Project No.	Sheet No.
I–5700	Sig. 1.0

Project: I–5700

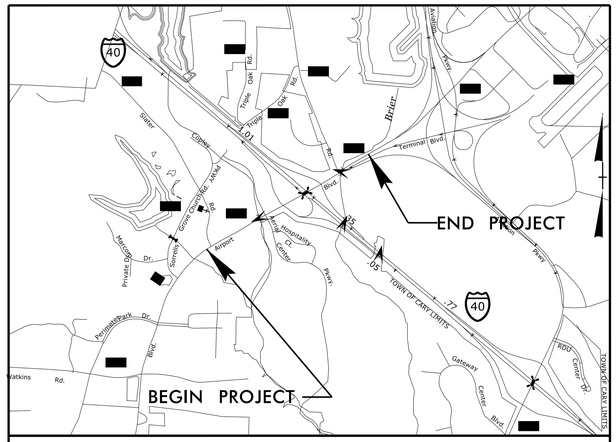
CONTRACT: C204351

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

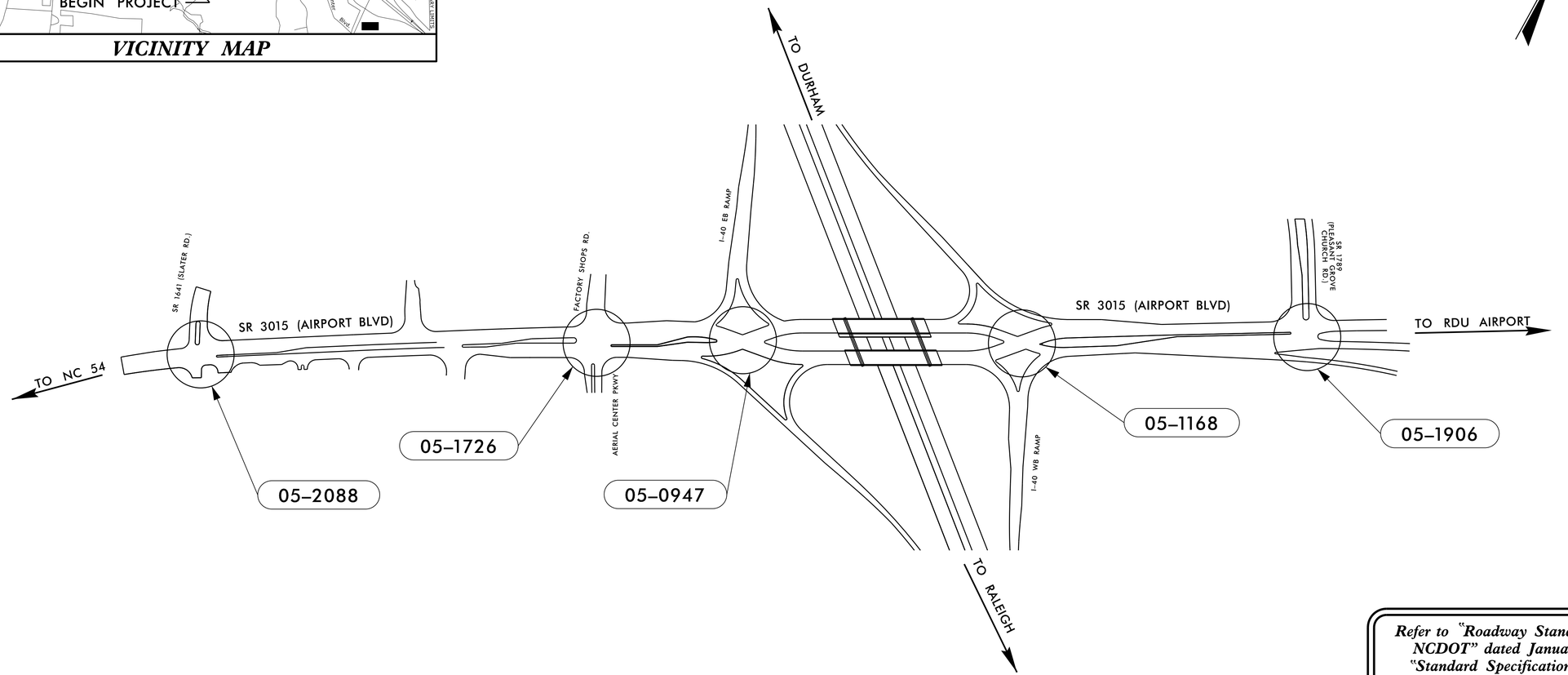
WAKE COUNTY

LOCATION: SR 3015 (AIRPORT BOULEVARD) FROM SR 1641 (SLATER ROAD) TO SR 1789 (PLEASANT GROVE CHURCH ROAD)

TYPE OF WORK: TRAFFIC SIGNALS AND SIGNAL COMMUNICATIONS



VICINITY MAP



Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.

Index of Plans

Sheet #	Reference #	Location/Description
Sig. 1.0	--------	Title Sheet
Sig. 2.0–6.2	05–2088	SR 3015 (Airport Boulevard) at SR 1641 (Slater Road)
Sig. 7.0–12.5	05–1726	SR 3015 (Airport Boulevard) at Factory Shops Road /Aerial Center Parkway
Sig. 13.0–18.5	05–0947	SR 3015 (Airport Boulevard) at I–40 EB Ramps
Sig. 19.0–23.3	05–1168	SR 3015 (Airport Boulevard) at I–40 WB Ramps
Sig. 24.0–28.4	05–1906	SR 3015 (Airport Boulevard) at SR 1789 (Pleasant Grove Church Road)
Sig. 29.0–29.1	--------	Standard Plate Sheets
M1–M8	--------	Standard Metal Pole Sheets
SCP 1–11	--------	Signal Communication Plans

INTELLIGENT TRANSPORTATION AND SIGNALS UNIT

Contacts:

Robert J. Ziemba, PE – Central Region Signals Engineer
Ryan W. Hough, PE – Signal Equipment Design Engineer
Gregg Green – Signal Communications Project Engineer

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

Transportation Mobility and Safety Division
ITS and Signals Unit
STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

750 N. Greenfield Parkway, Garner, NC 27529

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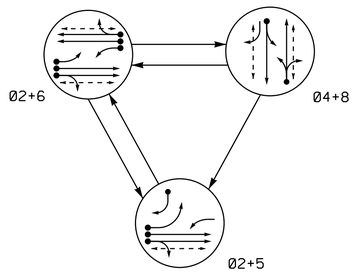
rziemba

PROJECT REFERENCE NO.	SHEET NO.
I-5700	Sig 2.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

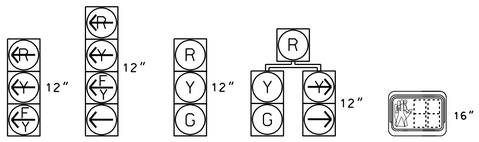
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 02+5	PHASE 02+6	PHASE 04+8	FLASH
21, 22	G	G	R	Y
41	R	R	G	R
42	R/→	R	G	R
51	←	F.Y	~~R~~	~~Y~~
61	~~F.Y~~	F.Y	~~R~~	~~Y~~
62, 63	R	G	R	Y
81, 82	R	R	G	R
P21, P22	W	W	DW	DRK
P41, P42	DW	DW	W	DRK
P61, P62	DW	W	DW	DRK
P81, P82	DW	DW	W	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR INSTALLATION CHART

ASC/3-2070EN2 CONTROLLER w/ TS-2 CABINET

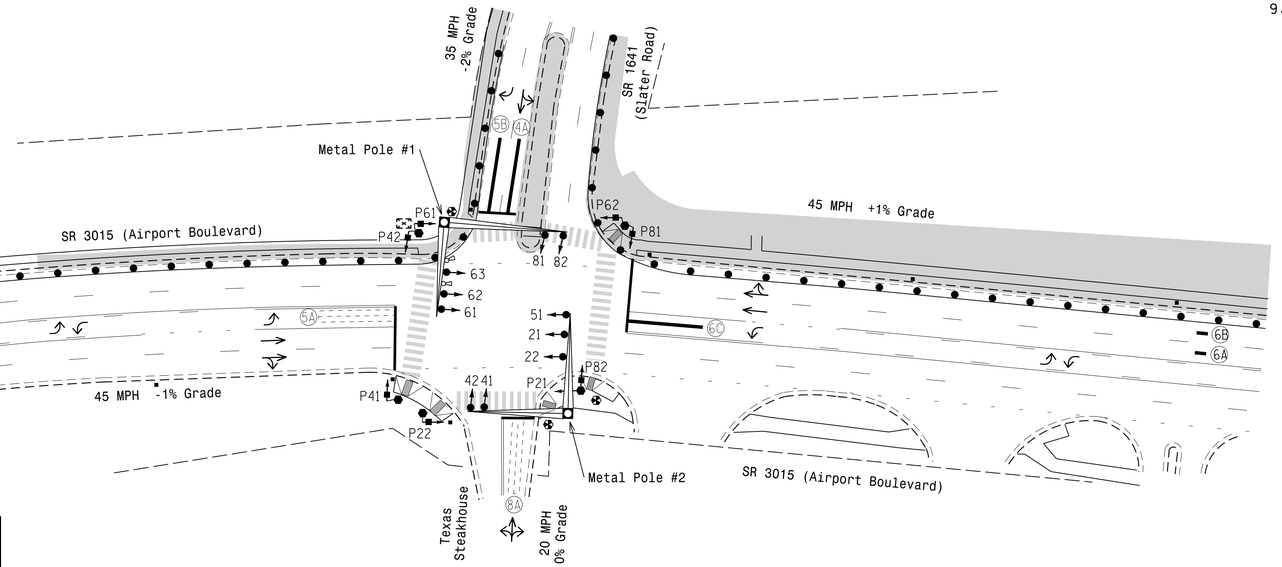
INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP / ZONE NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME (sec.)	ADDED INITIAL	DET. TYPE
2A	6X6	300	5	-	X	2	-	X	-	-	X	N
2B	6X6	300	5	-	X	2	-	X	-	-	X	N
4A*	6X40	0	*	X	-	4	*	-	-	-	-	S
5A	6X40	0	2-4-2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

* Video detection zone.

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. Disconnect and bag all existing pedestrian signal heads.
6. Pavement markings are existing.
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 #: 26.
9. This intersection features a video detection system. Shown locations of detectors are conceptual only. Refer to the manufacturer's guidelines for optimal detector placement.



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	◁▭
▭ DD ▭	Directional Drill	N/A
⊛	Type I Pushbutton Post	⊛
⬡	Type II Signal Pedestal	⬢
N/A	Curb Ramp	♿
○⊲	Out of Pavement Detector	●▬
▬	Video Detection Area	▬
●-●	Construction Zone Drums	●-●
▒	Construction Zone	▒

TIMING CHART

ASC/3-2070EN2 CONTROLLER

PHASE	02	04	05	06	08
MINIMUM GREEN *	12 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.
VEHICLE EXT. *	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.6 SEC.	4.0 SEC.	3.0 SEC.	4.6 SEC.	3.0 SEC.
RED CLEARANCE	1.6 SEC.	1.9 SEC.	3.2 SEC.	1.6 SEC.	3.2 SEC.
MAX. 1 *	90 SEC.	30 SEC.	15 SEC.	90 SEC.	30 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE
LOCK DET.	ON	OFF	OFF	ON	OFF
WALK *	7 SEC.	7 SEC.	– SEC.	7 SEC.	7 SEC.
PED. CLEAR	9 SEC.	14 SEC.	– SEC.	17 SEC.	17 SEC.
VOLUME DENSITY	ON	OFF	OFF	ON	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	1.5 SEC.	– SEC.	– SEC.	1.5 SEC.	– SEC.
MAX. INITIAL *	34 SEC.	– SEC.	– SEC.	34 SEC.	– SEC.
TIME B4 REDUCTION *	15 SEC.	– SEC.	– SEC.	15 SEC.	– SEC.
TIME TO REDUCE *	30 SEC.	– SEC.	– SEC.	30 SEC.	– SEC.
MINIMUM GAP	3.0 SEC.	– SEC.	– SEC.	3.0 SEC.	– SEC.
DUAL ENTRY	OFF	ON	OFF	OFF	ON
SIMULTANEOUS GAP	ON	ON	ON	ON	ON

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

Signal Upgrade - Temporary Design 1 (TMP Phase I, Step A)

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 3015 (Airport Boulevard)
at
SR 1641 (Slater Road)

Division 5 Wake County Morrisville

PLAN DATE: February 2019 REVIEWED BY:
PREPARED BY: J.A. Lohr REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA

DocuSigned by: 7/24/2019
SIG. INVENTORY NO. 05-2088TI

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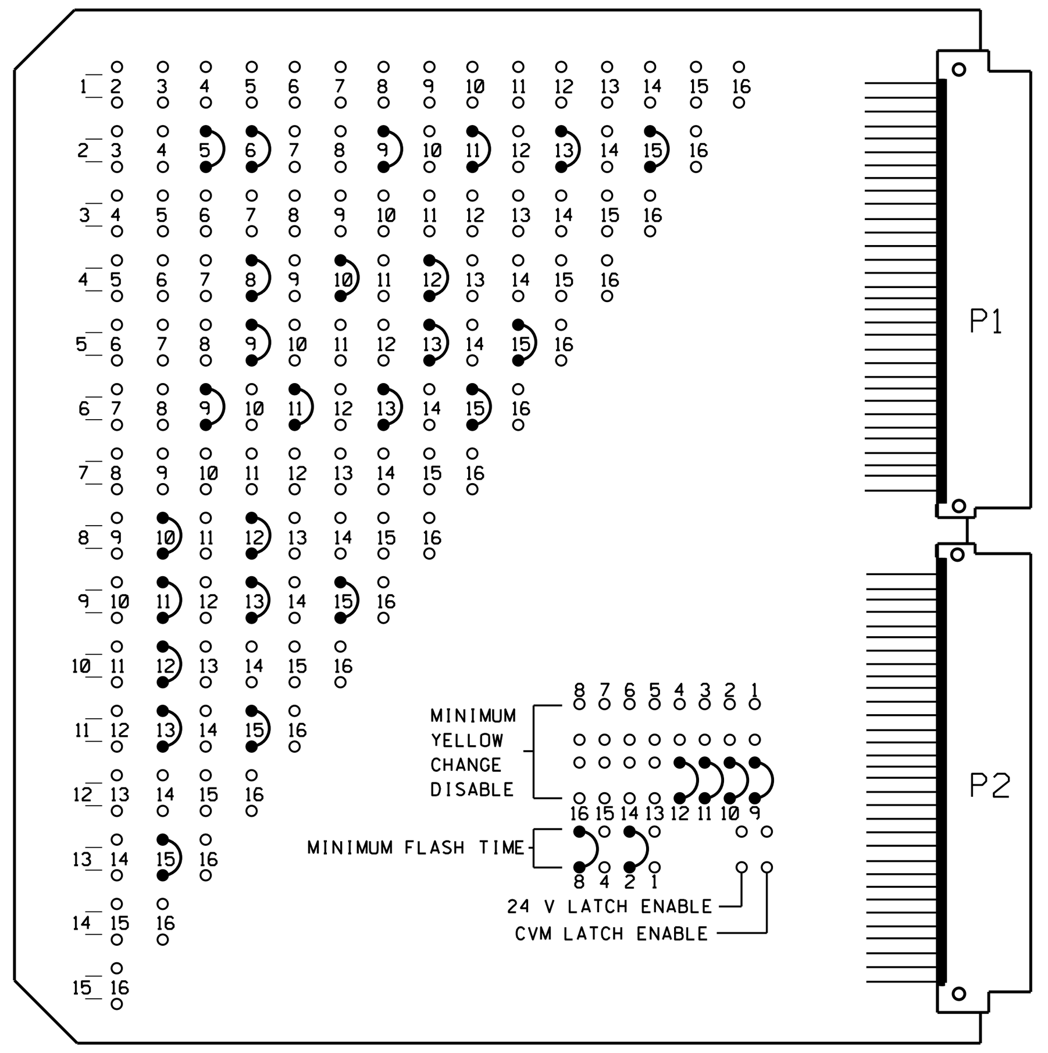
EDI MODEL MMU2-16LEip MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(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	ENABLE
9	ENABLE
10	ENABLE
11	ENABLE
12	ENABLE
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 1, 3, 7, 14 and 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 Walk 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 for all phases.
6. Program phases 2 and 6 for volume density operation.
7. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
8. Program detector call delay and extension timing on the controller, unless otherwise specified.
9. Set all detector card unit channels to "presence" mode.
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	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	42	51★	62,63	NU	81,82	P21, P22	P41, P42	P61, P62	P81, P82	61★	NU	51★	NU
RED		2R		4R		✳	6R		8R								
YELLOW		2Y		4Y			6Y		8Y								
GREEN		2G		4G			6G		8G								
RED ARROW														13R		15R	
YELLOW ARROW					5Y									13Y		15Y	
FLASHING YELLOW ARROW														13G		15G	
GREEN ARROW					5G	5G											
(Don't Walk)										9R	10R	11R	12R				
(Walk)										9G	10G	11G	12G				

NU = Not Used

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

★ 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 EMPTY	CH1 L1 ø2 ** / CH2 L2 ø2 **	SLOT EMPTY	CH1 L5 ø5 / CH2 L6 ø2 *	SLOT EMPTY	CH1 L9 NOT USED / CH2 L10 ø8	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
NU	L3A,L3B
NU	L4A,L4B
5A	L5A,L5B
	L6A,L6B
NU	L7A,L7B
NU	L8A,L8B
NU	L9A,L9B
8A	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

ADD JUMPERS FROM: L5A TO L6A, AND L5B TO L6B

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			
4			
5	ø5	DELAY	15
* 6	ø2	DELAY	3
7			
8			
9			
10	ø8	DELAY	5
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 - G
** Detector Type - N

SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans for zones 4A, 5B, 6A, 6B, and 6C.

For Detection Zone 5A the equipment placement and slots reserved for wired inputs are typical for a NCDOT installation.

EQUIPMENT INFORMATION

CONTROLLER.............2070EN2
CABINET TS-2
SOFTWARE ....ECONOLITE ASC/3-2070
CABINET MOUNT..........BASE
LOADBAY POSITIONS.......16
LOAD SWITCHES USED......2,4,5,6,8,9,10,11,12,13,15
PHASES USED............2,2PED,4,4PED,5,6,6PED,8,8PED
OLA....................*
OLB....................NOT USED
OLC....................*
OLD....................NOT USED

* See overlap programming detail on sheet 2

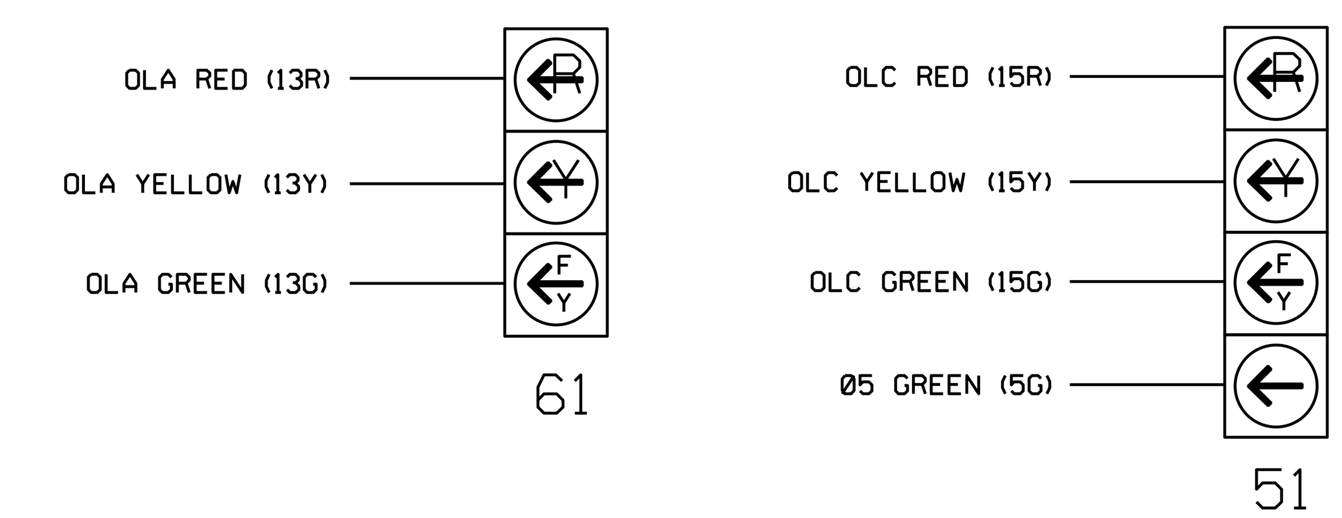
LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED
13	OLA
14	OLB
15	OLC
16	OLD

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

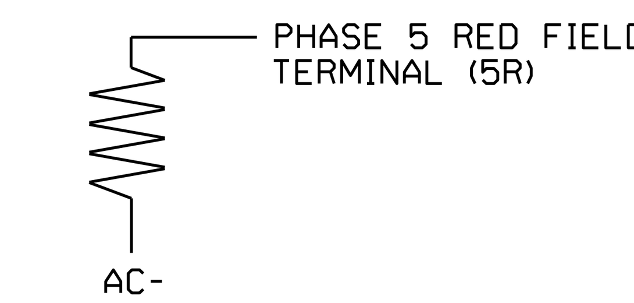


LOAD RESISTOR INSTALLATION DETAIL

(install resistor 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: 05-2088T1
DESIGNED: February 2019
SEALED: 7/24/2019
REVISED: N/A

Electrical Detail - Temp Design 1 (TMP Phase I, Step A)
Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

750 N.Greenfield Pkwy,Garner,NC 27529

SR 3015 (Airport Boulevard) at SR 1641 (Slater Road)

Division 5 | Wake County | Morrisville

PLAN DATE: May 2019	REVIEWED BY:
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 036833 RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 430320FAA2654C3...

DATE 8/1/2019

SIG. INVENTORY NO. 05-2088T1

PROJECT REFERENCE NO.	SHEET NO.
I-5700	Sig. 2.2

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 'OTHER/ECONOLITE'

```
TMG VEH OVLP...[A] TYPE:OTHER/ECONOLITE
  PHASES 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
INCLUDED . X . . . . . . . . . . . . . .
PROTECT  . . . . . . . . . . . . . . . .
PED PRTC . . . . . . . . . . . . . . . .
NOT OVLP . . . . . . . . . . . . . . . .
FLSH GRN . 1 . . . . . . . . . . . . . .
LAG X PH . . . . . . . . . . . . . . . .
LAG 2 PH . . . . . . . . . . . . . . . .

LAG GRN 0.0 YEL 0.0 RED 0.0 ADV GRN 0.0
```

Toggle Twice

OVERLAP C

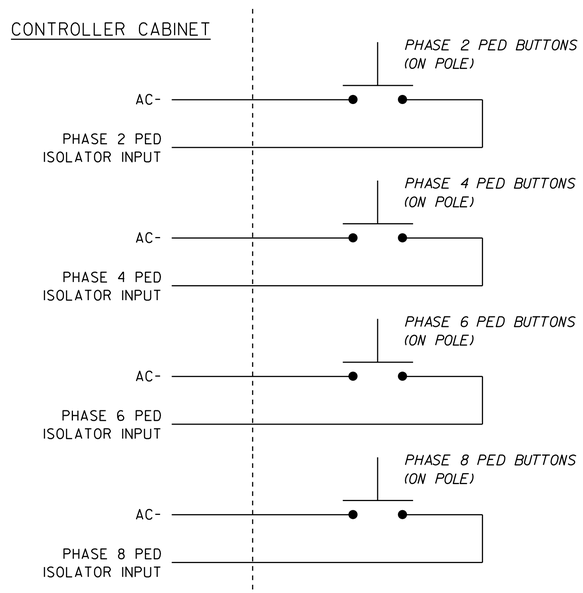
Select TMG VEH OVLP [C] and 'PPLT FYA'

```
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

PEDESTRIAN PUSH BUTTON WIRING DETAIL

(wire push buttons as shown)



ECONOLITE ASC/3-2070 SPECIAL MMU PROGRAMMING

(program controller as shown)

1. From Main Menu select [1. CONFIGURATION]
2. From CONFIGURATION Submenu select [4. PORT 1 (SDLC)]
3. From PORT 1 (SDLC) Submenu select [2. MMU PROGRAM]

CAUTION!

Set intersection to Flash before attempting to enter or change any MMU programming data.

This programming and that of the MMU programming card must match exactly. If they do not, the intersection will be placed into Flash.

```
MMU PROGRAM [    MANUAL]

      CH  6 5 4 3 2 1 0 9 8 7 6 5 4 3 2
       1  . . . . . . . . . . . . . . . .
       2  . X . X . X . X . . X X . . . .
       3  . . . . . . . . . . . . . . . .
       4  . . . . X . X . X . . . . . . .
       5  . X . X . . . X . . . . . . . .
       6  . X . X . X . X . . . . . . . .
       7  . . . . . . . . . . . . . . . .
       8  . . . . X . X . . . . . . . . .
       9  . X . X . X . . . . . . . . . .
      10  . . . . X . . . . . . . . . . .
      11  . X . X . . . . . . . . . . . .
      12  . . . . . . . . . . . . . . . .
      13  . X . . . . . . . . . . . . . .
      14  . . . . . . . . . . . . . . . .
      15  . . . . . . . . . . . . . . . .
```

END 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: 05-2088T1
DESIGNED: February 2019
SEALED: 7/24/2019
REVISED: N/A

Electrical Detail - Temp Design 1 (TMP Phase I, Step A)
Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:

Transportation Mobility and Safety Division
NC DEPARTMENT OF TRANSPORTATION
Traffic Engineering & Signal Management Section

750 N.Greenfield Pkwy,Garner,NC 27529

SR 3015 (Airport Boulevard)
at
SR 1641 (Slater Road)

Division 5 | Wake County | Morrisville

PLAN DATE: May 2019 | REVIEWED BY:

PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 430320FAA2654C3.
8/1/2019 DATE

SIG. INVENTORY NO. 05-2088T1

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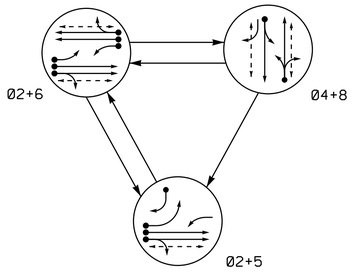
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
I-5700	Sig 3.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE 02+5	02+6	04+8	FLASH
21, 22	G	G	R	Y
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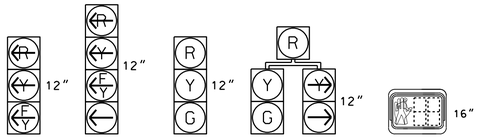
42	R/→	R	G	R
51	←	F.Y	~~R~~	~~Y~~
61	~~F.Y~~	F.Y	~~R~~	~~Y~~
62, 63	R	G	R	Y
81, 82	R	R	G	R
P21, P22	W	W	DW	DRK
P41, P42	DW	DW	W	DRK
P61, P62	DW	W	DW	DRK
P81, P82	DW	DW	W	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR INSTALLATION CHART

ASC/3-2070EN2 CONTROLLER w/ TS-2 CABINET

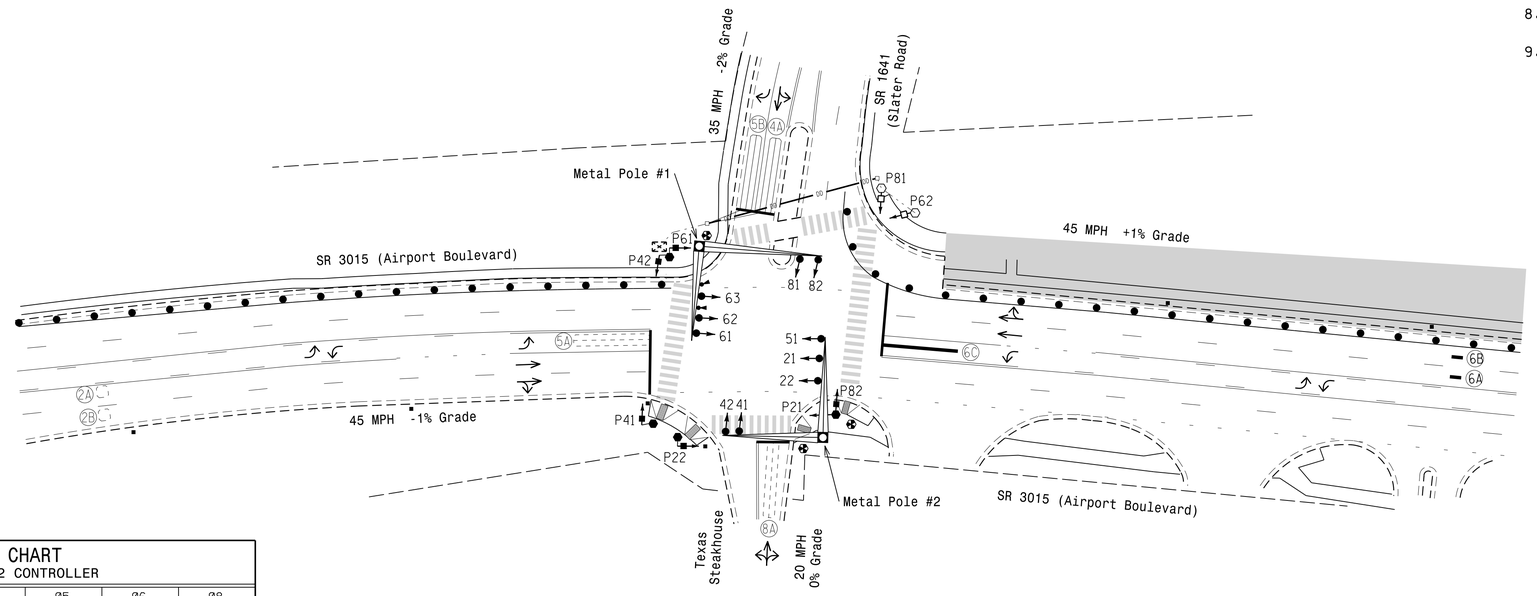
INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP / ZONE NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME (sec.)	ADDED INITIAL	DET. TYPE
2A	6X6	300	5	-	X	2	-	X	-	-	X	N
2B	6X6	300	5	-	X	2	-	X	-	-	X	N
4A	6X40	0	2-4-2	X	-	4	X	-	-	-	-	S
5A	6X40	0	2-4-2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

* Video detection zone.

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. 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. Cary signal system data:
   Fiber channel #: 26.
9. This intersection features a video detection system. Shown locations of detectors are conceptual only. Refer to the manufacturer's guidelines for optimal detector placement.



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	
	Type I Pushbutton Post	
	Type II Signal Pedestal	
N/A	Curb Ramp	
	Out of Pavement Detector	
	Video Detection Area	
	Construction Zone Drums	
	Construction Zone	

TIMING CHART

ASC/3-2070EN2 CONTROLLER

PHASE	02	04	05	06	08
MINIMUM GREEN *	12 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.
VEHICLE EXT. *	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.6 SEC.	4.0 SEC.	3.0 SEC.	4.6 SEC.	3.0 SEC.
RED CLEARANCE	1.8 SEC.	2.2 SEC.	3.4 SEC.	1.8 SEC.	3.5 SEC.
MAX. 1 *	90 SEC.	30 SEC.	15 SEC.	90 SEC.	30 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE
LOCK DET.	ON	OFF	OFF	ON	OFF
WALK *	7 SEC.	7 SEC.	– SEC.	7 SEC.	7 SEC.
PED. CLEAR	9 SEC.	14 SEC.	– SEC.	13 SEC.	17 SEC.
VOLUME DENSITY	ON	OFF	OFF	ON	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	1.5 SEC.	– SEC.	– SEC.	1.5 SEC.	– SEC.
MAX. INITIAL *	34 SEC.	– SEC.	– SEC.	34 SEC.	– SEC.
TIME B4 REDUCTION *	15 SEC.	– SEC.	– SEC.	15 SEC.	– SEC.
TIME TO REDUCE *	30 SEC.	– SEC.	– SEC.	30 SEC.	– SEC.
MINIMUM GAP	3.0 SEC.	– SEC.	– SEC.	3.0 SEC.	– SEC.
DUAL ENTRY	OFF	ON	OFF	OFF	ON
SIMULTANEOUS GAP	ON	ON	ON	ON	ON

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

Signal Upgrade - Temporary Design 2 (TMP Phase I, Step B)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 3015 (Airport Boulevard)
at
SR 1641 (Slater Road)

Division 5 Wake County Morrisville

PLAN DATE: February 2019 REVIEWED BY:

PREPARED BY: J.A. Lohr REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

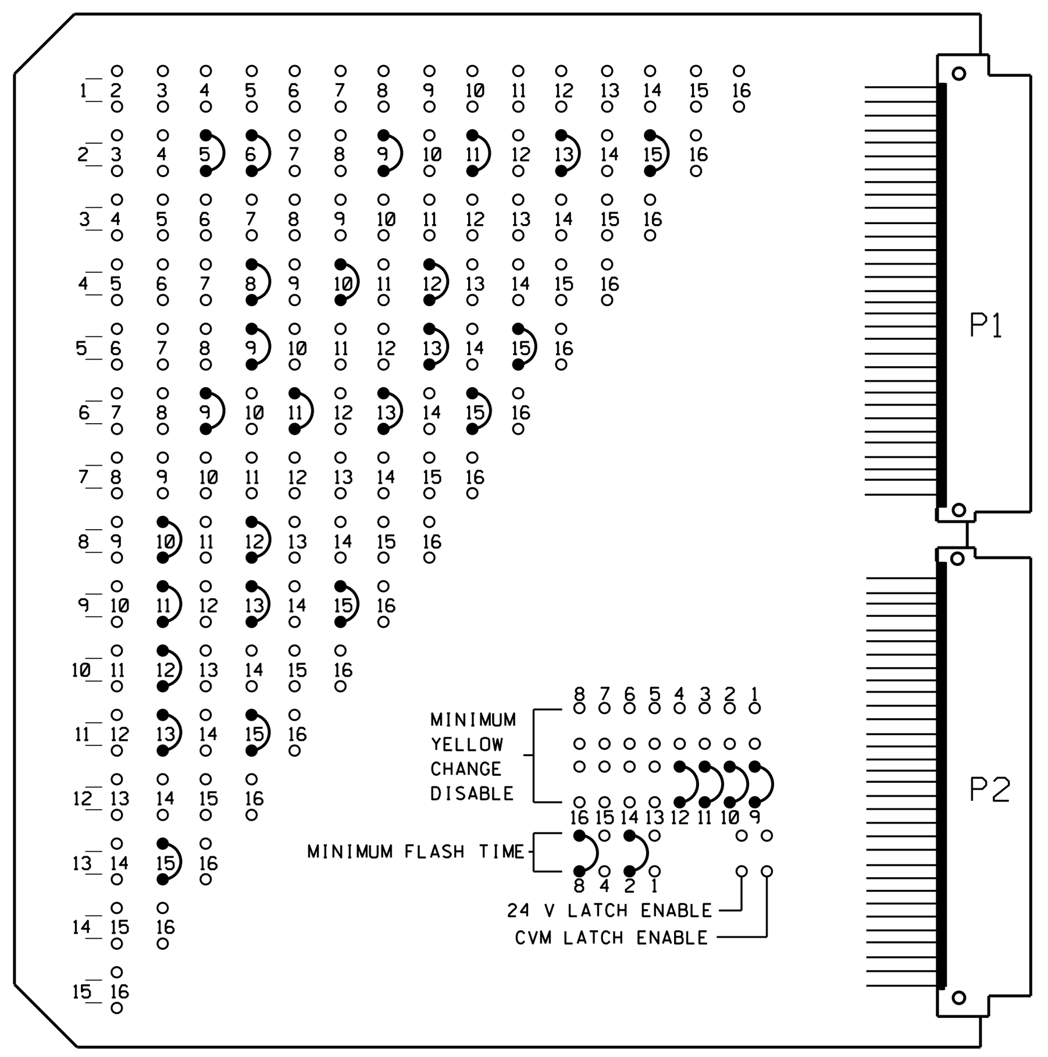
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA

DocuSigned by: 7/24/2019
SIGNATURE DATE

SIG. INVENTORY NO. 05-208812

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	ENABLE
9	ENABLE
10	ENABLE
11	ENABLE
12	ENABLE
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 1, 3, 7, 14 and 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 Walk 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 for all phases.
6. Program phases 2 and 6 for volume density operation.
7. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
8. Program detector call delay and extension timing on the controller, unless otherwise specified.
9. Set all detector card unit channels to "presence" mode.
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	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	42	51★	62,63	NU	81,82	P21, P22	P41, P42	P61, P62	P81, P82	61★	NU	51★	NU
RED		2R		4R		*	6R		8R								
YELLOW		2Y		4Y			6Y		8Y								
GREEN		2G		4G			6G		8G								
RED ARROW														13R		15R	
YELLOW ARROW					5Y									13Y		15Y	
FLASHING YELLOW ARROW														13G		15G	
GREEN ARROW					5G	5G											
(Don't Walk)										9R	10R	11R	12R				
(Walk)										9G	10G	11G	12G				

NU = Not Used

* Denotes install load resistor. See Load Resistor Installation Detail below.

★ 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	Slot 12
CH1		L3 ø 4	L1 ø 2 **	SLOT EMPTY	L5 ø 5	SLOT EMPTY	L9 NOT USED	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
CH2		L5 ø 5	L2 ø 2 **		L6 ø 2 *		L10 ø 8					

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
5B	L4A,L4B
5A	L5A,L5B
	L6A,L6B
NU	L7A,L7B
NU	L8A,L8B
NU	L9A,L9B
8A	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

ADD JUMPERS FROM: L5A TO L6A, AND L5B TO L6B

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 5	DELAY	15
5	ø 5	DELAY	15
* 6	ø 2	DELAY	3
7			
8			
9			
10	ø 8	DELAY	5
11			
12			
13			
14			
15			
16			

* Detector Type - G
** Detector Type - N

NOTE

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

SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans for zones 6A, 6B, and 6C.

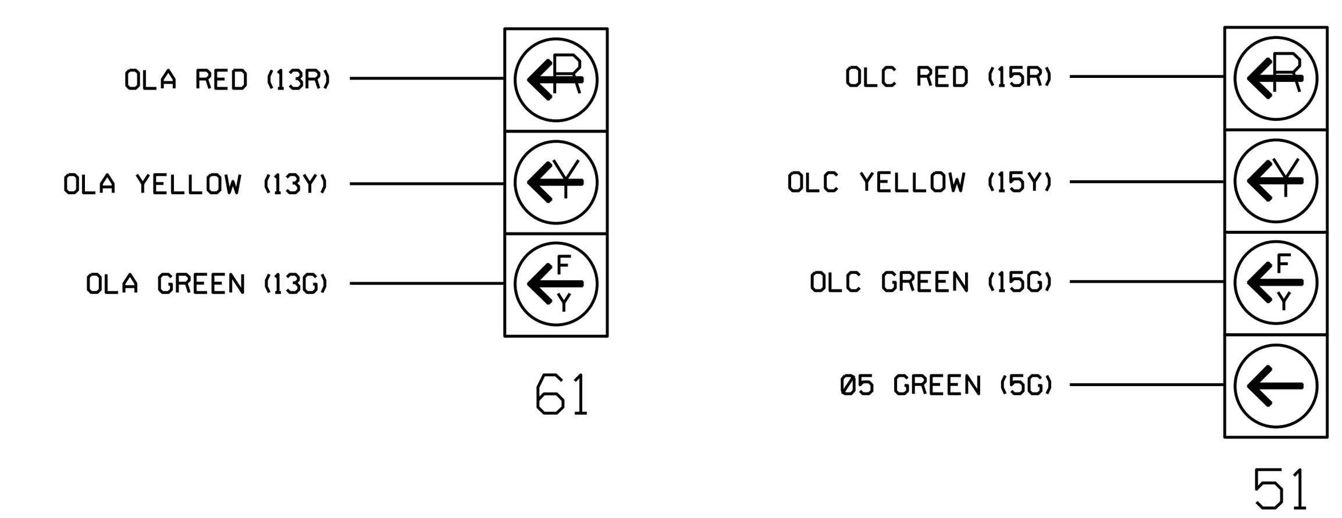
EQUIPMENT INFORMATION

CONTROLLER.............2070EN2
CABINET TS-2
SOFTWARE ....ECONOLITE ASC/3-2070
CABINET MOUNT..........BASE
LOADBAY POSITIONS.......16
LOAD SWITCHES USED......2,4,5,6,8,9,10,11,12,13,15
PHASES USED............2,2PED,4,4PED,5,6,6PED,8,8PED
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)

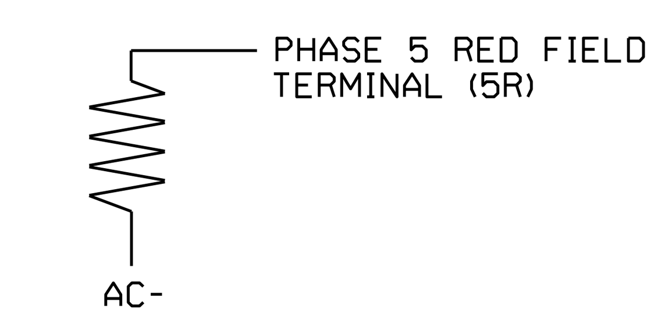
LOAD SWITCH NUMBER	FUNCTION
1	ø 1
2	ø 2
3	ø 3
4	ø 4
5	ø 5
6	ø 6
7	ø 7
8	ø 8
9	ø 2 PED
10	ø 4 PED
11	ø 6 PED
12	ø 8 PED
13	OLA
14	OLB
15	OLC
16	OLD

LOAD RESISTOR INSTALLATION DETAIL

(install resistor 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: 05-2088T2
DESIGNED: February 2019
SEALED: 7/24/2019
REVISED: N/A

Electrical Detail - Temp Design 2 (TMP Phase I, Step B)
Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 3015 (Airport Boulevard) at SR 1641 (Slater Road)

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

Division 5 | Wake County | Morrisville

PLAN DATE: May 2019	REVIEWED BY:
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 036833 RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 430320FAA2654C3... DATE 8/1/2019

SIG. INVENTORY NO. 05-2088T2

PROJECT REFERENCE NO.	SHEET NO.
I-5700	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 'OTHER/ECONOLITE'

```
TMG VEH OVLP...[A] TYPE:[OTHER/ECONOLITE]
  PHASES 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
INCLUDED . X . . . . . . . . . . . . . .
PROTECT  . . . . . . . . . . . . . . . .
PED PRTC . . . . . . . . . . . . . . . .
NOT OVLP . . . . . . . . . . . . . . . .
FLSH GRN . 1 . . . . . . . . . . . . . .
LAG X PH . . . . . . . . . . . . . . . .
LAG 2 PH . . . . . . . . . . . . . . . .

LAG GRN 0.0 YEL 0.0 RED 0.0 ADV GRN 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

ECONOLITE ASC/3-2070 SPECIAL MMU PROGRAMMING

(program controller as shown)

1. From Main Menu select [1. CONFIGURATION]
2. From CONFIGURATION Submenu select [4. PORT 1 (SDLC)]
3. From PORT 1 (SDLC) Submenu select [2. MMU PROGRAM]

CAUTION!

Set intersection to Flash before attempting to enter or change any MMU programming data.

This programming and that of the MMU programming card must match exactly. If they do not, the intersection will be placed into Flash.

```
MMU PROGRAM [    MANUAL]

      CH  6 5 4 3 2 1 0 9 8 7 6 5 4 3 2
       1  . . . . . . . . . . . . . . . .
       2  . X . X . X . X . . X X . . . .
       3  . . . . . . . . . . . . . . . .
       4  . . . . X . X . X . . . . . . .
       5  . X . X . . . X . . . . . . . .
       6  . X . X . X . X . . . . . . . .
       7  . . . . . . . . . . . . . . . .
       8  . . . . X . X . . . . . . . . .
       9  . X . X . X . . . . . . . . . .
      10  . . . . X . . . . . . . . . . .
      11  . X . X . . . . . . . . . . . .
      12  . . . . . . . . . . . . . . . .
      13  . X . . . . . . . . . . . . . .
      14  . . . . . . . . . . . . . . . .
      15  . . . . . . . . . . . . . . . .
```

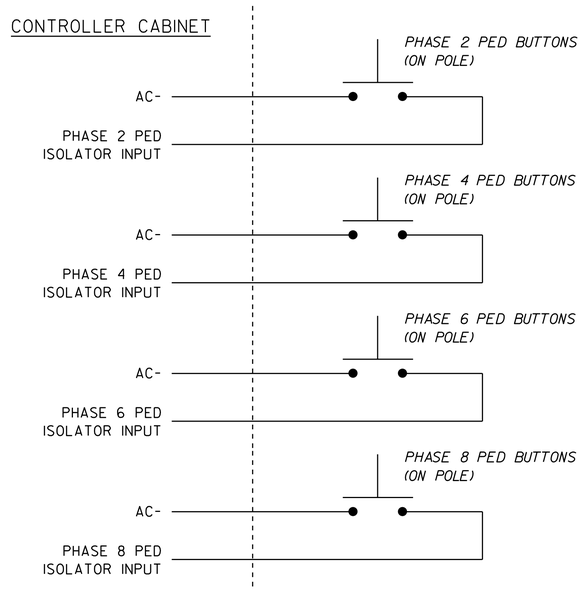
END PROGRAMMING

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.

PEDESTRIAN PUSH BUTTON WIRING DETAIL

(wire push buttons as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-2088T2
DESIGNED: February 2019
SEALED: 7/24/2019
REVISED: N/A

Electrical Detail - Temp Design 2 (TMP Phase I, Step B)
Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 3015 (Airport Boulevard)
at
SR 1641 (Slater Road)

Prepared in the Offices of:

Transportation Mobility and Safety Division
NC DEPARTMENT OF TRANSPORTATION
Traffic Engineering & Signal Management Section

750 N.Greenfield Pkwy,Garner,NC 27529

Division 5 | Wake County | Morrisville

PLAN DATE: May 2019	REVIEWED BY:
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

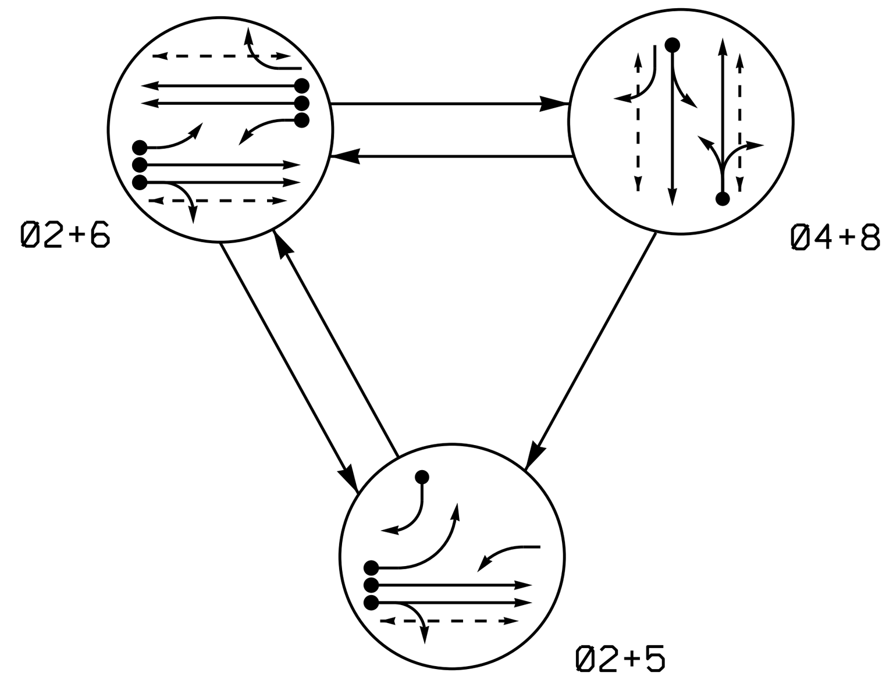
DocuSigned by: Ryan W. Hough 430320FAA2654C3 — 8/1/2019 DATE

SIG. INVENTORY NO. 05-2088T2

29-JUL-2019 06:46
#05088_sht_dtls_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
I-5700	Sig 4.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

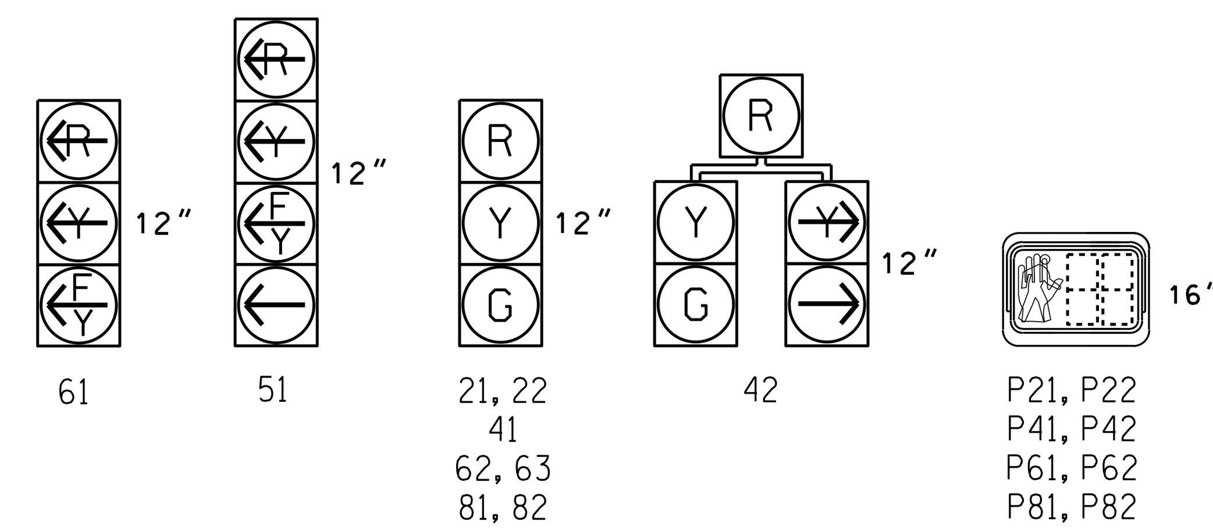
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

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

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR INSTALLATION CHART

ASC/3-2070EN2 CONTROLLER w/ TS-2 CABINET

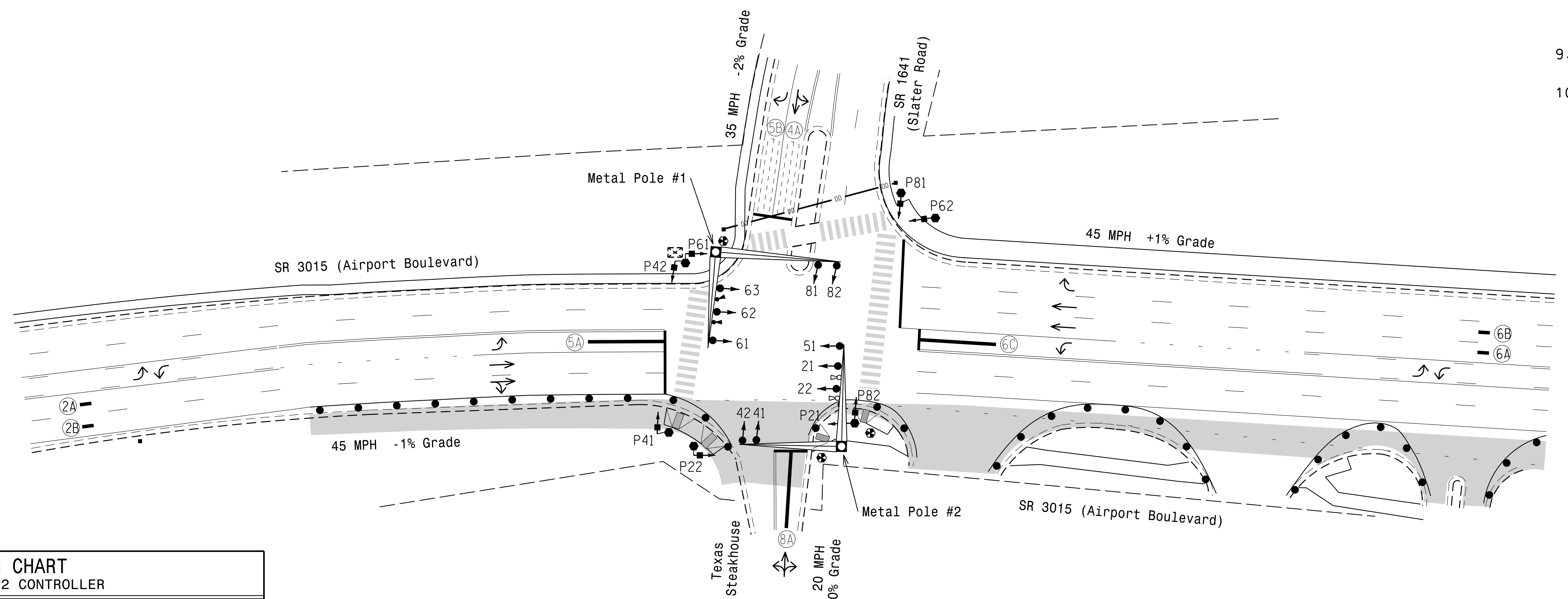
INDUCTIVE LOOPS: LOOP / ZONE NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	DETECTOR UNITS: NEMA PHASE	NEW	EXISTING	TIMING: FEATURE	TIMING: TIME (sec.)	ADDED INITIAL	DET. TYPE
2A*	6X6	300	*	X	-	2	*	-	-	-	X	N
2B*	6X6	300	*	X	-	2	*	-	-	-	X	N
4A	6X40	0	2-4-2	-	X	4	-	X	-	-	-	S
5A*	6X40	0	*	X	-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

* Video detection zone.

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. Reposition existing signal heads numbered 62 and 63.
5. Set all detector units to presence mode.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Cary signal system data: Fiber channel #: 26.
10. This intersection features a video detection system. Shown locations of detectors are conceptual only. Refer to the manufacturer's guidelines for optimal detector placement.



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	
	Type I Pushbutton Post	
	Type II Signal Pedestal	
N/A	Curb Ramp	
	Out of Pavement Detector	
DD	Directional Drill	N/A
	Video Detection Area	
	Construction Zone Drums	
	Construction Zone	

TIMING CHART

ASC/3-2070EN2 CONTROLLER

PHASE	Ø2	Ø4	Ø5	Ø6	Ø8
MINIMUM GREEN *	12 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.
VEHICLE EXT. *	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.6 SEC.	4.0 SEC.	3.0 SEC.	4.6 SEC.	3.0 SEC.
RED CLEARANCE	1.8 SEC.	2.2 SEC.	3.4 SEC.	1.8 SEC.	3.5 SEC.
MAX. 1 *	90 SEC.	30 SEC.	15 SEC.	90 SEC.	30 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE
LOCK DET.	ON	OFF	OFF	ON	OFF
WALK *	7 SEC.	7 SEC.	– SEC.	7 SEC.	7 SEC.
PED. CLEAR	9 SEC.	14 SEC.	– SEC.	17 SEC.	25 SEC.
VOLUME DENSITY	ON	OFF	OFF	ON	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	1.5 SEC.	– SEC.	– SEC.	1.5 SEC.	– SEC.
MAX. INITIAL *	34 SEC.	– SEC.	– SEC.	34 SEC.	– SEC.
TIME B4 REDUCTION *	15 SEC.	– SEC.	– SEC.	15 SEC.	– SEC.
TIME TO REDUCE *	30 SEC.	– SEC.	– SEC.	30 SEC.	– SEC.
MINIMUM GAP	3.0 SEC.	– SEC.	– SEC.	3.0 SEC.	– SEC.
DUAL ENTRY	OFF	ON	OFF	OFF	ON
SIMULTANEOUS GAP	ON	ON	ON	ON	ON

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

Signal Upgrade - Temporary Design 3 (TMP Phase III)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 3015 (Airport Boulevard) at SR 1641 (Slater Road)

Division 5 | Wake County | Morrisville

PLAN DATE:	February 2019	REVIEWED BY:
PREPARED BY:	J.A. Lohr	REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA

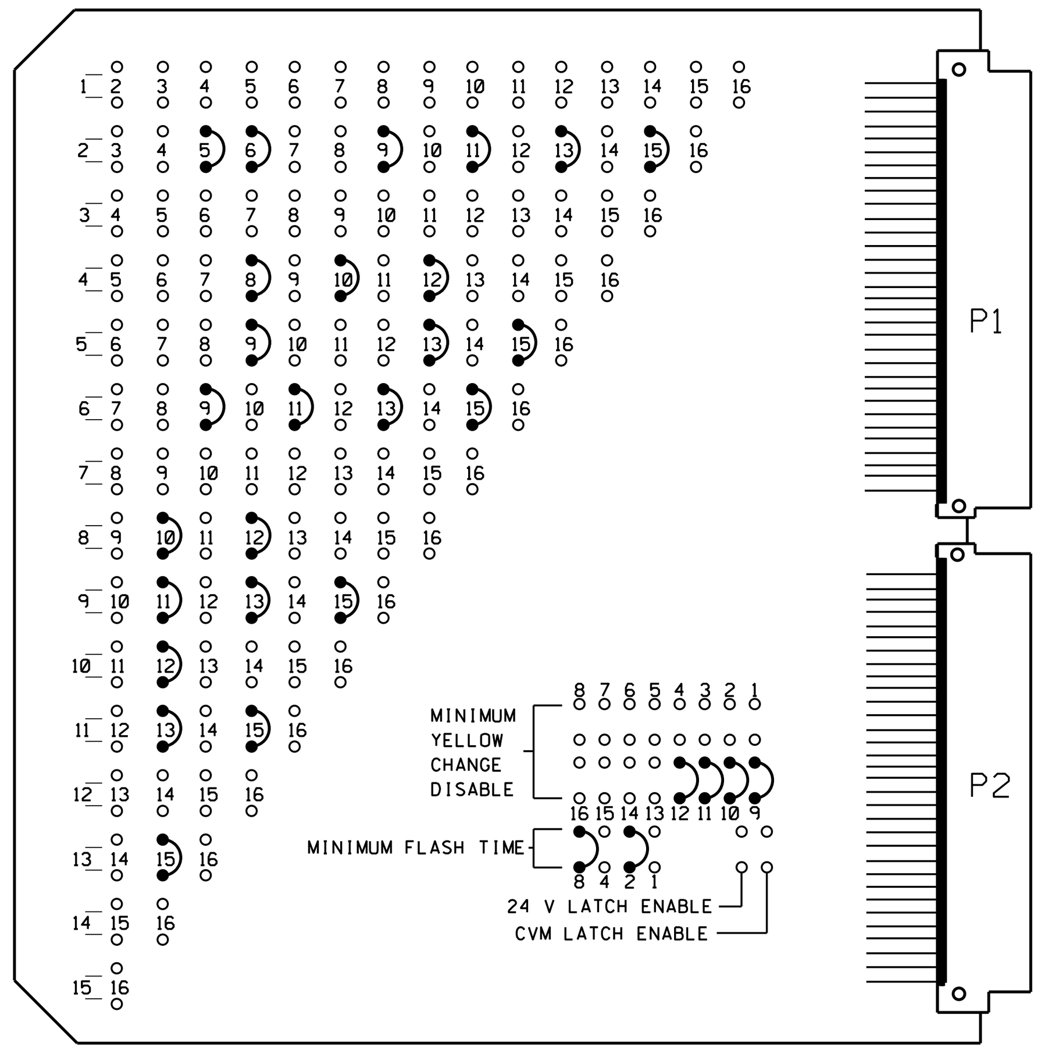
DocuSigned by: 1B9B4B66274A494
7/24/2019
DATE

SIG. INVENTORY NO. 05-2088T3

PROJECT REFERENCE NO.	SHEET NO.
I-5700	Sig. 4.1

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	ENABLE
6	ENABLE
7	DISABLE
8	ENABLE
9	ENABLE
10	ENABLE
11	ENABLE
12	ENABLE
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 1, 3, 7, 14 and 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 Walk 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. Program phases 2 and 6 for volume density operation.
6. Enable simultaneous gap-out feature for all phases.
7. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
8. Program detector call delay and extension timing on the controller, unless otherwise specified.
9. Set all detector card unit channels to "presence" mode.
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	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	42	51★	62,63	NU	81,82	P21, P22	P41, P42	P61, P62	P81, P82	61★	NU	51★	NU
RED		2R		4R		✳	6R		8R								
YELLOW		2Y		4Y			6Y		8Y								
GREEN		2G		4G			6G		8G								
RED ARROW														13R		15R	
YELLOW ARROW					5Y									13Y		15Y	
FLASHING YELLOW ARROW														13G		15G	
GREEN ARROW					5G	5G											
(hand symbol)										9R	10R	11R	12R				
(pedestrian symbol)										9G	10G	11G	12G				

NU = Not Used

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

★ 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 ø4 / CH2 L5 ø5	SLOT EMPTY	SLOT EMPTY	CH1 L5 ø5 / CH2 L6 ø2 ✳	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
NU	L1A,L1B
NU	L2A,L2B
4A	L3A,L3B
5B	L4A,L4B
5A	L5A,L5B
5A	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

ADD JUMPERS FROM: L5A TO L6A, AND L5B TO L6B

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

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
1			
2			
3	ø4		
4	ø5	DELAY	15
5	ø5	DELAY	15
✳ 6	ø2	DELAY	3
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 - G

SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans for zones 2A, 2B, 5A, 6A, 6B, 6C, and 8A.

For Detection Zone 5A the equipment placement and slots reserved for wired inputs are typical for a NCDOT installation.

EQUIPMENT INFORMATION

CONTROLLER.............2070EN2
CABINET TS-2
SOFTWARE ....ECONOLITE ASC/3-2070
CABINET MOUNT..........BASE
LOADBAY POSITIONS.......16
LOAD SWITCHES USED......2,4,5,6,8,9,10,11,12,13,15
PHASES USED............2,2PED,4,4PED,5,6,6PED,8,8PED
OLA....................✳
OLB....................NOT USED
OLC....................✳
OLD....................NOT USED

✳ See overlap programming detail on sheet 2

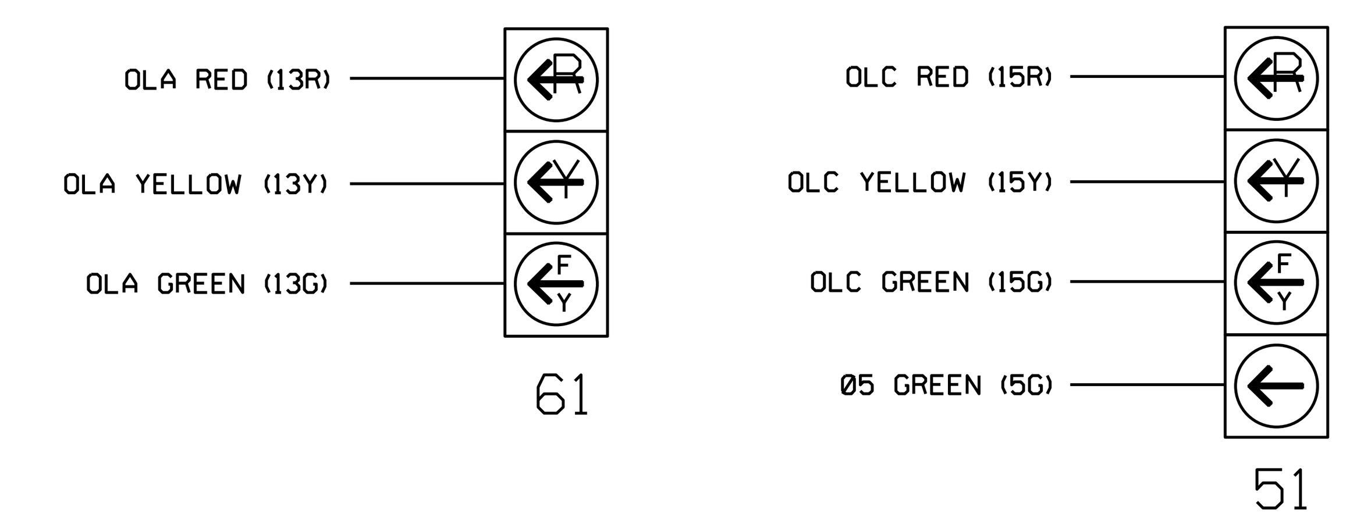
LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED
13	OLA
14	OLB
15	OLC
16	OLD

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

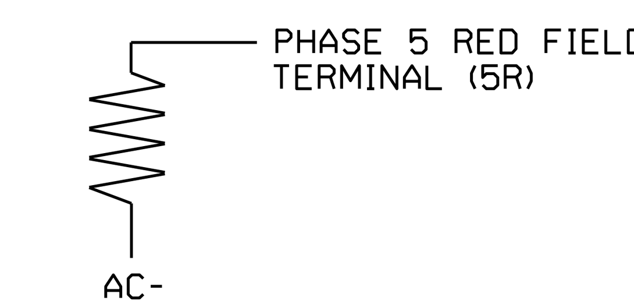


LOAD RESISTOR INSTALLATION DETAIL

(install resistor 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: 05-2088T3
DESIGNED: February 2019
SEALED: 7/24/2019
REVISED: N/A

Electrical Detail - Temp Design 3 (TMP Phase III)
Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 3015 (Airport Boulevard) at SR 1641 (Slater Road)

Division 5 Wake County Morrisville

PLAN DATE: May 2019 REVIEWED BY:
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 430320FAA2654C3... 8/1/2019 DATE

SIG. INVENTORY NO. 05-2088T3

29-JUL-2019 07:46
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sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
I-5700	Sig. 4.2

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 'OTHER/ECONOLITE'

```
TMG VEH OVLP...[A] TYPE:[OTHER/ECONOLITE]
  PHASES 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
INCLUDED . X . . . . . . . . . . . . . .
PROTECT  . . . . . . . . . . . . . . . .
PED PRTC . . . . . . . . . . . . . . . .
NOT OVLP . . . . . . . . . . . . . . . .
FLSH GRN . 1 . . . . . . . . . . . . . .
LAG X PH . . . . . . . . . . . . . . . .
LAG 2 PH . . . . . . . . . . . . . . . .

LAG GRN 0.0 YEL 0.0 RED 0.0 ADV GRN 0.0
```

Toggle Twice

OVERLAP C

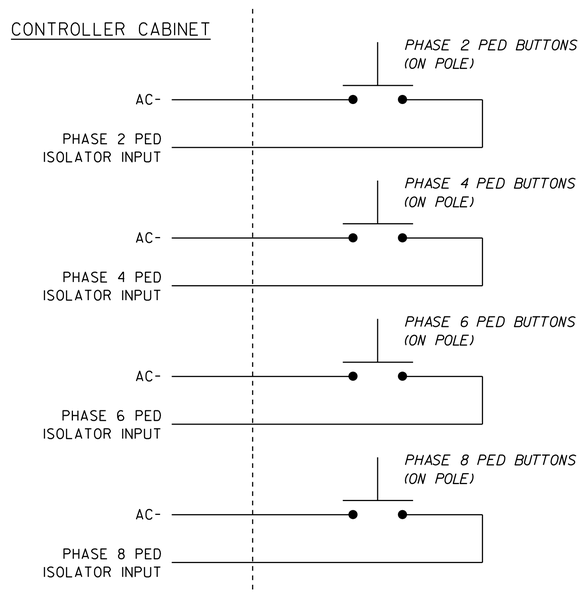
Select TMG VEH OVLP [C] and 'PPLT FYA'

```
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

PEDESTRIAN PUSH BUTTON WIRING DETAIL

(wire push buttons as shown)



ECONOLITE ASC/3-2070 SPECIAL MMU PROGRAMMING

(program controller as shown)

1. From Main Menu select [1. CONFIGURATION]
2. From CONFIGURATION Submenu select [4. PORT 1 (SDLC)]
3. From PORT 1 (SDLC) Submenu select [2. MMU PROGRAM]

CAUTION!

Set intersection to Flash before attempting to enter or change any MMU programming data.

This programming and that of the MMU programming card must match exactly. If they do not, the intersection will be placed into Flash.

```
MMU PROGRAM [     MANUAL]

       CH  6 5 4 3 2 1 0 9 8 7 6 5 4 3 2
        1  . . . . . . . . . . . . . . . .
        2  . X . X . X . X . . X X . . . .
        3  . . . . . . . . . . . . . . . .
        4  . . . . X . X . X . . . . . . .
        5  . X . X . . . X . . . . . . . .
        6  . X . X . X . X . . . . . . . .
        7  . . . . . . . . . . . . . . . .
        8  . . . . X . X . . . . . . . . .
        9  . X . X . X . . . . . . . . . .
       10  . . . . X . . . . . . . . . . .
       11  . X . X . . . . . . . . . . . .
       12  . . . . . . . . . . . . . . . .
       13  . X . . . . . . . . . . . . . .
       14  . . . . . . . . . . . . . . . .
       15  . . . . . . . . . . . . . . . .
```

END 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: 05-2088T3
DESIGNED: February 2019
SEALED: 7/24/2019
REVISED: N/A

Electrical Detail - Temp Design 3 (TMP Phase III)
Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 3015 (Airport Boulevard)
at
SR 1641 (Slater Road)

Division 5 | Wake County | Morrisville

PLAN DATE: May 2019 | REVIEWED BY:

PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 8/1/2019
430320FAA2654C3... DATE

SIG. INVENTORY NO. 05-2088T3

29-JUL-2019 06:47
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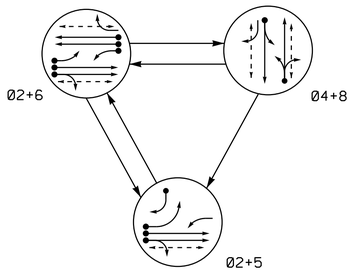
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
I-5700	Sig 5.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

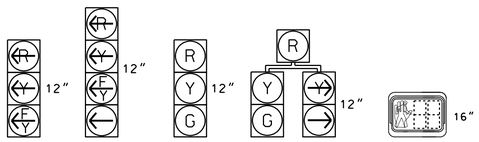
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

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

SIGNAL FACE I.D.

All Heads L.E.D.



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

LOOP & DETECTOR INSTALLATION CHART

ASC/3-2070EN2 CONTROLLER w/ TS-2 CABINET

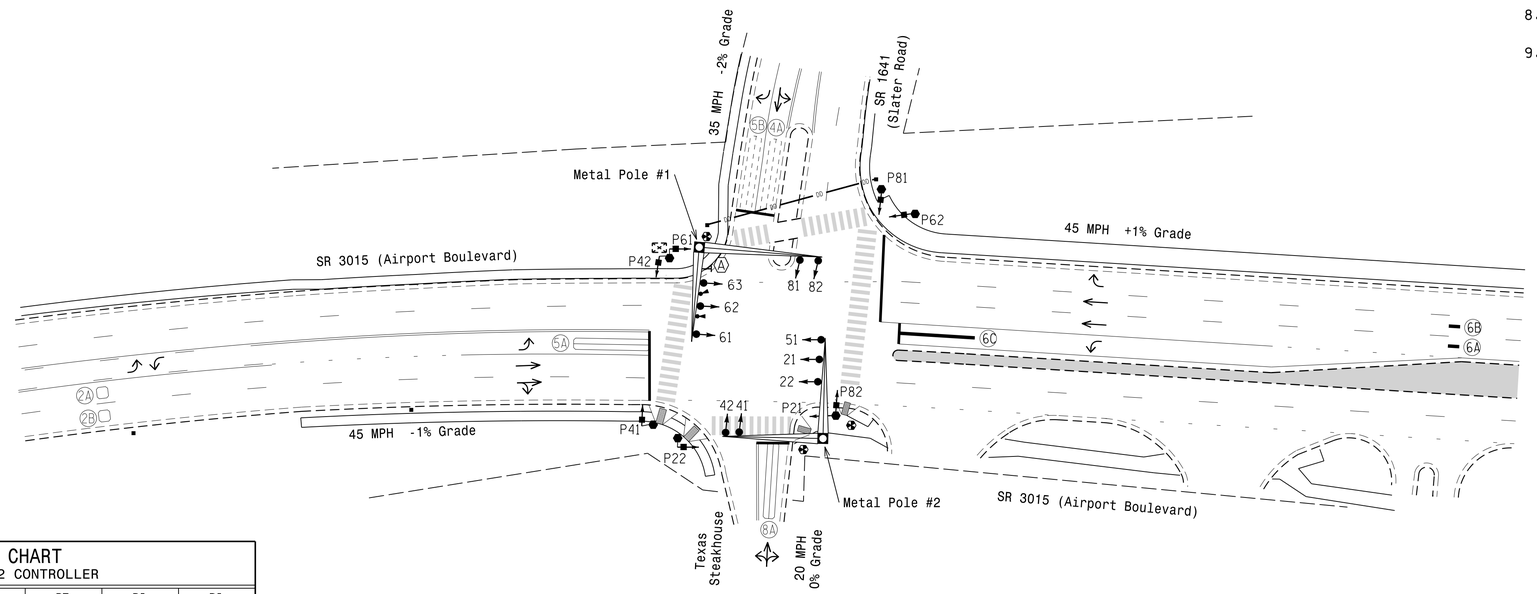
INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP / ZONE NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME (sec.)	ADDED INITIAL	DET. TYPE
2A	6X6	300	5	X	-	2	X	-	-	-	X	N
2B	6X6	300	5	X	-	2	X	-	-	-	X	N
4A	6X40	0	2-4-2	-	X	4	-	X	-	-	-	S
5A	6X40	0	2-4-2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

* Video detection zone.

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. 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. Cary signal system data:
   Fiber channel #: 26.
9. This intersection features a video detection system. Shown locations of detectors are conceptual only. Refer to the manufacturer's guidelines for optimal detector placement.



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	
	Type I Pushbutton Post	
	Type II Signal Pedestal	
N/A	Curb Ramp	
DD	Directional Drill	N/A
	Construction Zone	
	Out of Pavement Detector	
	Video Detection Area	
Ⓐ	Right Arrow "ONLY" Sign (R3-5R)	Ⓐ

TIMING CHART

ASC/3-2070EN2 CONTROLLER

PHASE	02	04	05	06	08
MINIMUM GREEN *	12 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.
VEHICLE EXT. *	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.6 SEC.	4.0 SEC.	3.0 SEC.	4.6 SEC.	3.0 SEC.
RED CLEARANCE	1.8 SEC.	2.2 SEC.	3.4 SEC.	1.8 SEC.	3.5 SEC.
MAX. 1 *	90 SEC.	30 SEC.	15 SEC.	90 SEC.	30 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE
LOCK DET.	ON	OFF	OFF	ON	OFF
WALK *	7 SEC.	7 SEC.	– SEC.	7 SEC.	7 SEC.
PED. CLEAR	9 SEC.	14 SEC.	– SEC.	17 SEC.	26 SEC.
VOLUME DENSITY	ON	OFF	OFF	ON	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	1.5 SEC.	– SEC.	– SEC.	1.5 SEC.	– SEC.
MAX. INITIAL *	34 SEC.	– SEC.	– SEC.	34 SEC.	– SEC.
TIME B4 REDUCTION *	15 SEC.	– SEC.	– SEC.	15 SEC.	– SEC.
TIME TO REDUCE *	30 SEC.	– SEC.	– SEC.	30 SEC.	– SEC.
MINIMUM GAP	3.0 SEC.	– SEC.	– SEC.	3.0 SEC.	– SEC.
DUAL ENTRY	OFF	ON	OFF	OFF	ON
SIMULTANEOUS GAP	ON	ON	ON	ON	ON

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

Signal Upgrade - Temporary Design 4 (TMP Phase IV)

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 3015 (Airport Boulevard)
at
SR 1641 (Slater Road)

Division 5 | Wake County | Morrisville

PLAN DATE: February 2019 | REVIEWED BY:
PREPARED BY: J.A. Lohr | REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA

DocuSigned by: 7/24/2019 DATE

SIG. INVENTORY NO. 05-2088T4

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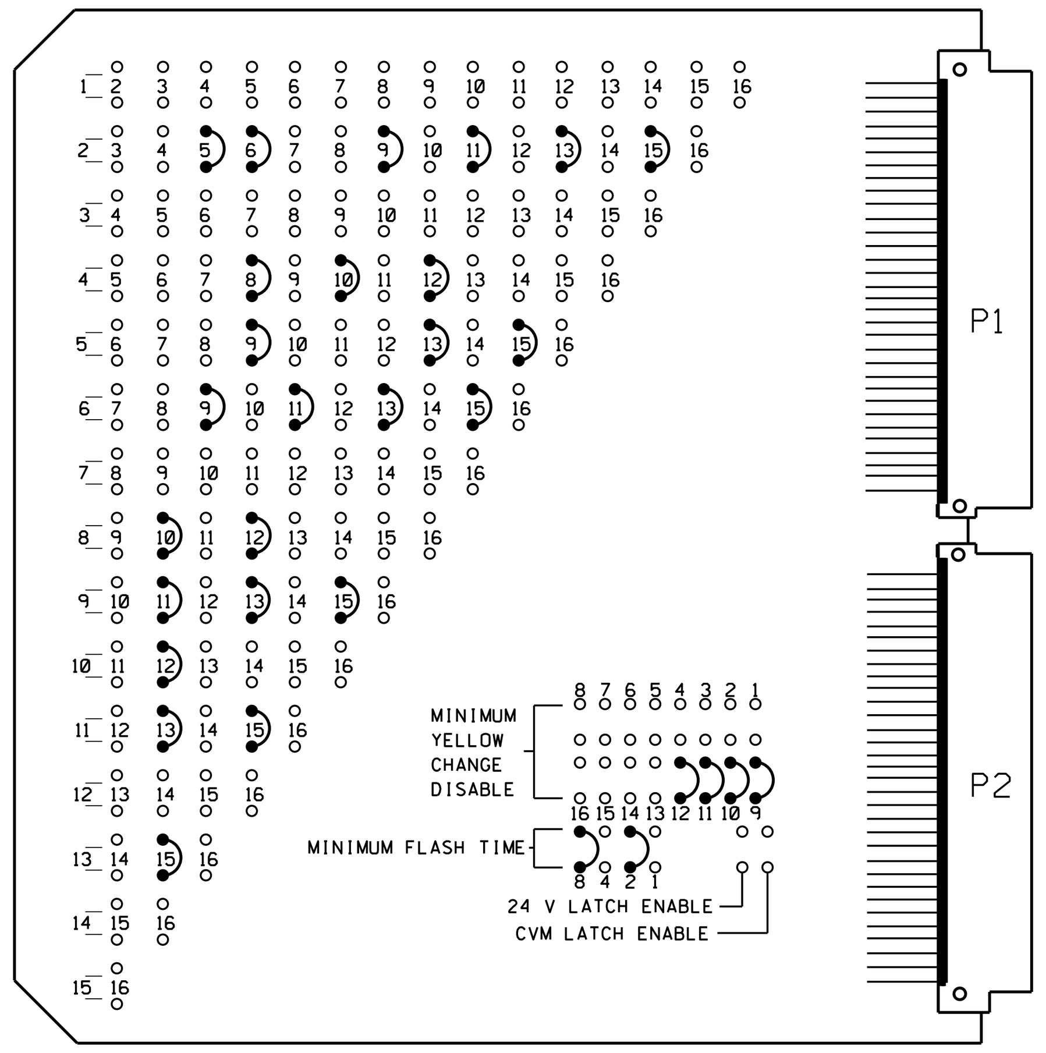
jalohr

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	ENABLE
9	ENABLE
10	ENABLE
11	ENABLE
12	ENABLE
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 1, 3, 7, 14 and 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 Walk 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 for all phases.
6. Program phases 2 and 6 for volume density operation.
7. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
8. Program detector call delay and extension timing on the controller, unless otherwise specified.
9. Set all detector card unit channels to "presence" mode.
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	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	42	51★	62,63	NU	81,82	P21, P22	P41, P42	P61, P62	P81, P82	61★	NU	51★	NU
RED		2R		4R		✳	6R		8R								
YELLOW		2Y		4Y			6Y		8Y								
GREEN		2G		4G			6G		8G								
RED ARROW														13R		15R	
YELLOW ARROW					5Y									13Y		15Y	
FLASHING YELLOW ARROW														13G		15G	
GREEN ARROW					5G	5G											
(Don't Walk hand)										9R	10R	11R	12R				
(Walk person)										9G	10G	11G	12G				

NU = Not Used

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

★ 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 ø4 / CH2 L5 ø5	CH1 L1 ø2 ** / CH2 L2 ø2 **	SLOT EMPTY	CH1 L5 ø5 / CH2 L6 ø2 *	SLOT EMPTY	CH1 L9 NOT USED / CH2 L10 ø8	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
5B	L4A,L4B
5A	L5A,L5B
5A	L6A,L6B
NU	L7A,L7B
NU	L8A,L8B
NU	L9A,L9B
8A	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

ADD JUMPERS FROM: L5A TO L6A, AND L5B TO L6B

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	ø5	DELAY	15
5	ø5	DELAY	15
* 6	ø2	DELAY	3
7			
8			
9			
10	ø8	DELAY	5
11			
12			
13			
14			
15			
16			

* Detector Type - G
** Detector Type - N

NOTE

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

SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans for zones 6A, 6B, and 6C.

EQUIPMENT INFORMATION

CONTROLLER..............2070EN2
CABINET TS-2
SOFTWARE ....ECONOLITE ASC/3-2070
CABINET MOUNT...........BASE
LOADBAY POSITIONS.......16
LOAD SWITCHES USED......2,4,5,6,8,9,10,11,12,13,15
PHASES USED.............2,2PED,4,4PED,5,6,6PED,8,8PED
OLA.....................*
OLB.....................NOT USED
OLC.....................*
OLD.....................NOT USED

* See overlap programming detail on sheet 2

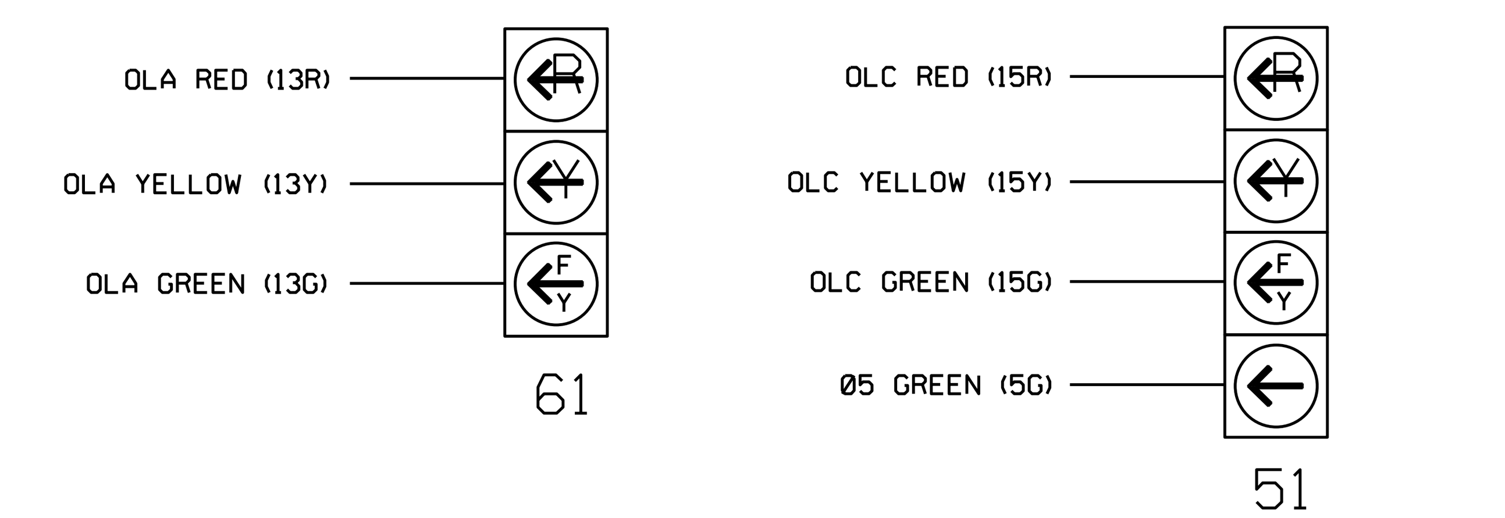
LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED
13	OLA
14	OLB
15	OLC
16	OLD

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

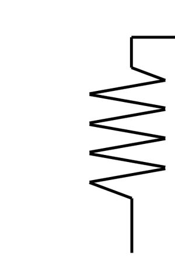


LOAD RESISTOR INSTALLATION DETAIL

(install resistor 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: 05-2088T4
DESIGNED: February 2019
SEALED: 7/24/2019
REVISED: N/A

Electrical Detail - Temp Design 4 (TMP Phase IV)
Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:

750 N.Greenfield Pkwy,Garner,NC 27529

SR 3015 (Airport Boulevard) at SR 1641 (Slater Road)

Division 5 Wake County Morrisville

PLAN DATE: May 2019	REVIEWED BY:
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 430320FAA2654C3... 8/1/2019 DATE

SIG. INVENTORY NO. 05-2088T4

PROJECT REFERENCE NO.	SHEET NO.
I-5700	Sig. 5.2

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 'OTHER/ECONOLITE'

```
TMG VEH OVLP...[A] TYPE:OTHER/ECONOLITE
  PHASES 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
INCLUDED . X . . . . . . . . . . . . . .
PROTECT  . . . . . . . . . . . . . . . .
PED PRTC . . . . . . . . . . . . . . . .
NOT OVLP . . . . . . . . . . . . . . . .
FLSH GRN . 1 . . . . . . . . . . . . . .
LAG X PH . . . . . . . . . . . . . . . .
LAG 2 PH . . . . . . . . . . . . . . . .

LAG GRN 0.0 YEL 0.0 RED 0.0 ADV GRN 0.0
```

Toggle Twice

OVERLAP C

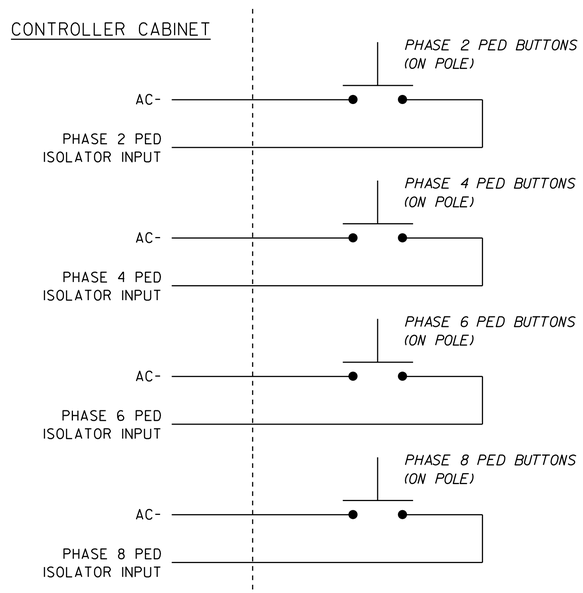
Select TMG VEH OVLP [C] and 'PPLT FYA'

```
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

PEDESTRIAN PUSH BUTTON WIRING DETAIL

(wire push buttons as shown)



ECONOLITE ASC/3-2070 SPECIAL MMU PROGRAMMING

(program controller as shown)

1. From Main Menu select [1. CONFIGURATION]
2. From CONFIGURATION Submenu select [4. PORT 1 (SDLC)]
3. From PORT 1 (SDLC) Submenu select [2. MMU PROGRAM]

CAUTION!

Set intersection to Flash before attempting to enter or change any MMU programming data.

This programming and that of the MMU programming card must match exactly. If they do not, the intersection will be placed into Flash.

```
MMU PROGRAM [    MANUAL]

      CH  6 5 4 3 2 1 0 9 8 7 6 5 4 3 2
       1  . . . . . . . . . . . . . . . .
       2  . X . X . X . X . . X X . . . .
       3  . . . . . . . . . . . . . . . .
       4  . . . . X . X . X . . . . . . .
       5  . X . X . . . X . . . . . . . .
       6  . X . X . X . X . . . . . . . .
       7  . . . . . . . . . . . . . . . .
       8  . . . . X . X . . . . . . . . .
       9  . X . X . X . . . . . . . . . .
      10  . . . . X . . . . . . . . . . .
      11  . X . X . . . . . . . . . . . .
      12  . . . . . . . . . . . . . . . .
      13  . X . . . . . . . . . . . . . .
      14  . . . . . . . . . . . . . . . .
      15  . . . . . . . . . . . . . . . .
```

END 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: 05-2088T4
DESIGNED: February 2019
SEALED: 7/24/2019
REVISED: N/A

Electrical Detail - Temp Design 4 (TMP Phase IV)
Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:

Transportation Mobility and Safety Division
NC DEPARTMENT OF TRANSPORTATION
Traffic Engineering & Signal Management Section

750 N.Greenfield Pkwy,Garner,NC 27529

SR 3015 (Airport Boulevard)
at
SR 1641 (Slater Road)

Division 5 | Wake County | Morrisville

PLAN DATE: May 2019	REVIEWED BY:
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

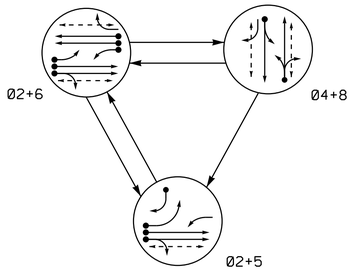
DocuSigned by: Ryan W. Hough 8/1/2019
430320FAA2054C3 DATE

SIG. INVENTORY NO. 05-2088T4

29-JUL-2019 06:48
#05088_sht_elec_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
I-5700	Sig 6.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

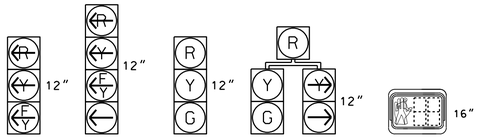
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 02+5	02+6	04+8	FLASH
21, 22	G	G	R	Y
41	R	R	G	R
42	R/→	R	G	R
51	←/F/Y	~~F/Y~~	~~R~~	~~Y~~
61	~~F/Y~~	~~F/Y~~	~~R~~	~~Y~~
62, 63	R	G	R	Y
81, 82	R	R	G	R
P21, P22	W	W	DW	DRK
P41, P42	DW	DW	W	DRK
P61, P62	DW	W	DW	DRK
P81, P82	DW	DW	W	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



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

LOOP & DETECTOR INSTALLATION CHART

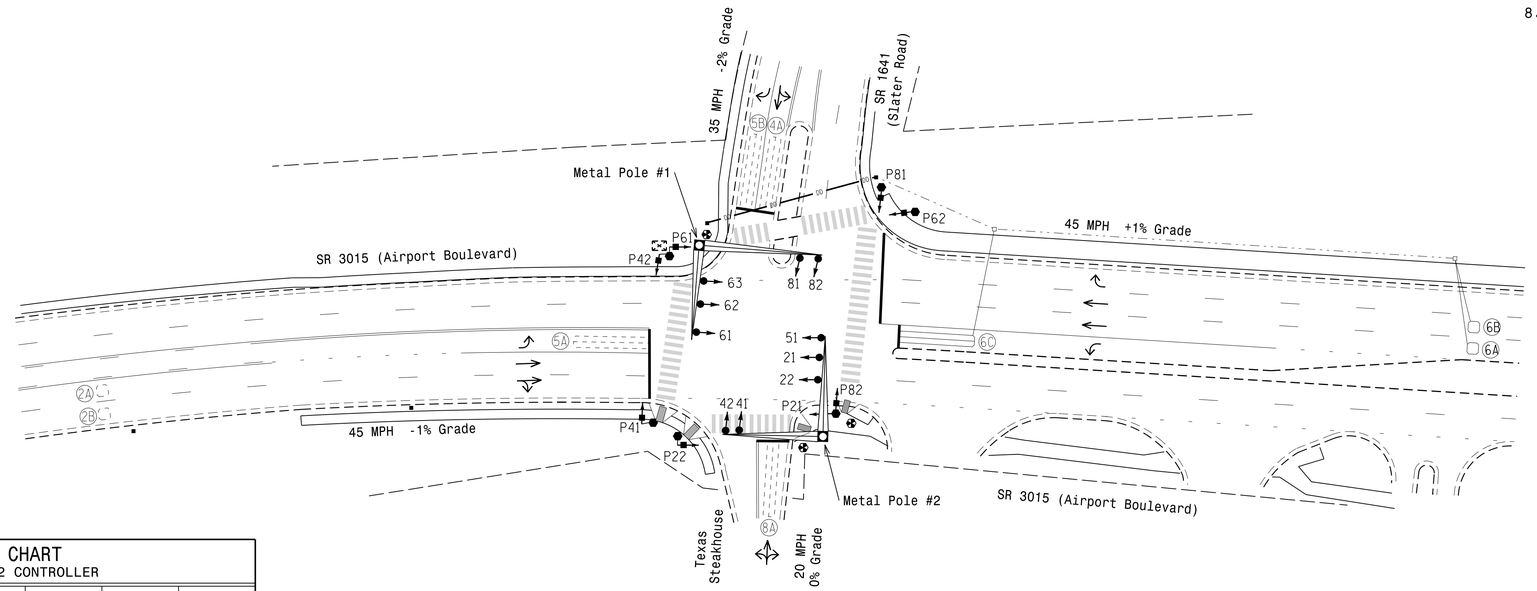
ASC/3-2070EN2 CONTROLLER w/ TS-2 CABINET

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

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. 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. Cary signal system data:
   Fiber channel #: 26.



TIMING CHART

ASC/3-2070EN2 CONTROLLER

PHASE	02	04	05	06	08
MINIMUM GREEN *	12 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.
VEHICLE EXT. *	6.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.6 SEC.	4.0 SEC.	3.0 SEC.	4.6 SEC.	3.0 SEC.
RED CLEARANCE	1.8 SEC.	2.2 SEC.	3.4 SEC.	1.8 SEC.	3.5 SEC.
MAX. 1 *	90 SEC.	30 SEC.	15 SEC.	90 SEC.	30 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE
LOCK DET.	ON	OFF	OFF	ON	OFF
WALK *	7 SEC.	7 SEC.	- SEC.	7 SEC.	7 SEC.
PED. CLEAR	9 SEC.	14 SEC.	- SEC.	17 SEC.	26 SEC.
VOLUME DENSITY	ON	OFF	OFF	ON	OFF
ACTUATION B4 ADD *	0 VEH.	- VEH.	- VEH.	0 VEH.	- VEH.
SEC. PER ACTUATION *	1.5 SEC.	- SEC.	- SEC.	1.5 SEC.	- SEC.
MAX. INITIAL *	34 SEC.	- SEC.	- SEC.	34 SEC.	- SEC.
TIME B4 REDUCTION *	15 SEC.	- SEC.	- SEC.	15 SEC.	- SEC.
TIME TO REDUCE *	30 SEC.	- SEC.	- SEC.	30 SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	- SEC.	- SEC.	3.0 SEC.	- SEC.
DUAL ENTRY	OFF	ON	OFF	OFF	ON
SIMULTANEOUS GAP	ON	ON	ON	ON	ON

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

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
▯↓	Pedestrian Signal Head With Push Button & Sign	■↓
○	Signal Pole with Guy	●
○⤵	Signal Pole with Sidewalk Guy	●⤵
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⛶
□	Junction Box	■
·-·-·	2-in Underground Conduit	·-·-·
N/A	Right of Way	- - - - -
→	Directional Arrow	→
—DD—	Directional Drill	N/A
⊙	Metal Pole with Mastarm	⊙
⊛	Type I Pushbutton Post	☢
⬡	Type II Signal Pedestal	⬢
N/A	Curb Ramp	◢◣

Signal Upgrade - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 3015 (Airport Boulevard)
at
SR 1641 (Slater Road)

Division 5 | Wake County | Morrisville

PLAN DATE: February 2019 | REVIEWED BY:
PREPARED BY: J.A. Lohr | REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 026486 ROBERT J. ZIEMBA
DocuSigned by: 7/24/2019
SIG. INVENTORY NO. 05-2088

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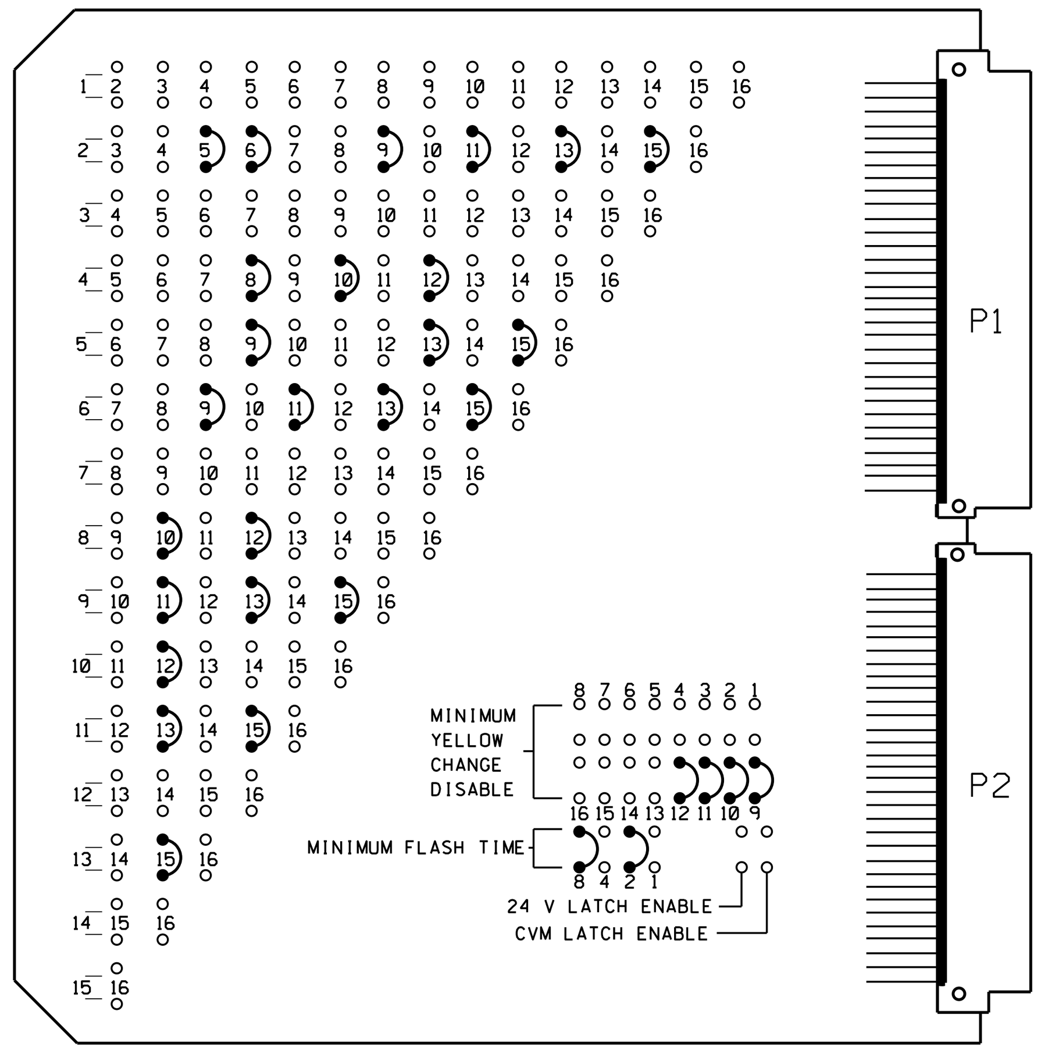
jalohr

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	ENABLE
9	ENABLE
10	ENABLE
11	ENABLE
12	ENABLE
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 1, 3, 7, 14 and 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 Walk 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 for all phases.
6. Program phases 2 and 6 for volume density operation.
7. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
8. Program detector call delay and extension timing on the controller, unless otherwise specified.
9. Set all detector card unit channels to "presence" mode.
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	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	42	51★	62,63	NU	81,82	P21, P22	P41, P42	P61, P62	P81, P82	61★	NU	51★	NU
RED		2R		4R		✻	6R		8R								
YELLOW		2Y		4Y			6Y		8Y								
GREEN		2G		4G			6G		8G								
RED ARROW														13R		15R	
YELLOW ARROW					5Y									13Y		15Y	
FLASHING YELLOW ARROW														13G		15G	
GREEN ARROW					5G	5G											
(Don't Walk)										9R	10R	11R	12R				
(Walk)										9G	10G	11G	12G				

NU = Not Used

✻ Denotes install load resistor. See Load Resistor Installation Detail below.

★ 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 Ø4	CH1 L1 Ø2 ✻✻	CH1 L7 Ø6 ✻✻	CH1 L5 Ø5	SLOT EMPTY	CH1 L9 Ø6 ✻	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L5 Ø5	CH2 L2 Ø2 ✻✻	CH2 L8 Ø6 ✻✻	CH2 L6 Ø2 ✻		CH2 L10 Ø8				

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
5B	L4A,L4B
5A	L5A,L5B
	L6A,L6B
6A	L7A,L7B
6B	L8A,L8B
6C	L9A,L9B
8A	L10A,L10B
NU	L11A,L11B
NU	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

ADD JUMPERS FROM: L5A TO L6A, AND L5B TO L6B

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	Ø5	DELAY	15
5	Ø5	DELAY	15
✻ 6	Ø2	DELAY	3
✻✻ 7	Ø6		
✻✻ 8	Ø6		
✻ 9	Ø6	DELAY	3
10	Ø8	DELAY	5
11			
12			
13			
14			
15			
16			

✻ Detector Type - G
✻✻ Detector Type - N

NOTE

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

EQUIPMENT INFORMATION

CONTROLLER..............2070EN2
CABINET TS-2
SOFTWARE ....ECONOLITE ASC/3-2070
CABINET MOUNT...........BASE
LOADBAY POSITIONS.......16
LOAD SWITCHES USED......2,4,5,6,8,9,10,11,12,13,15
PHASES USED.............2,2PED,4,4PED,5,6,6PED,8,8PED
OLA.....................✻
OLB.....................NOT USED
OLC.....................✻
OLD.....................NOT USED

✻ See overlap programming detail on sheet 2

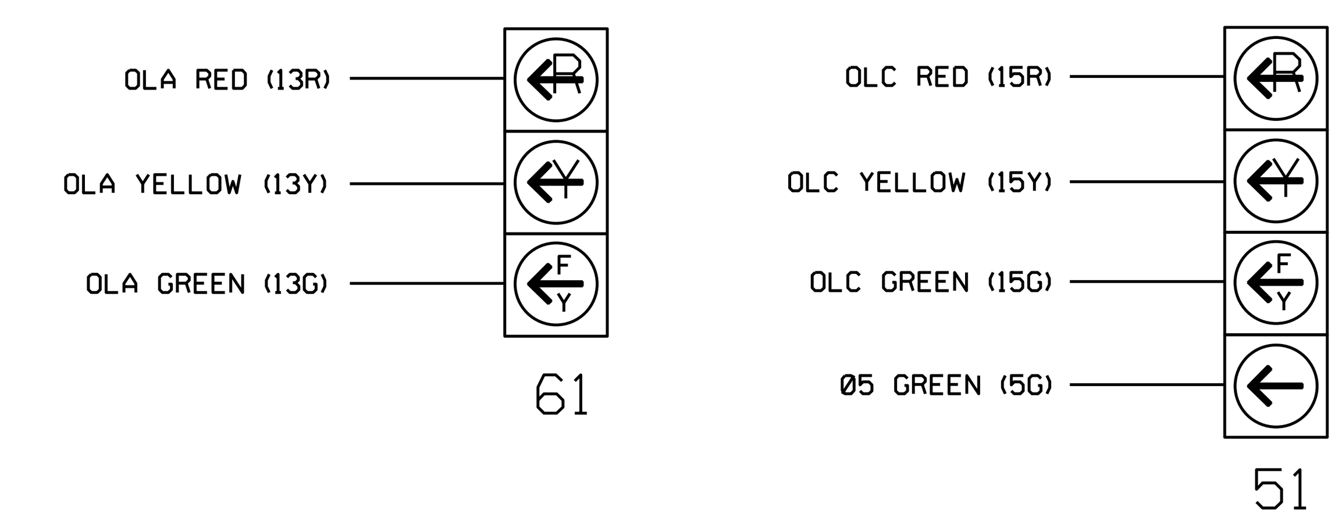
LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	Ø1
2	Ø2
3	Ø3
4	Ø4
5	Ø5
6	Ø6
7	Ø7
8	Ø8
9	Ø2 PED
10	Ø4 PED
11	Ø6 PED
12	Ø8 PED
13	OLA
14	OLB
15	OLC
16	OLD

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

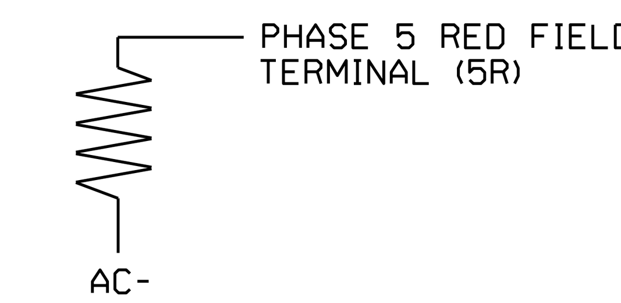


LOAD RESISTOR INSTALLATION DETAIL

(install resistor 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: 05-2088
DESIGNED: February 2019
SEALED: 7/24/2019
REVISED: N/A

Electrical Detail - Final Design - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 3015 (Airport Boulevard) at SR 1641 (Slater Road)

Division 5 Wake County Morrisville

PLAN DATE: May 2019 REVIEWED BY:
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 8/1/2019
430320FAA2654C3...
DATE

SIG. INVENTORY NO. 05-2088

29-JUL-2019 07:47
.*052088_sm_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
I-5700	Sig. 6.2

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 'OTHER/ECONOLITE'

```
TMG VEH OVLP...[A] TYPE:[OTHER/ECONOLITE]
  PHASES 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
INCLUDED . X . . . . . . . . . . . . . .
PROTECT  . . . . . . . . . . . . . . . .
PED PRTC . . . . . . . . . . . . . . . .
NOT OVLP . . . . . . . . . . . . . . . .
FLSH GRN . 1 . . . . . . . . . . . . . .
LAG X PH . . . . . . . . . . . . . . . .
LAG 2 PH . . . . . . . . . . . . . . . .

LAG GRN 0.0 YEL 0.0 RED 0.0 ADV GRN 0.0
```

Toggle Twice

OVERLAP C

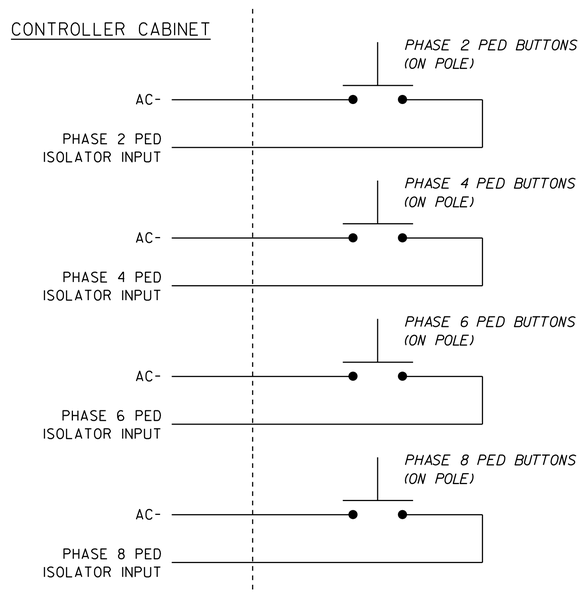
Select TMG VEH OVLP [C] and 'PPLT FYA'

```
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

PEDESTRIAN PUSH BUTTON WIRING DETAIL

(wire push buttons as shown)



ECONOLITE ASC/3-2070 SPECIAL MMU PROGRAMMING

(program controller as shown)

1. From Main Menu select [1. CONFIGURATION]
2. From CONFIGURATION Submenu select [4. PORT 1 (SDLC)]
3. From PORT 1 (SDLC) Submenu select [2. MMU PROGRAM]

CAUTION!

Set intersection to Flash before attempting to enter or change any MMU programming data.

This programming and that of the MMU programming card must match exactly. If they do not, the intersection will be placed into Flash.

```
MMU PROGRAM [    MANUAL]

      CH  6 5 4 3 2 1 0 9 8 7 6 5 4 3 2
       1  . . . . . . . . . . . . . . . .
       2  . X . X . X . X . . X X . . . .
       3  . . . . . . . . . . . . . . . .
       4  . . . . X . X . X . . . . . . .
       5  . X . X . . . X . . . . . . . .
       6  . X . X . X . X . . . . . . . .
       7  . . . . . . . . . . . . . . . .
       8  . . . . X . X . . . . . . . . .
       9  . X . X . X . . . . . . . . . .
      10  . . . . X . . . . . . . . . . .
      11  . X . X . . . . . . . . . . . .
      12  . . . . . . . . . . . . . . . .
      13  . X . . . . . . . . . . . . . .
      14  . . . . . . . . . . . . . . . .
      15  . . . . . . . . . . . . . . . .
```

END 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: 05-2088
DESIGNED: February 2019
SEALED: 7/24/2019
REVISED: N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 3015 (Airport Boulevard) at SR 1641 (Slater Road)

Prepared in the Offices of:

Transportation Mobility and Safety Division
NC DEPARTMENT OF TRANSPORTATION
Traffic Engineering & Signal Management Section

750 N.Greenfield Pkwy,Garner,NC 27529

Division 5 | Wake County | Morrisville

PLAN DATE: May 2019	REVIEWED BY:
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 430320FAA2654C3 — 8/1/2019 DATE

SIG. INVENTORY NO. 05-2088

29-JUL-2019 06:49
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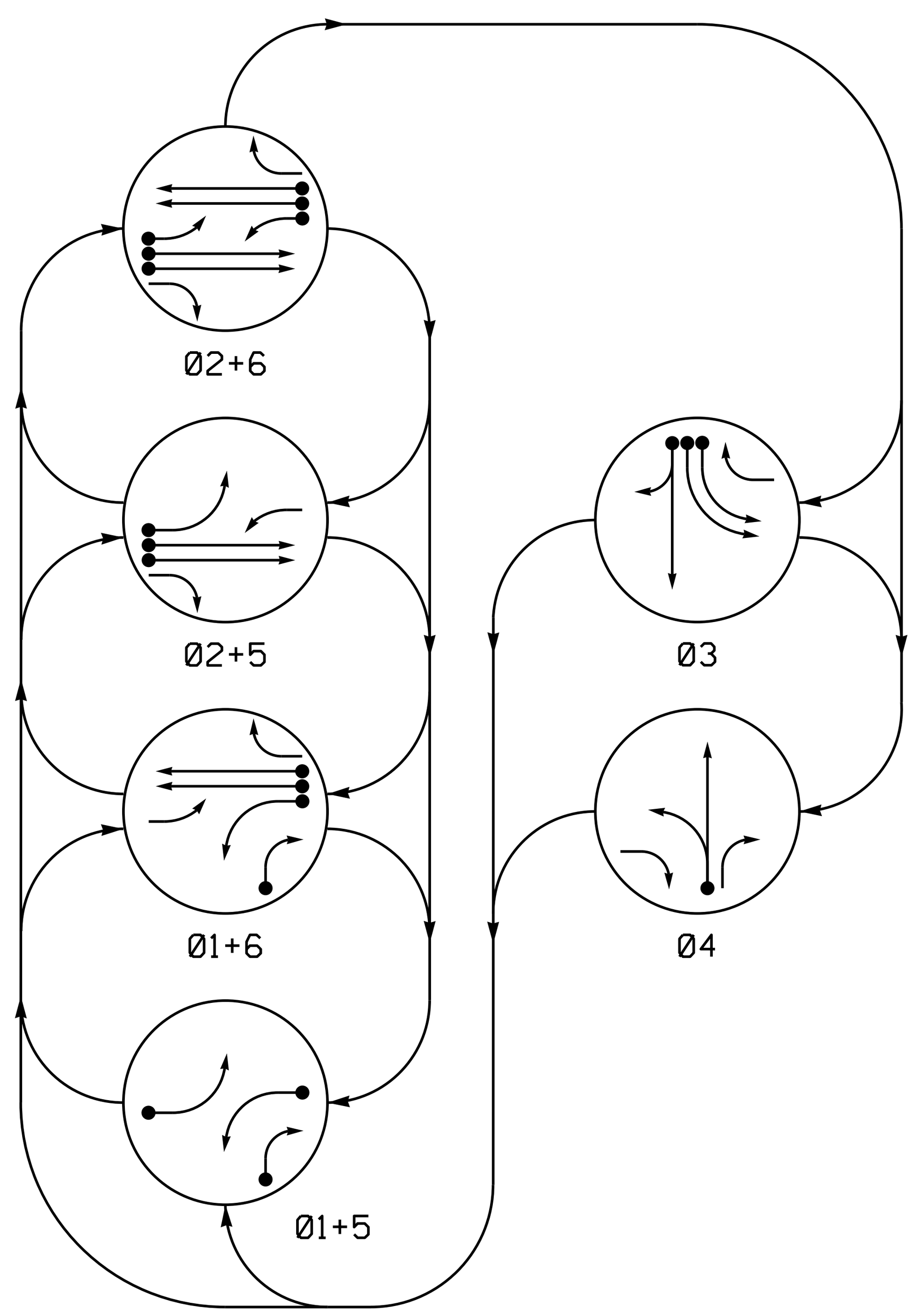
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
I-5700	Sig. 7.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

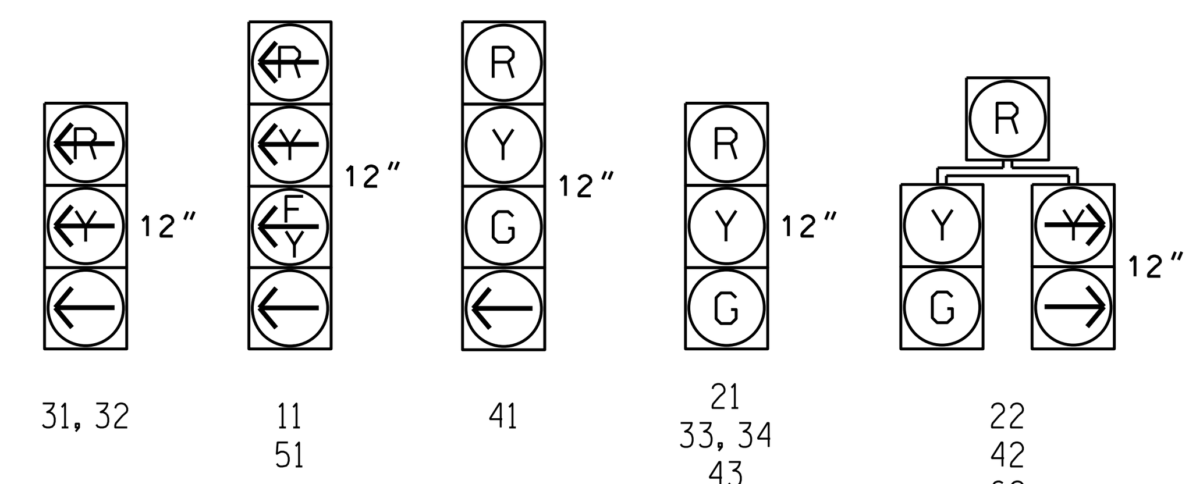
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3	Ø4	FLASH
11	←	←	←F/Y	←F/Y	←R	←R	←Y
21	R	R	G	G	R	R	Y
22	R	R	G	G	R	R/→	Y
31, 32	←R	←R	←R	←R	←	←R	←R
33, 34	R	R	R	R	G	R	R
41	R	R	R	R	R	G/←	R
42	R/→	R/→	R	R	R	G	R
43	R	R	R	R	R	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

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR INSTALLATION CHART

ASC/3-2070EN2 CONTROLLER w/ TS-2 CABINET

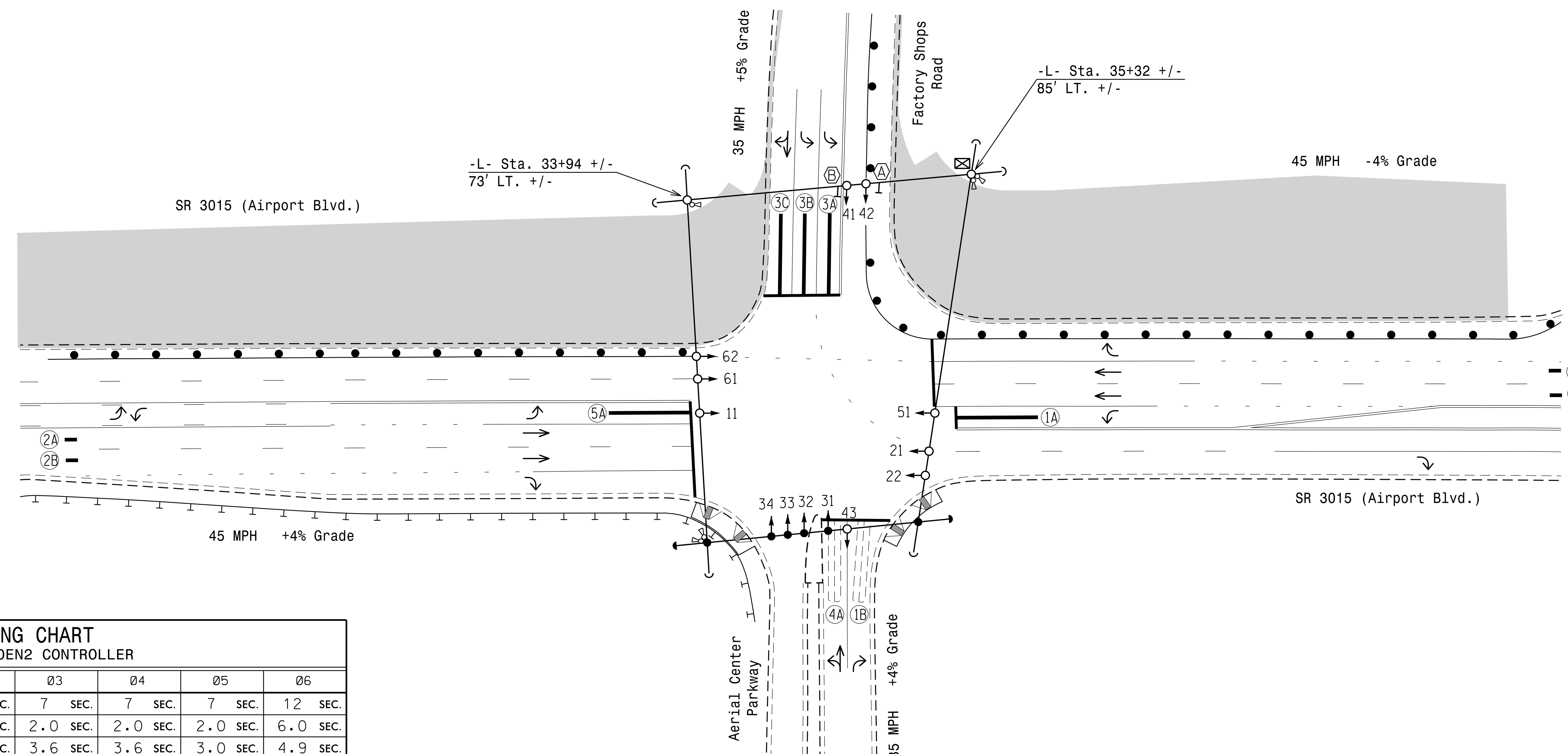
INDUCTIVE LOOPS: LOOP / ZONE NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	DETECTOR UNITS: NEMA PHASE	NEW	EXISTING	TIMING: FEATURE	TIMING: TIME (sec)	ADDED INITIAL	DET. TYPE
1A*	6X40	0	*	X	-	1	*	-	DELAY	15	-	S
						6	*	-	DELAY	3	-	G
1B	6X40	0	2-4-2	-	X	1	X	-	DELAY	15	-	S
2A*	6X6	300	*	X	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

* Video detection zone.

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. Phase 1 and/or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Set all detector units to presence mode.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
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 #: 26.
9. This intersection features a video detection system. Shown locations of detectors are conceptual only. Refer to the manufacturer's guidelines for optimal detector placement.



LEGEND

Item	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		
Right of Way	N/A	
Directional Arrow		
Type II Signal Pedestal		
Guardrail	N/A	
Curb Ramp	N/A	
Out of Pavement Detector		
Video Detection Area		
Construction Zone Drums		
Construction Zone		
Right Arrow "ONLY" Sign (R3-5R)	A	A
Combined Through and Left Arrow Sign (R3-6L)	B	B

TIMING CHART

ASC/3-2070EN2 CONTROLLER

PHASE	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6
MINIMUM GREEN *	7 SEC.	12 SEC.	7 SEC.	7 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.9 SEC.	3.6 SEC.	3.6 SEC.	3.0 SEC.	4.9 SEC.
RED CLEARANCE	2.9 SEC.	1.7 SEC.	2.6 SEC.	1.8 SEC.	2.9 SEC.	1.7 SEC.
MAX. 1 *	20 SEC.	120 SEC.	30 SEC.	20 SEC.	15 SEC.	120 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL
LOCK DET.	OFF	ON	OFF	OFF	OFF	ON
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
PED. CLEAR	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	OFF	ON
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	1.5 SEC.	– SEC.	– SEC.	– SEC.	1.5 SEC.
MAX. INITIAL *	– SEC.	34 SEC.	– SEC.	– SEC.	– SEC.	34 SEC.
TIME B4 REDUCTION *	– SEC.	15 SEC.	– SEC.	– SEC.	– SEC.	15 SEC.
TIME TO REDUCE *	– SEC.	45 SEC.	– SEC.	– SEC.	– SEC.	45 SEC.
MINIMUM GAP	– SEC.	3.0 SEC.	– SEC.	– SEC.	– SEC.	3.0 SEC.
DUAL ENTRY	OFF	OFF	OFF	OFF	OFF	OFF
SIMULTANEOUS GAP	ON	ON	ON	ON	ON	ON

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

Signal Upgrade - Temporary Design 1 (TMP Phase I, Step A)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 3015 (Airport Blvd.)
at
Factory Shops Road/
Aerial Center Parkway

Division 5 Wake County Morrisville

PLAN DATE:	March 2019	REVIEWED BY:
PREPARED BY:	J.A. Lohr	REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 40
1"=40'

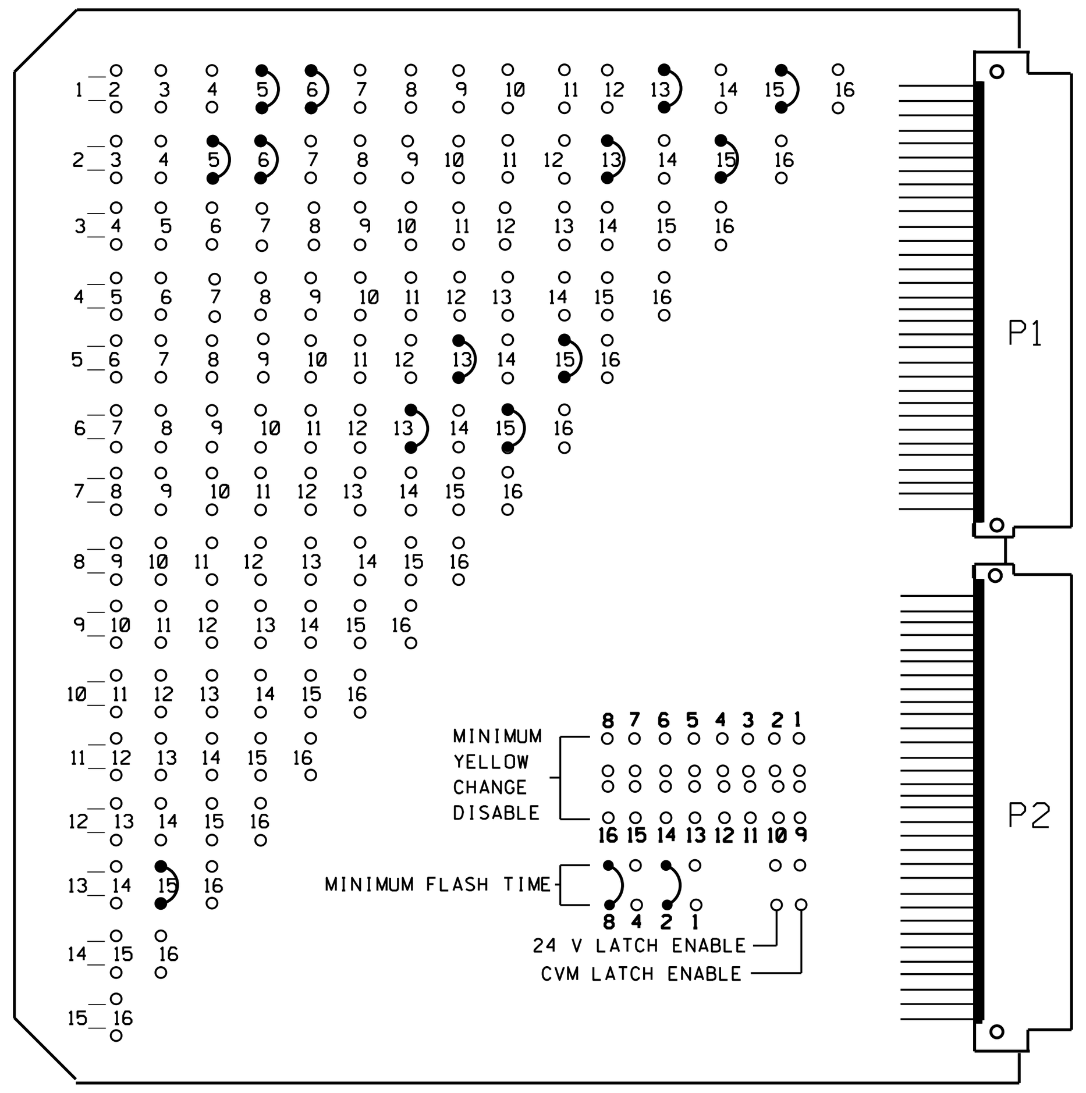
SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 026486 ROBERT J. ZIEMBA

DocuSigned by:
7/24/2019
DATE

SIG. INVENTORY NO. 05-1726TI

EDI MODEL MMU2-16LEip MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown below)



MMU PROGRAMMING CARD

FIELD CHECK ENABLE DUAL IND ENABLE RED FAIL ENABLE	
CHANNEL NUMBER	ENABLE/ DISABLE
1	ENABLE
2	ENABLE
3	ENABLE
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.

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	31,32	33,34	62	22	41	42,43	51★	61,62	NU	NU	NU	NU	NU	NU	11★	NU	51★	NU
RED		✱	2R		3R			4R	4R	✱	6R										
YELLOW			2Y		3Y			4Y	4Y	✱	6Y										
GREEN			2G		3G			4G	4G		6G										
RED ARROW				3R														13R		15R	
YELLOW ARROW		1Y		3Y		3Y	4Y											13Y		15Y	
FLASHING YELLOW ARROW																		13G		15G	
GREEN ARROW	1G	1G		3G		3G	4G	4G		5G											
✋																					
🚶																					

NU = Not Used

✱ Denotes install load resistor. See Load Resistor Installation Detail on sheet 2.

★ 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 Ø 1	CH1 L1 Ø 1	SLOT EMPTY	CH1 L5 NOT USED	SLOT EMPTY	CH1 L9 Ø 5	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L4 NOT USED	CH2 L2 Ø 6 ✱		CH2 L6 Ø 4		CH2 L10 Ø 2 ✱				

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
	4A	L6A,L6B
	NU	L7A,L7B
	NU	L8A,L8B
ADD JUMPERS FROM: L9A TO L10A, AND L9B TO L10B	5A	L9A,L9B
		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	Ø 1	DELAY	15
✱ 2	Ø 6	DELAY	3
3	Ø 1	DELAY	15
4			
5			
6	Ø 4		
7			
8			
9	Ø 5	DELAY	15
✱ 10	Ø 2	DELAY	3
11			
12			
13			
14			
15			
16			

✱ Detector Type - G (remove delay from existing detector card)

SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans for zones 1A, 2A, 2B, 3A, 3B, 3C, 5A, 6A, and 6B.

For Detection Zones 1A and 5A, the equipment placement and slots reserved for wired inputs are typical for a NCDOT installation.

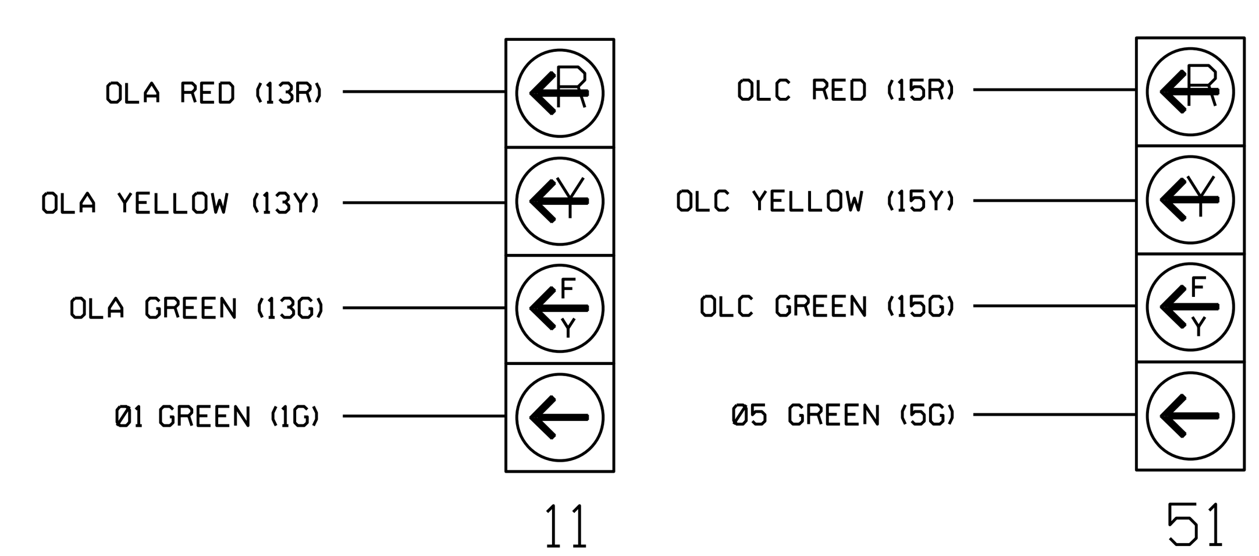
EQUIPMENT INFORMATION

CONTROLLER..............2070EN2
CABINET NC-8 TS-2
SOFTWARE ....ECONOLITE ASC/3-2070
CABINET MOUNT...........BASE
LOADBAY POSITIONS.......16
LOAD SWITCHES USED......1,2,3,4,5,6,13,15
PHASES USED.............1,2,3,4,5,6
OLA.....................✱
OLB.....................NOT USED
OLC.....................✱
OLD.....................NOT USED

✱ SEE OVERLAP PROGRAMMING DETAIL ON SHEET 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1726T1
DESIGNED: March 2019
SEALED: 7/24/2019
REVISED: N/A

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	Ø 1
2	Ø 2
3	Ø 3
4	Ø 4
5	Ø 5
6	Ø 6
7	Ø 7
8	Ø 8
9	Ø 2 PED
10	Ø 4 PED
11	Ø 6 PED
12	Ø 8 PED
13	OLA
14	OLB
15	OLC
16	OLD

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 7,8,9,10,11,12,14, and 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 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 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 for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

Electrical Detail - Temp 1 (TMP Phase I, Step A)
Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared In the Offices of: Transportation Mobility and Safety Division, ITS & Signals Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

SR 3015 (Airport Blvd.)
at
Factory Shops Road/
Aerial Center Parkway

Division 5 Wake County Morrisville

PLAN DATE: May 2019	REVIEWED BY:
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 430320FAA2654C3...
8/1/2019
DATE

SIG. INVENTORY NO. 05-1726T1

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sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
I-5700	Sig 7.2

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
```

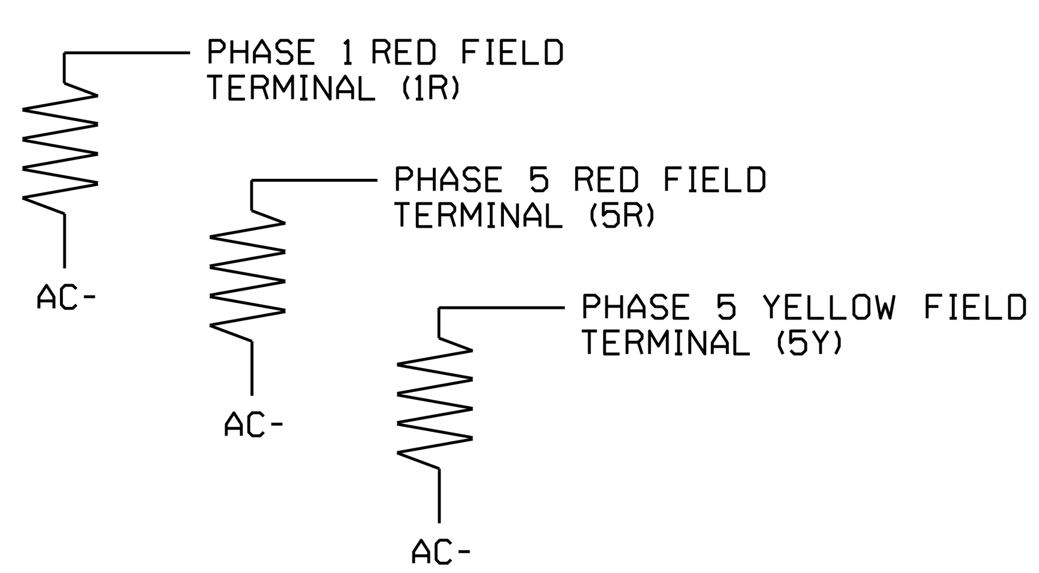
END PROGRAMMING

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)

ACCEPTABLE VALUES

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



ECONOLITE ASC/3-2070 SPECIAL MMU PROGRAMMING

(program controller as shown)

1. From Main Menu select [1. CONFIGURATION]
2. From CONFIGURATION Submenu select [4. PORT 1 (SDLC)]
3. From PORT 1 (SDLC) Submenu select [2. MMU PROGRAM]

CAUTION!

Set intersection to Flash before attempting to enter or change any MMU programming data.

This programming and that of the MMU programming card must match exactly. If they do not, the intersection will be placed into Flash.

MMU PROGRAM [MANUAL]

CH	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2
1	.	X	.	X	.	.	.	.	.	.	X	X	.	.	.
2	.	X	.	X	.	.	.	.	.	.	X	X	.	.	
3	.	.	.	.	.	.	.	.	.	.	.	.	.		
4	.	.	.	.	.	.	.	.	.	.	.	.			
5	.	X	.	X	.	.	.	.	.	.	.				
6	.	X	.	X	.	.	.	.	.	.					
7	.	.	.	.	.	.	.	.	.						
8	.	.	.	.	.	.	.	.							
9	.	.	.	.	.	.	.								
10	.	.	.	.	.	.									
11	.	.	.	.	.										
12	.	.	.	.											
13	.	X	.												
14	.	.													
15	.														

END PROGRAMMING

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1726T1
DESIGNED: March 2019
SEALED: 7/24/2019
REVISED: N/A

Electrical Detail - Temp 1 (TMP Phase I, Step A)
Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

SR 3015 (Airport Blvd.)
at
Factory Shops Road/
Aerial Center Parkway

Division 5 | Wake County | Morrisville

PLAN DATE: May 2019	REVIEWED BY:
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by:
Ryan W. Hough
430320FAA2654C3
8/1/2019
DATE

SIG. INVENTORY NO. 05-1726T1

25-JUL-2019 10:20
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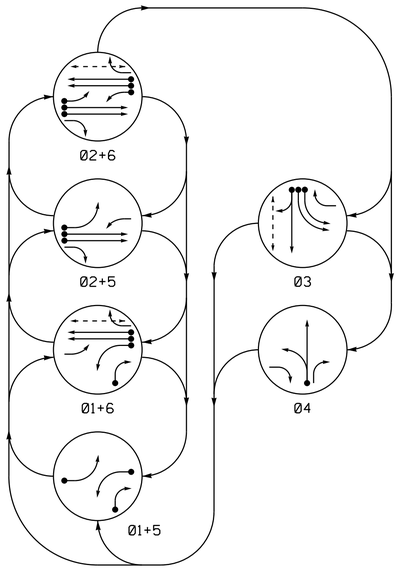
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
I-5700	Sig. 8.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

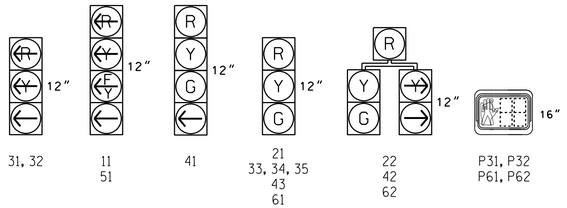
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3	Ø4	FLASH
11	←—	←—	F Y	F Y	~~R~~	~~R~~	~~Y~~
21	R	R	G	G	R	R	Y
22	R	R	G	G	R	R ←	Y
31, 32	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~ ←	~~R~~	~~R~~
33, 34, 35	R	R	R	R	G	R	R
41	R	R	R	R	R	G ←	R
42	R / ←	R / ←	R	R	R	G	R
43	R	R	R	R	R	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
P31, P32	DW	DW	DW	DW	W	DW	DRK
P61, P62	DW	W	DW	W	DW	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR INSTALLATION CHART

ASC/3-2070EN2 CONTROLLER w/ TS-2 CABINET

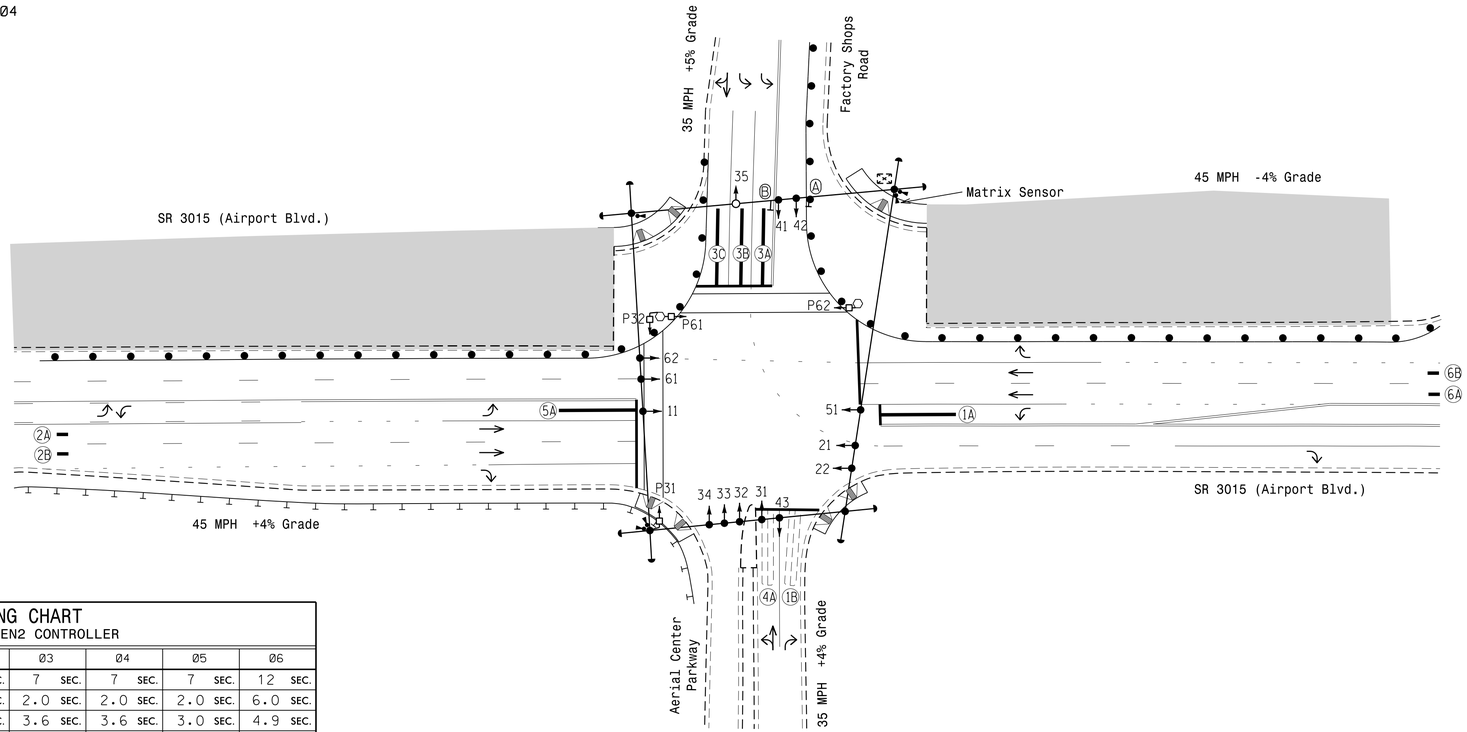
INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME (sec)	ADDED INITIAL	DET. TYPE
1A*	6X40	0	*	-	X	1	-	*	DELAY	15	-	S
						6	-	*	DELAY	3	-	G
1B	6X40	0	2-4-2	-	X	1	-	X	DELAY	15	-	S
2A*	6X6	300	*	-	X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

* Video detection zone.

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. Phase 1 and/or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Set all detector units to presence mode.
6. 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. Cary signal system data:
   Fiber Channel #: 26.
10. This intersection features a video detection system. Shown locations of detectors are conceptual only. Refer to the manufacturer's guidelines for optimal detector placement.



TIMING CHART

ASC/3-2070EN2 CONTROLLER

PHASE	01	02	03	04	05	06
MINIMUM GREEN *	7 SEC.	12 SEC.	7 SEC.	7 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.9 SEC.	3.6 SEC.	3.6 SEC.	3.0 SEC.	4.9 SEC.
RED CLEARANCE	2.9 SEC.	2.0 SEC.	2.7 SEC.	2.3 SEC.	3.2 SEC.	2.0 SEC.
MAX. 1 *	20 SEC.	120 SEC.	30 SEC.	20 SEC.	15 SEC.	120 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL
LOCK DET.	OFF	ON	OFF	OFF	OFF	ON
WALK *	– SEC.	– SEC.	7 SEC.	– SEC.	– SEC.	7 SEC.
PED. CLEAR	– SEC.	– SEC.	20 SEC.	– SEC.	– SEC.	18 SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	OFF	ON
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	1.5 SEC.	– SEC.	– SEC.	– SEC.	1.5 SEC.
MAX. INITIAL *	– SEC.	34 SEC.	– SEC.	– SEC.	– SEC.	34 SEC.
TIME B4 REDUCTION *	– SEC.	15 SEC.	– SEC.	– SEC.	– SEC.	15 SEC.
TIME TO REDUCE *	– SEC.	45 SEC.	– SEC.	– SEC.	– SEC.	45 SEC.
MINIMUM GAP	– SEC.	3.0 SEC.	– SEC.	– SEC.	– SEC.	3.0 SEC.
DUAL ENTRY	OFF	OFF	OFF	OFF	OFF	OFF
SIMULTANEOUS GAP	ON	ON	ON	ON	ON	ON

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

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
⊡↓	Pedestrian Signal Head With Push Button & Sign	■↓
○	Signal Pole with Guy	●●
○	Signal Pole with Sidewalk Guy	●●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊡
□	Junction Box	■
- - - - -	2-in Underground Conduit	- - - - -
N/A	Right of Way	- - - - -
→	Directional Arrow	→
N/A	Guardrail	⊤⊤
N/A	Curb Ramp	◢
○◁	Out of Pavement Detector	●◀
▬	Video Detection Area	▬
●●	Construction Zone Drums	●●
▒	Construction Zone	▒
⬡	Type II Signal Pedestal	⬢
Ⓐ	Right Arrow "ONLY" Sign (R3-5R)	Ⓐ
Ⓑ	Combined Through and Left Arrow Sign (R3-6L)	Ⓑ

Signal Upgrade - Temporary Design 2 (TMP Phase I, Step B)

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 3015 (Airport Blvd.)
at
Factory Shops Road/
Aerial Center Parkway

Division 5 Wake County Morrisville

PLAN DATE: March 2019 REVIEWED BY:

PREPARED BY: J.A. Lohr REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

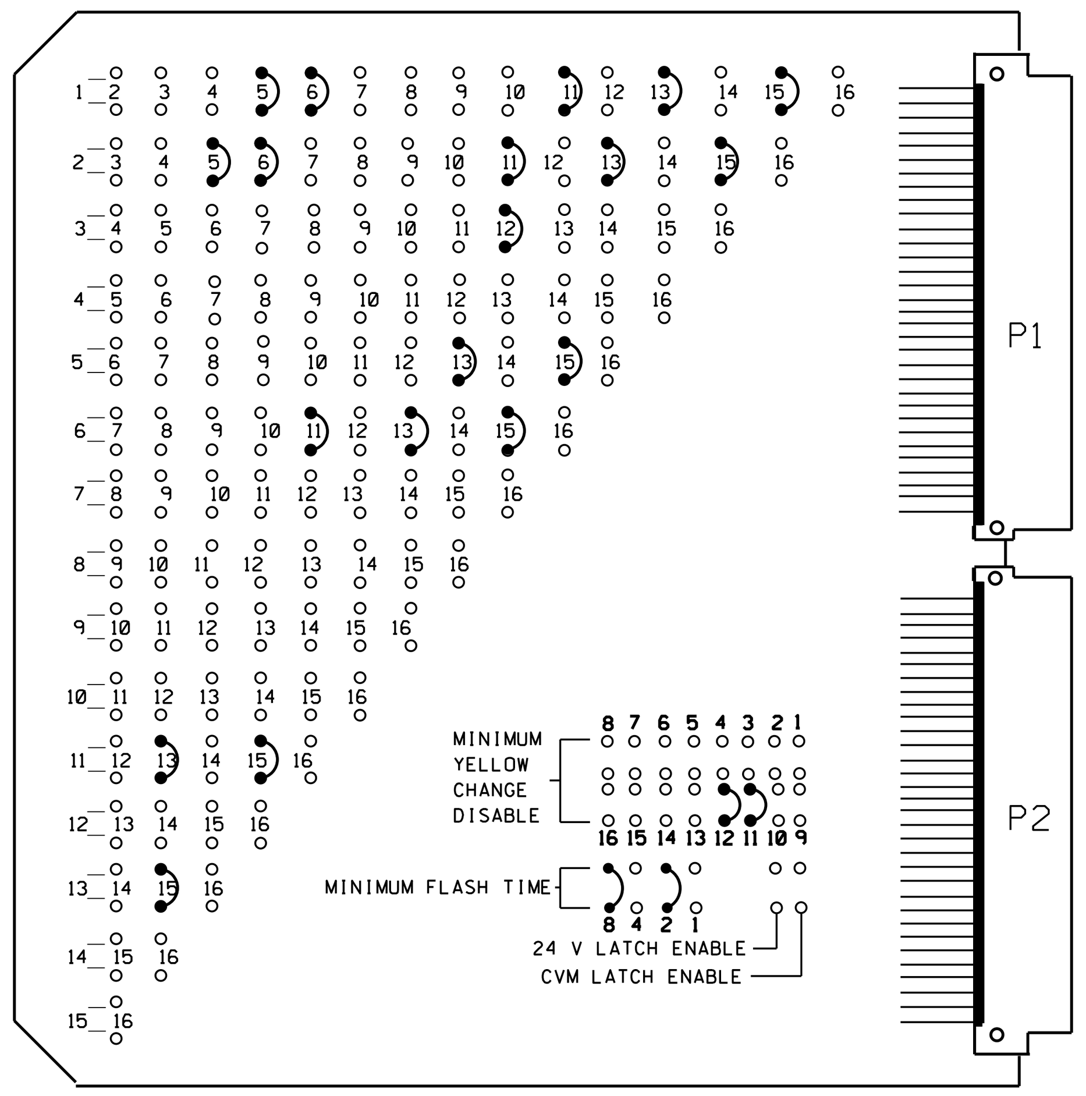
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA

DocuSigned by: 7/24/2019 DATE

SIG. INVENTORY NO. 05-172612

EDI MODEL MMU2-16LEip MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown below)



MMU PROGRAMMING CARD

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

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	31,32	33,34 35	62	22	41	42,43	51★	61,62	NU	NU	NU	NU	P61, P62	P31, P32	11★	NU	51★	NU
RED		✳	2R		3R			4R	4R	✳	6R										
YELLOW			2Y		3Y			4Y	4Y	✳	6Y										
GREEN			2G		3G			4G	4G		6G										
RED ARROW				3R														13R		15R	
YELLOW ARROW		1Y		3Y		3Y	4Y											13Y		15Y	
FLASHING YELLOW ARROW																		13G		15G	
GREEN ARROW	1G	1G		3G		3G	4G	4G		5G											
(hand symbol)																11R	12R				
(pedestrian symbol)																11G	12G				

NU = Not Used

✳ Denotes install load resistor. See Load Resistor Installation Detail on sheet 3.

★ 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 Ø 1	CH1 L1 Ø 1	SLOT EMPTY	CH1 L5 NOT USED	SLOT EMPTY	CH1 L9 Ø 5	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L4 NOT USED	CH2 L2 Ø 6 ✳		CH2 L6 Ø 4		CH2 L10 Ø 2 ✳					

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
	4A	L6A,L6B
	NU	L7A,L7B
	NU	L8A,L8B
ADD JUMPERS FROM: L9A TO L10A, AND L9B TO L10B	5A	L9A,L9B
		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	Ø 1	DELAY	15
✳ 2	Ø 6	DELAY	3
3	Ø 1	DELAY	15
4			
5			
6	Ø 4		
7			
8			
9	Ø 5	DELAY	15
✳ 10	Ø 2	DELAY	3
11			
12			
13			
14			
15			
16			

✳ Detector Type - G (remove delay from existing detector card)

SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans for zones 1A, 2A, 2B, 3A, 3B, 3C, 5A, 6A, and 6B.

For Detection Zones 1A and 5A, the equipment placement and slots reserved for wired inputs are typical for a NCDOT installation.

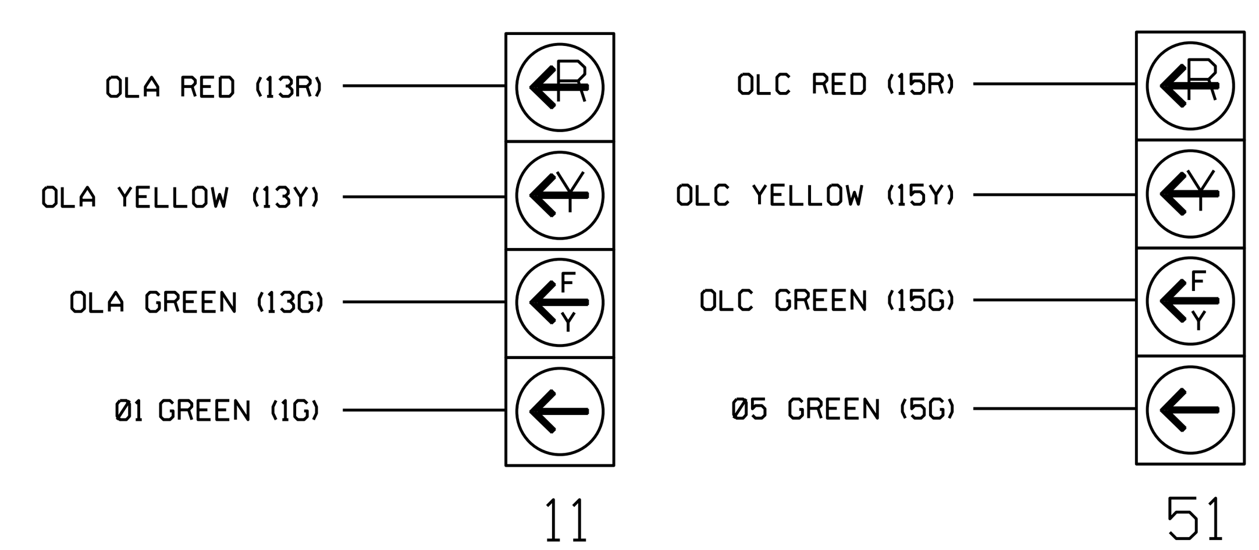
EQUIPMENT INFORMATION

CONTROLLER..............2070EN2
CABINET NC-8 TS-2
SOFTWARE ....ECONOLITE ASC/3-2070
CABINET MOUNT...........BASE
LOADBAY POSITIONS.......16
LOAD SWITCHES USED......1,2,3,4,5,6,11,12,13,15
PHASES USED.............1,2,3,3PED,4,5,6,6PED
OLA.....................✳
OLB.....................NOT USED
OLC.....................✳
OLD.....................NOT USED

✳ SEE OVERLAP PROGRAMMING DETAIL ON SHEET 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1726T2
DESIGNED: March 2019
SEALED: 7/24/2019
REVISED: N/A

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	Ø 1
2	Ø 2
3	Ø 3
4	Ø 4
5	Ø 5
6	Ø 6
7	Ø 7
8	Ø 8
9	Ø 2 PED
10	Ø 4 PED
11	Ø 6 PED
12	Ø 3 PED
13	OLA
14	OLB
15	OLC
16	OLD

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 7,8,9,10,14, and 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 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 for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

Electrical Detail - Temp 2 (TMP Phase I, Step B)
Sheet 1 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

SR 3015 (Airport Blvd.)
at
Factory Shops Road/
Aerial Center Parkway

Division 5 Wake County Morrisville

PLAN DATE: May 2019	REVIEWED BY:
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 430320EAA2654C3
8/1/2019
DATE

SIG. INVENTORY NO. 05-1726T2

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sarmstrong

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

ECONOLITE ASC/3-2070 SPECIAL MMU PROGRAMMING

(program controller as shown)

1. From Main Menu select [1. CONFIGURATION]
2. From CONFIGURATION Submenu select [4. PORT 1 (SDLC)]
3. From PORT 1 (SDLC) Submenu select [2. MMU PROGRAM]

CAUTION!

Set intersection to Flash before attempting to enter or change any MMU programming data.

This programming and that of the MMU programming card must match exactly. If they do not, the intersection will be placed into Flash.

MMU PROGRAM [MANUAL]

CH	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2
1	.	X	.	X	.	X	.	.	.	.	X	X	.	.	.
2	.	X	.	X	.	X	.	.	.	.	X	X	.	.	
3	.	.	.	.	X	.	.	.	.	.	.	.	.		
4	.	.	.	.	.	.	.	.	.	.	.	.			
5	.	X	.	X	.	.	.	.	.	.	.				
6	.	X	.	X	.	X	.	.	.	.					
7	.	.	.	.	.	.	.	.	.						
8	.	.	.	.	.	.	.	.							
9	.	.	.	.	.	.	.								
10	.	.	.	.	.	.									
11	.	X	.	X	.										
12	.	.	.	.											
13	.	X	.												
14	.	.													
15	.														

END PROGRAMMING

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1726T2
DESIGNED: March 2019
SEALED: 7/24/2018
REVISED: N/A

Electrical Detail - Temp 2 (TMP Phase I, Step B)
Sheet 2 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 3015 (Airport Blvd.)
at
Factory Shops Road/
Aerial Center Parkway

Division 5 Wake County Morrisville

PLAN DATE: May 2019	REVIEWED BY:
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

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

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SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 036833 RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 8/1/2019
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DATE

SIG. INVENTORY NO. 05-1726T2

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sarmstrong