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09/08/99

TIP PROJECT: I-5506

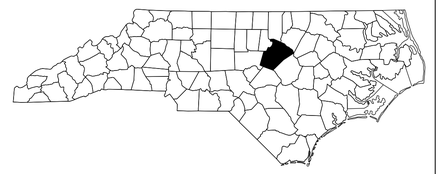
CONTRACT: 37649.1.1

DATE
U:\Traffic\Signals\Design\Signals\Plansheets\I-5506_Signal Title Sheet.dgn
User:rmuncey

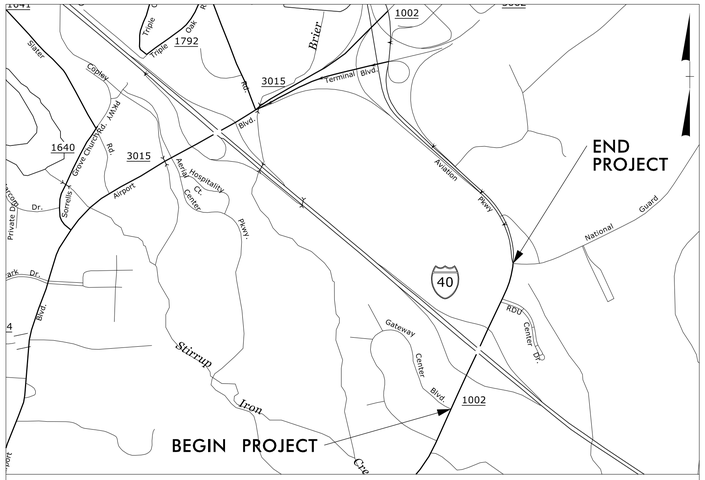
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

Project No.	Sheet No.
I-5506	SIG-1.0

WAKE COUNTY

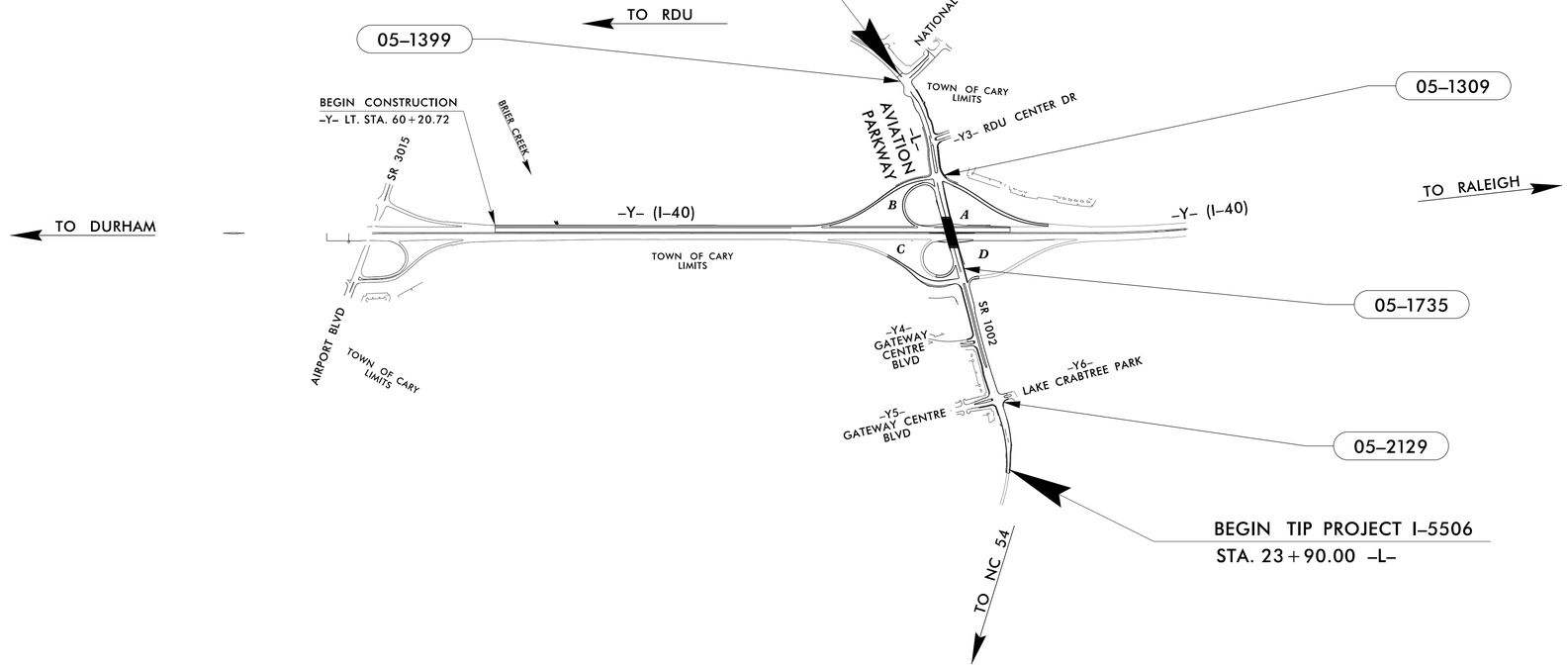


LOCATION: I-40 AT SR 1002 (AVIATION PARKWAY) INTERCHANGE
TYPE OF WORK: TRAFFIC SIGNALS AND SIGNAL COMMUNICATIONS



VICINITY MAP

END TIP PROJECT I-5506
STA. 68+70.00 -L-



Index of Plans

LEGEND

(XX-XXXX) - SIGNAL INVENTORY NUMBER

INTELLIGENT TRANSPORTATION AND SIGNALS UNIT
Contacts:

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Signals Engineer, Central Region

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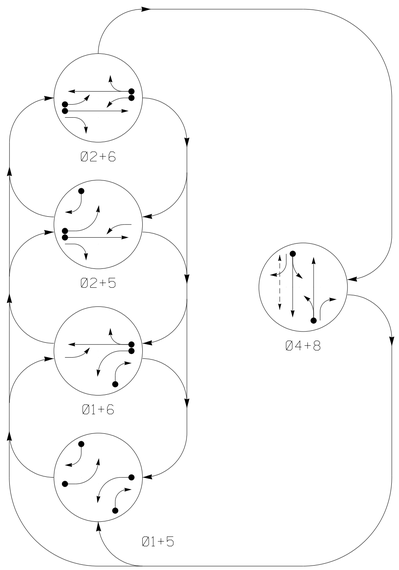
Betsy L. Watson, PE
Senior Transportation Engineer
Regina Muncey, PE
Transportation Engineer
Larry Overn, PE
Transportation Engineer

APPROVED: DocuSigned by: Betsy L. Watson 35E87BB34F874F...
DATE: 12/1/2017

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-2.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

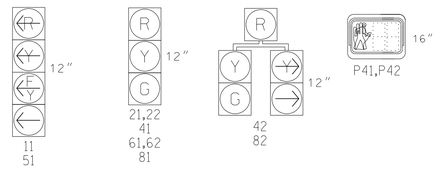
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←●	←●	←F/Y	←F/Y	←R	←Y
21, 22	R	R	G	G	R	Y
41	R	R	R	R	G	R
42	R/→	R	R/→	R	G	R
51	←●	←F/Y	←	←F/Y	←R	←Y
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

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR INSTALLATION CHART

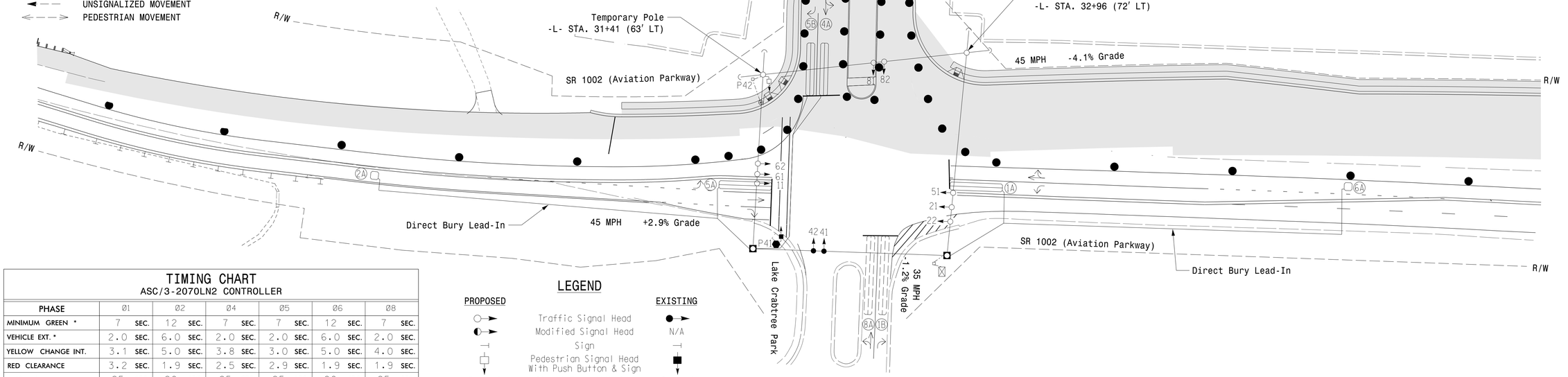
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS				
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
1A	6X40	0	2-4-2	X	-	1	X	-	DELAY	15	S
						6	X	-	DELAY	3	G
1B	6X60	0	EXIST	-	X	1	X	-	DELAY	15	S
2A	6X6	300	5	X	-	2	X	-	-	-	N
4A	6X40	0	2-4-2	X	-	4	X	-	-	-	S
5A	6X40	0	2-4-2	X	-	5	X	-	DELAY	15	S
						2	X	-	DELAY	3	G
5B	6X40	0	2-4-2	X	-	5	X	-	DELAY	15	S
6A	6X6	300	4	X	-	6	X	-	-	-	N
8A	6X60	0	EXIST	-	X	8	X	-	-	-	S

5 Phase Fully Actuated (Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Set all detector units to presence mode.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "DON'T WALK" time only.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Pedestrian pedestals are conceptual and shown for reference only. See 2018 NCDOT Roadway Standard Drawings 1705.04 Sheets 1-3 for push button location details.
10. Cary signal system data: Fiber Channel #: 25.



TIMING CHART

ASC/3-2070LN2 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6	Ø8
MINIMUM GREEN *	7 SEC.	12 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.
VEHICLE EXT. *	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.1 SEC.	5.0 SEC.	3.8 SEC.	3.0 SEC.	5.0 SEC.	4.0 SEC.
RED CLEARANCE	3.2 SEC.	1.9 SEC.	2.5 SEC.	2.9 SEC.	1.9 SEC.	1.9 SEC.
MAX. 1 *	25 SEC.	90 SEC.	25 SEC.	25 SEC.	90 SEC.	25 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE
LOCK DET.	OFF	ON	OFF	OFF	ON	OFF
WALK *	– SEC.	– SEC.	7 SEC.	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	28 SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	ON	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	2.5 SEC.	– SEC.	– SEC.	2.5 SEC.	– SEC.
MAX. INITIAL *	– SEC.	34 SEC.	– SEC.	– SEC.	34 SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	15 SEC.	– SEC.	– SEC.	15 SEC.	– SEC.
TIME TO REDUCE *	– SEC.	45 SEC.	– SEC.	– SEC.	45 SEC.	– SEC.
MINIMUM GAP	– SEC.	3.0 SEC.	– SEC.	– SEC.	3.0 SEC.	– SEC.
DUAL ENTRY	OFF	OFF	ON	OFF	OFF	ON
SIMULTANEOUS GAP	ON	ON	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Metal Strain Pole	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	Direct Bury Lead-In	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	N/A
N/A	Construction Zone	N/A
	Curb Ramp	
	Type I Pushbutton Post	
	Type II Signal Pedestal	

Signal Upgrade
Temporary Design 1 - TMP Phase I

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

SCALE 0 40 1" = 40'

SR 1002 (Aviation Parkway) at Gateway Centre Boulevard/ Lake Crabtree Park

Division 5 Wake County Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	R. MUNCEY
PREPARED BY:	B. WRIGHT	REVIEWED BY:	B. WATSON

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

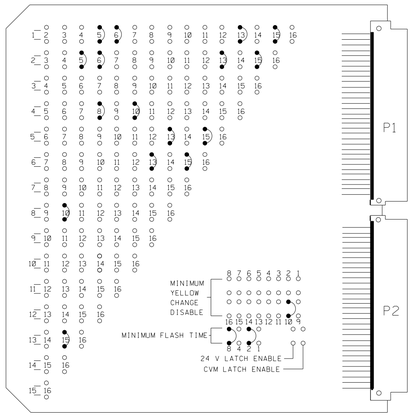
Developed by: Betsy L. Watson 12/1/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-2129TI

DATE: 12/1/2017
User:rmuncey

EDI MODEL MMU2-16LEip
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	ENABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	ENABLE
6	ENABLE
7	DISABLE
8	ENABLE
9	DISABLE
10	ENABLE
11	DISABLE
12	DISABLE
13	ENABLE
14	DISABLE
15	ENABLE
16	DISABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	OFF
CH 5-15	ON
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	ON
CH 3	OFF
CH 5	ON
CH 7	OFF
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 3,7,9,11,12,14&16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. Program phases 4 and 8 for dual entry.
11. The cabinet and controller are a part of the Cary Signal System.

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG- 2.1

SIGNAL HEAD HOOK-UP CHART

PHASE	1		2	3	4	5		6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	11★	82	21,22	NU	41,42	51★	42	61,62	NU	81,82	NU	P41, P42	NU	NU	11★	NU	51★	NU
RED		✳	2R		4R		✳	6R		8R								
YELLOW			2Y		4Y			6Y		8Y								
GREEN			2G		4G			6G		8G								
RED ARROW															13R		15R	
YELLOW ARROW		1Y					5Y								13Y		15Y	
FLASHING YELLOW ARROW															13G		15G	
GREEN ARROW	1G	1G				5G	5G											
✋												10R						
🚶												10G						

NU = Not Used

✳ Denotes install load resistor. See Load Resistor Installation Detail.

★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW.
PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU	CH1 L3 ø1 1B	CH1 L1 ø1 1A	CH1 L7 ø4 4A	CH1 L5 ø2 2A	CH1 L11 ø6 6A	CH1 L9 ø5 5A	SLOT EMPTY	CH1 L13 ø5 5B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L4 NOT USED	CH2 L2 ø6 1A	CH2 L8 NOT USED	CH2 L6 NOT USED	CH2 L12 NOT USED	CH2 L10 ø2 5A		CH2 L14 NOT USED			
RACK #2	BIU	SLOT EMPTY	CH1 L17 ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
			CH2 L18 NOT USED									

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

	LOOP NO.	LOOP PANEL TERMINALS
ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B	1A	L1A,L1B
		L2A,L2B
	1B	L3A,L3B
	NU	L4A,L4B
	2A	L5A,L5B
	NU	L6A,L6B
	4A	L7A,L7B
	NU	L8A,L8B
ADD JUMPERS FROM: L9A TO L10A, AND L9B TO L10B	5A	L9A,L9B
		L10A,L10B
	6A	L11A,L11B
	NU	L12A,L12B
	5B	L13A,L13B
	NU	L14A,L14B
	NU	L15A,L15B
	NU	L16A,L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
1	ø1	DELAY	15
✳ 2	ø6	DELAY	3
3	ø1	DELAY	15
4			
✳✳ 5	ø2		
6			
7	ø4		
8			
9	ø5	DELAY	15
✳ 10	ø2	DELAY	3
✳✳ 11	ø6		
12			
13	ø5	DELAY	15
14			
15			
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
8A	L17A,L17B
NU	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
17	ø8		
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE:
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

✳ Detector Type - G
✳✳ Detector Type - N

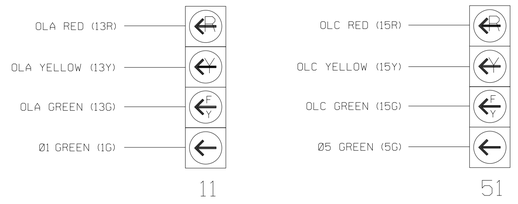
EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET TS-2
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....1,2,4,5,6,8,10,13,15
PHASES USED.....1,2,4,4PED,5,6,8
OLA.....✳
OLB.....NOT USED
OLC.....✳
OLD.....NOT USED

✳ See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



LOAD SWITCH ASSIGNMENT DETAIL

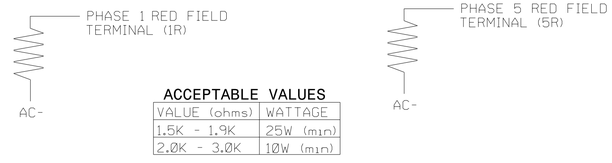
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	-
4	ø4
5	ø5
6	ø6
7	-
8	ø8
9	-
10	ø4 PED
11	-
12	-
13	OLA
14	-
15	OLC
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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: 05-2129T1
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 2
Temporary Design 1 - TMP Phase I

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Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SR 1002 (Aviation Parkway)
at
Gateway Centre Boulevard/
Lake Crabtree Park

Division 5 Wake County Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-2129T1

DATE:
User:Traffic\Signals\Design\Signals\Electrical Details\I-5506 sm.ele.05-2129.T1-1of2.dgn
User:rmuncey

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select [2. CONTROLLER]
2. From CONTROLLER Submenu select [2. VEHICLE OVERLAPS]

OVERLAP A

Select TMG VEH OVLP [A] and 'PPLT FYA'

```
TMG VEH OVLP...[A] TYPE: .....PPLT FYA

PROTECTED LEFT TURN....    PHASE    1
OPPOSING THROUGH.......    PHASE    2

FLASHING ARROW OUTPUT.....CH13  ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE........... 0
```

Toggle Twice

OVERLAP C

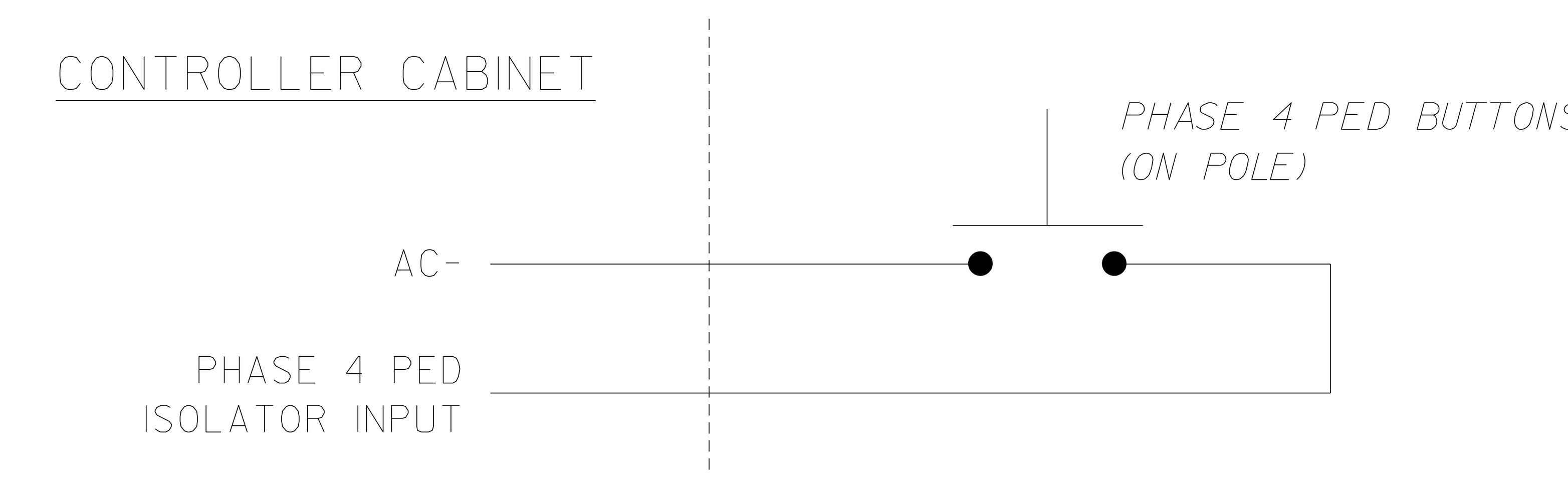
Select TMG VEH OVLP [C] and 'PPLT FYA'

```
TMG VEH OVLP...[C] TYPE: .....PPLT FYA

PROTECTED LEFT TURN....    PHASE    5
OPPOSING THROUGH.......    PHASE    6

FLASHING ARROW OUTPUT.....CH15 ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE........... 0
```

END PROGRAMMING

PEDESTRIAN PUSH BUTTON WIRING DETAIL

(wire push buttons as shown)



COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-2129T1
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 2 of 2
Temporary Design 1 - TMP Phase I

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SR 1002 (Aviation Parkway)
at
Gateway Centre Boulevard/
Lake Crabtree Park

Division 5 | Wake County | Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

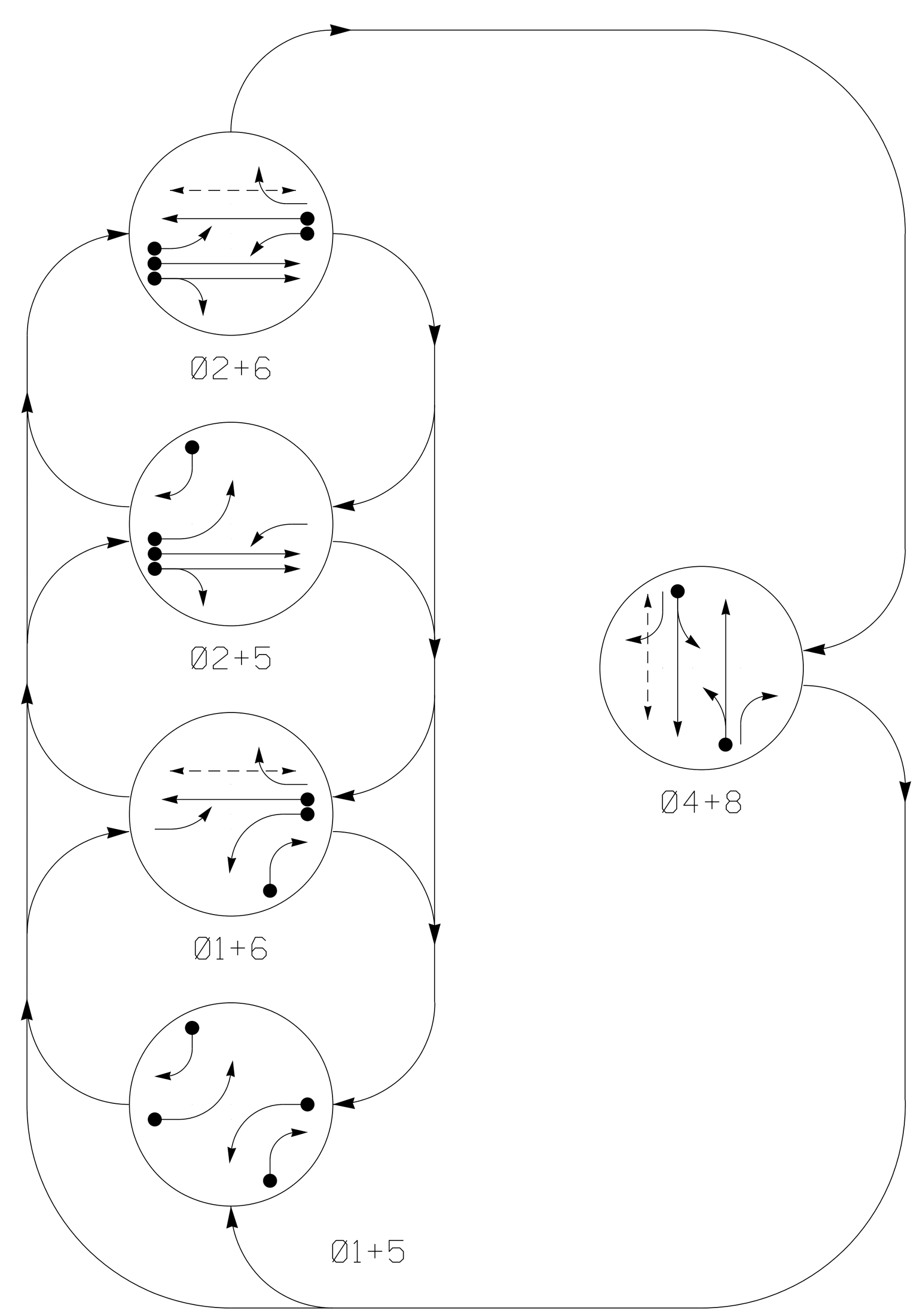
DocuSigned by: Betsy L. Watson 35E67BB34F8743F... 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-2129T1

DATE: u:\Traffic\Signals\Design\Signals\Electrical Details\I-5506 sm_ele_05-2129_T1-2of2.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-3.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

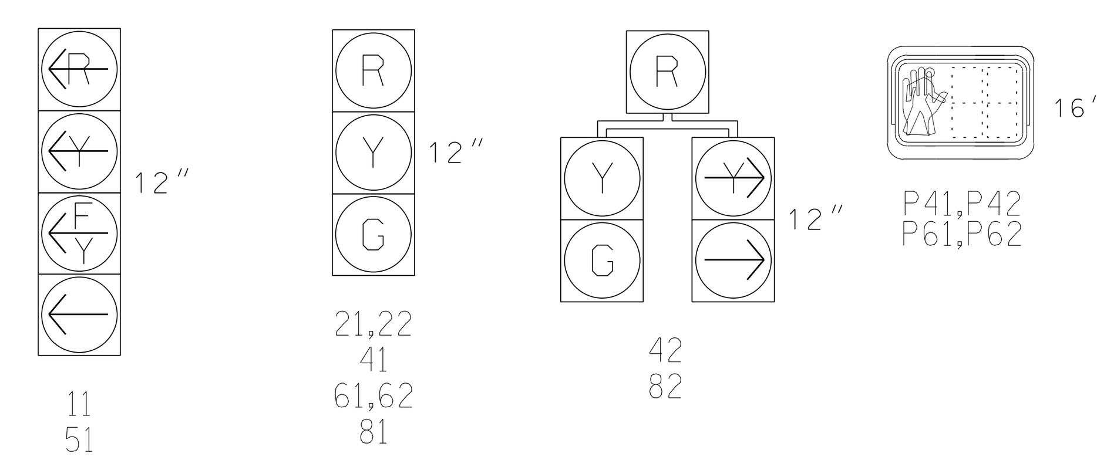
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	F/Y ←	F/Y ←	←R	←Y
21, 22	R	R	G	G	R	Y
41	R	R	R	R	G	R
42	R/→	R	R/→	R	G	R
51	←	F/Y ←	←	F/Y ←	←R	←Y
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
P61,P62	DW	W	DW	W	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR INSTALLATION CHART

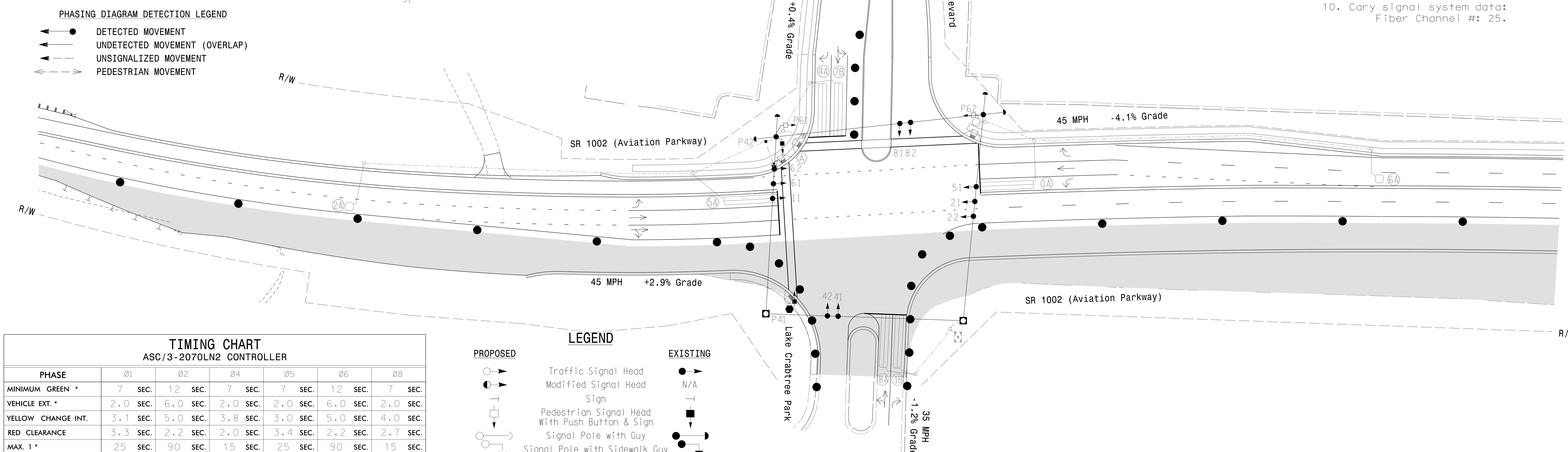
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
1A	6X40	0	2-4-2	X	-	1	-	X	DELAY	15	S
						6	-	X	DELAY	3	G
1B	6X40	0	2-4-2	X	-	1	-	X	DELAY	15	S
2A	6X6	300	5	X	-	2	-	X	-	-	N
4A	6X40	0	2-4-2	X	-	5	-	X	DELAY	15	S
5A	6X40	0	2-4-2	X	-	5	-	X	DELAY	15	S
						2	-	X	DELAY	3	G
6A	6X6	300	5	X	-	6	-	X	-	-	N
7B	6X40	0	2-4-2	X	-	4	-	X	-	-	S
8A	6X40	0	2-4-2	X	-	8	-	X	-	-	S

5 Phase
Fully Actuated
(Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or Phase 5 may be lagged.
4. Set all detector units to presence mode.
5. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
6. Program pedestrian heads to countdown the flashing "DON'T WALK" time only.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
8. Reposition signal heads 11, 21, 22, 51, 61, 62, 81, and 82.
9. Pedestrian pedestals are conceptual and shown for reference only. See 2018 NCDOT Roadway Standard Drawings 1705.04 Sheets 1-3 for push button location details.
10. Cary signal system data:
    Fiber Channel #: 25.



TIMING CHART

ASC/3-2070LN2 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6	Ø8
MINIMUM GREEN *	7 SEC.	12 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.
VEHICLE EXT. *	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.1 SEC.	5.0 SEC.	3.8 SEC.	3.0 SEC.	5.0 SEC.	4.0 SEC.
RED CLEARANCE	3.3 SEC.	2.2 SEC.	2.0 SEC.	3.4 SEC.	2.2 SEC.	2.7 SEC.
MAX. 1 *	25 SEC.	90 SEC.	15 SEC.	25 SEC.	90 SEC.	15 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE
LOCK DET.	OFF	ON	OFF	OFF	ON	OFF
WALK *	- SEC.	- SEC.	7 SEC.	- SEC.	7 SEC.	- SEC.
PED. CLEAR	- SEC.	- SEC.	25 SEC.	- SEC.	31 SEC.	- SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	ON	OFF
ACTUATION B4 ADD *	- VEH.	- VEH.	- VEH.	- VEH.	- VEH.	- VEH.
SEC. PER ACTUATION *	- SEC.	2.5 SEC.	- SEC.	- SEC.	2.5 SEC.	- SEC.
MAX. INITIAL *	- SEC.	34 SEC.	- SEC.	- SEC.	34 SEC.	- SEC.
TIME B4 REDUCTION *	- SEC.	15 SEC.	- SEC.	- SEC.	15 SEC.	- SEC.
TIME TO REDUCE *	- SEC.	45 SEC.	- SEC.	- SEC.	45 SEC.	- SEC.
MINIMUM GAP	- SEC.	3.0 SEC.	- SEC.	- SEC.	3.0 SEC.	- SEC.
DUAL ENTRY	OFF	OFF	ON	OFF	OFF	ON
SIMULTANEOUS GAP	ON	ON	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Metal Strain Pole	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	Direct Bury Lead-In	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	N/A
	Construction Zone	N/A
N/A	Curb Ramp	
	Type I Pushbutton Post	
	Type II Signal Pedestal	
	Right Arrow "ONLY" Sign (R3-5R)	

Signal Upgrade
Temporary Design 2 - TMP Phases II & III

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

SCALE 0 40
1" = 40'

SR 1002 (Aviation Parkway)
at
Gateway Centre Boulevard/
Lake Crabtree Park

Division 5 Wake County Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	R. MUNCEY
PREPARED BY:	B. WRIGHT	REVIEWED BY:	B. WATSON

REVISIONS	INIT.	DATE

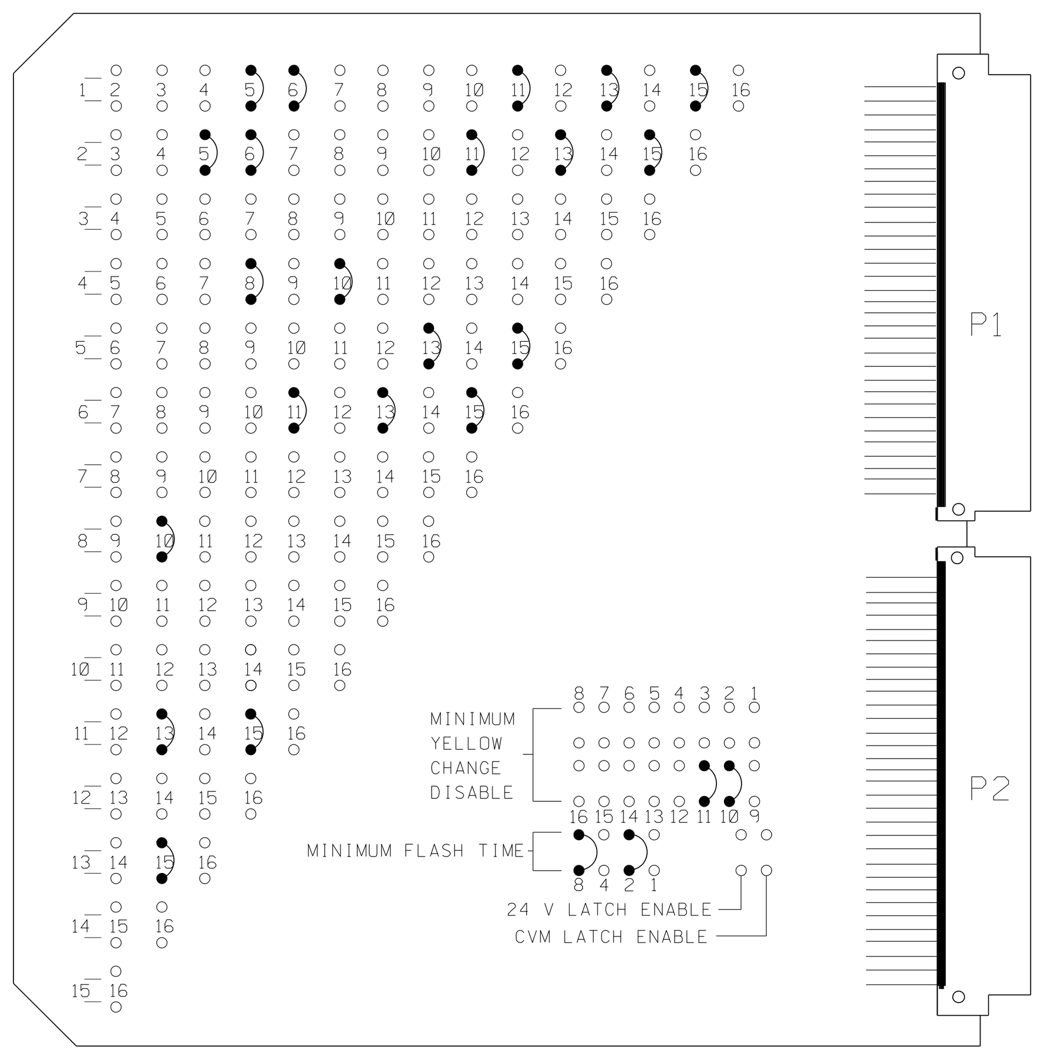
NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

DocuSigned by: Betsy L. Watson 35E67BB34F8743F... SIGNATURE 12/1/2017 DATE

SIG. INVENTORY NO. 05-2129T2

EDI MODEL MMU2-16LEip MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	ENABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	ENABLE
6	ENABLE
7	DISABLE
8	ENABLE
9	DISABLE
10	ENABLE
11	ENABLE
12	DISABLE
13	ENABLE
14	DISABLE
15	ENABLE
16	DISABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	OFF
CH 5-15	ON
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	ON
CH 3	OFF
CH 5	ON
CH 7	OFF
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 3,7,9,12,14&16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in Phase 2 Green and 6 Walk.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. Program phases 4 and 8 for dual entry.
11. The cabinet and controller are a part of the Cary Signal System.

SIGNAL HEAD HOOK-UP CHART

PHASE	1		2	3	4	5		6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	11★	82	21,22	NU	41,42	51★	42	61,62	NU	81,82	NU	P41, P42	P61, P62	NU	11★	NU	51★	NU
RED		✳	2R		4R		✳	6R		8R								
YELLOW			2Y		4Y			6Y		8Y								
GREEN			2G		4G			6G		8G								
RED ARROW															13R		15R	
YELLOW ARROW		1Y					5Y								13Y		15Y	
FLASHING YELLOW ARROW															13G		15G	
GREEN ARROW	1G	1G				5G	5G											
(Don't Walk)												10R	11R					
(Walk)												10G	11G					

NU = Not Used

✳ Denotes install load resistor. See Load Resistor Installation Detail.

★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU											
CH1		L3 Ø1 1B	L1 Ø1 1A	L7 Ø5 4A	L5 Ø2 2A	L11 Ø6 6A	L9 Ø5 5A	L15 Ø4 7B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
CH2		L4 NOT USED	L2 Ø6 1A	L8 NOT USED	L6 NOT USED	L12 NOT USED	L10 Ø2 5A	L16 NOT USED				

RACK #2	BIU											
CH1		SLOT EMPTY	L17 Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
CH2			L18 NOT USED									

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW — PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

	LOOP NO.	LOOP PANEL TERMINALS
ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B	1A	L1A,L1B
		L2A,L2B
	1B	L3A,L3B
	NU	L4A,L4B
	2A	L5A,L5B
	NU	L6A,L6B
	4A	L7A,L7B
	NU	L8A,L8B
ADD JUMPERS FROM: L9A TO L10A, AND L9B TO L10B	5A	L9A,L9B
		L10A,L10B
	6A	L11A,L11B
	NU	L12A,L12B
	NU	L13A,L13B
	NU	L14A,L14B
	7B	L15A,L15B
	NU	L16A,L16B

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
1	Ø1	DELAY	15
✳ 2	Ø6	DELAY	3
3	Ø1	DELAY	15
4			
✳✳ 5	Ø2		
6			
7	Ø5	DELAY	15
8			
9	Ø5	DELAY	15
✳ 10	Ø2	DELAY	3
✳✳ 11	Ø6		
12			
13			
14			
15	Ø4		
16			

LOOP NO.	LOOP PANEL TERMINALS
8A	L17A,L17B
NU	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
17	Ø8		
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE: BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

✳ Detector Type - G
✳✳ Detector Type - N

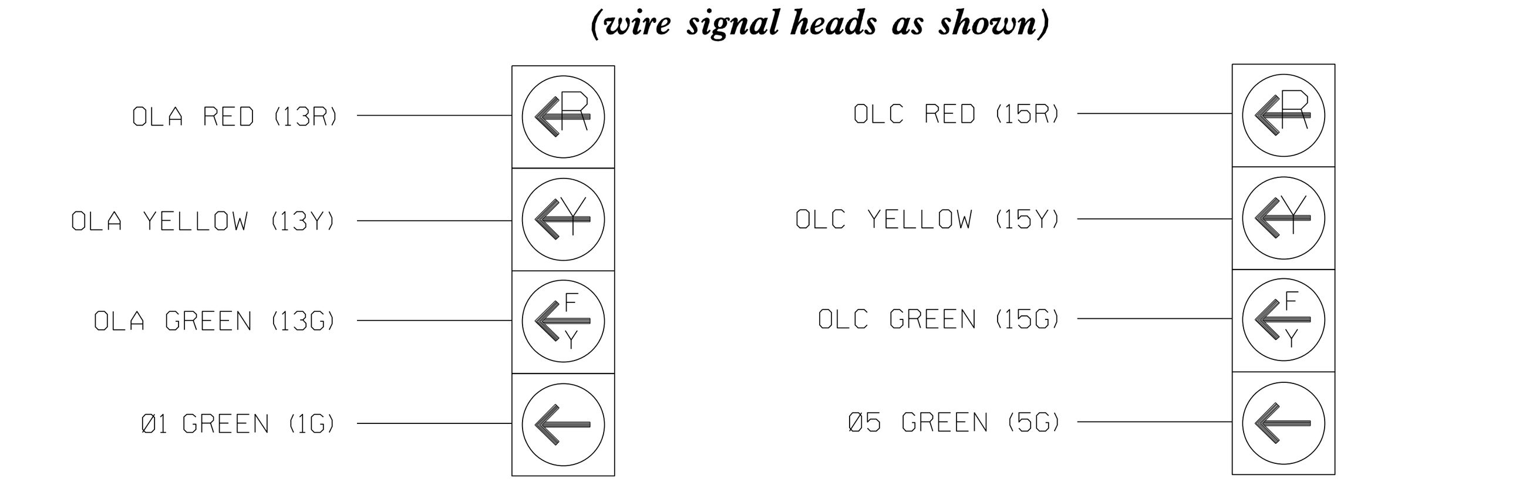
EQUIPMENT INFORMATION

CONTROLLER.............2070LN2
CABINET TS-2
SOFTWARE ....ECONOLITE ASC/3-2070
CABINET MOUNT...........BASE
LOADBAY POSITIONS.......16
LOAD SWITCHES USED......1,2,4,5,6,8,10,11,13,15
PHASES USED.............1,2,4,4PED,5,6,6PED,8
OLA.....................✳
OLB.....................NOT USED
OLC.....................✳
OLD.....................NOT USED

✳ See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



LOAD SWITCH ASSIGNMENT DETAIL

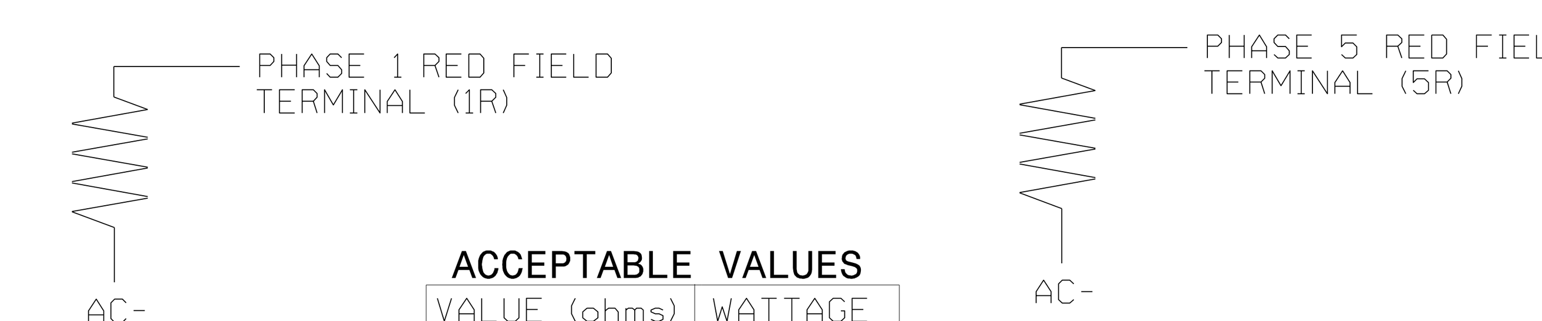
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	Ø1
2	Ø2
3	-
4	Ø4
5	Ø5
6	Ø6
7	-
8	Ø8
9	-
10	Ø4 PED
11	Ø6 PED
12	-
13	OLA
14	-
15	OLC
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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: 05-2129T2
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 2
Temporary Design 2 - TMP Phase II

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

SR 1002 (Aviation Parkway) at Gateway Centre Boulevard/ Lake Crabtree Park
Division 5 | Wake County | Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS | INIT. | DATE

SEAL 29449 NORTH CAROLINA PROFESSIONAL ENGINEER BETSY L. WATSON
SIGNATURE 12/5/2017 DATE
SIG. INVENTORY NO. 05-2129T2

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-3.2

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select [2. CONTROLLER]
2. From CONTROLLER Submenu select [2. VEHICLE OVERLAPS]

OVERLAP A

Select TMG VEH OVLP [A] and 'PPLT FYA'

```
TMG VEH OVLP...[A] TYPE: .....PPLT FYA

PROTECTED LEFT TURN....   PHASE    1
OPPOSING THROUGH.......   PHASE    2

FLASHING ARROW OUTPUT.....CH13  ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 0
```

Toggle Twice

OVERLAP C

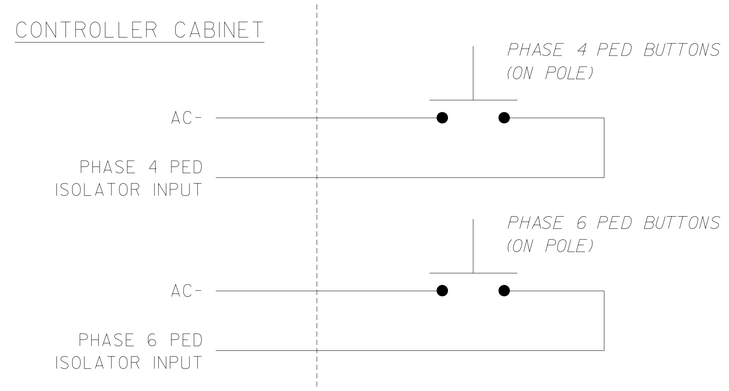
Select TMG VEH OVLP [C] and 'PPLT FYA'

```
TMG VEH OVLP...[C] TYPE: .....PPLT FYA

PROTECTED LEFT TURN....   PHASE    5
OPPOSING THROUGH.......   PHASE    6

FLASHING ARROW OUTPUT.....CH15 ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 0
```

END PROGRAMMING

PEDESTRIAN PUSH BUTTON WIRING DETAIL

(wire push buttons as shown)



COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-2129T2
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 2 of 2
Temporary Design 2 - TMP Phase II

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PLAN DATE: NOVEMBER 2017	REVIEWED BY: L. OVERN
PREPARED BY: G. SPELL	REVIEWED BY: R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

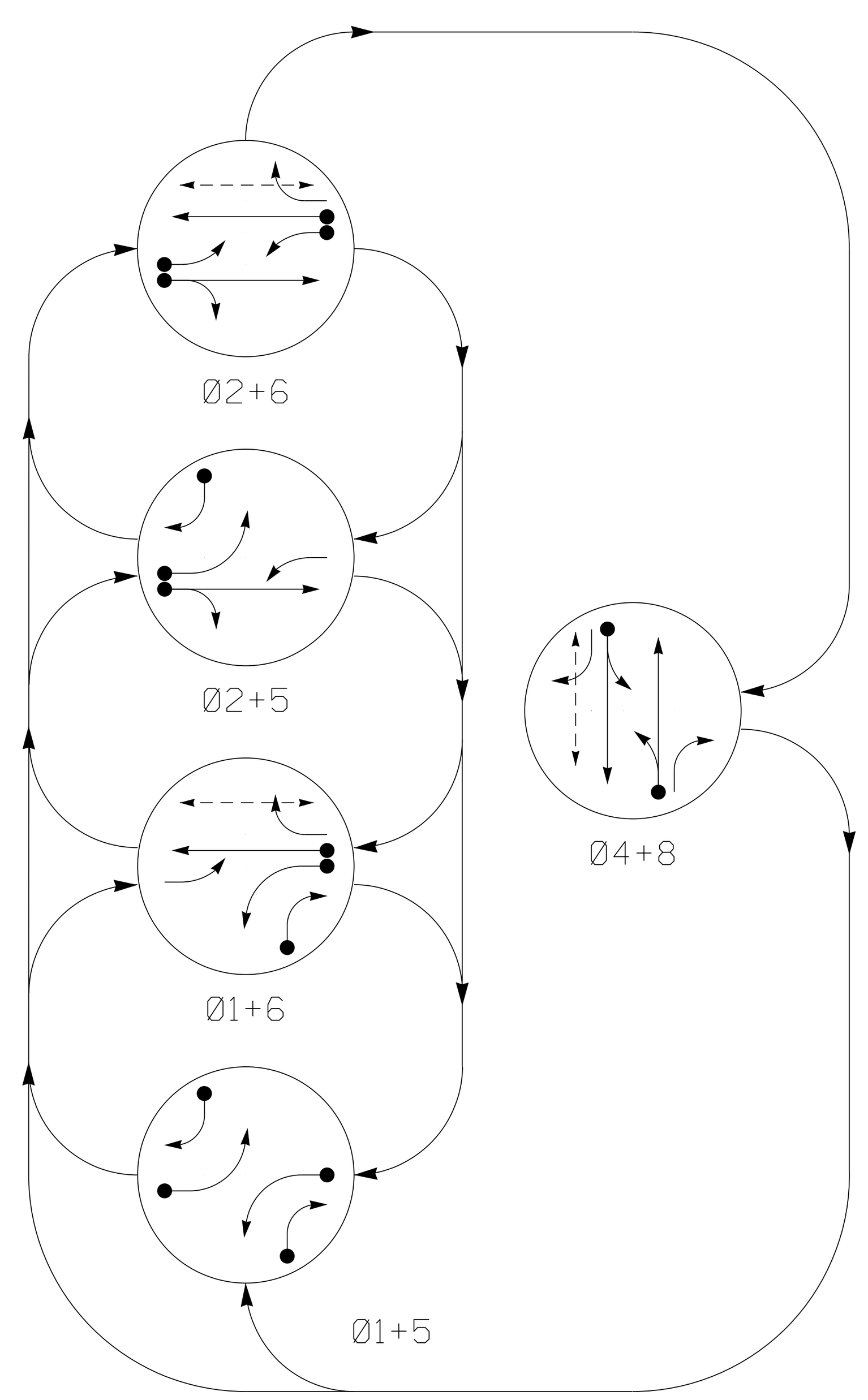
Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-2129T2

DATE
User:rmuncey
I:\Traffic\Signals\Design\Signals\Electrical Details\I-5506 sm_ele_05-2129_T2-2of2.dgn

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-4.0

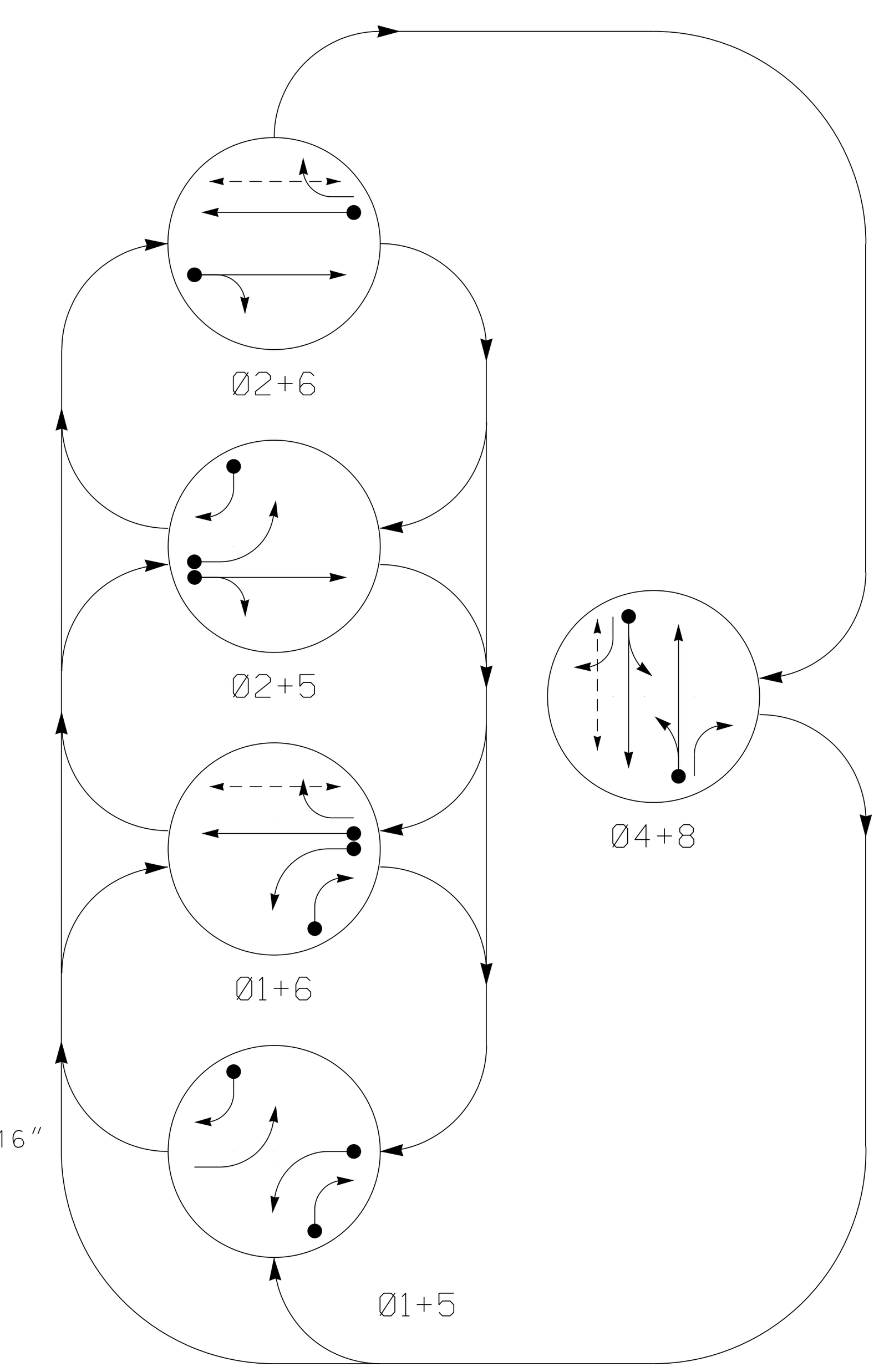
DEFAULT PHASING DIAGRAM



DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	F/Y ←	F/Y ←	R ←	Y ←
21, 22	R	R	G	G	R	Y
41	R	R	R	R	G	R
42	R/→	R	R/→	R	G	R
51	←	F/Y ←	←	F/Y ←	R ←	Y ←
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
P61,P62	DW	W	DW	W	DW	DRK

ALTERNATE PHASING DIAGRAM



ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	R ←	R ←	R ←	Y ←
21, 22	R	R	G	G	R	Y
41	R	R	R	R	G	R
42	R/→	R	R/→	R	G	R
51	←	R ←	←	R ←	R ←	Y ←
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
P61,P62	DW	W	DW	W	DW	DRK

LOOP & DETECTOR INSTALLATION CHART

ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
1A	6X40	0	EXIST	-	X	1	-	X	DELAY	15*	S
						6**	-	X	DELAY	3	G
1B	6X40	0	EXIST	-	X	1	-	X	DELAY	15	S
2B	6X6	300	5	X	-	2	-	X	-	-	N
4A	6X40	0	EXIST	-	X	5	-	X	DELAY	15	S
5A	6X40	0	2-4-2	X	-	5	-	X	DELAY	15*	S
						2**	-	X	DELAY	3	G
6A	6X6	300	EXIST	-	X	6	-	X	-	-	N
7B	6X40	0	EXIST	-	X	4	-	X	-	-	S
8A	6X40	0	EXIST	-	X	8	-	X	-	-	S

* Disable delay during Alternate Phasing Operation.
** Disable Phase(s) call during Alternate Phasing Operation.

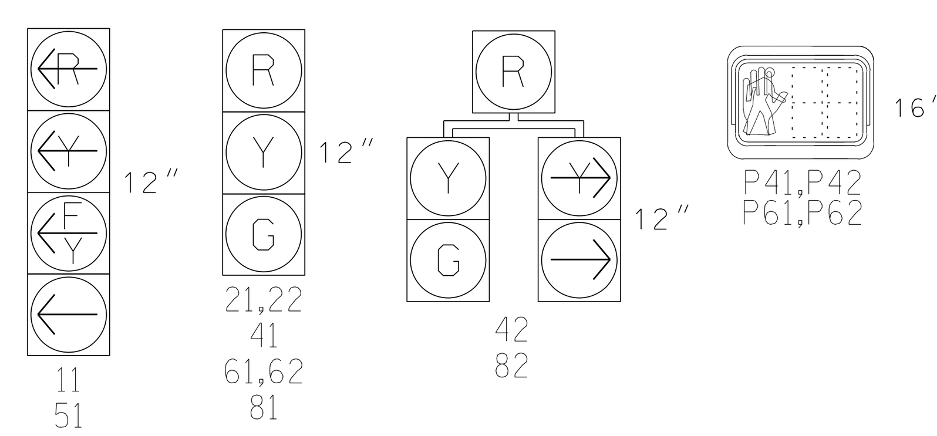
5 Phase
Fully Actuated
(Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or Phase 5 may be lagged.
3. Set all detector units to presence mode.
4. The Division (Town) Traffic Engineer will determine hours of use for each phasing plan.
5. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
6. Program pedestrian heads to countdown the flashing "DON'T WALK" time only.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
8. Reposition signal heads 21, 22, and 51.
9. Cary signal system data:
   Fiber Channel #: 25.

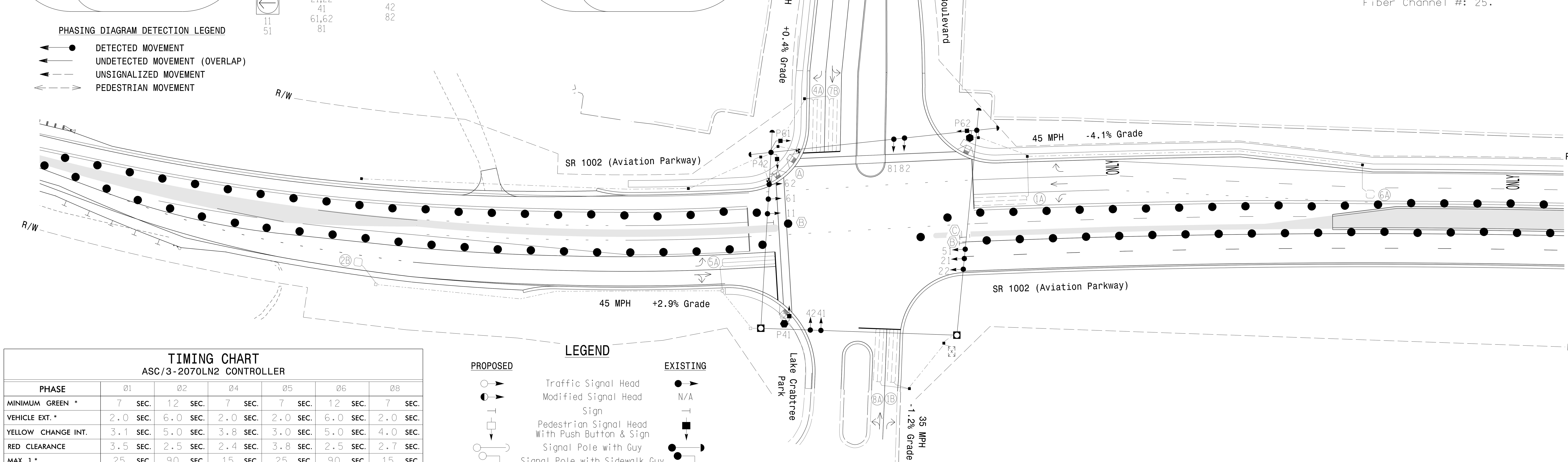
SIGNAL FACE I.D.

All Heads L.E.D.



PHASING DIAGRAM DETECTION LEGEND

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



TIMING CHART

ASC/3-2070LN2 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6	Ø8
MINIMUM GREEN *	7 SEC.	12 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.
VEHICLE EXT. *	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.1 SEC.	5.0 SEC.	3.8 SEC.	3.0 SEC.	5.0 SEC.	4.0 SEC.
RED CLEARANCE	3.5 SEC.	2.5 SEC.	2.4 SEC.	3.8 SEC.	2.5 SEC.	2.7 SEC.
MAX. 1 *	25 SEC.	90 SEC.	15 SEC.	25 SEC.	90 SEC.	15 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE
LOCK DET.	OFF	ON	OFF	OFF	ON	OFF
WALK *	– SEC.	– SEC.	7 SEC.	– SEC.	7 SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	25 SEC.	– SEC.	31 SEC.	– SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	ON	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	2.5 SEC.	– SEC.	– SEC.	2.5 SEC.	– SEC.
MAX. INITIAL *	– SEC.	34 SEC.	– SEC.	– SEC.	34 SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	15 SEC.	– SEC.	– SEC.	15 SEC.	– SEC.
TIME TO REDUCE *	– SEC.	45 SEC.	– SEC.	– SEC.	45 SEC.	– SEC.
MINIMUM GAP	– SEC.	3.0 SEC.	– SEC.	– SEC.	3.0 SEC.	– SEC.
DUAL ENTRY	OFF	OFF	ON	OFF	OFF	ON
SIMULTANEOUS GAP	ON	ON	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Metal Strain Pole	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	N/A
	Construction Zone	N/A
N/A	Guardrail	
N/A	Curb Ramp	
	Type I Pushbutton Post	
	Type II Signal Pedestal	
	Right Arrow "ONLY" Sign (R3-5R)	
	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	
	Left Arrow "ONLY" Sign (R3-5L)	

Signal Upgrade
Temporary Design 3 - TMP Phase IV

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

SCALE 0 40
1" = 40'

SR 1002 (Aviation Parkway)
at
Gateway Centre Boulevard/
Lake Crabtree Park

Division 5	Wake County		Cary
PLAN DATE: NOVEMBER 2017	REVIEWED BY: R. MUNCEY		
PREPARED BY: B. WRIGHT	REVIEWED BY: B. WATSON		
REVISIONS		INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

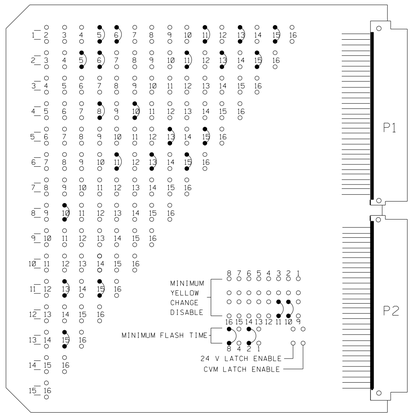
Betsy L. Watson 12/1/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-2129T3

DATE:
U:*Traffic*Signals*Design*Signals*Plansheets*I-5506 Sig_dsn_05-2129_T3.dgn
User:rmuncey

EDI MODEL MMU2-16LEip
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	ENABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	ENABLE
6	ENABLE
7	DISABLE
8	ENABLE
9	DISABLE
10	ENABLE
11	ENABLE
12	DISABLE
13	ENABLE
14	DISABLE
15	ENABLE
16	DISABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	OFF
CH 5-15	ON
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	ON
CH 3	OFF
CH 5	ON
CH 7	OFF
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 3,7,9,12,14&16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in Phase 2 Green and 6 Walk.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. Program phases 4 and 8 for dual entry.
11. The cabinet and controller are a part of the Cary Signal System.

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG- 4.1

SIGNAL HEAD HOOK-UP CHART

PHASE	1		2	3	4	5		6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	11★	82	21,22	NU	41,42	51★	42	61,62	NU	81,82	NU	P41, P42	P61, P62	NU	11★	NU	51★	NU
RED		✳	2R		4R		✳	6R		8R								
YELLOW			2Y		4Y			6Y		8Y								
GREEN			2G		4G			6G		8G								
RED ARROW															13R		15R	
YELLOW ARROW		1Y					5Y								13Y		15Y	
FLASHING YELLOW ARROW															13G		15G	
GREEN ARROW	1G	1G				5G	5G											
												10R	11R					
												10G	11G					

NU = Not Used

✳ Denotes install load resistor. See Load Resistor Installation Detail.

★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU	CH1 L3 ø1 1B	CH1 L1 ø1 1A	CH1 L7 ø5 4A	CH1 L5 NOT USED	CH1 L11 ø6 6A	CH1 L9 ø5 5A	CH1 L15 ø4 7B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L4 NOT USED	CH2 L2 ø6 1A	CH2 L8 NOT USED	CH2 L6 ø2 2B	CH2 L12 NOT USED	CH2 L10 ø2 5A	CH2 L16 NOT USED				
RACK #2	BIU	CH1 L17 ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L18 NOT USED										

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

	LOOP NO.	LOOP PANEL TERMINALS
ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B	1A	L1A,L1B
		L2A,L2B
	1B	L3A,L3B
	NU	L4A,L4B
	NU	L5A,L5B
	2B	L6A,L6B
	4A	L7A,L7B
	NU	L8A,L8B
ADD JUMPERS FROM: L9A TO L10A, AND L9B TO L10B	5A	L9A,L9B
		L10A,L10B
	6A	L11A,L11B
	NU	L12A,L12B
	NU	L13A,L13B
	NU	L14A,L14B
	7B	L15A,L15B
	NU	L16A,L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
1	ø1	DELAY	15
✳ 2	ø6	DELAY	3
3	ø1	DELAY	15
4			
5			
✳✳ 6	ø2		
7	ø5	DELAY	15
8			
9	ø4	DELAY	15
✳ 10	ø2	DELAY	3
✳✳ 11	ø6		
12			
13			
14			
15	ø4		
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
8A	L17A,L17B
NU	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
17	ø8		
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE: BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

✳ Detector Type - G

✳✳ Detector Type - N

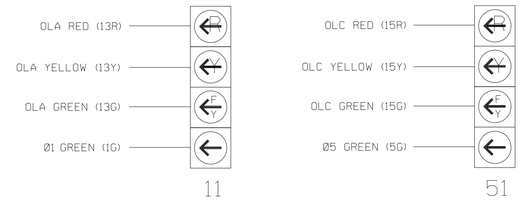
EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET TS-2
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....1,2,4,5,6,8,10,11,13,15
PHASES USED.....1,2,4,4PED,5,6,6PED,8
OLA.....✳
OLB.....NOT USED
OLC.....✳
OLD.....NOT USED

✳ See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



LOAD SWITCH ASSIGNMENT DETAIL

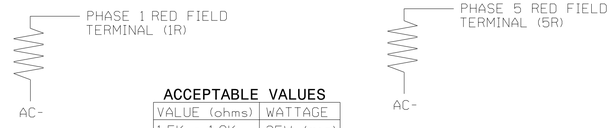
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	-
4	ø4
5	ø5
6	ø6
7	-
8	ø8
9	-
10	ø4 PED
11	ø6 PED
12	-
13	OLA
14	-
15	OLC
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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: 05-2129T3
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 3
Temporary Design 3 - TMP Phase IV

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Division 5 Wake County Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

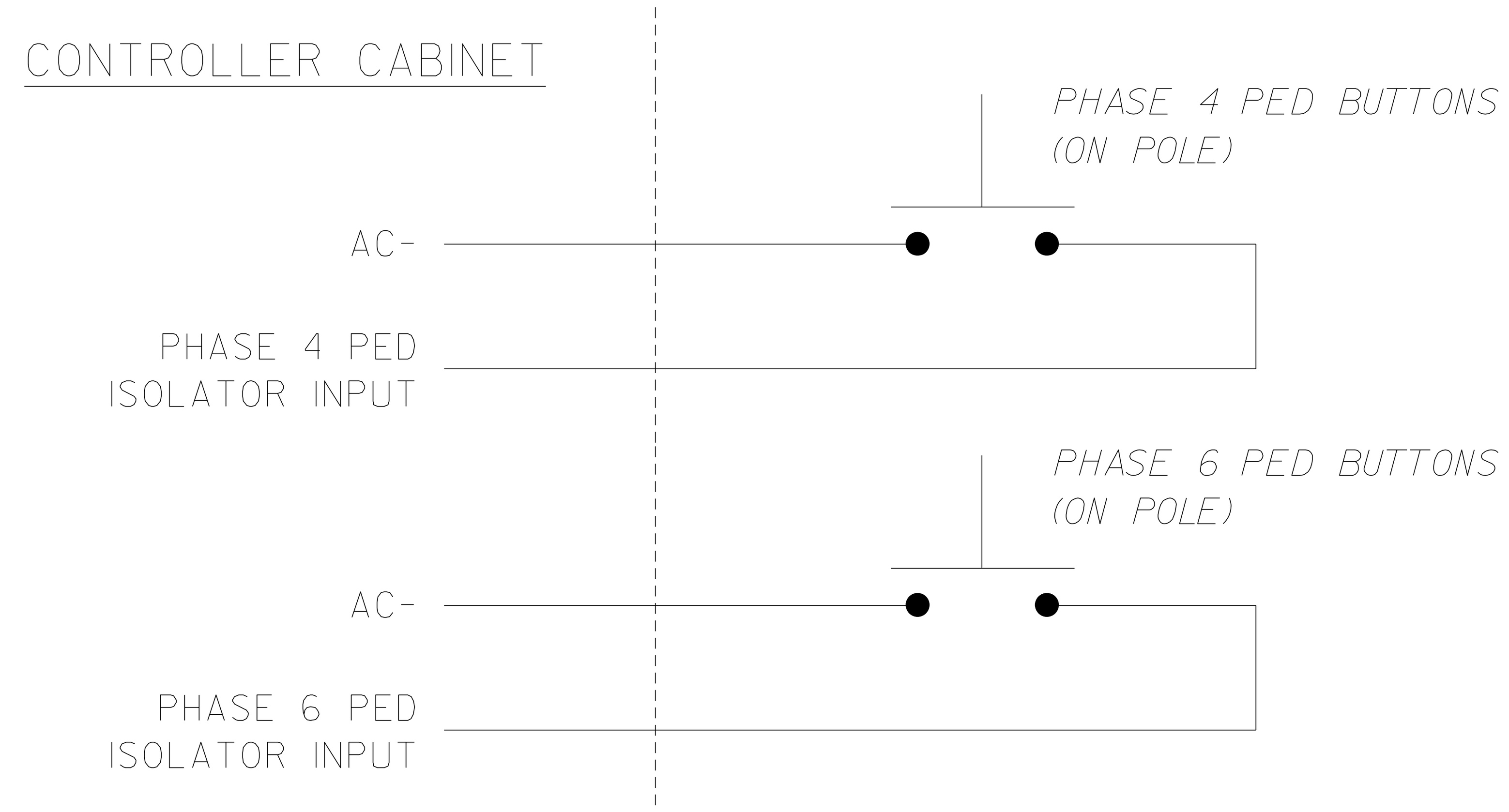
SIG. INVENTORY NO. 05-2129T3

DATE:
User:
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-4.2

PEDESTRIAN PUSH BUTTON WIRING DETAIL

(wire push buttons as shown)



COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

ALTERNATE PHASING ACTIVATION DETAIL

TO RUN ALT. PHASING DURING FREE RUN - PROGRAM CHANGES (SHOWN BELOW) IN A TIME BASED ACTION PLAN. SCHEDULE A DAY PLAN THAT INCLUDES THE ACTION PLAN PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BITS 1 AND 5.

TO RUN ALT. PHASING DURING COORDINATION - SELECT THE TIME BASED ACTION PLAN THAT IS PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BITS 1 AND 5.

PHASING	VEH DET PLAN	SF BITS ENABLED
ACTIONS REQUIRED TO RUN DEFAULT PHASING	1	NONE
ACTIONS REQUIRED TO RUN ALTERNATE PHASING	2	1,5

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OR WHAT TAKES PLACE WHEN SF BITS 1 AND 5 AND VEH DET PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

SF BITS 1 AND 5 — Modifies overlap parent phases for heads 11 and 51 to run protected turns only.

VEH DET PLAN 2: — Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 0 seconds.

Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 0 seconds.

ECONOLITE ASC/3-2070 ACTION PLAN PROGRAMMING DETAIL

1. From Main Menu select 5. TIME BASE
2. From TIME BASE Submenu select 2. ACTION PLAN

```
ACTION PLAN...[ 99]
PATTERN...........99   SYS OVERRIDE.... NO
TIMING PLAN........ 0  SEQUENCE........  0
VEH DETECTOR PLAN.. 2  DET LOG........NONE
FLASH..........   --   RED REST........ NO
VEH DET DIAG PLN... 0  PED DET DIAG PLN..0
DIMMING ENABLE..  NO   PRIORITY RETURN. NO
PED PR RETURN..   NO   QUEUE DELAY..... NO
PMT COND DELAY    NO
  PHASE   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
PED RCL   . . . . . . . . . . . . . . . .
WALK 2    . . . . . . . . . . . . . . . .
VEX 2     . . . . . . . . . . . . . . . .
VEH RCL   . . . . . . . . . . . . . . . .
MAX RCL   . . . . . . . . . . . . . . . .
MAX 2     . . . . . . . . . . . . . . . .
  PHASE   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
MAX 3     . . . . . . . . . . . . . . . .
CS INH    . . . . . . . . . . . . . . . .
OMIT      . . . . . . . . . . . . . . . .
SPC FCT   X . . . X . . . (1-8)
AUX FCT   . . . (1-3)
          1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
LP 1-15   . . . . . . . . . . . . . . .
LP 16-30  . . . . . . . . . . . . . . .
LP 31-45  . . . . . . . . . . . . . . .
LP 46-60  . . . . . . . . . . . . . . .
LP 61-75  . . . . . . . . . . . . . . .
LP 76-90  . . . . . . . . . . . . . . .
LP 91-100 . . . . . . . . . . . . . . .
```

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-2129T3
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select 2. CONTROLLER
2. From CONTROLLER Submenu select 2. VEHICLE OVERLAPS

OVERLAP A

Select TMG VEH OVLP [A] and 'PPLT FYA'

```
TMG VEH OVLP...[A] TYPE: .....PPLT FYA

PROTECTED LEFT TURN....    PHASE    1
OPPOSING THROUGH.......    PHASE    2

FLASHING ARROW OUTPUT.....CH13  ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE........... 1   !
```

Toggle Twice

OVERLAP C

Select TMG VEH OVLP [C] and 'PPLT FYA'

```
TMG VEH OVLP...[C] TYPE: .....PPLT FYA

PROTECTED LEFT TURN....    PHASE    5
OPPOSING THROUGH.......    PHASE    6

FLASHING ARROW OUTPUT.....CH15 ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE........... 5   !
```

END PROGRAMMING

! The PPLT FYA operation of Signal Head 11 (Overlap A) and Signal Head 51 (Overlap C) can be altered to fully protected operation.

Electrical Detail - Sheet 2 of 3
Temporary Design 3 - TMP Phase IV

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PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

DocuSigned by: Betsy L. Watson 35E67BB34F8743F...
SIGNATURE 12/5/2017 DATE

SIG. INVENTORY NO. 05-2129T3

DATE_
U:*Traffic*Signals*Design*Signals*Electrical Details*I-5506 sm_ele_05-2129_T3-2of3.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-4.3

ECONOLITE ASC/3-2070 VEHICLE DETECTOR SETUP PROGRAMMING DETAIL FOR ALTERATE PHASING

LOOPS 1A, 5A

(program controller as shown)

IMPORTANT!

Program detectors per the input file connection and programming chart shown on sheet 1 before proceeding.

1. From Main Menu selet [8. UTILITIES]
2. From UTILITIES Submenu select [1. COPY/CLEAR]
3. Copy from DETECTOR PLAN "1" to DETECTOR PLAN "2".

```
COPY / CLEAR UTILITY
       FROM             TO
PHASE TIMING.... . > PHASE TIMING.... .
TIMING PLAN..... . > TIMING PLAN..... .
PH DET OPT PLAN. . > PH DET OPT PLAN. .
DETECTOR PLAN... 1 > DETECTOR PLAN... 2
  TOGGLE TO SELECT A "FROM" AND A "TO"
           THEN PRESS ENTER
```

4. From Main Menu select [6. DETECTORS]
5. From DETECTOR Submenu select [2. VEHICLE DETECTOR SETUP]
6. Place cursor in VEH DET PLAN [ ] position and enter "2".

- For Loop 1A, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "1".
- Set delay time to "0".

```
VEH DETECTOR [ 1]   VEH DET PLAN [ 2]        ← NOTICE VEH DET PLAN 2
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 1  1   . . . . . . . . . . . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0  ← ENSURE DELAY IS SET TO '0'
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN....... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

- Place cursor in VEH DETECTOR [ ] position and enter "2".
- Set assigned phase to "0".

```
VEH DETECTOR [ 2]   VEH DET PLAN [ 2]        ← NOTICE VEH DET PLAN 2
TYPE: G-GREEN EXTENSION/DELAY
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 2  0   . . . . . . . . . . . . . . . .   ← ENSURE PHASE IS SET TO '0'
EXTEND TIME...  0.0 DELAY TIME...    3.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN....... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

- For Loop 5A, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "9".
- Set delay time to "0".

```
VEH DETECTOR [ 9]   VEH DET PLAN [ 2]        ← NOTICE VEH DET PLAN 2
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 9  5   . . . . . . . . . . . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0  ← ENSURE DELAY IS SET TO '0'
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN....... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

- Place cursor in VEH DETECTOR [ ] position and enter "10".
- Set assigned phase to "0".

```
VEH DETECTOR [10]   VEH DET PLAN [ 2]        ← NOTICE VEH DET PLAN 2
TYPE: G-GREEN EXTENSION/DELAY
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 10 0   . . . . . . . . . . . . . . . .   ← ENSURE PHASE IS SET TO '0'
EXTEND TIME...  0.0 DELAY TIME...    3.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN....... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-2129T3
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 3 of 3
Temporary Design 3 - TMP Phase IV

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

SR 1002 (Aviation Parkway)
at
Gateway Centre Boulevard/
Lake Crabtree Park

Division 5 | Wake County | Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

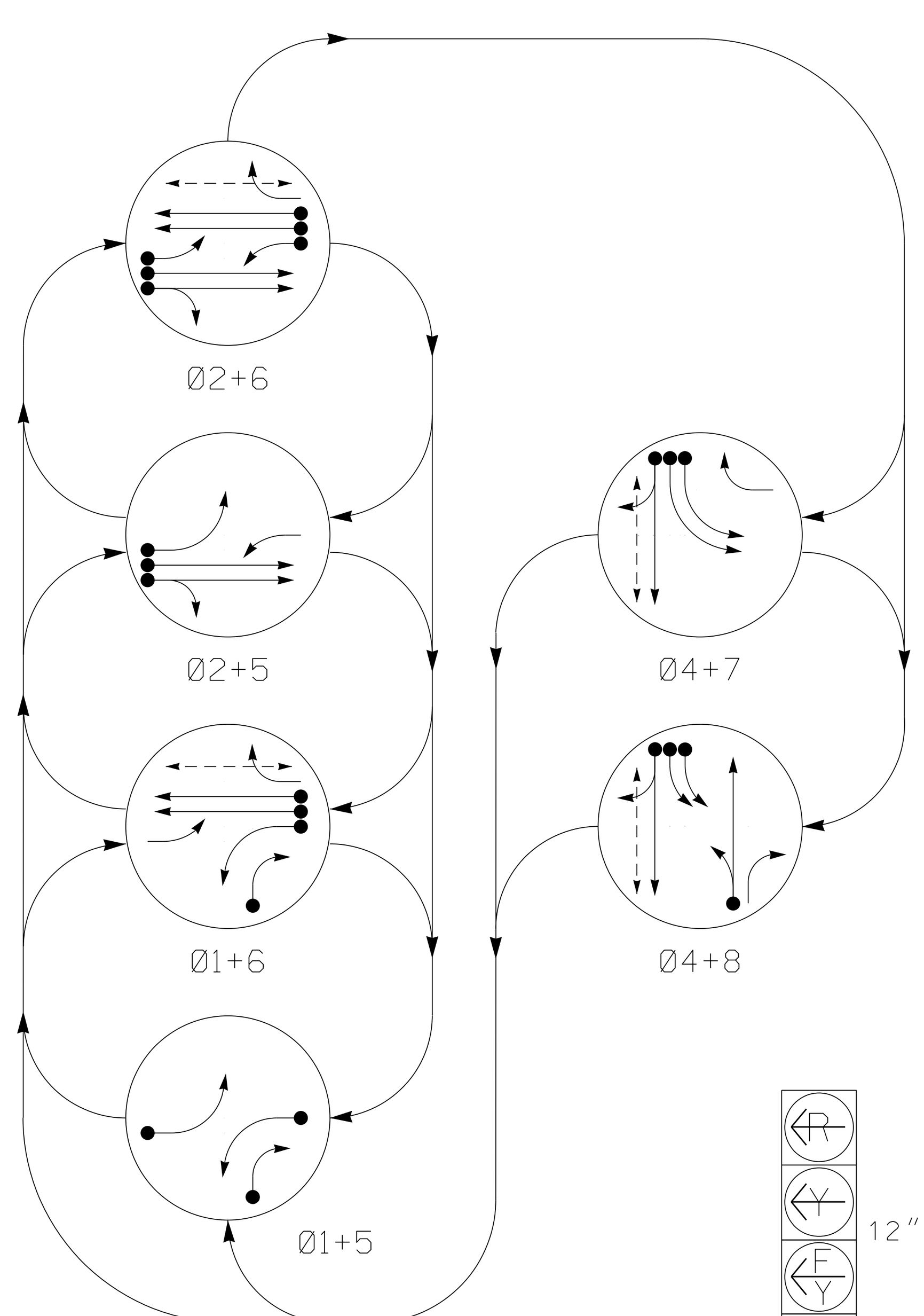
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29449 BETSY L. WATSON

Betsy L. Watson 12/5/2017

SIGNATURE | DATE

SIG. INVENTORY NO. 05-2129T3

DEFAULT PHASING DIAGRAM



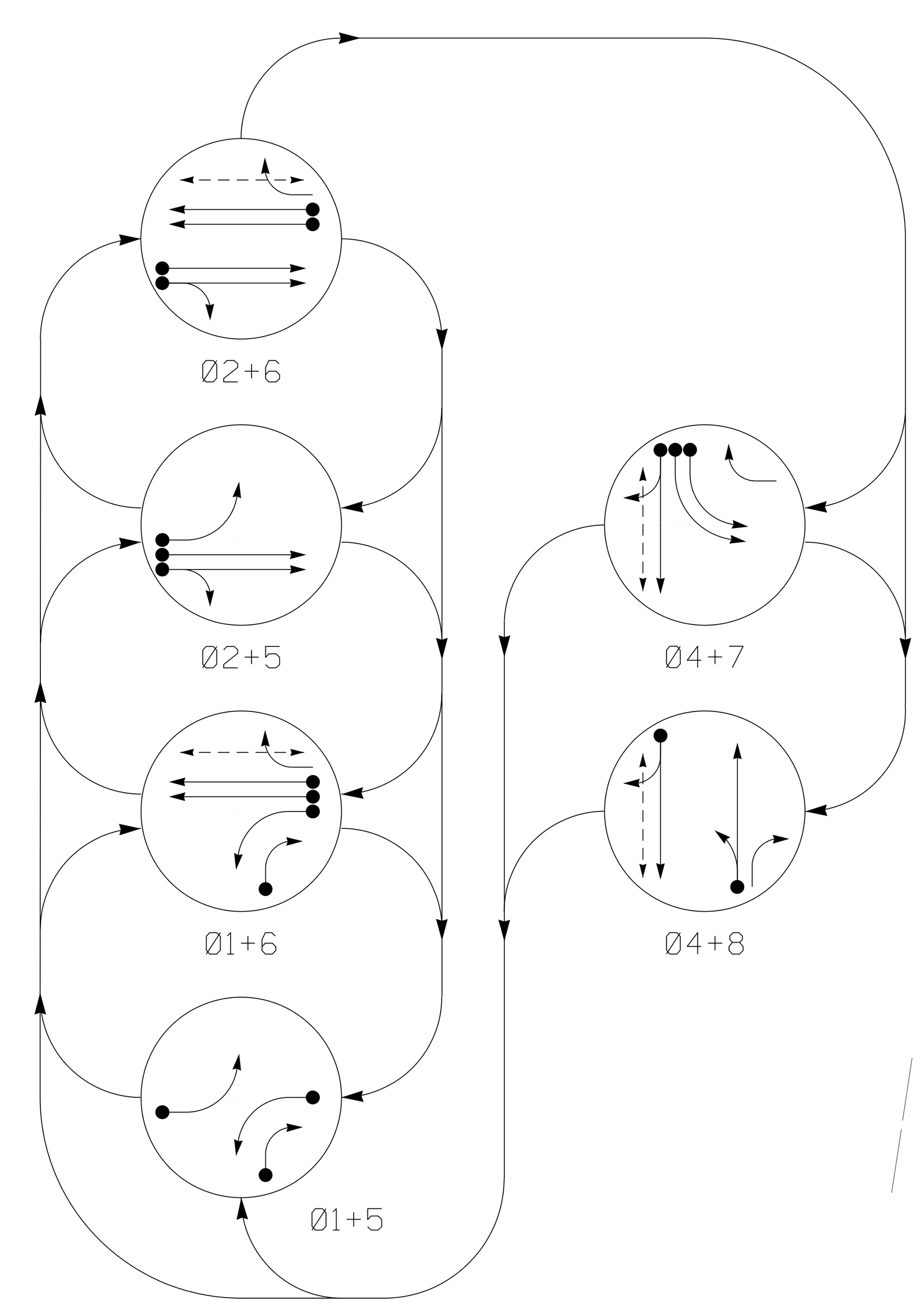
PHASING DIAGRAM DETECTION LEGEND

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

DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+7	Ø4+8	FLASH
11	←	←	←F/Y	←F/Y	←R	←R	←Y
21, 22	R	R	G	G	R	R	Y
41, 42	R	R	R	R	G	G	R
51	←	←F/Y	←	←F/Y	←R	←R	←Y
61	R	G	R	G	R	R	Y
62	R	G	R	G	R/→	R	Y
71, 72	←R	←R	←R	←R	←	←F/Y	←R
81	R	R	R	R	R	G	R
82	R/→	R/→	R	R	R	G	R
P41,P42	DW	DW	DW	DW	W	W	DRK
P61,P62	DW	W	DW	W	DW	DW	DRK

ALTERNATE PHASING DIAGRAM



ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+7	Ø4+8	FLASH
11	←	←	←R	←R	←R	←R	←Y
21, 22	R	R	G	G	R	R	Y
41, 42	R	R	R	R	G	G	R
51	←	←R	←	←R	←R	←R	←Y
61	R	G	R	G	R	R	Y
62	R	G	R	G	R/→	R	Y
71, 72	←R	←R	←R	←R	←	←R	←R
81	R	R	R	R	R	G	R
82	R/→	R/→	R	R	R	G	R
P41,P42	DW	DW	DW	DW	W	W	DRK
P61,P62	DW	W	DW	W	DW	DW	DRK

LOOP & DETECTOR INSTALLATION CHART

ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING: FEATURE	TIMING: TIME	DET. TYPE
1A	6X40	0	2-4-2	X	-	1	-	X	DELAY	15*	S
						6**	-	X	DELAY	3	G
1B	6X40	0	2-4-2	-	X	1	-	X	DELAY	15	S
2A	6X6	300	5	X	-	2	-	X	-	-	N
2B	6X6	300	EXIST	-	X	2	-	X	-	-	N
4A	6X40	0	EXIST	-	X	4	-	X	DELAY	10	S
5A	6X40	0	2-4-2	X	-	5	-	X	DELAY	15*	S
						2**	-	X	DELAY	3	G
6A	6X6	300	5	X	-	6	-	X	-	-	N
6B	6X6	300	5	X	-	6	-	X	-	-	N
7A	6X40	0	2-4-2	X	-	7	X	-	DELAY	15*	S
						4**	-	X	-	-	S
7B	6X40	0	EXIST	-	X	7	X	-	DELAY	15*	S
						4**	-	X	-	-	S
8A	6X40	0	2-4-2	-	X	8	-	X	-	-	S
S15	6X6	+300	6	X	-	-	X	-	-	-	N

* Disable delay during Alternate Phasing Operation.
** Disable Phase(s) call during Alternate Phasing Operation.

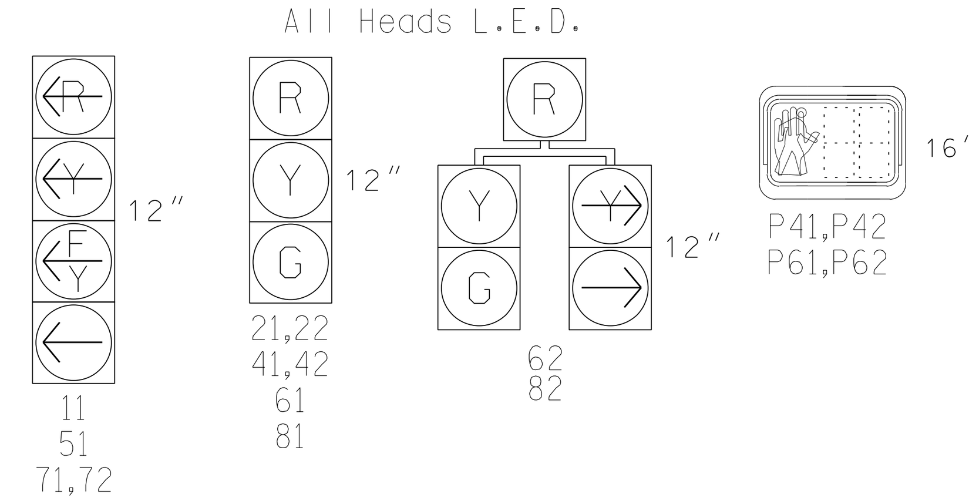
6 Phase
Fully Actuated
(Cary Signal System)

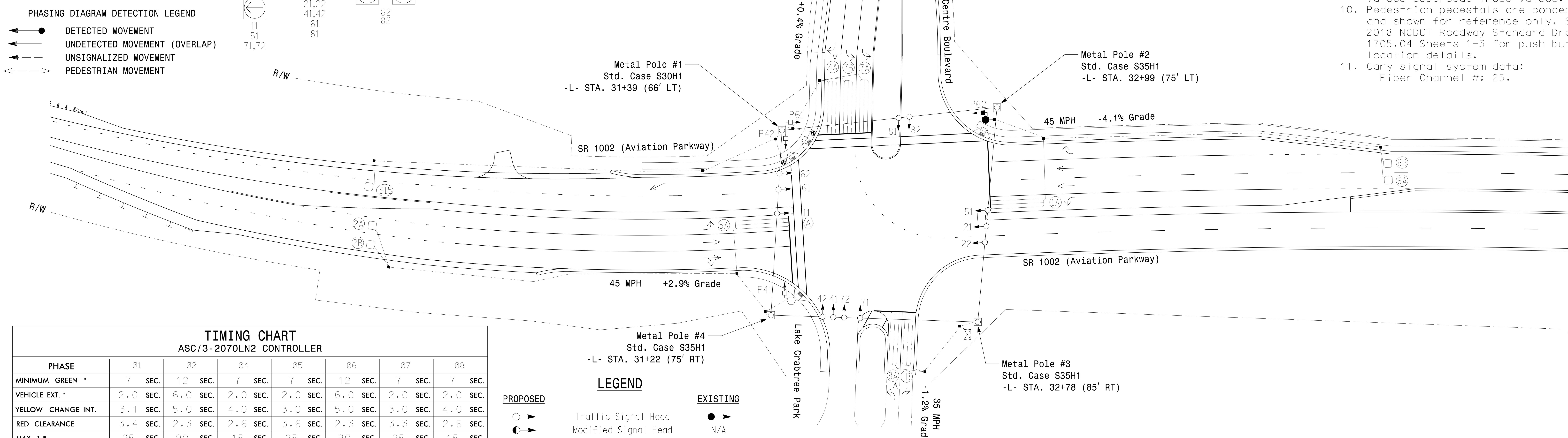
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Omit phase 7 during phase 8 on.
4. Phase 1 and/or Phase 5 may be lagged.
5. Set all detector units to presence mode.
6. The Division (Town) Traffic Engineer will determine hours of use for each phasing plan.
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 these values.
10. Pedestrian pedestals are conceptual and shown for reference only. See 2018 NCDOT Roadway Standard Drawings 1705.04 Sheets 1-3 for push button location details.
11. Cary signal system data: Fiber Channel #: 25.

SIGNAL FACE I.D.

All Heads L.E.D.





TIMING CHART

ASC/3-2070LN2 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6	Ø7	Ø8
MINIMUM GREEN *	7 SEC.	12 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.	7 SEC.
VEHICLE EXT. *	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.1 SEC.	5.0 SEC.	4.0 SEC.	3.0 SEC.	5.0 SEC.	3.0 SEC.	4.0 SEC.
RED CLEARANCE	3.4 SEC.	2.3 SEC.	2.6 SEC.	3.6 SEC.	2.3 SEC.	3.3 SEC.	2.6 SEC.
MAX. 1 *	25 SEC.	90 SEC.	15 SEC.	25 SEC.	90 SEC.	25 SEC.	15 SEC.
RED REVERT	2.0 SEC.	5.0 SEC.	2.0 SEC.	2.0 SEC.	5.0 SEC.	2.0 SEC.	2.0 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE	NONE
LOCK DET.	OFF	ON	OFF	OFF	ON	OFF	OFF
WALK *	- SEC.	- SEC.	7 SEC.	- SEC.	7 SEC.	- SEC.	- SEC.
PED. CLEAR	- SEC.	- SEC.	25 SEC.	- SEC.	31 SEC.	- SEC.	- SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	ON	OFF	OFF
ACTUATION B4 ADD *	- VEH.	- VEH.	- VEH.	- VEH.	- VEH.	- VEH.	- VEH.
SEC. PER ACTUATION *	- SEC.	2.5 SEC.	- SEC.	- SEC.	2.5 SEC.	- SEC.	- SEC.
MAX. INITIAL *	- SEC.	34 SEC.	- SEC.	- SEC.	34 SEC.	- SEC.	- SEC.
TIME B4 REDUCTION *	- SEC.	15 SEC.	- SEC.	- SEC.	15 SEC.	- SEC.	- SEC.
TIME TO REDUCE *	- SEC.	45 SEC.	- SEC.	- SEC.	45 SEC.	- SEC.	- SEC.
MINIMUM GAP	- SEC.	3.0 SEC.	- SEC.	- SEC.	3.0 SEC.	- SEC.	- SEC.
DUAL ENTRY	OFF	OFF	ON	OFF	OFF	OFF	ON
SIMULTANEOUS GAP	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.

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 Strain Pole	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Guardrail	
N/A	Curb Ramp	
	Type I Pushbutton Post	
	Type II Signal Pedestal	
	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	

Signal Upgrade - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SR 1002 (Aviation Parkway) at Gateway Centre Boulevard/ Lake Crabtree Park

Division 5 Wake County Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	R. MUNCEY
PREPARED BY:	B. WRIGHT	REVIEWED BY:	B. WATSON

REVISIONS	INIT.	DATE

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Prepared for the Offices of:
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State of North Carolina Department of Transportation
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 40
1" = 40'

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

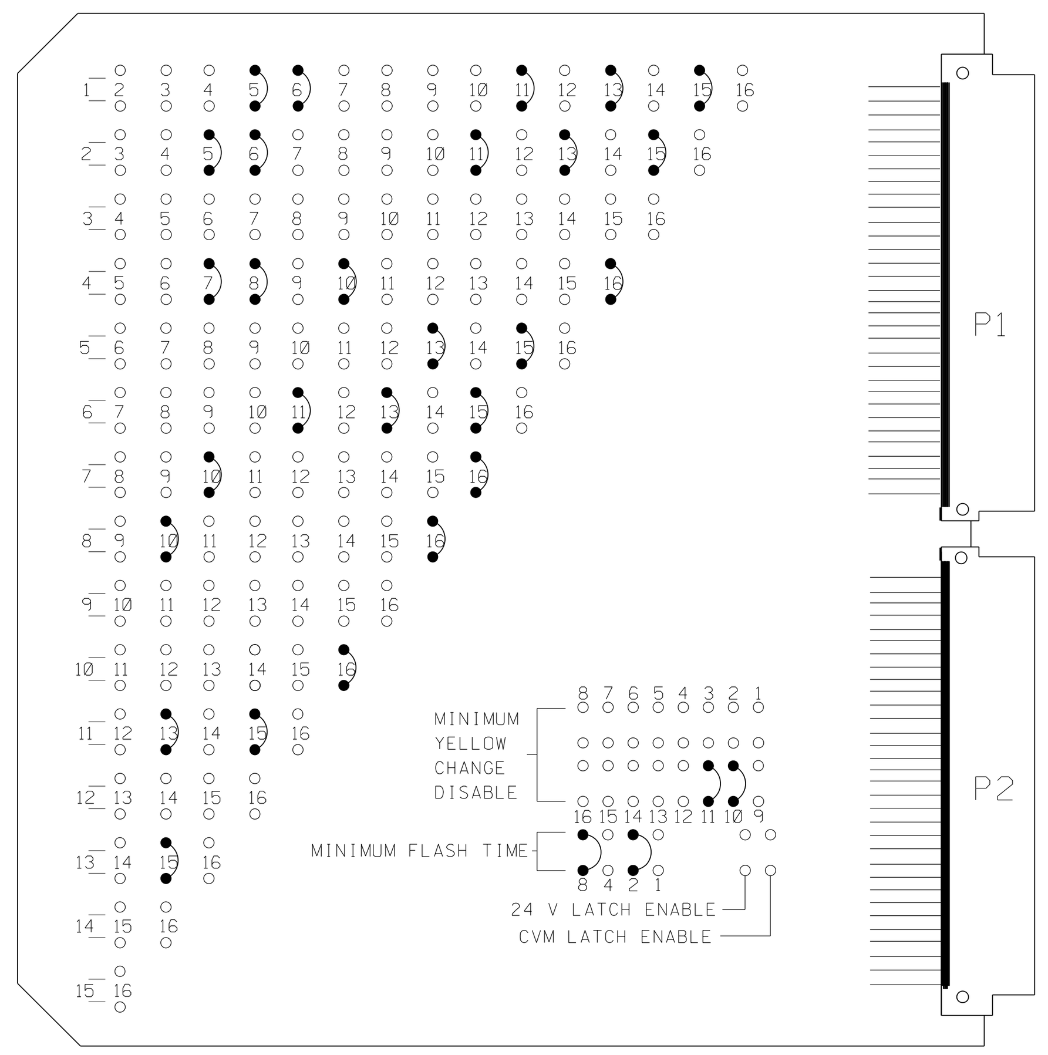
DocuSigned by: Betsy L. Watson
35E67BB34F8743F...
SIGNATURE 12/1/2017 DATE

SIG. INVENTORY NO. 05-2129

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG- 5.1

EDI MODEL MMU2-16LEip MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	ENABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	ENABLE
8	ENABLE
9	DISABLE
10	ENABLE
11	ENABLE
12	DISABLE
13	ENABLE
14	DISABLE
15	ENABLE
16	ENABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	OFF
CH 5-15	ON
CH 7-16	ON
RED/YEL INPUT ENABLE	
CH 1	ON
CH 3	OFF
CH 5	ON
CH 7	ON
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 3,9,12,&14 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 Green and 6 Walk.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. Program phases 4 and 8 for dual entry.
11. The cabinet and controller are a part of the Cary Signal System.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	1	2	3	4	5	6	7	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	11★	82	21,22	NU	41,42	51★	61,62	71,72★	62	81,82	NU	P41, P42	P61, P62	NU	11★	NU	51★	71,72★
RED		✳	2R		4R	✳	6R		✳	8R								
YELLOW			2Y		4Y	✳	6Y			8Y								
GREEN			2G		4G		6G			8G								
RED ARROW															13R		15R	16R
YELLOW ARROW		1Y							7Y						13Y		15Y	16Y
FLASHING YELLOW ARROW															13G		15G	16G
GREEN ARROW	1G	1G				5G		7G	7G									
(hand symbol)												10R	11R					
(pedestrian symbol)												10G	11G					

NU = Not Used

✳ Denotes install load resistor. See Load Resistor Installation Detail.

★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU	CH1 L3 Ø1 1B	CH1 L1 Ø1 1A	CH1 L7 Ø4 4A	CH1 L5 Ø2 2A	CH1 L11 Ø6 6A	CH1 L9 Ø5 5A	CH1 L15 Ø7 7B	CH1 L13 Ø7 7A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L4 NOT USED	CH2 L2 Ø6 1A	CH2 L8 NOT USED	CH2 L6 Ø2 2B	CH2 L12 Ø6 6B	CH2 L10 Ø2 5A	CH2 L16 Ø4 7B	CH2 L14 Ø4 7A			

RACK #2	BIU	CH1 L19 SYS DET S15	CH1 L17 Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L20 NOT USED	CH2 L18 NOT USED									

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

	LOOP NO.	LOOP PANEL TERMINALS
ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B	1A	L1A,L1B
		L2A,L2B
	1B	L3A,L3B
	NU	L4A,L4B
	2A	L5A,L5B
	2B	L6A,L6B
	4A	L7A,L7B
	NU	L8A,L8B
ADD JUMPERS FROM: L9A TO L10A, AND L9B TO L10B	5A	L9A,L9B
		L10A,L10B
	6A	L11A,L11B
	6B	L12A,L12B
ADD JUMPERS FROM: L13A TO L14A, AND L13B TO L14B	7A	L13A,L13B
		L14A,L14B
ADD JUMPERS FROM: L15A TO L16A, AND L15B TO L16B	7B	L15A,L15B
		L16A,L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
1	Ø1	DELAY	15
✳ 2	Ø6	DELAY	3
3	Ø1	DELAY	15
4			
✳✳ 5	Ø2		
✳✳ 6	Ø2		
7	Ø4	DELAY	10
8			
9	Ø5	DELAY	15
✳ 10	Ø2	DELAY	3
✳✳ 11	Ø6		
✳✳ 12	Ø6		
13	Ø7	DELAY	15
14	Ø4		
15	Ø7	DELAY	15
16	Ø4		

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
8A	L17A,L17B
NU	L18A,L18B
S15	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
17	Ø8		
18			
✳✳ 19	SYSTEM		
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE:
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

✳ Detector Type - G

✳✳ Detector Type - N

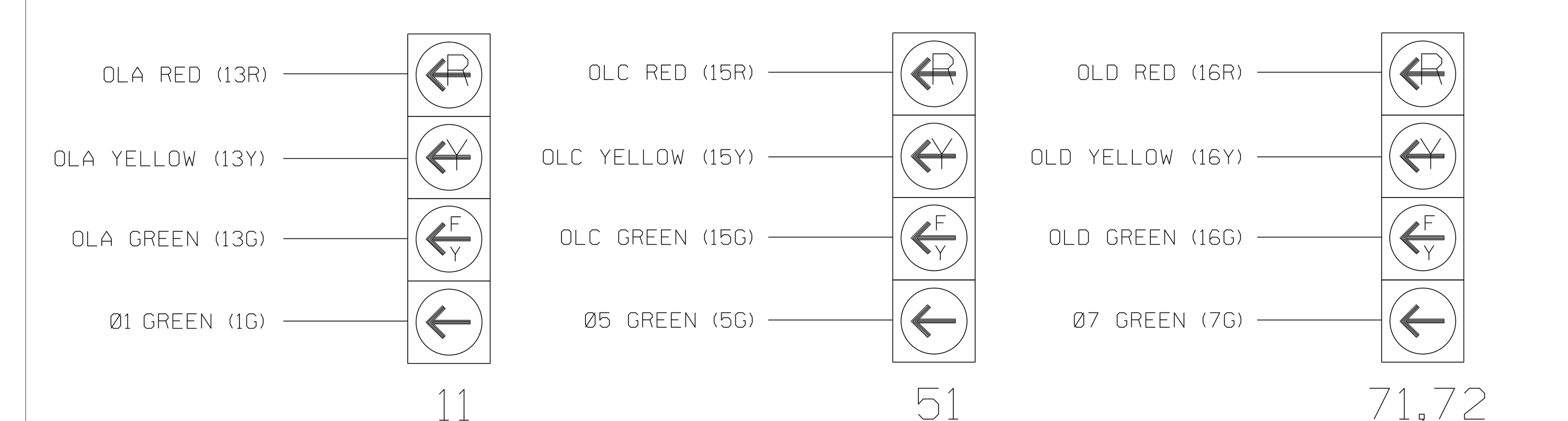
EQUIPMENT INFORMATION

CONTROLLER.............2070LN2
CABINET TS-2
SOFTWARE ....ECONOLITE ASC/3-2070
CABINET MOUNT..........BASE
LOADBAY POSITIONS.......16
LOAD SWITCHES USED......1,2,4,5,6,7,8,10,11,13,15,16
PHASES USED............1,2,4,4PED,5,6,6PED,7,8
OLA....................✳
OLB....................NOT USED
OLC....................NOT USED
OLD....................✳

✳ See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



LOAD SWITCH ASSIGNMENT DETAIL

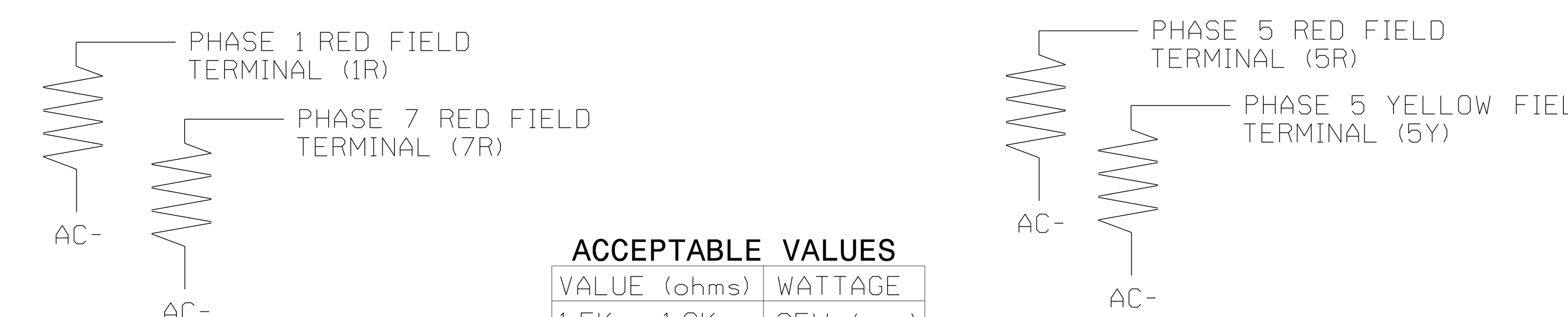
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	Ø1
2	Ø2
3	-
4	Ø4
5	Ø5
6	Ø6
7	Ø7
8	Ø8
9	-
10	Ø4 PED
11	Ø6 PED
12	-
13	OLA
14	-
15	OLC
16	OLD

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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: 05-2129
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 4
Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29449 BETSY L. WATSON

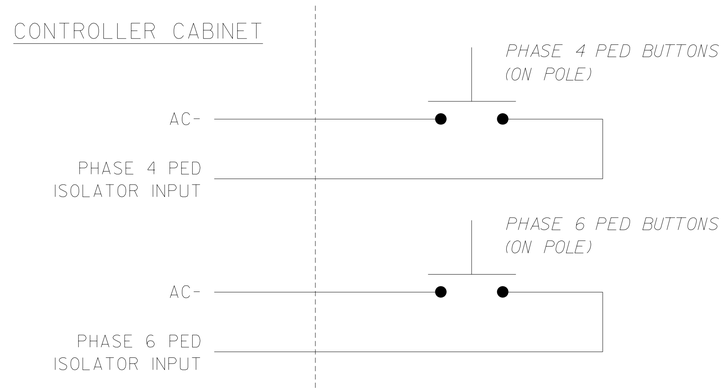
DocuSigned by: Betsy L. Watson 35E67BB34F8743F... 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-2129

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG- 5.2

PEDESTRIAN PUSH BUTTON WIRING DETAIL

(wire push buttons as shown)



COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

ALTERNATE PHASING ACTIVATION DETAIL

TO RUN ALT. PHASING DURING FREE RUN - PROGRAM CHANGES (SHOWN BELOW) IN A TIME BASED ACTION PLAN. SCHEDULE A DAY PLAN THAT INCLUDES THE ACTION PLAN PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BITS 1, 5, AND 7.

TO RUN ALT. PHASING DURING COORDINATION - SELECT THE TIME BASED ACTION PLAN THAT IS PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BITS 1, 5, AND 7.

PHASING	VEH DET PLAN	SF BITS ENABLED
ACTIONS REQUIRED TO RUN DEFAULT PHASING	1	NONE
ACTIONS REQUIRED TO RUN ALTERNATE PHASING	2	1,5,7

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OR WHAT TAKES PLACE WHEN SF BITS 1, 5, AND 7 AND VEH DET PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

SF BITS 1, 5, AND 7 Modifies overlap parent phases for heads 11, 51, 71, and 72 to run protected turns only.

VEH DET PLAN 2: Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 0 seconds.

Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 0 seconds.

Disables phase 4 call on loops 7A and 7B and reduces delay time for phase 7 call on loops 7A and 7B to 0 seconds.

ECONOLITE ASC/3-2070 ACTION PLAN PROGRAMMING DETAIL

1. From Main Menu select [5. TIME BASE]
2. From TIME BASE Submenu select [2. ACTION PLAN]

```
ACTION PLAN...[ 99]
PATTERN.............99   SYS OVERRIDE.... NO
TIMING PLAN........ 0   SEQUENCE........  0
VEH DETECTOR PLAN.. 2   DET LOG........NONE
FLASH...........   --   RED REST........ NO
VEH DET DIAG PLN... 0   PED DET DIAG PLN..0
DIMMING ENABLE..   NO   PRIORITY RETURN. NO
PED PR RETURN..    NO   QUEUE DELAY..... NO
PMT COND DELAY     NO
  PHASE   1  2  3  4  5  6  7  8  9  0  1  2  3  4  5  6
PED RCL   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
WALK 2    .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
VEX 2     .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
VEH RCL   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
MAX RCL   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
MAX 2     .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
  PHASE   1  2  3  4  5  6  7  8  9  0  1  2  3  4  5  6
MAX 3     .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
CS INH    .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
OMIT      .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
SPC FCT   X  .  .  .  X  .  X  .  (1-8)
AUX FCT   .  .  .  (1-3)
          1  2  3  4  5  6  7  8  9  0  1  2  3  4  5
LP 1-15   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 16-30  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 31-45  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 46-60  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 61-75  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 76-90  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 91-100 .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
```

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select [2. CONTROLLER]
2. From CONTROLLER Submenu select [2. VEHICLE OVERLAPS]

OVERLAP A

Select TMG VEH OVLP [A] and 'PPLT FYA'

```
TMG VEH OVLP...[A] TYPE: .....[PPLT FYA]

PROTECTED LEFT TURN....   PHASE    1
OPPOSING THROUGH.......   PHASE    2

FLASHING ARROW OUTPUT.....CH13  ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 1  /
```

Toggle Twice

OVERLAP C

Select TMG VEH OVLP [C] and 'PPLT FYA'

```
TMG VEH OVLP...[C] TYPE: .....[PPLT FYA]

PROTECTED LEFT TURN....   PHASE    5
OPPOSING THROUGH.......   PHASE    6

FLASHING ARROW OUTPUT.....CH15 ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 5  /
```

Toggle Once

OVERLAP D

Select TMG VEH OVLP [D] and 'PPLT FYA'

```
TMG VEH OVLP...[D] TYPE: .....[PPLT FYA]

LEFT TURN......... 7
OPPOSING THRU..... 8
FLASHING ARROW OUTPUT.....CH16 ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 7  /
```

END PROGRAMMING

/ The PPLT FYA operation of Signal Head 11 (Overlap A), Signal Head 51 (Overlap C) and Signal Heads 71 and 72 (Overlap D) can be altered to fully protected operation.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-2129
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 2 of 4
Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Prepared for the Offices of:
NCDOT Traffic Engineering Branch
750 N.Greenfield Pkwy.,Garner,NC 27529

SR 1002 (Aviation Parkway)
at
Gateway Centre Boulevard/
Lake Crabtree Park
Division 5 Wake County Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-2129

DATE:
User:TrafficSignals#Designs#Signals#Electrical Details#I-5506 sm_ele_05-2129-2of4.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-5.3

ECONOLITE ASC/3-2070 VEHICLE DETECTOR SETUP PROGRAMMING DETAIL FOR ALTERATE PHASING LOOPS 1A, 5A, 7A, AND 7B

(program controller as shown)

IMPORTANT!

Program detectors per the input file connection and programming chart shown on sheet 1 before proceeding.

1. From Main Menu selet [8. UTILITIES]
2. From UTILITIES Submenu select [1. COPY/CLEAR]
3. Copy from DETECTOR PLAN "1" to DETECTOR PLAN "2".

```
COPY / CLEAR UTILITY
        FROM                TO
PHASE TIMING.... . > PHASE TIMING.... .
TIMING PLAN..... . > TIMING PLAN..... .
PH DET OPT PLAN. . > PH DET OPT PLAN. .
DETECTOR PLAN... 1 > DETECTOR PLAN... 2
  TOGGLE TO SELECT A "FROM" AND A "TO"
          THEN PRESS ENTER
```

4. From Main Menu select [6. DETECTORS]
5. From DETECTOR Submenu select [2. VEHICLE DETECTOR SETUP]
6. Place cursor in VEH DET PLAN [ ] position and enter "2".

- For Loop 1A, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "1".
- Set delay time to "0".

```
VEH DETECTOR [ 1]   VEH DET PLAN [ 2]
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 1  1    . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

← NOTICE VEH DET PLAN 2

← ENSURE DELAY IS SET TO '0'

- Place cursor in VEH DETECTOR [ ] position and enter "2".
- Set assigned phase to "0".

```
VEH DETECTOR [ 2]   VEH DET PLAN [ 2]
TYPE: G-GREEN EXTENSION/DELAY
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 2  0    . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    3.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

ENSURE PHASE IS SET TO '0' →

← NOTICE VEH DET PLAN 2

- For Loop 5A, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "9".
- Set delay time to "0".

```
VEH DETECTOR [ 9]   VEH DET PLAN [ 2]
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 9  5    . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

← NOTICE VEH DET PLAN 2

← ENSURE DELAY IS SET TO '0'

- Place cursor in VEH DETECTOR [ ] position and enter "10".
- Set assigned phase to "0".

```
VEH DETECTOR [10]   VEH DET PLAN [ 2]
TYPE: G-GREEN EXTENSION/DELAY
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 10  0    . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    3.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

ENSURE PHASE IS SET TO '0' →

← NOTICE VEH DET PLAN 2

- For Loop 7A, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "13".
- Set delay time to "0".

```
VEH DETECTOR [13]   VEH DET PLAN [ 2]
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 13  7    . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

← NOTICE VEH DET PLAN 2

← ENSURE DELAY IS SET TO '0'

- Place cursor in VEH DETECTOR [ ] position and enter "14".
- Set assigned phase to "0".

```
VEH DETECTOR [14]   VEH DET PLAN [ 2]
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 14  0    . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

ENSURE PHASE IS SET TO '0' →

← NOTICE VEH DET PLAN 2

- For Loop 7B, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "15".
- Set delay time to "0".

```
VEH DETECTOR [15]   VEH DET PLAN [ 2]
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 15  7    . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

← NOTICE VEH DET PLAN 2

← ENSURE DELAY IS SET TO '0'

- Place cursor in VEH DETECTOR [ ] position and enter "16".
- Set assigned phase to "0".

```
VEH DETECTOR [16]   VEH DET PLAN [ 2]
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 16  0    . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

ENSURE PHASE IS SET TO '0' →

← NOTICE VEH DET PLAN 2

```
THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-2129
DESIGNED:  NOV 2017
SEALED:  12-01-2017
REVISED:  N/A
```

Electrical Detail - Sheet 3 of 4
Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SR 1002 (Aviation Parkway)
at
Gateway Centre Boulevard/
Lake Crabtree Park

Division 5 | Wake County | Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-2129

DATE:
User:rmuncey
File:C:\Traffic\Signals\Design\Signals\Electrical Details\I-5506 sm_ele_05-2129-3of4.dgn

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG- 5.4

ECONOLITE ASC/3-2070 BACKUP PROTECTION ENABLE PROGRAMMING

(program controller as shown)

1. From Main Menu select [1. CONFIGURATION]
2. From CONFIGURATION Submenu select [1. CONTROLLER SEQ]
3. From CONTROLLER SEQUENCE Submenu select [3. BACKUP PREVENT PHASES]

Follow programming as shown below. On the 'ENABLE BACKUP PREVENT' screen move cursor to the appropriate field and press 'YES/NO' on the controller keypad to toggle field value between 'X' ,'B', 'C' and 'OFF'.

```
ENABLE BACKUP PREVENT
TMG/BKUP 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
       1   . . . . . . . . . . . . . . .
       2 .   . . . . . . . . . . . . . .
       3 . .   . . . . . . . . . . . . .
       4 . . .   . . . . . . . . . . . .
       5 . . . .   . . . . . . . . . . .
       6 . . . . .   . . . . . . . . . .
       7 . . . . . .   . . . . . . . . .
       8 . . . . . . X   . . . . . . . .
       9 . . . . . . . .   . . . . . . .
      10 . . . . . . . . .   . . . . . .
      11 . . . . . . . . . .   . . . . .
      12 . . . . . . . . . . .   . . . .
      13 . . . . . . . . . . . .   . . .
      14 . . . . . . . . . . . . .   . .
      15 . . . . . . . . . . . . . .   .
      16 . . . . . . . . . . . . . . .
```

END PROGRAMMING

NOTE

1. 'B' without a 'C' programmed for the 'TIMING' (row) phase inhibits the controller from servicing the 'BACKUP' (column) phase when the 'TIMING' (row) phase is active, or next, until the controller goes through Red Revert and Red Clear. Make sure the proper Red Revert and Red Clear times shown on the Signal Design plan are programmed in the controller phase timing.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-2129
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 4 of 4
Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SR 1002 (Aviation Parkway)
at
Gateway Centre Boulevard/
Lake Crabtree Park

Division 5 Wake County Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L WATSON

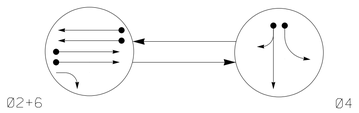
Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-2129

DATE:
I:\Traffic\Signals\Design\Signals\Electrical Details\I-5506 sm_ele_05-2129-4of4.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-6.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

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

SIGNAL FACE I.D.

All Heads L.E.D.

21,22
41,42
61,62

LOOP & DETECTOR INSTALLATION CHART

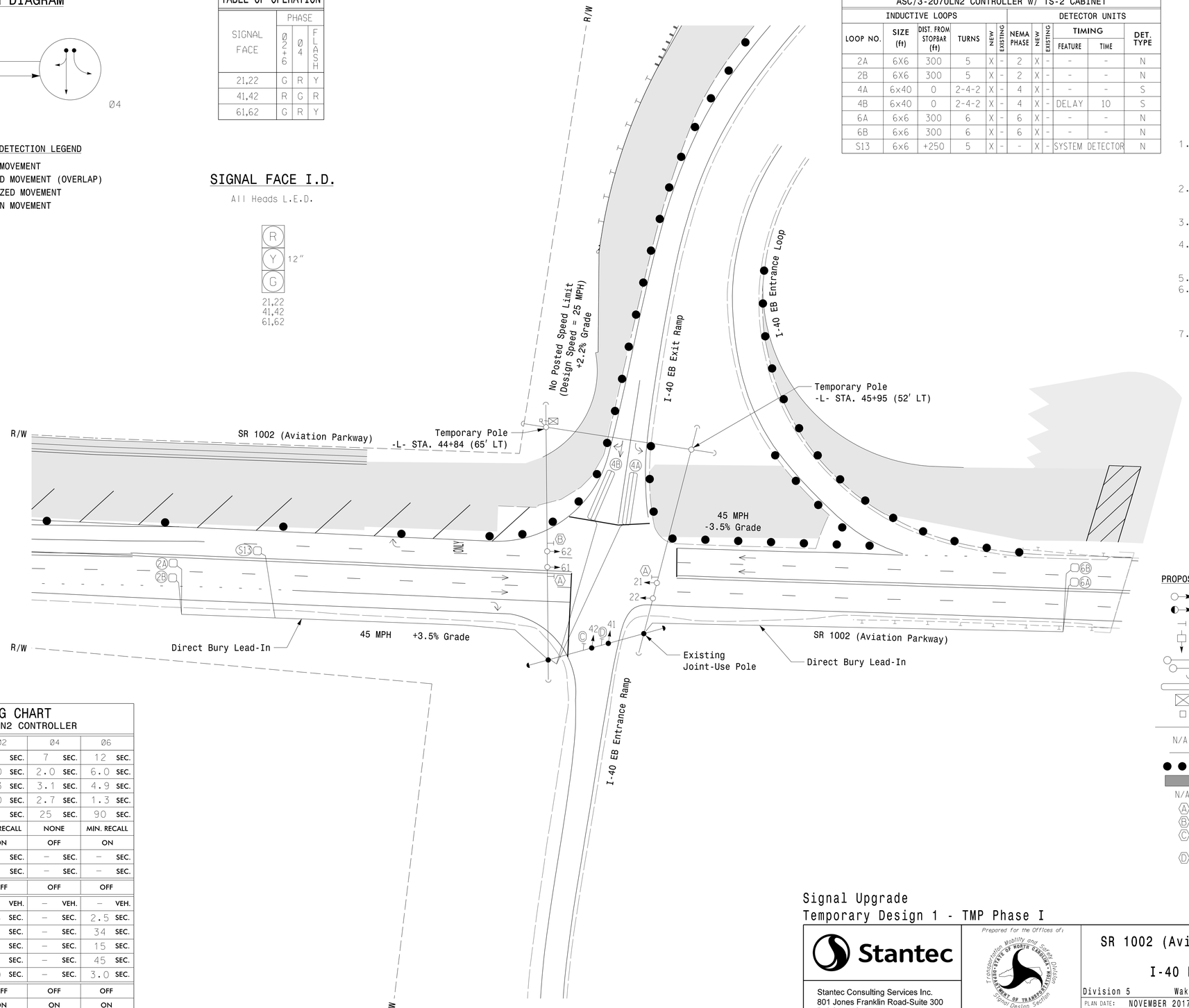
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
2A	6X6	300	5	X	-	2	X	-	-	-	N
2B	6X6	300	5	X	-	2	X	-	-	-	N
4A	6x40	0	2-4-2	X	-	4	X	-	-	-	S
4B	6x40	0	2-4-2	X	-	4	X	-	DELAY	10	S
6A	6x6	300	6	X	-	6	X	-	-	-	N
6B	6x6	300	6	X	-	6	X	-	-	-	N
S13	6x6	+250	5	X	-	-	X	-	SYSTEM DETECTOR		N

2 Phase
Fully Actuated
(Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
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. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. Pavement markings are existing.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Cary signal system data:
   Fiber Channel #: 25.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	Direct Bury Lead-In	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	N/A
	Construction Zone	N/A
N/A	Guardrail	
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ
Ⓑ	No Right Turn Sign (R3-1)	Ⓑ
Ⓒ	Combined Through and Right Arrow Sign (R3-6R)	Ⓒ
Ⓓ	Street Name Sign (D3-1)	Ⓓ

TIMING CHART

ASC/3-2070LN2 CONTROLLER

PHASE	Ø2	Ø4	Ø6
MINIMUM GREEN *	12 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	6.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	4.3 SEC.	3.1 SEC.	4.9 SEC.
RED CLEARANCE	1.0 SEC.	2.7 SEC.	1.3 SEC.
MAX. 1 *	90 SEC.	25 SEC.	90 SEC.
RECALL POSITION	MIN. RECALL	NONE	MIN. RECALL
LOCK DET.	ON	OFF	ON
WALK *	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	2.5 SEC.	– SEC.	2.5 SEC.
MAX. INITIAL *	34 SEC.	– SEC.	34 SEC.
TIME B4 REDUCTION *	15 SEC.	– SEC.	15 SEC.
TIME TO REDUCE *	45 SEC.	– SEC.	45 SEC.
MINIMUM GAP	3.0 SEC.	– SEC.	3.0 SEC.
DUAL ENTRY	OFF	OFF	OFF
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 - TMP Phase I

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Prepared for the Offices of:
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Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 40 1" = 40'

SR 1002 (Aviation Parkway)
at
I-40 EB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE: NOVEMBER 2017 | REVIEWED BY: R. MUNCEY
PREPARED BY: B. WRIGHT | REVIEWED BY: B. WATSON

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/1/2017
DESIGNER SIGNATURE DATE

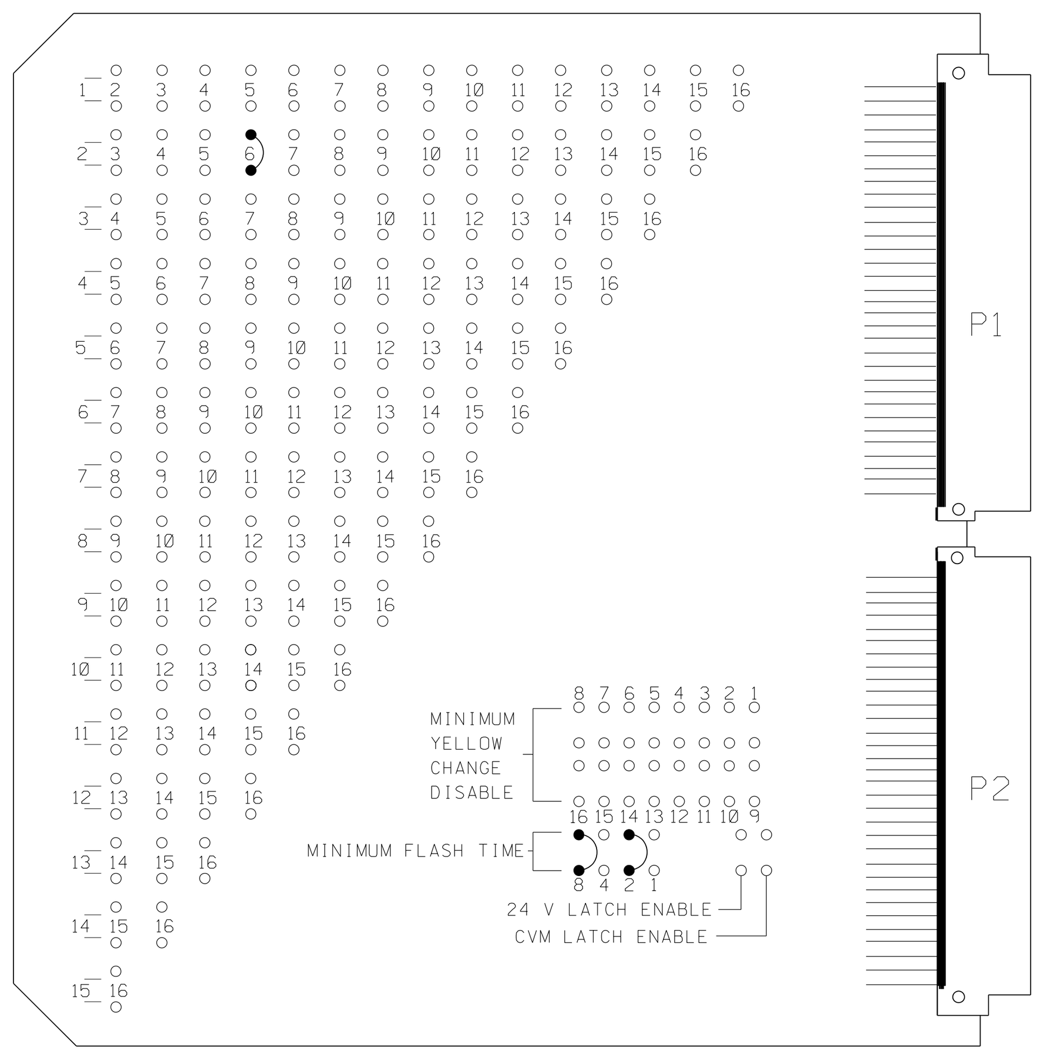
SIG. INVENTORY NO. 05-173511

DATE:
I:\Traffic\Signals\Design\Signals\Plansheets\I-5506 Sig_dsn_05-1735_T1.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG- 6.1

EDI MODEL MMU2-16LEip MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	DISABLE
14	DISABLE
15	DISABLE
16	DISABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	OFF
CH 3-14	OFF
CH 5-15	OFF
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	OFF
CH 3	OFF
CH 5	OFF
CH 7	OFF
FLASH RATE FAULT	OFF
FYA TRAP DETECT	OFF

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 1,3,5,7,8,9,10,11,12,13,14,15 & 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (Is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	NU	21,22	NU	41,42	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		2R		4R		6R										
YELLOW		2Y		4Y		6Y										
GREEN		2G		4G		6G										
RED ARROW																
YELLOW ARROW																
FLASHING YELLOW ARROW																
GREEN ARROW																
✋																
🚶																

NU = NOT USED

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1											
BIU	CH1 L3 Ø4 4A	CH1 L1 Ø2 2A	SLOT EMPTY	CH1 L5 Ø6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 Ø4 4B	CH2 L2 Ø2 2B		CH2 L6 Ø6 6B							

RACK #2											
BIU	SLOT EMPTY	CH1 L17 SYS DET S13	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L18 NOT USED									

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
2A	L1A,L1B
2B	L2A,L2B
4A	L3A,L3B
4B	L4A,L4B
6A	L5A,L5B
6B	L6A,L6B
NU	L7A,L7B
NU	L8A,L8B
NU	L9A,L9B
NU	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
** 1	Ø2		
** 2	Ø2		
3	Ø4		
4	Ø4	DELAY	10
** 5	Ø6		
** 6	Ø6		
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
S13	L17A,L17B
NU	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
** 17	SYSTEM		
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE:
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

** Detector Type - N

EQUIPMENT INFORMATION

CONTROLLER..............2070LN2
CABINET TS-2
SOFTWARE ....ECONOLITE ASC/3-2070
CABINET MOUNT...........BASE
LOADBAY POSITIONS.......16
LOAD SWITCHES USED......2,4,6
PHASES USED.............2,4,6
OLA.....................NOT USED
OLB.....................NOT USED
OLC.....................NOT USED
OLD.....................NOT USED

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	-
2	Ø2
3	-
4	Ø4
5	-
6	Ø6
7	-
8	-
9	-
10	-
11	-
12	-
13	-
14	-
15	-
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1735T1
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail
Temporary Design 1 - TMP Phase I

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1002 (Aviation Parkway)
at
I-40 EB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

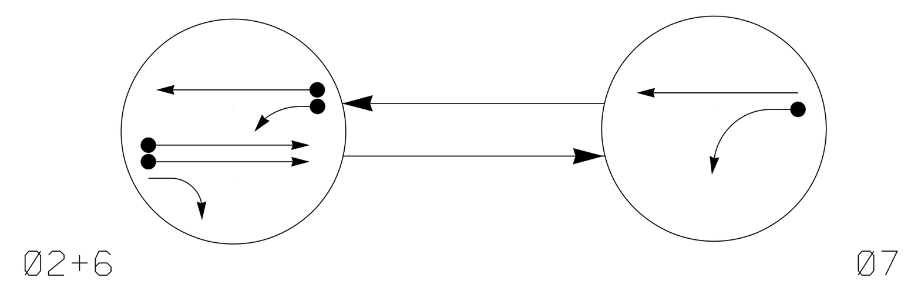
REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29449 BETSY L. WATSON

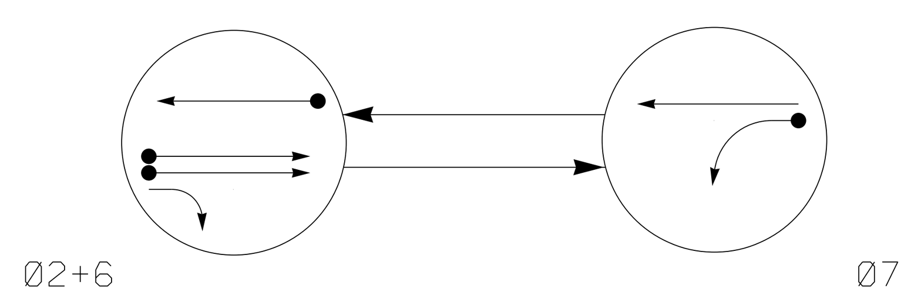
DocuSigned by: Betsy L. Watson 35E67BB34F8743F... | 12/5/2017
SIGNATURE | DATE

SIG. INVENTORY NO. 05-1735T1

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

DEFAULT PHASING TABLE OF OPERATION

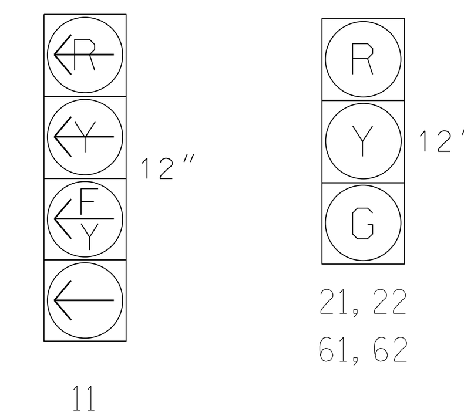
SIGNAL FACE	PHASE Ø2+6	PHASE Ø7	PHASE FLASH
11	← F Y	←	← Y
21,22	G	R	Y
61,62	G	G	Y

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø7	PHASE FLASH
11	← R	←	← Y
21,22	G	R	Y
61,62	G	G	Y

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR INSTALLATION CHART
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

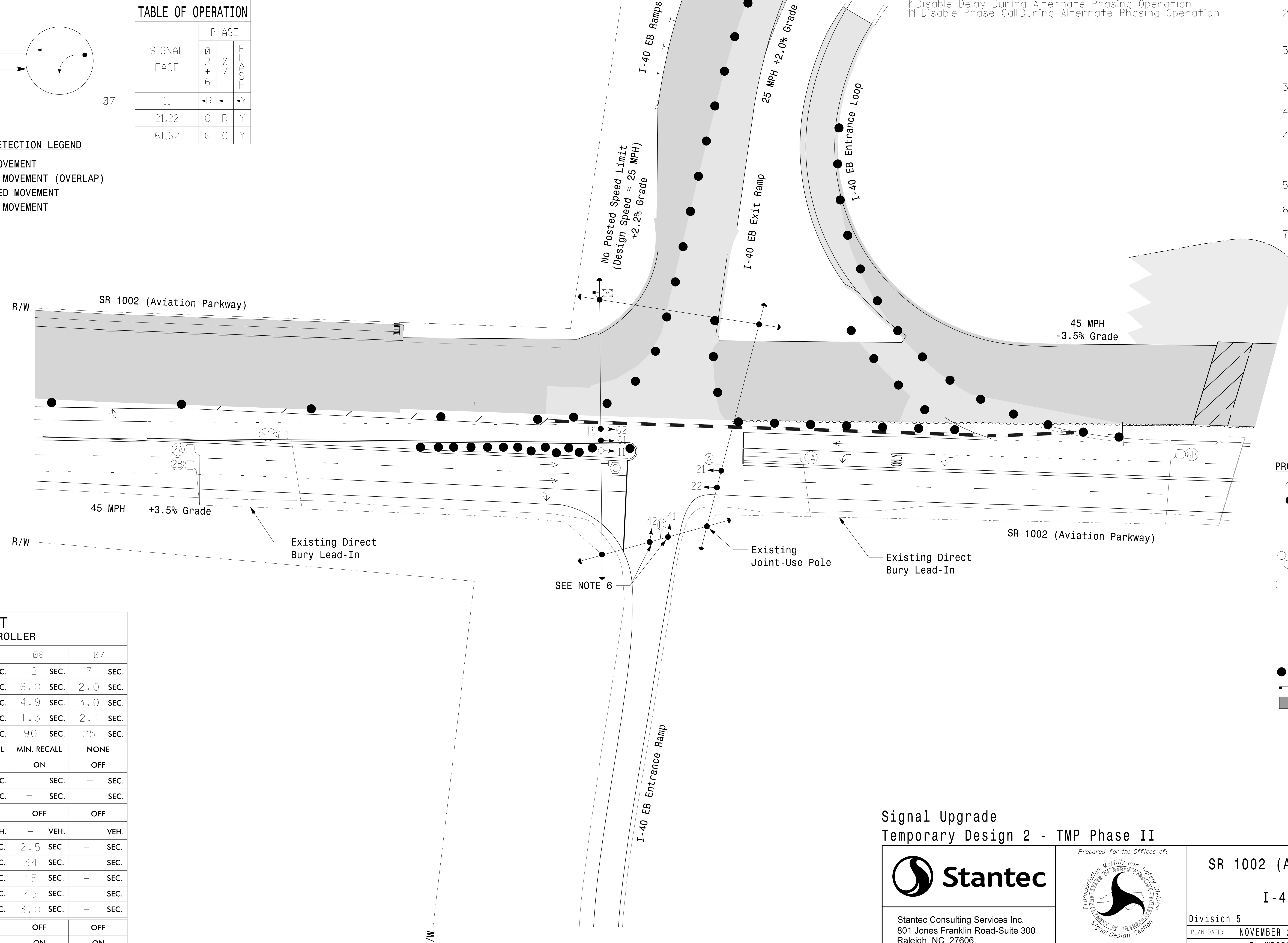
INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
1A	6X40	0	2-4-2	X	-	7	X	-	DELAY	15✳	S
						6✳✳	X	-	DELAY	3	G
2A	6x6	300	EXIST	-	X	2	-	X	-	-	N
2B	6X6	300	EXIST	-	X	2	-	X	-	-	N
6B	6X6	300	EXIST	-	X	6	-	X	-	-	N
S13	6x6	+250	EXIST	-	X	-	-	X	SYSTEM DETECTOR		N

✳ Disable Delay During Alternate Phasing Operation
✳✳ Disable Phase Call During Alternate Phasing Operation

2 Phase
Fully Actuated
(Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. The Division (Town) Traffic Engineer will determine hours of use for each phasing plan.
3. Set all detector units to presence mode.
4. Pavement markings are existing unless otherwise shown.
4. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
5. Reposition existing signal heads 61 and 62.
6. Bag and disconnect existing signal heads 41 and 42.
7. Cary Signal System Data:
   Fiber Channel #25



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	Direct Bury Lead-In	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	N/A
	Construction Zone Barrier	N/A
	Construction Zone	N/A
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ
Ⓑ	No Right Turn Sign (R3-1)	Ⓑ
Ⓒ	Left Arrow Sign (R3-5L)	Ⓒ
Ⓓ	Street Name Sign (D3-1)	Ⓓ

TIMING CHART
ASC/3-2070LN2 CONTROLLER

PHASE	Ø2	Ø6	Ø7
MINIMUM GREEN *	12 SEC.	12 SEC.	7 SEC.
VEHICLE EXT. *	6.0 SEC.	6.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.9 SEC.	4.9 SEC.	3.0 SEC.
RED CLEARANCE	1.3 SEC.	1.3 SEC.	2.1 SEC.
MAX. 1 *	90 SEC.	90 SEC.	25 SEC.
RECALL POSITION	MIN. RECALL	MIN. RECALL	NONE
LOCK DET.	ON	ON	OFF
WALK *	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	VEH.
SEC. PER ACTUATION *	2.5 SEC.	2.5 SEC.	– SEC.
MAX. INITIAL *	34 SEC.	34 SEC.	– SEC.
TIME B4 REDUCTION *	15 SEC.	15 SEC.	– SEC.
TIME TO REDUCE *	45 SEC.	45 SEC.	– SEC.
MINIMUM GAP	3.0 SEC.	3.0 SEC.	– SEC.
DUAL ENTRY	OFF	OFF	OFF
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 - TMP Phase II

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

SCALE 0 40
1" = 40'

SR 1002 (Aviation Parkway) at I-40 EB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	R. MUNCEY
PREPARED BY:	B. WRIGHT	REVIEWED BY:	B. WATSON

REVISIONS | INIT. | DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

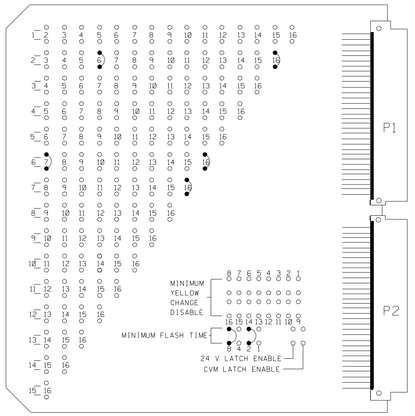
Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1735T2

DATE: U:*Traffic*Signals*Design*Signals*Plansheets*I-5506 Sig_dsn_05-1735_T2.dgn User:rmuncey

EDI MODEL MMU2-16LEip
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	DISABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	DISABLE
14	DISABLE
15	DISABLE
16	ENABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	OFF
CH 3-14	OFF
CH 5-15	OFF
CH 7-16	ON
RED/YEL INPUT ENABLE	
CH 1	OFF
CH 3	OFF
CH 5	OFF
CH 7	ON
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 1,3,4,5,8,9,10,11,12,13,14,& 15 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (Is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-7.1

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	OLE	OLG	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	NU	21,22	NU	NU	NU	61,62	11★	NU	NU	NU	NU	NU	NU	NU	NU	11★
RED		2R				6R	✳									
YELLOW		2Y				6Y	✳									
GREEN		2G				6G										
RED ARROW																16R
YELLOW ARROW																16Y
FLASHING YELLOW ARROW																16G
GREEN ARROW							7G									
✋																
🚶																

NU = Not Used
✳ Denotes install load resistor. See Load Resistor Installation Detail on this sheet.
★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW.
PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU	SLOT 1	SLOT 2	SLOT 3	SLOT 4	SLOT 5	SLOT 6	SLOT 7	SLOT 8	SLOT 9
		EMPTY	CH1 L1 ø2 2A CH2 L2 ø2 2B	CH1 L7 ø7 1A CH2 L8 ø6 1A	CH1 L5 NOT USED CH2 L6 ø6 6B	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

RACK #2	BIU	SLOT 1	SLOT 2	SLOT 3	SLOT 4	SLOT 5	SLOT 6	SLOT 7	SLOT 8	SLOT 9
		CH1 L17 SYS DET S13 CH2 L18 NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
2A	L1A,L1B
2B	L2A,L2B
NU	L3A,L3B
NU	L4A,L4B
NU	L5A,L5B
6B	L6A,L6B
1A	L7A,L7B
	L8A,L8B
NU	L9A,L9B
NU	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

ADD JUMPERS FROM L7A TO L8A, AND L7B TO L8B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
** 1	ø2		
** 2	ø2		
3			
4			
5			
** 6	ø6		
7	ø7	DELAY	15
* 8	ø6	DELAY	3
9			
10			
11			
12			
13			
14			
15			
16			

NOTE:
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
S13	L17A,L17B
NU	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
** 17	SYSTEM		
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

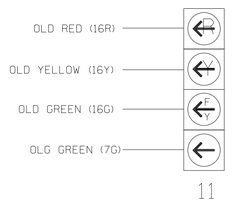
* Detector Type - G
** Detector Type - N

EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET TS-2
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....2,6,7,16
PHASES USED.....2,6,7
OLA.....NOT USED
OLB.....NOT USED
OLC.....NOT USED
OLD.....✳
OLE.....6+7
OLG.....✳
✳ See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



ECONOLITE ASC/3-2070
LOAD SWITCH ASSIGNMENT DETAIL

(program controller as shown)

To assign load switches 6 and 7 as OLE and OLG, program LD SWITCH 7 as OVLP '7' TYPE 'O' and LD SWITCH 6 as OVLP '5' TYPE 'O' as shown below.

1. From Main Menu select [1. CONFIGURATION]
2. From CONFIGURATION Submenu select [3. LOAD SW ASSIGN]

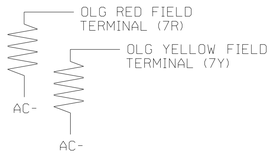
NOTICE LD SWITCHES 6 & 7 ASSIGNED TO TYPE 'O'

LD SWITCH ASSIGN

	PHASE /OVLP	TYPE	DIMMING R	Y	G	D	FLASH PWR	AUT	TGR
1	1	V	.	.	.	+	A	R	X
2	2	V	.	.	.	+	A	Y	.
3	3	V	.	.	.	+	A	R	X
4	4	V	.	.	.	+	A	R	.
5	5	V	.	.	.	−	A	R	.
6	5	O	.	.	.	−	A	Y	X
7	7	O	.	.	.	−	A	R	.
8	8	V	.	.	.	−	A	R	X
9	2	P	.	.	.	+	A	.	.
10	4	P	.	.	.	−	A	.	.
11	6	P	.	.	.	+	A	.	.
12	8	P	.	.	.	−	A	.	.
13	1	O	.	.	.	+	A	R	X
14	2	O	.	.	.	+	A	R	X
15	3	O	.	.	.	−	A	R	.
16	4	O	.	.	.	−	A	Y	.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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: 05-1735T2
DESIGNED: NOV 2017
SEALED: 12-05-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 3
Temporary Design 2 - TMP Phase II

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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I-40 EB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1735T2

DATE:
TIME:
User:rmuncey

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select [2. CONTROLLER]
2. From CONTROLLER Submenu select [2. VEHICLE OVERLAPS]
3. Toggle Three Times.

OVERLAP D

Select TMG VEH OVLP [D] and 'PPLT FYA'

```
TMG VEH OVLP...[D] TYPE: .....[PPLT FYA]

PROTECTED LEFT TURN....   OVERLAP G
OPPOSING THROUGH.......   PHASE    2

FLASHING ARROW OUTPUT.....CH16 ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 7
```

Toggle Once

OVERLAP E

Select TMG VEH OVLP [E] and 'NORMAL'

```
TMG VEH OVLP...[E] TYPE: ......[NORMAL]
  PHASES 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
INCLUDED . . . . . X X . . . . . .

LAG GRN 0.0 YEL 0.0 RED 0.0
```

Toggle Twice

OVERLAP G

MOVE CURSOR OVER [F]
TOGGLE TO TMG VEH OVLP [G]

```
TMG VEH OVLP...[G] TYPE: ......[NORMAL]
  PHASES 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
INCLUDED . . . . . X . . . . . .

LAG GRN 0.0 YEL 0.0 RED 0.0
```

END PROGRAMMING

! The PPLT FYA operation of Signal Head 11 (Overlap D) can be altered to fully protected operation.

ALTERNATE PHASING ACTIVATION DETAIL

TO RUN ALT. PHASING DURING FREE RUN - PROGRAM CHANGES (SHOWN BELOW) IN A TIME BASED ACTION PLAN. SCHEDULE A DAY PLAN THAT INCLUDES THE ACTION PLAN PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BIT 7.

TO RUN ALT. PHASING DURING COORDINATION - SELECT THE TIME BASED ACTION PLAN THAT IS PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BIT 7.

PHASING	VEH DET PLAN	SF BITS ENABLED
ACTIONS REQUIRED TO RUN DEFAULT PHASING	1	NONE
ACTIONS REQUIRED TO RUN ALTERNATE PHASING	2	7

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OR WHAT TAKES PLACE WHEN SF BIT 7 AND VEH DET PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

SF BIT 7	Modifies overlap parent phases for head 11 to run protected turns only.
VEH DET PLAN 2:	Disables phase 6 call on loop 1A and reduces delay time for phase 7 call on loop 1A to 0 seconds.

ECONOLITE ASC/3-2070 ACTION PLAN PROGRAMMING DETAIL

1. From Main Menu select [5. TIME BASE]
2. From TIME BASE Submenu select [2. ACTION PLAN]

```
ACTION PLAN...[ 99]
PATTERN.............99   SYS OVERRIDE.... NO
TIMING PLAN........ 0   SEQUENCE........  0
VEH DETECTOR PLAN.. 2   DET LOG........NONE
FLASH...........   --   RED REST........ NO
VEH DET DIAG PLN... 0   PED DET DIAG PLN..0
DIMMING ENABLE..   NO   PRIORITY RETURN. NO
PED PR RETURN..    NO   QUEUE DELAY..... NO
PMT COND DELAY     NO
  PHASE   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
PED RCL   . . . . . . . . . . . . . . . .
WALK 2    . . . . . . . . . . . . . . . .
VEX 2     . . . . . . . . . . . . . . . .
VEH RCL   . . . . . . . . . . . . . . . .
MAX RCL   . . . . . . . . . . . . . . . .
MAX 2     . . . . . . . . . . . . . . . .
  PHASE   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
MAX 3     . . . . . . . . . . . . . . . .
CS INH    . . . . . . . . . . . . . . . .
OMIT      . . . . . . . . . . . . . . . .
SPC FCT   . . . . . . . X . (1-8)
AUX FCT   . . . (1-3)
          1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
LP 1-15   . . . . . . . . . . . . . . .
LP 16-30  . . . . . . . . . . . . . . .
LP 31-45  . . . . . . . . . . . . . . .
LP 46-60  . . . . . . . . . . . . . . .
LP 61-75  . . . . . . . . . . . . . . .
LP 76-90  . . . . . . . . . . . . . . .
LP 91-100 . . . . . . . . . . . . . . .
```

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1735T2
DESIGNED: NOV 2017
SEALED: 12-05-2017
REVISED: N/A

Electrical Detail - Sheet 2 of 3
Temporary Design 2 - TMP Phase II

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1002 (Aviation Parkway)
at
I-40 EB Ramps

Division 5 Wake County

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE
SIG. INVENTORY NO. 05-1735T2

PROJECT REFERENCE NO. I-5506 | SHEET NO. SIG-7.2

DATE:
U:\Traffic\Signals\Designs\Signals\Electrical Details\I-5506 sm_ele_05-1735_T2-2of3.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-7.3

ECONOLITE ASC/3-2070 VEHICLE DETECTOR SETUP PROGRAMMING DETAIL FOR ALTERATE PHASING LOOP 1A

(program controller as shown)

IMPORTANT!

Program detectors per the input file connection and programming chart shown on sheet 1 before proceeding.

1. From Main Menu selet [8. UTILITIES]
2. From UTILITIES Submenu select [1. COPY/CLEAR]
3. Copy from DETECTOR PLAN "1" to DETECTOR PLAN "2".

```
COPY / CLEAR UTILITY
       FROM                TO
PHASE TIMING.... . > PHASE TIMING.... .
TIMING PLAN..... . > TIMING PLAN..... .
PH DET OPT PLAN. . > PH DET OPT PLAN. .
DETECTOR PLAN... 1 > DETECTOR PLAN... 2
  TOGGLE TO SELECT A "FROM" AND A "TO"
            THEN PRESS ENTER
```

4. From Main Menu select [6. DETECTORS]
5. From DETECTOR Submenu select [2. VEHICLE DETECTOR SETUP]
6. Place cursor in VEH DET PLAN [ ] position and enter "2".

- For Loop 1A, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "7".
- Set delay time to "0".

```
VEH DETECTOR [ 7]   VEH DET PLAN [ 2]      <- NOTICE VEH DET PLAN 2
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 7  7    . . . . . . . . . . . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0  <- ENSURE DELAY IS SET TO '0'
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

- Place cursor in VEH DETECTOR [ ] position and enter "8".
- Set assigned phase to "0".

```
VEH DETECTOR [ 8]   VEH DET PLAN [ 2]      <- NOTICE VEH DET PLAN 2
TYPE: G-GREEN
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 8  0    . . . . . . . . . . . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    3.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

ENSURE PHASE IS SET TO '0' →

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1735T2
DESIGNED: NOV 2017
SEALED: 12-05-2017
REVISED: N/A

Electrical Detail - Sheet 3 of 3
Temporary Design 2 - TMP Phase II

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I-40 EB Ramps

Division 5 Wake County

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

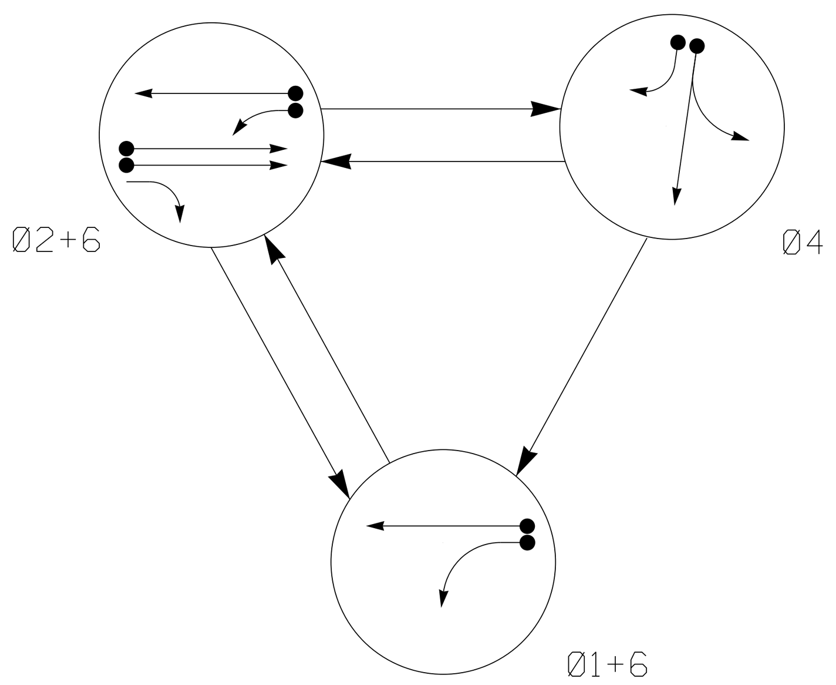
Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1735T2

DATE:
File: C:\Traffic\Signals\Design\Signals\Electrical Details\t-5506 sm_ele_05-1735_12-3of3.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-8.0

DEFAULT PHASING DIAGRAM



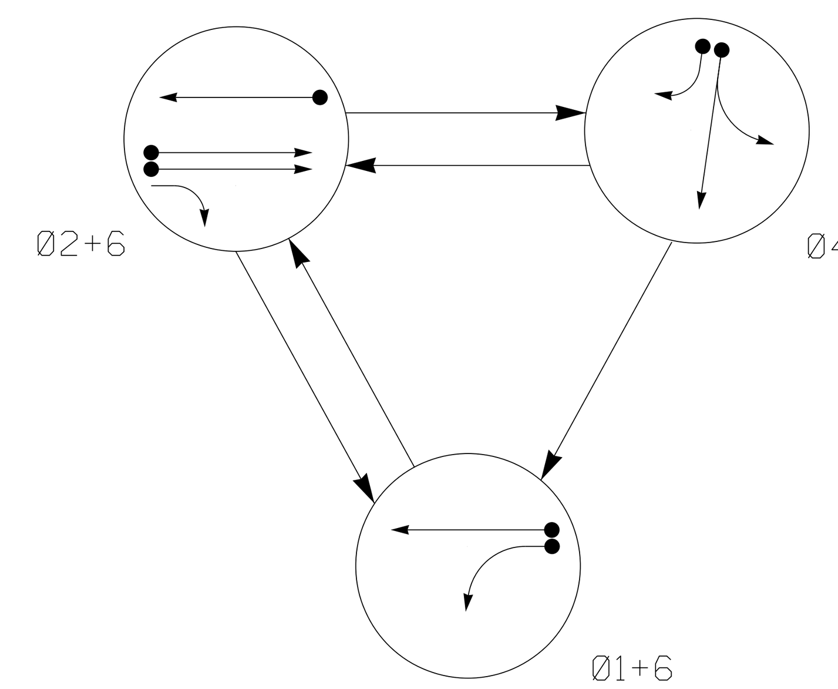
PHASING DIAGRAM DETECTION LEGEND

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

DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+6	Ø2+6	Ø4	FLASH
11	←	← F/Y	← R	← Y
21,22	R	G	R	Y
41,42	R	R	G	R
61,62	G	G	R	Y

ALTERNATE PHASING DIAGRAM

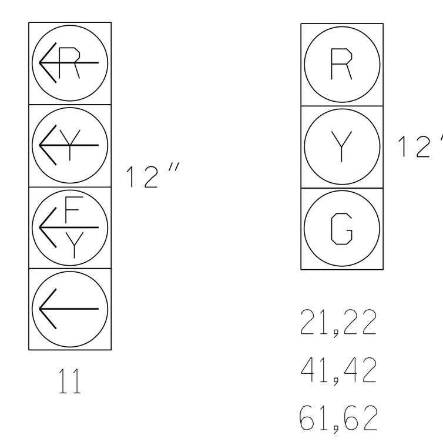


ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+6	Ø2+6	Ø4	FLASH
11	←	← R	← R	← Y
21,22	R	G	R	Y
41,42	R	R	G	R
61,62	G	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR INSTALLATION CHART
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

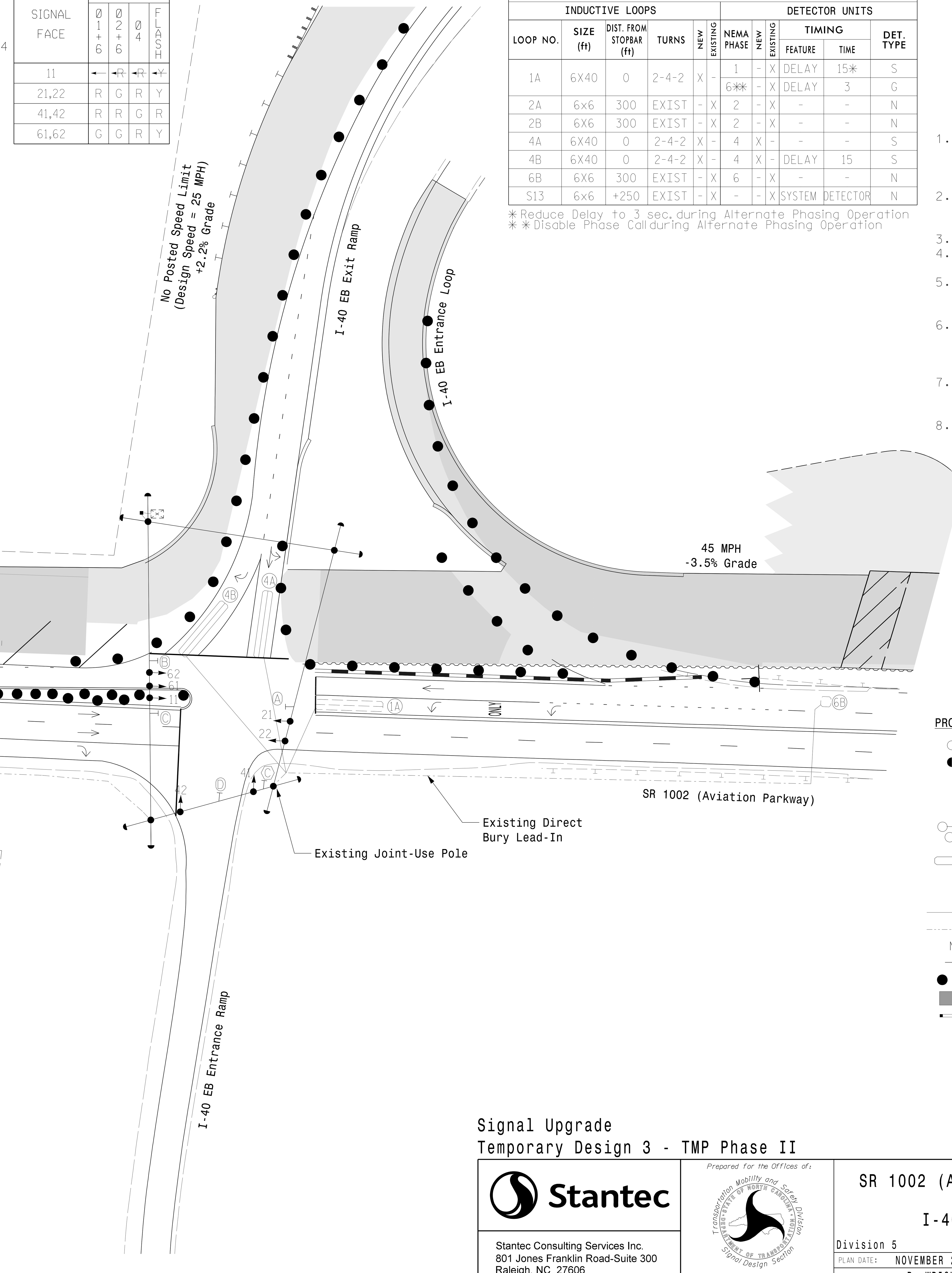
INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
1A	6X40	0	2-4-2	X	-	1	-	X	DELAY	15*	S
						6**	-	X	DELAY	3	G
2A	6x6	300	EXIST	-	X	2	-	X	-	-	N
2B	6X6	300	EXIST	-	X	2	-	X	-	-	N
4A	6X40	0	2-4-2	X	-	4	X	-	-	-	S
4B	6X40	0	2-4-2	X	-	4	X	-	DELAY	15	S
6B	6X6	300	EXIST	-	X	6	-	X	-	-	N
S13	6x6	+250	EXIST	-	X	-	-	X	SYSTEM	DETECTOR	N

* Reduce Delay to 3 sec. during Alternate Phasing Operation
** Disable Phase Call during Alternate Phasing Operation

3 Phase
Fully Actuated
(Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 may be lagged.
4. Set all detector units to presence mode.
5. The Division (Town) Traffic Engineer will determine hours of use for each phasing plan.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Unbag and reconnect existing signal heads 41 and 42. Reposition existing signal heads 41 and 42.
8. Cary Signal System Data:
   Fiber Channel #25.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	Direct Bury Lead-In	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	N/A
	Construction Zone	N/A
	Construction Zone Barrier	N/A
N/A	Guardrail	
(A)	No Left Turn Sign (R3-2)	(A)
(B)	No Right Turn Sign (R3-1)	(B)
(C)	Left Arrow Sign (R3-5L)	(C)
(D)	Street Name Sign (D3-1)	(D)

TIMING CHART
ASC/3-2070LN2 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø6
MINIMUM GREEN *	7 SEC.	12 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	2.0 SEC.	6.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.9 SEC.	3.0 SEC.	4.9 SEC.
RED CLEARANCE	2.1 SEC.	1.5 SEC.	1.2 SEC.	1.5 SEC.
MAX. 1 *	25 SEC.	90 SEC.	25 SEC.	90 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	MIN. RECALL
LOCK DET.	OFF	ON	OFF	ON
WALK *	– SEC.	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	2.5 SEC.	– SEC.	2.5 SEC.
MAX. INITIAL *	– SEC.	34 SEC.	– SEC.	34 SEC.
TIME B4 REDUCTION *	– SEC.	15 SEC.	– SEC.	15 SEC.
TIME TO REDUCE *	– SEC.	45 SEC.	– SEC.	45 SEC.
MINIMUM GAP	– SEC.	3.0 SEC.	– SEC.	3.0 SEC.
DUAL ENTRY	OFF	OFF	OFF	OFF
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.

DATE_
U:*Traffic*Signals*Design*Signals*Plansheets*I-5506 Sig_dsn_05-1735_T3.dgn
User:rmuncey

Signal Upgrade
Temporary Design 3 - TMP Phase II

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Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 40
1" = 40'

SR 1002 (Aviation Parkway)
at
I-40 EB Ramps

Division 5	Wake County	Morrisville
PLAN DATE: NOVEMBER 2017	REVIEWED BY: R. MUNCEY	
PREPARED BY: B. WRIGHT	REVIEWED BY: B. WATSON	

REVISIONS | INIT. | DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

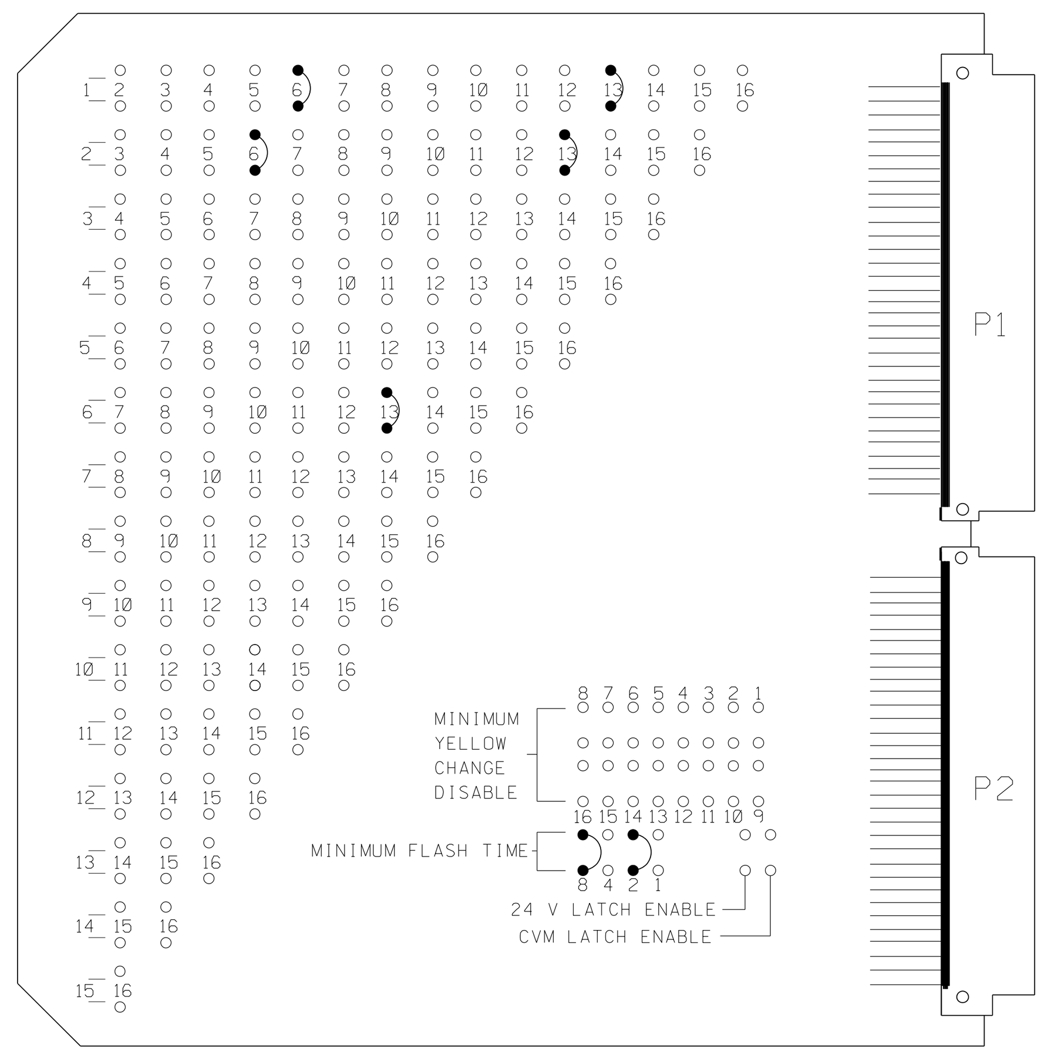
Betsy L. Watson SIGNATURE 12/1/2017 DATE

SIG. INVENTORY NO. 05-1735T3

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG- 8.1

EDI MODEL MMU2-16LEip MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	ENABLE
14	DISABLE
15	DISABLE
16	DISABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	OFF
CH 5-15	OFF
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	ON
CH 3	OFF
CH 5	OFF
CH 7	OFF
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 3,5,7,8,9,10,11,12,14,15 & 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (Is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	11★	21,22	NU	41,42	NU	61,62	NU	NU	NU	NU	NU	NU	11★	NU	NU	NU
RED	✳	2R		4R		6R										
YELLOW	✳	2Y		4Y		6Y										
GREEN		2G		4G		6G										
RED ARROW													13R			
YELLOW ARROW													13Y			
FLASHING YELLOW ARROW													13G			
GREEN ARROW	1G															
(hand symbol)																
(pedestrian symbol)																

NU = Not Used
✳ Denotes install load resistor. See Load Resistor Installation Detail.
★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9	Slot 10	Slot 11
CH1		L3 Ø4 4A	L1 Ø2 2A	L7 Ø1 1A	L5 NOT USED	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
CH2		L4 Ø4 4B	L2 Ø2 2B	L8 Ø6 1A	L6 Ø6 6B							

RACK #2	BIU	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9	Slot 10	Slot 11
CH1		SLOT EMPTY	L17 SYS DET S13	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
CH2			L18 NOT USED									

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
2A	L1A,L1B
2B	L2A,L2B
4A	L3A,L3B
4B	L4A,L4B
NU	L5A,L5B
6B	L6A,L6B
1A	L7A,L7B
	L8A,L8B
NU	L9A,L9B
NU	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

ADD JUMPERS FROM: L7A TO L8A, AND L7B TO L8B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
✳✳ 1	Ø2		
✳✳ 2	Ø2		
3	Ø4		
4	Ø4	DELAY	15
5			
✳✳ 6	Ø6		
7	Ø1	DELAY	15
✳ 8	Ø6	DELAY	3
9			
10			
11			
12			
13			
14			
15			
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
S13	L17A,L17B
NU	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
✳✳ 17	SYSTEM		
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE:
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

✳ Detector Type - G
✳✳ Detector Type - N

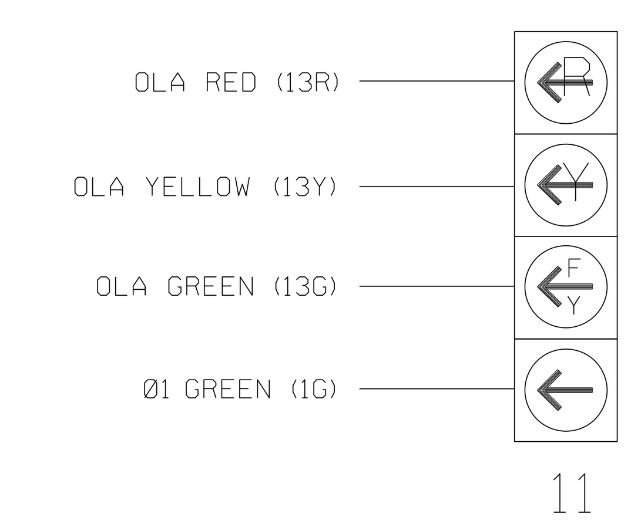
EQUIPMENT INFORMATION

CONTROLLER.............2070LN2
CABINET TS-2
SOFTWARE ....ECONOLITE ASC/3-2070
CABINET MOUNT..........BASE
LOADBAY POSITIONS.......16
LOAD SWITCHES USED......1,2,4,6,13
PHASES USED............1,2,4,6
OLA....................✳
OLB....................NOT USED
OLC....................NOT USED
OLD....................NOT USED

✳ See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



LOAD SWITCH ASSIGNMENT DETAIL

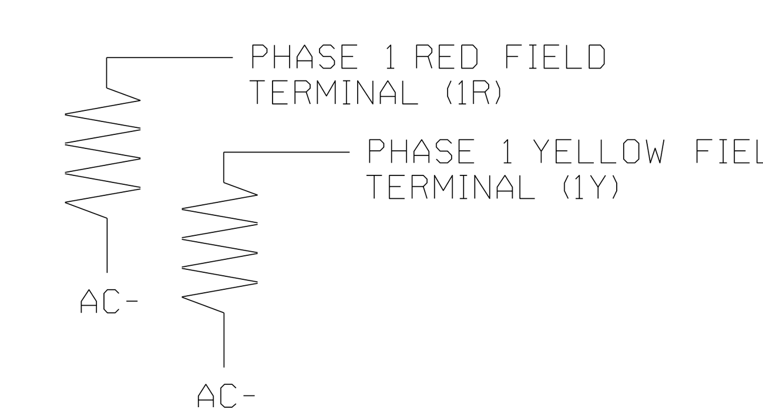
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	Ø1
2	Ø2
3	-
4	Ø4
5	-
6	Ø6
7	-
8	-
9	-
10	-
11	-
12	-
13	ØOLA
14	-
15	-
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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: 05-1735T3
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 3
Temporary Design 3 - TMP Phase II

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

SR 1002 (Aviation Parkway) at I-40 EB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

DocuSigned by: Betsy L. Watson 35E67BB34F8743F... | 12/5/2017
SIGNATURE | DATE

SIG. INVENTORY NO. 05-1735T3

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-8.2

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select [2. CONTROLLER]
2. From CONTROLLER Submenu select [2. VEHICLE OVERLAPS]

OVERLAP A

Select TMG VEH OVLP [A] and 'PPLT FYA'

```
TMG VEH OVLP...[A] TYPE: .....PPLT FYA

PROTECTED LEFT TURN....   PHASE    1
OPPOSING THROUGH.......   PHASE    2

FLASHING ARROW OUTPUT.....CH13  ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE........... 1  !
```

END PROGRAMMING

! The PPLT FYA operation of Signal Head 11 (Overlap A) can be altered to fully protected operation.

ALTERNATE PHASING ACTIVATION DETAIL

TO RUN ALT. PHASING DURING FREE RUN - PROGRAM CHANGES (SHOWN BELOW) IN A TIME BASED ACTION PLAN. SCHEDULE A DAY PLAN THAT INCLUDES THE ACTION PLAN PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BITS 1 AND 5.

TO RUN ALT. PHASING DURING COORDINATION - SELECT THE TIME BASED ACTION PLAN THAT IS PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BITS 1 AND 5.

PHASING	VEH DET PLAN	SF BITS ENABLED
ACTIONS REQUIRED TO RUN DEFAULT PHASING	1	NONE
ACTIONS REQUIRED TO RUN ALTERNATE PHASING	2	1

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OR WHAT TAKES PLACE WHEN SF BIT 1 AND VEH DET PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

SF BIT 1 — Modifies overlap parent phases for heads 11 to run protected turns only.

VEH DET PLAN 2: — Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 3 seconds.

ECONOLITE ASC/3-2070 ACTION PLAN PROGRAMMING DETAIL

1. From Main Menu select [5. TIME BASE]
2. From TIME BASE Submenu select [2. ACTION PLAN]

```
ACTION PLAN...[ 99]
PATTERN............99   SYS OVERRIDE.... NO
TIMING PLAN........ 0   SEQUENCE........  0
VEH DETECTOR PLAN.. 2   DET LOG........NONE
FLASH...........   --   RED REST........ NO
VEH DET DIAG PLN... 0   PED DET DIAG PLN..0
DIMMING ENABLE..   NO   PRIORITY RETURN. NO
PED PR RETURN..    NO   QUEUE DELAY..... NO
PMT COND DELAY     NO
  PHASE  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
PED RCL  . . . . . . . . . . . . . . . .
WALK 2   . . . . . . . . . . . . . . . .
VEX 2    . . . . . . . . . . . . . . . .
VEH RCL  . . . . . . . . . . . . . . . .
MAX RCL  . . . . . . . . . . . . . . . .
MAX 2    . . . . . . . . . . . . . . . .
  PHASE  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
MAX 3    . . . . . . . . . . . . . . . .
CS INH   . . . . . . . . . . . . . . . .
OMIT     . . . . . . . . . . . . . . . .
SPC FCT  X . . . . . . . (1-8)
AUX FCT  . . . (1-3)
         1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
LP 1-15  . . . . . . . . . . . . . . .
LP 16-30 . . . . . . . . . . . . . . .
LP 31-45 . . . . . . . . . . . . . . .
LP 46-60 . . . . . . . . . . . . . . .
LP 61-75 . . . . . . . . . . . . . . .
LP 76-90 . . . . . . . . . . . . . . .
LP 91-100 . . . . . . . . . . . . . .
```

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1735T3
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 2 of 3
Temporary Design 3 - TMP Phase II

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1002 (Aviation Parkway)
at
I-40 EB Ramps

Division 5 — Wake County

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

DocuSigned by: Betsy L. Watson 35E67BB34F8743F... — 12/5/2017
SIGNATURE — DATE

SIG. INVENTORY NO. 05-1735T3

DATE:
u:#Traffic#Signals#Design#Signals#Electrical Details#I-5506 sm_ele_05-1735_T3-2of3.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-8.3

ECONOLITE ASC/3-2070 VEHICLE DETECTOR SETUP PROGRAMMING DETAIL FOR ALTERATE PHASING

LOOPS 1A

(program controller as shown)

IMPORTANT!

Program detectors per the input file connection and programming chart shown on sheet 1 before proceeding.

1. From Main Menu selet [8. UTILITIES]
2. From UTILITIES Submenu select [1. COPY/CLEAR]
3. Copy from DETECTOR PLAN "1" to DETECTOR PLAN "2".

```
COPY / CLEAR UTILITY
      FROM                TO
PHASE TIMING.... . > PHASE TIMING.... .
TIMING PLAN..... . > TIMING PLAN..... .
PH DET OPT PLAN. . > PH DET OPT PLAN. .
DETECTOR PLAN... 1 > DETECTOR PLAN... 2
  TOGGLE TO SELECT A "FROM" AND A "TO"
           THEN PRESS ENTER
```

4. From Main Menu select [6. DETECTORS]
5. From DETECTOR Submenu select [2. VEHICLE DETECTOR SETUP]
6. Place cursor in VEH DET PLAN [ ] position and enter "2".

- For Loop 1A, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "7".
- Set delay time to "3".

```
VEH DETECTOR [ 7]   VEH DET PLAN [ 2]      ← NOTICE VEH DET PLAN 2
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 7  1     . . . . . . . . . . . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    3.0   ← ENSURE DELAY IS SET TO '3'
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN....... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

- Place cursor in VEH DETECTOR [ ] position and enter "8".
- Set assigned phase to "0".

```
                    VEH DETECTOR [ 8]   VEH DET PLAN [ 2]      ← NOTICE VEH DET PLAN 2
                    TYPE: G-GREEN EXTENSION DELAY
                    TS2 DETECTOR..... X ECPI LOG.......   NO
                    DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
ENSURE PHASE   →     8  0     . . . . . . . . . . . . . . . .
IS SET TO '0'       EXTEND TIME...  0.0 DELAY TIME...    3.0
                    USE ADDED INITIAL . CROSS SWITCH PH..  0
                    LOCK IN....... NONE NTCIP VOL . OR OCC .
                    PMT QUEUE DELAY. NO
```

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1735T3
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 3 of 3
Temporary Design 3 - TMP Phase II

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SR 1002 (Aviation Parkway)
at
I-40 EB Ramps

Division 5 Wake County

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

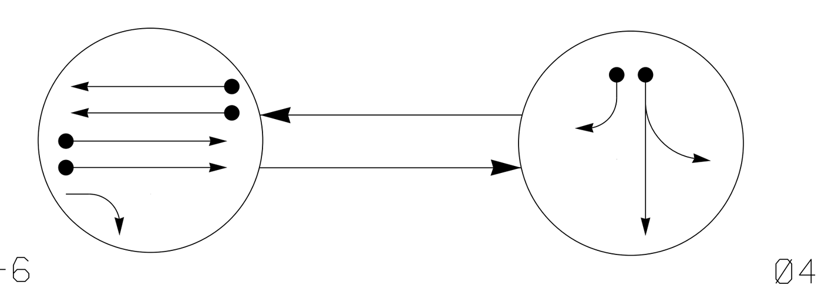
DocuSigned by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1735T3

DATE:
U:\Traffic\Signals\Design\Signals\Electrical Details\I-5506 sm_ele_05-1735_T3-3of3.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-9.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

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

SIGNAL FACE I.D.

All Heads L.E.D.

R
Y
G
12"
21,22
41,42
61,62

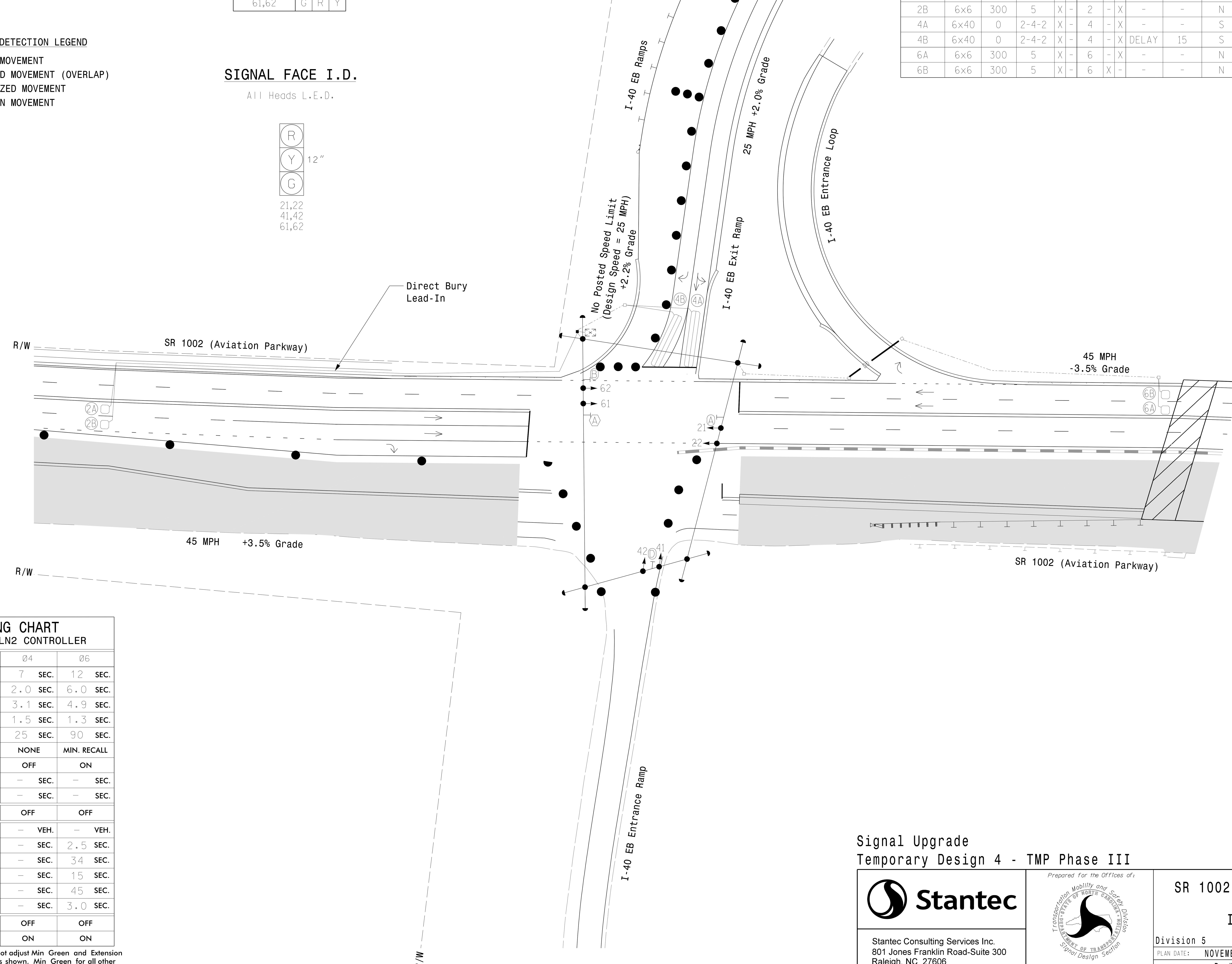
LOOP & DETECTOR INSTALLATION CHART
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
2A	6x6	300	5	X	-	2	-	X	-	-	N
2B	6x6	300	5	X	-	2	-	X	-	-	N
4A	6x40	0	2-4-2	X	-	4	-	X	-	-	S
4B	6x40	0	2-4-2	X	-	4	-	X	DELAY	15	S
6A	6x6	300	5	X	-	6	-	X	-	-	N
6B	6x6	300	5	X	-	6	X	-	-	-	N

2 Phase
Fully Actuated
(Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
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 existing signal heads 21, 22, 41, 42, & 62.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
6. Cary Signal System Data: Fiber Channel #25



TIMING CHART
ASC/3-2070LN2 CONTROLLER

PHASE	Ø2	Ø4	Ø6
MINIMUM GREEN *	12 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	6.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	4.3 SEC.	3.1 SEC.	4.9 SEC.
RED CLEARANCE	2.0 SEC.	1.5 SEC.	1.3 SEC.
MAX. 1 *	90 SEC.	25 SEC.	90 SEC.
RECALL POSITION	MIN. RECALL	NONE	MIN. RECALL
LOCK DET.	ON	OFF	ON
WALK *	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	2.5 SEC.	– SEC.	2.5 SEC.
MAX. INITIAL *	34 SEC.	– SEC.	34 SEC.
TIME B4 REDUCTION *	15 SEC.	– SEC.	15 SEC.
TIME TO REDUCE *	45 SEC.	– SEC.	45 SEC.
MINIMUM GAP	3.0 SEC.	– SEC.	3.0 SEC.
DUAL ENTRY	OFF	OFF	OFF
SIMULTANEOUS GAP	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Direct Bury Lead-In	
	Directional Drill	N/A
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	N/A
	Construction Zone	N/A
	Construction Zone Barrier	N/A
N/A	Guardrail	
(A)	No Left Turn Sign (R3-2)	(A)
(B)	No Right Turn Sign (R3-1)	(B)
(D)	Street Name Sign (D3-1)	(D)

Signal Upgrade
Temporary Design 4 - TMP Phase III

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State of North Carolina Department of Transportation
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 40
1" = 40'

SR 1002 (Aviation Parkway)
at
I-40 EB Ramps

Division 5 Wake County Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	R. MUNCEY
PREPARED BY:	B. WRIGHT	REVIEWED BY:	B. WATSON

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

DocuSigned by: Betsy L. Watson
35E67BB34F8743F...
SIGNATURE 12/1/2017 DATE

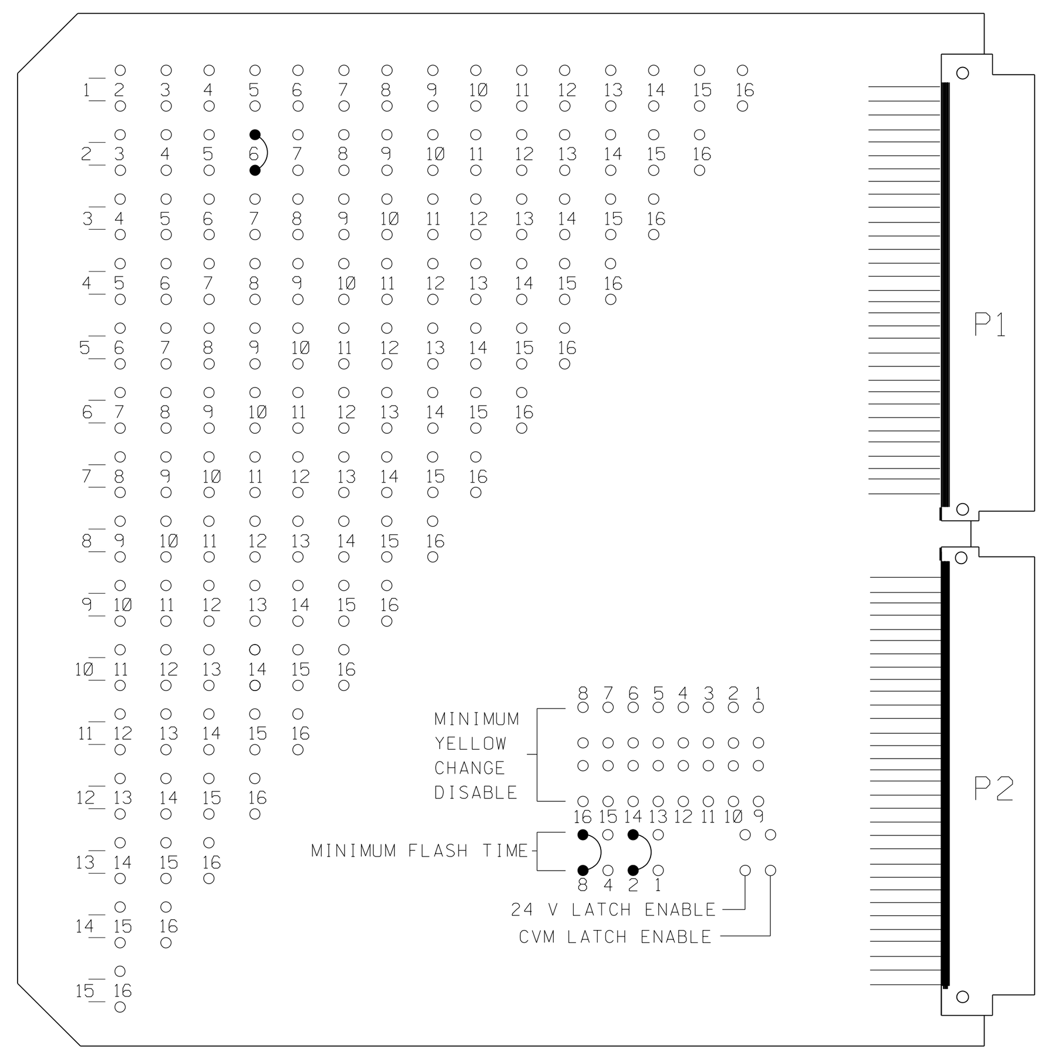
SIG. INVENTORY NO. 05-1735T4

DATE_
U:*Traffic*Signals*Design*Signals*Plansheets*I-5506 Sig_dsn_05-1735_T4.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-9.1

EDI MODEL MMU2-16LEip MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE

CHANNEL NUMBER	ENABLE/ DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	DISABLE
14	DISABLE
15	DISABLE
16	DISABLE

UNIT OPTIONS

OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW

CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	OFF
CH 3-14	OFF
CH 5-15	OFF
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	OFF
CH 3	OFF
CH 5	OFF
CH 7	OFF
FLASH RATE FAULT	OFF
FYA TRAP DETECT	OFF

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 1,3,5,7,8,9,10,11,12,13,14,15 & 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (Is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	NU	21,22	NU	41,42	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		2R		4R		6R										
YELLOW		2Y		4Y		6Y										
GREEN		2G		4G		6G										
RED ARROW																
YELLOW ARROW																
FLASHING YELLOW ARROW																
GREEN ARROW																

NU = NOT USED

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK												
RACK #1	BIU	CH1 L3 ø4 4A / CH2 L4 ø4 4B	CH1 L1 ø2 2A / CH2 L2 ø2 2B	SLOT EMPTY	CH1 L5 ø6 6A / CH2 L6 ø6 6B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
RACK #2	BIU	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
2A	L1A,L1B
2B	L2A,L2B
4A	L3A,L3B
4B	L4A,L4B
6A	L5A,L5B
6B	L6A,L6B
NU	L7A,L7B
NU	L8A,L8B
NU	L9A,L9B
NU	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
** 1	ø2		
** 2	ø2		
3	ø4		
4	ø4	DELAY	15
** 5	ø6		
** 6	ø6		
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
NU	L17A,L17B
NU	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE: BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

** Detector Type - N

EQUIPMENT INFORMATION

CONTROLLER.............2070LN2
CABINET TS-2
SOFTWARE ....ECONOLITE ASC/3-2070
CABINET MOUNT..........BASE
LOADBAY POSITIONS.......16
LOAD SWITCHES USED......2,4,6
PHASES USED............2,4,6
OLA....................NOT USED
OLB....................NOT USED
OLC....................NOT USED
OLD....................NOT USED

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	-
2	ø2
3	-
4	ø4
5	-
6	ø6
7	-
8	-
9	-
10	-
11	-
12	-
13	-
14	-
15	-
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1735T4
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail
Temporary Design 4 - TMP Phase III

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SR 1002 (Aviation Parkway) at I-40 EB Ramps

Division 5	Wake County	Morrisville
PLAN DATE: NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY: G. SPELL	REVIEWED BY:	R. MUNCEY
REVISIONS	INIT.	DATE

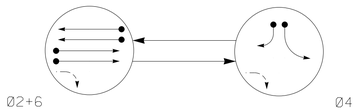
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29449 BETSY L. WATSON

SIGNATURE: Betsy L. Watson — DATE: 12/5/2017

SIG. INVENTORY NO. 05-1735T4

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-10.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

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

SIGNAL FACE I.D.

All Heads L.E.D.

21,22
41,42
61,62

LOOP & DETECTOR INSTALLATION CHART

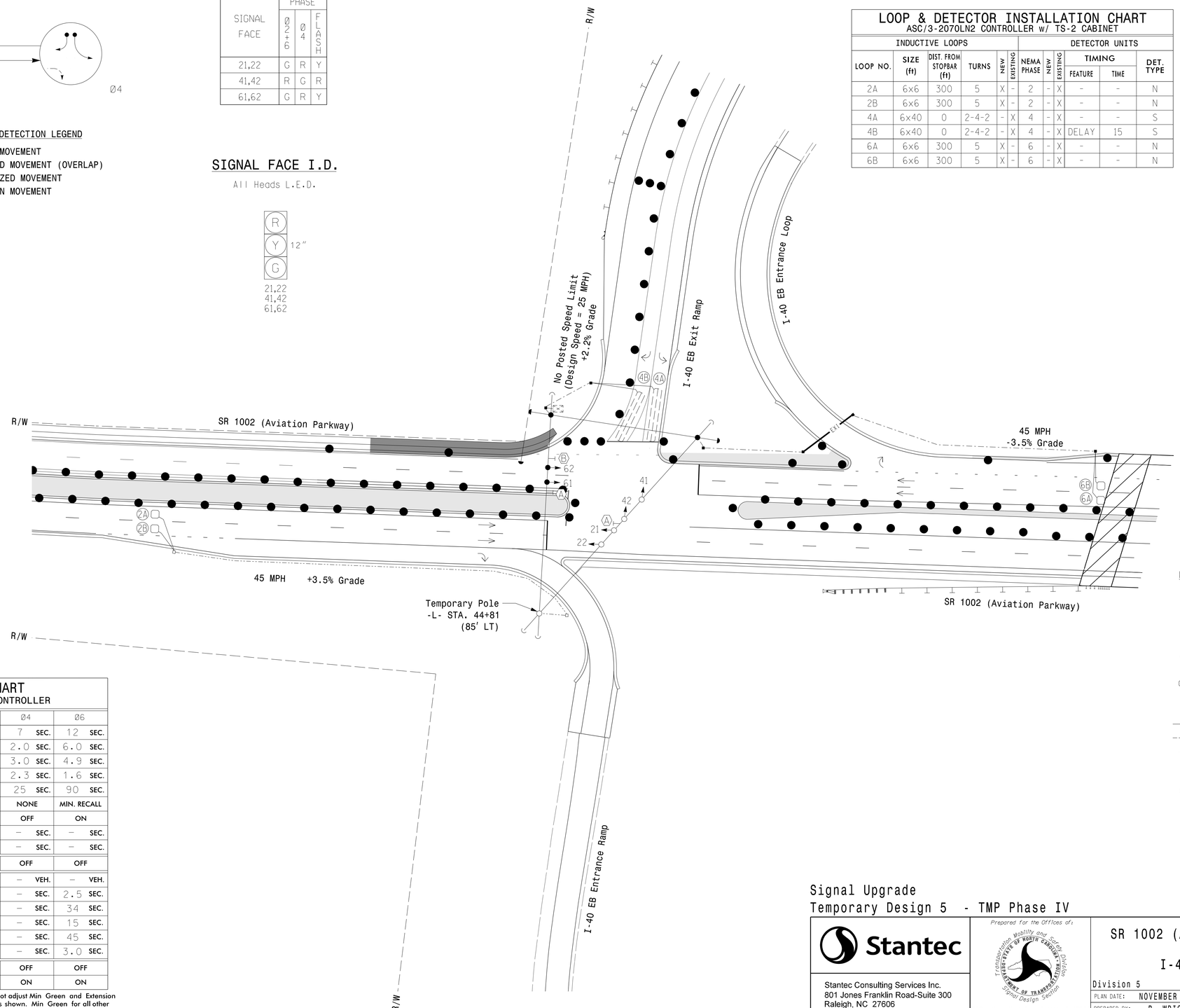
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
2A	6x6	300	5	X	-	2	-	X	-	-	N
2B	6x6	300	5	X	-	2	-	X	-	-	N
4A	6x40	0	2-4-2	-	X	4	-	X	-	-	S
4B	6x40	0	2-4-2	-	X	4	-	X	DELAY	15	S
6A	6x6	300	5	X	-	6	-	X	-	-	N
6B	6x6	300	5	X	-	6	-	X	-	-	N

2 Phase
Fully Actuated
(Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
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 existing signal heads 61, & 62.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
6. Cary Signal System Data: Fiber Channel #25



LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
▭↓	Pedestrian Signal Head With Push Button & Sign	■↓
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
———	Direct Bury Lead-In	———
———	2-in Underground Conduit	———
DD	Directional Drill	DD
N/A	Right of Way	———
→	Directional Arrow	→
● ● ●	Construction Zone Drums	N/A
▬	Construction Zone	N/A
▬	Construction Zone Barrier	N/A
N/A	Guardrail	⊣
Ⓐ	No U-Turn/No Left Turn Sign (R3-18)	Ⓐ
Ⓑ	No Right Turn Sign (R3-1)	Ⓑ

TIMING CHART

ASC/3-2070LN2 CONTROLLER

PHASE	02	04	06
MINIMUM GREEN *	12 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	6.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	4.3 SEC.	3.0 SEC.	4.9 SEC.
RED CLEARANCE	1.3 SEC.	2.3 SEC.	1.6 SEC.
MAX. 1 *	90 SEC.	25 SEC.	90 SEC.
RECALL POSITION	MIN. RECALL	NONE	MIN. RECALL
LOCK DET.	ON	OFF	ON
WALK *	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	2.5 SEC.	– SEC.	2.5 SEC.
MAX. INITIAL *	34 SEC.	– SEC.	34 SEC.
TIME B4 REDUCTION *	15 SEC.	– SEC.	15 SEC.
TIME TO REDUCE *	45 SEC.	– SEC.	45 SEC.
MINIMUM GAP	3.0 SEC.	– SEC.	3.0 SEC.
DUAL ENTRY	OFF	OFF	OFF
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 5 - TMP Phase IV

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SCALE 0 40 1" = 40'

SR 1002 (Aviation Parkway)
at
I-40 EB Ramps

Division 5 Wake County Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	R. MUNCEY
PREPARED BY:	B. WRIGHT	REVIEWED BY:	B. WATSON

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

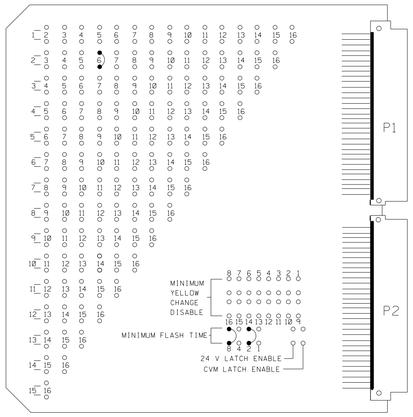
Designed by: Betsy L. Watson 12/1/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1735T5

DATE:
I:\Traffic\Signals\Design\Signals\PlanSheets\I-5506 Sig_dsn_05-1735_T5.dgn
User:rmuncey

EDI MODEL MMU2-16LEip
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	DISABLE
14	DISABLE
15	DISABLE
16	DISABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	OFF
CH 3-14	OFF
CH 5-15	OFF
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	OFF
CH 3	OFF
CH 5	OFF
CH 7	OFF
FLASH RATE FAULT	OFF
FYA TRAP DETECT	OFF

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 1,3,5,7,8,9,10,11,12,13,14,15 & 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-10.1

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	NU	21,22	NU	41,42	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		2R		4R		6R										
YELLOW		2Y		4Y		6Y										
GREEN		2G		4G		6G										
RED ARROW																
YELLOW ARROW																
FLASHING YELLOW ARROW																
GREEN ARROW																
✋																
🚶																

NU = NOT USED

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW.
PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU	CH1 L3 ø4 4A CH2 L4 ø4 4B	CH1 L1 ø2 2A CH2 L2 ø2 2B	SLOT EMPTY	CH1 L5 ø6 6A CH2 L6 ø6 6B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
RACK #2	BIU	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
2A	L1A,L1B
2B	L2A,L2B
4A	L3A,L3B
4B	L4A,L4B
6A	L5A,L5B
6B	L6A,L6B
NU	L7A,L7B
NU	L8A,L8B
NU	L9A,L9B
NU	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
** 1	ø 2		
** 2	ø 2		
3	ø 4		
4	ø 4	DELAY	15
** 5	ø 6		
** 6	ø 6		
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

NOTE:
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

** Detector Type - N

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
NU	L17A,L17B
NU	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET TS-2
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....2,4,6
PHASES USED.....2,4,6
OLA.....NOT USED
OLB.....NOT USED
OLC.....NOT USED
OLD.....NOT USED

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	-
2	ø 2
3	-
4	ø 4
5	-
6	ø 6
7	-
8	-
9	-
10	-
11	-
12	-
13	-
14	-
15	-
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: Ø5-1735T5
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail
Temporary Design 5 - TMP Phase IV

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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SR 1002 (Aviation Parkway)
at
I-40 EB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

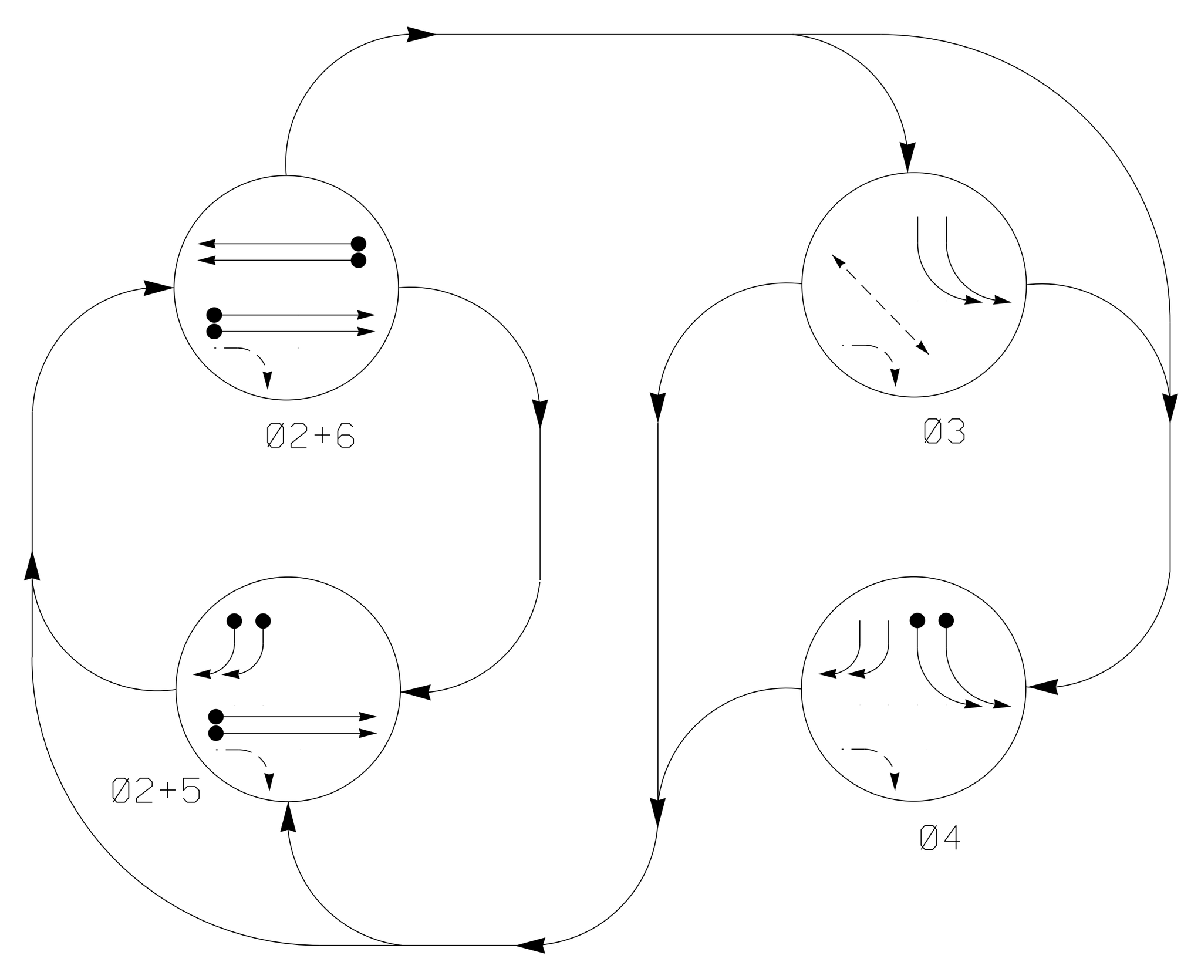
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29449 BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1735T5

DATE:
File: C:\Traffic\Signals\Design\Signals\Electrical Details\I-5506 sm_ele_05-1735_T5.dgn
User:rmuncey

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

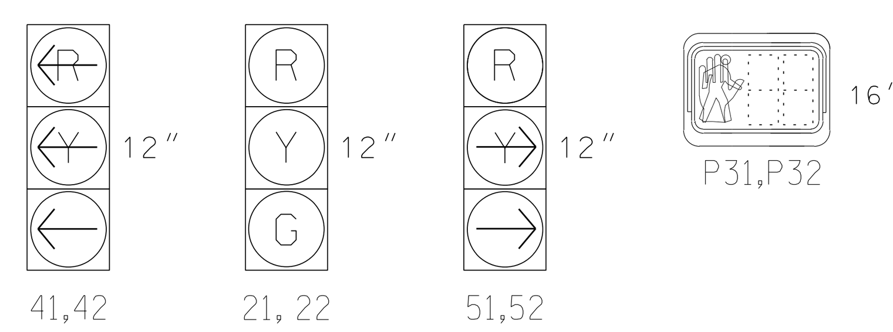
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø3	Ø4	FLASH
21,22	G	G	R	R	Y
41,42	←R	←R	←	←	←R
51,52	→	R	R	→	R
61,62	R	G	R	R	Y
P31,P32	DW	DW	W	DW	DRK
SIGN C	OFF	OFF	ON	OFF	OFF

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

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR INSTALLATION CHART

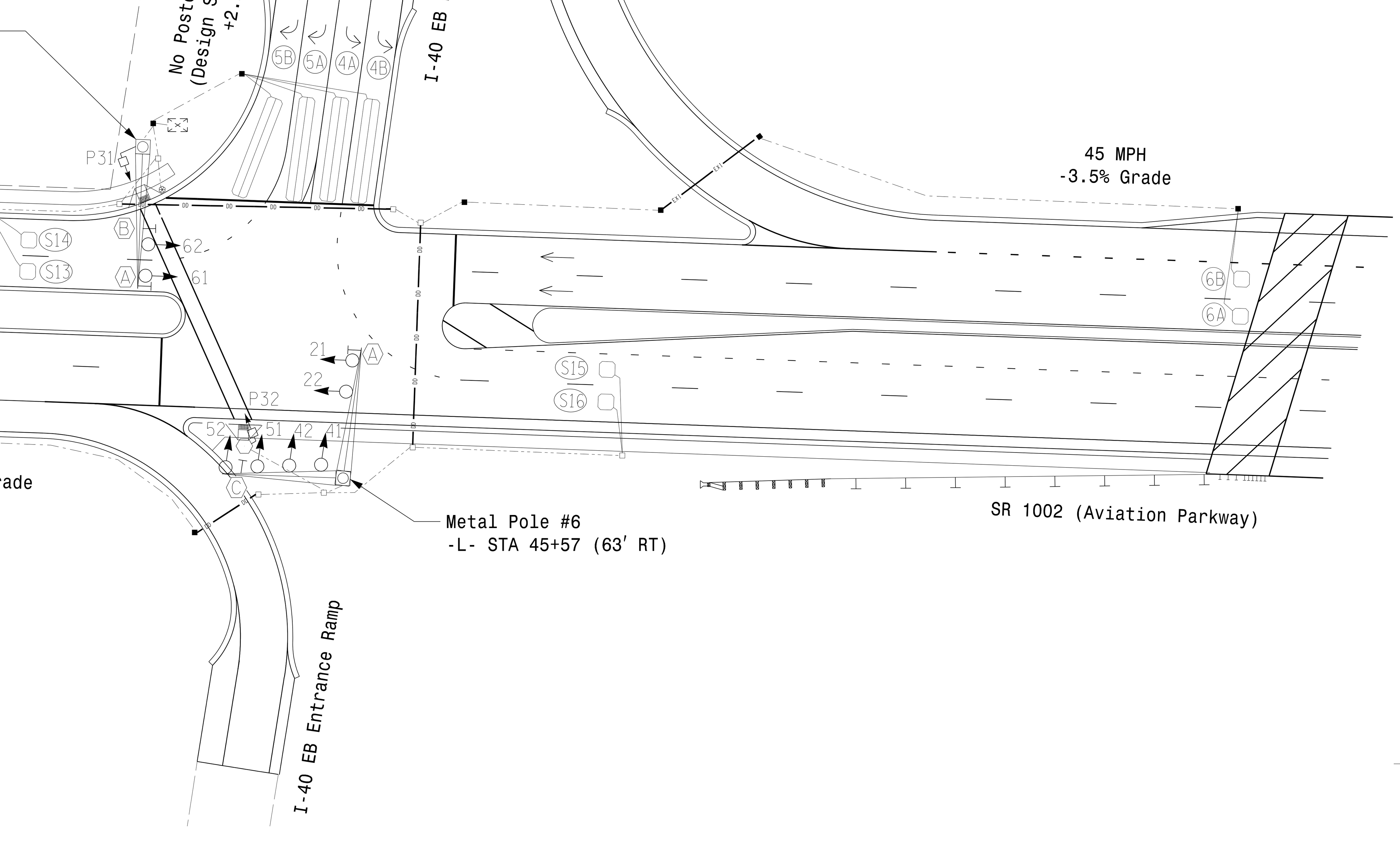
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
2A	6x6	300	5	X	-	2	-	X	-	-	N
2B	6x6	300	5	X	-	2	-	X	-	-	N
4A	6x40	0	2-4-2	X	-	4	-	X	-	-	S
4B	6x40	0	2-4-2	X	-	4	-	X	-	-	S
5A	6x40	0	2-4-2	X	-	5	X	-	DELAY	15	S
5B	6x40	0	2-4-2	X	-	5	X	-	DELAY	15	S
6A	6x6	300	6	X	-	6	-	X	-	-	N
6B	6x6	300	6	X	-	6	-	X	-	-	N
S13	6x6	+160	3	X	-	-	X	-	SYSTEM DETECTOR		N
S14	6x6	+160	3	X	-	-	X	-	SYSTEM DETECTOR		N
S15	6x6	+160	5	X	-	-	X	-	SYSTEM DETECTOR		N
S16	6x6	+160	5	X	-	-	X	-	SYSTEM DETECTOR		N

4 Phase
Fully Actuated
(Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
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. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
5. Program pedestrian heads to countdown the flashing "DON'T WALK" time only.
6. Illuminate Sign C at beginning of preceeding red change interval. This sign will remain illuminated until the beginning of the succeeding green phase.
7. Refer to pavement marking plan for final pavement markings.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Pedestrian pedestals are conceptual and shown for reference only. See 2018 NCDOT Roadway Standard Drawings 1705.04 Sheets 1-3 for push button location details.
10. Cary signal system data:
    Fiber Channel #25



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Directional Drill	
N/A	Guardrail	
	Metal Pole with Mastarm	
N/A	Curb Ramp	
	Type II Signal Pedestal	
(A)	No U-Turn/ No Left Turn Sign (R3-18)	(A)
(B)	No Right Turn Sign (R3-1)	(B)
(C)	No Turn on Red - LED BO Sign	(C)

TIMING CHART

ASC/3-2070LN2 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø5	Ø6
MINIMUM GREEN *	12 SEC.	7 SEC.	7 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	6.0 SEC.	– SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	4.3 SEC.	3.1 SEC.	3.1 SEC.	3.1 SEC.	4.9 SEC.
RED CLEARANCE	1.7 SEC.	2.4 SEC.	2.4 SEC.	1.5 SEC.	1.8 SEC.
MAX. 1 *	90 SEC.	32 SEC.	25 SEC.	25 SEC.	90 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL
LOCK DET.	ON	OFF	OFF	OFF	ON
WALK *	– SEC.	7 SEC.	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	25 SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	2.5 SEC.	– SEC.	– SEC.	– SEC.	2.5 SEC.
MAX. INITIAL *	34 SEC.	– SEC.	– SEC.	– SEC.	34 SEC.
TIME B4 REDUCTION *	15 SEC.	– SEC.	– SEC.	– SEC.	15 SEC.
TIME TO REDUCE *	45 SEC.	– SEC.	– SEC.	– SEC.	45 SEC.
MINIMUM GAP	3.0 SEC.	– SEC.	– SEC.	– SEC.	3.0 SEC.
DUAL ENTRY	OFF	OFF	OFF	OFF	OFF
SIMULTANEOUS GAP	ON	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

Signal Upgrade - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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SCALE 0 40
1" = 40'

SR 1002 (Aviation Parkway) at I-40 EB Ramps

Division 5 Wake County Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	R. MUNCEY
PREPARED BY:	B. WRIGHT	REVIEWED BY:	B. WATSON

REVISIONS	INIT.	DATE

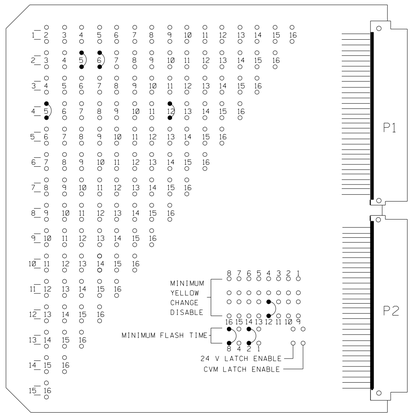
NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

DocuSigned by: Betsy L. Watson 35E67BB34F8743E — SIGNATURE
12/1/2017 — DATE

SIG. INVENTORY NO. 05-1735

EDI MODEL MMU2-16LEip
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	ENABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
** 12	ENABLE
13	DISABLE
14	DISABLE
15	DISABLE
16	DISABLE

**Disable R-Y, G-Y dual indication monitoring

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	OFF
CH 3-14	OFF
CH 5-15	OFF
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	OFF
CH 3	OFF
CH 5	OFF
CH 7	OFF
FLASH RATE FAULT	OFF
FYA TRAP DETECT	OFF

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 1,3,7,8,9,10,11,13,14,15 & 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (ls AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-11.1

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	OLE	OLF	6	7	8	2 PED	4 PED	6 PED	3 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	NU	21,22	NC	41,42	51,52	61,62	NU	NU	NU	NU	NU	P31, P32	NU	NU	NU	NU
RED		2R				6R										
YELLOW		2Y				6Y										
GREEN		2G				6G										
RED ARROW				4R	5R											
YELLOW ARROW				4Y	5Y											
FLASHING YELLOW ARROW																
GREEN ARROW				4G	5G											
✋												12R				
🚶												12G				

NU = NOT USED

NC = NO CONNECTION

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW.
PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU	CH1 L3 ø4 4A	CH1 L1 ø2 2A	CH1 L7 ø6 6A	CH1 L5 ø4 5A	CH1 L11 ø4 5B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L4 ø4 4B	CH2 L2 ø2 2B	CH2 L8 ø6 6B	CH2 L6 ø5 5A	CH2 L12 ø5 5B						
RACK #2	BIU	CH1 L19 SYS DET S13	SLOT EMPTY	CH1 L23 SYS DET S15	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L20 SYS DET S14		CH2 L24 SYS DET S16								

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
2A	L1A,L1B
2B	L2A,L2B
4A	L3A,L3B
4B	L4A,L4B
5A	L5A,L5B
5B	L6A,L6B
6A	L7A,L7B
6B	L8A,L8B
NU	L9A,L9B
NU	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
** 1	ø2		
** 2	ø2		
3	ø4		
4	ø4		
5	ø5	DELAY	15
6	ø5	DELAY	15
** 7	ø6		
** 8	ø6		
9			
10			
11			
12			
13			
14			
15			
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
NU	L17A,L17B
NU	L18A,L18B
S13	L19A,L19B
S14	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
S15	L23A,L23B
S16	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
17			
18			
** 19	SYSTEM		
** 20	SYSTEM		
21			
22			
** 23	SYSTEM		
** 24	SYSTEM		
25			
26			
27			
28			
29			
30			
31			
32			

NOTE:
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

** Detector Type - N

EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET TS-2
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....2,4,5,6,12
PHASES USED.....2,3PED,4,5,6,*3
OLA.....NOT USED
OLB.....NOT USED
OLC.....NOT USED
OLD.....NOT USED
OLE.....3+4
OLF.....4+5
OLG (DUMMY).....2+4+5+6

* Used for timing purposes

ECONOLITE ASC/3-2070
LOAD SWITCH ASSIGNMENT DETAIL

(program controller as shown)

To assign load switches 4 and 5 as OLE and OLF, program LD SWITCH 4 as OVLP '5' TYPE 'O' and LD SWITCH 5 as OVLP '6' TYPE 'O' as shown below.

1. From Main Menu select [1. CONFIGURATION]
2. From CONFIGURATION Submenu select [3. LOAD SW ASSIGN]

LD SWITCH ASSIGN

	PHASE /OVLP	TYPE	DIMMING R	Y	G	D	FLASH PWR	AUT	TGR	
1	1	V	.	.	.	+	A	R	X	
2	2	V	.	.	.	+	A	Y	.	
** 3	0	.	.	.	.	+	A	R	X	NOTICE ASSIGN PHASE 0 TO LD SWITCH 3 & REMOVE TYPE
4	5	O	.	.	.	+	A	R	.	NOTICE LD SWITCHES 4 & 5 ASSIGNED TO TYPE 'O'
5	6	O	.	.	.	-	A	R	.	
6	6	V	.	.	.	-	A	Y	X	
7	7	V	.	.	.	-	A	R	.	
8	8	V	.	.	.	-	A	R	X	
9	2	P	.	.	.	-	A	R	X	
10	4	P	.	.	.	+	A	R	X	
11	6	P	.	.	.	-	A	R	.	
12	3	P	.	.	.	+	A	R	.	NOTICE PHASE 3 PED ASSIGNED TO LD SWITCH 12
13	1	O	.	.	.	+	A	.	.	
14	2	O	.	.	.	+	A	.	.	
15	3	O	.	.	.	-	A	.	.	
16	4	O	.	.	.	-	A	.	.	

ECONOLITE ASC/3-2070
PED 3 PROGRAMMING ASSIGNMENT DETAIL

(program controller as shown)

1. From Main Menu select [6. DETECTORS]
2. From DETECTOR Submenu select [3. PED DETECTOR INPUT ASSIGNMENT]

PED DET PHASE ASSIGNMENT MODE: NTCIP

PHASE	1	2	3	4	5	6	7	8
DETECTOR	0	2	8	4	0	6	0	0

← NOTICE PED DETECTOR 8 ASSIGNED TO PHASE 3

PHASE	9	10	11	12	13	14	15	16
DETECTOR	0	0	0	0	0	0	0	0

1. See "ECONOLITE ASC/3-2070 LOAD SWITCH ASSIGNMENT DETAIL" for load switch assignment configuration.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: Ø5-1735
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 2
Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1002 (Aviation Parkway)
at
I-40 EB Ramps

Division 5 Wake County Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29449 BETSY L. WATSON

DocuSigned by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1735

12/5/2017
U:\Traffic\Projects\Signals\Design\Signals\Electrical Details\I-5506 sm_ele_05-1735-1of2.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-11.2

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select [2. CONTROLLER]
2. From CONTROLLER Submenu select [2. VEHICLE OVERLAPS]

Toggle Four Times

OVERLAP E

Select TMG VEH OVLP [E] and 'NORMAL'

```
TMG VEH OVLP...[E] TYPE: ......NORMAL
  PHASES 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
INCLUDED . . X X . . . . . . . . . . . .

LAG GRN 0.0 YEL 0.0 RED 0.0
```

Toggle Once

OVERLAP F

Select TMG VEH OVLP [F] and 'NORMAL'

```
TMG VEH OVLP...[F] TYPE: ......NORMAL
  PHASES 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
INCLUDED . . . X X . . . . . . . . . . .

LAG GRN 0.0 YEL 0.0 RED 0.0
```

Toggle Once

OVERLAP G (DUMMY)

MOVE CURSOR OVER [F]
TOGGLE TO TMG VEH OVLP [G]

```
TMG VEH OVLP...[G] TYPE: ......NORMAL
  PHASES 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
INCLUDED . X . X X X . . . . . . . . . .

LAG GRN 0.0 YEL 0.0 RED 0.0
```

END PROGRAMMING

ECONOLITE ASC/3-2070 LOGIC PROCESSOR PROGRAMMING DETAIL FOR "NO TURN ON RED" BLANK OUT SIGN

(program controller as shown)

The following logic processor configuration activates the blank out sign during normal operation. Upon the red interval preceeding phase 3, the logic will activate the blank out sign.

1. From Main Menu select [1. CONFIGURATION]
2. From CONFIGURATION Submenu select [8. LOGIC PROCESSOR]
3. From LOGIC PROCESSOR Submenu select [2. LOGIC STATEMENTS]

ENTER A "1" IN THE LP# FIELD, PRESS 'ENTER', AND PROGRAM AS SHOWN.

```
LP#:      1  COPY FROM:   1  ACTIVE:  M   (T/F)
IF      VEH OVERLAP RED       7   IS  ON
AND     LP COB CODE OFF           544
THEN    SIG SET PH PED CLR 3      ON

ELSE    SIG SET PH PED CLR 3      OFF
```

LOGIC FOR ACTIVATING THE BLANK OUT SIGN DURING NORMAL OPERATION. THE AND CONDITION ENSURES SIGN IS OFF DUING CONTROLLER FLASH.

END PROGRAMMING

Notes:
1. COB 544 is a controller flash internal logic processor reference.
2. To ensure sign does not illuminate upon exit from cabinet or controller flash, enable overlap G for START UP and AUTOMATIC flash.

1. From Main Menu select [1. CONFIGURATION]
2. From CONFIGURATION Submenu select [8. LOGIC PROCESSOR]
3. From LOGIC PROCESSOR Submenu select [1. LOGIC STATEMENT CONTROL]

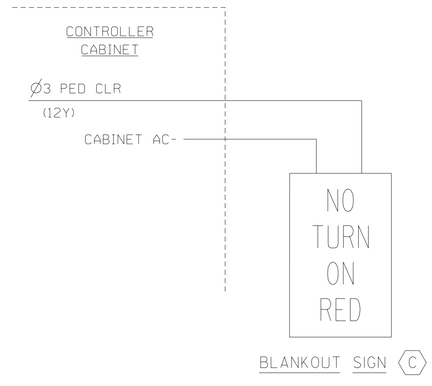
ENABLE LOGIC PROCESSOR STATEMENT 1 BY POSITIONING THE CURSOR OVER THE FIELD SHOWN BELOW AND USING THE TOGGLE KEY TO ENABLE IT.

```
LOGIC STATEMENT CONTROL
          1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
LP 1-15   E . . . . . . . . . . . . . . .
LP 16-30  . . . . . . . . . . . . . . . .
LP 31-45  . . . . . . . . . . . . . . . .
LP 46-60  . . . . . . . . . . . . . . . .
LP 61-75  . . . . . . . . . . . . . . . .
LP 76-90  . . . . . . . . . . . . . . . .
```

END PROGRAMMING

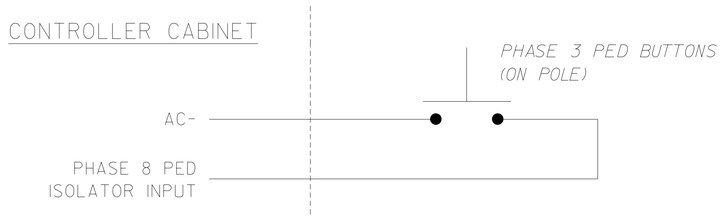
BLANKOUT SIGN WIRING DETAIL

(wire as shown)



PEDESTRIAN PUSH BUTTON WIRING DETAIL

(wire push buttons as shown)



COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: Ø5-1735
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 2 of 2
Final Design

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Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SR 1002 (Aviation Parkway)
at
I-40 EB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

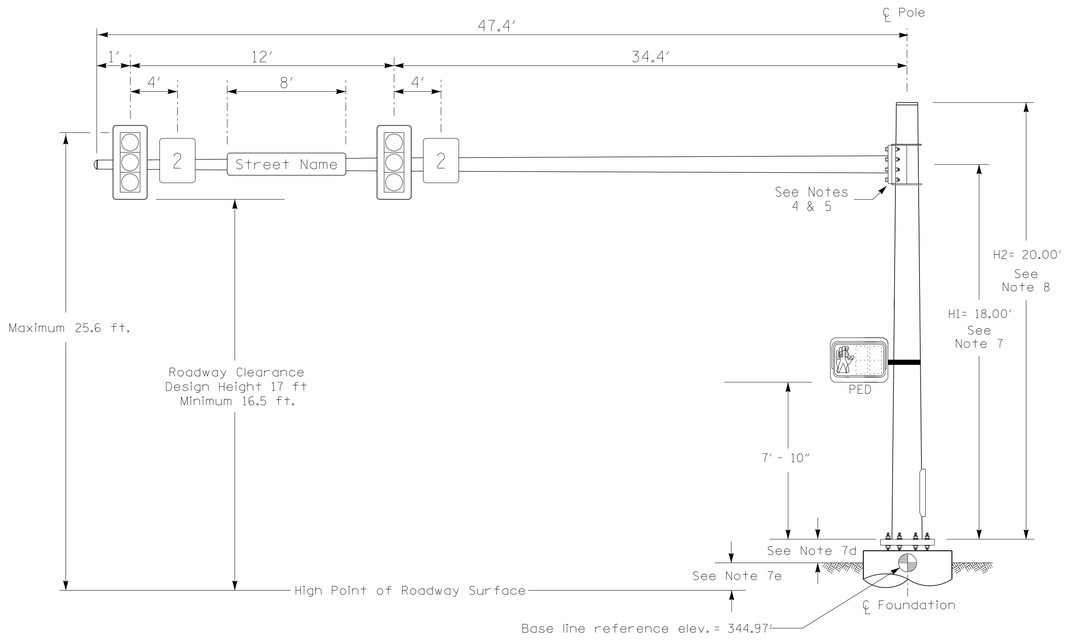
REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1735

Design Loading for METAL POLE NO. 5



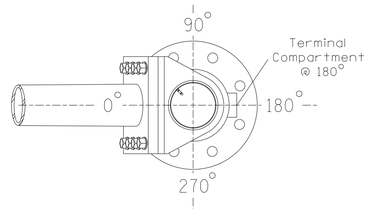
Elevation View

SPECIAL NOTE

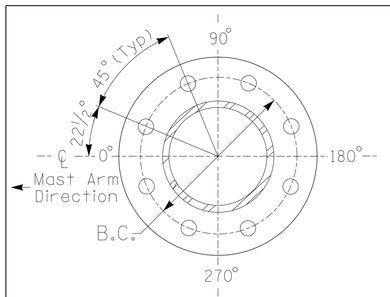
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 5	
Baseline reference point at ℄ Foundation @ ground level	344.97 ft.	
Elevation difference at High point of roadway surface	-1.03 ft.	
Elevation difference at Edge of travelway or face of curb	-1.43 ft.	

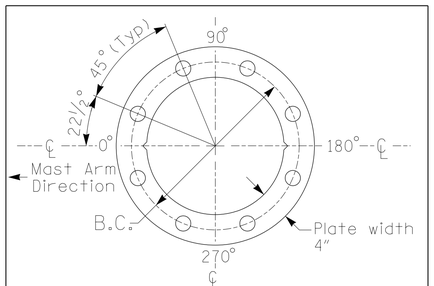


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

METAL POLE No. 5

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-11.3

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5" W X 52.5"L	60 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0"L	21 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0" W X 36.0"L	14 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
   - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
   - The 2018 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

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. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. 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.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. 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 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. 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 Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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NCDOT Wind Zone 4 (90 mph)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1002 (Aviation Parkway) at I-40 EB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE: NOVEMBER 2017 | REVIEWED BY: D. HARRIS
PREPARED BY: R. MUNCEY | REVIEWED BY: B. WATSON

SCALE: 0 N/A N/A

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/1/2017
SIGNATURE DATE

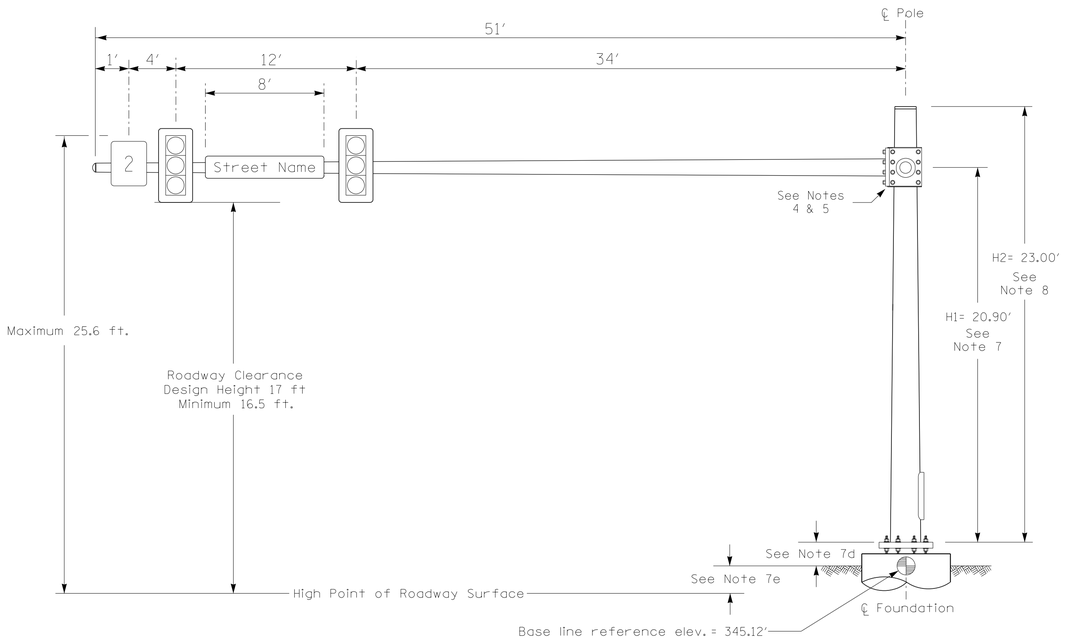
SIG. INVENTORY NO. 05-1735

DATE:
I:\Traffic\Signals\Design\Signals\Metal Poles\I-5506 Sig_dsn_Metal_Pole_#5.dgn
User:rmuncey

METAL POLE No. 6

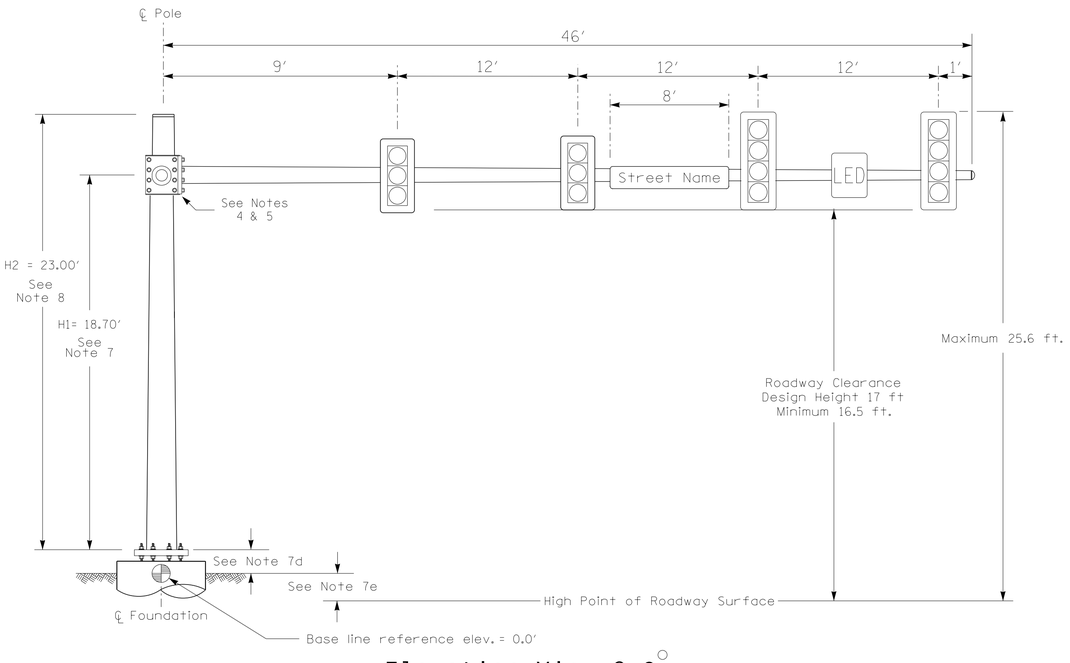
PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-11.4

Design Loading for METAL POLE NO. 6, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 6, MAST ARM B



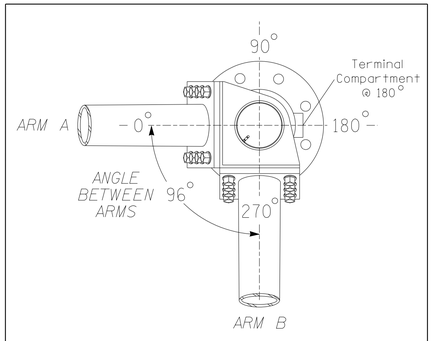
Elevation View @ 0°

SPECIAL NOTE

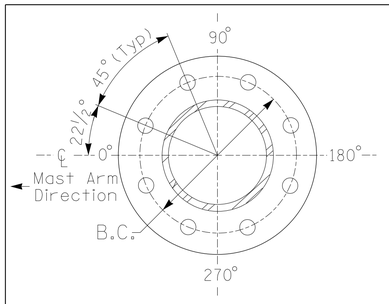
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ℄ Foundation @ ground level	345.12 ft.	345.12 ft.
Elevation difference at High point of roadway surface	+1.89 ft.	-0.80 ft.
Elevation difference at Edge of travelway or face of curb	+1.43 ft.	-0.34 ft.

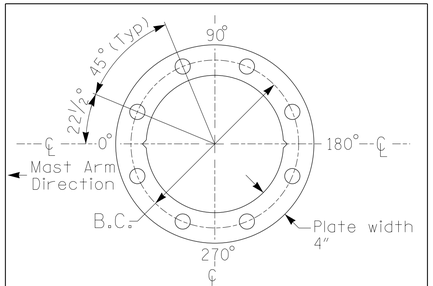


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12″-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5″W X 66.0″L	74 LBS
	RIGID MOUNTED SIGNAL HEAD 12″-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5″W X 52.5″L	60 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0″W X 36.0″L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″W X 96.0″L	36 LBS
LED	L.E.D. BLANKOUT SIGN RIGID MOUNTED	5.0 S.F.	24.0″W X 36.0″L	110 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
   - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
   - The 2018 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

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. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. 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 arm connection points.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. 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 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. 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 Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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NCDOT Wind Zone 4 (90 mph)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1002 (Aviation Parkway) at I-40 WB Ramps

Division 5 Wake County Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	D. HARRIS
PREPARED BY:	R. MUNCEY	REVIEWED BY:	B. WATSON

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Betsy L. Watson 12/1/2017
SIGNATURE DATE

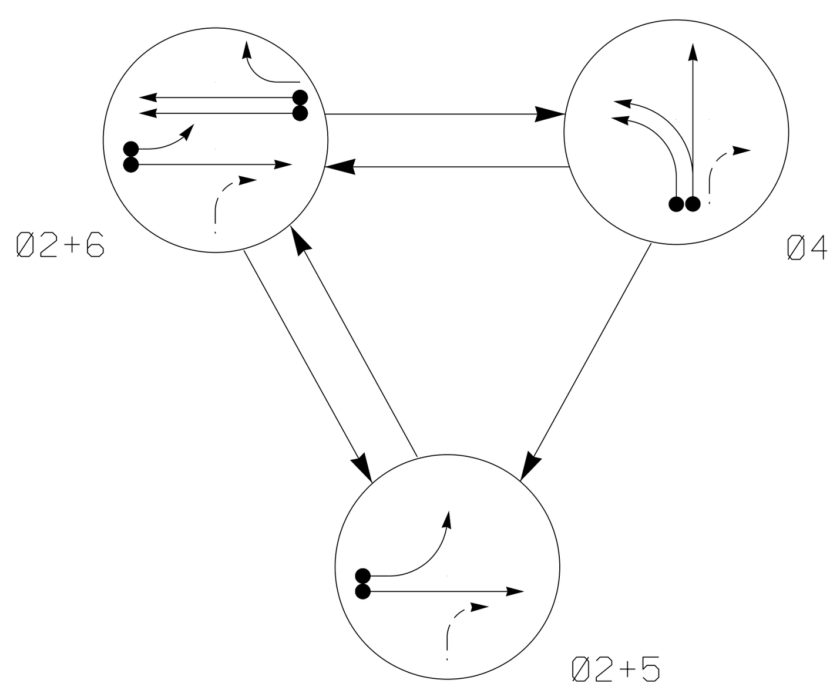
SIG. INVENTORY NO. 05-1735

DATE
U:\Traffic\Signals\Designs\Signals\Metal Poles\I-5506 Sig_dsn_Metal_Pole_#6.dgn
User:rmuncey

DocuSign Envelope ID: A28246C7-56D4-4CF7-94EA-19E5B7F03DFE

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-12.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

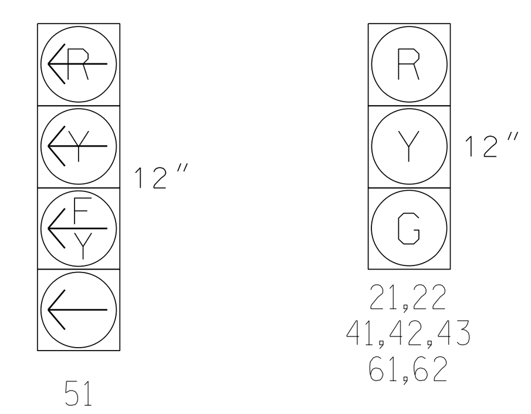
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø4	FLASH
21,22	G	G	R	Y
41,42,43	R	R	G	R
51	←	←FY	←R	←Y
61,62	R	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR INSTALLATION CHART

ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
2A**	**	300	EXIST	-	X	2	X	-	-	-	N
4A	6x60	0	EXIST	-	X	4	X	-	-	-	S
4B	6x60	0	EXIST	-	X	4	X	-	-	-	S
5A	6x60	0	EXIST	-	X	5	X	-	DELAY	15	S
						2	X	-	DELAY	3	G
6A	6x6	300	EXIST	-	X	6	X	-	-	-	N
6B	6x6	300	EXIST	-	X	6	X	-	-	-	N
S11	6X6	+530	EXIST	-	X	-	X	-	SYSTEM DETECTOR		N
S12	6X6	+530	EXIST	-	X	-	X	-	SYSTEM DETECTOR		N

** 2-Probe Microloop

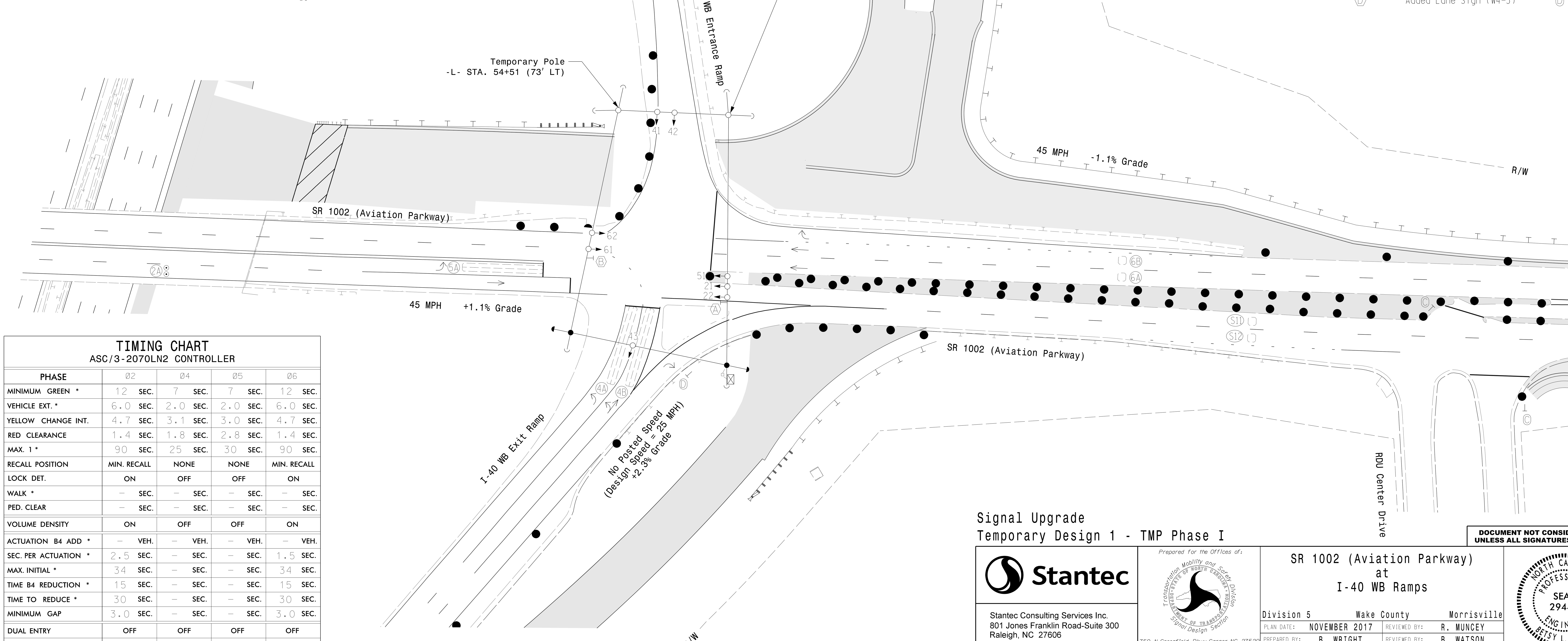
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
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. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
7. Cary signal system data:
   Fiber Channel #: 25.

3 Phase
Fully Actuated
(Cary Signal System)

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	N/A
	Construction Zone	N/A
N/A	Guardrail	
N/A	Microloop Probe	
(A)	No Right Turn Sign (R3-1)	(A)
(B)	No U-Turn/No Left Turn Sign (R3-18)	(B)
(C)	"STOP" Sign (R1-1)	(C)
(D)	Added Lane Sign (W4-3)	(D)



TIMING CHART

ASC/3-2070LN2 CONTROLLER

PHASE	Ø2	Ø4	Ø5	Ø6
MINIMUM GREEN *	12 SEC.	7 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	4.7 SEC.	3.1 SEC.	3.0 SEC.	4.7 SEC.
RED CLEARANCE	1.4 SEC.	1.8 SEC.	2.8 SEC.	1.4 SEC.
MAX. 1 *	90 SEC.	25 SEC.	30 SEC.	90 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	MIN. RECALL
LOCK DET.	ON	OFF	OFF	ON
WALK *	– SEC.	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	ON	OFF	OFF	ON
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	2.5 SEC.	– SEC.	– SEC.	1.5 SEC.
MAX. INITIAL *	34 SEC.	– SEC.	– SEC.	34 SEC.
TIME B4 REDUCTION *	15 SEC.	– SEC.	– SEC.	15 SEC.
TIME TO REDUCE *	30 SEC.	– SEC.	– SEC.	30 SEC.
MINIMUM GAP	3.0 SEC.	– SEC.	– SEC.	3.0 SEC.
DUAL ENTRY	OFF	OFF	OFF	OFF
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.

DATE:
U:*Traffic*Signals*Design*Signals*Plansheets*I-5506 Sig_dsn_05-1309_T1.dgn
User:rmuncey

Signal Upgrade
Temporary Design 1 - TMP Phase I

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

SCALE 0 40
1" = 40'

SR 1002 (Aviation Parkway)
at
I-40 WB Ramps

Division 5	Wake County	Morrisville	
PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	R. MUNCEY
PREPARED BY:	B. WRIGHT	REVIEWED BY:	B. WATSON

REVISIONS	INIT.	DATE

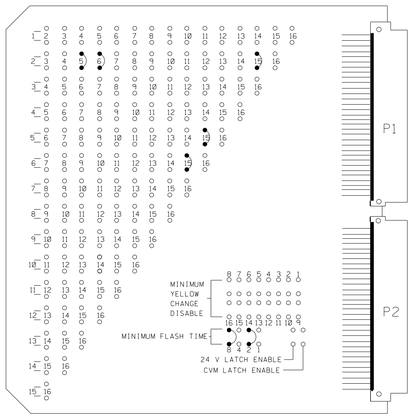
NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Betsy L. Watson 12/1/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1309T1

EDI MODEL MMU2-16LEip
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	DISABLE
14	DISABLE
15	ENABLE
16	DISABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	OFF
CH 3-14	OFF
CH 5-15	ON
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	OFF
CH 3	OFF
CH 5	ON
CH 7	OFF
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 1,3,7,8,9,10,11,12,13,14, & 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (Is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-12.1

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	NU	21,22	NU	41,42, 43	51 ★	61,62	NU	NU	NU	NU	NU	NU	NU	NU	51 ★	NU
RED		2R		4R	✳	6R										
YELLOW		2Y		4Y	✳	6Y										
GREEN		2G		4G		6G										
RED ARROW															15R	
YELLOW ARROW															15Y	
FLASHING YELLOW ARROW															15G	
GREEN ARROW					5G											
✋																
🚶																

NU = Not Used

✳ Denotes install load resistor. See Load Resistor Installation Detail.

★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU	CH1 L3 ø2 2A / CH2 L4 NOT USED	CH1 L1 ø5 5A / CH2 L2 ø2 5A	CH1 L7 ø6 6A / CH2 L8 ø6 6B	CH1 L5 ø4 4A / CH2 L6 ø4 4B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
RACK #2	BIU	SLOT EMPTY	CH1 L17 SYS DET S11 / CH2 L18 SYS DET S12	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B

LOOP NO.	LOOP PANEL TERMINALS
5A	L1A,L1B
	L2A,L2B
2A	L3A,L3B
NU	L4A,L4B
4A	L5A,L5B
4B	L6A,L6B
6A	L7A,L7B
6B	L8A,L8B
NU	L9A,L9B
NU	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
1	ø 5	DELAY	15
✳ 2	ø 2	DELAY	3
✳✳ 3	ø 2		
4			
5	ø 4		
6	ø 4		
✳✳ 7	ø 6		
✳✳ 8	ø 6		
9			
10			
11			
12			
13			
14			
15			
16			

NOTE: BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
S11	L17A,L17B
S12	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
✳✳ 17	SYSTEM		
✳✳ 18	SYSTEM		
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

✳ Detector Type - G

✳✳ Detector Type - N

EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET TS-2
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....2,4,5,6,15
PHASES USED.....2,4,5,6
OLA.....NOT USED
OLB.....NOT USED
OLC.....✳
OLD.....NOT USED

✳ See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

LOAD SWITCH ASSIGNMENT DETAIL

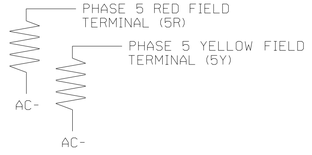
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	-
2	ø 2
3	-
4	ø 4
5	ø 5
6	ø 6
7	-
8	-
9	-
10	-
11	-
12	-
13	-
14	-
15	OLC
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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: Ø5-1309T1
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 2
Temporary Design 1 - TMP Phase I

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

SR 1002 (Aviation Parkway)
at
I-40 WB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1309T1

DATE:
USER:traffic\Signals\Design\Signals\Electrical Details\I-5506 sm_ele_05-1309_T1-1of2.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-12.2

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select [2. CONTROLLER]
2. From CONTROLLER Submenu select [2. VEHICLE OVERLAPS]
3. Toggle Twice.

OVERLAP C

Select TMG VEH OVLP [C] and 'PPLT FYA'

```
TMG VEH OVLP...[C] TYPE: .....PPLT FYA

PROTECTED LEFT TURN....   PHASE    5
OPPOSING THROUGH.......   PHASE    6

FLASHING ARROW OUTPUT.....CH15 ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 0
```

END PROGRAMMING

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1309T1
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 2 of 2
Temporary Design 1 - TMP Phase I

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Division 5 | Wake County | Morrisville

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PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1309T1

DATE:
File: c:\traffic\signals\Design\Signals\Electrical Details\I-5506 sht_ele_05-1309_T1-2of2.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-13.0

PHASING DIAGRAM

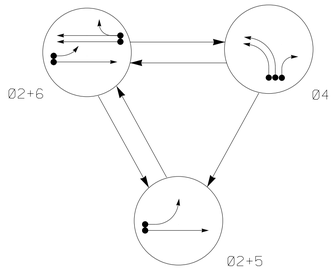


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø4	FLASH
21,22	G	G	R	Y
41,42	~~R~~	~~R~~	←	~~R~~
43,44	R	R	→	R
51	←	~~F~~ Y	~~R~~	~~Y~~
61,62	R	G	R	Y

LOOP & DETECTOR INSTALLATION CHART
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
2A	6x6	300	5	X	-	2	-	X	-	-	N
4A	6x40	0	2-4-2	X	-	4	-	X	-	-	S
4B	6x40	0	2-4-2	X	-	4	-	X	-	-	S
4C	6x40	0	2-4-2	X	-	4	X	-	DELAY	10	S
5A	6x40	0	2-4-2	X	-	5	-	X	DELAY	15	S
						2	-	X	DELAY	3	G
6A	6x6	300	6	X	-	6	-	X	-	-	N
6B	6x6	300	6	X	-	6	-	X	-	-	N
S11	6X6	+530	EXIST	-	X	-	-	X	SYSTEM DETECTOR		N
S12	6X6	+530	EXIST	-	X	-	-	X	SYSTEM DETECTOR		N

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
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. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
6. Cary signal system data:
   Fiber Channel #: 25.

3 Phase Fully Actuated (Cary Signal System)

LEGEND

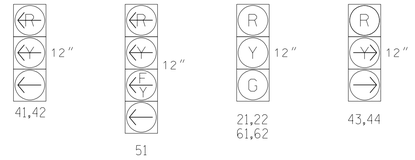
PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
N/A	Microloop Probe	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Direct Bury Lead-In	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	N/A
	Construction Zone	N/A
	Construction Zone Barrier	N/A
N/A	Guardrail	
Ⓐ	No Right Turn Sign (R3-1)	Ⓐ
Ⓑ	No U-Turn/No Left Turn Sign (R3-18)	Ⓑ
Ⓒ	"STOP" Sign (R1-1)	Ⓒ
Ⓓ	Right Arrow "ONLY" Sign (R3-5R)	Ⓓ

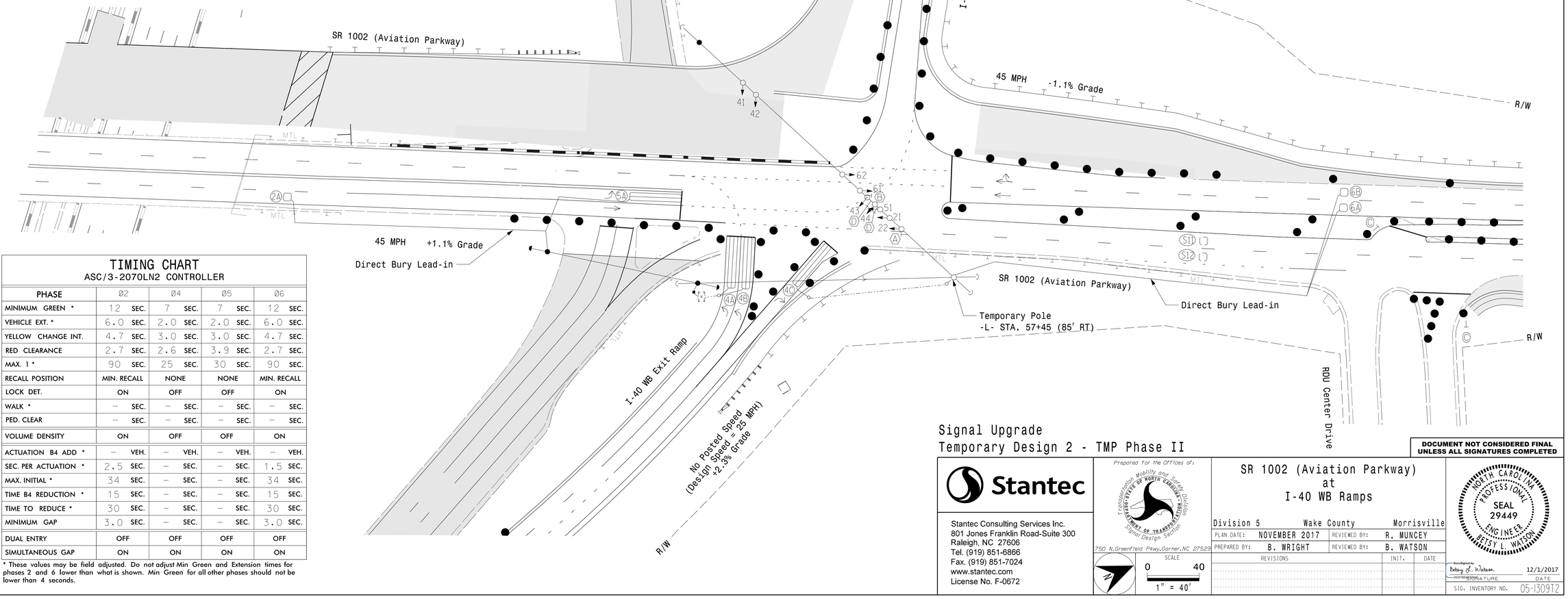
PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

All Heads L.E.D.





TIMING CHART
ASC/3-2070LN2 CONTROLLER

PHASE	Ø2	Ø4	Ø5	Ø6
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RED CLEARANCE	2.7 SEC.	2.6 SEC.	3.9 SEC.	2.7 SEC.
MAX. 1 *	90 SEC.	25 SEC.	30 SEC.	90 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	MIN. RECALL
LOCK DET.	ON	OFF	OFF	ON
WALK *	– SEC.	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	ON	OFF	OFF	ON
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	2.5 SEC.	– SEC.	– SEC.	1.5 SEC.
MAX. INITIAL *	34 SEC.	– SEC.	– SEC.	34 SEC.
TIME B4 REDUCTION *	15 SEC.	– SEC.	– SEC.	15 SEC.
TIME TO REDUCE *	30 SEC.	– SEC.	– SEC.	30 SEC.
MINIMUM GAP	3.0 SEC.	– SEC.	– SEC.	3.0 SEC.
DUAL ENTRY	OFF	OFF	OFF	OFF
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 - TMP Phase II

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SCALE 0 40 1" = 40'

SR 1002 (Aviation Parkway)
at
I-40 WB Ramps

Division 5 Wake County Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	R. MUNCEY
PREPARED BY:	B. WRIGHT	REVIEWED BY:	B. WATSON

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

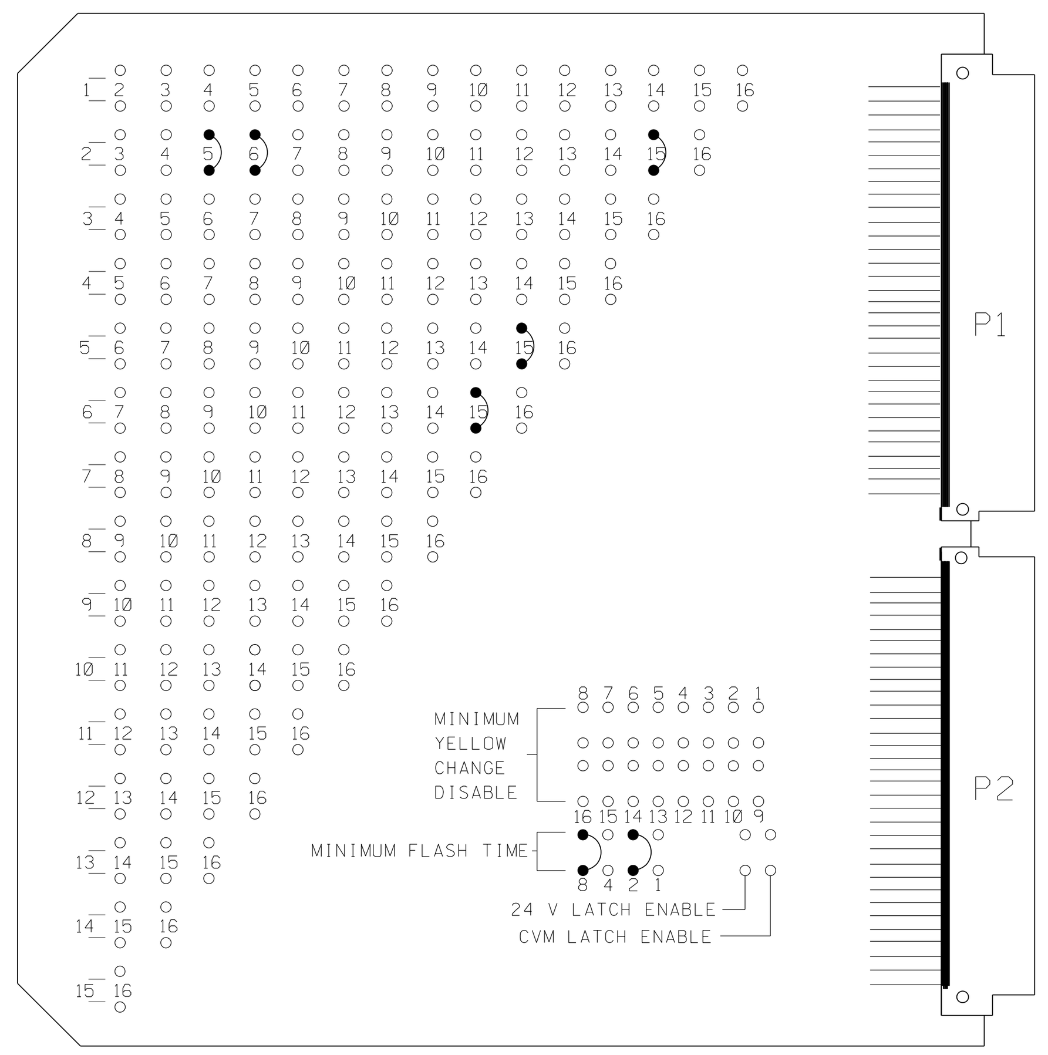
Developed by: Betsy L. Watson 12/1/2017
DESIGNER SIGNATURE DATE

SIG. INVENTORY NO. 05-1309T2

DATE:
I:\Traffic\Signals\Design\MS\signals\PlansheetsW\I-5506 Sig.dsn,05-1309_T2.dgn
User:rmuncey

EDI MODEL MMU2-16LEip MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	DISABLE
14	DISABLE
15	ENABLE
16	DISABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	OFF
CH 3-14	OFF
CH 5-15	ON
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	OFF
CH 3	OFF
CH 5	ON
CH 7	OFF
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 1,3,7,8,9,10,11,12,13,14, & 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	NU	21,22	NU	41,42	43,44	51 ★	61,62	NU	NU	NU	NU	NU	NU	NU	NU	51 ★	NU
RED		2R			4R	✳	6R										
YELLOW		2Y				✳	6Y										
GREEN		2G					6G										
RED ARROW				4R												15R	
YELLOW ARROW				4Y	4Y											15Y	
FLASHING YELLOW ARROW																15G	
GREEN ARROW				4G	4G	5G											
(hand symbol)																	
(pedestrian symbol)																	

NU = Not Used

✳ Denotes install load resistor. See Load Resistor Installation Detail.

★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU											
CH1		L3 ø2 2A	L1 ø5 5A	L7 ø6 6A	L5 ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	L13 ø4 4C	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
CH2		L4 NOT USED	L2 ø2 5A	L8 ø6 6B	L6 ø4 4B				L14 NOT USED			

RACK #2	BIU											
CH1		SLOT EMPTY	L17 SYS DET S11	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
CH2			L18 SYS DET S12									

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B

LOOP NO.	LOOP PANEL TERMINALS
5A	L1A,L1B
5A	L2A,L2B
2A	L3A,L3B
NU	L4A,L4B
4A	L5A,L5B
4B	L6A,L6B
6A	L7A,L7B
6B	L8A,L8B
NU	L9A,L9B
NU	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
4C	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
1	ø5	DELAY	15
✳ 2	ø2	DELAY	3
✳✳ 3	ø2		
4			
5	ø4		
6	ø4		
✳✳ 7	ø6		
✳✳ 8	ø6		
9			
10			
11			
12			
13	ø4	DELAY	10
14			
15			
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
S11	L17A,L17B
S12	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
✳✳ 17	SYSTEM		
✳✳ 18	SYSTEM		
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE: BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

✳ Detector Type - G

✳✳ Detector Type - N

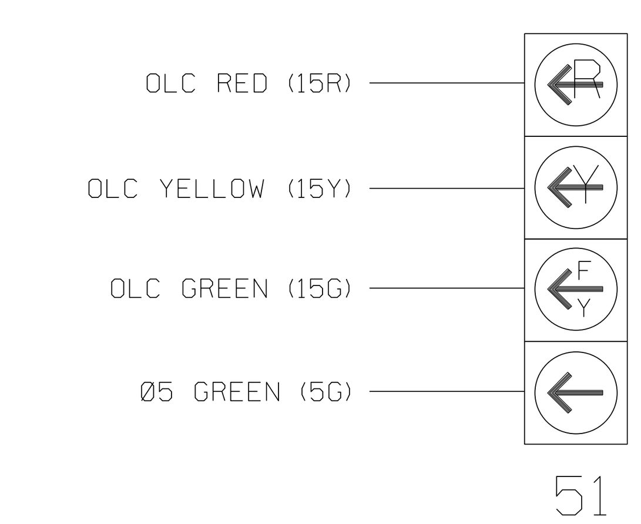
EQUIPMENT INFORMATION

CONTROLLER..............2070LN2
CABINET TS-2
SOFTWARE ....ECONOLITE ASC/3-2070
CABINET MOUNT...........BASE
LOADBAY POSITIONS.......16
LOAD SWITCHES USED......2,4,5,6,15
PHASES USED.............2,4,5,6
OLA.....................NOT USED
OLB.....................NOT USED
OLC.....................✳
OLD.....................NOT USED

✳ See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



LOAD SWITCH ASSIGNMENT DETAIL

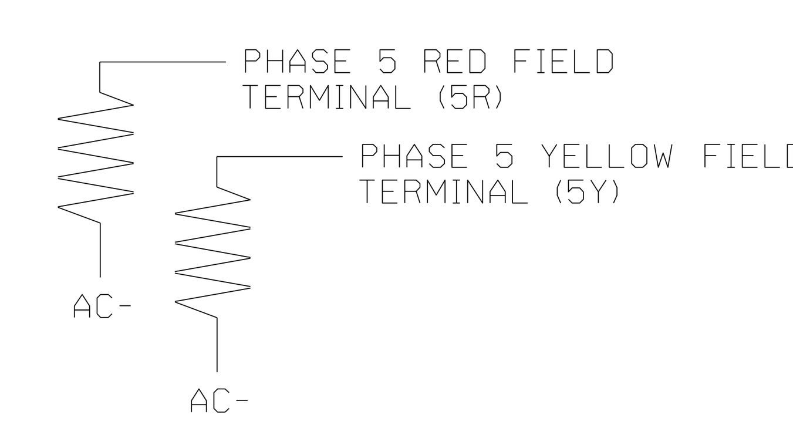
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	-
2	ø2
3	-
4	ø4
5	ø5
6	ø6
7	-
8	-
9	-
10	-
11	-
12	-
13	-
14	-
15	OLC
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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: 05-1309T2
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 2
Temporary Design 2 - TMP Phase II

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1002 (Aviation Parkway) at I-40 WB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

DocuSigned by: Betsy L. Watson 35E67BB34F8743F... | 12/5/2017
SIGNATURE | DATE

SIG. INVENTORY NO. 05-1309T2

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-13.2

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select 2. CONTROLLER
2. From CONTROLLER Submenu select 2. VEHICLE OVERLAPS
3. Toggle Twice.

OVERLAP C

Select TMG VEH OVLP [C] and 'PPLT FYA'

```
TMG VEH OVLP...[C] TYPE: .....PPLT FYA

PROTECTED LEFT TURN....   PHASE    5
OPPOSING THROUGH.......   PHASE    6

FLASHING ARROW OUTPUT.....CH15 ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE........... 0
```

END PROGRAMMING

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1309T2
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 2 of 2
Temporary Design 2 - TMP Phase II

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SR 1002 (Aviation Parkway)
at
I-40 WB Ramps

Division 5	Wake County	Morrisville
PLAN DATE: NOVEMBER 2017	REVIEWED BY: L. OVERN	
PREPARED BY:	REVIEWED BY: R. MUNCEY	

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Betsy L. Watson 12/5/2017

SIGNATURE DATE

SIG. INVENTORY NO. 05-1309T2

DATE:
u:\Traffic\Signals\Design\Signals\Electrical Details\I-5506 sm_ele_05-1309_T2-2of2.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-14.0

PHASING DIAGRAM

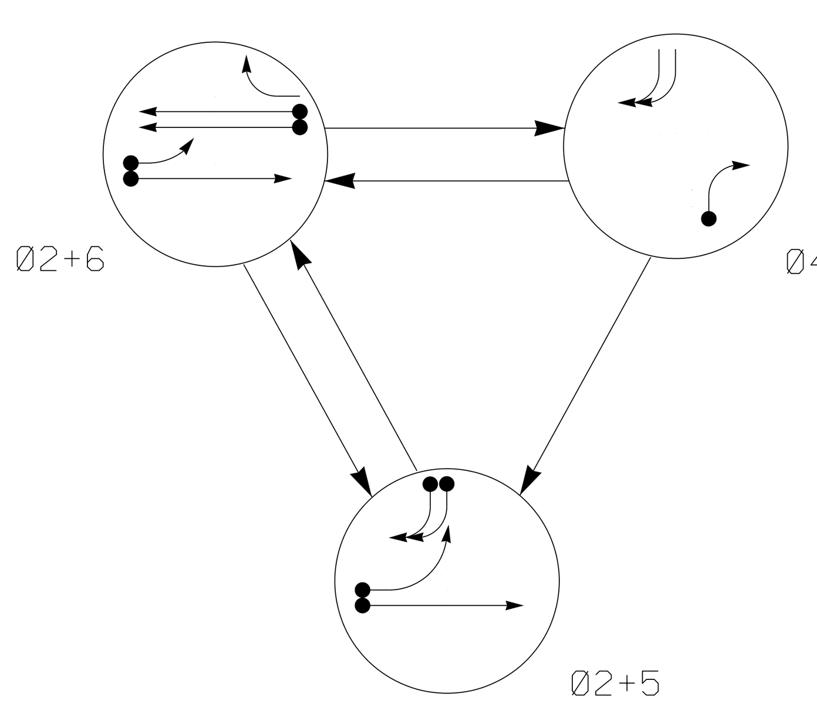


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø4	FLASH
21,22	G	G	R	Y
43,44	R	R	→	R
51	←	← F/Y	← R	← Y
52,53	→	R	→	R
61,62	R	G	R	Y

LOOP & DETECTOR INSTALLATION CHART
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
2A	6x6	300	5	X	-	2	-	X	-	-	N
4A	6x40	0	EXIST	-	X	4	-	X	DELAY	10	S
5A	6x40	0	2-4-2	X	-	5	-	X	DELAY	15	S
				X	-	2	-	X	DELAY	3	G
5B	6x40	0	2-4-2	X	-	5	-	X	DELAY	15	S
5C	6x40	0	2-4-2	X	-	5	-	X	DELAY	15	S
6A	6x6	300	6	X	-	6	-	X	-	-	N
6B	6x6	300	6	X	-	6	-	X	-	-	N
S11	6X6	+300	6	X	-	-	-	X	SYSTEM DETECTOR		N
S12	6X6	+300	6	X	-	-	-	X	SYSTEM DETECTOR		N

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
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. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
6. Cary signal system data:
   Fiber Channel #: 25.

3 Phase
Fully Actuated
(Cary Signal System)

LEGEND

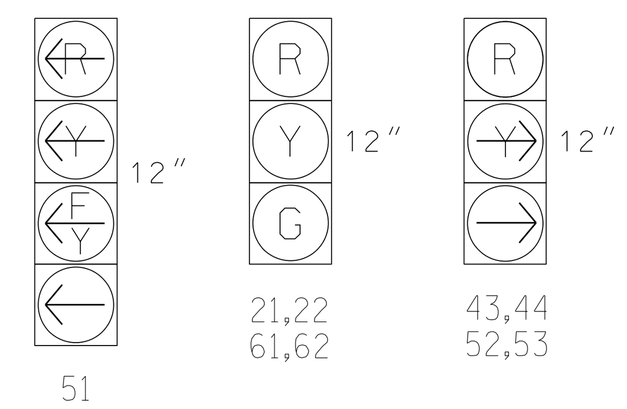
PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
N/A	Microloop Probe	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Direct Bury Lead-In	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	N/A
	Construction Zone	N/A
	Construction Zone Barrier	N/A
N/A	Guardrail	
Ⓐ	No Right Turn Sign (R3-1)	Ⓐ
Ⓑ	No U-turn/No Left Turn Sign (R3-18)	Ⓑ
Ⓒ	"STOP" Sign (R1-1)	Ⓒ
Ⓓ	No Left Turn Sign (R3-2)	Ⓓ
Ⓔ	Right Arrow "ONLY" Sign (R3-5R)	Ⓔ

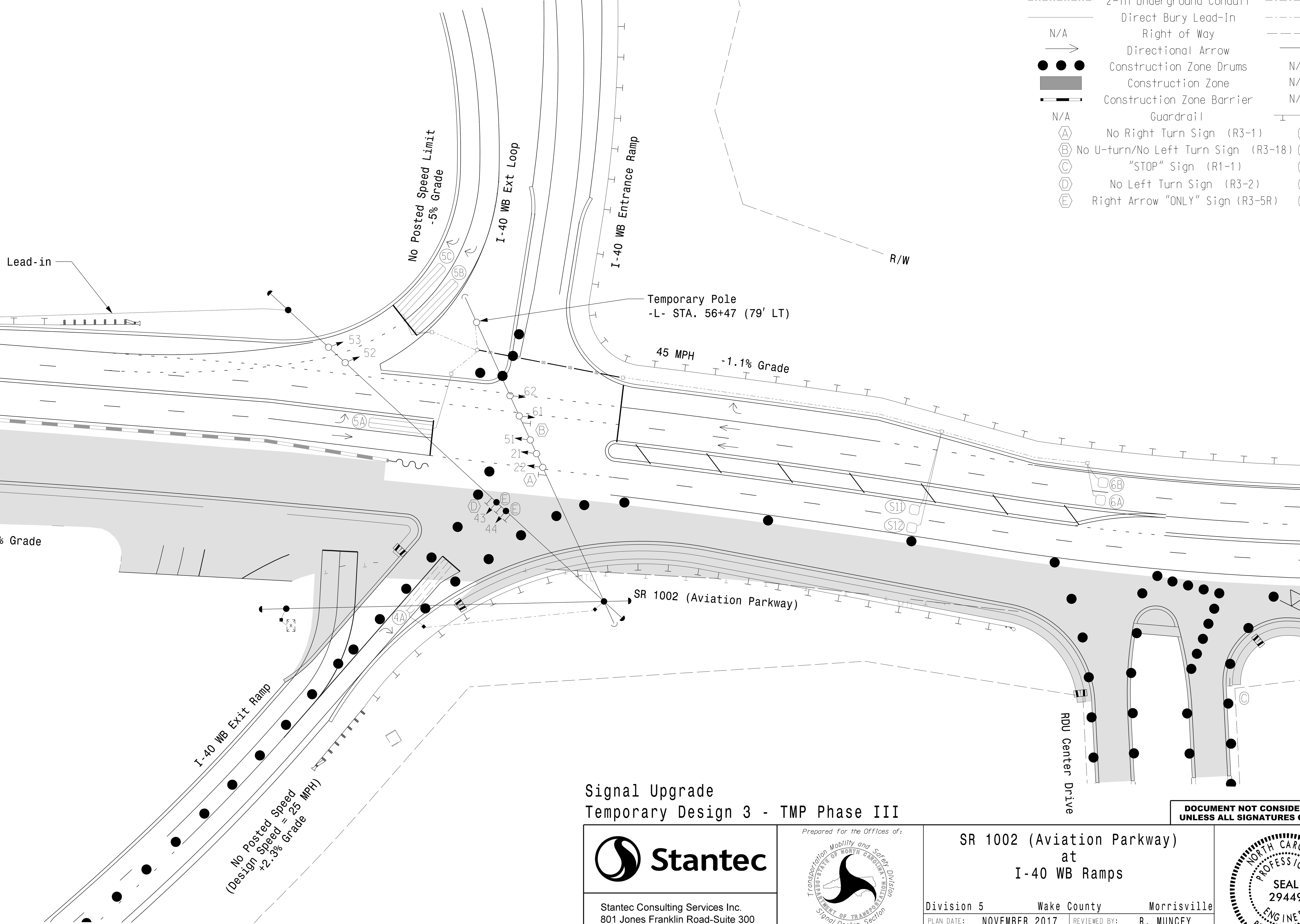
PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

All Heads L.E.D.





TIMING CHART
ASC/3-2070LN2 CONTROLLER

PHASE	Ø2	Ø4	Ø5	Ø6
MINIMUM GREEN *	12 SEC.	7 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	4.7 SEC.	3.0 SEC.	3.0 SEC.	4.7 SEC.
RED CLEARANCE	1.3 SEC.	3.1 SEC.	1.9 SEC.	1.3 SEC.
MAX. 1 *	90 SEC.	25 SEC.	30 SEC.	90 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	MIN. RECALL
LOCK DET.	ON	OFF	OFF	ON
WALK *	– SEC.	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	ON	OFF	OFF	ON
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	2.5 SEC.	– SEC.	– SEC.	1.5 SEC.
MAX. INITIAL *	34 SEC.	– SEC.	– SEC.	34 SEC.
TIME B4 REDUCTION *	15 SEC.	– SEC.	– SEC.	15 SEC.
TIME TO REDUCE *	30 SEC.	– SEC.	– SEC.	30 SEC.
MINIMUM GAP	3.0 SEC.	– SEC.	– SEC.	3.0 SEC.
DUAL ENTRY	OFF	OFF	OFF	OFF
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 - TMP Phase III

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Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 40
1" = 40'

SR 1002 (Aviation Parkway)
at
I-40 WB Ramps

Division 5	Wake County	Morrisville
PLAN DATE: NOVEMBER 2017	REVIEWED BY: R. MUNCEY	
PREPARED BY: B. WRIGHT	REVIEWED BY: B. WATSON	

REVISIONS | INIT. | DATE

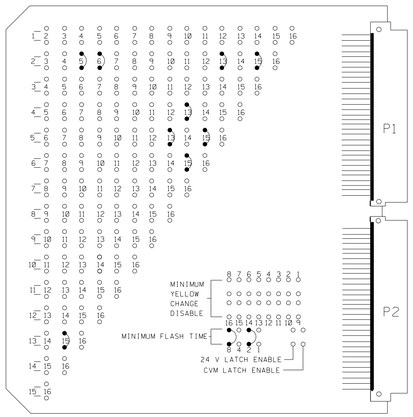
NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Betsy L. Watson 12/1/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1309T3

EDI MODEL MMU2-16LEip
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	ENABLE
14	DISABLE
15	ENABLE
16	DISABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	OFF
CH 3-14	OFF
CH 5-15	ON
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	OFF
CH 3	OFF
CH 5	ON
CH 7	OFF
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 1,3,7,8,9,10,11,12,14, & 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (Is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-14.1

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	NU	21,22	NU	43,44	51 ★	61,62	NU	NU	NU	NU	NU	NU	52,53	NU	51 ★	NU
RED		2R		4R	✳	6R							13R			
YELLOW		2Y			✳	6Y										
GREEN		2G				6G										
RED ARROW															15R	
YELLOW ARROW				4Y									13Y		15Y	
FLASHING YELLOW ARROW															15G	
GREEN ARROW				4G	5G								13G			
✋																
🚶																

NU = Not Used

✳ Denotes install load resistor. See Load Resistor Installation Detail.

★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW.
PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK												
#1	BIU	CH1 L3 ø2 2A CH2 L4 NOT USED	CH1 L1 ø5 5A CH2 L2 ø2 5A	CH1 L7 ø6 6A CH2 L8 ø6 6B	CH1 L5 ø4 4A CH2 L6 NOT USED	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	CH1 L13 ø5 5B CH2 L14 ø5 5C	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
#2	BIU	SLOT EMPTY	CH1 L17 SYS DET S11 CH2 L18 SYS DET S12	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B

LOOP NO.	LOOP PANEL TERMINALS
5A	L1A,L1B
	L2A,L2B
2A	L3A,L3B
NU	L4A,L4B
4A	L5A,L5B
NU	L6A,L6B
6A	L7A,L7B
6B	L8A,L8B
NU	L9A,L9B
NU	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
5B	L13A,L13B
5C	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
1	ø5	DELAY	15
✳ 2	ø2	DELAY	3
✳✳ 3	ø2		
4			
5	ø4	DELAY	10
6			
✳✳ 7	ø6		
✳✳ 8	ø6		
9			
10			
11			
12			
13	ø5	DELAY	15
14	ø5	DELAY	15
15			
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
S11	L17A,L17B
S12	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
✳✳ 17	SYSTEM		
✳✳ 18	SYSTEM		
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE:
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

✳ Detector Type - G

✳✳ Detector Type - N

EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET TS-2
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....2,4,5,6,13,15
PHASES USED.....2,4,5,6
OLA.....4+5
OLB.....NOT USED
OLC.....✳
OLD.....NOT USED

✳ See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

LOAD SWITCH ASSIGNMENT DETAIL

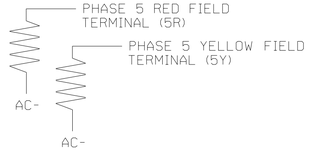
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	-
2	ø2
3	-
4	ø4
5	ø5
6	ø6
7	-
8	-
9	-
10	-
11	-
12	-
13	OLA
14	-
15	OLC
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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: 05-1309T3
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 2
Temporary Design 3 - TMP Phase III

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License No. F-0672

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

SR 1002 (Aviation Parkway)
at
I-40 WB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1309T3

DATE:
User:rmuncey
K:\Traffic\Signals\Design\Signals\Electrical Details\I-5506 sm_ele_05-1309_T3-1of2.dgn

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-14.2

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select [2. CONTROLLER]
2. From CONTROLLER Submenu select [2. VEHICLE OVERLAPS]

OVERLAP A

Select TMG VEH OVLP [A] and 'NORMAL'

```
TMG VEH OVLP...[A] TYPE: .......NORMAL
  PHASES 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
INCLUDED . . . X X . . . . . . . . . . .

LAG GRN 0.0 YEL 0.0 RED 0.0
```

Toggle Twice

OVERLAP C

Select TMG VEH OVLP [C] and 'PPLT FYA'

```
TMG VEH OVLP...[C] TYPE: .....PPLT FYA

PROTECTED LEFT TURN....   PHASE    5
OPPOSING THROUGH.......   PHASE    6

FLASHING ARROW OUTPUT.....CH15 ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 0
```

END PROGRAMMING

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1309T3
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 2 of 2
Temporary Design 3 - TMP Phase III

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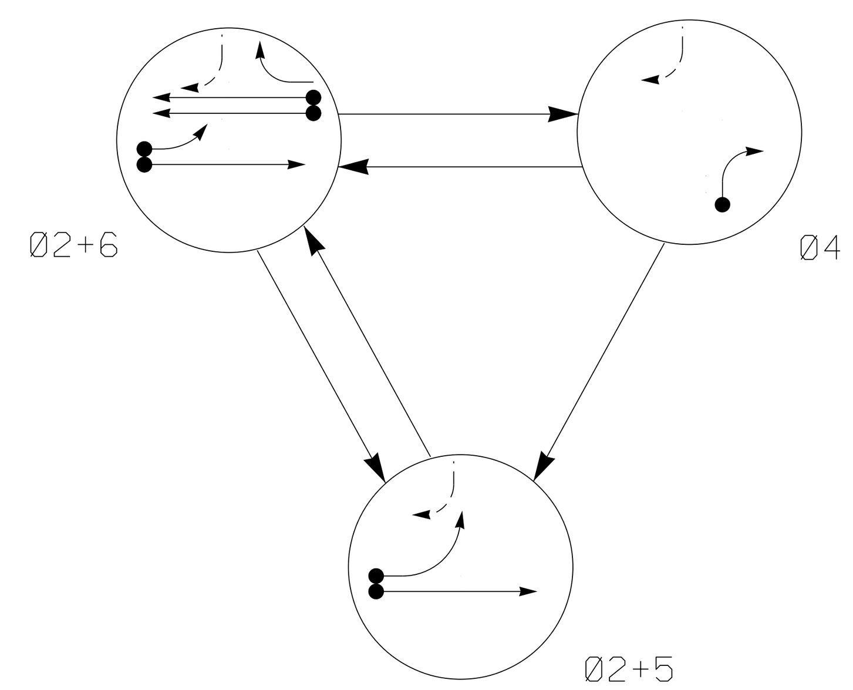
NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1309T3

12/5/2017
User:rmuncey
I:\projects\signals\Design\Signals\Electrical Details\I-5506 sm_ele_05-1309_T3-2of2.dgn
User:rmuncey

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

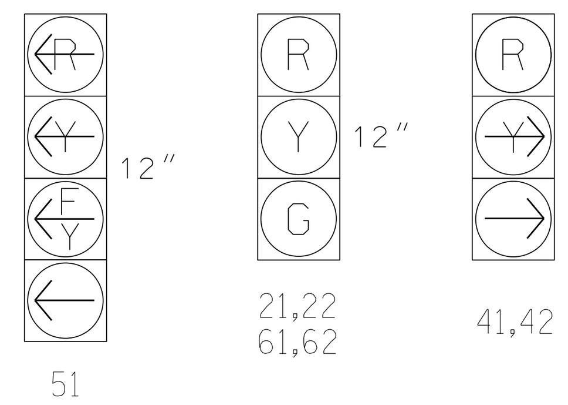
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø4	FLASH
21,22	G	G	R	Y
41,42	R	R	→	R
51	←	←F/Y	←R	←Y
61,62	R	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR INSTALLATION CHART

ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
2A	6x40	300	5	X	-	2	-	X	-	-	N
4A	6x40	0	EXIST	-	X	4	-	X	DELAY	10	S
5A	6x40	0	2-4-2	X	-	5	-	X	DELAY	15	S
						2	-	X	DELAY	3	G
6A	6x6	300	EXIST	-	X	6	-	X	-	-	N
6B	6x6	300	EXIST	-	X	6	-	X	-	-	N
S11	6X6	+170	4	X	-	-	-	X	SYSTEM DETECTOR		N
S12	6X6	+170	4	X	-	-	-	X	SYSTEM DETECTOR		N

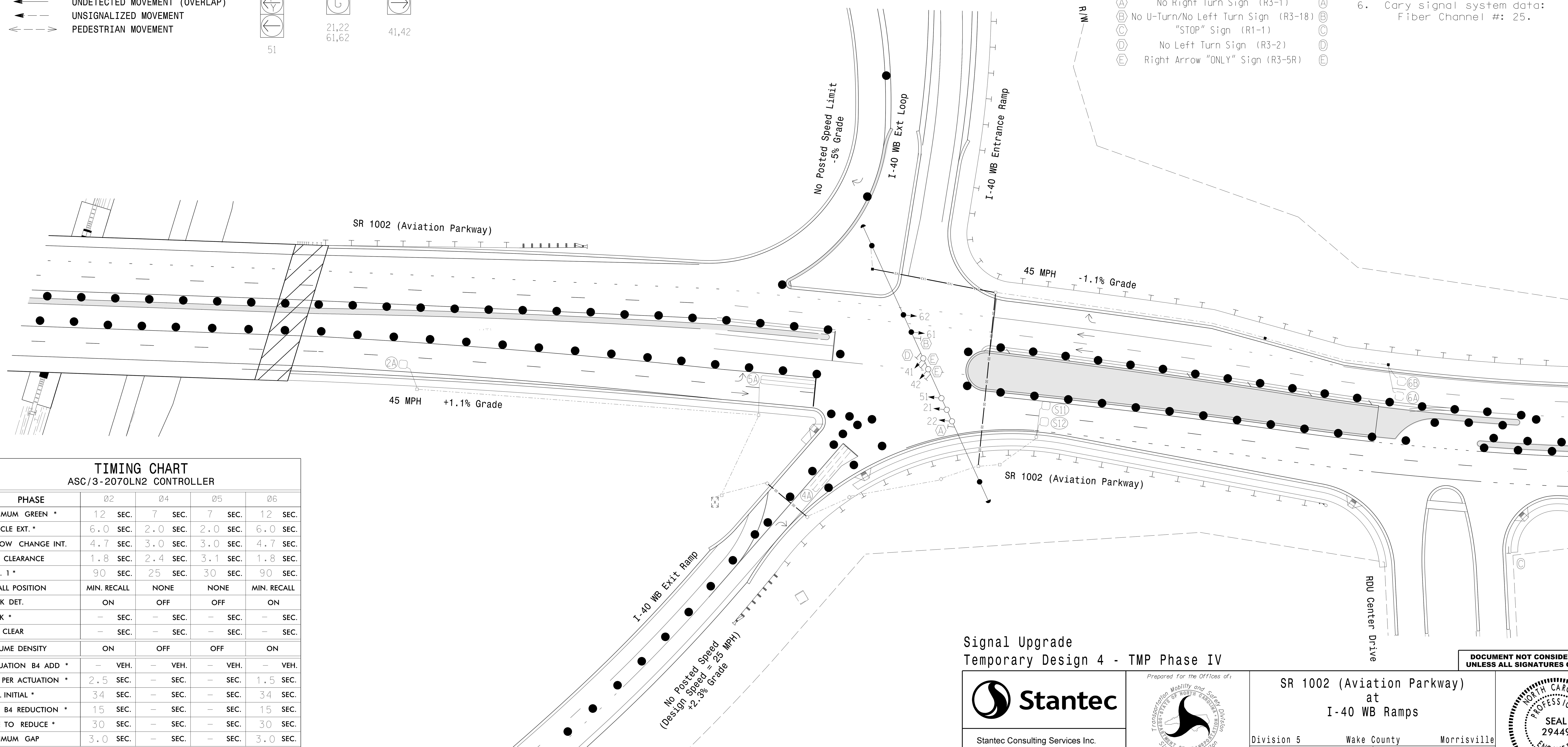
LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Directional Drill	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	N/A
	Construction Zone	N/A
N/A	Guardrail	
Ⓐ	No Right Turn Sign (R3-1)	Ⓐ
Ⓑ	No U-Turn/No Left Turn Sign (R3-18)	Ⓑ
Ⓒ	"STOP" Sign (R1-1)	Ⓒ
Ⓓ	No Left Turn Sign (R3-2)	Ⓓ
Ⓔ	Right Arrow "ONLY" Sign (R3-5R)	Ⓔ

3 Phase
Fully Actuated
(Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
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. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
6. Cary signal system data: Fiber Channel #: 25.



TIMING CHART

ASC/3-2070LN2 CONTROLLER

PHASE	Ø2	Ø4	Ø5	Ø6
MINIMUM GREEN *	12 SEC.	7 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	4.7 SEC.	3.0 SEC.	3.0 SEC.	4.7 SEC.
RED CLEARANCE	1.8 SEC.	2.4 SEC.	3.1 SEC.	1.8 SEC.
MAX. 1 *	90 SEC.	25 SEC.	30 SEC.	90 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	MIN. RECALL
LOCK DET.	ON	OFF	OFF	ON
WALK *	- SEC.	- SEC.	- SEC.	- SEC.
PED. CLEAR	- SEC.	- SEC.	- SEC.	- SEC.
VOLUME DENSITY	ON	OFF	OFF	ON
ACTUATION B4 ADD *	- VEH.	- VEH.	- VEH.	- VEH.
SEC. PER ACTUATION *	2.5 SEC.	- SEC.	- SEC.	1.5 SEC.
MAX. INITIAL *	34 SEC.	- SEC.	- SEC.	34 SEC.
TIME B4 REDUCTION *	15 SEC.	- SEC.	- SEC.	15 SEC.
TIME TO REDUCE *	30 SEC.	- SEC.	- SEC.	30 SEC.
MINIMUM GAP	3.0 SEC.	- SEC.	- SEC.	3.0 SEC.
DUAL ENTRY	OFF	OFF	OFF	OFF
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 4 - TMP Phase IV

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Transportation Mobility and Safety Division – Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 40
1" = 40'

SR 1002 (Aviation Parkway)
at
I-40 WB Ramps

Division 5	Wake County	Morrisville
PLAN DATE: NOVEMBER 2017	REVIEWED BY: R. MUNCEY	
PREPARED BY: B. WRIGHT	REVIEWED BY: B. WATSON	

REVISIONS	INIT.	DATE

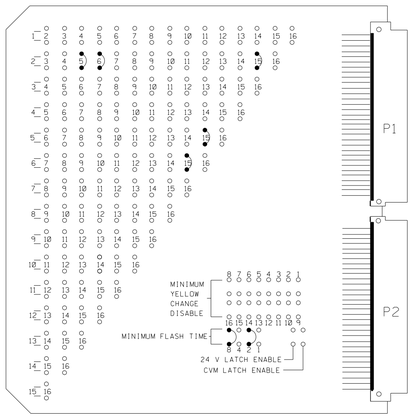
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29449 BETSY L. WATSON

Betsy L. Watson 12/1/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1309T4

EDI MODEL MMU2-16LEip
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	DISABLE
14	DISABLE
15	ENABLE
16	DISABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	OFF
CH 3-14	OFF
CH 5-15	ON
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	OFF
CH 3	OFF
CH 5	ON
CH 7	OFF
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 1,3,7,8,9,10,11,12,13,14, & 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-15.1

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	NU	21,22	NU	41,42	51 ★	61,62	NU	NU	NU	NU	NU	NU	NU	NU	51 ★	NU
RED		2R		4R	✳	6R										
YELLOW		2Y			✳	6Y										
GREEN		2G				6G										
RED ARROW															15R	
YELLOW ARROW				4Y											15Y	
FLASHING YELLOW ARROW															15G	
GREEN ARROW				4G	5G											
✋																
🚶																

NU = Not Used

✳ Denotes install load resistor. See Load Resistor Installation Detail.

★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU	CH1 L3 ø2 2A / CH2 L4 NOT USED	CH1 L1 ø5 5A / CH2 L2 ø2 5A	CH1 L7 ø6 6A / CH2 L8 ø6 6B	CH1 L5 ø4 4A / CH2 L6 NOT USED	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
RACK #2	BIU	SLOT EMPTY	CH1 L17 SYS DET S11 / CH2 L18 SYS DET S12	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B	
5A	L1A,L1B
	L2A,L2B
2A	L3A,L3B
NU	L4A,L4B
4A	L5A,L5B
NU	L6A,L6B
6A	L7A,L7B
6B	L8A,L8B
NU	L9A,L9B
NU	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
1	ø5	DELAY	15
* 2	ø2	DELAY	3
** 3	ø2		
4			
5	ø4	DELAY	10
6			
** 7	ø6		
** 8	ø6		
9			
10			
11			
12			
13			
14			
15			
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
S11	L17A,L17B
S12	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
** 17	SYSTEM		
** 18	SYSTEM		
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE: BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

* Detector Type - G

** Detector Type - N

EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET TS-2
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....2,4,5,6,15
PHASES USED.....2,4,5,6
OLA.....NOT USED
OLB.....NOT USED
OLC.....✳
OLD.....NOT USED

✳ See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

LOAD SWITCH ASSIGNMENT DETAIL

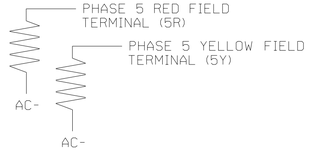
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	-
2	ø2
3	-
4	ø4
5	ø5
6	ø6
7	-
8	-
9	-
10	-
11	-
12	-
13	-
14	-
15	OLC
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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: 05-1309T4
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 2
Temporary Design 4 - TMP Phase IV

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Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

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K:\Traffic\Signals\Design\Signals\Electrical Details\t-5506 sm_e1e_05-1309_T4-1of2.dgn

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-15.2

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select [2. CONTROLLER]
2. From CONTROLLER Submenu select [2. VEHICLE OVERLAPS]
3. Toggle Twice.

OVERLAP C

Select TMG VEH OVLP [C] and 'PPLT FYA'

```
TMG VEH OVLP...[C] TYPE: .....[PPLT FYA]

PROTECTED LEFT TURN....   PHASE    5
OPPOSING THROUGH.......   PHASE    6

FLASHING ARROW OUTPUT.....CH15 ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 0
```

END PROGRAMMING

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1309T4
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 2 of 2
Temporary Design 4 - TMP Phase IV

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PREPARED BY:	REVIEWED BY:	R. MUNCEY	

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

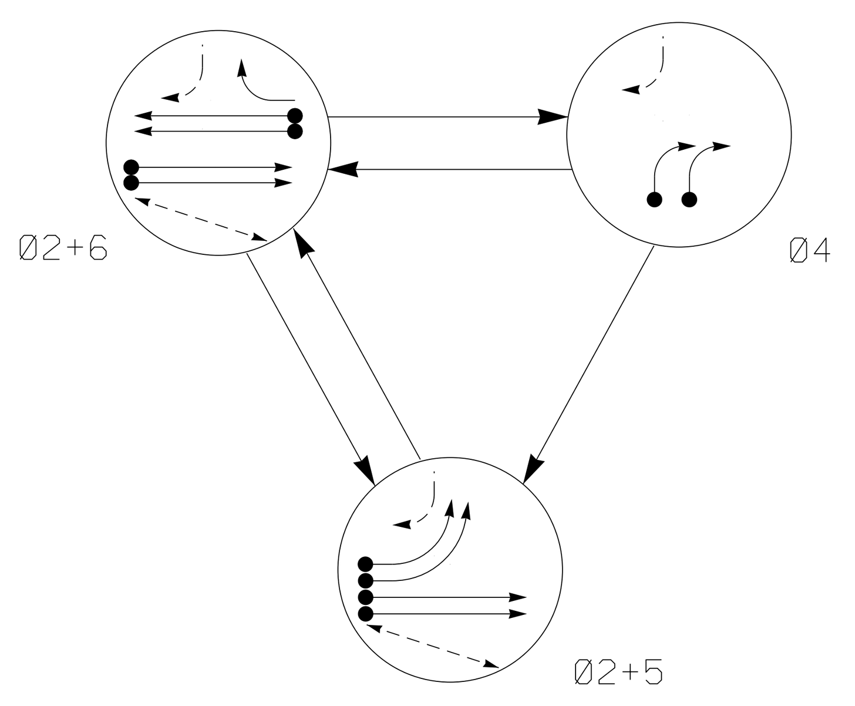
Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1309T4

DATE
User:
K:\traffic\Signals\Designs\Signals\Electrical Details\I-5506 sm_ele_05-1309_T4-2of2.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-16.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

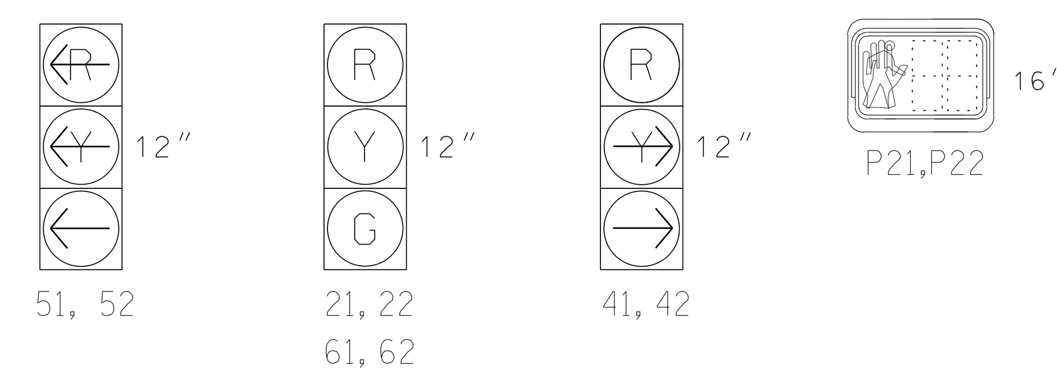
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø4	FLASH
21,22	G	G	R	Y
41,42	R	R	→	R
51,52	←	←R	←R	←R
61,62	R	G	R	Y
P21,P22	W	W	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR INSTALLATION CHART
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
2A	6x6	300	5	X	-	2	-	X	-	-	N
2B	6x6	300	5	X	-	2	X	-	-	-	N
4A	6x40	0	2-4-2	X	-	4	-	X	DELAY	15	S
4B	6x40	0	2-4-2	X	-	4	-	X	DELAY	15	S
5A	6x40	0	2-4-2	X	-	5	-	X	-	-	S
5B	6x40	0	2-4-2	X	-	5	-	X	-	-	S
6A	6x6	300	6	X	-	6	-	X	-	-	N
6B	6x6	300	6	X	-	6	-	X	-	-	N
S11	6x6	+160	4	X	-	-	-	X	SYSTEM DETECTOR		N
S12	6x6	+160	4	X	-	-	-	X	SYSTEM DETECTOR		N

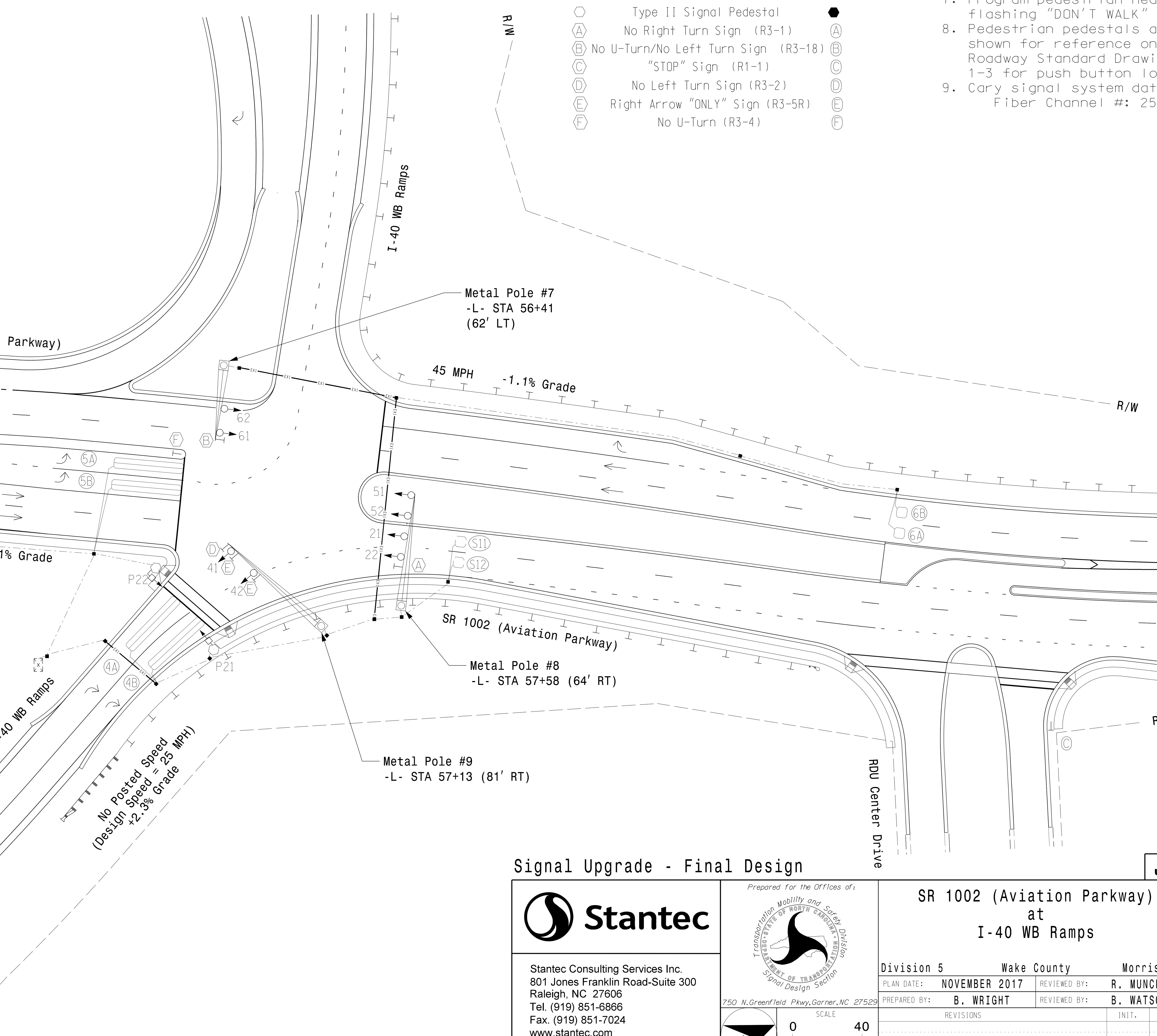
LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Metal Pole with Mastarm	
N/A	Curb Ramp	
N/A	Guardrail	
	Type II Signal Pedestal	
(A)	No Right Turn Sign (R3-1)	(A)
(B)	No U-Turn/No Left Turn Sign (R3-18)	(B)
(C)	"STOP" Sign (R1-1)	(C)
(D)	No Left Turn Sign (R3-2)	(D)
(E)	Right Arrow "ONLY" Sign (R3-5R)	(E)
(F)	No U-Turn (R3-4)	(F)

3 Phase
Fully Actuated
(Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
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. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
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. Pedestrian pedestals are conceptual and shown for reference only. See 2018 NCDOT Roadway Standard Drawings 1705.04 Sheets 1-3 for push button location details.
9. Cary signal system data:
   Fiber Channel #: 25.



TIMING CHART
ASC/3-2070LN2 CONTROLLER

PHASE	Ø2	Ø4	Ø5	Ø6
MINIMUM GREEN *	12 SEC.	7 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	4.4 SEC.	3.0 SEC.	3.0 SEC.	4.7 SEC.
RED CLEARANCE	1.1 SEC.	3.3 SEC.	3.1 SEC.	1.6 SEC.
MAX. 1 *	90 SEC.	25 SEC.	30 SEC.	90 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	MIN. RECALL
LOCK DET.	ON	OFF	OFF	ON
WALK *	7 SEC.	- SEC.	- SEC.	- SEC.
PED. CLEAR	9 SEC.	- SEC.	- SEC.	- SEC.
VOLUME DENSITY	ON	OFF	OFF	ON
ACTUATION B4 ADD *	- VEH.	- VEH.	- VEH.	- VEH.
SEC. PER ACTUATION *	1.5 SEC.	- SEC.	- SEC.	1.5 SEC.
MAX. INITIAL *	34 SEC.	- SEC.	- SEC.	34 SEC.
TIME B4 REDUCTION *	15 SEC.	- SEC.	- SEC.	15 SEC.
TIME TO REDUCE *	30 SEC.	- SEC.	- SEC.	30 SEC.
MINIMUM GAP	3.0 SEC.	- SEC.	- SEC.	3.0 SEC.
DUAL ENTRY	OFF	OFF	OFF	OFF
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.

DATE_
U:*Traffic*Signals*Design*Signals*Plansheets*I-5506 Sig_dsn_05-1309.dgn
User:rmuncey

Signal Upgrade - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Stantec

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License No. F-0672

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

SCALE 0 40
1" = 40'

SR 1002 (Aviation Parkway) at I-40 WB Ramps

Division 5	Wake County	Morrisville
PLAN DATE: NOVEMBER 2017	REVIEWED BY: R. MUNCEY	
PREPARED BY: B. WRIGHT	REVIEWED BY: B. WATSON	

REVISIONS	INIT.	DATE

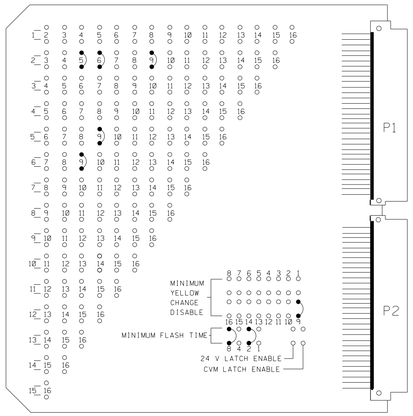
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29449 BETSY L. WATSON

Betsy L. Watson 12/1/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1309

EDI MODEL MMU2-16LEip
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	ENABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	ENABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	DISABLE
14	DISABLE
15	DISABLE
16	DISABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	OFF
CH 3-14	OFF
CH 5-15	OFF
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	OFF
CH 3	OFF
CH 5	OFF
CH 7	OFF
FLASH RATE FAULT	OFF
FYA TRAP DETECT	OFF

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 1,3,7,8,10,11,12,13,14,15 & 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 Walk and 6 Green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-16.1

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	NU	21,22	NU	41,42	51,52	61,62	NU	NU	P21, P22	NU	NU	NU	NU	NU	NU	NU
RED		2R		4R		6R										
YELLOW		2Y				6Y										
GREEN		2G				6G										
RED ARROW					5R											
YELLOW ARROW				4Y	5Y											
FLASHING YELLOW ARROW																
GREEN ARROW				4G	5G											
✋									9R							
🚶									9G							

NU = Not Used

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW.
PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU	CH1 L3 ø2 2A	CH1 L1 ø5 5A	CH1 L7 ø6 6A	CH1 L5 ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L4 ø2 2B	CH2 L2 ø5 5B	CH2 L8 ø6 6B	CH2 L6 ø4 4B							
RACK #2	BIU	SLOT EMPTY	CH1 L17 SYS DET S11 / CH2 L18 SYS DET S12	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
5A	L1A, L1B
5B	L2A, L2B
2A	L3A, L3B
2B	L4A, L4B
4A	L5A, L5B
4B	L6A, L6B
6A	L7A, L7B
6B	L8A, L8B
NU	L9A, L9B
NU	L10A, L10B
NU	L11A, L11B
NU	L12A, L12B
NU	L13A, L13B
NU	L14A, L14B
NU	L15A, L15B
NU	L16A, L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
1	ø5		
2	ø5		
** 3	ø2		
** 4	ø2		
5	ø4	DELAY	15
6	ø4	DELAY	15
** 7	ø6		
** 8	ø6		
9			
10			
11			
12			
13			
14			
15			
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
S11	L17A, L17B
S12	L18A, L18B
NU	L19A, L19B
NU	L20A, L20B
NU	L21A, L21B
NU	L22A, L22B
NU	L23A, L23B
NU	L24A, L24B
NU	L25A, L25B
NU	L26A, L26B
NU	L27A, L27B
NU	L28A, L28B
NU	L29A, L29B
NU	L30A, L30B
NU	L31A, L31B
NU	L32A, L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
** 17	SYSTEM		
** 18	SYSTEM		
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE: BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

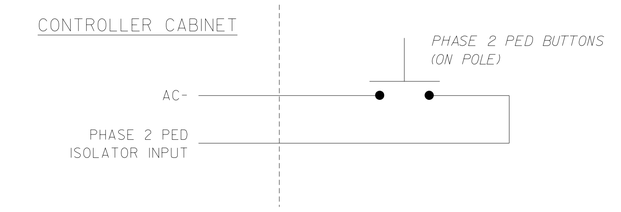
** Detector Type - N

EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET TS-2
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....2,4,5,6,9
PHASES USED.....2,2PED,4,5,6
OLA.....NOT USED
OLB.....NOT USED
OLC.....NOT USED
OLD.....NOT USED

PEDESTRIAN PUSH-BUTTON WIRING DETAIL

(wire push-buttons as shown below)



LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	-
2	ø2
3	-
4	ø4
5	ø5
6	ø6
7	-
8	-
9	ø2 PED
10	-
11	-
12	-
13	-
14	-
15	-
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

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: ø5-1309
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Stantec

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

SR 1002 (Aviation Parkway)
at
I-40 WB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

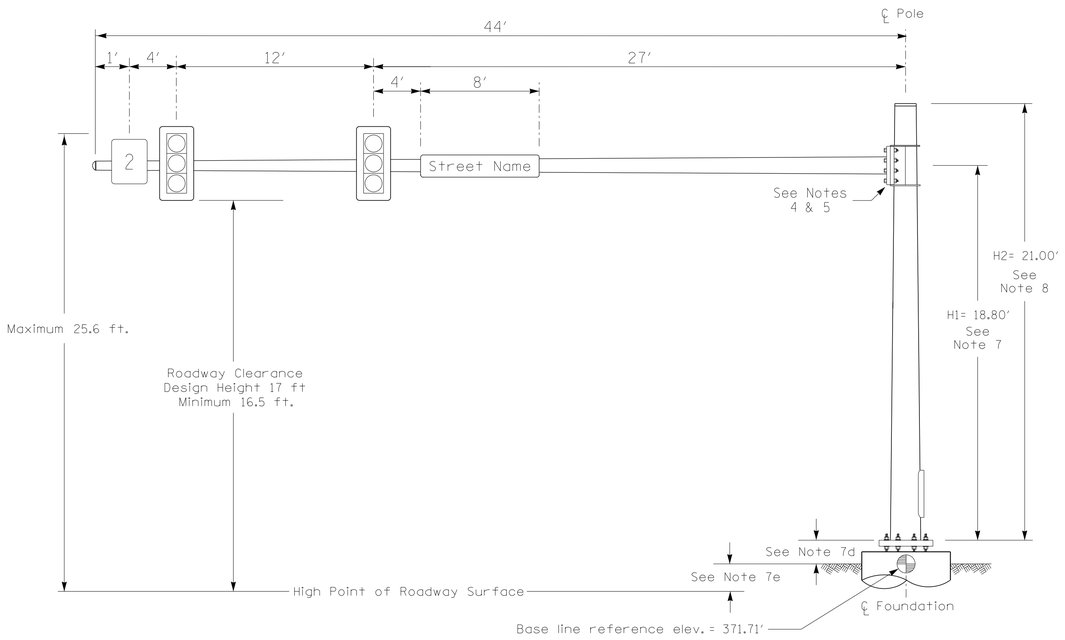
SIG. INVENTORY NO. 05-1309

DATE:
User:traffic\Signals\Design\Signals\Electrical Details\I-5506 sm.ele.05-1309.dgn
User:rmuncey

METAL POLE No. 7 and 8

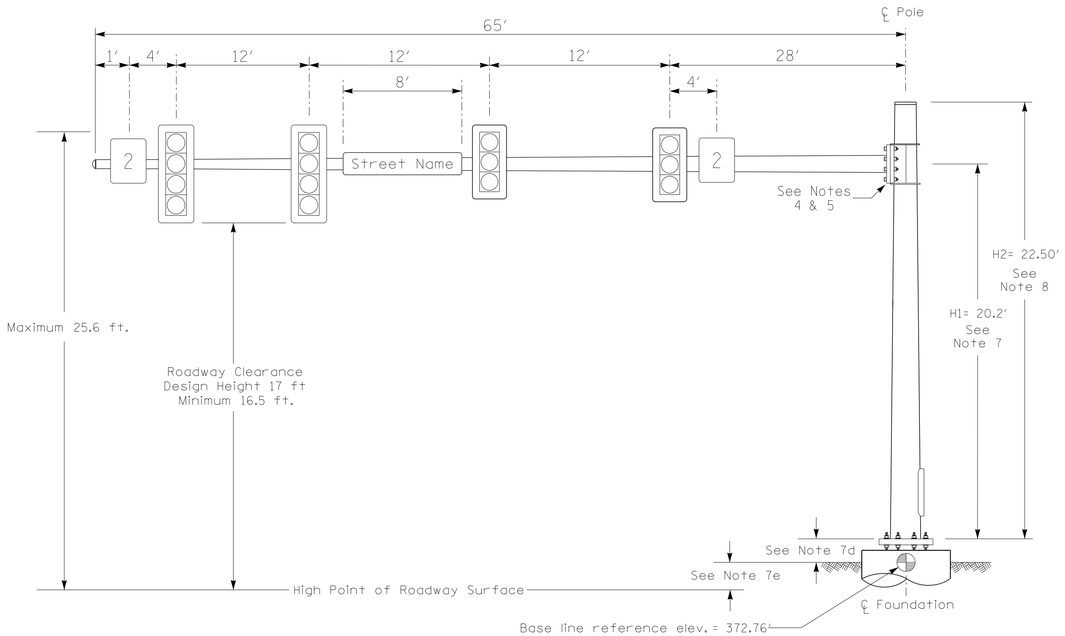
PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-16.2

Design Loading for METAL POLE NO. 7



Elevation View

Design Loading for METAL POLE NO. 8



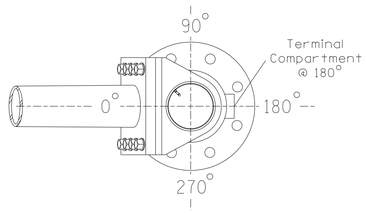
Elevation View

SPECIAL NOTE

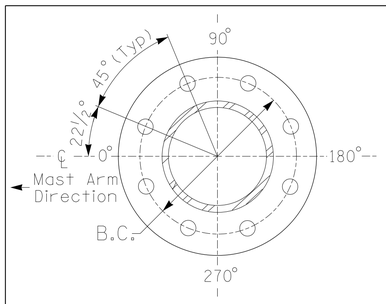
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 7	Pole 8
Baseline reference point at ⊕ Foundation @ ground level	369.25 ft.	372.76 ft.
Elevation difference at High point of roadway surface	+3.19 ft.	+0.39 ft.
Elevation difference at Edge of travelway or face of curb	+2.74 ft.	+1.18 ft.

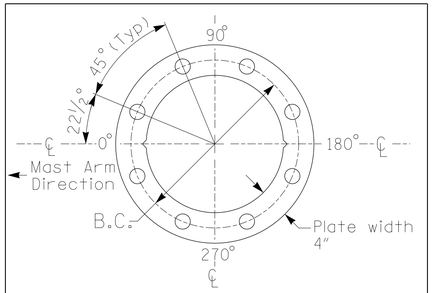


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL
For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12″-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5″ W X 52.5″L	60 LBS
	RIGID MOUNTED SIGNAL HEAD 12″-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5″ W X 66.0″L	74 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0″ W X 36.0″L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″ W X 96.0″L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
   - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
   - The 2018 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

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. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. 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.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. 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 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. 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 Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

Stantec

NCDOT Wind Zone 4 (90 mph)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared In the Offices of:
Stantec
750 N.Greenfield Pkwy.Garner,NC 27529

SR 1002 (Aviation Parkway) at I-40 WB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	D. HARRIS
PREPARED BY:	R. MUNCEY	REVIEWED BY:	B. WATSON

SCALE: 0 N/A N/A

REVISIONS	INIT.	DATE

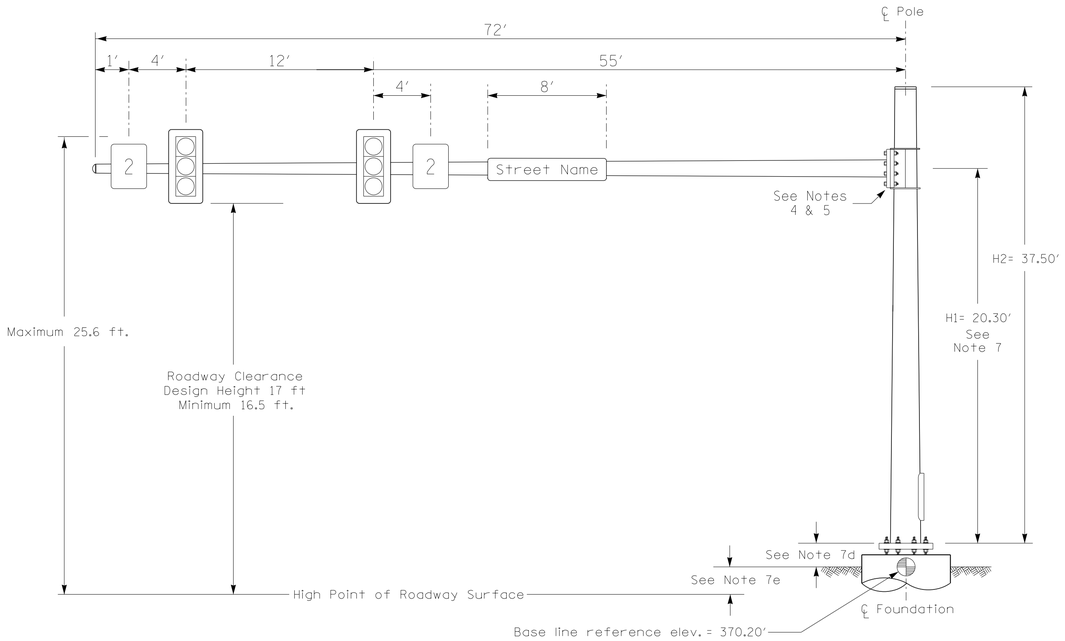
NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/1/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1309

DATE:
I:\Traffic\Signals\Design\Signals\Metal Poles\I-5506 Sig.dsn_Metal_Pole_#7-8.dgn
User:rmuncey

Design Loading for METAL POLE NO. 9



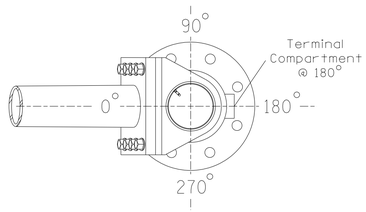
Elevation View

SPECIAL NOTE

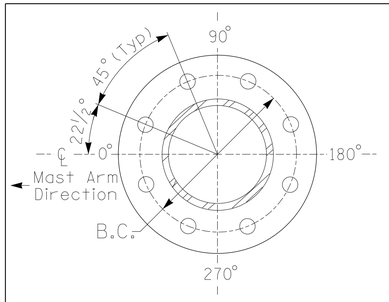
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 9	
Baseline reference point at ℄ Foundation @ ground level	367.99 ft.	
Elevation difference at High point of roadway surface	+4.99 ft.	
Elevation difference at Edge of travelway or face of curb	+4.27 ft.	

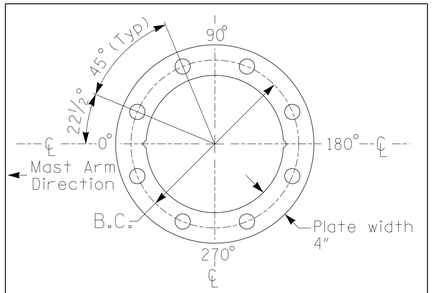


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL
For 8 Bolt Base Plate

METAL POLE No. 9

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-16.3

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12″-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5″W X 52.5″L	60 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0″W X 36.0″L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″W X 96.0″L	36 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. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. 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.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. 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 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. 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 Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
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Stantec

NCDOT Wind Zone 4 (90 mph)

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Prepared In the Offices of:
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SR 1002 (Aviation Parkway)
at
I-40 EB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	D. HARRIS
PREPARED BY:	R. MUNCEY	REVIEWED BY:	B. WATSON

SCALE: 0 N/A N/A

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

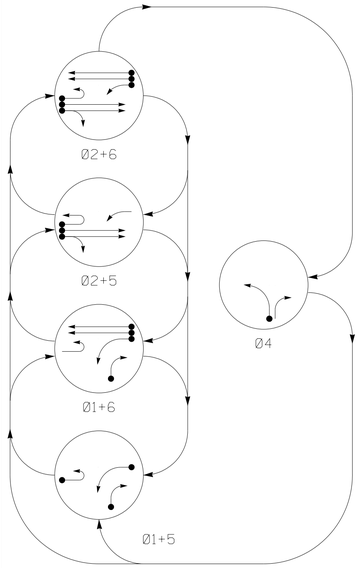
Developed by: Betsy L. Watson 12/1/2017
RECOMMENDED BY: SIGNATURE DATE

SIG. INVENTORY NO. 05-1309

DATE:
I:\Traffic\Signals\Designs\Signals\Metal Poles\#I-5506 Sig_dsn_Metal_Pole_#9.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-17.0

DEFAULT PHASING DIAGRAM



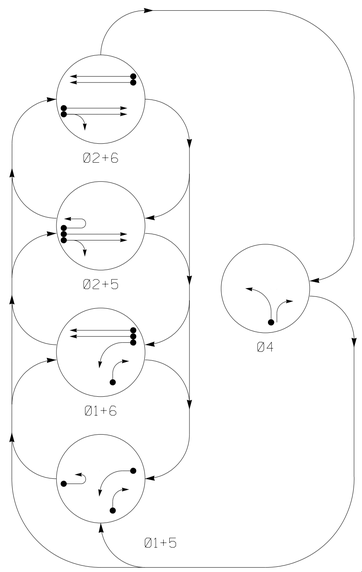
DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4	FLASH
11	←	←	←F Y	←F Y	←R	←Y
21,22	R	R	G	G	R	Y
41	R	R	R	R	G	R
42	R↘	R↘	R	R	G	R
51	↓F Y	↓F Y	↓R	↓R	↓R	↓Y
61,62	R	G	R	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.

ALTERNATE PHASING DIAGRAM



ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4	FLASH
11	←	←	←R	←R	←R	←Y
21,22	R	R	G	G	R	Y
41	R	R	R	R	G	R
42	R↘	R↘	R	R	G	R
51	↓F Y	↓F Y	↓R	↓R	↓R	↓Y
61,62	R	G	R	G	R	Y

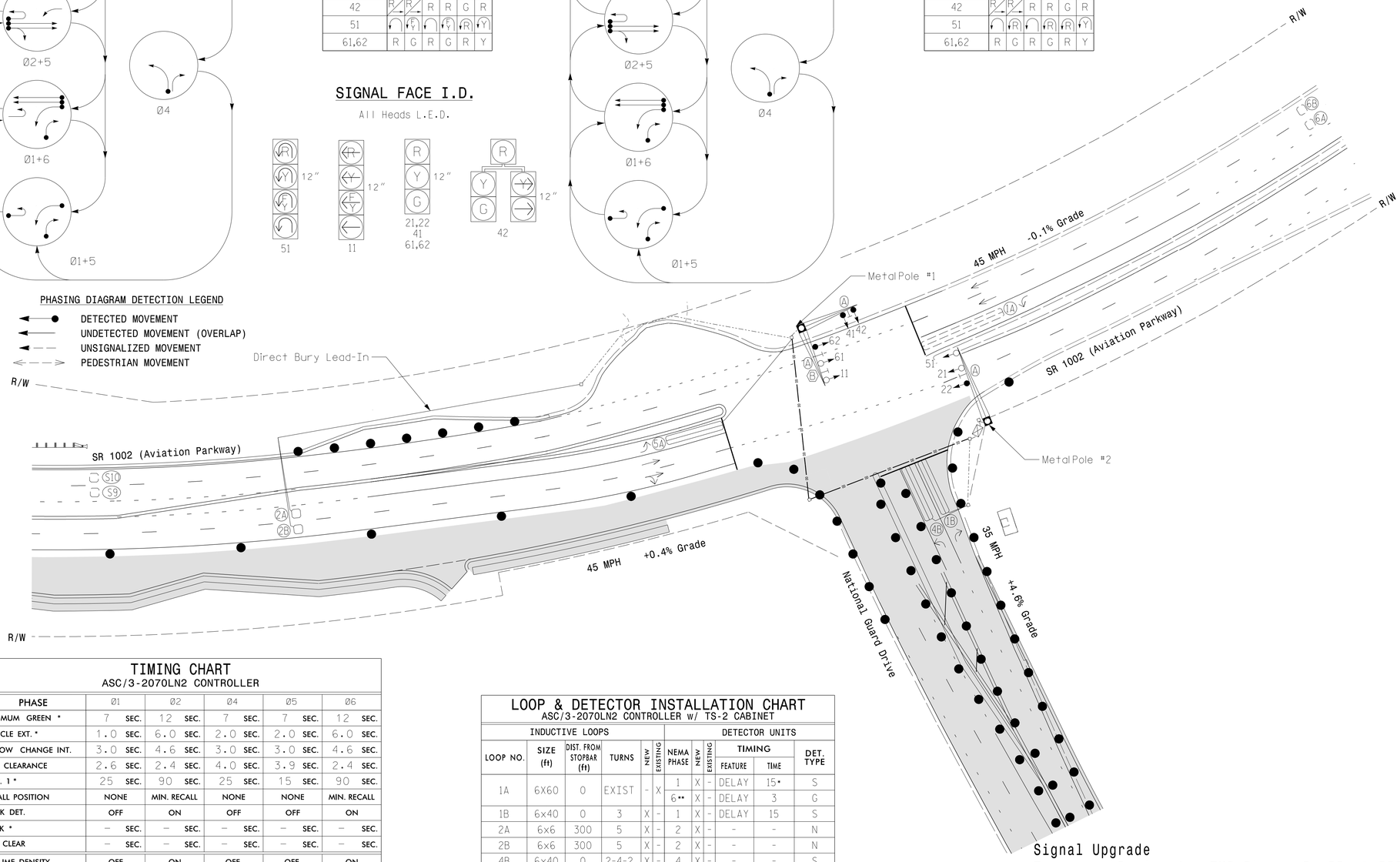
5 Phase
Fully Actuated
(Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Reposition signal heads 22, 41, 42, and 62.
5. The Division (Town) Traffic Engineer will determine hours of use for each phasing plan.
6. Set all detector units to presence mode.
7. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Cary signal system data:
   Fiber Channel #: 25.

PHASING DIAGRAM DETECTION LEGEND

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



TIMING CHART
ASC/3-2070LN2 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6
MINIMUM GREEN *	7 SEC.	12 SEC.	7 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	1.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.6 SEC.	3.0 SEC.	3.0 SEC.	4.6 SEC.
RED CLEARANCE	2.6 SEC.	2.4 SEC.	4.0 SEC.	3.9 SEC.	2.4 SEC.
MAX. 1 *	25 SEC.	90 SEC.	25 SEC.	15 SEC.	90 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	MIN. RECALL
LOCK DET.	OFF	ON	OFF	OFF	ON
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	ON
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	2.0 SEC.	– SEC.	– SEC.	2.0 SEC.
MAX. INITIAL *	– SEC.	34 SEC.	– SEC.	– SEC.	34 SEC.
TIME B4 REDUCTION *	– SEC.	15 SEC.	– SEC.	– SEC.	15 SEC.
TIME TO REDUCE *	– SEC.	60 SEC.	– SEC.	– SEC.	60 SEC.
MINIMUM GAP	– SEC.	2.5 SEC.	– SEC.	– SEC.	2.5 SEC.
DUAL ENTRY	OFF	OFF	OFF	OFF	OFF
SIMULTANEOUS GAP	ON	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

LOOP & DETECTOR INSTALLATION CHART
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
1A	6X60	0	EXIST	-	X	1	X	-	DELAY	15*	S
						6**	X	-	DELAY	3	G
1B	6x40	0	3	X	-	1	X	-	DELAY	15	S
2A	6x6	300	5	X	-	2	X	-	-	-	N
2B	6x6	300	5	X	-	2	X	-	-	-	N
4B	6x40	0	2-4-2	X	-	4	X	-	-	-	S
5A	6x40	0	2-4-2	X	-	5	X	-	DELAY	30*	S
						2**	X	-	DELAY	3	G
6A	6x6	300	EXIST	-	X	6	X	-	-	-	N
6B	6x6	300	EXIST	-	X	6	X	-	-	-	N
S9	6x6	+520	EXIST	-	X	-	X	-	SYSTEM DETECTOR		N
S10	6x6	+520	EXIST	-	X	-	X	-	SYSTEM DETECTOR		N

* Disable delay during Alternate Phasing Operation.
** Disable Phase(s) call during Alternate Phasing Operation.

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	·-·-·
———	Direct Bury Lead-In	·-·-·
DD	Directional Drill	N/A
N/A	Right of Way	- - - - -
→	Directional Arrow	→
● ● ●	Construction Zone Drums	N/A
▬	Construction Zone	N/A
Ⓐ	Street Name Sign (D3-1)	Ⓐ
Ⓑ	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓑ

Signal Upgrade
Temporary Design 1 - TMP Phases I, II, & III

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

SCALE 0 40 1" = 40'

SR 1002 (Aviation Parkway)
at
National Guard Drive

Division 5 Wake County Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	R. MUNCEY
PREPARED BY:	B. WRIGHT	REVIEWED BY:	B. WATSON

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

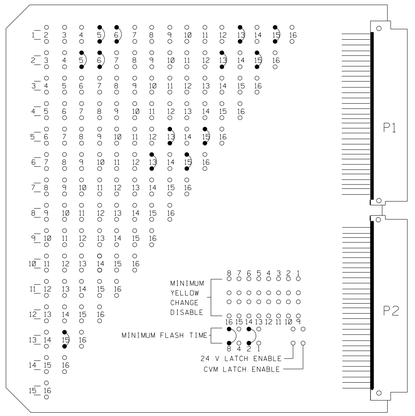
Designed by: Betsy L. Watson 12/1/2017
DESIGNER'S SIGNATURE DATE

SIG. INVENTORY NO. 05-I399TI

DATE:
User:
I:\traffic\Signals\Design\Signals\Plansheets\I-5506 Sig_dsn_05-I399_TI.dgn
User:rmuncey

EDI MODEL MMU2-16LEip
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	ENABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	ENABLE
14	DISABLE
15	ENABLE
16	DISABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	OFF
CH 5-15	ON
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	ON
CH 3	OFF
CH 5	ON
CH 7	OFF
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 3,7,8,9,10,11,12,14 & 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-17.1

SIGNAL HEAD HOOK-UP CHART

PHASE	1		2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	11★	42	21,22	NU	41,42	51★	61,62	NU	NU	NU	NU	NU	NU	11★	NU	51★	NU
RED	✳		2R		4R	✳	6R										
YELLOW			2Y		4Y	✳	6Y										
GREEN			2G		4G		6G										
RED ARROW														13R		15R	
YELLOW ARROW		1Y												13Y		15Y	
FLASHING YELLOW ARROW														13G		15G	
GREEN ARROW	1G	1G				5G											
✋																	
🚶																	

NU = Not Used

✳ Denotes install load resistor. See Load Resistor Installation Detail.

★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU	CH1 L3 ø1 1B	CH1 L1 ø1 1A	CH1 L7 NOT USED	CH1 L5 ø2 2A	CH1 L11 ø6 6A	CH1 L9 ø5 5A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L4 NOT USED	CH2 L2 ø6 1A	CH2 L8 ø4 4B	CH2 L6 ø2 2B	CH2 L12 ø6 6B	CH2 L10 ø2 5A					
RACK #2	BIU	SLOT EMPTY	CH1 L17 SYS DET S9 / CH2 L18 SYS DET S10	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS	
ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B	1A	L1A, L1B
		L2A, L2B
	1B	L3A, L3B
	NU	L4A, L4B
	2A	L5A, L5B
	2B	L6A, L6B
	NU	L7A, L7B
	4B	L8A, L8B
ADD JUMPERS FROM: L9A TO L10A, AND L9B TO L10B	5A	L9A, L9B
		L10A, L10B
	6A	L11A, L11B
	6B	L12A, L12B
	NU	L13A, L13B
	NU	L14A, L14B
	NU	L15A, L15B
	NU	L16A, L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
1	ø1	DELAY	15
✳ 2	ø6	DELAY	3
3	ø1	DELAY	15
4			
✳✳ 5	ø2		
✳✳ 6	ø2		
7			
8	ø4		
9	ø5	DELAY	30
✳ 10	ø2	DELAY	3
✳✳ 11	ø6		
✳✳ 12	ø6		
13			
14			
15			
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
S9	L17A, L17B
S10	L18A, L18B
NU	L19A, L19B
NU	L20A, L20B
NU	L21A, L21B
NU	L22A, L22B
NU	L23A, L23B
NU	L24A, L24B
NU	L25A, L25B
NU	L26A, L26B
NU	L27A, L27B
NU	L28A, L28B
NU	L29A, L29B
NU	L30A, L30B
NU	L31A, L31B
NU	L32A, L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
✳✳ 17	SYSTEM		
✳✳ 18	SYSTEM		
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE: BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

✳ Detector Type - G

✳✳ Detector Type - N

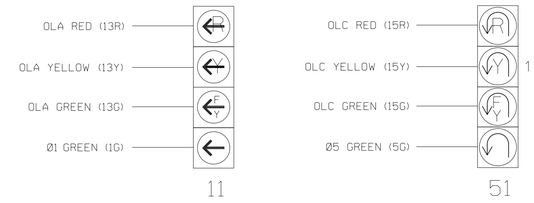
EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET TS-2
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....1,2,4,5,6,13,15
PHASES USED.....1,2,4,5,6
OLA.....✳
OLB.....NOT USED
OLC.....✳
OLD.....NOT USED

✳ See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



LOAD SWITCH ASSIGNMENT DETAIL

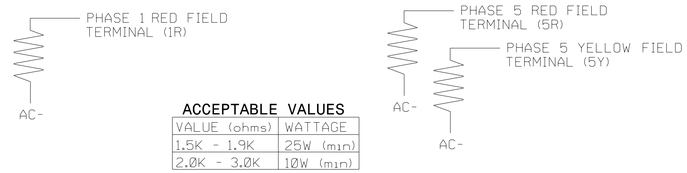
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	-
4	ø4
5	ø5
6	ø6
7	-
8	-
9	-
10	-
11	-
12	-
13	OLA
14	-
15	OLC
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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: Ø5-1399T1
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 3
Temporary Design 1 - TMP Phase III

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750 N.Greenfield Pkwy,Garner,NC 27529

SR 1002 (Aviation Parkway) at National Guard Drive

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29449 BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1399T1

DATE:
User:traffic\Signals\Design\Signals\Electrical Details\#1-5506 sm.ele.05-1399.T1-1of3.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-17.2

ECONOLITE ASC/3-2070 ACTION PLAN PROGRAMMING DETAIL

1. From Main Menu select [5. TIME BASE]
2. From TIME BASE Submenu select [2. ACTION PLAN]

```
ACTION PLAN...[ 99]
PATTERN.............99   SYS OVERRIDE.... NO
TIMING PLAN........ 0   SEQUENCE........  0
VEH DETECTOR PLAN.. 2   DET LOG........NONE
FLASH...........   --   RED REST........ NO
VEH DET DIAG PLN... 0   PED DET DIAG PLN..0
DIMMING ENABLE..   NO   PRIORITY RETURN. NO
PED PR RETURN..    NO   QUEUE DELAY..... NO
PMT COND DELAY     NO
  PHASE   1  2  3  4  5  6  7  8  9  0  1  2  3  4  5  6
PED RCL   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
WALK 2    .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
VEX 2     .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
VEH RCL   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
MAX RCL   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
MAX 2     .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
  PHASE   1  2  3  4  5  6  7  8  9  0  1  2  3  4  5  6
MAX 3     .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
CS INH    .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
OMIT      .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
SPC FCT   X  .  .  .  X  .  .  .  (1-8)
AUX FCT   .  .  .  (1-3)
          1  2  3  4  5  6  7  8  9  0  1  2  3  4  5
LP 1-15   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 16-30  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 31-45  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 46-60  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 61-75  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 76-90  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 91-100 .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
```

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select [2. CONTROLLER]
2. From CONTROLLER Submenu select [2. VEHICLE OVERLAPS]

OVERLAP A

Select TMG VEH OVLP [A] and 'PPLT FYA'

```
TMG VEH OVLP...[A] TYPE: .....[PPLT FYA]

PROTECTED LEFT TURN....   PHASE    1
OPPOSING THROUGH.......   PHASE    2

FLASHING ARROW OUTPUT.....CH13  ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 1
```

/ Toggle Twice

OVERLAP C

Select TMG VEH OVLP [C] and 'PPLT FYA'

```
TMG VEH OVLP...[C] TYPE: .....[PPLT FYA]

PROTECTED LEFT TURN....   PHASE    5
OPPOSING THROUGH.......   PHASE    6

FLASHING ARROW OUTPUT.....CH15 ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 5
```

/

END PROGRAMMING

/ The PPLT FYA operation of Signal Head 11 (Overlap A), Signal Head 51 (Overlap C) can be altered to fully protected operation.

ALTERNATE PHASING ACTIVATION DETAIL

TO RUN ALT. PHASING DURING FREE RUN - PROGRAM CHANGES (SHOWN BELOW) IN A TIME BASED ACTION PLAN. SCHEDULE A DAY PLAN THAT INCLUDES THE ACTION PLAN PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BITS 1 AND 5.

TO RUN ALT. PHASING DURING COORDINATION - SELECT THE TIME BASED ACTION PLAN THAT IS PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BITS 1 AND 5.

PHASING	VEH DET PLAN	SF BITS ENABLED
ACTIONS REQUIRED TO RUN DEFAULT PHASING	1	NONE
ACTIONS REQUIRED TO RUN ALTERNATE PHASING	2	1,5

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OR WHAT TAKES PLACE WHEN SF BITS 1 AND 5 AND VEH DET PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

SF BITS 1 AND 5	Modifies overlap parent phases for heads 11 and 51 to run protected turns only.
VEH DET PLAN 2:	Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 0 seconds.
	Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 0 seconds.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1399T1
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 2 of 3
Temporary Design 1 - TMP Phase III

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SR 1002 (Aviation Parkway)
at
I-40 WB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L WATSON

Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1399T1

DATE:
12/5/2017
G:\Traffic\Signals\Design\Signals\Electrical Details\I-5506 sm_ele_05-1399_T1-2of3.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-17.3

ECONOLITE ASC/3-2070 VEHICLE DETECTOR SETUP PROGRAMMING DETAIL FOR ALTERATE PHASING LOOPS 1A, 5A

(program controller as shown)

IMPORTANT!

Program detectors per the input file connection and programming chart shown on sheet 1 before proceeding.

1. From Main Menu selet [8. UTILITIES]
2. From UTILITIES Submenu select [1. COPY/CLEAR]
3. Copy from DETECTOR PLAN "1" to DETECTOR PLAN "2".

```
COPY / CLEAR UTILITY
      FROM                TO
PHASE TIMING.... . > PHASE TIMING.... .
TIMING PLAN..... . > TIMING PLAN..... .
PH DET OPT PLAN. . > PH DET OPT PLAN. .
DETECTOR PLAN... 1 > DETECTOR PLAN... 2
  TOGGLE TO SELECT A "FROM" AND A "TO"
            THEN PRESS ENTER
```

4. From Main Menu select [6. DETECTORS]
5. From DETECTOR Submenu select [2. VEHICLE DETECTOR SETUP]
6. Place cursor in VEH DET PLAN [ ] position and enter "2".

- For Loop 1A, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "1".
- Set delay time to "0".

```
VEH DETECTOR [ 1]   VEH DET PLAN [ 2]      <- NOTICE VEH DET PLAN 2
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 1  1    . . . . . . . . . . . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0  <- ENSURE DELAY IS SET TO '0'
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

- Place cursor in VEH DETECTOR [ ] position and enter "2".
- Set assigned phase to "0".

```
VEH DETECTOR [ 2]   VEH DET PLAN [ 2]      <- NOTICE VEH DET PLAN 2
TYPE: G-GREEN EXTENSION/DELAY
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 2  0    . . . . . . . . . . . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    3.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

ENSURE PHASE IS SET TO '0' →

- For Loop 5A, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "9".
- Set delay time to "0".

```
VEH DETECTOR [ 9]   VEH DET PLAN [ 2]      <- NOTICE VEH DET PLAN 2
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 9  5    . . . . . . . . . . . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0  <- ENSURE DELAY IS SET TO '0'
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

- Place cursor in VEH DETECTOR [ ] position and enter "10".
- Set assigned phase to "0".

```
VEH DETECTOR [10]   VEH DET PLAN [ 2]      <- NOTICE VEH DET PLAN 2
TYPE: G-GREEN EXTENSION/DELAY
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 10 0    . . . . . . . . . . . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    3.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

ENSURE PHASE IS SET TO '0' →

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1399T1
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 3 of 3
Temporary Design 1 - TMP Phase III

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Prepared for the Offices of:
Traffic Engineering Branch
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SR 1002 (Aviation Parkway)
at
I-40 WB Ramps

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

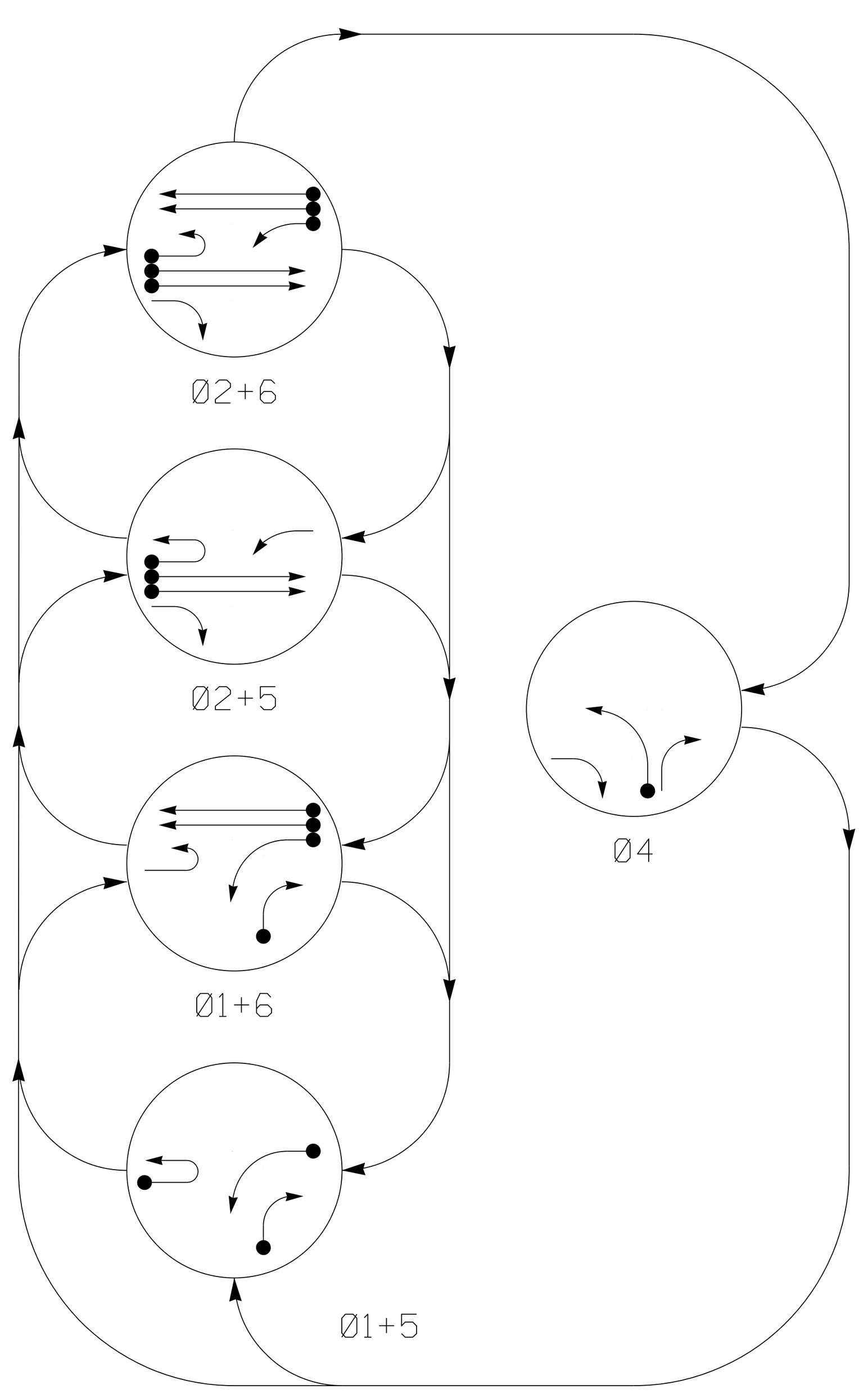
NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE
SIG. INVENTORY NO. 05-1399T1

DATE
User:Traffic\Signals\Design\Signals\Electrical Details\I-5506 sm_ele_05-1399_T1-3of3.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-18.0

DEFAULT PHASING DIAGRAM

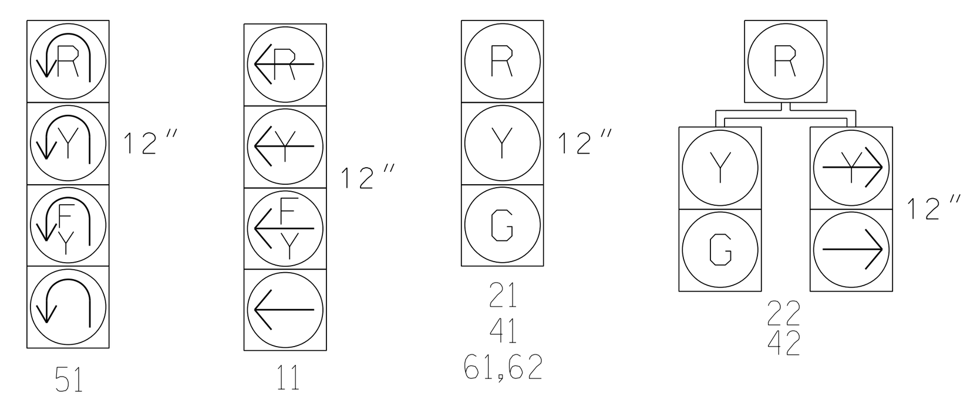


DEFAULT PHASING TABLE OF OPERATION

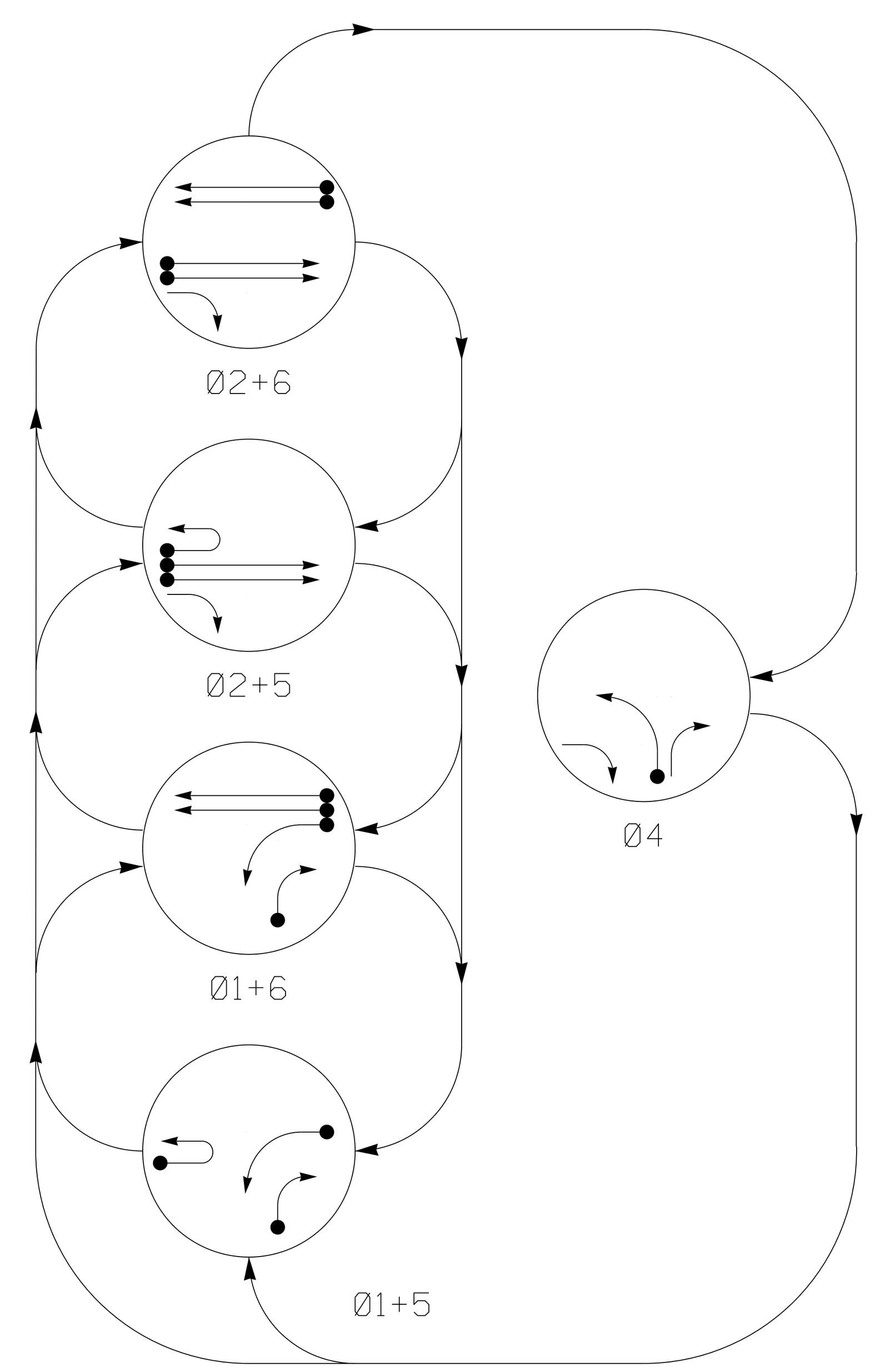
SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4	FLASH
11	←	←	←F/Y	←F/Y	←R	←Y
21	R	R	G	G	R	Y
22	R	R	G	G	R/→	Y
41	R	R	R	R	G	R
42	R/→	R/→	R	R	G	R
51	∩	F/Y	∩	F/Y	R	Y
61,62	R	G	R	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



ALTERNATE PHASING DIAGRAM



ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4	FLASH
11	←	←	←R	←R	←R	←Y
21	R	R	G	G	R	Y
22	R	R	G	G	R/→	Y
41	R	R	R	R	G	R
42	R/→	R/→	R	R	G	R
51	∩	R	∩	R	R	Y
61,62	R	G	R	G	R	Y

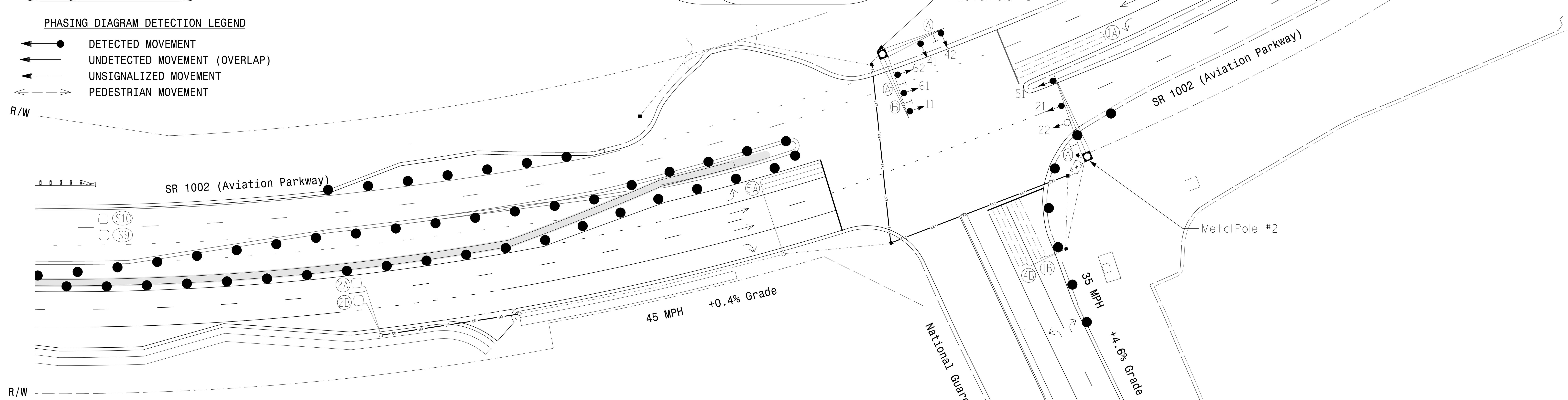
5 Phase
Fully Actuated
(Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or Phase 5 may be lagged.
4. Reposition signal heads 21, and 51.
5. Set all detector units to presence mode.
6. The Division (Town) Traffic Engineer will determine hours of use for each phasing plan.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
8. Cary signal system data:
   Fiber Channel #: 25.

PHASING DIAGRAM DETECTION LEGEND

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



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Metal Pole with Mastarm	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Directional Drill	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	N/A
	Construction Zone	N/A
Ⓐ	Street Name Sign (D3-1)	Ⓐ
Ⓑ	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓑ

TIMING CHART

ASC/3-2070LN2 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6
MINIMUM GREEN *	7 SEC.	12 SEC.	7 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	1.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.6 SEC.	3.0 SEC.	3.0 SEC.	4.6 SEC.
RED CLEARANCE	2.9 SEC.	2.3 SEC.	3.9 SEC.	3.8 SEC.	2.3 SEC.
MAX. 1 *	25 SEC.	90 SEC.	25 SEC.	15 SEC.	90 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	MIN. RECALL
LOCK DET.	OFF	ON	OFF	OFF	ON
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	ON
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	2.0 SEC.	– SEC.	– SEC.	2.0 SEC.
MAX. INITIAL *	– SEC.	34 SEC.	– SEC.	– SEC.	34 SEC.
TIME B4 REDUCTION *	– SEC.	15 SEC.	– SEC.	– SEC.	15 SEC.
TIME TO REDUCE *	– SEC.	60 SEC.	– SEC.	– SEC.	60 SEC.
MINIMUM GAP	– SEC.	2.5 SEC.	– SEC.	– SEC.	2.5 SEC.
DUAL ENTRY	OFF	OFF	OFF	OFF	OFF
SIMULTANEOUS GAP	ON	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

LOOP & DETECTOR INSTALLATION CHART

ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
1A	6X60	0	EXIST	-	X	1	-	X	DELAY	15*	S
						6**	-	X	DELAY	3	G
1B	6x40	0	EXIST	-	X	1	-	X	DELAY	15	S
2A	6x6	300	5	X	-	2	-	X	-	-	N
2B	6x6	300	5	X	-	2	-	X	-	-	N
4B	6x40	0	EXIST	-	X	4	-	X	-	-	S
5A	6x40	0	2-4-2	X	-	5	-	X	DELAY	30*	S
						2**	-	X	DELAY	3	G
6A	6x6	300	EXIST	-	X	6	-	X	-	-	N
6B	6x6	300	EXIST	-	X	6	-	X	-	-	N
S9	6x6	+520	EXIST	-	X	-	-	X	SYSTEM DETECTOR		N
S10	6x6	+520	EXIST	-	X	-	-	X	SYSTEM DETECTOR		N

* Disable delay during Alternate Phasing Operation.
** Disable Phase(s) call during Alternate Phasing Operation.

Signal Upgrade
Temporary Design 2 - TMP Phase IV

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

SCALE 0 40 — 1" = 40'

SR 1002 (Aviation Parkway)
at
National Guard Drive

Division 5	Wake County	Morrisville	
PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	R. MUNCEY
PREPARED BY:	B. WRIGHT	REVIEWED BY:	B. WATSON

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29449 BETSY L. WATSON

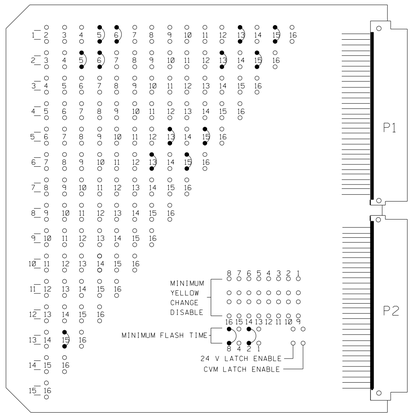
DocuSigned by: Betsy L. Watson 35E67BB34F8743F... SIGNATURE — DATE 12/1/2017

SIG. INVENTORY NO. 05-1399T2

DATE_
U:*Traffic*Signals*Signals*Design*Signals*Plansheets*I-5506 Sig_dsn_05-1399_T2.dgn
User:rmuncey

EDI MODEL MMU2-16LEip
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	ENABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	ENABLE
14	DISABLE
15	ENABLE
16	DISABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	OFF
CH 5-15	ON
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	ON
CH 3	OFF
CH 5	ON
CH 7	OFF
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 3,7,8,9,10,11,12,14 & 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-18.1

SIGNAL HEAD HOOK-UP CHART

PHASE	1		2	3	4		5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	11★	42	21,22	NU	41,42	22	51★	61,62	NU	NU	NU	NU	NU	NU	11★	NU	51★	NU
RED	✳		2R		4R		✳	6R										
YELLOW			2Y		4Y		✳	6Y										
GREEN			2G		4G			6G										
RED ARROW															13R		15R	
YELLOW ARROW		1Y				4Y									13Y		15Y	
FLASHING YELLOW ARROW															13G		15G	
GREEN ARROW	1G	1G				4G	5G											
✋																		
🚶																		

NU = Not Used

✳ Denotes install load resistor. See Load Resistor Installation Detail.

★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU	CH1 L3 ø1 1B	CH1 L1 ø1 1A	CH1 L7 NOT USED	CH1 L5 ø2 2A	CH1 L11 ø6 6A	CH1 L9 ø5 5A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L4 NOT USED	CH2 L2 ø6 1A	CH2 L8 ø4 4B	CH2 L6 ø2 2B	CH2 L12 ø6 6B	CH2 L10 ø2 5A					
RACK #2	BIU	SLOT EMPTY	CH1 L17 SYS DET S9 / CH2 L18 SYS DET S10	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B	
1A	L1A,L1B
	L2A,L2B
1B	L3A,L3B
NU	L4A,L4B
2A	L5A,L5B
2B	L6A,L6B
NU	L7A,L7B
4B	L8A,L8B
ADD JUMPERS FROM: L9A TO L10A, AND L9B TO L10B	
5A	L9A,L9B
	L10A,L10B
6A	L11A,L11B
6B	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
1	ø1	DELAY	15
✳ 2	ø6	DELAY	3
3	ø1	DELAY	15
4			
✳✳ 5	ø2		
✳✳ 6	ø2		
7			
8	ø4		
9	ø5	DELAY	30
✳ 10	ø2	DELAY	3
✳✳ 11	ø6		
✳✳ 12	ø6		
13			
14			
15			
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
S9	L17A,L17B
S10	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
✳✳ 17	SYSTEM		
✳✳ 18	SYSTEM		
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE:
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

✳ Detector Type - G

✳✳ Detector Type - N

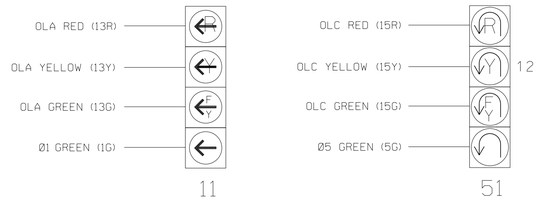
EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET TS-2
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....1,2,4,5,6,13,15
PHASES USED.....1,2,4,5,6
OLA.....✳
OLB.....NOT USED
OLC.....✳
OLD.....NOT USED

✳ See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



LOAD SWITCH ASSIGNMENT DETAIL

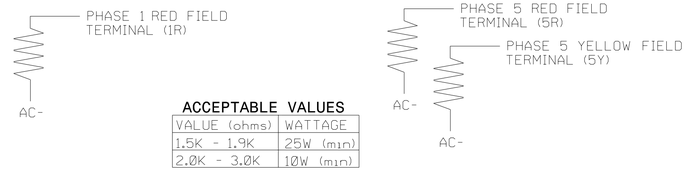
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	-
4	ø4
5	ø5
6	ø6
7	-
8	-
9	-
10	-
11	-
12	-
13	OLA
14	-
15	OLC
16	-

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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: 05-1399T2
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 3
Temporary Design 2 - TMP Phase IV

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1002 (Aviation Parkway)
at
National Guard Drive

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1399T2

DATE:
User:traffic\Signals\Design\Signals\Electrical Details\#1-5506 sm.ele.05-1399.T2-1of3.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-18.2

ECONOLITE ASC/3-2070 ACTION PLAN PROGRAMMING DETAIL

1. From Main Menu select [5. TIME BASE]
2. From TIME BASE Submenu select [2. ACTION PLAN]

```
ACTION PLAN...[ 99]
PATTERN.............99   SYS OVERRIDE.... NO
TIMING PLAN........ 0   SEQUENCE........  0
VEH DETECTOR PLAN.. 2   DET LOG........NONE
FLASH...........   --   RED REST........ NO
VEH DET DIAG PLN... 0   PED DET DIAG PLN..0
DIMMING ENABLE..   NO   PRIORITY RETURN. NO
PED PR RETURN..    NO   QUEUE DELAY..... NO
PMT COND DELAY     NO
  PHASE   1  2  3  4  5  6  7  8  9  0  1  2  3  4  5  6
PED RCL   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
WALK 2    .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
VEX 2     .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
VEH RCL   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
MAX RCL   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
MAX 2     .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
  PHASE   1  2  3  4  5  6  7  8  9  0  1  2  3  4  5  6
MAX 3     .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
CS INH    .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
OMIT      .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
SPC FCT   X  .  .  .  X  .  .  .  (1-8)
AUX FCT   .  .  .  (1-3)
          1  2  3  4  5  6  7  8  9  0  1  2  3  4  5
LP 1-15   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 16-30  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 31-45  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 46-60  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 61-75  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 76-90  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 91-100 .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
```

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select [2. CONTROLLER]
2. From CONTROLLER Submenu select [2. VEHICLE OVERLAPS]

OVERLAP A

Select TMG VEH OVLP [A] and 'PPLT FYA'

```
TMG VEH OVLP...[A] TYPE: .....[PPLT FYA]

PROTECTED LEFT TURN....   PHASE    1
OPPOSING THROUGH.......   PHASE    2

FLASHING ARROW OUTPUT.....CH13  ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 1
```

/ Toggle Twice

OVERLAP C

Select TMG VEH OVLP [C] and 'PPLT FYA'

```
TMG VEH OVLP...[C] TYPE: .....[PPLT FYA]

PROTECTED LEFT TURN....   PHASE    5
OPPOSING THROUGH.......   PHASE    6

FLASHING ARROW OUTPUT.....CH15 ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 5
```

/

END PROGRAMMING

/ The PPLT FYA operation of Signal Head 11 (Overlap A), Signal Head 51 (Overlap C) can be altered to fully protected operation.

ALTERNATE PHASING ACTIVATION DETAIL

TO RUN ALT. PHASING DURING FREE RUN - PROGRAM CHANGES (SHOWN BELOW) IN A TIME BASED ACTION PLAN. SCHEDULE A DAY PLAN THAT INCLUDES THE ACTION PLAN PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BITS 1 AND 5.

TO RUN ALT. PHASING DURING COORDINATION - SELECT THE TIME BASED ACTION PLAN THAT IS PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BITS 1 AND 5.

PHASING	VEH DET PLAN	SF BITS ENABLED
ACTIONS REQUIRED TO RUN DEFAULT PHASING	1	NONE
ACTIONS REQUIRED TO RUN ALTERNATE PHASING	2	1,5

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OR WHAT TAKES PLACE WHEN SF BITS 1 AND 5 AND VEH DET PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

SF BITS 1 AND 5	Modifies overlap parent phases for heads 11 and 51 to run protected turns only.
VEH DET PLAN 2:	Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 0 seconds.
	Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 0 seconds.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-I399T2
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 2 of 3
Temporary Design 2 - TMP Phase IV

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1002 (Aviation Parkway)
at
I-40 WB Ramps

Division 5 Wake County Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L WATSON

Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-I399T2

DATE:
12/5/2017
I:\Traffic\Signals\Designs\Signals\Electrical Details\I-5506 sm_ele_05-1399_T2-2of3.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-18.3

ECONOLITE ASC/3-2070 VEHICLE DETECTOR SETUP PROGRAMMING DETAIL FOR ALTERATE PHASING

LOOPS 1A, 5A

(program controller as shown)

IMPORTANT!

Program detectors per the input file connection and programming chart shown on sheet 1 before proceeding.

1. From Main Menu selet `8. UTILITIES`
2. From UTILITIES Submenu select `1. COPY/CLEAR`
3. Copy from DETECTOR PLAN "1" to DETECTOR PLAN "2".

```
COPY / CLEAR UTILITY
        FROM                TO
PHASE TIMING.... . > PHASE TIMING.... .
TIMING PLAN..... . > TIMING PLAN..... .
PH DET OPT PLAN. . > PH DET OPT PLAN. .
DETECTOR PLAN... 1 > DETECTOR PLAN... 2
  TOGGLE TO SELECT A "FROM" AND A "TO"
             THEN PRESS ENTER
```

4. From Main Menu select `6. DETECTORS`
5. From DETECTOR Submenu select `2. VEHICLE DETECTOR SETUP`
6. Place cursor in VEH DET PLAN [ ] position and enter "2".

- For Loop 1A, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "1".
- Set delay time to "0".

```
VEH DETECTOR [ 1]   VEH DET PLAN [ 2]          <- NOTICE VEH DET PLAN 2
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 1  1    . . . . . . . . . . . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0   <- ENSURE DELAY IS SET TO '0'
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN....... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

- Place cursor in VEH DETECTOR [ ] position and enter "2".
- Set assigned phase to "0".

```
                        VEH DETECTOR [ 2]   VEH DET PLAN [ 2]          <- NOTICE VEH DET PLAN 2
                        TYPE: G-GREEN EXTENSION/DELAY
                        TS2 DETECTOR..... X ECPI LOG.......   NO
                        DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
ENSURE PHASE            2  0    . . . . . . . . . . . . . . . .
IS SET TO '0' ->        EXTEND TIME...  0.0 DELAY TIME...    3.0
                        USE ADDED INITIAL . CROSS SWITCH PH..  0
                        LOCK IN....... NONE NTCIP VOL . OR OCC .
                        PMT QUEUE DELAY. NO
```

- For Loop 5A, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "9".
- Set delay time to "0".

```
VEH DETECTOR [ 9]   VEH DET PLAN [ 2]          <- NOTICE VEH DET PLAN 2
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 9  5    . . . . . . . . . . . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0   <- ENSURE DELAY IS SET TO '0'
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN....... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

- Place cursor in VEH DETECTOR [ ] position and enter "10".
- Set assigned phase to "0".

```
                        VEH DETECTOR [10]   VEH DET PLAN [ 2]          <- NOTICE VEH DET PLAN 2
                        TYPE: G-GREEN EXTENSION/DELAY
                        TS2 DETECTOR..... X ECPI LOG.......   NO
                        DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
ENSURE PHASE            10  0    . . . . . . . . . . . . . . . .
IS SET TO '0' ->        EXTEND TIME...  0.0 DELAY TIME...    3.0
                        USE ADDED INITIAL . CROSS SWITCH PH..  0
                        LOCK IN....... NONE NTCIP VOL . OR OCC .
                        PMT QUEUE DELAY. NO
```

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1399T2
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 3 of 3
Temporary Design 2 - TMP Phase IV

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I-40 WB Ramps

Division 5 Wake County Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

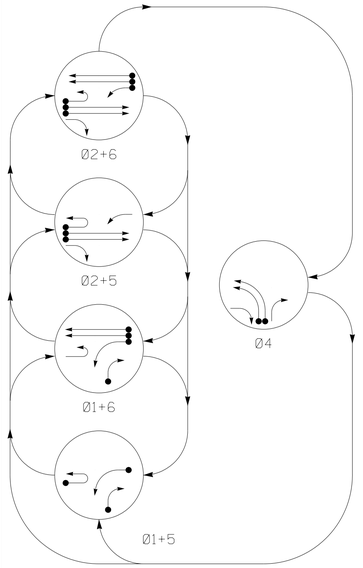
North Carolina Professional Seal 29449 Engineer Betsy L. Watson

DocuSigned by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1399T2

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-19.0

DEFAULT PHASING DIAGRAM



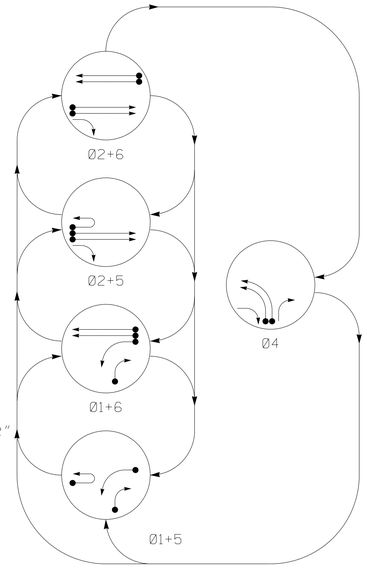
DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4	FLASH
11	←●	←●	F(Y)	F(Y)	R	Y
12	→●	→●	R	R	→●	R
21	R	R	G	G	R	Y
22	R	R	G	G	R/→	Y
41,42	←R	←R	←R	←R	←●	←R
51	↓(F(Y))	↓(F(Y))	↓(F(Y))	↓(R)	↓(R)	↓(Y)
61,62	R	G	R	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.

ALTERNATE PHASING DIAGRAM



ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4	FLASH
11	←●	←●	←R	←R	←R	←Y
12	→●	→●	R	R	→●	R
21	R	R	G	G	R	Y
22	R	R	G	G	R/→	Y
41,42	←R	←R	←R	←R	←●	←R
51	↓(R)	↓(R)	↓(R)	↓(R)	↓(R)	↓(Y)
61,62	R	G	R	G	R	Y

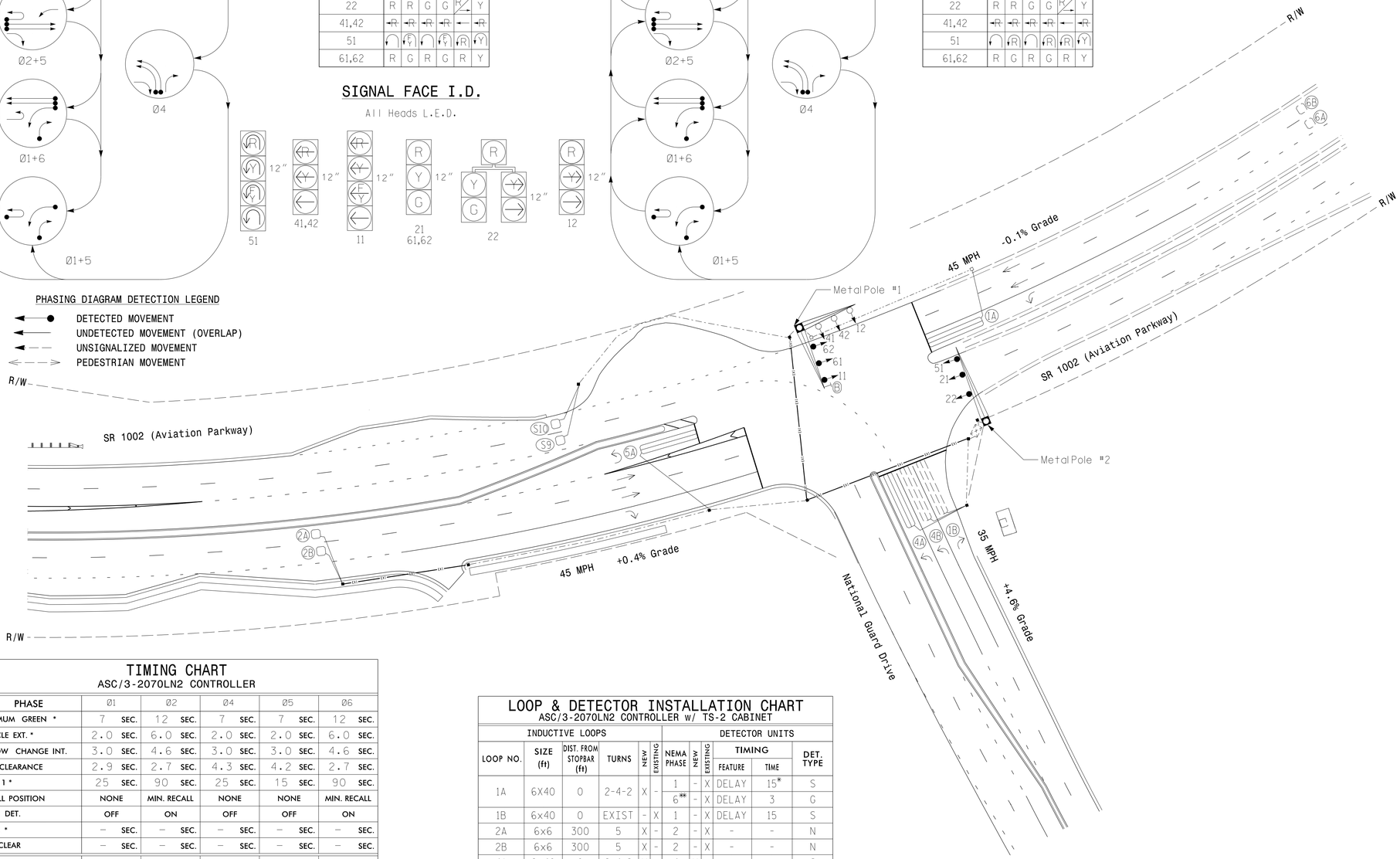
5 Phase
Fully Actuated
(Cary Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or Phase 5 may be lagged.
4. Set all detector units to presence mode.
5. The Division (Town) Traffic Engineer will determine hours of use for each phasing plan.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Cary signal system data:
   Fiber Channel #: 25.

PHASING DIAGRAM DETECTION LEGEND

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



TIMING CHART
ASC/3-2070LN2 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6
MINIMUM GREEN *	7 SEC.	12 SEC.	7 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.6 SEC.	3.0 SEC.	3.0 SEC.	4.6 SEC.
RED CLEARANCE	2.9 SEC.	2.7 SEC.	4.3 SEC.	4.2 SEC.	2.7 SEC.
MAX. 1 *	25 SEC.	90 SEC.	25 SEC.	15 SEC.	90 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	MIN. RECALL
LOCK DET.	OFF	ON	OFF	OFF	ON
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	ON
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	2.0 SEC.	– SEC.	– SEC.	2.0 SEC.
MAX. INITIAL *	– SEC.	34 SEC.	– SEC.	– SEC.	34 SEC.
TIME B4 REDUCTION *	– SEC.	15 SEC.	– SEC.	– SEC.	15 SEC.
TIME TO REDUCE *	– SEC.	60 SEC.	– SEC.	– SEC.	60 SEC.
MINIMUM GAP	– SEC.	2.5 SEC.	– SEC.	– SEC.	2.5 SEC.
DUAL ENTRY	OFF	OFF	OFF	OFF	OFF
SIMULTANEOUS GAP	ON	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

LOOP & DETECTOR INSTALLATION CHART
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	DET. TYPE
1A	6X40	0	2-4-2	X	-	1	-	X	DELAY	15*	S
						6**	-	X	DELAY	3	G
1B	6x40	0	EXIST	-	X	1	-	X	DELAY	15	S
2A	6x6	300	5	X	-	2	-	X	-	-	N
2B	6x6	300	5	X	-	2	-	X	-	-	N
4A	6x40	0	2-4-2	X	-	4	X	-	-	-	S
4B	6x40	0	EXIST	-	X	4	-	X	-	-	S
5A	6x40	0	2-4-2	X	-	5	-	X	DELAY	30*	S
						2**	-	X	DELAY	3	G
6A	6x6	300	EXIST	-	X	6	-	X	-	-	N
6B	6x6	300	EXIST	-	X	6	-	X	-	-	N
S9	6x6	+260	6	X	-	-	-	X	SYSTEM	DETECTOR	N
S10	6x6	+260	6	X	-	-	-	X	SYSTEM	DETECTOR	N

*. Disable delay during Alternate Phasing Operation.
**. Disable Phase(s) call during Alternate Phasing Operation.

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	----------
—DD—	Directional Drill	N/A
N/A	Right of Way	----------
→	Directional Arrow	→
●●●	Construction Zone Drums	N/A
▭	Construction Zone	N/A
Ⓐ	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓐ

Signal Upgrade - Final Design

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750 N.Greenfield Pkwy.Garner,NC 27529

SR 1002 (Aviation Parkway)
at
National Guard Drive

Division 5 Wake County Morrisville

PLAN DATE: NOVEMBER 2017 REVIEWED BY: R. MUNCEY
PREPARED BY: B. WRIGHT REVIEWED BY: B. WATSON

SCALE 0 40 1" = 40'

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

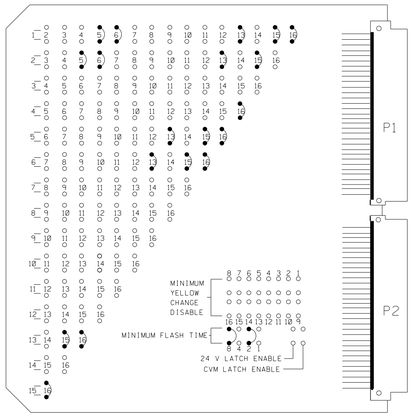
Digitally signed by Betsy L. Watson 12/1/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1399

DATE
I:\Traffic\Signals\Designs\Signals\Plansheets\I-5506 Sig_dsn_05-1399.dgn
User:rmuncey

EDI MODEL MMU2-16LEip MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	ENABLE
14	DISABLE
15	ENABLE
16	ENABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF
VM 3x/Day Latch	ON

FLASHING YELLOW ARROW	
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	OFF
CH 5-15	ON
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	ON
CH 3	OFF
CH 5	ON
CH 7	OFF
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE

ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 3,7,8,9,10,11,12 & 14 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (Is AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the malfunction management unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-19.1

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4		5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	11★	21,22	NU	41,42	22	51★	61,62	NU	NU	NU	NU	NU	NU	11★	NU	51★	12
RED	✳	2R				✳	6R										16R
YELLOW	✳	2Y				✳	6Y										
GREEN		2G					6G										
RED ARROW				4R										13R		15R	
YELLOW ARROW				4Y	4Y									13Y		15Y	16Y
FLASHING YELLOW ARROW														13G		15G	
GREEN ARROW	1G			4G	4G	5G											16G
✋																	
🚶																	

NU = Not Used

✳ Denotes install load resistor. See Load Resistor Installation Detail.

★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #1	BIU	CH1 L3 ø1 1B	CH1 L1 ø1 1A	CH1 L7 ø4 4A	CH1 L5 ø2 2A	CH1 L11 ø6 6A	CH1 L9 ø5 5A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L4 NOT USED	CH2 L2 ø6 1A	CH2 L8 ø4 4A	CH2 L6 ø2 2B	CH2 L12 ø6 6B	CH2 L10 ø2 5A					
RACK #2	BIU	SLOT EMPTY	CH1 L17 SYS DET S9	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
			CH2 L18 SYS DET S10									

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

	LOOP NO.	LOOP PANEL TERMINALS
ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B	1A	L1A,L1B
		L2A,L2B
	1B	L3A,L3B
	NU	L4A,L4B
	2A	L5A,L5B
	2B	L6A,L6B
	4A	L7A,L7B
	4B	L8A,L8B
ADD JUMPERS FROM: L9A TO L10A, AND L9B TO L10B	5A	L9A,L9B
		L10A,L10B
	6A	L11A,L11B
	6B	L12A,L12B
	NU	L13A,L13B
	NU	L14A,L14B
	NU	L15A,L15B
	NU	L16A,L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
1	ø1	DELAY	15
✳ 2	ø6	DELAY	3
3	ø1	DELAY	15
4			
✳✳ 5	ø2		
✳✳ 6	ø2		
7	ø4		
8	ø4		
9	ø5	DELAY	30
✳ 10	ø2	DELAY	3
✳✳ 11	ø6		
✳✳ 12	ø6		
13			
14			
15			
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
S9	L17A,L17B
S10	L18A,L18B
NU	L19A,L19B
NU	L20A,L20B
NU	L21A,L21B
NU	L22A,L22B
NU	L23A,L23B
NU	L24A,L24B
NU	L25A,L25B
NU	L26A,L26B
NU	L27A,L27B
NU	L28A,L28B
NU	L29A,L29B
NU	L30A,L30B
NU	L31A,L31B
NU	L32A,L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
✳✳ 17	SYSTEM		
✳✳ 18	SYSTEM		
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

NOTE: BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

✳ Detector Type - G

✳✳ Detector Type - N

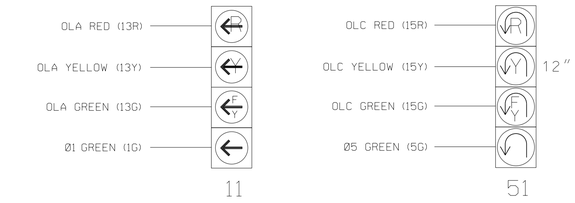
EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET TS-2
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....1,2,4,5,6,13,15,16
PHASES USED.....1,2,4,5,6
OLA.....✳
OLB.....NOT USED
OLC.....✳
OLD.....1+4

✳ See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



LOAD SWITCH ASSIGNMENT DETAIL

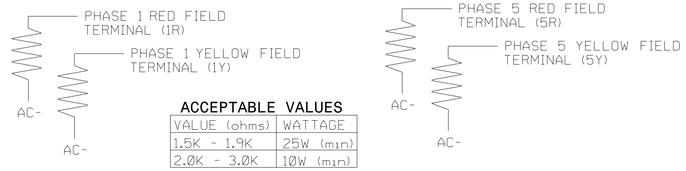
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	-
4	ø4
5	ø5
6	ø6
7	-
8	-
9	-
10	-
11	-
12	-
13	OLA
14	-
15	OLC
16	OLD

UNUSED LOAD SWITCH CHANNELS SHALL BE DISABLED IN CONTROLLER PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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: 05-1399
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 1 of 3
Final Design

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

SR 1002 (Aviation Parkway) at National Guard Drive

Division 5 | Wake County | Morrisville

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1399

DATE:
User:traffic\Signals\Design\Signals\Electrical Details\I-5506 sm.ele.05-1399-1of3.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-19.2

ECONOLITE ASC/3-2070 ACTION PLAN PROGRAMMING DETAIL

1. From Main Menu select [5. TIME BASE]
2. From TIME BASE Submenu select [2. ACTION PLAN]

```
ACTION PLAN...[ 99]
PATTERN.............99   SYS OVERRIDE.... NO
TIMING PLAN........ 0   SEQUENCE........  0
VEH DETECTOR PLAN.. 2   DET LOG........NONE
FLASH...........   --   RED REST........ NO
VEH DET DIAG PLN... 0   PED DET DIAG PLN..0
DIMMING ENABLE..   NO   PRIORITY RETURN. NO
PED PR RETURN..    NO   QUEUE DELAY..... NO
PMT COND DELAY     NO
  PHASE   1  2  3  4  5  6  7  8  9  0  1  2  3  4  5  6
PED RCL   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
WALK 2    .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
VEX 2     .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
VEH RCL   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
MAX RCL   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
MAX 2     .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
  PHASE   1  2  3  4  5  6  7  8  9  0  1  2  3  4  5  6
MAX 3     .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
CS INH    .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
OMIT      .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
SPC FCT   X  .  .  .  X  .  .  .  (1-8)
AUX FCT   .  .  .  (1-3)
          1  2  3  4  5  6  7  8  9  0  1  2  3  4  5
LP 1-15   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 16-30  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 31-45  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 46-60  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 61-75  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 76-90  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
LP 91-100 .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
```

ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select [2. CONTROLLER]
2. From CONTROLLER Submenu select [2. VEHICLE OVERLAPS]

OVERLAP A

Select TMG VEH OVLP [A] and 'PPLT FYA'

```
TMG VEH OVLP...[A] TYPE: .....PPLT FYA

PROTECTED LEFT TURN....   PHASE    1
OPPOSING THROUGH.......   PHASE    2

FLASHING ARROW OUTPUT.....CH13  ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 1
```

/ Toggle Twice

OVERLAP C

Select TMG VEH OVLP [C] and 'PPLT FYA'

```
TMG VEH OVLP...[C] TYPE: .....PPLT FYA

PROTECTED LEFT TURN....   PHASE    5
OPPOSING THROUGH.......   PHASE    6

FLASHING ARROW OUTPUT.....CH15 ISOLATE

DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE.......... 5
```

/ Toggle Once

OVERLAP D

Select TMG VEH OVLP [D] and 'NORMAL'

```
TMG VEH OVLP...[D] TYPE: .......NORMAL
  PHASES 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
INCLUDED X . . X . . . . . . . . . . . .

LAG GRN 0.0 YEL 0.0 RED 0.0
```

END PROGRAMMING

/ The PPLT FYA operation of Signal Head 11 (Overlap A), Signal Head 51 (Overlap C) can be altered to fully protected operation.

ALTERNATE PHASING ACTIVATION DETAIL

TO RUN ALT. PHASING DURING FREE RUN - PROGRAM CHANGES (SHOWN BELOW) IN A TIME BASED ACTION PLAN. SCHEDULE A DAY PLAN THAT INCLUDES THE ACTION PLAN PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BITS 1 AND 5.

TO RUN ALT. PHASING DURING COORDINATION - SELECT THE TIME BASED ACTION PLAN THAT IS PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BITS 1 AND 5.

PHASING	VEH DET PLAN	SF BITS ENABLED
ACTIONS REQUIRED TO RUN DEFAULT PHASING	1	NONE
ACTIONS REQUIRED TO RUN ALTERNATE PHASING	2	1,5

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OR WHAT TAKES PLACE WHEN SF BITS 1, 5, AND VEH DET PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

SF BITS 1 AND 5	Modifies overlap parent phases for heads 11 and 51 to run protected turns only.
VEH DET PLAN 2:	Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 0 seconds.
	Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 0 seconds.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1399
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 2 of 3
Final Design

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at
National Guard Drive

Division 5 | Wake County | Cary

PLAN DATE:	NOVEMBER 2017	REVIEWED BY:	L. OVERN
PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Designed by Betsy L. Watson 12/5/2017
SIGNATURE DATE

SIG. INVENTORY NO. 05-1399

DATE
I:\Traffic\Signals\Designs\Signals\Electrical Details\I-5506 sm_ele_05-1399-2of3.dgn
User:rmuncey

PROJECT REFERENCE NO.	SHEET NO.
I-5506	SIG-19.3

ECONOLITE ASC/3-2070 VEHICLE DETECTOR SETUP PROGRAMMING DETAIL FOR ALTERATE PHASING LOOPS 1A, 5A

(program controller as shown)

IMPORTANT!

Program detectors per the input file connection and programming chart shown on sheet 1 before proceeding.

1. From Main Menu selet [8. UTILITIES]
2. From UTILITIES Submenu select [1. COPY/CLEAR]
3. Copy from DETECTOR PLAN "1" to DETECTOR PLAN "2".

```
COPY / CLEAR UTILITY
      FROM                TO
PHASE TIMING.... . > PHASE TIMING.... .
TIMING PLAN..... . > TIMING PLAN..... .
PH DET OPT PLAN. . > PH DET OPT PLAN. .
DETECTOR PLAN... 1 > DETECTOR PLAN... 2
  TOGGLE TO SELECT A "FROM" AND A "TO"
            THEN PRESS ENTER
```

4. From Main Menu select [6. DETECTORS]
5. From DETECTOR Submenu select [2. VEHICLE DETECTOR SETUP]
6. Place cursor in VEH DET PLAN [ ] position and enter "2".

- For Loop 1A, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "1".
- Set delay time to "0".

```
VEH DETECTOR [ 1]   VEH DET PLAN [ 2]
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 1  1    . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

← NOTICE VEH DET PLAN 2

← ENSURE DELAY IS SET TO '0'

- Place cursor in VEH DETECTOR [ ] position and enter "2".
- Set assigned phase to "0".

```
VEH DETECTOR [ 2]   VEH DET PLAN [ 2]
TYPE: G-GREEN EXTENSION/DELAY
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 2  0    . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    3.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

← NOTICE VEH DET PLAN 2

ENSURE PHASE IS SET TO '0' →

- For Loop 5A, modify vehicle detectors.
- Place cursor in VEH DETECTOR [ ] position and enter "9".
- Set delay time to "0".

```
VEH DETECTOR [ 9]   VEH DET PLAN [ 2]
TYPE: S-STANDARD
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 9  5    . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    0.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

← NOTICE VEH DET PLAN 2

← ENSURE DELAY IS SET TO '0'

- Place cursor in VEH DETECTOR [ ] position and enter "10".
- Set assigned phase to "0".

```
VEH DETECTOR [10]   VEH DET PLAN [ 2]
TYPE: G-GREEN EXTENSION/DELAY
TS2 DETECTOR..... X ECPI LOG.......   NO
DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 10 0    . . . . . .
EXTEND TIME...  0.0 DELAY TIME...    3.0
USE ADDED INITIAL . CROSS SWITCH PH..  0
LOCK IN..... NONE NTCIP VOL . OR OCC .
PMT QUEUE DELAY. NO
```

← NOTICE VEH DET PLAN 2

ENSURE PHASE IS SET TO '0' →

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1399
DESIGNED: NOV 2017
SEALED: 12-01-2017
REVISED: N/A

Electrical Detail - Sheet 3 of 3
Final Design

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PREPARED BY:	G. SPELL	REVIEWED BY:	R. MUNCEY

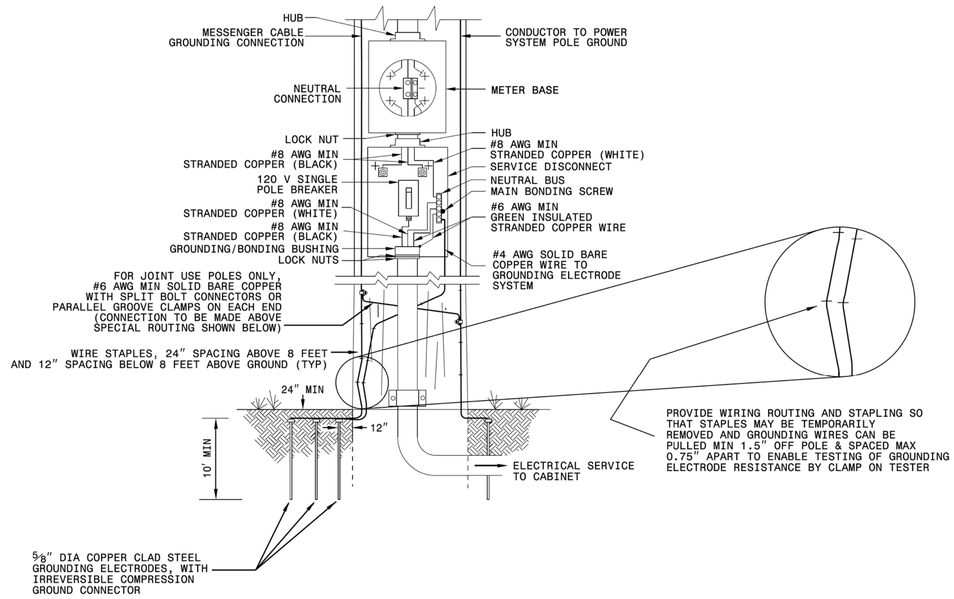
REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 29449 ENGINEER BETSY L. WATSON

Developed by: Betsy L. Watson 12/5/2017
SIGNATURE DATE
SIG. INVENTORY NO. 05-1399

DATE
User:TrafficSignals\Design\Signals\Electrical Details\I-5506 sm_ele_05-1399-3of3.dgn
User:rmuncey

PROJECT NO.	SHEET NO.
I-5506	Sig. 20.0



1-18 STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

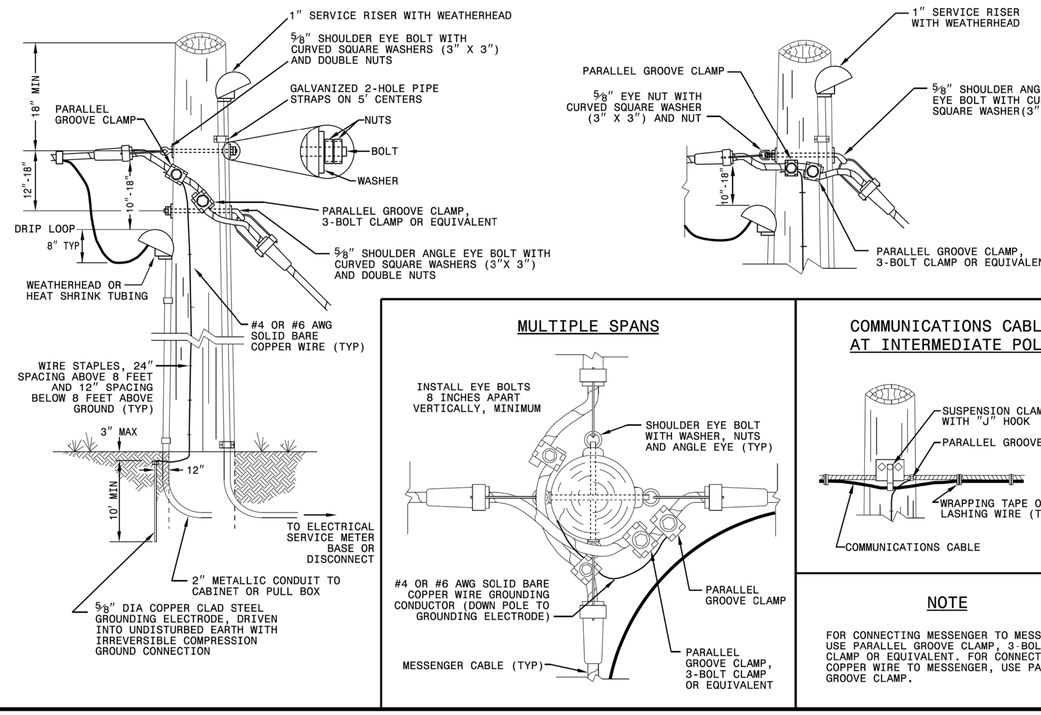
ENGLISH STANDARD DRAWING FOR

ELECTRICAL SERVICE GROUNDING

GROUNDING AND BONDING

SHEET 1 OF 1

1700D01



NOTE

FOR CONNECTING MESSENGER TO MESSENGER, USE PARALLEL GROOVE CLAMP, 3-BOLT CLAMP OR EQUIVALENT. FOR CONNECTING COPPER WIRE TO MESSENGER, USE PARALLEL GROOVE CLAMP.

1-18 STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

ENGLISH STANDARD DRAWING FOR

WOOD POLES

METHODS OF ATTACHMENT AND GROUNDING

SHEET 1 OF 1

1720D01

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Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ITS & Signals Unit

750 N. Greenfield Parkway
Garner, NC 27529

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032108 ENGINEER MOHD A. ASLAMI

DocuSigned by: Mohd Aslami 5D980BA6DBB6495...

10/11/2017 DATE

11-OCT-2017 08:56
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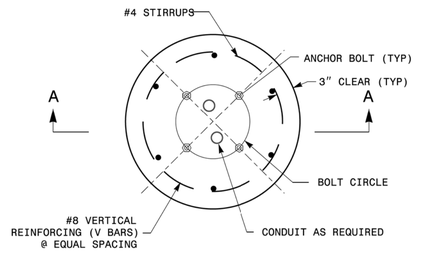
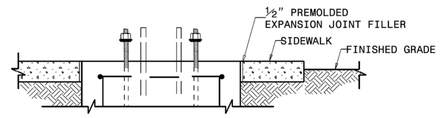
PROJECT NO.	SHEET NO.
I-5506	Sig. 20.1



PEDESTAL FOUNDATION - PLAN VIEW

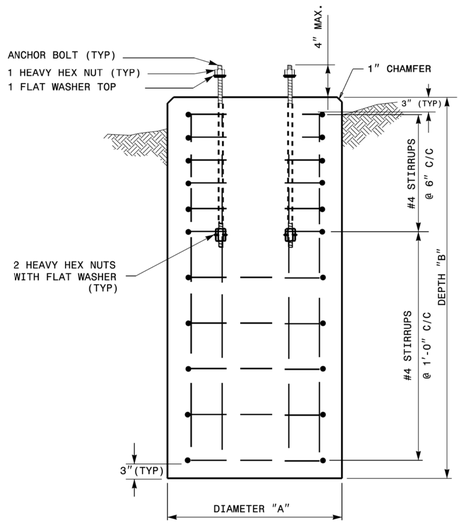


PEDESTAL FOUNDATION DETAILS FOR SIDEWALK

NOTES:

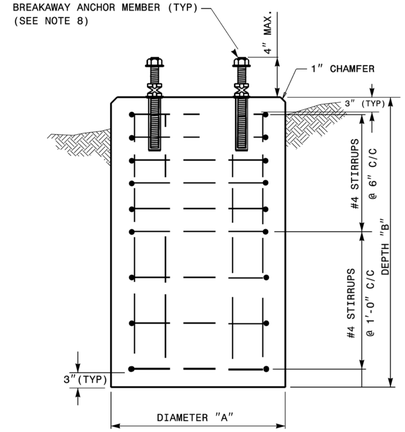
1. CAST FOUNDATION AGAINST UNDISTURBED SOIL WHEREVER CONDITIONS PERMIT. IN UNSTABLE SOIL, CAST-IN-PLACE TUBE FORMS ARE ALLOWED WITH APPROVAL.
2. COMPLY WITH APPLICABLE PROVISIONS OF SECTION 825 FOR CONCRETE CONSTRUCTION.
3. USE CLASS "A" CONCRETE THAT MEETS THE REQUIREMENTS OF SECTION 1000 WITH A COMPRESSION STRENGTH AT 28 DAYS OF F'c= 3000 PSI (MIN.).
4. USE ASTM GRADE 60 DEFORMED BARS FOR ALL REINFORCING STEEL.
5. GRADE IS ASSUMED TO BE (8H:1V) OR FLATTER. FOUNDATION SIZE AND DEPTHS ARE BASED ON THE FOLLOWING SOIL DESIGN PARAMETERS:
   A. SANDY TYPE SOIL
   B. NO GROUND WATER WITHIN 5'-0" OF SURFACE ELEVATION
   C. WIND SPEED NOT TO EXCEED 140 MPH

   IF ACTUAL CONDITIONS VARY SUBSTANTIALLY FROM THOSE ASSUMED, THE FOUNDATION DEPTH MAY BE ADJUSTED. IN THIS CASE, CONTACT THE ENGINEER.
6. MAINTAIN AT LEAST 3" COVER ON ALL REINFORCEMENT.
7. ORIENT CONDUIT AS REQUIRED BY THE DESIGN OR AS DICTATED BY FIELD CONDITIONS.
8. USE ADHESIVE ANCHOR FOR THREADED COUPLING INSERT. FOR TYPE I MINIMUM DEPTH NECESSARY IS 0'-4½" AND FOR TYPE II MINIMUM DEPTH NECESSARY IS 0'-6⅝". FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS.



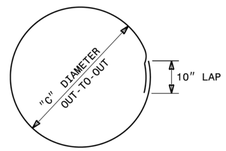
TYPES I, II & III

SECTION A-A

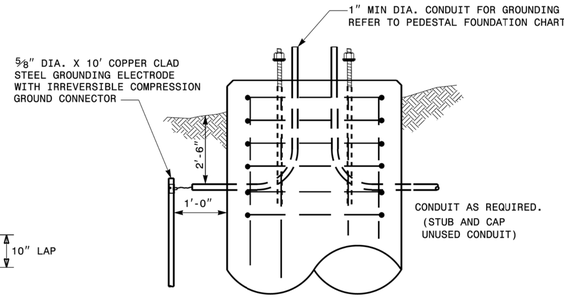


TYPES I & II ONLY

SECTION A-A



CLOSED HOOPS



GROUNDING & CONDUIT DETAIL

PEDESTAL FOUNDATION TYPE AND SIZE

TYPE	PEDESTAL DESCRIPTION	SIZE			ANCHOR BOLT		INSTALL GROUNDING SYSTEM (YES/NO)
		DIAMETER "A" FT	DEPTH "B" FT	CONCRETE VOLUME CY	DIAMETER (MIN.) IN	LENGTH FT-IN	
I	PEDESTRIAN PUSHBUTTON	2'-0"	3'-6"	.41	½	1'-6"	NO
II	NORMAL-DUTY	2'-0"	5'-0"	.58	¾	2'-0"	YES
III	HEAVY-DUTY	2'-6"	7'-0"	1.27	1	4'-0"	YES

REINFORCING STEEL SCHEDULE

TYPE	V-BAR				STIRRUP								TOTAL STEEL WEIGHT LBS
						QUANTITY							
						VERTICAL SPACING							
	SIZE #	QTY	LENGTH	WEIGHT LBS	SIZE #	ON 6" CENTERS	ON 12" CENTERS	TOTAL	LENGTH	DIAMETER "C" FT	OVERLAP MIN.	WEIGHT LBS	
I	8	6	3'-0"	56	4	0	4	4	5'-7"	1'-6"	0'-10"	15	71
II	8	6	4'-6"	86	4	5	3	8	5'-7"	1'-6"	0'-10"	30	116
III	8	6	6'-6"	122	4	7	4	11	7'-2"	2'-0"	0'-10"	53	175

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-18

ENGLISH STANDARD DRAWING FOR

PEDESTALS

FOUNDATIONS

SHEET 1 OF 1

1743D01

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See Plate for Title

Prepared in the Offices of:

Transportation Mobility and Safety Division
ITS & Signals Unit
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

750 N. Greenfield Parkway
Garner, NC 27529

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NORTH CAROLINA
PROFESSIONAL
SEAL
028094
ENGINEER
DEBESH C. SARKAR

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Debesh C. Sarkar
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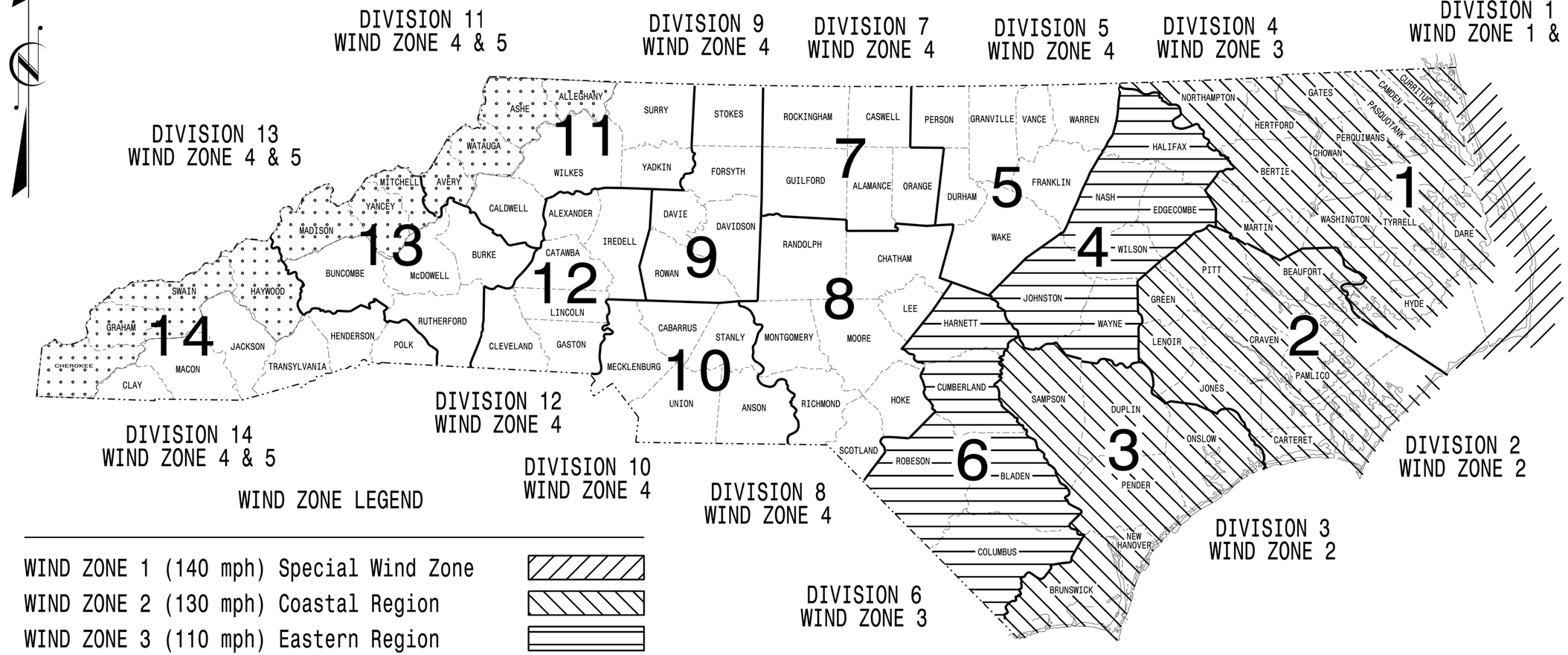
PROJECT I.D. NO.	SHEET NO.
I-5506	Sig.M1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR ALL 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	

https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

Prepared In the Offices of:

Transportation Mobility and Safety Division
Signal Design Section
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

750 N.Greenfield Pkwy.
Garner,NC 27529

Designed in conformance with the latest 2015 Interim to the 6th Edition 2013

AASHTO

Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

INDEX OF PLANS

NCDOT CONTACTS:

MOBILITY AND SAFETY DIVISION – ITS AND SIGNALS UNIT

M.M. MCDIARMID, P.E. – STATE ITS AND SIGNALS ENGINEER

J. P. GALLOWAY, P.E. – STATE SIGNALS ENGINEER

D.C. SARKAR, P.E. – ITS AND SIGNALS SENIOR STRUCTURAL ENGINEER

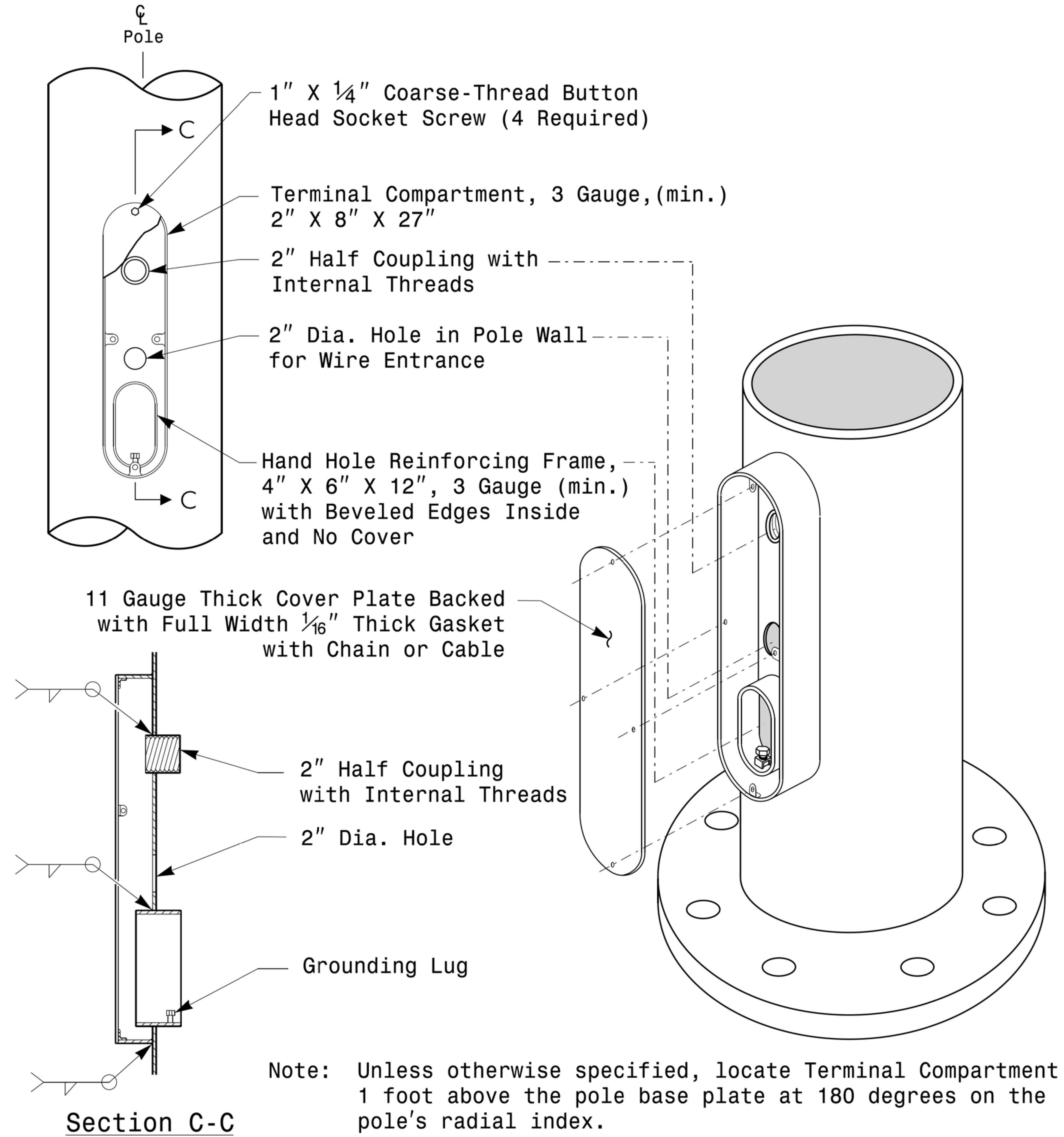
SEAL

NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

DocuSigned by: Debesh C. Sarkar 44E8E3... SIGNATURE

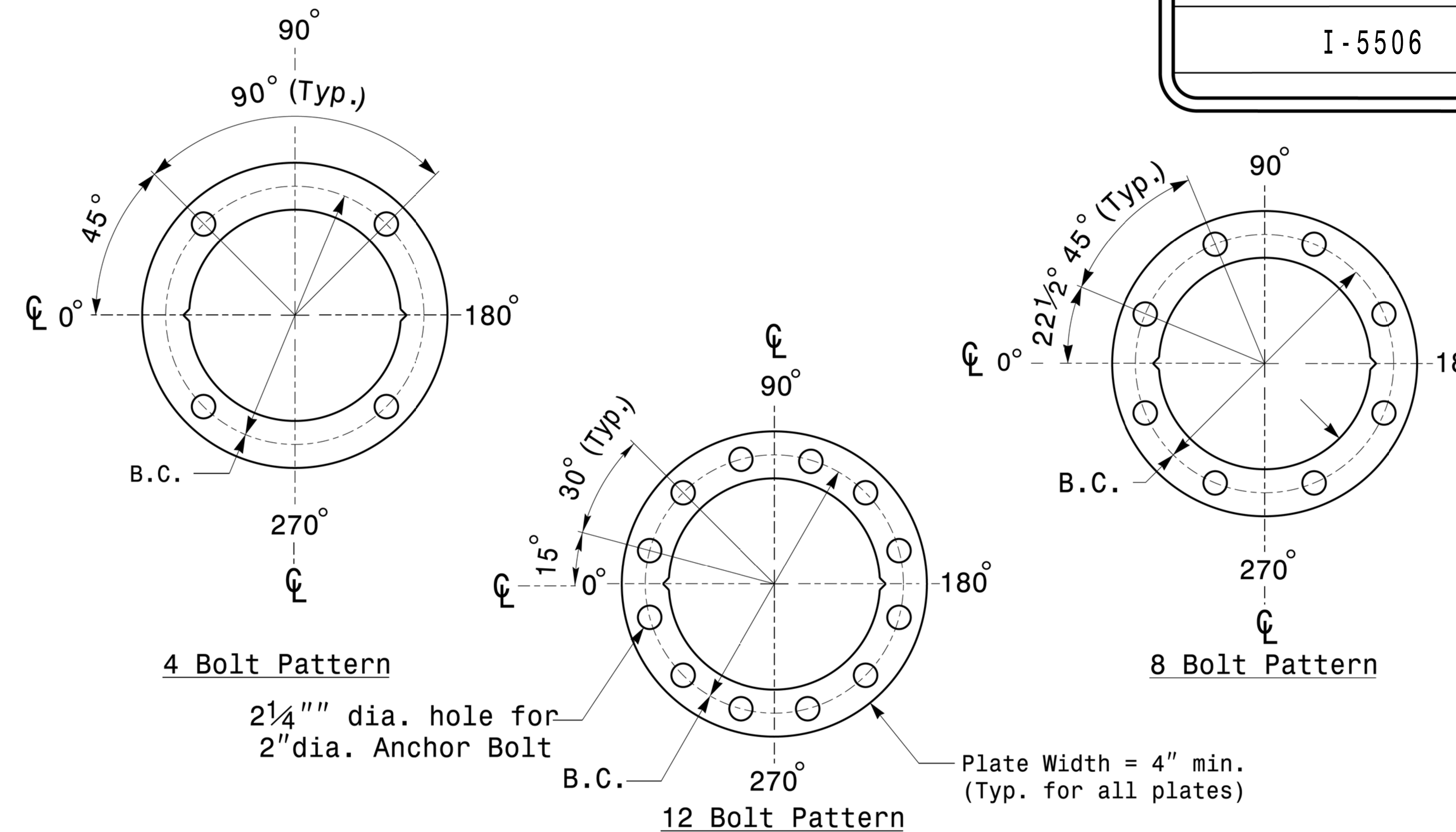
10/11/2017 DATE

Fabrication Details – All Metal 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

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 SIG. INV. NO.	________
NCDOT POLE NO.	________

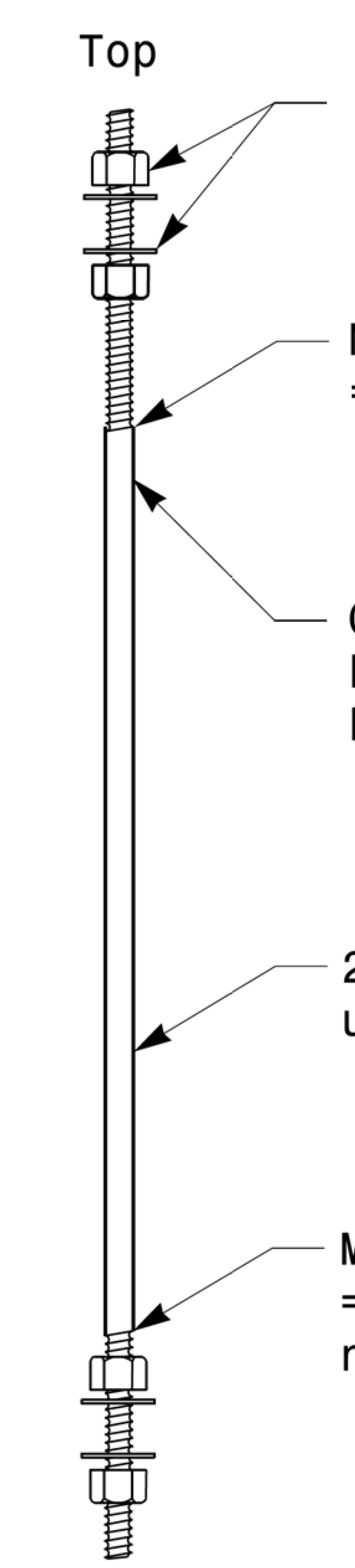
Shaft I.D. Tag
(Provide on Shaft of Strain Poles and Mast Arm Poles Shaft)

MFG ________ MFG. DATE: MM/YY	
SECTION D/T/L/Y	----/----/----/----
NCDOT SIG. INV. NO.	________
NCDOT POLE NO.	________

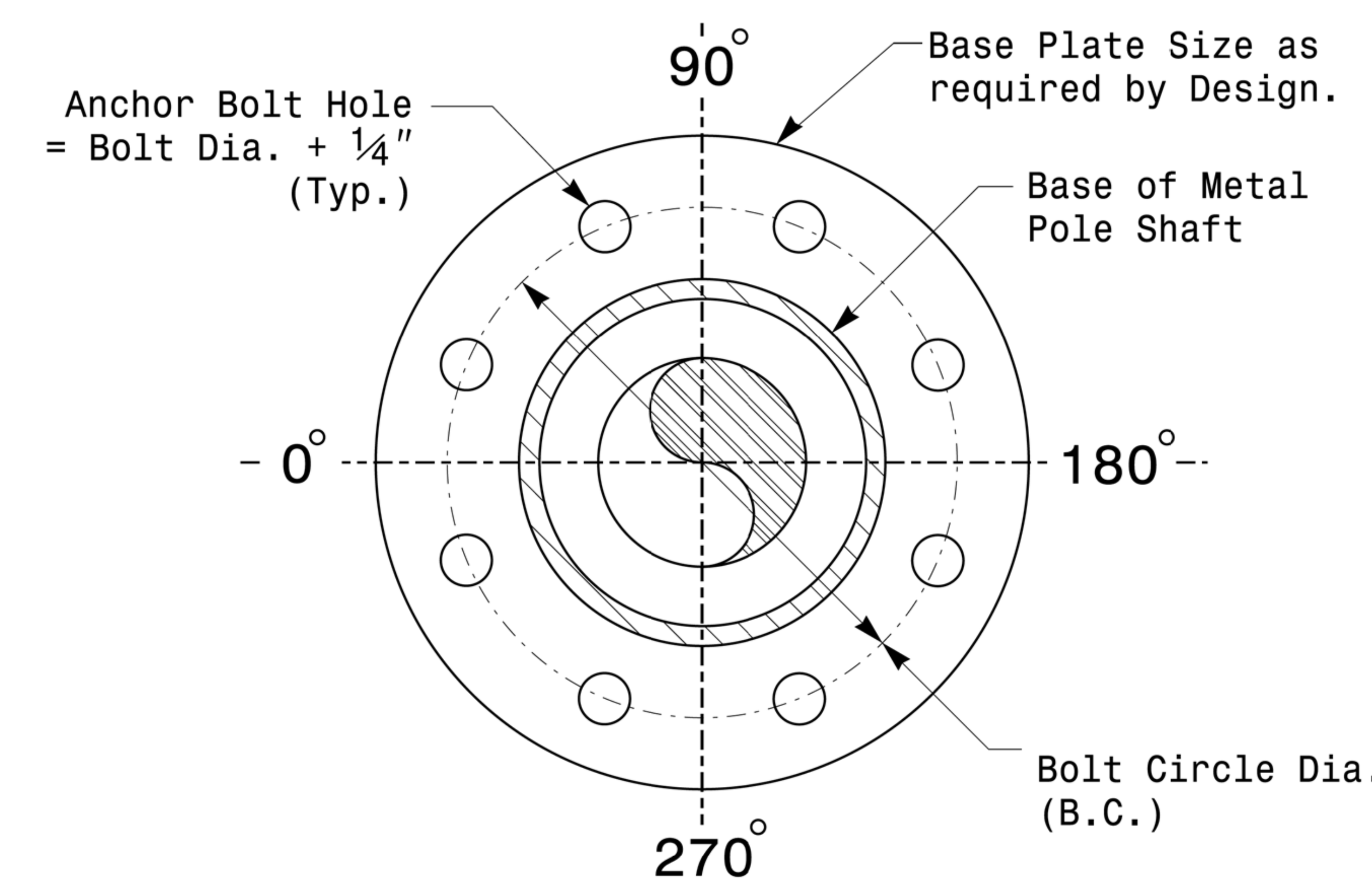
Arm I.D. Tag
(Provide on each section of a multi-section mast arm.)

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 Signal Inv. Number and pole I.D. number
5) See drawing M3 and M4 for mounting positions of I.D. tags.

Identification Tag Details



Anchor Bolt Detail



Note: Base plate may be circular,octagonal,square or rectangular in shape.

Typical Base Plate Detail

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

Typical Fabrication Details For All Metal Poles

PLAN DATE:	OCTOBER 2017	DESIGNED BY:	C.F.ANDREWS
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

SCALE: 0 NA — NONE

REVISIONS	INIT.	DATE

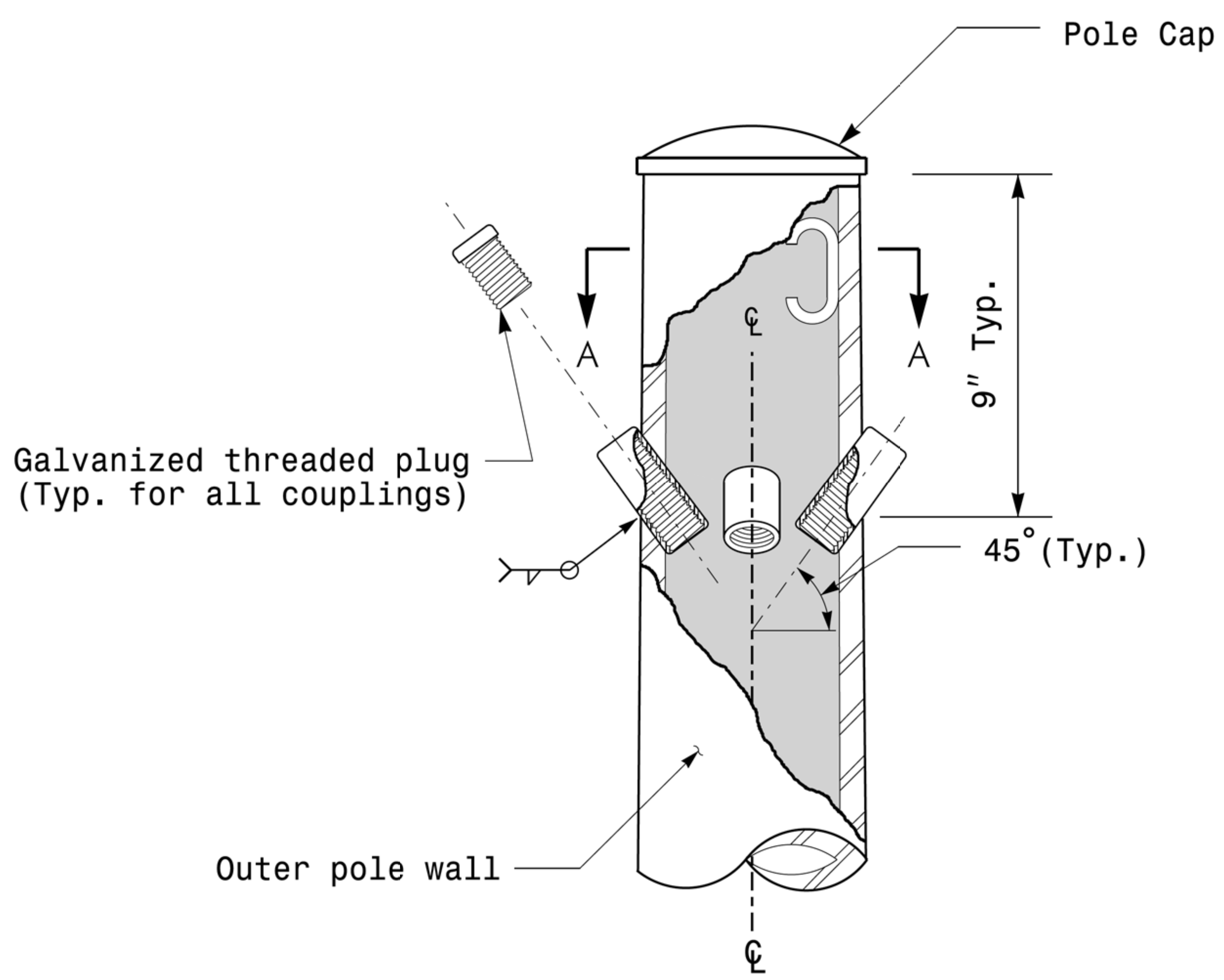
SEAL: North Carolina Professional Engineer Seal 028094, Debesh C. Sarkar

DocuSigned by: Debesh C. Sarkar
SIGNATURE — 10/11/2017 DATE

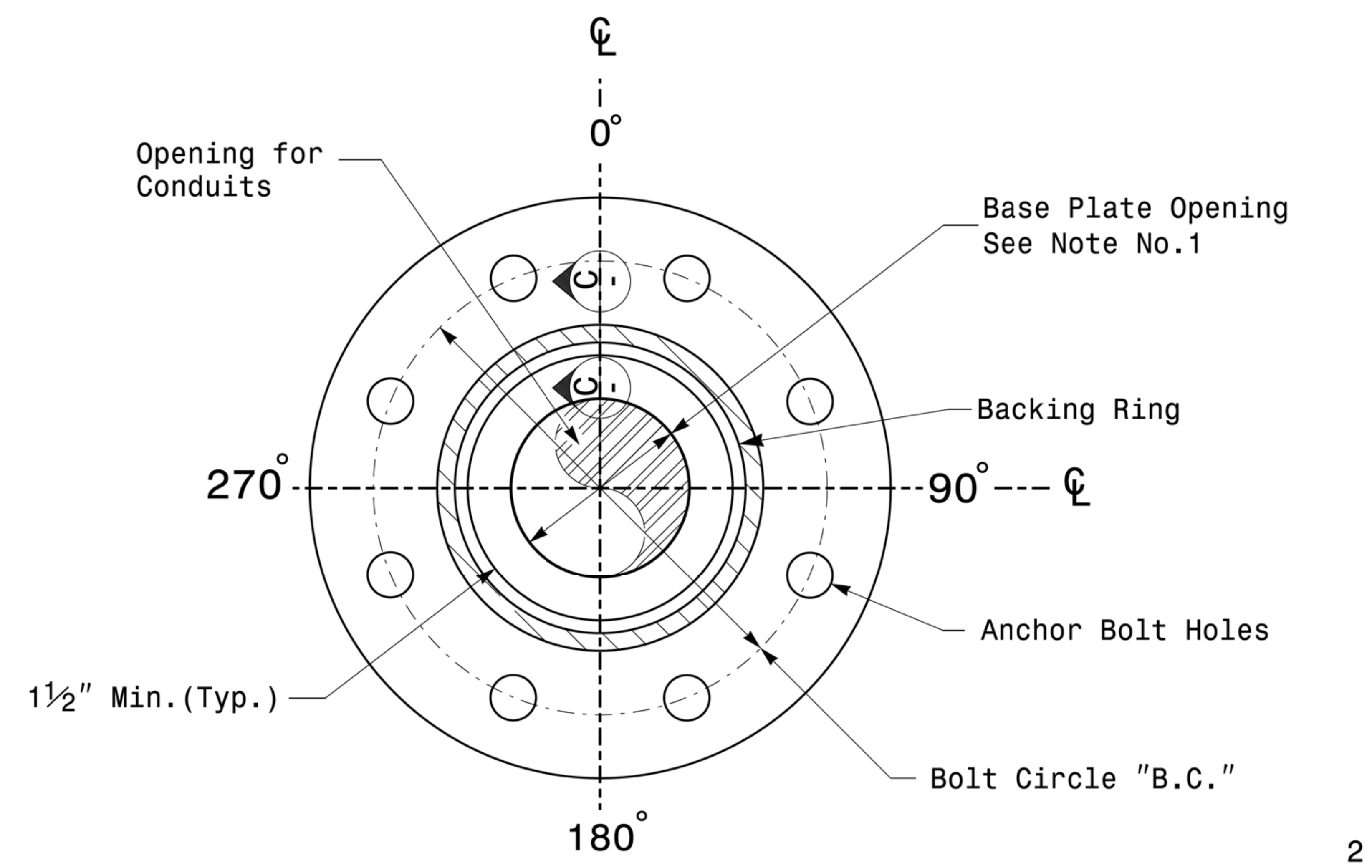
11-OCT-2017 08:30
S:*ITS&SU*ITS Signals*Signal Design Section*Eastern Region*M Sheets*2016*2014 Sig.M2 Std. Fabrication Details-All Poles..dgn
rnzinser

PROJECT ID. NO.	SHEET NO.
I-5506	Sig.M3

Note:
1.Opening in pole base plate shall be equal to pole base inside diameter minus 3½″ but shall not be less than 8½″.

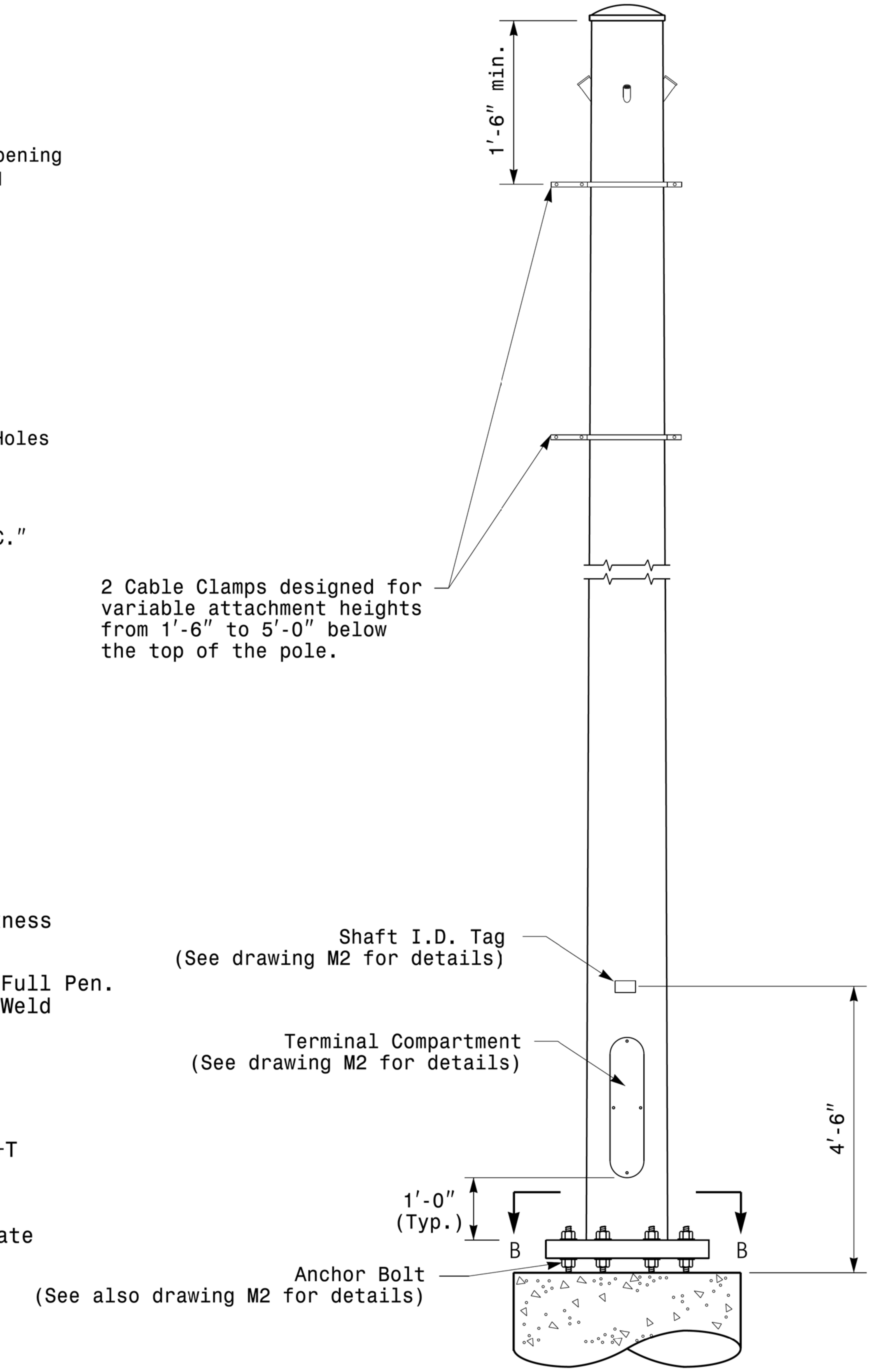


Cable Entrances at Top of Pole

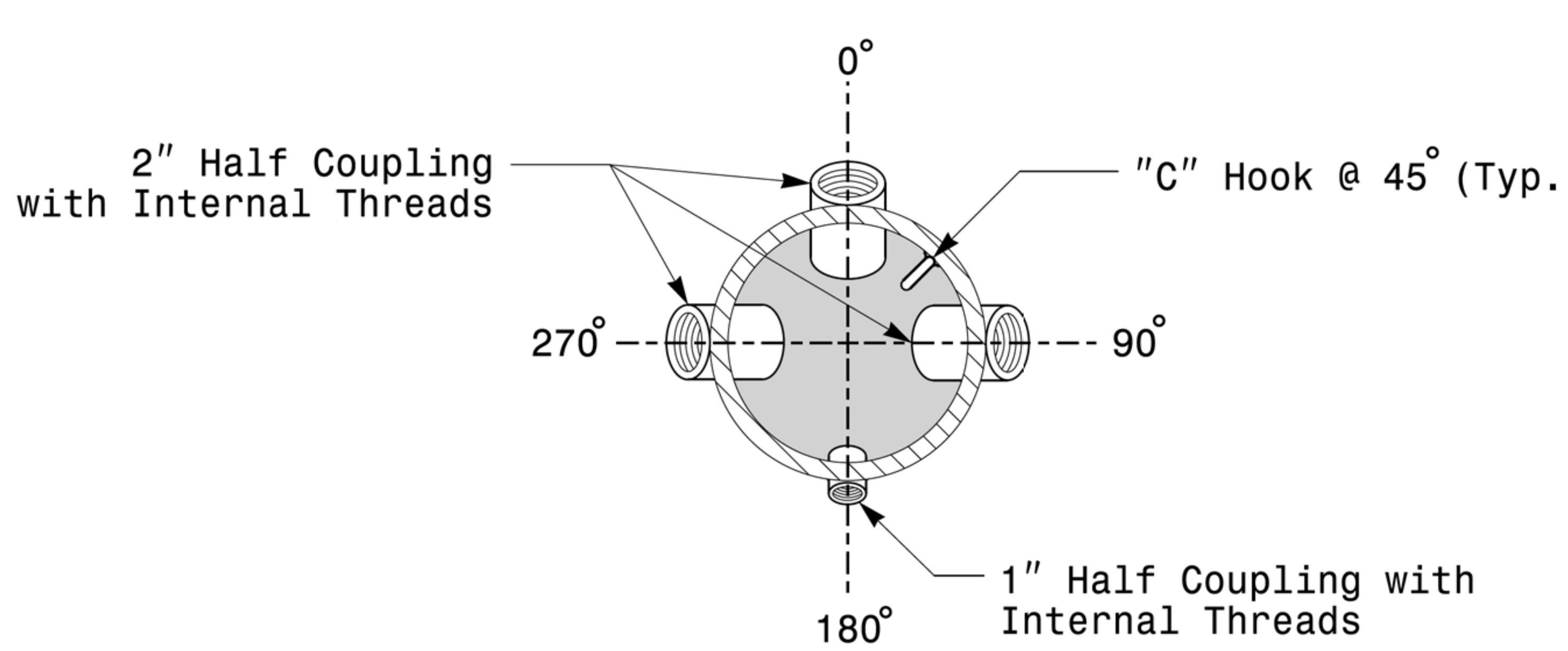


Section B-B

Pole Base Plate Details
(8 and 12 Bolt Pattern)

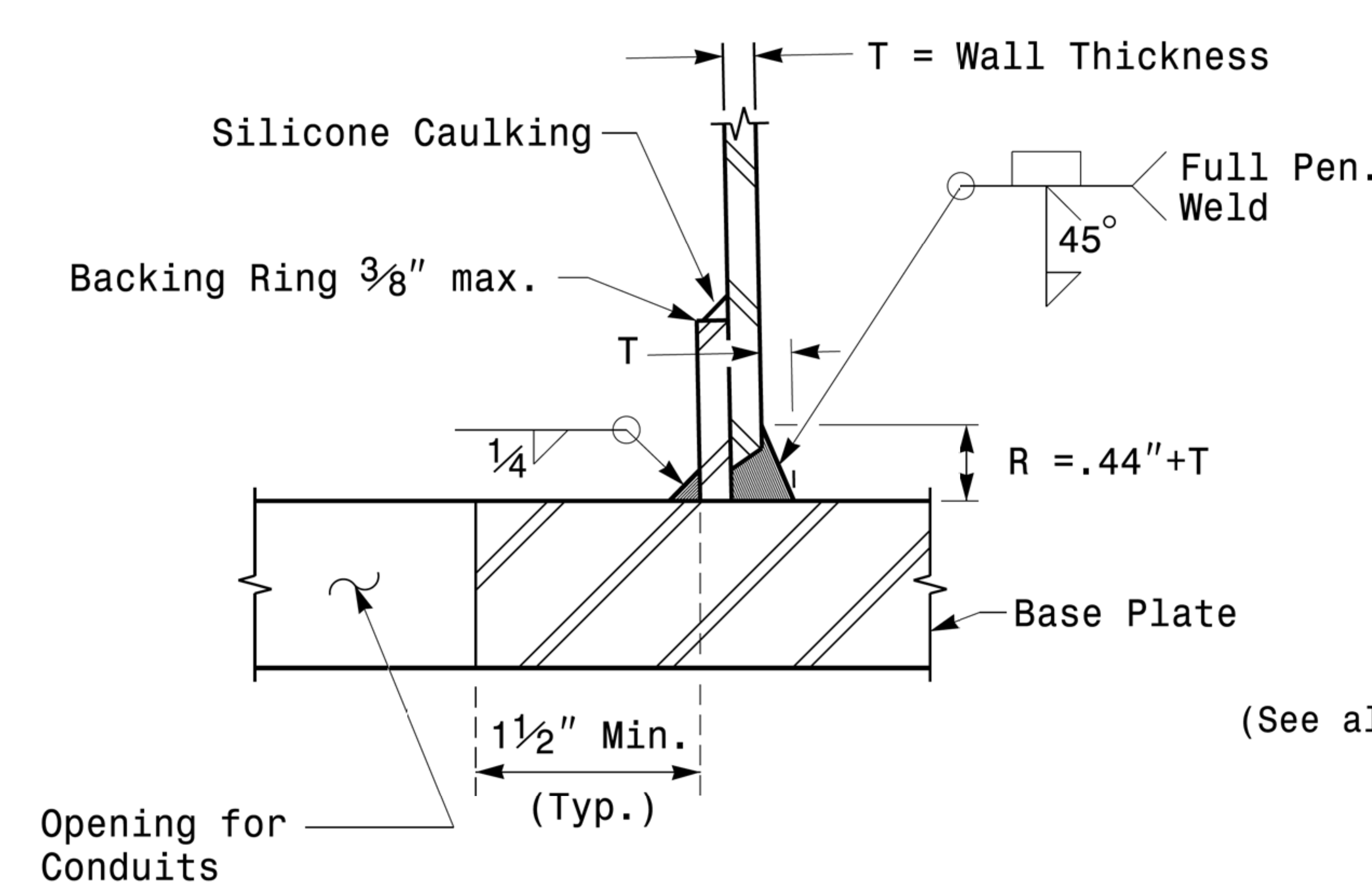


Monotube Strain Pole



Section A-A

Radial Orientation for Factory Installed Accessories at Top of Pole



Section C-C

(Pole Attachment to Base Plate)

Full-Penetration Groove Weld Detail

Fabrication Details – Strain Poles

Prepared in the Offices of: Transportation Mobility and Safety Division, Signal Design Section

750 N.Greenfield Pkwy,Garner,NC 27529

Typical Fabrication Details For Strain Poles

PLAN DATE:	OCTOBER 2017	DESIGNED BY:	K.C.DURIGON
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

SCALE: 0 NA — NONE

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 028094 DEBESH C. SARKAR

DocuSigned by: Debesh C. Sarkar

SIGNATURE 10/11/2017 DATE

11-OCT-2017 08:25
S:*ITS&SU*ITS Signals*Signal Design Section*Eastern Region*M Sheets*2016*2014 Sig.M3 Std. Fabrication Details-Strain Poles.dgn