PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.11.0

PHASING DIAGRAM

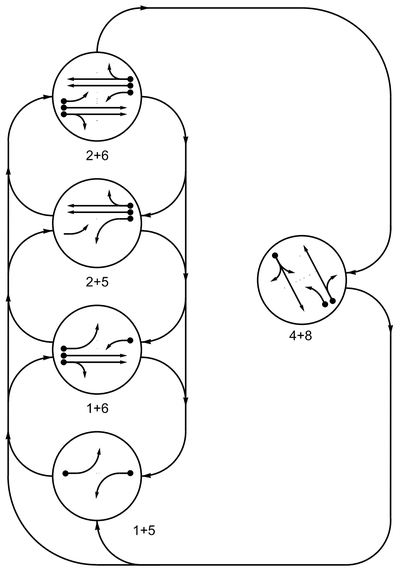
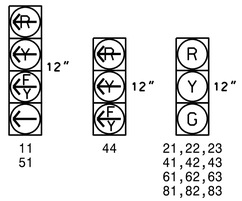


TABLE OF OPERATION

SIGNAL FACE	PHASE 1+5	1+6	2+5	2+6	4+8	FLASH
11	←	←	FY	~~R~~	~~R~~	~~R~~
21,22,23	R	R	G	G	R	R
41,42,43	R	R	R	G	R	R
44	~~R~~	~~R~~	~~R~~	~~R~~	FY	~~R~~
51	←	FY	←	FY	~~R~~	~~R~~
61,62,63	R	G	R	G	R	R
81,82,83	R	R	R	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	2-4-2	X	1	30.0	-	X	-	X	-	X
					6	3.0	-	X	-	X	X	X
2A	6X6	200	4	X	2	-	-	X	X	X	-	X
2B	6X6	200	4	X	2	-	-	X	X	X	-	X
4A	6X40	0	2-4-2	X	4	3.0	-	X	-	X	-	X
4B	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
5A	6X40	0	2-4-2	X	5	15.0	-	X	-	X	-	X
					2	3.0	-	X	-	X	X	X
6A	6X6	200	6	X	6	-	-	X	X	X	-	X
6B	6X6	200	6	X	6	-	-	X	X	X	-	X
8A	6X40	0	2-4-2	X	8	3.0	-	X	-	X	-	X

5 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or Phase 5 may be lagged.
4. Set all detector units to presence mode.

PHASING DIAGRAM DETECTION LEGEND

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

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Metal Pole with Mastarm	
DD	Directional Drill	N/A
Ⓐ	"NO TURN ON RED" Sign (R10-11)	Ⓐ
Ⓑ	"STOP HERE ON RED" Sign (R10-6)	Ⓑ

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Walk *	–	–	–	–	–	–
Ped Clear *	–	–	–	–	–	–
Min Green *	7	10	7	7	10	7
Passage *	2.0	5.0	2.0	2.0	5.0	2.0
Max 1 *	20	45	30	20	45	30
Yellow Change	3.0	3.8	4.4	3.0	3.8	4.4
Red Clear	2.1	1.5	2.5	2.3	1.5	2.5
Added Initial *	–	1.5	–	–	1.5	–
Maximum Initial *	–	24	–	–	24	–
Time Before Reduction *	–	15	–	–	15	–
Time To Reduce *	–	30	–	–	30	–
Minimum Gap	–	3.0	–	–	3.0	–
Advance Walk	–	–	–	–	–	–
Non Lock Detector	X	–	X	X	–	X
Vehicle Recall	–	MIN RECALL	–	–	MIN RECALL	–
Dual Entry	–	–	X	–	–	X

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

$$$$USERNAME$$$$
$$$$DESIGN$$$$
$$$$TIME$$$$
$$$$DATE$$$$

Signal Upgrade - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

NC 73-211/NC 211
at
NC 73/SR 1133 (Mode Rd)

Division 8 Moore County West End

PLAN DATE:	June 2024	REVIEWED BY:	R. Mullinax
PREPARED BY:	LD Stouchko	REVIEWED BY:	

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 034437 LORI D. STOUCHKO

SIGNATURE DATE

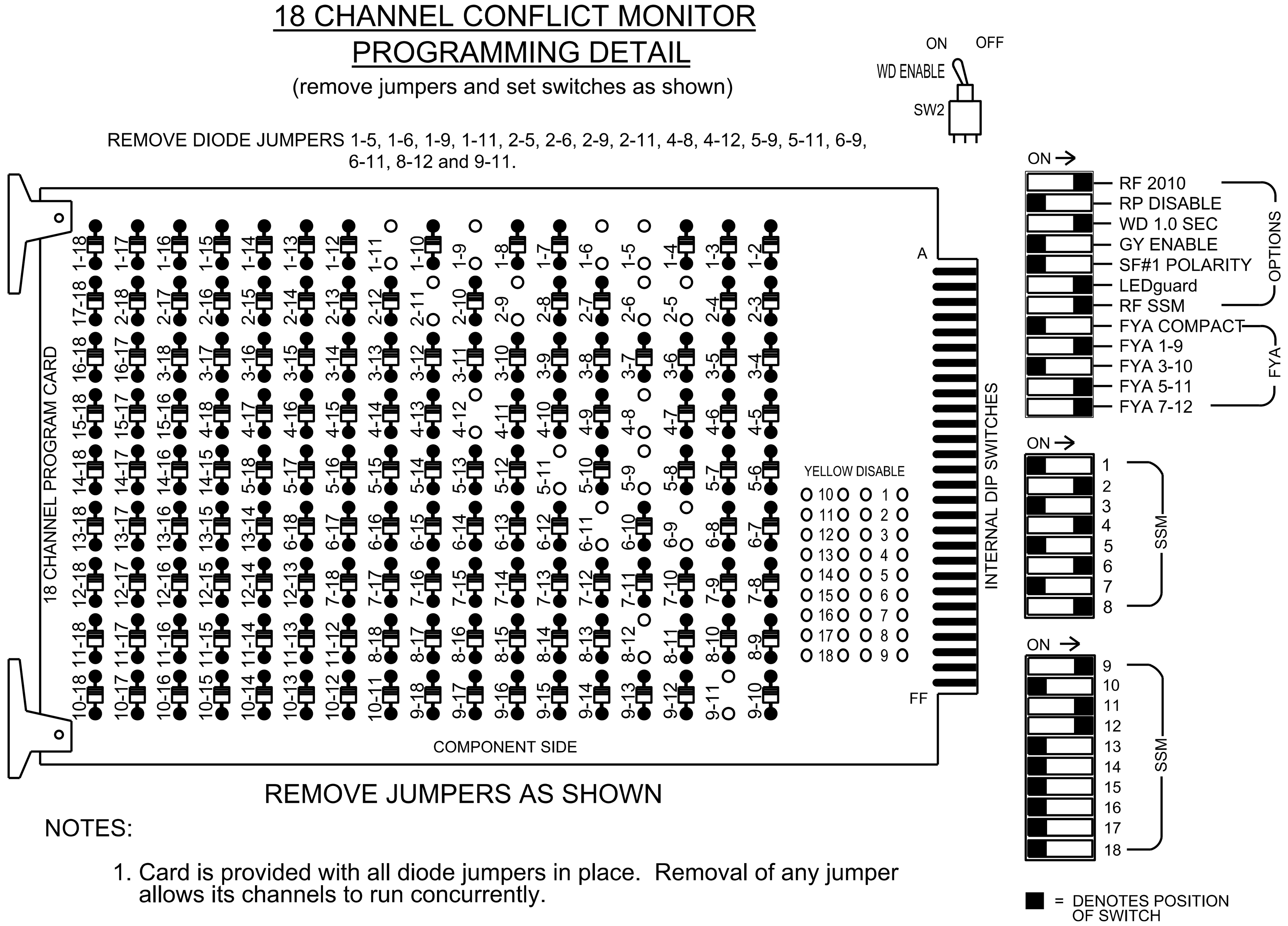
SIG. INVENTORY NO. 08-0098

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.11.1

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 2-5, 2-6, 2-9, 2-11, 4-8, 4-12, 5-9, 5-11, 6-9, 6-11, 8-12 and 9-11.



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 the 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. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program phases 4 and 8 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller..2070LX
Cabinet..332 w/ Aux
Software...Q-Free MAXTIME
Cabinet Mount....................................Base
Output File Positions..........................18 With Aux. Output File
Load Switches Used...........................S1, S2, S5, S7, S8, S11, AUX S1, AUX S4, AUX S5
Phases Used.......................................1, 2, 4, 5, 6, 8
Overlap "1"..*
Overlap "2"..NOT USED
Overlap "3"..*
Overlap "4"..*

*See overlap 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.	11★	21,22 23	NU	NU	41,42 43	NU	51★	61,62 63	NU	NU	81,82 83	NU	11★	NU	NU	51★	44★	NU
RED		128			101			134			107							
YELLOW	✱	129			102		✱	135			108							
GREEN		130			103			136			109							
RED ARROW													A121			A114	A101	
YELLOW ARROW													A122			A115	A102	
FLASHING YELLOW ARROW													A123			A116	A103	
GREEN ARROW	127						133											

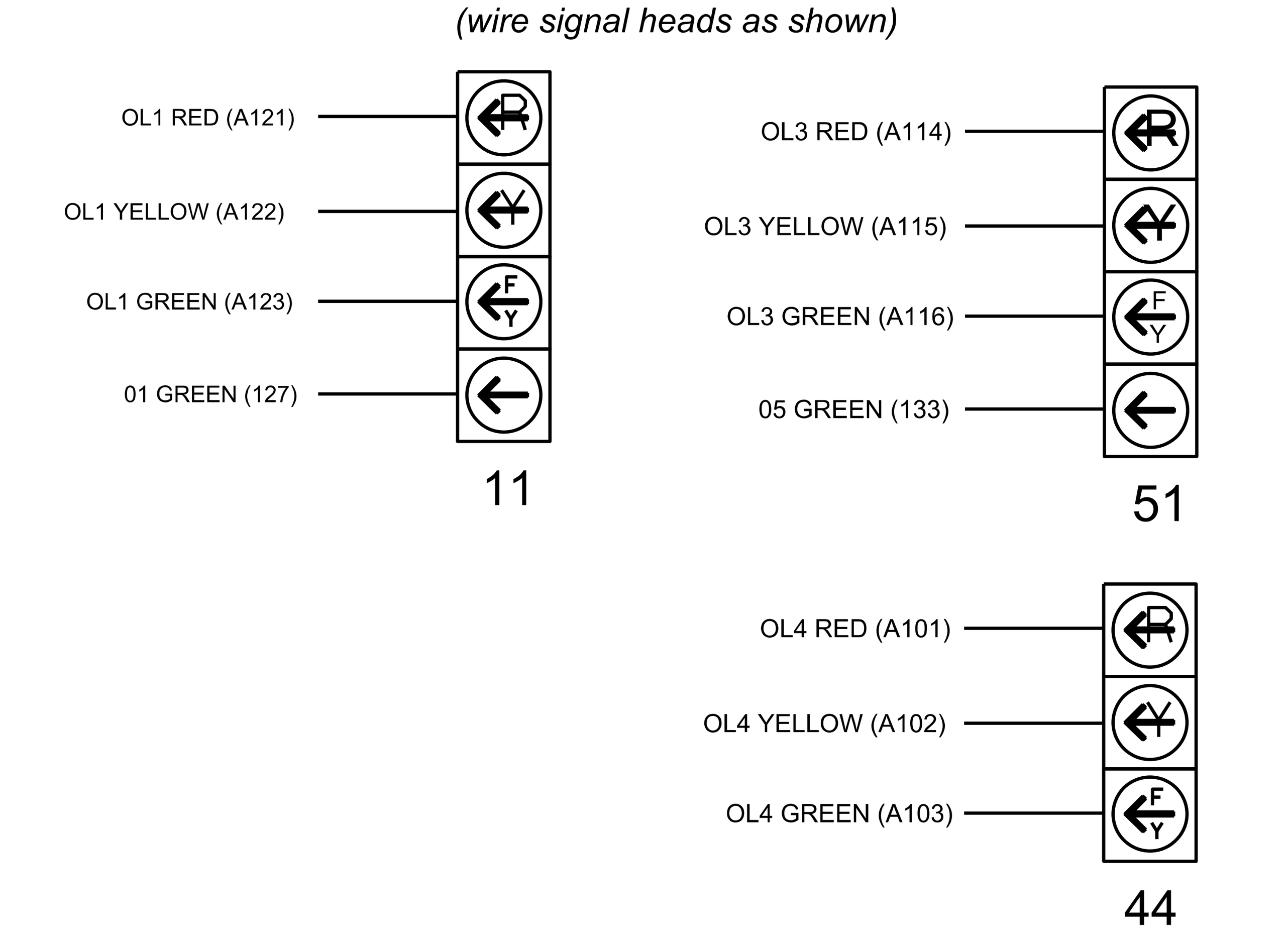
NU = Not Used

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

★ See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

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

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1A	TB2-1,2	I1U	56	18	1	1	30.0		X		X	
				-	29	6	3.0		X		X	X
2A	TB2-5,6	I2U	39	1	2	2			X	X	X	
2B	TB2-7,8	I2L	43	5	3	2			X	X	X	
4A	TB4-9,10	I6U	41	3	8	4	3.0		X		X	
4B	TB4-11,12	I6L	45	7	9	4			X		X	
5A	TB3-1,2	J1U	55	17	15	5	15.0		X		X	
				-	31	2	3.0		X		X	X
6A	TB3-5,6	J2U	40	2	16	6			X	X	X	
6B	TB3-7,8	J2L	44	6	17	6			X	X	X	
8A	TB5-9,10	J6U	42	4	22	8	3.0		X		X	

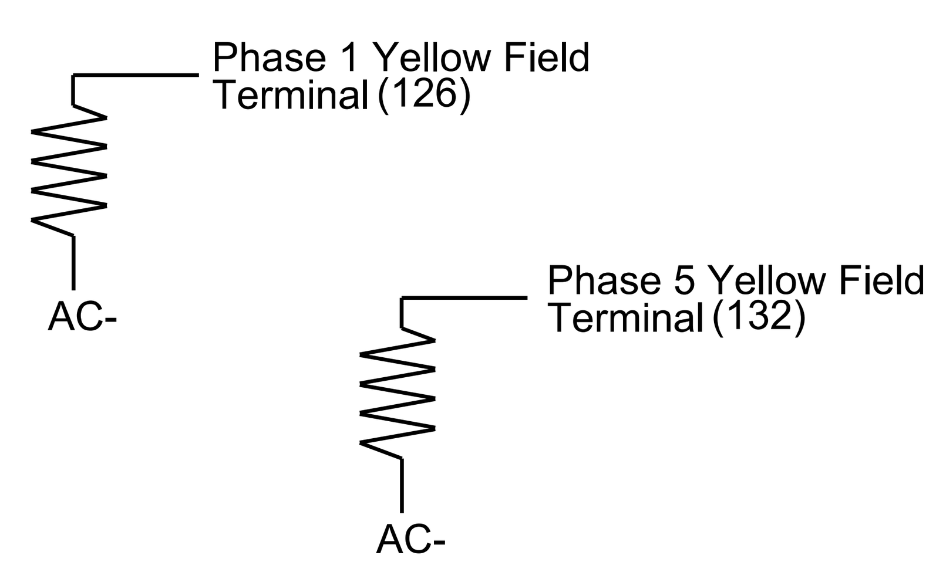
INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0098
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

Electrical Detail - Sheet 1 of 2

MOTT MACDONALD
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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for:

Transportation Mobility and Safety Division — ITS & Signals Management Section — State of North Carolina Department of Transportation

750 N.Greenfield Pkwy.Garner,NC 27529

NC 73-211/NC 211
at
NC 73/SR 1133 (Mode Rd)

Division 8 Moore County West End

PLAN DATE: June 2024	REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0098

OVERLAP PROGRAMMING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	3	4
Type	FYA 4 - Section	OFF	FYA 4 - Section	FYA 4 - Section
Included Phases	2	-	6	8
Modifier Phases	1	-	5	-
Modifier Overlaps	-	-	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0

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.

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

Notice	Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
	1	Phase Vehicle	1	·	X	X	1
NOTICE PHASE 2 FLASH RED →	2	Phase Vehicle	2	·	X	·	2
	3	Phase Vehicle	3	·	X	X	3
	4	Phase Vehicle	4	·	X	·	4
	5	Phase Vehicle	5	·	X	·	5
NOTICE PHASE 6 FLASH RED →	6	Phase Vehicle	6	·	X	X	6
	7	Phase Vehicle	7	·	X	·	7
	8	Phase Vehicle	8	·	X	X	8
NOTICE OVERLAP 1 FLASH RED →	9	Overlap	1	·	X	X	9
	10	Overlap	2	·	X	X	10
NOTICE OVERLAP 3 FLASH RED →	11	Overlap	3	·	X	·	11
	12	Overlap	4	·	X	·	12
	13	Phase Ped	2	·	·	·	13
	14	Phase Ped	4	·	·	·	14
	15	Phase Ped	6	·	·	·	15
	16	Phase Ped	8	·	·	·	16
	17	Overlap	5	·	X	X	17
	18	Overlap	6	·	X	·	18

MAXTIME STARTUP AND SOFTWARE FLASH PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Startup Parameters	Unit Flash Parameters
Startup Clearance Hold	All Red Flash Exit Time
6	6

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 08-0098
DESIGNED: June 2024
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REVISED:

Electrical Detail - Sheet 2 of 2

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Division 8 | Moore County | West End

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NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

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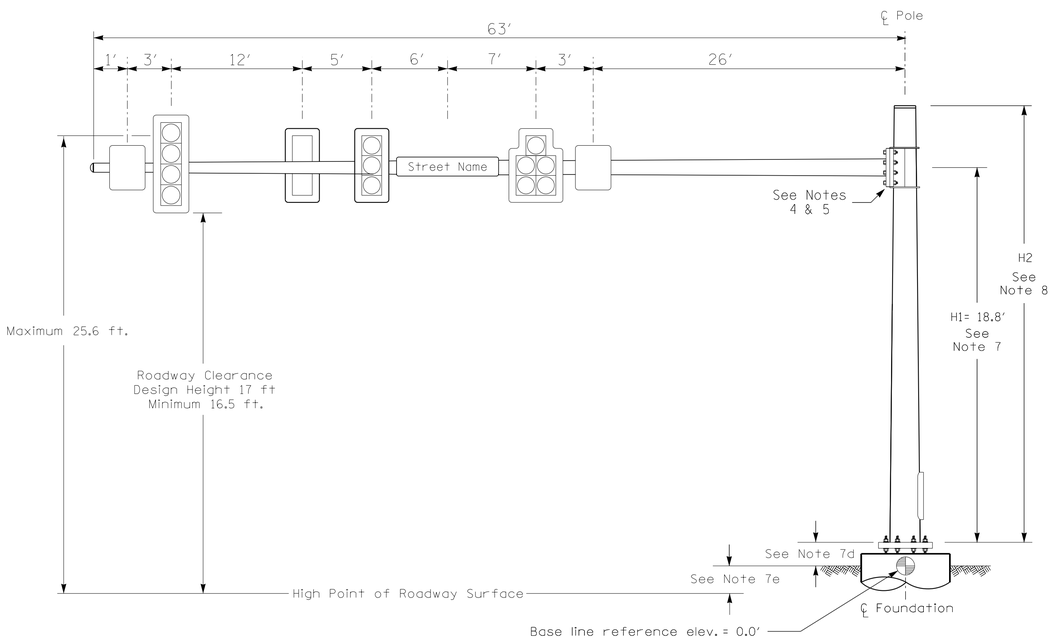
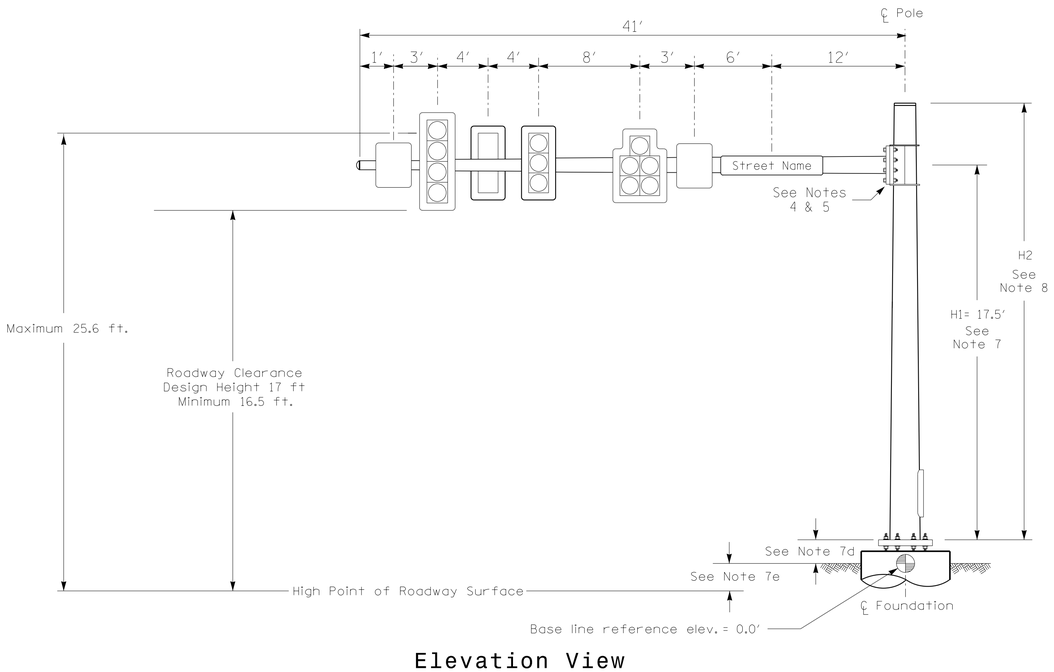
SIG. INVENTORY NO. 08-0098

Design Loading for METAL POLE NO. 1



Elevation View

Design Loading for METAL POLE NO. 2



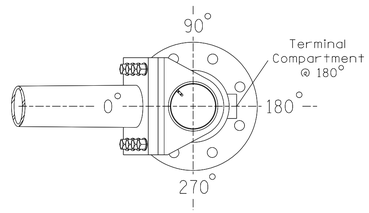
Elevation View

SPECIAL NOTE

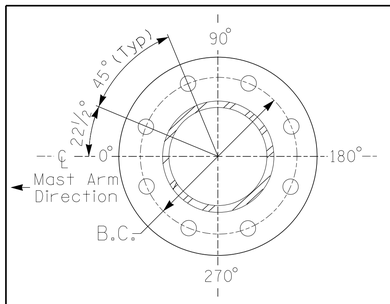
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	Pole 2
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-2.5 ft.	+1.5 ft.
Elevation difference at Edge of travelway or face of curb	+0.9 ft.	0.3 ft.

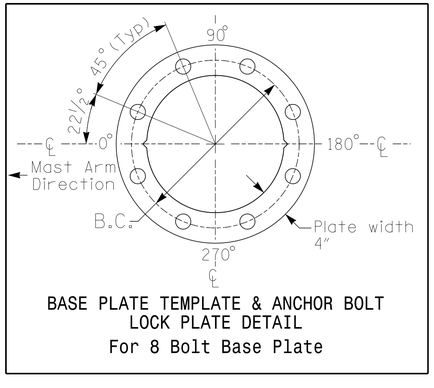


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12″-5 SECTION-WITH BACKPLATE	16.3 S.F.	42.0″W X 56.0″L	103 LBS
	RIGID MOUNTED SIGNAL HEAD 12″-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5″W X 66.0″L	74 LBS
	RIGID MOUNTED SIGNAL HEAD 12″-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5″W X 52.5″L	60 LBS
	SIGN RIGID MOUNTED	7.5 S.F.	30.0″W X 36.0″L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″W X 96.0″L	36 LBS

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NOTES

DESIGN REFERENCE MATERIAL

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

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 4 (90 mph)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared for: Transportation Mobility and Safety Division, North Carolina Department of Transportation, Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

NC 73-211/NC 211
at
NC 73/SR 1133 (Mode Rd)

Division 8 Moore County West End

PLAN DATE:	June 2024	REVIEWED BY:	R. Mullinax
PREPARED BY:	LD Stouchko	REVIEWED BY:	

SCALE: 0 N/A N/A

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D STOUCHKO

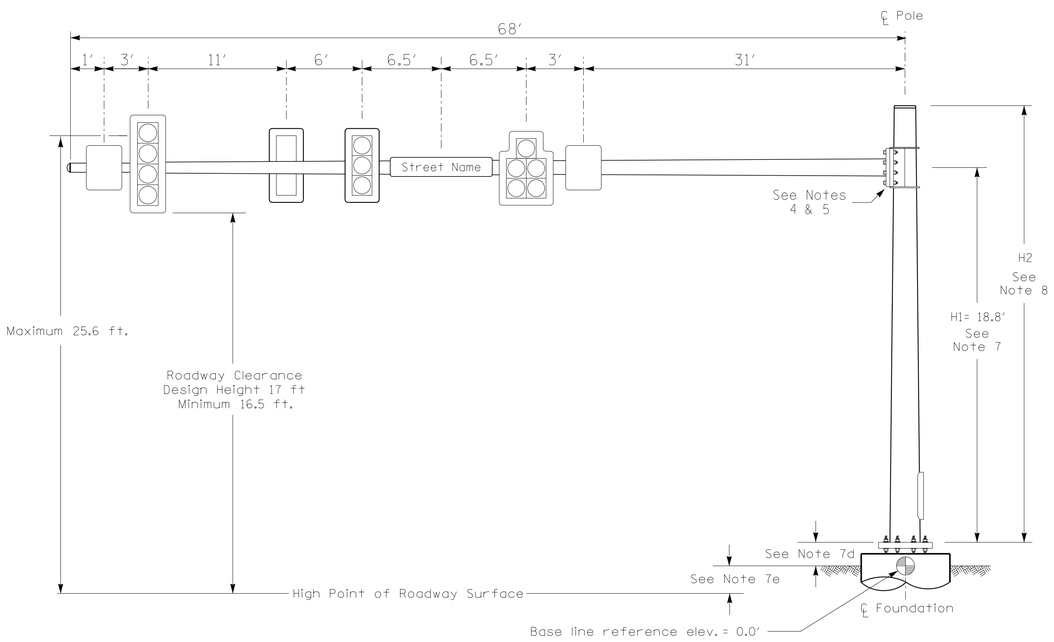
SIGNATURE DATE

SIG. INVENTORY NO. 08-0098

METAL POLE No. 3 and No. 4

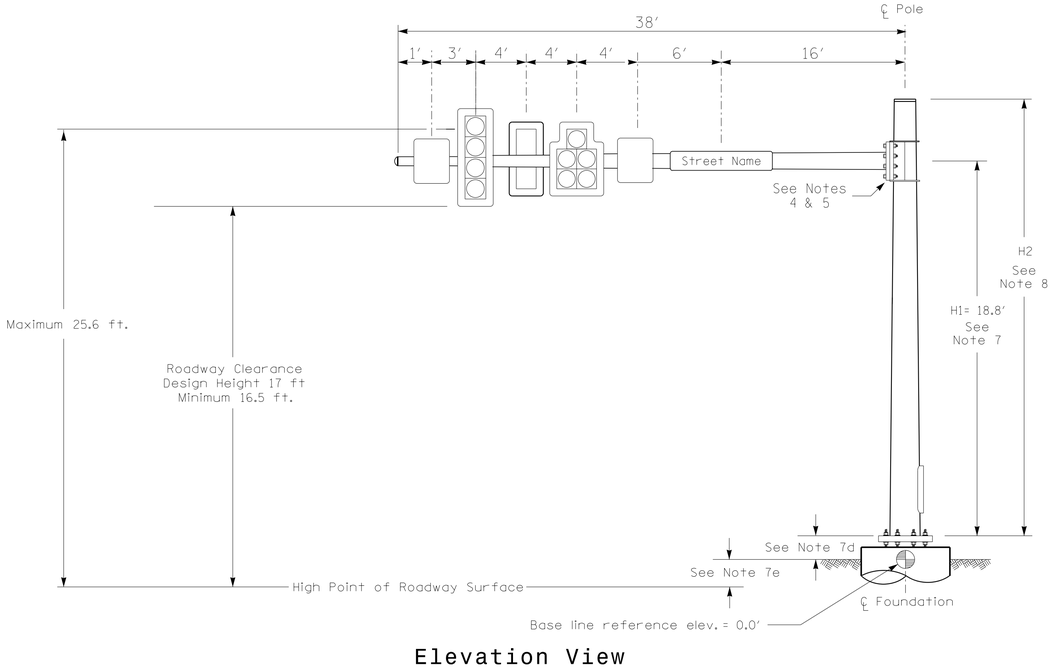
PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.11.4

Design Loading for METAL POLE NO. 3



Elevation View

Design Loading for METAL POLE NO. 4



Elevation View

SPECIAL NOTE

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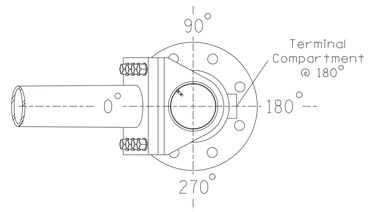
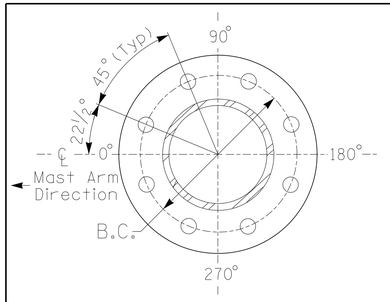
Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 3	Pole 4
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.2 ft.	+0.2 ft.
Elevation difference at Edge of travelway or face of curb	0.0 ft.	+0.5 ft.

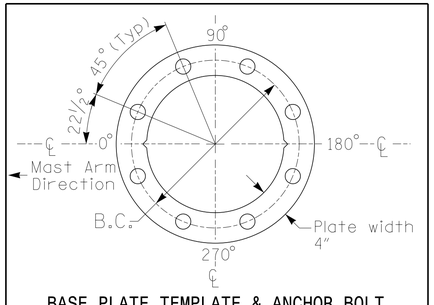


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE	16.3 S.F.	42.0"W X 56.0"L	103 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5"W X 66.0"L	74 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5"W X 52.5"L	60 LBS
	SIGN RIGID MOUNTED	7.5 S.F.	30.0"W X 36.0"L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0"W X 96.0"L	36 LBS

MOTT MACDONALD

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Suite 200
RALEIGH, NC 27606
License No. F-0669

NOTES

DESIGN REFERENCE MATERIAL

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

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 4 (90 mph)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared for: Transportation Mobility and Safety Division, North Carolina Department of Transportation, Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

NC 73-211/NC 211
at
NC 73/SR 1133 (Mode Rd)

Division 8 Moore County West End

PLAN DATE: June 2024 REVIEWED BY: R. Mullinax

PREPARED BY: LD Stouchko REVIEWED BY:

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

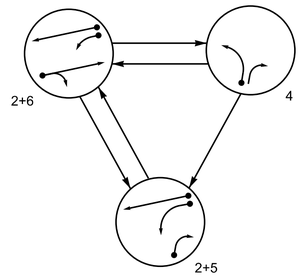
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D STOUCHKO

SIGNATURE DATE

SIG. INVENTORY NO. 08-0098

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.12.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

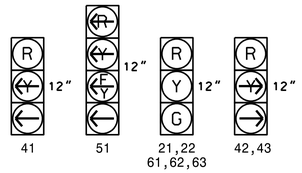
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 2+5	PHASE 2+6	PHASE 4	PHASE FLASH
21,22	G	G	R	R
41	R	R	←	R
42,43	→	R	→	R
51	←	FY	R	R
61,62,63	R	G	R	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A ✳	6X6	420	✳	✳	2	-	-	X	X	X	-	✳
4A ✳	6X40	0	✳	✳	4	3.0	-	X	-	X	-	✳
5A ✳	6X40	0	✳	✳	5	15.0	-	X	-	X	-	✳
					2	3.0	-	X	-	X	X	✳
5B ✳	6X40	0	✳	✳	5	15.0	-	X	-	X	-	✳
6A ✳	6X6	420	✳	✳	6	-	-	X	X	X	-	✳

✳ Video Detection Zone

3 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by Engineer.
3. Phase 5 may be lagged.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. Set all detector units to presence mode.
6. This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.

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	
— PUE —	Permanent Utility Easement	N/A
— DUE —	Drainage Utility Easement	N/A
— PDE —	Permanent Drainage Easement	N/A
— TDE —	Temporary Drainage Easement	N/A
	Directional Arrow	
	Guardrail	
	Construction Zone	
	Non-Intrusive Detection Zone	
N/A	Railroad Tracks	

MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 5	PHASE 6
Walk *	–	–	–	–
Ped Clear *	–	–	–	–
Min Green *	14	7	7	14
Passage *	6.0	2.0	2.0	6.0
Max 1 *	90	30	30	90
Yellow Change	5.3	3.0	3.0	5.3
Red Clear	1.5	2.8	2.3	1.5
Added Initial *	2.5	–	–	2.5
Maximum Initial *	46	–	–	46
Time Before Reduction *	15	–	–	15
Time To Reduce *	45	–	–	45
Minimum Gap	3.4	–	–	3.4
Advance Walk	–	–	–	–
Non Lock Detector	–	X	X	–
Vehicle Recall	MIN RECALL	–	–	MIN RECALL
Dual Entry	–	–	–	–

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

Signal Upgrade
Temporary Design 1 (TMP Phase I)

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

SCALE
0 40
1" = 40'

NC 211
at
SR 1238 (Love Grove Church Rd)

Division 8 Moore County West End

PLAN DATE:	June 2024	REVIEWED BY:	R. Mullinax
PREPARED BY:	LD Stouchko	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LONG D. STOUCHKO

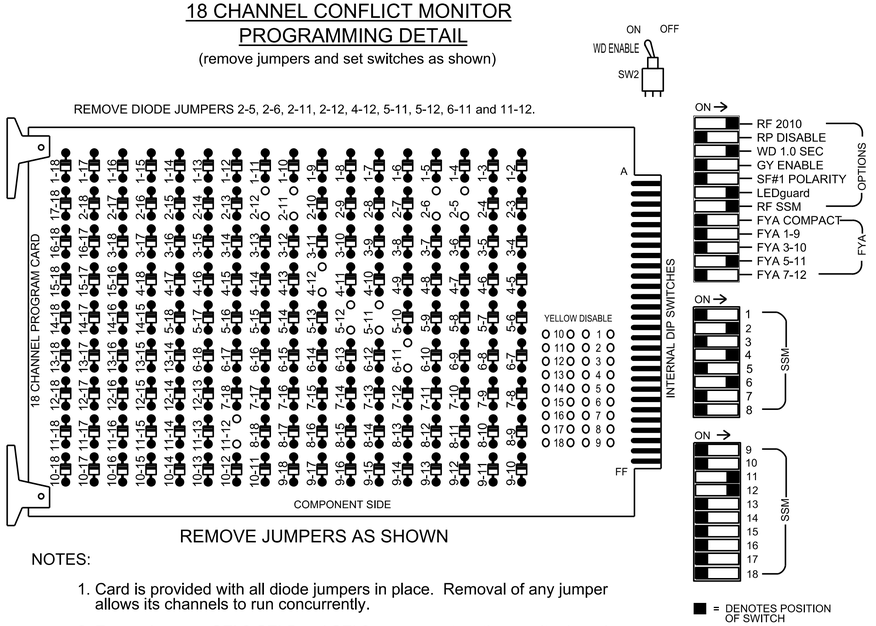
SIGNATURE DATE

SIG. INVENTORY NO. 08-07097I

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.12.1

18 CHANNEL 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 the 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. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S2, S5, S7, S8, AUX S4, AUX S5
Phases Used.....2, 4, 5, 6
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....*

*See overlap programming detail on sheet 2

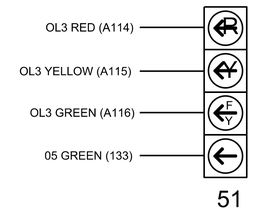
SIGNAL HEAD HOOK-UP CHART

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	21,22	NU	NU	41	NU	51★	61,62 63	NU	NU	NU	NU	NU	NU	NU	51★	42,43	NU
RED		128			101			134									A101	
YELLOW		129					*	135										
GREEN		130						136										
RED ARROW																A114		
YELLOW ARROW					102											A115	A102	
FLASHING YELLOW ARROW																A116		
GREEN ARROW					103		133										A103	

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

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

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

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTES

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.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 08-0709TI
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

MOTT MACDONALD
MOTT MACDONALD I & E, LLC
930 Main Campus Drive
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Electrical Detail - Sheet 1 of 2
Temporary Design 1 (TMP Phase I)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for:

750 N.Greenfield Pkwy.Garner,NC 27529

NC 211
at
SR 1238 (Love Grove Church Rd)

Division 8 Moore County West End

PLAN DATE:	June 2024	REVIEWED BY:	R. Mullinax
PREPARED BY:	LD Stouchko	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0709TI

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.12.2

OVERLAP PROGRAMMING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	3	4
Type	Off	Off	FYA 4 - Section	Normal
Included Phases	-	-	6	4,5
Modifier Phases	-	-	5	0
Modifier Overlaps	-	-	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0

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.

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

	Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
	1	Phase Vehicle	1		X	X	1
NOTICE PHASE 2 FLASH RED →	2	Phase Vehicle	2		X		2
	3	Phase Vehicle	3		X	X	3
	4	Phase Vehicle	4		X		4
	5	Phase Vehicle	5		X		5
NOTICE PHASE 6 FLASH RED →	6	Phase Vehicle	6		X	X	6
	7	Phase Vehicle	7		X		7
	8	Phase Vehicle	8		X	X	8
NOTICE OVERLAP 1 FLASH RED →	9	Overlap	1		X	X	9
	10	Overlap	2		X	X	10
NOTICE OVERLAP 3 FLASH RED →	11	Overlap	3		X		11
	12	Overlap	4		X		12
	13	Phase Ped	2				13
	14	Phase Ped	4				14
	15	Phase Ped	6				15
	16	Phase Ped	8				16
	17	Overlap	5		X	X	17
	18	Overlap	6		X		18

MAXTIME STARTUP AND SOFTWARE FLASH PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Startup Parameters	Unit Flash Parameters
Startup Clearance Hold	All Red Flash Exit Time
6	6

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0709T1
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

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

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for:

750 N.Greenfield Pkwy.Garner,NC 27529

NC 211
at
SR 1238 (Love Grove Church Rd)

Division 8 Moore County West End

PLAN DATE:	June 2024	REVIEWED BY:	R. Mullinax
PREPARED BY:	LD Stouchko	REVIEWED BY:	

REVISIONS	INIT.	DATE

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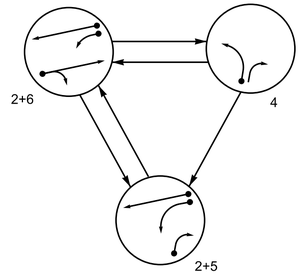
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0709T1

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.13.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

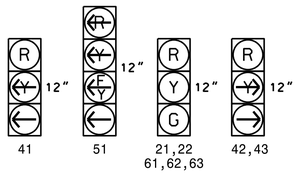
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 2+5	PHASE 2+6	PHASE 4	FLASH
21,22	G	G	R	R
41	R	R	←	R
42,43	→	R	→	R
51	←	~~F Y~~	~~R~~	~~R~~
61,62,63	R	G	R	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A ✱	6X6	420	✱	✱	2	-	-	X	X	X	-	✱
4A ✱	6X40	0	✱	✱	4	3.0	-	X	-	X	-	✱
5A ✱	6X40	0	✱	✱	5	15.0	-	X	-	X	-	✱
					2	3.0	-	X	-	X	X	✱
5B ✱	6X40	0	✱	✱	5	15.0	-	X	-	X	-	✱
6A ✱	6X6	420	✱	✱	6	-	-	X	X	X	-	✱

✱ Video Detection Zone

3 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation, unless otherwise directed by Engineer.
3. Phase 5 may be lagged.
4. Reposition existing signal heads numbered 21, 22, 41, 42, 51, 61, 62 and 63.
5. Set all detector units to presence mode.
6. This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.

MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 5	PHASE 6
Walk *	–	–	–	–
Ped Clear *	–	–	–	–
Min Green *	14	7	7	14
Passage *	6.0	2.0	2.0	6.0
Max 1 *	90	30	30	90
Yellow Change	5.3	3.0	3.0	5.3
Red Clear	1.0	2.4	1.4	1.0
Added Initial *	2.5	–	–	2.5
Maximum Initial *	46	–	–	46
Time Before Reduction *	15	–	–	15
Time To Reduce *	45	–	–	45
Minimum Gap	3.4	–	–	3.4
Advance Walk	–	–	–	–
Non Lock Detector	–	X	X	–
Vehicle Recall	MIN RECALL	–	–	MIN RECALL
Dual Entry	–	–	–	–

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

LEGEND

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

Signal Upgrade
Temporary Design 2 (TMP Phase II)

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PLAN DATE:	June 2024	REVIEWED BY:	R. Mullinax
PREPARED BY:	LD Stouchko	REVIEWED BY:	

SCALE 0 40 1" = 40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D STOUCHKO

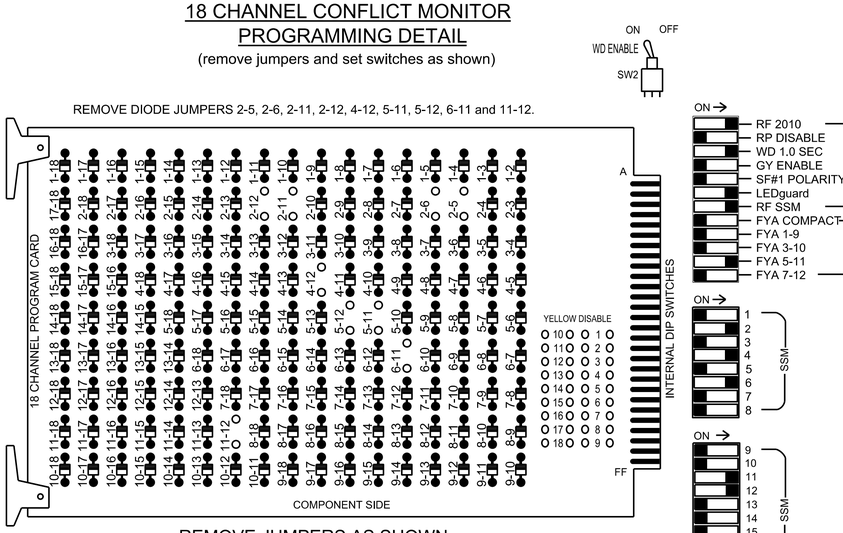
SIGNATURE DATE

SIG. INVENTORY NO. 08-070912

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.13.1

18 CHANNEL 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 the 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. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S2, S5, S7, S8, AUX S4, AUX S5
Phases Used.....2, 4, 5, 6
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....*

*See overlap 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	21,22	NU	NU	41	NU	51 ★	61,62 63	NU	NU	NU	NU	NU	NU	NU	51 ★	42,43	NU
RED		128			101			134									A101	
YELLOW		129					*	135										
GREEN		130						136										
RED ARROW																A114		
YELLOW ARROW					102											A115	A102	
FLASHING YELLOW ARROW																A116		
GREEN ARROW					103		133										A103	

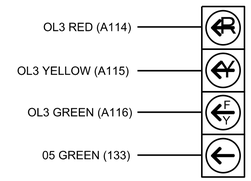
NU = Not Used

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

★See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

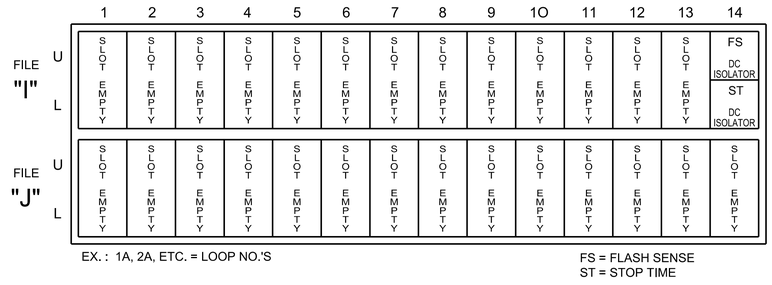
(wire signal heads as shown)



51

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME

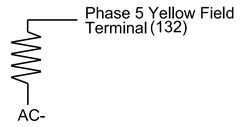
SPECIAL DETECTOR NOTES

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.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0709T2
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for:

750 N.Greenfield Pkwy.Garner,NC 27529

NC 211
at
SR 1238 (Love Grove Church Rd)

Division 8 Moore County West End

PLAN DATE:	June 2024	REVIEWED BY:	R. Mullinax
PREPARED BY:	LD Stouchko	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0709T2

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.13.2

OVERLAP PROGRAMMING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	3	4
Type	Off	Off	FYA 4 - Section	Normal
Included Phases	-	-	6	4,5
Modifier Phases	-	-	5	0
Modifier Overlaps	-	-	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0

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.

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

Notes	Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
	1	Phase Vehicle	1		X	X	1
NOTICE PHASE 2 FLASH RED →	2	Phase Vehicle	2		X		2
	3	Phase Vehicle	3		X	X	3
	4	Phase Vehicle	4		X		4
	5	Phase Vehicle	5		X		5
NOTICE PHASE 6 FLASH RED →	6	Phase Vehicle	6		X	X	6
	7	Phase Vehicle	7		X		7
	8	Phase Vehicle	8		X	X	8
NOTICE OVERLAP 1 FLASH RED →	9	Overlap	1		X	X	9
	10	Overlap	2		X	X	10
NOTICE OVERLAP 3 FLASH RED →	11	Overlap	3		X		11
	12	Overlap	4		X		12
	13	Phase Ped	2				13
	14	Phase Ped	4				14
	15	Phase Ped	6				15
	16	Phase Ped	8				16
	17	Overlap	5		X	X	17
	18	Overlap	6		X		18

MAXTIME STARTUP AND SOFTWARE FLASH PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Startup Parameters	Unit Flash Parameters
Startup Clearance Hold	All Red Flash Exit Time
6	6

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0709T2
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

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

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 211
at
SR 1238 (Love Grove Church Rd)

Division 8 Moore County West End

PLAN DATE: June 2024	REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

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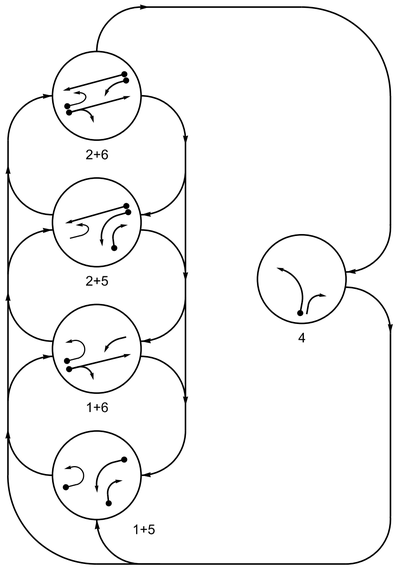
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0709T2

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.14.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

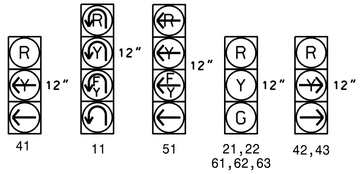
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 1+5	PHASE 1+6	PHASE 2+5	PHASE 2+6	PHASE 4	PHASE FLASH
11			FY	FY	R	R
21,22	R	R	G	G	R	R
41	R	R	R	R	←	R
42,43	→	R	→	R	→	R
51	←	FY	←	FY	R	R
61,62,63	R	G	R	G	R	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

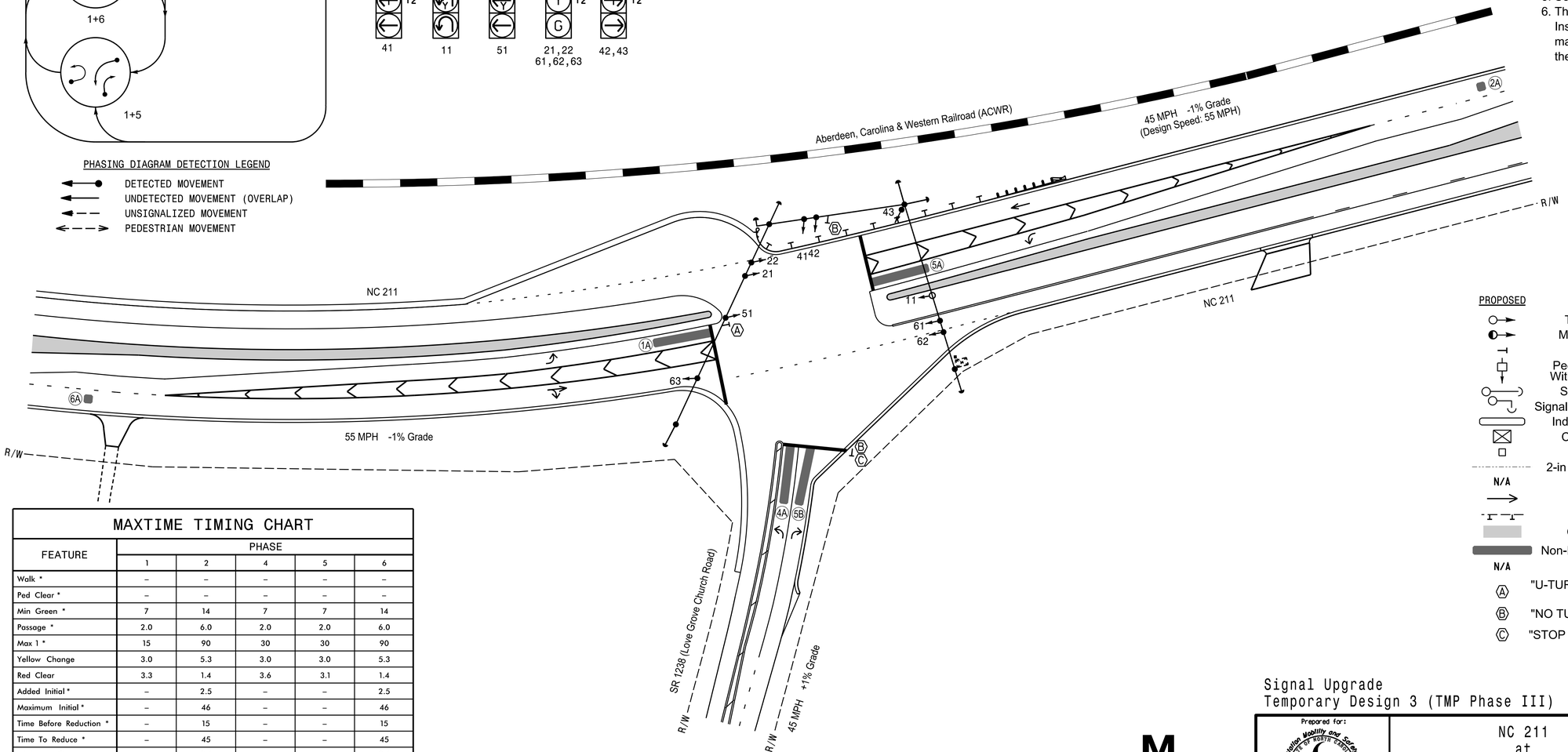
DETECTOR ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A ✱	6X40	0	✱	✱	1	30.0	-	X	-	X	-	✱
					6	3.0	-	X	-	X	X	✱
2A ✱	6X6	420	✱	✱	2	-	-	X	X	X	-	✱
4A ✱	6X40	0	✱	✱	4	3.0	-	X	-	X	-	✱
5A ✱	6X40	0	✱	✱	5	15.0	-	X	-	X	-	✱
					2	3.0	-	X	-	X	X	✱
5B ✱	6X40	0	✱	✱	5	-	-	X	-	X	-	✱
6A ✱	6X6	420	✱	✱	6	-	-	X	X	X	-	✱

✱ Video Detection Zone

5 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Reposition existing signal heads numbered 11,61 and 62.
5. Set all detector units to presence mode.
6. This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.



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	
	Guardrail	
	Construction Zone	
	Non-Intrusive Detection Zone	
N/A	Railroad Tracks	
Ⓐ	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓐ
Ⓑ	"NO TURN ON RED" Sign (R10-11)	Ⓑ
Ⓒ	"STOP HERE ON RED" Sign (R10-6)	Ⓒ

MAXTIME TIMING CHART

FEATURE	PHASE 1	PHASE 2	PHASE 4	PHASE 5	PHASE 6
Walk *	–	–	–	–	–
Ped Clear *	–	–	–	–	–
Min Green *	7	14	7	7	14
Passage *	2.0	6.0	2.0	2.0	6.0
Max 1 *	15	90	30	30	90
Yellow Change	3.0	5.3	3.0	3.0	5.3
Red Clear	3.3	1.4	3.6	3.1	1.4
Added Initial *	–	2.5	–	–	2.5
Maximum Initial *	–	46	–	–	46
Time Before Reduction *	–	15	–	–	15
Time To Reduce *	–	45	–	–	45
Minimum Gap	–	3.4	–	–	3.4
Advance Walk	–	–	–	–	–
Non Lock Detector	X	–	X	X	–
Vehicle Recall	–	MIN RECALL	–	–	MIN RECALL
Dual Entry	–	–	–	–	–

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

Signal Upgrade
Temporary Design 3 (TMP Phase III)

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SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LON D. STOUCHKO

SIGNATURE DATE

SIG. INVENTORY NO. 08-070913

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

SCALE
0 40'
1"=40'

NC 211
at
SR 1238 (Love Grove Church Rd)

Division 8 Moore County West End

PLAN DATE:	June 2024	REVIEWED BY:	R. Mullinax
PREPARED BY:	LD Stouchko	REVIEWED BY:	

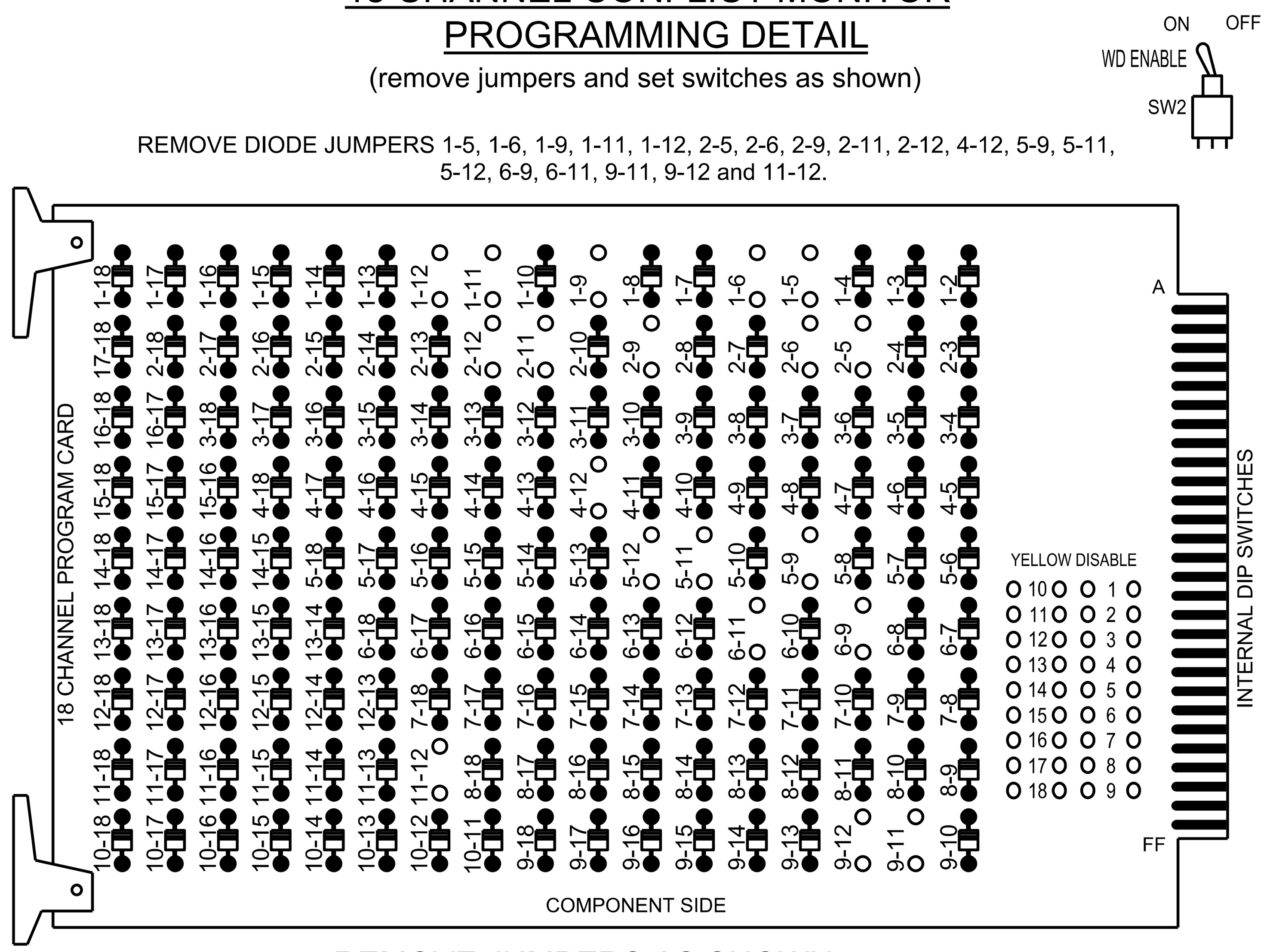
REVISIONS	INIT.	DATE

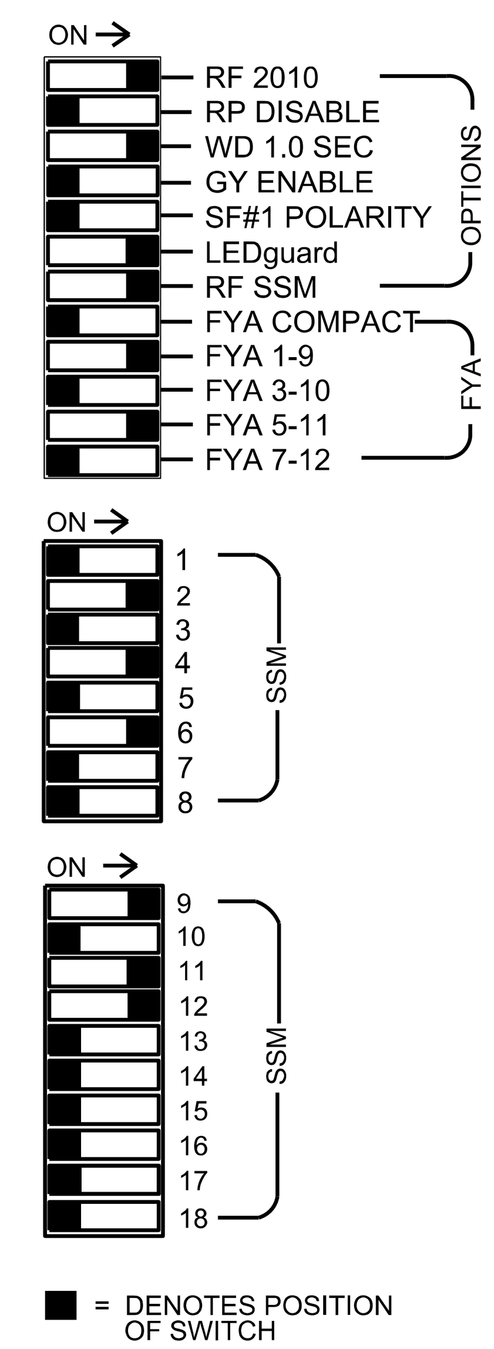
PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig. 14.1

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 1-12, 2-5, 2-6, 2-9, 2-11, 2-12, 4-12, 5-9, 5-11, 5-12, 6-9, 6-11, 9-11, 9-12 and 11-12.





REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the 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. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller..2070LX
Cabinet...332 w/ Aux
Software..Q-Free MAXTIME
Cabinet Mount....................................Base
Output File Positions...........................18 With Aux. Output File
Load Switches Used............................S1, S2, S5, S7, S8, AUX S1, AUX S4, AUX S5
Phases Used.......................................1, 2, 4, 5, 6
Overlap "1"..*
Overlap "2"..NOT USED
Overlap "3"..*
Overlap "4"..*

*See overlap 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.	11★	21,22	NU	NU	41	NU	51★	61,62 63	NU	NU	NU	NU	11★	NU	NU	51★	42,43	NU
RED		128			101			134									A101	
YELLOW	✱	129					✱	135										
GREEN		130						136										
RED ARROW													A121			A114		
YELLOW ARROW					102								A122			A115	A102	
FLASHING YELLOW ARROW													A123			A116		
GREEN ARROW	127				103		133										A103	

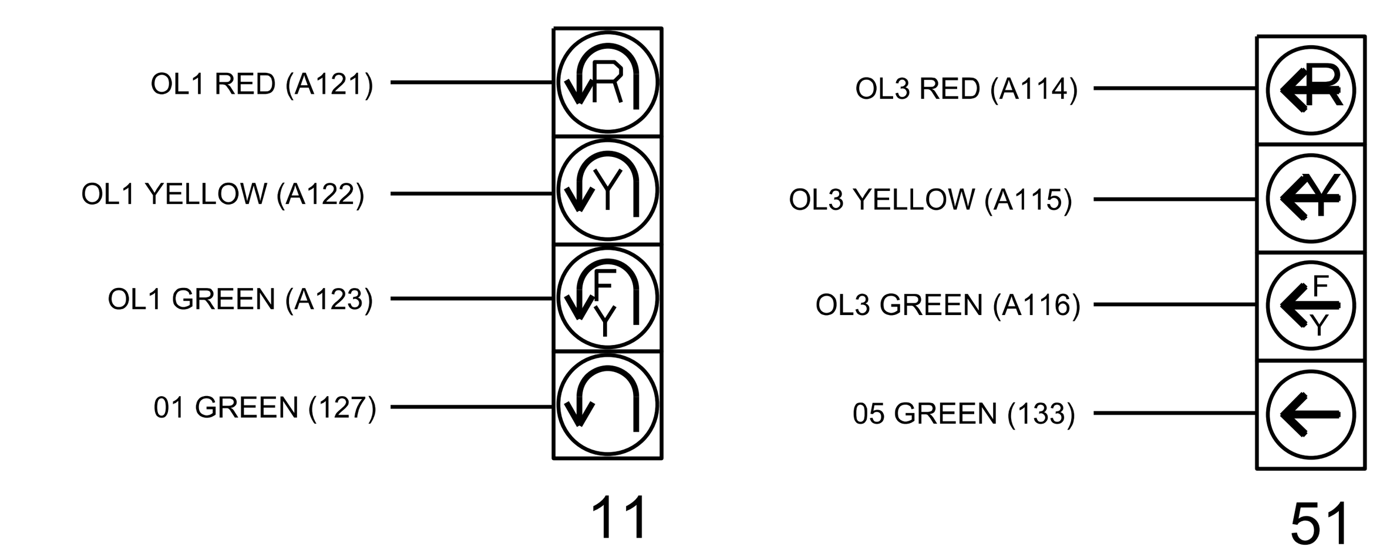
NU = Not Used

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

★See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

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

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

FS = FLASH SENSE
ST = STOP TIME

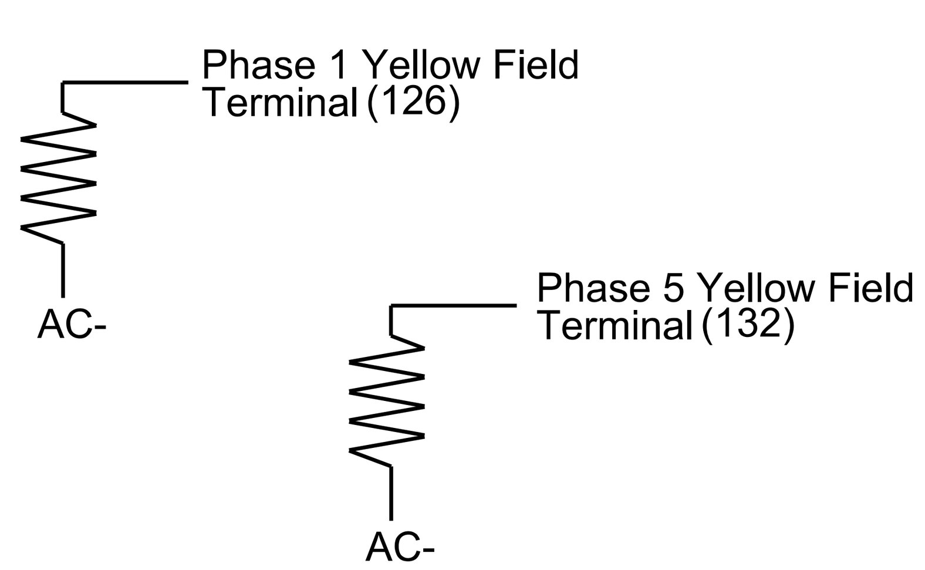
SPECIAL DETECTOR NOTES

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.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 08-0709T3
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

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

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 211
at
SR 1238 (Love Grove Church Rd)

Division 8 Moore County West End

PLAN DATE: June 2024	REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0709T3

OVERLAP PROGRAMMING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	3	4
Type	FYA 4 - Section	OFF	FYA 4 - Section	Normal
Included Phases	2	-	6	4,5
Modifier Phases	1	-	5	-
Modifier Overlaps	-	-	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0

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.

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

Notice	Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
	1	Phase Vehicle	1		X	X	1
NOTICE PHASE 2 FLASH RED →	2	Phase Vehicle	2		X		2
	3	Phase Vehicle	3		X	X	3
	4	Phase Vehicle	4		X		4
	5	Phase Vehicle	5		X		5
NOTICE PHASE 6 FLASH RED →	6	Phase Vehicle	6		X	X	6
	7	Phase Vehicle	7		X		7
	8	Phase Vehicle	8		X	X	8
NOTICE OVERLAP 1 FLASH RED →	9	Overlap	1		X	X	9
	10	Overlap	2		X	X	10
NOTICE OVERLAP 3 FLASH RED →	11	Overlap	3		X		11
	12	Overlap	4		X		12
	13	Phase Ped	2				13
	14	Phase Ped	4				14
	15	Phase Ped	6				15
	16	Phase Ped	8				16
	17	Overlap	5		X	X	17
	18	Overlap	6		X		18

MAXTIME STARTUP AND SOFTWARE FLASH PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Startup Parameters

Startup Clearance Hold
6

Unit Flash Parameters

All Red Flash Exit Time
6

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0709T3
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

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

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Division 8 Moore County West End

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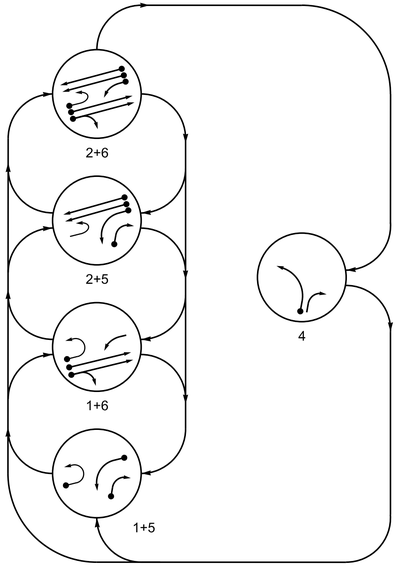
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0709T3

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.15.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

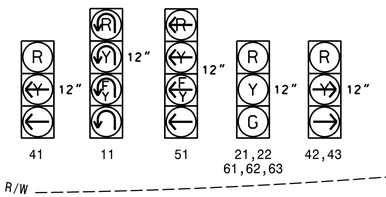
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 1+5	1+6	2+5	2+6	4	FLASH
11					R	R
21,22	R	R	G	G	R	R
41	R	R	R	R	←	R
42,43	→	R	→	R	→	R
51	←	FY	←	FY	~~R~~	~~R~~
61,62,63	R	G	R	G	R	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	2-4-2	X	1	30.0	-	X	-	X	-	X
					6	3.0	-	X	-	X	X	X
2A	6X6	420	5	X	2	-	-	X	X	X	-	X
2B	6X6	420	5	X	2	-	-	X	X	X	-	X
4A	6X40	0	2-4-2	X	4	3.0	-	X	-	X	-	X
5A	6X40	0	2-4-2	X	5	15.0	-	X	-	X	-	X
					2	3.0	-	X	-	X	X	X
5B	6X40	0	2-4-2	X	5	-	-	X	-	X	-	X
6A	6X6	420	6	X	6	-	-	X	X	X	-	X
6B	6X6	420	6	X	6	-	-	X	X	X	-	X

5 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Set all detector units to presence mode.

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	4	5	6
Walk *	–	–	–	–	–
Ped Clear *	–	–	–	–	–
Min Green *	7	14	7	7	14
Passage *	2.0	6.0	2.0	2.0	6.0
Max 1 *	15	100	20	25	100
Yellow Change	3.0	5.3	3.0	3.0	5.3
Red Clear	3.8	1.5	3.7	2.9	1.5
Added Initial *	–	1.5	–	–	1.5
Maximum Initial *	–	46	–	–	46
Time Before Reduction *	–	15	–	–	15
Time To Reduce *	–	45	–	–	45
Minimum Gap	–	3.4	–	–	3.4
Advance Walk	–	–	–	–	–
Non Lock Detector	X	–	X	X	–
Vehicle Recall	–	MIN RECALL	–	–	MIN RECALL
Dual Entry	–	–	–	–	–

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

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
⊡	Pedestrian Signal Head With Push Button & Sign	■
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
----------	2-in Underground Conduit	----------
DD	Directional Drill	N/A
N/A	Right of Way	----------
→	Directional Arrow	→
N/A	Railroad Tracks	▬
◁	Metal Pole with Mastarm	◁
N/A	Guardrail	⊣
⬡	Type II Signal Pedestal	⬢

Ⓐ "U-TURN YIELD TO RIGHT TURN" Sign (R10-16) Ⓐ

Ⓑ "NO TURN ON RED" Sign (R10-11) Ⓑ

Ⓒ "STOP HERE ON RED" Sign (R10-6) Ⓒ

Signal Upgrade - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Prepared for: Transportation Mobility and Safety Division, NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

NC 211
at
SR 1238 (Love Grove Church Rd)

Division 8 Moore County West End

PLAN DATE: June 2024	REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko	REVIEWED BY:

SCALE 0 40' 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

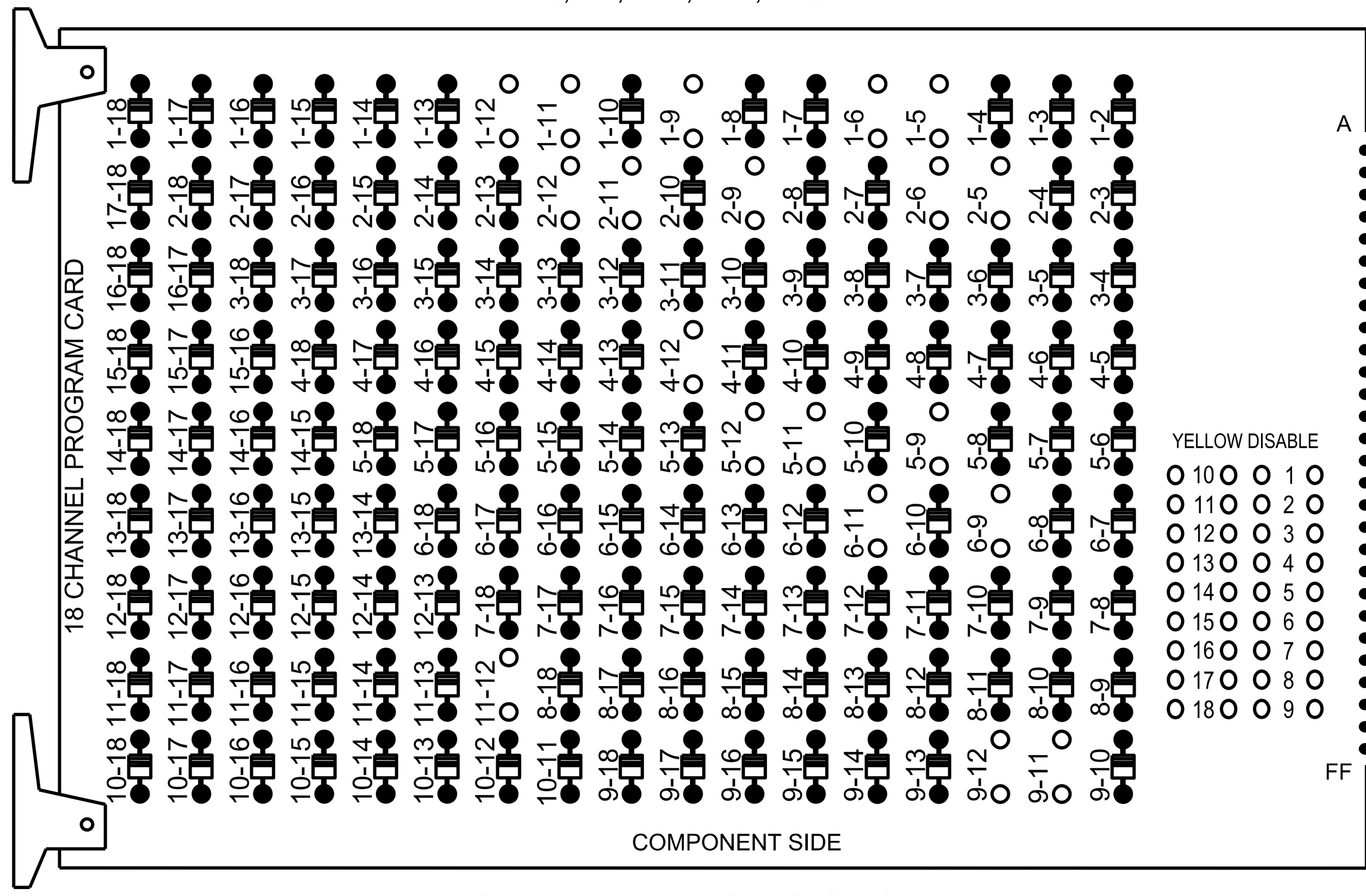
SIGNATURE DATE

SIG. INVENTORY NO. 08-0709

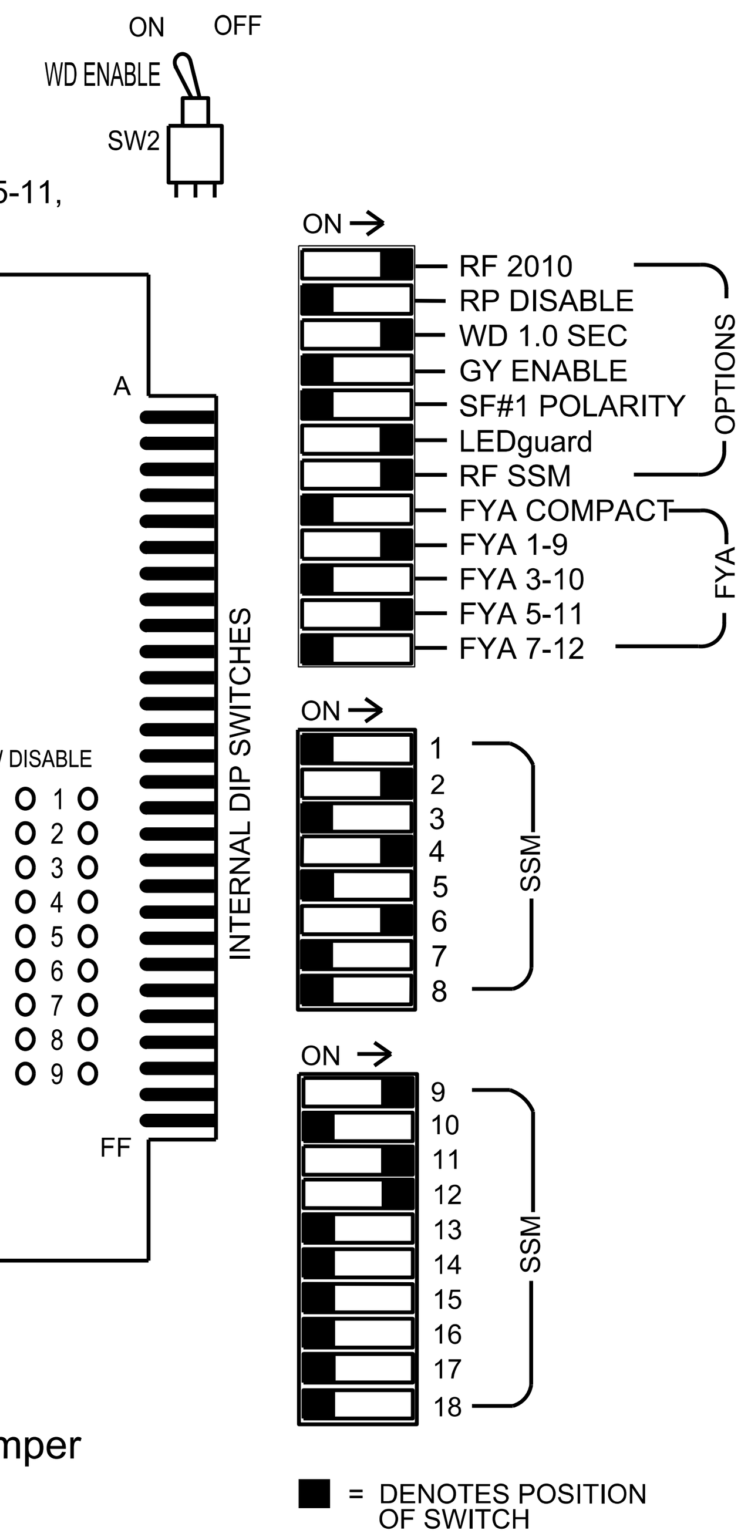
18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 1-12, 2-5, 2-6, 2-9, 2-11, 2-12, 4-12, 5-9, 5-11, 5-12, 6-9, 6-11, 9-11, 9-12 and 11-12.



REMOVE JUMPERS AS SHOWN



NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the 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. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller..2070LX
Cabinet..332 w/ Aux
Software..Q-Free MAXTIME
Cabinet Mount....................................Base
Output File Positions..........................18 With Aux. Output File
Load Switches Used...........................S1, S2, S5, S7, S8, AUX S1, AUX S4, AUX S5
Phases Used.......................................1, 2, 4, 5, 6
Overlap "1"..*
Overlap "2"..NOT USED
Overlap "3"..*
Overlap "4"..*

*See overlap 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.	11★	21,22	NU	NU	41	NU	51★	61,62 63	NU	NU	NU	NU	11★	NU	NU	51★	42,43	NU
RED		128			101			134									A101	
YELLOW	✱	129					✱	135										
GREEN		130						136										
RED ARROW													A121			A114		
YELLOW ARROW					102								A122			A115	A102	
FLASHING YELLOW ARROW													A123			A116		
GREEN ARROW	127				103		133										A103	

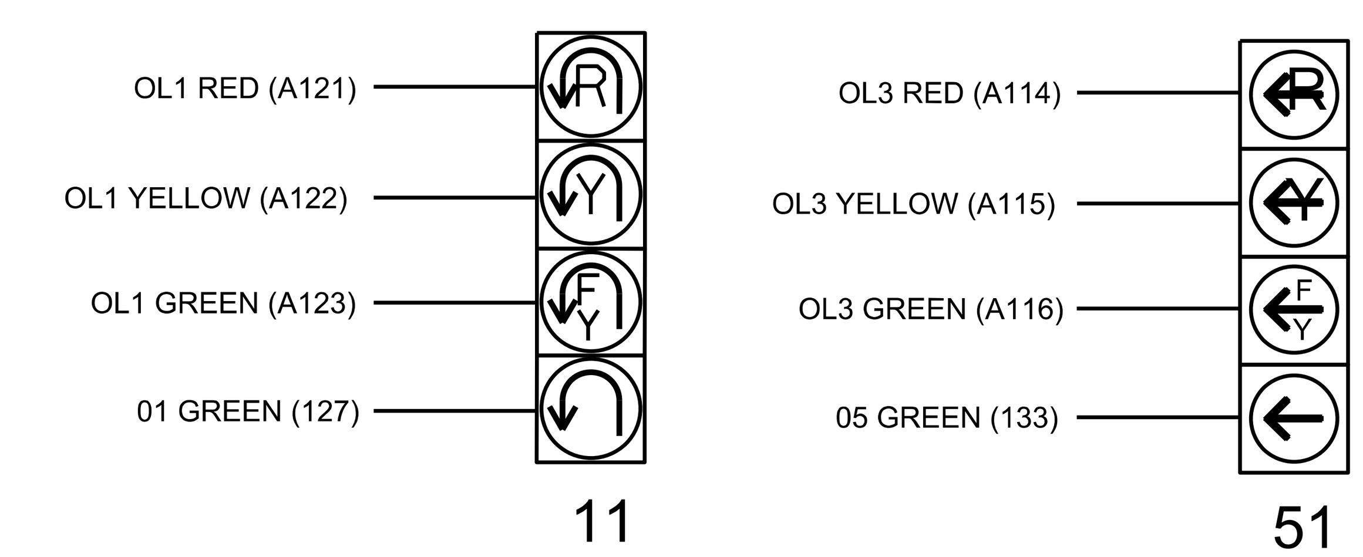
NU = Not Used

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

★See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

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

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

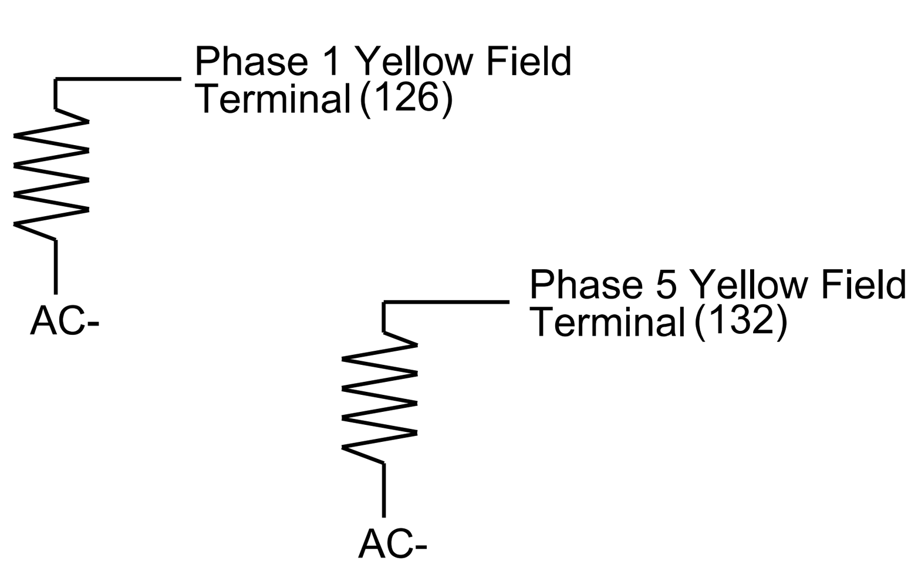
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1A	TB2-1,2	I1U	56	18	1	1	30.0		X		X	
				-	29	6	3.0		X		X	X
2A	TB2-5,6	I2U	39	1	2	2			X	X	X	
2B	TB2-7,8	I2L	43	5	3	2			X	X	X	
4A	TB4-9,10	I6U	41	3	8	4	3.0		X		X	
5A	TB3-1,2	J1U	55	17	15	5	15.0		X		X	
				-	31	2	3.0		X		X	X
5B	TB2-11,12	I3L	76	42	5	5			X		X	
6A	TB3-5,6	J2U	40	2	16	6			X	X	X	
6B	TB3-7,8	J2L	44	6	17	6			X	X	X	

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0709
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

MOTT MACDONALD
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Electrical Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for:

Transportation Mobility and Safety Division — ITS & Signals Management Section — State of North Carolina Department of Transportation

750 N.Greenfield Pkwy,Garner,NC 27529

NC 211
at
SR 1238 (Love Grove Church Rd)

Division 8 Moore County West End

PLAN DATE: June 2024	REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 034437 LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0709

OVERLAP PROGRAMMING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	3	4
Type	FYA 4 - Section	OFF	FYA 4 - Section	Normal
Included Phases	2	-	6	4,5
Modifier Phases	1	-	5	-
Modifier Overlaps	-	-	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0

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.

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

Notes	Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
	1	Phase Vehicle	1		X	X	1
NOTICE PHASE 2 FLASH RED →	2	Phase Vehicle	2		X		2
	3	Phase Vehicle	3		X	X	3
	4	Phase Vehicle	4		X		4
	5	Phase Vehicle	5		X		5
NOTICE PHASE 6 FLASH RED →	6	Phase Vehicle	6		X	X	6
	7	Phase Vehicle	7		X		7
	8	Phase Vehicle	8		X	X	8
NOTICE OVERLAP 1 FLASH RED →	9	Overlap	1		X	X	9
	10	Overlap	2		X	X	10
NOTICE OVERLAP 3 FLASH RED →	11	Overlap	3		X		11
	12	Overlap	4		X		12
	13	Phase Ped	2				13
	14	Phase Ped	4				14
	15	Phase Ped	6				15
	16	Phase Ped	8				16
	17	Overlap	5		X	X	17
	18	Overlap	6		X		18

MAXTIME STARTUP AND SOFTWARE FLASH PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Startup Parameters	Unit Flash Parameters
Startup Clearance Hold	All Red Flash Exit Time
6	6

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0709
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

Electrical Detail - Sheet 2 of 2

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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ITS & Signals Management Section
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Division 8 Moore County West End

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PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

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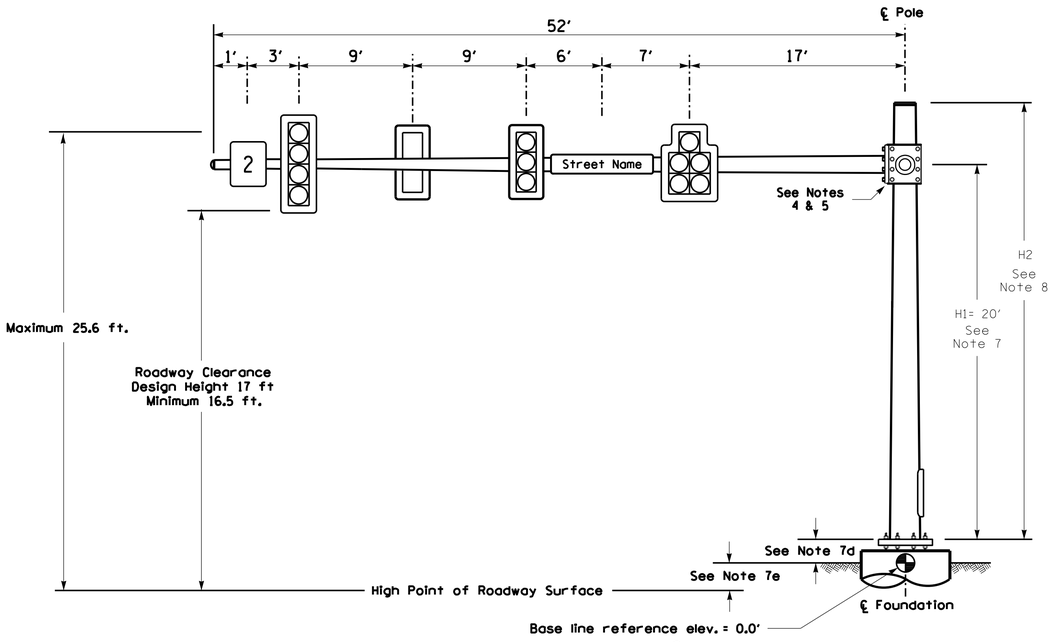
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

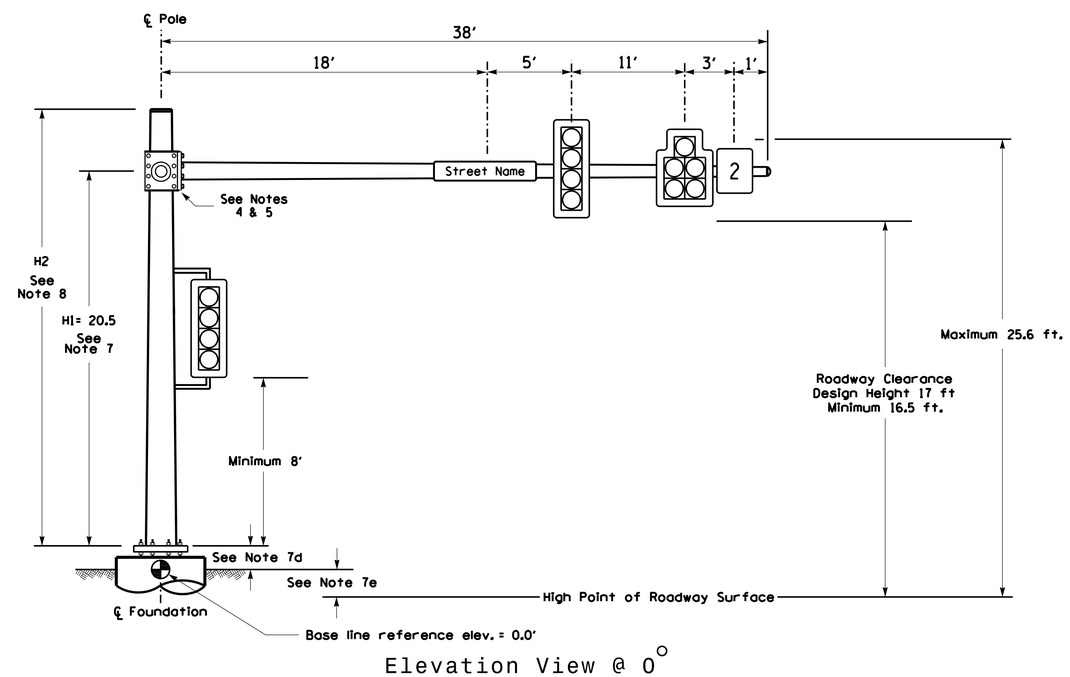
SIG. INVENTORY NO. 08-0709

Design Loading for METAL POLE NO. 1, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 1, MAST ARM B



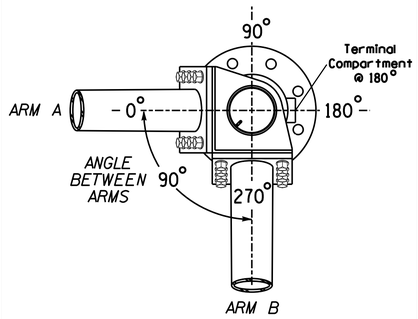
Elevation View @ 0°

SPECIAL NOTE

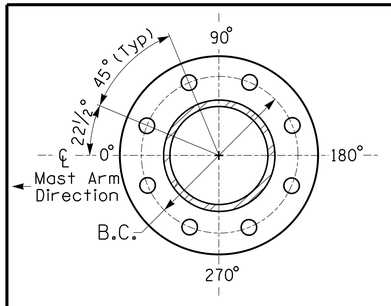
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	
Baseline reference point at ℄ Foundation @ ground level ⊕	0.0 ft.	
Elevation difference at High point of roadway surface	-1.0 ft.	
Elevation difference at Edge of travelway or face of curb	0.7 ft.	

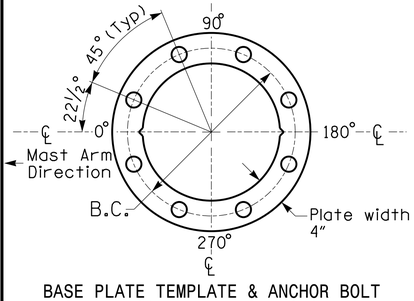


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

METAL POLE No. 1

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.15.3

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE	16.3 S.F.	42.0"W X 56.0"L	103 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5"W X 66.0"L	74 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5"W X 52.5"L	60 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0"W X 36.0"L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0"W X 96.0"L	36 LBS

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NOTES

DESIGN REFERENCE MATERIAL

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

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate arm connection points.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   Mast arm attachment height (H1) plus 2 feet, or
   H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 4 (90 mph)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared for: Transportation Mobility and Safety Division, North Carolina Department of Transportation, Signal Design Section

750 N.Greenfield Pkwy,Garner,NC 27529

NC 211
at
SR 1238 (Love Grove Church Rd)

Division 8 Moore County West End

PLAN DATE:	June 2024	REVIEWED BY:	R. Mullinax
PREPARED BY:	LD Stouchko	REVIEWED BY:	

SCALE 0 N/A N/A

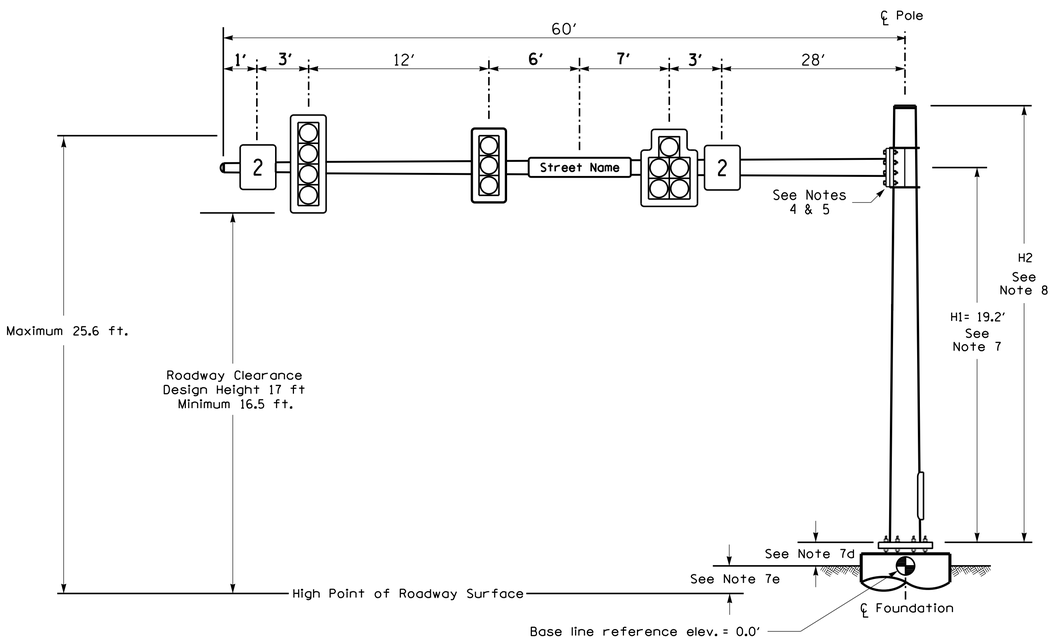
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

SIGNATURE DATE

SIG. INVENTORY NO. 08-0709

Design Loading for METAL POLE NO. 2



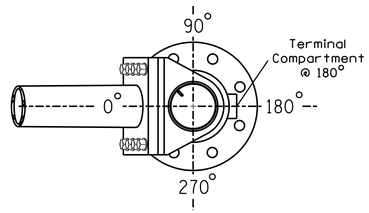
Elevation View @ 270°

SPECIAL NOTE

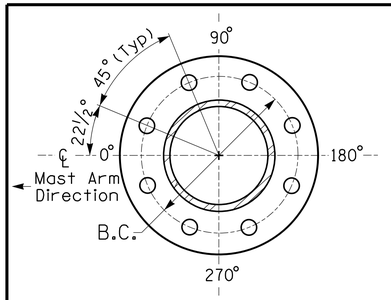
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 2	
Baseline reference point at ⊕ ℄ Foundation @ ground level	0.0 ft.	
Elevation difference at High point of roadway surface	-0.2 ft.	
Elevation difference at Edge of travelway or face of curb	0.0 ft.	

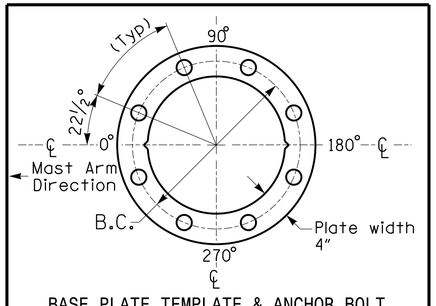


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

METAL POLE No. 2

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.15.4

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12″-5 SECTION-WITH BACKPLATE	16.3 S.F.	42.0″W X 56.0″L	103 LBS
	RIGID MOUNTED SIGNAL HEAD 12″-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5″W X 66.0″L	74 LBS
	RIGID MOUNTED SIGNAL HEAD 12″-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5″W X 52.5″L	60 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0″W X 36.0″L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″W X 96.0″L	36 LBS

MOTT MACDONALD

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NOTES

DESIGN REFERENCE MATERIAL

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

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 4 (90 mph)

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Prepared for: Transportation Mobility and Safety Division — North Carolina Department of Transportation — Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

NC 211
at
SR 1238 (Love Grove Church Rd)

Division 8 | Moore County | West End

PLAN DATE:	June 2024	REVIEWED BY:	R. Mullinax
PREPARED BY:	LD Stouchko	REVIEWED BY:	

SCALE: 0 N/A — N/A

REVISIONS	INIT.	DATE

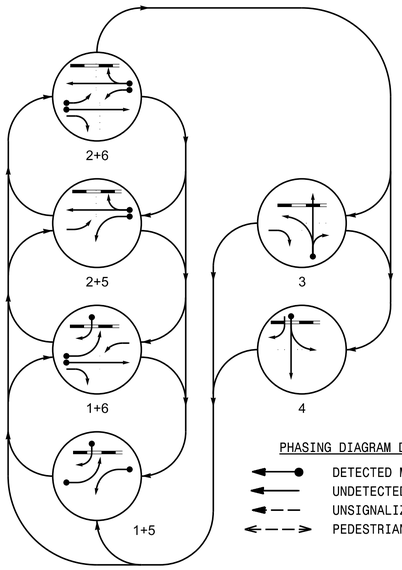
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D STOUCHKO

SIGNATURE | DATE

SIG. INVENTORY NO. 08-0709

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.16.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

RAIL PREEMPT PHASES

(High Priority)

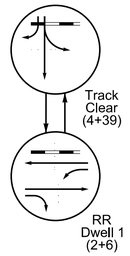


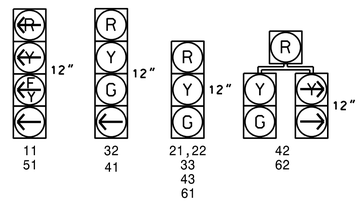
TABLE OF OPERATION

SIGNAL FACE	PHASE 1+5	1+6	2+5	2+6	3	4	TRACK CLEAR	RR DWELL 1	FLASH
11	—	—	FY	FY	R	R	R	R	R
21,22	R	R	G	G	R	R	R	G	R
32	R	R	R	R	G	R	R	R	R
33	R	R	R	R	G	R	R	R	R
41	R	R	R	R	R	G	G	R	R
42	R/—	R/—	R	R	R	G	G	R	R
43	R	R	R	R	R	G	G	R	R
51	—	FY	—	FY	R	R	R	FY	R
61	R	G	R	G	R	R	R	G	R
62	R	G	R	G	R/—	R	R	G	R
Sign C	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	✱

✱See Note 7

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP/ ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A✱	6X60	0	✱	✱	1	15.0	-	X	-	X	-	✱
					6	3.0	-	X	-	X	X	✱
1B	6X40	# +5	EXIST	-	1	15.0	2.0	X	-	X	-	X
1C✱	6X20	0	✱	✱	1	15.0	-	X	-	X	-	✱
1D✱	6X15	0	✱	✱	1	15.0	-	X	-	X	-	✱
2A✱	6X6	300	✱	✱	2	-	-	X	X	X	-	✱
3A✱	6X60	0	✱	✱	3	3.0	-	X	-	X	-	✱
4A	6X40	# +5	EXIST	-	4	-	2.0	X	-	X	-	X
4B✱	6X20	0	✱	✱	4	3.0	-	X	-	X	-	✱
5A✱	6X60	0	✱	✱	5	15.0	-	X	-	X	-	✱
					2	3.0	-	X	-	X	X	✱
6A✱	6X6	300	✱	✱	6	-	-	X	X	X	-	✱

Located at Stopbar at RR Gate
✱ Video Detection Zone

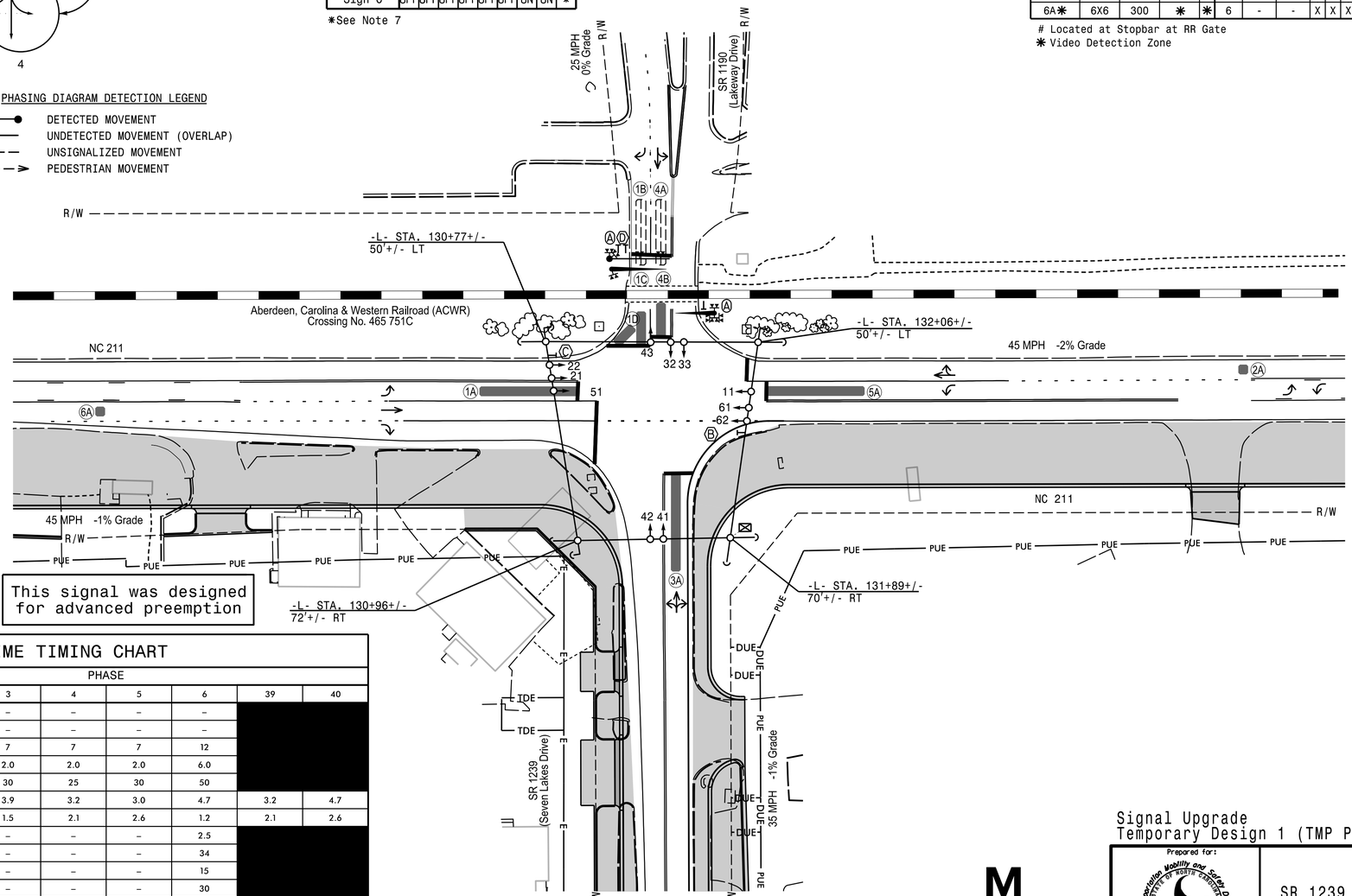
6 Phase
Fully Actuated
W/ Railroad Preemption
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. This location contains railroad preemption phasing. Do not program signal for late night flashing operation.
3. Phase 1 and/or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Set all detector units to presence mode.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
7. Ensure flashing operation does not alter operation of blankout signs.
8. Program phase 40 to run concurrently with all phases during normal operation. Phase 39 must be incompatible with Phase 40 and included as a track clear phase.
9. This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
10. Remove existing metal strain pole foundation of existing damaged/removed metal strain pole in northwest quadrant.

MAXTIME PREEMPTION CHART

FUNCTION	PRE 1
Type	RAIL ROAD
Exit Phases	4
Delay	0
Max Presence	0
Enter Min Green	1
Enter Walk	0
Enter Ped Clear	0
Enter Yellow Change	4.7 *
Enter Red Clear	2.6 *
Track Green	18
Track Yellow Change	3.2
Track Red Clear	2.1
Dwell Green	0
Exit Min Green	255 *
Exit Yellow Change	25.5 *
Exit Red Clear	25.5 *
Call Extend Time	1.0
Exit Type	EXIT PHASES
Ped Clear Through Yellow	–
Require All Red Entry	–



This signal was designed for advanced preemption

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	39	40
Walk *	–	–	–	–	–	–		
Ped Clear *	–	–	–	–	–	–		
Min Green *	7	12	7	7	7	12		
Passage *	2.0	6.0	2.0	2.0	2.0	6.0		
Max 1 *	30	50	30	25	30	50		
Yellow Change	3.0	4.7	3.9	3.2	3.0	4.7	3.2	4.7
Red Clear	2.4	1.2	1.5	2.1	2.6	1.2	2.1	2.6
Added Initial *	–	2.5	–	–	–	2.5		
Maximum Initial *	–	34	–	–	–	34		
Time Before Reduction *	–	15	–	–	–	15		
Time To Reduce *	–	30	–	–	–	30		
Minimum Gap	–	3.0	–	–	–	3.0		
Advance Walk	–	–	–	–	–	–		
Non Lock Detector	X	–	X	X	X	–		
Vehicle Recall	–	MIN RECALL	–	–	–	MIN RECALL		MIN RECALL
Dual Entry	–	–	–	–	–	–		

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

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
PUE	Permanent Utility Easement	N/A
E	Temporary Construction Easement	N/A
DUE	Permanent Drainage/Utility Easement	N/A
TDE	Temporary Drainage Easement	N/A
	Directional Arrow	
	Construction Zone	
	Non-Intrusive Detection Zone	
N/A	Railroad Cantilever	
N/A	Railroad Gate and Flasher	
N/A	Railroad Tracks	
Ⓐ	"DO NOT STOP ON TRACKS" Sign (R8-8)	Ⓐ
Ⓑ	"NO TURN ON RED" Sign (R10-11)	Ⓑ
Ⓒ	"NO RIGHT TURN - TRAIN" LED Blankout Sign	Ⓒ
Ⓓ	"STOP HERE ON RED" Sign (R10-6)	Ⓓ

Signal Upgrade
Temporary Design 1 (TMP Phase I)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

NC 211
at
SR 1239 (Seven Lakes Drive)
and SR 1190 (Lakeway Drive)

Division 8 Moore County Seven Lakes

PLAN DATE: June 2024	REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LONG D STOUCHKO

SIGNATURE DATE

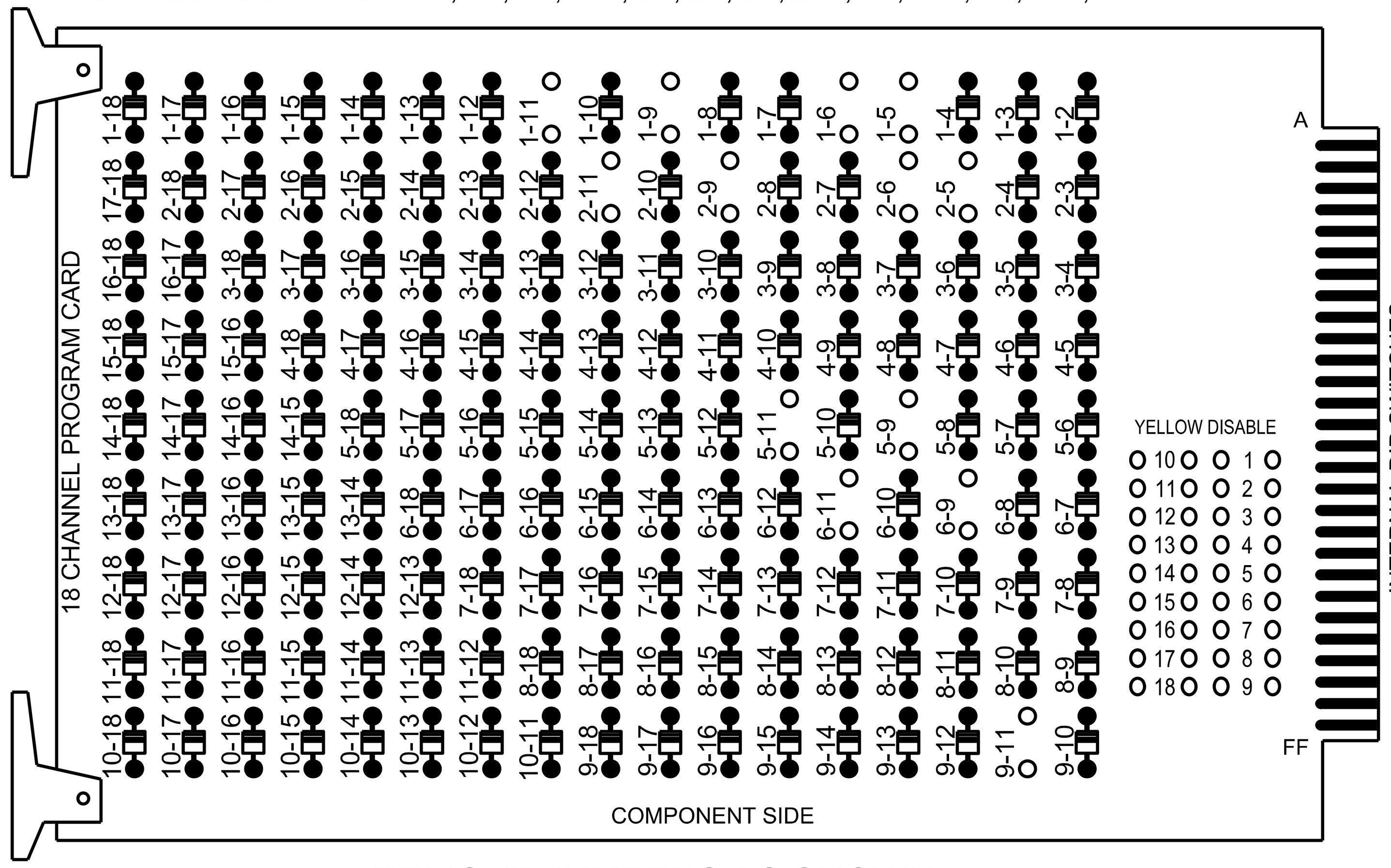
SIG. INVENTORY NO. 08-04101

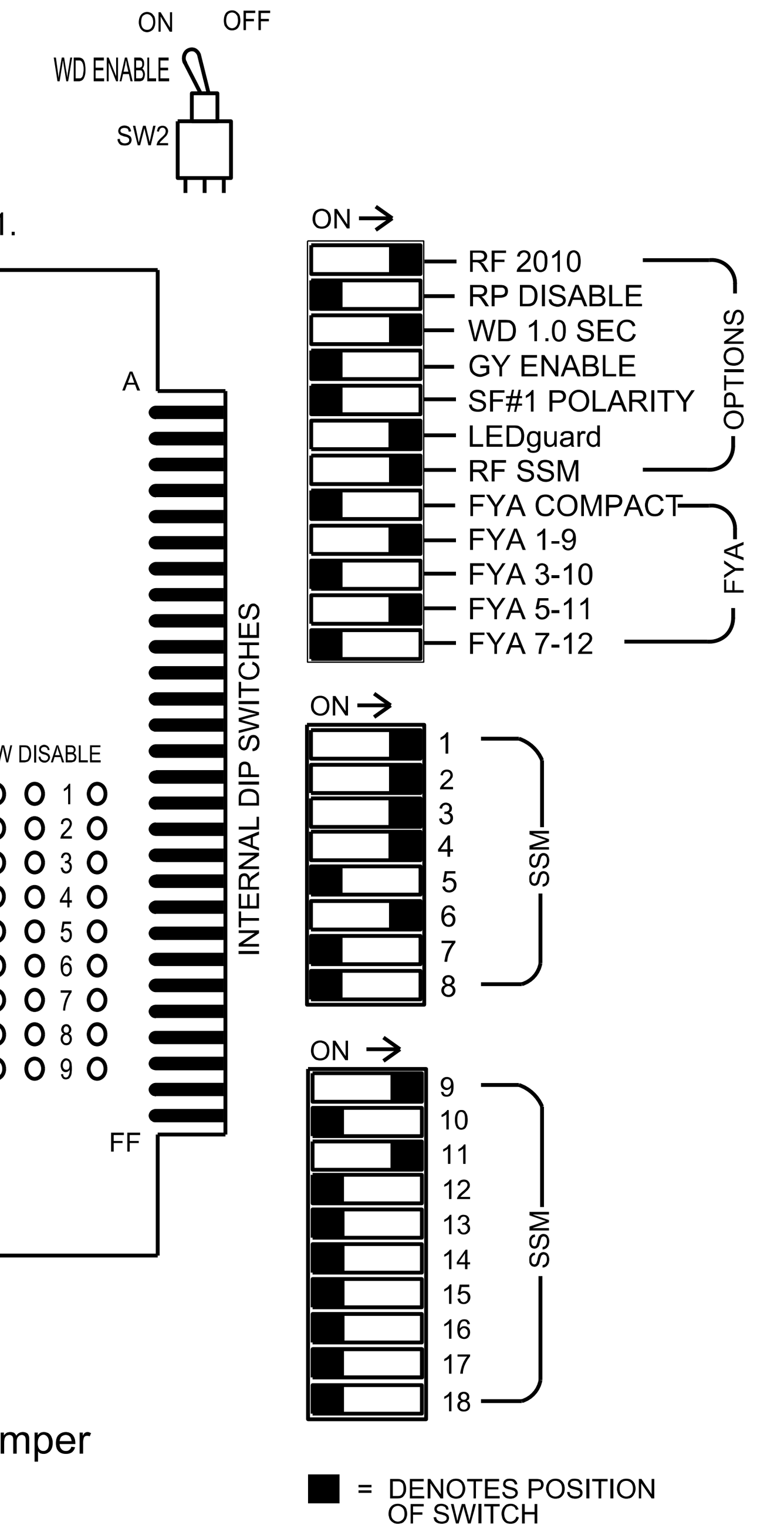
PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.16.1

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 2-5, 2-6, 2-9, 2-11, 5-9, 5-11, 6-9, 6-11, and 9-11.





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 the 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. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk, 6 Green No Walk, 39 Phase Not On, and 40 Green No Walk.
3. Program Phase 39 for No Startup Veh Call.
4. Program Phase 40 for Min Recall.
5. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller..2070LX
Cabinet...332 w/ Aux
Software...Q-Free MAXTIME
Cabinet Mount....................................Base
Output File Positions...........................18 With Aux. Output File
Load Switches Used...........................S1, S2, S4, S5, S7, S8, AUX S1, AUX S4
Phases Used.......................................1, 2, 3, 4, 5, 6, 39**, 40**
Overlap "1"..*
Overlap "2"..NOT USED
Overlap "3"..*
Overlap "4"..NOT USED

*See overlap programming detail on sheet 2
**Phase used for preemption timing purposes only

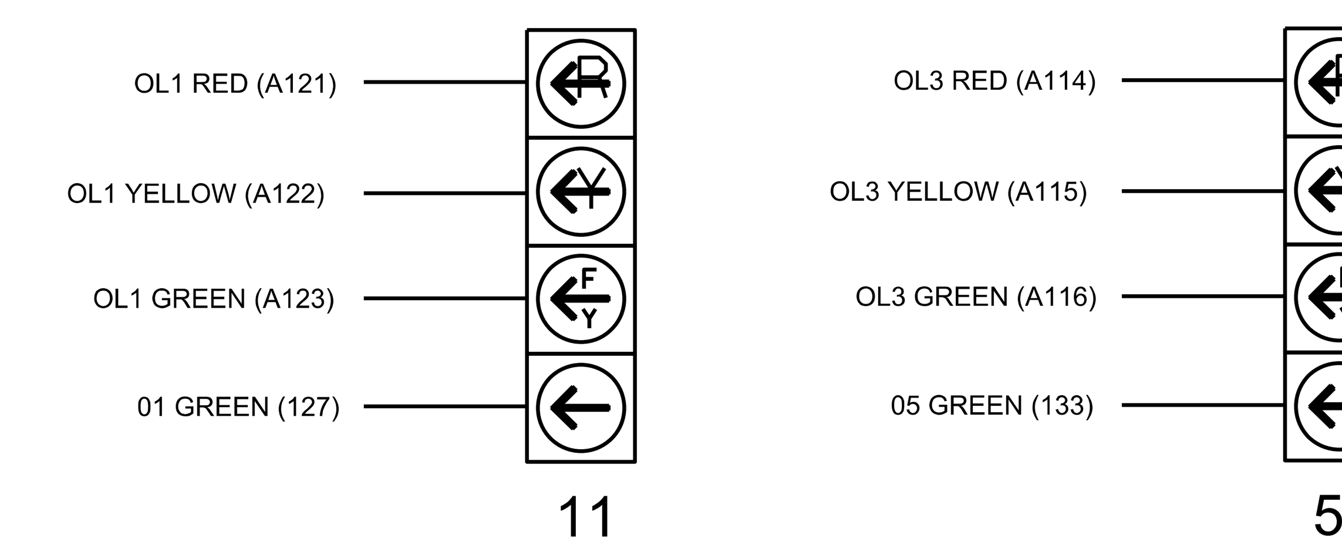
SIGNAL HEAD HOOK-UP CHART

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★	42	21.22	NU	32	33	62	41	42,43	NU	51★	61,62	NU	NU	NU	NU	11★	NU	NU	51★	NU	NU
RED		*	128		116	116		101	101			134										
YELLOW			129		117	117		102	102		*	135										
GREEN			130		118	118		103	103			136										
RED ARROW																	A121			A114		
YELLOW ARROW		126					117										A122			A115		
FLASHING YELLOW ARROW																	A123			A116		
GREEN ARROW	127	127			118		118	103			133											

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

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	1O	11	12	13	14
"I"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø 4 4A	ø 1 1B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L						NOT USED	NOT USED							ST DC ISOLATOR
"J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	PRE1 AC ISOLATOR
	L														NOT USED

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

FS = FLASH SENSE
ST = STOP TIME
PRE = PREEMPT

INPUT FILE CONNECTION & PROGRAMMING CHART

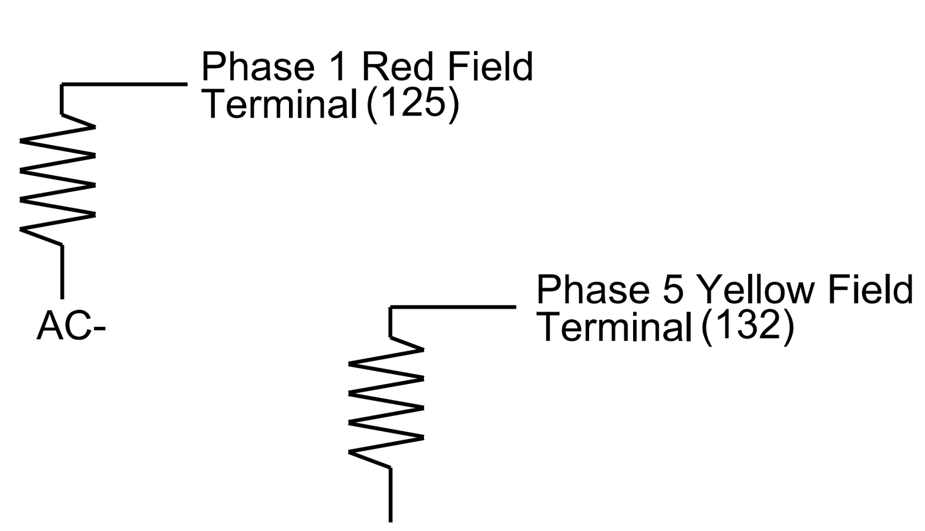
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1B	TB6-1,2	I7U	65	31	10	1	15.0	2.0	X		X	
4A	TB4-9,10	I6U	41	3	8	4		2.0	X		X	

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



SPECIAL DETECTOR NOTES

1. 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: 08-0410T1
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

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Electrical Detail - Sheet 1 of 3
Temporary Design 1 (TMP Phase I)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 211
at
SR 1239 (Seven Lakes Drive)
and SR 1190 (Lakeway Drive)

Division 8 Moore County Seven Lakes

PLAN DATE: June 2024	REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0410T1

OVERLAP PROGRAMMING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	3	4
Type	FYA 4 - Section	OFF	FYA 4 - Section	OFF
Included Phases	2	-	6	-
Modifier Phases	1	-	5	-
Modifier Overlaps	-	-	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0

MAXTIME STARTUP AND SOFTWARE FLASH PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Startup Parameters

Startup Clearance Hold
6

Unit Flash Parameters

All Red Flash Exit Time
6

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

Notice	Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
	1	Phase Vehicle	1		X	X	1
NOTICE PHASE 2 FLASH RED →	2	Phase Vehicle	2		X		2
	3	Phase Vehicle	3		X	X	3
	4	Phase Vehicle	4		X		4
	5	Phase Vehicle	5		X		5
NOTICE PHASE 6 FLASH RED →	6	Phase Vehicle	6		X	X	6
	7	Phase Vehicle	7		X		7
	8	Phase Vehicle	8		X	X	8
NOTICE OVERLAP 1 FLASH RED →	9	Overlap	1		X	X	9
	10	Overlap	2		X	X	10
NOTICE OVERLAP 3 FLASH RED →	11	Overlap	3		X		11
	12	Overlap	4		X		12
	13	Phase Ped	2				13
	14	Phase Ped	4				14
	15	Phase Ped	6				15
	16	Phase Ped	8				16
	17	Overlap	5		X	X	17
	18	Overlap	6		X		18

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0410T1
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

Electrical Detail - Sheet 2 of 3
Temporary Design 1 (TMP Phase I)

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 211
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and SR 1190 (Lakeway Drive)

Division 8 Moore County Seven Lakes

PLAN DATE: June 2024	REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

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SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0410T1

PREEMPTION PROGRAMMING

Front Panel
Main Menu >Controller >Preemption >Preempt Phasing/Preempt Parameters

Web Interface
Home >Controller >Preempt Configuration >Preempts

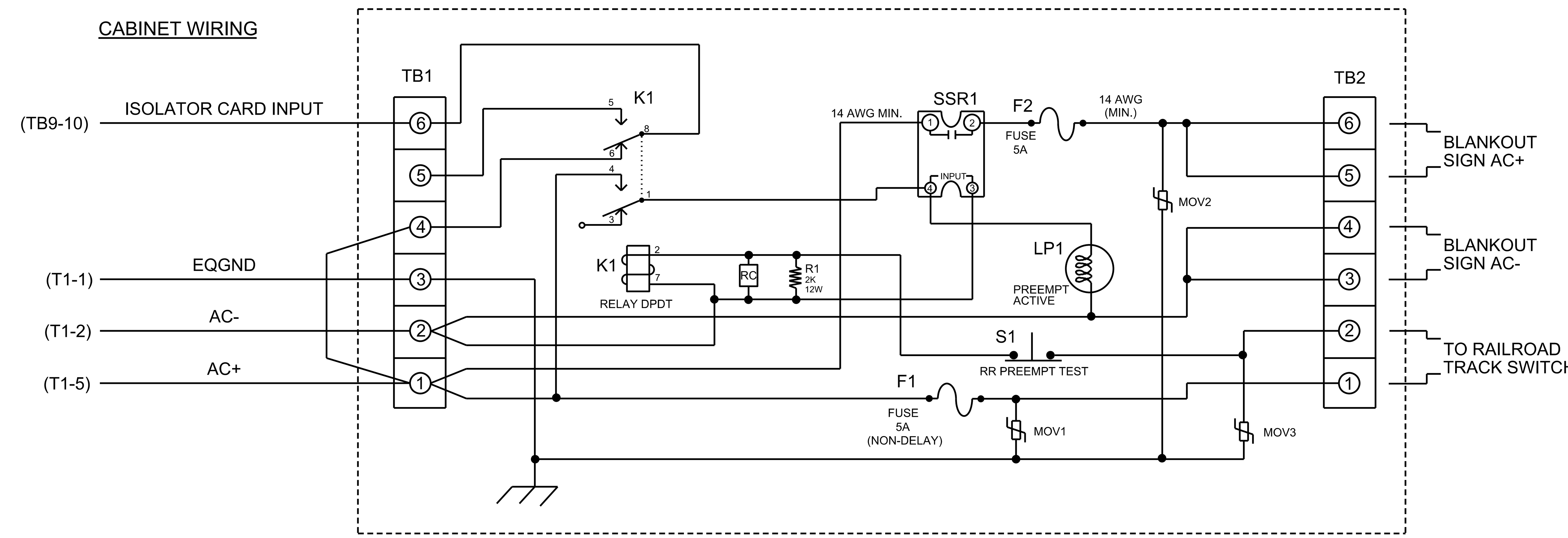
Preempt Configuration

Preempt	1
Enabled	Enabled
Type	Rail Road
Track Phases	4,39
Track Overlaps	-
Dwell Phases	2,6
Dwell Peds	-
Dwell Overlaps	3
Cycling Phases	-
Cycling Peds	-
Cycling Overlaps	-
Exit Phases	4
Exit Overlaps	-
Delay	0
Call Ext Time	1.0
Max Presence	0
Max Pres Act	Terminate
Enter Min Green	1
Enter Walk	0
Enter Ped Clear	0
Enter Yellow Change	4.7
Enter Red Clear	2.6
Track Green	18
Track Yellow Clr	3.2
Track Red Clear	2.1
Dwell Green	0
Exit Min Green	255
Exit Yellow Change	25.5
Exit Red Clear	25.5
Exit Type	Exit Phases
Non Locking Memory	-
Not Ovrd Flash	X
Not Ovrd Nxt Pre	-
Require All Red Entry	-
Track Clear Ovrd	X
Ped Clear During Yellow	-
Entry Omit OLTG	X
Track Reserve	X

RAILROAD PREEMPTION WIRING DETAIL

(wire as shown below)

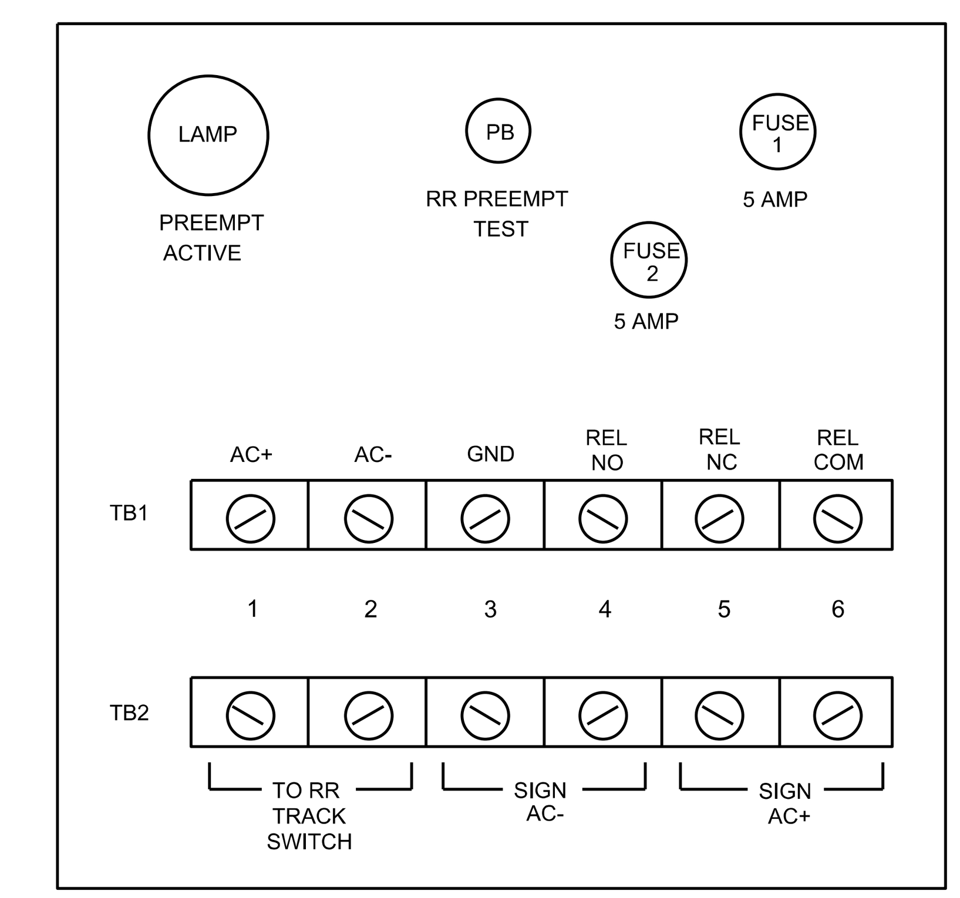
PREEMPTION AND BLANKOUT SIGN CONTROL BOX



NOTES

1. Relay K1 is shown in the energized (Preempt not active) normal operation state.
2. Relay K1 is a DPDT with 120VAC coil with octal base.
3. Relay SSR1 is a SPST (normally open) Solid State Relay with AC input and AC (25 amp) output.
4. AC Isolator Card shall activate preemption upon removal of AC+ from the input (as shown above). To accomplish this set invert dip switch on AC Isolator Card.
5. IMPORTANT!! A jumper must be added between input file terminals J14-E and J14-K if not already present. Also, terminal TB9-12 (on input panel) shall be connected to AC neutral (jumper may have to be added).

FRONT VIEW



SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

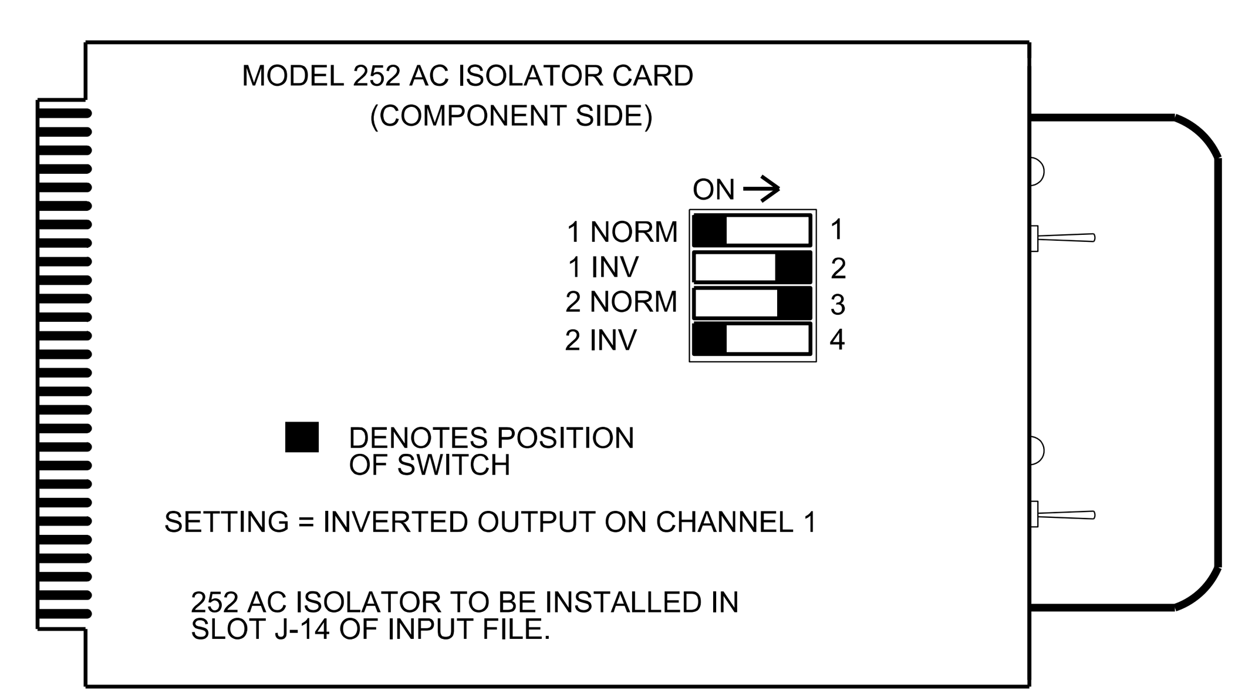
Web Interface
Home >Controller >Sequence

Sequence 1

Ring	Sequence Data
1	1,2,a,3,4,b
2	5,6,a,7,8,b
3	39,c,40,d

PREEMPT 1 AC ISOLATOR (MODEL 252) OUTPUT PROGRAMMING DETAIL

(set DIP switches as shown below)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0410T1
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

Electrical Detail - Sheet 3 of 3
Temporary Design 1 (TMP Phase I)

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 211
at
SR 1239 (Seven Lakes Drive)
and SR 1190 (Lakeway Drive)

Division 8 Moore County Seven Lakes

PLAN DATE: June 2024	REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

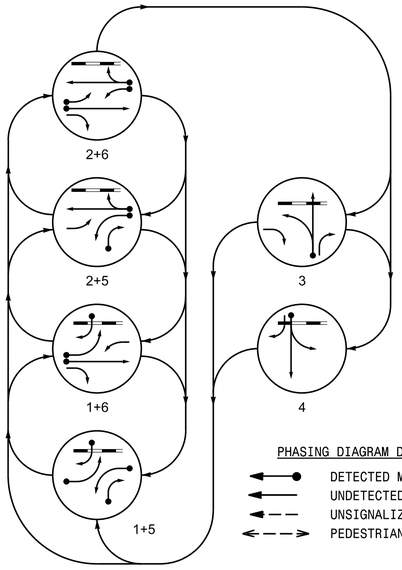
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0410T1

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.17.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

RAIL PREEMPT PHASES

(High Priority)

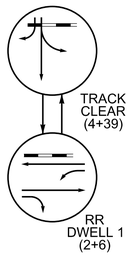


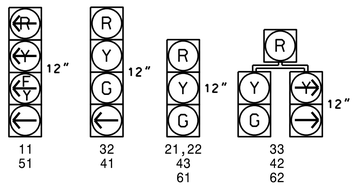
TABLE OF OPERATION

SIGNAL FACE	PHASE 1+5	1+6	2+5	2+6	3	4	TRACK CLEARANCE	RR DWELL 1	FLASH
11	—	—	F Y	F Y	R	R	R	R	R
21,22	R	R	G	G	R	R	R	G	R
32	R	R	R	R	G	R	R	R	R
33	R/—	R	R/—	R	G	R	R	R	R
41	R	R	R	R	R	G	G	R	R
42	R/—	R/—	R	R	R	G	G	R	R
43	R	R	R	R	R	G	G	R	R
51	—	F Y	—	F Y	R	R	R	F Y	R
61	R	G	R	G	R	R	R	G	R
62	R	G	R	G	R/—	R	R	G	R
Sign C	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	*

*See Note 7

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP/ ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A✱	6X60	0	✱	✱	1	15.0	-	X	-	X	-	✱
					6	3.0	-	X	-	X	X	✱
1B	6X40	# +5	EXIST	-	1	15.0	2.0	X	-	X	-	-
1C✱	6X40	0	✱	✱	1	15.0	-	X	-	X	-	✱
2A✱	6X6	300	✱	✱	2	-	-	X	X	X	-	✱
3A✱	6X40	0	✱	✱	3	3.0	-	X	-	X	-	✱
4A	6X40	# +5	EXIST	-	4	-	2.0	X	-	X	-	-
4B✱	6X40	0	✱	✱	4	3.0	-	X	-	X	-	✱
5A✱	6X60	0	✱	✱	5	15.0	-	X	-	X	-	✱
					2	3.0	-	X	-	X	X	✱
5B✱	6X40	0	✱	✱	5	15.0	-	X	-	X	-	✱
6A✱	6X6	300	✱	✱	6	-	-	X	X	X	-	✱

Located at Stopbar at RR Gate
✱ Video Detection Zone

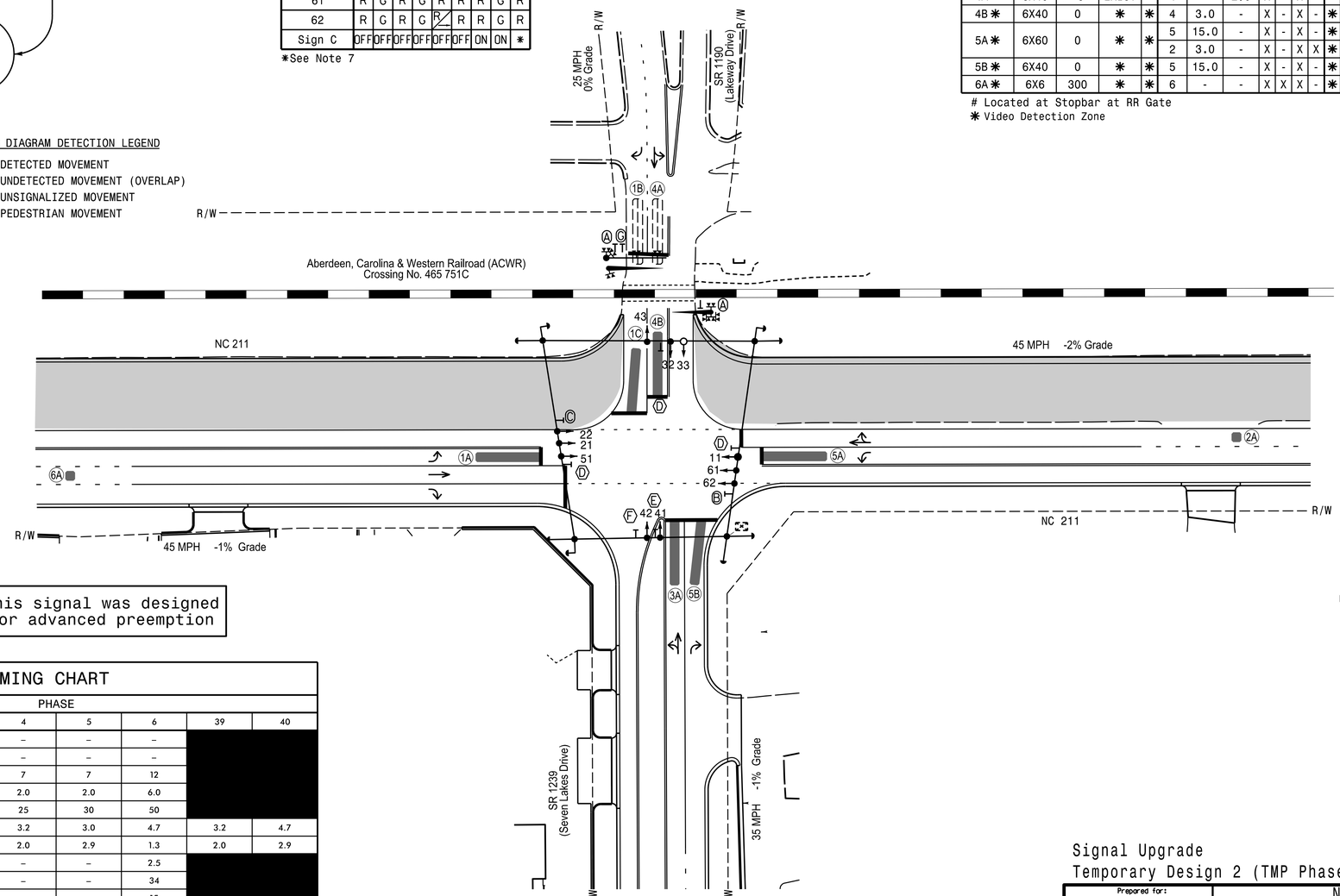
6 Phase
Fully Actuated
W/ Railroad Preemption
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. This location contains railroad preemption phasing. Do not program signal for late night flashing operation.
3. Phase 1 and/or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Reposition existing signal heads numbered 11,21,22,32,51,61, and 62.
6. Set all detector units to presence mode.
7. Ensure flashing operation does not alter operation of blankout signs.
8. Program phase 40 to run concurrently with all phases during normal operation. Phase 39 must be incompatible with Phase 40 and included as a track clear phase.
9. This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.

MAXTIME PREEMPTION CHART

FUNCTION	PRE 1
Type	RAIL ROAD
Exit Phases	4
Delay	0
Max Presence	0
Enter Min Green	1
Enter Walk	0
Enter Ped Clear	0
Enter Yellow Change	4.7 *
Enter Red Clear	2.9 *
Track Green	22
Track Yellow Change	3.2
Track Red Clear	2.0
Dwell Green	0
Exit Min Green	255 *
Exit Yellow Change	25.5 *
Exit Red Clear	25.5 *
Call Extend Time	1.0
Exit Type	EXIT PHASES
Ped Clear Through Yellow	–
Require All Red Entry	–



This signal was designed for advanced preemption

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	39	40
Walk *	–	–	–	–	–	–		
Ped Clear *	–	–	–	–	–	–		
Min Green *	7	12	7	7	7	12		
Passage *	2.0	6.0	2.0	2.0	2.0	6.0		
Max 1 *	30	50	30	25	30	50		
Yellow Change	3.0	4.7	3.9	3.2	3.0	4.7	3.2	4.7
Red Clear	2.9	1.3	1.2	2.0	2.9	1.3	2.0	2.9
Added Initial *	–	2.5	–	–	–	2.5		
Maximum Initial *	–	34	–	–	–	34		
Time Before Reduction *	–	15	–	–	–	15		
Time To Reduce *	–	30	–	–	–	30		
Minimum Gap	–	3.0	–	–	–	3.0		
Advance Walk	–	–	–	–	–	–		
Non Lock Detector	X	–	X	X	X	–		
Vehicle Recall	–	MIN RECALL	–	–	–	MIN RECALL		MIN RECALL
Dual Entry	–	–	–	–	–	–		

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

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone	
	Non-Intrusive Detection Zone	
N/A	Railroad Cantilever	
N/A	Railroad Gate and Flasher	
N/A	Railroad Tracks	
Ⓐ	"DO NOT STOP ON TRACKS" Sign (R8-8)	Ⓐ
Ⓑ	"NO TURN ON RED" Sign (R10-11)	Ⓑ
Ⓒ	"NO RIGHT TURN - TRAIN" LED Blankout Sign	Ⓒ
Ⓓ	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓓ
Ⓔ	Dual Turn and Through Arrows Sign (R3-6L)	Ⓔ
Ⓕ	Right Arrow "ONLY" Sign (R3-5R)	Ⓕ
Ⓖ	"STOP HERE ON RED" Sign (R10-6)	Ⓒ

Signal Upgrade
Temporary Design 2 (TMP Phase II)

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

NC 211
at
SR 1239 (Seven Lakes Drive)
and SR 1190 (Lakeway Drive)
Division 8 Moore County Seven Lakes

PLAN DATE: June 2024 REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNTIL ALL SIGNATURES COMPLETED.

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

SIGNATURE DATE

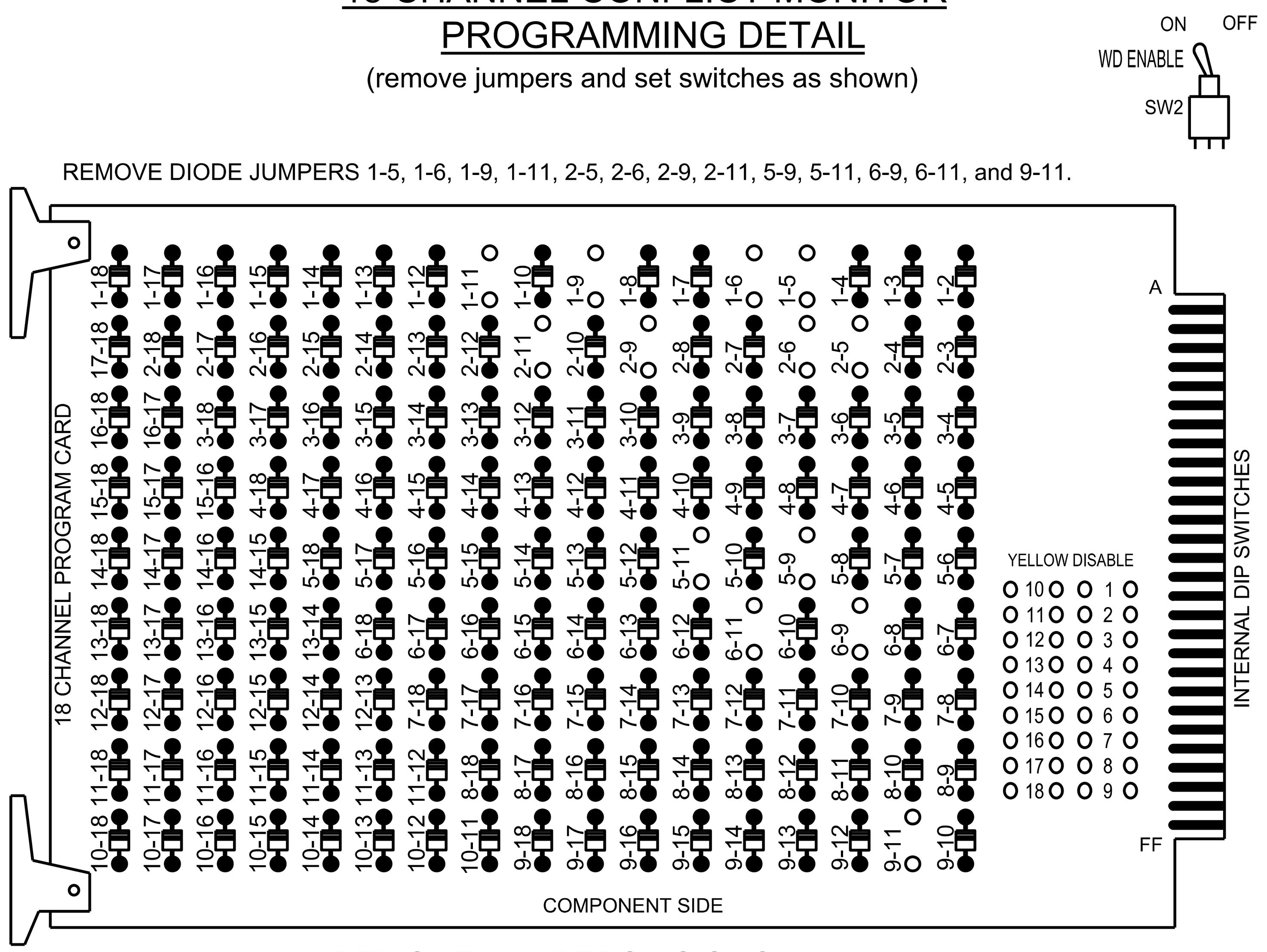
SIG. INVENTORY NO. 08-04107

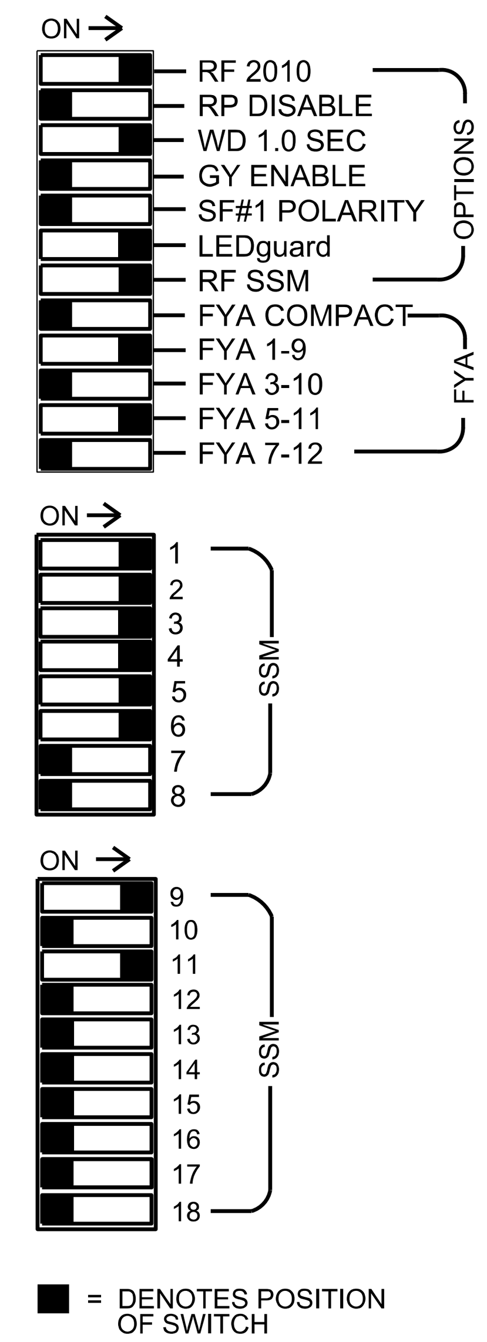
PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.17.1

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 2-5, 2-6, 2-9, 2-11, 5-9, 5-11, 6-9, 6-11, and 9-11.





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 the 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. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk, 6 Green No Walk, 39 Phase Not On, and 40 Green No Walk.
3. Program Phase 39 for No Startup Veh Call.
4. Program Phase 40 for Min Recall.
5. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller..2070LX
Cabinet...332 w/ Aux
Software...Q-Free MAXTIME
Cabinet Mount....................................Base
Output File Positions...........................18 With Aux. Output File
Load Switches Used............................S1, S2, S4, S5, S7, S8, AUX S1, AUX S4
Phases Used.......................................1, 2, 3, 4, 5, 6, 39**, 40**
Overlap "1"..*
Overlap "2"..NOT USED
Overlap "3"..*
Overlap "4"..NOT USED

*See overlap programming detail on sheet 2
**Phase used for preemption timing purposes only

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★	42	21.22	NU	32	33	62	41	42,43	NU	33	51★	61,62	NU	NU	NU	NU	11★	NU	NU	51★	NU	NU
RED		*	128		116	116		101	101		*		134										
YELLOW			129		117	117		102	102				135										
GREEN			130		118	118		103	103				136										
RED ARROW																		A121			A114		
YELLOW ARROW		126					117				132							A122			A115		
FLASHING YELLOW ARROW																		A123			A116		
GREEN ARROW	127	127			118		118	103			133	133											
(hand)																							
(walk)																							

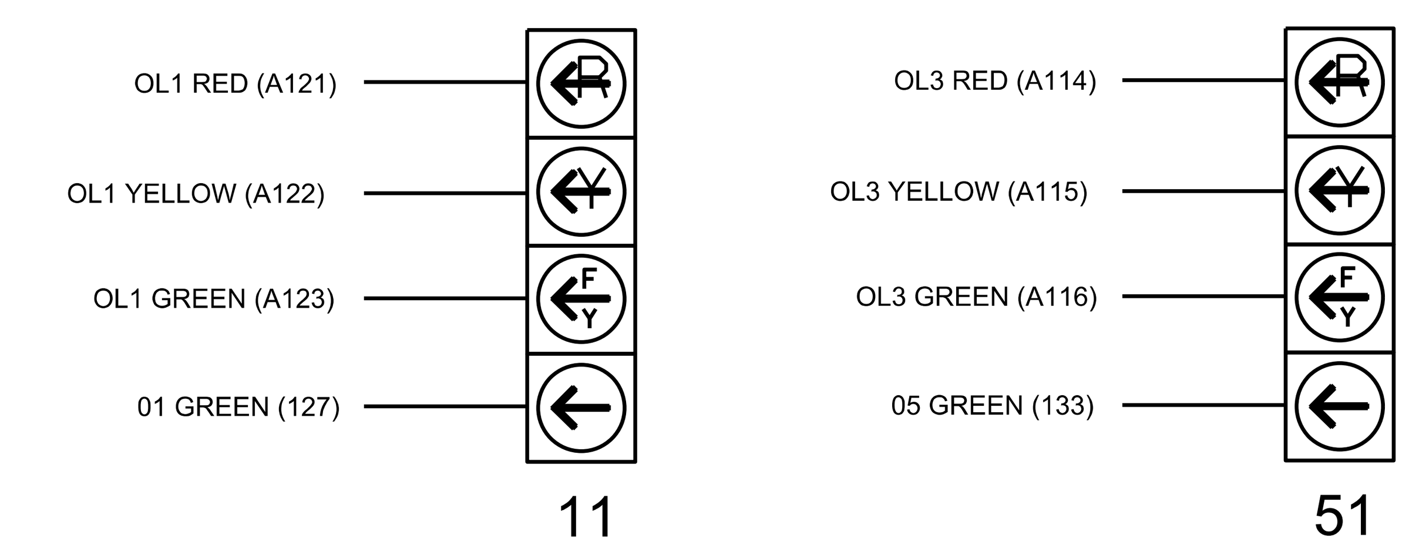
NU = Not Used

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

★See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	1O	11	12	13	14
FILE "I"	U	SLOT	SLOT	SLOT	SLOT	SLOT	ø 4 4A	ø 1 1B	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	NOT USED	NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	PRE1 AC ISOLATOR
	L	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	NOT USED

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

FS = FLASH SENSE
ST = STOP TIME
PRE = PREEMPT

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1B	TB6-1,2	I7U	65	31	10	1	15.0	2.0	X		X	
4A	TB4-9,10	I6U	41	3	8	4		2.0	X		X	

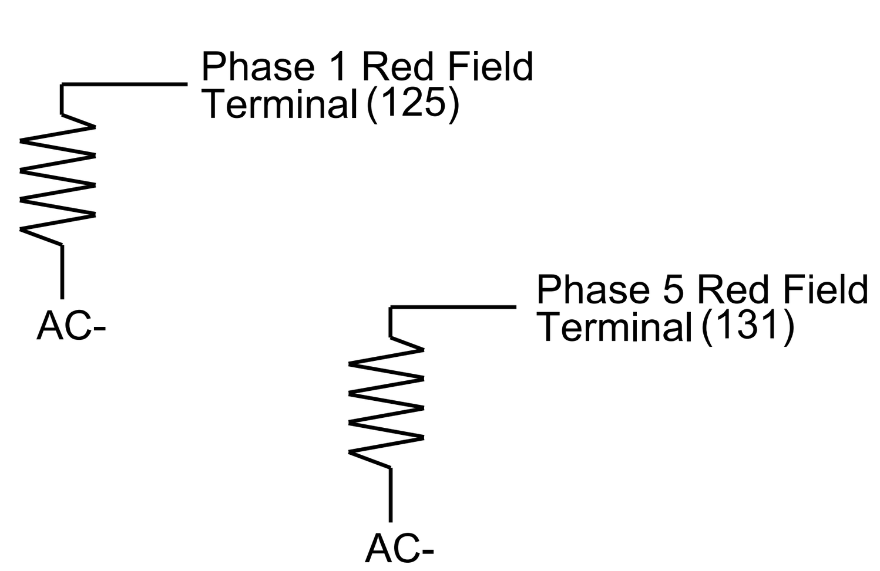
INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



SPECIAL DETECTOR NOTES

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: 08-0410T2
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

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

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

750 N.Greenfield Pkwy,Garner,NC 27529

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Division 8 Moore County Seven Lakes

PLAN DATE: June 2024	REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

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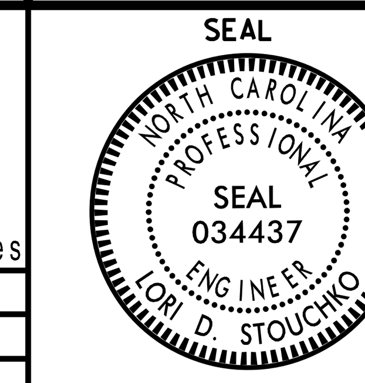
SEAL



DATE

SIG. INVENTORY NO. 08-0410T2

OVERLAP PROGRAMMING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	3	4
Type	FYA 4 - Section	OFF	FYA 4 - Section	OFF
Included Phases	2	-	6	-
Modifier Phases	1	-	5	-
Modifier Overlaps	-	-	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0

MAXTIME STARTUP AND SOFTWARE FLASH PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Startup Parameters

Startup Clearance Hold
6

Unit Flash Parameters

All Red Flash Exit Time
6

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

NOTICE PHASE 2 FLASH RED → Channel 2
NOTICE PHASE 6 FLASH RED → Channel 6
NOTICE OVERLAP 1 FLASH RED → Channel 9
NOTICE OVERLAP 3 FLASH RED → Channel 11

Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
1	Phase Vehicle	1		X	X	1
2	Phase Vehicle	2		X		2
3	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Phase Vehicle	5		X		5
6	Phase Vehicle	6		X	X	6
7	Phase Vehicle	7		X		7
8	Phase Vehicle	8		X	X	8
9	Overlap	1		X	X	9
10	Overlap	2		X	X	10
11	Overlap	3		X		11
12	Overlap	4		X		12
13	Phase Ped	2				13
14	Phase Ped	4				14
15	Phase Ped	6				15
16	Phase Ped	8				16
17	Overlap	5		X	X	17
18	Overlap	6		X		18

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0410T2
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

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

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for:
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Division 8 Moore County Seven Lakes

PLAN DATE: June 2024 REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko REVIEWED BY:

REVISIONS	INIT.	DATE

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SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0410T2

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.17.3

PREEMPTION PROGRAMMING

Front Panel
Main Menu >Controller >Preemption >Preempt Phasing/Preempt Parameters

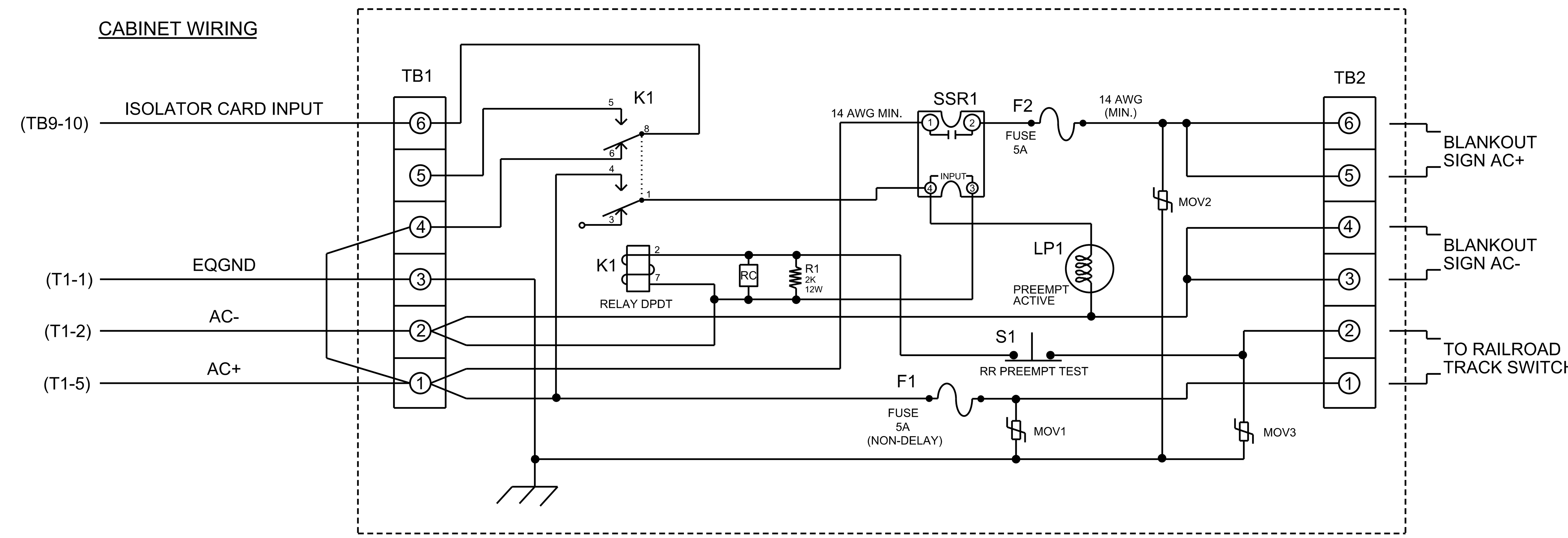
Web Interface
Home >Controller >Preempt Configuration >Preempts

Preempt Configuration

Preempt	1
Enabled	Enabled
Type	Rail Road
Track Phases	4,39
Track Overlaps	-
Dwell Phases	2,6
Dwell Peds	-
Dwell Overlaps	3
Cycling Phases	-
Cycling Peds	-
Cycling Overlaps	-
Exit Phases	4
Exit Overlaps	-
Delay	0
Call Ext Time	1.0
Max Presence	0
Max Pres Act	Terminate
Enter Min Green	1
Enter Walk	0
Enter Ped Clear	0
Enter Yellow Change	4.7
Enter Red Clear	2.9
Track Green	22
Track Yellow Clr	3.2
Track Red Clear	2.0
Dwell Green	0
Exit Min Green	255
Exit Yellow Change	25.5
Exit Red Clear	25.5
Exit Type	Exit Phases
Non Locking Memory	-
Not Ovrd Flash	X
Not Ovrd Nxt Pre	-
Require All Red Entry	-
Track Clear Ovrd	X
Ped Clear During Yellow	-
Entry Omit OLTG	X
Track Reserve	X

RAILROAD PREEMPTION WIRING DETAIL

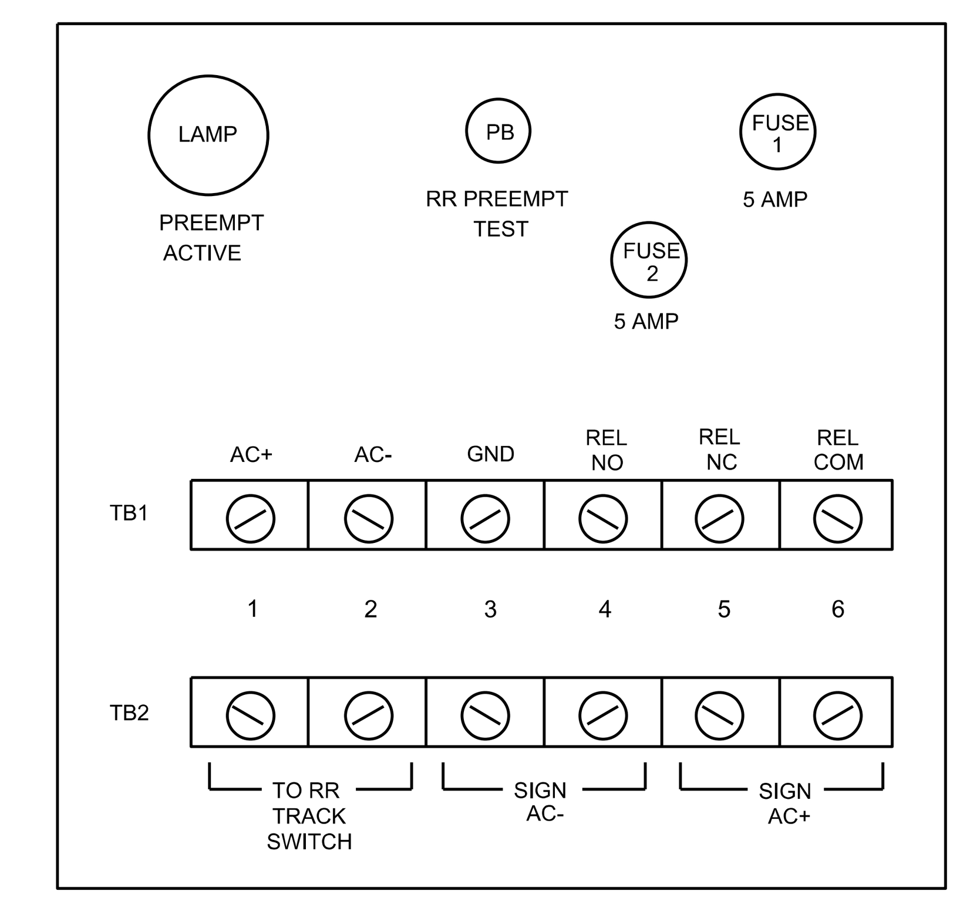
(wire as shown below)



NOTES

1. Relay K1 is shown in the energized (Preempt not active) normal operation state.
2. Relay K1 is a DPDT with 120VAC coil with octal base.
3. Relay SSR1 is a SPST (normally open) Solid State Relay with AC input and AC (25 amp) output.
4. AC Isolator Card shall activate preemption upon removal of AC+ from the input (as shown above). To accomplish this set invert dip switch on AC Isolator Card.
5. IMPORTANT!! A jumper must be added between input file terminals J14-E and J14-K if not already present. Also, terminal TB9-12 (on input panel) shall be connected to AC neutral (jumper may have to be added).

FRONT VIEW



SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

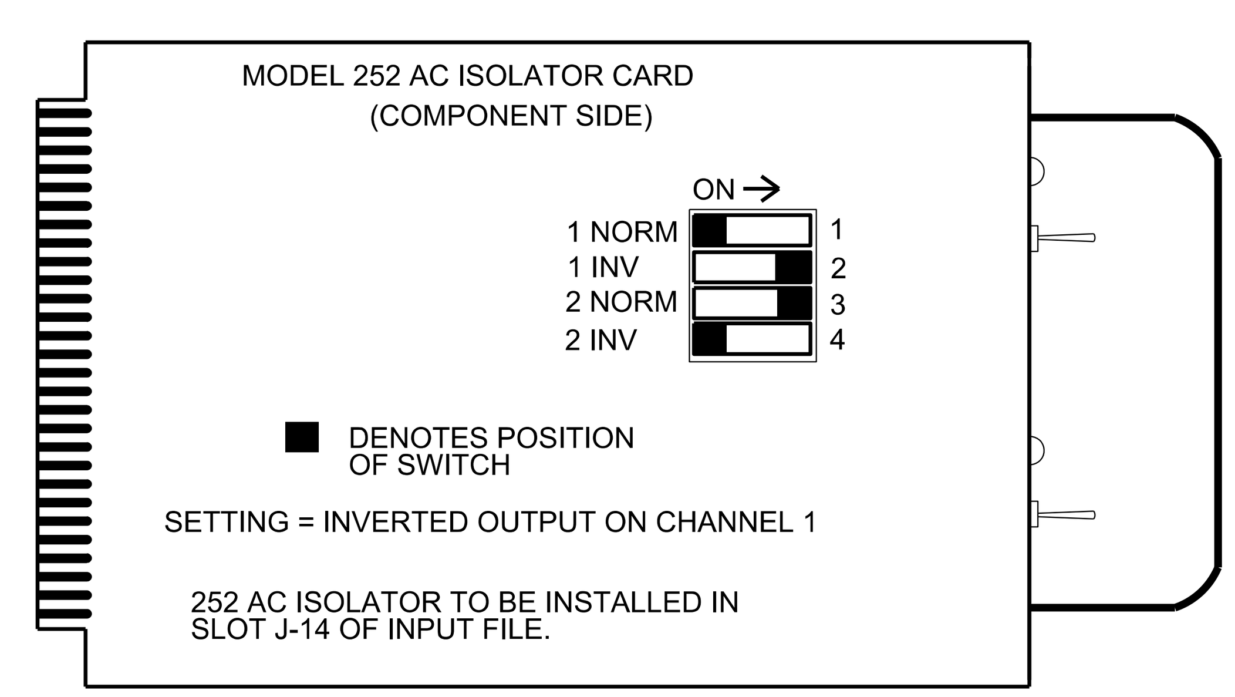
Web Interface
Home >Controller >Sequence

Sequence 1

Ring	Sequence Data
1	1,2,a,3,4,b
2	5,6,a,7,8,b
3	39,c,40,d

PREEMPT 1 AC ISOLATOR (MODEL 252) OUTPUT PROGRAMMING DETAIL

(set DIP switches as shown below)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0410T2
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

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

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 211
at
SR 1239 (Seven Lakes Drive)
and SR 1190 (Lakeway Drive)

Division 8 Moore County Seven Lakes

PLAN DATE: June 2024	REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

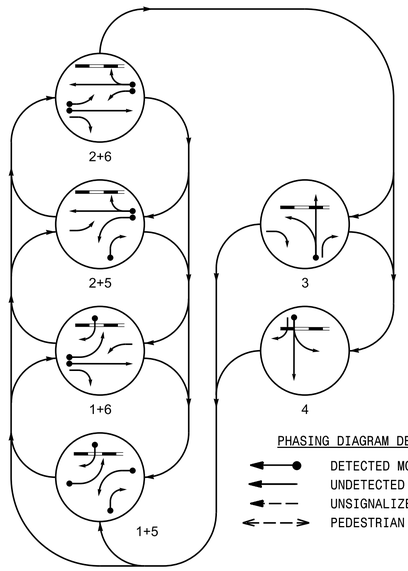
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0410T2

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.18.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

RAIL PREEMPT PHASES

(High Priority)

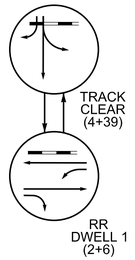


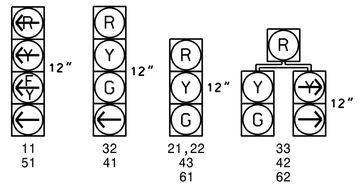
TABLE OF OPERATION

SIGNAL FACE	PHASE 1+5	1+6	2+5	2+6	3	4	TRACK CLEARANCE	RR DWELL 1	FLASH
11	—	—	F Y	F Y	R	R	R	R	R
21,22	R	R	G	G	R	R	R	G	R
32	R	R	R	R	G	R	R	R	R
33	R/—	R	R/—	R	G	R	R	R	R
41	R	R	R	R	R	G —	G —	R	R
42	R/—	R/—	R	R	R	G	G	R	R
43	R	R	R	R	R	G	G	R	R
51	—	F Y	—	F Y	R	R	R	F Y	R
61	R	G	R	G	R	R	R	G	R
62	R	G	R	G	R/—	R	R	G	R
Sign C	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	✱

✱See Note 7

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

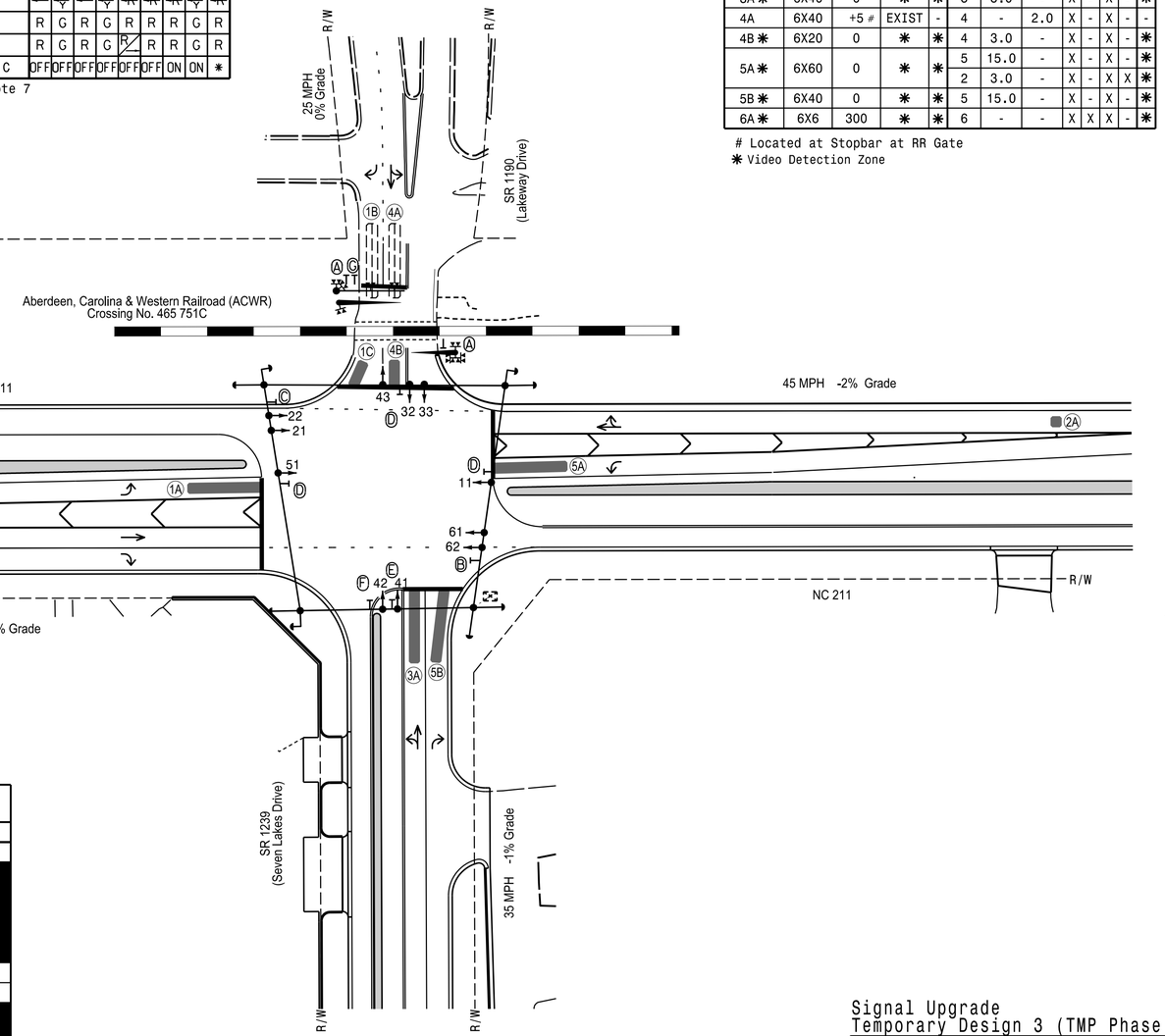
DETECTOR LOOP/ ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A✱	6X60	0	✱	✱	1	15.0	-	X	-	X	-	✱
					6	3.0	-	X	-	X	X	✱
1B	6X40	+5 #	EXIST	-	1	15.0	2.0	X	-	X	-	-
1C✱	6X20	0	✱	✱	1	15.0	-	X	-	X	-	✱
2A✱	6X6	300	✱	✱	2	-	-	X	X	X	-	✱
3A✱	6X40	0	✱	✱	3	3.0	-	X	-	X	-	✱
4A	6X40	+5 #	EXIST	-	4	-	2.0	X	-	X	-	-
4B✱	6X20	0	✱	✱	4	3.0	-	X	-	X	-	✱
5A✱	6X60	0	✱	✱	5	15.0	-	X	-	X	-	✱
					2	3.0	-	X	-	X	X	✱
5B✱	6X40	0	✱	✱	5	15.0	-	X	-	X	-	✱
6A✱	6X6	300	✱	✱	6	-	-	X	X	X	-	✱

Located at Stopbar at RR Gate
✱ Video Detection Zone

6 Phase Fully Actuated W/ Railroad Preemption (Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. This location contains railroad preemption phasing. Do not program signal for late night flashing operation.
3. Phase 1 and/or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Reposition existing signal heads numbered 11,21,22, and 51.
6. Set all detector units to presence mode.
7. Ensure flashing operation does not alter operation of blankout signs.
8. Program phase 40 to run concurrently with all phases during normal operation. Phase 39 must be incompatible with Phase 40 and included as a track clear phase.
9. This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.



MAXTIME PREEMPTION CHART

FUNCTION	PRE 1
Type	RAIL ROAD
Exit Phases	4
Delay	0
Max Presence	0
Enter Min Green	1
Enter Walk	0
Enter Ped Clear	0
Enter Yellow Change	4.7 *
Enter Red Clear	3.1 *
Track Green	22
Track Yellow Change	3.2
Track Red Clear	2.8
Dwell Green	0
Exit Min Green	255 *
Exit Yellow Change	25.5 *
Exit Red Clear	25.5 *
Call Extend Time	1.0
Exit Type	EXIT PHASES
Ped Clear Through Yellow	–
Require All Red Entry	–

This signal was designed for advanced preemption

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	39	40
Walk *	–	–	–	–	–	–		
Ped Clear *	–	–	–	–	–	–		
Min Green *	7	12	7	7	7	12		
Passage *	2.0	6.0	2.0	2.0	2.0	6.0		
Max 1 *	30	50	30	25	30	50		
Yellow Change	3.0	4.7	3.9	3.2	3.0	4.7	3.2	4.7
Red Clear	3.1	1.6	2.3	2.8	3.1	1.6	2.8	3.1
Added Initial *	–	2.5	–	–	–	2.5		
Maximum Initial *	–	34	–	–	–	34		
Time Before Reduction *	–	15	–	–	–	15		
Time To Reduce *	–	30	–	–	–	30		
Minimum Gap	–	3.0	–	–	–	3.0		
Advance Walk	–	–	–	–	–	–		
Non Lock Detector	X	–	X	X	X	–		
Vehicle Recall	–	MIN RECALL	–	–	–	MIN RECALL		MIN RECALL
Dual Entry	–	–	–	–	–	–		

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

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
▯↓	Pedestrian Signal Head With Push Button & Sign	■↓
○→	Signal Pole with Guy	●→
○↓	Signal Pole with Sidewalk Guy	●↓
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⛶
□	Junction Box	■
----------	2-in Underground Conduit	----------
N/A	Right of Way	----------
→	Directional Arrow	→
▭	Construction Zone	▭
▬	Non-Intrusive Detection Zone	▬
N/A	Railroad Cantilever	✱-✱
N/A	Railroad Gate and Flasher	✱
N/A	Railroad Tracks	▬
Ⓐ	"DO NOT STOP ON TRACKS" Sign (R8-8)	Ⓐ
Ⓑ	"NO TURN ON RED" Sign (R10-11)	Ⓑ
Ⓒ	"NO RIGHT TURN - TRAIN" LED Blankout Sign	Ⓒ
Ⓓ	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓓ
Ⓔ	Dual Turn and Through Arrows Sign (R3-6L)	Ⓔ
Ⓕ	Right Arrow "ONLY" Sign (R3-5R)	Ⓕ
Ⓖ	"STOP HERE ON RED" Sign (R10-6)	Ⓖ

Signal Upgrade
Temporary Design 3 (TMP Phase III)

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

NC 211
at
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and SR 1190 (Lakeway Drive)

Division 8 Moore County Seven Lakes

PLAN DATE:	June 2024	REVIEWED BY:	R. Mullinax
PREPARED BY:	LD Stouchko	REVIEWED BY:	

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

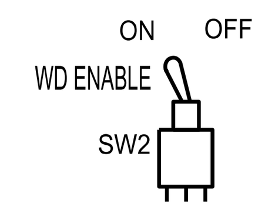
SIGNATURE DATE

SIG. INVENTORY NO. 08-0410T3

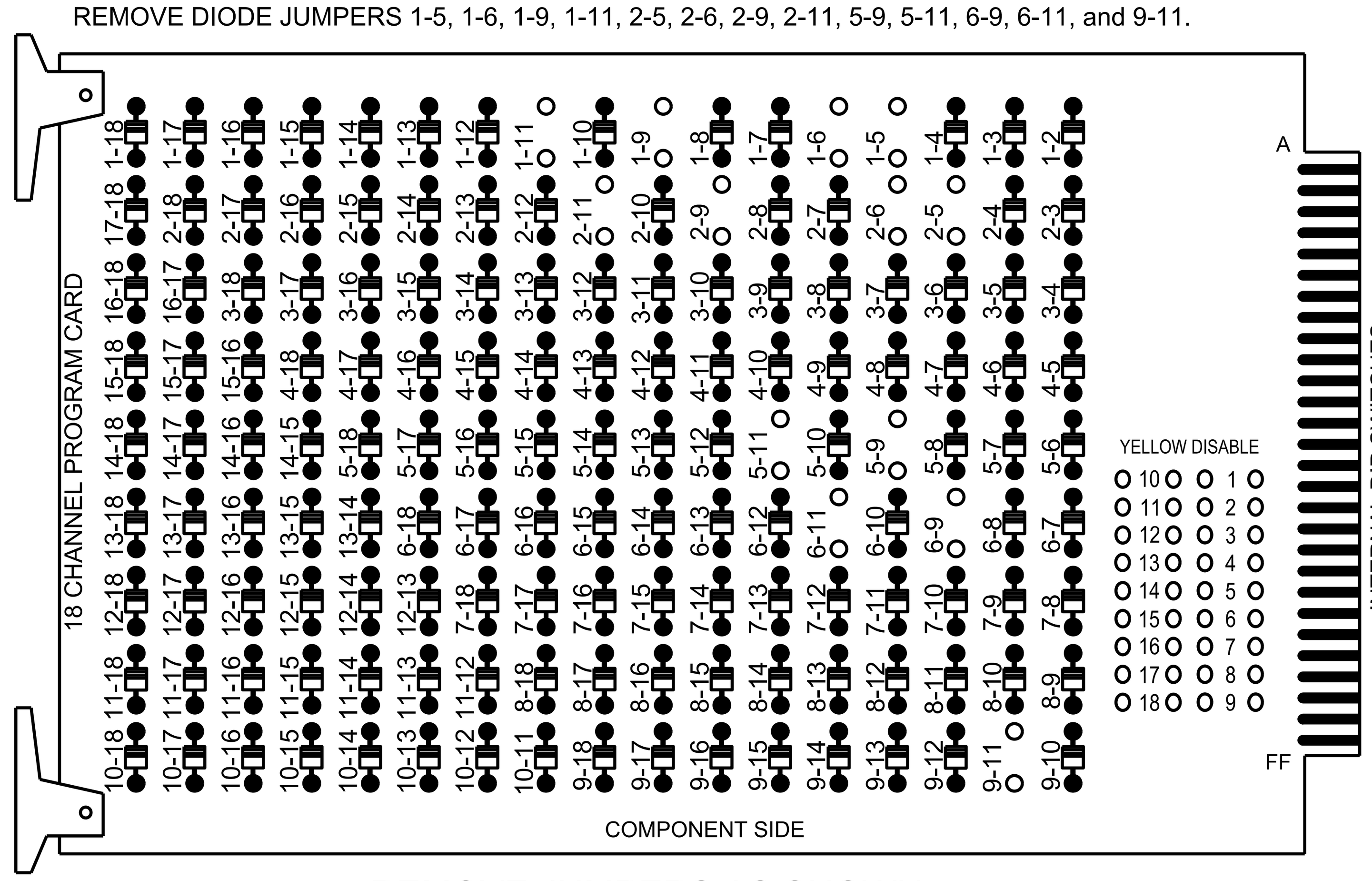
PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.18.1

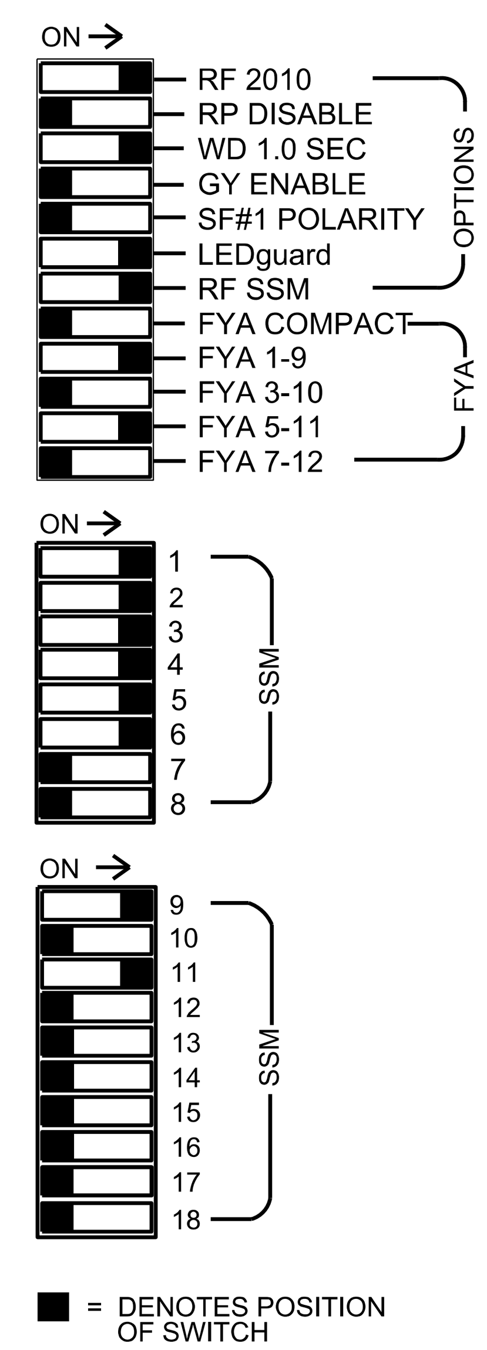
18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 2-5, 2-6, 2-9, 2-11, 5-9, 5-11, 6-9, 6-11, and 9-11.





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 the 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. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk, 6 Green No Walk, 39 Phase Not On, and 40 Green No Walk.
3. Program Phase 39 for No Startup Veh Call.
4. Program Phase 40 for Min Recall.
5. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller..2070LX
Cabinet..332 w/ Aux
Software..Q-Free MAXTIME
Cabinet Mount....................................Base
Output File Positions..........................18 With Aux. Output File
Load Switches Used............................S1, S2, S4, S5, S7, S8, AUX S1, AUX S4
Phases Used.......................................1, 2, 3, 4, 5, 6, 39**, 40**
Overlap "1"..*
Overlap "2"..NOT USED
Overlap "3"..*
Overlap "4"..NOT USED

*See overlap programming detail on sheet 2
**Phase used for preemption timing purposes only

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★	42	21.22	NU	32	33	62	41	42,43	NU	33	51★	61,62	NU	NU	NU	NU	11★	NU	NU	51★	NU	NU
RED		*	128		116	116		101	101		*		134										
YELLOW			129		117	117		102	102				135										
GREEN			130		118	118		103	103				136										
RED ARROW																		A121			A114		
YELLOW ARROW		126					117				132							A122			A115		
FLASHING YELLOW ARROW																		A123			A116		
GREEN ARROW	127	127			118		118	103			133	133											
(Don't Walk)																							
(Walk)																							

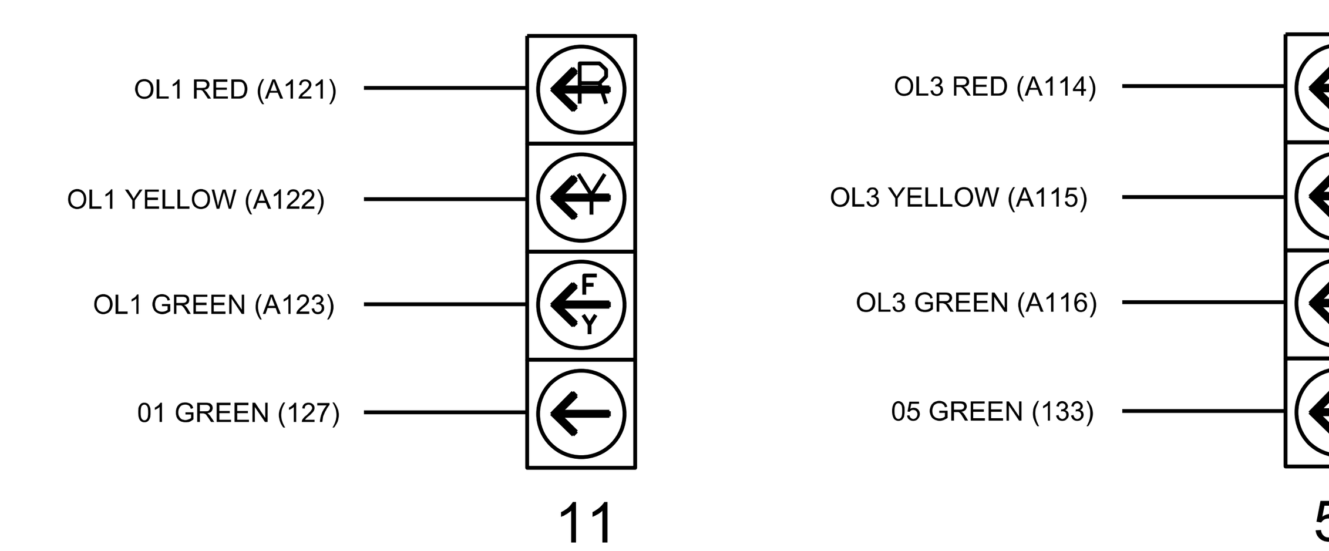
NU = Not Used

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

★See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	1O	11	12	13	14
"I"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø 4 4A	Ø 1 1B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L						NOT USED	NOT USED							ST DC ISOLATOR
"J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	PRE1 AC ISOLATOR
	L														NOT USED

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

FS = FLASH SENSE
ST = STOP TIME
PRE = PREEMPT

INPUT FILE CONNECTION & PROGRAMMING CHART

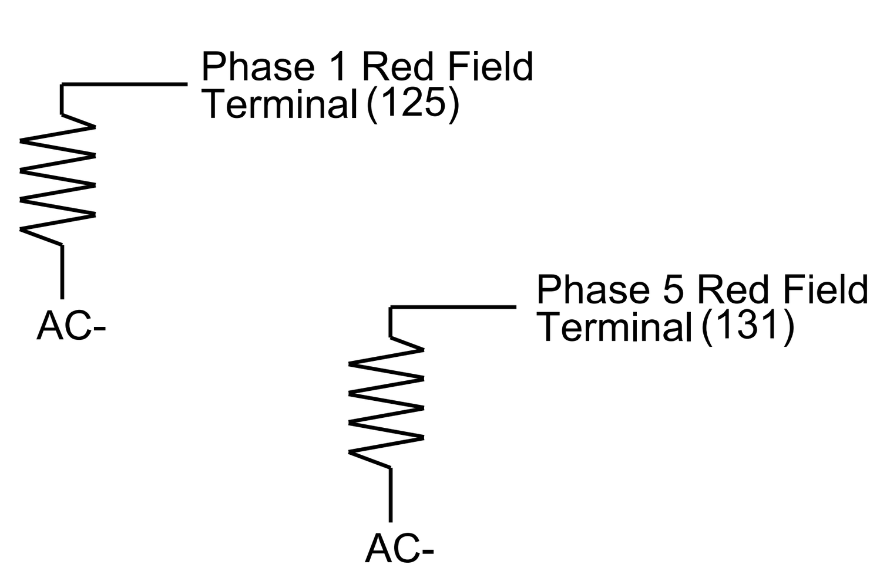
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1B	TB6-1,2	I7U	65	31	10	1	15.0	2.0	X		X	
4A	TB4-9,10	I6U	41	3	8	4		2.0	X		X	

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



SPECIAL DETECTOR NOTES

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: 08-0410T3
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

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

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

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Division 8 Moore County Seven Lakes

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PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

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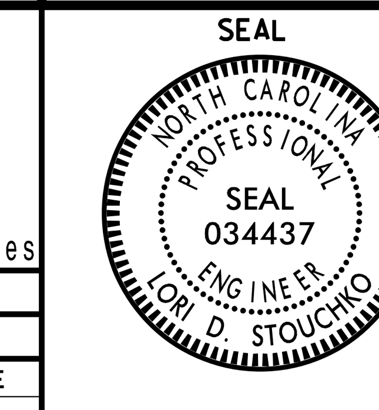
SEAL



DATE

SIG. INVENTORY NO. 08-0410T3

OVERLAP PROGRAMMING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	3	4
Type	FYA 4 - Section	OFF	FYA 4 - Section	OFF
Included Phases	2	-	6	-
Modifier Phases	1	-	5	-
Modifier Overlaps	-	-	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0

MAXTIME STARTUP AND SOFTWARE FLASH PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Startup Parameters

Startup Clearance Hold
6

Unit Flash Parameters

All Red Flash Exit Time
6

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

Notice	Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
	1	Phase Vehicle	1		X	X	1
NOTICE PHASE 2 FLASH RED →	2	Phase Vehicle	2		X		2
	3	Phase Vehicle	3		X	X	3
	4	Phase Vehicle	4		X		4
	5	Phase Vehicle	5		X		5
NOTICE PHASE 6 FLASH RED →	6	Phase Vehicle	6		X	X	6
	7	Phase Vehicle	7		X		7
	8	Phase Vehicle	8		X	X	8
NOTICE OVERLAP 1 FLASH RED →	9	Overlap	1		X	X	9
	10	Overlap	2		X	X	10
NOTICE OVERLAP 3 FLASH RED →	11	Overlap	3		X		11
	12	Overlap	4		X		12
	13	Phase Ped	2				13
	14	Phase Ped	4				14
	15	Phase Ped	6				15
	16	Phase Ped	8				16
	17	Overlap	5		X	X	17
	18	Overlap	6		X		18

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0410T3
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

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

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PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

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SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0410T3

PREEMPTION PROGRAMMING

Front Panel
Main Menu >Controller >Preemption >Preempt Phasing/Preempt Parameters

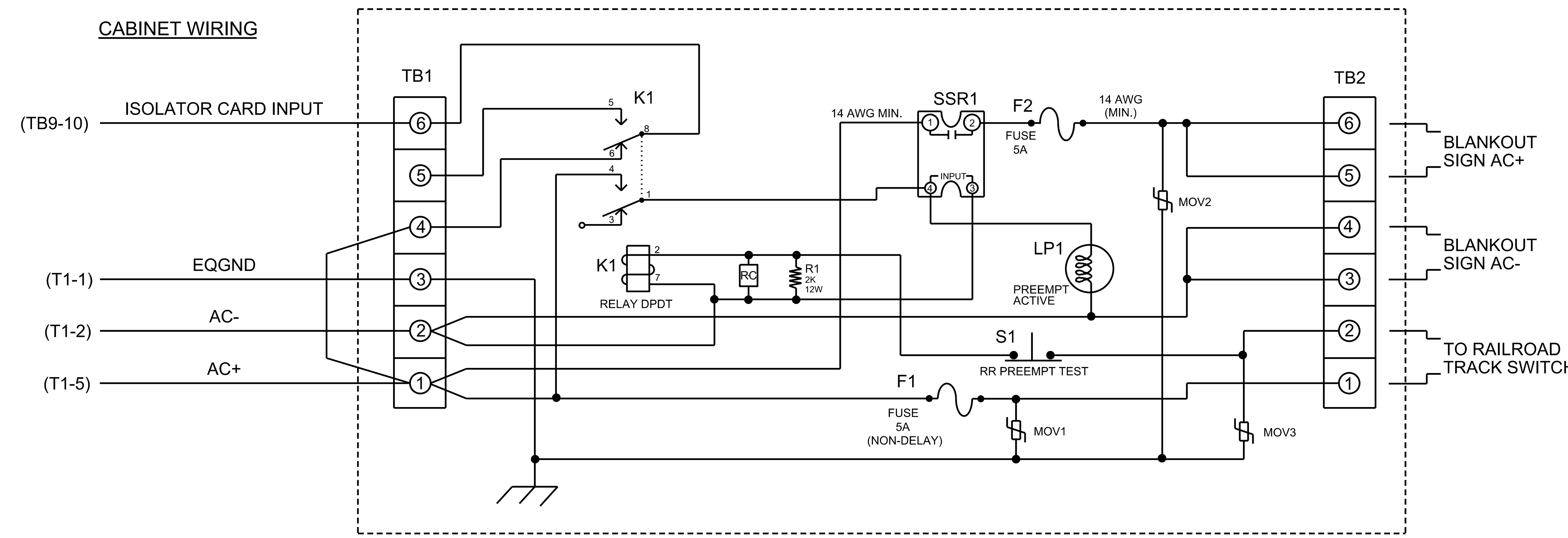
Web Interface
Home >Controller >Preempt Configuration >Preempts

Preempt Configuration

Preempt	1
Enabled	Enabled
Type	Rail Road
Track Phases	4,39
Track Overlaps	-
Dwell Phases	2,6
Dwell Peds	-
Dwell Overlaps	3
Cycling Phases	-
Cycling Peds	-
Cycling Overlaps	-
Exit Phases	4
Exit Overlaps	-
Delay	0
Call Ext Time	1.0
Max Presence	0
Max Pres Act	Terminate
Enter Min Green	1
Enter Walk	0
Enter Ped Clear	0
Enter Yellow Change	4.7
Enter Red Clear	3.1
Track Green	22
Track Yellow Clr	3.2
Track Red Clear	2.8
Dwell Green	0
Exit Min Green	255
Exit Yellow Change	25.5
Exit Red Clear	25.5
Exit Type	Exit Phases
Non Locking Memory	-
Not Ovrd Flash	X
Not Ovrd Nxt Pre	-
Require All Red Entry	-
Track Clear Ovrd	X
Ped Clear During Yellow	-
Entry Omit OLTG	X
Track Reserve	X

RAILROAD PREEMPTION WIRING DETAIL

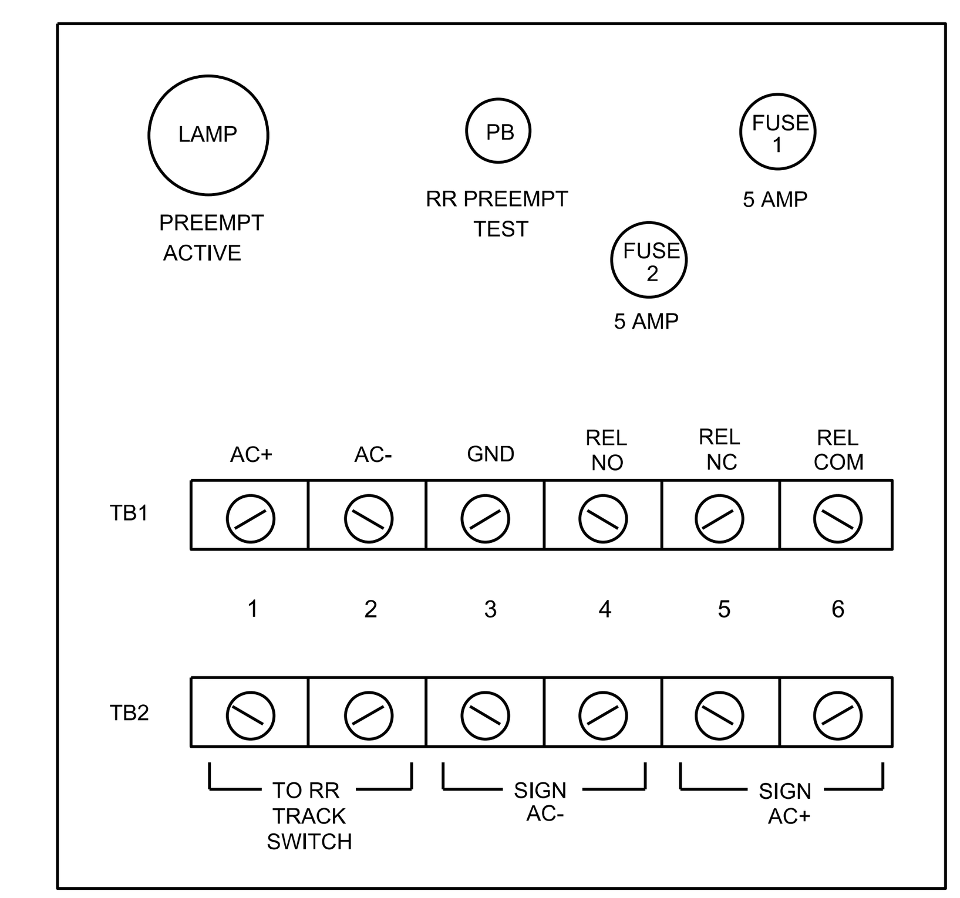
(wire as shown below)



NOTES

1. Relay K1 is shown in the energized (Preempt not active) normal operation state.
2. Relay K1 is a DPDT with 120VAC coil with octal base.
3. Relay SSR1 is a SPST (normally open) Solid State Relay with AC input and AC (25 amp) output.
4. AC Isolator Card shall activate preemption upon removal of AC+ from the input (as shown above). To accomplish this set invert dip switch on AC Isolator Card.
5. IMPORTANT!! A jumper must be added between input file terminals J14-E and J14-K if not already present. Also, terminal TB9-12 (on input panel) shall be connected to AC neutral (jumper may have to be added).

FRONT VIEW



SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

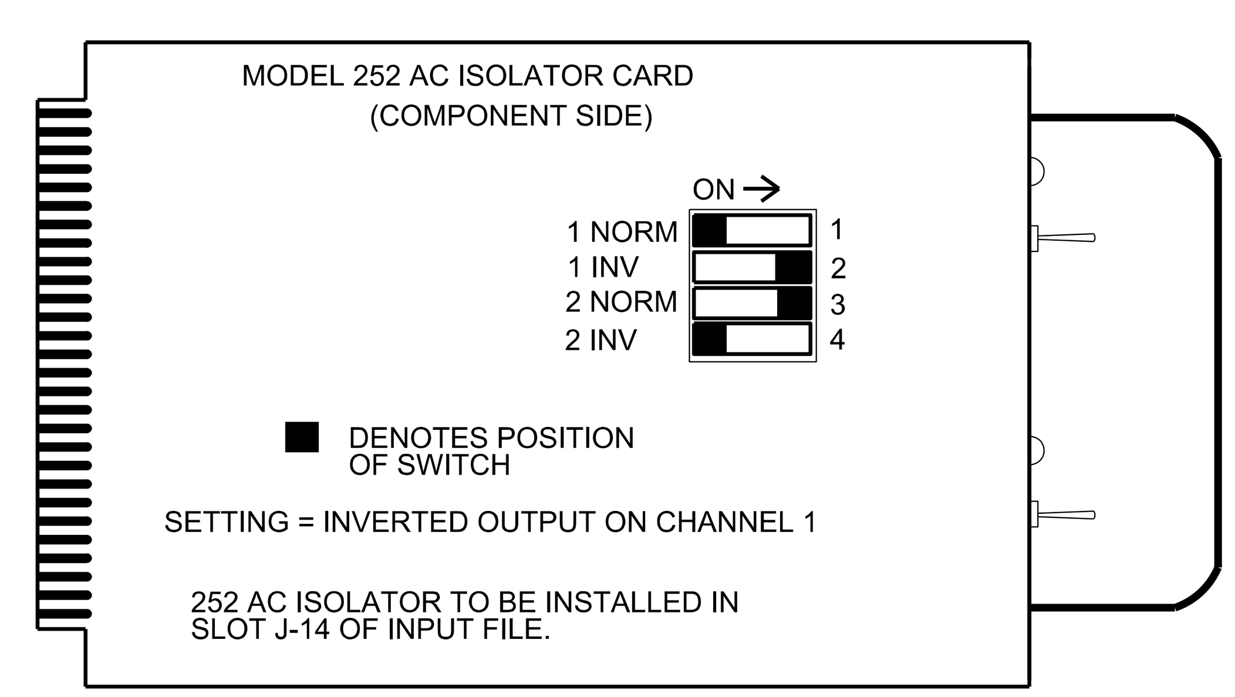
Web Interface
Home >Controller >Sequence

Sequence 1

Ring	Sequence Data
1	1,2,a,3,4,b
2	5,6,a,7,8,b
3	39,c,40,d

PREEMPT 1 AC ISOLATOR (MODEL 252) OUTPUT PROGRAMMING DETAIL

(set DIP switches as shown below)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0410T3
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

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

MOTT MACDONALD
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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 211
at
SR 1239 (Seven Lakes Drive)
and SR 1190 (Lakeway Drive)

Division 8 Moore County Seven Lakes

PLAN DATE: June 2024	REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

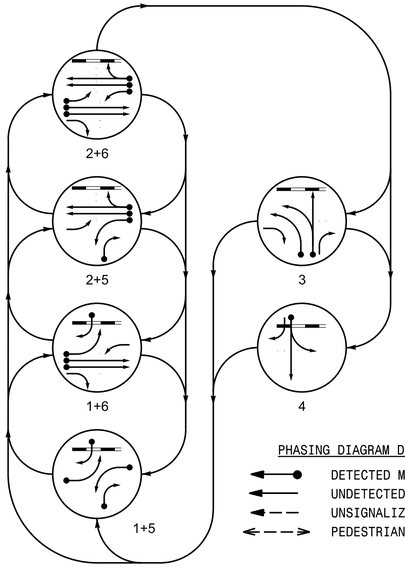
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0410T3

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.19.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

RAIL PREEMPT PHASES

(High Priority)

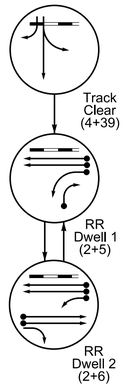


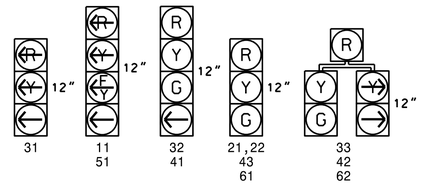
TABLE OF OPERATION

SIGNAL FACE	PHASE 1+5	1+6	2+5	2+6	3	4	TRACK CLEAR	RR DWELL 1	RR DWELL 2	FLASH
11	←	←	F Y	F Y	R	R	R	R	R	R
21,22	R	R	G	G	R	R	R	G	G	R
31	R	R	R	R	—	R	R	R	R	R
32	R	R	R	G	G	R	R	R	R	R
33	R/—	R	R/—	R	G	R	R	R/—	R	R
41	R	R	R	R	G	G	R	R	R	R
42	R/—	R/—	R	R	G	G	R	R	R	R
43	R	R	R	R	G	G	R	R	R	R
51	←	F Y	←	F Y	R	R	R	←	F Y	R
61	R	G	R	G	R	R	R	R	G	R
62	R	G	R	G	R/—	R	R	R	G	R
Sign B	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	✱

✱ See Note 6

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	2-4-2	X	1	15.0	-	X	-	X	-	X
					6	3.0	-	X	-	X	X	X
1B	6X40	# +5	EXIST	-	1	15.0	2.0	X	-	X	-	-
1C	6X20	0	2-4-2	X	1	15.0	-	X	-	X	-	X
2A	6X6	300	5	X	2	-	-	X	X	X	-	X
2B	6X6	300	5	X	2	-	-	X	X	X	-	X
3A	6X40	0	2-4-2	X	3	3.0	-	X	-	X	-	X
3B	6X40	0	2-4-2	X	3	-	-	X	-	X	-	X
4A	6X40	# +5	EXIST	-	4	-	2.0	X	-	X	-	-
4B	6X20	0	2-4-2	X	4	3.0	-	X	-	X	-	X
5A	6X40	0	2-4-2	X	5	15.0	-	X	-	X	-	X
					2	3.0	-	X	-	X	X	X
5B	6X40	0	2-4-2	X	5	15.0	-	X	-	X	-	X
6A	6X6	300	5	X	6	-	-	X	X	X	-	X
6B	6X6	300	5	X	6	-	-	X	X	X	-	X

Located at Stopbar at RR Gate

6 Phase
Fully Actuated
W/ Railroad Preemption
(Isolated)

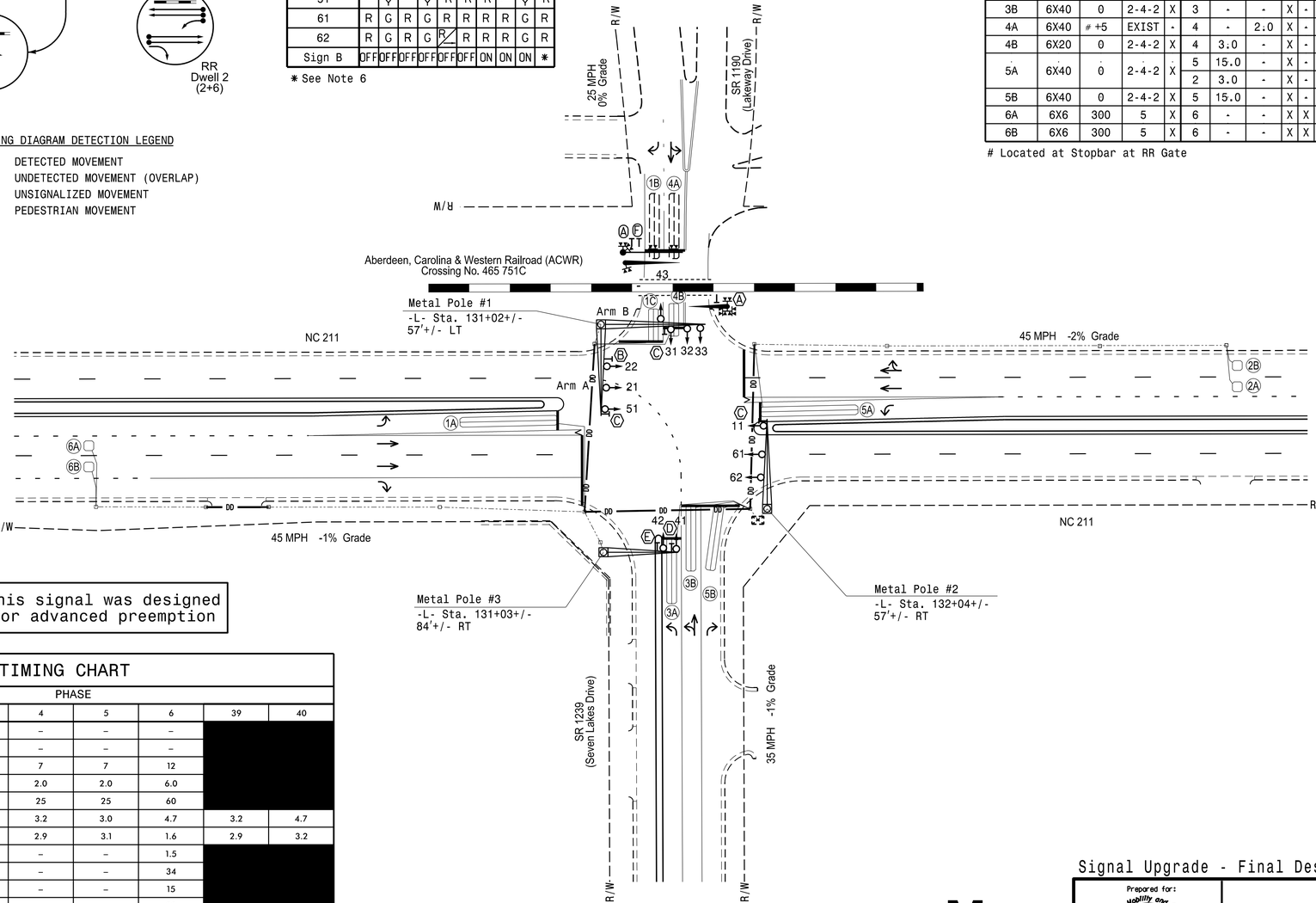
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. This location contains railroad preemption phasing. Do not program signal for late night flashing operation.
3. Phase 1 and/or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Set all detector units to presence mode.
6. Ensure flashing operation does not alter operation of blankout signs.
7. Program phase 40 to run concurrently with all phases during normal operation. Phase 39 must be incompatible with Phase 40 and included as a track clear phase.

MAXTIME PREEMPTION CHART

FUNCTION	PRE 1
Type	RAIL ROAD
Exit Phases	4
Delay	0
Max Presence	0
Enter Min Green	1
Enter Walk	0
Enter Ped Clear	0
Enter Yellow Change	4.7 *
Enter Red Clear	3.2 *
Track Green	22
Track Yellow Change	3.2
Track Red Clear	2.9
Dwell Green	0
Exit Min Green	255 *
Exit Yellow Change	25.5 *
Exit Red Clear	25.5 *
Call Extend Time	1.0
Exit Type	EXIT PHASES
Ped Clear Through Yellow	–
Require All Red Entry	–

This signal was designed for advanced preemption



MAXTIME TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	39	40
Walk *	–	–	–	–	–	–		
Ped Clear *	–	–	–	–	–	–		
Min Green *	7	12	7	7	7	12		
Passage *	2.0	6.0	2.0	2.0	2.0	6.0		
Max 1 *	25	60	30	25	25	60		
Yellow Change	3.0	4.7	3.9	3.2	3.0	4.7	3.2	4.7
Red Clear	3.2	1.6	2.2	2.9	3.1	1.6	2.9	3.2
Added Initial *	–	1.5	–	–	–	1.5		
Maximum Initial *	–	34	–	–	–	34		
Time Before Reduction *	–	15	–	–	–	15		
Time To Reduce *	–	30	–	–	–	30		
Minimum Gap	–	3.0	–	–	–	3.0		
Advance Walk	–	–	–	–	–	–		
Non Lock Detector	X	–	X	X	X	–		
Vehicle Recall	–	MIN RECALL	–	–	–	MIN RECALL		MIN RECALL
Dual Entry	–	–	–	–	–	–		

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

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	■
	2-in Underground Conduit	
N/A	Right of Way	
→	Directional Arrow	→
	Metal Pole with Mastarm	
N/A	Railroad Cantilever	
N/A	Railroad Gate and Flasher	
N/A	Railroad Tracks	
DD	Directional Drill	N/A
Ⓐ	"DO NOT STOP ON TRACKS" Sign (R8-8)	Ⓐ
Ⓑ	"NO RIGHT TURN - TRAIN" LED Blankout Sign	Ⓑ
Ⓒ	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓒ
Ⓓ	Dual Turn and Through Arrows Sign (R3-6L)	Ⓓ
Ⓔ	Right Arrow "ONLY" Sign (R3-5R)	Ⓔ
Ⓕ	"STOP HERE ON RED" Sign (R10-6)	Ⓕ

Signal Upgrade - Final Design

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Prepared for: Transportation Mobility and Safety Division, North Carolina Department of Transportation, Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

SCALE 0 40 1"=40'

NC 211
at
SR 1239 (Seven Lakes Drive)
and SR 1190 (Lakeway Drive)

Division 8 Moore County Seven Lakes

PLAN DATE: June 2024 REVIEWED BY: R. Mullinax

PREPARED BY: LD Stouchko REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER
SEAL 034437
L. D. STOUCHKO

SIGNATURE DATE

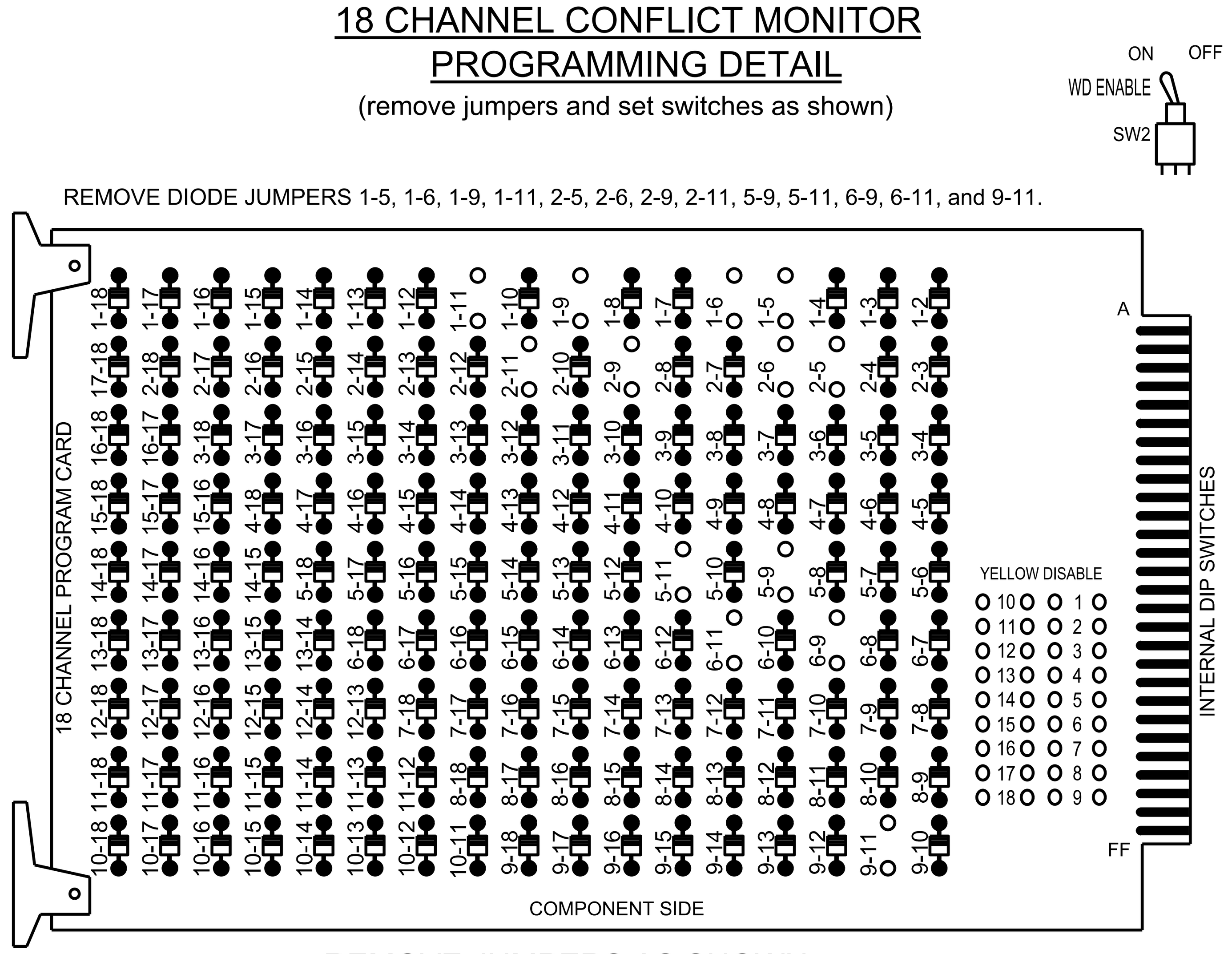
SIG. INVENTORY NO. 08-0410

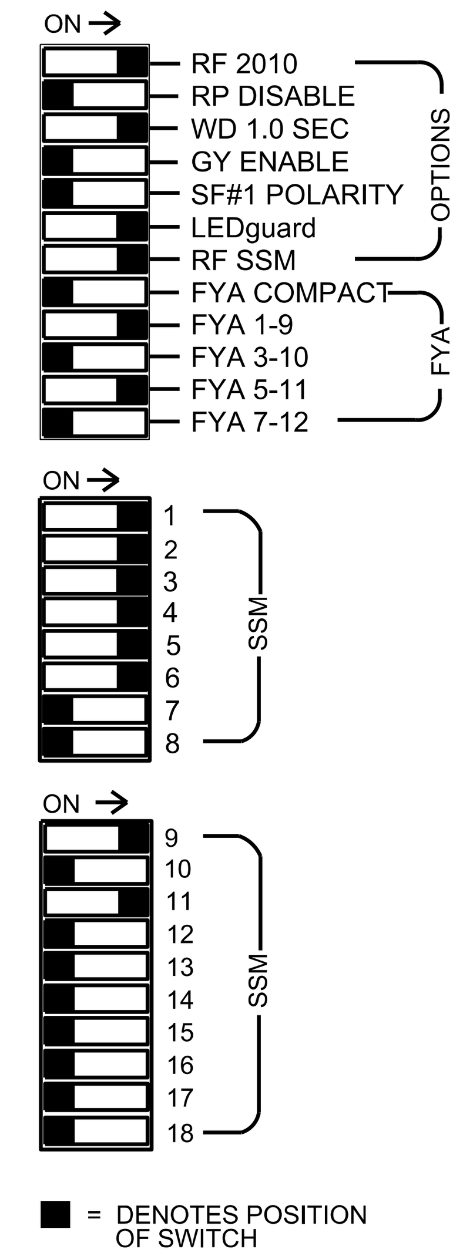
PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.19.1

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 2-5, 2-6, 2-9, 2-11, 5-9, 5-11, 6-9, 6-11, and 9-11.





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 the 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. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk, 6 Green No Walk, 39 Phase Not On, and 40 Green No Walk.
3. Program Phase 39 for No Startup Veh Call.
4. Program Phase 40 for Min Recall.
5. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller..2070LX
Cabinet..332 w/ Aux
Software..Q-Free MAXTIME
Cabinet Mount...................................Base
Output File Positions..........................18 With Aux. Output File
Load Switches Used...........................S1, S2, S4, S5, S7, S8, AUX S1, AUX S4
Phases Used.......................................1, 2, 3, 4, 5, 6, 39**, 40**
Overlap "1"...*
Overlap "2"...NOT USED
Overlap "3"...*
Overlap "4"...NOT USED

*See overlap programming detail on sheet 2
**Phase used for preemption timing purposes only

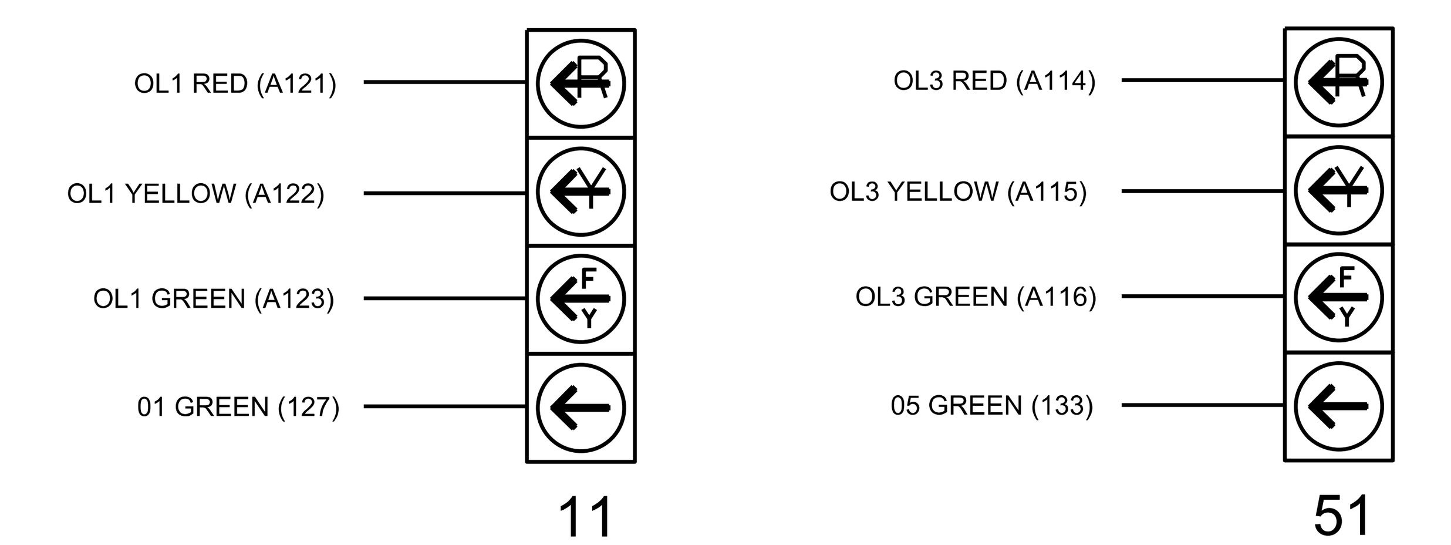
SIGNAL HEAD HOOK-UP CHART

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★	42	21.22	NU	31	32	33	62	41	42,43	NU	33	51★	61,62	NU	NU	NU	NU	11★	NU	NU	51★	NU	NU
RED		*	128			116	116		101	101		*		134										
YELLOW			129			117	117		102	102				135										
GREEN			130			118	118		103	103				136										
RED ARROW					116														A121			A114		
YELLOW ARROW		126			117			117				132							A122			A115		
FLASHING YELLOW ARROW																			A123			A116		
GREEN ARROW	127	127			118	118		118	103			133	133											
(hand)																								
(walk)																								

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

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	10	11	12	13	14
"I"	U	ø 1 1A	ø 2 2A	SLOT EMPTY	SLOT EMPTY	ø 3 3A	ø 4 4A	ø 1 1B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L	NOT USED	ø 2 2B			NOT USED	ø 4 4B	ø 1 1C							ST DC ISOLATOR
"J"	U	ø 5 5A	ø 6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø 3 3B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	PRE1 AC ISOLATOR
	L	NOT USED	ø 6 6B				ø 5 5B								NOT USED

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

FS = FLASH SENSE
ST = STOP TIME
PRE = PREEMPT

INPUT FILE CONNECTION & PROGRAMMING CHART

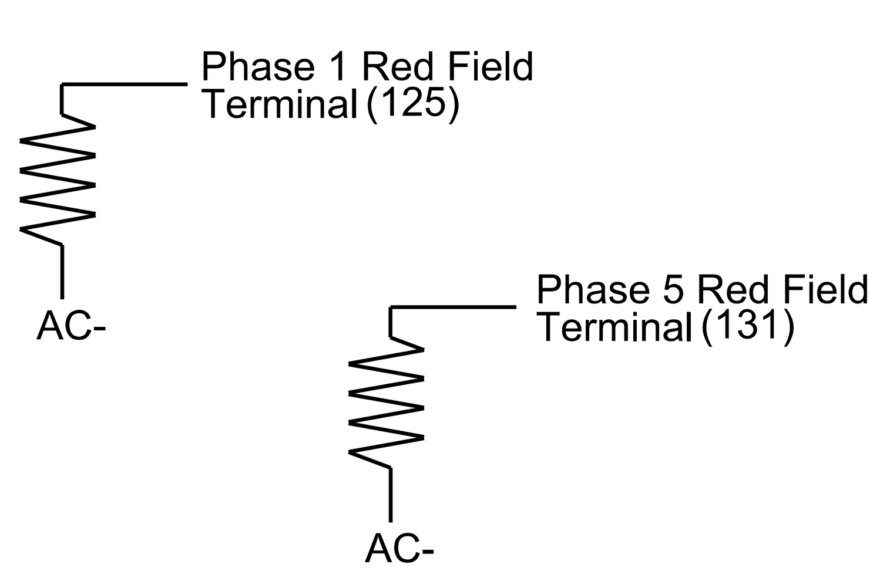
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1A	TB2-1,2	I1U	56	18	1	1	15.0		X		X	
				-	29	6	3.0		X		X	X
1B	TB6-1,2	I7U	65	31	10	1	15.0	2.0	X		X	
1C	TB6-3,4	I7L	78	44	11	1	15.0		X		X	
2A	TB2-5,6	I2U	39	1	2	2			X	X	X	
2B	TB2-7,8	I2L	43	5	3	2			X	X	X	
3A	TB4-5,6	I5U	58	20	7	3	3.0		X		X	
3B	TB5-9,10	J6U	42	4	22	3			X		X	
4A	TB4-9,10	I6U	41	3	8	4		2.0	X		X	
4B	TB4-11,12	I6L	45	7	9	4	3.0		X		X	
5A	TB3-1,2	J1U	55	17	15	5	15.0		X		X	
				-	31	2	3.0		X		X	X
5B	TB5-11,12	J6L	46	8	23	5	15.0		X		X	
6A	TB3-5,6	J2U	40	2	16	6			X	X	X	
6B	TB3-7,8	J2L	44	6	17	6			X	X	X	

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



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THE SIGNAL DESIGN: 08-0410
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

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Electrical Detail - Sheet 1 of 3

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Prepared for:
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ITS & Signals Management Section
State of North Carolina Department of Transportation
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Division 8 Moore County Seven Lakes

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REVISIONS	INIT.	DATE

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SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

DATE

SIG. INVENTORY NO. 08-0410

OVERLAP PROGRAMMING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	3	4
Type	FYA 4 - Section	OFF	FYA 4 - Section	OFF
Included Phases	2	-	6	-
Modifier Phases	1	-	5	-
Modifier Overlaps	-	-	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0

MAXTIME STARTUP AND SOFTWARE FLASH PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Startup Parameters
Startup Clearance Hold
6

Unit Flash Parameters
All Red Flash Exit Time
6

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

Notice	Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
	1	Phase Vehicle	1		X	X	1
NOTICE PHASE 2 FLASH RED	2	Phase Vehicle	2		X		2
	3	Phase Vehicle	3		X	X	3
	4	Phase Vehicle	4		X		4
	5	Phase Vehicle	5		X		5
NOTICE PHASE 6 FLASH RED	6	Phase Vehicle	6		X	X	6
	7	Phase Vehicle	7		X		7
	8	Phase Vehicle	8		X	X	8
NOTICE OVERLAP 1 FLASH RED	9	Overlap	1		X	X	9
	10	Overlap	2		X	X	10
NOTICE OVERLAP 3 FLASH RED	11	Overlap	3		X		11
	12	Overlap	4		X		12
	13	Phase Ped	2				13
	14	Phase Ped	4				14
	15	Phase Ped	6				15
	16	Phase Ped	8				16
	17	Overlap	5		X	X	17
	18	Overlap	6		X		18

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0410
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

Electrical Detail - Sheet 2 of 3

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SIG. INVENTORY NO. 08-0410

PREEMPTION PROGRAMMING

Front Panel
Main Menu >Controller >Preemption >Preempt Phasing/Preempt Parameters

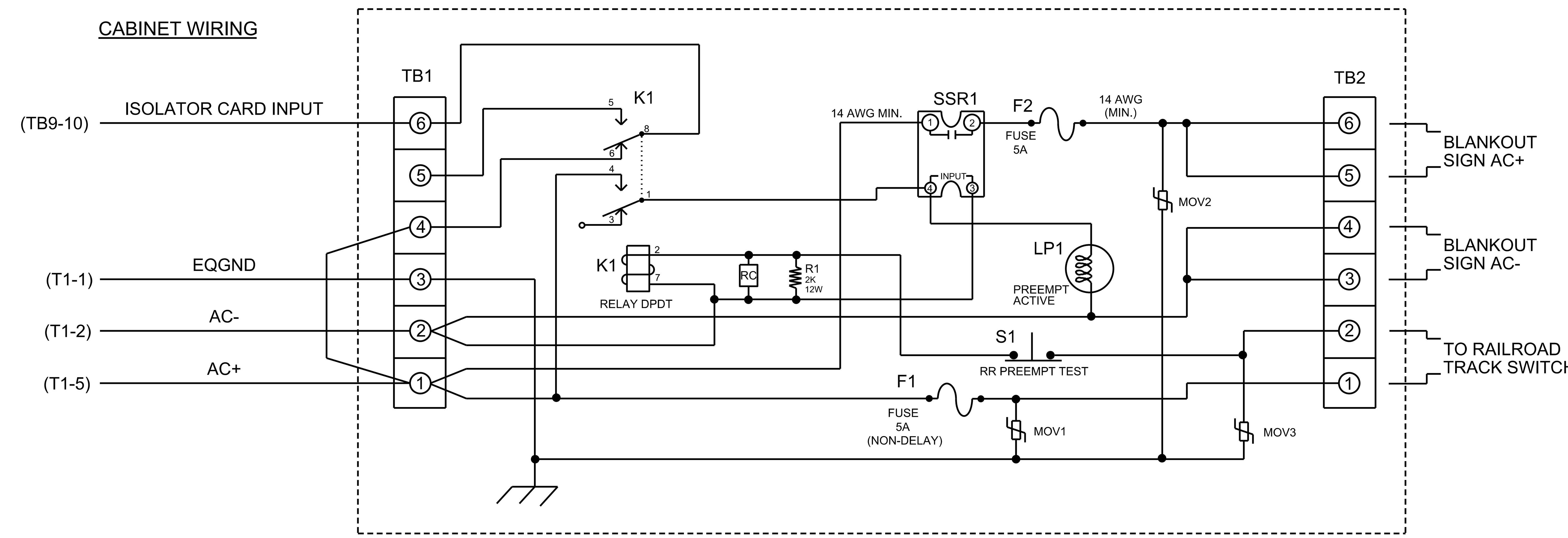
Web Interface
Home >Controller >Preempt Configuration >Preempts

Preempt Configuration

Preempt	1
Enabled	Enabled
Type	Rail Road
Track Phases	4,39
Track Overlaps	-
Dwell Phases	2,5
Dwell Peds	-
Dwell Overlaps	3
Cycling Phases	2,5,6
Cycling Peds	-
Cycling Overlaps	3
Exit Phases	4
Exit Overlaps	-
Delay	0
Call Ext Time	1.0
Max Presence	0
Max Pres Act	Terminate
Enter Min Green	1
Enter Walk	0
Enter Ped Clear	0
Enter Yellow Change	4.7
Enter Red Clear	3.2
Track Green	22
Track Yellow Clr	3.2
Track Red Clear	2.9
Dwell Green	0
Exit Min Green	255
Exit Yellow Change	25.5
Exit Red Clear	25.5
Exit Type	Exit Phases
Non Locking Memory	-
Not Ovrd Flash	X
Not Ovrd Nxt Pre	-
Require All Red Entry	-
Track Clear Ovrd	X
Ped Clear During Yellow	-
Entry Omit OLTG	X
Track Reserve	X

RAILROAD PREEMPTION WIRING DETAIL

(wire as shown below)



NOTES

1. Relay K1 is shown in the energized (Preempt not active) normal operation state.

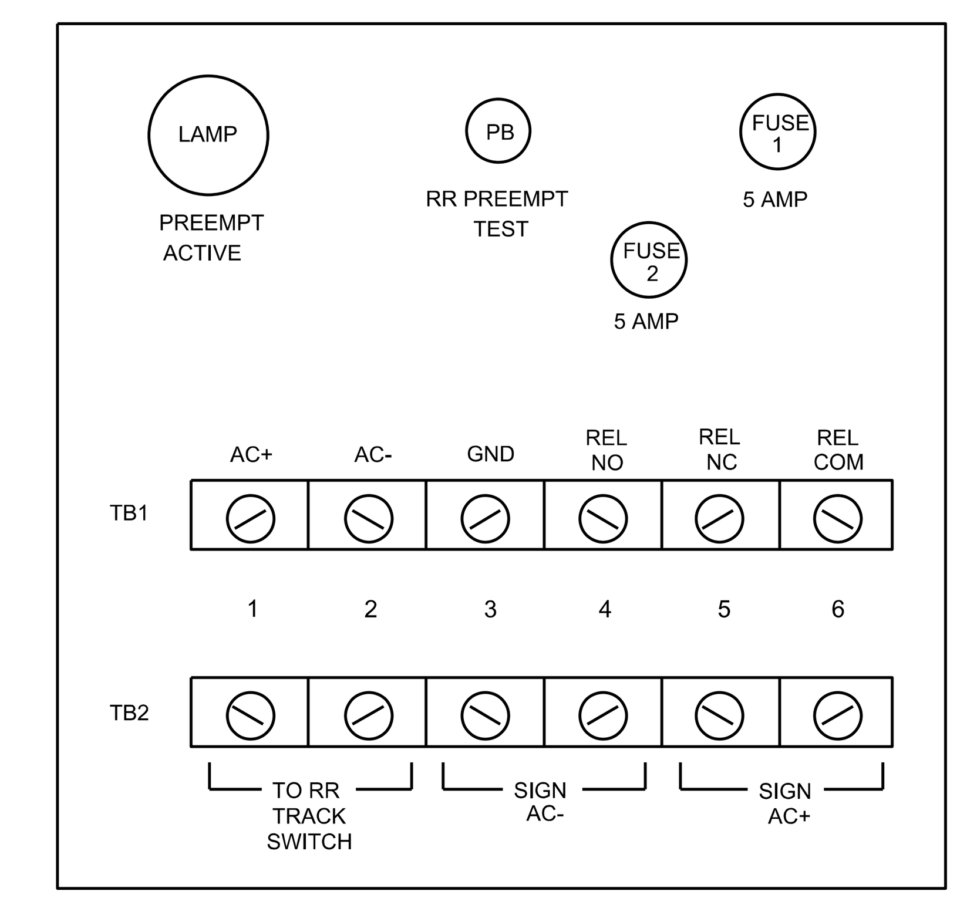
2. Relay K1 is a DPDT with 120VAC coil with octal base.

3. Relay SSR1 is a SPST (normally open) Solid State Relay with AC input and AC (25 amp) output.

4. AC Isolator Card shall activate preemption upon removal of AC+ from the input (as shown above). To accomplish this set invert dip switch on AC Isolator Card.

5. IMPORTANT!! A jumper must be added between input file terminals J14-E and J14-K if not already present. Also, terminal TB9-12 (on input panel) shall be connected to AC neutral (jumper may have to be added).

FRONT VIEW



SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

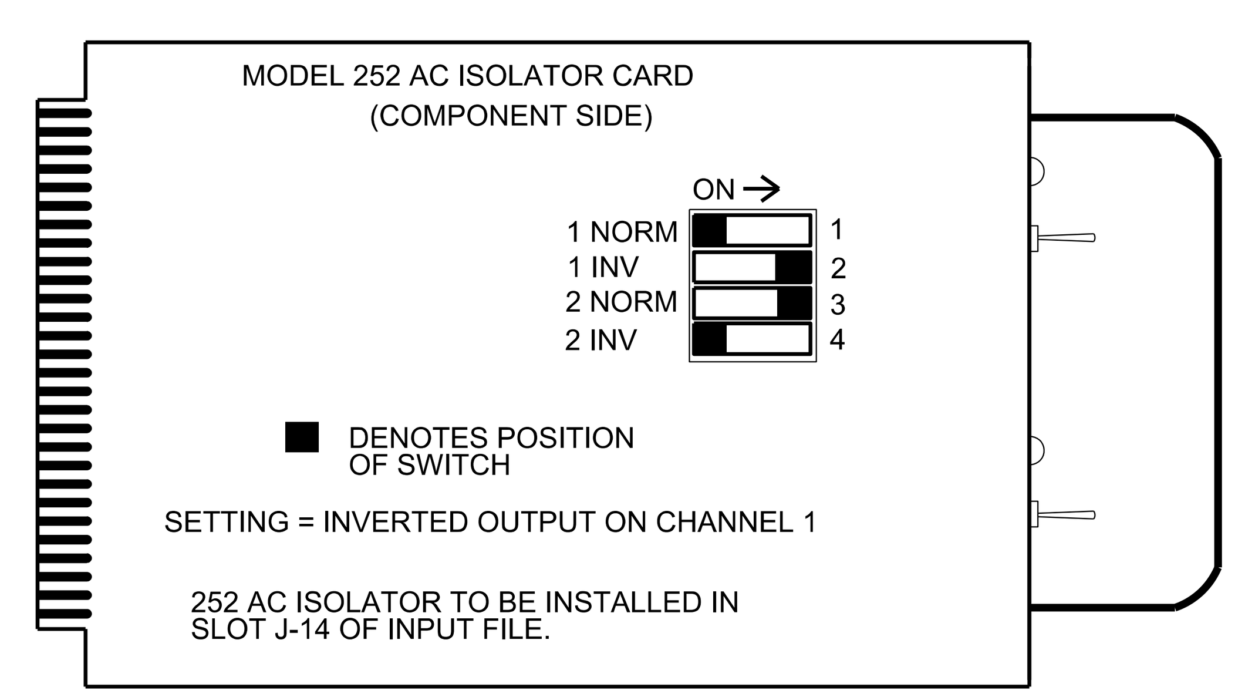
Web Interface
Home >Controller >Sequence

Sequence 1

Ring	Sequence Data
1	1,2,a,3,4,b
2	5,6,a,7,8,b
3	39,c,40,d

PREEMPT 1 AC ISOLATOR (MODEL 252) OUTPUT PROGRAMMING DETAIL

(set DIP switches as shown below)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 08-0410
DESIGNED: June 2024
SEALED: 7/11/2024
REVISED:

MOTT MACDONALD
MOTT MACDONALD I & E, LLC
930 Main Campus Drive
Suite 200
RALEIGH, NC 27606
License No. F-0669

Electrical Detail - Sheet 3 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 211
at
SR 1239 (Seven Lakes Drive)
and SR 1190 (Lakeway Drive)

Division 8 Moore County Seven Lakes

PLAN DATE: June 2024	REVIEWED BY: R. Mullinax
PREPARED BY: LD Stouchko	REVIEWED BY:

REVISIONS	INIT.	DATE

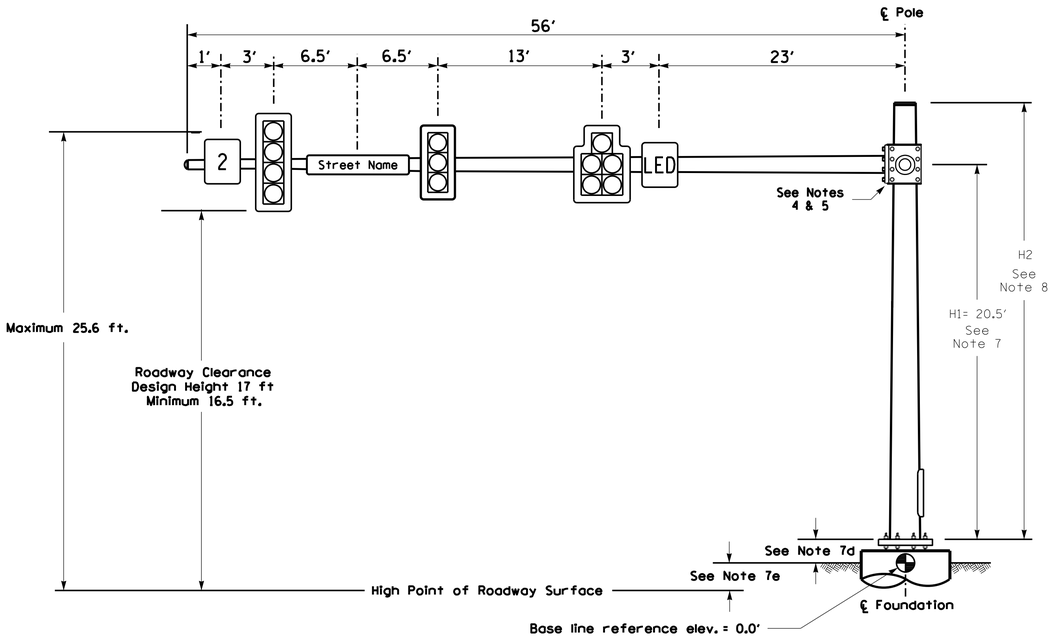
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 034437 LORI D. STOUCHKO

DATE

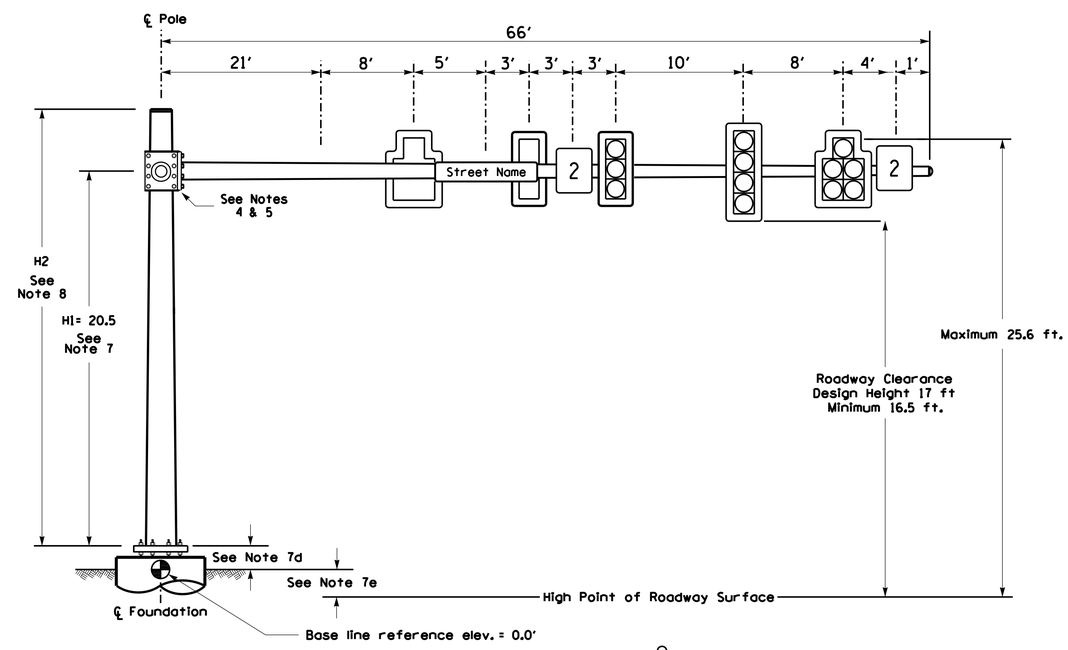
SIG. INVENTORY NO. 08-0410

Design Loading for METAL POLE NO. 1, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 1, MAST ARM B



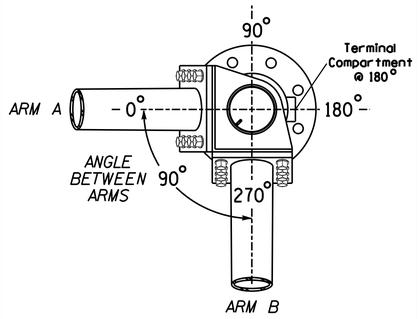
Elevation View @ 0°

SPECIAL NOTE

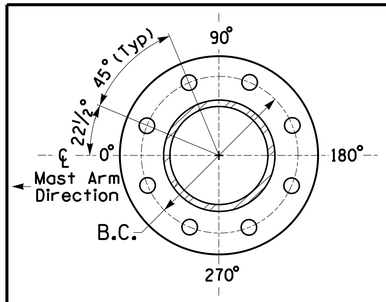
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

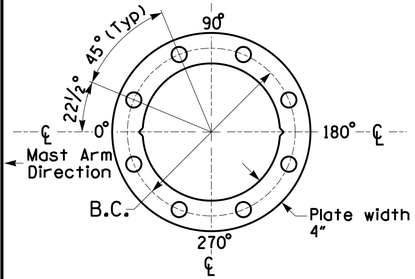
Elevation Differences for:	Pole 1	
Baseline reference point at ℄ Foundation @ ground level ⊕	0.0 ft.	
Elevation difference at High point of roadway surface	-1.5 ft.	
Elevation difference at Edge of travelway or face of curb	-0.6 ft.	



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. 3

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.19.4

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE	16.3 S.F.	42.0"W X 56.0"L	103 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5"W X 66.0"L	74 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5"W X 52.5"L	60 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0"W X 36.0"L	14 LBS
LED	L.E.D. BLANKOUT SIGN RIGID MOUNTED	5.0 S.F.	24.0"W X 36.0"L	110 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0"W X 96.0"L	36 LBS

MOTT MACDONALD

MOTT MACDONALD I & E, LLC
930 Main Campus Drive
Suite 200
RALEIGH, NC 27606
License No. F-0669

NOTES

DESIGN REFERENCE MATERIAL

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

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate arm connection points.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   Mast arm attachment height (H1) plus 2 feet, or
   H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 4 (90 mph)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

NC 211
at
SR 1239 (Seven Lakes Drive)
and SR 1190 (Lakeway Drive)

Division 8 | Moore County | Seven Lakes

PLAN DATE:	June 2024	REVIEWED BY:	R. Mullinax
PREPARED BY:	LD Stouchko	REVIEWED BY:	

SCALE: 0 N/A N/A

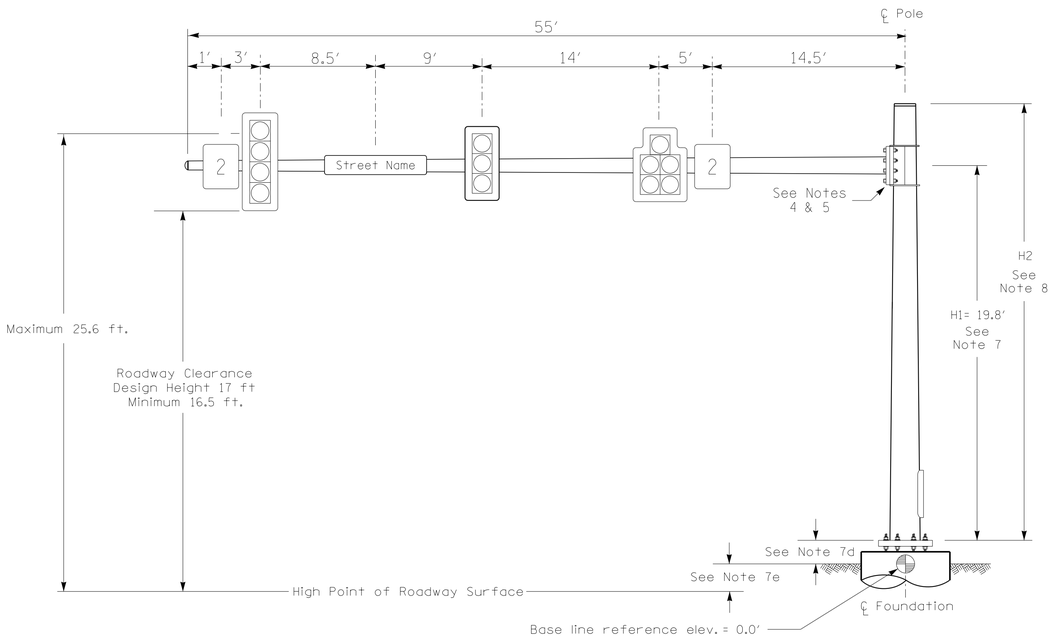
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D. STOUCHKO

SIGNATURE | DATE

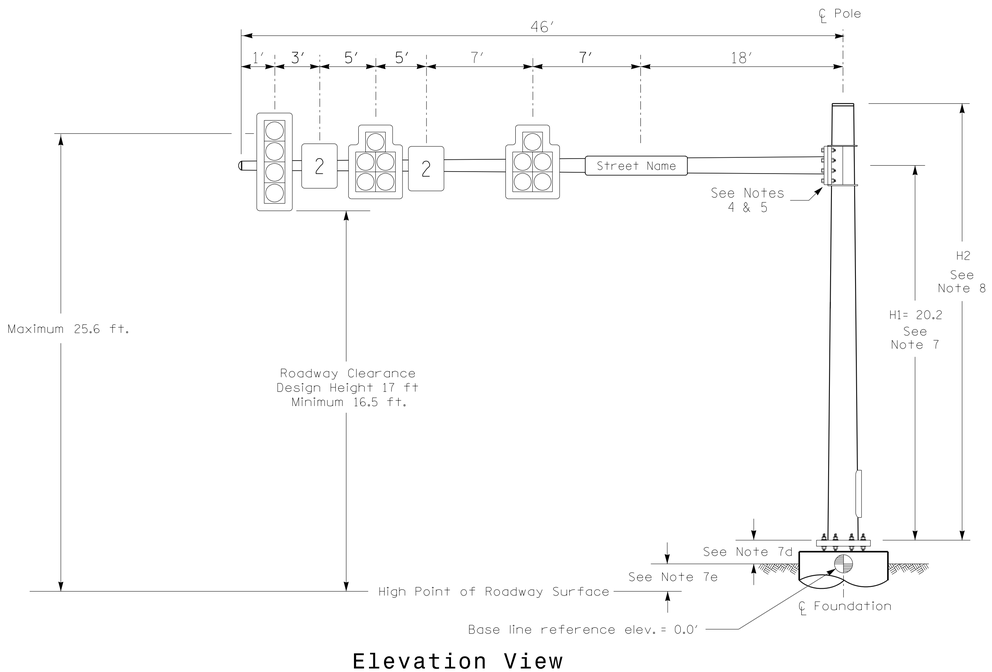
SIG. INVENTORY NO. 08-0410

Design Loading for METAL POLE NO. 2



Elevation View @ 270°

Design Loading for METAL POLE NO. 3



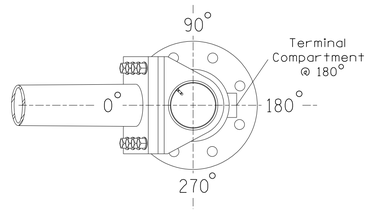
Elevation View

SPECIAL NOTE

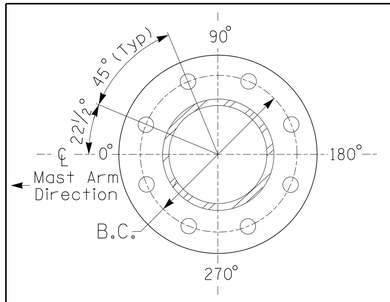
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 2	Pole 3
Baseline reference point at ℄ Foundation @ ground level ⊕	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-0.8 ft.	-1.1 ft.
Elevation difference at Edge of travelway or face of curb	0.5 ft.	-0.6 ft.

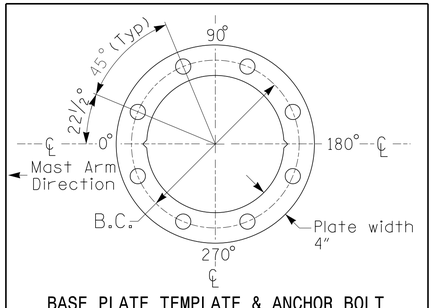


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

METAL POLE No. 2 and 3

PROJECT REFERENCE NO.	SHEET NO.
R-5726	Sig.19.5

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12″-5 SECTION-WITH BACKPLATE	16.3 S.F.	42.0″W X 56.0″L	103 LBS
	RIGID MOUNTED SIGNAL HEAD 12″-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5″W X 66.0″L	74 LBS
	RIGID MOUNTED SIGNAL HEAD 12″-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5″W X 52.5″L	60 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0″W X 36.0″L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″W X 96.0″L	36 LBS

MOTT MACDONALD

MOTT MACDONALD I & E, LLC
930 Main Campus Drive
Suite 200
RALEIGH, NC 27606
License No. F-0669

NOTES

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

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 4 (90 mph)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared for: Transportation Mobility and Safety Division, North Carolina Department of Transportation, Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

NC 211
at
SR 1239 (Seven Lakes Drive)
and SR 1190 (Lakeway Drive)

Division 8 Moore County Seven Lakes

PLAN DATE: June 2024 REVIEWED BY: R. Mullinax

PREPARED BY: LD Stouchko REVIEWED BY:

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 034437 ENGINEER LORI D STOUCHKO

SIGNATURE DATE

SIG. INVENTORY NO. 08-0410

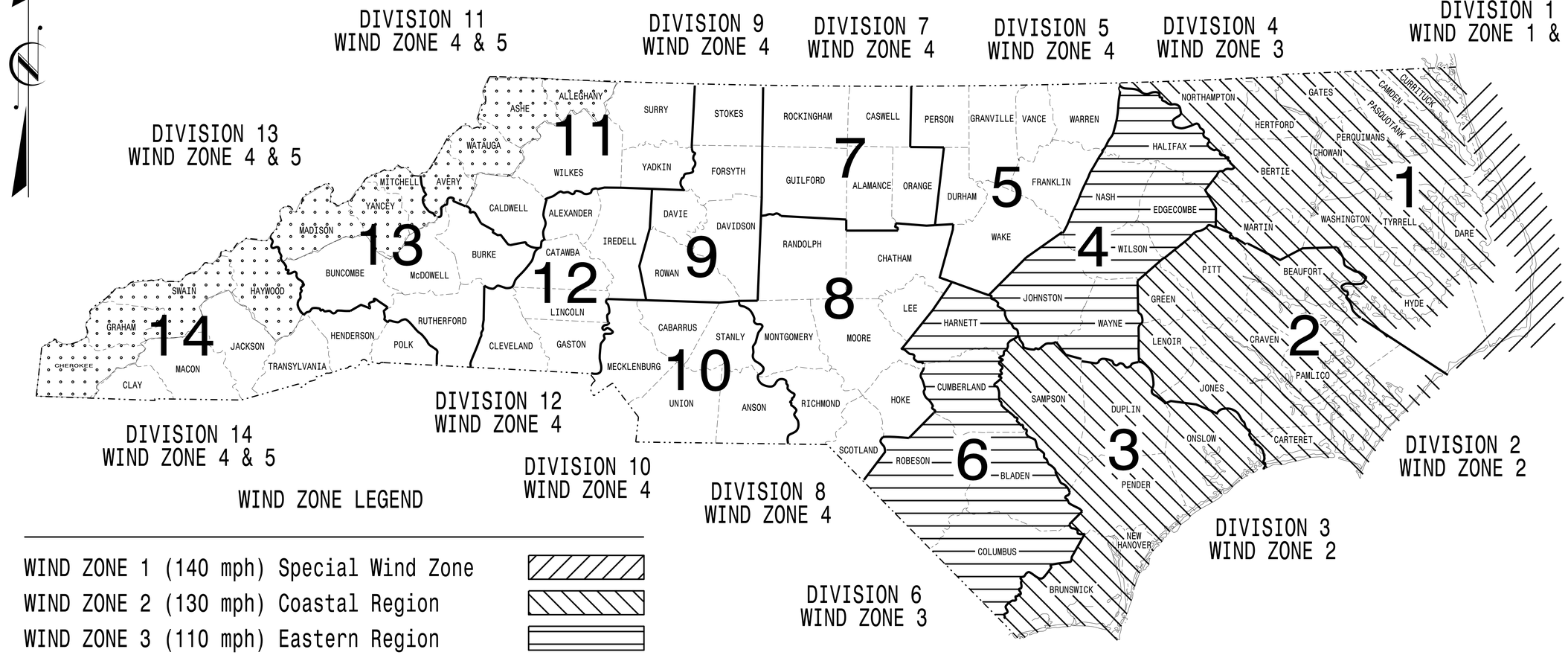
PROJECT I.D. NO.	SHEET NO.
	Sig.M1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR ALL METAL POLES

POLE STANDARDS

NCDOT METAL P



WIND ZONE LEGEND

WIND ZONE 1 (140 mph) Special Wind Zone	
WIND ZONE 2 (130 mph) Coastal Region	
WIND ZONE 3 (110 mph) Eastern Region	
WIND ZONE 4 (90 mph) Central & Mtn. Region	
WIND ZONE 5 (120 mph) Special Wind Zone	

https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

Prepared In the Offices of:

Transportation Mobility and Safety Division
Signal Design Section
STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

750 N.Greenfield Pkwy.
Garner,NC 27529

Designed in conformance with the latest 2015 Interim to the 6th Edition 2013

AASHTO

Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

INDEX OF PLANS

DRAWING NUMBER	*DESCRIPTION*
Sig. M 1	*Statewide Wind Zone Map*
Sig. M 2	*Typical Fabrication Details–All Metal Poles*
Sig. M 3	*Typical Fabrication Details–Strain Poles*
Sig. M 4	*Typical Fabrication Details–Mast Arm Poles*
Sig. M 5	*Typical Fabrication Details–Mast Arm Connection*
Sig. M 6	*Typical Fabrication Details–Strain Pole Attachments*
Sig. M 7	*Construction Details–Foundations*
Sig. M 8	*Standard Strain Pole Foundation–All Soil Conditions*

NCDOT CONTACTS:

MOBILITY AND SAFETY DIVISION – ITS AND SIGNALS UNIT

M.M. MCDIARMID, P.E. – STATE ITS AND SIGNALS ENGINEER

J. P. GALLOWAY, P.E. – STATE SIGNALS ENGINEER

D.C. SARKAR, P.E. – ITS AND SIGNALS SENIOR STRUCTURAL ENGINEER

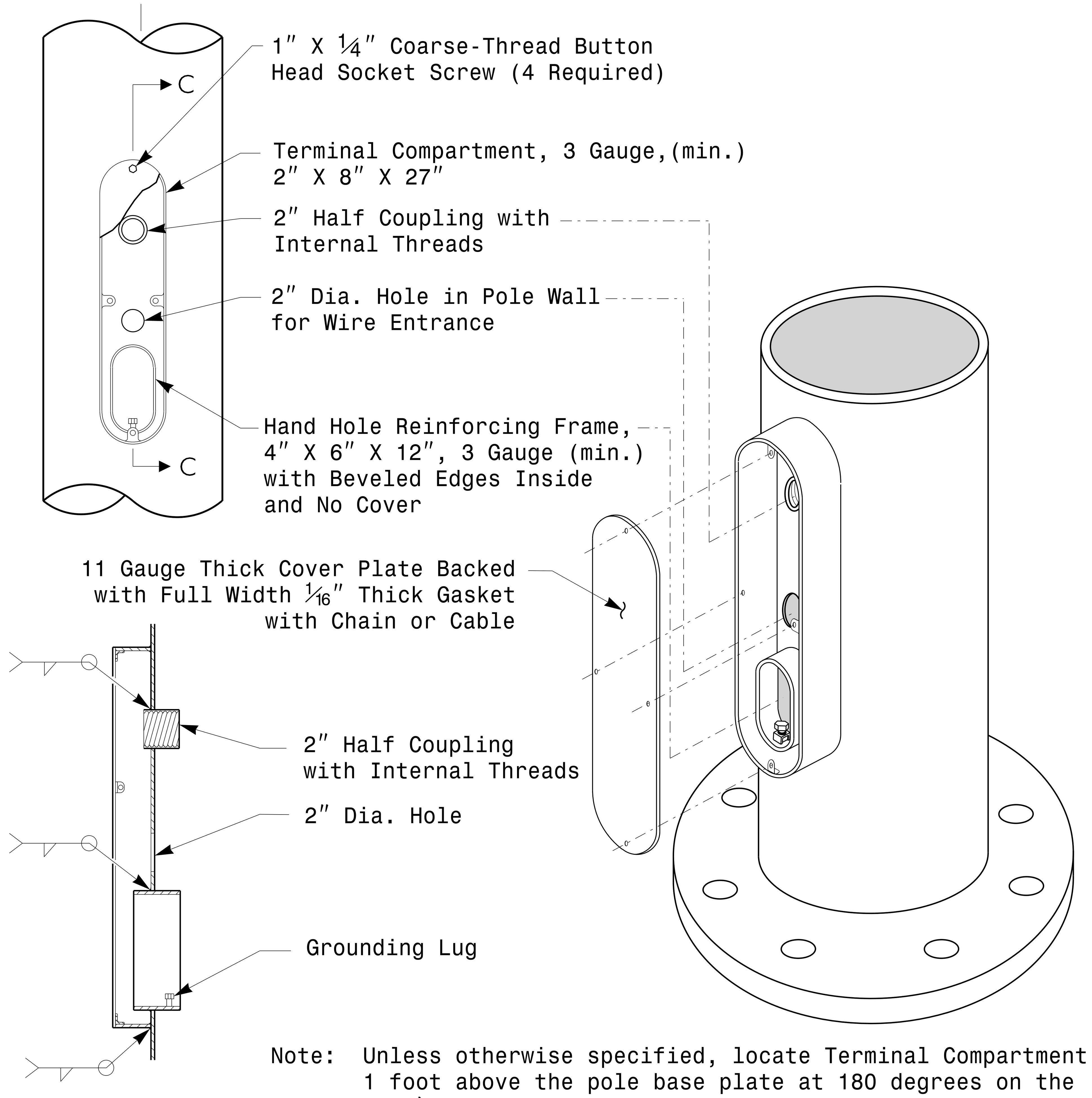
SEAL

NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

DocuSigned by: Debesh C. Sarkar 44E8E3... SIGNATURE

10/11/2017 DATE

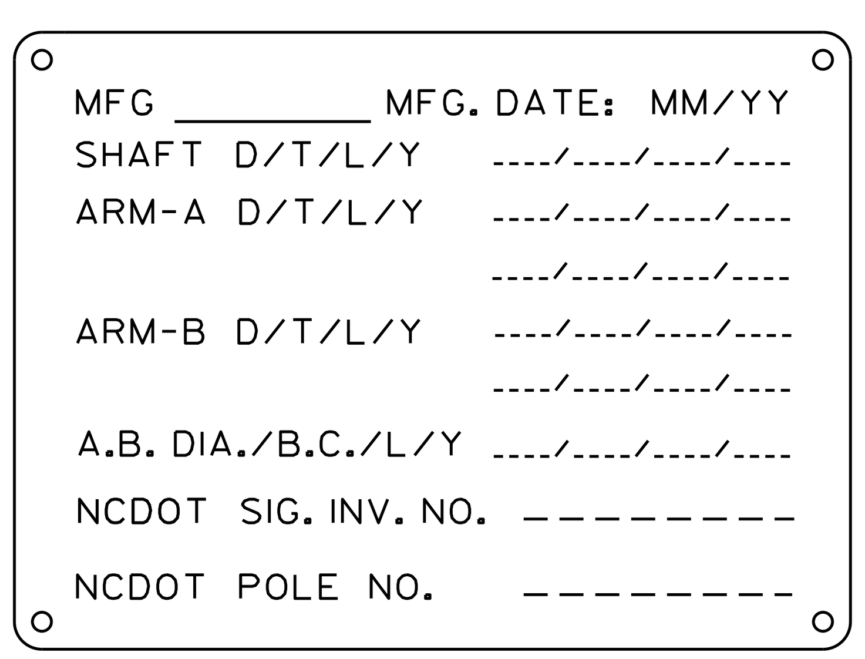
Fabrication Details – All Metal Poles



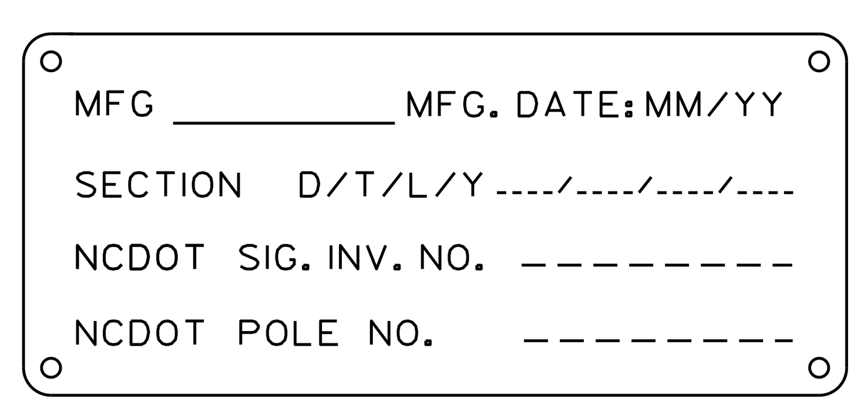
Section C-C

Note: Unless otherwise specified, locate Terminal Compartment 1 foot above the pole base plate at 180 degrees on the pole's radial index.

Terminal Compartment Detail



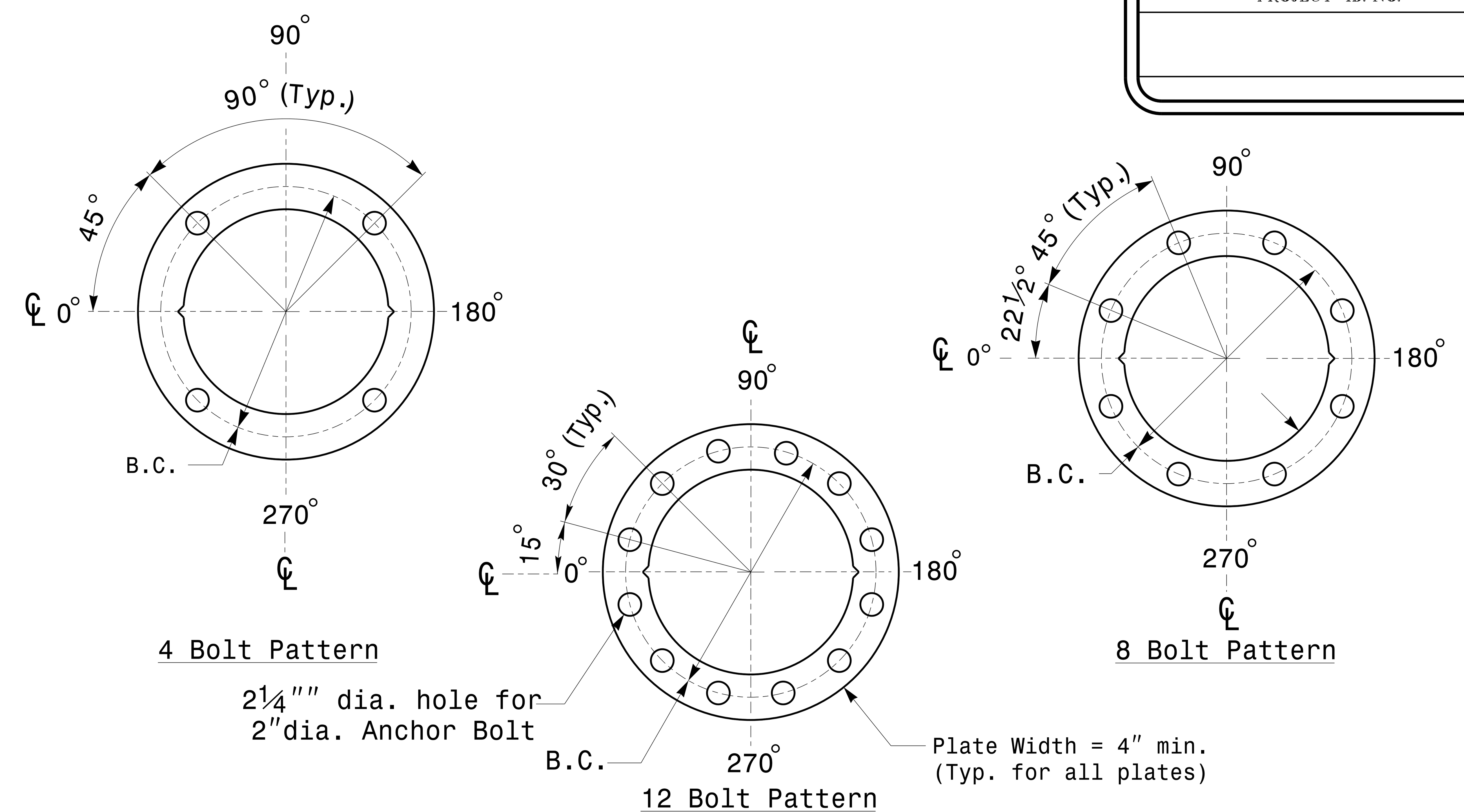
Shaft I.D. Tag
(Provide on Shaft of Strain Poles and Mast Arm Poles Shaft)



Arm I.D. Tag
(Provide on each section of a multi-section mast arm.)

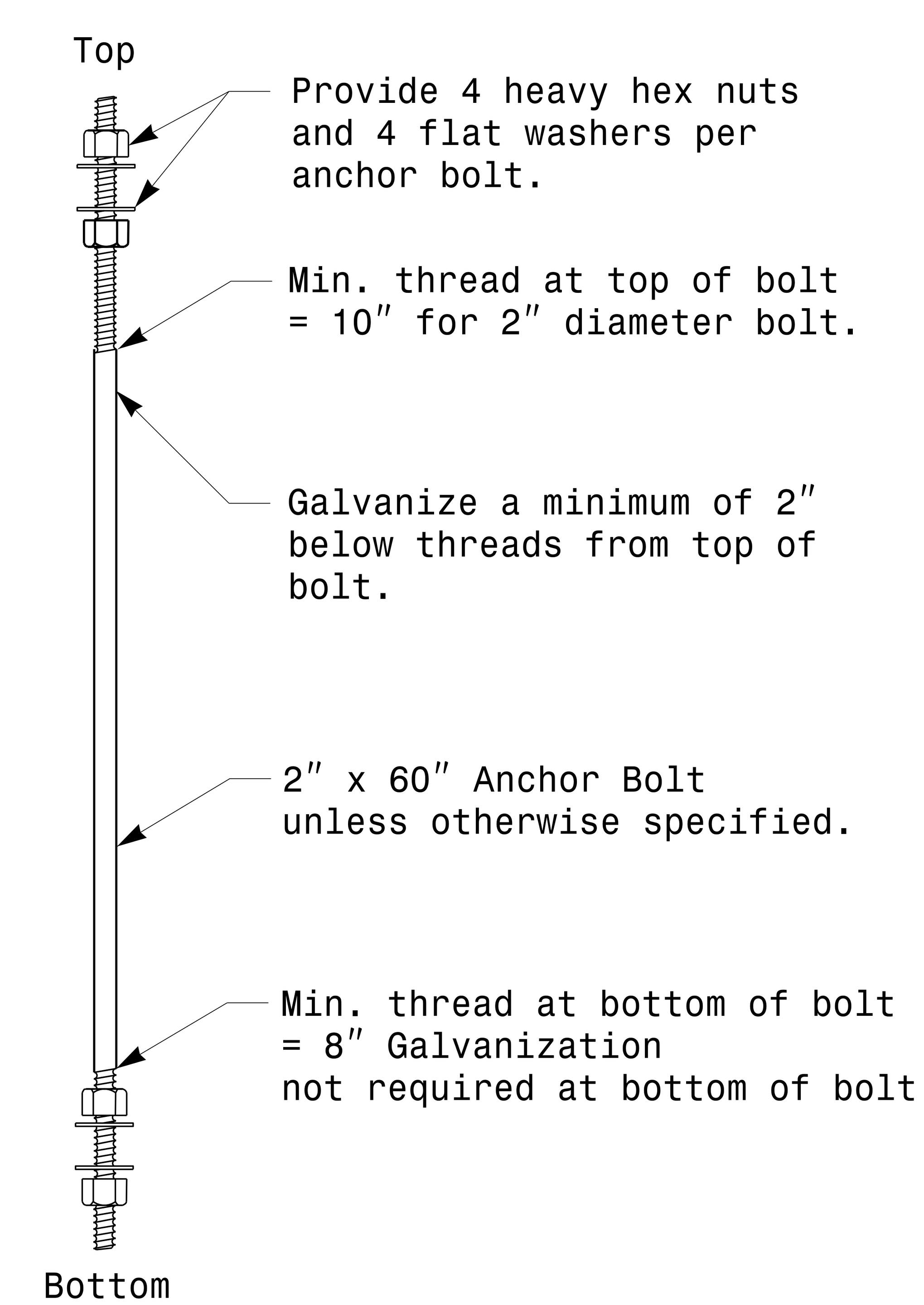
Notes:
1) D= Diameter, T= Thickness, L= Length, Y= Yield Strength
2) A.B. = Anchor Bolt
3) B.C. = Bolt Circle of Anchor Bolts
4) If Custom Design, use "NCDOT STANDARD" line for Signal Inv. Number and pole I.D. number
5) See drawing M3 and M4 for mounting positions of I.D. tags.

Identification Tag Details

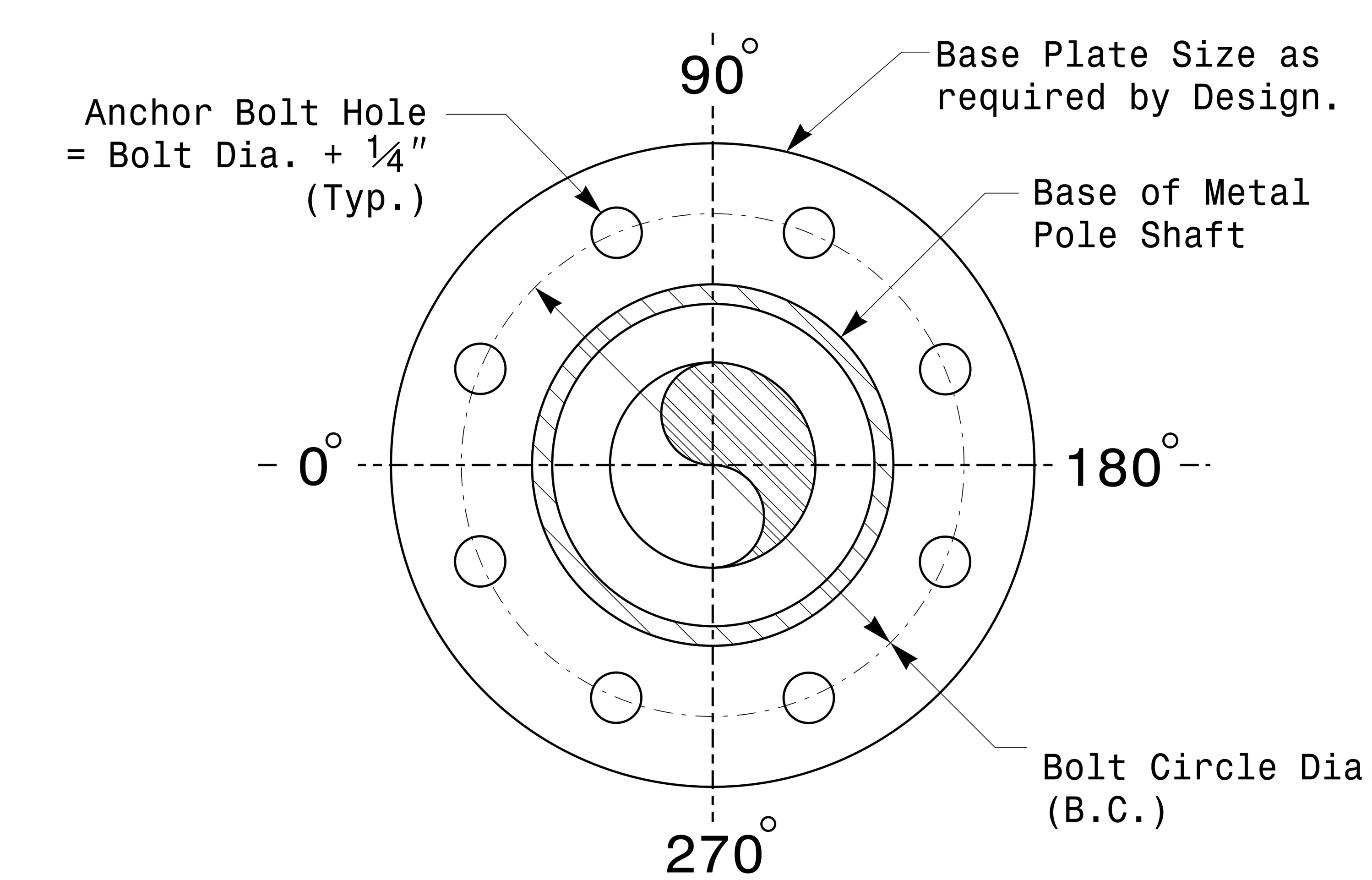


Construct Templates and Plates from 1/4″ min. thick Steel. Galvanizing is not required.

Base Plate Template and Anchor Bolt Lock Plate Details



Anchor Bolt Detail



Note: Base plate may be circular,octagonal,square or rectangular in shape.

Typical Base Plate Detail

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

SCALE 0 NA NONE

Typical Fabrication Details For All Metal Poles

PLAN DATE:	OCTOBER 2017	DESIGNED BY:	C.F.ANDREWS
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

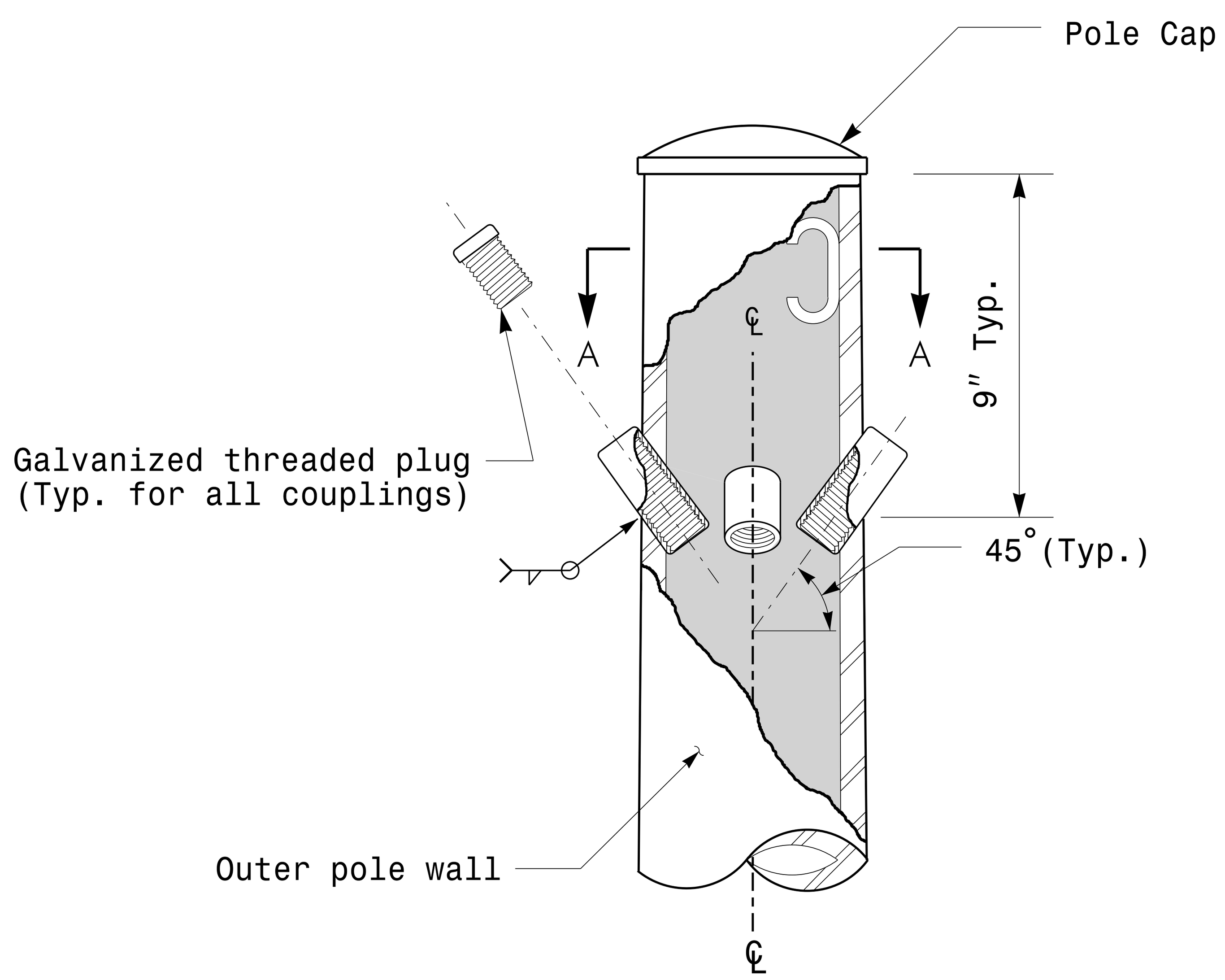
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

DocuSigned by: Debesh C. Sarkar 44E8E32... SIGNATURE
10/11/2017 DATE

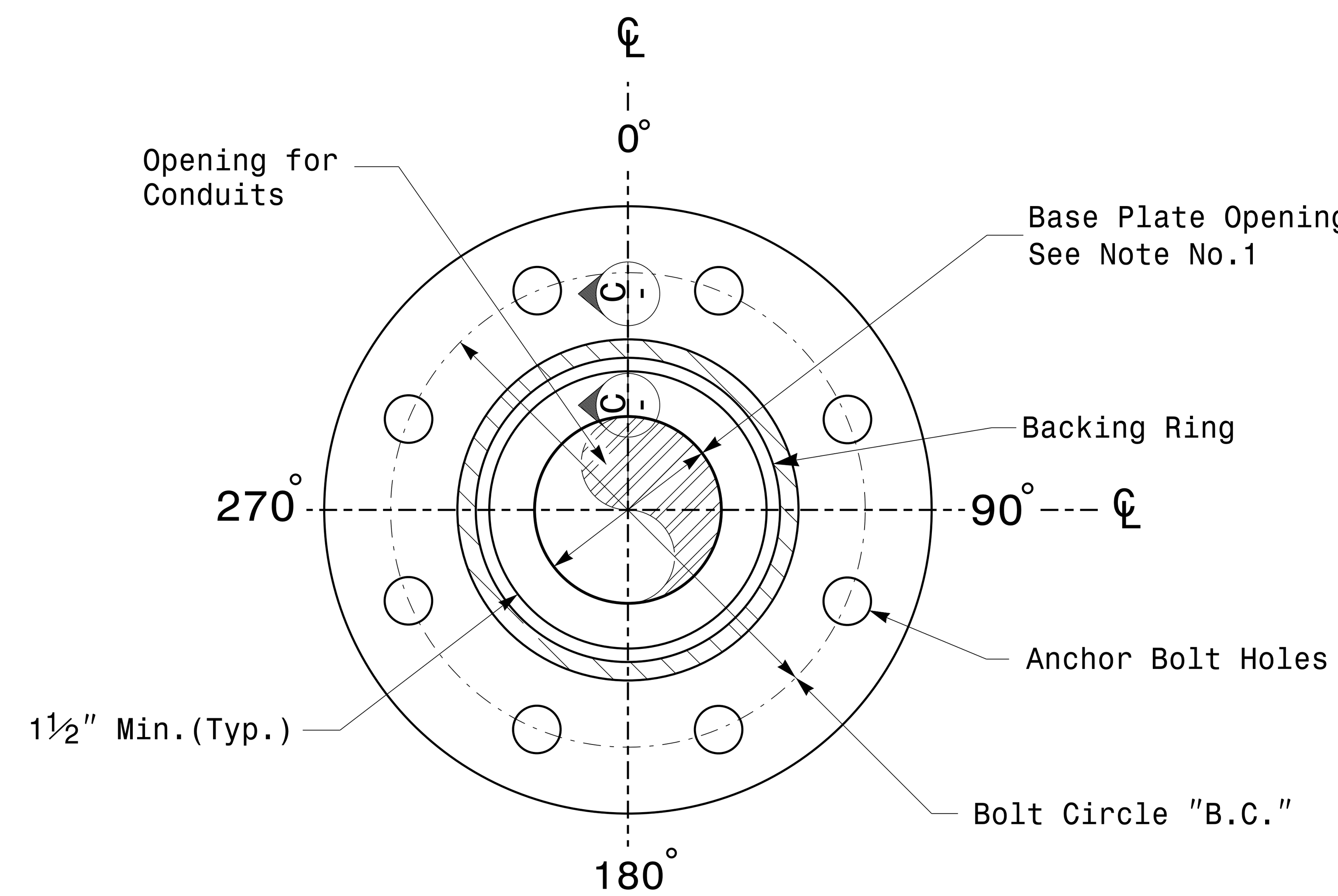
PROJECT ID. NO.	SHEET NO.
	Sig.M3

Fabrication Details – Strain Poles

Note:
1. Opening in pole base plate shall be equal to pole base inside diameter minus 3½″ but shall not be less than 8½″.

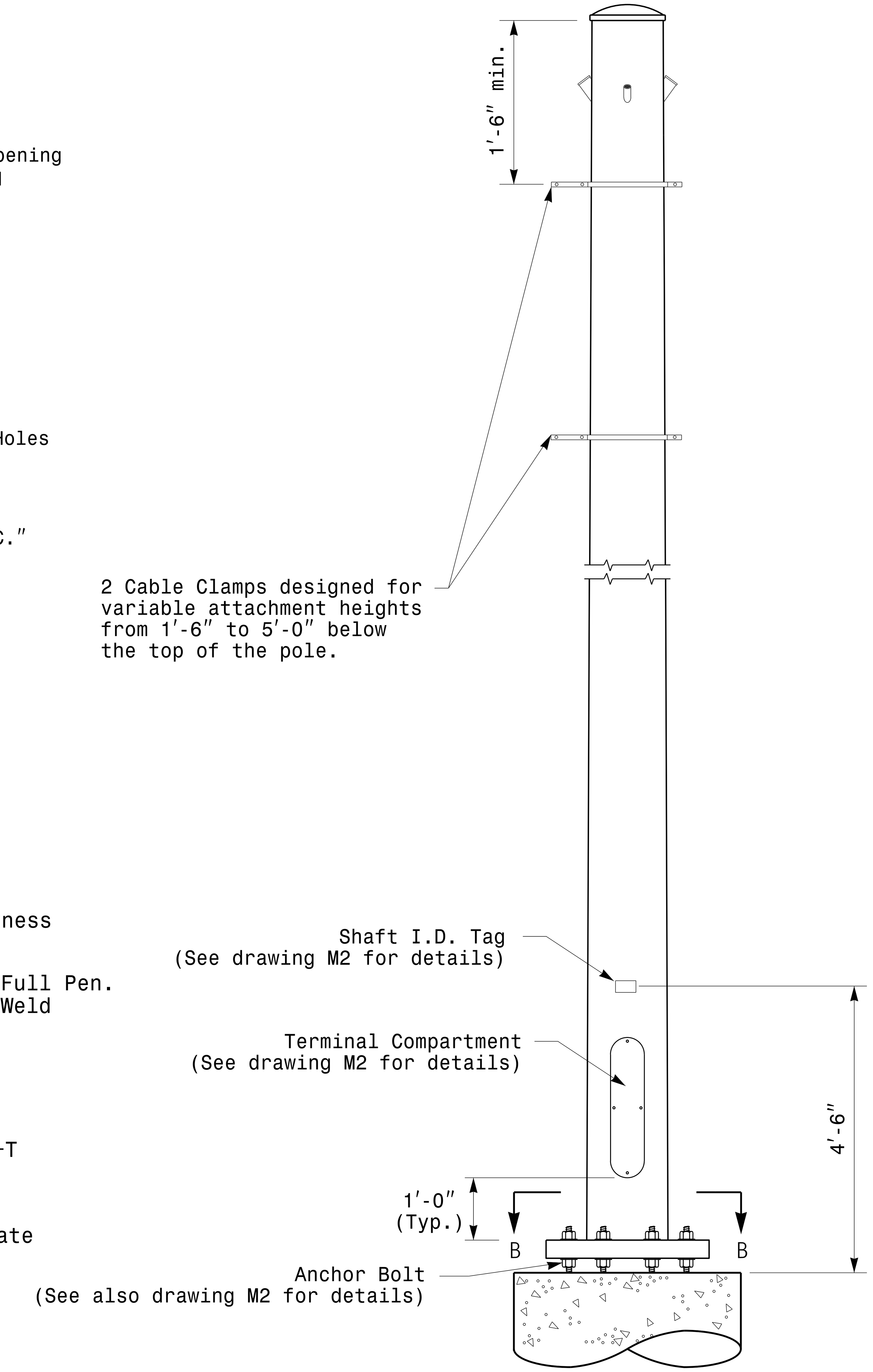


Cable Entrances at Top of Pole

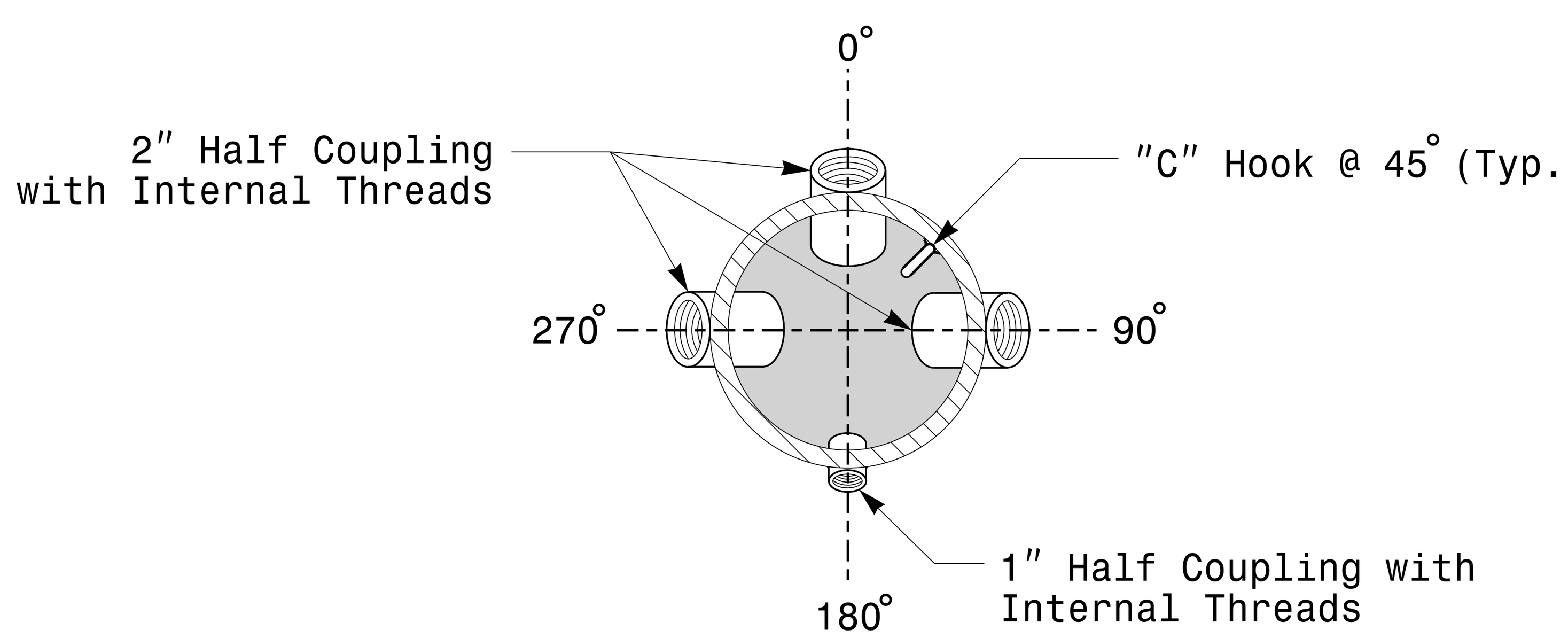


Section B-B

Pole Base Plate Details
(8 and 12 Bolt Pattern)

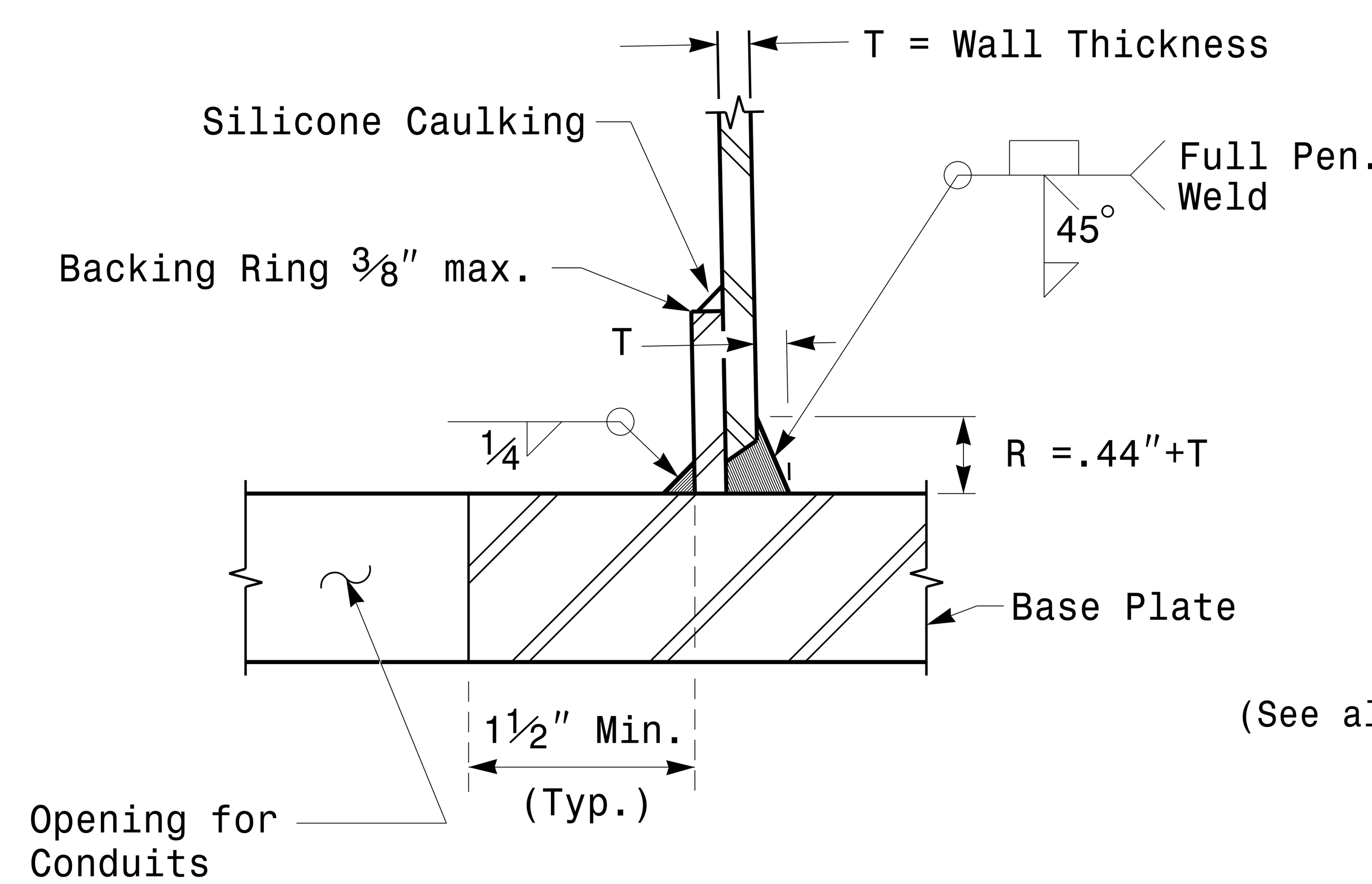


Monotube Strain Pole



Section A-A

Radial Orientation for Factory Installed Accessories at Top of Pole



Section C-C

(Pole Attachment to Base Plate)

Full-Penetration Groove Weld Detail

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

Typical Fabrication Details
For
Strain Poles

PLAN DATE:	OCTOBER 2017	DESIGNED BY:	K.C.DURIGON
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

SCALE
0 NA
NONE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
028094
ENGINEER
DEBESH C. SARKAR

DocuSigned by:
Debesh C. Sarkar
SIGNATURE

10/11/2017
DATE