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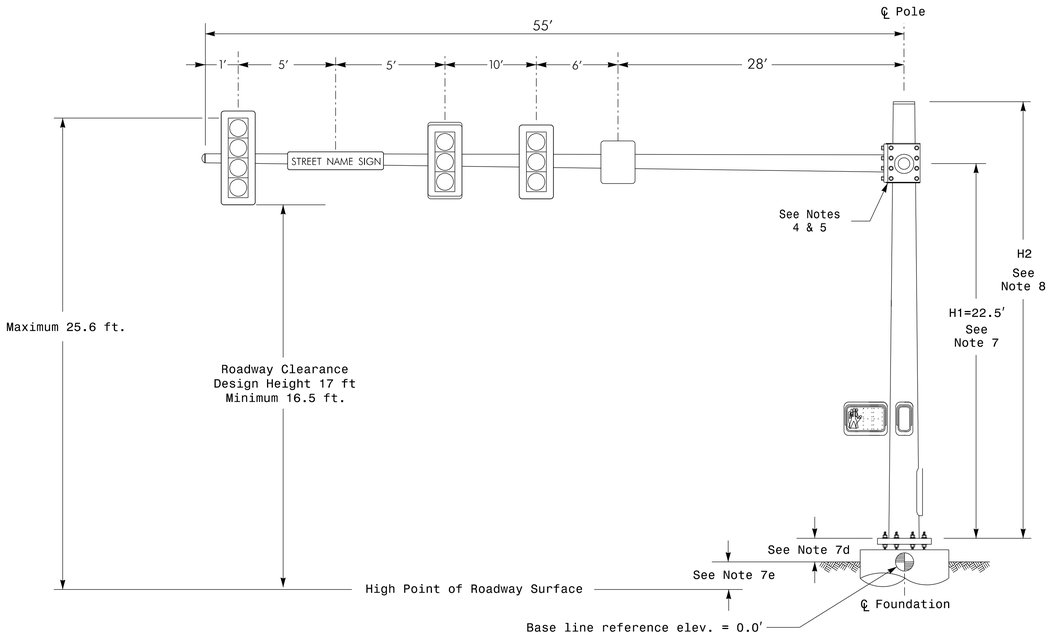
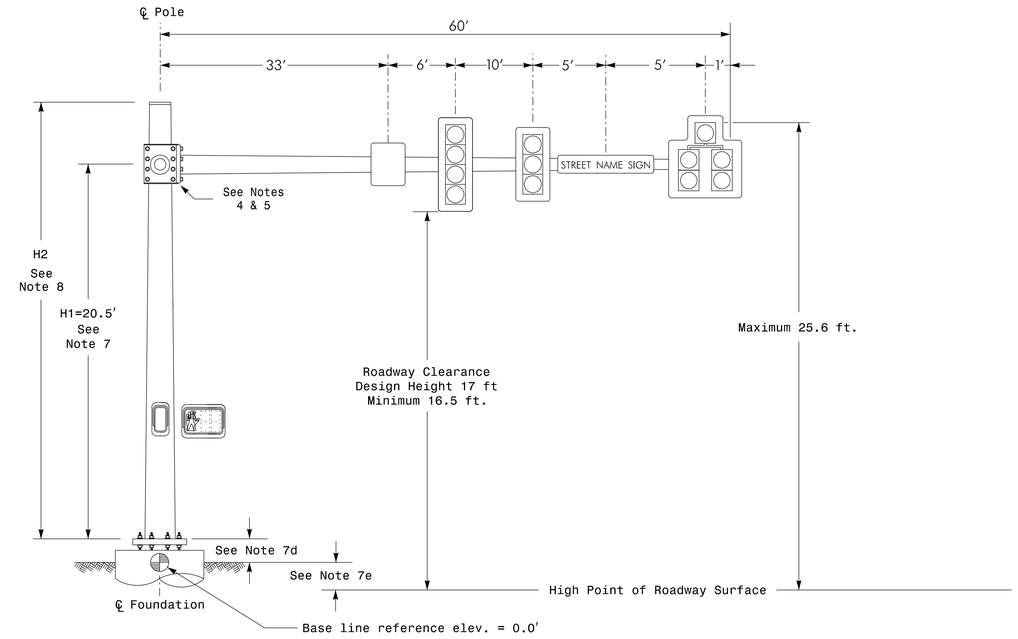
Design Loading for METAL POLE NO. 5, MAST ARM A



Elevation View @ 0°

Design Loading for METAL POLE NO. 5, MAST ARM B



Elevation View @ 270°

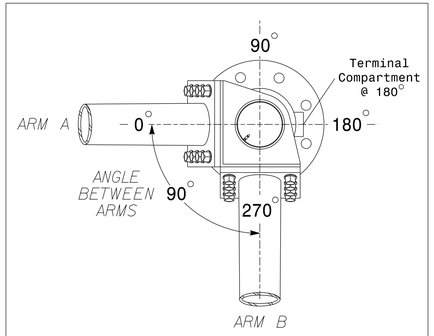
$$$$SYSTIME$$$$
$$$$DOCNAME$$$$
$$$$USERNAME$$$$

SPECIAL NOTE

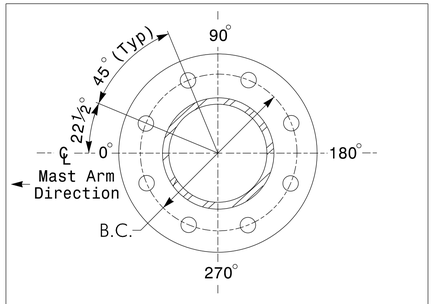
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+3.03 ft.	+1.12 ft.
Elevation difference at Edge of travelway or face of curb	+0.66 ft.	-0.60 ft.

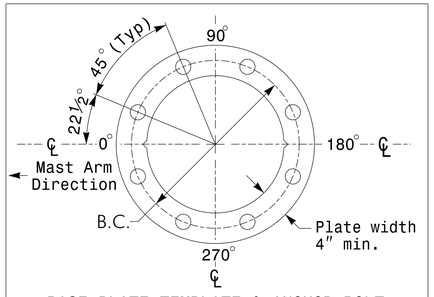


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL
For 8 Bolt Base Plate

METAL POLE No. 5

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 16.3

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"–4 SECTION WITH 8" BACKPLATE RIGID MOUNTED	15.8 S.F.	31.5" W X 72.0" L	78 LBS
	SIGNAL HEAD 12"–3 SECTION WITH 8" BACKPLATE RIGID MOUNTED	12.8 S.F.	31.5" W X 58.5" L	63 LBS
	SIGNAL HEAD 12"–5 SECTION WITH 8" BACKPLATE RIGID MOUNTED	20.7 S.F.	48.0" W X 62.0" L	107 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED	12.0 S.F.	18.0" W X 96.0" L	27 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS
	SIGN RIGID MOUNTED	7.5 S.F.	30.0" W X 36.0" L	14 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 5th Edition 2009 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2012 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2012 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate arm connection points.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. The pole manufacturer will determine the total height (H2) of the pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Structural Engineer for assistance at (919) 773-2800.
10. The contractor is responsible for verifying that the mast arm lengths shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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

NCDOT Wind Zone 4 (90 mph)

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

NC 55 (South Alston Avenue) at SR 1926 (Angier Avenue)

Division 5 Durham County Durham

PLAN DATE: December 2014 REVIEWED BY: J Hochanadel

PREPARED BY: M Copple REVIEWED BY:

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

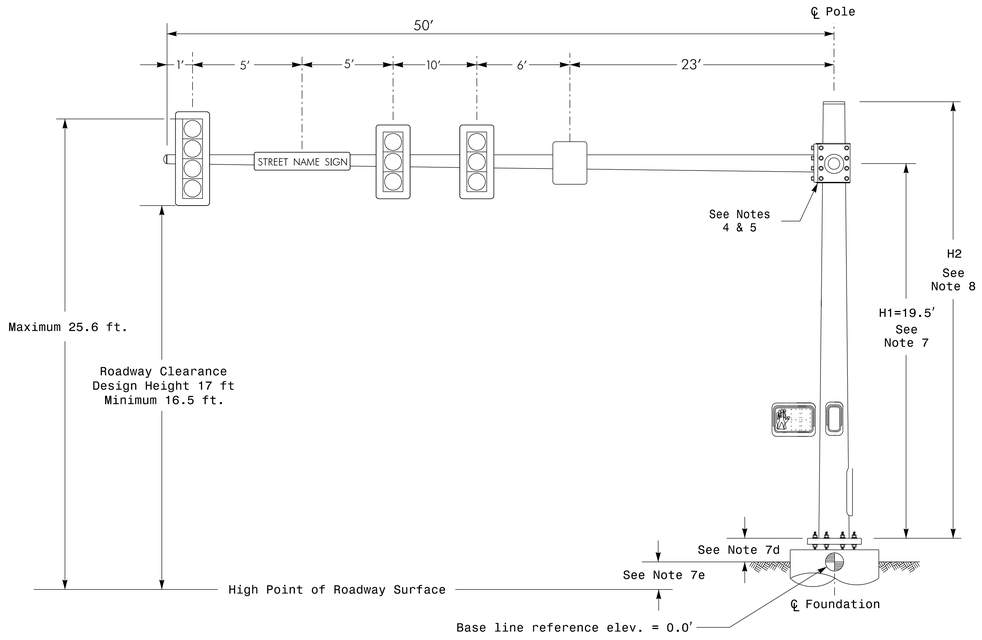
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15
607B1D3BF98C4B5... DATE

SIG. INVENTORY NO. 05-1026

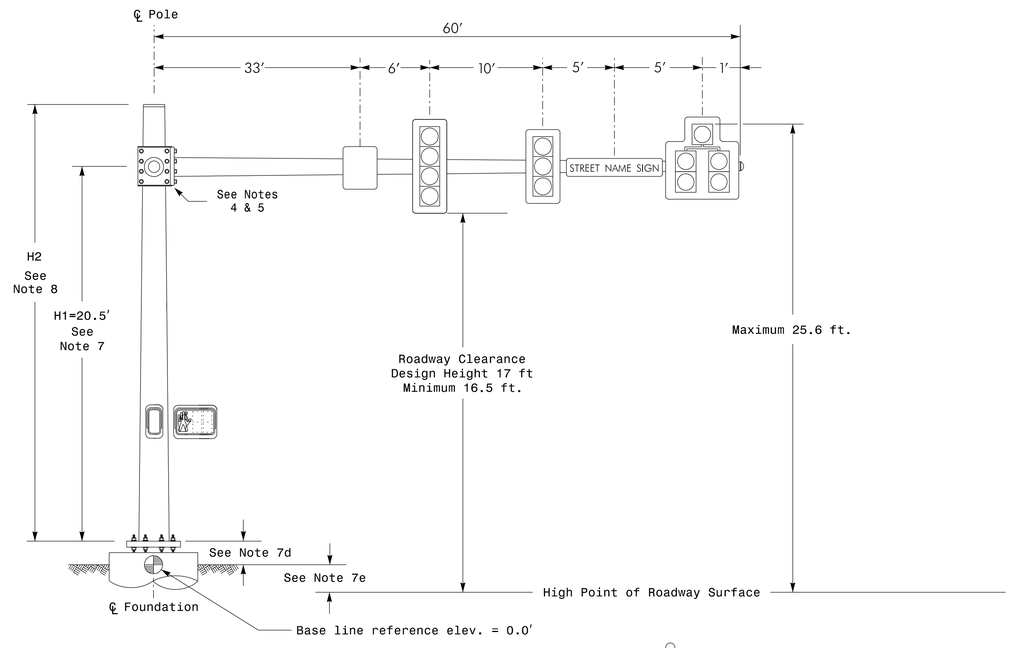
DocuSign Envelope ID: 2B82073C-8CA6-44D2-96FA-5BE27AB92A1C

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



Elevation View @ 0°

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



Elevation View @ 270°

$$$$SYSTIME$$$$
$$$$DOCNAME$$$$
$$$$USERNAME$$$$

SPECIAL NOTE

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Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
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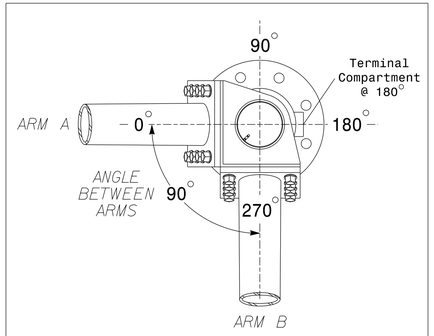
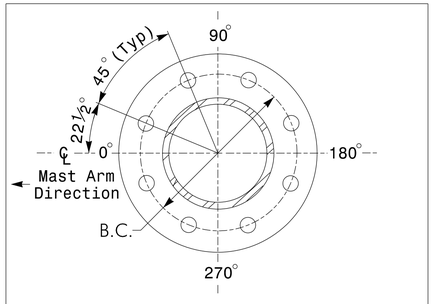
Elevation difference at High point of roadway surface	-0.01 ft.	+1.15 ft.
Elevation difference at Edge of travelway or face of curb	+0.66 ft.	+0.75 ft.

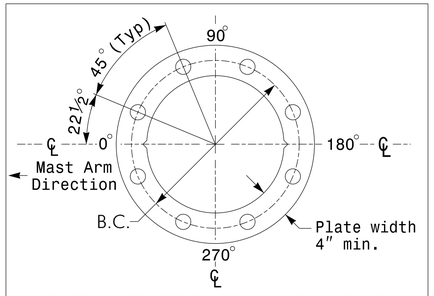


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

METAL POLE No. 6

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 16.4

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"–4 SECTION WITH 8" BACKPLATE RIGID MOUNTED	15.8 S.F.	31.5" W X 72.0" L	78 LBS
	SIGNAL HEAD 12"–3 SECTION WITH 8" BACKPLATE RIGID MOUNTED	12.8 S.F.	31.5" W X 58.5" L	63 LBS
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1. Design the traffic signal structure and foundation in accordance with:
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Fax:919-789-9591
License #: C-2197

NCDOT Wind Zone 4 (90 mph)

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

NC 55 (South Alston Avenue) at SR 1926 (Angier Avenue)

Division 5 Durham County Durham

PLAN DATE:	December 2014	REVIEWED BY:	J Hochanadel
PREPARED BY:	M Copple	REVIEWED BY:	

REVISIONS	INIT.	DATE

SCALE 0 N/A N/A

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

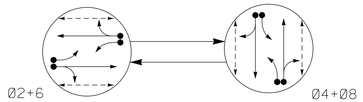
DocuSigned by: 4/02/15 DATE
507B1D2BF98C498...

SIG. INVENTORY NO. 05-1026

DocuSign Envelope ID: 2B82073C-8CA6-44D2-96FA-5BE27AB92A1C

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 17.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV Preempt Phases

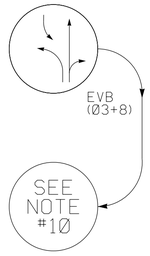


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4+8	PHASE EVB	PHASE FLASH
21	~~FY~~	~~R~~	~~R~~	~~Y~~
22,23	G	R	R	Y
31	~~R~~	~~FY~~	←	~~R~~
41	~~R~~	~~FY~~	~~FY~~	~~R~~
42,43	R	G	R	R
61	~~FY~~	~~R~~	~~R~~	~~Y~~
62,63	G	R	R	Y
81,82	R	G	G	R
P21,P22	W	DW	DW	DRK
P41,P42	DW	W	DW	DRK
P61,P62	W	DW	DW	DRK
P81,P82	DW	W	DW	DRK

2033 EV PREEMPTION

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
MIN. PED. CLEAR BEFORE PREEMPT	*
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

* See Timing Chart for Min Ped Clearance
** Program Timing on Optical Detector Unit

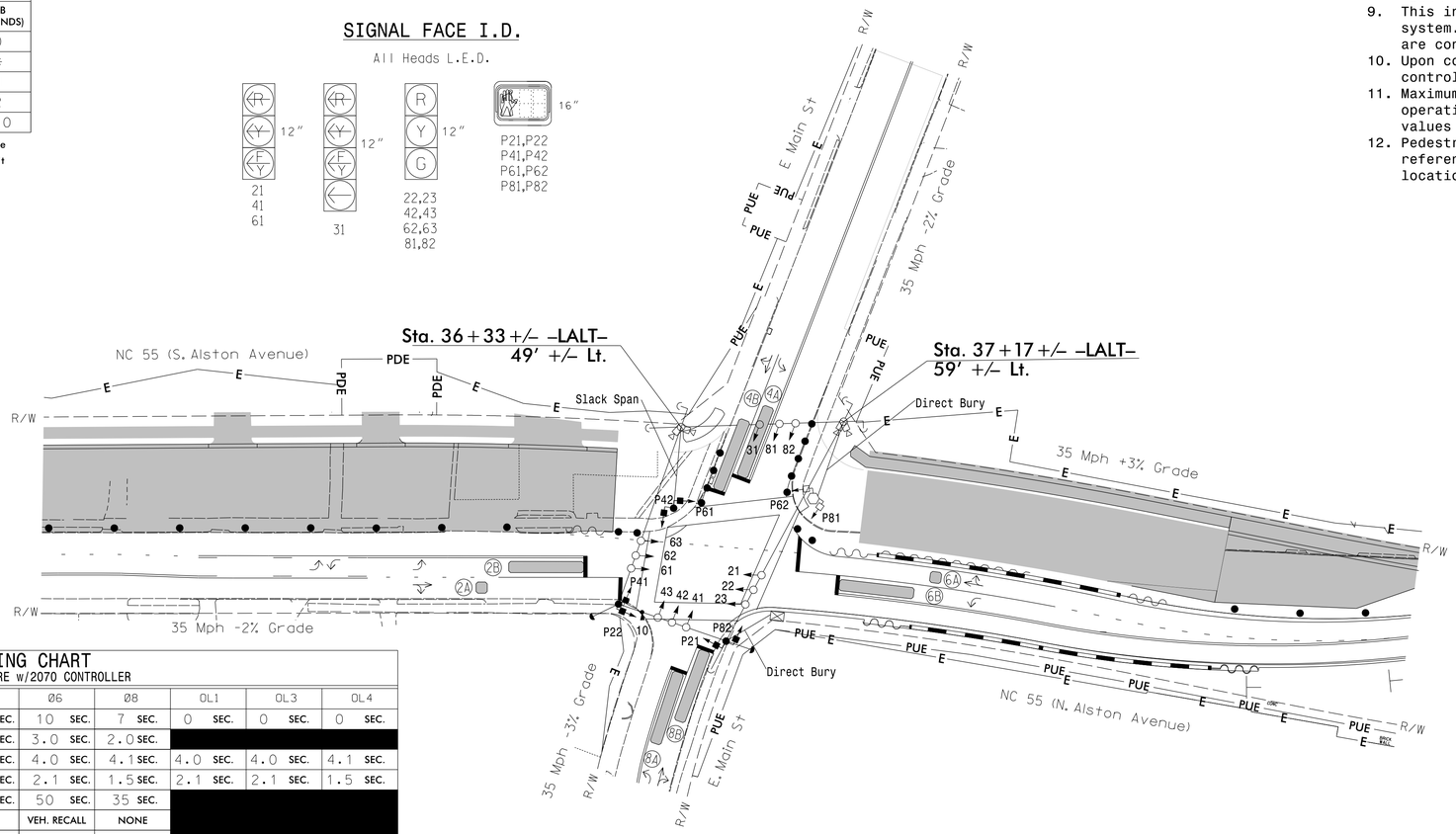
SIGNAL FACE I.D.

All Heads L.E.D.

2033 SOFTWARE w/ 2070 CONTROLLER
LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS: LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	DETECTOR PROGRAMMING: NEMA PHASE	TIMING: DELAY	TIMING: CARRY (STRETCH)	ATTRIBUTES 1: FULL TIME DELAY	2: PEDESTRIAN CALL	3: RESERVED	4: COUNT	5: EXTENSION	6: TYPE 3	7: CALLING	8: ALTERNATE	STATUS: SYSTEM LOOPS NEW	SYSTEM LOOPS EXISTING
2A	6x6	*	70	*	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	*	-
2B	6x40	*	0	*	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	*	-
4A	6x40	*	0	*	-	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	*	-
4B	6x40	*	0	*	-	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	*	-
6A	6x6	*	70	*	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	*	-
6B	6x40	*	0	*	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	*	-
8A	6x40	*	0	*	-	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	*	-
8B	6x40	*	0	*	-	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	*	-
PEDESTRIAN DETECTION																		
P21,P22	N/A	N/A	N/A	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X	-
P41,P42	N/A	N/A	N/A	X	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X	-
P61,P62	N/A	N/A	N/A	X	-	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X	-
P81,P82	N/A	N/A	N/A	X	-	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X	-

* Video Detection Zone



TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø6	Ø8	OL1	OL3	OL4
MINIMUM INITIAL *	10 SEC.	- SEC.	7 SEC.	10 SEC.	7 SEC.	0 SEC.	0 SEC.	0 SEC.
VEHICLE EXTENSION *	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			
YELLOW CHANGE INT.	4.0 SEC.	4.1 SEC.	4.1 SEC.	4.0 SEC.	4.1 SEC.	4.0 SEC.	4.0 SEC.	4.1 SEC.
RED CLEARANCE	2.1 SEC.	2.3 SEC.	1.5 SEC.	2.1 SEC.	1.5 SEC.	2.1 SEC.	2.1 SEC.	1.5 SEC.
MAXIMUM LIMIT *	50 SEC.	- SEC.	35 SEC.	50 SEC.	35 SEC.			
RECALL POSITION	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE			
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE			
DOUBLE ENTRY	OFF	OFF	ON	OFF	ON			
WALK *	4 SEC.	- SEC.	4 SEC.	4 SEC.	4 SEC.			
FLASHING DON'T WALK	14 SEC.	- SEC.	11 SEC.	14 SEC.	16 SEC.			
MIN PED CLEARANCE	7 SEC.	- SEC.	6 SEC.	7 SEC.	8 SEC.			
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM GAP*	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MINIMUM GAP	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			

* 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.

2 Phase
Fully Actuated
W/ EV Preemption
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet as to not obstruct sight distance of vehicles turning right on red.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time.
9. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
10. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
11. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
12. Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for pushbutton location details.

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	N/A
→	Directional Arrow	→
▭	Work Area	N/A
●	Drums	N/A
E	Construction Easement	N/A
PUE	Permanent Utility Easement	N/A
PDE	Permanent Drainage Easement	N/A
▨	Barricades	N/A
----------	Direct Bury	----------
⊲	Optical Detector	⊲
⬡	Type II Signal Pedestal	●
▭	Video Detector	■
▭	Video Detection Area	▭

Signal Upgrade - Temporary Design 1 (TMP Phase 1, Steps 11-21)

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

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

NC 55
(South/North Alston Avenue)
at
E. Main St

Division 5 Durham County Durham

PLAN DATE: September 2014 REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15 DATE
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SIG. INVENTORY NO. 05-1030TI

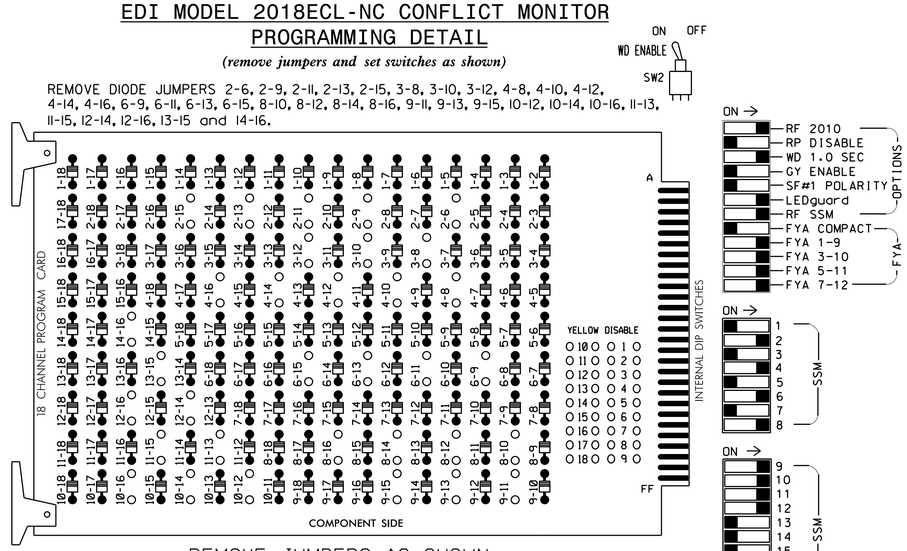
4/2/2015
G:\FCON\Transportation\TIP\R13.017.00 NCDOT 2012 Traffic LSA\TIP\R13.017-03 (U-3308 Signals)\Traffic\Signals\Designs\Signals\TEMP SIGNALS WITH VIDEO\05-1030\05-1030T1.dgn
JHochanadel

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig.17.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-6, 2-9, 2-11, 2-13, 2-15, 3-8, 3-10, 3-12, 4-8, 4-10, 4-12, 4-14, 4-16, 6-9, 6-11, 6-13, 6-15, 8-10, 8-12, 8-14, 8-16, 9-11, 9-13, 9-15, 10-12, 10-14, 10-16, 11-13, 11-15, 12-14, 12-16, 13-15 and 14-16.



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Calls for phases 2, 4, 6, and 8.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S3,S4,S5,S6,S8,S9,S11,S12, AUX S1,AUX S2,AUX S4,AUX S5
PHASES USED.....2,3,4,6,8,2 PED,4 PED,6 PED,8 PED
OVERLAP 1.....2
OVERLAP 2.....*
OVERLAP 3.....6
OVERLAP 4.....8

* See FYA PPLT Programming Detail on Sheet 2.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	22,23	P21, P22	31★	42,43	P41, P42	NU	62,63	P61, P62	NU	81,82	P81, P82	61★	31★	NU	21★	41★	NU
RED		128			101			134			107							
YELLOW		129		✳	102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121	A124		A114	A101	
YELLOW ARROW													A122	A125		A115	A102	
FLASHING YELLOW ARROW													A123	A126		A116	A103	
GREEN ARROW				118														
✋			113			104			119			110						
🚶			115			106			121			112						

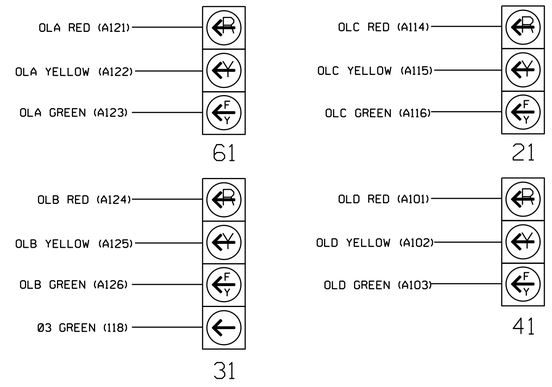
NU = Not Used

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

★ See pictorial of head wiring in detail below.

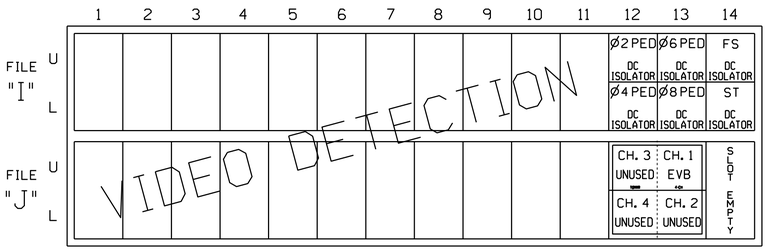
4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD INSERT CARD INTO SLOT J13

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
PED PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED
P61,P62	TB8-7,9	I13U	26	68	2	6 PED
P81,P82	TB8-8,9	I13L	28	70	2	8 PED

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

DETECTOR ATTRIBUTES LEGEND:
1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

LOAD RESISTOR INSTALLATION DETAIL

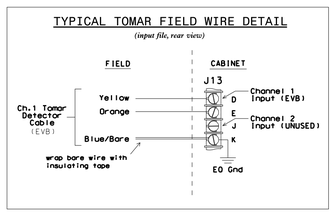
(install resistors as shown below)

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

PHASE 3 YELLOW FIELD TERMINAL (117)
AC-

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



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.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1030T1
DESIGNED: September 2014
SEALED: 4-02-15
REVISED: N/A

Electrcial Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:	NC 55 (South/North Alston Avenue) at E. Main St.	SEAL
Prepared in the Offices of: Transportation Mobility and Safety Division, NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, Signals Management Section	Division 5 Durham County DS Durham	NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
750 N.Greenfield Pkwy,Garner,NC 27529	PLAN DATE: November 2014 REVIEWED BY: JTR	DocuSigned by: John T. Rowe, Jr. 4/2/2015
	PREPARED BY: James Peterson REVIEWED BY:	SIG. INVENTORY NO. 05-1030T1
	REVISIONS / INIT. / DATE	

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jmpeterson

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig.17.2

OVERLAPS [1-4] PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

OVERLAP [1]:
LOADSWITCH = 9 NOTE: FOR SIGNAL HEAD 61
VEH SET 1 = 2
YELLOW CLEARANCE = 4.0
RED CLEARANCE = 2.1

PRESS '+' TWICE

OVERLAP [3]:
LOADSWITCH = 11 NOTE: FOR SIGNAL HEAD 21
VEH SET 1 = 6
YELLOW CLEARANCE = 4.0
RED CLEARANCE = 2.1

PRESS '+'

OVERLAP [4]:
LOADSWITCH = 12 NOTE: FOR SIGNAL HEAD 41
VEH SET 1 = 8
YELLOW CLEARANCE = 4.1
RED CLEARANCE = 1.5

END OF OVERLAP PROGRAMMING

FYA PPLT PROGRAMMING

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 3

2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 3 = 96

3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 3 RED = 94, Phase 3 YELLOW = 95

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 2) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 3.8

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 7
   PHASE 4 MIN FDW = 6
   PHASE 6 MIN FDW = 7
   PHASE 8 MIN FDW = 8

Program extend time on optical detector units for 2.0 sec for EVB.

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.

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

OVERLAP GREEN FLASH PROGRAMMING FOR 3 SECTION FYA

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrow. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 1, 3, 4

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

STARTUP CALLS PROGRAMMING

Prevents Veh Call to phase 3 during Startup. Phase 3 used only during Preempt.
Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,4,6,8

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1030T1
DESIGNED: September 2014
SEALED: 4-02-15
REVISED: N/A

Electrcial Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55
(South/North Alston Avenue)
at
E. Main St.

Division 5 Durham County SR Durham
PLAN DATE: November 2014 REVIEWED BY: JTR
PREPARED BY: James Peterson REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
DocuSigned by: John T. Rowe, Jr. 4/2/2015 DATE
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SIG. INVENTORY NO. 05-1030T1

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jtpeterson

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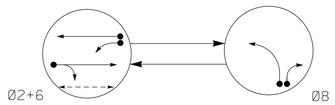
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 18.0

2 Phase Fully Actuated w/ EV Preemption (Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV Preempt Phases

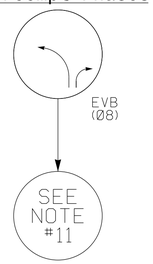


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø8	EVB	FLASH
22,23	G	R	R	Y
61	~~F~~ Y	~~R~~	~~R~~	~~Y~~
62,63	G	R	R	Y
81,82	R	G	G	R
P21,P22	W	DW	DW	DRK

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS: LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	DETECTOR PROGRAMMING: NEMA PHASE	TIMING: DELAY	TIMING: CARRY (STRETCH)	ATTRIBUTES 1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	STATUS: SYSTEM LOOPS NEW	SYSTEM LOOPS EXISTING
2A	6x6	✳	70	-	✳	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳
6A	6x6	✳	70	-	✳	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳
6B	6x40	✳	0	-	✳	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳
8A	6x40	✳	0	-	✳	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳
8B	6x40	✳	0	-	✳	8	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳
PEDESTRIAN DETECTION																		
P21,P22	N/A	N/A	N/A	-	X	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X

✳ Video Detection Zone

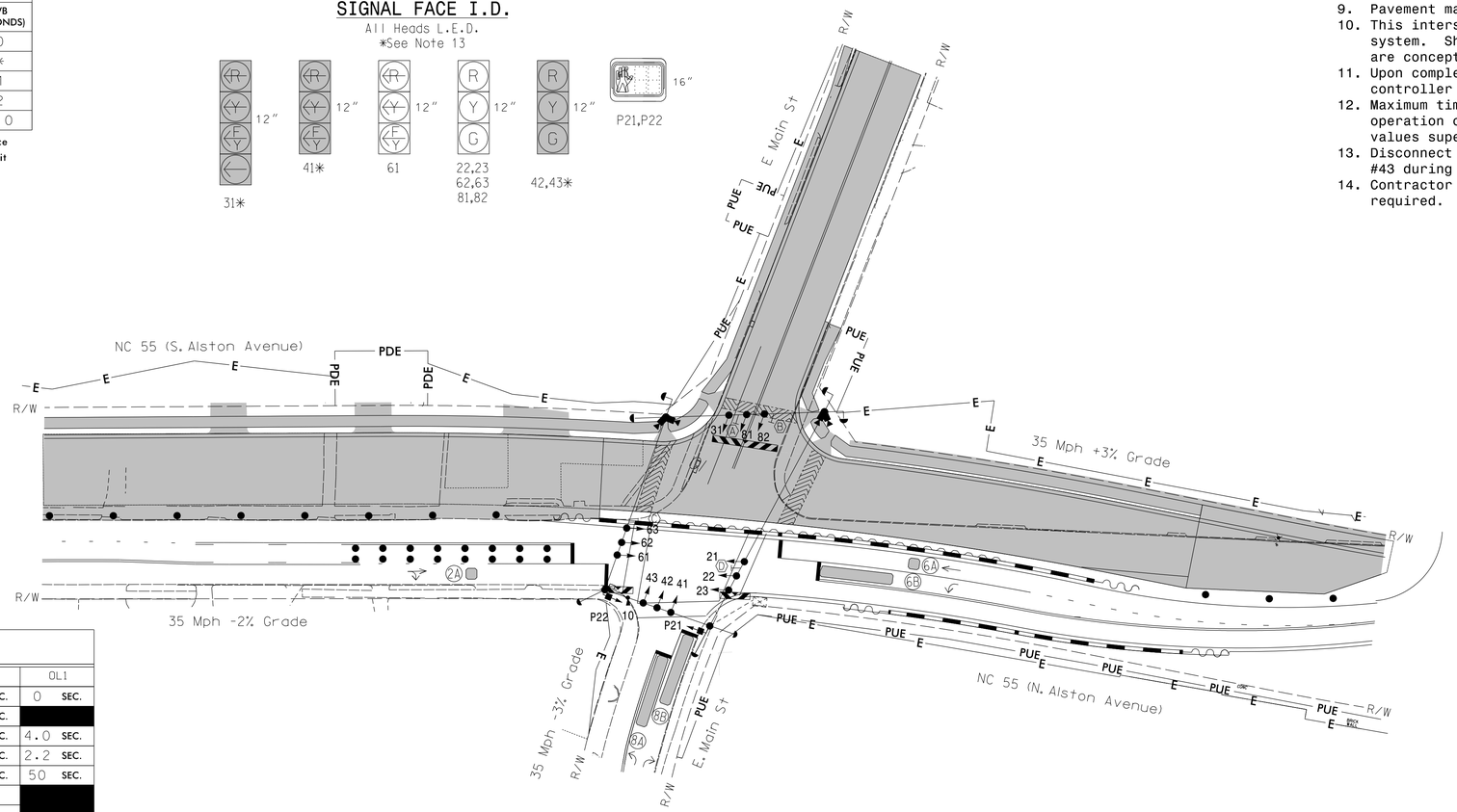
2033 EV PREEMPTION

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
MIN. PED. CLEAR BEFORE PREEMPT	✳
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

✳ See Timing Chart for Min Ped Clearance
** Program Timing on Optical Detector Unit

SIGNAL FACE I.D.

All Heads L.E.D.
✳See Note 13



TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø6	Ø8	OL1
MINIMUM INITIAL *	10 SEC.	10 SEC.	7 SEC.	0 SEC.
VEHICLE EXTENSION *	3.0 SEC.	3.0 SEC.	2.0 SEC.	
YELLOW CHANGE INT.	4.0 SEC.	4.0 SEC.	3.0 SEC.	4.0 SEC.
RED CLEARANCE	2.2 SEC.	2.2 SEC.	2.3 SEC.	2.2 SEC.
MAXIMUM LIMIT *	50 SEC.	50 SEC.	35 SEC.	50 SEC.
RECALL POSITION	VEH. RECALL	VEH. RECALL	NONE	
VEHICLE CALL MEMORY	YELLOW LOCK	YELLOW LOCK	NONE	
DOUBLE ENTRY	OFF	OFF	OFF	
WALK *	4 SEC.	- SEC.	- SEC.	
FLASHING DON'T WALK	11 SEC.	- SEC.	- SEC.	
MIN PED CLEARANCE	6 SEC.	- SEC.	- SEC.	
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	
MAXIMUM GAP*	3.0 SEC.	3.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	
MINIMUM GAP	3.0 SEC.	3.0 SEC.	2.0 SEC.	

* 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.

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Reposition signal heads #81 and #82.
4. Set all detector units to presence mode.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time.
9. Pavement markings are existing.
10. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
11. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
12. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
13. Disconnect and bag signal head #31, #41, #42 and #43 during this phase of construction.
14. Contractor shall adjust video detection zones as required.

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	N/A
→	Directional Arrow	→
Ⓐ	Left Arrow "ONLY" Sign (R3-5L)	Ⓐ
Ⓑ	Right Arrow "Only" Sign (R3-5R)	Ⓑ
Ⓒ	No Right Turn Sign (R3-1)	Ⓒ
Ⓓ	No Left Turn Sign (R3-2)	Ⓓ
▭	Work Area	N/A
●	Drums	N/A
E	Construction Easement	N/A
PUE	Permanent Utility Easement	N/A
PDE	Permanent Drainage Easement	N/A
▨	Barricades	N/A
	Direct Bury	----
○	Optical Detector	●
□	Video Detector	■
▭	Video Detection Area	▭

Signal Upgrade - Temporary Design 2 (TMP Phase 1, Steps 11-21)

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

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

NC 55
(South/North Alston Avenue)
at
E. Main St

Division 5 Durham County Durham

PLAN DATE: September 2014 REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15
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DATE

SIG. INVENTORY NO. 05-1030T2

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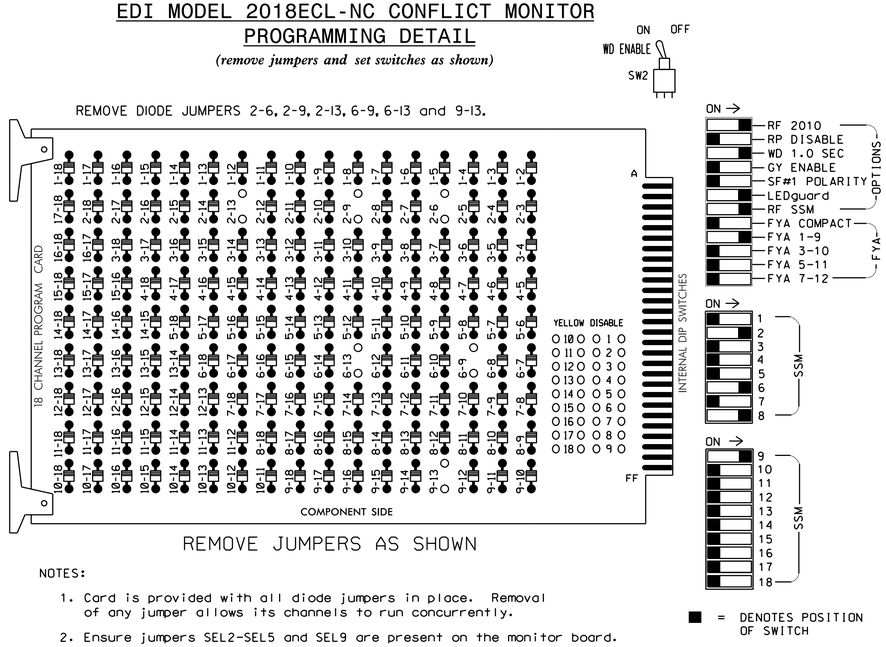
clawson

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig.18.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. Program Startup Ped Calls for phase 2.
9. Set the Red Revert interval on the controller to 1 second.
10. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S3,S8,S11,AUX S1
PHASES USED.....2,6,8,2 PED
OVERLAP 1.....2
OVERLAP 2.....NOT USED
OVERLAP 3.....NOT USED
OVERLAP 4.....NOT USED

SIGNAL HEAD HOOK-UP CHART

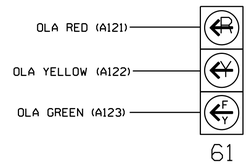
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	22,23	P21, P22	NU	NU	NU	NU	62,63	NU	NU	81,82	NU	61 ★	NU	NU	NU	NU	NU
RED		128						134			107							
YELLOW		129						135			108							
GREEN		130						136			109							
RED ARROW													A121					
YELLOW ARROW													A122					
FLASHING YELLOW ARROW													A123					
GREEN ARROW																		
✋			113															
🚶			115															

NU = Not Used

★ See pictorial of head wiring in detail below.

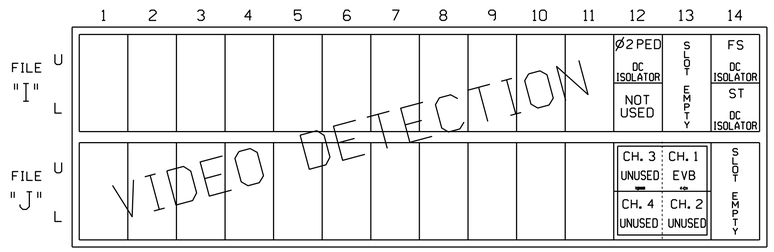
3 SECTION FYA WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



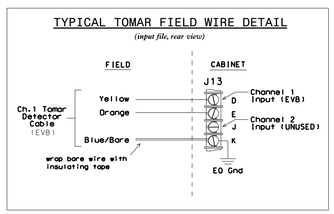
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD
INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
PED PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	25	67	2	2 PED

INPUT FILE POSITION LEGEND: J2L
- FILE J
- SLOT 2
- LOWER

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

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.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1030T2
DESIGNED: September 2014
SEALED: 4-02-15
REVISED: N/A

Electrcial Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
Signal Management Section

750 N.Greenfield Pkwy,Garner,NC 27529

NC 55
(South/North Alston Avenue)
at
E. Main St.

Division 5 | Durham County | Durham

PLAN DATE: November 2014 | REVIEWED BY: JTR
PREPARED BY: James Peterson | REVIEWED BY:

REVISIONS	INIT.	DATE

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

DocuSigned by: John T. Rowe, Jr. 4/2/2015 DATE
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SIG. INVENTORY NO. 05-1030T2

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jtpeterson

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig.18.2

OVERLAPS [1] PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

OVERLAP [1]:
LOADSWITCH = 9
VEH SET 1 = 2
YELLOW CLEARANCE = 4.0
RED CLEARANCE = 2.2

NOTE: FOR SIGNAL HEAD 61

END OF OVERLAP 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.

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 2) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 8

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 6

Program extend time on optical detector units for 2.0 sec for EVB.

OVERLAP GREEN FLASH PROGRAMMING FOR 3 SECTION FYA

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrow. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 1

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1030T2
DESIGNED: September 2014
SEALED: 4-02-15
REVISED: N/A

Electrcial Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

750 N.Greenfield Pkwy,Garner,NC 27529

NC 55
(South/North Alston Avenue)
at
E. Main St.

Division 5 Durham County DR Durham

PLAN DATE: November 2014	REVIEWED BY:	JTR
PREPARED BY: James Peterson	REVIEWED BY:	

REVISIONS	INIT.	DATE

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

DocuSigned by:
John T. Rowe, Jr. 4/2/2015
DATE

SIG. INVENTORY NO. 05-1030T2

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jtpeterson

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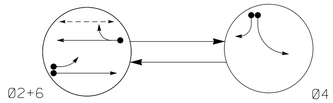
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 19.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

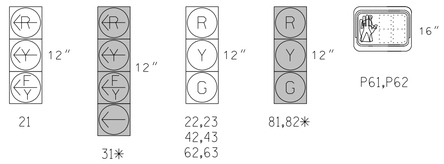
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4+8	FLASH
21	~~G~~ Y	~~R~~	~~Y~~
22,23	G	R	Y
42,43	R	G	R
62,63	G	R	Y
P61,P62	W	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.
*See Note 9



2033 SOFTWARE w/ 2070 CONTROLLER
LOOP & DETECTOR UNIT INSTALLATION CHART

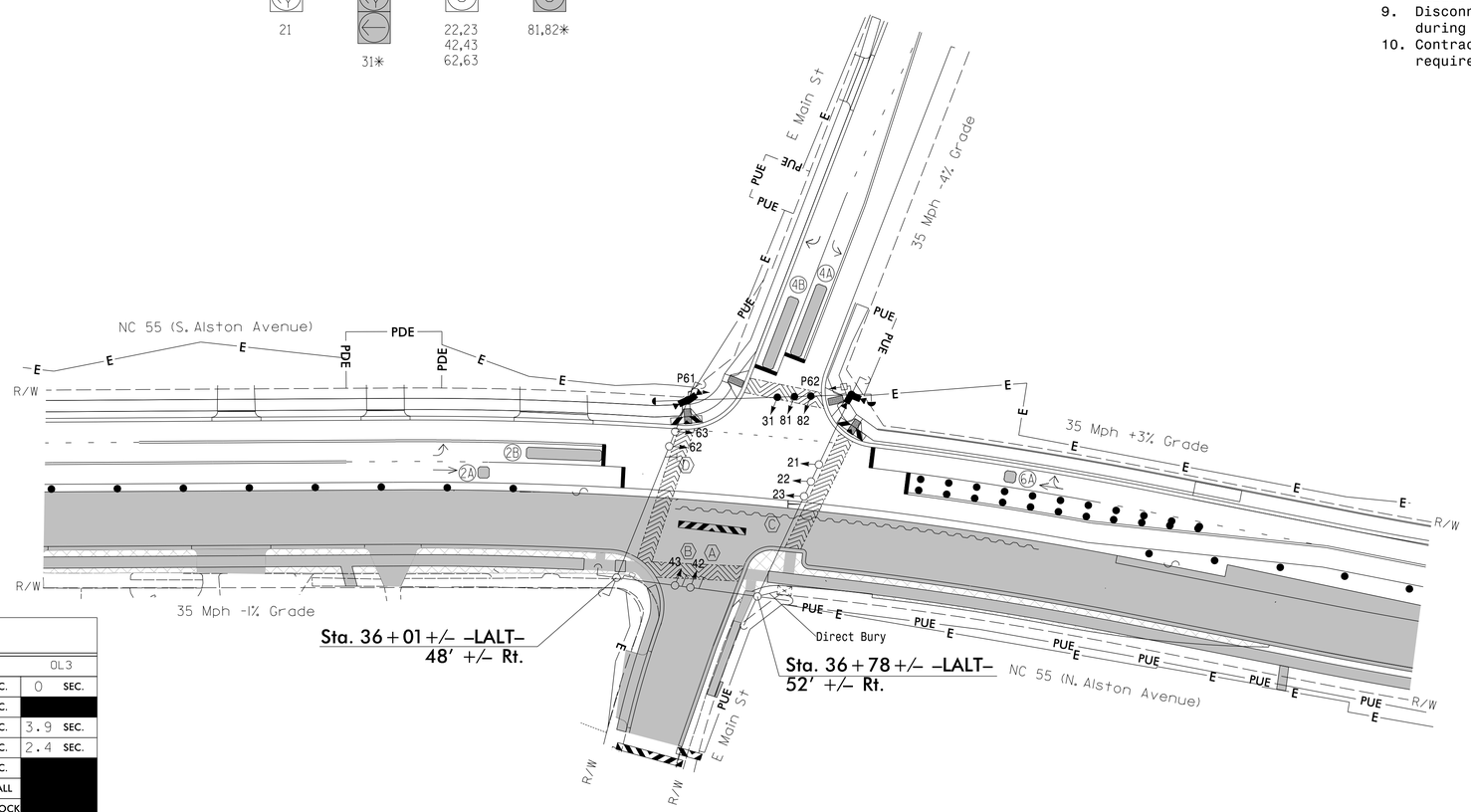
INDUCTIVE LOOPS						DETECTOR PROGRAMMING											
							TIMING		ATTRIBUTES								STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS NEW	SYSTEM LOOPS EXISTING
2A	6x6	*	70	*	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	*
2B	6x40	*	0	*	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	*
4A	6x40	*	0	*	-	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	*
4B	6x40	*	0	*	-	4	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	*
6A	6x6	*	70	*	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	*
PEDESTRIAN DETECTION																		
P61,P62	N/A	N/A	N/A	-	X	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X

* Video Detection Zone

2 Phase
Fully Actuated
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Disconnect and bag signal heads #31, #81 and #82 during this phase of construction.
10. Contractor shall adjust video detection zones as required.



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	
A	Left Arrow "ONLY" Sign (R3-5L)	A
B	Right Arrow "Only" Sign (R3-5R)	B
C	No Right Turn Sign (R3-1)	C
D	No Left Turn Sign (R3-2)	D
	Work Area	N/A
	Drums	N/A
E	Construction Easement	N/A
PUE	Permanent Utility Easement	N/A
PDE	Permanent Drainage Easement	N/A
	Barricades	N/A
	Direct Bury	
	Video Detector	
	Video Detection Area	

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø4	Ø6	OL3
MINIMUM INITIAL *	10 SEC.	7 SEC.	10 SEC.	0 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	3.0 SEC.	
YELLOW CHANGE INT.	3.9 SEC.	3.0 SEC.	3.9 SEC.	3.9 SEC.
RED CLEARANCE	2.4 SEC.	2.4 SEC.	2.4 SEC.	2.4 SEC.
MAXIMUM LIMIT *	50 SEC.	35 SEC.	50 SEC.	
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL	
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK	
DOUBLE ENTRY	OFF	OFF	OFF	
WALK *	- SEC.	- SEC.	4 SEC.	
FLASHING DON'T WALK	- SEC.	- SEC.	10 SEC.	
MIN PED CLEARANCE	- SEC.	- SEC.	- SEC.	
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	3.0 SEC.	
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	
MINIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 SEC.	

* 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 2, Steps 1-6)

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

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

NC 55
(South/North Alston Avenue)
at
E. Main St

Division 5 Durham County Durham

PLAN DATE: September 2014 REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15
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DATE
SIG. INVENTORY NO. 05-1030T3

3/20/2015
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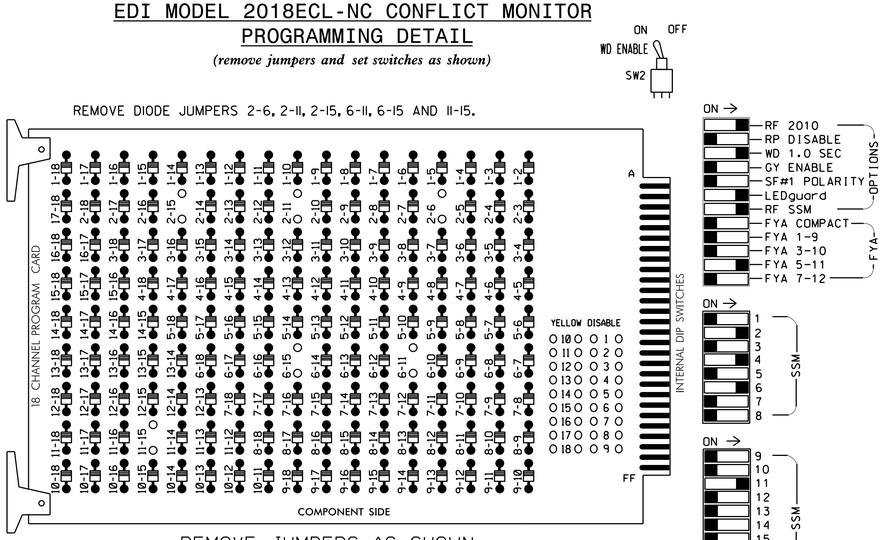
Clawson

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig.19.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. Program Startup Ped Calls for phase 6.
9. Set the Red Revert interval on the controller to 1 second.
10. This cabinet and controller are part of the Durham Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	22,23	NU	NU	42,43	NU	NU	62,63	P61, P62	NU	NU	NU	NU	NU	NU	21★	NU	NU
RED		128			101			134										
YELLOW		129			102			135										
GREEN		130			103			136										
RED ARROW																A114		
YELLOW ARROW																A115		
FLASHING YELLOW ARROW																A116		
GREEN ARROW																		
✋									119									
🚶									121									

NU = Not Used

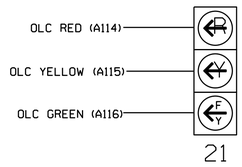
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S5,S8,S9,AUX S4
PHASES USED.....2,4,6,6 PED
OVERLAP 1.....NOT USED
OVERLAP 2.....NOT USED
OVERLAP 3.....6
OVERLAP 4.....NOT USED

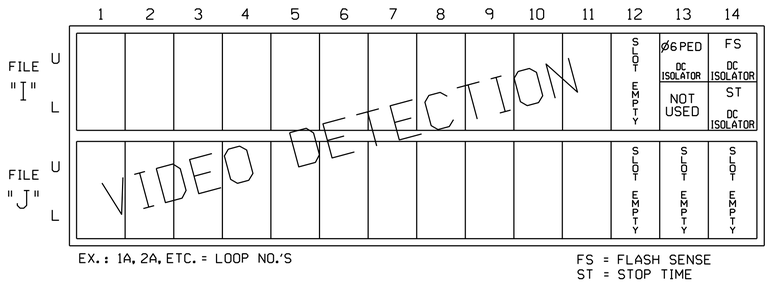
3 SECTION FYA WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
PED PUSH BUTTONS						
P61,P62	TB8-7,9	I13U	26	68	2	6 PED

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

DETECTOR ATTRIBUTES LEGEND:
1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

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.

OVERLAPS [3] PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

PRESS '+' TWO TIMES

OVERLAP [3]:
LOADSWITCH = 11 NOTE: FOR SIGNAL HEAD 21
VEH SET 1 = 6
YELLOW CLEARANCE = 3.9
RED CLEARANCE = 2.4

OVERLAP GREEN FLASH PROGRAMMING FOR 3 SECTION FYA

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrow. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 3

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: 05-1030T3
DESIGNED: September 2014
SEALED: 4-02-15
REVISED: N/A

Electrcial Detail

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55
(South/North Alston Avenue)
at
E. Main St.

Division 5 Durham County Durham
PLAN DATE: November 2014 REVIEWED BY:
PREPARED BY: James Peterson REVIEWED BY:

REVISIONS	BY	DATE
	DS JTR	

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
DocuSigned by: John T. Rowe, Jr. 4/2/2015
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SIG. INVENTORY NO. 05-1030T3

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jpeterson

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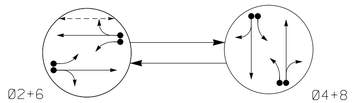
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 20.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV Preempt Phases

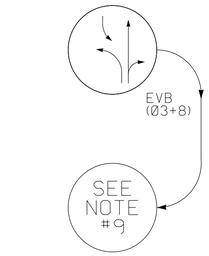


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4+8	PHASE EVB	PHASE FLASH
21	~~G~~ Y	~~R~~	~~R~~	~~Y~~
22,23	G	R	R	Y
31	~~R~~	~~G~~ Y	←	~~R~~
41	~~R~~	~~G~~ Y	~~G~~ Y	~~R~~
42,43	R	G	R	R
61	~~G~~ Y	~~R~~	~~R~~	~~Y~~
62,63	G	R	R	Y
81,82	R	G	G	R
P61,P62	W	DW	DW	DRK

2033 EV PREEMPTION

FUNCTION	EV6 (SECONDS)
DELAY BEFORE PREEMPT	0
MIN. PED. CLEAR BEFORE PREEMPT	✳
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

✳ See Timing Chart for Min Ped Clearance
** Program Timing on Optical Detector Unit

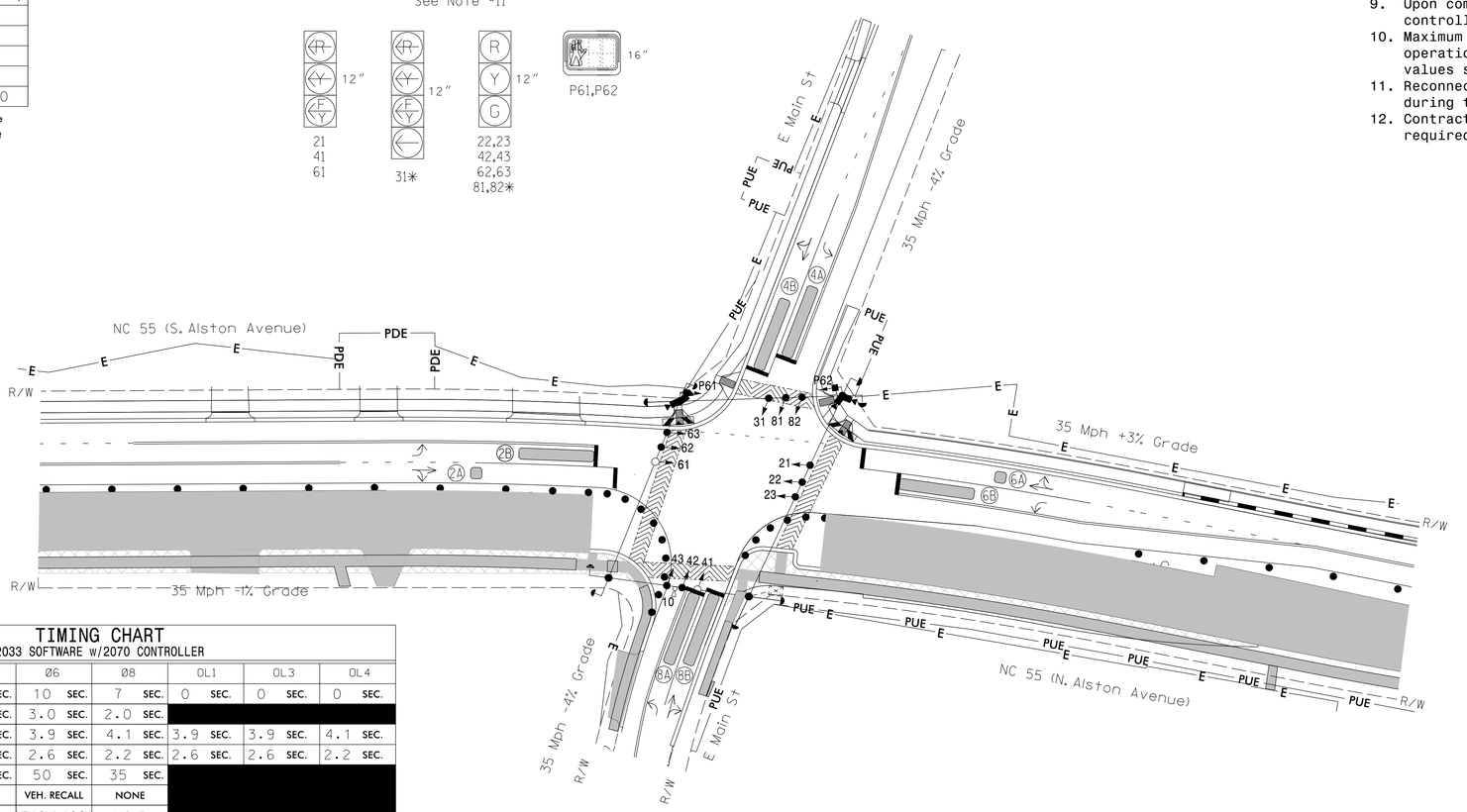
SIGNAL FACE I.D.

All Heads L.E.D.
See Note #11

2033 SOFTWARE w/ 2070 CONTROLLER
LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS: LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	DETECTOR PROGRAMMING: NEMA PHASE	TIMING: DELAY	TIMING: CARRY (STRETCH)	ATTRIBUTES 1: FULL TIME DELAY	2: PEDESTRIAN CALL	3: RESERVED	4: COUNT	5: EXTENSION	6: TYPE 3	7: CALLING	8: ALTERNATE	STATUS: SYSTEM LOOPS NEW	SYSTEM LOOPS EXISTING
2A	6x6	✳	70	-	✳	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳
2B	6x40	✳	0	-	✳	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳
4A	6x40	✳	0	-	✳	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳
4B	6x40	✳	0	-	✳	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳
6A	6x6	✳	70	-	✳	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳
6B	6x40	✳	0	✳	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳
8A	6x40	✳	0	✳	-	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳
8B	6x40	✳	0	✳	-	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳
PEDESTRIAN DETECTION																		
P61,P62	N/A	N/A	N/A	-	X	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X

✳ Video Detection Zone



TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø6	Ø8	OL1	OL3	OL4
MINIMUM INITIAL *	10 SEC.	- SEC.	7 SEC.	10 SEC.	7 SEC.	0 SEC.	0 SEC.	0 SEC.
VEHICLE EXTENSION *	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			
YELLOW CHANGE INT.	3.9 SEC.	4.1 SEC.	4.1 SEC.	3.9 SEC.	4.1 SEC.	3.9 SEC.	3.9 SEC.	4.1 SEC.
RED CLEARANCE	2.6 SEC.	2.6 SEC.	2.2 SEC.	2.6 SEC.	2.2 SEC.	2.6 SEC.	2.6 SEC.	2.2 SEC.
MAXIMUM LIMIT *	50 SEC.	- SEC.	35 SEC.	50 SEC.	35 SEC.			
RECALL POSITION	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE			
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE			
DOUBLE ENTRY	OFF	OFF	ON	OFF	ON			
WALK *	- SEC.	- SEC.	- SEC.	4 SEC.	- SEC.			
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	10 SEC.	- SEC.			
MIN PED CLEARANCE	- SEC.	- SEC.	- SEC.	5 SEC.	- SEC.			
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	SEC.			
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM GAP*	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MINIMUM GAP	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			

* 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.

2 Phase
Fully Actuated
W/ EV Preemption
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time.
8. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
9. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
11. Reconnect and unbag signal heads #31, #81 and #82 during this phase of construction.
12. Contractor shall adjucst video detection zones as required.

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	→
▭	Work Area	N/A
●	Drums	N/A
E	Construction Easement	N/A
PUE	Permanent Utility Easement	N/A
PDE	Permanent Drainage Easement	N/A
▨	Barricades	N/A
———	Direct Bury	-----
○	Optical Detector	●
▭	Video Detector	■
▭	Video Detection Area	▭

Signal Upgrade - Temporary Design 4 (TMP Phase 2, Steps 1-6)

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

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

NC 55
(South/North Alston Avenue)
at
E. Main St

Division 5 Durham County Durham

PLAN DATE: September 2014 REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15 DATE
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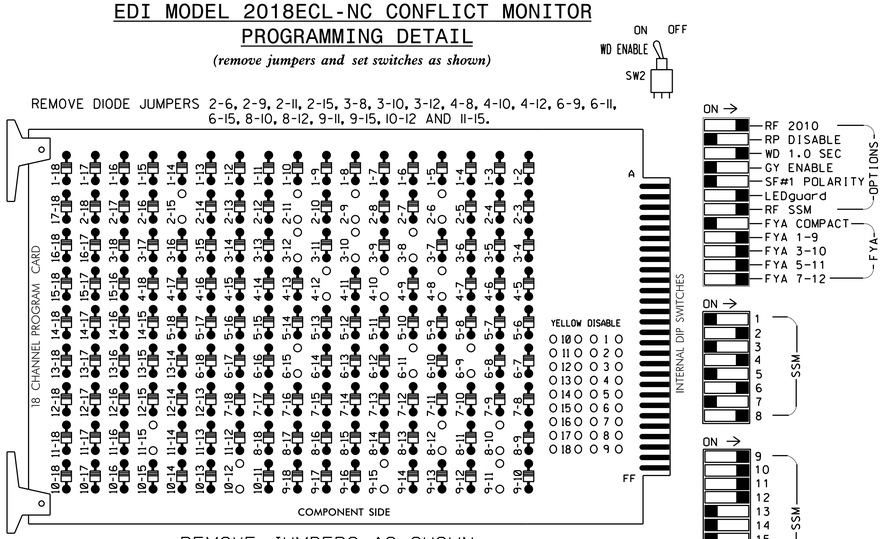
SIG. INVENTORY NO. 05-103014

3/20/2015
G:\#TIP\Transportation\R13.017.00 NCDOT 2012 Traffic LSA\TR13.017.03 (U-3308 Signals)\Traffic\Signals\Design\Signals\TEMP SIGNALS WITH VIDEO\05-103005-103014.dgn
clawson

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig.20.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Calls for phase 6.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S4,S5,S8,S9,S11, AUX S1,AUX S2,AUX S4,AUX S5
PHASES USED.....2,3,4,6,8,6 PED
OVERLAP 1.....2
OVERLAP 2.....*
OVERLAP 3.....6
OVERLAP 4.....8

* See FYA PPLT Programming Detail on Sheet 2.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	22,23	NU	31★	42,43	NU	NU	62,63	P61, P62	NU	81,82	NU	61★	31★	NU	21★	41★	NU
RED		128			101			134			107							
YELLOW		129		*	102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121	A124		A114	A101	
YELLOW ARROW													A122	A125		A115	A102	
FLASHING YELLOW ARROW													A123	A126		A116	A103	
GREEN ARROW				118														
✋									119									
🚶									121									

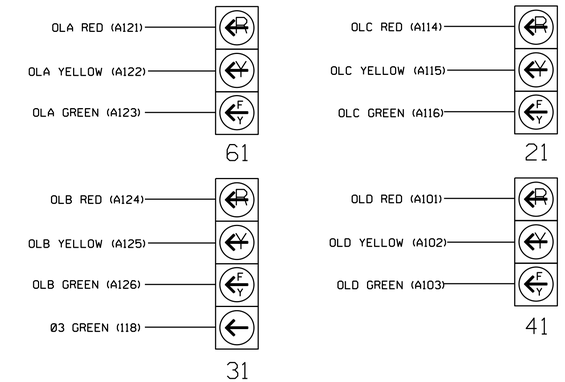
NU = Not Used

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

★ See pictorial of head wiring in detail below.

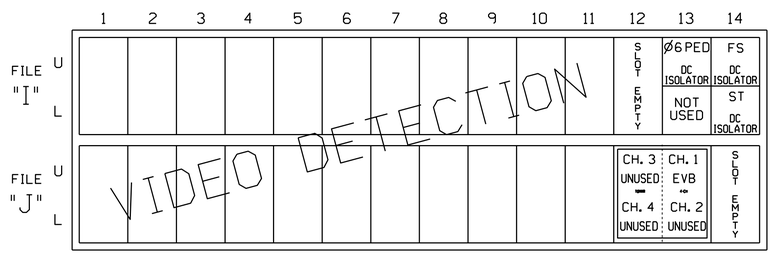
4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD INSERT CARD INTO SLOT J13

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
PED PUSH BUTTONS						
P61,P62	TB8-7,9	I13U	26	68	2	6 PED

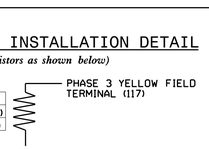
INPUT FILE POSITION LEGEND: J2L
J = FILE
2 = SLOT
L = LOWER

DETECTOR ATTRIBUTES LEGEND:
1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

LOAD RESISTOR INSTALLATION DETAIL

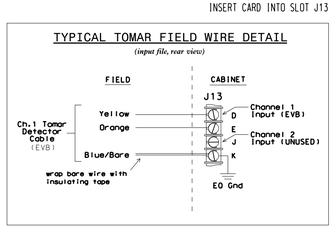
(install resistors as shown below)

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



TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



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.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1030T4
DESIGNED: September 2014
SEALED: 4-02-15
REVISED: N/A

Electrcial Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

750 N.Greenfield Pkwy,Garner,NC 27529

NC 55
(South/North Alston Avenue)
at
E. Main St.

Division 5 | Durham County | DS | Durham

PLAN DATE: November 2014 | REVIEWED BY: JTR

PREPARED BY: James Peterson | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T ROWE JR

DocuSigned by: John T. Rowe, Jr. 4/2/2015
DATE
SIG. INVENTORY NO. 05-1030T4

01-APR-2015 10:59
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jtpeterson

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig.20.2

OVERLAPS [1-4] PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

OVERLAP [1]:
LOADSWITCH = 9 NOTE: FOR SIGNAL HEAD 61
VEH SET 1 = 2
YELLOW CLEARANCE = 3.9
RED CLEARANCE = 2.6

PRESS '+' TWICE

OVERLAP [3]:
LOADSWITCH = 11 NOTE: FOR SIGNAL HEAD 21
VEH SET 1 = 6
YELLOW CLEARANCE = 3.9
RED CLEARANCE = 2.6

PRESS '+'

OVERLAP [4]:
LOADSWITCH = 12 NOTE: FOR SIGNAL HEAD 41
VEH SET 1 = 8
YELLOW CLEARANCE = 4.1
RED CLEARANCE = 2.2

END OF OVERLAP PROGRAMMING

FYA PPLT PROGRAMMING

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 3
2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 3 = 96
3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 3 RED = 94, Phase 3 YELLOW = 95

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 2) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 3,8
2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1
3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING

   PHASE 6 MIN FDW = 5

Program extend time on optical detector units for 2.0 sec for EVB.

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.

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

OVERLAP GREEN FLASH PROGRAMMING FOR 3 SECTION FYA

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrow. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 1, 3, 4

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

STARTUP CALLS PROGRAMMING

Prevents Veh Call to phase 3 during Startup. Phase 3 used only during Preempt.
Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,4,6,8

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1030T4
DESIGNED: September 2014
SEALED: 4-02-15
REVISED: N/A

Electrcial Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55
(South/North Alston Avenue)
at
E. Main St.

Division 5 Durham County DS Durham

PLAN DATE: November 2014	REVIEWED BY: JTR		
PREPARED BY: James Peterson	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
DocuSigned by: John T. Rowe, Jr. 4/2/2015
641D60C145EE4F5 DATE
SIG. INVENTORY NO. 05-1030T4

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jtpeterson

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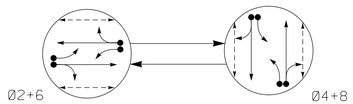
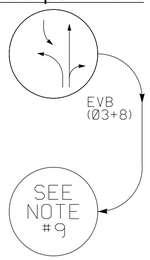
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 21.0

2 Phase Fully Actuated W/ EV Preemption (Durham Signal System)

PHASING DIAGRAM



EV Preempt Phases



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4+8	PHASE EVB	PHASE FLASH
21	F Y	R	R	Y
22,23	G	R	R	Y
31	R	F Y	←	R
41	R	F Y	F Y	R
42,43	R	G	R	R
61	F Y	R	R	Y
62,63	G	R	R	Y
81,82	R	G	G	R
P21,P22	W	DW	DW	DRK
P41,P42	DW	W	DW	DRK
P61,P62	W	DW	DW	DRK
P81,P82	DW	W	DW	DRK

2033 EV PREEMPTION

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
MIN. PED. CLEAR BEFORE PREEMPT	*
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

* See Timing Chart for Min Ped Clearance
** Program Timing on Optical Detector Unit

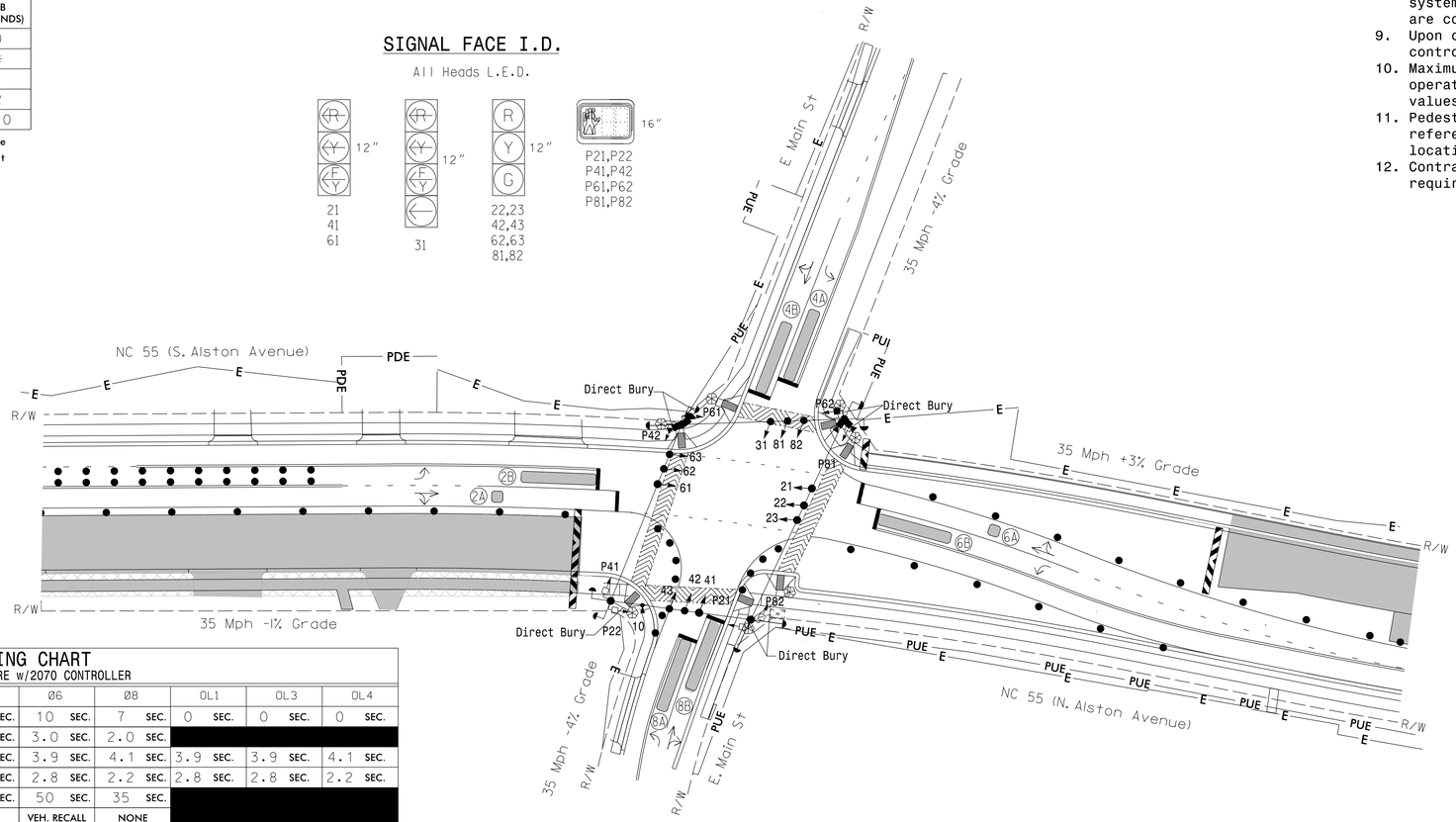
2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS: LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	DETECTOR PROGRAMMING: NEMA PHASE	TIMING: DELAY	TIMING: CARRY (STRETCH)	ATTRIBUTES 1: FULL TIME DELAY	2: PEDESTRIAN CALL	3: RESERVED	4: COUNT	5: EXTENSION	6: TYPE 3	7: CALLING	8: ALTERNATE	SYSTEM LOOPS	STATUS: NEW	STATUS: EXISTING
2A	6x6	*	70	-	*	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	*
2B	6x40	*	0	-	*	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	*
4A	6x40	*	0	-	*	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	*
4B	6x40	*	0	-	*	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	*
6A	6x6	*	70	*	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	*
6B	6x40	*	0	*	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	*
8A	6x40	*	0	*	-	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	*
8B	6x40	*	0	*	-	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	*
PEDESTRIAN DETECTION																			
P21,P22	N/A	N/A	N/A	-	X	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X
P41,P42	N/A	N/A	N/A	-	X	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X
P61,P62	N/A	N/A	N/A	-	X	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X
P81,P82	N/A	N/A	N/A	-	X	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X

* Video Detection Zone

SIGNAL FACE I.D.

All Heads L.E.D.



TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø6	Ø8	OL1	OL3	OL4
MINIMUM INITIAL *	10 SEC.	- SEC.	7 SEC.	10 SEC.	7 SEC.	0 SEC.	0 SEC.	0 SEC.
VEHICLE EXTENSION *	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			
YELLOW CHANGE INT.	3.9 SEC.	4.1 SEC.	4.1 SEC.	3.9 SEC.	4.1 SEC.	3.9 SEC.	3.9 SEC.	4.1 SEC.
RED CLEARANCE	2.8 SEC.	3.1 SEC.	2.2 SEC.	2.8 SEC.	2.2 SEC.	2.8 SEC.	2.8 SEC.	2.2 SEC.
MAXIMUM LIMIT *	50 SEC.	- SEC.	35 SEC.	50 SEC.	35 SEC.			
RECALL POSITION	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE			
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE			
DOUBLE ENTRY	OFF	OFF	ON	OFF	ON			
WALK *	4 SEC.	- SEC.	4 SEC.	4 SEC.	4 SEC.			
FLASHING DON'T WALK	11 SEC.	- SEC.	18 SEC.	10 SEC.	16 SEC.			
MIN PED CLEARANCE	6 SEC.	- SEC.	9 SEC.	5 SEC.	8 SEC.			
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM GAP*	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MINIMUM GAP	3.0 SEC.	- SEC.	2.0 SEC	3.0 SEC.	2.0 SEC.			

* 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.
** Timing to be determined by the City of Durham.

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time.
8. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
9. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
11. Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for pushbutton location details.
12. Contractor shall adjust video detection zones as required.

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	N/A
→	Directional Arrow	→
▭	Work Area	N/A
●	Drums	N/A
E	Construction Easement	N/A
PUE	Permanent Utility Easement	N/A
PDE	Permanent Drainage Easement	N/A
———	Direct Bury	----------
◁	Optical Detector	◀
⊛	Type I Pushbutton Post	✤
▭◁	Video Detector	▬◀
▭	Video Detection Area	▭

Signal Upgrade - Temporary Design 5 (TMP Phase II, Steps 7-12)

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

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

NC 55
(South/North Alston Avenue)
at
E. Main St

Division 5 Durham County Durham
PLAN DATE: September 2014 REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15
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DATE
SIG. INVENTORY NO. 05-1030T5

3/20/2015
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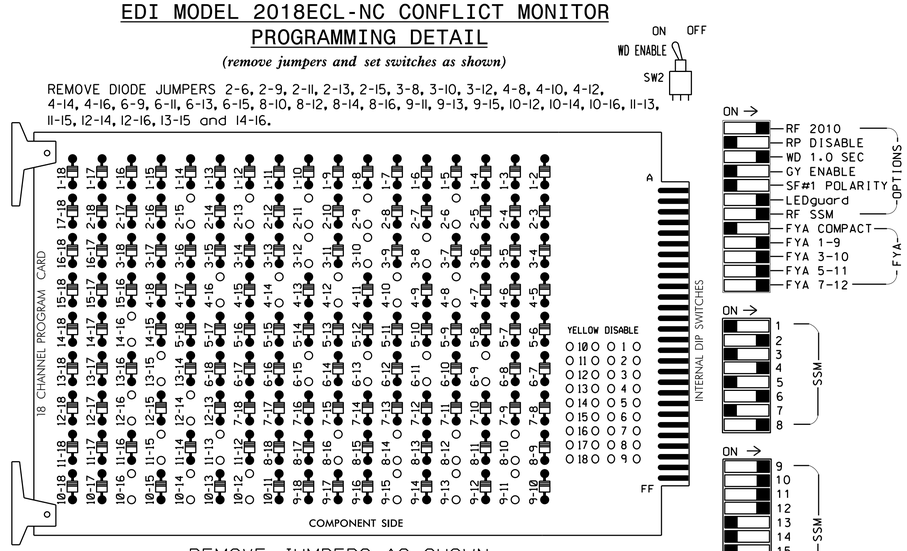
clawson

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig.21.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-6, 2-9, 2-11, 2-13, 2-15, 3-8, 3-10, 3-12, 4-8, 4-10, 4-12, 4-14, 4-16, 6-9, 6-11, 6-13, 6-15, 8-10, 8-12, 8-14, 8-16, 9-11, 9-13, 9-15, 10-12, 10-14, 10-16, 11-13, 11-15, 12-14, 12-16, 13-15 and 14-16.



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Calls for phases 2, 4, 6, and 8.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S3,S4,S5,S6,S8,S9,S11,S12, AUX S1,AUX S2,AUX S4,AUX S5
PHASES USED.....2,3,4,6,8,2 PED,4 PED,6 PED,8 PED
OVERLAP 1.....2
OVERLAP 2.....*
OVERLAP 3.....6
OVERLAP 4.....8

* See FYA PPLT Programming Detail on Sheet 2.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	22,23	P21, P22	31 ★	42,43	P41, P42	NU	62,63	P61, P62	NU	81,82	P81, P82	61 ★	31 ★	NU	21 ★	41 ★	NU
RED		128			101			134			107							
YELLOW		129		*	102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121	A124		A114	A101	
YELLOW ARROW													A122	A125		A115	A102	
FLASHING YELLOW ARROW													A123	A126		A116	A103	
GREEN ARROW				118														
✋			113			104			119			110						
🚶			115			106			121			112						

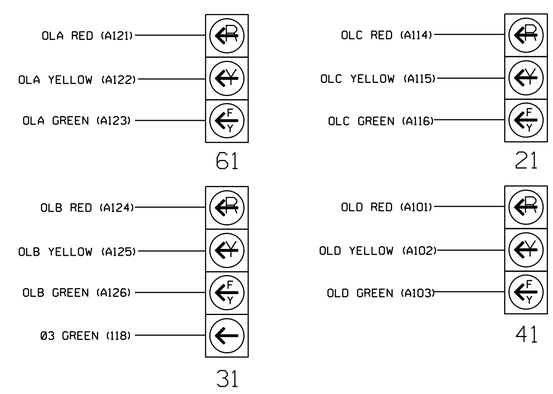
NU = Not Used

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

★ See pictorial of head wiring in detail below.

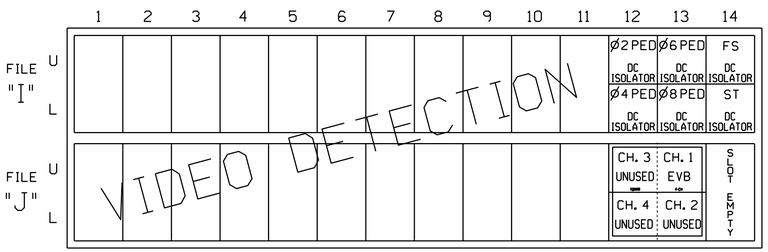
4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD INSERT CARD INTO SLOT J13

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
PED PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED
P61,P62	TB8-7,9	I13U	26	68	2	6 PED
P81,P82	TB8-8,9	I13L	28	70	2	8 PED

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

LOAD RESISTOR INSTALLATION DETAIL

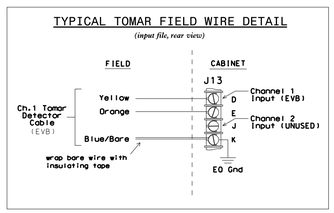
(install resistors as shown below)

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

PHASE 3 YELLOW FIELD TERMINAL (117)
AC-

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



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.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1030T5
DESIGNED: September 2014
SEALED: 4-02-15
REVISED: N/A

Electrcial Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:	NC 55 (South/North Alston Avenue) at E. Main St.	SEAL
Prepared in the Offices of: Transportation Mobility and Safety Division, North Carolina Department of Transportation, Signals Management Section	Division 5 — Durham County — DS — Durham	NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
750 N.Greenfield Pkwy,Garner,NC 27529	PLAN DATE: November 2014 — REVIEWED BY: JTR	DocuSigned by: John T. Rowe, Jr. 641D80C145E6F5... DATE
	PREPARED BY: James Peterson — REVIEWED BY:	SIG. INVENTORY NO. 05-1030T5
	REVISIONS — INIT. — DATE	

01-APR-2015 11:52
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jrpeterson

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig.21.2

OVERLAPS [1-4] PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

OVERLAP [1]:
LOADSWITCH = 9 NOTE: FOR SIGNAL HEAD 61
VEH SET 1 = 2
YELLOW CLEARANCE = 3.9
RED CLEARANCE = 2.8

PRESS '+' TWICE

OVERLAP [3]:
LOADSWITCH = 11 NOTE: FOR SIGNAL HEAD 21
VEH SET 1 = 6
YELLOW CLEARANCE = 3.9
RED CLEARANCE = 2.8

PRESS '+'

OVERLAP [4]:
LOADSWITCH = 12 NOTE: FOR SIGNAL HEAD 41
VEH SET 1 = 8
YELLOW CLEARANCE = 4.1
RED CLEARANCE = 2.2

END OF OVERLAP PROGRAMMING

FYA PPLT PROGRAMMING

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 3
2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 3 = 96
3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 3 RED = 94, Phase 3 YELLOW = 95

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 2) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 3,8
2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1
3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 6
   PHASE 4 MIN FDW = 9
   PHASE 6 MIN FDW = 5
   PHASE 8 MIN FDW = 8

Program extend time on optical detector units for 2.0 sec for EVB.

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.

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

OVERLAP GREEN FLASH PROGRAMMING FOR 3 SECTION FYA

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrow. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 1, 3, 4

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

STARTUP CALLS PROGRAMMING

Prevents Veh Call to phase 3 during Startup. Phase 3 used only during Preempt.
Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,4,6,8

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1030T5
DESIGNED: September 2014
SEALED: 4-02-15
REVISED: N/A

Electrcial Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55
(South/North Alston Avenue)
at
E. Main St.

Division 5 Durham County DS Durham

PLAN DATE: November 2014	REVIEWED BY: JTR		
PREPARED BY: James Peterson	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
DocuSigned by: John T. Rowe, Jr.
641D60C145EE4F5
DATE
SIG. INVENTORY NO. 05-1030T5

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jtpeterson

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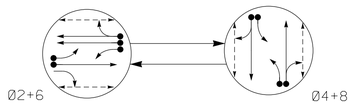
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 22.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV Preempt Phases

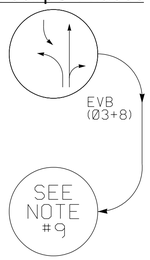


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø4+8	EVB	FLASH
21	F Y	R	R	Y
22,23	G	R	R	Y
31	R	F Y	←	R
41	R	F Y	F Y	R
42,43	R	G	R	R
61	F Y	R	R	Y
62,63	G	R	R	Y
81,82	R	G	G	R
P21,P22	W	DW	DW	DRK
P41,P42	DW	W	DW	DRK
P61,P62	W	DW	DW	DRK
P81,P82	DW	W	DW	DRK

2033 EV PREEMPTION

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
MIN. PED. CLEAR BEFORE PREEMPT	✳
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

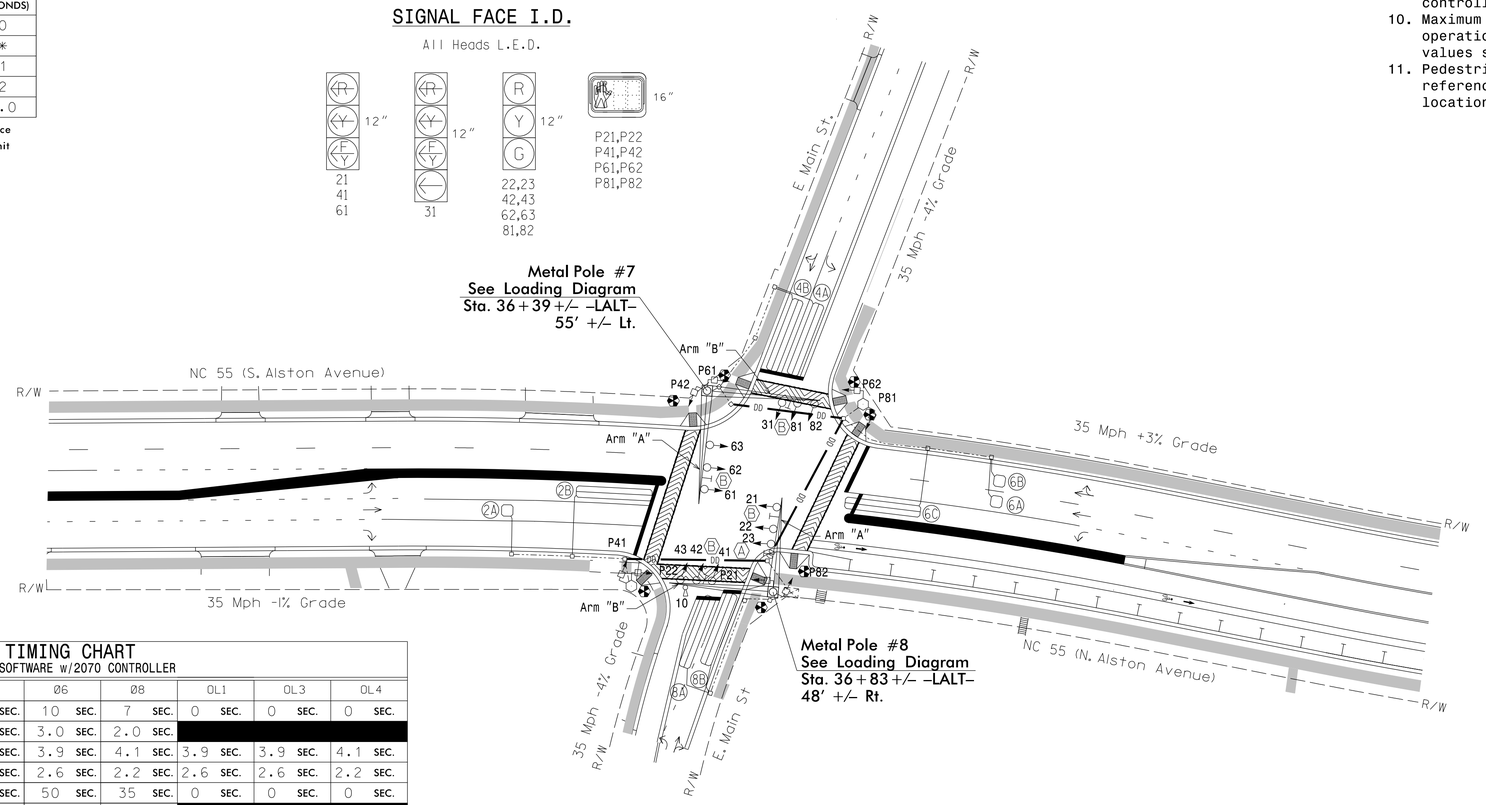
✳ See Timing Chart for Min Ped Clearance
** Program Timing on Optical Detector Unit

SIGNAL FACE I.D.

All Heads L.E.D.

2033 SOFTWARE w/ 2070 CONTROLLER
LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS: LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	DETECTOR PROGRAMMING: NEMA PHASE	TIMING: DELAY	TIMING: CARRY (STRETCH)	ATTRIBUTES: 1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	STATUS: NEW	EXISTING
2A	6x6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6x40	2-4-2	0	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6x40	2-4-2	0	X	-	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4B	6x40	2-4-2	0	X	-	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6x6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6x6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6C	6x40	2-4-2	+5	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6x40	2-4-2	0	X	-	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8B	6x40	2-4-2	0	X	-	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
PEDESTRIAN DETECTION																			
P21,P22	N/A	N/A	N/A	-	X	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X
P41,P42	N/A	N/A	N/A	-	X	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X
P61,P62	N/A	N/A	N/A	-	X	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X
P81,P82	N/A	N/A	N/A	-	X	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X



TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø6	Ø8	OL1	OL3	OL4
MINIMUM INITIAL *	10 SEC.	- SEC.	7 SEC.	10 SEC.	7 SEC.	0 SEC.	0 SEC.	0 SEC.
VEHICLE EXTENSION *	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			
YELLOW CHANGE INT.	3.9 SEC.	4.1 SEC.	4.1 SEC.	3.9 SEC.	4.1 SEC.	3.9 SEC.	3.9 SEC.	4.1 SEC.
RED CLEARANCE	2.6 SEC.	2.9 SEC.	2.2 SEC.	2.6 SEC.	2.2 SEC.	2.6 SEC.	2.6 SEC.	2.2 SEC.
MAXIMUM LIMIT *	50 SEC.	- SEC.	35 SEC.	50 SEC.	35 SEC.	0 SEC.	0 SEC.	0 SEC.
RECALL POSITION	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE			
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE			
DOUBLE ENTRY	OFF	OFF	ON	OFF	ON			
WALK *	4 SEC.	- SEC.	4 SEC.	4 SEC.	4 SEC.			
FLASHING DON'T WALK	11 SEC.	- SEC.	18 SEC.	10 SEC.	16 SEC.			
MIN PED CLEARANCE	6 SEC.	- SEC.	9 SEC.	5 SEC.	8 SEC.			
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM GAP*	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MINIMUM GAP	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			

* 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.

2 Phase
Fully Actuated
W/ EV Preemption
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time.
8. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
9. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
11. Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for pushbutton location details.

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
Ⓐ	Right Arrow "Only" Sign (R3-5R)	Ⓐ
Ⓑ	Street Name Sign	Ⓑ
⊛	Type I Pushbutton Post	●
⬡	Type II Signal Pedestal	⬢
▱	Metal Pole with Mastarm	▣
⋈	Optical Detector	⋈

Signal Upgrade - Final Design

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

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

NC 55
(South/North Alston Avenue)
at
E. Main St

Division 5 Durham County Durham

PLAN DATE: September 2014 REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15 DATE
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SIG. INVENTORY NO. 05-1030

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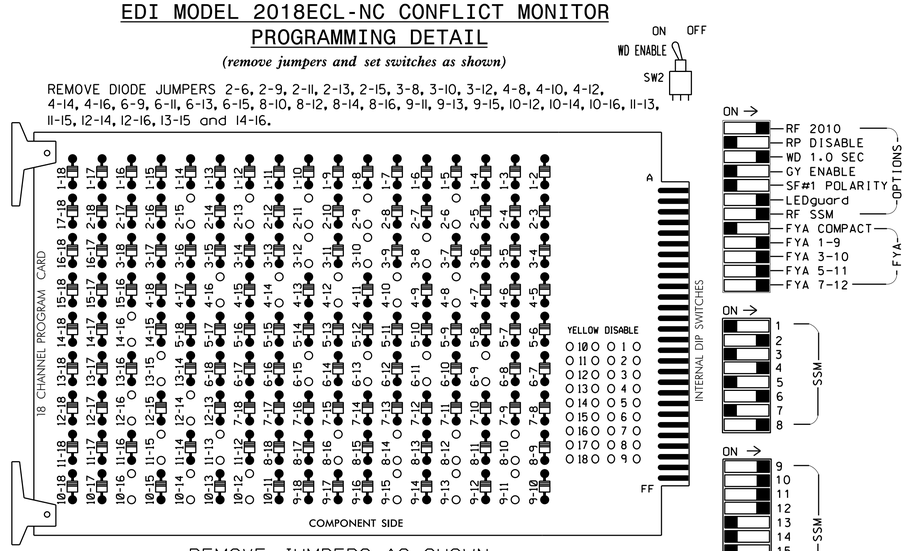
clawson

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig.22.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-6, 2-9, 2-11, 2-13, 2-15, 3-8, 3-10, 3-12, 4-8, 4-10, 4-12, 4-14, 4-16, 6-9, 6-11, 6-13, 6-15, 8-10, 8-12, 8-14, 8-16, 9-11, 9-13, 9-15, 10-12, 10-14, 10-16, 11-13, 11-15, 12-14, 12-16, 13-15 and 14-16.



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Calls for phases 2, 4, 6, and 8.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S3,S4,S5,S6,S8,S9,S11,S12, AUX S1,AUX S2,AUX S4,AUX S5
PHASES USED.....2,3,4,6,8,2 PED,4 PED,6 PED,8 PED
OVERLAP 1.....2
OVERLAP 2.....*
OVERLAP 3.....6
OVERLAP 4.....8

* See FYA PPLT Programming Detail on Sheet 2.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	22,23	P21, P22	31★	42,43	P41, P42	NU	62,63	P61, P62	NU	81,82	P81, P82	61★	31★	NU	21★	41★	NU
RED		128			101			134			107							
YELLOW		129		✳	102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121	A124		A114	A101	
YELLOW ARROW													A122	A125		A115	A102	
FLASHING YELLOW ARROW													A123	A126		A116	A103	
GREEN ARROW				118														
✋			113			104			119			110						
🚶			115			106			121			112						

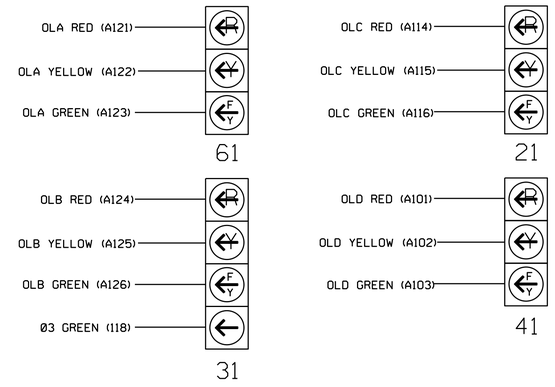
NU = Not Used

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

★ See pictorial of head wiring in detail below.

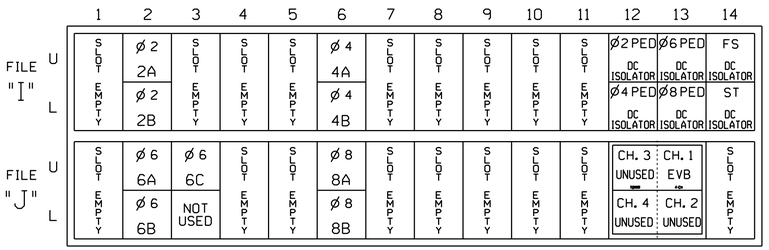
4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD INSERT CARD INTO SLOT J13

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
4B	TB4-11,12	I6L	7	45	5 7	4
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
6C	TB3-9,10	J3U	22	64	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
8B	TB5-11,12	J6L	8	46	5 7	8
PED PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED
P61,P62	TB8-7,9	I13U	26	68	2	6 PED
P81,P82	TB8-8,9	I13L	28	70	2	8 PED

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

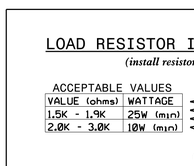
INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

DETECTOR ATTRIBUTES LEGEND:
1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

LOAD RESISTOR INSTALLATION DETAIL

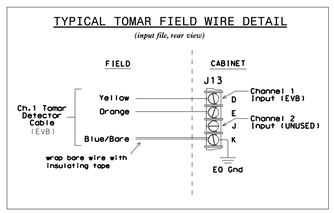
(install resistors as shown below)

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



TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1030
DESIGNED: September 2014
SEALED: 4-02-15
REVISED: N/A

Electrcial Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:	NC 55 (South/North Alston Avenue) at E. Main St.	SEAL
Prepared in the Offices of: NCDOT Transportation Mobility and Safety Division, Signals Management Section	Division 5 — Durham County — DS — Durham	NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
750 N.Greenfield Pkwy,Garner,NC 27529	PLAN DATE: November 2014 — REVIEWED BY: JTR	DocuSigned by: John T. Rowe, Jr. 4/2/2015
	PREPARED BY: James Peterson — REVIEWED BY:	SIG. INVENTORY NO. 05-1030
	REVISIONS — INIT. — DATE	

01-APR-2015 11:05
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jpeterson

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig.22.2

OVERLAPS [1-4] PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

OVERLAP [1]:
LOADSWITCH = 9 NOTE: FOR SIGNAL HEAD 61
VEH SET 1 = 2
YELLOW CLEARANCE = 3.9
RED CLEARANCE = 2.6

PRESS '+' TWICE

OVERLAP [3]:
LOADSWITCH = 11 NOTE: FOR SIGNAL HEAD 21
VEH SET 1 = 6
YELLOW CLEARANCE = 3.9
RED CLEARANCE = 2.6

PRESS '+'

OVERLAP [4]:
LOADSWITCH = 12 NOTE: FOR SIGNAL HEAD 41
VEH SET 1 = 8
YELLOW CLEARANCE = 4.1
RED CLEARANCE = 2.2

END OF OVERLAP PROGRAMMING

FYA PPLT PROGRAMMING

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 3
2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 3 = 96
3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 3 RED = 94, Phase 3 YELLOW = 95

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 2) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 3.8
2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1
3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 6
   PHASE 4 MIN FDW = 9
   PHASE 6 MIN FDW = 5
   PHASE 8 MIN FDW = 8

Program extend time on optical detector units for 2.0 sec for EVB.

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.

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

OVERLAP GREEN FLASH PROGRAMMING FOR 3 SECTION FYA

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrow. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 1, 3, 4

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

STARTUP CALLS PROGRAMMING

Prevents Veh Call to phase 3 during Startup. Phase 3 used only during Preempt.
Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,4,6,8

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1030
DESIGNED: September 2014
SEALED: 4-02-15
REVISED: N/A

Electrcial Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55
(South/North Alston Avenue)
at
E. Main St.

Division 5 Durham County Durham

PLAN DATE: November 2014	REVIEWED BY:	DS JTR	
PREPARED BY: James Peterson	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
DocuSigned by: John T. Rowe, Jr. 4/2/2015
DATE
SIG. INVENTORY NO. 05-1030

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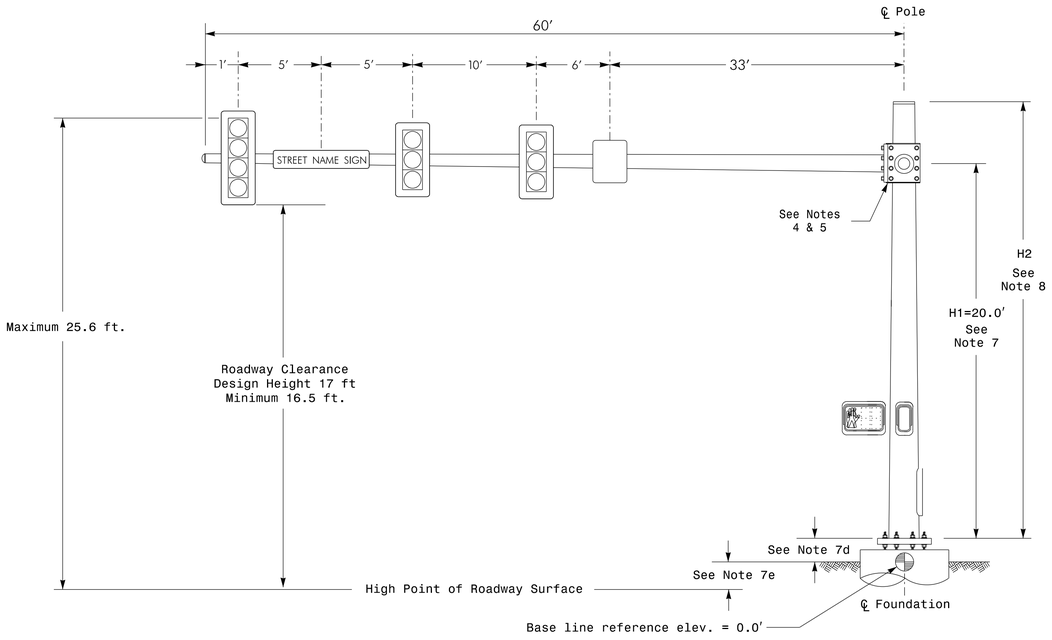
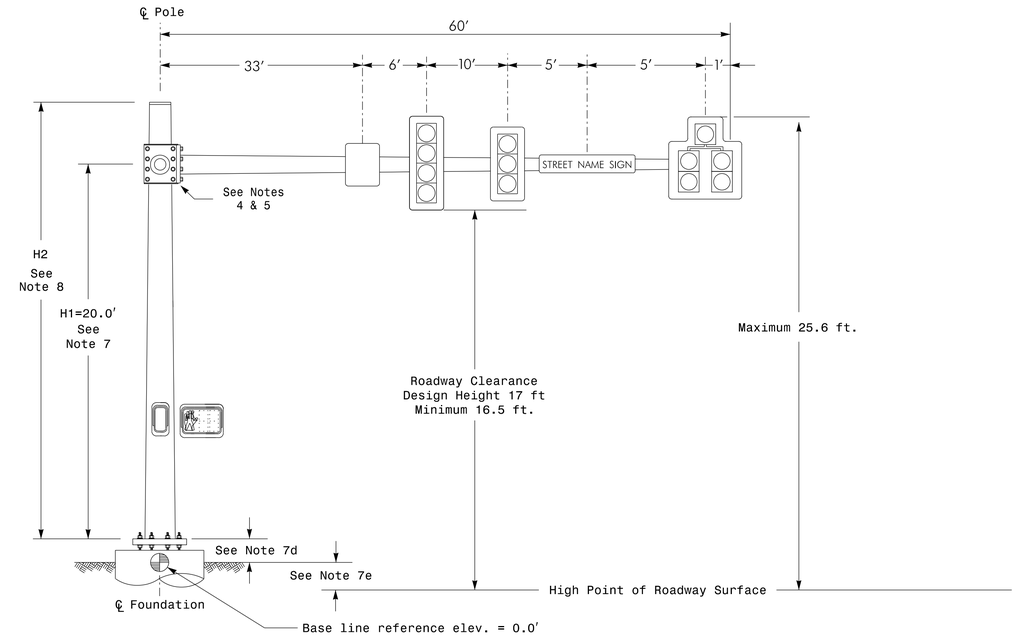
Design Loading for METAL POLE NO. 7, MAST ARM A



Elevation View @ 0°

Design Loading for METAL POLE NO. 7, MAST ARM B



Elevation View @ 270°

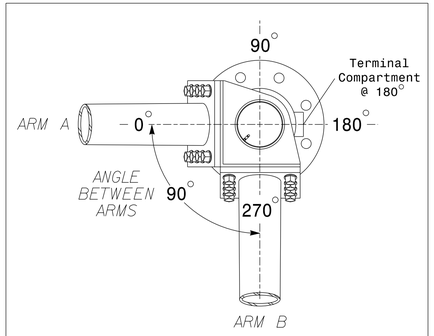
$$$$SYSTIME$$$$
$$$$DOCNAME$$$$
$$$$USERNAME$$$$

SPECIAL NOTE

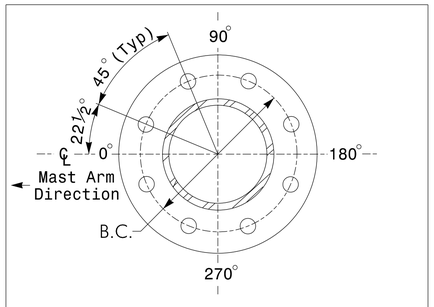
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.59 ft.	+0.55 ft.
Elevation difference at Edge of travelway or face of curb	-0.66 ft.	-0.52 ft.

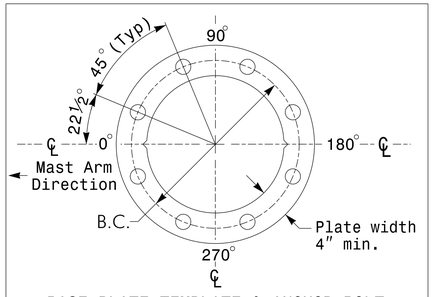


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

METAL POLE No. 7

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 22.3

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"–4 SECTION WITH 8" BACKPLATE RIGID MOUNTED	15.8 S.F.	31.5" W X 72.0" L	78 LBS
	SIGNAL HEAD 12"–3 SECTION WITH 8" BACKPLATE RIGID MOUNTED	12.8 S.F.	31.5" W X 58.5" L	63 LBS
	SIGNAL HEAD 12"–5 SECTION WITH 8" BACKPLATE RIGID MOUNTED	20.7 S.F.	48.0" W X 62.0" L	107 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED	12.0 S.F.	18.0" W X 96.0" L	27 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS
	SIGN RIGID MOUNTED	7.5 S.F.	30.0" W X 36.0" L	14 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 5th Edition 2009 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2012 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2012 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate arm connection points.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. The pole manufacturer will determine the total height (H2) of the pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Structural Engineer for assistance at (919) 773-2800.
10. The contractor is responsible for verifying that the mast arm lengths shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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

NCDOT Wind Zone 4 (90 mph)

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

NC 55 (South Alston Avenue) at E. Main ST

Division 5 Durham County Durham

PLAN DATE: December 2014 REVIEWED BY: J Hochanadel

PREPARED BY: M Copple REVIEWED BY:

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15
507B1D2BF98C498... DATE

SIG. INVENTORY NO. 05-1030

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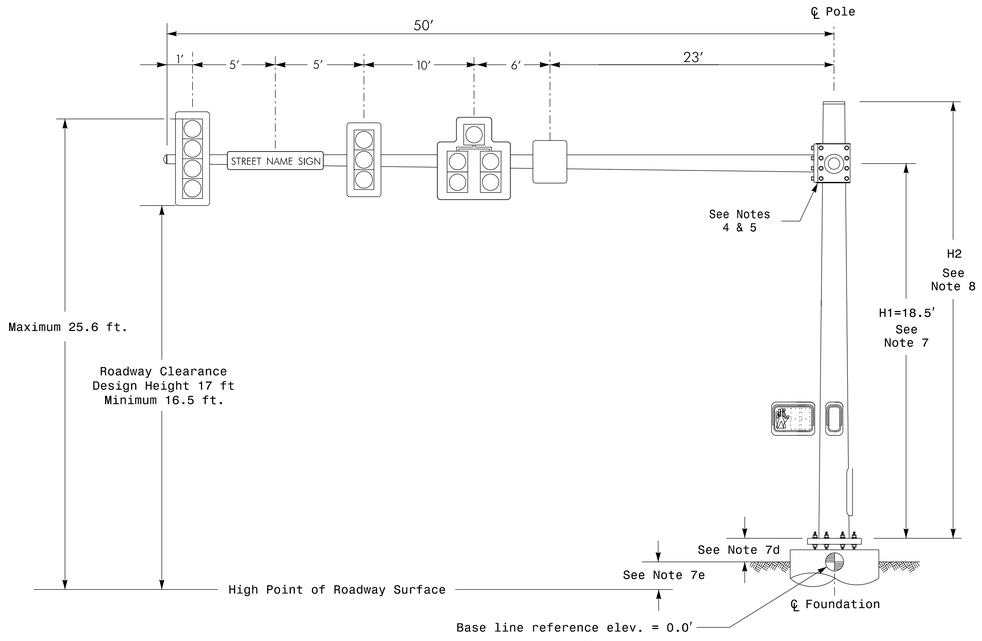
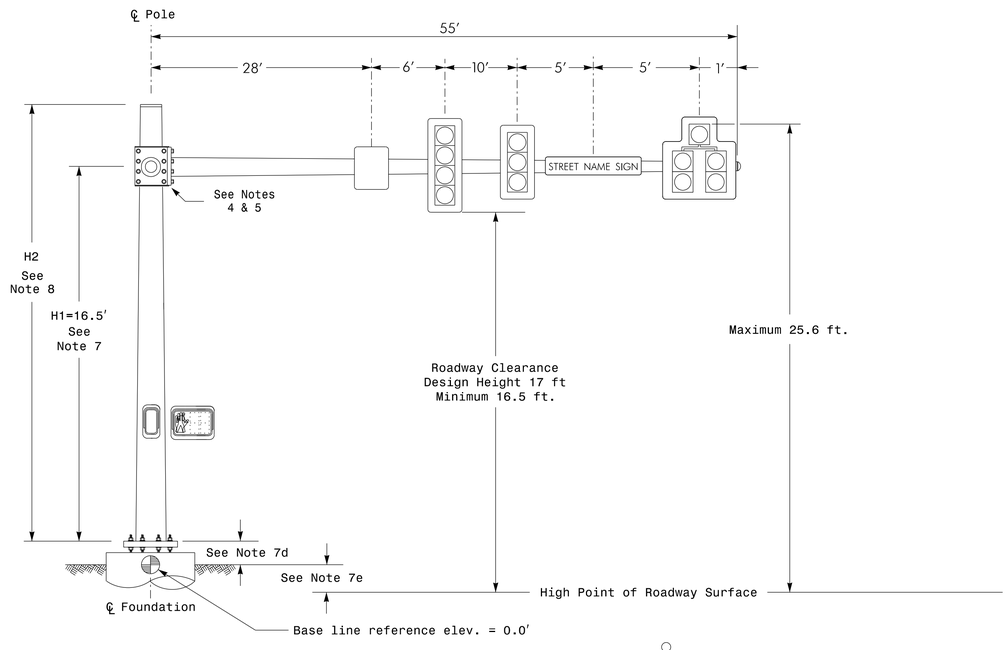
Design Loading for METAL POLE NO. 8, MAST ARM A



Elevation View @ 0°

Design Loading for METAL POLE NO. 8, MAST ARM B



Elevation View @ 270°

$$$$SYSTIME$$$$
$$$$DOCNAME$$$$
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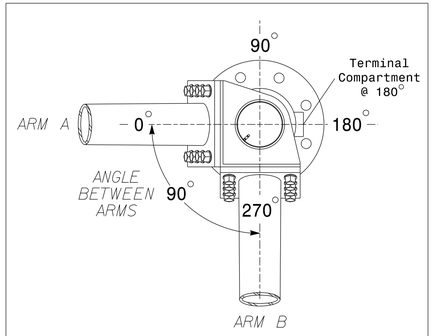
SPECIAL NOTE

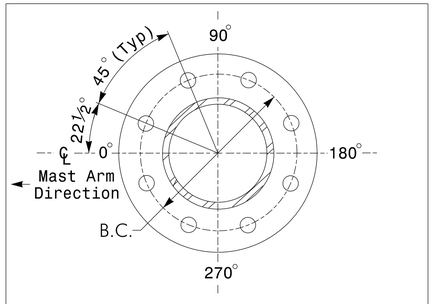
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-1.13 ft.	-2.73 ft.
Elevation difference at Edge of travelway or face of curb	+0.50 ft.	+0.30 ft.

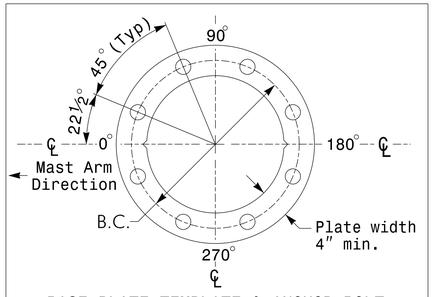


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

METAL POLE No. 8

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 22.4

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"–4 SECTION WITH 8" BACKPLATE RIGID MOUNTED	15.8 S.F.	31.5" W X 72.0" L	78 LBS
	SIGNAL HEAD 12"–3 SECTION WITH 8" BACKPLATE RIGID MOUNTED	12.8 S.F.	31.5" W X 58.5" L	63 LBS
	SIGNAL HEAD 12"–5 SECTION WITH 8" BACKPLATE RIGID MOUNTED	20.7 S.F.	48.0" W X 62.0" L	107 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED	12.0 S.F.	18.0" W X 96.0" L	27 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS
	SIGN RIGID MOUNTED	7.5 S.F.	30.0" W X 36.0" L	14 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 5th Edition 2009 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2012 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2012 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate arm connection points.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. The pole manufacturer will determine the total height (H2) of the pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Structural Engineer for assistance at (919) 773-2800.
10. The contractor is responsible for verifying that the mast arm lengths shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
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NCDOT Wind Zone 4 (90 mph)

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

NC 55 (South Alston Avenue) at E. Main St

Division 5 Durham County Durham

PLAN DATE: December 2014 REVIEWED BY: J Hochanadel

PREPARED BY: M Copple REVIEWED BY:

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15 DATE
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SIG. INVENTORY NO. 05-1030

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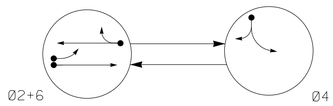
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 23.0

2 Phase Fully Actuated W/ EV Preemption (Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV Preempt Phases

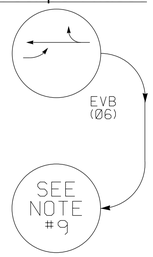


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4	PHASE EVB	PHASE FLASH
	~~G~~ Y	~~R~~ R	~~G~~ Y	~~Y~~ Y
22,23	G	R	R	Y
41,42	R	G	R	R
61,62	G	R	G	Y

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN ALWAYS	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6x6	✳	70	✳	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-
2B	6x40	✳	0	✳	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-
4A	6x40	✳	0	✳	-	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-
6A	6x6	✳	70	✳	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-

✳ Video Detection Zone

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet as to not obstruct sight distance of vehicles turning right on red.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Pavement markings are existing.
8. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
9. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
11. Contractor to maintain pedestrian movements through Taylor Street construction areas.

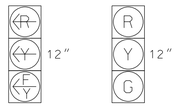
2033 EV PREEMPTION

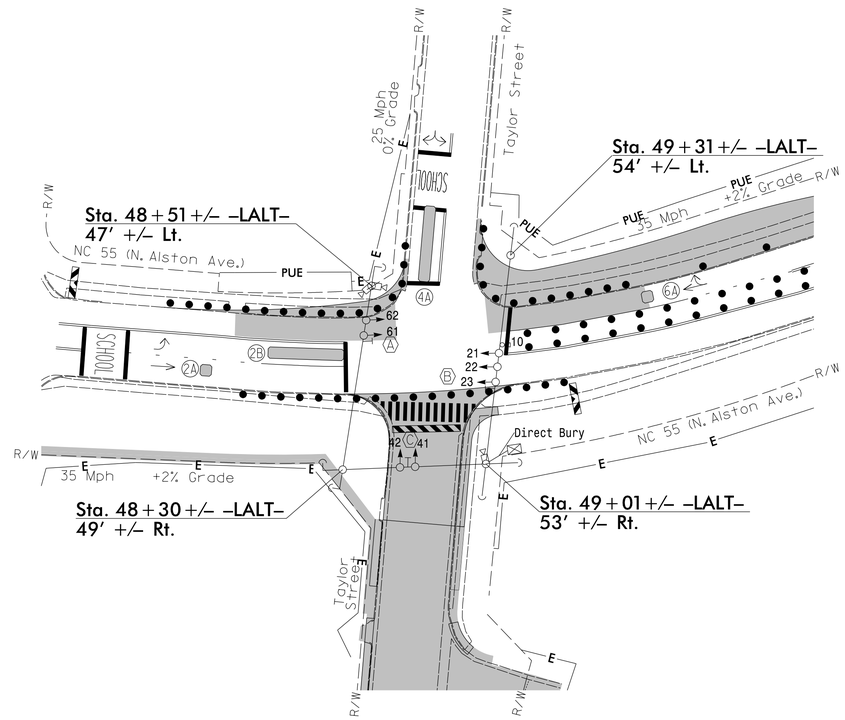
FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
MIN. PED. CLEAR BEFORE PREEMPT	0
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

** Program Timing on Optical Detector Unit

SIGNAL FACE I.D.

All Heads L.E.D.





LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□	Pedestrian Signal Head With Push Button & Sign	■
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
----------	2-in Underground Conduit	----------
N/A	Right of Way	----------
→	Directional Arrow	→
Ⓐ	"No Left Turn" (R3-2)	Ⓐ
Ⓑ	"No Right Turn" (R3-1)	Ⓑ
Ⓒ	"Dual Turn Arrows" (R10-21) w/ Flags	Ⓒ
▭	Work Area	N/A
●	Drums	N/A
E	Construction Easement	N/A
PUE	Permanent Utility Easement	N/A
▰▰	Barricades	N/A
----------	Direct Bury	----------
○◁	Optical Detector	●◀
▭◁	Video Detector	■◀
▭	Video Detection Area	▭

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø4	Ø6	OL3
MINIMUM INITIAL *	10 SEC.	7 SEC.	10 SEC.	0 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	3.0 SEC.	
YELLOW CHANGE INT.	3.7 SEC.	3.0 SEC.	3.7 SEC.	3.7 SEC.
RED CLEARANCE	1.3 SEC.	1.9 SEC.	1.3 SEC.	1.3 SEC.
MAXIMUM LIMIT *	50 SEC.	35 SEC.	50 SEC.	
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL	
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK	
DOUBLE ENTRY	OFF	OFF	OFF	
WALK *	- SEC.	- SEC.	- SEC.	
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	
MIN PED CLEARANCE	- SEC.	- SEC.	- SEC.	
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	3.0 SEC.	
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	
MINIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 SEC.	

* 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 1, Steps 1-10)

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

NC 55 (North Alston Avenue) at Taylor Street
Division 5 Durham County Durham

PLAN DATE: September 2014 REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15
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DATE

SIG. INVENTORY NO. 05-0228TI

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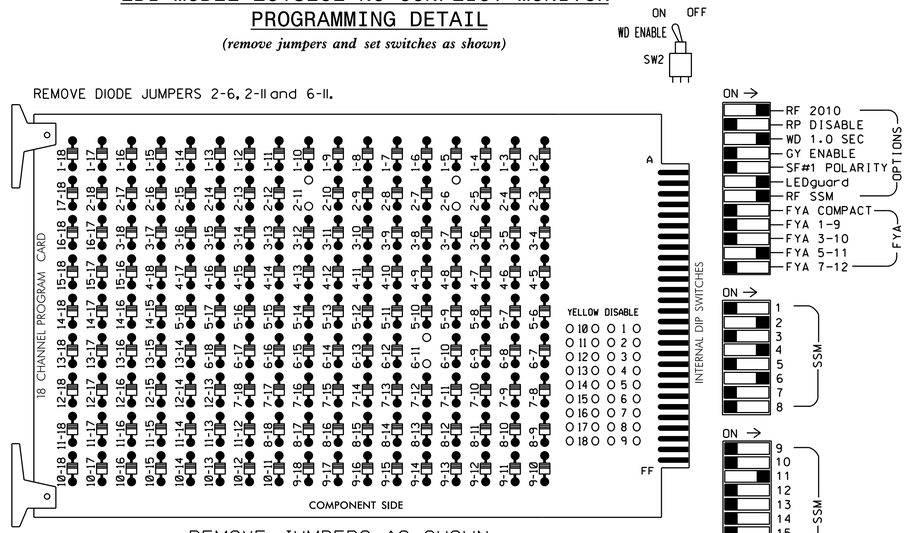
hpark

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 23.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Ensure conflict monitor communicates with 2070.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. Set the Red Revert interval on the controller to 1 second.
9. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S5,S8,AUX S4
PHASES USED.....2,4,6
OVERLAP 1.....NOT USED
OVERLAP 2.....NOT USED
OVERLAP 3.....2+6
OVERLAP 4.....NOT USED

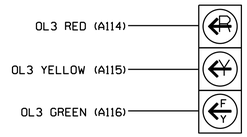
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	22,23	NU	NU	41,42	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	21★	NU	NU
RED		128			101			134										
YELLOW		129			102			135										
GREEN		130			103			136										
RED ARROW																A114		
YELLOW ARROW																A115		
FLASHING YELLOW ARROW																A116		
GREEN ARROW																		

NU = Not Used
★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

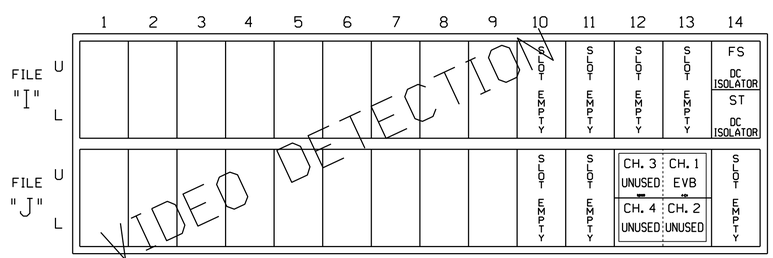
(wire signal heads as shown)



21

INPUT FILE POSITION LAYOUT

(front view)



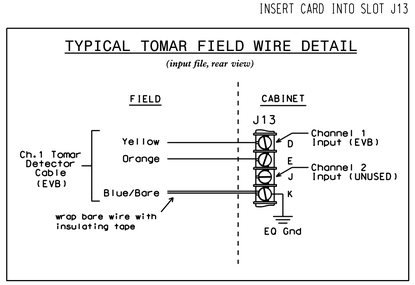
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD
INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



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.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0228T1
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

Electrical Detail - Temporary 1 - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 55 (North Alston Avenue) at Taylor Street

Division 5 | Durham County | Durham

PLAN DATE: November 2014 | REVIEWED BY: T. Joyce

PREPARED BY: C. Strickland | REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown 4/2/2015
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SIG. INVENTORY NO. 05-0228T1

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PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 23.2

OVERLAP [3] PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

PRESS '+' TWICE

OVERLAP [3]:
LOADSWITCH = 11 NOTE: FOR SIGNAL HEAD 21
VEH SET 1 = 2,6
YELLOW CLEARANCE = 3.7
RED CLEARANCE = 1.3

END OF OVERLAP PROGRAMMING

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 6

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

Program extend time on optical detector units for 2.0 sec for EVB.

OVERLAP GREEN FLASH PROGRAMMING FOR 3 SECTION FYA

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrow. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 3

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0228T1
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

Electrical Detail - Temporary 1 - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55 (North Alston Avenue)
at
Taylor Street

Division 5 Durham County Durham

PLAN DATE:	November 2014	REVIEWED BY:	T. Joyce
PREPARED BY:	C. Strickland	REVIEWED BY:	

REVISIONS	INIT.	DATE

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NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by:
George C. Brown 4/2/2015
F12601EDDBEB434 DATE

SIG. INVENTORY NO. 05-0228T1

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cestrickland

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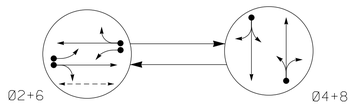
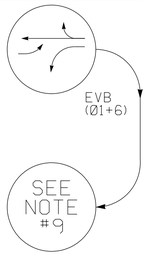
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 24.0

2 Phase Fully Actuated W/ EV Preemption (Durham Signal System)

PHASING DIAGRAM



EV Preempt Phases



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4+8	EVB	FLASH
11	~~G~~	~~R~~	←	~~Y~~
21	~~G~~	~~R~~	~~G~~	~~Y~~
22,23	G	R	R	Y
41,42	R	G	R	R
61,62	G	R	G	Y
81,82	R	G	R	R
P21,P22	W	DW	DW	DRK

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6x6	✳	70	-	✳	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
2B	6x40	✳	0	-	✳	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
4A	6x40	✳	0	-	✳	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
6A	6x6	✳	70	-	✳	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
6B	6x40	✳	0	✳	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-
8A	6x40	✳	0	✳	-	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-
PEDESTRIAN DETECTION																			
P21,P22	N/A	N/A	N/A	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-

✳ Video Detection Zone

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time.
8. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
9. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
10. Maximum times shown in timing chart are for free -run operation only. Coordinated signal system timing values supersede these values.
11. Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for pushbutton location details.
12. Contractor shall adjust video detection zones as required.

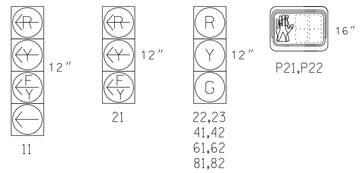
2033 EV PREEMPTION

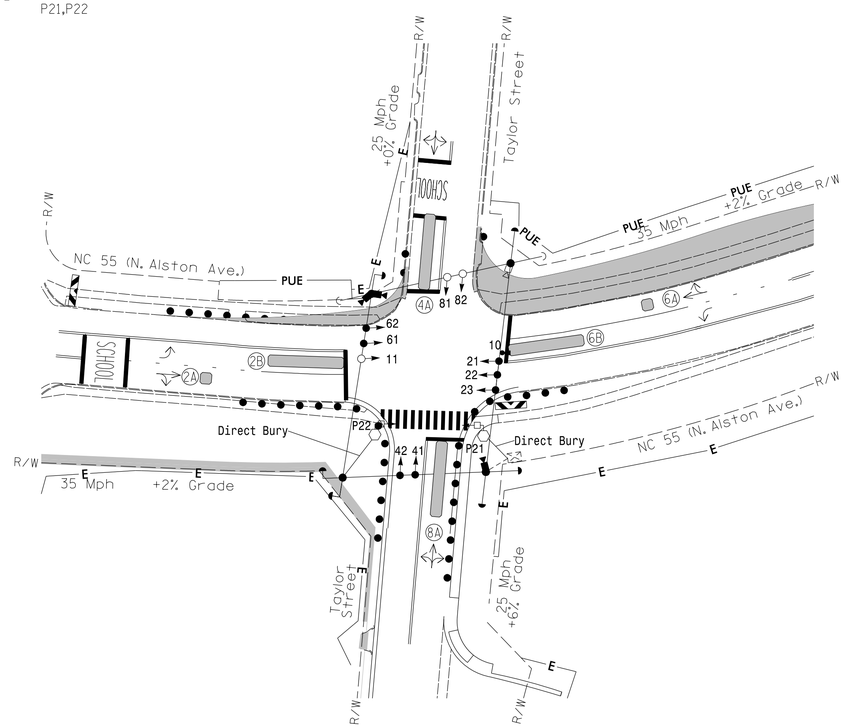
FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
MIN. PED. CLEAR BEFORE PREEMPT	✳
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

✳ See Timing Chart for Min Ped Clearance
** Program Timing on Optical Detector Unit

SIGNAL FACE I.D.

All Heads L.E.D.





LEGEND

PROPOSED		EXISTING
●→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
▯↓	Pedestrian Signal Head With Push Button & Sign	■↓
○→	Signal Pole with Guy	●→
○↘	Signal Pole with Sidewalk Guy	●↘
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
-----	2-in Underground Conduit	-----
N/A	Right of Way	-----
→	Directional Arrow	→
▬	Work Area	N/A
●	Drums	N/A
E	Construction Easement	N/A
PUE	Permanent Utility Easement	N/A
▨	Barricades	N/A
———	Direct Bury	----------
○	Optical Detector	●→
⬡	Type II Signal Pedestal	⬢
▭◁	Video Detector	■◀
▬	Video Detection Area	▬

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø6	Ø8	OL3
MINIMUM INITIAL *	- SEC.	10 SEC.	7 SEC.	10 SEC.	7 SEC.	0 SEC.
VEHICLE EXTENSION *	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	
YELLOW CHANGE INT.	3.7 SEC.	3.7 SEC.	3.2 SEC.	3.7 SEC.	3.0 SEC.	3.7 SEC.
RED CLEARANCE	2.1 SEC.	1.4 SEC.	1.8 SEC.	1.4 SEC.	1.9 SEC.	1.4 SEC.
MAXIMUM LIMIT *	- SEC.	50 SEC.	35 SEC.	50 SEC.	35 SEC.	
RECALL POSITION	NONE	VEH. RECALL	NONE	VEH. RECALL	NONE	
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	YELLOW LOCK	NONE	
DOUBLE ENTRY	OFF	OFF	ON	OFF	ON	
WALK *	- SEC.	4 SEC.	- SEC.	- SEC.	- SEC.	
FLASHING DON'T WALK	- SEC.	11 SEC.	- SEC.	- SEC.	- SEC.	
MIN PED CLEARANCE	- SEC.	6 SEC.	- SEC.	- SEC.	- SEC.	
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MAXIMUM GAP*	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MINIMUM GAP	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	

* 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 1, Steps 1-10)

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

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

NC 55 (North Alston Avenue)
at
Taylor Street
Division 5 Durham County Durham

PLAN DATE: September 2014 REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15
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DATE

SIG. INVENTORY NO. 05-0228T2

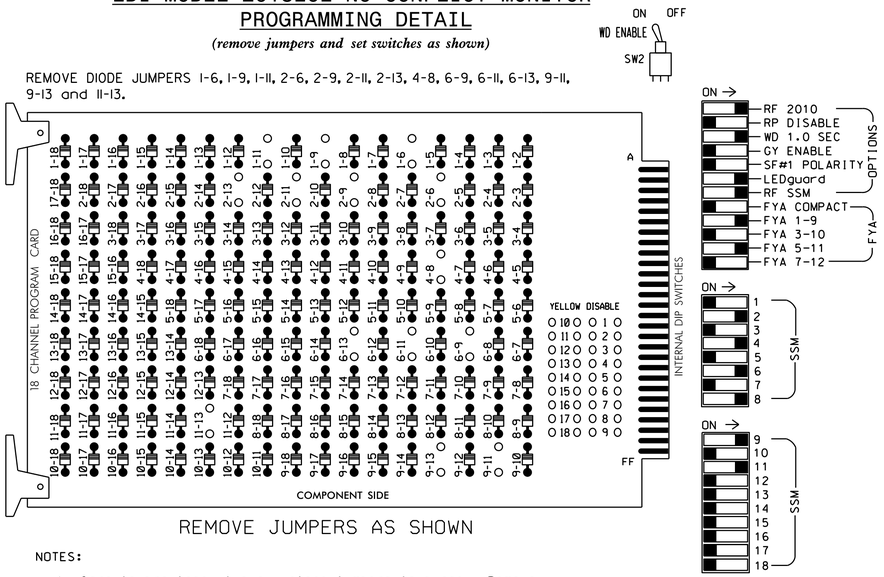
3/20/2015
G:\NCDOT\Projects\TIP\R13.017.00 NCDOT 2012 Traffic LSA\TIP\R13.017.03 (U-3308 Signals)\Traffic\Signals\Design\Signals\TEMP SIGNALS WITH VIDEO\05-0228\05-0228T2.dgn
hpark

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 24.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS I-6, I-9, I-11, 2-6, 2-9, 2-11, 2-13, 4-8, 6-9, 6-11, 6-13, 9-11, 9-13 and 11-13.



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Call for phase 2.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S3,S5,S8,S11,AUX S1,AUX S4
PHASES USED.....**1,2,2 PED,4,6,8
OVERLAP 1.....*
OVERLAP 2.....NOT USED
OVERLAP 3.....2+6
OVERLAP 4.....NOT USED

* See FYA PPLT Programming Detail on Sheet 2.
** Phase used only during Preempt.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11★	22,23	P21, P22	NU	41,42	NU	NU	61,62	NU	NU	81,82	NU	11★	NU	NU	21★	NU	NU
RED		128			101			134			107							
YELLOW	*	129			102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121			A114		
YELLOW ARROW													A122			A115		
FLASHING YELLOW ARROW													A123			A116		
GREEN ARROW	127																	
✋			113															
🚶			115															

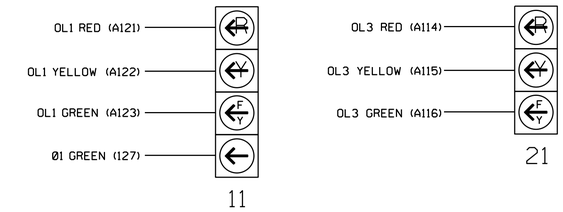
NU = Not Used

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

★ See pictorial of head wiring in detail below.

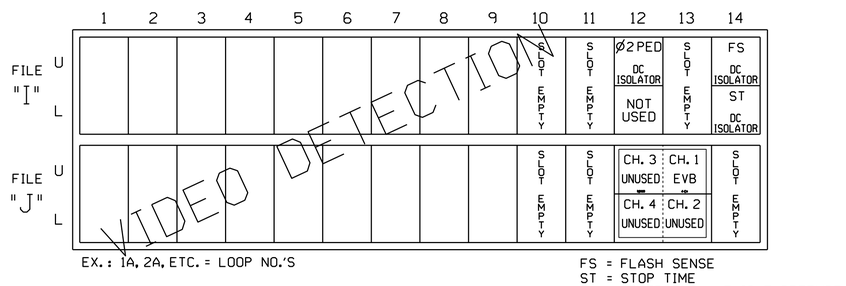
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



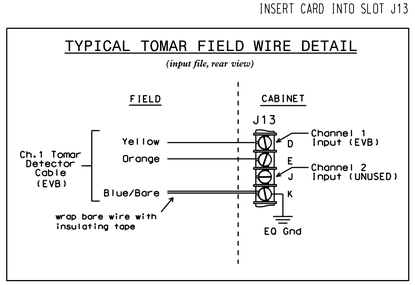
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



INPUT FILE CONNECTION & PROGRAMMING CHART

PED PUSH BUTTONS	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
P21,P22	TB8-4,6	I12U	25	67	2	2 PED

NOTE: INSTALL DC ISOLATORS IN INPUT FILE SLOT I12.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

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.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0228T2
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

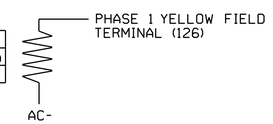
STARTUP CALLS PROGRAMMING

Prevents Veh Call to phase 1 during Startup. Phase 1 used only during Preempt.
Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,4,6,8

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

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



Electrical Detail - Temporary 2 - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 55 (North Alston Avenue) at Taylor Street

Division 5 | Durham County | Durham

PLAN DATE: November 2014 | REVIEWED BY: T. Joyce

PREPARED BY: C. Strickland | REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown F12601ED0BE8434... 4/2/2015 DATE

SIG. INVENTORY NO. 05-0228T2

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cestrickland

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 24.2

OVERLAP [3] PROGRAMMING DETAIL

Program overlap as follows:
Main Menu - 4) OVERLAP

PRESS '+' TWICE

OVERLAP [3]:
LOADSWITCH = 11 NOTE: FOR SIGNAL HEAD 21
VEH SET 1 = 2,6
YELLOW CLEARANCE = 3.7
RED CLEARANCE = 1.4

END OF OVERLAP PROGRAMMING

FYA PPLT PROGRAMMING (SIGNAL HEAD 11)

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1

2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99

3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 1,6

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 6

Program extend time on optical detector units for 2.0 sec for EVB.

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

OVERLAP GREEN FLASH PROGRAMMING FOR 3 SECTION FYA

The following will cause the overlap green output to flash, which is wired to the flashing yellow arrow. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 3

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.

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

Electrical Detail - Temporary 2 - Sheet 2 of 2

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0228T2
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55 (North Alston Avenue) at Taylor Street

Division 5 Durham County Durham

PLAN DATE:	November 2014	REVIEWED BY:	T. Joyce
PREPARED BY:	C. Strickland	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown 4/2/2015
F12601EDC6EB434 DATE

SIG. INVENTORY NO. 05-0228T2

27-MAR-2015 16:04
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cestrickland

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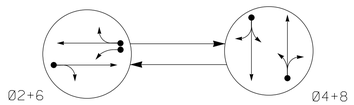
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 25.0

2 Phase
Fully Actuated
W/ EV Preemption
(Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV Preempt Phases

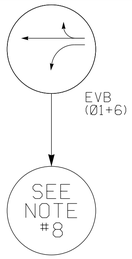


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø4+8	EVB	FLASH
11	FY	R	←	Y
22,23	G	R	R	Y
41,42	R	G	R	R
61,62	G	R	G	Y
81,82	R	G	R	R

2033 SOFTWARE w/ 2070 CONTROLLER
LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6x6	✳	70	✳	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
4A	6x40	✳	0	-	✳	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
6A	6x6	✳	70	✳	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
6B	6x40	✳	0	✳	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
8A	6x40	✳	0	✳	-	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳

✳ Video Detection Zone

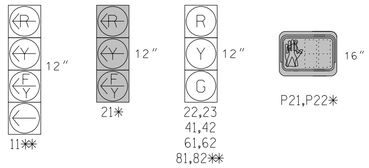
2033 EV PREEMPTION

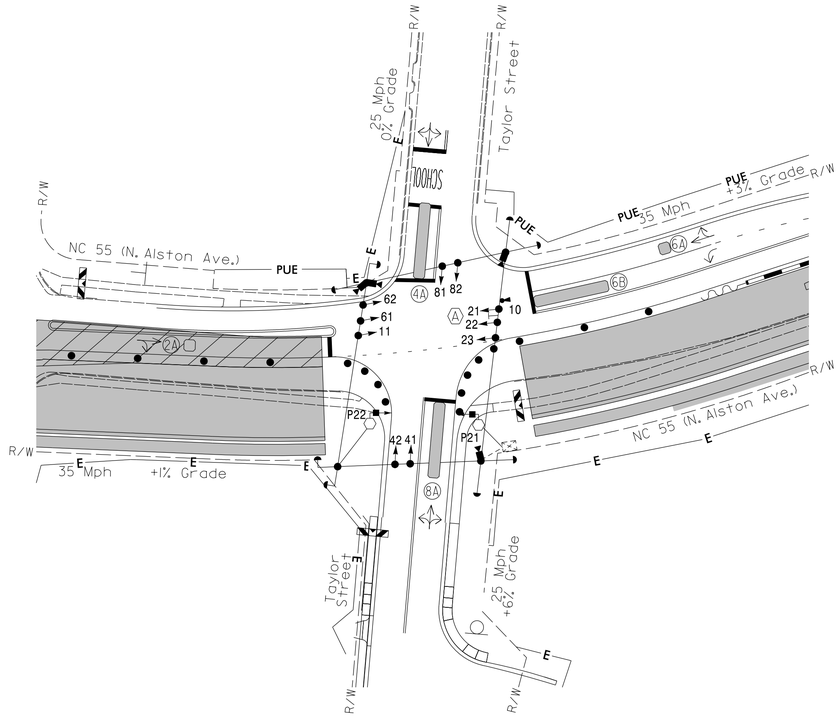
FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	0
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

** Program Timing on Optical Detector Unit

SIGNAL FACE I.D.

All Heads L.E.D.
✳ See Note 10
✳✳ See Note 11





TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø6	Ø8
MINIMUM INITIAL *	- SEC.	10 SEC.	7 SEC.	10 SEC.	7 SEC.
VEHICLE EXTENSION *	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.8 SEC.	3.8 SEC.	3.2 SEC.	3.8 SEC.	3.0 SEC.
RED CLEARANCE	2.3 SEC.	1.6 SEC.	1.2 SEC.	1.6 SEC.	1.9 SEC.
MAXIMUM LIMIT *	- SEC.	50 SEC.	35 SEC.	50 SEC.	35 SEC.
RECALL POSITION	NONE	VEH. RECALL	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	YELLOW LOCK	NONE
DOUBLE ENTRY	OFF	OFF	ON	OFF	ON
WALK *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MIN PED CLEARANCE	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM GAP*	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.

* 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.

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Reposition signal heads #11, #21, #22, #23, #61, #62, and optical detector #10 during this phase of construction.
4. Set all detector units to presence mode.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
8. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
9. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
10. Disconnect and bag signal head #21 and pedestrian signals #P21 and #P22 for Temporary Design 3. Signal head #21 shall remain disconnected and bagged for Temporary Design 5.
11. Reconnect and unbag signal heads #11, #81 and #82 for Temporary Design 5 that were disconnected and bagged for Temporary Design 4.
12. Contractor shall adjust video detection zones as required.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
◥→	Modified Pedestrian 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	→
Ⓐ	"No Left Turn" (R3-2)	Ⓐ
▭	Work Area	N/A
●	Drums	N/A
—E—	Construction Easement	N/A
—PUE—	Permanent Utility Easement	N/A
▰▰▰	Barricades	N/A
————	Direct Bury	----------
○◁	Optical Detector	●◀
▭◁	Video Detector	■◀
▭	Video Detection Area	▭

Signal Upgrade - Temporary Design 5 (TMP Phase 1, Steps 11-21)
Signal Upgrade - Temporary Design 3 (TMP Phase 1, Steps 11-21)

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

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

NC 55 (North Alston Avenue)
at
Taylor Street
Division 5 Durham County Durham

PLAN DATE: September 2014 REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15 DATE
SIG. INVENTORY NO. 05-0228T3/T5

3/20/2015
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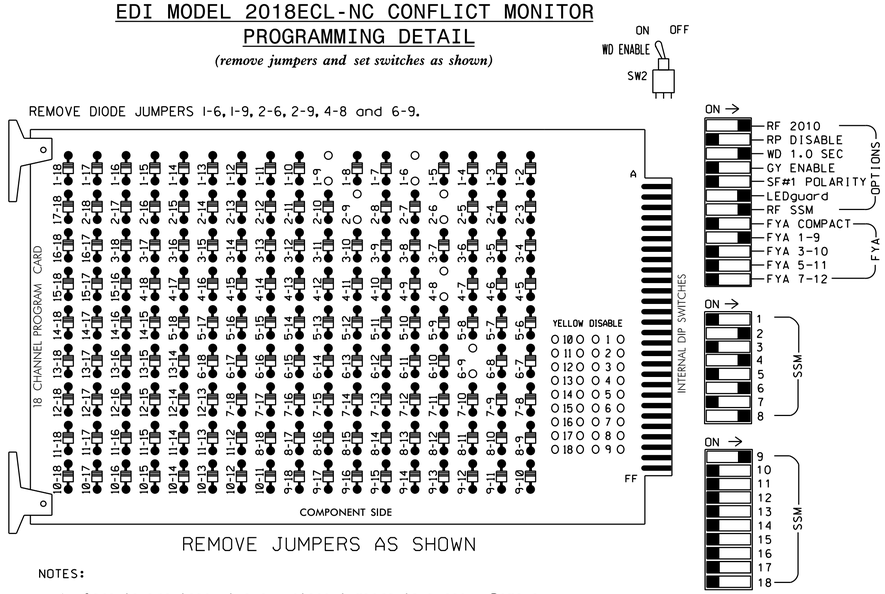
hpark

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 25.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Set the Red Revert interval on the controller to 1 second.
10. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S5,S8,S11,AUX S1
PHASES USED.....**1,2,4,6,8
OVERLAP 1.....*
OVERLAP 2.....NOT USED
OVERLAP 3.....NOT USED
OVERLAP 4.....NOT USED

* See FYA PPLT Programming Detail on Sheet 2.
** Phase used only during Preempt.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11 ★	22,23	NU	NU	41,42	NU	NU	61,62	NU	NU	81,82	NU	11 ★	NU	NU	NU	NU	NU
RED		128			101			134			107							
YELLOW	*	129			102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121					
YELLOW ARROW													A122					
FLASHING YELLOW ARROW													A123					
GREEN ARROW	127																	

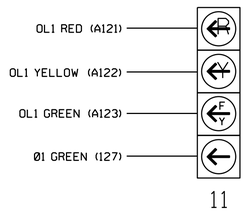
NU = Not Used

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

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

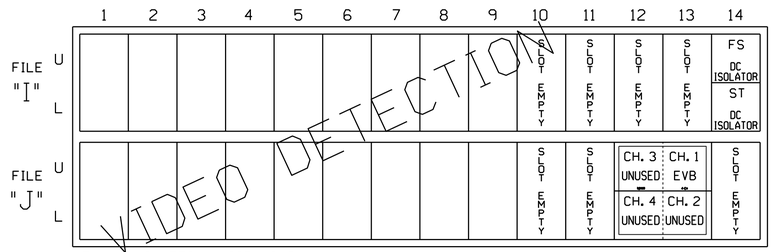
(wire signal heads as shown)



11

INPUT FILE POSITION LAYOUT

(front view)



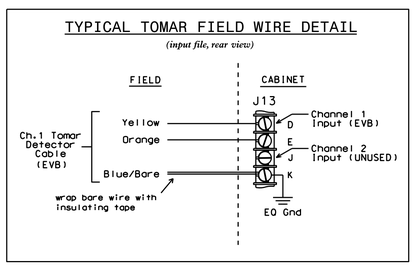
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD
INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



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.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0228T3/T5
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

STARTUP CALLS PROGRAMMING

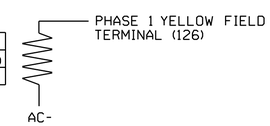
Prevents Veh Call to phase 1 during Startup. Phase 1 used only during Preempt.
Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,4,6,8

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

ACCEPTABLE VALUES

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



Electrical Detail - Temporary 3 and 5 - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 55 (North Alston Avenue) at Taylor Street

Division 5 | Durham County | Durham

PLAN DATE: November 2014 | REVIEWED BY: T. Joyce

PREPARED BY: C. Strickland | REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown 4/2/2015
F12001ED0BE0434 DATE

SIG. INVENTORY NO. 05-0228T3/T5

27-MAR-2015 16:06
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cestrickland

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 25.2

FYA PPLT PROGRAMMING
(SIGNAL HEAD 11)

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1

2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99

3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 1,6

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

Program extend time on optical detector units for 2.0 sec for EVB.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0228T3/T5
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

Electrical Detail - Temporary 3 and 5 - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55 (North Alston Avenue)
at
Taylor Street

Division 5 Durham County Durham

PLAN DATE:	November 2014	REVIEWED BY:	T. Joyce
PREPARED BY:	C. Strickland	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by:
George C. Brown 4/2/2015
F12601ED0BEB434 DATE

SIG. INVENTORY NO. 05-0228T3/T5

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cestrickland

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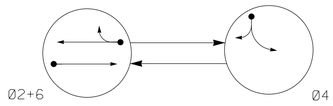
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 26.0

2 Phase Fully Actuated W/ EV Preemption (Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV Preempt Phases

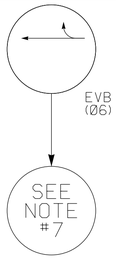


TABLE OF OPERATION				
SIGNAL FACE	PHASE Ø2+6	PHASE Ø4	PHASE EVB	PHASE FLASH
22,23	G	R	R	Y
41,42	R	G	R	R
61,62	G	R	G	Y

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING														
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN ALWAYS	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6x6	✳	70	✳	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
4A	6x40	✳	0	-	✳	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
6A	6x6	✳	70	-	✳	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳

✳ Video Detection Zone

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
7. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Disconnect and bag signal heads #11, #81 and #82 during this phase of construction.
10. Signal head #21 to remain bagged during this phase of construction.
11. Contractor shall adjust video detection zones as required.

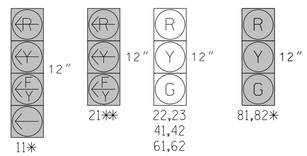
2033 EV PREEMPTION

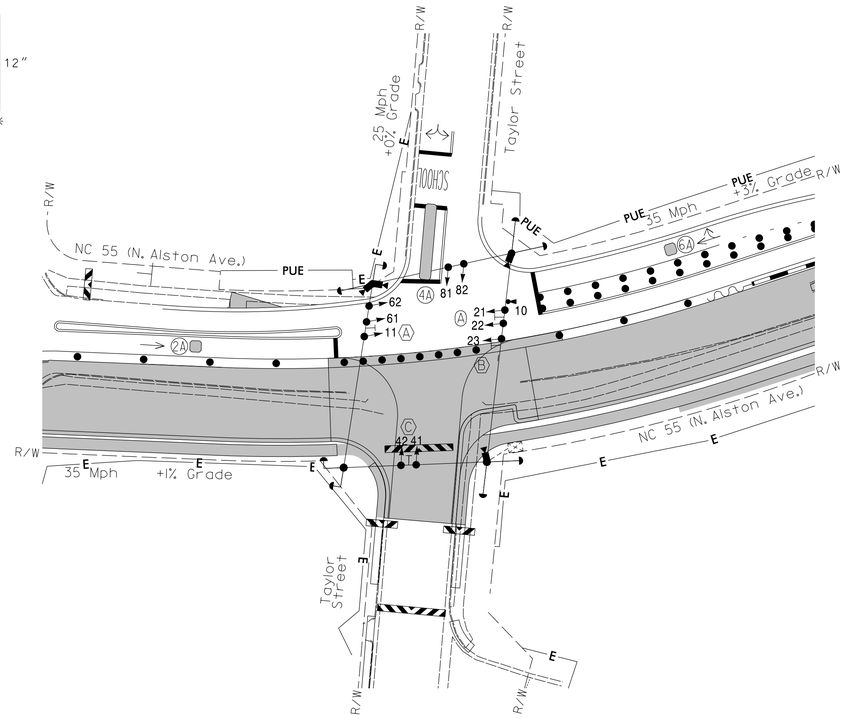
FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	0
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

** Program Timing on Optical Detector Unit

SIGNAL FACE I.D.

All Heads L.E.D.
✳ See Note 9
✳ See Note 10





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	
Ⓐ	"No Left Turn" (R3-2)	Ⓐ
Ⓑ	"No Right Turn" (R3-1)	Ⓑ
Ⓒ	"Dual Turn Arrows" (R10-21) w/ Flags	Ⓒ
	Work Area	N/A
	Drums	N/A
E	Construction Easement	N/A
PUE	Permanent Utility Easement	N/A
	Barricades	N/A
	Direct Bury	
	Optical Detector	
	Video Detector	
	Video Detection Area	

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	02	04	06
MINIMUM INITIAL *	10 SEC.	7 SEC.	10 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.8 SEC.	3.0 SEC.	3.7 SEC.
RED CLEARANCE	1.4 SEC.	1.4 SEC.	1.4 SEC.
MAXIMUM LIMIT *	50 SEC.	35 SEC.	50 SEC.
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK
DOUBLE ENTRY	OFF	OFF	OFF
WALK *	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.
MIN PED CLEARANCE	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	3.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 SEC.

* 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 1, Steps 11-21)

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

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

NC 55 (North Alston Avenue) at Taylor Street
Division 5 Durham County Durham

PLAN DATE: September 2014	REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson	REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15 DATE
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SIG. INVENTORY NO. 05-0228T4

3/20/2015
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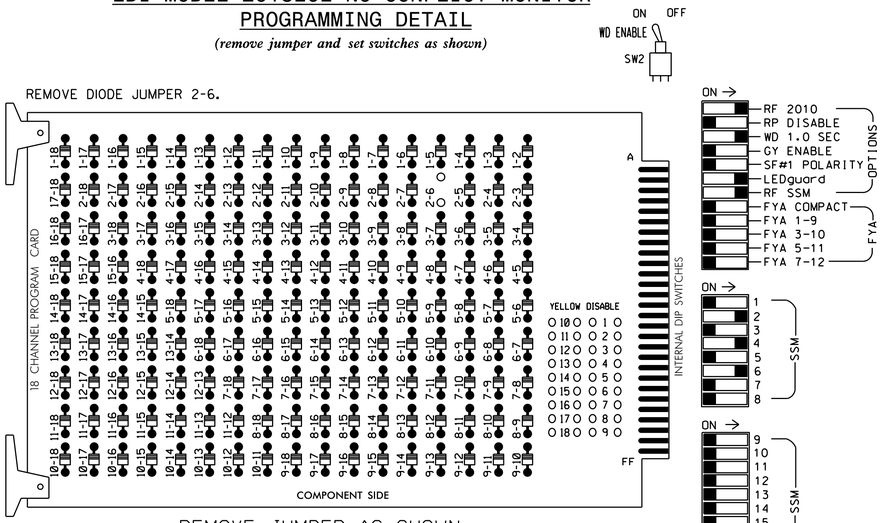
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 26.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



REMOVE JUMPER AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Ensure conflict monitor communicates with 2070.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. Set the Red Revert interval on the controller to 1 second.
9. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S5,S8
PHASES USED.....2,4,6
OVERLAP 1.....NOT USED
OVERLAP 2.....NOT USED
OVERLAP 3.....NOT USED
OVERLAP 4.....NOT USED

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	22,23	NU	NU	41,42	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128			101			134										
YELLOW		129			102			135										
GREEN		130			103			136										
RED ARROW																		
YELLOW ARROW																		
FLASHING YELLOW ARROW																		
GREEN ARROW																		

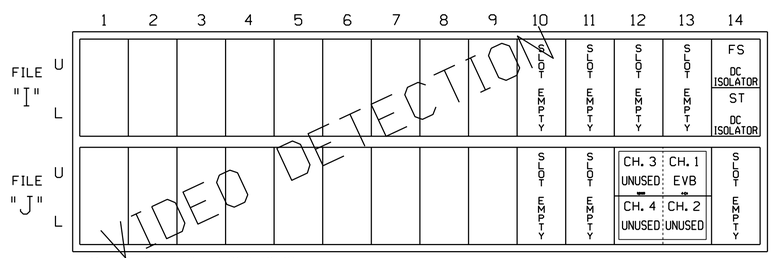
NU = Not Used

STARTUP CALLS PROGRAMMING

Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,4,6

INPUT FILE POSITION LAYOUT

(front view)



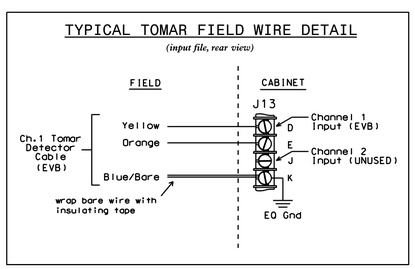
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD
INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



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.

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 6

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

Program extend time on optical detector units for 2.0 sec for EVB.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0228T4
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

Electrical Detail - Temporary 4

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55 (North Alston Avenue) at Taylor Street

Division 5 | Durham County | Durham

PLAN DATE: November 2014 | REVIEWED BY: T. Joyce

PREPARED BY: C. Strickland | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown 4/2/2015
F12691ED0BEB434...
DATE

SIG. INVENTORY NO. 05-0228T4

27-MAR-2015 16:09
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cestrickland

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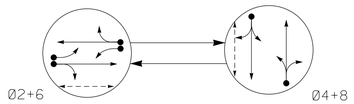
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 27.0

2 Phase Fully Actuated W/ EV Preemption (Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV Preempt Phases

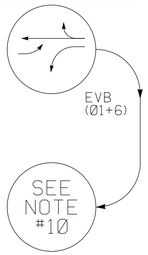


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø4+8	EVB	FLASH
11	~~G~~	~~R~~	←	~~Y~~
21	~~G~~	~~R~~	~~G~~	~~Y~~
22,23	G	R	R	Y
41,42	R	G	R	R
61,62	G	R	G	Y
81,82	R	G	R	R
P21,P22	W	DW	DW	DRK
P41,P42	DW	W	DW	DRK

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING												
							TIMING		ATTRIBUTES								SYSTEM LOOPS	STATUS
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE		NEW	EXISTING
2A	6x6	✳	70	✳	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
2B	6x40	✳	0	✳	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
4A	6x40	✳	0	✳	-	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
6A	6x6	✳	70	✳	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
6B	6x40	✳	0	✳	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
8A	6x40	✳	0	✳	-	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
PEDESTRIAN DETECTION																			
P21,P22	N/A	N/A	N/A	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X
P41,P42	N/A	N/A	N/A	X	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X	-	-

✳ Video Detection Zone

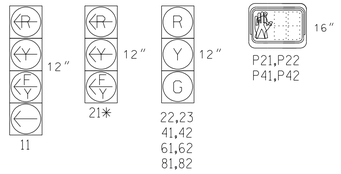
2033 EV PREEMPTION

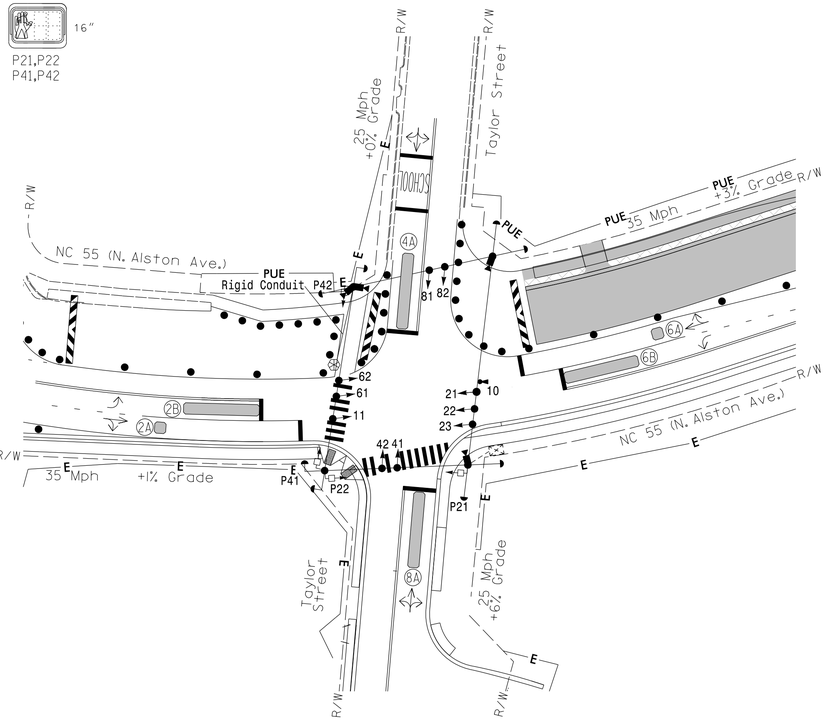
FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
MIN. PED. CLEAR BEFORE PREEMPT	✳
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

✳ See Timing Chart for Min Ped Clearance
** Program Timing on Optical Detector Unit

SIGNAL FACE I.D.

All Heads L.E.D.
✳ See Note 12





TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø6	Ø8	OL3
MINIMUM INITIAL *	- SEC.	10 SEC.	7 SEC.	10 SEC.	7 SEC.	0 SEC.
VEHICLE EXTENSION *	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	
YELLOW CHANGE INT.	3.8 SEC.	3.8 SEC.	3.2 SEC.	3.8 SEC.	3.0 SEC.	3.8 SEC.
RED CLEARANCE	3.2 SEC.	2.5 SEC.	1.8 SEC.	2.5 SEC.	2.4 SEC.	2.5 SEC.
MAXIMUM LIMIT *	- SEC.	50 SEC.	35 SEC.	50 SEC.	35 SEC.	
RECALL POSITION	NONE	VEH. RECALL	NONE	VEH. RECALL	NONE	
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	YELLOW LOCK	NONE	
DOUBLE ENTRY	OFF	OFF	ON	OFF	ON	
WALK *	- SEC.	4 SEC.	4 SEC.	- SEC.	- SEC.	
FLASHING DON'T WALK	- SEC.	10 SEC.	9 SEC.	- SEC.	- SEC.	
MIN PED CLEARANCE	- SEC.	5 SEC.	5 SEC.	- SEC.	- SEC.	
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MAXIMUM GAP*	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MINIMUM GAP	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	

* 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.

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Reposition signal heads #11, #21, #22, #23, #61, #62 and optical detector #10 during this phase of construction.
4. Set all detector units to presence mode.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time.
9. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
10. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
11. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
12. Reconnect and unbag signal head #21 during this phase of construction.
13. Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for location details.
14. Contractor shall adjust video detection zones as required.

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	→
▭	Work Area	N/A
●	Dums	N/A
E	Construction Easement	N/A
PUE	Permanent Utility Easement	N/A
▨	Barricades	N/A
◁▭	Optical Detector	●▬
⊛	Type I Signal Pedestal	⊛
————	Rigid Conduit	----------
▭◁	Video Detector	▬●
▭	Video Detection Area	▭

Signal Upgrade - Temporary Design 6 (TMP Phase 2, Steps 1-6)

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

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

NC 55 (North Alston Avenue) at Taylor Street
Division 5 Durham County Durham
PLAN DATE: September 2014 REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15
50781D2BF98C498...
DATE
SIG. INVENTORY NO. 05-0228T6

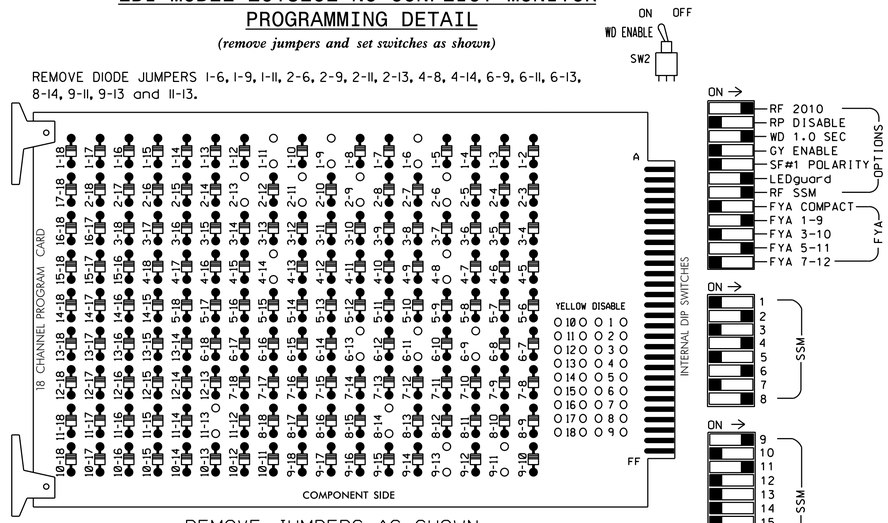
3/20/2015
G:\Traffic\Transportation\TIP\U-3308 NCDOT 2012 Traffic LSA\TIP\U-3308 Signals\Traffic\Signals\Design\Signals\TEMP SIGNALS WITH VIDEO\05-0228T6.dgn
hpark

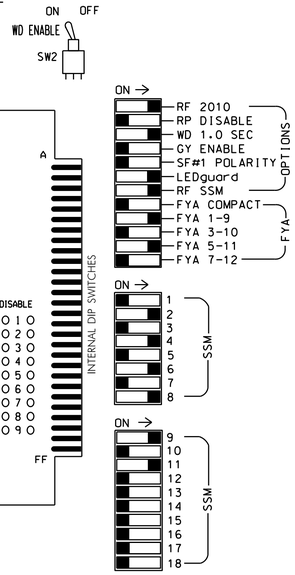
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 27.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS I-6, I-9, I-11, 2-6, 2-9, 2-11, 2-13, 4-8, 4-14, 6-9, 6-11, 6-13, 8-14, 9-11, 9-13 and 11-13.





■ = DENOTES POSITION OF SWITCH

REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Calls for phases 2 and 4.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S3,S5,S6,S8,S11,AUX S1,AUX S4
PHASES USED.....**1,2 PED,4,4 PED,6,8
OVERLAP 1.....*
OVERLAP 2.....NOT USED
OVERLAP 3.....2+6
OVERLAP 4.....NOT USED

* See FYA PPLT Programming Detail on Sheet 2.
** Phase used only during Preempt.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11★	22,23	P21, P22	NU	41,42	P41, P42	NU	61,62	NU	NU	81,82	NU	11★	NU	NU	21★	NU	NU
RED		128			101			134			107							
YELLOW	*	129			102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121			A114		
YELLOW ARROW													A122			A115		
FLASHING YELLOW ARROW													A123			A116		
GREEN ARROW	127																	
✋			113			104												
🚶			115			106												

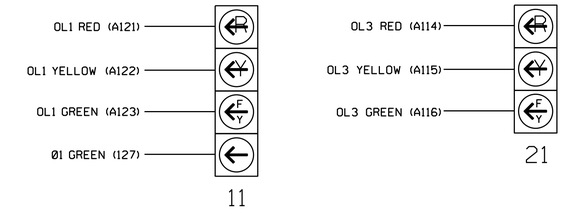
NU = Not Used

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

★ See pictorial of head wiring in detail below.

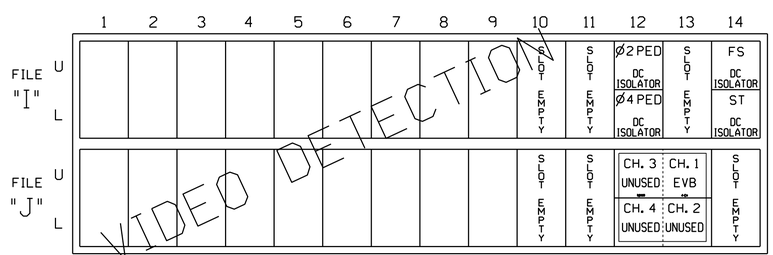
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



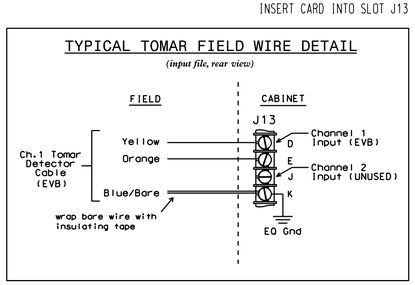
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD
INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



INPUT FILE CONNECTION & PROGRAMMING CHART

PED PUSH BUTTONS	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED

NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOT I12.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

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.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0228T6
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

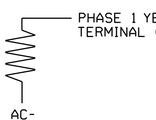
STARTUP CALLS PROGRAMMING

Prevents Veh Call to phase 1 during Startup. Phase 1 used only during Preempt.
Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,4,6,8

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

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



Electrical Detail - Temporary 6 - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 55 (North Alston Avenue) at Taylor Street

Division 5 | Durham County | Durham

PLAN DATE: November 2014 | REVIEWED BY: T. Joyce

PREPARED BY: C. Strickland | REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown 4/2/2015
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SIG. INVENTORY NO. 05-0228T6

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cestrickland

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 27.2

OVERLAP [3] PROGRAMMING DETAIL

Program overlap as follows:
Main Menu - 4) OVERLAP

PRESS '+' TWICE

OVERLAP [3]:
LOADSWITCH = 11 NOTE: FOR SIGNAL HEAD 21
VEH SET 1 = 2,6
YELLOW CLEARANCE = 3.8
RED CLEARANCE = 2.5

END OF OVERLAP PROGRAMMING

FYA PPLT PROGRAMMING (SIGNAL HEAD 11)

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1

2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99

3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 1,6

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 5
   PHASE 4 MIN FDW = 5

Program extend time on optical detector units for 2.0 sec for EVB.

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

OVERLAP GREEN FLASH PROGRAMMING FOR 3 SECTION FYA

The following will cause the overlap green output to flash, which is wired to the flashing yellow arrow. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 3

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.

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

Electrical Detail - Temporary 6 - Sheet 2 of 2

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0228T6
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55 (North Alston Avenue) at Taylor Street

Division 5 Durham County Durham

PLAN DATE:	November 2014	REVIEWED BY:	T. Joyce
PREPARED BY:	C. Strickland	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown 4/2/2015
F12601EC0BEB434 DATE

SIG. INVENTORY NO. 05-0228T6

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cestrickland

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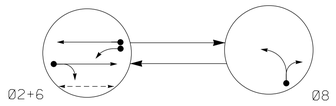
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 28.0

2 Phase Fully Actuated W/ EV Preemption (Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV Preempt Phases

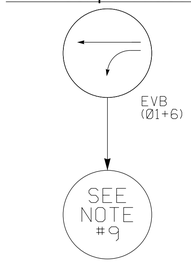


TABLE OF OPERATION				
SIGNAL FACE	PHASE Ø2+6	PHASE Ø8	PHASE EVB	PHASE FLASH
11	FY	R	←	Y
22,23	G	R	R	Y
61,62	G	R	G	Y
81,82	R	G	R	R
P21,P22	W	DW	DW	DRK

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES									SYSTEM LOOPS	STATUS
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE		NEW	EXISTING
2A	6x6	✳	70	-	✳	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-		-	✳
6A	6x6	✳	70	-	✳	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-		-	✳
6B	6x40	✳	0	-	✳	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-		-	✳
8A	6x40	✳	0	-	✳	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-		-	✳
PEDESTRIAN DETECTION																			
P21,P22	N/A	N/A	N/A	-	X	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-		-	X

✳ Video Detection Zone

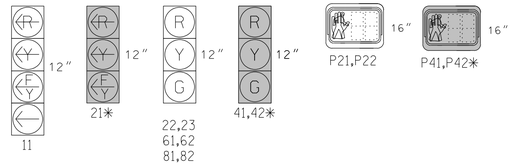
2033 EV PREEMPTION

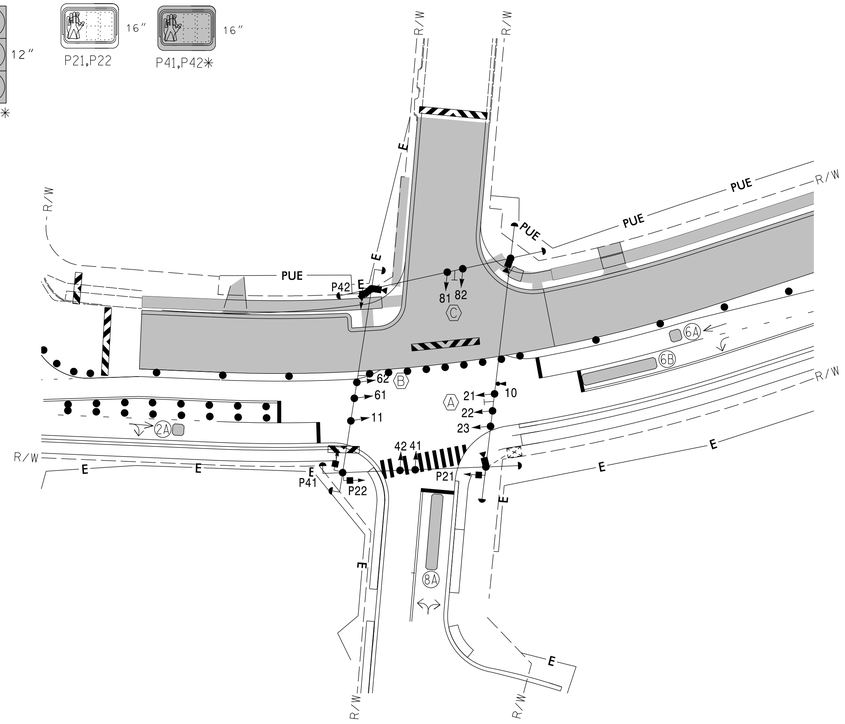
FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
MIN. PED. CLEAR BEFORE PREEMPT	✳
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

✳ See Timing Chart for Min Ped Clearance
** Program Timing on Optical Detector Unit

SIGNAL FACE I.D.

All Heads L.E.D.
✳ See Note 11





TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø1	Ø2	Ø6	Ø8
MINIMUM INITIAL *	- SEC.	10 SEC.	10 SEC.	7 SEC.
VEHICLE EXTENSION *	- SEC.	3.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.8 SEC.	3.8 SEC.	3.8 SEC.	3.0 SEC.
RED CLEARANCE	3.1 SEC.	2.4 SEC.	2.4 SEC.	2.1 SEC.
MAXIMUM LIMIT *	- SEC.	50 SEC.	50 SEC.	35 SEC.
RECALL POSITION	NONE	VEH. RECALL	VEH. RECALL	NONE
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	YELLOW LOCK	NONE
DOUBLE ENTRY	OFF	OFF	OFF	OFF
WALK *	- SEC.	4 SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	10 SEC.	- SEC.	- SEC.
MIN PED CLEARANCE	- SEC.	5 SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM GAP*	- SEC.	3.0 SEC.	3.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	- SEC.	3.0 SEC.	3.0 SEC.	2.0 SEC.

* 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.

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time.
8. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
9. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
11. Disconnect and bag signal heads #21,#41 and #42 and pedestrian heads #P41 and #P42 during this phase of construction.
12. Contractor shall adjust video detection zones as required.

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	
Ⓐ	"No Left Turn" (R3-2)	Ⓐ
Ⓑ	"No Right Turn" (R3-1)	Ⓑ
Ⓒ	"Dual Turn Arrows" (R10-21) w/ Flags	Ⓒ
	Work Area	N/A
	Drums	N/A
E	Construction Easement	N/A
PUE	Permanent Utility Easement	N/A
	Barricades	N/A
	Direct Bury	
	Video Detector	
	Video Detection Area	

Signal Upgrade - Temporary Design 7 (TMP Phase 2, Steps 7-12)

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

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

NC 55 (North Alston Avenue) at Taylor Street
Division 5 Durham County Durham

PLAN DATE: September 2014 REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15
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DATE

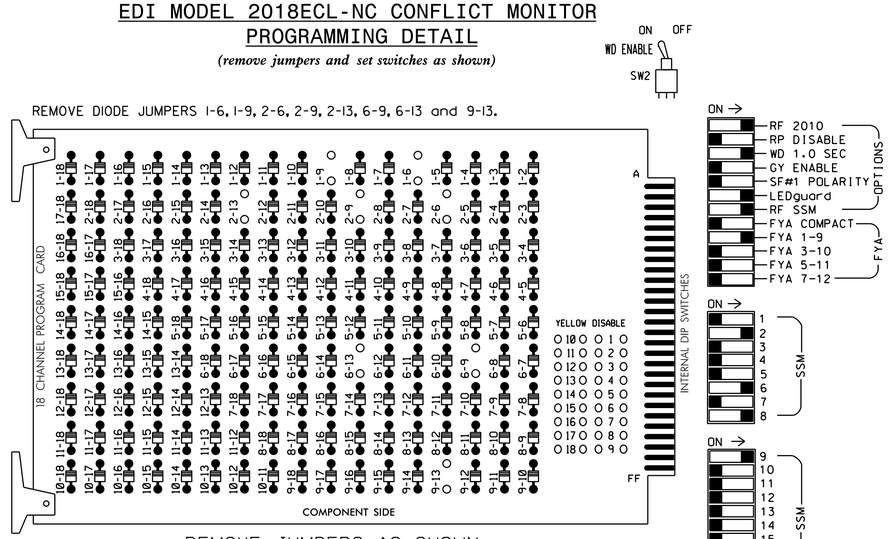
SIG. INVENTORY NO. 05-0228T7

3/20/2015
G:\NCDOT\Corporation\TIP\R13.017.00 NCDOT 2012 Traffic LSA\TIP\R13.017.03 (U-3308 Signals)\Traffic\Signals\Design\Signals\TEMP SIGNALS WITH VIDEO\05-0228\05-0228T7.dgn
hpark

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 28.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. Program Startup Ped Call for phase 2.
9. Set the Red Revert interval on the controller to 1 second.
10. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S3,S8,S11,AUX S1
PHASES USED.....*1,2,2 PED,6,8
OVERLAP 1.....*
OVERLAP 2.....NOT USED
OVERLAP 3.....NOT USED
OVERLAP 4.....NOT USED

* See FYA PPLT Programming Detail on Sheet 2.
** Phase used only during Preempt.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11★	22,23	P21, P22	NU	NU	NU	NU	61,62	NU	NU	81,82	NU	11★	NU	NU	NU	NU	NU
RED		128						134			107							
YELLOW	*	129						135			108							
GREEN		130						136			109							
RED ARROW													A121					
YELLOW ARROW													A122					
FLASHING YELLOW ARROW													A123					
GREEN ARROW	127																	
✋			113															
🚶			115															

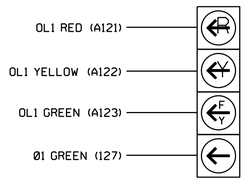
NU = Not Used

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

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

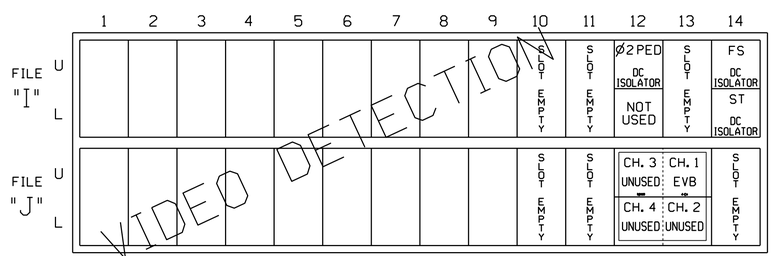
(wire signal heads as shown)



11

INPUT FILE POSITION LAYOUT

(front view)



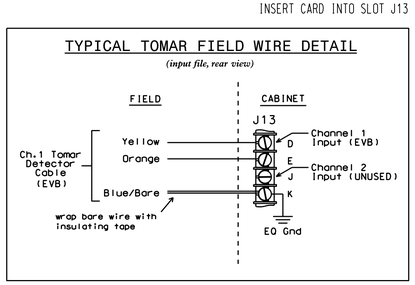
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD
INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



INPUT FILE CONNECTION & PROGRAMMING CHART

PED PUSH BUTTONS	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
P21,P22	TB8-4,6	I12U	25	67	2	2 PED

NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOT I12.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

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.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0228T7
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

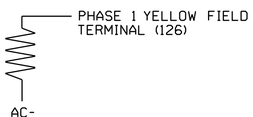
STARTUP CALLS PROGRAMMING

Prevents Veh Call to phase 1 during Startup. Phase 1 used only during Preempt.
Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,6,8

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

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



Electrical Detail - Temporary 7 - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 55 (North Alston Avenue) at Taylor Street

Division 5 | Durham County | Durham

PLAN DATE: November 2014 | REVIEWED BY: T. Joyce

PREPARED BY: C. Strickland | REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown 4/2/2015
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SIG. INVENTORY NO. 05-0228T7

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PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 28.2

FYA PPLT PROGRAMMING (SIGNAL HEAD 11)

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1

2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99

3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98

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.

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 1,6

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 5

Program extend time on optical detector units for 2.0 sec for EVB.

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

Electrical Detail - Temporary 7 - Sheet 2 of 2

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0228T7
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55 (North Alston Avenue) at Taylor Street

Division 5 Durham County Durham

PLAN DATE:	November 2014	REVIEWED BY:	T. Joyce
PREPARED BY:	C. Strickland	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown 4/2/2015
F12601ED0BEB434 DATE

SIG. INVENTORY NO. 05-0228T7

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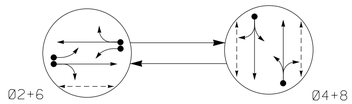
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 29.0

2 Phase Fully Actuated W/ EV Preemption (Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV Preempt Phases

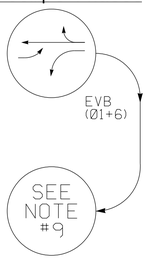


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4+8	EVB	FLASH
11	~~F Y~~	~~R~~	←	~~Y~~
21	~~F Y~~	~~R~~	~~F Y~~	~~Y~~
22,23	G	R	R	Y
41,42	R	G	R	R
61,62	G	R	G	Y
81,82	R	G	R	R
P21,P22	W	DW	DW	DRK
P41,P42	DW	W	DW	DRK
P81,P82	DW	W	DW	DRK

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN ALWAYS	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6x6	✳	70	-	✳	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
2B	6x40	✳	0	-	✳	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
4A	6x40	✳	0	✳	-	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
6A	6x6	✳	70	-	✳	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
6B	6x40	✳	0	-	✳	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
8A	6x40	✳	0	-	✳	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
PEDESTRIAN DETECTION																			
P21,P22	N/A	N/A	N/A	-	X	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X
P41,P42	N/A	N/A	N/A	-	X	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X
P81,P82	N/A	N/A	N/A	X	-	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X	-	

✳ Video Detection Zone

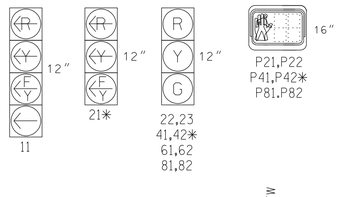
2033 EV PREEMPTION

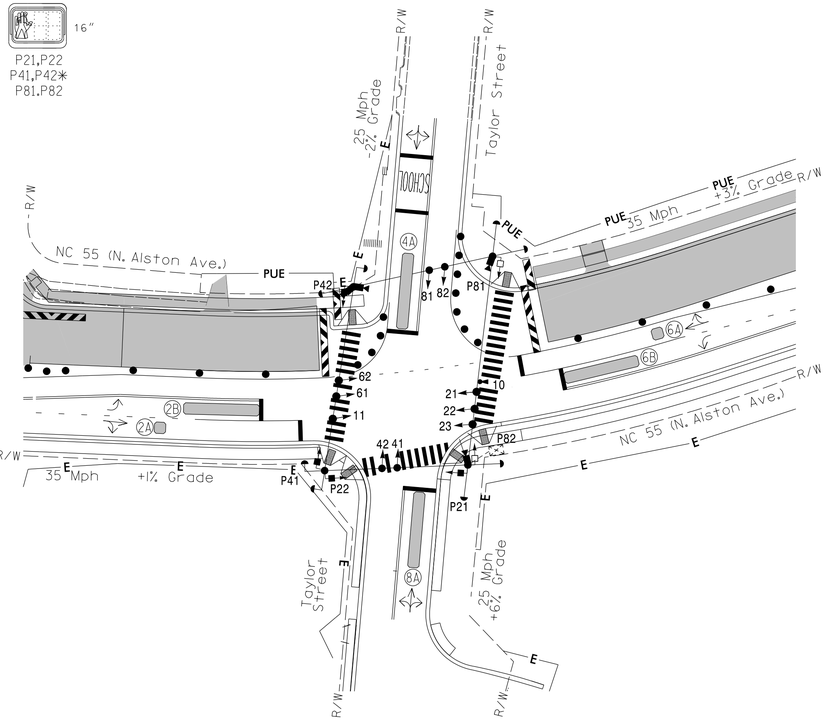
FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
MIN. PED. CLEAR BEFORE PREEMPT	✳
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

✳ See Timing Chart for Min Ped Clearance
** Program Timing on Optical Detector Unit

SIGNAL FACE I.D.

All Heads L.E.D.
✳ See Note 11





NOTES

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3. Set all detector units to presence mode.
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6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time.
8. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
9. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
11. Reconnect and unbag signal heads #21, #41 and #42 and pedestrian heads #P41 and #P42 during this phase of construction.
12. Contractor shall adjust video detection zones as required.

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	→
▭	Work Area	N/A
●	Drums	N/A
E	Construction Easement	N/A
PUE	Permanent Utility Easement	N/A
▨	Barricades	N/A
———	Direct Bury	N/A
⋈	Optical Detector	◆
▭	Video Detector	■
▭	Video Detection Area	▭

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø6	Ø8	OL3
MINIMUM INITIAL *	- SEC.	10 SEC.	7 SEC.	10 SEC.	7 SEC.	0 SEC.
VEHICLE EXTENSION *	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	
YELLOW CHANGE INT.	3.8 SEC.	3.8 SEC.	3.3 SEC.	3.8 SEC.	3.0 SEC.	3.8 SEC.
RED CLEARANCE	3.2 SEC.	2.5 SEC.	2.0 SEC.	2.5 SEC.	2.4 SEC.	2.5 SEC.
MAXIMUM LIMIT *	- SEC.	50 SEC.	35 SEC.	50 SEC.	35 SEC.	
RECALL POSITION	NONE	VEH. RECALL	NONE	VEH. RECALL	NONE	
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	YELLOW LOCK	NONE	
DOUBLE ENTRY	OFF	OFF	ON	OFF	ON	
WALK *	- SEC.	4 SEC.	4 SEC.	- SEC.	4 SEC.	
FLASHING DON'T WALK	- SEC.	10 SEC.	16 SEC.	- SEC.	19 SEC.	
MIN PED CLEARANCE	- SEC.	5 SEC.	8 SEC.	- SEC.	10 SEC.	
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MAXIMUM GAP*	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MINIMUM GAP	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	

* 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 8 (TMP Phase 2, Steps 7-12)

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

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

NC 55 (North Alston Avenue)
at
Taylor Street

Division 5 Durham County Durham

PLAN DATE: September 2014 REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by:
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4/02/15
DATE

SIG. INVENTORY NO. 05-0228T8

3/20/2015
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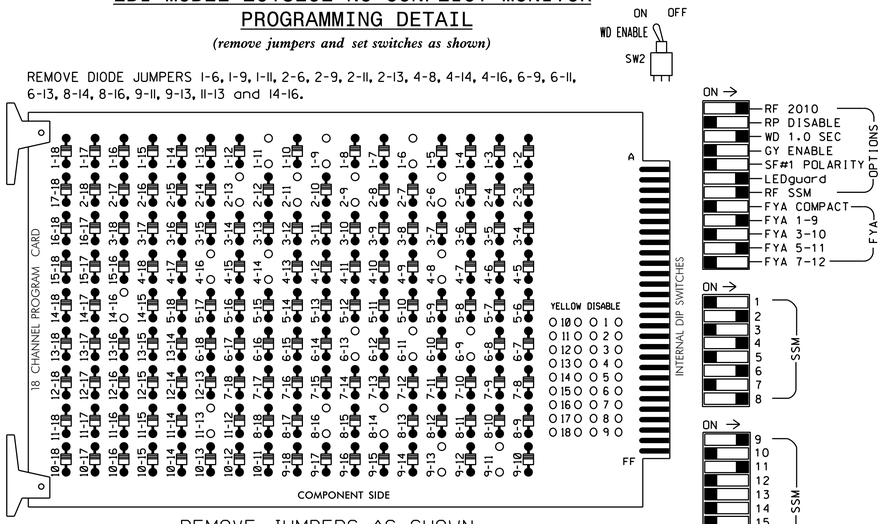
hpark

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 29.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-6, 1-9, 1-11, 2-6, 2-9, 2-11, 2-13, 4-8, 4-14, 4-16, 6-9, 6-11, 6-13, 8-14, 8-16, 9-11, 9-13, 11-13 and 14-16.



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Calls for phases 2, 4 and 8.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S3,S5,S6,S8,S11,S12, AUX S1,AUX S4
PHASES USED.....**1,2,2 PED,4,4 PED,6,8,8 PED
OVERLAP 1.....*
OVERLAP 2.....NOT USED
OVERLAP 3.....2+6
OVERLAP 4.....NOT USED

* See FYA PPLT Programming Detail on Sheet 2.
** Phase used only during Preempt.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11★	22,23	P21, P22	NU	41,42	P41, P42	NU	61,62	NU	NU	81,82	P81, P82	11★	NU	NU	21★	NU	NU
RED		128			101			134			107							
YELLOW	*	129			102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121			A114		
YELLOW ARROW													A122			A115		
FLASHING YELLOW ARROW													A123			A116		
GREEN ARROW	127																	
✋			113			104						110						
🚶			115			106						112						

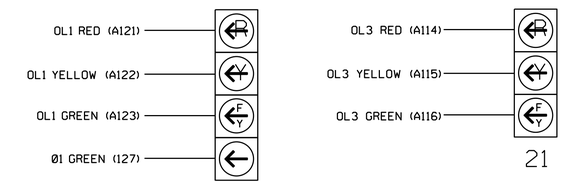
NU = Not Used

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

★ See pictorial of head wiring in detail below.

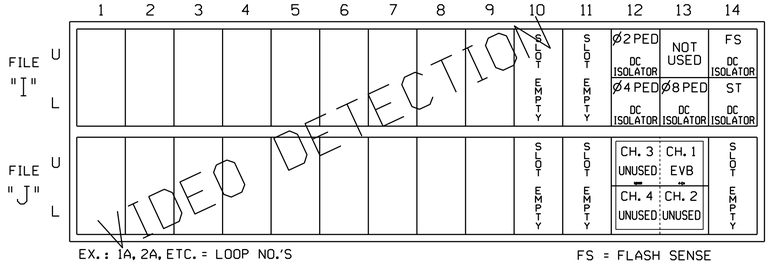
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



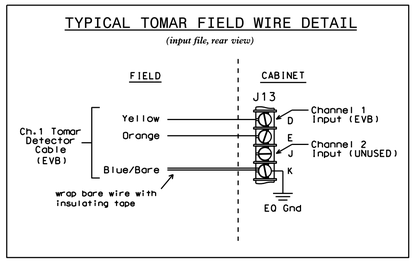
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD
INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



INPUT FILE CONNECTION & PROGRAMMING CHART

PED PUSH BUTTONS	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED
P81,P82	TB8-8,9	I13L	28	70	2	8 PED

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

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

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.

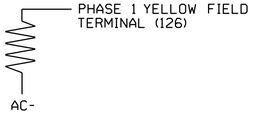
STARTUP CALLS PROGRAMMING

Prevents Veh Call to phase 1 during Startup. Phase 1 used only during Preempt.
Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,4,6,8

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

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



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0228T8
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

Electrical Detail - Temporary 8 - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:	NC 55 (North Alston Avenue) at Taylor Street	SEAL
Prepared in the Offices of: Transportation Mobility and Safety Division, Traffic Engineering Branch, Signals Management Section, NC DEPARTMENT OF TRANSPORTATION	Division 5 Durham County Durham	NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN
750 N.Greenfield Pkwy.Garner,NC 27529	PLAN DATE: November 2014 REVIEWED BY: T. Joyce	DocuSigned by: George C. Brown 4/2/2015
	PREPARED BY: C. Strickland REVIEWED BY:	F12001ED0BE8434... DATE
	REVISIONS INIT. DATE	SIG. INVENTORY NO. 05-0228T8

07 MAR 2015 16:15
S:\TITSIG\TS Signals\Workgroups\Sig Mgmt\Strickland\D50228_sm_ele_xxx.dgn
cestrickland

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 29.2

OVERLAP [3] PROGRAMMING DETAIL

Program overlap as follows:
Main Menu - 4) OVERLAP

PRESS '+' TWICE

OVERLAP [3]:
LOADSWITCH = 11 NOTE: FOR SIGNAL HEAD 21
VEH SET 1 = 2,6
YELLOW CLEARANCE = 3.8
RED CLEARANCE = 2.5

END OF OVERLAP PROGRAMMING

FYA PPLT PROGRAMMING (SIGNAL HEAD 11)

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1

2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99

3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 1,6

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 5
   PHASE 4 MIN FDW = 8
   PHASE 8 MIN FDW = 10

Program extend time on optical detector units for 2.0 sec for EVB.

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

OVERLAP GREEN FLASH PROGRAMMING FOR 3 SECTION FYA

The following will cause the overlap green output to flash, which is wired to the flashing yellow arrow. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 3

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.

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

Electrical Detail - Temporary 8 - Sheet 2 of 2

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0228T8
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55 (North Alston Avenue) at Taylor Street

Division 5 Durham County Durham

PLAN DATE:	November 2014	REVIEWED BY:	T. Joyce
PREPARED BY:	C. Strickland	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown 4/2/2015
F12601ED0BEB434 DATE
SIG. INVENTORY NO. 05-0228T8

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cestrickland

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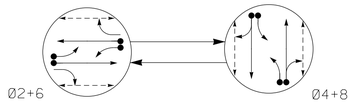
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 30.0

2 Phase Fully Actuated W/ EV Preemption (Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV Preempt Phases

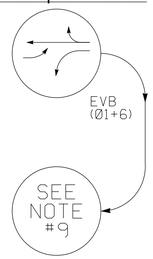


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4+8	EVB	FLASH
11	~~F~~	~~R~~	←	~~Y~~
21	~~F~~	~~R~~	~~F~~	~~Y~~
22,23	G	R	R	Y
41	~~R~~	~~F~~	~~R~~	~~R~~
42,43	R	G	R	R
61,62	G	R	G	Y
81	~~R~~	~~F~~	~~R~~	~~R~~
82,83	R	G	R	R
P21,P22	W	DW	DW	DRK
P41,P42	DW	W	DW	DRK
P61,P62	W	DW	DW	DRK
P81,P82	DW	W	DW	DRK

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6x6	4	70	X		2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6x40	2-4-2	0	X		2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6x40	2-4-2	0	X	-	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4B	6x40	2-4-2	0	X	-	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6x6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6x40	2-4-2	0	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6x40	2-4-2	0	X	-	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8B	6x40	2-4-2	0	X	-	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
PEDESTRIAN DETECTION																			
P21,P22	N/A	N/A	N/A	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X
P41,P42	N/A	N/A	N/A	X	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X
P61,P62	N/A	N/A	N/A	X	-	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P81,P82	N/A	N/A	N/A	X	-	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X

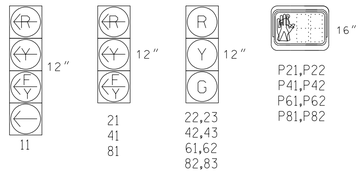
2033 EV PREEMPTION

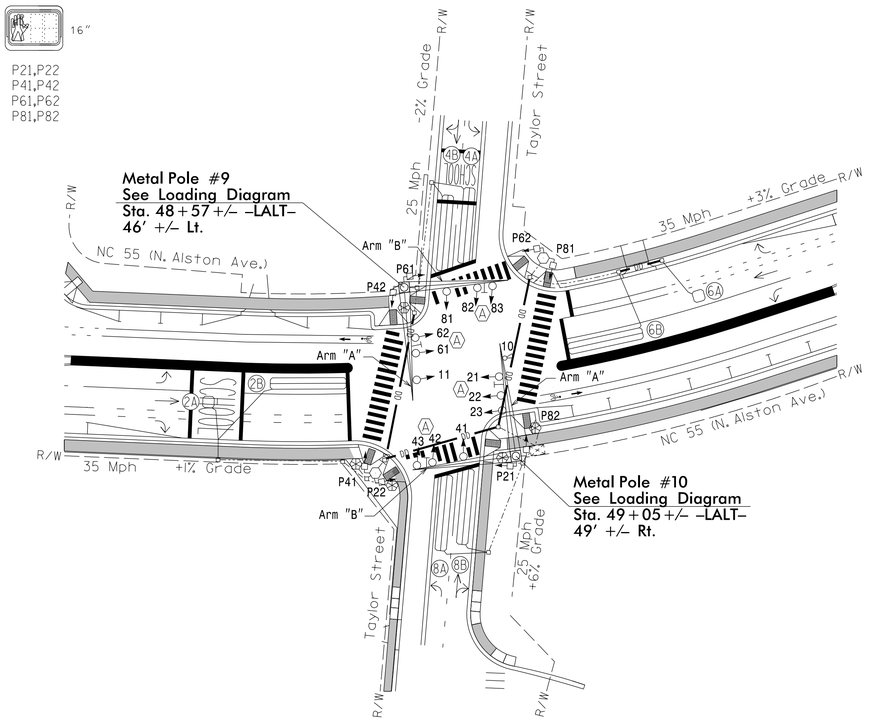
FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
MIN. PED. CLEAR BEFORE PREEMPT	✳
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

✳ See Timing Chart for Min Ped Clearance
** Program Timing on Optical Detector Unit

SIGNAL FACE I.D.

All Heads L.E.D.





TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø6	Ø8	OL2	OL3	OL4
MINIMUM INITIAL *	- SEC.	10 SEC.	7 SEC.	10 SEC.	7 SEC.	0 SEC.	0 SEC.	0 SEC.
VEHICLE EXTENSION *	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			
YELLOW CHANGE INT.	3.8 SEC.	3.8 SEC.	3.3 SEC.	3.8 SEC.	3.3 SEC.	3.3 SEC.	3.8 SEC.	3.3 SEC.
RED CLEARANCE	3.3 SEC.	2.6 SEC.	2.6 SEC.	2.6 SEC.	2.6 SEC.	2.6 SEC.	2.6 SEC.	2.6 SEC.
MAXIMUM LIMIT *	- SEC.	50 SEC.	35 SEC.	50 SEC.	35 SEC.			
RECALL POSITION	NONE	VEH. RECALL	NONE	VEH. RECALL	NONE			
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	YELLOW LOCK	NONE			
DOUBLE ENTRY	OFF	OFF	ON	OFF	ON			
WALK *	- SEC.	4 SEC.	4 SEC.	4 SEC.	4 SEC.			
FLASHING DON'T WALK	- SEC.	10 SEC.	16 SEC.	11 SEC.	16 SEC.			
MIN PED CLEARANCE	- SEC.	5 SEC.	8 SEC.	6 SEC.	8 SEC.			
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM GAP*	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MINIMUM GAP	- SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			

* 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.

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time.
8. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
9. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
11. Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for location details.

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
Ⓐ	Street Name Sign	Ⓐ
⊛	Type I Pushbutton Post	⊛
⬡	Type II Signal Pedestal	⬢
▱	Metal Pole with Mastarm	▱
⊂	Optical Detector	◀

Signal Upgrade - Final Design

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

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

NC 55 (North Alston Avenue) at Taylor Street
Division 5 Durham County Durham

PLAN DATE: September 2014 REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15
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DATE

SIG. INVENTORY NO. 05-0228

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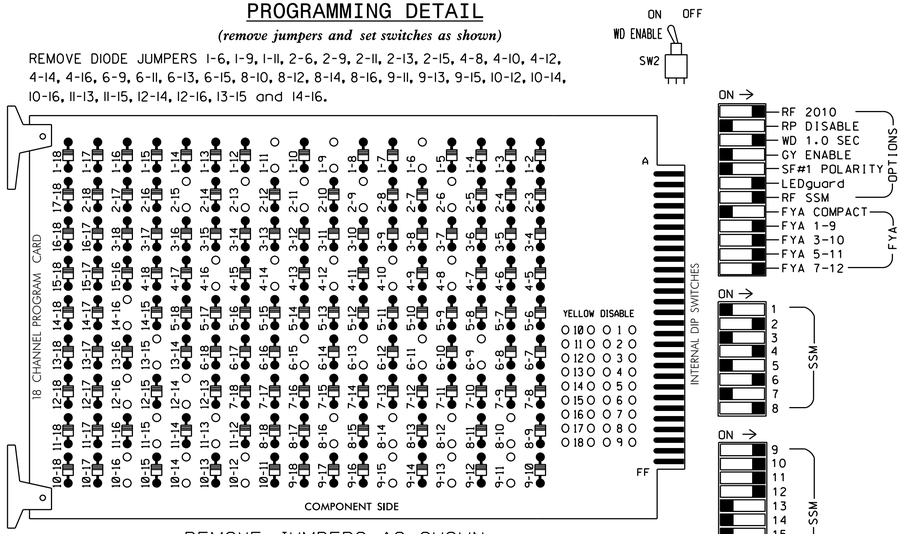
clawson

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 30.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-6, 1-9, 1-11, 2-6, 2-9, 2-11, 2-13, 2-15, 4-8, 4-10, 4-12, 4-14, 4-16, 6-9, 6-11, 6-13, 6-15, 8-10, 8-12, 8-14, 8-16, 9-11, 9-13, 9-15, 10-12, 10-14, 10-16, 11-13, 11-15, 12-14, 12-16, 13-15 and 14-16.



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Calls for phases 2, 4, 6, and 8.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S3,S5,S6,S8,S9,S11,S12, AUX S1,AUX S2,AUX S4,AUX S5
PHASES USED.....**1,2,2 PED,4,4 PED,6,6 PED,8,8 PED
OVERLAP 1.....*
OVERLAP 2.....4+8
OVERLAP 3.....2+6
OVERLAP 4.....4+8

* See FYA PPLT Programming Detail on Sheet 2.
** Phase used only during Preempt.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11★	22,23	P21, P22	NU	42,43	P41, P42	NU	61,62	P61, P62	NU	82,83	P81, P82	11★	81★	NU	21★	41★	NU
RED		128			101			134			107							
YELLOW	*	129			102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121	A124		A114	A101	
YELLOW ARROW													A122	A125		A115	A102	
FLASHING YELLOW ARROW													A123	A126		A116	A103	
GREEN ARROW	127																	
			113			104			119			110						
			115			106			121			112						

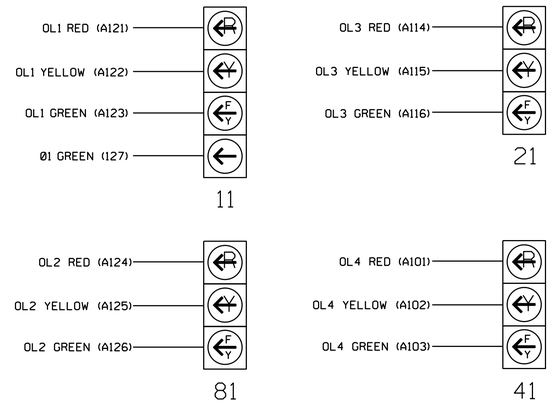
NU = Not Used

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

★ See pictorial of head wiring in detail below.

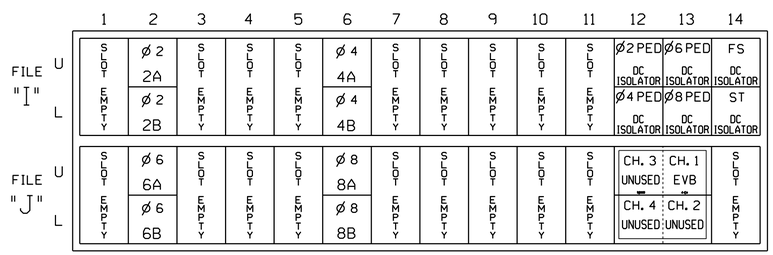
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



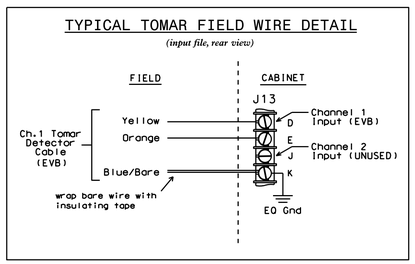
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVx = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD
INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
4B	TB4-11,12	I6L	7	45	5 7	4
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
8B	TB5-11,12	J6L	8	46	5 7	8
PED PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED
P61,P62	TB8-7,9	I13U	26	68	2	6 PED
P81,P82	TB8-8,9	I13L	28	70	2	8 PED

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

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

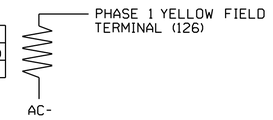
INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

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



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0228
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

Electrical Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 55 (North Alston Avenue) at Taylor Street

Division 5 | Durham County | Durham

PLAN DATE: November 2014 | REVIEWED BY: T. Joyce

PREPARED BY: C. Strickland | REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown F12601ED0BED434... 4/2/2015

SIG. INVENTORY NO. 05-0228

27-MAR-2015 15:17
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cstrickland

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 30.2

OVERLAPS [2-4] PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

PRESS '+'

OVERLAP [2]:
LOADSWITCH = 10 NOTE: FOR SIGNAL HEAD 81
VEH SET 1 = 4,8
YELLOW CLEARANCE = 3.3
RED CLEARANCE = 2.6

PRESS '+'

OVERLAP [3]:
LOADSWITCH = 11 NOTE: FOR SIGNAL HEAD 21
VEH SET 1 = 2,6
YELLOW CLEARANCE = 3.8
RED CLEARANCE = 2.6

PRESS '+'

OVERLAP [4]:
LOADSWITCH = 12 NOTE: FOR SIGNAL HEAD 41
VEH SET 1 = 4,8
YELLOW CLEARANCE = 3.3
RED CLEARANCE = 2.6

END OF OVERLAP PROGRAMMING

OVERLAP GREEN FLASH PROGRAMMING FOR 3 SECTION FYA

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrow. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 2, 3, 4

FYA PPLT PROGRAMMING (SIGNAL HEAD 11)

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1
2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99
3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98

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.

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 1,6
2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1
3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 5
   PHASE 4 MIN FDW = 8
   PHASE 6 MIN FDW = 6
   PHASE 8 MIN FDW = 8

Program extend time on optical detector units for 2.0 sec for EVB.

SPECIAL NOTES EV PREEMPT PROGRAMMING

Setting 'FYA DURING PREEMPT' to 'Y' eliminates yellow trap when transitioning to preempt from adjacent through phase.
Main Menu - 9) UTILITIES - 9) MISC
FYA DURING PREEMPT (Y/N) = Y

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

STARTUP CALLS PROGRAMMING

Prevents Veh Call to phase 1 during Startup. Phase 1 used only during Preempt.
Main Menu - 9) UTILITIES - 1) STARTUP
VEHICLE CALLS 2,4,6,8

Electrical Detail - Sheet 2 of 2

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0228
DESIGNED: September 2014
SEALED: 04/02/2015
REVISED: N/A

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 55 (North Alston Avenue) at Taylor Street

Division 5 Durham County Durham

PLAN DATE:	November 2014	REVIEWED BY:	T. Joyce
PREPARED BY:	C. Strickland	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown 4/2/2015
F12601ED08EB434 DATE

SIG. INVENTORY NO. 05-0228

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cestrickland

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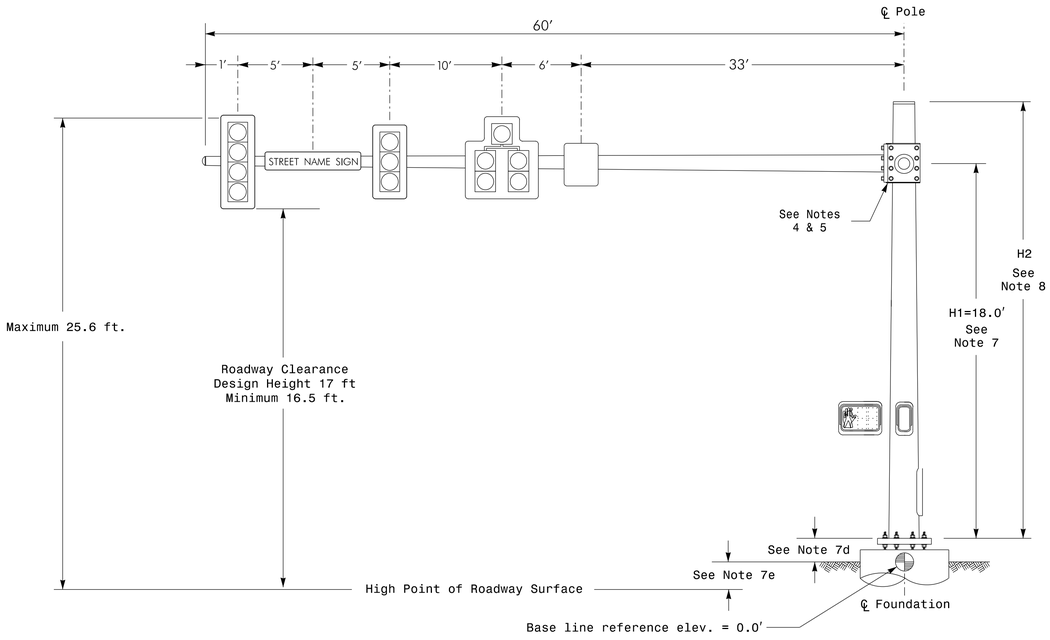
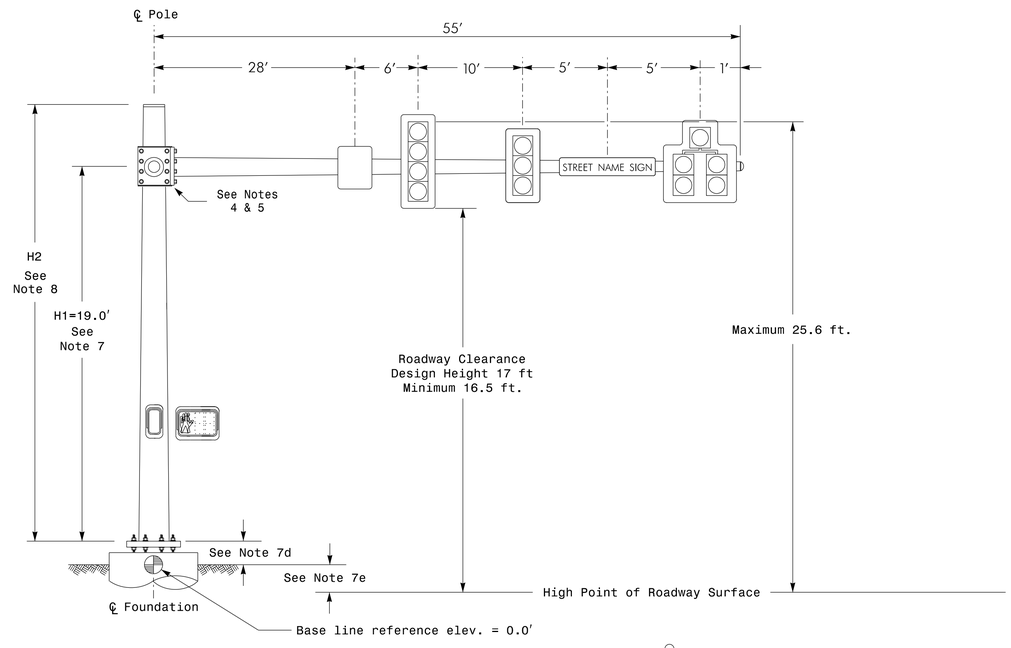
Design Loading for METAL POLE NO. 9, MAST ARM A



Elevation View @ 0°

Design Loading for METAL POLE NO. 9, MAST ARM B



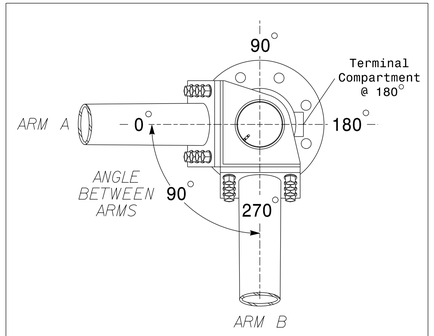
Elevation View @ 270°

SPECIAL NOTE

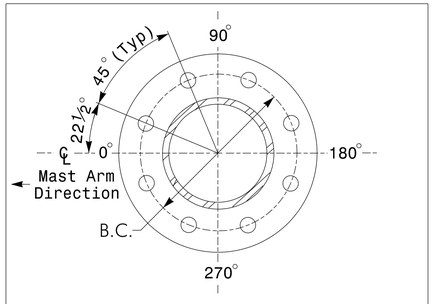
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-1.31 ft.	-0.36 ft.
Elevation difference at Edge of travelway or face of curb	+0.75 ft.	+0.42 ft.

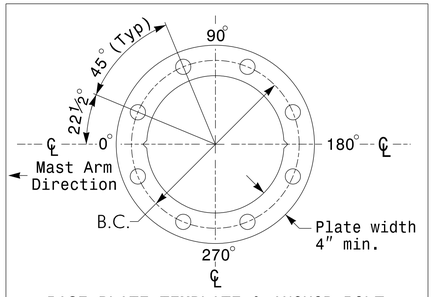


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

METAL POLE No. 9

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 30.3

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"–4 SECTION WITH 8" BACKPLATE RIGID MOUNTED	15.8 S.F.	31.5" W X 72.0" L	78 LBS
	SIGNAL HEAD 12"–3 SECTION WITH 8" BACKPLATE RIGID MOUNTED	12.8 S.F.	31.5" W X 58.5" L	63 LBS
	SIGNAL HEAD 12"–5 SECTION WITH 8" BACKPLATE RIGID MOUNTED	20.7 S.F.	48.0" W X 62.0" L	107 LBS
STREET NAME SIGN	STREET NAME SIGN RIGID MOUNTED	12.0 S.F.	18.0" W X 96.0" L	27 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS
	SIGN RIGID MOUNTED	7.5 S.F.	30.0" W X 36.0" L	14 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
   - The 5th Edition 2009 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2012 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2012 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

Design Requirements

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate arm connection points.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. The pole manufacturer will determine the total height (H2) of the pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Structural Engineer for assistance at (919) 773-2800.
10. The contractor is responsible for verifying that the mast arm lengths shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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

NCDOT Wind Zone 4 (90 mph)

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

NC 55 (North Alston Avenue) at Taylor Street

Division 5 Durham County Durham

PLAN DATE: December 2014 REVIEWED BY: J Hochanadel

PREPARED BY: M Copple REVIEWED BY:

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15 DATE
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SIG. INVENTORY NO. 05-0228

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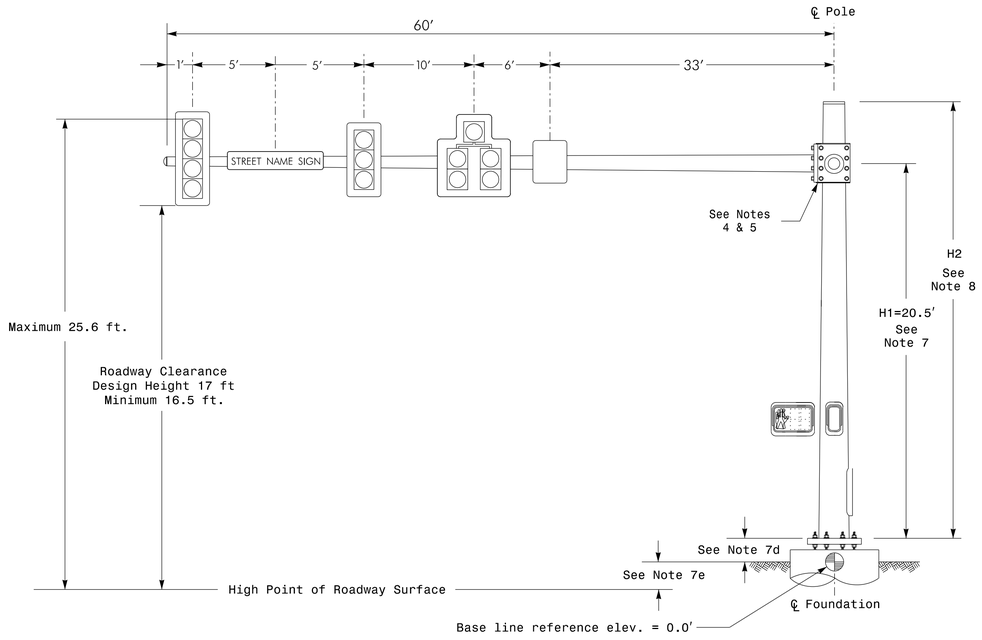
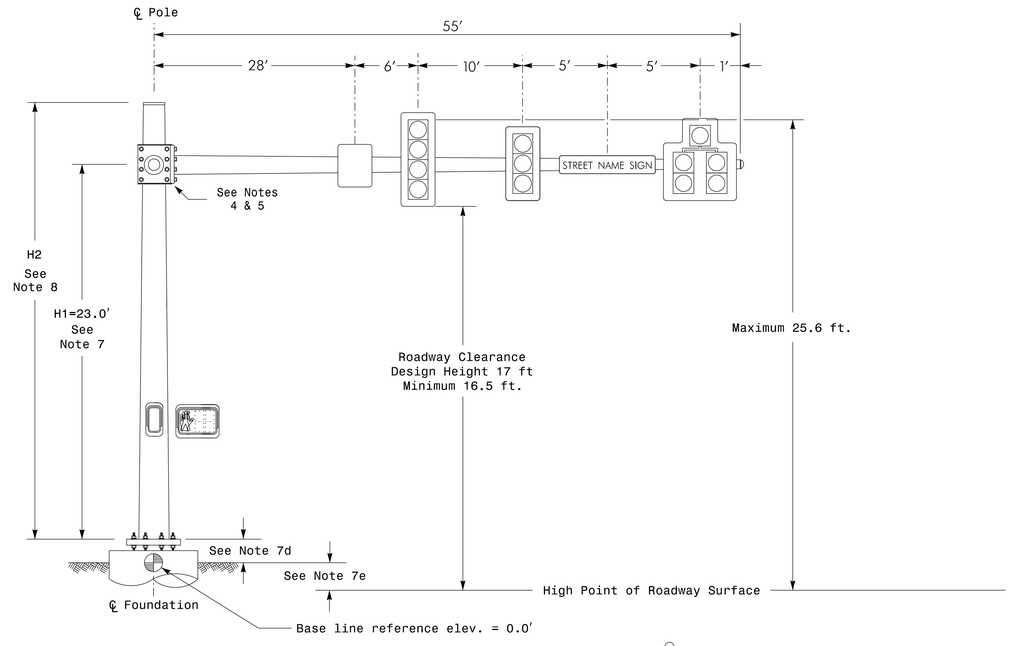
Design Loading for METAL POLE NO. 10, MAST ARM A



Elevation View @ 0°

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



Elevation View @ 270°

$$$$SYSTIME$$$$
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SPECIAL NOTE

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Elevation Data for Mast Arm Attachment (H1)

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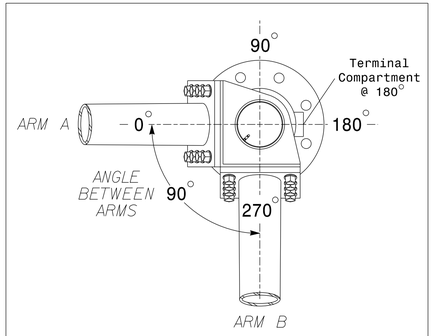
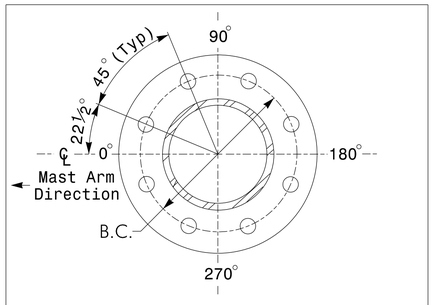
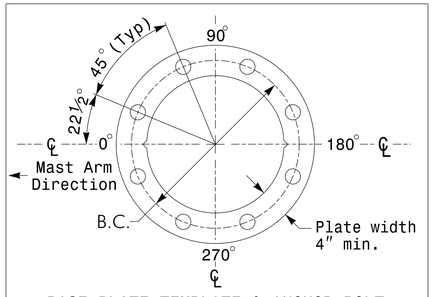


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

METAL POLE No. 10

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 30.4

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"–4 SECTION WITH 8" BACKPLATE RIGID MOUNTED	15.8 S.F.	31.5" W X 72.0" L	78 LBS
	SIGNAL HEAD 12"–3 SECTION WITH 8" BACKPLATE RIGID MOUNTED	12.8 S.F.	31.5" W X 58.5" L	63 LBS
	SIGNAL HEAD 12"–5 SECTION WITH 8" BACKPLATE RIGID MOUNTED	20.7 S.F.	48.0" W X 62.0" L	107 LBS
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	SIGN RIGID MOUNTED	7.5 S.F.	30.0" W X 36.0" L	14 LBS

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

NC 55 (North Alston Avenue) at Taylor Street

Division 5 Durham County Durham

PLAN DATE: December 2014 REVIEWED BY: J Hochanadel

PREPARED BY: M Copple REVIEWED BY:

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15 DATE
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SIG. INVENTORY NO. 05-0228

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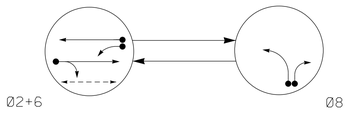
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 31.0

2 Phase Fully Actuated W/ EV Preemption (Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV Preempt Phases

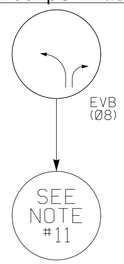
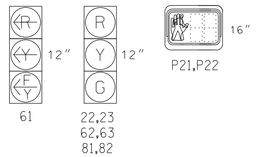


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø8	EVB	FLASH
22,23	G	R	R	Y
61	~~F Y~~	~~R~~	~~R~~	~~Y~~
62,63	G	R	R	Y
81,82	R	G	G	R
P21,P22	W	DW	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING															
							TIMING		ATTRIBUTES										STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	LOOPS SYSTEM	NEW	EXISTING
2A	6x6	✳	70	✳	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-
6A	6x6	✳	70	✳	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-
6B	6x40	✳	0	✳	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-
8A	6x40	✳	0	✳	-	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-
8B	6x40	✳	0	✳	-	8	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-
PEDESTRIAN DETECTION																				
P21,P22	N/A	N/A	N/A	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-

✳ Video Detection Zone

2033 EV PREEMPTION

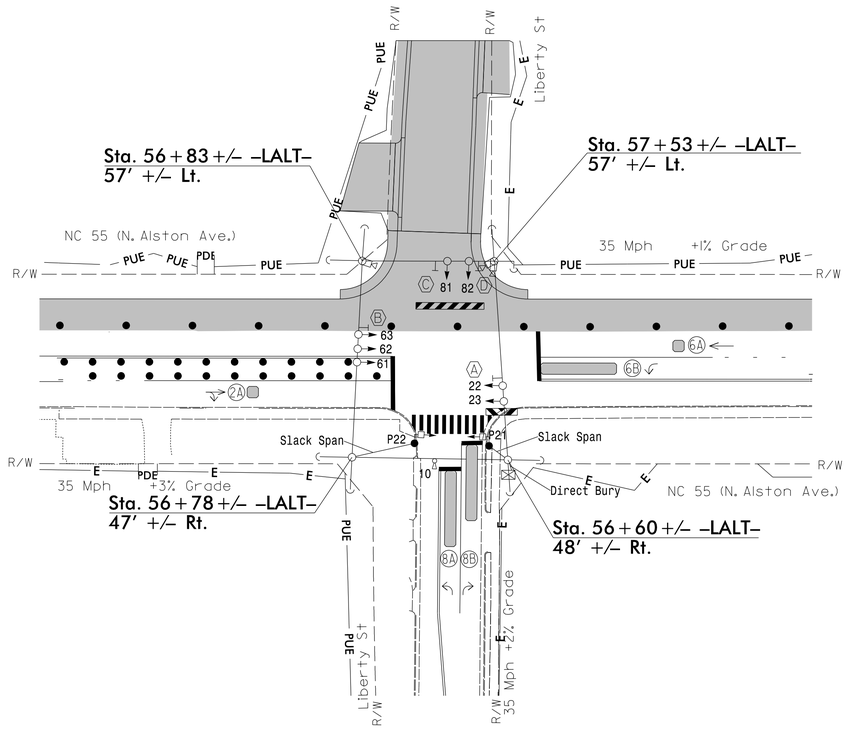
FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
MIN. PED. CLEAR BEFORE PREEMPT	✳
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

✳ See Timing Chart for Min Ped Clearance
** Program Timing on Optical Detector Unit

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø6	Ø8	OL1
MINIMUM INITIAL *	10 SEC.	10 SEC.	7 SEC.	0 SEC.
VEHICLE EXTENSION *	3.0 SEC.	3.0 SEC.	2.0 SEC.	
YELLOW CHANGE INT.	3.8 SEC.	3.8 SEC.	3.0 SEC.	3.8 SEC.
RED CLEARANCE	1.3 SEC.	1.3 SEC.	2.3 SEC.	1.3 SEC.
MAXIMUM LIMIT *	50 SEC.	50 SEC.	35 SEC.	
RECALL POSITION	VEH. RECALL	VEH. RECALL	NONE	
VEHICLE CALL MEMORY	YELLOW LOCK	YELLOW LOCK	NONE	
DOUBLE ENTRY	OFF	OFF	OFF	
WALK *	4 SEC.	- SEC.	- SEC.	
FLASHING DON'T WALK	10 SEC.	- SEC.	- SEC.	
MIN PED CLEARANCE	5 SEC.	- SEC.	- SEC.	
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	
MAXIMUM GAP*	3.0 SEC.	3.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	
MINIMUM GAP	3.0 SEC.	3.0 SEC.	2.0 SEC.	

* 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.



NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet as to not obstruct sight distance of vehicles turning right on red.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time.
9. Pavement markings are existing.
10. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
11. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
12. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□	Pedestrian Signal Head With Push Button & Sign	■
○	Signal Pole with Guy	●●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊡
□	Junction Box	■
----	2-in Underground Conduit	----
N/A	Right of Way	
→	Directional Arrow	→
Ⓐ	"No Left Turn" (R3-2)	Ⓐ
Ⓑ	"No Right Turn" (R3-1)	Ⓑ
Ⓒ	"Left Arrow Only" (R3-2)	Ⓒ
Ⓓ	"Right Arrow Only" (R3-1)	Ⓓ
▭	Work Area	N/A
●	Drums	N/A
E	Construction Easement	N/A
PUE	Permanent Utility Easment	N/A
PDE	Permanent Drainage Easment	N/A
▨	Barricades	N/A
----------	Direct Bury	----------
◁	Optical Detector	●
▭◁	Video Detector	■
▭	Video Detection Area	▭

Signal Upgrade - Temporary Design 1 (TMP Phase 1, Steps 1-10)

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

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

NC 55 (North Alston Avenue) at Liberty St

Division 5 Durham County Durham

PLAN DATE:	September 2014	REVIEWED BY:	J Hochanadel
PREPARED BY:	R Drayton	REVIEWED BY:	

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15
5078102B59BC498...
DATE

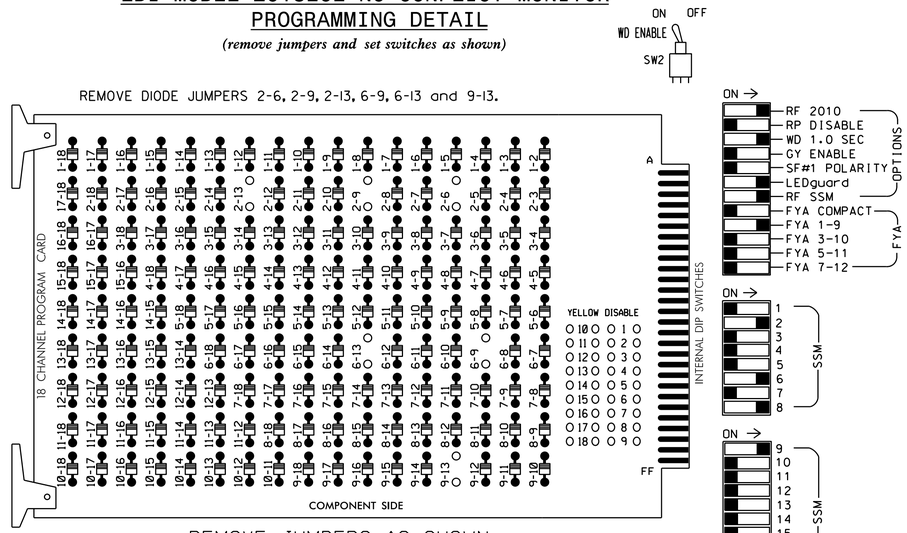
SIG. INVENTORY NO. 05-1029TI

3/20/2015
Drafting Station
C:\Projects\TR13.017.00 NCDOT 2012 Traffic LSA\TR13.017-03 (U-3308 Signals)\Traffic\Signals\Design\Signals\TEMP SIGNALS WITH VIDEO\05-1029\05-1029T1.dgn
Clawson

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 31.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Ensure conflict monitor communicates with 2070.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. Program Startup Ped Call for phase 2.
9. Set the Red Revert interval on the controller to 1 second.
10. This cabinet and controller are part of the Durham Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	22,23	P21, P22	NU	NU	NU	NU	62,63	NU	NU	81,82	NU	61 ★	NU	NU	NU	NU	NU
RED		128						134			107							
YELLOW		129						135			108							
GREEN		130						136			109							
RED ARROW													A121					
YELLOW ARROW													A122					
FLASHING YELLOW ARROW													A123					
GREEN ARROW																		
✋			113															
🚶			115															

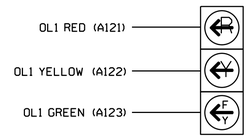
NU = Not Used
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S3,S8,S11,AUX S1
PHASES USED.....2,2 PED,6,8
OVERLAP 1.....2+6
OVERLAP 2.....NOT USED
OVERLAP 3.....NOT USED
OVERLAP 4.....NOT USED

FYA SIGNAL WIRING DETAIL

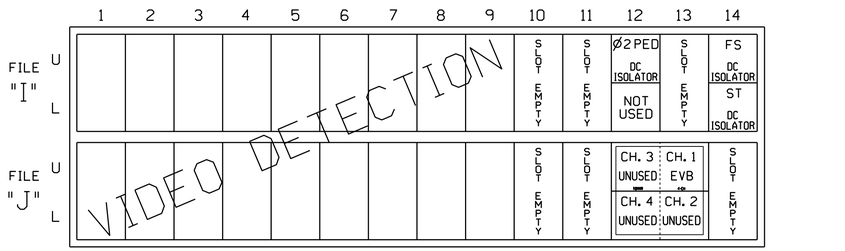
(wire signal heads as shown)



61

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME
EVB = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD
INSERT CARD INTO SLOT J13

INPUT FILE CONNECTION & PROGRAMMING CHART

PED PUSH BUTTONS	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
P21,P22	TB8-4,6	I12U	25	67	2	2 PED

NOTE:
INSTALL DC ISOLATOR IN INPUT FILE SLOT I12

DETECTOR ATTRIBUTES LEGEND:

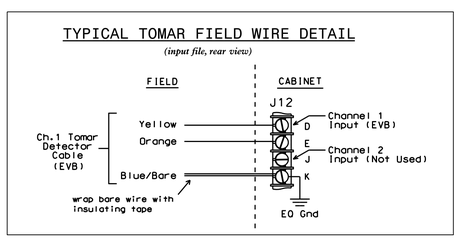
1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1029T1
DESIGNED: September 2014
SEALED: 4/2/15
REVISED: N/A

Electrical Detail - Sheet 1 of 2 (Temporary Design 1)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

750 N.Greenfield Pkwy.Garner,NC 27529

NC 55 (North Alston Avenue) at Liberty St

Division 5 Durham County Durham

PLAN DATE:	November 2014	REVIEWED BY:	T. Joyce
PREPARED BY:	B. Simmons	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown 4/7/2015
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SIG. INVENTORY NO. 05-1029T1

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bsimmons

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 31.2

EMERGENCY VEHICLE PREEMPTION PROGRAMMING

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 4) EMERGENCY VEHICLE
   EVB Clear = 2
   EVB Clearance Phases = 8

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

3. Ped Clear Before Preempt is a pedestrian timing parameter, and is programmed as follows:
   Main Menu - 1) PHASE - 5) PEDESTRIAN TIMING
   PHASE 2 MIN FDW = 5

Program extend time on optical detector units for 2.0 sec for EVB

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.

MIN WALK DURING PREEMPTION PROGRAMMING

To disable MIN WALK pedestrian timing during preemption, program the controller as follows:
Main Menu - 9) UTILITIES - 5) CONFIGURATION
EXTRA TWO = 3

OVERLAP (1) PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

OVERLAP [1]:
LOADSWITCH = 9
VEH SET 1 = 2,6
YELLOW CLEARANCE = 3.8
RED CLEARANCE = 1.3

END OF OVERLAP PROGRAMMING

OVERLAP GREEN FLASH PROGRAMMING (SIGNAL HEAD 61)

The following will cause the overlap green output to flash, which is wired to the FYA. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 1

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1029T1
DESIGNED: September 2014
SEALED: 4/2/15
REVISED: N/A

Electrical Detail - Sheet 2 of 2 (Temporary Design 1)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 55 (North Alston Avenue)
at
Liberty St

Division 5 | Durham County | Durham

PLAN DATE: November 2014 | REVIEWED BY: T. Joyce

PREPARED BY: B. Simmons | REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown 4/7/2015
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SIG. INVENTORY NO. 05-1029T1

27-MAR-2015 10:51
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bsimmons

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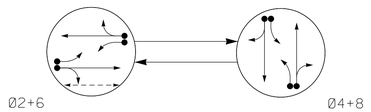
PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 32.0

2 Phase Fully Actuated W/ EV Preemption (Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV Preempt Phases

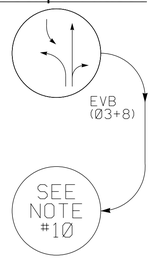
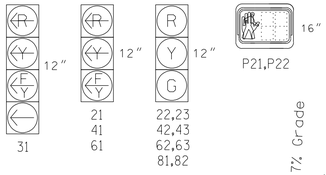


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4+8	PHASE EVB	PHASE FLASH
21	~~G~~ ~~Y~~	~~R~~	~~R~~	~~Y~~
22,23	G	R	R	Y
31	~~R~~	~~G~~ ~~Y~~	←	~~R~~
41	~~R~~	~~G~~ ~~Y~~	~~G~~ ~~Y~~	~~R~~
42,43	R	G	R	R
61	~~G~~ ~~Y~~	~~R~~	~~R~~	~~Y~~
62,63	G	R	R	Y
81,82	R	G	G	R
P21,P22	W	DW	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING															
							TIMING		ATTRIBUTES										LOOPS	STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM	NEW	EXISTING
2A	6x6	✳	70	-	✳	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
2B	6x40	✳	0	✳	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-
4A	6x40	✳	0	✳	-	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-
4B	6x40	✳	0	✳	-	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	✳	-
6A	6x6	✳	70	-	✳	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
6B	6x40	✳	0	-	✳	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
8A	6x40	✳	0	-	✳	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
8B	6x40	✳	0	-	✳	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	✳
PEDESTRIAN DETECTION																			
P21,P22	N/A	N/A	N/A	-	X	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X

✳ Video Detection Zone

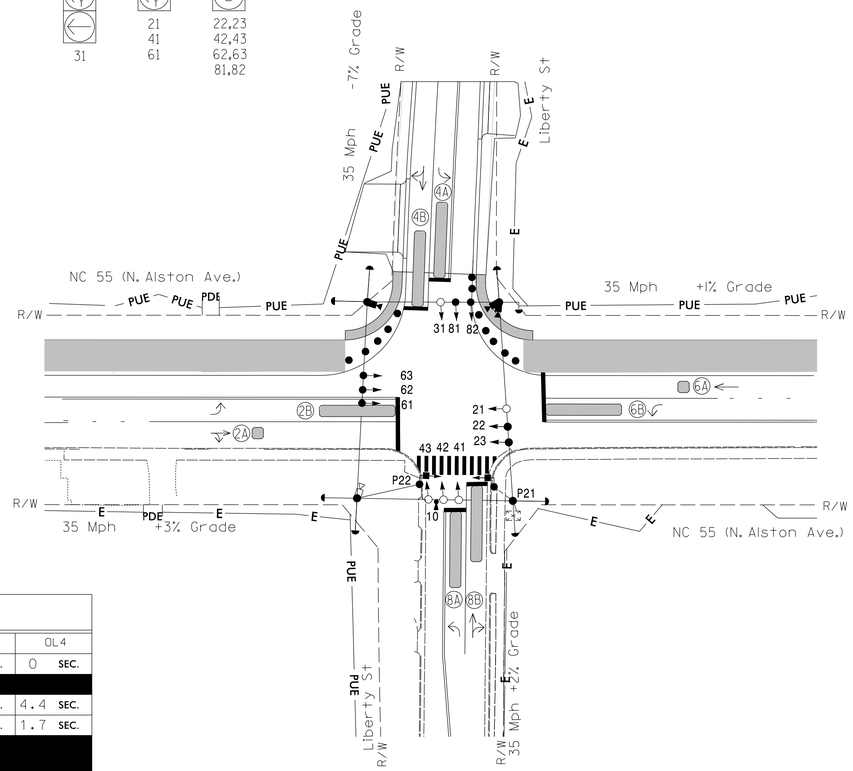
NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time.
8. Pavement markings are existing.
9. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
10. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
11. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
12. Contractor shall adjust video detection zones as required.

2033 EV PREEMPTION

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
MIN. PED. CLEAR BEFORE PREEMPT	✳
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	2
PREEMPT EXTEND**	2.0

✳ See Timing Chart for Min Ped Clearance
** Program Timing on Optical Detector Unit



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	→
▭	Work Area	N/A
●	Drums	N/A
E	Construction Easement	N/A
PUE	Permanent Utility Easment	N/A
PDE	Permanent Drainage Easment	N/A
▨	Barricades	N/A
————	Direct Bury	----------
○	Optical Detector	●
▭	Video Detector	■
▭	Video Detection Area	▭

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø6	Ø8	OL1	OL3	OL4
MINIMUM INITIAL *	10 SEC.	- SEC.	7 SEC.	10 SEC.	7 SEC.	0 SEC.	0 SEC.	0 SEC.
VEHICLE EXTENSION *	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			
YELLOW CHANGE INT.	3.8 SEC.	4.4 SEC.	4.4 SEC.	3.8 SEC.	4.4 SEC.	3.8 SEC.	3.8 SEC.	4.4 SEC.
RED CLEARANCE	1.5 SEC.	2.4 SEC.	1.7 SEC.	1.5 SEC.	1.7 SEC.	1.5 SEC.	1.5 SEC.	1.7 SEC.
MAXIMUM LIMIT *	50 SEC.	35 SEC.	35 SEC.	50 SEC.	35 SEC.			
RECALL POSITION	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE			
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE			
DOUBLE ENTRY	OFF	OFF	ON	OFF	ON			
WALK *	4 SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
FLASHING DON'T WALK	10 SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MIN PED CLEARANCE	5 SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM GAP*	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MINIMUM GAP	3.0 SEC.	- SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.			

* 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 1, Steps 1-10)

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

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

NC 55 (North Alston Avenue) at Liberty St

Division 5 Durham County Durham

PLAN DATE: September 2014 REVIEWED BY: J Hochanadel

PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

DocuSigned by: 4/02/15
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DATE

SIG. INVENTORY NO. 05-1029T2

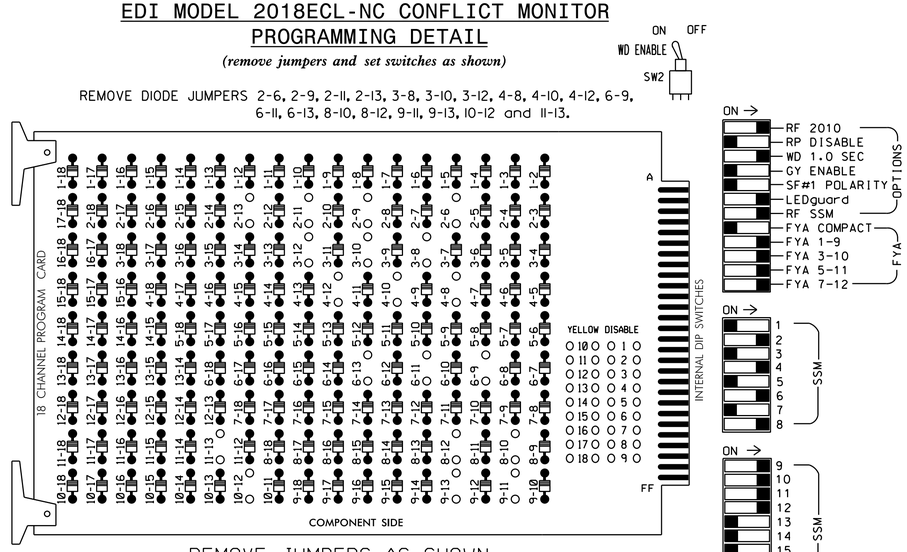
3/20/2015
C:\MYJOBS\Application\TIP\R13.017.00 NCDOT 2012 Traffic LSA\TIP13.017.03 (U-3308 Signals)\Traffic\Signals\Design\Signals\TEMP SIGNALS WITH VIDEO\05-1029\05-1029T2.dgn
CLOWSON

PROJECT REFERENCE NO.	SHEET NO.
U-3308	Sig. 32.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-6, 2-9, 2-11, 2-13, 3-8, 3-10, 3-12, 4-8, 4-10, 4-12, 6-9, 6-11, 6-13, 8-10, 8-12, 9-11, 9-13, 10-12 and 11-13.



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Ensure conflict monitor communicates with 2070.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 0 seconds within the controller programming. The conflict monitor will govern startup flash. Ensure STARTUP "RED START" is set to 0 seconds.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Double Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Call for phase 2.
10. Set the Red Revert interval on the controller to 1 second.
11. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S3,S4,S5,S8,S11
AUX S1,AUX S2,AUX S4,AUX S5
PHASES USED.....2,2 PED,3*,4,6,8
OVERLAP 1.....2+6
OVERLAP 2.....**
OVERLAP 3.....2+6
OVERLAP 4.....4+8

* Phase used only during Preempt.
** See FYA PPLT Programming - Sheet 2.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	22,23	P21, P22	31 ★	42,43	NU	NU	62,63	NU	NU	81,82	NU	61 ★	31 ★	NU	21 ★	41 ★	NU
RED		128			101			134			107							
YELLOW		129		*	102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121	A124		A114	A101	
YELLOW ARROW													A122	A125		A115	A102	
FLASHING YELLOW ARROW													A123	A126		A116	A103	
GREEN ARROW				118														
✋			113															
🚶			115															

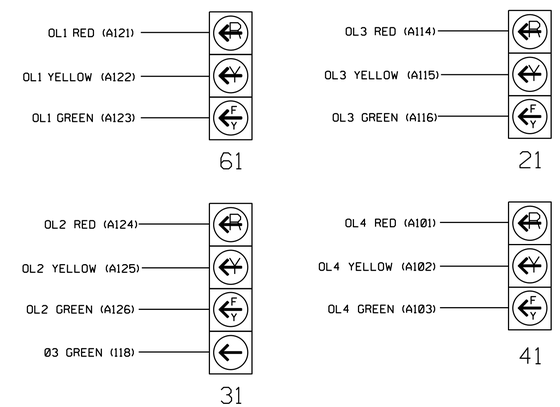
NU = Not Used

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

★ See pictorial of head wiring in detail below.

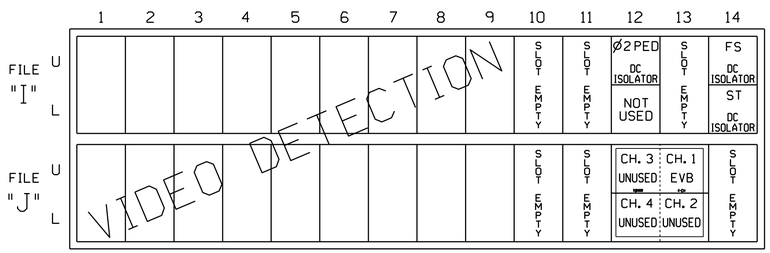
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME
EVB = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD
INSERT CARD INTO SLOT J13

INPUT FILE CONNECTION & PROGRAMMING CHART

PED PUSH BUTTONS	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
P21,P22	TB8-4,6	I12U	25	67	2	2 PED

NOTE:
INSTALL DC ISOLATOR IN INPUT FILE SLOT I12

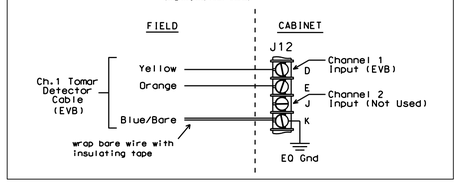
DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



LOAD RESISTOR INSTALLATION DETAIL

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

PHASE 3 YELLOW FIELD TERMINAL (117)

AC-

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1029T2
DESIGNED: September 2014
SEALED: 4/2/15
REVISED: N/A

Electrical Detail - Sheet 1 of 2 (Temporary Design 2)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 55 (North Alston Avenue) at Liberty St

Division 5 | Durham County | Durham

PLAN DATE: November 2014 | REVIEWED BY: T. Joyce

PREPARED BY: B. Simmons | REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

DocuSigned by: George C. Brown 4/7/2015
F12601E0DBEB434 DATE

SIG. INVENTORY NO. 05-1029T2

27 MAR 2015 10:39
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