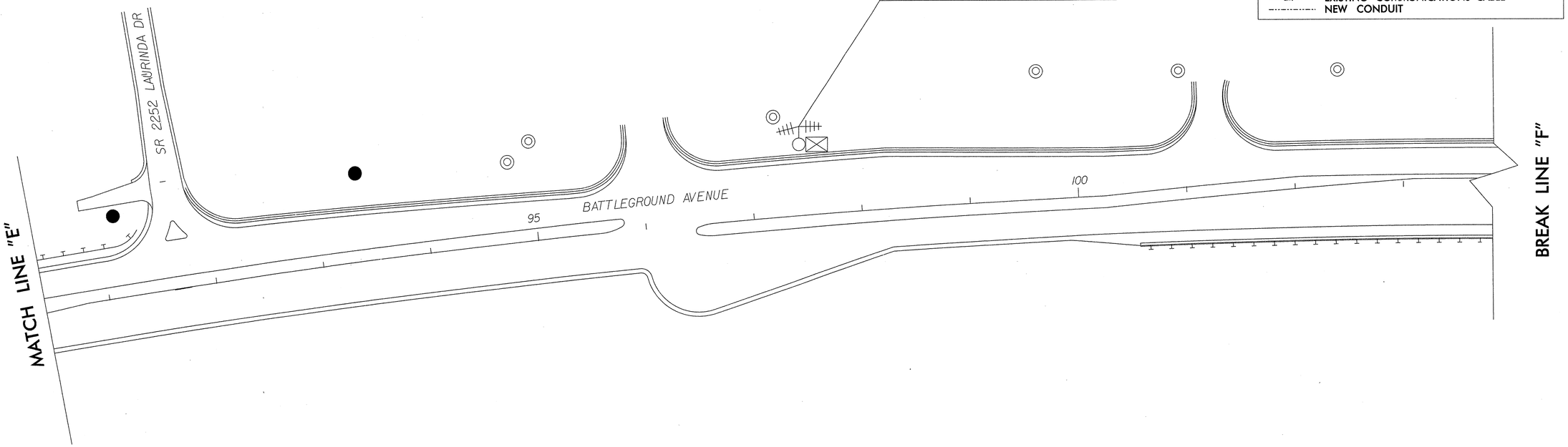
- NEW CONDUIT



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Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

TMP PHASE I COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 7 Guilford County Greensboro

PLAN DATE: September 2011 REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/31/11 DATE

SIG. INVENTORY NO.

$$$$$$SYSTIME$$$$$$
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$$$$DGNNAME$$$$

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PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.85

NOTES FOR WIRELESS COMMUNICATIONS:

1. INSTALL COAXIAL CABLE:
   A. ON WOOD POLES, REQUIRING A NEW RISER, INSTALL A 2" RISER WITH WEATHERHEAD TO ROUTE THE COAXIAL CABLE TO THE ANTENNA. ON POLES WITH EXISTING RISERS WITH WEATHER HEADS REUSE THE RISER ASSEMBLY.
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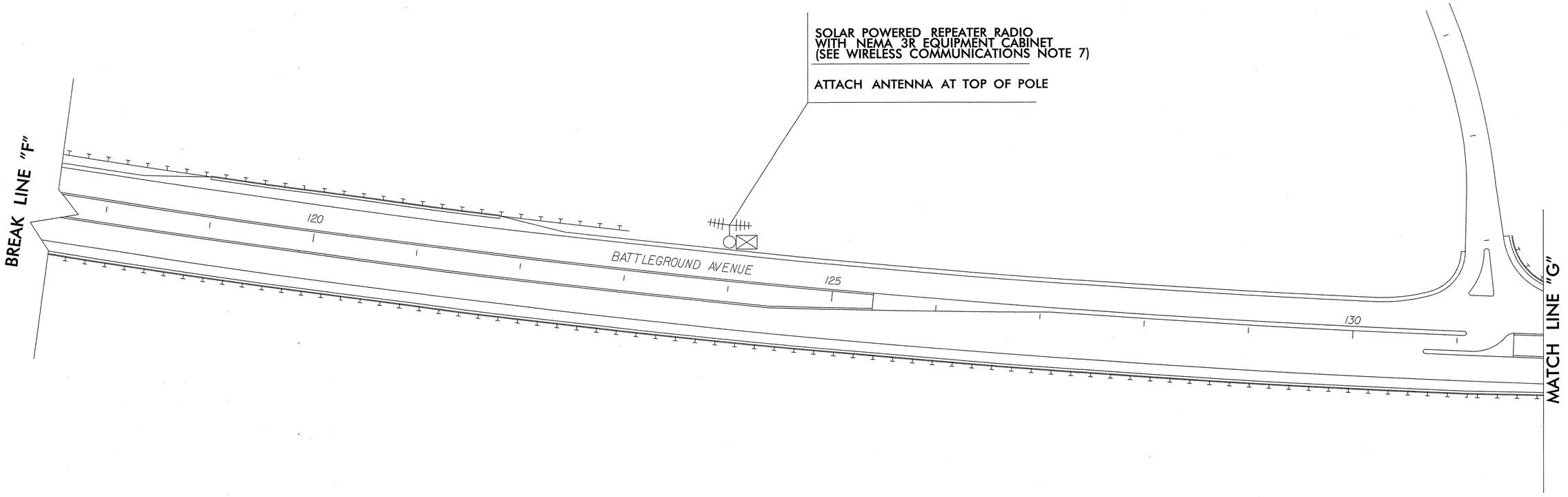

$$$$$$$SYSTIME$$$$$
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$$$$USERNAME$$$$

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
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Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

TMP PHASE I COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 7 Guilford County Greensboro

PLAN DATE: September 2011 REVIEWED BY: J Hochanadel

PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/31/11 DATE

SIG. INVENTORY NO.

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PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.86

NOTES FOR WIRELESS COMMUNICATIONS:

1. INSTALL COAXIAL CABLE:
   A. ON WOOD POLES, REQUIRING A NEW RISER, INSTALL A 2" RISER WITH WEATHERHEAD TO ROUTE THE COAXIAL CABLE TO THE ANTENNA. ON POLES WITH EXISTING RISERS WITH WEATHER HEADS REUSE THE RISER ASSEMBLY.
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- EXISTING OVERSIZED JUNCTION BOX
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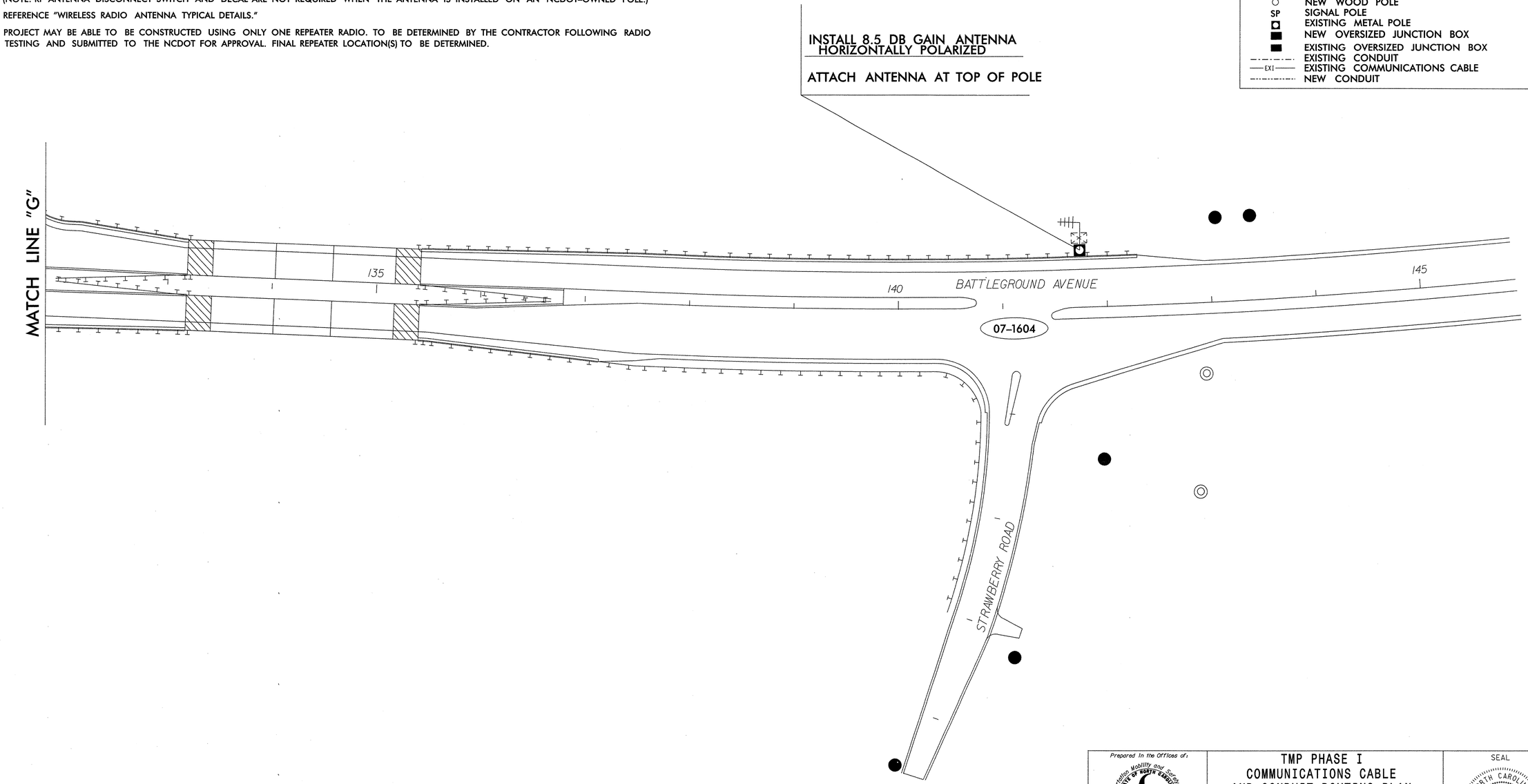
- EXI EXISTING COMMUNICATIONS CABLE
- NEW CONDUIT



SEPI ENGINEERING & CONSTRUCTION
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SCALE 0 50 1"=50'

TMP PHASE I COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 7 Guilford County Greensboro

PLAN DATE: September 2011 REVIEWED BY: J Hochanadel

PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

8/31/11
SIGNATURE DATE

SIG. INVENTORY NO.

$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

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PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.87

AERIAL SPLICE ENCLOSURE #1

GROUP BC04
BATTLEGROUND (US 220)
AT OLD BATTLEGROUND/
HORSE PEN CREEK

SIG. INV. 07-1016
CCTV-25
WFHS.CCTV-25

LEGEND

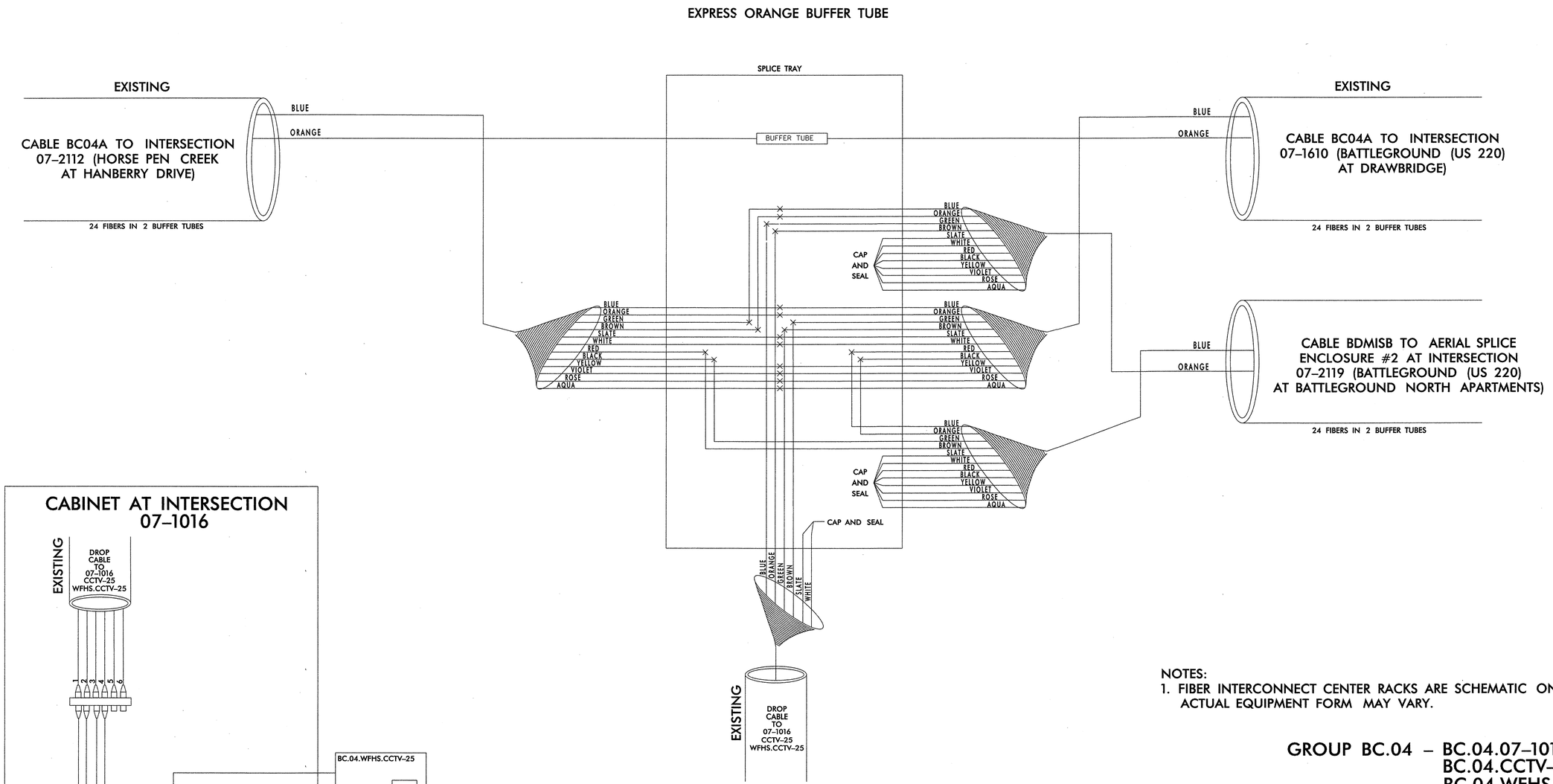
COLOR CODE TIA/EIA 598-A

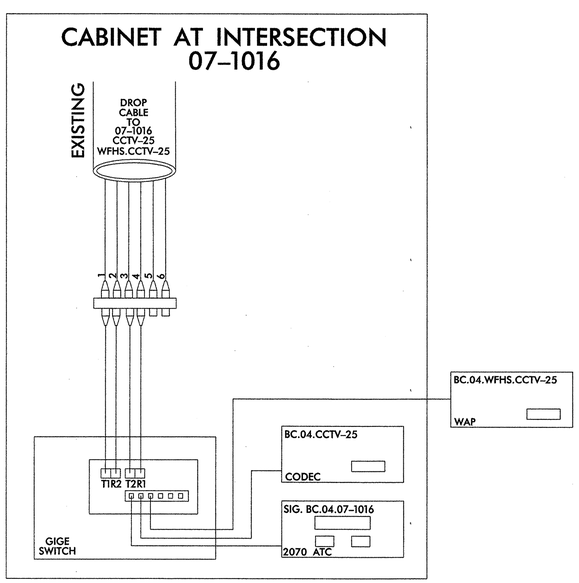
(1) BLUE	(7) RED
(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA

ETHERNET SWITCH TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING / ENSURING PROPER TERMINATION.

X - FUSION SPLICE INDIVIDUAL FIBER

BUFFER TUBE — SPLICE OR EXPRESS ENTIRE BUFFER TUBE AS NOTED





NOTES:
1. FIBER INTERCONNECT CENTER RACKS ARE SCHEMATIC ONLY - ACTUAL EQUIPMENT FORM MAY VARY.

GROUP BC.04 - BC.04.07-1016
BC.04.CCTV-25
BC.04.WFHS.CCTV-25

SEPI ENGINEERING & CONSTRUCTION
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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 NTS

City of Greensboro
Computerized
Signal System Upgrade
Splice Details

Division 7 Guilford County Greensboro

PLAN DATE: September 2011 REVIEWED BY: J Hochanadel
PREPARED BY: M Copple REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 8/31/11 DATE
SIG. INVENTORY NO.

...\Fiber Optic Splice.dgn 8/31/2011 1:42:06 PM

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.88

AERIAL SPLICE ENCLOSURE #2

GROUP BC04
BATTLEGROUND (US 220)
AT BATTLEGROUND NORTH APARTMENTS

SIG. INV. 07–2119

LEGEND

COLOR CODE TIA/EIA 598–A

(1) BLUE	(7) RED
(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA

ETHERNET SWITCH TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING / ENSURING PROPER TERMINATION.

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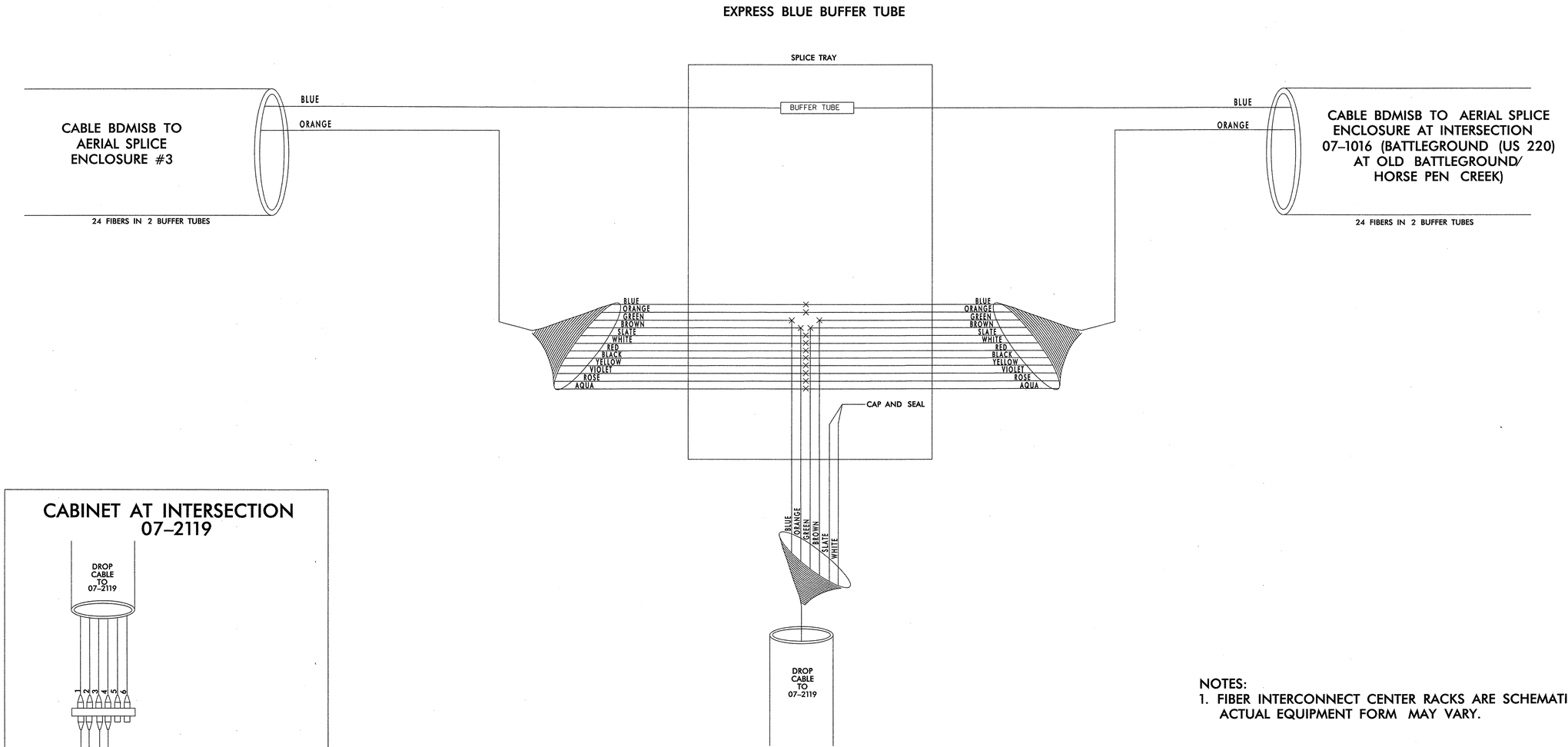
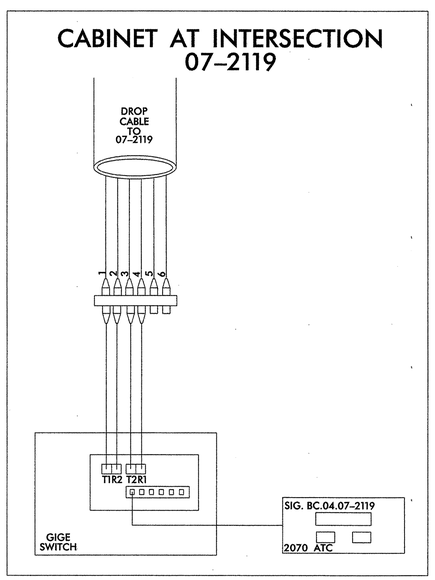
BUFFER TUBE – SPLICE OR EXPRESS ENTIRE BUFFER TUBE AS NOTED





NOTES:
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GROUP BC.04 – BC.04.07–2119

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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 NTS

City of Greensboro
Computerized
Signal System Upgrade
Splice Details

Division 7 Guilford County Greensboro

PLAN DATE: September 2011		REVIEWED BY: J Hochanadel	
PREPARED BY: M Copple		REVIEWED BY:	
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 8/21/11 DATE
SIG. INVENTORY NO.

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig.89

AERIAL SPLICE ENCLOSURE #3

GROUP BDMIS AERIAL SPLICE ENCLOSURE #3

LEGEND

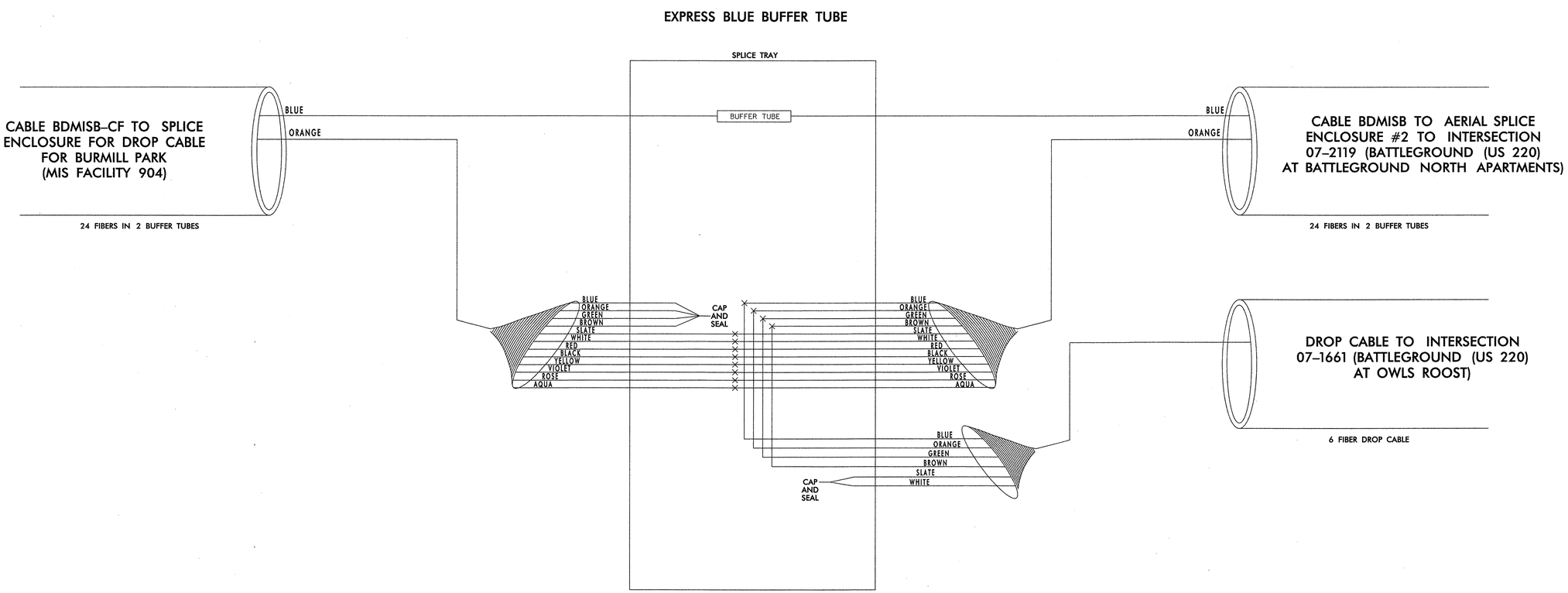
COLOR CODE TIA/EIA 598-A

(1) BLUE	(7) RED
(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA

ETHERNET SWITCH TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING / ENSURING PROPER TERMINATION.

X - FUSION SPLICE INDIVIDUAL FIBER

BUFFER TUBE — SPLICE OR EXPRESS ENTIRE BUFFER TUBE AS NOTED



NOTES:
1. FIBER INTERCONNECT CENTER RACKS ARE SCHEMATIC ONLY – ACTUAL EQUIPMENT FORM MAY VARY.

GROUP BDMIS

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

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SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 8/31/11 DATE

SIG. INVENTORY NO.

PROJECT REFERENCE NO.	SHEET NO.
R-2309AB	Sig. 90

GROUP BC04
BATTLEGROUND (US 220)
AT OWLS ROOST

SIG. INV. 07–1661

COLOR CODE
TIA/EIA 598-A

(1) BLUE	(7) RED
(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
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LEGEND

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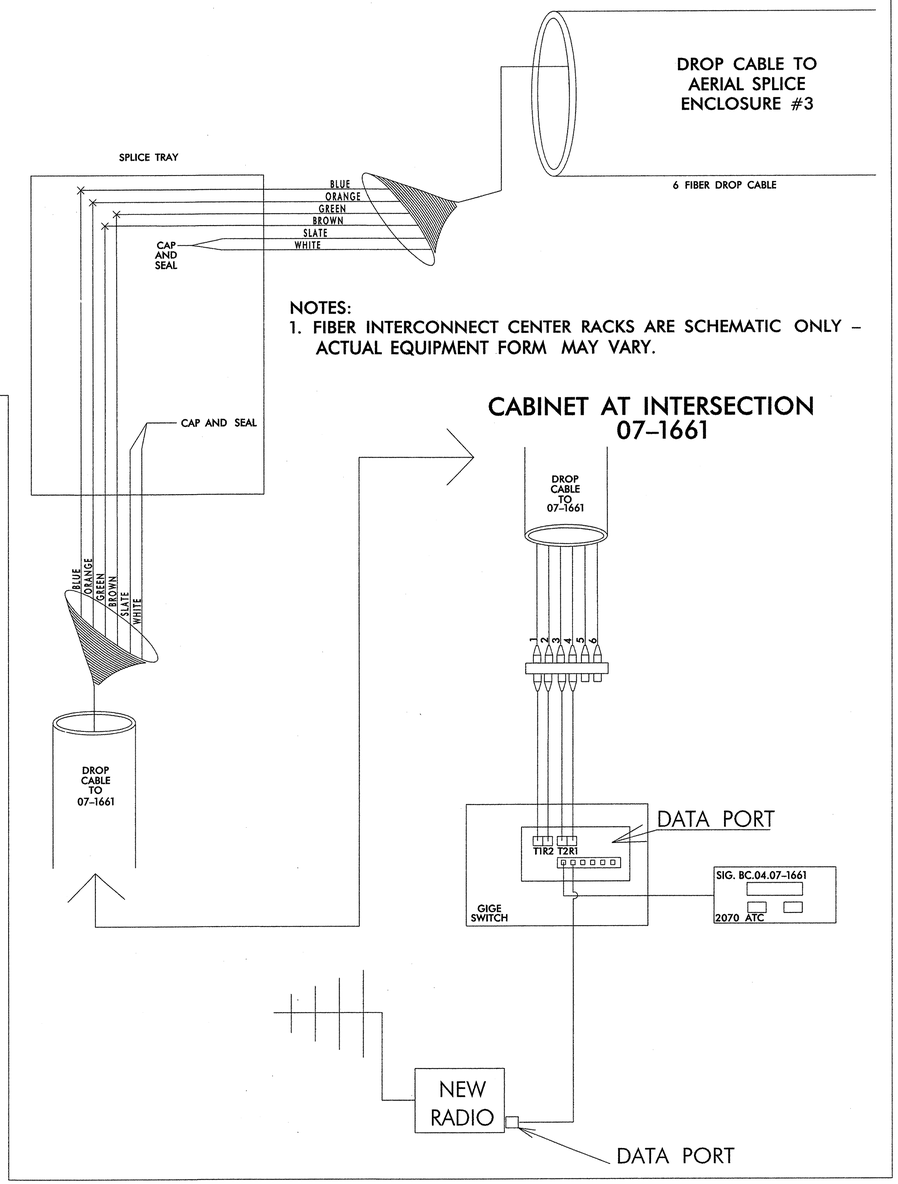
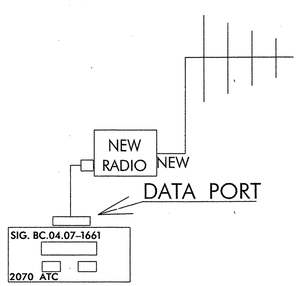
X - FUSION SPLICE INDIVIDUAL FIBER

BUFFER TUBE — SPLICE OR EXPRESS ENTIRE BUFFER TUBE AS NOTED

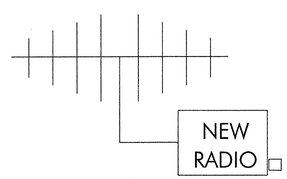


NOTES:
1. FIBER INTERCONNECT CENTER RACKS ARE SCHEMATIC ONLY – ACTUAL EQUIPMENT FORM MAY VARY.

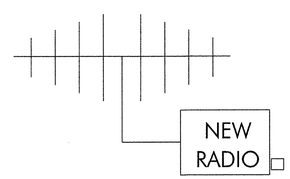
BATTLEGROUND (US 220) AT STRAWBERRY ROAD
SIG. INV. # 07–1604



EXISTING



NEW SOLAR POWERED 900 MHz, WIRELESS ETHERENT RADIO (REPEATER)



NEW SOLAR POWERED 900 MHz, WIRELESS ETHERENT RADIO (REPEATER)

GROUP BC.04 – BC.04.07–1661

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...\Fiber Optic Splice.dgn 8/31/2011 1:42:38 PM