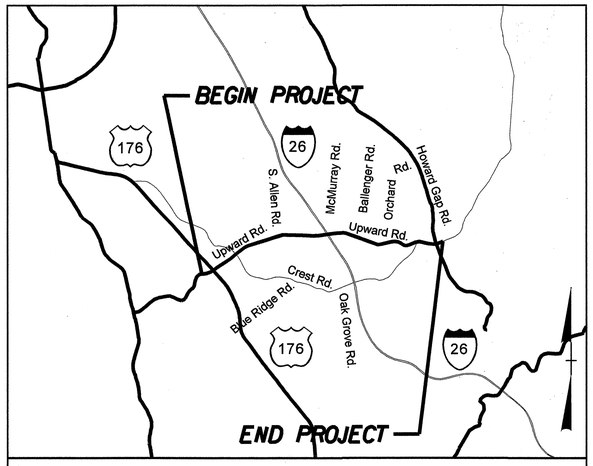
STATE PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 1

TIP PROJECT: R-4430

CONTRACT:

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

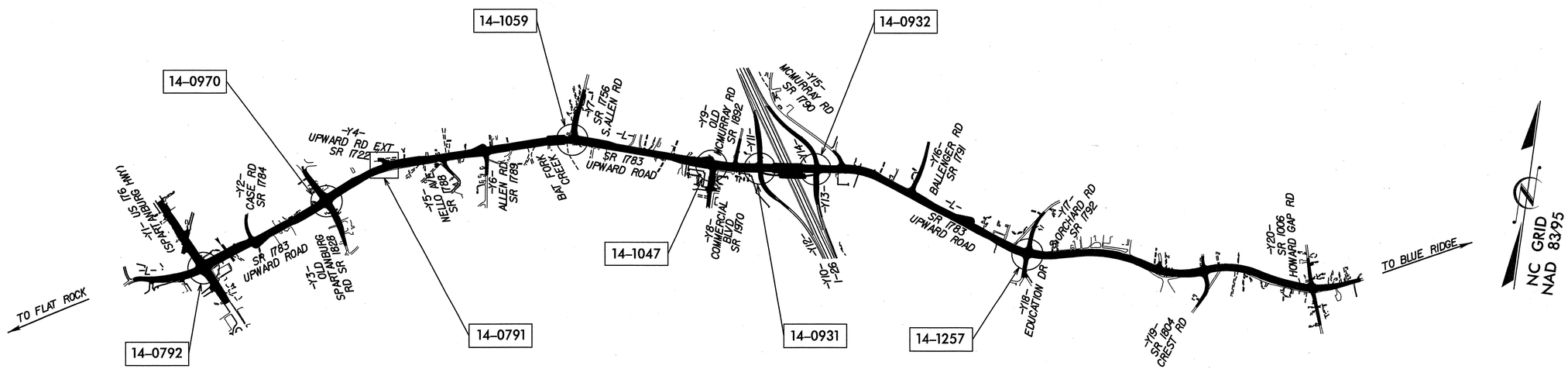
HENDERSON COUNTY



VICINITY MAP

LOCATION: SR 1783 (UPWARD ROAD) FROM US 176 (SPARTANBURG HWY) TO SR 1006 (HOWARD GAP ROAD)

TYPE OF WORK: TRAFFIC SIGNALS AND COMMUNICATIONS CABLE



PLANS PREPARED FOR NCDOT BY:

Kimley-Horn and Associates, Inc.

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Post Office Box 33068
Raleigh, North Carolina 27636

Kimley-Horn and Associates, Inc. Contacts:

Stephanie Privette, P.E. – Project Engineer
Jerry Cross – Designer
David Shinbara – Technician

INDEX OF PLANS

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Sig. 16 – Sig. 26	14-0970	SR 1783 (Upward Road) at SR 1828 (Old Spartanburg Road)
Sig. 27 – Sig. 30	14-0791	SR 1783 (Upward Road) at SR 1722 (Upward Road Extension)
Sig. 31 – Sig. 39	14-1059	SR 1783 (Upward Road) at SR 1756 (South Allen Road)
Sig. 40 – Sig. 51	14-1047	SR 1783 (Upward Road) at SR 1970 (Commercial Boulevard)
Sig. 52 – Sig. 64	14-0931	SR 1783 (Upward Road) at I-26 Eastbound Ramps
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Sig. 93 – Sig. 106	– – – – –	Cable Routing Plans

Plans Prepared For The Offices of:

Traffic Engineering and Safety Systems Branch · Signals and Geometrics Section · Department of Transportation · State of North Carolina

750 N. Greenfield Pkwy, Garner, NC 27529

North Carolina Department of Transportation
Traffic Engineering and Safety Systems Branch Contacts:

Timothy J. Williams, P.E. – Signals and Geometrics Contracts Engineer
George C. Brown, P.E. – Signal Equipment Design Engineer
I. Neil Avery – Signal Communications Project Engineer

LEGEND

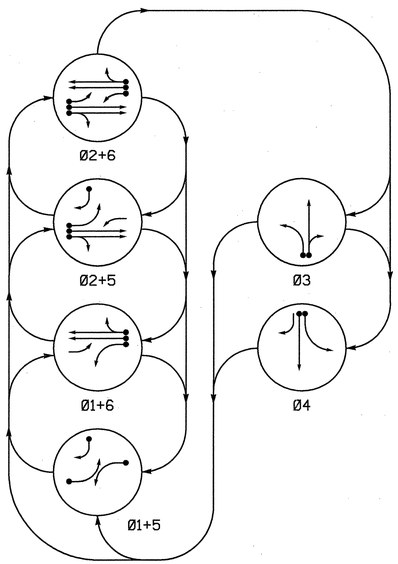
XX-XXXX Signal Inventory Number

NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 2

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	03	04	FLASH
11	←	←	FY	FY	R	R	R
21,22	R	R	G	G	R	R	Y
31	R	R	R	R	G ←	R	R
32	R	R	R	R	G	R	R
41	R	R	R	R	R	G ←	R
42	R/→	R	R/→	R	R	G	R
51	←	FY	←	FY	R	R	R
61,62	R	G	R	G	R	R	Y

FY FLASHING YELLOW ARROW

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM	TO ← 1	← 2	FY 1	FY 2	R 1	R 2
←	←	←	FY	FY	R	R
FY	FY	FY	FY	FY	R	R
R	R	R	R	R	R	R

FY FLASHING YELLOW ARROW

SIGNAL FACE I.D.

Denotes L.E.D.

2070L LOOP & DETECTOR INSTALLATION

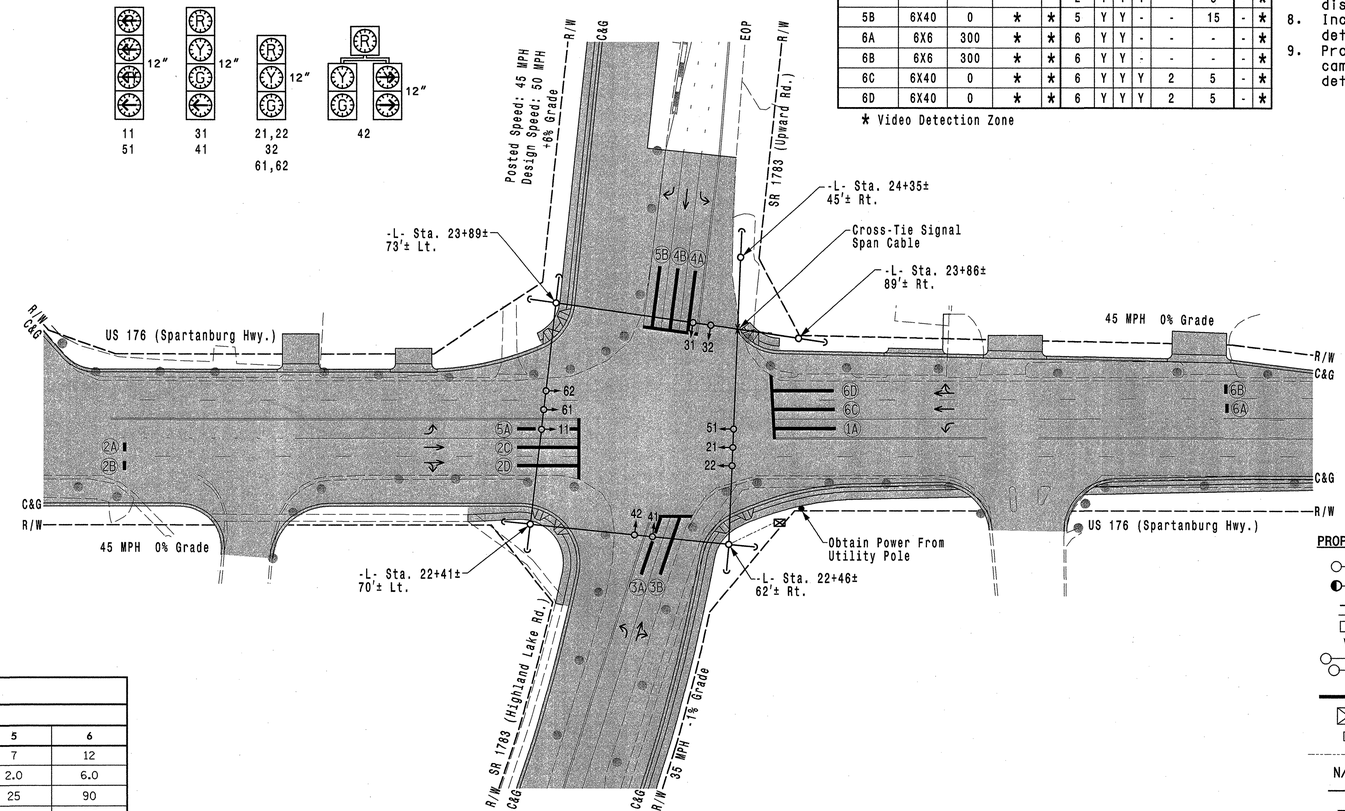
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	*	*	1	Y	Y	-	-	15	-	*
					6	Y	Y	Y	-	3	-	*
2A	6X6	300	*	*	2	Y	Y	-	-	-	-	*
2B	6X6	300	*	*	2	Y	Y	-	-	-	-	*
2C	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
2D	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
3A	6X40	0	*	*	3	Y	Y	-	-	3	-	*
3B	6X40	0	*	*	3	Y	Y	-	-	10	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	3	-	*
4B	6X40	0	*	*	4	Y	Y	-	-	-	-	*
5A	6X40	0	*	*	5	Y	Y	-	-	15	-	*
					2	Y	Y	Y	-	3	-	*
5B	6X40	0	*	*	5	Y	Y	-	-	15	-	*
6A	6X6	300	*	*	6	Y	Y	-	-	-	-	*
6B	6X6	300	*	*	6	Y	Y	-	-	-	-	*
6C	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
6D	6X40	0	*	*	6	Y	Y	Y	2	5	-	*

* Video Detection Zone

6 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Set all detector units to presence mode.
6. Install backplates for signal heads numbered 31,32, 41 and 42.
7. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
8. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
9. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6
Min Green 1 *	7	12	7	7	7	12
Extension 1 *	2.0	6.0	2.0	2.0	2.0	6.0
Max Green 1 *	25	90	30	30	25	90
Yellow Clearance	3.0	4.5	3.9	4.3	3.0	4.5
Red Clearance	2.9	1.5	1.9	1.5	2.9	1.5
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	-	-	-	-	-
Max Variable Initial *	-	-	-	-	-	-
Time Before Reduction *	-	15	-	-	-	15
Time To Reduce *	-	45	-	-	-	45
Minimum Gap	-	3.0	-	-	-	3.0
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL
Vehicle Call Memory	-	-	-	-	-	-
Dual Entry	-	-	-	-	-	-
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 1 - TCP PHASE 1

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

US 176 (Spartanburg Highway)
at
SR 1783 (Upward Road/
Highland Lake Road)

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

SIG. INVENTORY NO. 14-0792T1

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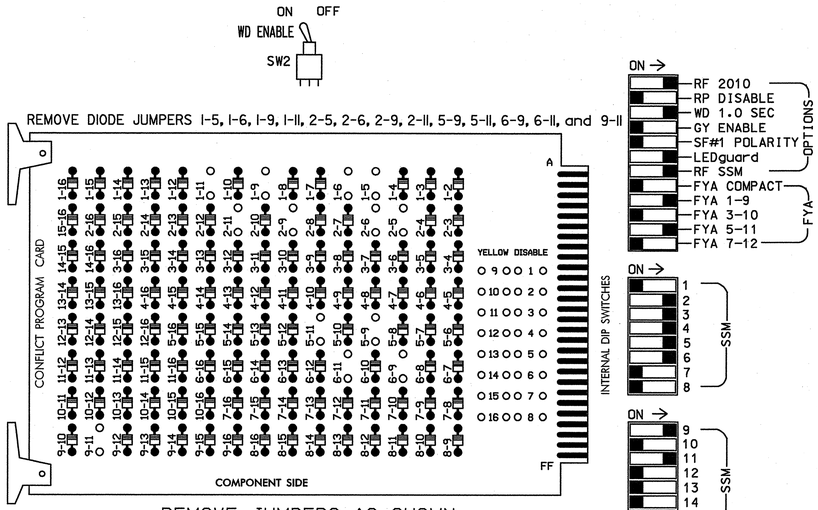
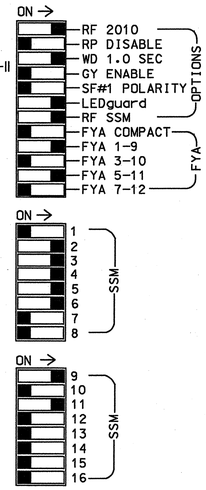
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 3

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

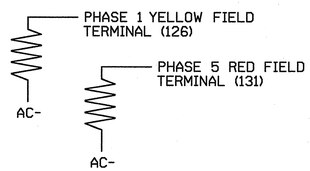
FS = FLASH SENSE
ST = STOP TIME

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 1,7,8, 10,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332 /W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S3,S4,S5,S6,S9,S12
PHASES USED.....1,2,3,4,5,6
OVERLAP "A".....1+2
OVERLAP "B".....NOT USED
OVERLAP "C".....5+6
OVERLAP "D".....NOT USED

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

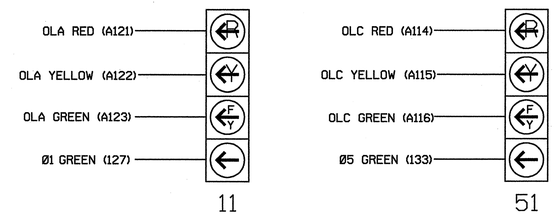
SIGNAL HEAD HOOK-UP CHART

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	31	32	41	42	NU	51★	42	61,62	NU	NU	NU	NU	11★	NU	NU	51★	NU	NU
RED		128		116	116	101	101		*		134										
YELLOW	*	129		117	117	102	102				135										
GREEN		130		118	118	103	103				136										
RED ARROW																A121			A114		
YELLOW ARROW										132						A122			A115		
FLASHING YELLOW ARROW																A123			A116		
GREEN ARROW	127			118		103			133	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

1. The sequence display for this signal requires special logic programming. See sheet 2 for programming instructions.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0792
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

SIGNAL UPGRADE - TEMP DESIGN 1 - TCP PHASE 1 ELECTRICAL DETAIL SHEET 1 OF 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:
Traffic Engineering and Safety Systems Branch
Signal Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

US 176 (Spartanburg Highway)
at
SR 1783 (Upward Road / Highland Lake Road)
Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE
DATE 10-30-08
SIG. INVENTORY NO. 14-0792T1

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david.shinbara
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10/30/2008

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 4

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?...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 '+' 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?...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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0792
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

SIGNAL UPGRADE - TEMP DESIGN 1 - TCP PHASE 1 ELECTRICAL SHEET 2 OF 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

US 176 (Spartanburg Highway)
at
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Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 10-21-08 DATE
SIG. INVENTORY NO. 14-0792T1

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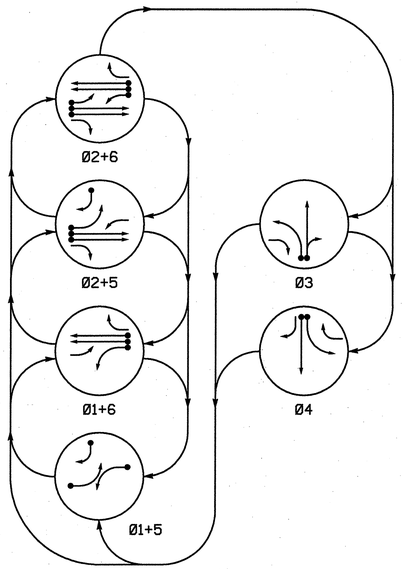
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 5

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	Ø4	FLASH
11	←	←	←FY	←FY	~~←R~~	~~←R~~	~~←R~~
21	R	R	G	G	R	R	Y
22	R	R	G	G	R/↙	R	Y
31	R	R	R	R	G	R	R
32	R	R	R	R	G	R	R
41	R	R	R	R	G	R	R
42	R/↙	R	R/↙	R	R	G	R
51	←	←FY	←	←FY	~~←R~~	~~←R~~	~~←R~~
61	R	G	R	G	R	R	Y
62	R	G	R	G	R	R/↙	Y

←FY FLASHING YELLOW ARROW

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

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

←FY FLASHING YELLOW ARROW

SIGNAL FACE I.D.

Denotes L.E.D.

2070L LOOP & DETECTOR INSTALLATION

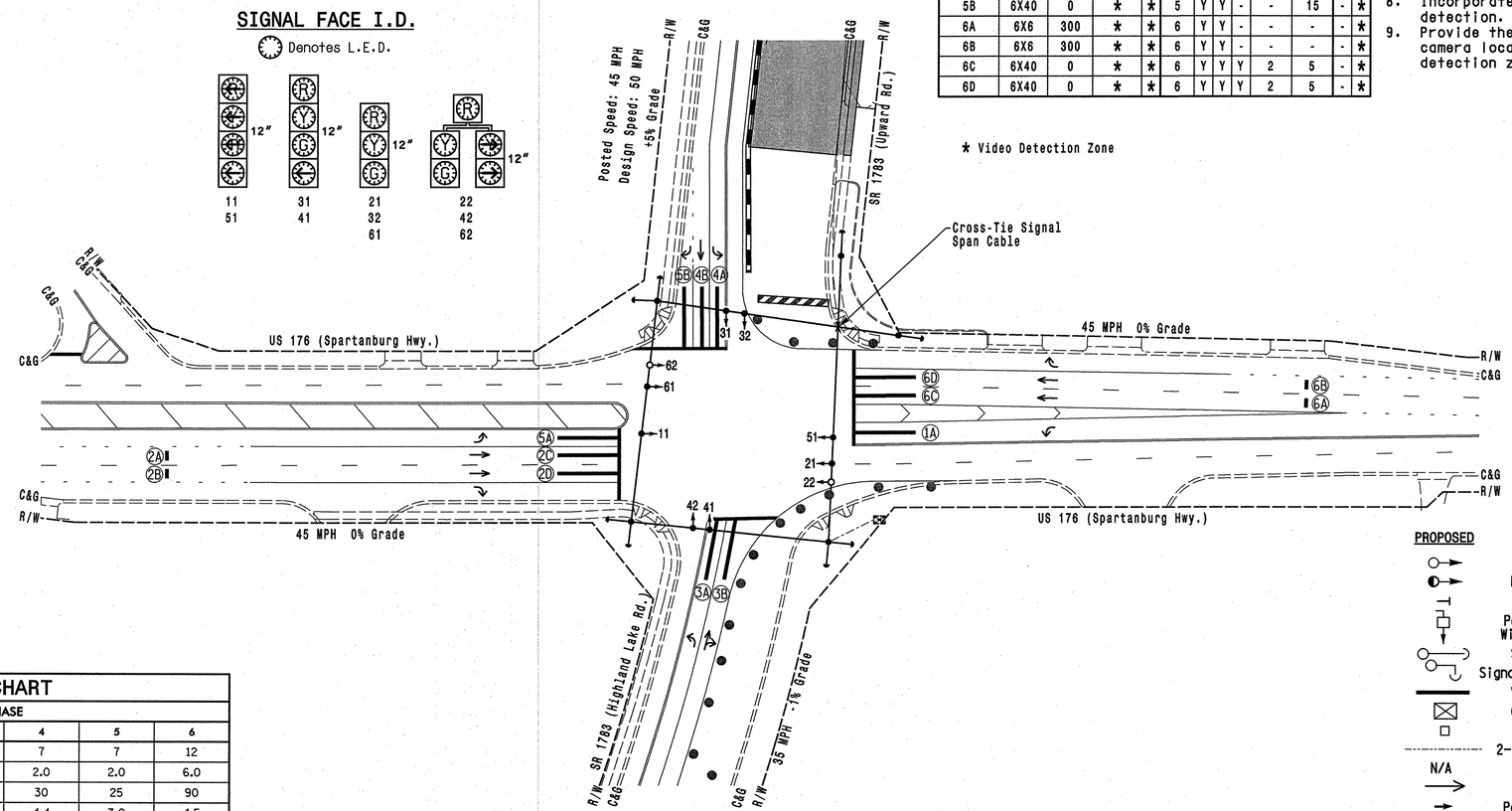
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	*	*	1	Y	Y	-	-	15	-	*
					6	Y	Y	Y	-	3	-	*
2A	6X6	300	*	*	2	Y	Y	-	-	-	-	*
2B	6X6	300	*	*	2	Y	Y	-	-	-	-	*
2C	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
2D	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
3A	6X40	0	*	*	3	Y	Y	-	-	3	-	*
3B	6X40	0	*	*	3	Y	Y	-	-	-	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	3	-	*
4B	6X40	0	*	*	4	Y	Y	-	-	-	-	*
5A	6X40	0	*	*	5	Y	Y	-	-	15	-	*
					2	Y	Y	Y	-	3	-	*
5B	6X40	0	*	*	5	Y	Y	-	-	15	-	*
6A	6X6	300	*	*	6	Y	Y	-	-	-	-	*
6B	6X6	300	*	*	6	Y	Y	-	-	-	-	*
6C	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
6D	6X40	0	*	*	6	Y	Y	Y	2	5	-	*

* Video Detection Zone

6 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Set all detector units to presence mode.
6. Install backplates for signal head numbered 32.
7. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
8. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
9. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
N/A	Type III Barricade	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6
Min Green 1 *	7	12	7	7	7	12
Extension 1 *	2.0	6.0	2.0	2.0	2.0	6.0
Max Green 1 *	25	90	30	30	25	90
Yellow Clearance	3.0	4.5	3.9	4.4	3.0	4.5
Red Clearance	3.4	1.7	2.3	1.4	3.2	1.9
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	-	-	-	-	-
Max Variable Initial *	-	-	-	-	-	-
Time Before Reduction *	-	15	-	-	-	15
Time To Reduce *	-	45	-	-	-	45
Minimum Gap	-	3.0	-	-	-	3.0
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL
Vehicle Call Memory	-	-	-	-	-	-
Dual Entry	-	-	-	-	-	-
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 2 - TCP PHASE 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
NC License #F-0102
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

US 176 (Spartanburg Highway) at SR 1783 (Upward Road/ Highland Lake Road)
Division 14 Henderson County Flat Rock
PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: J.C. Cross REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 12.22.09 DATE
SIGN INVENTORY NO. 14-0792T2

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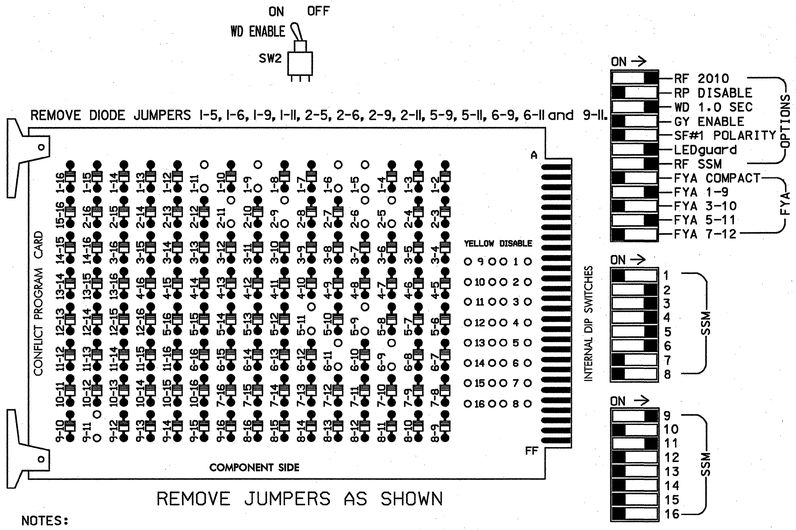
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 6

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 1,7,8,10,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

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	22	31	32	41	42	62	NU	51★	42	61,62	NU	NU	NU	NU	11★	NU	NU	51★	NU	NU
RED		128			116	116	101	101			✳		134										
YELLOW	✳	129			117	117	102	102					135										
GREEN		130			118	118	103	103					136										
RED ARROW																		A121			A114		
YELLOW ARROW				117					102			132						A122			A115		
FLASHING YELLOW ARROW																		A123			A116		
GREEN ARROW	127			118	118		103		103		133	133											
✋																							
🚶																							

NU = Not Used

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

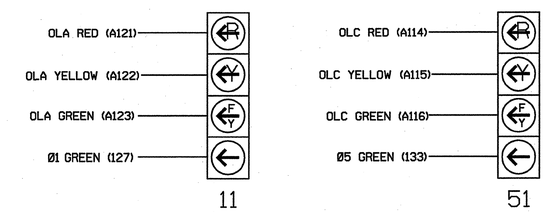
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332 /W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S3,S4,S5,S6,S9,S12
PHASES USED.....1,2,3,4,5,6
OVERLAP "A".....1+2
OVERLAP "B".....NOT USED
OVERLAP "C".....5+6
OVERLAP "D".....NOT USED

4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

1. The sequence display for this signal requires special logic programming. See sheet 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	SLOT EMPTY	SLOT EMPTY	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														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L														

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

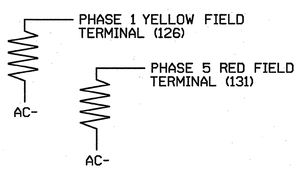
THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0792
DESIGNED: AUGUST 2008
SEALED: 12-22-09
REVISED: N/A

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 - TEMP DESIGN 2 - TCP PHASE 2 ELECTRICAL DETAIL SHEET 1 OF 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
NC License #F-0102
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
Signal Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

US 176 (Spartanburg Highway)
at
SR 1783 (Upward Road / Highland Lake Road)

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	D.A. Shinbara	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 12-22-09 DATE
SIG. INVENTORY NO. 14-0792T2

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PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 7

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?...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 '+' 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?...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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0792
DESIGNED: AUGUST 2008
SEALED: 12-22-09
REVISED: N/A

SIGNAL UPGRADE - TEMP DESIGN 2 - TCP PHASE 2

ELECTRICAL SHEET 2 OF 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
NC License #F-0102
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

North Carolina Department of Transportation
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

US 176 (Spartanburg Highway)
at
SR 1783 (Upward Road / Highland Lake Road)

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	D.A. Shinbara	REVIEWED BY:	S.B. Privette

REVISIONS	INIT:	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-22-09 DATE

SIG. INVENTORY NO. 14-0792T2

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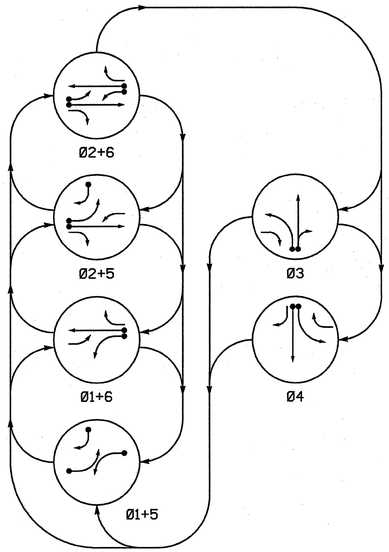
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 8

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	03	04	FLASH
11	←	←	FY	FY	R	R	R
21	R	R	G	G	R	R	Y
22	R	R	G	G	R/←	R	Y
31	R	R	R	R	G	R	R
32	R	R	R	R	G	R	R
41	R	R	R	R	G	R	R
42	R/←	R	R/←	R	R	G	R
51	←	FY	←	FY	R	R	R
61	R	G	R	G	R	R	Y
62	R	G	R	G	R	R/←	Y

FY FLASHING YELLOW ARROW

STANDARD SIGNAL FACE CLEARANCES FOR 4 SECTION LEFT TURN SIGNAL

FROM	TO ←	TO FY 1	TO FY 2	TO R 1	TO R 2
←	←	←	FY	R	FY	R
FY	FY	FY	FY	FY	FY	R
R	R	R	R	R	R	R

FY FLASHING YELLOW ARROW

2070L LOOP & DETECTOR INSTALLATION

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	*	*	1	Y	Y	-	-	15	-	*
					6	Y	Y	Y	-	3	-	*
2A	6X6	300	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
3A	6X40	0	*	*	3	Y	Y	-	-	-	-	*
3B	6X40	0	*	*	3	Y	Y	-	-	5	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	-	-	*
4B	6X40	0	*	*	4	Y	Y	-	-	-	-	*
5A	6X40	0	*	*	5	Y	Y	-	-	15	-	*
					2	Y	Y	Y	-	3	-	*
5B	6X40	0	*	*	5	Y	Y	-	-	15	-	*
6A	6X6	300	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	2	5	-	*

* Video Detection Zone

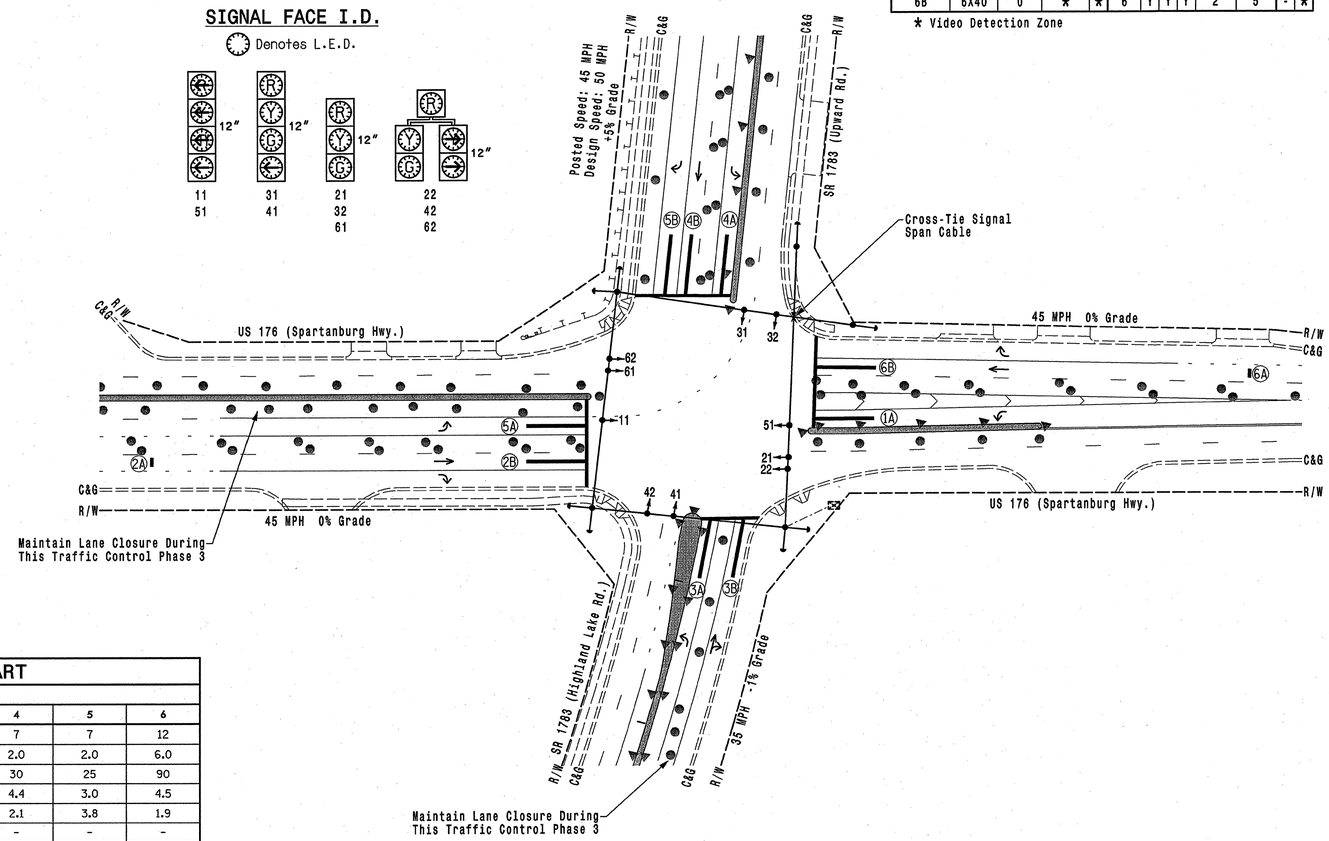
6 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Reposition all existing signal heads.
6. Set all detector units to presence mode.
7. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
8. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.
9. Adjust detection zones as necessary during construction.

SIGNAL FACE I.D.

Denotes 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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone Cones	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6
Min Green 1 *	7	12	7	7	7	12
Extension 1 *	2.0	6.0	2.0	2.0	2.0	6.0
Max Green 1 *	25	90	30	30	25	90
Yellow Clearance	3.0	4.5	3.9	4.4	3.0	4.5
Red Clearance	3.4	2.3	2.6	2.1	3.8	1.9
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	-	-	-	-	-
Max Variable Initial *	-	-	-	-	-	-
Time Before Reduction *	-	15	-	-	-	15
Time To Reduce *	-	45	-	-	-	45
Minimum Gap	-	3.0	-	-	-	3.0
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL
Vehicle Call Memory	-	-	-	-	-	-
Dual Entry	-	-	-	-	-	-
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 - TCP PHASE 3

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
NC License #F-0102
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
759 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

US 176 (Spartanburg Highway)
at
SR 1783 (Upward Road/
Highland Lake Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:	
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette	
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 12-22-09 DATE
SIG. INVENTORY NO. 14-0792T3

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jerry.cross
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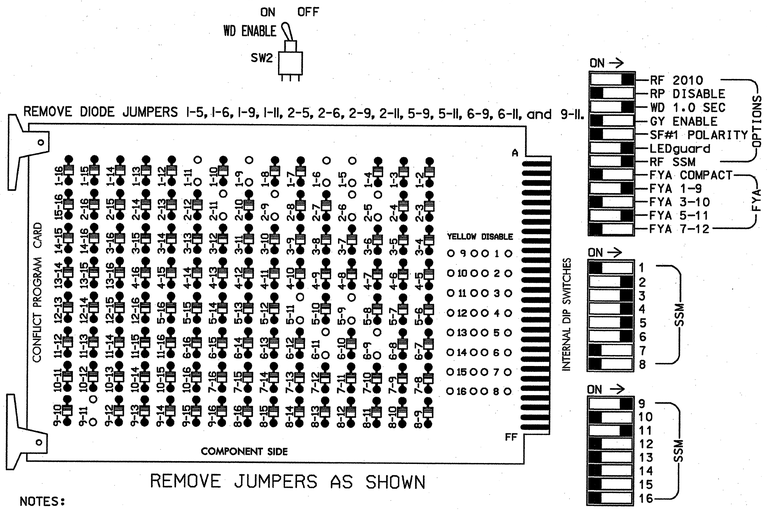
12/22/2009

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 9

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 1,7,8,10,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

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	22	31	32	41	42	62	NU	51★	42	61,62	NU	NU	NU	NU	11★	NU	NU	51★	NU	NU
RED		128			116	116	101	101			*		134										
YELLOW	*	129			117	117	102	102					135										
GREEN		130			118	118	103	103					136										
RED ARROW																		A121			A114		
YELLOW ARROW				117					102			132						A122			A115		
FLASHING YELLOW ARROW																		A123			A116		
GREEN ARROW	127			118	118		103		103		133	133											
✋																							
🚶																							

NU = Not Used

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

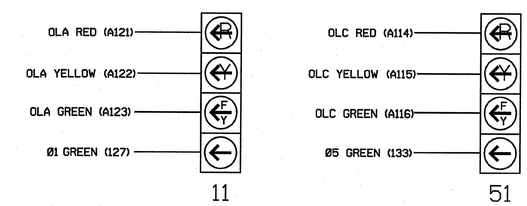
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332 /W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S3,S4,S5,S6,S9,S12
PHASES USED.....1,2,3,4,5,6
OVERLAP "A".....1+2
OVERLAP "B".....NOT USED
OVERLAP "C".....5+6
OVERLAP "D".....NOT USED

4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

1. The sequence display for this signal requires special logic programming. See sheet 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	SLOT EMPTY	SLOT EMPTY	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														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L														

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

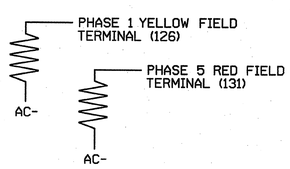
THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0792
DESIGNED: AUGUST 2008
SEALED: 12-22-09
REVISED: N/A

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 - TEMP DESIGN 3 - TCP PHASE 3 ELECTRICAL DETAIL SHEET 1 OF 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
NC License #F-0102
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:
Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

US 176 (Spartanburg Highway)
at
SR 1783 (Upward Road / Highland Lake Road)
Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 12-22-09 DATE
SIG. INVENTORY NO. 14-0792T3

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PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 10

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?...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 '+' 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?...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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0792
DESIGNED: AUGUST 2008
SEALED: 12-22-09
REVISED: N/A

SIGNAL UPGRADE - TEMP DESIGN 3 - TCP PHASE 3 ELECTRICAL DETAIL SHEET 2 OF 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
NC License #F-0102
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Traffic Engineering and Safety Systems Branch
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

US 176 (Spartanburg Highway)
at
SR 1783 (Upward Road / Highland Lake Road)

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	D.A. Shinbara	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 12-22-09 DATE
SIG. INVENTORY NO. 14-0792T3

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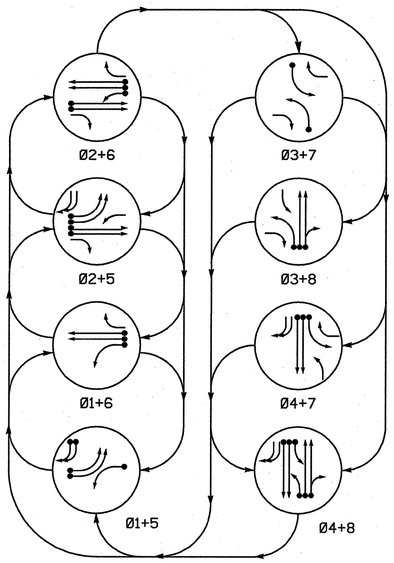
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 11

8 Phase
Fully Actuated
(SR 1783 (Upward Road) Closed-Loop System)

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	←	←	←FY	←FY	↖R	↖R	↖R	↖R	↖R
21	R	R	G	G	R	R	R	R	Y
22	R	R	G	G	R↗	R↗	R	R	Y
31	↖R	↖R	↖R	↖R	←	←	←FY	←FY	↖R
41,42	R	R	R	R	R	R	G	G	R
43,44	R↗	R	R↗	R	R	R	G	G	R
51,52	←	↖R	←	↖R	↖R	↖R	↖R	↖R	↖R
61	R	G	R	G	R	R	R	R	Y
62	R	G	R	G	R↗	R	R↗	R	Y
71	↖R	↖R	↖R	↖R	←	←FY	←	←FY	↖R
81,82	R	R	R	R	R	G	R	G	R

←FY FLASHING YELLOW ARROW

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

SIGNAL FACE I.D.

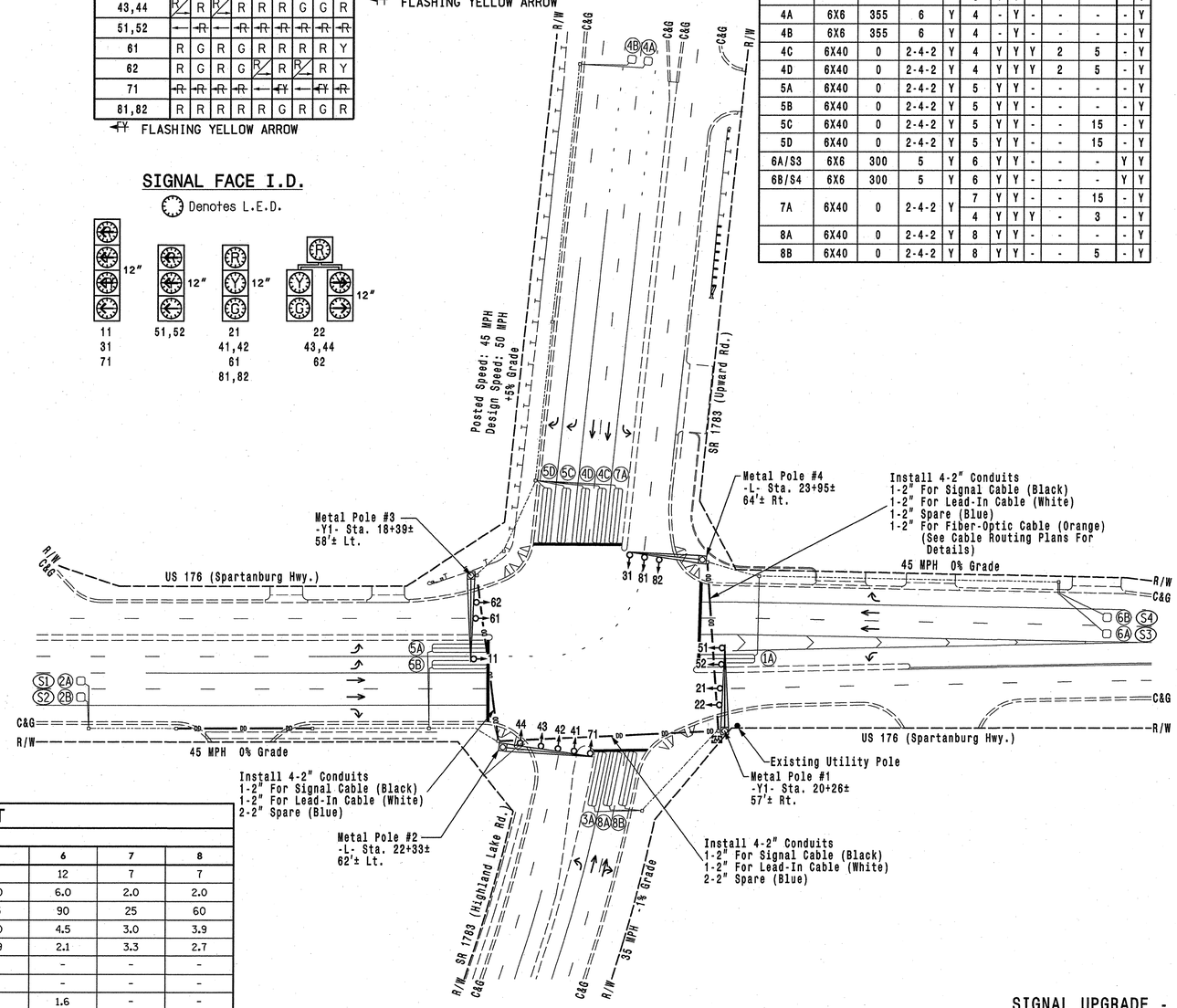
Denotes L.E.D.

2070L LOOP & DETECTOR INSTALLATION

INDUCTIVE LOOPS: LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	DETECTOR PROGRAMMING: 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/S1	6X6	300	5	Y	2	Y	Y	-	-	-	Y	Y
2B/S2	6X6	300	5	Y	2	Y	Y	-	-	-	Y	Y
3A	6X40	0	2-4-2	Y	3	Y	Y	-	-	15	-	Y
					8	Y	Y	-	-	-	-	Y
4A	6X6	355	6	Y	4	-	Y	-	-	-	-	Y
4B	6X6	355	6	Y	4	-	Y	-	-	-	-	Y
4C	6X40	0	2-4-2	Y	4	Y	Y	Y	2	5	-	Y
4D	6X40	0	2-4-2	Y	4	Y	Y	Y	2	5	-	Y
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	-	-	Y
5B	6X40	0	2-4-2	Y	5	Y	Y	-	-	-	-	Y
5C	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
5D	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
6A/S3	6X6	300	5	Y	6	Y	Y	-	-	-	Y	Y
6B/S4	6X6	300	5	Y	6	Y	Y	-	-	-	Y	Y
7A	6X40	0	2-4-2	Y	7	Y	Y	-	-	15	-	Y
					4	Y	Y	Y	-	3	-	Y
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	Y
8B	6X40	0	2-4-2	Y	8	Y	Y	-	-	5	-	Y

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 or phase 5 may be lagged.
4. Phase 3 or phase 7 may be lagged.
5. Install backplates for signal heads numbered 31,41, 42,43,44,71,81 and 82.
6. Set all detector units to presence mode.
7. Maximum times shown in timing chart are for free run operation only. Coordinated signal system timing values supersede there.
8. Closed loop system data: Master Asset # 11408, Controller Asset # 0792.
9. All signal heads shall be hunter green in color.



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	
	Metal Pole with Mastarm	
	Pedestrian Signal Pedestal	
	Inductive Loop Detector	
	Controller & Cabinet	
	Master Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Directional Drill	N/A
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	

2070L TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Min Green 1 *	7	12	7	12	7	12	7	7
Extension 1 *	2.0	6.0	2.0	6.0	2.0	6.0	2.0	2.0
Max Green 1 *	25	90	25	60	25	90	25	60
Yellow Clearance	3.0	4.5	3.0	4.4	3.0	4.5	3.0	3.9
Red Clearance	3.3	2.1	3.6	1.9	3.9	2.1	3.3	2.7
Walk 1 *	-	-	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-	-	-
Seconds Per Actuation *	-	1.6	-	-	-	1.6	-	-
Max Variable Initial *	-	34	-	-	-	34	-	-
Time Before Reduction *	-	15	-	15	-	15	-	-
Time To Reduce *	-	45	-	45	-	45	-	-
Minimum Gap	-	3.0	-	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	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 - FINAL DESIGN

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
NC License #F-0102
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

US 176 (Spartanburg Highway)
at
SR 1783 (Upward Road / Highland Lake Road)
Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 12-22-09 DATE
SIG. INVENTORY NO. 14-0792

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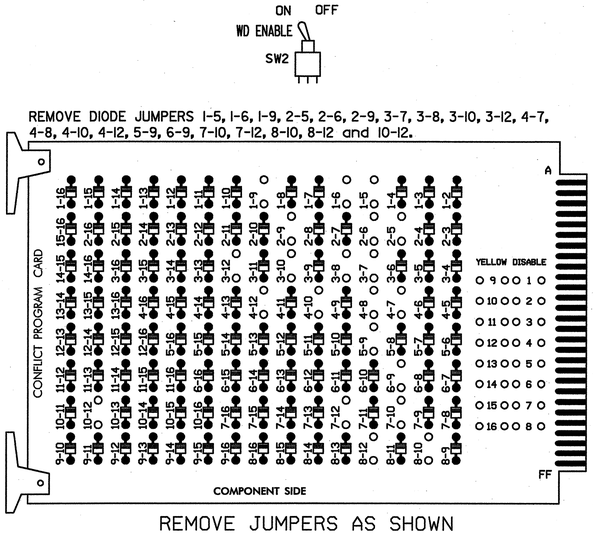
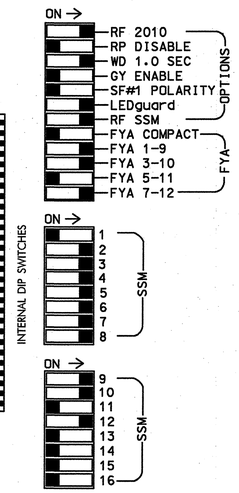
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 12

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

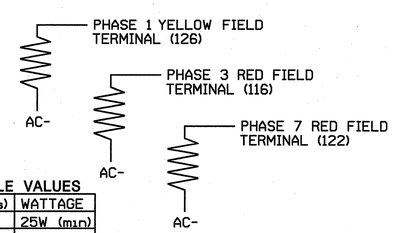
EX.: 1A, 2A, ETC. = LOOP NO.'S

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)

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 1,11, 13,14,15,& 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 4 and 8, on the controller unit, for Dual Entry.
6. Program phases 2 and 6 for Variable Initial Reduction.
7. Program phases 2,4 and 6 for Gap Reduction.
8. The cabinet and controller are part of the SR 1783 (Upward Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332 /W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S3,S4,S5,S6,S7,S8,S9,S10,S13
PHASES USED.....1,2,3,4,5,6,7,8
OVERLAP "A".....1+2
OVERLAP "B".....3+4
OVERLAP "C".....NOT USED
OVERLAP "D".....7+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
2A/S1	TB2-9,10	I3U	63	25	32	2/SYS	Y	Y			
2B/S2	TB2-11,12	I3L	76	38	42	2/SYS	Y	Y			
3A[2]	TB4-5,6	I5U	58	20	3	3	Y	Y			15
	-	J8U	50	12	28	8	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	-	Y			
4B	TB4-11,12	I6L	45	7	14	4	-	Y			
4C	TB6-1,2	I7U	65	27	34	4	Y	Y	Y	2	5
4D	TB6-3,4	I7L	78	40	44	4	Y	Y	Y	2	5
5A	TB3-1,2	J1U	55	17	5	5	Y	Y			
5B	TB3-3,4	J1L	55	17	5	5	Y	Y			
5C	TB3-5,6	J2U	40	2	6	5	Y	Y			15
5D	TB3-7,8	J2L	44	6	16	5	Y	Y			15
6A/S3	TB3-9,10	J3U	64	26	36	6/SYS	Y	Y			
6B/S4	TB3-11,12	J3L	77	39	46	6/SYS	Y	Y			
7A[3]	TB5-5,6	J5U	57	19	7	7	Y	Y			15
	-	I8U	49	11	24	4	Y	Y	Y		3
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			
8B	TB5-11,12	J6L	46	8	18	8	Y	Y			5

[1] Add jumper from I1-W to J4-W, on rear of input file.
[2] Add jumper from I5-W to J8-W, on rear of input file.
[3] Add jumper from J5-W to I8-W, on rear of input file.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

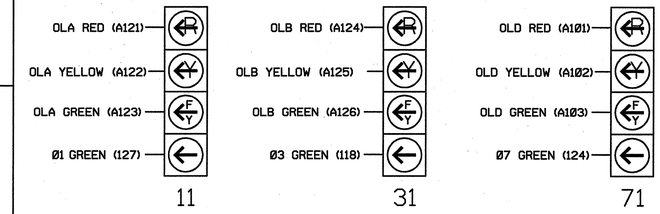
SIGNAL HEAD HOOK-UP CHART

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	31★	22	41,42 43,44	NU	51,52	43,44	61,62	NU	71★	62	81,82	NU	11★	31★	NU	NU	71★	NU
RED		128		✳		101				134		✳		107							
YELLOW	✳	129				102				135				108							
GREEN		130				103				136				109							
RED ARROW								131								A121	A124			A101	
YELLOW ARROW					117			132	132				123			A122	A125			A102	
FLASHING YELLOW ARROW																A123	A126			A103	
GREEN ARROW	127			118	118			133	133			124	124								
✋																					
🚶																					

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

1. The sequence display for this signal requires special logic programming. See sheet 2 for programming instructions.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0792
DESIGNED: AUGUST 2008
SEALED: 12-22-09
REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN

ELECTRICAL DETAIL SHEET 1 OF 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 176 (Spartanburg Highway) at SR 1783 (Upward Road / Highland Lake Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-22-09 DATE

SIG. INVENTORY NO. 14-0792

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
NC License #F-0102
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

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PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 13

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, 6, 7, 8 AND 9

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        #3  IS ON
AND RED CLEAR ON PHASE #3  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #47 ON
SET OUTPUT  ASSIGNMENT #48 OFF
```

NOTE: LOGIC FOR PHASE 3 RED CLEAR WHEN TRANSITIONING FROM PHASE 3 TO PHASE 4 (HEAD 31).

PRESS '+'

```
LOGICAL I/O COMMAND #5  (+/-COMMAND#)
IF  ACTIVE PHASE        #3  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #49 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 3 (HEAD 31).

PRESS '+'

```
LOGICAL I/O COMMAND #6  (+/-COMMAND#)
IF  YELLOW ON PHASE     #3  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #48 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 3 (HEAD 31).

PRESS '+'

```
LOGICAL I/O COMMAND #7 (+/-COMMAND#)
IF  ACTIVE PHASE        #7  IS ON
AND RED CLEAR ON PHASE #7  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #39 ON
SET OUTPUT  ASSIGNMENT #40 OFF
```

NOTE: LOGIC FOR PHASE 7 RED CLEAR WHEN TRANSITIONING FROM PHASE 7 TO PHASE 8 (HEAD 71).

PRESS '+'

```
LOGICAL I/O COMMAND #8 (+/-COMMAND#)
IF  ACTIVE PHASE        #7  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #41 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 7 (HEAD 71).

PRESS '+'

```
LOGICAL I/O COMMAND #9 (+/-COMMAND#)
IF  YELLOW ON PHASE     #7  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #40 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 7 (HEAD 71).

LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

OUTPUT REFERENCE SCHEDULE

USE TO INTERPRET LOGIC PROCESSOR

OUTPUT 39 = Overlap D Red
OUTPUT 40 = Overlap D Yellow
OUTPUT 41 = Overlap D Green
OUTPUT 47 = Overlap B Red
OUTPUT 48 = Overlap B Yellow
OUTPUT 49 = Overlap B 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?...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 'B' 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?...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 '+' TWICE

```
PAGE 1: VEHICLE OVERLAP 'D' 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?...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.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0792
DESIGNED: AUGUST 2008
SEALED: 12-22-09
REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN — ELECTRICAL DETAIL SHEET 2 OF 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
NC License #F-0102
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:
Traffic Engineering and Safety Systems Branch
Department of Transportation
Signal and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

US 176 (Spartanburg Highway)
at
SR 1783 (Upward Road / Highland Lake Road)
Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	D.A. Shinbara	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

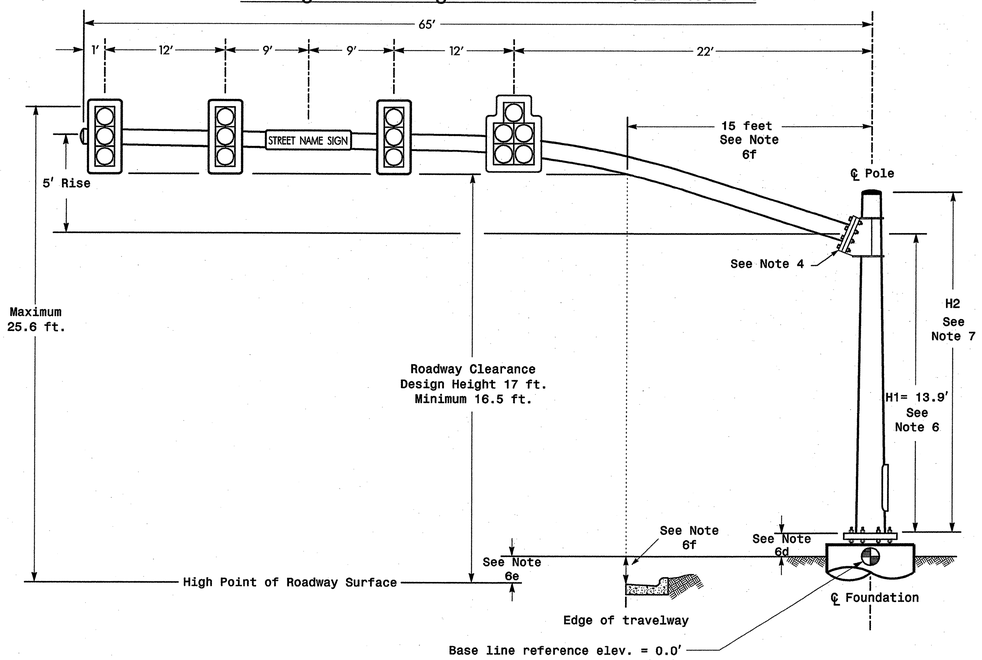
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 12-22-09 DATE
SIG. INVENTORY NO. 14-0792

12/22/2009 11:12:01 AM jerry.cross k:\rtal_roadway\011008\108\traffic\signals\14-0792\14-0792_2008F_slab.dgn

METAL POLE No. 1 and 2

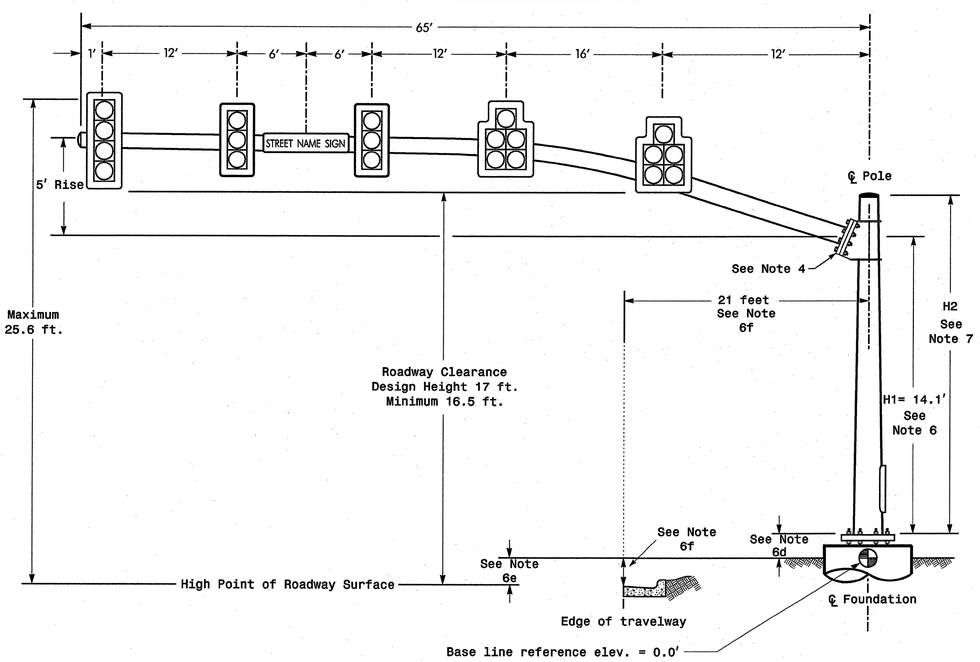
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 14

Design Loading for METAL POLE NO. 1



Elevation View

Design Loading for METAL POLE NO. 2



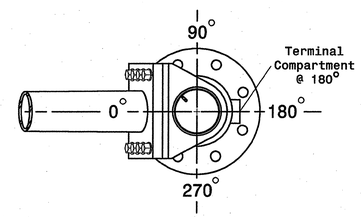
Elevation View

SPECIAL NOTE

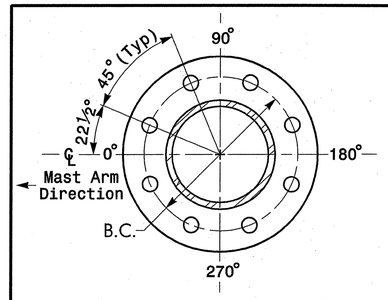
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	Pole 2
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.3 ft.	+0.1 ft.
Elevation difference at Edge of travelway or face of curb	-0.4 ft.	-1.4 ft.

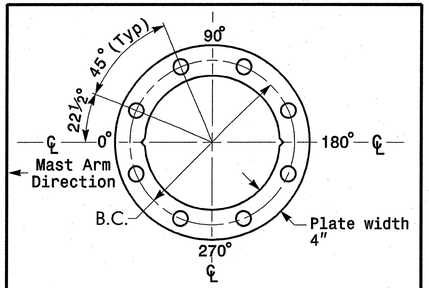


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"–5 SECTION–WITH BACKPLATE AND ASTRO–BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	SIGNAL HEAD 12"–4 SECTION–WITH BACKPLATE AND ASTRO–BRAC	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	SIGNAL HEAD 12"–3 SECTION–WITH BACKPLATE AND ASTRO–BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO–SIGN–BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2006 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
NC License #F-0102
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

NCDOT Wind Zone 4 (90 mph)

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

US 176 (Spartanburg Highway)
at
SR 1783 (Upward Road)/
Highland Lake Road

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette

SCALE	REVISIONS	INIT.	DATE
0 N/A N/A			

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE: 12.22.08 DATE

SIG. INVENTORY NO. 14-0792

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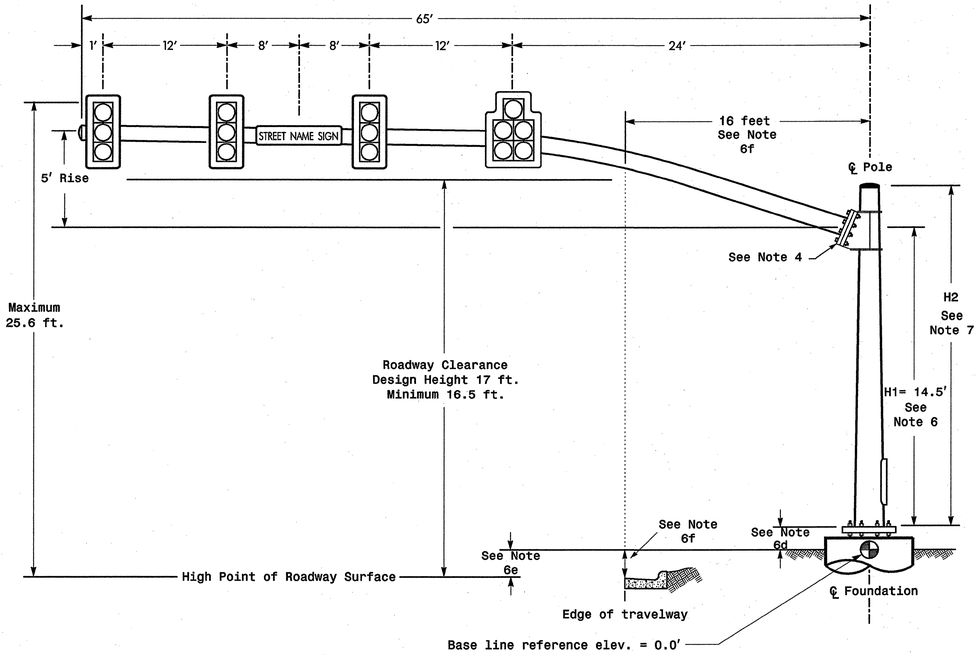
12/22/2009 11:12:03 AM jerry.cross

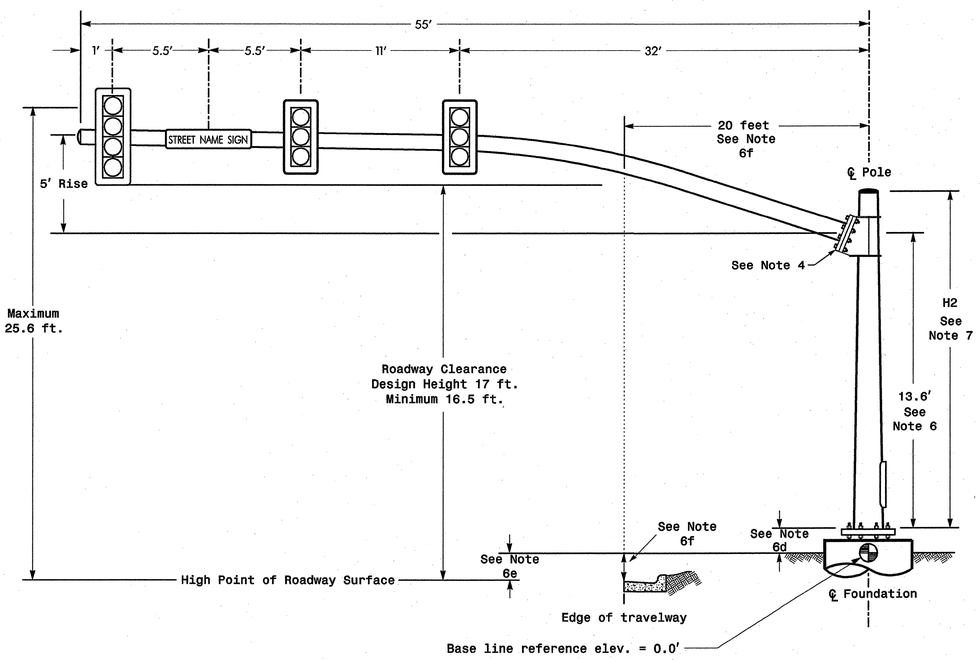
METAL POLE No. 3 and 4

Design Loading for METAL POLE NO. 3



ELEVATION VIEW

Design Loading for METAL POLE NO. 4



Elevation View

SPECIAL NOTE

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Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 3	Pole 4
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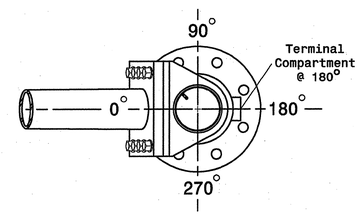
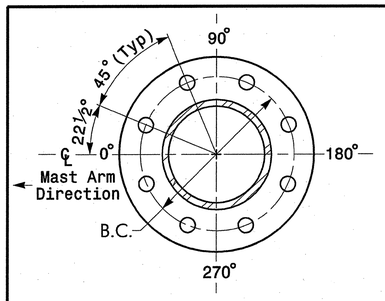
Elevation difference at High point of roadway surface	+0.5 ft.	-0.4 ft.
Elevation difference at Edge of travelway or face of curb	-0.6 ft.	-1.0 ft.

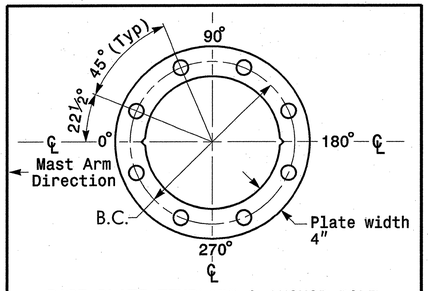


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
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	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

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1. Design the traffic signal structure and foundation in accordance with:
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5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
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   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 4 (90 mph)

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
NC License #F-0102
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

US 176 (Spartanburg Highway)
at
SR 1783 (Upward Road)/
Highland Lake Road

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

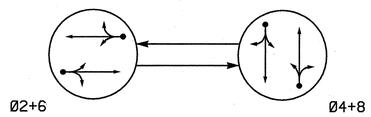
SIGNATURE 12-22-08 DATE

SIG. INVENTORY NO. 14-0792

12/22/2009 11:12:05 AM jerry.cross k:\rdwy_roadway\011036108\traffic\signals\14-0792\14-0792_2006F_MP2.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 16

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

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

SIGNAL FACE I.D.

Denotes L.E.D.

21,22
41,42
61,62
81,82

2070L LOOP & DETECTOR INSTALLATION

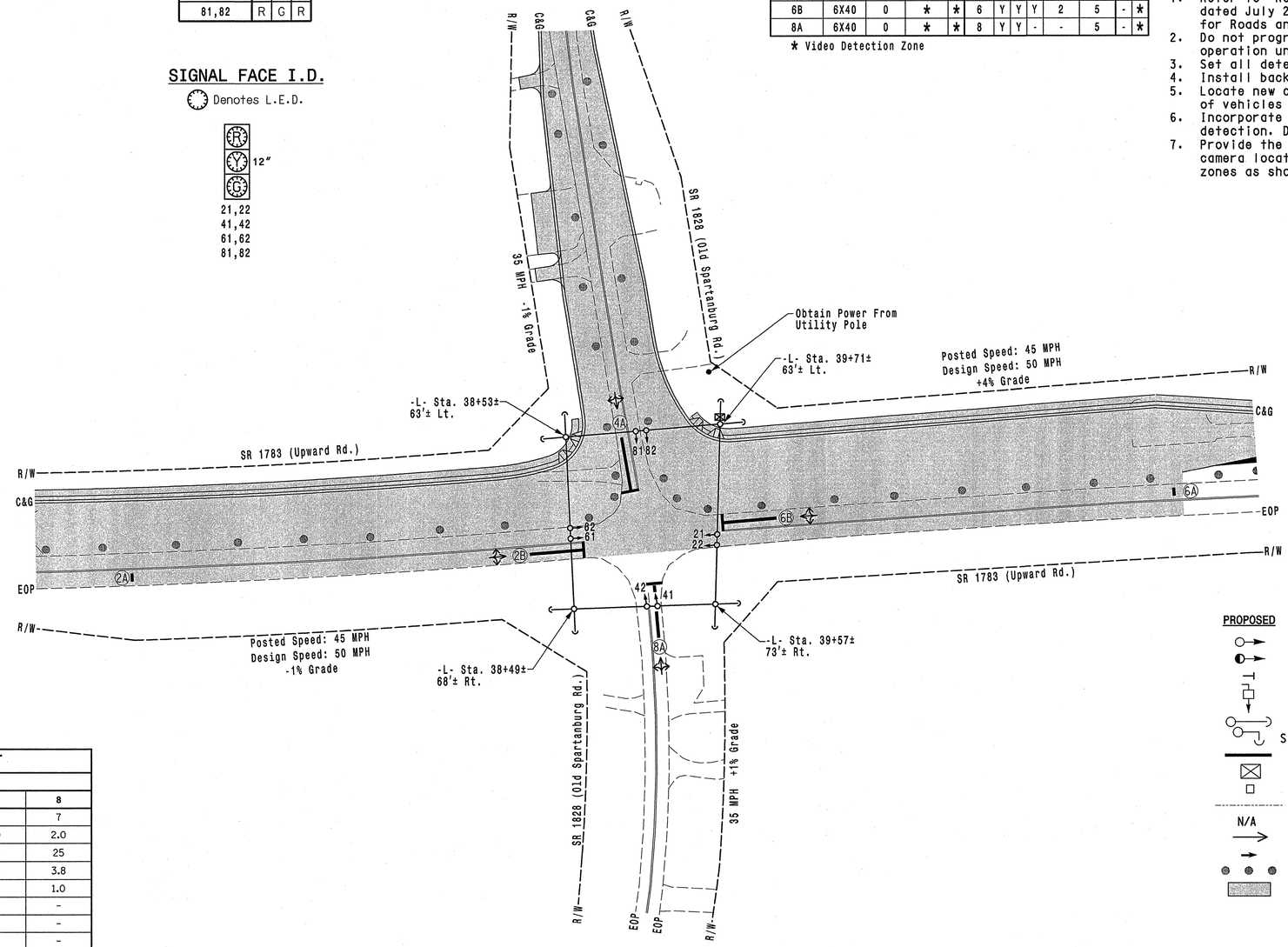
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	5	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
8A	6X40	0	*	*	8	Y	Y	-	-	5	-	*

* Video Detection Zone

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 detector units to presence mode.
4. Install backplates for signal heads numbered 21,22,61,62.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
7. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 6	PHASE 8
Min Green 1 *	14	7	14	7
Extension 1 *	6.0	2.0	6.0	2.0
Max Green 1 *	90	25	90	25
Yellow Clearance	4.9	3.9	4.5	3.8
Red Clearance	1.0	1.0	1.1	1.0
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	15	-
Time To Reduce *	45	-	45	-
Minimum Gap	3.1	-	3.1	-
Recall Mode	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	-	-	-	-
Dual Entry	-	ON	-	ON
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 1 - TCP PHASE 1

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
759 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
SR 1828 (Old Spartanburg Road)

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-30-08 DATE

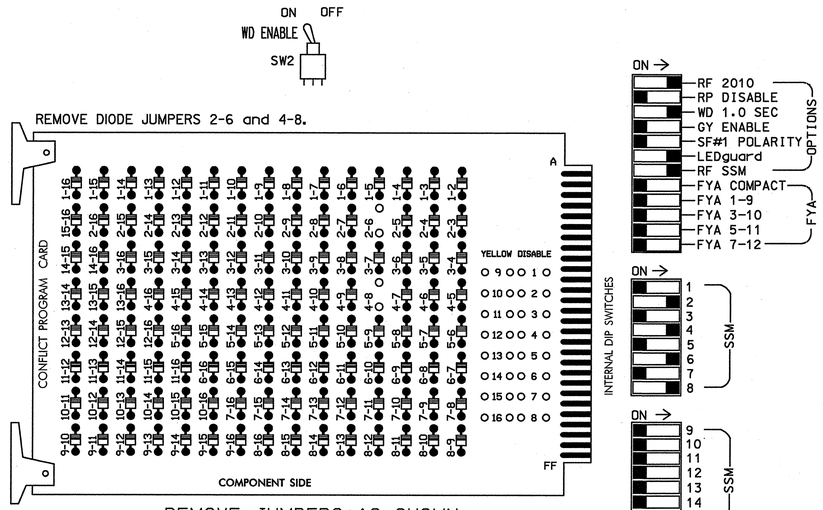
SIG. INVENTORY NO. 14-0970T1

k:\rd_roadway\011008108\traffic\signals\14-0970\14-0970_2008T1_sig.dgn 12:21:46 PM jerry.cross 10/30/2008

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 17

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, 5,7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 4 and 8, on the controller unit, for Dual Entry.
6. Program phases 2 and 6, on the controller unit, for Gap Reduction.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	NU	NU	61,62	NU	NU	81,82	NU
RED		128			101			134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S4,S6,S8
PHASES USED.....2,4,6,8
OVERLAPS.....NONE

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	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0970
DESIGNED: AUGUST 2008
SEALED: 10-30-08
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 1 - TCP PHASE 1

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1828 (Old Spartanburg Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-30-08 DATE

SIG. INVENTORY NO. 14-0970T1

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

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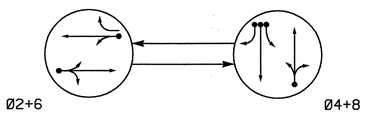
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 18

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

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

SIGNAL FACE I.D.

Denotes L.E.D.

21,22
41,42
61,62
81,82

2070L LOOP & DETECTOR INSTALLATION

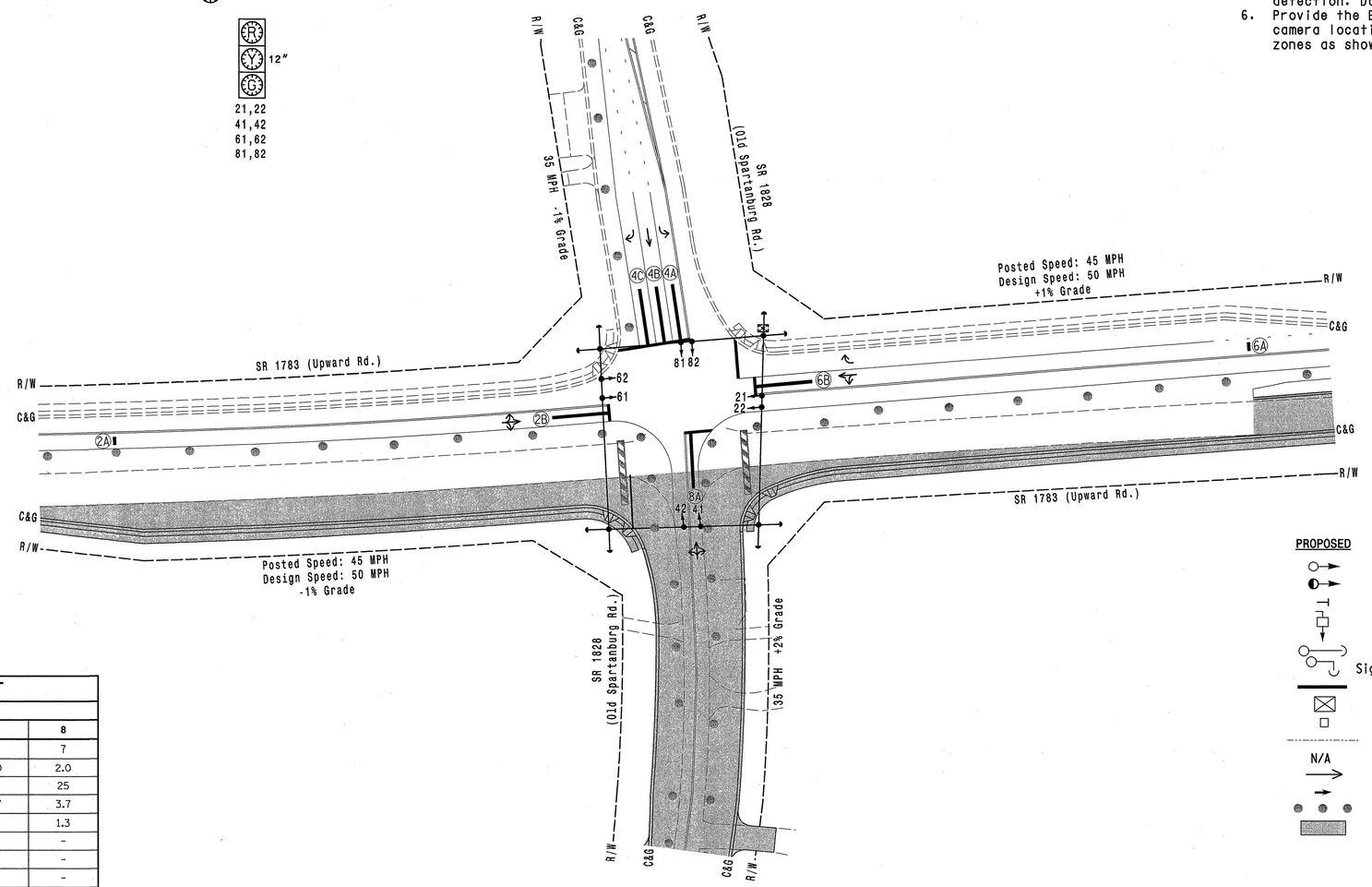
INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	-	-	*
4B	6X40	0	*	*	4	Y	Y	-	-	-	-	*
4C	6X40	0	*	*	4	Y	Y	-	-	15	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
8A	6X40	0	*	*	8	Y	Y	-	-	-	-	*

* Video Detection Zone

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 detector units to presence mode.
4. Reposition all existing signal heads.
5. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
6. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 6	PHASE 8
Min Green 1 *	14	7	14	7
Extension 1 *	6.0	2.0	6.0	2.0
Max Green 1 *	90	25	90	25
Yellow Clearance	4.9	3.9	4.7	3.7
Red Clearance	1.1	1.1	1.1	1.3
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	15	-
Time To Reduce *	45	-	45	-
Minimum Gap	3.1	-	3.1	-
Recall Mode	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	-	-	-	-
Dual Entry	-	ON	-	ON
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 2

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
SR 1828 (Old Spartanburg Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

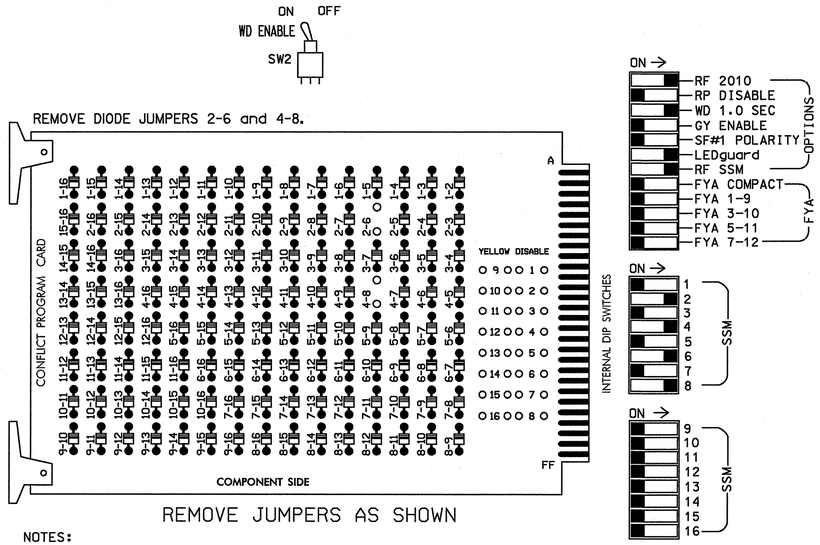
SIG. INVENTORY NO. 14-0970T2

10/22/2008 12:50:03 PM jerry.cross k:\ral_roadway\011008\08\traffic\signals\14-0970\14-0970_200872_sig.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 19

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, 5,7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 4 and 8, on the controller unit, for Dual Entry.
6. Program phases 2 and 6, on the controller unit, for Gap Reduction.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	NU	NU	61,62	NU	NU	81,82	NU
RED		128			101			134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S4,S6,S8
PHASES USED.....2,4,6,8
OVERLAPS.....NONE

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	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0970
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1783 (Upward Road)
at
SR 1828 (Old Spartanburg Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
10-30-08
SIGNATURE DATE
SIG. INVENTORY NO. 14-0970T2

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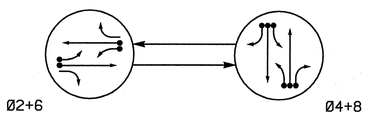
10/30/2008 4:53:32 PM david.shinbara

PROJECT REFERENCE NO.	SHEET NO.
R-4430	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 Ø4+8	PHASE FLASH
21,22,23	G	R	Y
41,42	R	G	R
61,62,63	G	R	Y
81,82	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.

21,22,23
41,42
61,62,63
81,82

2070L LOOP & DETECTOR INSTALLATION

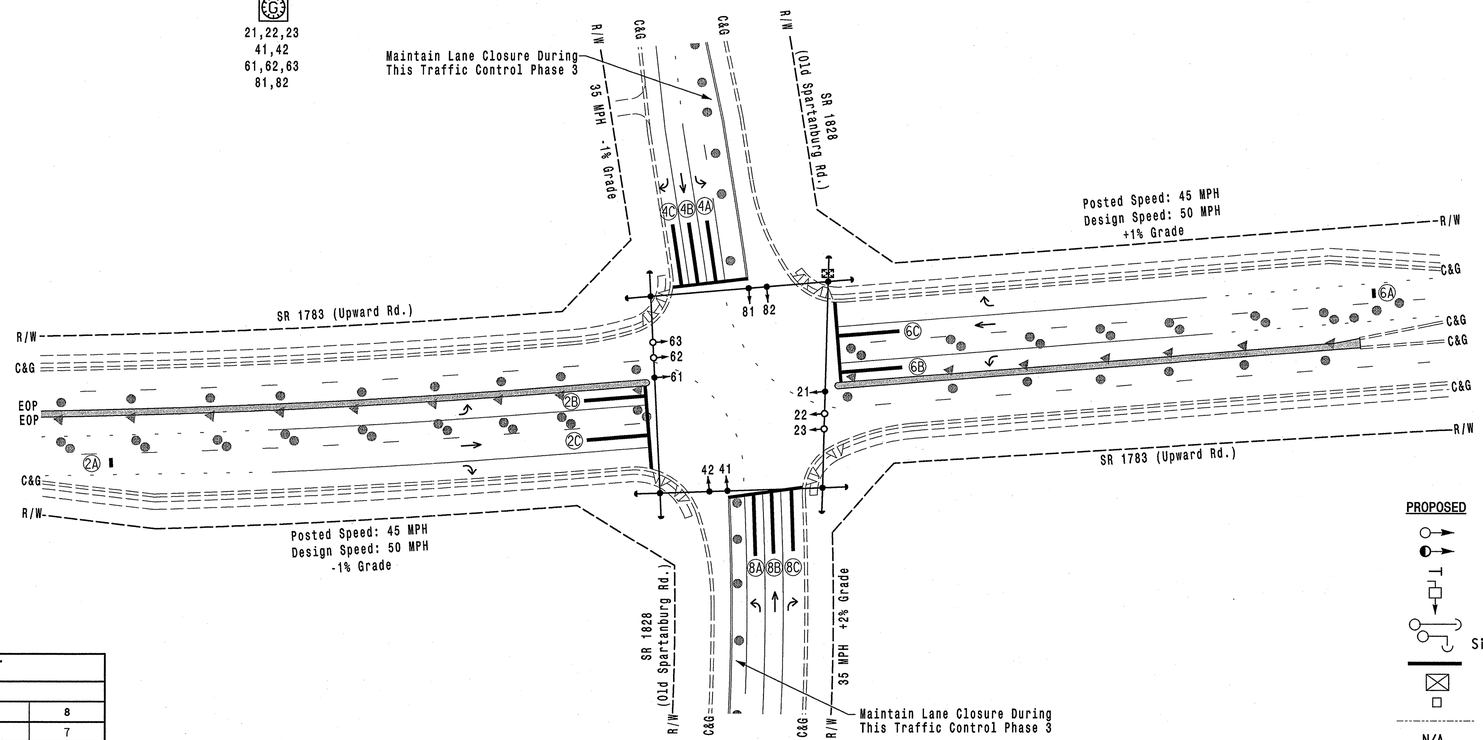
INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	-	3	-	*
2C	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	-	-	*
4B	6X40	0	*	*	4	Y	Y	-	-	-	-	*
4C	6X40	0	*	*	4	Y	Y	-	-	15	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	-	3	-	*
6C	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
8A	6X40	0	*	*	8	Y	Y	-	-	-	-	*
8B	6X40	0	*	*	8	Y	Y	-	-	-	-	*
8C	6X40	0	*	*	8	Y	Y	-	-	15	-	*

* Video Detection Zone

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 detector units to presence mode.
4. Reposition all existing signal heads.
5. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
6. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone Cones	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 6	PHASE 8
Min Green 1 *	14	7	14	7
Extension 1 *	6.0	2.0	6.0	2.0
Max Green 1 *	90	25	90	25
Yellow Clearance	4.9	3.9	4.7	3.7
Red Clearance	1.5	2.4	1.6	2.7
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	15	-
Time To Reduce *	45	-	45	-
Minimum Gap	3.1	-	3.1	-
Recall Mode	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	-	-	-	-
Dual Entry	-	ON	-	ON
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 3 - TCP PHASE 3

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50
1"=50'

SR 1783 (Upward Road)
at
SR 1828 (Old Spartanburg Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: J.C. Cross REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-30-08 DATE
SIG. INVENTORY NO. 14-0970T3

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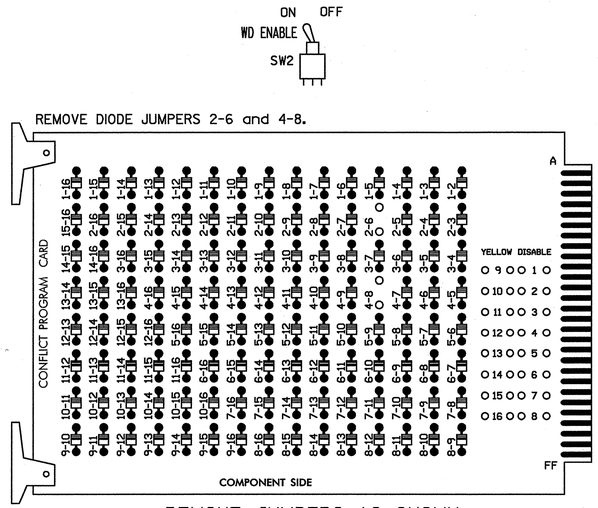
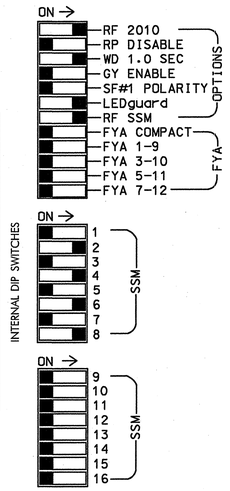
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 21

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, 5,7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 4 and 8, on the controller unit, for Dual Entry.
6. Program phases 2 and 6, on the controller unit, for Gap Reduction.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22 23	NU	NU	41,42	NU	NU	61,62 63	NU	NU	81,82	NU
RED		128			101			134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S4,S6,S8
PHASES USED.....2,4,6,8
OVERLAPS.....NONE

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	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0970
DESIGNED: AUGUST 2008
SEALED: 10-30-08
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 3 - TCP PHASE 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1783 (Upward Road)
at
SR 1828 (Old Spartanburg Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
10-30-08
SIGNATURE DATE
SIG. INVENTORY NO. 14-0970T3

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

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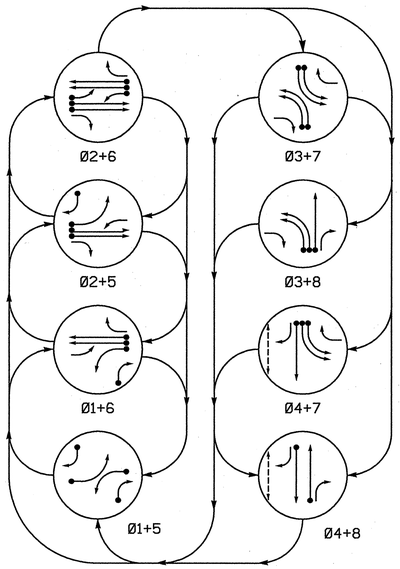
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 22

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	←	←	FY	FY	R	R	R	R	R
21	R	R	G	G	R	R	R	R	Y
22	R	R	G	G	R/←	R/←	R	R	Y
31,32	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	←	FY	←	FY	R	R	R	R	R
61	R	G	R	G	R	R	R	R	Y
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
P41,P42	DW	DW	DW	DW	DW	DW	W	W	DRK

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

STANDARD SIGNAL FACE CLEARANCES FOR FLASHING LEFT TURN SIGNAL

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

FY FLASHING YELLOW ARROW

SIGNAL FACE I.D.

Denotes L.E.D.

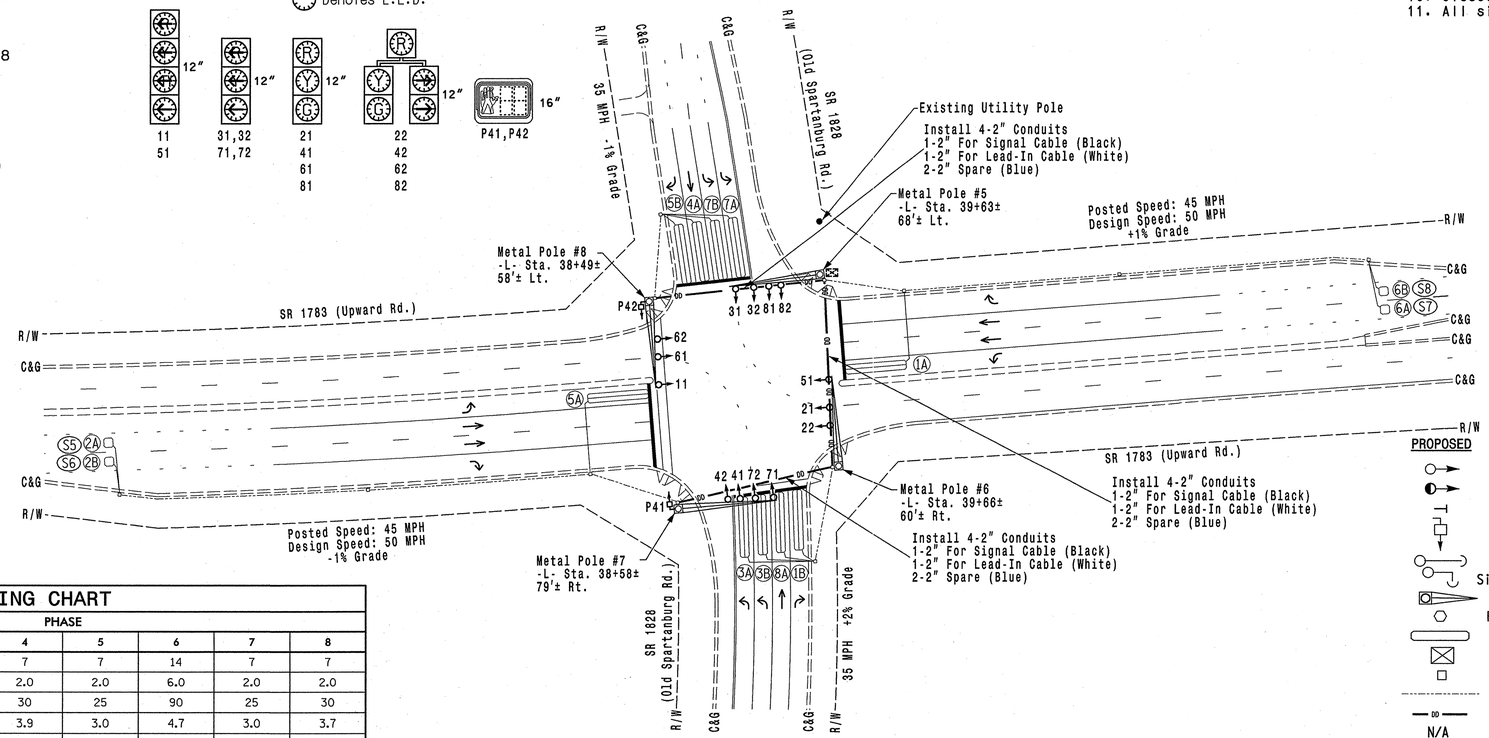
2070L LOOP & DETECTOR INSTALLATION

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
1B	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	Y
2A/S5	6X6	355	6	Y	2	Y	Y	-	-	-	Y	Y
2B/S6	6X6	355	6	Y	2	Y	Y	-	-	-	Y	Y
3A	6X40	0	2-4-2	Y	3	Y	Y	-	-	3	-	Y
3B	6X40	0	2-4-2	Y	3	Y	Y	-	-	-	-	Y
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	-	-	Y
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
					2	Y	Y	Y	-	3	-	Y
5B	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
6A/S7	6X6	355	5	Y	6	Y	Y	-	-	-	Y	Y
6B/S8	6X6	355	5	Y	6	Y	Y	-	-	-	Y	Y
7A	6X40	0	2-4-2	Y	7	Y	Y	-	-	3	-	Y
7B	6X40	0	2-4-2	Y	7	Y	Y	-	-	-	-	Y
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	Y

8 Phase
Fully Actuated
(SR 1783 (Upward Road) Closed-Loop System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 or phase 5 may be lagged.
4. Phase 3 or phase 7 may be lagged.
5. Install backplates for signal heads numbered 11,21, 22,61 and 62.
6. Set all detector units to presence mode.
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. Maximum times shown in timing chart are for free run operation only. Coordinated signal system timing values supersede there.
10. Closed loop system data: Controller Asset # 0970.
11. All signal heads shall be hunter green in color.



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	
	Metal Pole with Mastarm	
	Pedestrian Signal Pedestal	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Directional Drill	N/A
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	

2070L TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Min Green 1 *	7	14	7	7	7	14	7	7
Extension 1 *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Max Green 1 *	25	90	25	30	25	90	25	30
Yellow Clearance	3.0	4.9	3.0	3.9	3.0	4.7	3.0	3.7
Red Clearance	3.3	1.5	3.5	2.4	3.2	1.7	3.3	2.5
Walk 1 *	-	-	-	7	-	-	-	-
Don't Walk 1	-	-	-	22	-	-	-	-
Seconds Per Actuation *	-	1.7	-	-	-	1.7	-	-
Max Variable Initial *	-	40	-	-	-	40	-	-
Time Before Reduction *	-	15	-	-	-	15	-	-
Time To Reduce *	-	45	-	-	-	45	-	-
Minimum Gap	-	3.1	-	-	-	3.1	-	-
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Vehicle Call Memory	-	YELLOW	-	-	-	YELLOW	-	-
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 5 seconds.

SIGNAL UPGRADE - FINAL DESIGN

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 1"=50' (0 – 50)

SR 1783 (Upward Road)
at
SR 1828 (Old Spartanburg Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: J.C. Cross REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-11-08 DATE
SIG. INVENTORY NO. 14-0970

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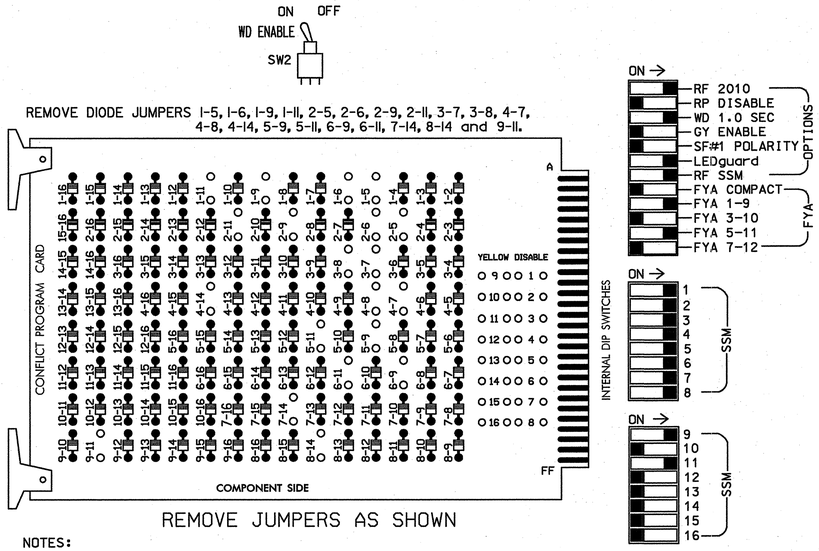
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 23

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

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/SYS 2A/S5	WIRED INPUT ⊗	SLOT EMPTY	Ø3 3A	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	NOT USED	SLOT EMPTY	FS DC ISOLATOR
	L	NOT USED	NOT USED	Ø2/SYS 2B/S6			Ø3 3B	NOT USED					Ø4 PED DC ISOLATOR		ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø6 5B	Ø6/SYS 6A/S7	WIRED INPUT ⊗	SLOT EMPTY	Ø7 7A	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	NOT USED	Ø6/SYS 6B/S8			Ø7 7B	NOT USED							

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

FS = FLASH SENSE
ST = STOP TIME

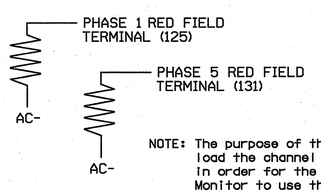
⊗ Wired Input - Do not populate slot with detector card

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)



NOTE: The purpose of these resistors is to load the channel red monitor inputs in order for the Signal Sequence Monitor to use the full signal sequence monitoring capability on channels that do not use the red display in the field.

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 10, 12,13,14,15 and 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Variable Initial and Gap Reduction.
6. Program phase 4 for 'STARTUP PED CALL'.
7. The cabinet and controller are part of the SR 1783 (Upward Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332 W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S3,S4,S4P,S5,S6,S7,S8,S9,S12.
PHASES USED.....1,2,3,4,4PED,5,6,7,8.
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
1B	TB2-5,6	I2U	39	1	2	1	Y	Y			15
2A/S5	TB2-9,10	I3U	63	25	32	2/SYS	Y	Y			
2B/S6	TB2-11,12	I3L	76	38	42	2/SYS	Y	Y			
3A	TB4-9,10	I6U	41	3	4	3	Y	Y			3
3B	TB4-11,12	I6L	45	7	14	3	Y	Y			
4A	TB6-1,2	I7U	65	27	34	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/S7	TB3-9,10	J3U	64	26	36	6/SYS	Y	Y			
6B/S8	TB3-11,12	J3L	77	39	46	6/SYS	Y	Y			
7A	TB5-9,10	J6U	42	4	8	7	Y	Y			3
7B	TB5-11,12	J6L	46	8	18	7	Y	Y			
8A	TB7-1,2	J7U	66	28	38	8	Y	Y			
PED PUSH BUTTONS											
P41,P42	TB8-5,6	I12L	69	31	PED 4	4 PED					

NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOT I12.

[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

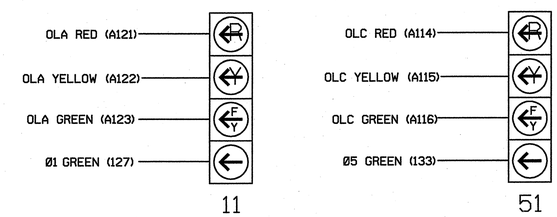
SIGNAL HEAD HOOK-UP CHART

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★	82	21,22	NU	31,32	22	41,42	P41, P42	51★	42	61,62	NU	71,72	62	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					116								122				A121			A114		
YELLOW ARROW		126			117	117			132				123	123			A122			A115		
FLASHING YELLOW ARROW																	A123			A116		
GREEN ARROW	127	127			118	118			133	133			124	124								
✋								104														
🚶								106														

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

1. The sequence display for this signal requires special logic programming. See sheet 2 for programming instructions.

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: 14-0970
DESIGNED: AUGUST 2008
SEALED: 12-11-08
REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN

ELECTRICAL DETAIL SHEET 1 OF 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1783 (Upward Road)
at
SR 1828 (Old Spartanburg Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 1-15-09 DATE

SIG. INVENTORY NO. 14-0970

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000
750 N. Greenfield Pkwy, Garner, NC 27529

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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:            |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?...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 '+' TWICE

```
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?...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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0970
DESIGNED: AUGUST 2008
SEALED: 12-11-08
REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN

ELECTRICAL DETAIL SHEET 2 OF 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1828 (Old Spartanburg Road)

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	D.A. Shinbara	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-11-08 DATE

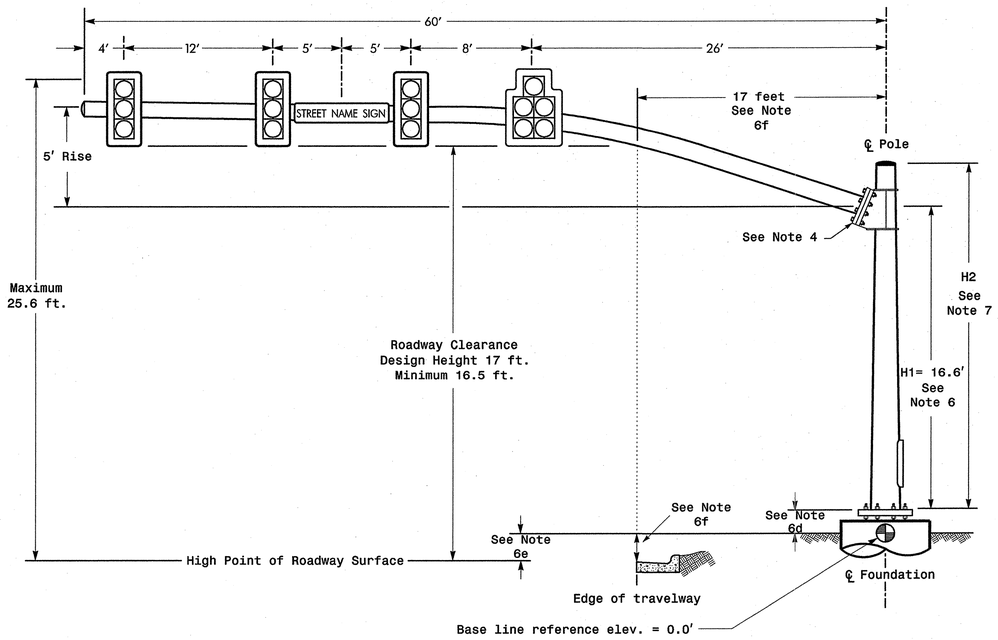
SIG. INVENTORY NO. 14-0970

12/11/2008 12:37:42 PM jerry_cross k:\rdl_roadway\011036108\traffic\signals\PLOT\14-0970_2008F_sig8.dgn

METAL POLE No. 5 and 6

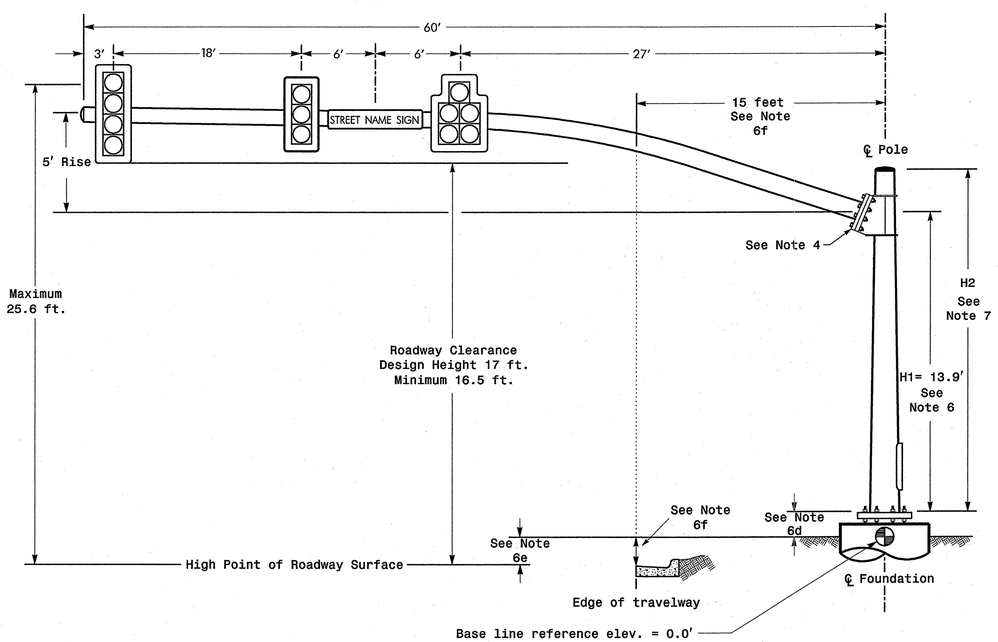
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 25

Design Loading for METAL POLE NO. 5



ELEVATION VIEW

Design Loading for METAL POLE NO. 6



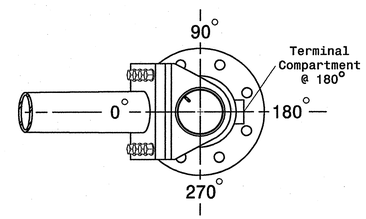
Elevation View

SPECIAL NOTE

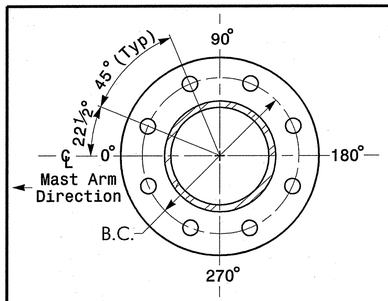
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 5	Pole 6
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+3.0 ft.	-0.1 ft.
Elevation difference at Edge of travelway or face of curb	+2.3 ft.	-0.9 ft.

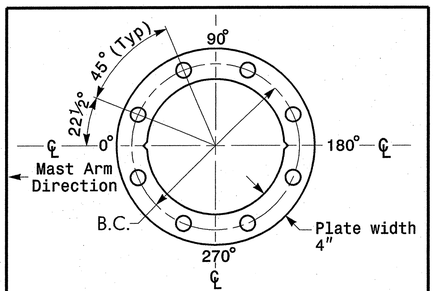


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"–5 SECTION–WITH BACKPLATE AND ASTRO–BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	SIGNAL HEAD 12"–4 SECTION–WITH BACKPLATE AND ASTRO–BRAC	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	SIGNAL HEAD 12"–3 SECTION–WITH BACKPLATE AND ASTRO–BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO–SIGN–BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2006 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

NCDOT Wind Zone 4 (90 mph)

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: 0 N/A — N/A

SR 1783 (Upward Road)
at
SR 1803 (Old Spartanburg Road)

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	D.A. Shinbara	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

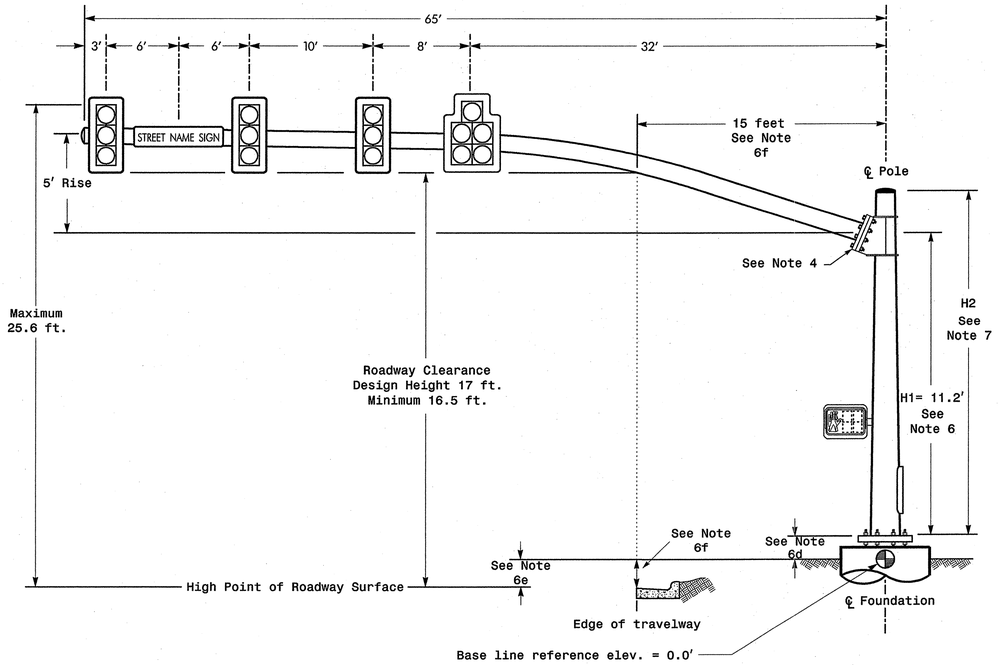
SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-11-08 DATE

SIG. INVENTORY NO. 14-0970

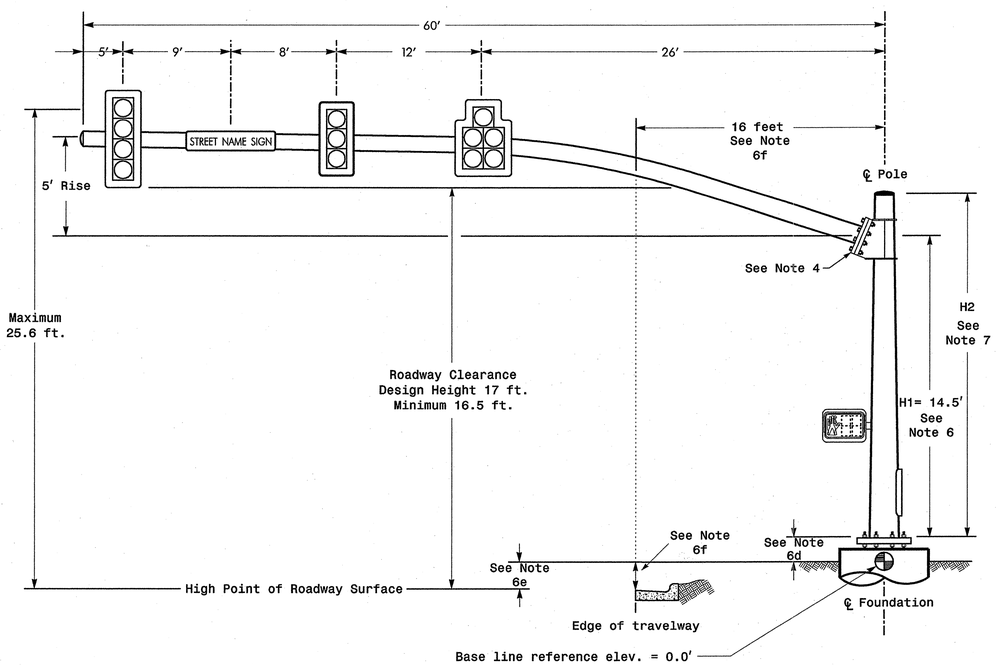
12/11/2008 1:33:34 PM jerry.cross k:\rd_roadway\011038108\traffic\signals\14-0970\14-0970_2008F_BP1.dgn

Design Loading for METAL POLE NO. 7



ELEVATION VIEW

Design Loading for METAL POLE NO. 8



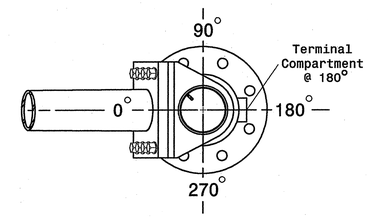
Elevation View

SPECIAL NOTE

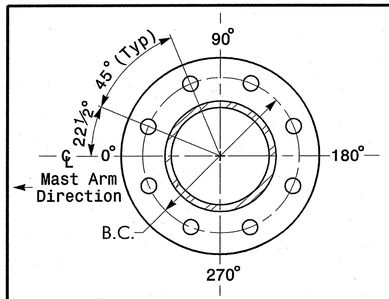
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 7	Pole 8
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-2.4 ft.	+0.5 ft.
Elevation difference at Edge of travelway or face of curb	-2.4 ft.	-0.4 ft.

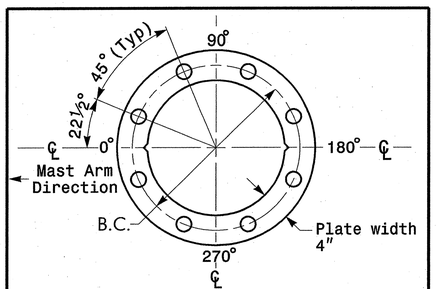


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12″–5 SECTION–WITH BACKPLATE AND ASTRO–BRAC	16.3 S.F.	42.0″ W X 56.0″ L	103 LBS
	SIGNAL HEAD 12″–4 SECTION–WITH BACKPLATE AND ASTRO–BRAC	11.5 S.F.	25.5″ W X 66.0″ L	74 LBS
	SIGNAL HEAD 12″–3 SECTION–WITH BACKPLATE AND ASTRO–BRAC	9.3 S.F.	25.5″ W X 52.5″ L	60 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO–SIGN–BRAC	12.0 S.F.	18.0″ W X 96.0″ L	27 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5″ W X 17.0″ L	21 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2006 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
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   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

NCDOT Wind Zone 4 (90 mph)

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1803 (Old Spartanburg Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:	
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette	

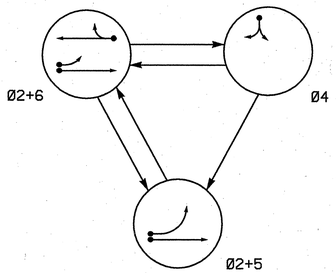
SCALE	REVISIONS	INIT.	DATE
0 N/A N/A			

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 12-11-08 DATE
SIG. INVENTORY NO. 14-0970

12/11/2008 1:33:35 PM jerry.cross k:\traf_roadway\011036108\traffic\signals\14-0970\14-0970_2008F_MP2.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 27

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

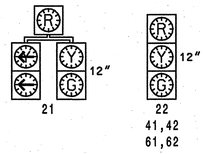
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø4	FLASH
21	G	G	R	Y
22	G	G	R	Y
41,42	R	R	G	R
61,62	R	G	R	Y

SIGNAL FACE I.D.

Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION

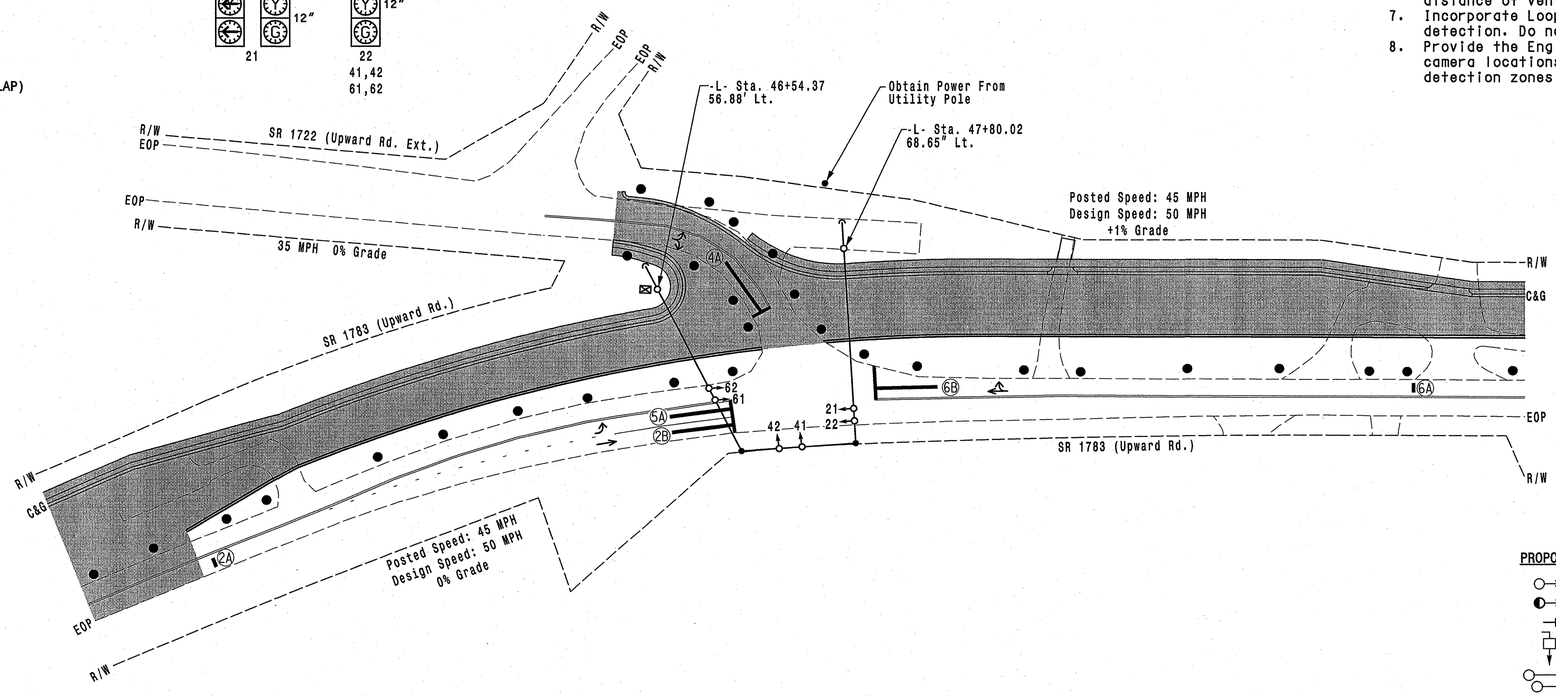
INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
5A	6X40	0	*	*	5	Y	Y	-	-	15	-	*
					2	Y	Y	Y	-	3	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	5	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	2	5	-	*

* Video Detection Zone

3 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 detector units to presence mode.
4. Phase 5 may be lagged.
5. Install backplates for signal heads numbered 21,22, 61 and 62.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
7. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
8. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 5	PHASE 6
Min Green 1 *	14	7	7	14
Extension 1 *	6.0	2.0	2.0	6.0
Max Green 1 *	90	30	30	90
Yellow Clearance	4.8	3.0	3.0	4.7
Red Clearance	1.1	2.9	1.8	1.1
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	-	15
Time To Reduce *	45	-	-	45
Minimum Gap	3.1	-	-	3.1
Recall Mode	MIN RECALL	-	-	MIN RECALL
Vehicle Call Memory	-	-	-	-
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 1 - TCP PHASE 1

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
SR 1722 (Upward Road Extension)

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10.21.08 DATE

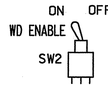
SIG. INVENTORY NO. 14-0791T1

1/22/2009 7:14:40 AM jerry.cross K:\RAL_Roadway\011086108\Traffic\Signals\14-0871\14-0871_2008T1_sig.dgn

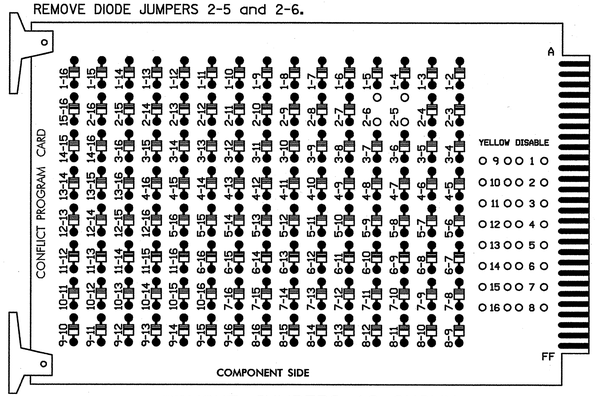
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 28

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

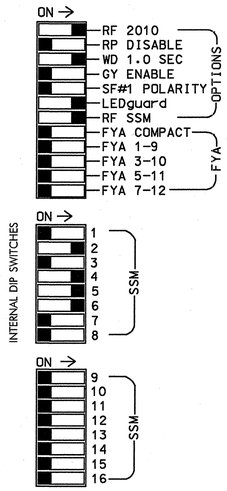
(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 2-5 and 2-6.



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, 7,8,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	NU	21	61,62	NU	NU	NU	NU
RED		128			101		*	134				
YELLOW		129			102			135				
GREEN		130			103			136				
RED ARROW												
YELLOW ARROW							132					
GREEN ARROW							133					
✋												
🚶												

NU = Not Used

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

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S4,S5,S6
PHASES USED.....2,4,5,6
OVERLAPS.....NONE

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	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

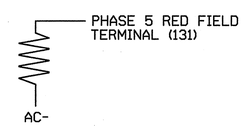
SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



NOTE: The purpose of this resistor is to load the channel red monitor inputs in order for the Signal Sequence Monitor to use the full signal sequence monitoring capability on channels that do not use the red display in the field.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0791
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 1 - TCP PHASE 1

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1783 (Upward Road)
at
SR 1722 (Upward Road Extension)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 10-30-08 DATE
SIG. INVENTORY NO. 14-0791T1

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

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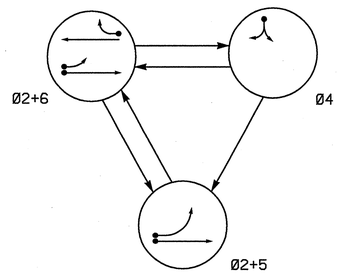
10/30/2008 4:58:35 PM davidd.shinbara

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 29

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

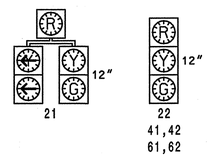
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø4	FLASH
21	G	G	R	Y
22	G	G	R	Y
41,42	R	R	G	R
61,62	R	G	R	Y

SIGNAL FACE I.D.

Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION

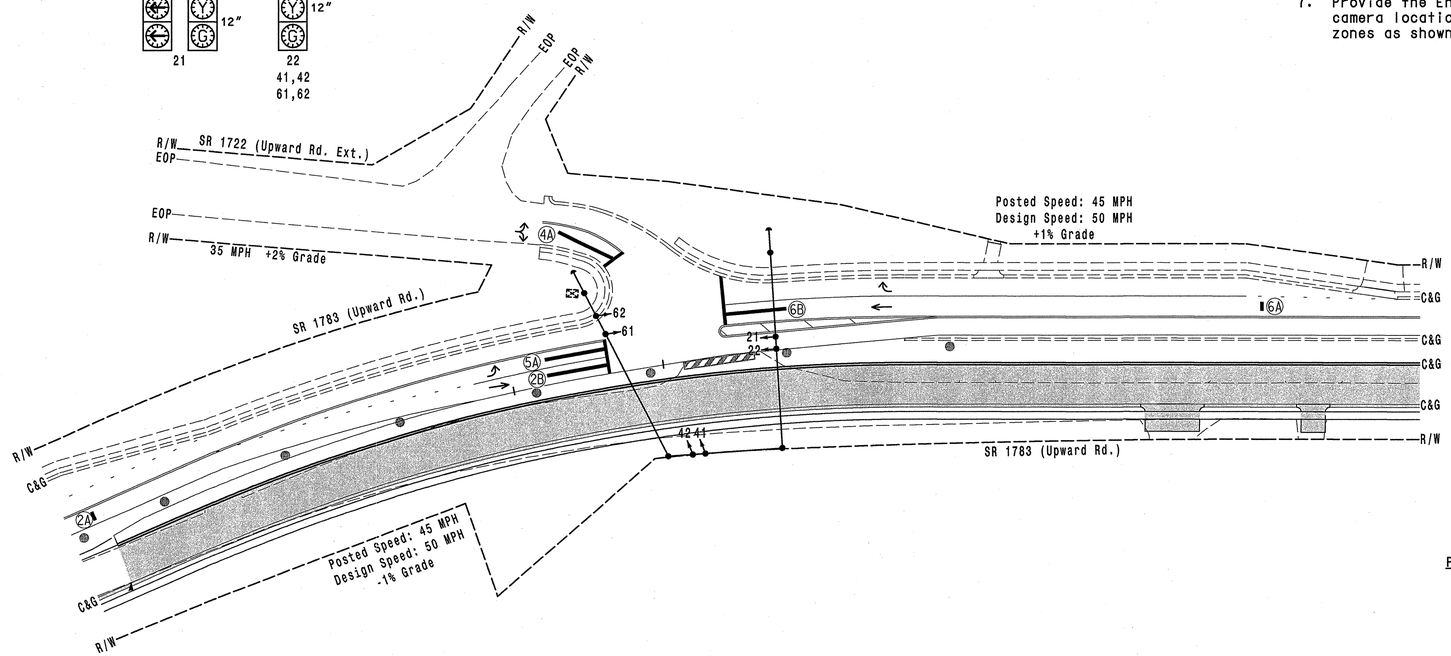
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
5A	6X40	0	*	*	5	Y	Y	-	-	15	-	*
					2	Y	Y	Y	-	3	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	5	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	2	5	-	*

* Video Detection Zone

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 all exsiting signal heads.
5. Set all detector units to presence mode.
6. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
7. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 5	PHASE 6
Min Green 1 *	14	7	7	14
Extension 1 *	6.0	2.0	2.0	6.0
Max Green 1 *	90	30	30	90
Yellow Clearance	4.9	3.0	3.0	4.7
Red Clearance	1.1	3.1	1.9	1.1
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	-	15
Time To Reduce *	45	-	-	45
Minimum Gap	3.1	-	-	3.1
Recall Mode	MIN RECALL	-	-	MIN RECALL
Vehicle Call Memory	-	-	-	-
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 2

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
SR 1722 (Upward Road Extension)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-30-08 DATE

SIG. INVENTORY NO. 14-0791T2

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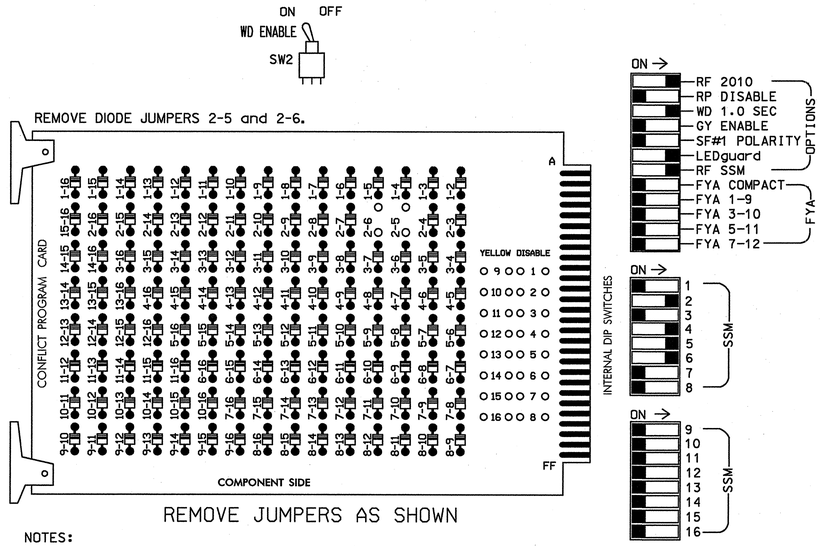
12:21:55 PM jerry.cross
10/30/2008

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 30

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, 7,8,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	NU	21	61,62	NU	NU	NU	NU
RED		128			1Ø1		*	134				
YELLOW		129			1Ø2			135				
GREEN		13Ø			1Ø3			136				
RED ARROW												
YELLOW ARROW							132					
GREEN ARROW							133					
✋												
🚶												

NU = Not Used

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

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S4,S5,S6
PHASES USED.....2,4,5,6
OVERLAPS.....NONE

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	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

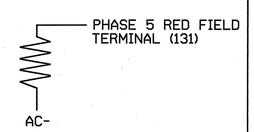
SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



NOTE: The purpose of this resistor is to load the channel red monitor inputs in order for the Signal Sequence Monitor to use the full signal sequence monitoring capability on channels that do not use the red display in the field.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0791
DESIGNED: AUGUST 2008
SEALED: 10-30-08
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety System Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1782 (Upward Road)
at
SR 1722 (Upward Road Extension)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:		
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 10-30-08 DATE
SIG. INVENTORY NO. 14-0791T2

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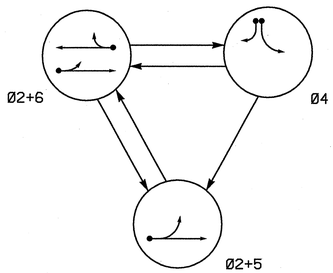
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 31

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

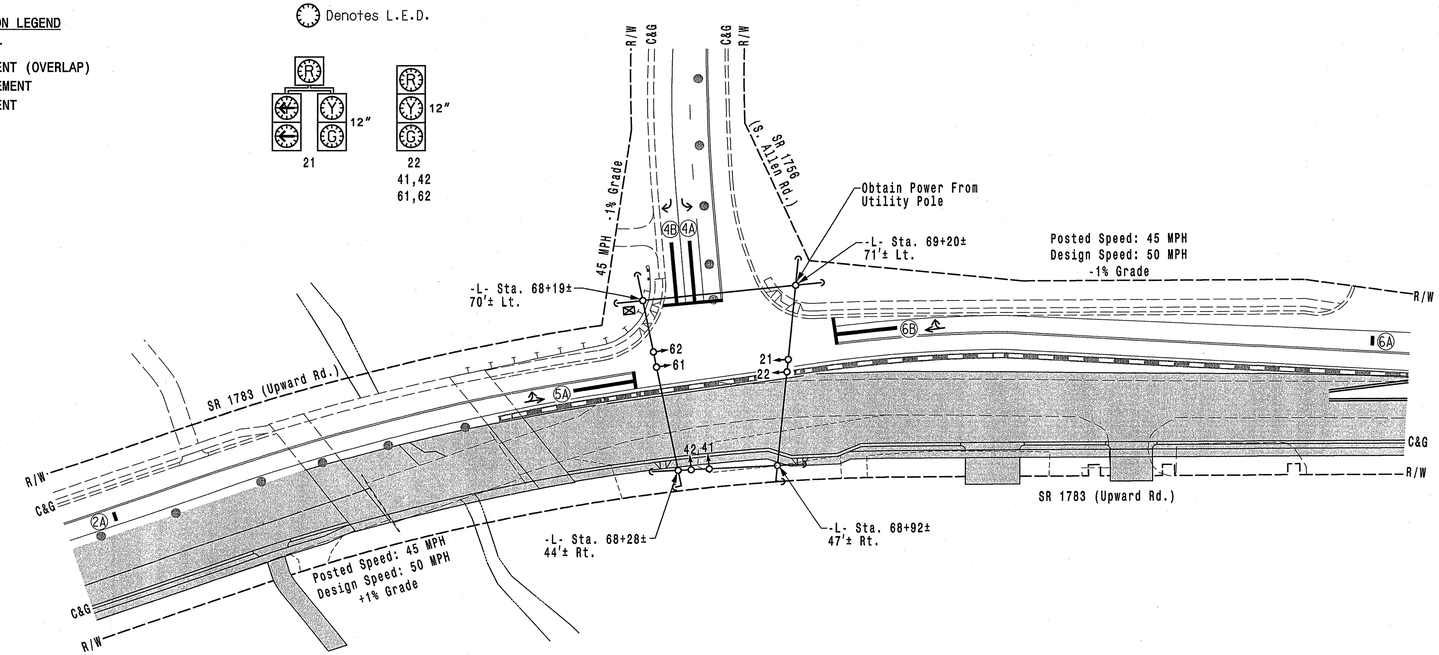
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø4	FLASH
21	G	G	R	Y
22	G	G	R	Y
41,42	R	R	G	R
61,62	R	G	R	Y

SIGNAL FACE I.D.

Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION

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
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	-	-	*
4B	6X40	0	*	*	4	Y	Y	-	-	15	-	*
5A	6X40	0	*	*	5	Y	Y	-	-	15	-	*
					2	Y	Y	Y	2	5	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	2	5	-	*

* Video Detection Zone

3 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 detector units to presence mode.
4. Install backplates for signal heads numbered 21,22,61,62.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
7. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 5	PHASE 6
Min Green 1 *	14	7	7	14
Extension 1 *	6.0	2.0	2.0	6.0
Max Green 1 *	90	25	15	90
Yellow Clearance	4.7	3.0	3.0	4.9
Red Clearance	1.1	1.9	2.4	1.5
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	-	15
Time To Reduce *	45	-	-	45
Minimum Gap	3.1	-	-	3.1
Recall Mode	MIN RECALL	-	-	MIN RECALL
Vehicle Call Memory	-	-	-	-
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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
N/A	Type III Barricade	
	Construction Zone	

SIGNAL UPGRADE - TEMPORARY DESIGN 1 - TCP PHASE 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Public Transportation and Safety Series Bureau
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
SR 1756 (S. Allen Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: J.C. Cross REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

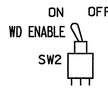
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 10-30-08 DATE
SIG. INVENTORY NO. 14-1059T1

10/30/2008 12:22:00 PM jerry.cross k:\rel_roadway\01109108\traffic\signals\14-1059\14-1059_2008T1_Sig.dgn

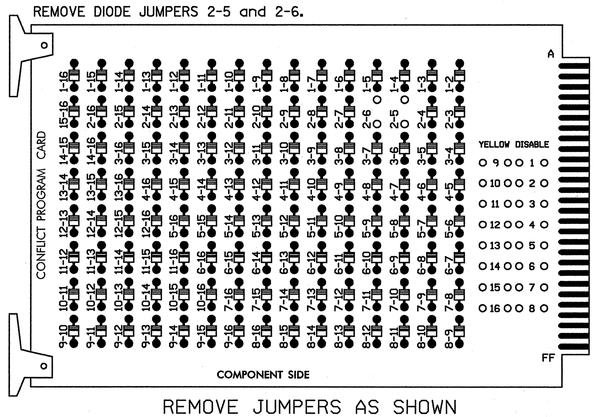
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 32

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

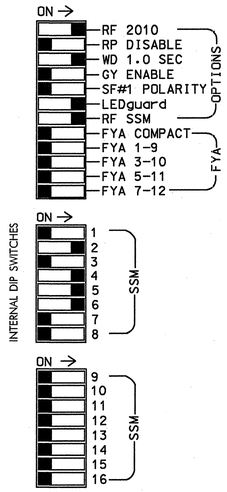
(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 2-5 and 2-6.



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 1,3,7, 8,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332 W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S2,S4,S5,S6
PHASES USED.....2,4,5,6
OVERLAP "A".....NOT USED
OVERLAP "B".....NOT USED
OVERLAP "C".....NOT USED
OVERLAP "D".....NOT USED

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	NU	21	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128			101		*	134										
YELLOW		129			102			135										
GREEN		130			103			136										
RED ARROW																		
YELLOW ARROW							132											
FLASHING YELLOW ARROW							133											
GREEN ARROW																		
✋																		
🚶																		

NU = Not Used

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

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	SLOT EMPTY	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														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L														

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

FS = FLASH SENSE
ST = STOP TIME

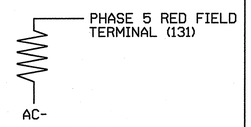
SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



NOTE: The purpose of this resistor is to load the channel red monitor inputs in order for the Signal Sequence Monitor to use the full signal sequence monitoring capability on channels that do not use the red display in the field.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-1059
DESIGNED: AUGUST 2008
SEALED: 10-30-08
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 1 - TCP PHASE 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1756 (S. Allen Road)

Division 14 | Henderson County | Flat Rock

PLAN DATE: August 2008 | REVIEWED BY:
PREPARED BY: D.A. Shinbara | REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE | DATE 10-30-08

SIG. INVENTORY NO. 14-1059T1

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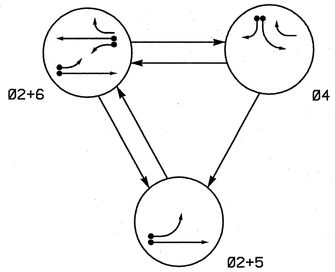
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 33

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

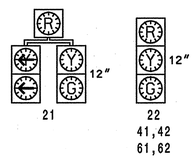
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø4	FLASH
21	G	G	R	Y
22	G	G	R	Y
41,42	R	R	G	R
61,62	R	G	R	Y

SIGNAL FACE I.D.

Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION

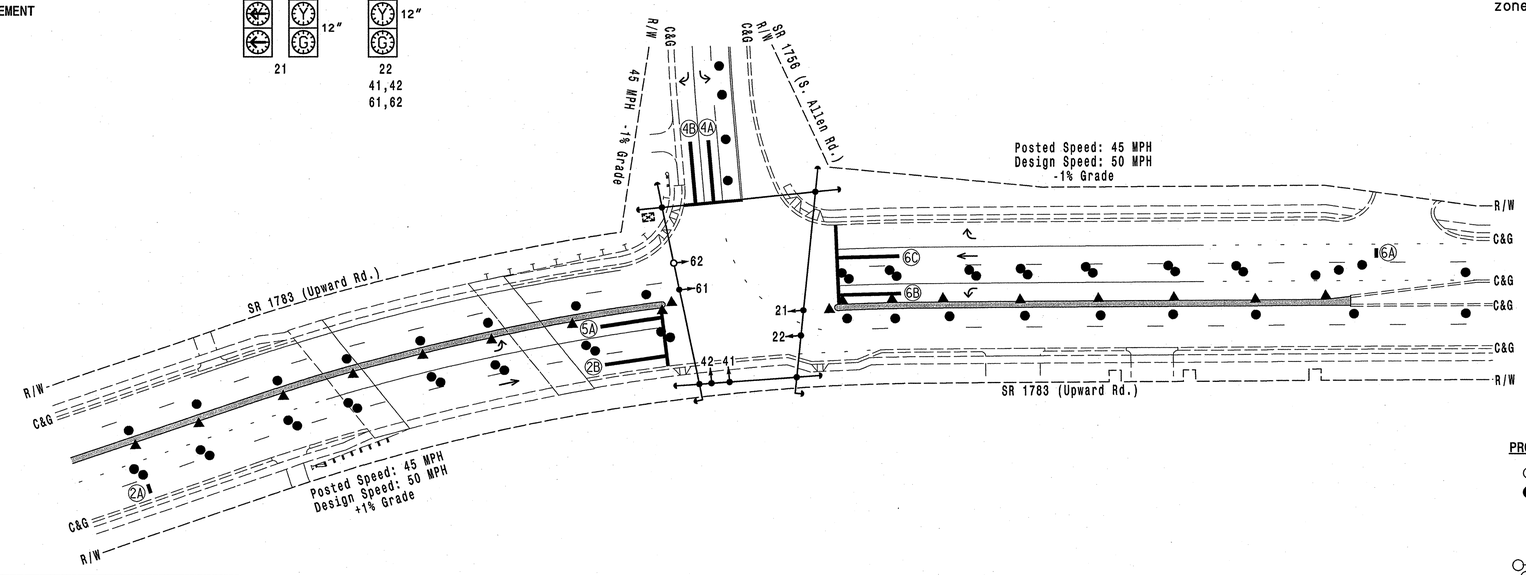
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	-	-	*
4B	6X40	0	*	*	5	Y	Y	-	-	15	-	*
5A	6X40	0	*	*	5	Y	Y	-	-	15	-	*
					2	Y	Y	Y	-	3	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	-	3	-	*
6C	6X40	0	*	*	6	Y	Y	Y	2	5	-	*

* Video Detection Zone

3 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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. Enable Backup Protection for phase 2 to allow the controller to clear from phase 2+6 to phase 2+5 by progressing through an all red display.
4. Set all detector units to presence mode.
5. Reposition all existing signal heads.
6. Install backplates for signal head numbered 62.
7. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
8. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone Cones	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 5	PHASE 6
Min Green 1 *	14	7	7	14
Extension 1 *	6.0	2.0	2.0	6.0
Max Green 1 *	90	25	15	90
Yellow Clearance	4.7	3.0	3.0	4.9
Red Clearance	1.2	3.3	2.9	1.4
Red Revert	5.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	-	15
Time To Reduce *	45	-	-	45
Minimum Gap	3.1	-	-	3.1
Recall Mode	MIN RECALL	-	-	MIN RECALL
Vehicle Call Memory	-	-	-	-
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 3

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1756 (S. Allen Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

SCALE 0 50 1"=50'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-30-08 DATE

SIG. INVENTORY NO. 14-1059T2

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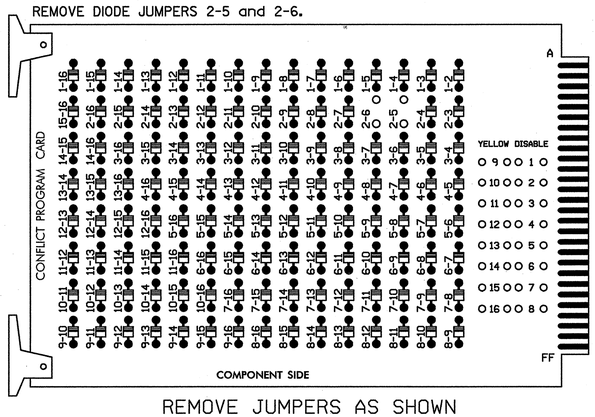
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 34

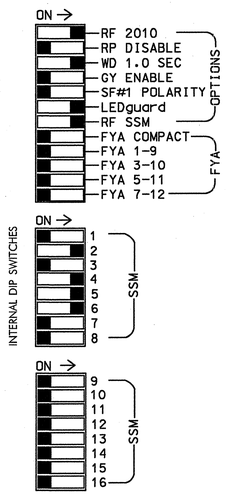
EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-5 and 2-6.



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 1,3,7, 8,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332 W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S2,S4,S5,S6
PHASES USED.....2,4,5,6
OVERLAP "A".....NOT USED
OVERLAP "B".....NOT USED
OVERLAP "C".....NOT USED
OVERLAP "D".....NOT USED

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	NU	21	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128			101		*	134										
YELLOW		129			102			135										
GREEN		130			103			136										
RED ARROW																		
YELLOW ARROW							132											
FLASHING YELLOW ARROW							133											
GREEN ARROW																		
✋																		
🚶																		

NU = Not Used
* Denotes install load resistor. See load resistor installation detail this sheet.

BACKUP PROTECTION NOTE

(program controller as shown below)

From Main Menu press '2' (Phase Control), then '1' (Phase Control Functions). Program phase 2 for 'Backup Protect'. Make sure the Red Revert times shown on the Signal Design Plans are programmed in the 'Phase Timing' menu.

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	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

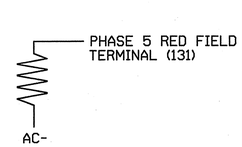
SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



NOTE: The purpose of this resistor is to load the channel red monitor inputs in order for the Signal Sequence Monitor to use the full signal sequence monitoring capability on channels that do not use the red display in the field.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-1059
DESIGNED: AUGUST 2008
SEALED: 10-30-08
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 3

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
Traffic Engineering Unit of North Carolina Department of Transportation
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1756 (S. Allen Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:		
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 10-30-08 DATE
SIG. INVENTORY NO. 14-1059T2

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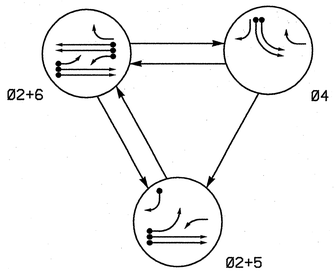
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 35

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	FLASH
21,22	G	G	R	Y
41	R	R	G	R
42	R/Y	R	G	R
51	←	~~FY~~	~~R~~	~~R~~
61	~~FY~~	~~FY~~	~~R~~	~~R~~
62	R	G	R	Y
63	R	G	R/Y	Y

~~FY~~ FLASHING YELLOW ARROW

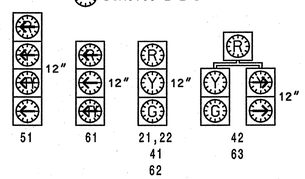
STANDARD SIGNAL FACE CLEARANCES FOR FLASHING LEFT TURN SIGNAL

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.

Denotes L.E.D.



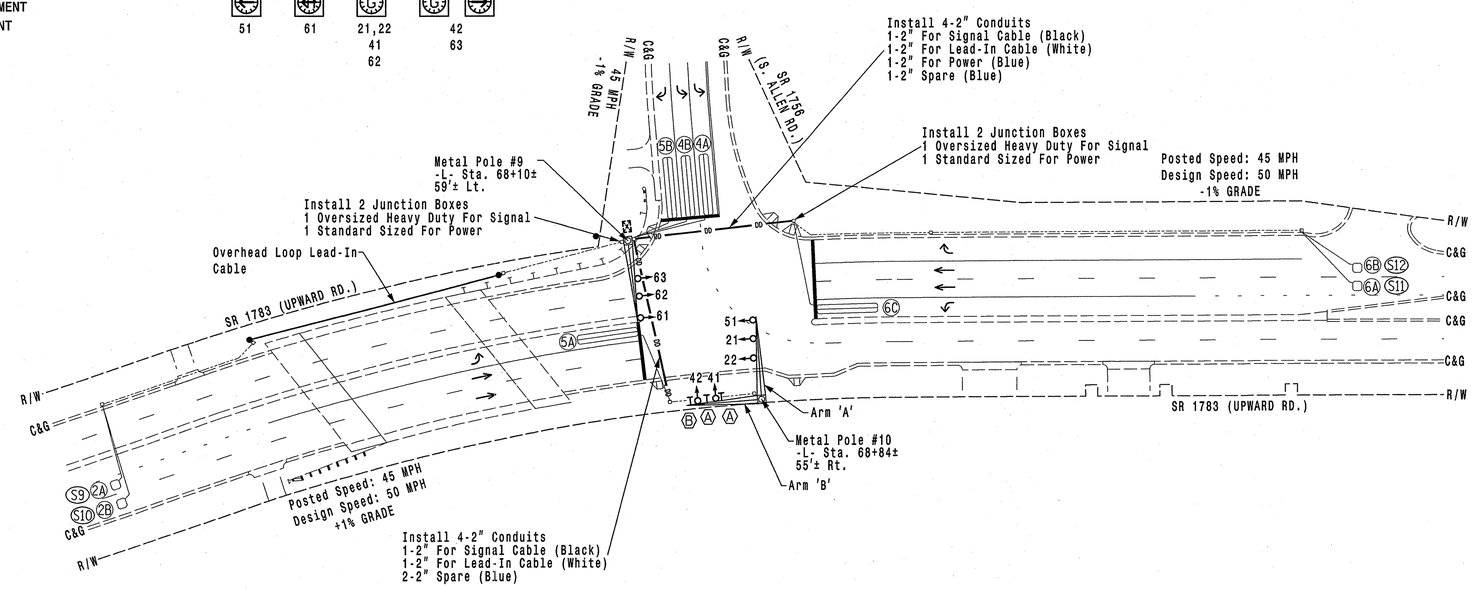
2070L LOOP & DETECTOR INSTALLATION

INDUCTIVE LOOPS: LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	DETECTOR PROGRAMMING: PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A/S9	6X6	355	5	Y	2	Y	Y	-	-	-	Y	Y
2B/S10	6X6	355	5	Y	2	Y	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	-	-	-	-	Y
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
					2	Y	Y	Y	-	3	-	Y
5B	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
6A/S11	6X6	355	5	Y	6	Y	Y	-	-	-	Y	Y
6B/S12	6X6	355	5	Y	6	Y	Y	-	-	-	Y	Y
6C	6X40	0	2-4-2	Y	6	Y	Y	Y	-	3	-	Y

3 Phase
Fully Actuated
(SR 1783 (Upward Road) Closed-Loop System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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. Install backplates for signal heads numbered 21,22, 51,61,62 and 63.
5. Set all detector units to presence mode.
6. Maximum times shown in timing chart are for free run operation only. Coordinated signal system timing values supersede there.
7. Closed loop system data: Controller Asset #1059.
8. All signal heads shall be hunter green in color.



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	
	Metal Pole with Mastarm	
	Pedestrian Signal Pedestal	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Directional Drill	N/A
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
Ⓐ	Left Arrow "ONLY" Sign (R3-5L)	Ⓐ
Ⓑ	Right Arrow "ONLY" Sign (R3-5R)	Ⓑ

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 5	PHASE 6
Min Green 1 *	14	7	7	14
Extension 1 *	6.0	2.0	2.0	6.0
Max Green 1 *	90	30	30	90
Yellow Clearance	4.7	3.0	3.0	4.9
Red Clearance	1.2	3.3	2.9	1.4
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	1.7	-	-	1.7
Max Variable Initial *	40	-	-	40
Time Before Reduction *	15	-	-	15
Time To Reduce *	45	-	-	45
Minimum Gap	3.1	-	-	3.1
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.

SIGNAL UPGRADE - FINAL DESIGN

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Prepared in the Offices of:
Traffic Engineering Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road) at SR 1756 (S. Allen Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-11-08 DATE

SIG. INVENTORY NO. 14-1059

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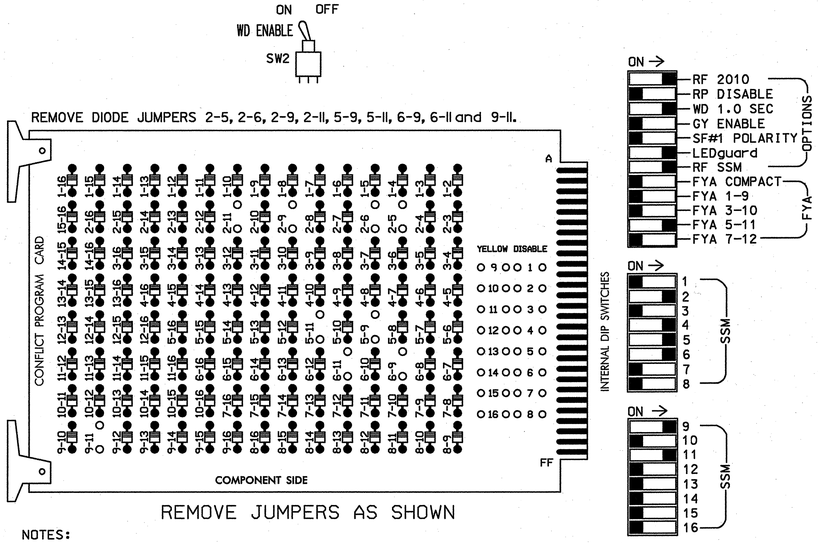
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 36

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/SYS 2A/S9	SLOT EMPTY	WIRED INPUT ⊗	SLOT EMPTY	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L		Ø2/SYS 2B/S10				Ø4 4B								ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø5 5B	Ø6/SYS 6A/S11	Ø6 6C	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	NOT USED	Ø6/SYS 6B/S12	NOT USED										

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

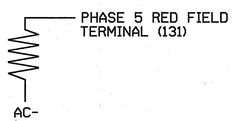
FS = FLASH SENSE
ST = STOP TIME

⊗ 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)



NOTE: The purpose of this resistor is to load the channel red monitor inputs in order for the Signal Sequence Monitor to use the full signal sequence monitoring capability on channels that do not use the red display in the field.

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, 7,8,10,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Variable Initial and Gap Reduction.
6. The cabinet and controller are part of the SR 1783 (Upward Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332 W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S2,S4,S5,S6,S9,S12.
PHASES USED.....2,4,5,6
OVERLAP "A".....5+6
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
2A/S9	TB2-5,6	I2U	39	1	2	2/SYS	Y	Y			
2B/S10	TB2-7,8	I2L	43	5	12	2/SYS	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			
5A[1]	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/S11	TB3-9,10	J3U	64	26	36	6/SYS	Y	Y			
6B/S12	TB3-11,12	J3L	77	39	46	6/SYS	Y	Y			
6C	TB5-1,2	J4U	48	10	26	6	Y	Y	Y		3

[1] 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.	NU	21,22	NU	NU	41,42	63	NU	51★	42	62,63	NU	NU	NU	NU	61★	NU	NU	51★	NU	NU
RED		128			101			✳		134										
YELLOW		129			102					135										
GREEN		130			103					136										
RED ARROW															A121			A114		
YELLOW ARROW						102			132						A122			A115		
FLASHING YELLOW ARROW															A123			A116		
GREEN ARROW						103		133	133											
✋																				
🚶																				

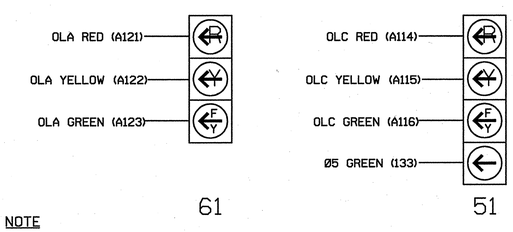
NU = Not Used

✳ 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

1. The sequence display for signal head 51 requires special logic programming. See sheet 2 of 2 for programming instructions.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-1059
DESIGNED: AUGUST 2008
SEALED: 12-11-08
REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN — ELECTRICAL DETAIL SHEET 1 OF 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1783 (Upward Road)
at
SR 1756 (S. Allen Road)

Division 14 — Henderson County — Flat Rock

PLAN DATE: August 2008 — REVIEWED BY:
PREPARED BY: D.A. Shinbara — REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE — DATE 1-15-09

SIG. INVENTORY NO. 14-1059

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

750 N. Greenfield Pkwy, Garner, NC 27529

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PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 37

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          #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 #2  (+/-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 #3  (+/-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

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?...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 '+' 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?...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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-1059
DESIGNED: AUGUST 2008
SEALED: 12-11-08
REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN

ELECTRICAL DETAIL SHEET 2 OF 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch — Department of Transportation — State of North Carolina
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR1756 (S. Allen Road)

Division 14 | Henderson County | Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-11-08 DATE

SIG. INVENTORY NO. 14-1059

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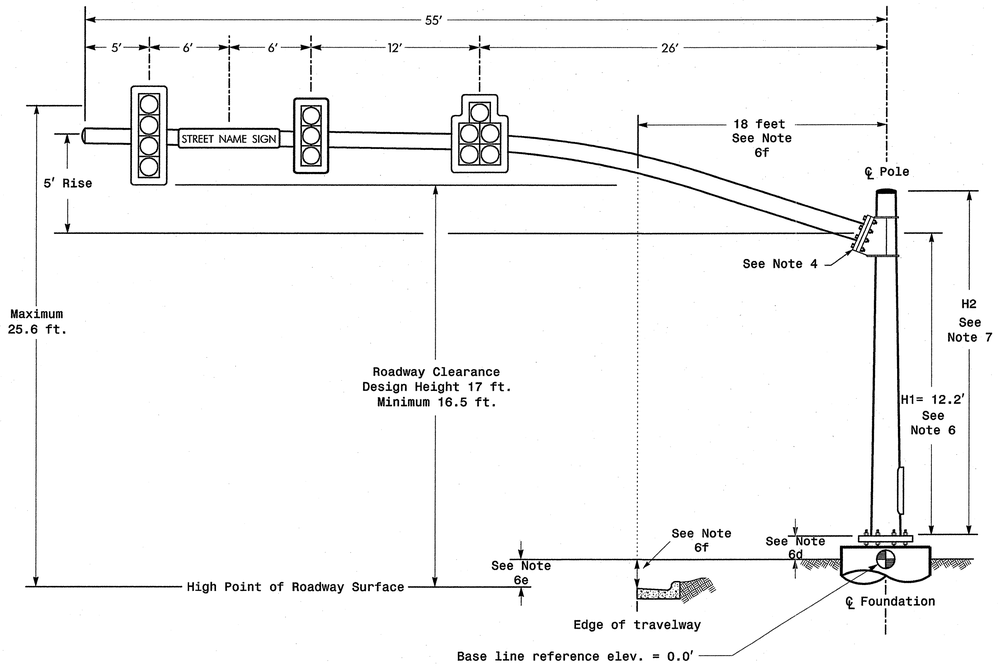
METAL POLE No. 9

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 38

Design Loading for METAL POLE NO. 9



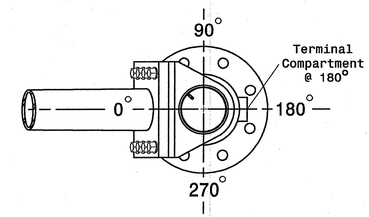
ELEVATION VIEW

SPECIAL NOTE

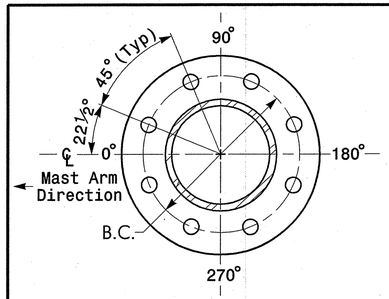
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 9
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	-1.8 ft.
Elevation difference at Edge of travelway or face of curb	-0.5 ft.

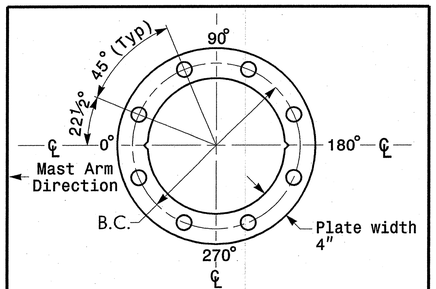


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"–5 SECTION–WITH BACKPLATE AND ASTRO–BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	SIGNAL HEAD 12"–4 SECTION–WITH BACKPLATE AND ASTRO–BRAC	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	SIGNAL HEAD 12"–3 SECTION–WITH BACKPLATE AND ASTRO–BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO–SIGN–BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2006 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

NCDOT Wind Zone 4 (90 mph)

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: 0 N/A — N/A

SR 1783 (Upward Road)
at
SR 1756 (S. Allen Road)

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	D.A. Shinbara	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-11-08 DATE

SIG. INVENTORY NO. 14-1059

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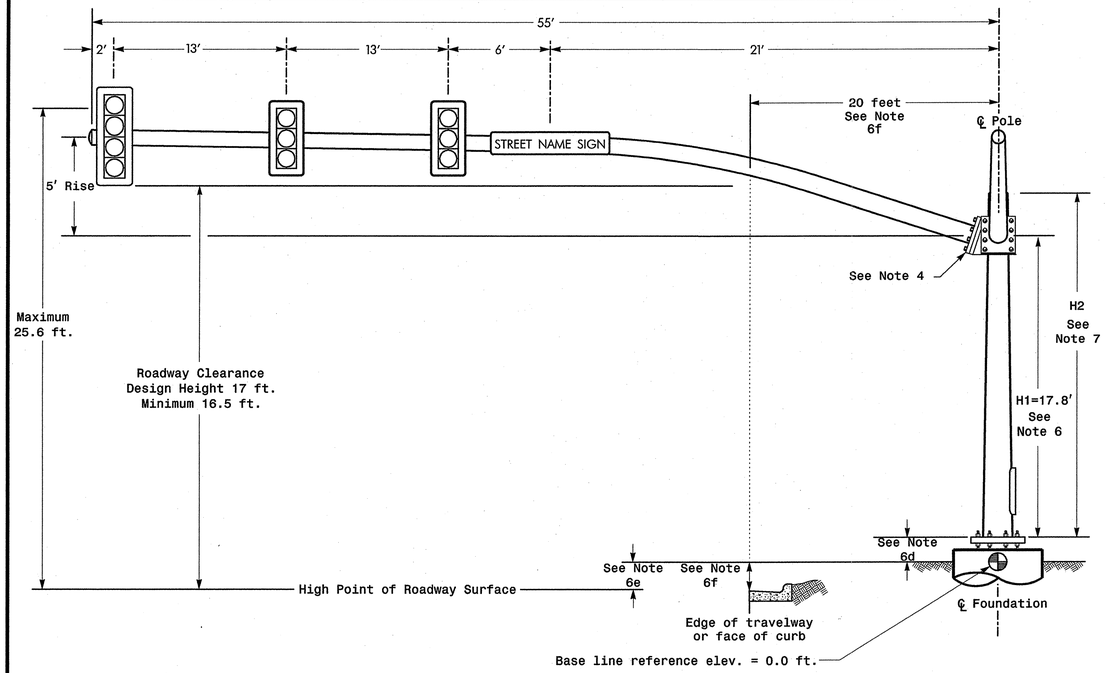
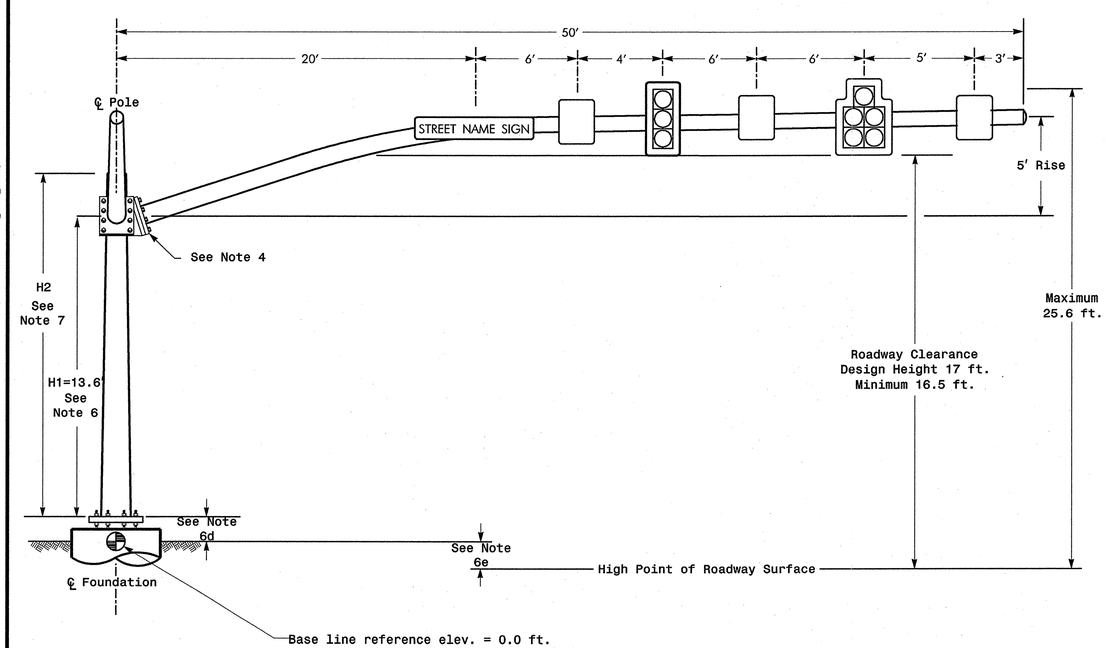
Design Loading for METAL POLE NO. 10, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 10, MAST ARM B



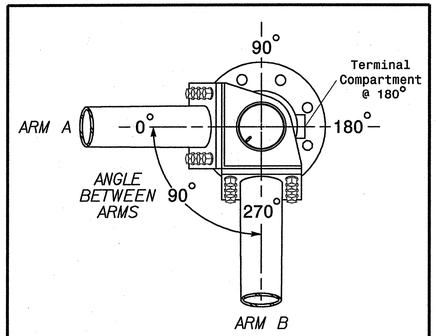
Elevation View @ 0°

SPECIAL NOTE

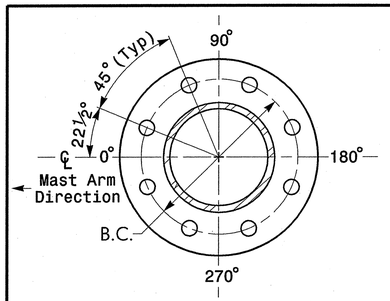
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+3.8 ft.	0.0 ft.
Elevation difference at Edge of travelway or face of curb	+2.5 ft.	0.0 ft.

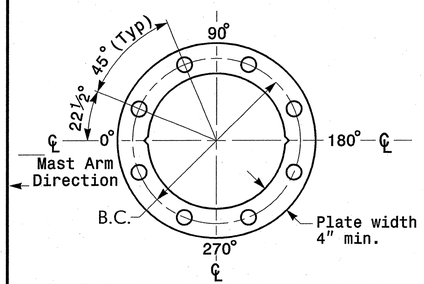


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
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	SIGNAL HEAD 12"–3 SECTION–WITH BACKPLATE AND ASTRO–BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	SIGN RIGID MOUNTED WITH ASTRO–SIGN–BRAC	5.0 S.F.	24.0" W X 30.0" L	11 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO–SIGN–BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
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3. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate connection points.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
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   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
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   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
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NCDOT Wind Zone 4 (90 mph)

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1756 (S. Allen Road)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SCALE 0 N/A N/A

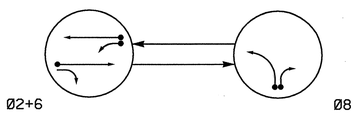
SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12.11.08 DATE

SIG. INVENTORY NO. 14-1059

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 40

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

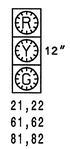
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

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

SIGNAL FACE I.D.

Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION

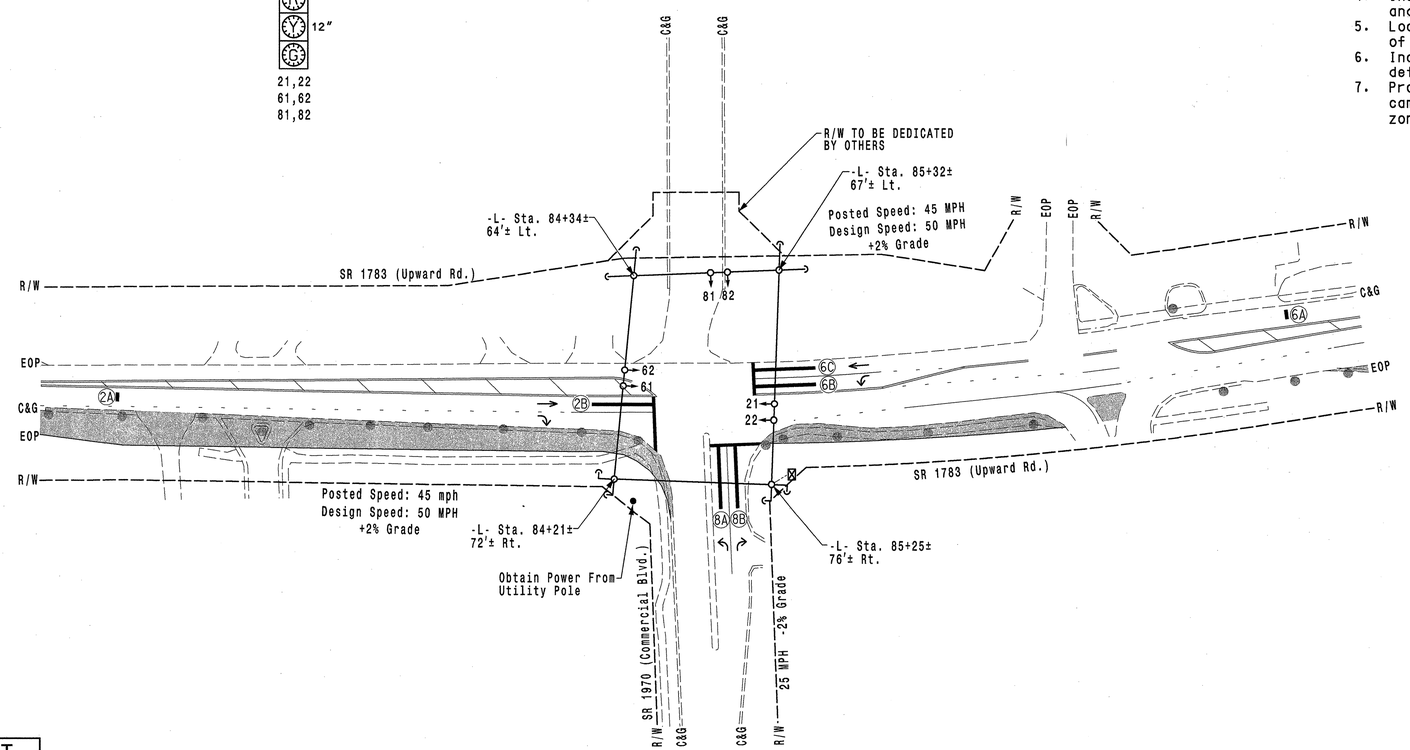
INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	-	3	-	*
6C	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
8A	6X40	0	*	*	8	Y	Y	-	-	-	-	*
8B	6X40	0	*	*	8	Y	Y	-	-	15	-	*

* Video Detection Zone

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 detector units to presence mode.
4. Install backplates for signal heads numbered 21,22,61 and 62.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
7. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 6	PHASE 8
Min Green 1 *	14	14	7
Extension 1 *	6.0	6.0	2.0
Max Green 1 *	90	90	20
Yellow Clearance	4.6	4.6	3.0
Red Clearance	1.0	1.0	2.3
Walk 1 *	-	-	-
Don't Walk 1	-	-	-
Seconds Per Actuation *	-	-	-
Max Variable Initial *	-	-	-
Time Before Reduction *	15	15	-
Time To Reduce *	45	45	-
Minimum Gap	3.1	3.1	-
Recall Mode	MIN RECALL	MIN RECALL	-
Vehicle Call Memory	-	-	-
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 1-TCP PHASE 1 TEMP. PVT.

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1970 (Commercial Boulevard)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008
PREPARED BY: J.C. Cross
REVIEWED BY:
REVIEWED BY: S.B. Privette

SCALE 0 50 1"=50'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

10-21-08
SIGNATURE DATE

SIG. INVENTORY NO. 14-1047T1

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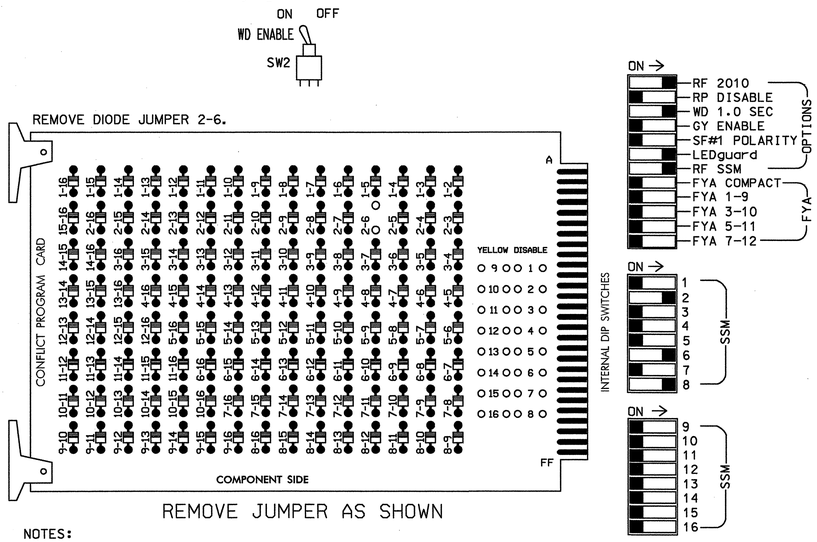
10/22/2008 12:51:25 PM jerry.cross

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 41

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper 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, 5,7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	NU	NU	NU	61,62	NU	NU	81,82	NU
RED		128						134			107	
YELLOW		129						135			108	
GREEN		130						136			109	
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S6,S8
PHASES USED.....2,6,8
OVERLAPS.....NONE

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	SLOT EMPTY	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														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L														

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-1047
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 1-TCP PHASE 1 TEMP. PVT.

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety System Branch
Signal Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1970 (Commercial Boulevard)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE DATE 10-21-08

SIG. INVENTORY NO. 14-1047T1

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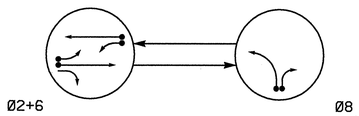
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 42

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
61,62	G	R	Y
81,82	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.

21,22
61,62
81,82

2070L LOOP & DETECTOR INSTALLATION

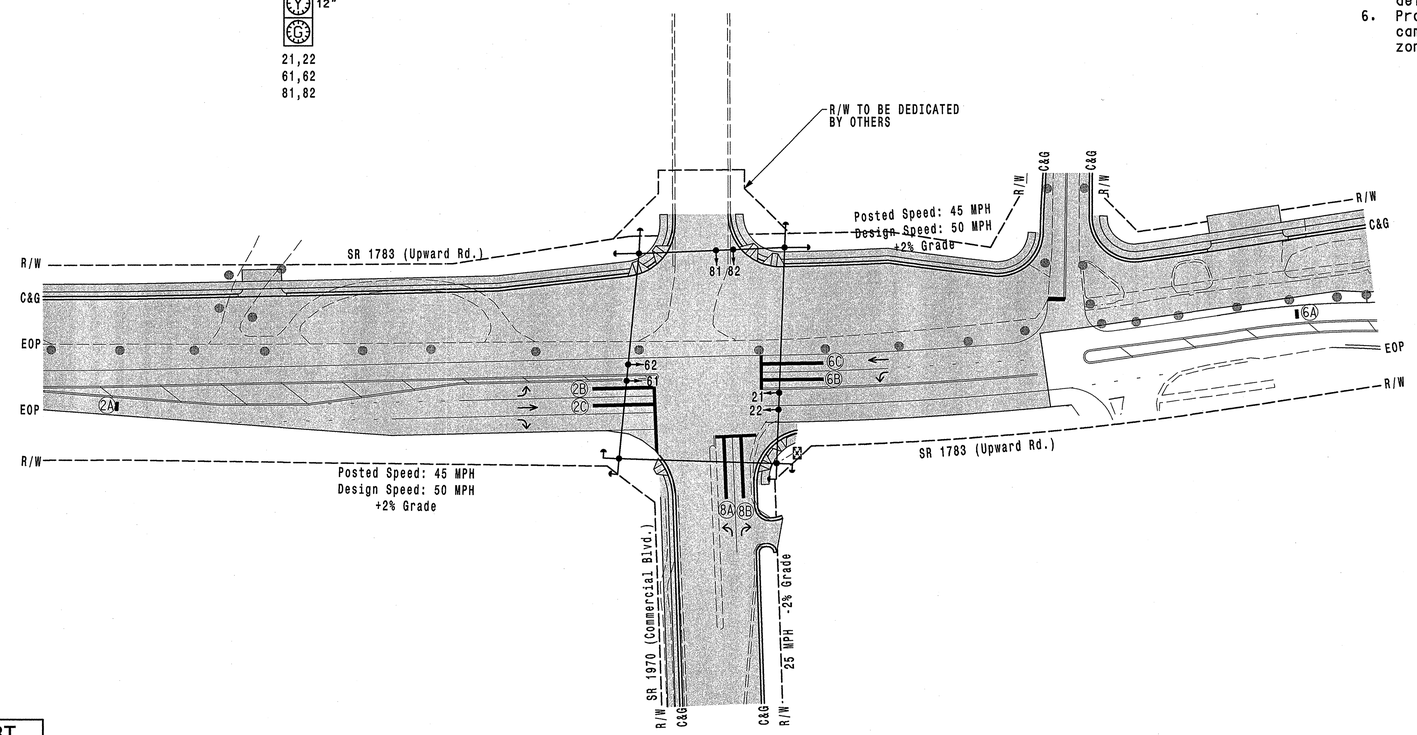
INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	-	3	-	*
2C	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	-	3	-	*
6C	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
8A	6X40	0	*	*	8	Y	Y	-	-	-	-	*
8B	6X40	0	*	*	8	Y	Y	-	-	15	-	*

* Video Detection Zone

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 all existing signal heads.
4. Set all detector units to presence mode.
5. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
6. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 6	PHASE 8
Min Green 1 *	14	14	7
Extension 1 *	6.0	6.0	2.0
Max Green 1 *	90	90	20
Yellow Clearance	4.6	4.6	3.0
Red Clearance	1.0	1.0	2.4
Walk 1 *	-	-	-
Don't Walk 1	-	-	-
Seconds Per Actuation *	-	-	-
Max Variable Initial *	-	-	-
Time Before Reduction *	15	15	-
Time To Reduce *	45	45	-
Minimum Gap	3.1	3.1	-
Recall Mode	MIN RECALL	MIN RECALL	-
Vehicle Call Memory	-	-	-
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 1

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
SR 1970 (Commercial Boulevard)

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-30-08 DATE

SIG. INVENTORY NO. 14-1047T2

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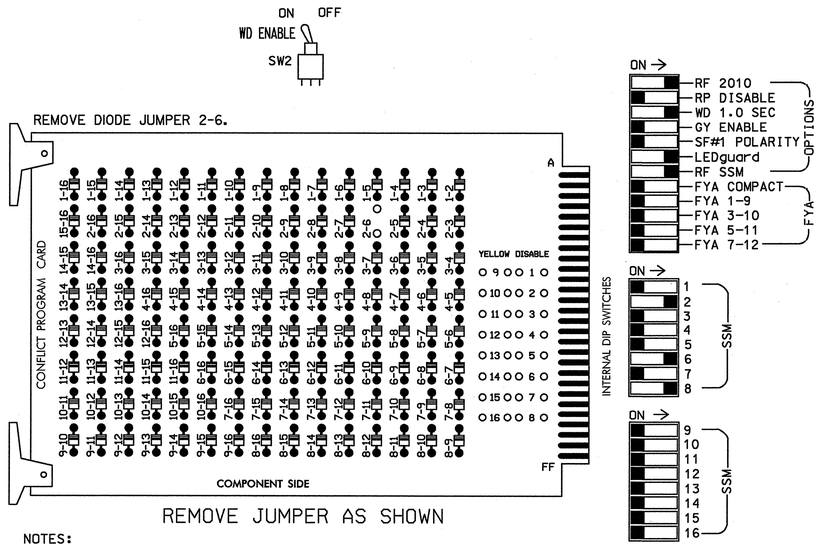
12:22:15 PM jerry.cross
10/30/2008

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 43

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper 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, 5,7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S6,S8
PHASES USED.....2,6,8
OVERLAPS.....NONE

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	NU	NU	NU	61,62	NU	NU	81,82	NU
RED		128						134			107	
YELLOW		129						135			108	
GREEN		130						136			109	
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-1047
DESIGNED: AUGUST 2008
SEALED: 10-30-08
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 1

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
State of North Carolina
Department of Transportation
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1970 (Commercial Boulevard)

Division 14 | Henderson County | Flat Rock

PLAN DATE: August 2008 | REVIEWED BY:
PREPARED BY: D.A. Shinbara | REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE | DATE 10-30-08

SIG. INVENTORY NO. 14-1047T2

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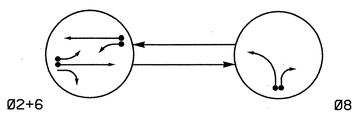
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 44

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
61,62	G	R	Y
81,82	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.

21,22
61,62
81,82

2070L LOOP & DETECTOR INSTALLATION

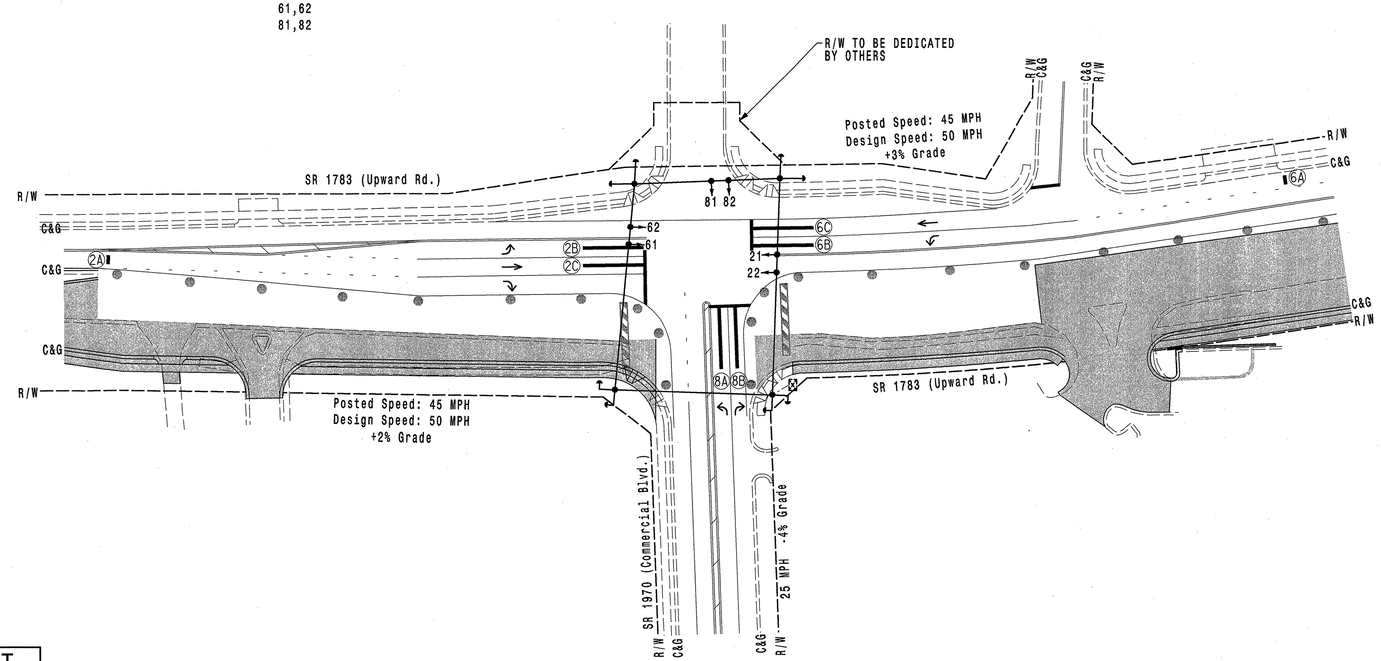
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	-	3	-	*
2C	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	-	3	-	*
6C	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
8A	6X40	0	*	*	8	Y	Y	-	-	3	-	*
8B	6X40	0	*	*	8	Y	Y	-	-	15	-	*

* Video Detection Zone

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 and 62.
4. Set all detector units to presence mode.
5. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
6. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 6	PHASE 8
Min Green 1 *	14	14	7
Extension 1 *	6.0	6.0	2.0
Max Green 1 *	90	90	20
Yellow Clearance	4.6	4.6	3.0
Red Clearance	1.0	1.0	2.3
Walk 1 *	-	-	-
Don't Walk 1	-	-	-
Seconds Per Actuation *	-	-	-
Max Variable Initial *	-	-	-
Time Before Reduction *	15	15	-
Time To Reduce *	45	45	-
Minimum Gap	3.1	3.1	-
Recall Mode	MIN RECALL	MIN RECALL	-
Vehicle Call Memory	-	-	-
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 3-TCP PHASE 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
SR 1970 (Commercial Boulevard)

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE DATE 10-21-08

SIG. INVENTORY NO. 14-1047T3

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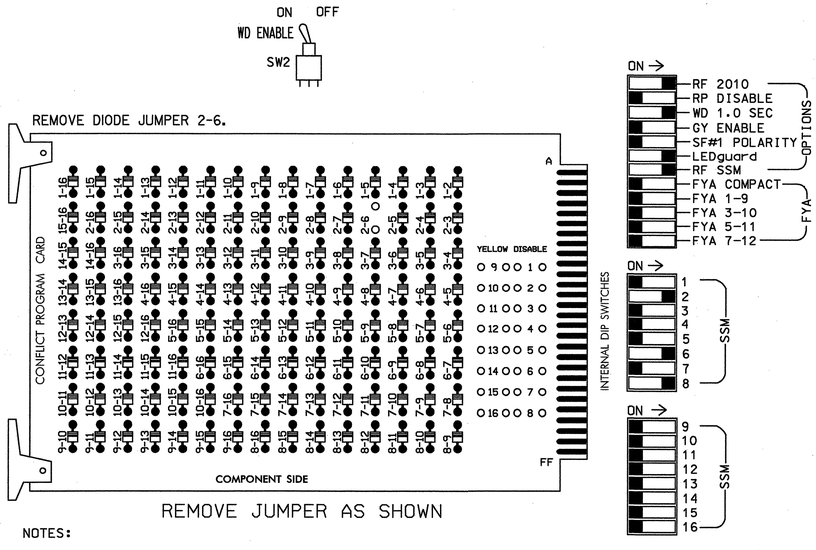
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 45

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



REMOVE JUMPER AS SHOWN

NOTES:

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

■ = 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, 5,7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	NU	NU	NU	61,62	NU	NU	81,82	NU
RED		128						134			107	
YELLOW		129						135			108	
GREEN		130						136			109	
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S6,S8
PHASES USED.....2,6,8
OVERLAPS.....NONE

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	SLOT EMPTY	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														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L														

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-1047
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 3 - TCP PHASE 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1970 (Commercial Boulevard)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
10.21.08
SIGNATURE DATE
SIG. INVENTORY NO. 14-1047T3

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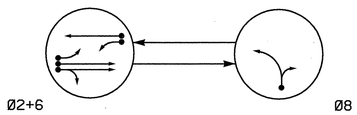
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 46

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
61,62	G	R	Y
81,82	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.

21,22
61,62
81,82

2070L LOOP & DETECTOR INSTALLATION

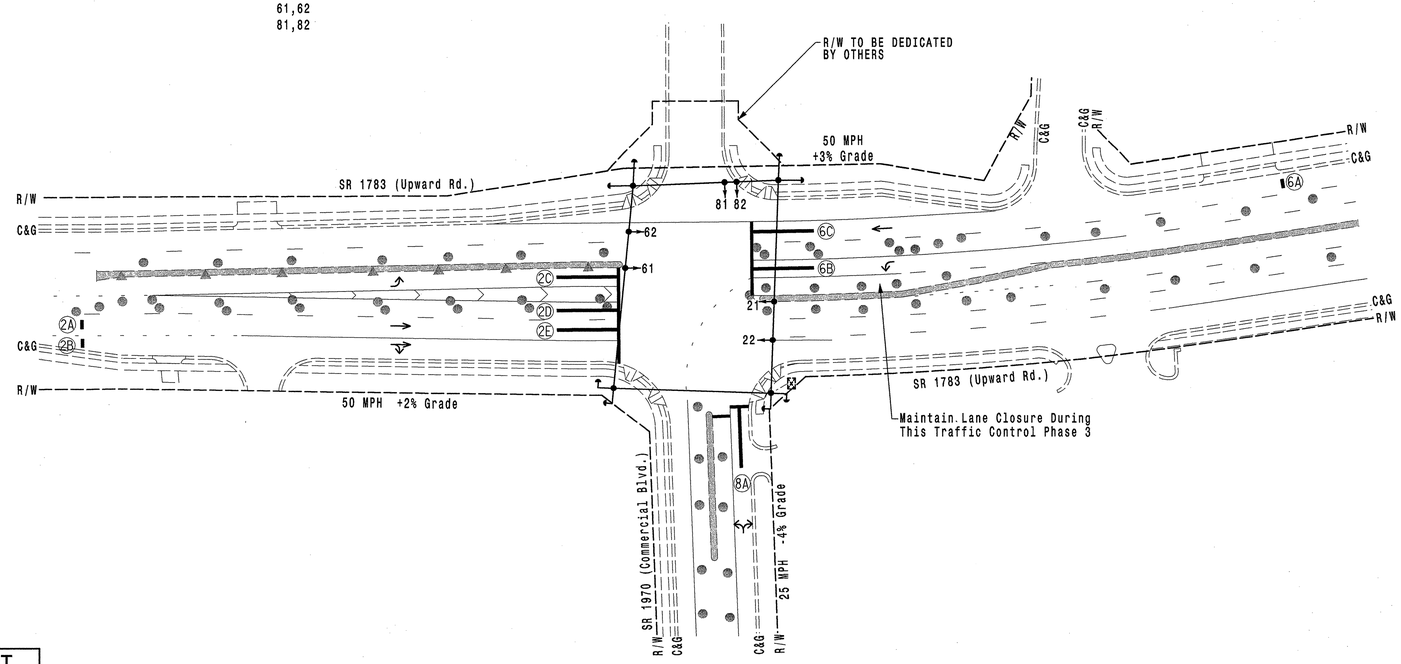
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2C	6X40	0	*	*	2	Y	Y	-	-	-	-	*
2D	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
2E	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	-	-	-	-	*
6C	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
8A	6X40	0	*	*	8	Y	Y	-	-	5	-	*

* Video Detection Zone

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 all existing signal heads.
4. Set all detector units to presence mode.
5. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
6. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone Cones	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 6	PHASE 8
Min Green 1 *	14	14	7
Extension 1 *	6.0	6.0	2.0
Max Green 1 *	90	90	20
Yellow Clearance	4.6	4.6	3.0
Red Clearance	1.5	1.3	3.5
Walk 1 *	-	-	-
Don't Walk 1	-	-	-
Seconds Per Actuation *	-	-	-
Max Variable Initial *	-	-	-
Time Before Reduction *	15	15	-
Time To Reduce *	45	45	-
Minimum Gap	3.1	3.1	-
Recall Mode	MIN RECALL	MIN RECALL	-
Vehicle Call Memory	-	-	-
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 4 - TCP PHASE 3

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
SR 1970 (Commercial Boulevard)

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER TERRANCE B. PRIVETTE

SIGNATURE 10-21-08 DATE

SIG. INVENTORY NO. 14-1047T4

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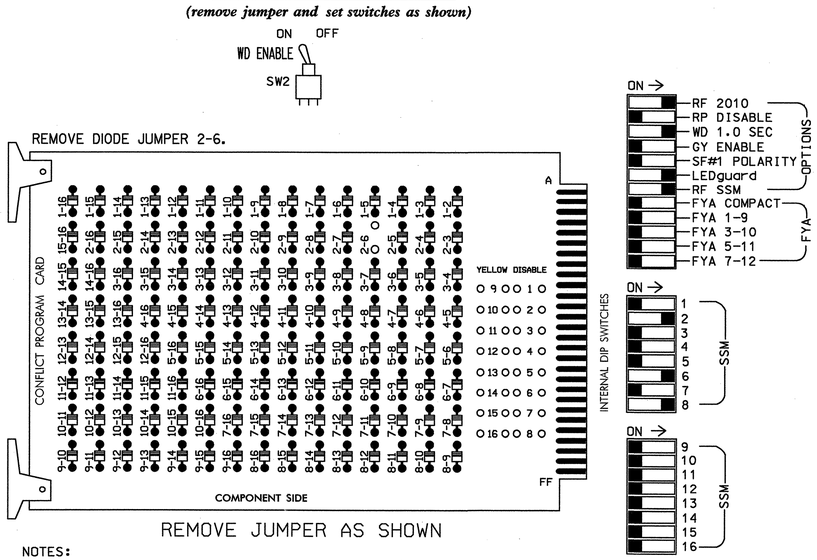
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 47

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



REMOVE JUMPER AS SHOWN

NOTES:

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

■ = 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, 5,7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	NU	NU	NU	61,62	NU	NU	81,82	NU
RED		128						134			107	
YELLOW		129						135			108	
GREEN		130						136			109	
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S6,S8
PHASES USED.....2,6,8
OVERLAPS.....NONE

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	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-1047
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 4 - TCP PHASE 3

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering Branch, Signal Management Section, Department of Transportation, State of North Carolina
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1970 (Commercial Boulevard)

Division 14 | Henderson County | Flat Rock

PLAN DATE: August 2008 | REVIEWED BY:
PREPARED BY: D.A. Shinbara | REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 10.21.08 DATE
SIG. INVENTORY NO. 14-1047T4

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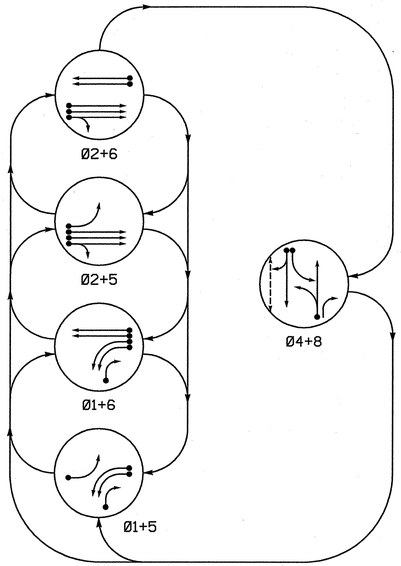
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 48

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

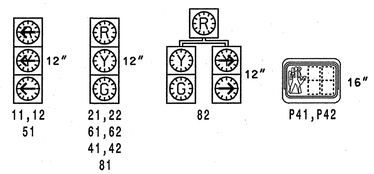
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLOOT
11,12	←	←	~~R~~	~~R~~	~~R~~	~~R~~
21,22	R	R	G	G	R	Y
41,42	R	R	R	R	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~
61,62	R	G	R	G	R	Y
81	R	R	R	R	G	R
82	R/	R/	R	R	G	R
P41,P42	DW	DW	DW	DW	W	DRK

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

SIGNAL FACE I.D.

Denotes L.E.D.



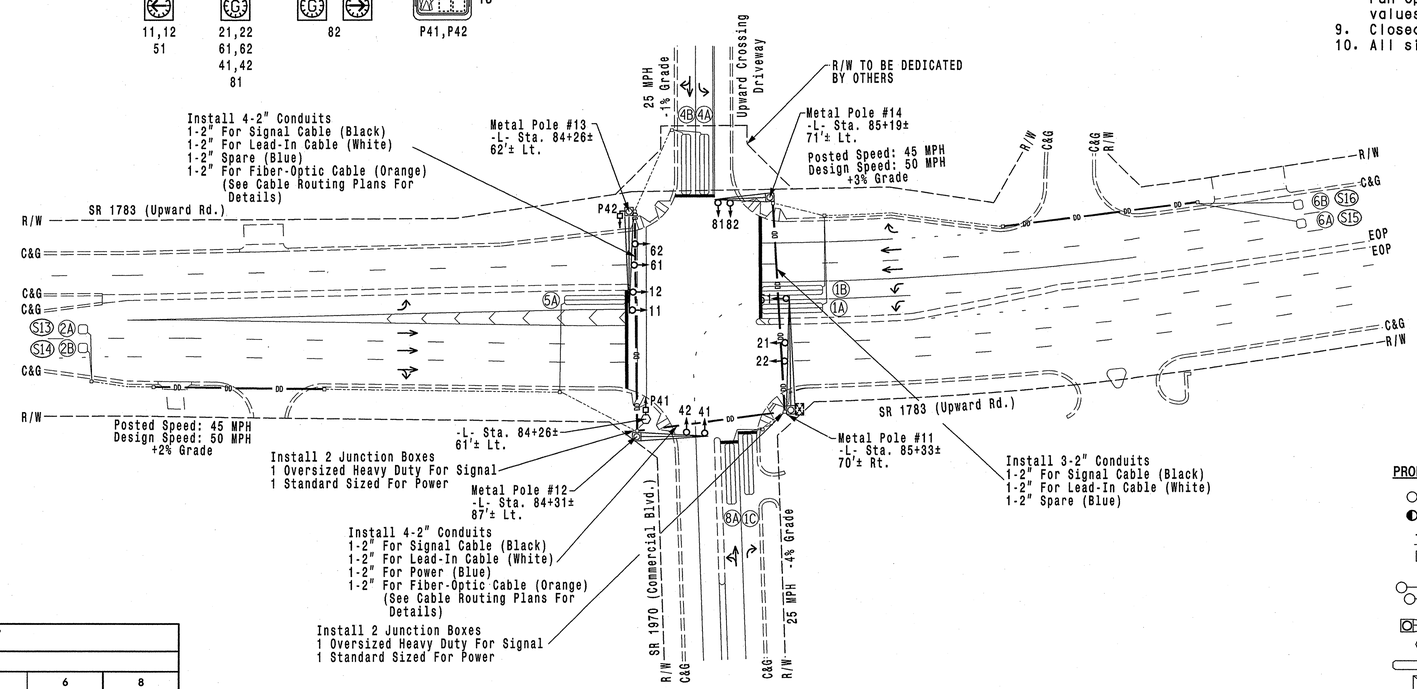
2070L LOOP & DETECTOR INSTALLATION

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	-	-	-	-	Y
1B	6X40	0	2-4-2	Y	1	Y	Y	-	-	-	-	Y
1C	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	Y
2A/S13	6X6	355	5	Y	2	Y	Y	-	-	-	Y	Y
2B/S14	6X6	355	5	Y	2	Y	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	-	-	-	-	Y
6A/S15	6X6	355	6	Y	6	Y	Y	-	-	-	Y	Y
6B/S16	6X6	355	6	Y	6	Y	Y	-	-	-	Y	Y
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	Y

5 Phase
Fully Actuated
(SR 1783 (Upward Road) Closed-Loop System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 or phase 5 may be lagged.
4. Install backplates for signal heads numbered 11,12, 21,22,51,61 and 62.
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 there.
9. Closed loop system data: Controller Asset # 1047.
10. All signal heads shall be hunter green in color.



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	
	Metal Pole with Mastarm	
	Pedestrian Signal Pedestal	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Directional Drill	N/A

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 *	20	90	20	20	90	20
Yellow Clearance	3.0	4.6	3.2	3.0	4.6	3.4
Red Clearance	2.9	1.2	3.3	2.9	1.1	3.6
Walk 1 *	-	-	7	-	-	-
Don't Walk 1	-	-	25	-	-	-
Seconds Per Actuation *	-	1.3	-	-	1.7	-
Max Variable Initial *	-	40	-	-	40	-
Time Before Reduction *	-	15	-	-	15	-
Time To Reduce *	-	45	-	-	45	-
Minimum Gap	-	3.1	-	-	3.1	-
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 5 seconds.

SIGNAL UPGRADE - FINAL DESIGN

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road) at SR 1970 (Commercial Boulevard)

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 12-11-08 DATE
SIG. INVENTORY NO. 14-1047

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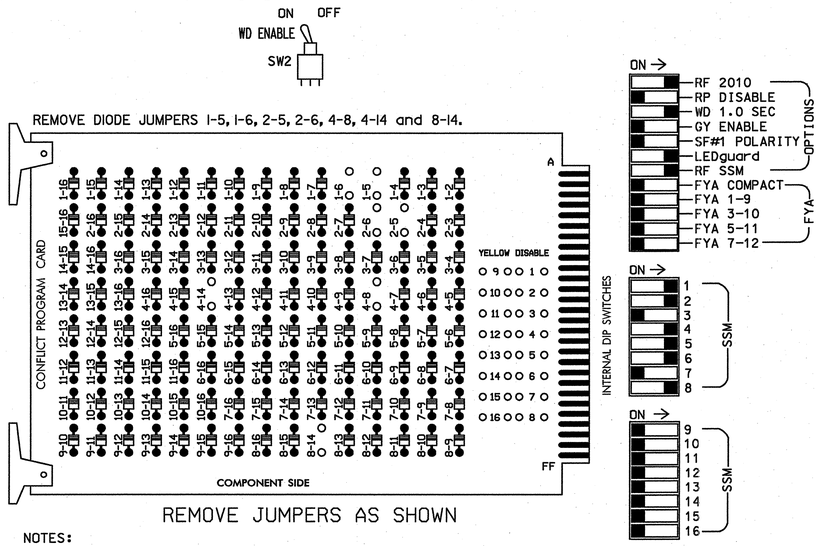
jerry.cross
1/5/2009

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 49

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.

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, 9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Variable Initial and Gap Reduction.
6. Program phase 4 for 'STARTUP PED CALL'.
7. Program phases 4 and 8, on the controller unit, for Dual Entry.
8. The cabinet and controller are part of the SR 1783 (Upward Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S1,S2,S4,S4P,S5,S6,S8
PHASES USED.....1,2,4,4PED,5,6,8
OVERLAPS.....NONE

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1		2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	11,12	82	21,22	NU	NU	41,42	P41, P42	51	61,62	NU	NU	81,82	NU
RED			128			101			134			107	
YELLOW			129			102			135			108	
GREEN			130			103			136			109	
RED ARROW	125							131					
YELLOW ARROW	126	126						132					
GREEN ARROW	127	127						133					
✋							104						
🚶							106						

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø 1	Ø 1	Ø2/SYS	SLOT	SLOT	Ø 4	SLOT	SLOT	SLOT	SLOT	SLOT	NOT USED	SLOT	FS
		1C	1A	2A/S13			4A								DC ISOLATOR
	L	NOT USED	Ø 1	Ø2/SYS	EMPTY	EMPTY	Ø 4	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	Ø4 PED	EMPTY	ST
			1B	2B/S14			4B						DC ISOLATOR		DC ISOLATOR
FILE "J"	U	Ø 5	Ø6/SYS	SLOT	SLOT	SLOT	Ø 8	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
		5A	6A/S15				8A								
	L	NOT USED	Ø6/SYS	EMPTY	EMPTY	EMPTY	NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
			6B/S16												

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.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A	TB2-5,6	I2U	39	1	2	1	Y	Y	_	___	__
1B	TB2-7,8	I2L	43	5	12	1	Y	Y	_	___	__
1C	TB2-1,2	I1U	56	18	1	1	Y	Y	_	___	15
2A/S13	TB2-9,10	I3U	63	25	32	2/SYS	Y	Y	_	___	__
2B/S14	TB2-11,12	I3L	76	38	42	2/SYS	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	TB3-1,2	J1U	55	17	5	5	Y	Y	_	___	__
6A/S15	TB3-5,6	J2U	40	2	6	6/SYS	Y	Y	_	___	__
6B/S16	TB3-7,8	J2L	44	6	16	6/SYS	Y	Y	_	___	__
8A	TB5-9,10	J6U	42	4	8	8	Y	Y	_	___	__
PED PUSH BUTTONS											
P41,P42	TB8-5,6	I12L	69	31	PED 4	4 PED					

NOTE:
INSTALL DC ISOLATORS 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.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-1047
DESIGNED: AUGUST 2008
SEALED: 12-11-08
REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1783 (Upward Road)
at
SR 1970 (Commercial Boulevard)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

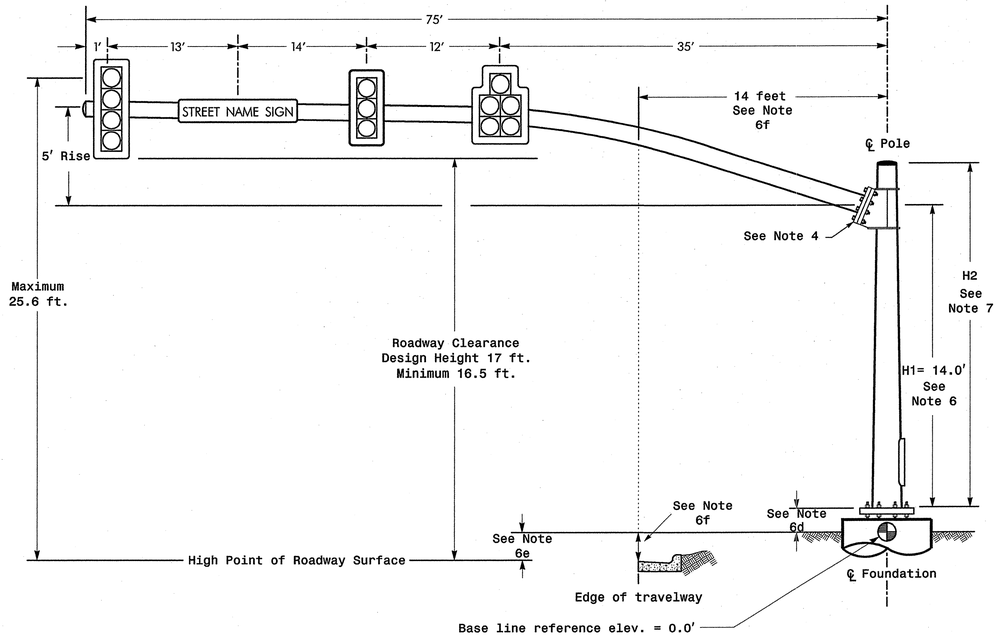
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 1-15-09 DATE
SIG. INVENTORY NO. 14-1047

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

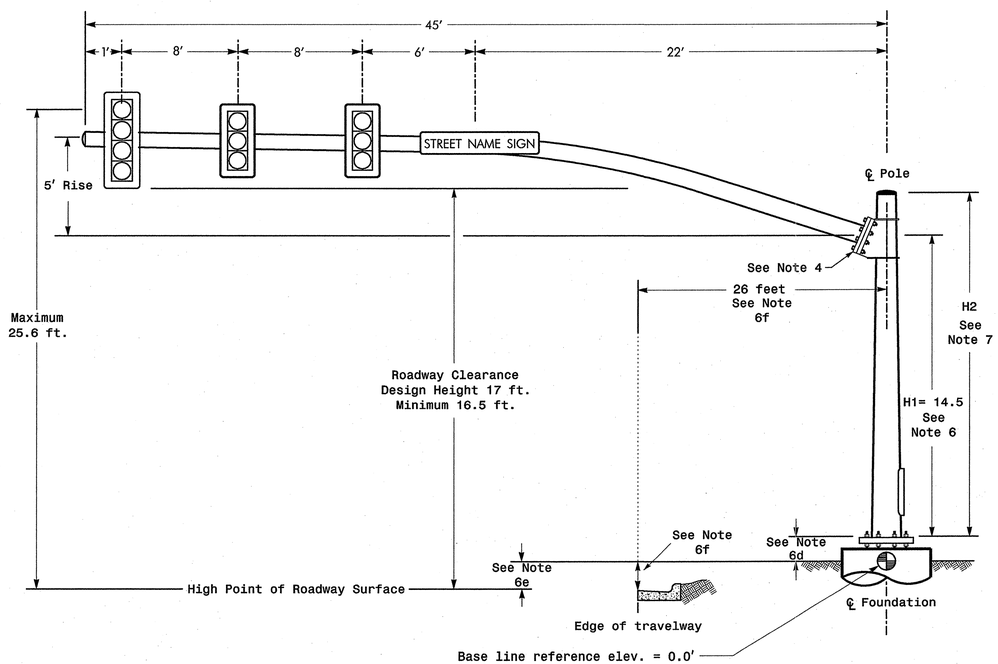
K:\RAL_Roadway\01108108\Traffic\Signals\14-1047\14-1047_2008E_als.dgn jerry_cross 2:50:06 PM 1/15/2009

Design Loading for METAL POLE NO. 11



ELEVATION VIEW

Design Loading for METAL POLE NO. 12



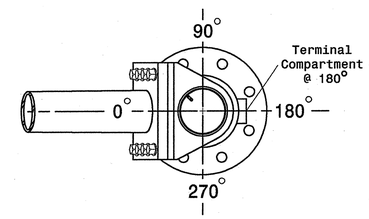
Elevation View

SPECIAL NOTE

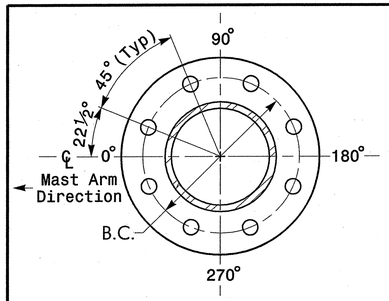
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 11	Pole 12
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	0.0 ft.	+0.5 ft.
Elevation difference at Edge of travelway or face of curb	0.0 ft.	-0.0 ft.

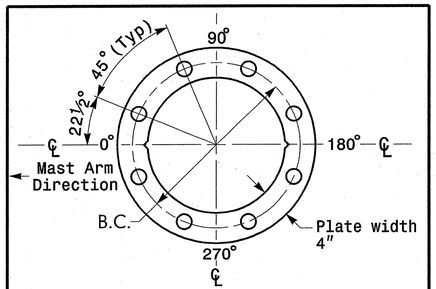


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	SIGNAL HEAD 8"-4 SECTION (VERTICAL)-WITH BACKPLATE AND ASTRO-BRAC	7.9 S.F.	22.0" W X 52.0" L	53.5 LBS
	SIGNAL HEAD 8"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	10.6 S.F.	35.0" W X 43.5" L	75 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2006 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

NCDOT Wind Zone 4 (90 mph)

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1970 (Commercial Boulevard)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:	
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette	

REVISIONS	INIT.	DATE

SCALE 0 N/A N/A

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-11-08 DATE

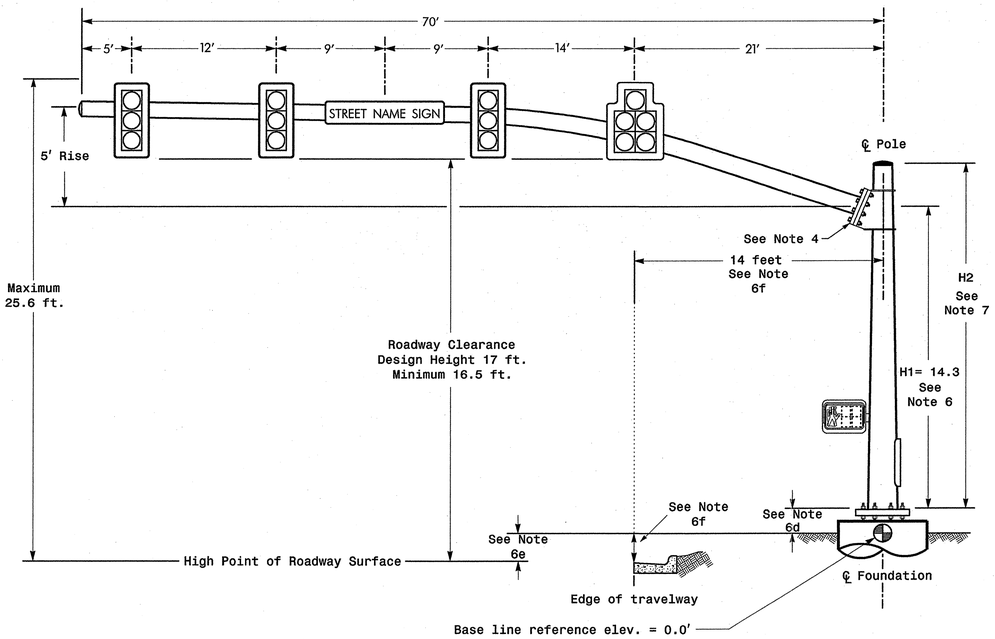
SIG. INVENTORY NO. 14-1047

12/11/2008 1:38:38 PM jerry.cross k:\rd_roadway\01108108\traffic\signals\14-1047\14-1047_2008P_MP1.dgn

METAL POLE No. 13 and 14

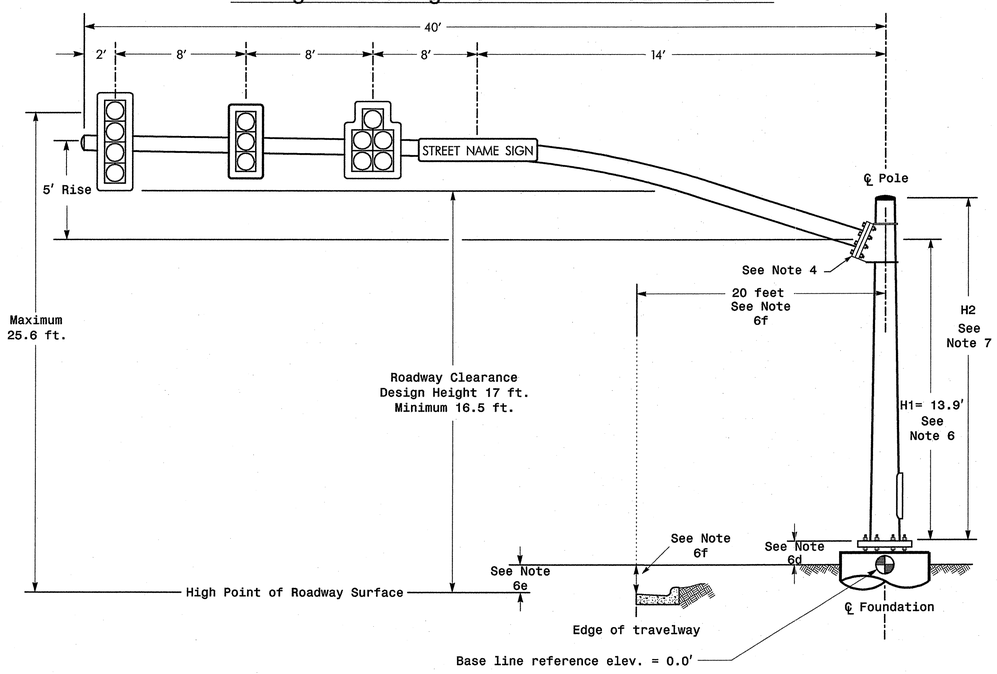
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 51

Design Loading for METAL POLE NO. 13



Elevation View

Design Loading for METAL POLE NO. 14



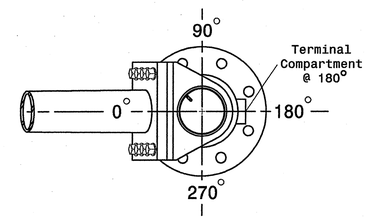
ELEVATION VIEW

SPECIAL NOTE

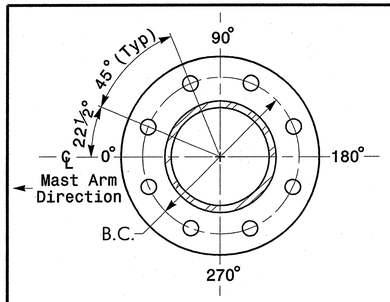
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 13	Pole 14
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.8 ft.	+0.3 ft.
Elevation difference at Edge of travelway or face of curb	-0.2 ft.	-1.4 ft.

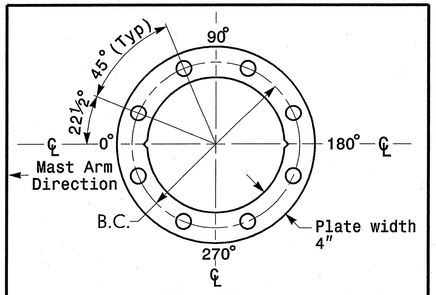


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2006 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

NCDOT Wind Zone 4 (90 mph)

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1970 (Commercial Boulevard)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette

SCALE: 0 N/A N/A

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-11-08 DATE

SIG. INVENTORY NO. 14-1047

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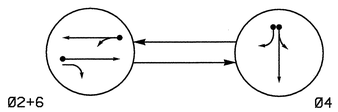
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 52

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

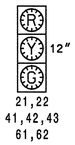
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4	PHASE FLASH
21,22	G	R	Y
41,42,43	R	G	R
61,62	G	R	Y

SIGNAL FACE I.D.

Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION

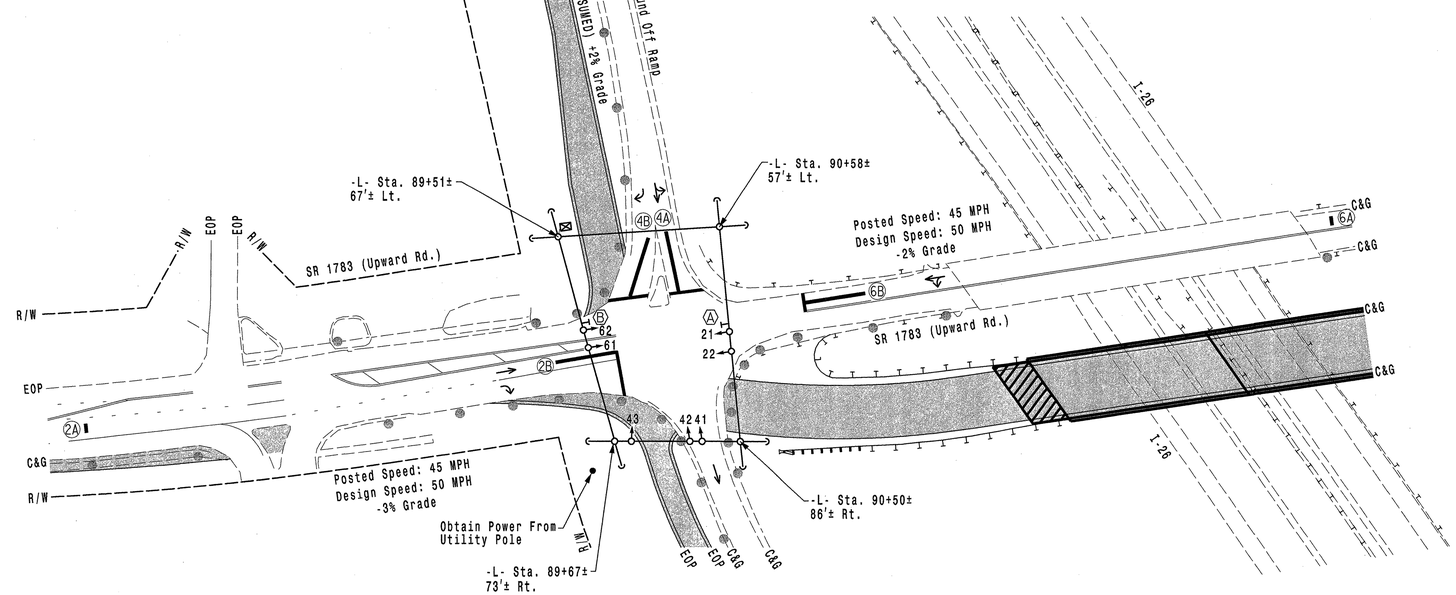
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	-	-	*
4B	6X40	0	*	*	4	Y	Y	-	-	15	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	2	5	-	*

* Video Detection Zone

2 Phase
Fully Actuated
(GPS Coordination)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 detector units to presence mode.
4. Install backplates for signal heads numbered 21,22,61,62.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
7. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.
8. Add Trimble Acutime Gold (RS-232) GPS unit for time synchronization with 14-0932.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	
Ⓐ	No Left Turn Sign (R3-2L)	Ⓐ
Ⓑ	No Right Turn Sign (R3-2R)	Ⓑ

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 6
Min Green 1 *	14	7	14
Extension 1 *	6.0	2.0	6.0
Max Green 1 *	90	30	90
Yellow Clearance	5.1	3.7	5.0
Red Clearance	1.0	1.2	1.8
Walk 1 *	-	-	-
Don't Walk 1	-	-	-
Seconds Per Actuation *	-	-	-
Max Variable Initial *	-	-	-
Time Before Reduction *	15	-	15
Time To Reduce *	45	-	45
Minimum Gap	3.1	-	3.1
Recall Mode	MIN RECALL	-	MIN RECALL
Vehicle Call Memory	-	-	-
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 1 - TCP PHASE 1 TEMPORARY PAVEMENT

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
I-26 Eastbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

10-21-08
SIGNATURE DATE

SIG. INVENTORY NO. 14-0931T1

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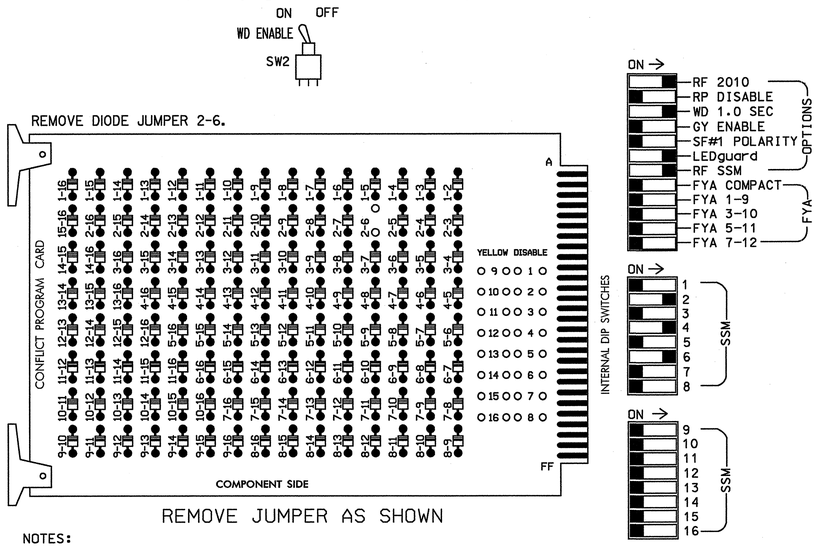
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 53

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper 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 1,3,5,7, 8,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S2,S4,S6
PHASES USED.....2,4,6
OVERLAP "A".....NOT USED
OVERLAP "B".....NOT USED
OVERLAP "C".....NOT USED
OVERLAP "D".....NOT USED

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 43	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128			101			134										
YELLOW		129			102			135										
GREEN		130			103			136										
RED ARROW																		
YELLOW ARROW																		
FLASHING YELLOW ARROW																		
GREEN ARROW																		
✋																		
🚶																		

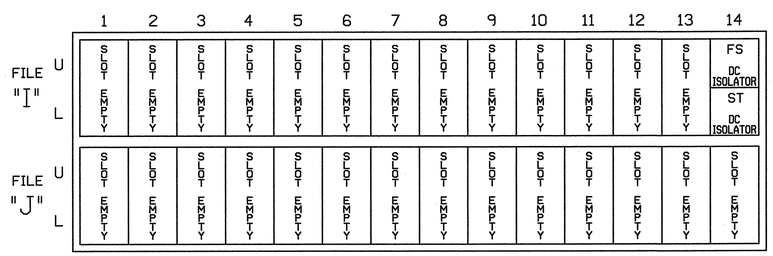
NU = Not Used

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

INPUT FILE POSITION LAYOUT

(front view)

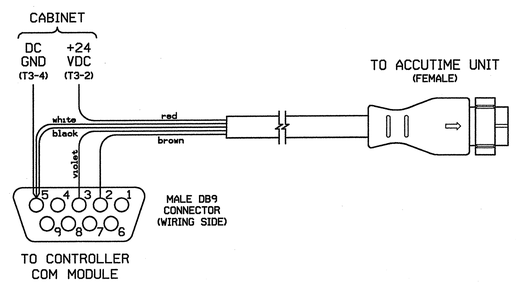


EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME

CONNECTOR WIRING DETAIL FOR ACCUTIME GPS ANTENNA WITH SERIAL INTERFACE

(make connections as shown)



SIGNAL DESCRIPTION	12 CONDUCTOR CABLE COLOR	ACCUTIME CONNECTOR	DB9 TO CONTROLLER	CABINET CONNECTION
DC POWER	RED	PIN 1		T3-2
PORT B: RECEIVE	VIOLET	PIN 2	PIN 3	
PORT B: TRANSMIT	BROWN	PIN 4	PIN 2	
PORT A: RECEIVE	WHITE	PIN 6	PIN 5	
DC GROUND	BLACK	PIN 9	PIN 5	T3-4

Note: All other wires in the Accutime cable are unused and should be tied off.

Configure the Com Port used by the Accutime unit in the Oasis software using the settings below:

* 9600 Baud
* 8 Data Bits
* 1 Stop Bit
* Odd Parity
* Trimble TSIP GPS Protocol

Be sure to enable the "GET TIME FROM GPS" option under D-1 (Set Clock) menu.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0931
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

SIGNAL UPGRADE - TEMPORARY DESIGN 1 - TCP PHASE 1 TEMPORARY PAVEMENT

ELECTRICAL AND PROGRAMMING DETAILS FOR:

State of North Carolina Department of Transportation Traffic Engineering and Safety Systems Branch Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
I-26 Eastbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

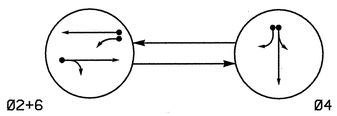
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 10-30-08 DATE
SIG. INVENTORY NO. 14-0931T1

10/30/2008 4:53:46 PM david.shinbara k:\ral_roadway\011608108\traffic\signals\14-0931\14-0931_2008T1_ela.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 54

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

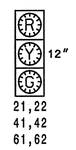
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4	FLASH
21,22	G	R	Y
41,42	R	G	R
61,62	G	R	Y

SIGNAL FACE I.D.

Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION

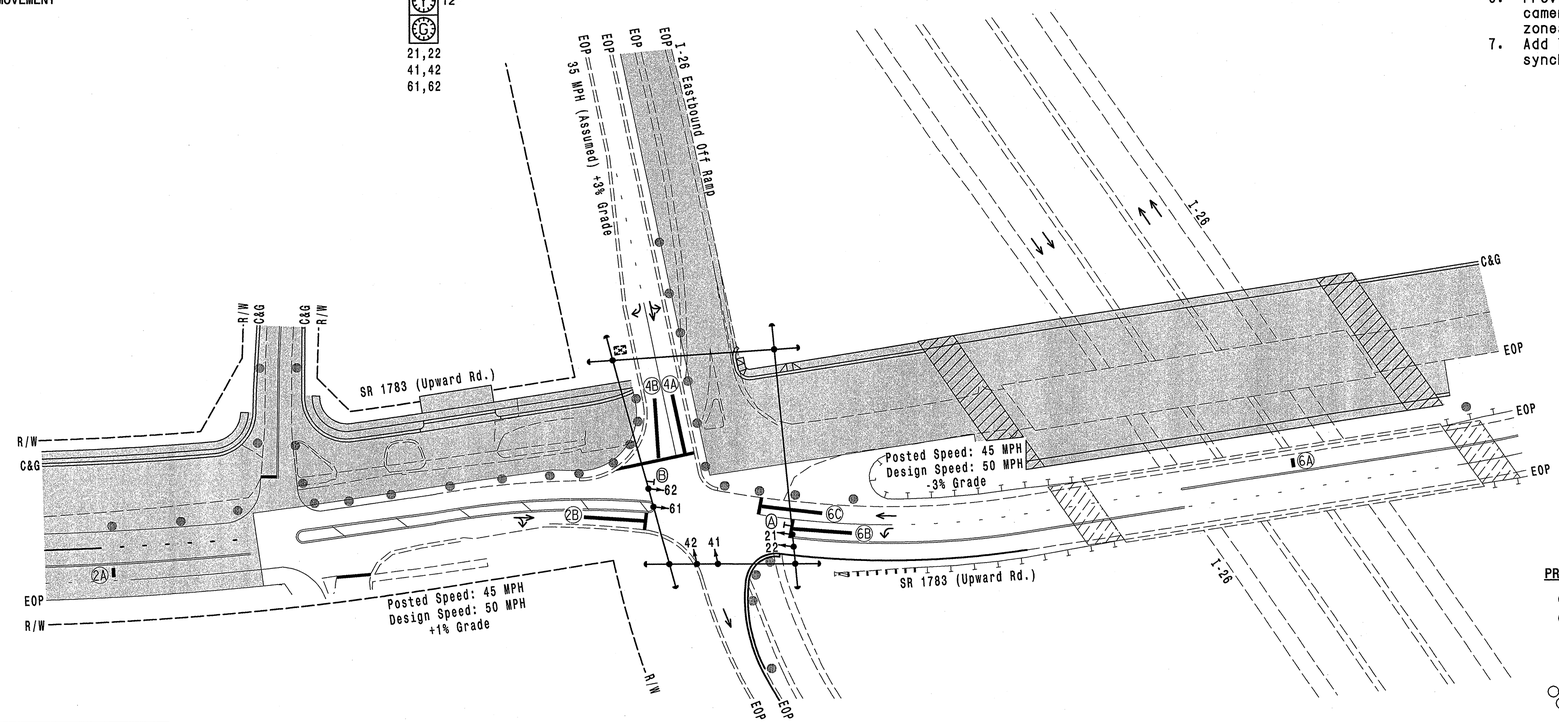
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	-	-	*
4B	6X40	0	*	*	4	Y	Y	-	-	15	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	-	3	-	*
6C	6X40	0	*	*	6	Y	Y	Y	2	5	-	*

* Video Detection Zone

2 Phase
Fully Actuated
(GPS Coordination)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 all existing signal heads.
4. Set all detector units to presence mode.
5. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
6. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.
7. Add Trimble Acutime Gold (RS-232) GPS unit for time synchronization with 14-0932.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	
Ⓐ	No Left Turn Sign (R3-2L)	Ⓐ
Ⓑ	No Right Turn Sign (R3-2R)	Ⓑ

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 6
Min Green 1 *	14	7	14
Extension 1 *	6.0	2.0	6.0
Max Green 1 *	90	30	90
Yellow Clearance	4.7	3.7	5.1
Red Clearance	1.0	1.2	1.0
Walk 1 *	-	-	-
Don't Walk 1	-	-	-
Seconds Per Actuation *	-	-	-
Max Variable Initial *	-	-	-
Time Before Reduction *	15	-	15
Time To Reduce *	45	-	45
Minimum Gap	3.1	-	3.1
Recall Mode	MIN RECALL	-	MIN RECALL
Vehicle Call Memory	-	-	-
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 1

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
AT
I-26 Eastbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE DATE 10-30-08

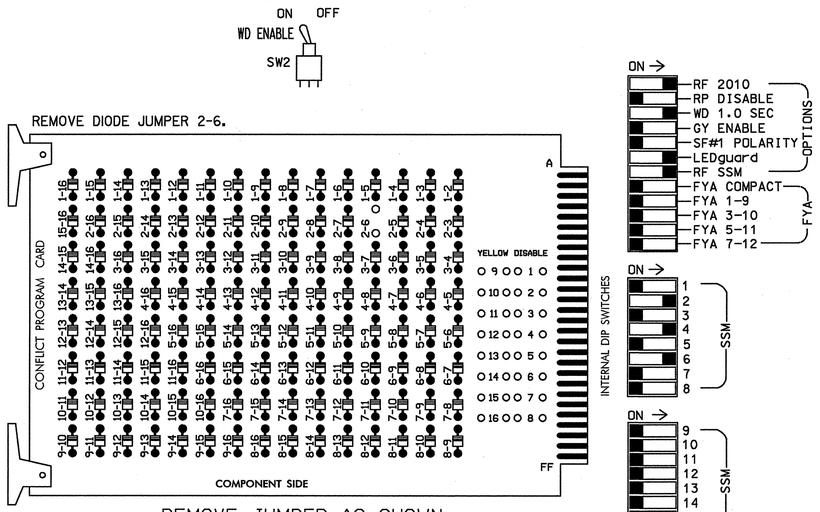
SIG. INVENTORY NO. 14-0931T2

10/30/2008 12:22:27 PM jerry.cross k:\tpl_roadway\011008\108\traffic\signals\14-0931\14-0931_20082_sig.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 55

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper 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 1,3,5,7, 8,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S2,S4,S6
PHASES USED.....2,4,6
OVERLAP "A".....NOT USED
OVERLAP "B".....NOT USED
OVERLAP "C".....NOT USED
OVERLAP "D".....NOT USED

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	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128			101			134										
YELLOW		129			102			135										
GREEN		130			103			136										
RED ARROW																		
YELLOW ARROW																		
FLASHING YELLOW ARROW																		
GREEN ARROW																		
✋																		
🚶																		

NU = Not Used

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

INPUT FILE POSITION LAYOUT

(front view)

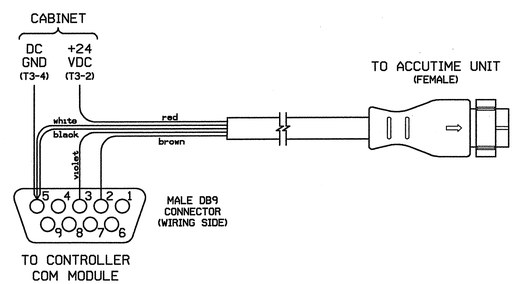
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

CONNECTOR WIRING DETAIL FOR ACCUTIME GPS ANTENNA WITH SERIAL INTERFACE

(make connections as shown)



SIGNAL DESCRIPTION	12 CONDUCTOR CABLE COLOR	ACCUTIME CONNECTOR	DB9 TO CONTROLLER	CABINET CONNECTION
DC POWER	RED	PIN 1		T3-2
PORT B: RECEIVE	VIOLET	PIN 2	PIN 3	
PORT B: TRANSMIT	BROWN	PIN 4	PIN 2	
PORT A: RECEIVE	WHITE	PIN 6	PIN 5	
DC GROUND	BLACK	PIN 9	PIN 5	T3-4

Note: All other wires in the Accutime cable are unused and should be tied off.

Configure the Com Port used by the Accutime unit in the Oasis software using the settings below:

* 9600 Baud
* 8 Data Bits
* 1 Stop Bit
* Odd Parity
* Trimble TSIP GPS Protocol

Be sure to enable the "GET TIME FROM GPS" option under D-1 (Set Clock) menu.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0931
DESIGNED: AUGUST 2008
SEALED: 10-30-08
REVISED: N/A

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 1

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
I-26 Eastbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-30-08 DATE

SIG. INVENTORY NO. 14-0931T2

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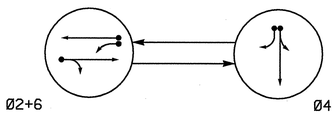
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 56

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4	FLASH
21,22	G	R	Y
41,42	R	G	R
61,62	G	R	Y

SIGNAL FACE I.D.

Denotes L.E.D.

21,22
41,42
61,62

2070L LOOP & DETECTOR INSTALLATION

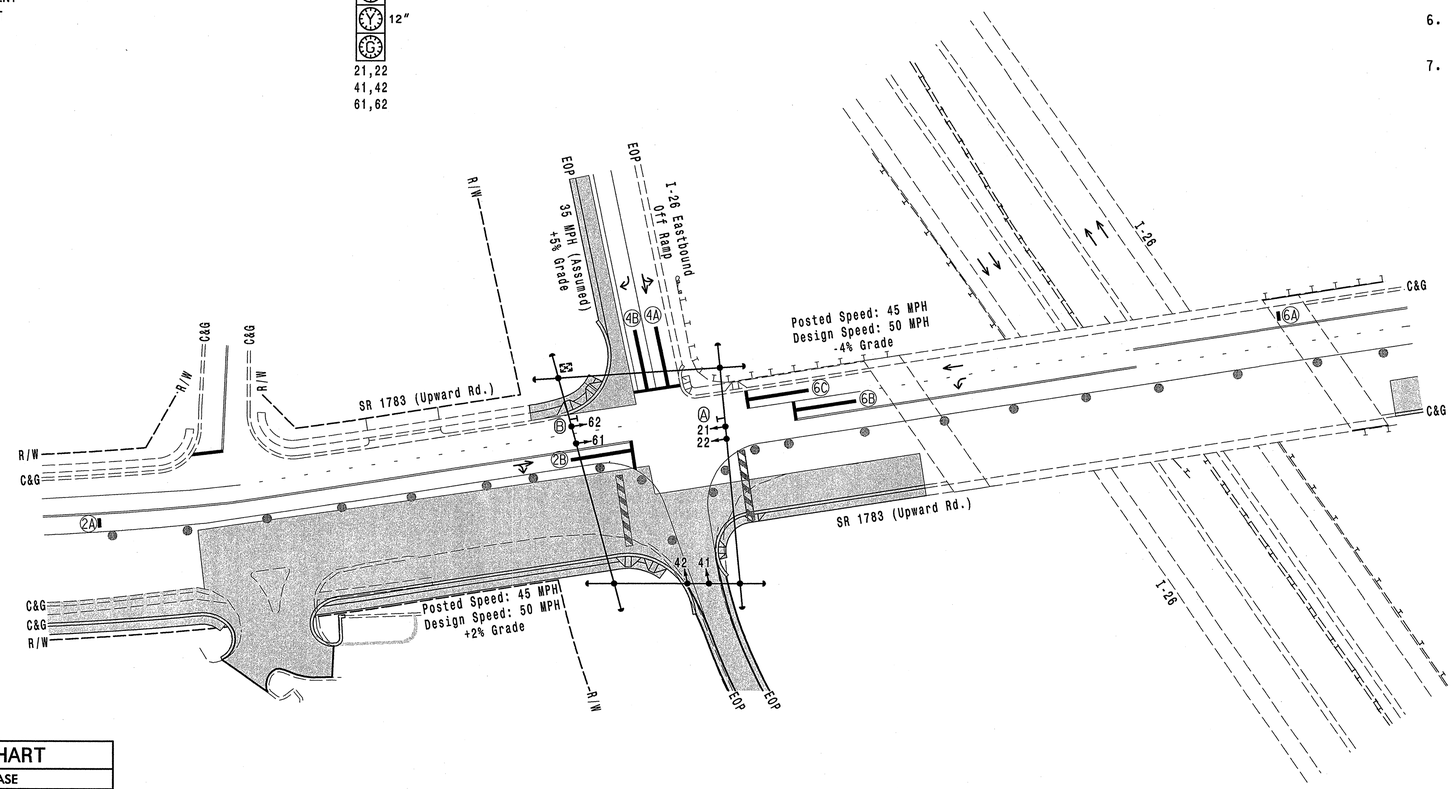
INDUCTIVE LOOPS				DETECTOR PROGRAMMING								
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	-	-	*
4B	6X40	0	*	*	4	Y	Y	-	-	15	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	-	3	-	*
6C	6X40	0	*	*	6	Y	Y	Y	2	5	-	*

* Video Detection Zone

2 Phase
Fully Actuated
(GPS Coordination)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 all existing signal heads numbered.
4. Set all detector units to presence mode.
5. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
6. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.
7. Add Trimble Acutime Gold (RS-232) GPS unit for time synchronization with 14-0932.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	
A	No Left Turn Sign (R3-2L)	A
B	No Right Turn Sign (R3-2R)	B

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 6
Min Green 1 *	14	7	14
Extension 1 *	6.0	2.0	6.0
Max Green 1 *	90	30	90
Yellow Clearance	4.6	3.6	5.2
Red Clearance	1.0	1.0	1.0
Walk 1 *	-	-	-
Don't Walk 1	-	-	-
Seconds Per Actuation *	-	-	-
Max Variable Initial *	-	-	-
Time Before Reduction *	15	-	15
Time To Reduce *	45	-	45
Minimum Gap	3.1	-	3.1
Recall Mode	MIN RECALL	-	MIN RECALL
Vehicle Call Memory	-	-	-
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 3 - TCP PHASE 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
AT
I-26 Eastbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-30-08 DATE

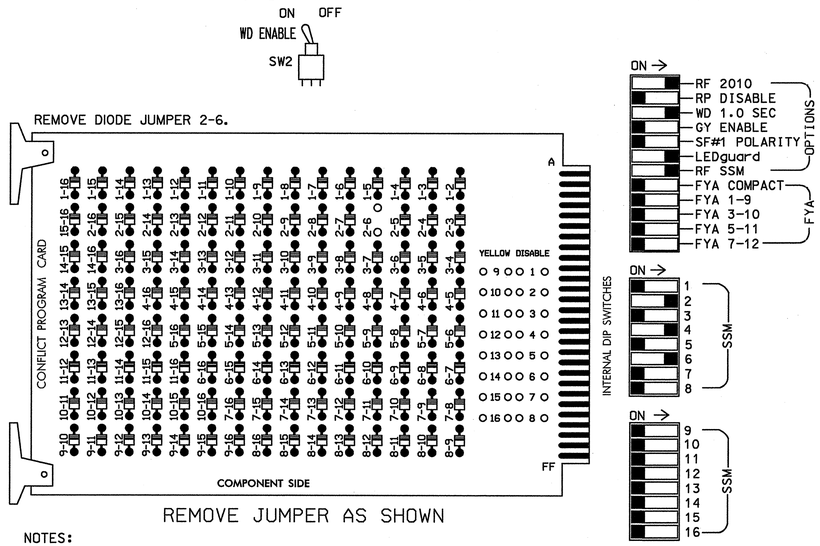
SIG. INVENTORY NO. 14-0931T3

10/30/2008 12:22:31 PM jerry.cross k:\ral_roadway\01103610\traffic\signals\14-0931\14-0931_200873_sig.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 57

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



REMOVE JUMPER AS SHOWN

NOTES:

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

■ = 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, 8,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

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	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128			101			134										
YELLOW		129			102			135										
GREEN		130			103			136										
RED ARROW																		
YELLOW ARROW																		
FLASHING YELLOW ARROW																		
GREEN ARROW																		
✋																		
🚶																		

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S2,S4,S6
PHASES USED.....2,4,6
OVERLAP "A".....NOT USED
OVERLAP "B".....NOT USED
OVERLAP "C".....NOT USED
OVERLAP "D".....NOT USED

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

INPUT FILE POSITION LAYOUT

(front view)

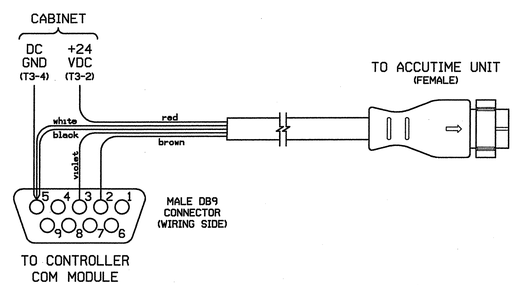
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L														

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

FS = FLASH SENSE
ST = STOP TIME

CONNECTOR WIRING DETAIL FOR ACCUTIME GPS ANTENNA WITH SERIAL INTERFACE

(make connections as shown)



SIGNAL DESCRIPTION	12 CONDUCTOR CABLE COLOR	ACCUTIME CØNNECTOR	DB9 TO CØNTROLLER	CABINET CØNNECTION
DC POWER	RED	PIN 1		T3-2
PORT B: RECEIVE	VIOLET	PIN 2	PIN 3	
PORT B: TRANSMIT	BROWN	PIN 4	PIN 2	
PORT A: RECEIVE	WHITE	PIN 6	PIN 5	
DC GROUND	BLACK	PIN 9	PIN 5	T3-4

Note: All other wires in the Accutime cable are unused and should be tied off.

Configure the Com Port used by the Accutime unit in the Oasis software using the settings below:

* 9600 Baud
* 8 Data Bits
* 1 Stop Bit
* Odd Parity
* Trimble TSIP GPS Protocol

Be sure to enable the "GET TIME FROM GPS" option under D-1 (Set Clock) menu.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0931
DESIGNED: AUGUST 2008
SEALED: 10-30-08
REVISED: N/A

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

SIGNAL UPGRADE - TEMPORARY DESIGN 3 - TCP PHASE 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
I-26 Eastbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 10-30-08 DATE
SIG. INVENTORY NO. 14-0931T3

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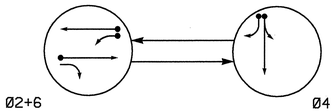
10/30/2008 4:33:48 PM david.shinbara

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 58

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4	FLASH
21,22	G	R	Y
41,42	R	G	R
61,62	G	R	Y

SIGNAL FACE I.D.

Denotes L.E.D.

21,22
41,42
61,62

2070L LOOP & DETECTOR INSTALLATION

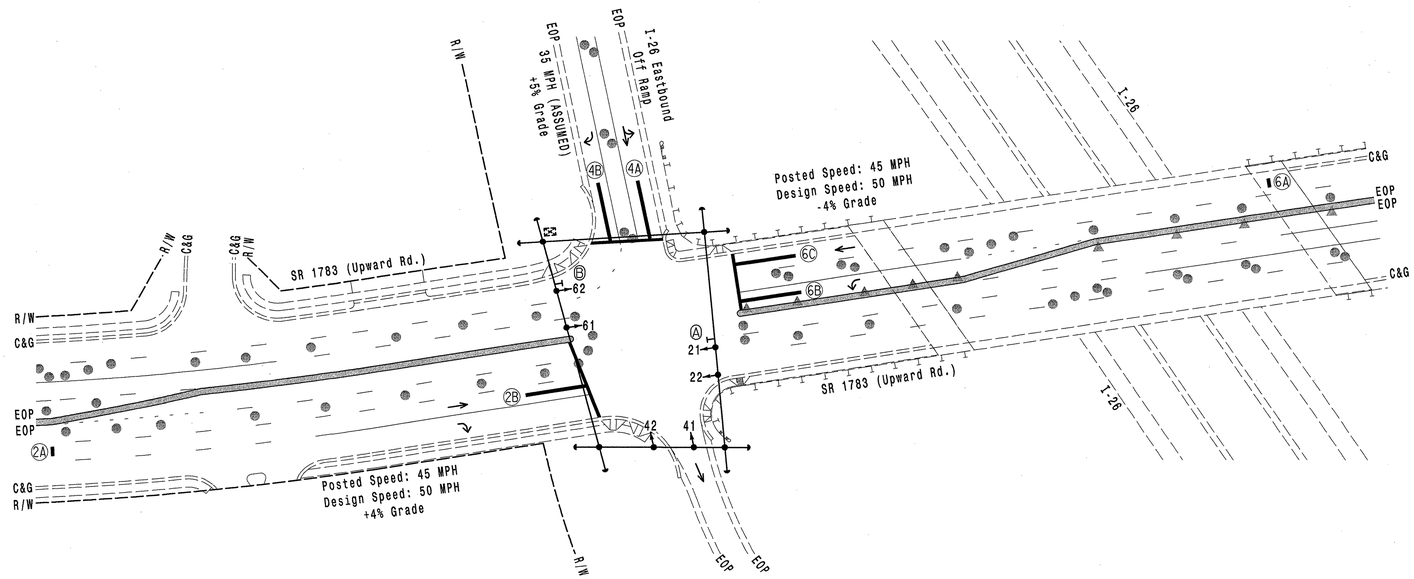
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	-	-	*
4B	6X40	0	*	*	4	Y	Y	-	-	15	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	-	3	-	*
6C	6X40	0	*	*	6	Y	Y	Y	2	5	-	*

* Video Detection Zone

2 Phase
Fully Actuated
(GPS Coordination)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 all existing signal heads.
4. Set all detector units to presence mode.
5. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
6. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.
7. Add Trimble Acutime Gold (RS-232) GPS unit for time synchronization with 14-0932.



2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 6
Min Green 1 *	14	7	14
Extension 1 *	6.0	2.0	6.0
Max Green 1 *	90	30	90
Yellow Clearance	4.5	3.6	5.2
Red Clearance	1.0	2.5	1.3
Walk 1 *	-	-	-
Don't Walk 1	-	-	-
Seconds Per Actuation *	-	-	-
Max Variable Initial *	-	-	-
Time Before Reduction *	15	-	15
Time To Reduce *	45	-	45
Minimum Gap	3.1	-	3.1
Recall Mode	MIN RECALL	-	MIN RECALL
Vehicle Call Memory	-	-	-
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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone Cones	
A	No Left Turn Sign (R3-2L)	A
B	No Right Turn Sign (R3-2R)	B

SIGNAL UPGRADE -TEMPORARY DESIGN 4 - TCP PHASE 3

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
I-26 Eastbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE DATE 10-21-08
SIG. INVENTORY NO. 14-0931T4

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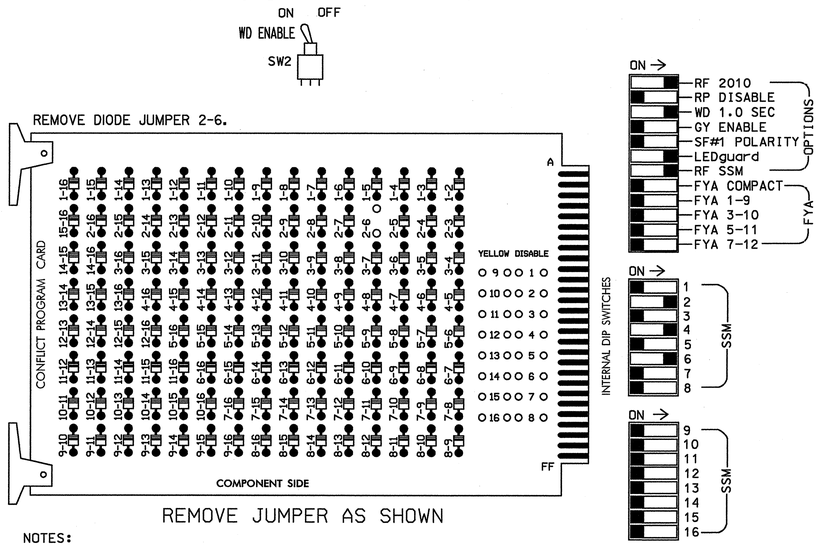
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 59

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper 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.

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, 8,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S2,S4,S6
PHASES USED.....2,4,6
OVERLAP "A".....NOT USED
OVERLAP "B".....NOT USED
OVERLAP "C".....NOT USED
OVERLAP "D".....NOT USED

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	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128			101			134										
YELLOW		129			102			135										
GREEN		130			103			136										
RED ARROW																		
YELLOW ARROW																		
FLASHING YELLOW ARROW																		
GREEN ARROW																		
✋																		
🚶																		

NU = Not Used

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

INPUT FILE POSITION LAYOUT

(front view)

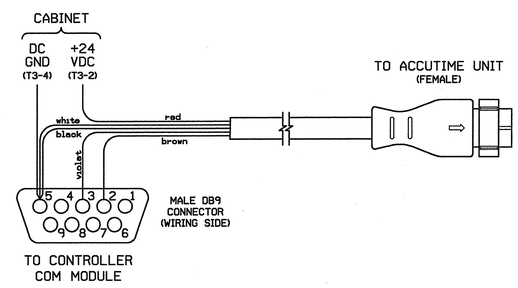
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

CONNECTOR WIRING DETAIL FOR ACCUTIME GPS ANTENNA WITH SERIAL INTERFACE

(make connections as shown)



SIGNAL DESCRIPTION	12 CONDUCTOR CABLE COLOR	ACCUTIME CONNECTOR	DB9 TO CONTROLLER	CABINET CONNECTION
DC POWER	RED	PIN 1		T3-2
PORT B: RECEIVE	VIOLET	PIN 2	PIN 3	
PORT B: TRANSMIT	BROWN	PIN 4	PIN 2	
PORT A: RECEIVE	WHITE	PIN 6	PIN 5	
DC GROUND	BLACK	PIN 9	PIN 5	T3-4

Note: All other wires in the Accutime cable are unused and should be tied off.

Configure the Com Port used by the Accutime unit in the Oasis software using the settings below:

* 9600 Baud
* 8 Data Bits
* 1 Stop Bit
* Odd Parity
* Trimble TSIP GPS Protocol

Be sure to enable the "GET TIME FROM GPS" option under D-1 (Set Clock) menu.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0931
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

SIGNAL UPGRADE - TEMPORARY DESIGN 4 - TCP PHASE 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
I-26 Eastbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

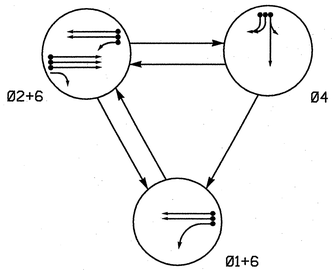
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 10-30-08 DATE
SIG. INVENTORY NO. 14-0931T4

10/30/2008 4:33:49 PM david.shinbara k:\rd_roadway\011036108\traffic\signals\14-0931\14-0931_20081_sig.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 60

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 Ø4	FLASH
11	←	FY	R	R
21,22,23	R	G	R	Y
41,42	R	R	G	R
61,62	G	G	R	Y

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

SIGNAL FACE I.D.

Denotes L.E.D.

2070L LOOP & DETECTOR INSTALLATION

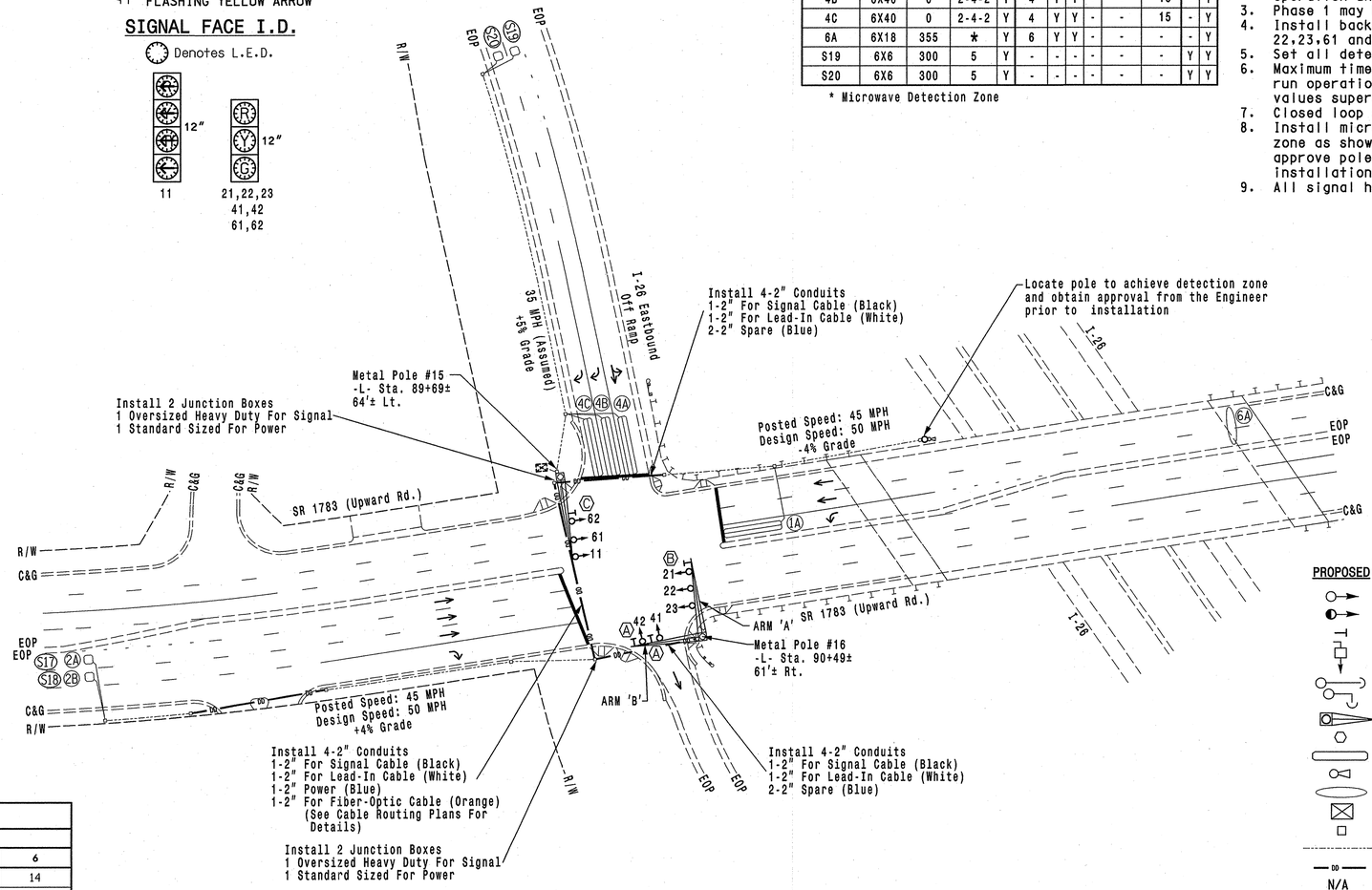
INDUCTIVE LOOPS: LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	DETECTOR PROGRAMMING: PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	Y
					6	Y	Y	Y	-	3	-	Y
2A/S17	6X6	355	5	Y	2	Y	Y	-	-	-	Y	Y
2B/S18	6X6	355	5	Y	2	Y	Y	-	-	-	Y	Y
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	-	-	Y
4B	6X40	0	2-4-2	Y	4	Y	Y	-	-	15	-	Y
4C	6X40	0	2-4-2	Y	4	Y	Y	-	-	15	-	Y
6A	6X18	355	*	Y	6	Y	Y	-	-	-	-	Y
S19	6X6	300	5	Y	-	-	-	-	-	-	Y	Y
S20	6X6	300	5	Y	-	-	-	-	-	-	Y	Y

* Microwave Detection Zone

3 Phase
Fully Actuated
(SR 1783 (Upward Road Closed-Loop System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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. Install backplates for signal heads numbered #11, 21, 22,23,61 and 62.
5. Set all detector units to presence mode.
6. Maximum times shown in timing chart are for free run operation only. Coordinated signal system timing values supersede there.
7. Closed loop system data: Controller Asset #0931.
8. Install microwave detection to achieve detecton zone as shown. NCDOT Resident Engineer shall approve pole location for microwave before pole installation.
9. All signal heads shall be hunter green in color.



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	
	Metal Pole with Mastarm	
	Pedestrian Signal Pedestal	
	Inductive Loop Detector	
	Out of Pavement Detector	
	Microwave Detection Zone	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
DD	Directional Drill	N/A
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
A	Right Arrow "ONLY" Sign (R3-5R)	A
B	No Left Turn Sign (R3-2L)	B
C	No Right Turn Sign (R3-2R)	B

2070L TIMING CHART

FEATURE	PHASE 1	PHASE 2	PHASE 4	PHASE 6
Min Green 1 *	7	14	7	14
Extension 1 *	2.0	6.0	2.0	6.0
Max Green 1 *	25	90	30	90
Yellow Clearance	3.0	4.5	3.6	5.2
Red Clearance	3.4	1.1	2.3	1.2
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	1.3	-	2.3
Max Variable Initial *	-	40	-	40
Time Before Reduction *	-	15	-	15
Time To Reduce *	-	45	-	45
Minimum Gap	-	3.1	-	3.1
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.

SIGNAL UPGRADE - FINAL DESIGN

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 1"=50' (0 – 50)

SR 1783 (Upward Road)
AT
I-26 Eastbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE DATE 12.11.08

SIG. INVENTORY NO. 14-0931

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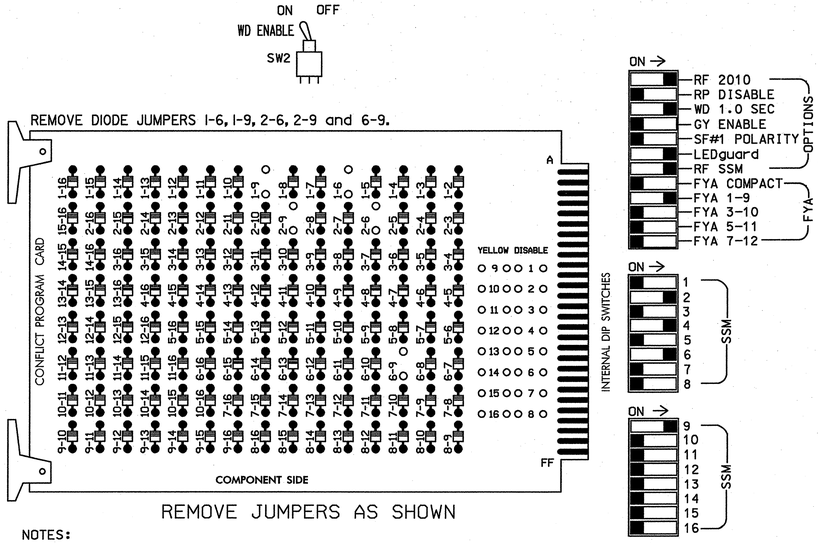
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 61

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.

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, 7,8,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Variable Initial and Gap Reduction.
6. The cabinet and controller are part of the SR 1783 (Upward Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332 W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S4,S6,S9
PHASES USED.....1,2,4,6
OVERLAP "A".....1+2
OVERLAP "B".....NOT USED
OVERLAP "C".....NOT USED
OVERLAP "D".....NOT USED

SIGNAL HEAD HOOK-UP CHART

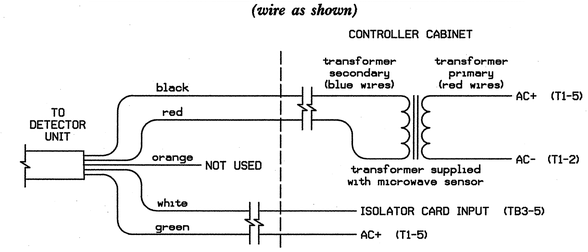
LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	11★	21,22, 23	NU	NU	41,42	NU	NU	61,62	NU	NU	NU	NU	11★	NU	NU	NU	NU	NU
RED		128			101			134										
YELLOW	✳	129			102			135										
GREEN		130			103			136										
RED ARROW													A121					
YELLOW ARROW													A122					
FLASHING YELLOW ARROW													A123					
GREEN ARROW	127																	
✋																		
🚶																		

✳ Denotes install load resistor. See load resistor installation detail this sheet. NU = Not Used

★ See pictorial of head wiring in detail (bottom left this page).

MICROWAVE DETECTOR WIRING DETAIL

(wire as shown)



TC26B WIRE LIST

COLOR	FUNCTION
black	12V to 24V AC/DC (no polarity)
red	12V to 24V AC/DC (no polarity)
orange	Output Relay Normally Open
white	Output Relay Normally Closed
green	Output Relay Common

NOTES:

1. Sensor is a Microwave Sensors, Inc. Model TC-26B microwave motion detector mounted on poles as indicated on the Signal Design Plans.
2. Configure AC isolator card to place call upon removal of AC+ from the input.
3. Important: For proper operation of the microwave detector, remove surge protection from TB3-5 and TB3-6. Tie TB3-6 to AC neutral.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø 1 1A	Ø2/SYS 2A/S17	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø 4 4A	Ø 4 4C	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L	NOT USED	Ø2/SYS 2B/S18				Ø 4 4B	NOT USED							ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	Ø 6 6A AC ISOLATOR	SLOT EMPTY	WIRED INPUT ⊗	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SYS. DET. S19	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		NOT USED							SYS. DET. S20					

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

FS = FLASH SENSE
ST = STOP TIME

⊗ Wired Input - Do not populate slot with detector card

NOTE: INSTALL MODEL 252 AC ISOLATOR IN SLOT J2 FOR USE WITH MICROWAVE DETECTOR. SEE MICROWAVE DETECTOR WIRING ON THIS PAGE.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

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/S17	TB2-5,6	I2U	39	1	2	2/SYS	Y	Y			
2B/S18	TB2-7,8	I2L	43	5	12	2/SYS	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			15
4C	TB6-1,2	I7U	65	27	34	4	Y	Y			15
✳ 6A	TB3-5,6	J2U	40	2	6	6	Y	Y			
✳✳ S19	TB7-9,10	J9U	59	21	15	SYS					
✳✳ S20	TB7-11,12	J9L	61	23	17	SYS					

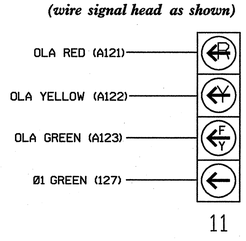
[1] Add jumper from I1-W to J4-W, on rear of input file.

✳ Microwave detection, install AC isolator in input file slot J2.

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

4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal head as shown)



NOTE

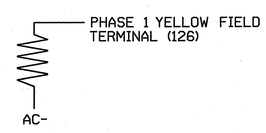
1. The sequence display for this signal requires special logic programming. See sheet 2 for programming instructions.

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 DESIGN: 14-0931
DESIGNED: AUGUST 2008
SEALED: 12-11-08
REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN

ELECTRICAL DETAIL SHEET 1 OF 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
I-26 Eastbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 12-11-08 DATE
SIG. INVENTORY NO. 14-0931

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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:                |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?...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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0931
DESIGNED: AUGUST 2008
SEALED: 12-11-08
REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN

ELECTRICAL DETAIL SHEET 2 OF 2

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
TRANSPORTATION MANAGEMENT UNIT
DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
I-26 Eastbound Off Ramp

Division 14 | Henderson County | Flat Rock

PLAN DATE: August 2008		REVIEWED BY:	
PREPARED BY: D.A. Shinbara		REVIEWED BY: S.B. Privette	
REVISIONS		INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-11-08 DATE

SIG. INVENTORY NO. 14-0931

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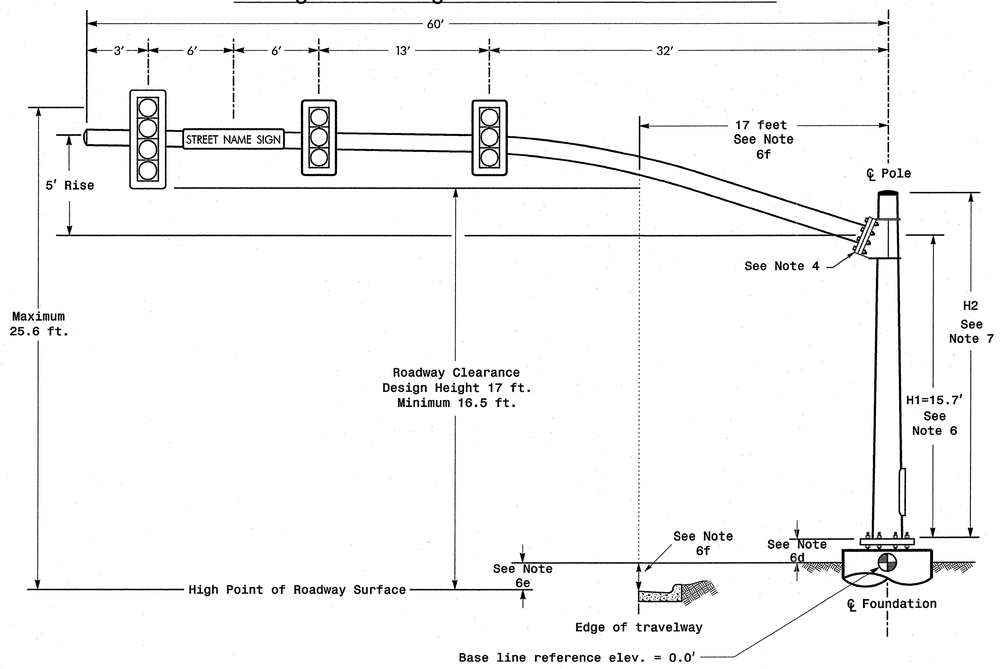
METAL POLE No. 15

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 63

Design Loading for METAL POLE NO. 15



ELEVATION VIEW

SPECIAL NOTE

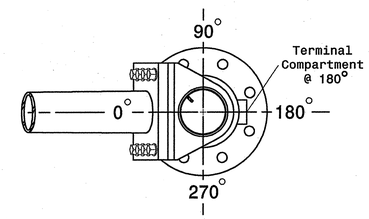
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

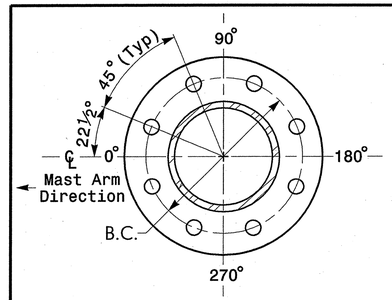
Elevation Differences for:	Pole 15
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	+1.7 ft.
Elevation difference at Edge of travelway or face of curb	+1.1 ft.

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"–4 SECTION–WITH BACKPLATE AND ASTRO–BRAC	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	SIGNAL HEAD 12"–3 SECTION–WITH BACKPLATE AND ASTRO–BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO–SIGN–BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

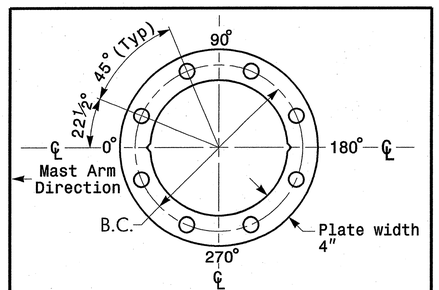


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2006 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

NCDOT Wind Zone 4 (90 mph)

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 N/A N/A

SR 1783 (Upward Road)
at
I-26 Eastbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:	
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette	

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-11-08 DATE

SIG. INVENTORY NO. 14-0931

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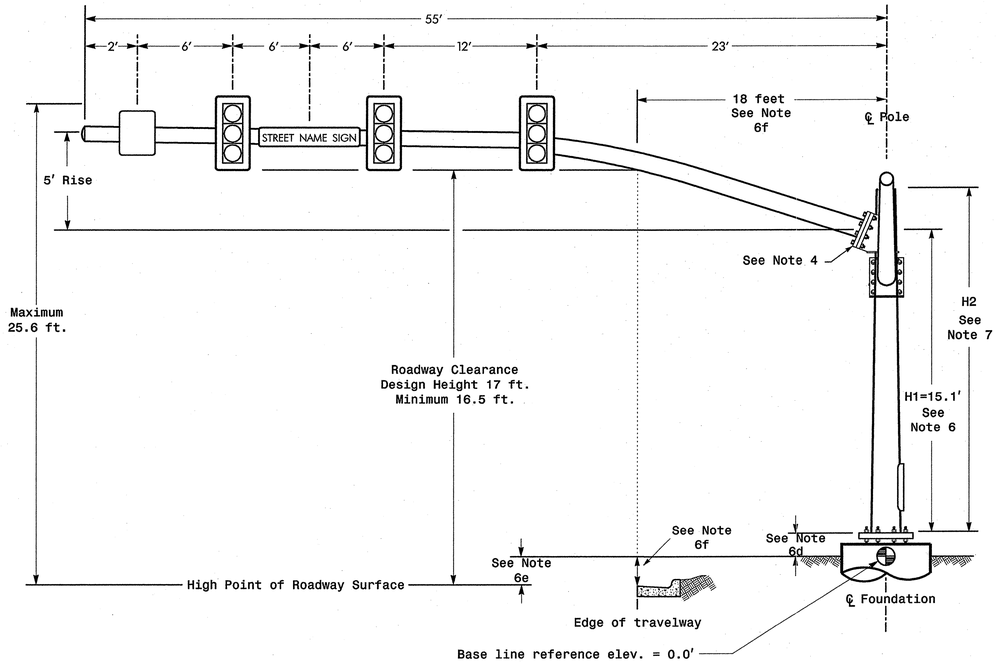
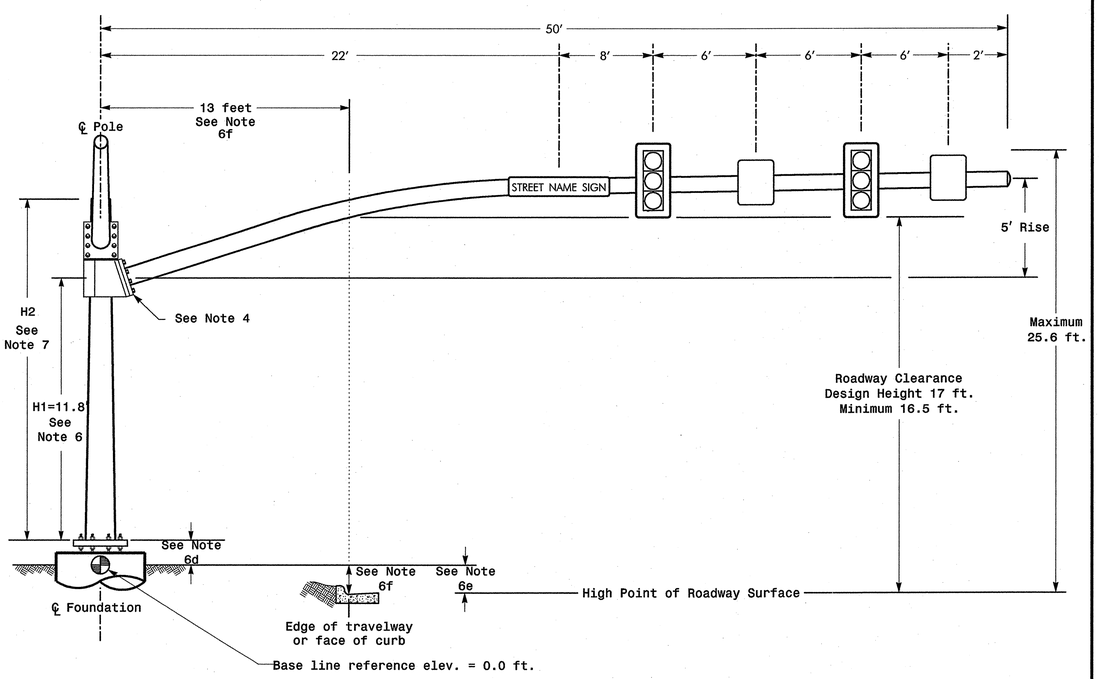
Design Loading for METAL POLE NO. 16, Mast Arm A



ELEVATION VIEW

Design Loading for METAL POLE NO. 16, Mast Arm B



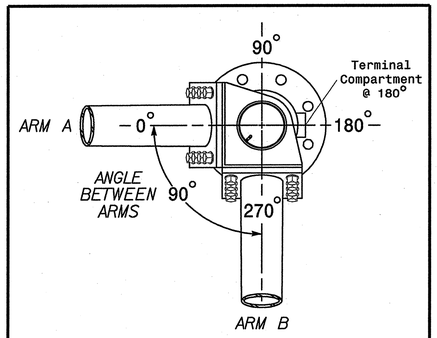
ELEVATION VIEW

SPECIAL NOTE

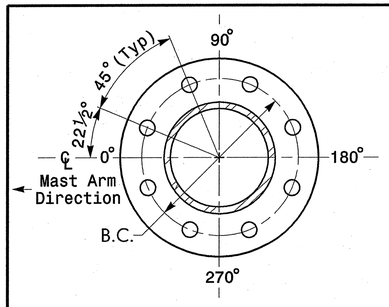
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+1.1 ft.	-1.8 ft.
Elevation difference at Edge of travelway or face of curb	+0.3 ft.	-1.7 ft.

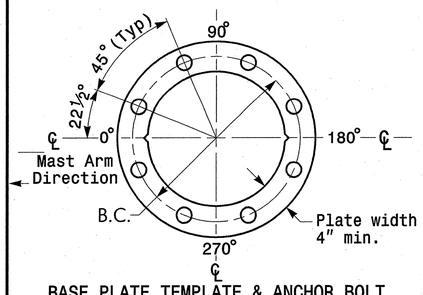


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

METAL POLE No. 16

PROJECT REFERENCE NO.	SHEET NO.
	Sig. 64

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	5.0 S.F.	24.0" W X 30.0" L	11 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
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3. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate connection points.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
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PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

NCDOT Wind Zone 4 (90 mph)

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 N/A N/A

SR 1783 (Upward Road)
at
I-26 Eastbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:	
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette	

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12.11.08 DATE

SIG. INVENTORY NO. 14-0931

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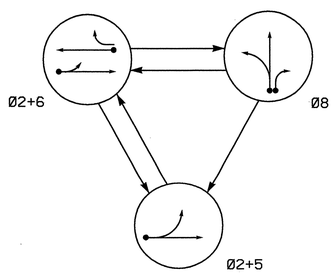
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 65

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

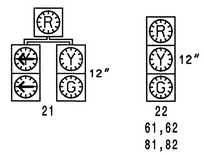
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø8	FLASH
21	G	G	R	Y
22	G	G	R	Y
61,62	R	G	R	Y
81,82	R	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION

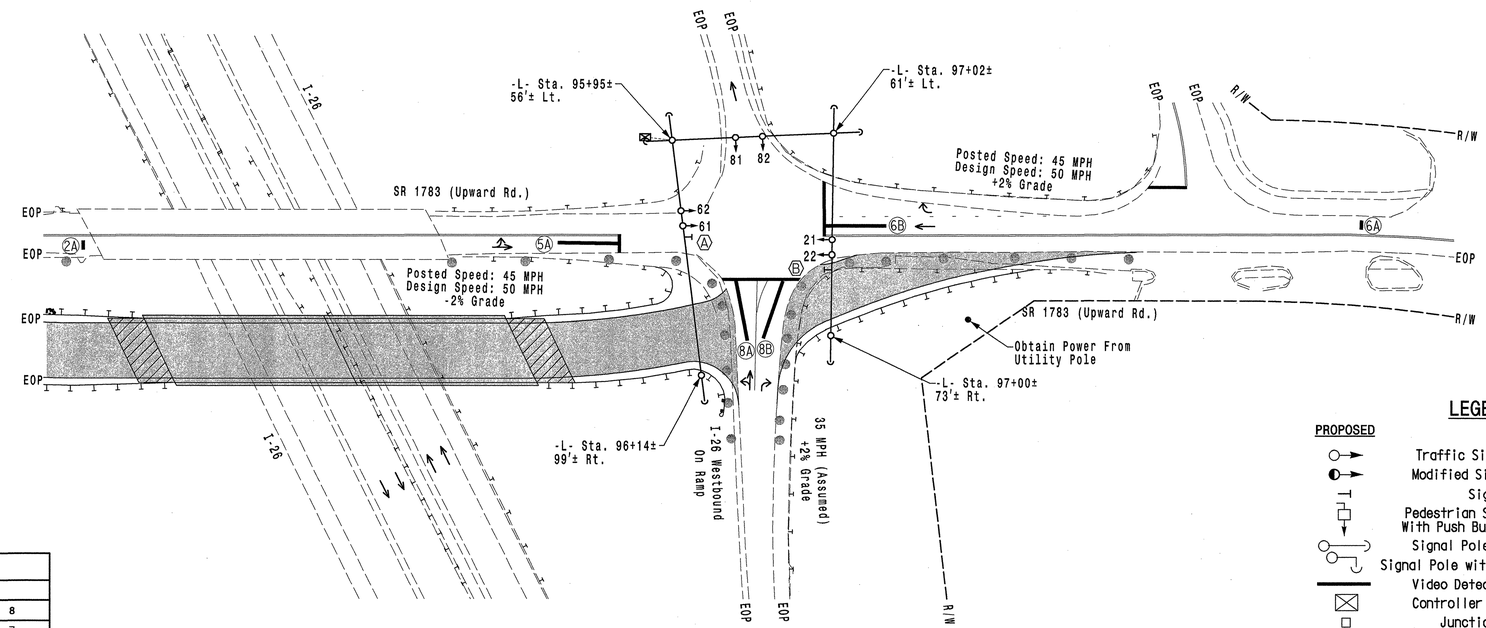
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
5A	6X40	0	*	*	5	Y	Y	-	-	15	-	*
					2	Y	Y	Y	2	5	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
8A	6X40	0	*	*	8	Y	Y	-	-	-	-	*
8B	6X40	0	*	*	8	Y	Y	-	-	15	-	*

* Video Detection Zone

3 Phase
Fully Actuated
(GPS Coordination)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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. Install backplates for signal heads numbered 21,22,61,62.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
7. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
8. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.
9. Add Trimble Acutime Gold (RS-232) GPS unit for time synchronization with 14-0931.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	
A	No Left Turn Sign (R3-2L)	A
B	No Right Turn Sign (R3-2R)	B

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 5	PHASE 6	PHASE 8
Min Green 1 *	14	7	14	7
Extension 1 *	6.0	2.0	6.0	2.0
Max Green 1 *	90	35	90	40
Yellow Clearance	5.0	3.0	4.6	3.7
Red Clearance	1.6	3.3	1.0	1.4
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	15	-
Time To Reduce *	45	-	45	-
Minimum Gap	3.1	-	3.1	-
Recall Mode	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	-	-	-	-
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 1 - TCP PHASE 1 TEMPORARY PAVEMENT

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
I-26 Westbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

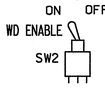
SIG. INVENTORY NO. 14-0932T1

10/22/2008 12:52:57 PM jerry.cross k:\ra1_roadway\011030108\traffic\signals\14-0932\14-0932_20081T1_sig.dgn

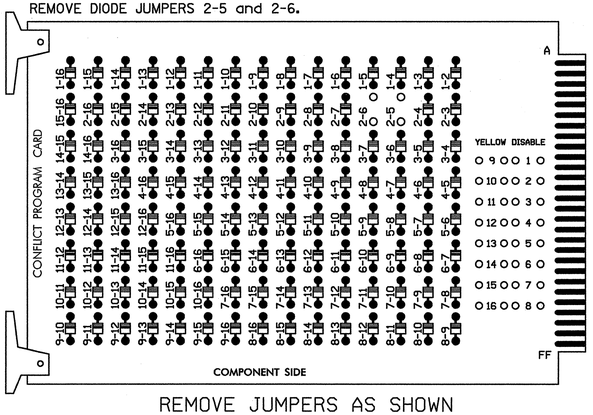
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 66

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

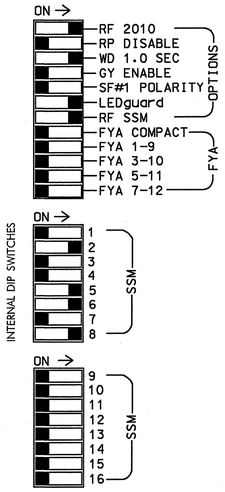
(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 2-5 and 2-6.



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, 4,7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S5,S6,S8
PHASES USED.....2,5,6,8
OVERLAPS.....NONE

SIGNAL HEAD HOOK-UP CHART

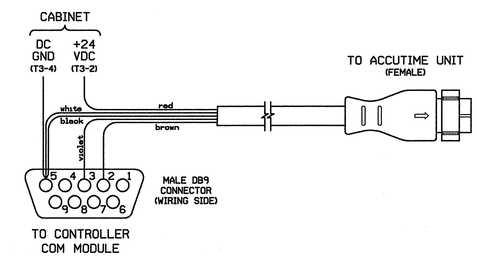
LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	NU	NU	21	61,62	NU	NU	81,82	NU
RED		128					*	134			107	
YELLOW		129						135			108	
GREEN		130						136			109	
RED ARROW												
YELLOW ARROW							132					
GREEN ARROW							133					
✋												
🚶												

NU = Not Used

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

CONNECTOR WIRING DETAIL FOR ACCUTIME GPS ANTENNA WITH SERIAL INTERFACE

(make connections as shown)



SIGNAL DESCRIPTION	12 CONDUCTOR CABLE COLOR	ACCUTIME CONNECTOR	DB9 TO CONTROLLER	CABINET CONNECTION
DC POWER	RED	PIN 1		T3-2
PORT B: RECEIVE	VIOLET	PIN 2	PIN 3	
PORT B: TRANSMIT	BROWN	PIN 4	PIN 2	
PORT A: RECEIVE	WHITE	PIN 6	PIN 5	
DC GROUND	BLACK	PIN 9	PIN 5	T3-4

Note: All other wires in the Accutime cable are unused and should be tied off.

Configure the Com Port used by the Accutime unit in the Oasis software using the settings below:

* 9600 Baud
* 8 Data Bits
* 1 Stop Bit
* Odd Parity
* Trimble TSIP GPS Protocol

Be sure to enable the "GET TIME FROM GPS" option under D-1 (Set Clock) menu.

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	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

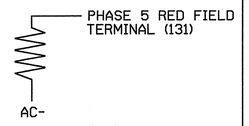
SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



NOTE: The purpose of this resistor is to load the channel red monitor inputs in order for the Signal Sequence Monitor to use the full signal sequence monitoring capability on channels that do not use the red display in the field.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0932
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

SIGNAL UPGRADE - TEMPORARY DESIGN 1 - TCP PHASE 1 TEMPORARY PAVEMENT

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
I-26 Westbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 10-30-08 DATE
SIG. INVENTORY NO. 14-0932T1

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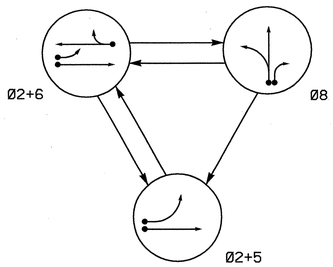
10/30/2008 4:58:52 PM david.shinbara

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 67

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

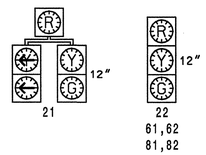
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø8	FLASH
21	G	G	R	Y
22	G	G	R	Y
61,62	R	R	G	R
81,82	R	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION

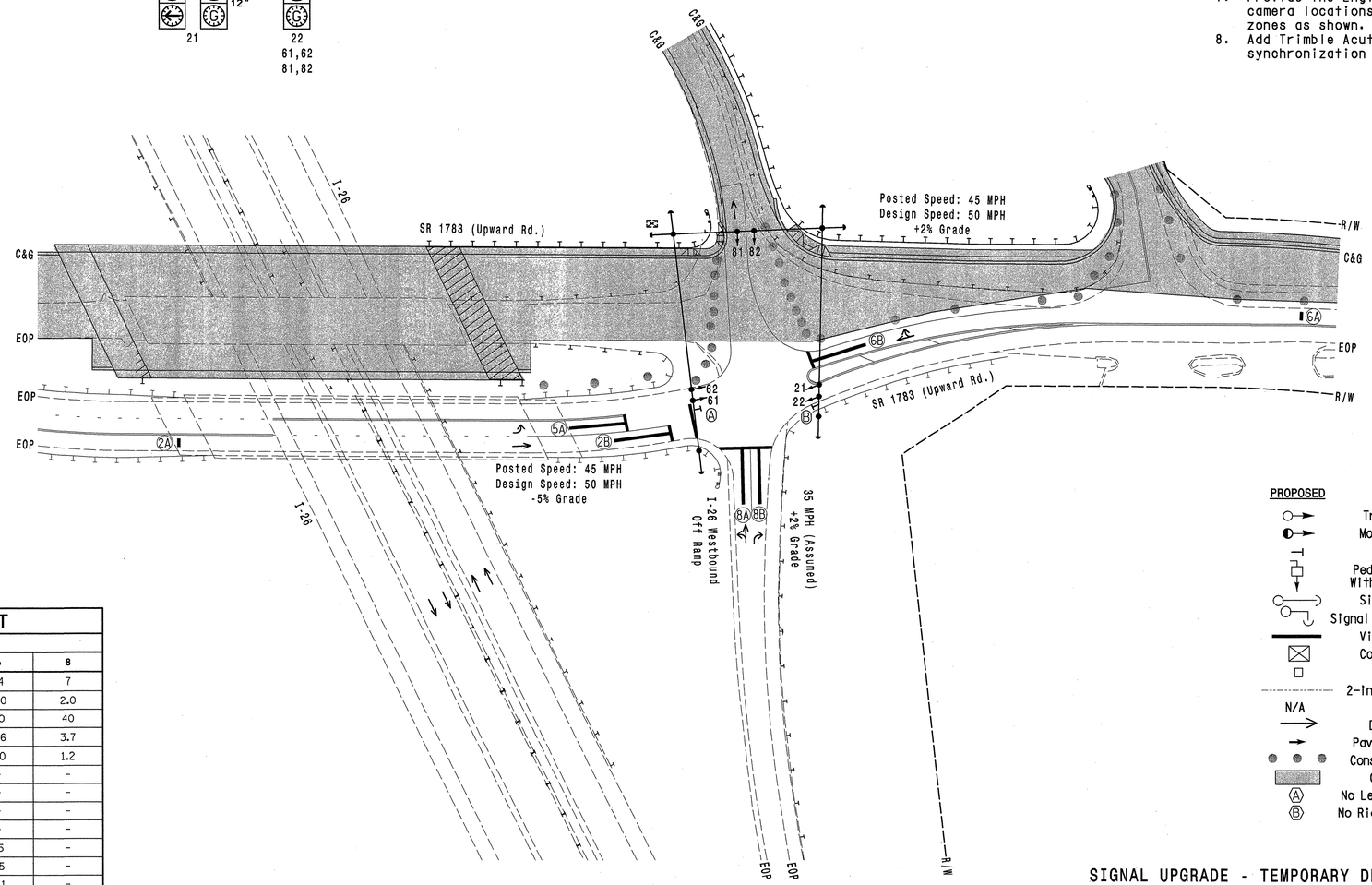
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
5A	6X6	0	*	*	5	Y	Y	-	-	15	-	*
					2	Y	Y	Y	-	3	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
8A	6X40	0	*	*	8	Y	Y	-	-	-	-	*
8B	6X40	0	*	*	8	Y	Y	-	-	15	-	*

* Video Detection Zone

3 Phase
Fully Actuated
(GPS Coordination)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 all existing signal heads and sign.
5. Set all detector units to presence mode.
6. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
7. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.
8. Add Trimble Acutime Gold (RS-232) GPS unit for time synchronization with 14-0931.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	
	No Left Turn Sign (R3-2L)	
	No Right Turn Sign (R3-2R)	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 5	PHASE 6	PHASE 8
Min Green 1 *	14	7	14	7
Extension 1 *	6.0	2.0	6.0	2.0
Max Green 1 *	90	35	90	40
Yellow Clearance	5.4	3.1	4.6	3.7
Red Clearance	1.1	3.3	1.0	1.2
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	15	-
Time To Reduce *	45	-	45	-
Minimum Gap	3.1	-	3.1	-
Recall Mode	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	-	-	-	-
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 1

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 1"=50' (0 – 50)

SR 1783 (Upward Road) at I-26 Westbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE DATE 10-21-08

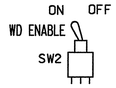
SIG. INVENTORY NO. 14-0932T2

10/22/2008 12:53:15 PM jerry.cross k:\rel_roadway\011096108\traffic\signals\14-0932\14-0932_2003T2_sig.dgn

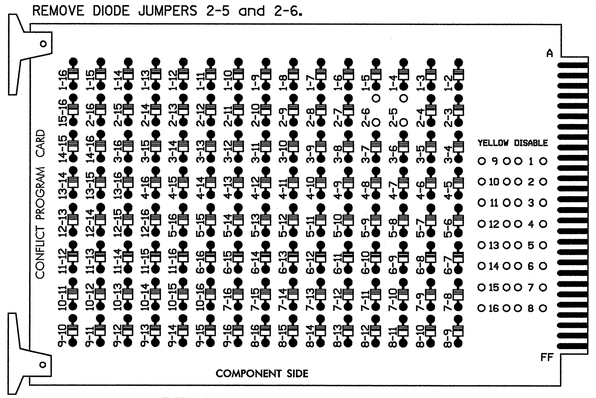
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 68

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

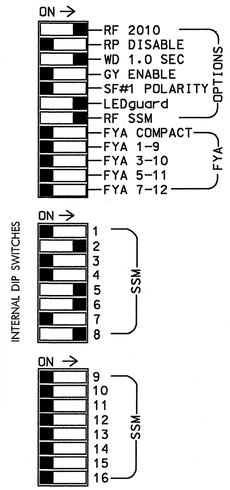
(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 2-5 and 2-6.



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, 4,7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S5,S6,S8
PHASES USED.....2,5,6,8
OVERLAPS.....NONE

SIGNAL HEAD HOOK-UP CHART

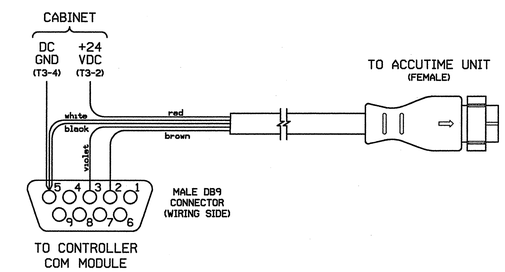
LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	NU	NU	21	61,62	NU	NU	81,82	NU
RED		128					*	134			107	
YELLOW		129						135			108	
GREEN		130						136			109	
RED ARROW												
YELLOW ARROW							132					
GREEN ARROW							133					
✋												
🚶												

NU = Not Used

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

CONNECTOR WIRING DETAIL FOR ACCUTIME GPS ANTENNA WITH SERIAL INTERFACE

(make connections as shown)



SIGNAL DESCRIPTION	12 CONDUCTOR CABLE COLOR	ACCUTIME CONNECTOR	DB9 TO CONTROLLER	CABINET CONNECTION
DC POWER	RED	PIN 1		T3-2
PORT B: RECEIVE	VIOLET	PIN 2	PIN 3	
PORT B: TRANSMIT	BROWN	PIN 4	PIN 2	
PORT A: RECEIVE	WHITE	PIN 6	PIN 5	
DC GROUND	BLACK	PIN 9	PIN 5	T3-4

Note: All other wires in the Accutime cable are unused and should be tied off.

Configure the Com Port used by the Accutime unit in the Oasis software using the settings below:

* 9600 Baud
* 8 Data Bits
* 1 Stop Bit
* Odd Parity
* Trimble TSIP GPS Protocol

Be sure to enable the "GET TIME FROM GPS" option under D-1 (Set Clock) menu.

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	SLOT EMPTY	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														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L														

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

FS = FLASH SENSE
ST = STOP TIME

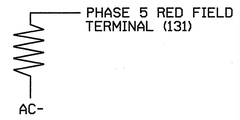
SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



NOTE: The purpose of this resistor is to load the channel red monitor inputs in order for the Signal Sequence Monitor to use the full signal sequence monitoring capability on channels that do not use the red display in the field.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0932
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
Department of Transportation
State of North Carolina
Signal Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
I-26 Westbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-30-08 DATE

SIG. INVENTORY NO. 14-0932T2

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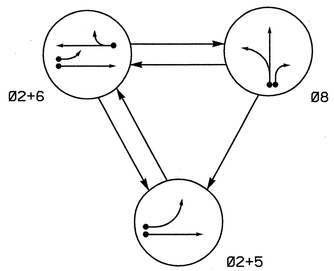
10/30/2008 4:50:33 PM davidd.shinbara

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 69

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

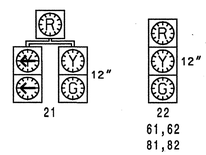
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø8	FLASH
21	G	G	R	Y
22	G	G	R	Y
61,62	R	G	R	Y
81,82	R	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION

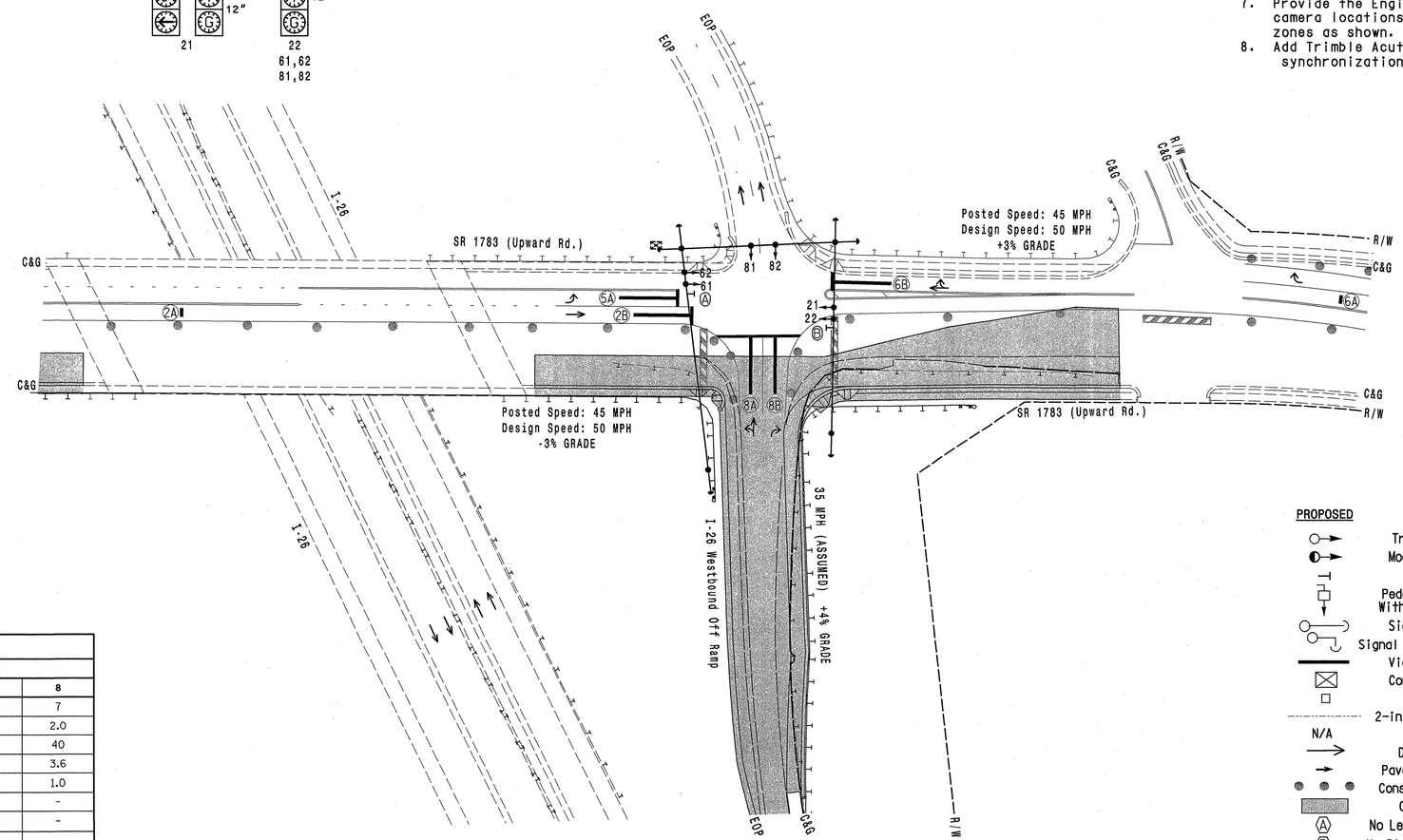
INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
5A	6X6	0	*	*	5	Y	Y	-	-	15	-	*
					2	Y	Y	Y	-	3	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
8A	6X40	0	*	*	8	Y	Y	-	-	-	-	*
8B	6X40	0	*	*	8	Y	Y	-	-	15	-	*

* Video Detection Zone

3 Phase
Fully Actuated
(GPS Coordination)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 all existing signal heads and sign.
5. Set all detector units to presence mode.
6. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
7. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.
8. Add Trimble Acutime Gold (RS-232) GPS unit for time synchronization with 14-0931.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	
Ⓐ	No Left Turn Sign (R3-2L)	Ⓐ
Ⓑ	No Right Turn Sign (R3-2R)	Ⓑ

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 5	PHASE 6	PHASE 8
Min Green 1 *	14	7	14	7
Extension 1 *	6.0	2.0	6.0	2.0
Max Green 1 *	90	35	90	40
Yellow Clearance	5.1	3.0	4.6	3.6
Red Clearance	1.0	2.3	1.0	1.0
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	15	-
Time To Reduce *	45	-	45	-
Minimum Gap	3.1	-	3.1	-
Recall Mode	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	-	-	-	-
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 3 - TCP PHASE 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
I-26 Westbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

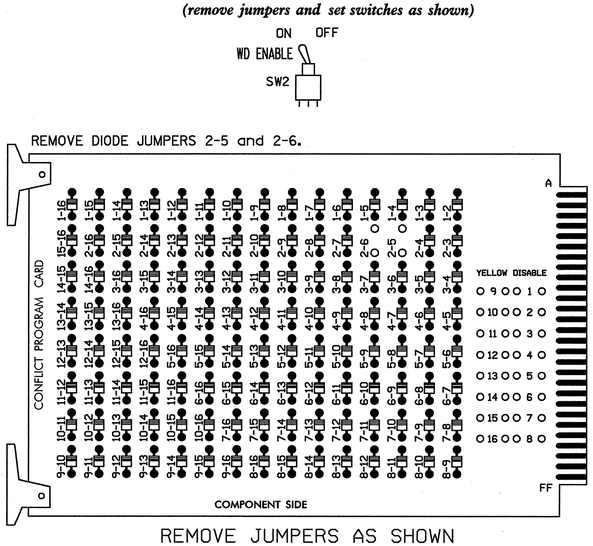
SIGNATURE 10-21-08 DATE

SIG. INVENTORY NO. 14-0932T3

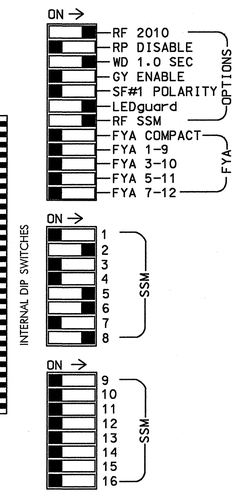
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 70

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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, 4,7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	NU	NU	21	61,62	NU	NU	81,82	NU
RED		128					*	134			107	
YELLOW		129						135			108	
GREEN		130						136			109	
RED ARROW												
YELLOW ARROW							132					
GREEN ARROW							133					
✋												
🚶												

NU = Not Used

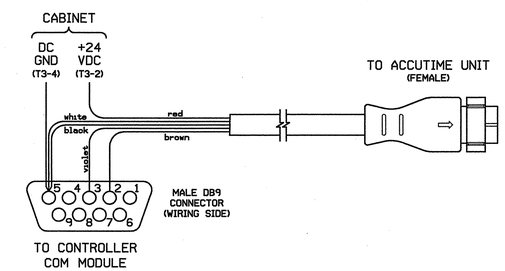
* Denotes install load resistor. See load resistor installation detail this sheet.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S5,S6,S8
PHASES USED.....2,5,6,8
OVERLAPS.....NONE

CONNECTOR WIRING DETAIL FOR ACCUTIME GPS ANTENNA WITH SERIAL INTERFACE

(make connections as shown)



SIGNAL DESCRIPTION	12 CONDUCTOR CABLE COLOR	ACCUTIME CONNECTOR	DB9 TO CONTROLLER	CABINET CONNECTION
DC POWER	RED	PIN 1		T3-2
PORT B: RECEIVE	VIOLET	PIN 2	PIN 3	
PORT B: TRANSMIT	BROWN	PIN 4	PIN 2	
PORT A: RECEIVE	WHITE	PIN 6	PIN 5	
DC GROUND	BLACK	PIN 9	PIN 5	T3-4

Note: All other wires in the Accutime cable are unused and should be tied off.

Configure the Com Port used by the Accutime unit in the Oasis software using the settings below:

* 9600 Baud
* 8 Data Bits
* 1 Stop Bit
* Odd Parity
* Trimble TSIP GPS Protocol

Be sure to enable the "GET TIME FROM GPS" option under D-1 (Set Clock) menu.

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	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

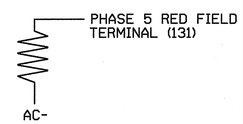
SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



NOTE: The purpose of this resistor is to load the channel red monitor inputs in order for the Signal Sequence Monitor to use the full signal sequence monitoring capability on channels that do not use the red display in the field.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0932
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

SIGNAL UPGRADE - TEMPORARY DESIGN 3 - TCP PHASE 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety System Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
I-26 Westbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
10-30-08
SIGNATURE DATE
SIG. INVENTORY NO. 14-0932T3

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PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 71

PHASING DIAGRAM

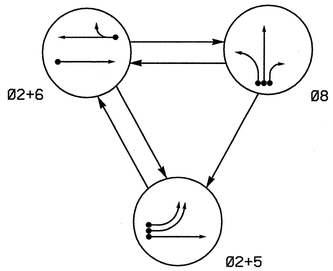
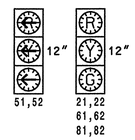


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø8	PHASE FLASH
21,22	G	G	R	Y
51,52	~~R~~	~~R~~	~~R~~	~~R~~
61,62	R	G	R	Y
81,82	R	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION

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
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
5A	6X40	0	*	*	5	Y	Y	-	-	3	-	*
5B	6X40	0	*	*	5	Y	Y	-	-	-	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
8A	6X40	0	*	*	8	Y	Y	-	-	-	-	*
8B	6X40	0	*	*	8	Y	Y	-	-	-	-	*
8C	6X40	0	*	*	8	Y	Y	-	-	15	-	*

* Video Detection Zone

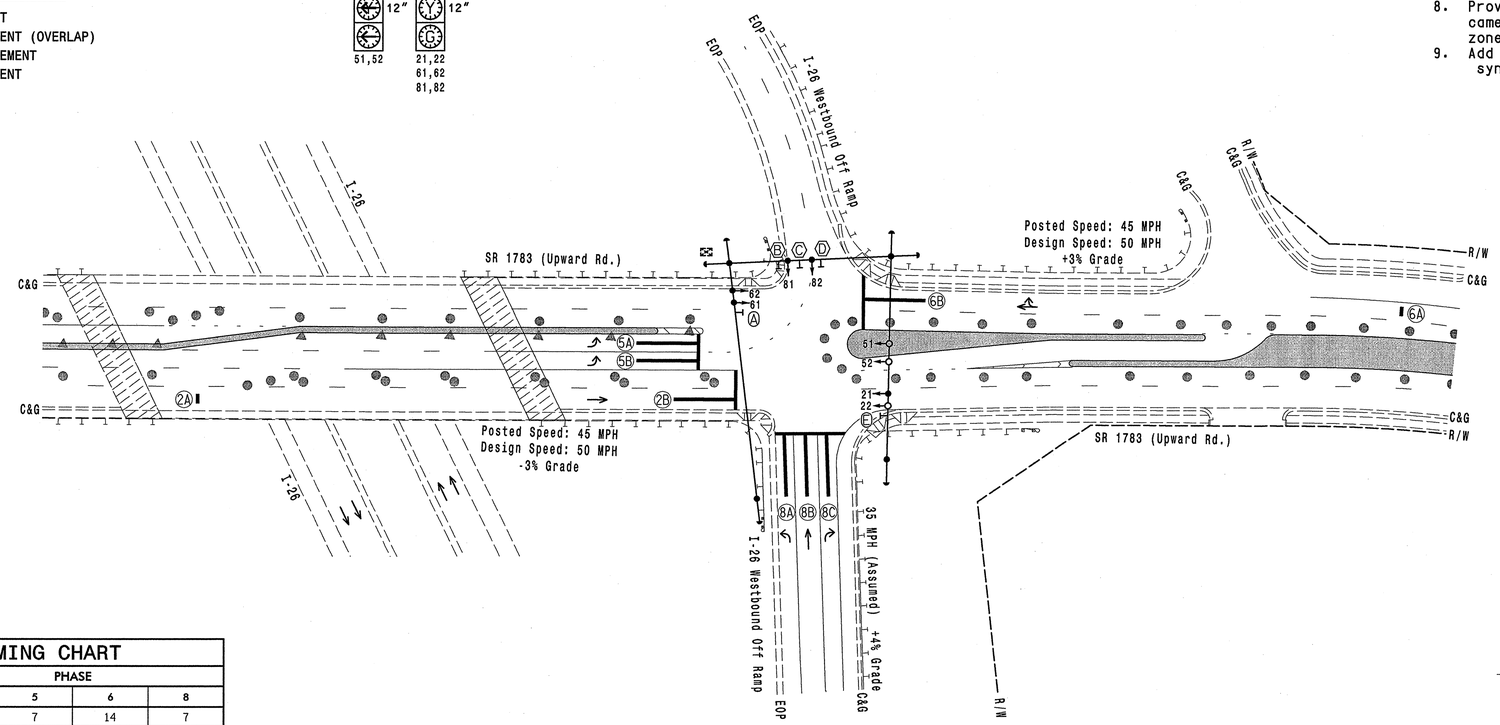
3 Phase
Fully Actuated
(GPS Coordination)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 all existing signal heads and sign.
5. Install backplates for signal heads numbered 22 and 52.
6. Set all detector units to presence mode.
7. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
8. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.
9. Add Trimble Acutime Gold (RS-232) GPS unit for time synchronization with 14-0931.

PHASING DIAGRAM DETECTION LEGEND

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



2070L TIMING CHART

FEATURE	PHASE 2	PHASE 5	PHASE 6	PHASE 8
Min Green 1 *	14	7	14	7
Extension 1 *	6.0	2.0	6.0	2.0
Max Green 1 *	90	35	90	40
Yellow Clearance	5.1	3.0	4.6	3.6
Red Clearance	1.1	3.2	1.0	2.5
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	15	-
Time To Reduce *	45	-	45	-
Minimum Gap	3.1	-	3.1	-
Recall Mode	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	-	-	-	-
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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone Cones	
	Construction Zone	
A	No Left Turn Sign (R3-2L)	A
B	Left Arrow "ONLY" Sign (R3-5L)	B
C	Combined Through and Left Arrow Sign (R3-6L)	C
D	Right Arrow "ONLY" Sign (R3-5R)	D
E	No Right Turn Sign (R3-2R)	E

SIGNAL UPGRADE - TEMPORARY DESIGN 4 - TCP PHASE 3

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
759 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
I-26 Westbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-30-08 DATE

SIG. INVENTORY NO. 14-0932T4

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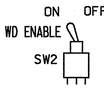
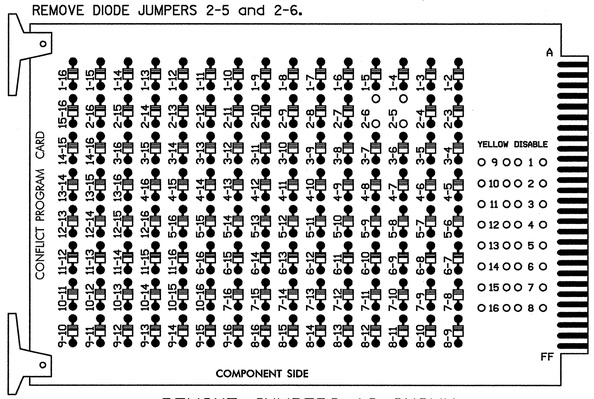
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 72

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

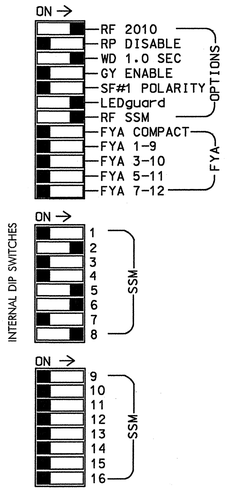
(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 2-5 and 2-6.



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, 4,7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Gap Reduction.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	NU	NU	51,52	61,62	NU	NU	81,82	NU
RED		128						134			107	
YELLOW		129						135			108	
GREEN		130						136			109	
RED ARROW							131					
YELLOW ARROW							132					
GREEN ARROW							133					
✋												
🚶												

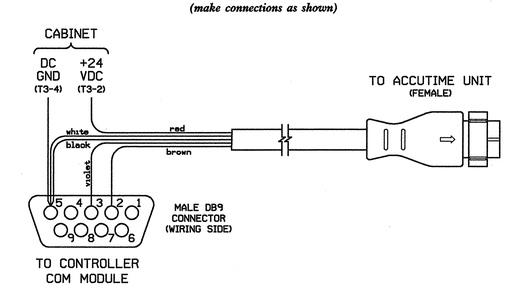
NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S5,S6,S8
PHASES USED.....2,5,6,8
OVERLAPS.....NONE

CONNECTOR WIRING DETAIL FOR ACCUTIME GPS ANTENNA WITH SERIAL INTERFACE

(make connections as shown)



SIGNAL DESCRIPTION	12 CONDUCTOR CABLE COLOR	ACCUTIME CONNECTOR	DB9 TO CONTROLLER	CABINET CONNECTION
DC POWER	RED	PIN 1		T3-2
PORT B: RECEIVE	VIOLET	PIN 2	PIN 3	
PORT B: TRANSMIT	BROWN	PIN 4	PIN 2	
PORT A: RECEIVE	WHITE	PIN 6	PIN 5	
DC GROUND	BLACK	PIN 9	PIN 5	T3-4

Note: All other wires in the Accutime cable are unused and should be tied off.

Configure the Com Port used by the Accutime unit in the Oasis software using the settings below:

* 9600 Baud
* 8 Data Bits
* 1 Stop Bit
* Odd Parity
* Trimble TSIP GPS Protocol

Be sure to enable the "GET TIME FROM GPS" option under D-1 (Set Clock) menu.

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	SLOT EMPTY	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														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L														

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0932
DESIGNED: AUGUST 2008
SEALED: 10-30-08
REVISED: N/A

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SIGNAL UPGRADE - TEMPORARY DESIGN 4 - TCP PHASE 3

SR 1783 (Upward Road)
At
I-26 Westbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-30-08 DATE

SIG. INVENTORY NO. 14-0932T4

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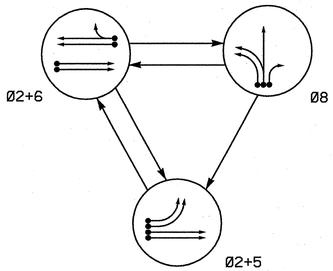
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 73

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

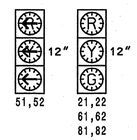
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø8	FLASH
21,22	G	G	R	Y
51,52	~~←~~	~~R~~	~~R~~	~~R~~
61,62	R	G	R	Y
81,82	R	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION

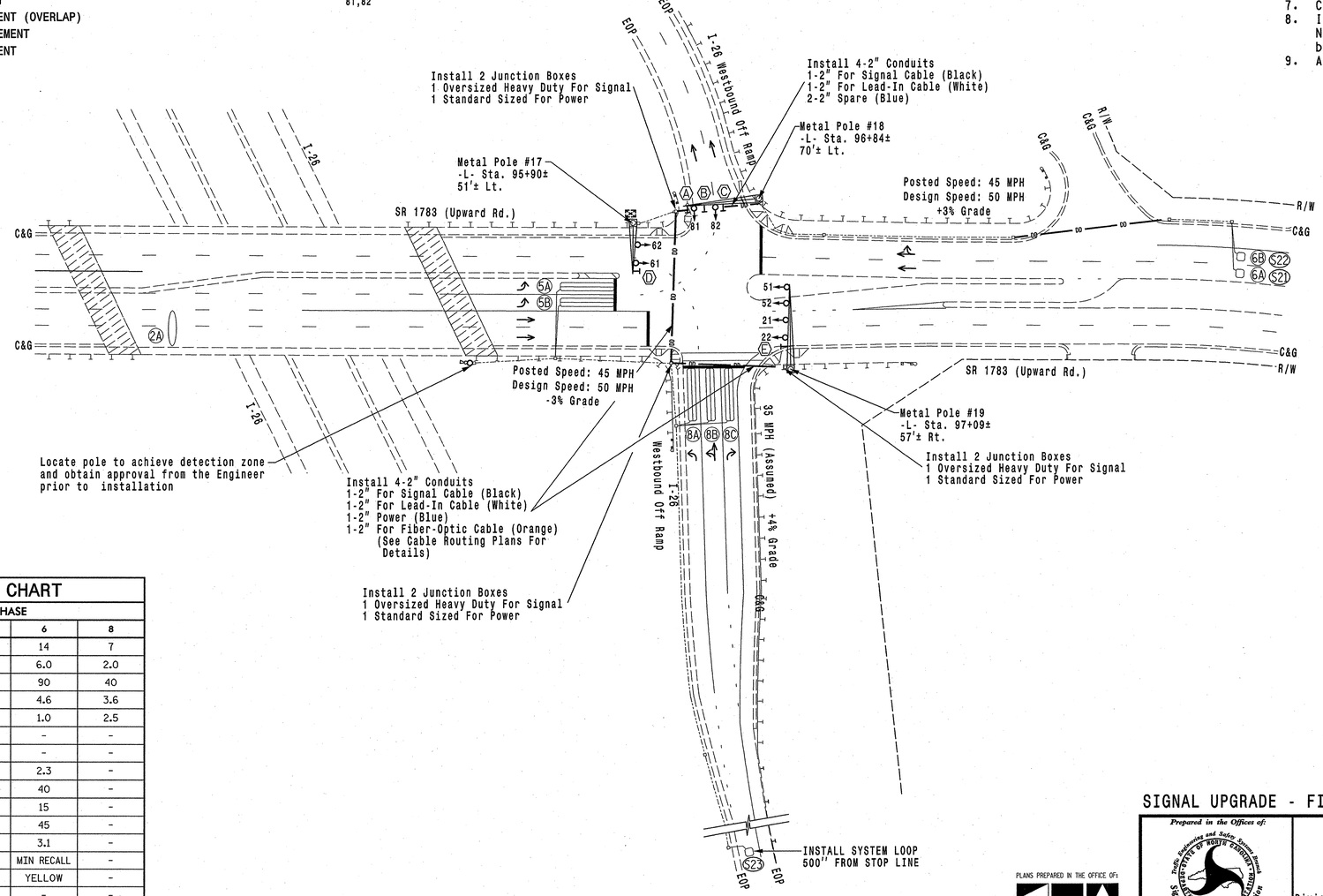
INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X18	355	*	Y	2	Y	Y	-	-	-	-	Y
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	-	-	Y
5B	6X40	0	2-4-2	Y	5	Y	Y	-	-	-	-	Y
6A/S21	6X6	355	5	Y	6	Y	Y	-	-	-	Y	Y
6B/S22	6X6	355	5	Y	6	Y	Y	-	-	-	Y	Y
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	Y
8B	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	Y
8C	6X40	0	2-4-2	Y	8	Y	Y	-	-	15	-	Y
S23	6X6	500	5	Y	-	-	-	-	-	-	Y	Y

* Microwave Detection Zone

3 Phase
Fully Actuated
(SR 1783 (Upward Road) Closed-Loop System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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. Install backplates for signal heads numbered 21,22, 51,52,61 and 62.
5. Set all detector units to presence mode.
6. Maximum times shown in timing chart are for free run operation only. Coordinated signal system timing values supersede there.
7. Closed loop system data: Controller Asset # 0932.
8. Install detection to achieve detection zone as shown. NCDOT Resident Engineer shall approve pole location before pole installation.
9. All signal heads shall be hunter green in color.



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	
	Metal Pole with Mastarm	
	Pedestrian Signal Pedestal	
	Inductive Loop Detector	
	Out of Pavement Detector	
	Microwave Detection Zone	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Directional Drill	N/A
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
Ⓐ	Left Arrow "ONLY" Sign (R3-5L)	Ⓐ
Ⓑ	Combined Through and Left Arrow Sign (R3-6L)	Ⓑ
Ⓒ	Right Arrow "ONLY" Sign (R3-5R)	Ⓒ
Ⓓ	No Left Turn Sign (R3-2L)	Ⓓ
Ⓔ	No Right Turn Sign (R3-2R)	Ⓔ

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 5	PHASE 6	PHASE 8
Min Green 1 *	14	7	14	7
Extension 1 *	6.0	2.0	6.0	2.0
Max Green 1 *	90	35	90	40
Yellow Clearance	5.1	3.0	4.6	3.6
Red Clearance	1.1	3.3	1.0	2.5
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	2.3	-	2.3	-
Max Variable Initial *	40	-	40	-
Time Before Reduction *	15	-	15	-
Time To Reduce *	45	-	45	-
Minimum Gap	3.1	-	3.1	-
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.

SIGNAL UPGRADE - FINAL DESIGN

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road) at I-26 Westbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-11-08 DATE

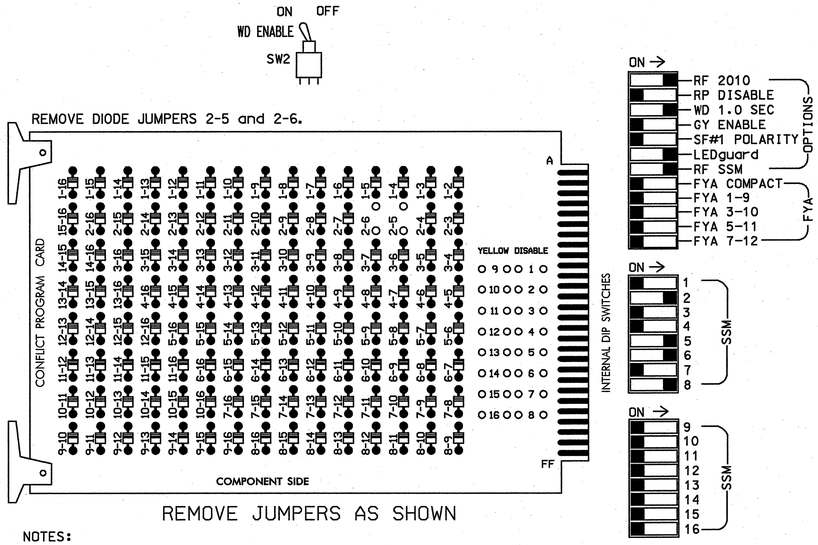
SIG. INVENTORY NO. 14-0932

12/11/2008 12:37:59 PM jerry.cross k:\rdl_roadway\0110980\traffic\signals\PLOT\14-0932_2070F_Sig.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 74

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.

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, 7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Variable Initial and Gap Reduction.
6. The cabinet and controller are part of the SR 1783 (Upward Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S5,S6,S8
PHASES USED.....2,5,6,8
OVERLAPS.....NONE

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	NU	NU	51,52	61,62	NU	NU	81,82	NU
RED		128						134			107	
YELLOW		129						135			108	
GREEN		130						136			109	
RED ARROW							131					
YELLOW ARROW							132					
GREEN ARROW							133					
✋												
🚶												

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	Ø2 2A AC ISOLATOR	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	Ø5 5A	Ø6/SYS 6A/S21	SLOT EMPTY	SLOT EMPTY	Ø8 8A	Ø8 8C	SLOT EMPTY	SYS. DET. S23	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		Ø5 5B	Ø6/SYS 6B/S22			Ø8 8B	NOT USED		NOT USED					

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

FS = FLASH SENSE
ST = STOP TIME

NOTE: INSTALL MODEL 252 AC ISOLATOR IN SLOT I2 FOR USE WITH MICROWAVE DETECTOR. SEE MICROWAVE DETECTOR WIRING ON THIS PAGE.

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
2A•	TB2-5,6	I2U	39	1	2	2	Y	Y	_	___	__
5A	TB3-5,6	J2U	40	2	6	5	Y	Y	_	___	__
5B	TB3-7,8	J2L	44	6	16	5	Y	Y	_	___	__
6A/S21	TB3-9,10	J3U	64	26	36	6/SYS	Y	Y	_	___	__
6B/S22	TB3-11,12	J3L	77	39	46	6/SYS	Y	Y	_	___	__
8A	TB5-9,10	J6U	42	4	8	8	Y	Y	_	___	__
8B	TB5-11,12	J6L	46	8	18	8	Y	Y	_	___	__
8C	TB7-1,2	J7U	66	28	38	8	Y	Y	_	___	15
*S23	TB7-9,10	J9U	59	21	15	SYS					

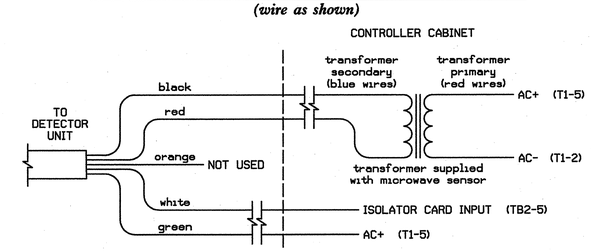
• MICROWAVE DETECTION, INSTALL AC ISOLATOR IN INPUT FILE SLOT I2.

* 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

MICROWAVE DETECTOR WIRING DETAIL

(wire as shown)



TC26B WIRE LIST

COLOR	FUNCTION
black	12V to 24V AC/DC (no polarity)
red	12V to 24V AC/DC (no polarity)
orange	Output Relay Normally Open
white	Output Relay Normally Closed
green	Output Relay Common

NOTES:

1. Sensor is a Microwave Sensors, Inc. Model TC-26B microwave motion detector mounted on poles as indicated on the Signal Design Plans.
2. Configure AC isolator card to place call upon removal of AC+ from the input.
3. Important: For proper operation of the microwave detector, remove surge protection from TB2-5 and TB2-6. Tie TB2-6 to AC neutral.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0932
DESIGNED: AUGUST 2008
SEALED: 12-11-08
REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road) at I-26 Westbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 1-15-09 DATE
SIG. INVENTORY NO. 14-0932

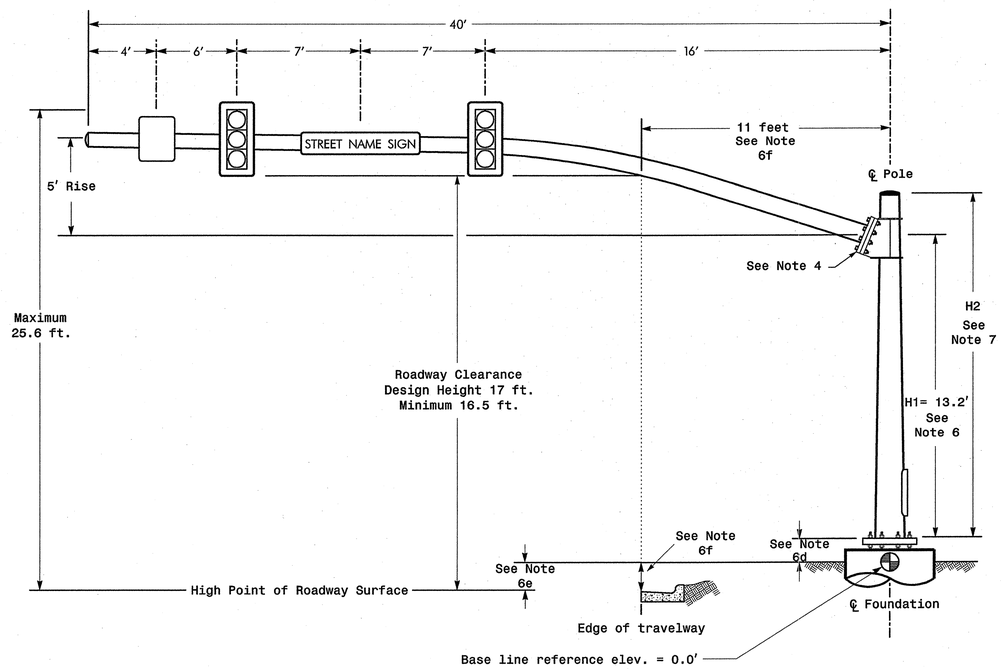
PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

K:\RAL_Roadway\01108108\Traffic\Signals\14-0932\14-0932_2008E_ala.dgn jerry.cross 2:54:48 PM 1/15/2009

METAL POLE No. 17 and 18

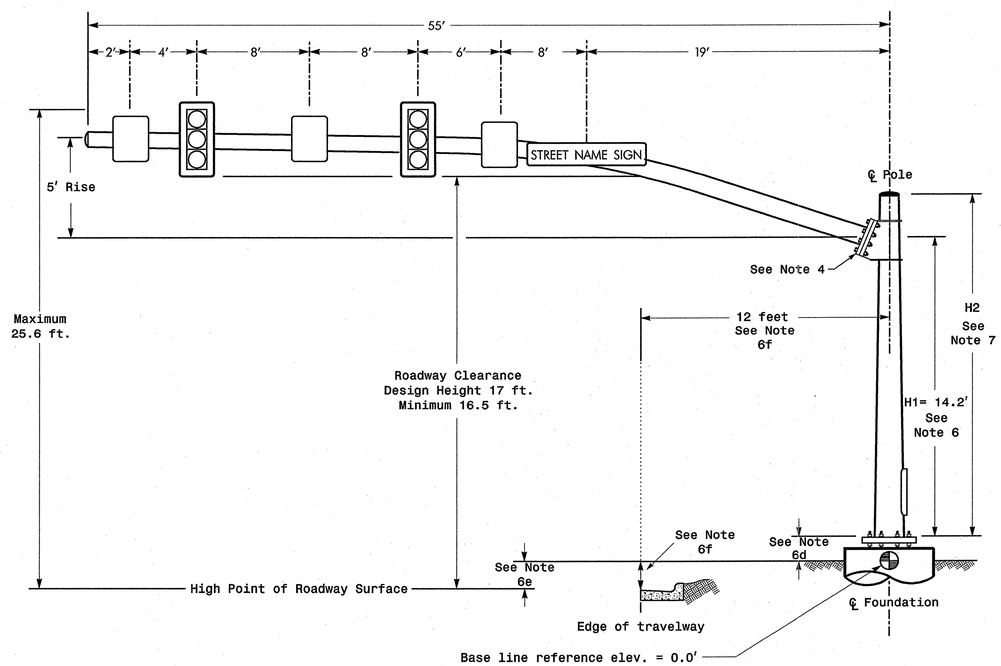
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 75

Design Loading for METAL POLE NO. 17



ELEVATION VIEW

Design Loading for METAL POLE NO. 18



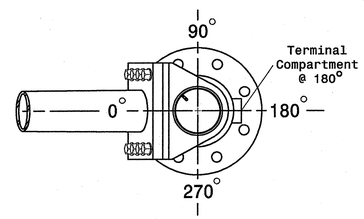
Elevation View

SPECIAL NOTE

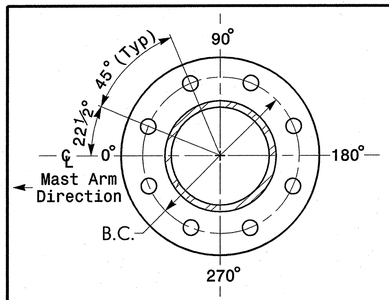
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 17	Pole 18
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-0.3 ft.	+0.7 ft.
Elevation difference at Edge of travelway or face of curb	-0.6 ft.	+0.2 ft.

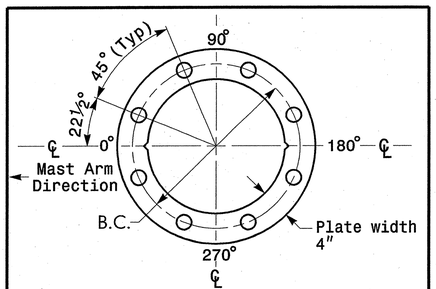


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	5.0 S.F.	24.0" W X 30.0" L	11 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2006 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 4 (90 mph)

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
I-26 Westbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:	
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette	

REVISIONS	INIT.	DATE

SCALE 0 N/A N/A

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

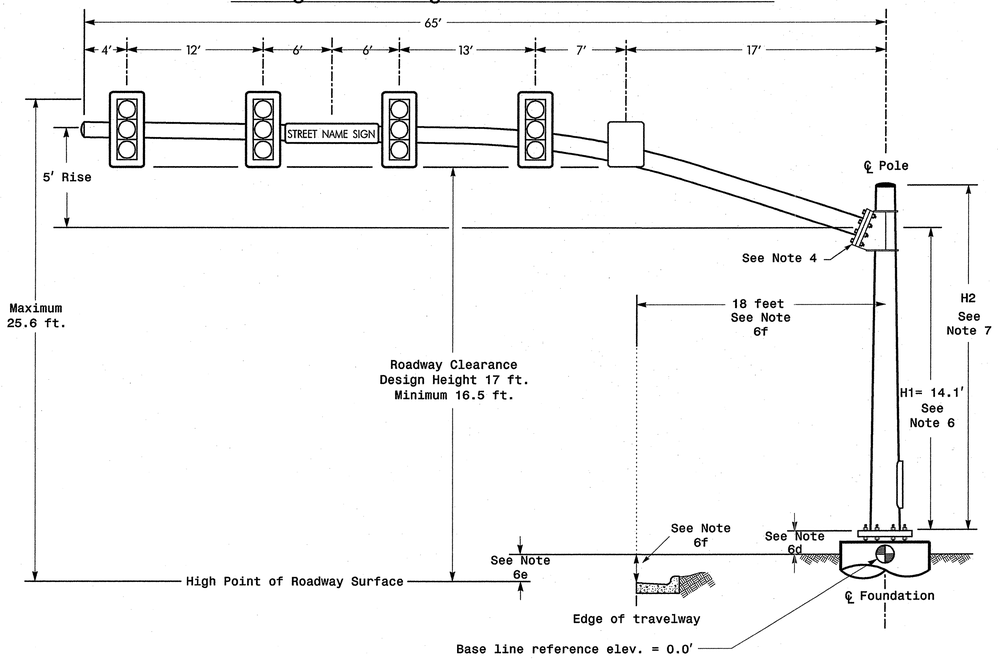
SIGNATURE 12-11-08 DATE

SIG. INVENTORY NO. 14-0932

12/11/2008 1:33:48 PM jerry.cross k:\ral_roadway\011098108\traffic\signals\14-0932\14-0932_2006F_MP1.dgn

METAL POLE No. 19	PROJECT REFERENCE NO.	SHEET NO.
	R-4430	Sig. 76

Design Loading for METAL POLE NO. 19



ELEVATION VIEW

SPECIAL NOTE

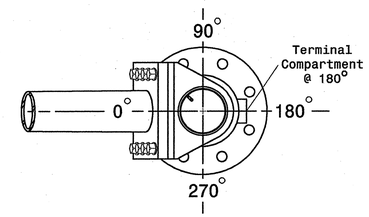
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

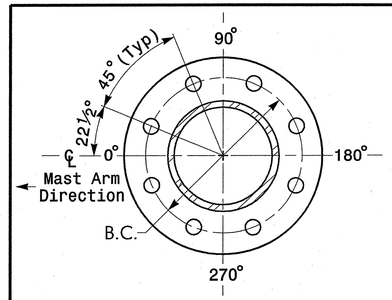
Elevation Differences for:	Pole 19
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	+0.6 ft.
Elevation difference at Edge of travelway or face of curb	-0.1 ft.

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	7.5 S.F.	30.0" W X 36.0" L	14 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

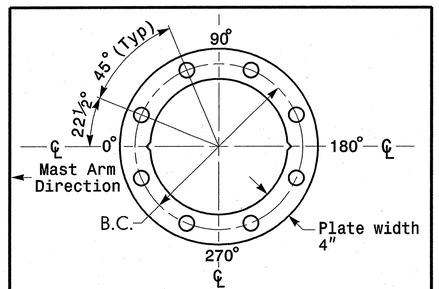


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
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   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

NCDOT Wind Zone 4 (90 mph)

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
759 N. Greenfield Pkwy, Garner, NC 27529

SCALE: 0 N/A — N/A

SR 1783 (Upward Road)
at
I-26 Westbound Off Ramp

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:	
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette	

REVISIONS	INIT.	DATE

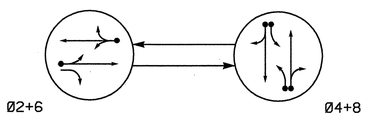
SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE — DATE 12-11-08

SIG. INVENTORY NO. 14-0932

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 77

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

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

SIGNAL FACE I.D.

Denotes L.E.D.

R Y G 12"

21,22
41,42
61,62
81,82

2070L LOOP & DETECTOR INSTALLATION

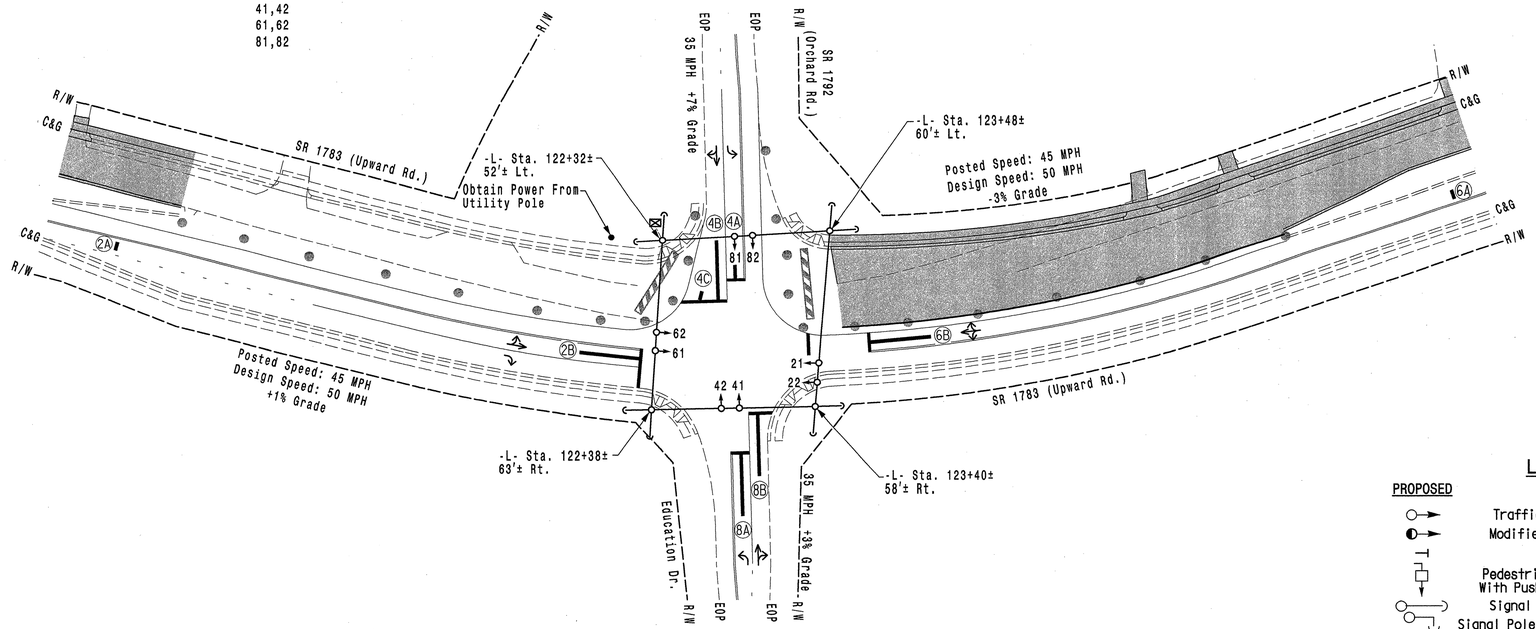
INDUCTIVE LOOPS				DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	3	-	*
4B	6X40	0	*	*	4	Y	Y	-	-	10	-	*
4C	6X6	0	*	*	4	Y	Y	-	-	15	-	*
6A	6X6	355	*	*	6	Y	Y	-	-	-	-	*
6B	6X40	0	*	*	6	Y	Y	Y	2	5	-	*
8A	6X40	0	*	*	8	Y	Y	-	-	3	-	*
8B	6X40	0	*	*	8	Y	Y	-	-	10	-	*

* Video Detection Zone

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 detector units to presence mode.
4. Install backplates for signal heads numbered 21,22,61,62.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
7. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 6	PHASE 8
Min Green 1 *	14	7	14	7
Extension 1 *	6.0	2.0	6.0	2.0
Max Green 1 *	90	30	90	30
Yellow Clearance	4.7	3.5	5.1	3.7
Red Clearance	1.2	1.6	1.5	1.9
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	15	-
Time To Reduce *	45	-	45	-
Minimum Gap	3.1	-	3.1	-
Recall Mode	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	-	-	-	-
Dual Entry	-	ON	-	ON
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.

SIGNAL INSTALLATION - TEMPORARY DESIGN 1 - TCP PHASE 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1783 (Upward Road)
at
SR 1792 (Orchard Road)/
Education Drive

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

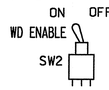
SIG. INVENTORY NO. 14-1257T1

K:\R4_Roadway\0110081\08\Traffic\Signals\14-1257\14-1257_20081_sig.dgn jerry.cross 1:51:07 PM 10/22/2008

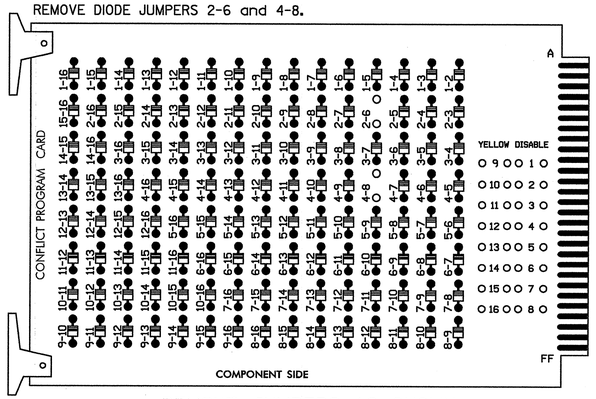
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 78

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

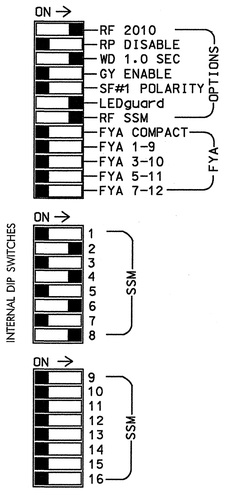
(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 2-6 and 4-8.



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, 7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 4 and 8, on the controller unit, for Dual Entry.
6. Program phases 2 and 6, on the controller unit, for Gap Reduction.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	NU	NU	61,62	NU	NU	81,82	NU
RED		128			101			134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S4,S6,S8
PHASES USED.....2,4,6,8
OVERLAPS.....NONE

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	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS / DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST / DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-1257
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

SIGNAL INSTALLATION - TEMPORARY DESIGN 1 - TCP PHASE 2

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

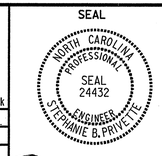
SR 1783 (Upward Road)
at
SR 1792 (Orchard Road)/
Education Drive

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL



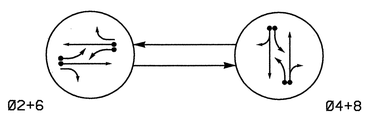
SIGNATURE 10-30-08 DATE

SIG. INVENTORY NO. 14-1257T1

k:\rail_roadway\011008108\traffic\signals\14-1257\14-1257_20081_ela.dgn
10/30/2008 4:53:56 PM david.shinbara

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 79

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

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

SIGNAL FACE I.D.

Denotes L.E.D.

21,22
41,42
61,62
81,82

2070L LOOP & DETECTOR INSTALLATION

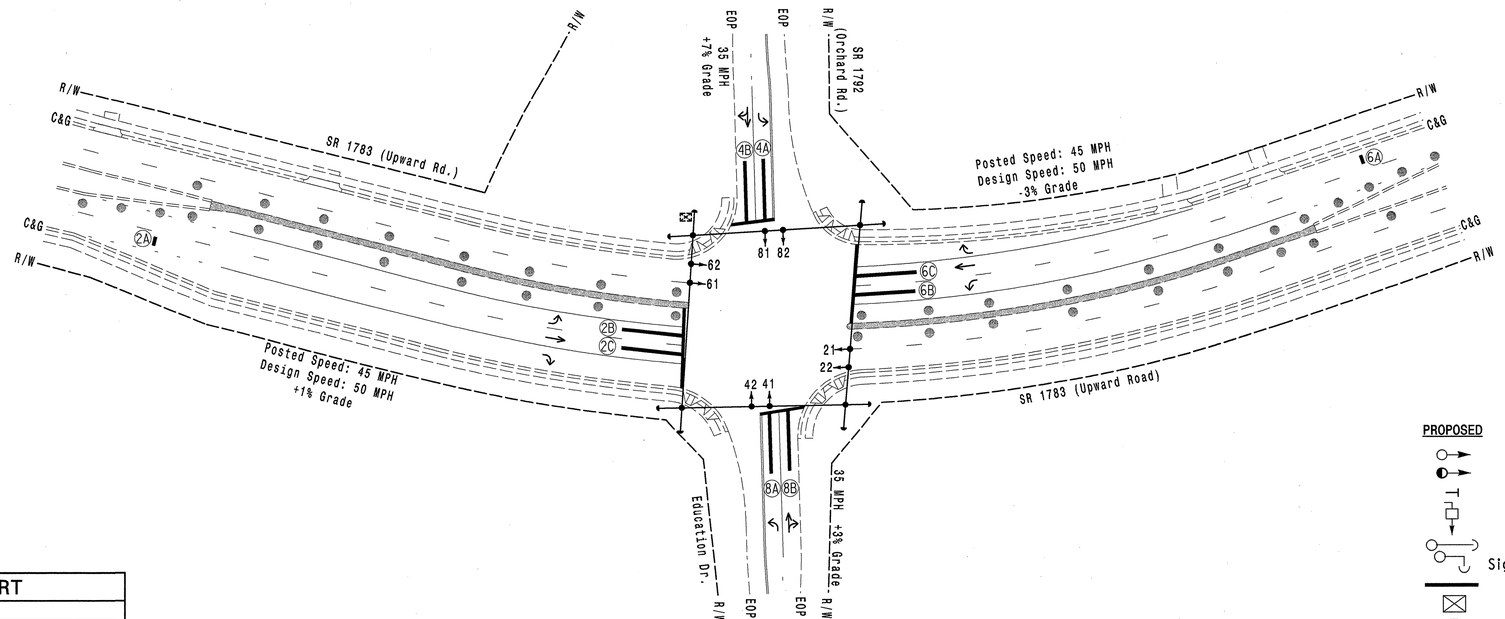
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	355	*	*	2	Y	Y	-	-	-	-	*
2B	6X40	0	*	*	2	Y	Y	Y	-	3	-	*
2C	6X40	0	*	*	2	Y	Y	Y	2	5	-	*
4A	6X40	0	*	*	4	Y	Y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

* Video Detection Zone

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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 and 62.
4. Set all detector units to presence mode.
5. Incorporate Loop Emulator Detection System for vehicle detection. Do not mount detectors on signal poles.
6. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.



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	
	Video Detection Area	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
	Construction Zone Drums	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 6	PHASE 8
Min Green 1 *	14	7	14	7
Extension 1 *	6.0	2.0	6.0	2.0
Max Green 1 *	90	30	90	30
Yellow Clearance	4.7	3.5	5.1	3.7
Red Clearance	1.5	2.3	1.1	2.2
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	15	-
Time To Reduce *	45	-	45	-
Minimum Gap	3.1	-	3.1	-
Recall Mode	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	-	-	-	-
Dual Entry	-	ON	-	ON
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.

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 3

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50
1"=50'

SR 1783 (Upward Road)
at
SR 1792 (Orchard Road)/
Education Drive

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

SIG. INVENTORY NO. 14-1257T2

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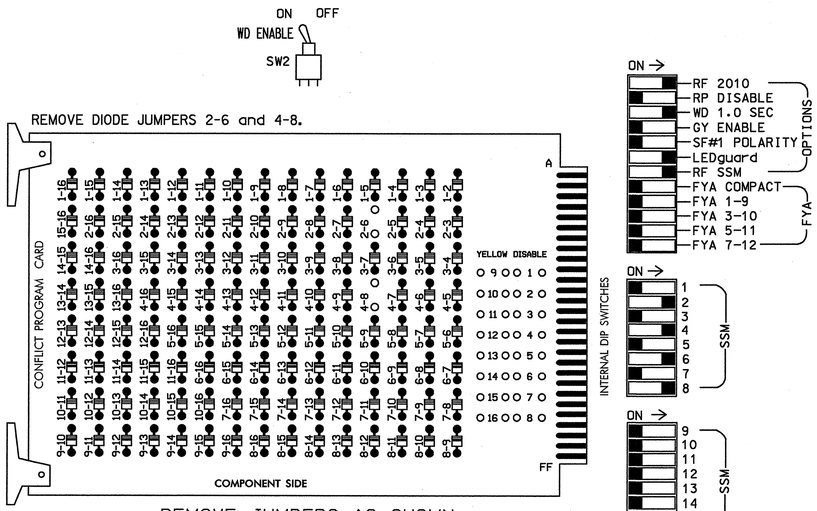
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 80

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 1,3,5, 7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 4 and 8, on the controller unit, for Dual Entry.
6. Program phases 2 and 6, on the controller unit, for Gap Reduction.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	NU	NU	61,62	NU	NU	81,82	NU
RED		128			101			134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S4,S6,S8
PHASES USED.....2,4,6,8
OVERLAPS.....NONE

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	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS / DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST / DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-1257
DESIGNED: AUGUST 2008
SEALED: 10-21-08
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - TCP PHASE 3

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
Department of Transportation
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1792 (Orchard Road)/
Education Drive

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 10-30-08 DATE
SIG. INVENTORY NO. 14-1257T2

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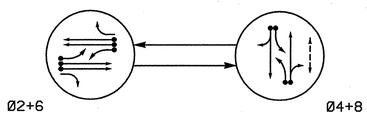
10/30/2008 4:53:57 PM davids.shinbara

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 81

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

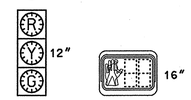
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4+8	FLASH
21,22,23	G	R	Y
41,42	R	G	R
61,62,63	G	R	Y
81,82	R	G	R
P81,P82	DW	W	DRK

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

SIGNAL FACE I.D.

Denotes L.E.D.



21,22,23
41,42
61,62,63
81,82

P81,P82

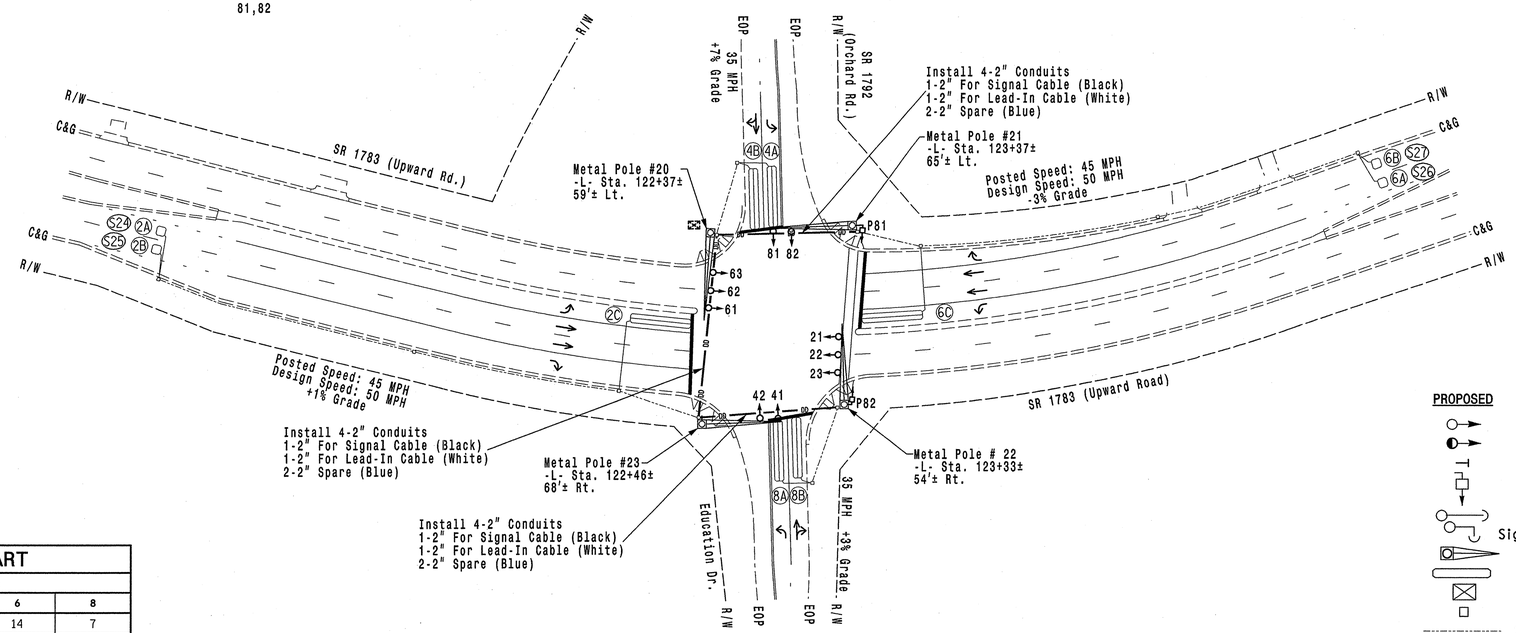
2070L LOOP & DETECTOR INSTALLATION

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
2A/S24	6X6	355	5	Y	2	Y	Y	-	-	-	Y	Y
2B/S25	6X6	355	5	Y	2	Y	Y	-	-	-	Y	Y
2C	6X40	0	2-4-2	Y	2	Y	Y	Y	-	3	-	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
6A/S26	6X6	355	5	Y	6	Y	Y	-	-	-	Y	Y
6B/S27	6X6	355	5	Y	6	Y	Y	-	-	-	Y	Y
6C	6X40	0	2-4-2	Y	6	Y	Y	Y	-	3	-	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

2 Phase
Fully Actuated
(SR 1783 (Upward Road) Closed-Loop System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "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. Install backplates for signal heads numbered 21,22,23, 61,62 and 63.
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 there.
8. Closed loop system data: Controller Asset # 1257.
9. All signal heads shall be hunter green in color.



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	
	Metal Pole with Mastarm	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Directional Drill	N/A
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 6	PHASE 8
Min Green 1 *	14	7	14	7
Extension 1 *	6.0	2.0	6.0	2.0
Max Green 1 *	90	30	90	30
Yellow Clearance	4.7	3.5	5.1	3.7
Red Clearance	1.5	2.6	1.1	2.3
Walk 1 *	-	-	-	7
Don't Walk 1	-	-	-	19
Seconds Per Actuation *	1.7	-	1.7	-
Max Variable Initial *	40	-	40	-
Time Before Reduction *	15	-	15	-
Time To Reduce *	45	-	45	-
Minimum Gap	3.1	-	3.1	-
Recall Mode	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	YELLOW	-	YELLOW	-
Dual Entry	-	ON	-	ON
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.

SIGNAL UPGRADE - FINAL DESIGN

PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1792 (Orchard Road)/
Education Drive

DIVISION 14 HENDERSON COUNTY FLAT ROCK

PLAN DATE:	AUGUST 2008	REVIEWED BY:	
PREPARED BY:	J.C. CROSS	REVIEWED BY:	S.B. PRIVETTE

SCALE 0 50 1"=50'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-11-08 DATE

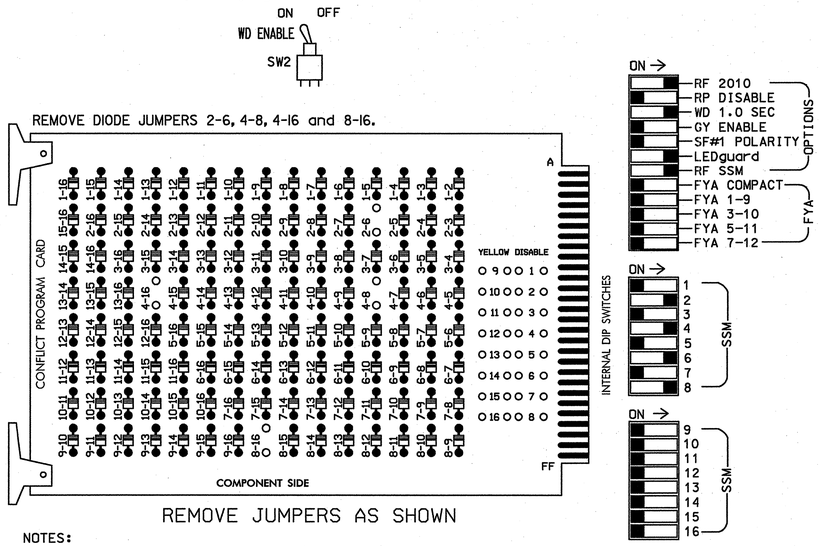
SIG. INVENTORY NO. 14-1257

12/12/2008 7:24:39 AM jerry.cross k:\ral_roadway\01108108\traffic\signals\14-1257\14-1257_2006F_sig.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 82

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 1,3,5, 7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 4 and 8, on the controller unit, for Dual Entry.
6. Program phases 2 and 6, on the controller unit, for Variable Initial and Gap Reduction.
7. Program phase 8 for 'STARTUP PED CALL'.
8. The cabinet and controller are part of the SR 1783 (Upward Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S4,S6,S8,S8P
PHASES USED.....2,4,6,8,8PED
OVERLAPS.....NONE

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22 23	NU	NU	41,42	NU	NU	61,62 63	NU	NU	81,82	P81, P82
RED		128			101			134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												110
🚶												112

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT	Ø2/SYS	Ø 2	SLOT	SLOT	Ø 4	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	NOT USED	FS
		EMPTY	2A/S24	2C	EMPTY	EMPTY	4A	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY		DC ISOLATOR
	L		Ø2/SYS	NOT USED			Ø 4							Ø8 PED	ST
			2B/S25				4B							DC ISOLATOR	DC ISOLATOR
FILE "J"	U	SLOT	Ø6/SYS	Ø 6	SLOT	SLOT	Ø 8	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
		EMPTY	6A/S26	6C	EMPTY	EMPTY	8A	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
	L		Ø6/SYS	NOT USED			Ø 8								
			6B/S27				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.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A/S24	TB2-5,6	I2U	39	1	2	2/SYS	Y	Y	_	___	__
2B/S25	TB2-7,8	I2L	43	5	12	2/SYS	Y	Y	_	___	__
2C	TB2-9,10	I3U	63	25	32	2	Y	Y	Y	___	3
4A	TB4-9,10	I6U	41	3	4	4	Y	Y	_	___	3
4B	TB4-11,12	I6L	45	7	14	4	Y	Y	_	___	10
6A/S26	TB3-5,6	J2U	40	2	6	6/SYS	Y	Y	_	___	__
6B/S27	TB3-7,8	J2L	44	6	16	6/SYS	Y	Y	_	___	__
6C	TB3-9,10	J3U	64	26	36	6	Y	Y	Y	___	3
8A	TB5-9,10	J6U	42	4	8	8	Y	Y	_	___	3
8B	TB5-11,12	J6L	46	8	18	8	Y	Y	_	___	10
PED PUSH BUTTONS											
P81,P82	TB8-8,9	I13L	70	32	PED 8	8 PED					

NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOT 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.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-1257
DESIGNED: AUGUST 2008
SEALED: 12-11-08
REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1792 (Orchard Road)/
Education Drive

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:
PREPARED BY: D.A. Shinbara REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE
SIGNATURE 1-15-09 DATE
SIG. INVENTORY NO. 14-1257

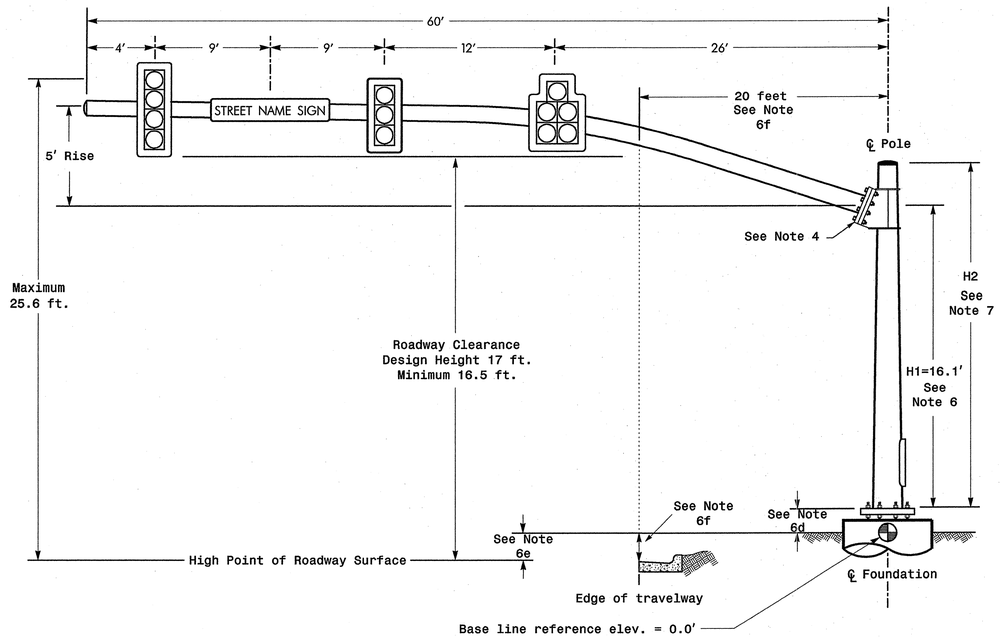
PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

K:\RAL_Roadway\011086108\Traffic\Signals\14-1257\14-1257_2008F_sig.dgn
1/15/2009 3:00:08 PM jerry.cross

METAL POLE No. 20 and 21

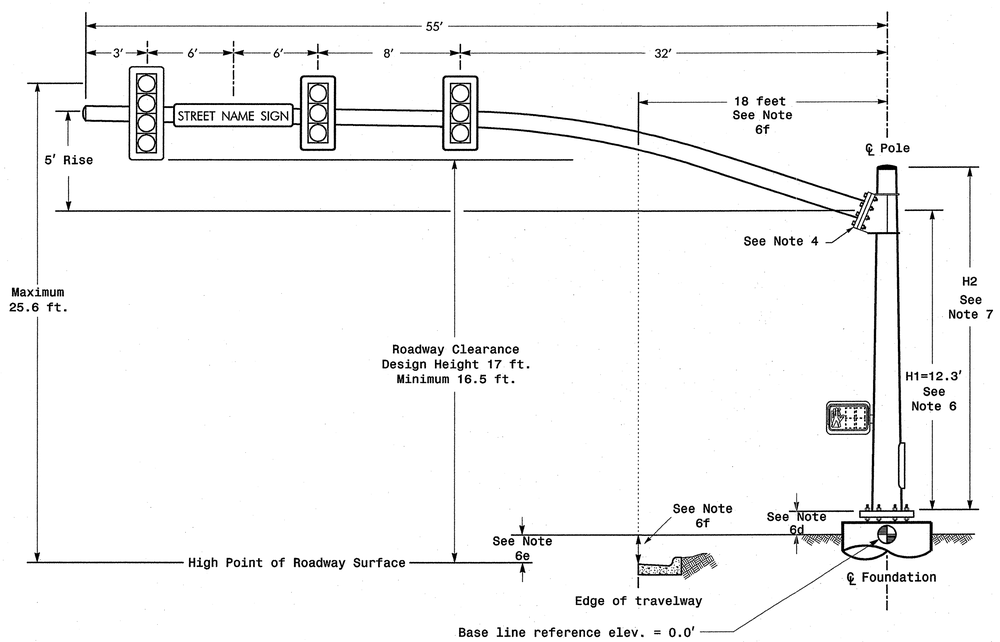
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 83

Design Loading for METAL POLE NO. 20



ELEVATION VIEW

Design Loading for METAL POLE NO. 21



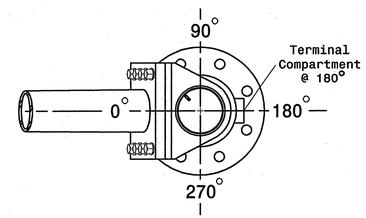
ELEVATION VIEW

SPECIAL NOTE

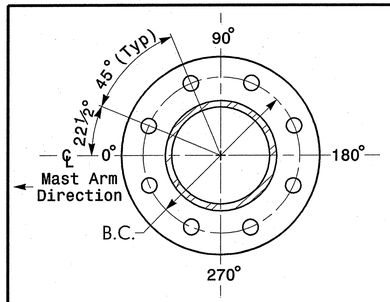
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 20	Pole 21
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+2.1 ft.	-1.3 ft.
Elevation difference at Edge of travelway or face of curb	+0.8 ft.	-1.4 ft.

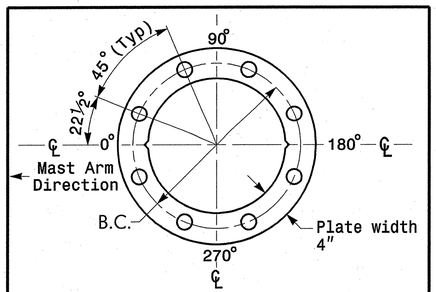


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"–3 SECTION–WITH BACKPLATE AND ASTRO–BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	SIGNAL HEAD 12"–4 SECTION (VERTICAL)–WITH BACKPLATE AND ASTRO–BRAC	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	SIGNAL HEAD 8"–5 SECTION–WITH BACKPLATE AND ASTRO–BRAC	10.6 S.F.	35.0" W X 43.5" L	75 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO–SIGN–BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2006 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

NCDOT Wind Zone 4 (90 mph)

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: 0 N/A — N/A

SR 1783 (Upward Road)
at
SR 1792 (Orchard Road/ Education Drive)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. PRIVETTE

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE — DATE 12-11-08

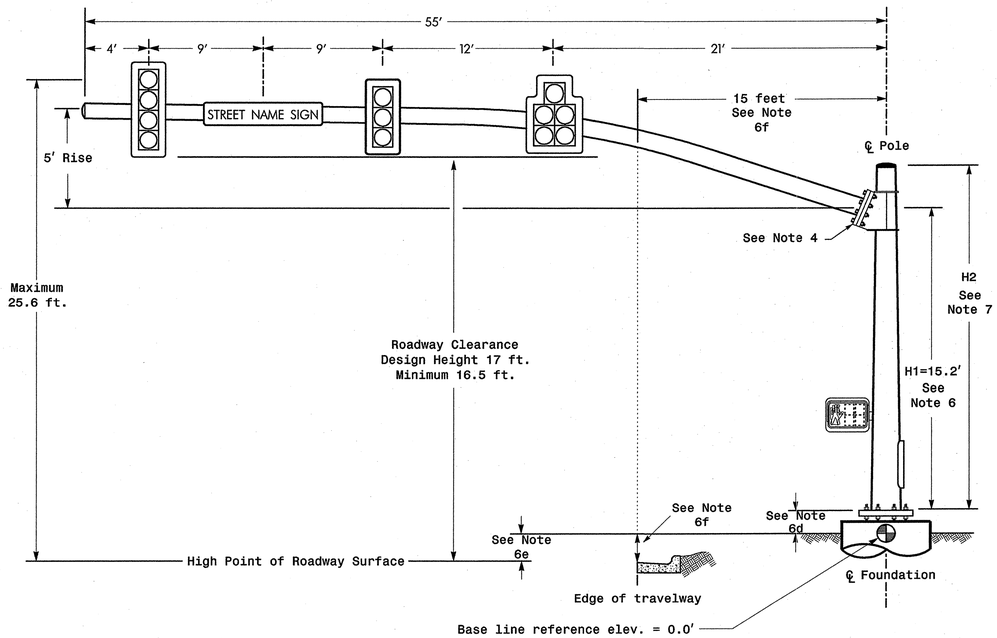
SIG. INVENTORY NO. 14-1257

12/11/2008 1:38:45 PM jerry.cross k:\rd_roadway\01109108\traffic\signals\14-1257\14-1257_2006F_MP1.dgn

METAL POLE No. 22 and 23

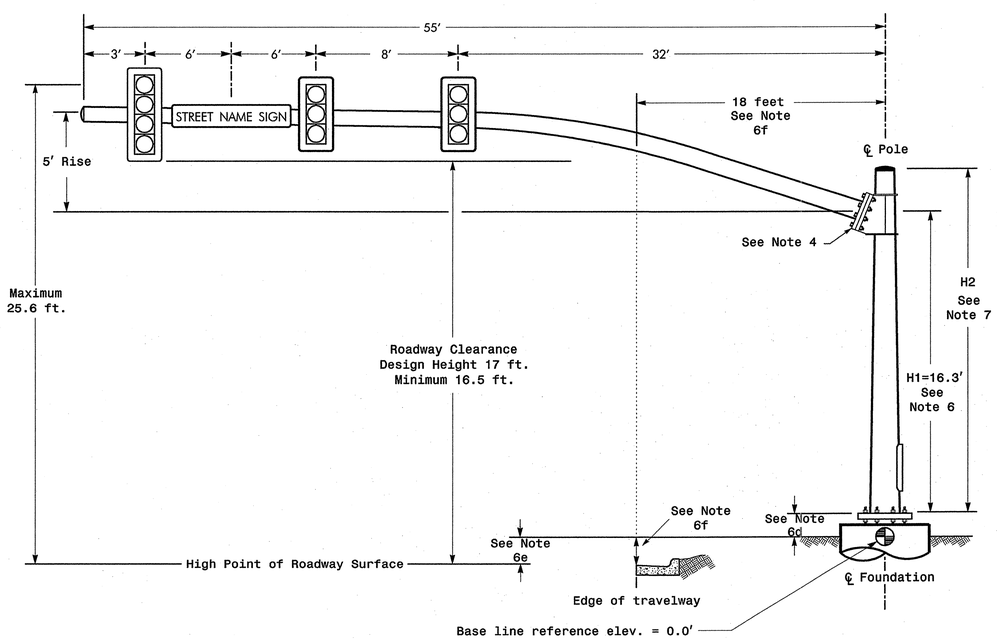
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 84

Design Loading for METAL POLE NO. 22



ELEVATION VIEW

Design Loading for METAL POLE NO. 23



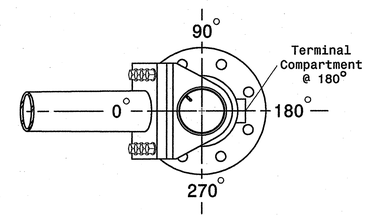
ELEVATION VIEW

SPECIAL NOTE

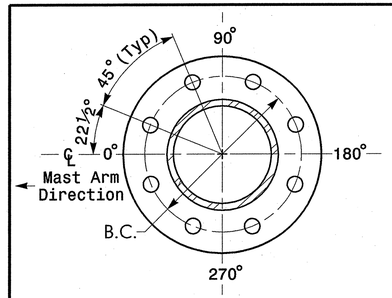
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 22	Pole 23
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+1.2 ft.	+2.7 ft.
Elevation difference at Edge of travelway or face of curb	+1.2 ft.	+2.4 ft.

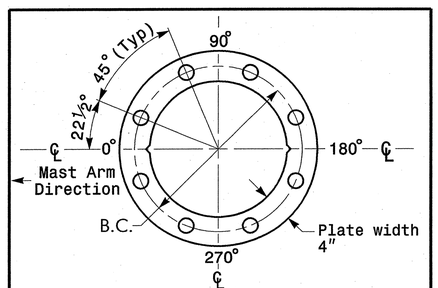


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"–3 SECTION–WITH BACKPLATE AND ASTRO–BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	SIGNAL HEAD 8"–4 SECTION (VERTICAL)–WITH BACKPLATE AND ASTRO–BRAC	7.9 S.F.	22.0" W X 52.0" L	53.5 LBS
	SIGNAL HEAD 8"–5 SECTION–WITH BACKPLATE AND ASTRO–BRAC	10.6 S.F.	35.0" W X 43.5" L	75 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED WITH ASTRO–SIGN–BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
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Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
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   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
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   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, NC 27636
(919) 677-2000

NCDOT Wind Zone 4 (90 mph)

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1783 (Upward Road)
at
SR 1792 (Orachard Road/ Education Drive)

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:	
PREPARED BY: D.A. Shinbara	REVIEWED BY: S.B. Privette	

SCALE	REVISIONS	INIT.	DATE
0 N/A N/A			

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 12-11-08 DATE

SIG. INVENTORY NO. 14-1257

12/11/2008 1:33:47 PM jerry.cross k:\rd_roadway\01109108\traffic\signals\14-1257\14-1257_2008F_MP2.dgn

PROJECT REFERENCE NO.	SHEET NO.
	Sig. 25

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

5-07

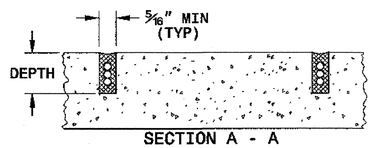
ENGLISH DETAIL DRAWING FOR

INDUCTIVE DETECTION LOOPS

CONVENTIONAL 4-SIDED LOOP

SAW SLOT DEPTH CHART

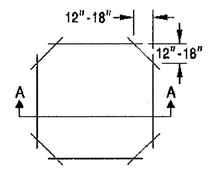
DEPTH (IN)	NO. OF WIRE TURNS				
	2	3	4	5	6
CONCRETE	2.0	2.0	2.5	2.5	3.0
ASPHALT	2.0	2.5	3.0	3.0	3.0



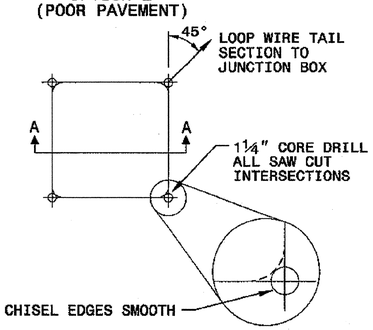
SECTION A - A

SAW CUT OPTIONS

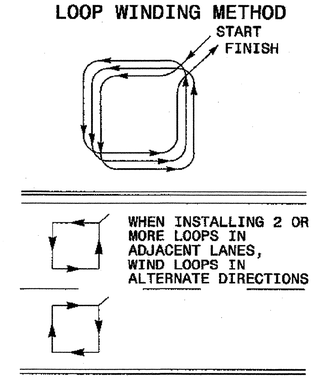
OPTION 1



OPTION 2
(POOR PAVEMENT)



LOOP WINDING METHOD



LOOP WIRE TWISTING METHOD

INCORRECT WAY TO TWIST WIRE

CORRECT WAY TO TWIST WIRE

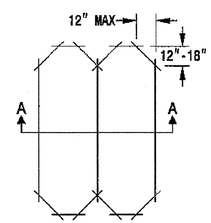
NOTES

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.

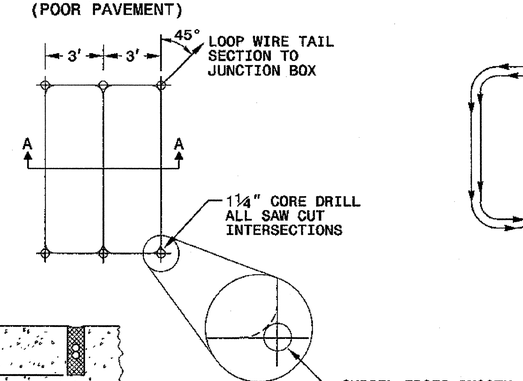
QUADRUPOLE LOOP

SAW CUT OPTIONS

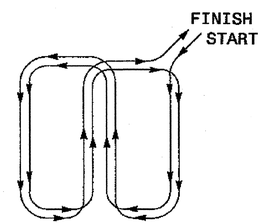
OPTION 1

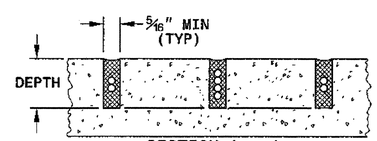


OPTION 2
(POOR PAVEMENT)



LOOP WINDING METHOD





SECTION A - A

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.

5-07

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
750 N. Greenfield Parkway
Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 016286 ENGINEER MILTON I. DEAN
SIGNATURE
9/5/07
DATE

05-SEP-2007 14:00
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jmilliken

PROJECT REFERENCE NO.	SHEET NO.
	Sig. 86

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

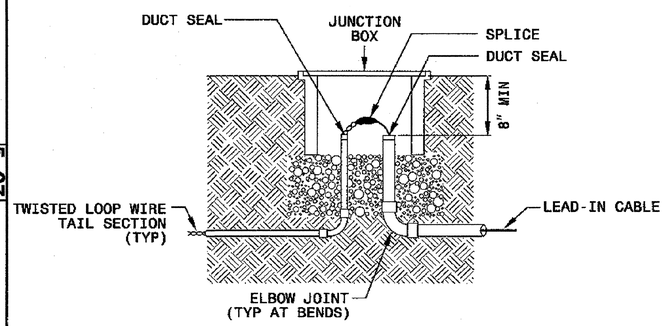
5-07

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

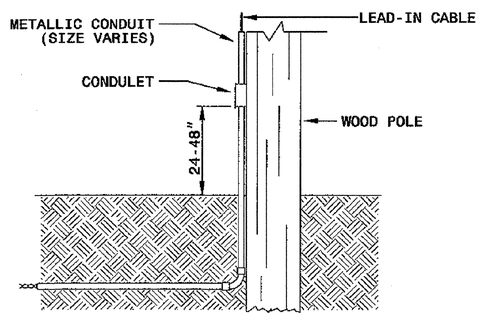
SHEET 2 OF 3
1725D01

LOOP WIRE SPLICE POINT DETAILS

LOOP WIRE AT JUNCTION BOX



LOOP WIRE AT POLE

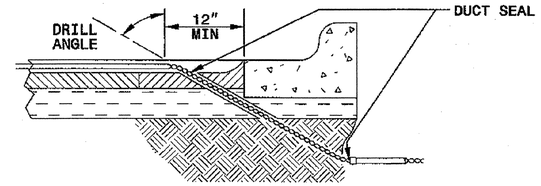


NOTE

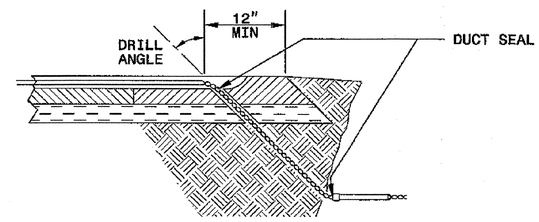
SPLICE ALL LOOP WIRE TAIL SECTIONS/LEAD-IN CABLE IN JUNCTION BOXES OR APPROVED CONDULETS.

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

5-07

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 016286 ENGINEER MILTON L. DEAN
SIGNATURE
9/5/07
DATE

05-SEP-2007 14:00
c:\documents and settings\mldean\desktop\standard metal pole sheets\1725d02_mod2301.dgn
mldean

PROJECT REFERENCE NO.	SHEET NO.
	Sig. 27

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

5-07

ENGLISH DETAIL DRAWING FOR

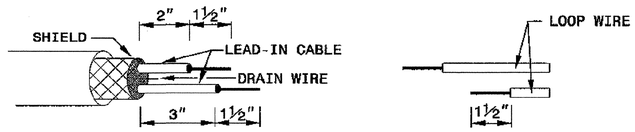
INDUCTION DETECTION LOOPS

SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

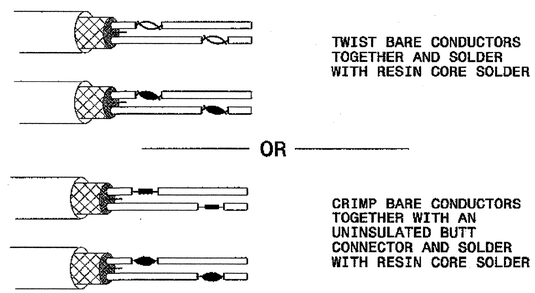
SHEET 3 OF 3

1725D01

STEP 1. STRIP LOOP WIRE AND LEAD-IN CABLE



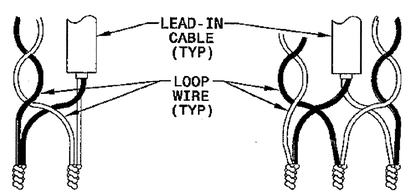
STEP 2. CONNECT AND SOLDER



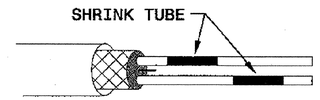
BOND SHIELD DRAIN WIRE AT SPLICE SECTIONS (DO NOT GROUND)

LOOP WIRE AND LEAD-IN CABLE CONNECTION DETAILS

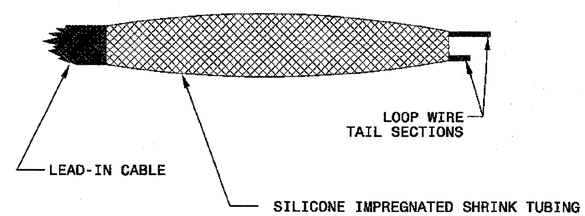
SINGLE CONNECTION SERIES CONNECTION



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.

5-07

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 016286 ENGINEER MILTON L. DEAN

Milton L. Dean 9/5/07
SIGNATURE DATE

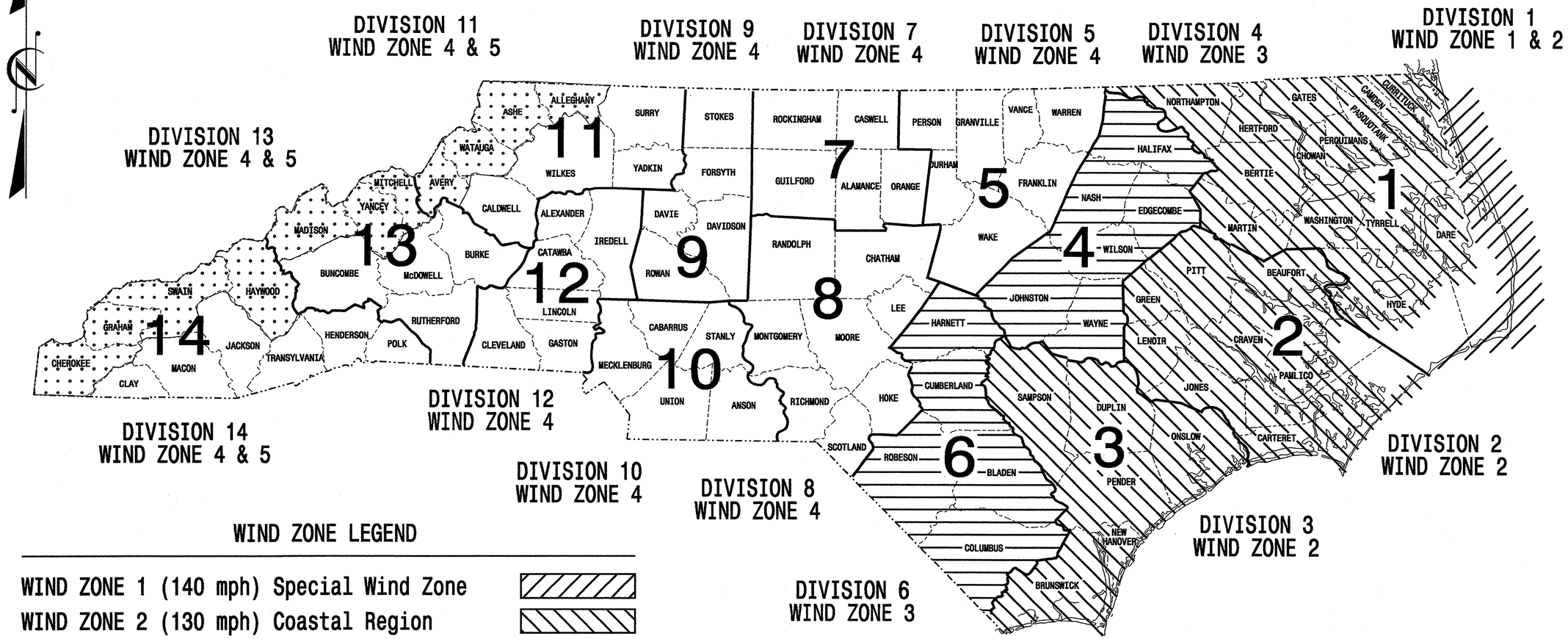
05-SEP-2007 14:01
c:\documents and settings\mdean\desktop\mastroncard metal pole sheets\1725d03.mwy2007.dgn

STATE	PROJECT NO.	SHEET NO.
N.C.		Sig. 88
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/tmssu/ws/default.htm

Prepared in the Offices of:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section

122 N. McDowell St., Raleigh, NC 27603

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:

TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

G. A. Fuller, P.E. – State ITS and Signals Engineer
R. E. Mullinax, P.E. – Signals and Geometrics Engineer
P. L. Alexander, P.E. – Signals and Geometrics Special Projects Engineer
D. C. Sarkar, P.E. – Signals and Geometrics Structural Engineer
A. M. Esposito, P.E. – Signals and Geometrics Project Engineer
C. F. Andrews, Jr. – Signals and Geometrics Project Engineer

SEAL

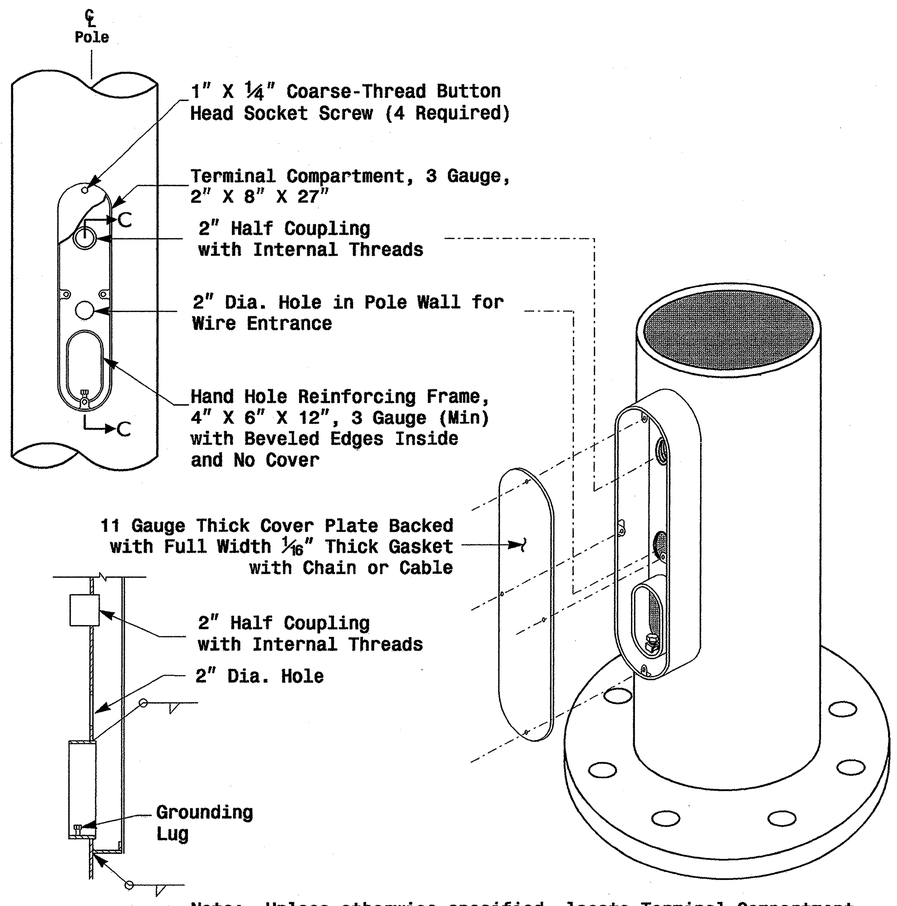
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

D. Sarkar — SIGNATURE

9.2.2005 — DATE

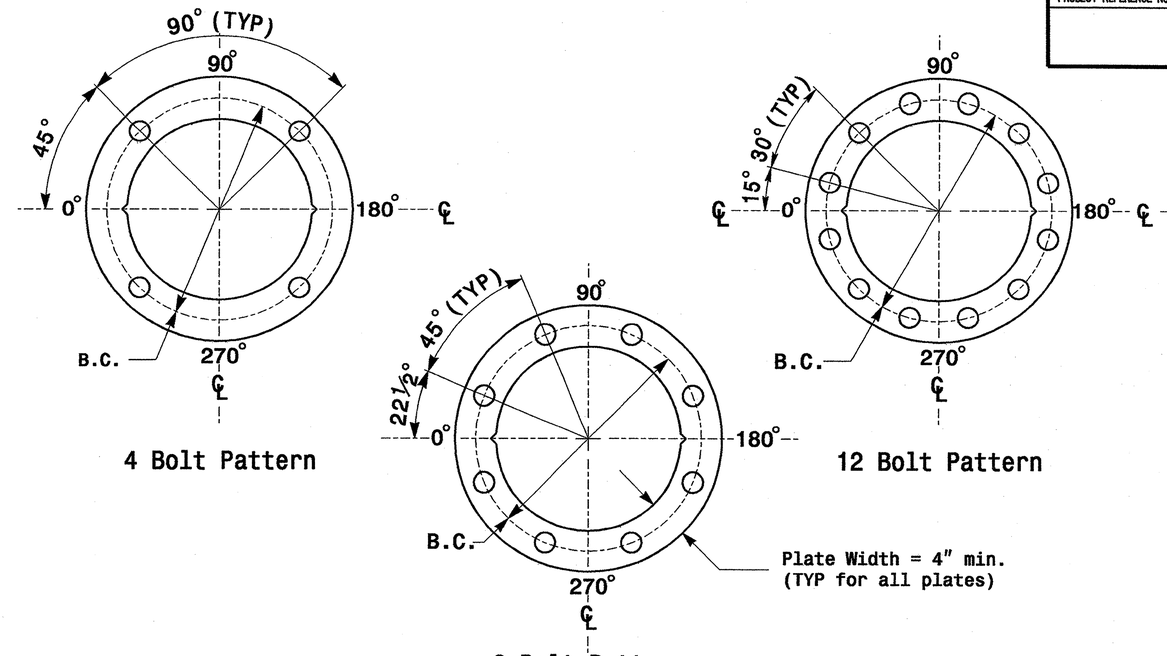
PROJECT REFERENCE NO.	SHEET NO.
	Sig. 89 M 2

Fabrication Details – All Poles



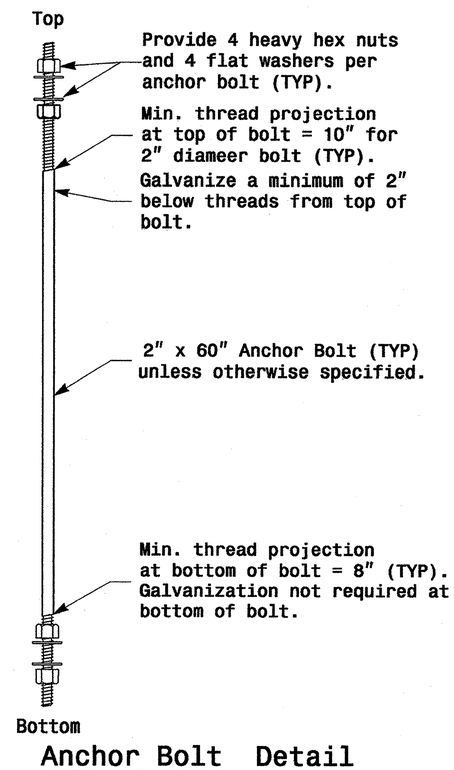
Note: Unless otherwise specified, locate Terminal Compartment 1 foot above the pole base plate at 180 degrees on the pole's radial index.

Terminal Compartment Detail



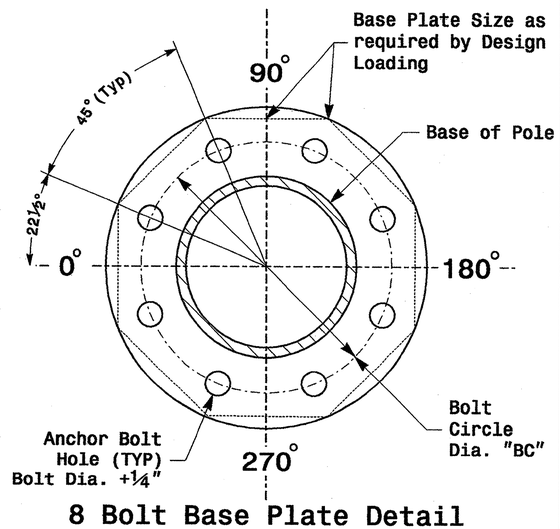
Construct Templates and Plates from ¼" min. thick Steel. Galvanizing is not required.

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

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Signals and Geometric Section, Division of Highways, N.C. Department of Transportation, 122 N. McDowell St., Raleigh, NC 27603

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

SCALE: 0 NA — NONE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DIBESH C. SARKAR

D. Sarkar 9.2.2005
SIGNATURE DATE

SIG. INVENTORY NO.

01-SEP-2005 18:22
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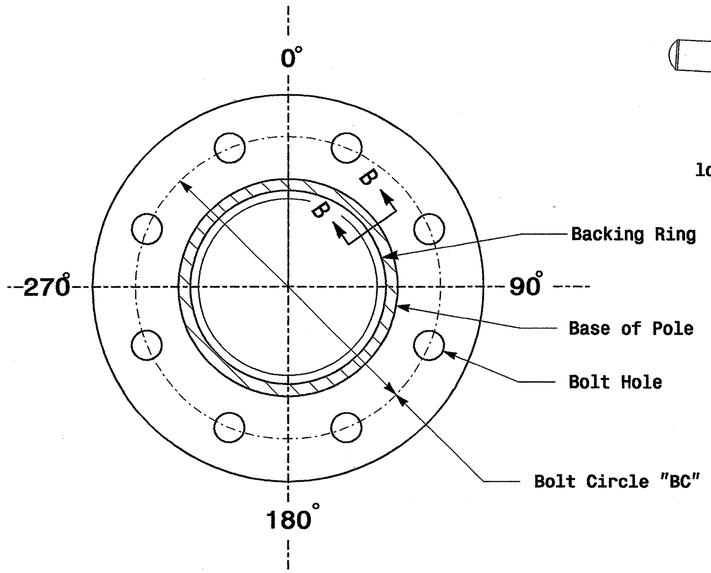
condrews

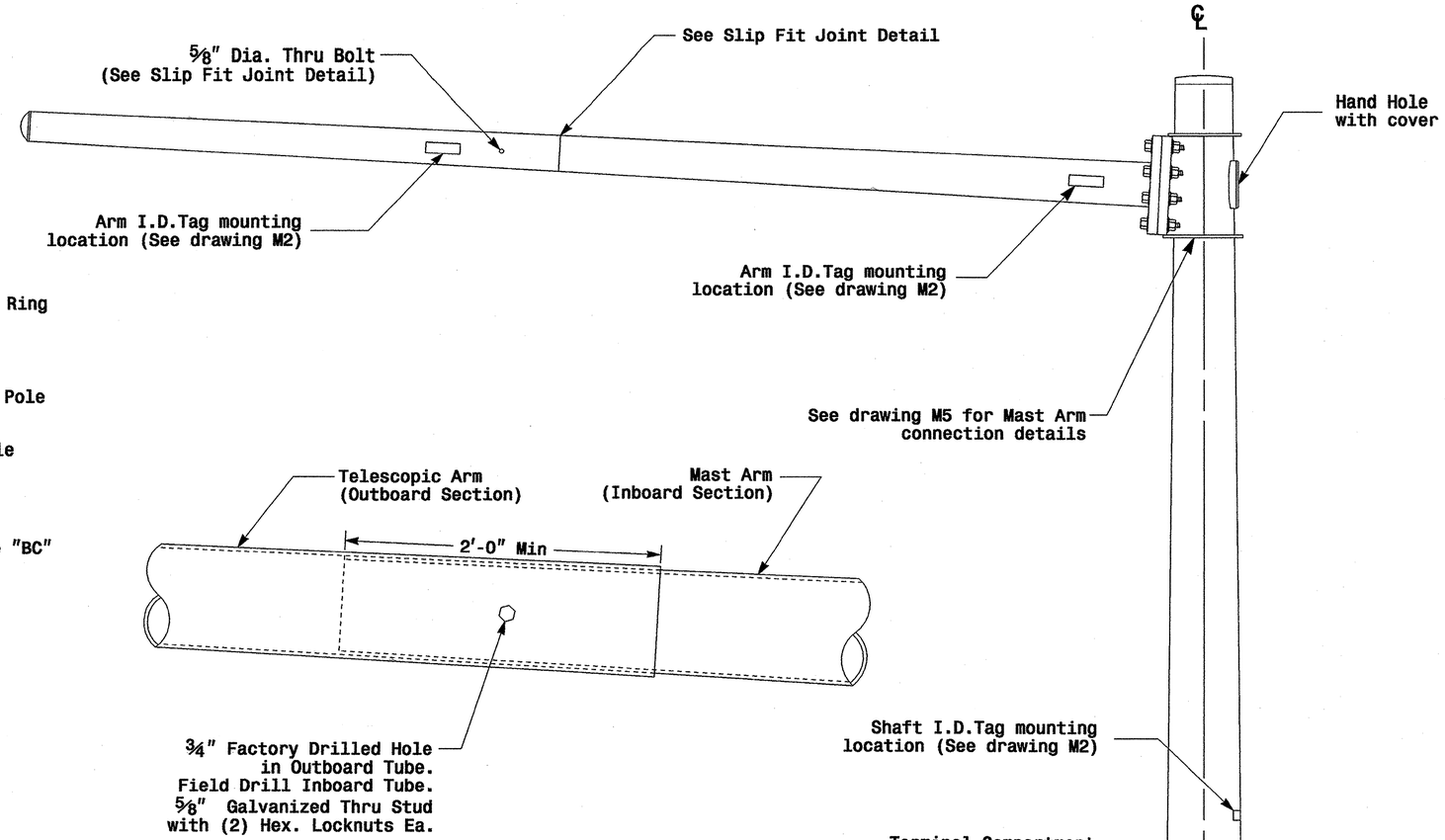
PROJECT REFERENCE NO.	SHEET NO.
	Sig. 90 M 4

Fabrication Details – Mast Arm Poles



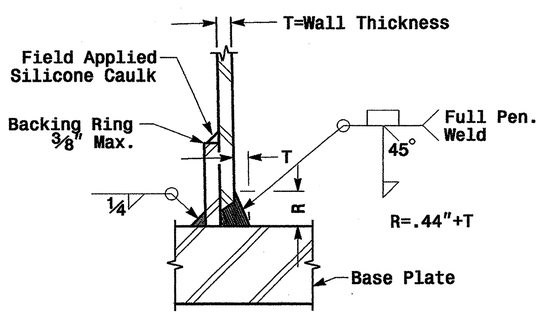
Section A-A
(See drawing M 2)

Pole Base Plate



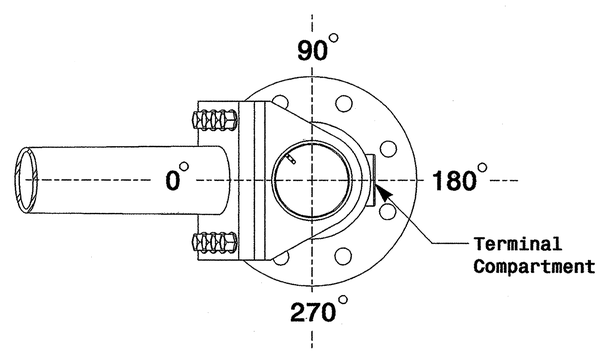
Slip Fit Joint Detail for Mast Arm

Monotube Mast Arm Pole
(.14in./ft. taper)



Section B-B
(Pole Attachment to Base Plate)

Full-Penetration Groove Weld Detail



Mast Arm Radial Orientation

Prepared in the Offices of:
Traffic Engineering and Roadway Standards Unit
Standards and Geometrics Section
122 N. McDowell St., Raleigh, NC 27603

SCALE
0 NA
NONE

Typical Fabrication Details
for Mast Arm Poles

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
SIGNATURE D. Sarkar DATE 9.2.2005
SIG. INVENTORY NO.

01-SEP-2005 14:08
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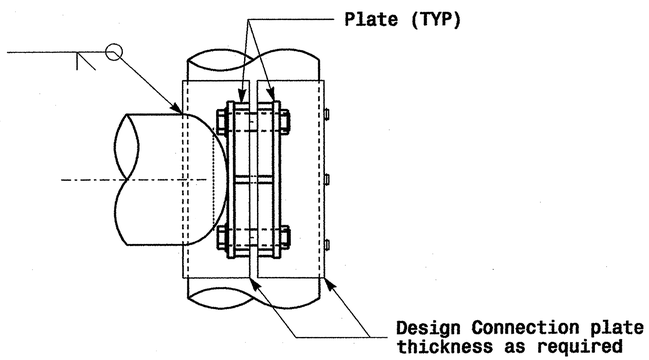
palexander

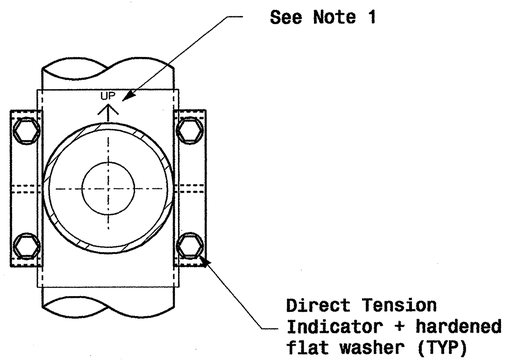
PROJECT REFERENCE NO.	SHEET NO.
	Sig. 91 M 5

Fabrication Details – Mast Arm Poles

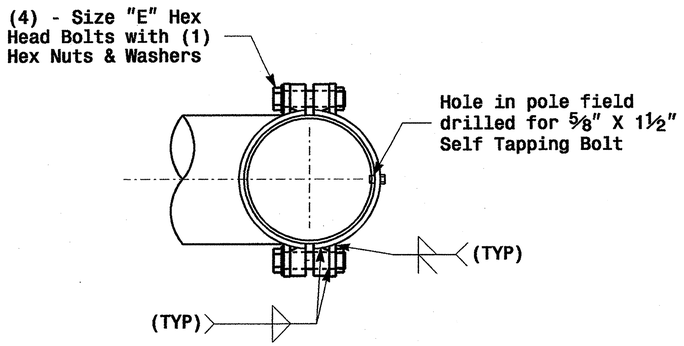
Adjustable Clamp Type Bolted Mast Arm Connection



Side Elevation View

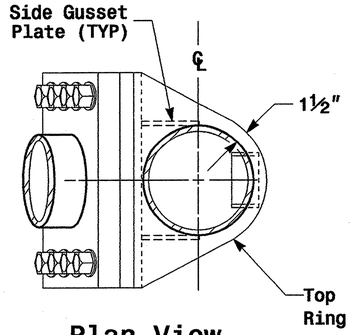


Front Elevation View

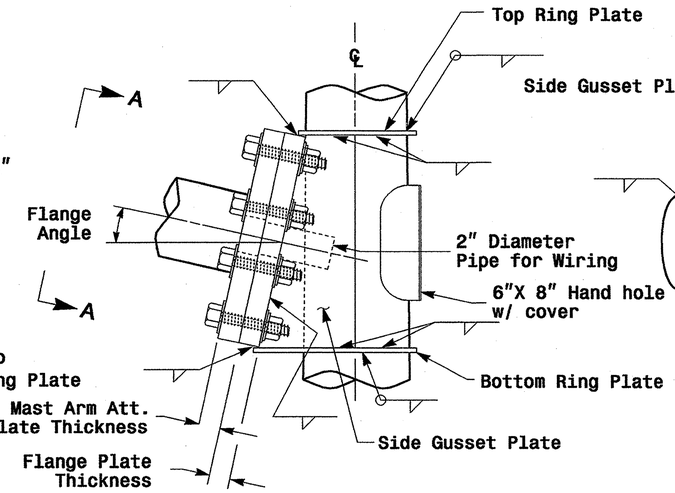


Plan View

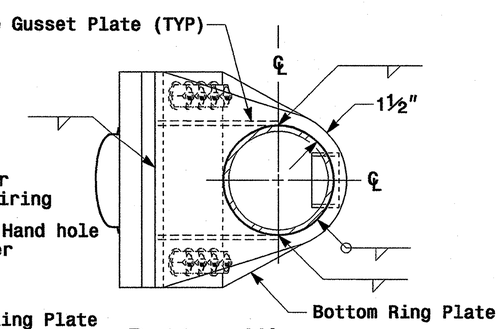
Welded Ring Stiffened Mast Arm Connection



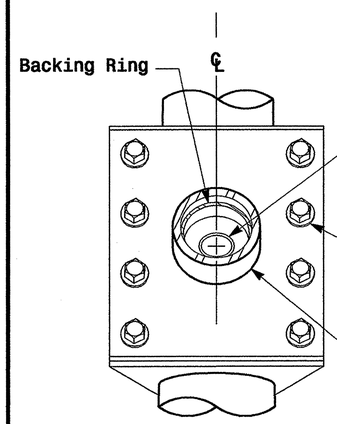
Plan View



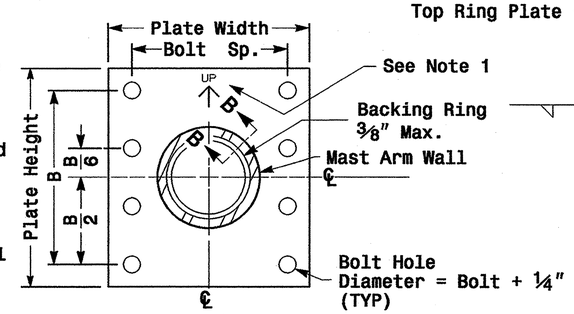
Side Elevation View



Bottom View

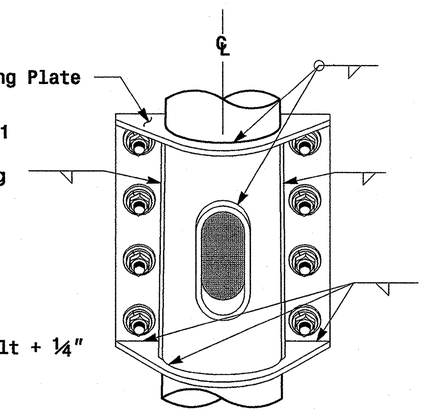


Front Elevation View

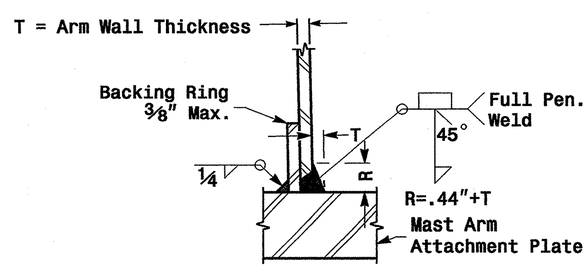


Section View A-A

Mast Arm Attachment Plate



Back Elevation View



Section B-B

Full-Penetration Groove Weld Detail

Notes:

1. Provide a permanent means of identification above the mast arm to indicate proper attachment orientation of the mast arm.
2. Designer will determine the size of all structural components, plates, fasteners, and welds shown unless they are already specified.
3. Designer is responsible for providing appropriate drainage points.

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Structure and Geotechnical Section, Department of Transportation, State of North Carolina, 122 N. McDonald St., Raleigh, NC 27603

Fabrication Details For Mast Arm Connection To Pole

PLAN DATE: May 2005	REVIEWED BY: C.F. Andrews
PREPARED BY: P.L. Alexander	REVIEWED BY: A.M. Esposito

REVISIONS	INIT.	DATE

SCALE: 0 NA — NONE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

SIGNATURE: D. Sarkar DATE: 9.2.2005

SIG. INVENTORY NO.

01-SEP-2005 14:11
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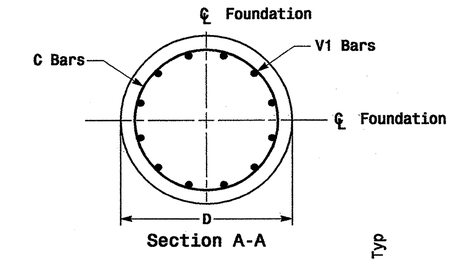
palexander

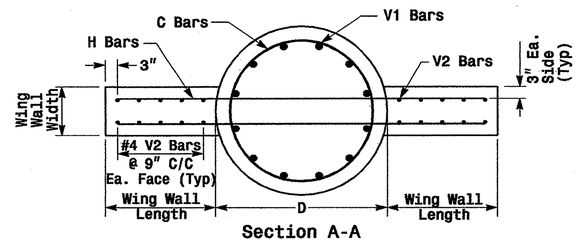
PROJECT REFERENCE NO.	SHEET NO.
	Sig. 92 M 7

Construction Details – Foundations

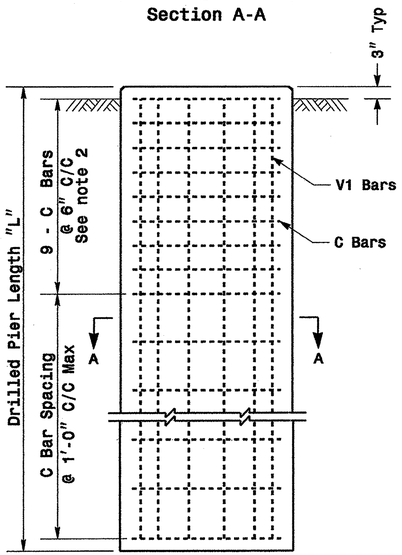
Reinforcing Steel Bars

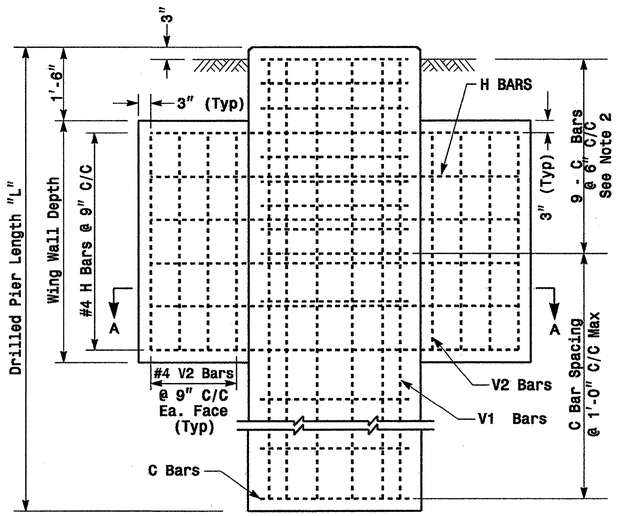


Section A-A



Section A-A



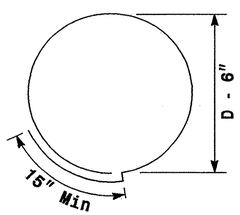


REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (42" & 48" DIAMETER)						
Shaft Dia (in.)	Conc. Volume (cu. yds.)	Bar Name	No.	Size	Type	Length
42"	.356 x L	V1	9	#8	STR.	**
		C	*	#4	CIR.	10'-9"
48"	.465 x L	V1	12	#8	STR.	**
		C	*	#4	CIR.	12'-6"

* 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



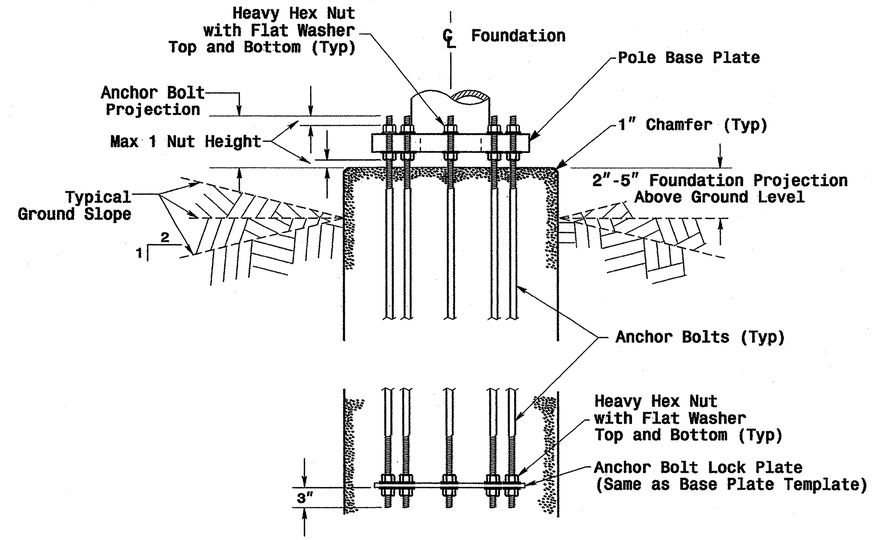
Typical "C" Bars

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

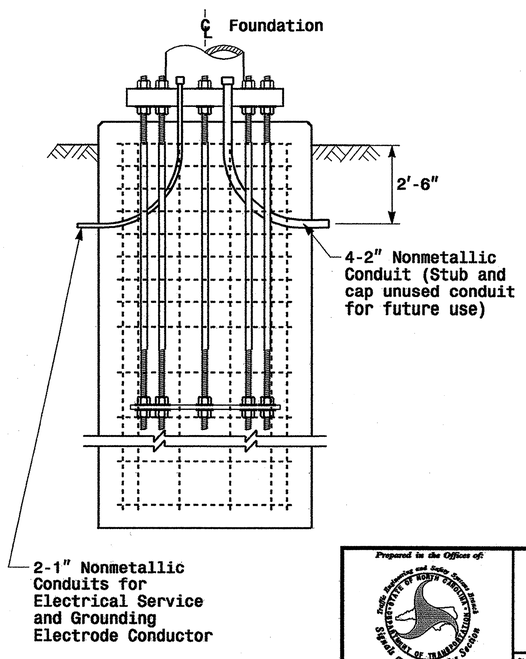
See Note No. 4

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, 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

SCALE: 0 NA — NONE

REVISIONS	INIT.	DATE

SEAL: North Carolina Professional Engineer Seal 028094, Dhiresh C. Sarkar

D. Sarkar 9.2.2005
SIGNATURE DATE

SIG. INVENTORY NO.

01-SEP-2005 17:48
w:\people\es-unit\workgroups\2004 metal pole standards\2004 mf.dgn
pb19kcarder

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 93

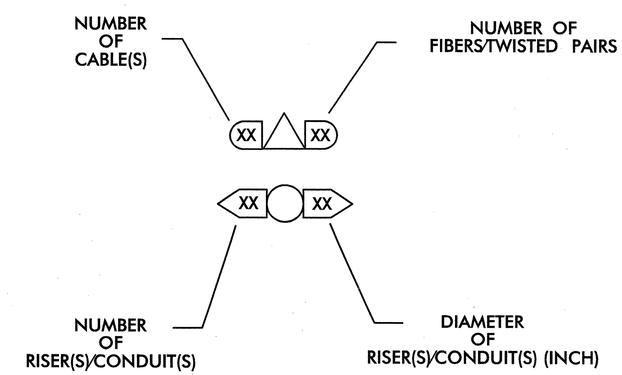
1. INSTALL REA, PE – 22, SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
2. INSTALL REA, PE – 38, (FIGURE – 8) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
3. INSTALL REA, PE – 39, (UNDERGROUND) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
4. INSTALL SMFO CABLE
5. INSTALL MMFO CABLE
6. INSTALL FIBER OPTIC 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. INSTALL FIBER OPTIC TRANSCEIVER

LEGEND

- FO — NEW FIBER OPTIC COMMUNICATIONS CABLE
- DD — NEW DIRECTIONAL DRILLED CONDUIT
- NEW CONDUIT
- EXISTING WOOD POLE
- S — NEW AERIAL SPLICE ENCLOSURE
- S — EXISTING AERIAL SPLICE ENCLOSURE
- NEW STANDARD GUY ASSEMBLY
- NEW CABLE STORAGE RACKS (SNOW SHOES)
- EXISTING CONTROLLER AND CABINET
- M — NEW MASTER CONTROLLER AND CABINET
- 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)



PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh N.C. 27636-3068
(919) 677-2000

Traffic Engineering and Safety Systems Branch
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
750 Greenfield Pkwy., Garner, NC 27529

SR 1783 (Upward Road)
Closed-Loop System
CONSTRUCTION NOTES AND LEGEND

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:	
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10/21/08 DATE

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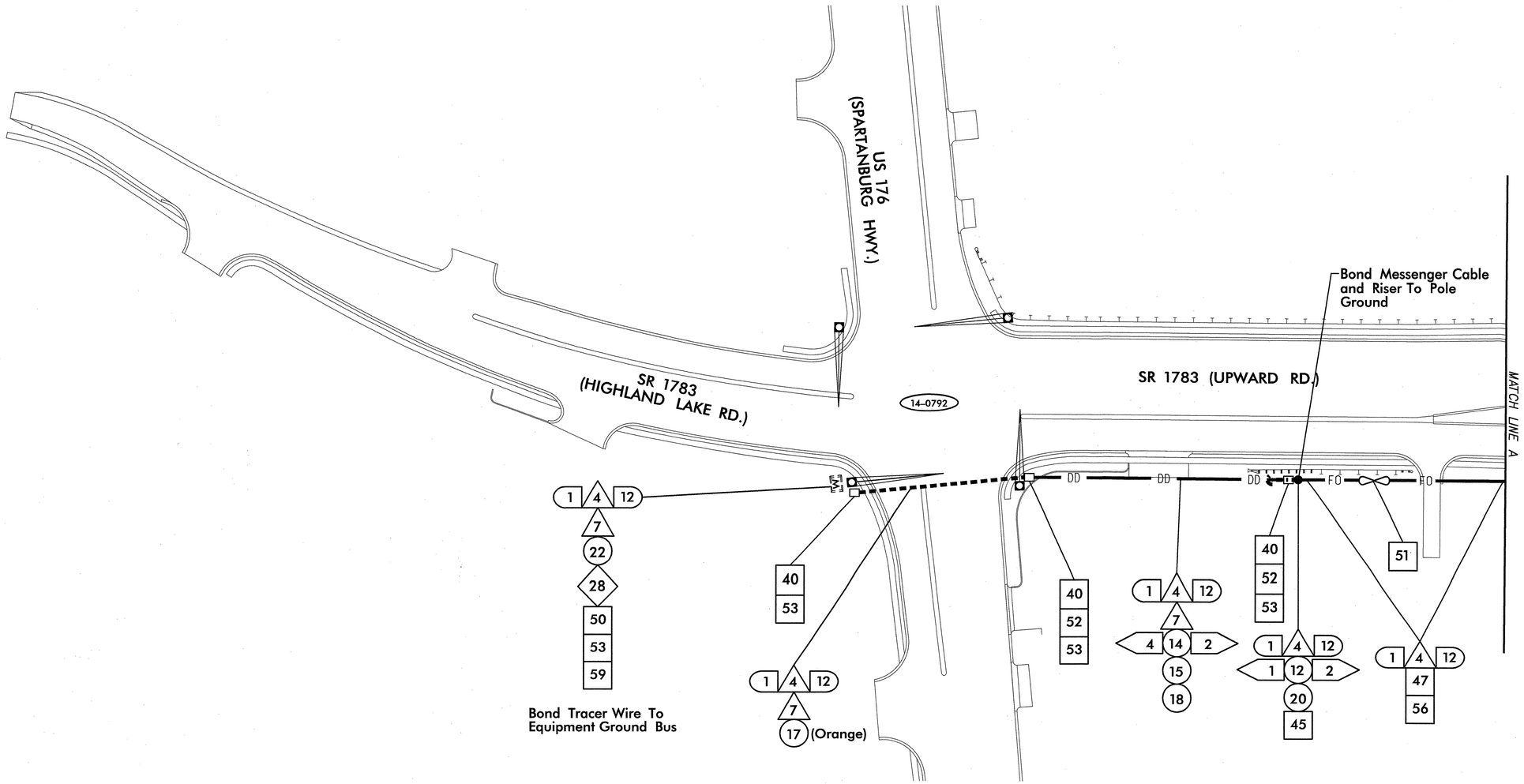
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 94



NOTES:

1. All attachment points are 40" below power company neutral unless otherwise noted.
2. At the direction of the Engineer, in TCP Phase 1, install messenger cable to reserve spot on pole for NCDOT SMFO cable attachment location on new pole line (See TCP Phase 1). Identify messenger cable by installing communications cable ID marker on new pole line.

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750 Greenfield Pkwy., Garner, NC 27529

SCALE 0 50

SR 1783 (Upward Road) Closed-Loop System
CABLE ROUTING SHEET

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

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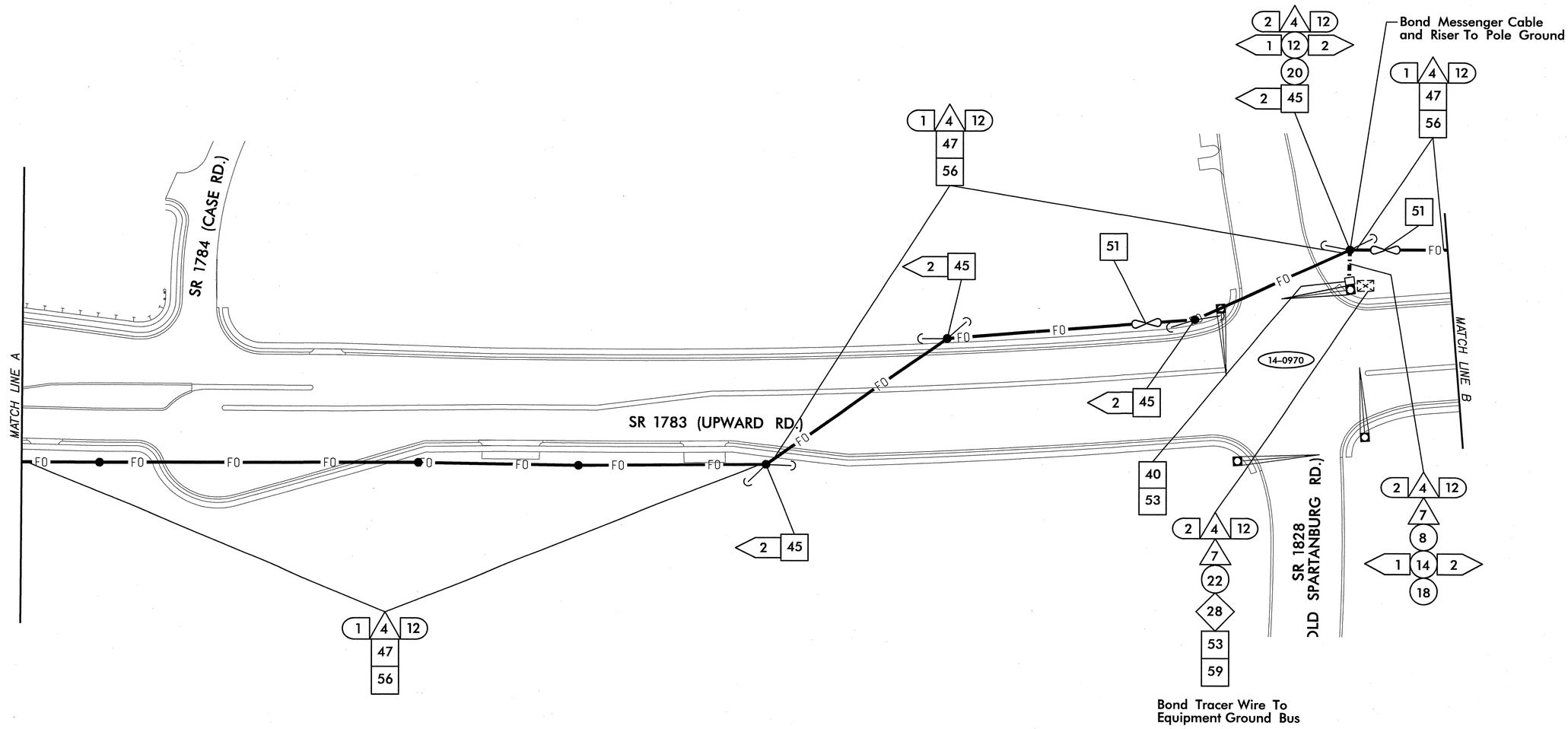
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 95



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750 Greenfield Pkwy., Garner, NC 27529

SCALE 0 50

SR 1783 (Upward Road)
Closed-Loop System
CABLE ROUTING SHEET

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

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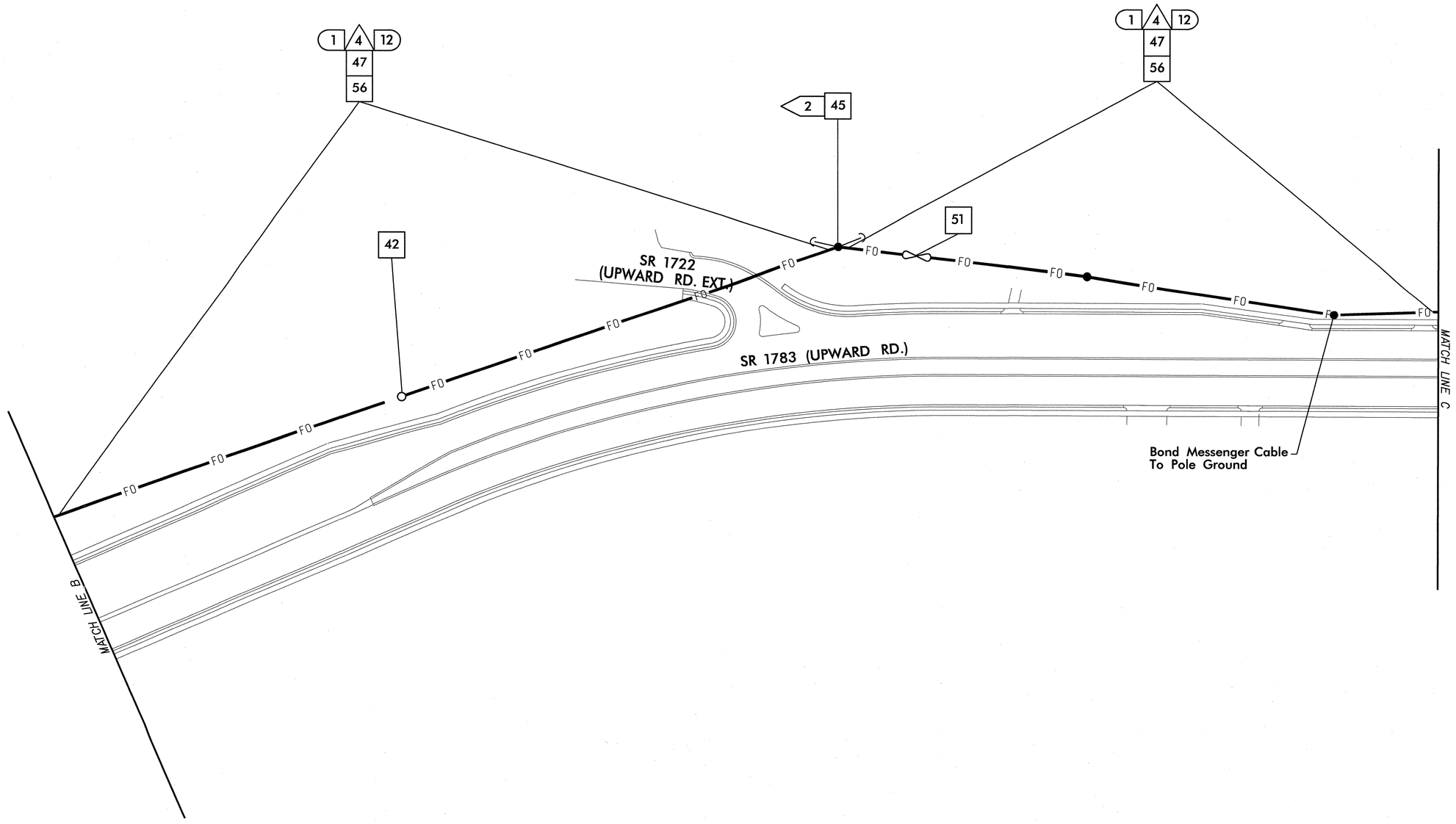
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 96



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SCALE 0 50

SR 1783 (Upward Road) Closed-Loop System
CABLE ROUTING SHEET

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

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NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10.21.08 DATE

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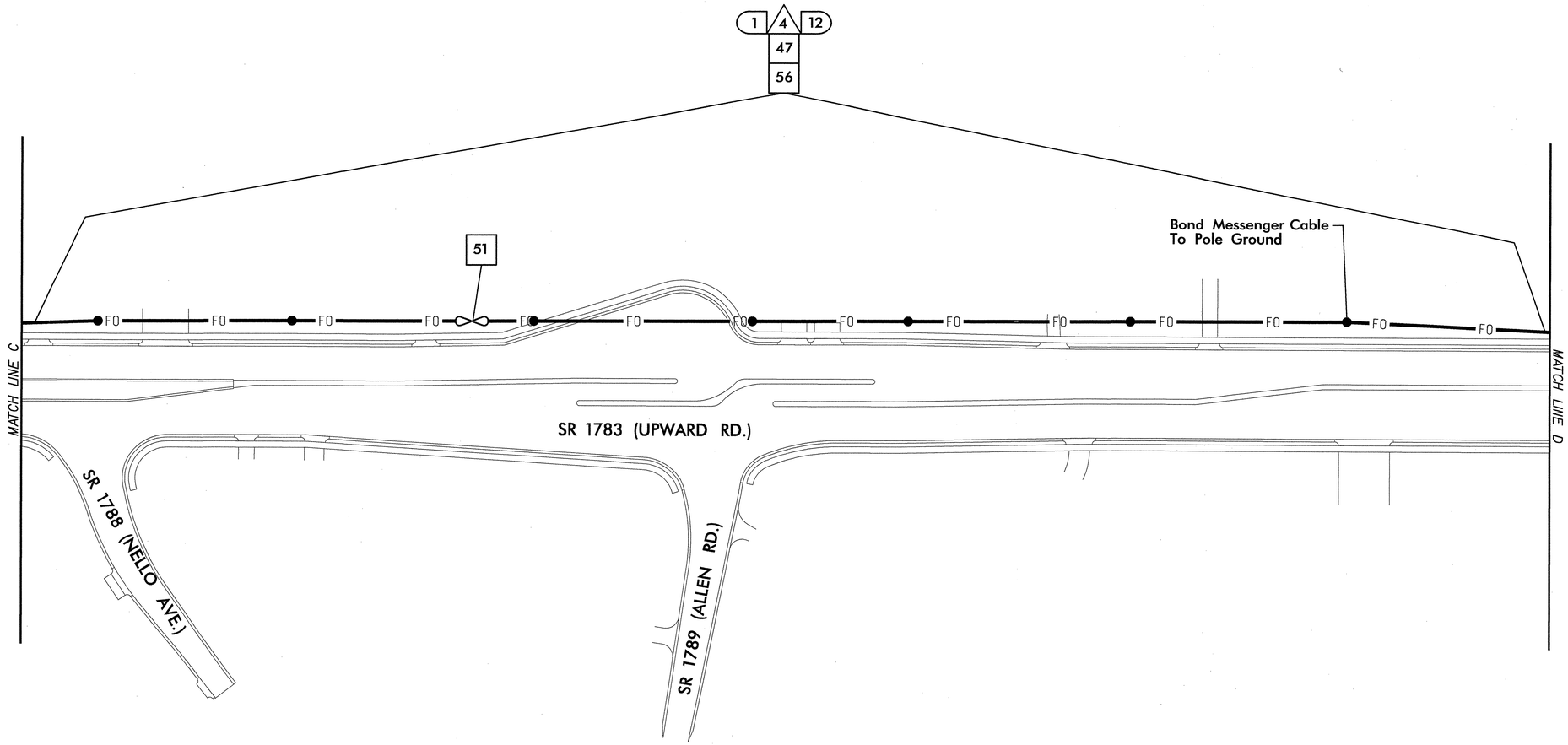
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 97



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SCALE 0 50

SR 1783 (Upward Road) Closed-Loop System
CABLE ROUTING SHEET

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

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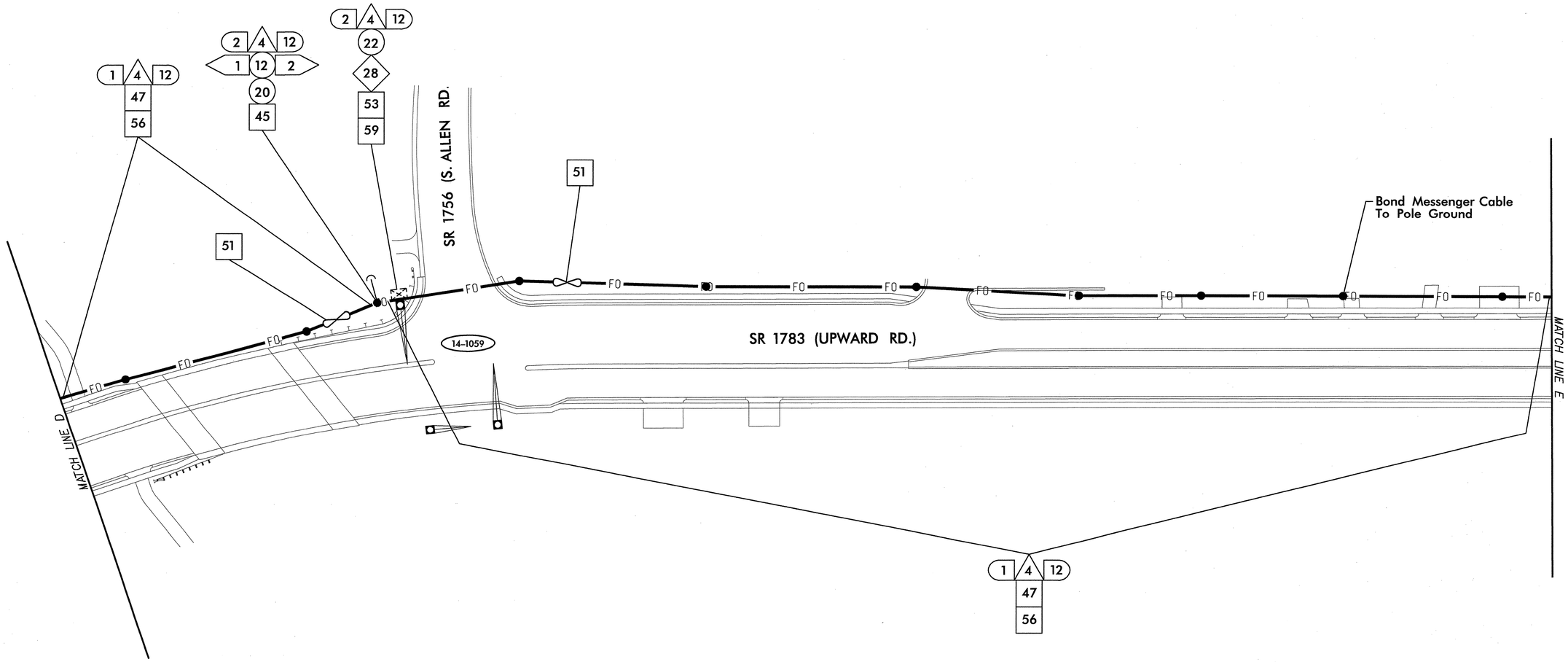
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 98



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Institute of North Carolina Transportation Systems
750 Greenfield Pkwy., Garner, NC 27529

SCALE 0 50

SR 1783 (Upward Road) Closed-Loop System
CABLE ROUTING SHEET

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

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NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

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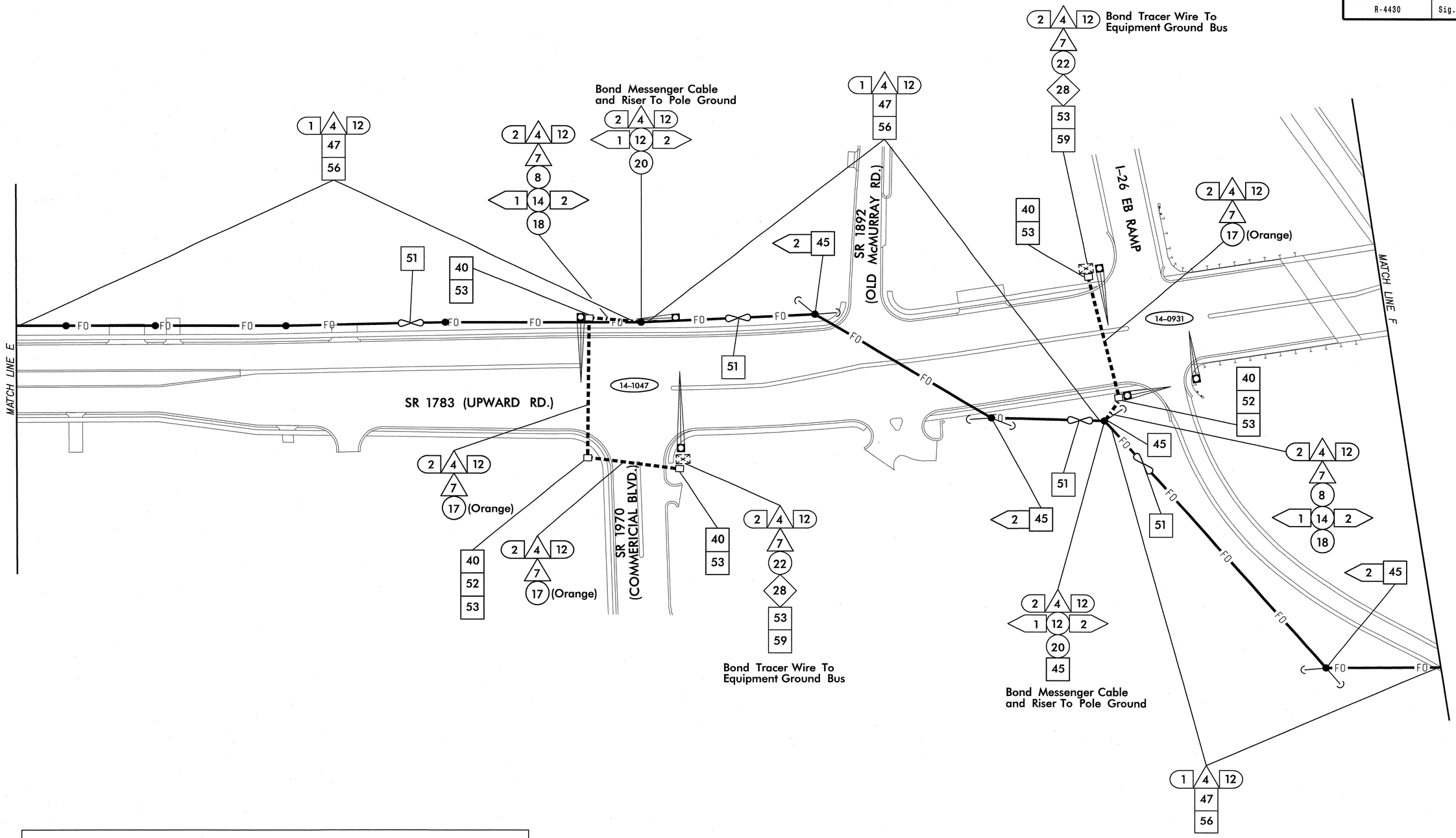
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 99



NOTES:

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2. At the direction of the Engineer, in TCP Phase 1, install messenger cable to reserve spot on pole for NCDOT SMFO cable attachment location on new pole line (See TCP Phase 1). Identify messenger cable by installing communications cable ID marker on new pole line.

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(919) 677-2000

Traffic Engineering and Safety Systems Branch
Division of Highways
Department of Transportation
750 Greenfield Pkwy., Garner, NC 27529

SCALE 0 50

SR 1783 (Upward Road) Closed-Loop System
CABLE ROUTING SHEET

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:

PREPARED BY: J.C. Cross REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

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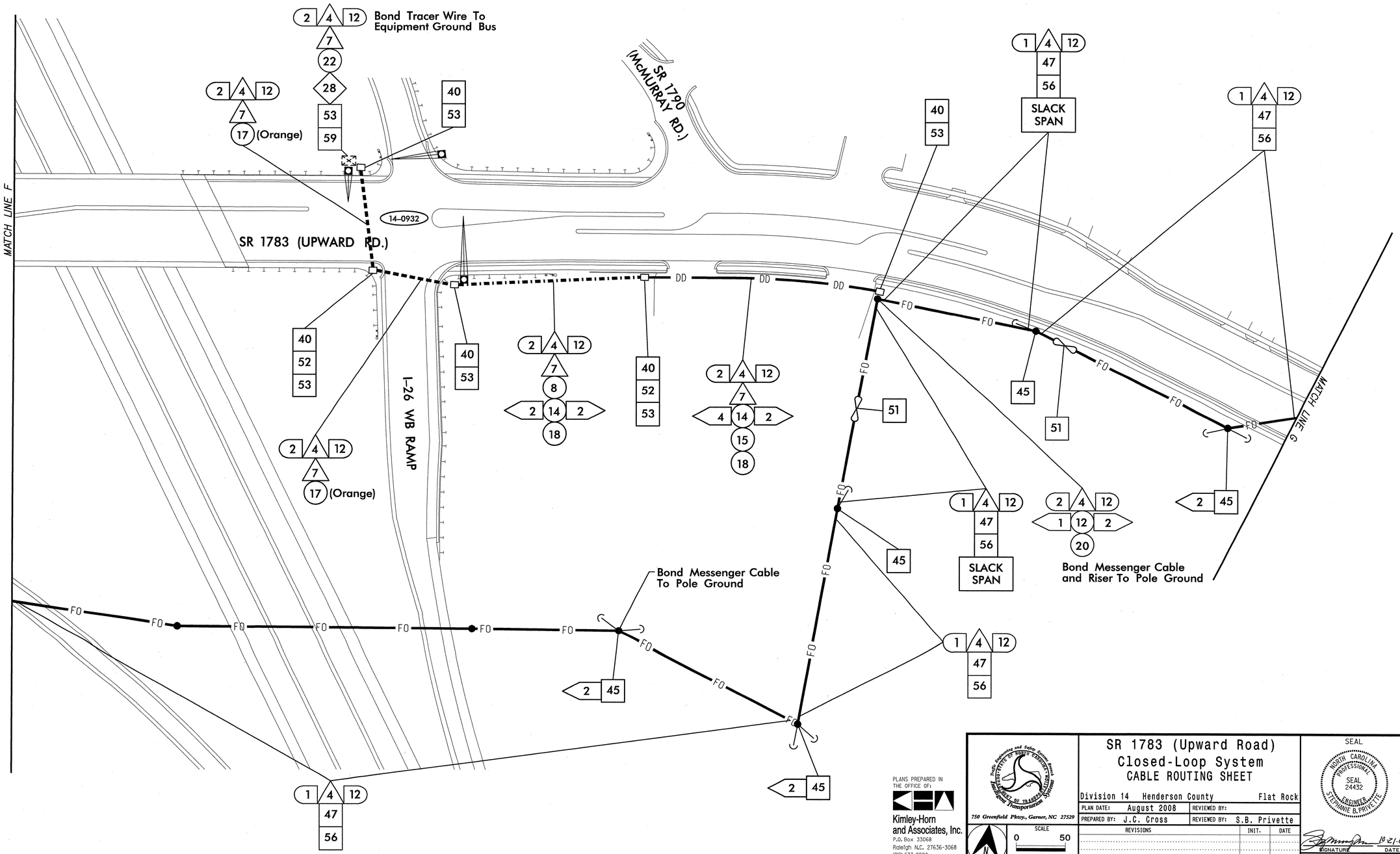
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 100

NOTES:
1. All attachment points are 40" below power company neutral unless otherwise noted.
2. At the direction of the Engineer, in TCP Phase 1, install messenger cable to reserve spot on pole for NCDOT SMFO cable attachment location on new pole line (See TCP Phase 1). Identify messenger cable by installing communications cable ID marker on new pole line.



PLANS PREPARED IN THE OFFICE OF:
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(919) 677-2000

750 Greenfield Pkwy., Garner, NC 27529

SCALE 0 50

SR 1783 (Upward Road) Closed-Loop System
CABLE ROUTING SHEET

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

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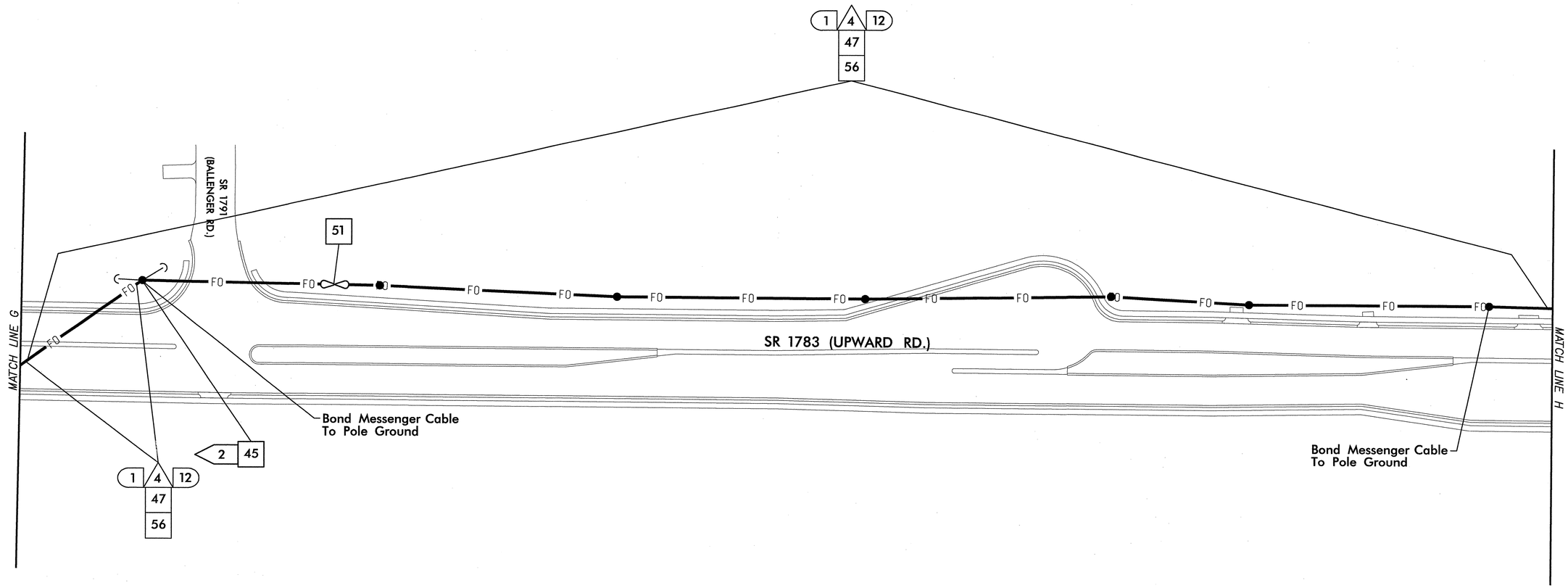
PROJECT REFERENCE NO.	SHEET NO.
R-4430	SIG. 101



NOTES:

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SCALE 0 50

SR 1783 (Upward Road) Closed-Loop System
CABLE ROUTING SHEET

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

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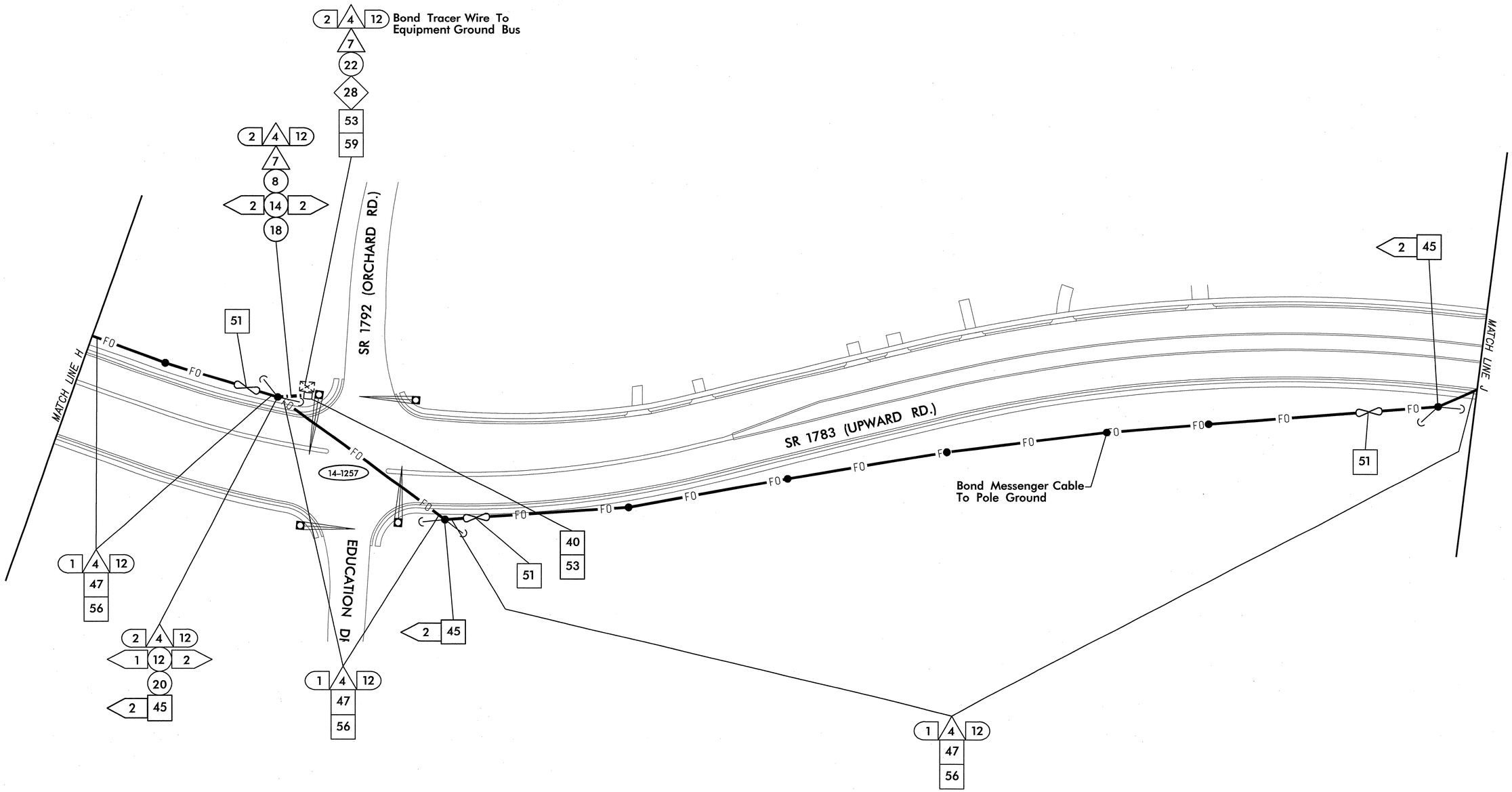
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 102



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Raleigh N.C. 27636-3068
(919) 677-2000

Traffic Engineering and Safety Systems Branch
Department of Transportation
750 Greenfield Pkwy., Garner, NC 27529

SCALE 0 50

SR 1783 (Upward Road) Closed-Loop System
CABLE ROUTING SHEET

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008 REVIEWED BY:

PREPARED BY: J.C. Cross REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

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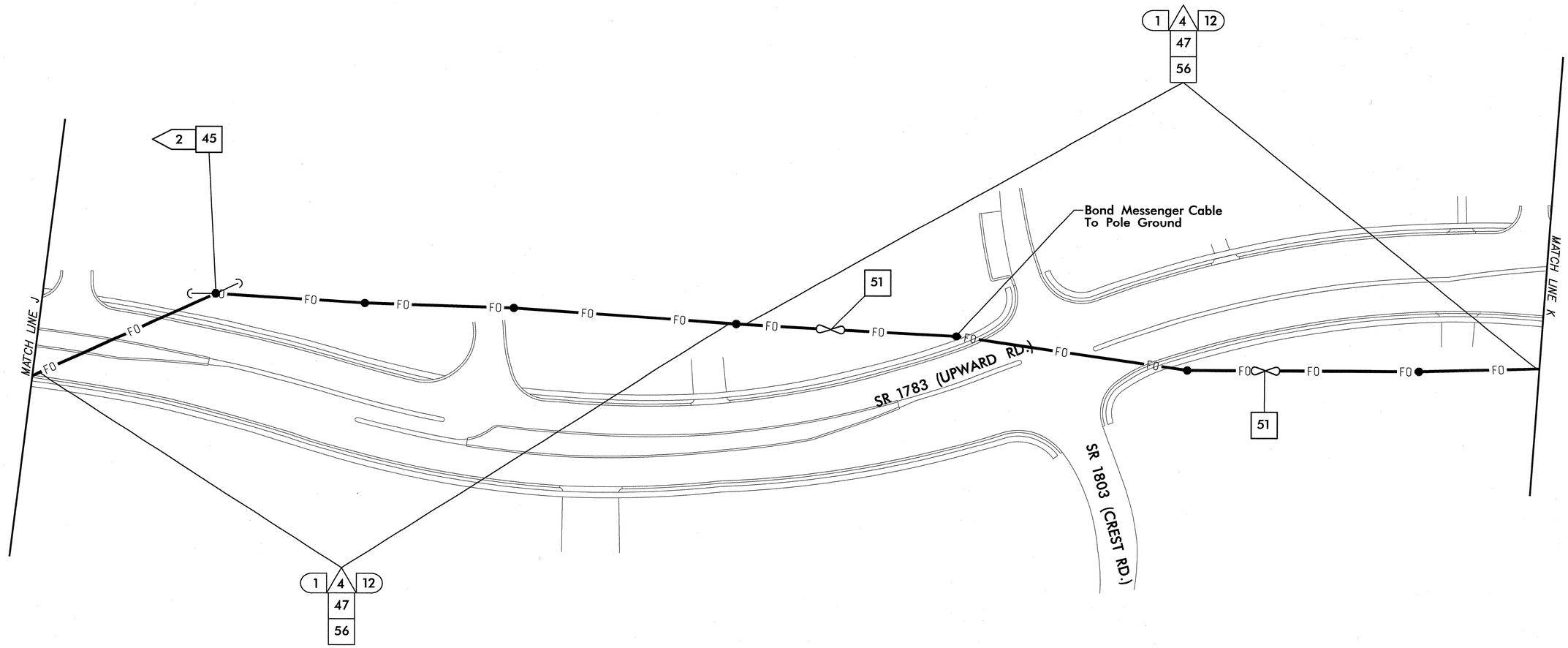
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 103



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(919) 677-2000

750 Greenfield Pkwy., Garner, NC 27529

SCALE 0 50

SR 1783 (Upward Road) Closed-Loop System
CABLE ROUTING SHEET

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

CADD Filename:

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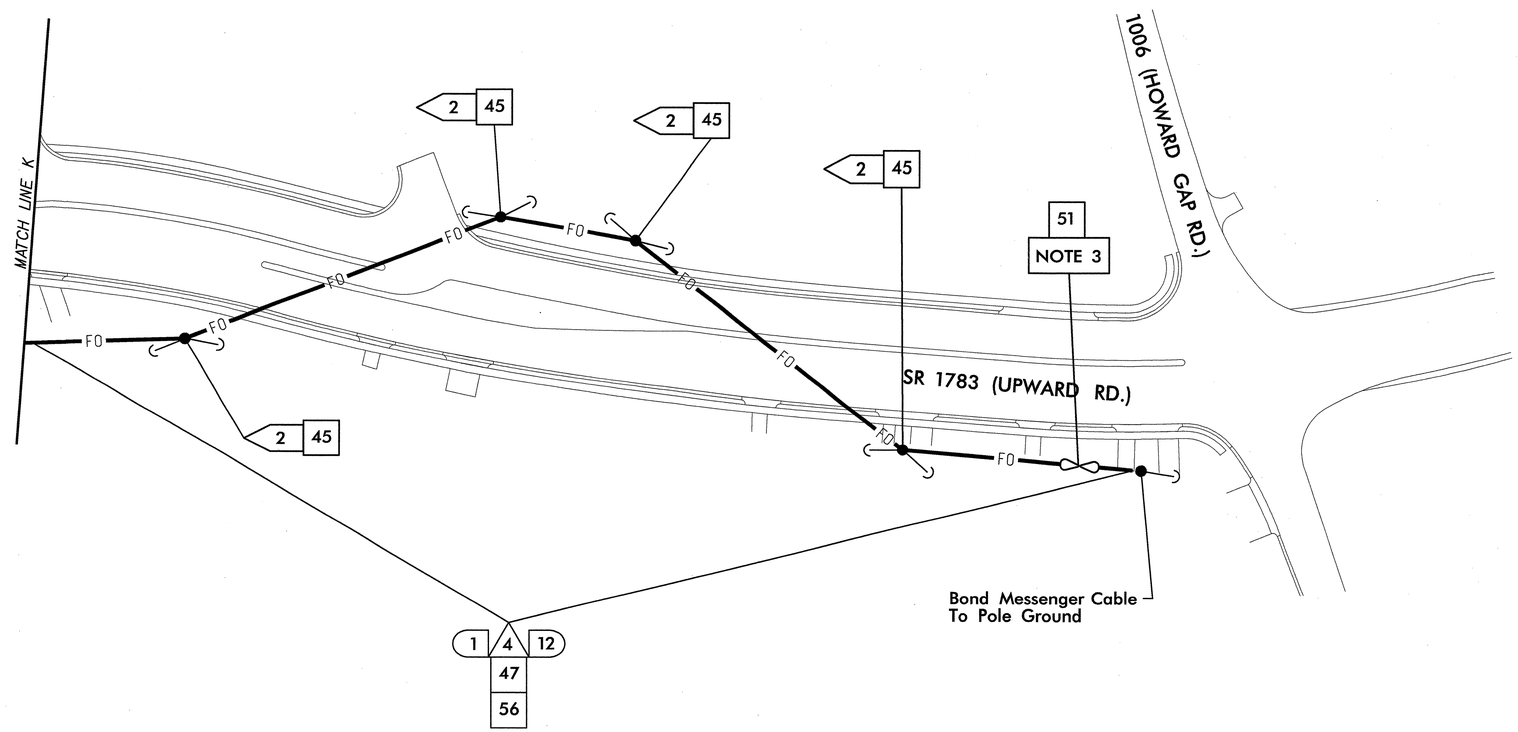
PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 104



NOTES:

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2. At the direction of the Engineer, in TCP Phase 1, install messenger cable to reserve spot on pole for NCDOT SMFO cable attachment location on new pole line (See TCP Phase 1). Identify messenger cable by installing communications cable ID marker on new pole line.
3. Cap and seal all fibers.

PLANS PREPARED IN THE OFFICE OF:

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P.O. Box 33068
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750 Greenfield Pkwy., Garner, NC 27529

SCALE 0 50

SR 1783 (Upward Road)
Closed-Loop System
CABLE ROUTING SHEET

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:	
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE DATE 10-21-08

CADD Filename:

10/22/2008 12:54:55 PM jerry.cross k:\ra2_roadway\011008\08\traffic\Cable Routing\SMFO2.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 105

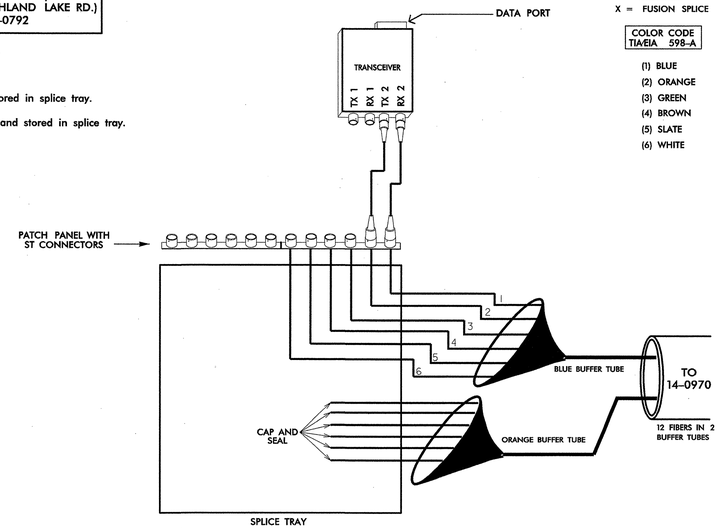
MASTER

US 176 (SPARTANBURG HWY.) AT
SR 1783 (UPWARD RD./HIGHLAND LAKE RD.)
SIG. INV. # 14-0792

Notes:

Unused fibers left coiled and stored in splice tray.

Unused Buffer Tubes left coiled and stored in splice tray.



LEGEND
X = FUSION SPLICE

COLOR CODE TIA/EIA 598-A

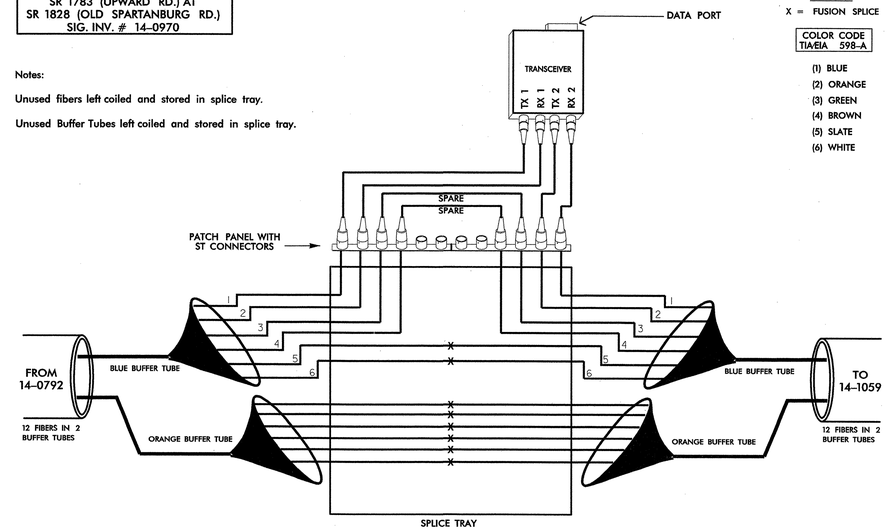
(1) BLUE
(2) ORANGE
(3) GREEN
(4) BROWN
(5) SLATE
(6) WHITE

SR 1783 (UPWARD RD.) AT
SR 1828 (OLD SPARTANBURG RD.)
SIG. INV. # 14-0970

Notes:

Unused fibers left coiled and stored in splice tray.

Unused Buffer Tubes left coiled and stored in splice tray.



LEGEND
X = FUSION SPLICE

COLOR CODE TIA/EIA 598-A

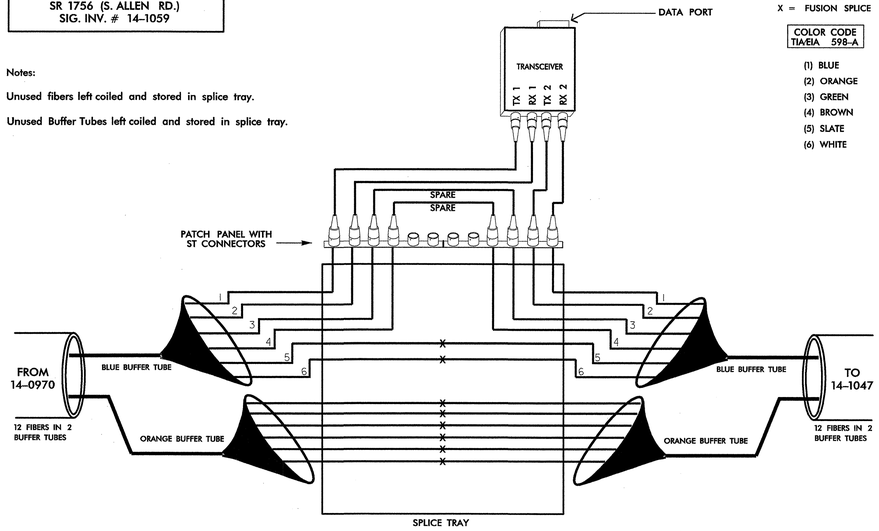
(1) BLUE
(2) ORANGE
(3) GREEN
(4) BROWN
(5) SLATE
(6) WHITE

SR 1783 (UPWARD RD.) AT
SR 1756 (S. ALLEN RD.)
SIG. INV. # 14-1059

Notes:

Unused fibers left coiled and stored in splice tray.

Unused Buffer Tubes left coiled and stored in splice tray.



LEGEND
X = FUSION SPLICE

COLOR CODE TIA/EIA 598-A

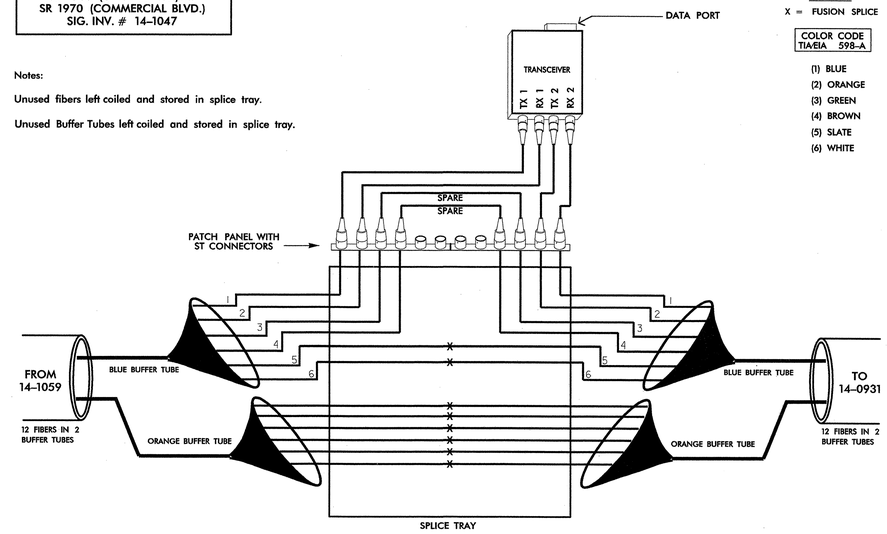
(1) BLUE
(2) ORANGE
(3) GREEN
(4) BROWN
(5) SLATE
(6) WHITE

SR 1783 (UPWARD RD.) AT
SR 1970 (COMMERCIAL BLVD.)
SIG. INV. # 14-1047

Notes:

Unused fibers left coiled and stored in splice tray.

Unused Buffer Tubes left coiled and stored in splice tray.



LEGEND
X = FUSION SPLICE

COLOR CODE TIA/EIA 598-A

(1) BLUE
(2) ORANGE
(3) GREEN
(4) BROWN
(5) SLATE
(6) WHITE

TRANSCEIVER TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING/ENSURING PROPER TERMINATIONS.

PLANS PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh N.C. 27636-3068
(919) 677-2000

Traffic Engineering and Safety Systems Branch
Division of Highways
Department of Transportation
750 Greenfield Pkwy., Garner, NC 27529

SCALE
0
N/A

SR 1783 (Upward Road) Closed-Loop System
SPLICE DIAGRAM

Division 14 Henderson County Flat Rock

PLAN DATE:	August 2008	REVIEWED BY:	
PREPARED BY:	J.C. Cross	REVIEWED BY:	S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE DATE 10-21-08

CADD Filename:

k:\tel_roadway\01100810\traffic\Cable Routing\SHT13-splice.dgn
10/22/2008 12:55:01 PM jerry.cross

PROJECT REFERENCE NO.	SHEET NO.
R-4430	Sig. 106

SR 1783 (UPWARD RD.) AT
I-26 EASTBOUND RAMPS
SIG. INV. # 14-0931

Notes:

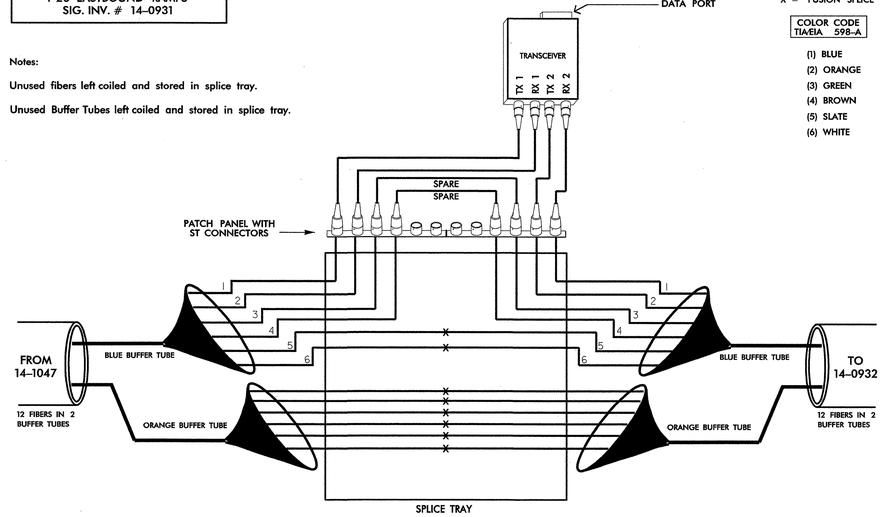
Unused fibers left coiled and stored in splice tray.

Unused Buffer Tubes left coiled and stored in splice tray.

LEGEND
X = FUSION SPLICE

COLOR CODE
TIA/EIA 598-A

(1) BLUE
(2) ORANGE
(3) GREEN
(4) BROWN
(5) SLATE
(6) WHITE



SR 1783 (UPWARD RD.) AT
I-26 WESTBOUND RAMPS
SIG. INV. # 14-0932

Notes:

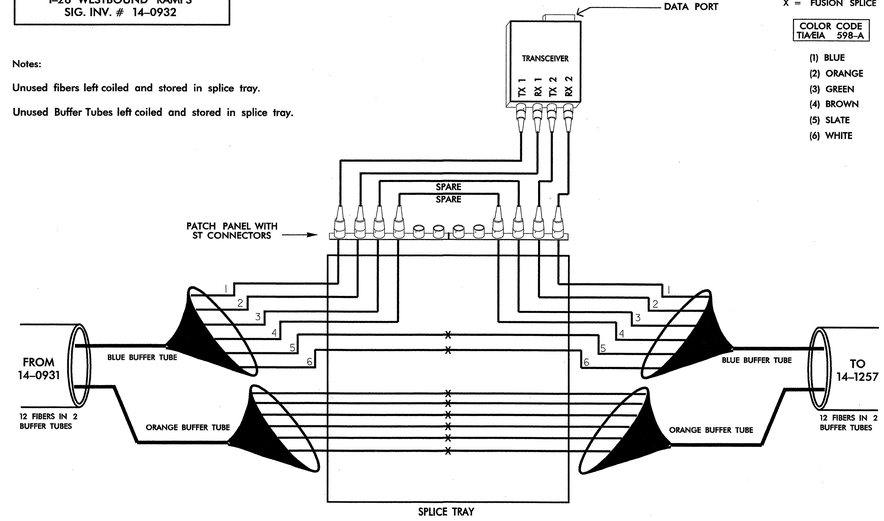
Unused fibers left coiled and stored in splice tray.

Unused Buffer Tubes left coiled and stored in splice tray.

LEGEND
X = FUSION SPLICE

COLOR CODE
TIA/EIA 598-A

(1) BLUE
(2) ORANGE
(3) GREEN
(4) BROWN
(5) SLATE
(6) WHITE



SR 1783 (UPWARD RD.) AT
SR 1792 (ORCHARD RD.)/EDUCATION DR.
SIG. INV. # 14-1257

Notes:

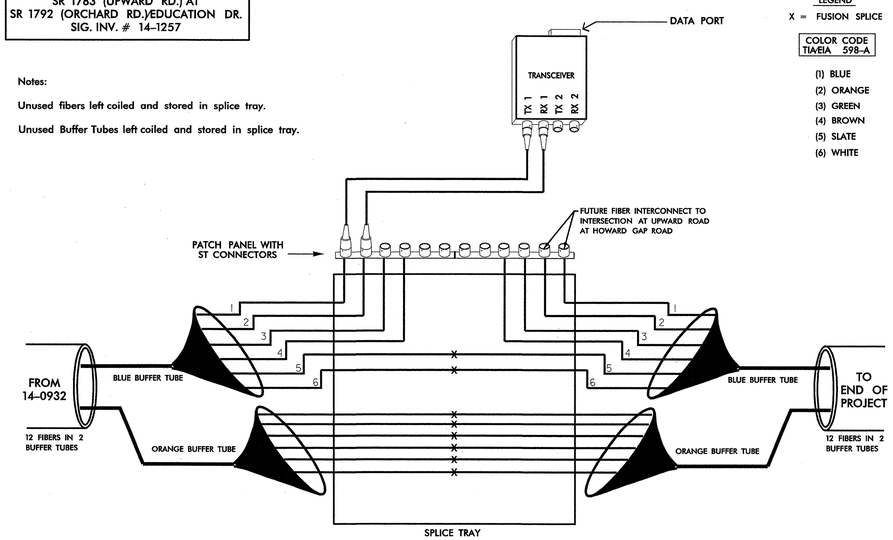
Unused fibers left coiled and stored in splice tray.

Unused Buffer Tubes left coiled and stored in splice tray.

LEGEND
X = FUSION SPLICE

COLOR CODE
TIA/EIA 598-A

(1) BLUE
(2) ORANGE
(3) GREEN
(4) BROWN
(5) SLATE
(6) WHITE



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PLANS PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh N.C. 27636-3068
(919) 677-2000

750 Greenfield Pkwy., Garner, NC 27529

0
N/A

SR 1783 (Upward Road) Closed-Loop System
SPLICE DIAGRAM

Division 14 Henderson County Flat Rock

PLAN DATE: August 2008	REVIEWED BY:
PREPARED BY: J.C. Cross	REVIEWED BY: S.B. Privette

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24432 ENGINEER STEPHANIE B. PRIVETTE

SIGNATURE 10-21-08 DATE

CADD Filenames

k:\rdl_roadway\011006\08\traffic\Cable Routing\SRT14-splice.dgn jerry.cross 12:55:04 PM 10/22/2008