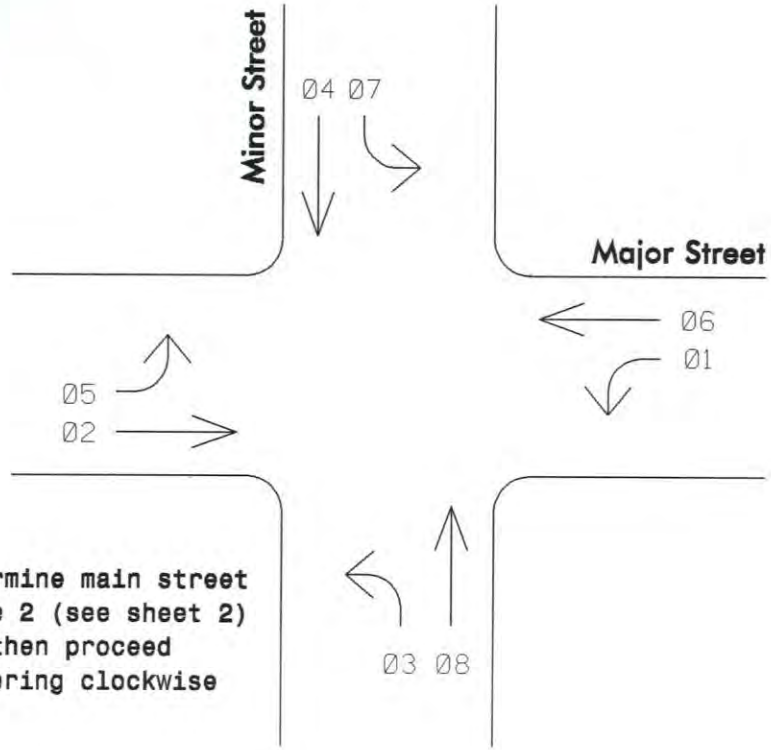
## Standard NEMA Orientation
## Dual Ring Cabinet

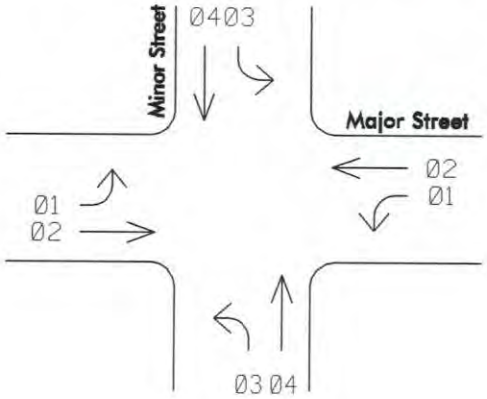



Determine main street phase 2 (see sheet 2) and then proceed numbering clockwise

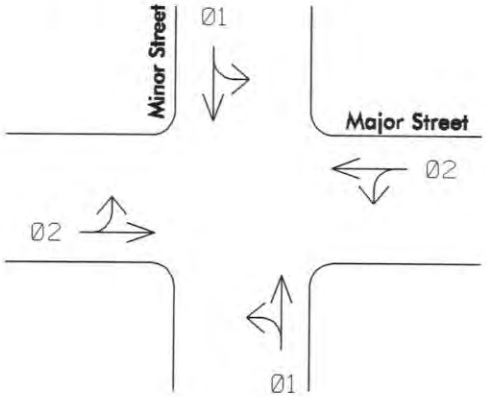
Sum of phases for each major street approach is 7.
(1+6=7 and 2+5=7)

Sum of phases for each minor street approach is 11.
(3+8=11 and 4+7=11)

## Standard NEMA Orientation
## Single Ring 4 Phase Cabinet




## Standard NEMA Orientation
## Single Ring 2 Phase Cabinet



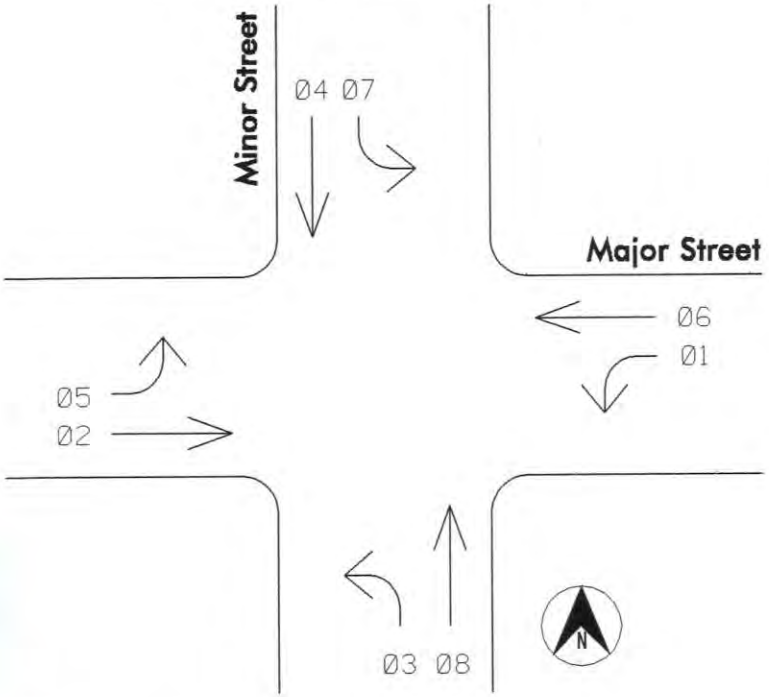

# Numbering of NEMA Phases

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-09

STD. NO.
2.0
SHEET 1 OF 4

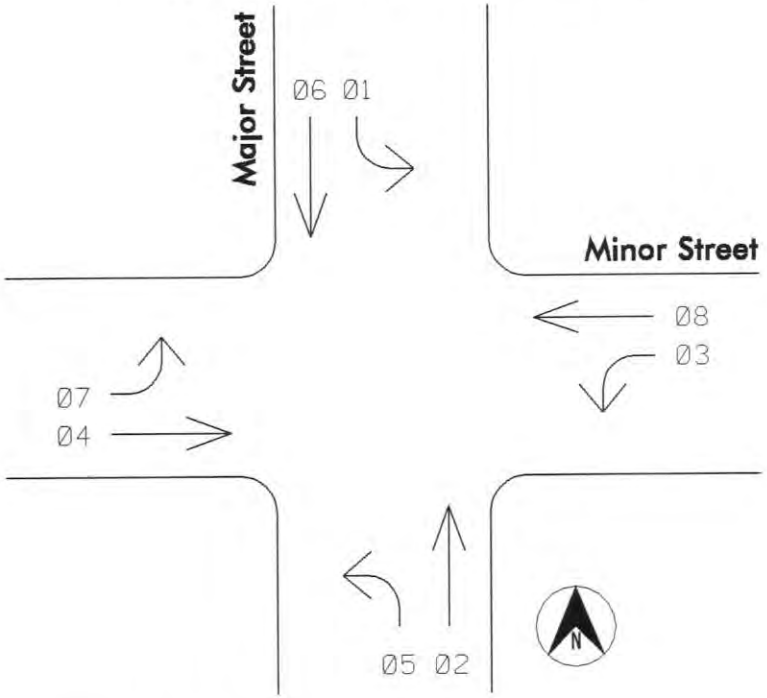
## Standard NEMA Orientation
## Dual Ring Cabinet
## Major Street runs East–West




### Phase Numbering

Phase 2 - Eastbound through movement
Phase 4 - Southbound through movement
Phase 6 - Westbound through movement
Phase 8 - Northbound through movement
Pair turning movements with the through movements if an exclusive left turn phase (protected or protected/permissive) is not used.
If location is being added to an existing system, match phase numbering to the system.

## Standard NEMA Orientation
## Dual Ring Cabinet
## Major Street runs North–South




### Phase Numbering

Phase 2 - Northbound through movement
Phase 4 - Eastbound through movement
Phase 6 - Southbound through movement
Phase 8 - Westbound through movement
Pair turning movements with the through movements if an exclusive left turn phase (protected or protected/permissive) is not used.
If location is being added to an existing system, match phase numbering to the system.

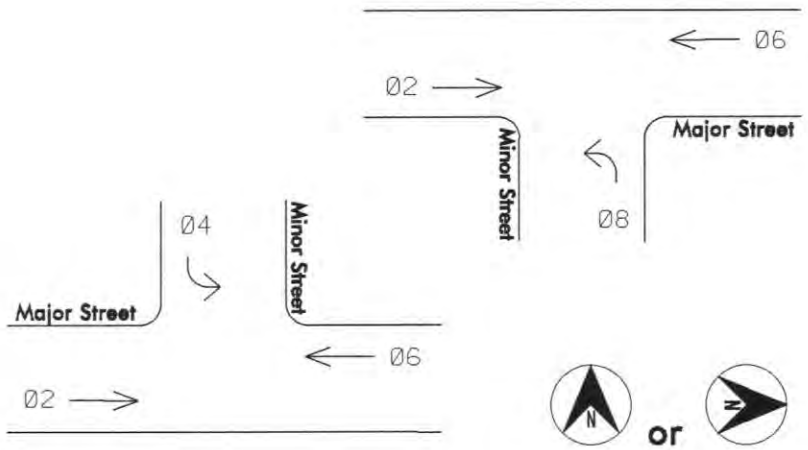
# Numbering of NEMA Phases

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-09

STD. NO.
2.0
SHEET 2 OF 4

## Determining Movement Phase Numbers
## Tee Intersections



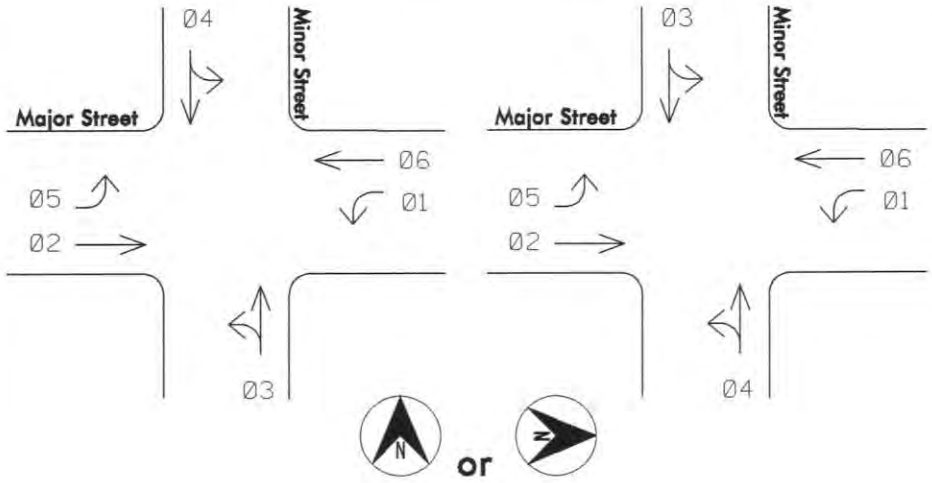

### Phase Numbering

Movement numbering will conform to standard NEMA phasing shown on Sheet 1.

Phase 2 - Eastbound or Northbound through movement
Phase 4 - Southbound or Eastbound Stem of Tee movement
Phase 6 - Westbound or Southbound through movement
Phase 8 - Northbound or Westbound Stem of Tee movement

NOTE: For 2070 SE-PAC, there must be a phase in Ring 1 for phase 2 to operate. This means that there must be a phase 2 for phase 6 to operate and there must be a phase 4 if using phase 8. For Tee intersections on SE-PAC use phase 4 for the stem of the Tee.

## Determining Movement Phase Numbers
## Split Side Streets




### Phase Numbering

Main street movement numbering will conform to standard NEMA phasing shown on Sheet 1.

For side street movement numbering:

- If one approach is desired to be serviced first, label it phase 3 and the other approach phase 4.
- If there is no desire for either approach to be serviced first, label phase 4 for the eastbound or southbound movement and phase 3 for the westbound or northbound movement.

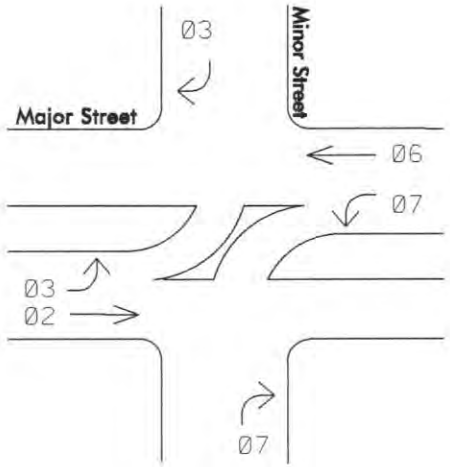
# Numbering of NEMA Phases

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

12-10

STD. NO.
2.0
SHEET 3 OF 4

## Determining Superstreet Phase Numbers
### Cross Intersections w/"Leftovers"

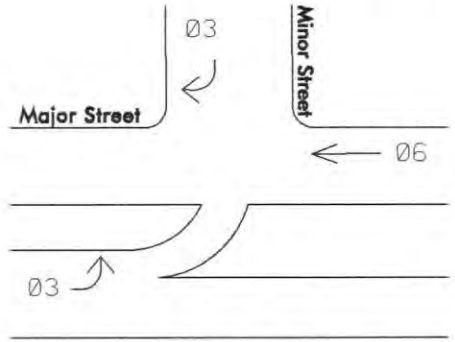



### Phase Numbering

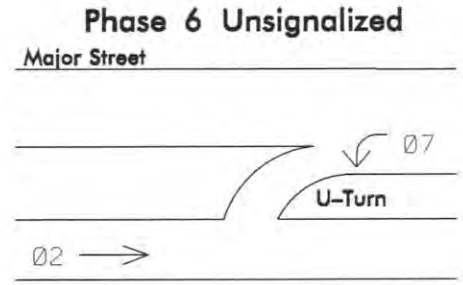
Main street through movement numbering will conform to standard NEMA phasing shown on Sheet 1.

For left turn and side street movement numbering:
- -Phase should be an odd number on the opposite side of NEMA barrier (3 or 7).
- -Sum of phases used at a superstreet signal should total 9 (2+7=9 or 3+6=9).
- -At a cross, each "pair" of movements should be controlled by separate controllers and cabinets to facilitate system coordination

## Determining Superstreet Phase Numbers
### U-Turn Only, Tee, or Unsignalized Right Turns




Phase 2 Unsignalized




### Phase Numbering

Main street through movement numbering will conform to standard NEMA phasing shown on Sheet 1.

No signal heads needed for through movement adjacent to left turn movement if there is no signalized conflicting movment.

For left turn movement numbering:
- -Phase should be an odd number on the opposite side of NEMA barrier (3 or 7).
- -Sum of phases used at a superstreet signal should total 9 (2+7=9 or 3+6=9).
- -At a cross, each "pair" of movements should be controlled by separate controllers and cabinets to facilitate system coordination

# Numbering of NEMA Phases

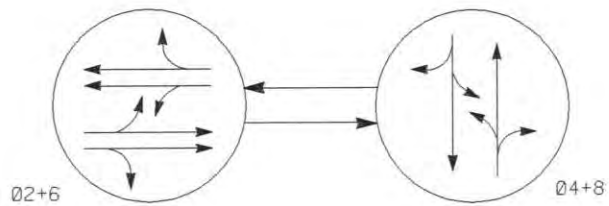
SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-09

STD. NO.
2.0
SHEET 4 OF 4

# 2–Phase
# Dual–Ring Cabinet

## PHASING DIAGRAM




| TABLE OF OPERATION | | | |
|---|---|---|---|
| SIGNAL FACE | PHASE | | |
| | Ø2+6 | Ø4+8 | FLASH |
| | | | |
| | | | |
| | | | |
| | | | |

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## Phasing Typicals: 2–Phase Operation

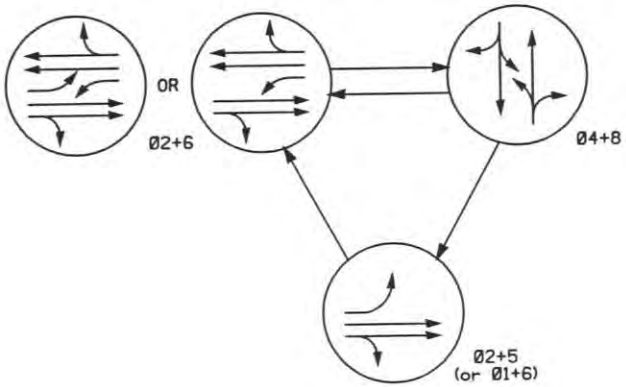
SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.1
SHEET 1 OF 1

## 3–Phase
## Minimum Recall
## Protected or Protected/Permissive
## at Cross Intersection
## Dual–Ring Cabinet

PHASING DIAGRAM



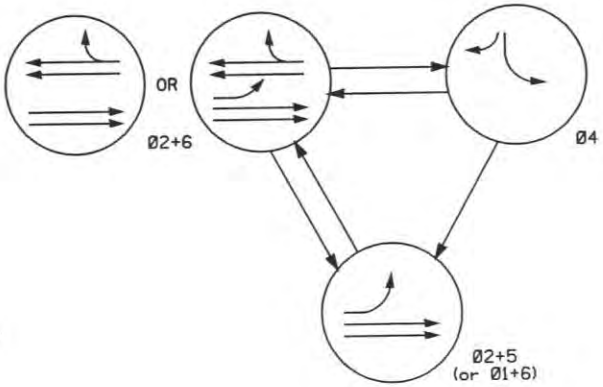

| TABLE OF OPERATION | | | | |
|---|---|---|---|---|
| SIGNAL FACE | PHASE | | | |
| | Ø + | Ø 2 + 6 | Ø 4 + 8 | FLASH |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

*Use appropriate omit note(s)*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 3–Phase
## Minimum Recall
## Protected or Protected/Permissive
## at Tee Intersection
## Dual–Ring Cabinet

PHASING DIAGRAM




| TABLE OF OPERATION | | | | |
|---|---|---|---|---|
| SIGNAL FACE | PHASE | | | |
| | Ø + | Ø 2 + 6 | Ø 4 | FLASH |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

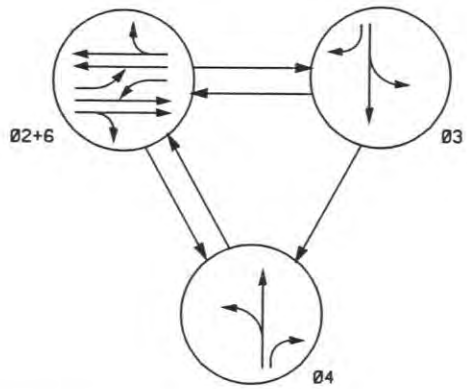
# Phasing Typicals: 3–Phase Operation

SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

STD. NO.
**2.1.2**
SHEET 1 OF 2

## 3–Phase
## Minimum Recall
## Split–Side Street
## Dual–Ring Cabinet

PHASING DIAGRAM

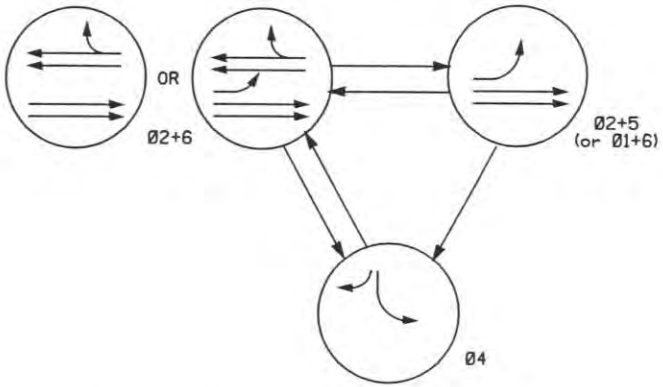



| TABLE OF OPERATION | | | | |
|---|---|---|---|---|
| SIGNAL FACE | PHASE | | | |
| | Ø2+6 | Ø3 | Ø4 | FLASH |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 3–Phase
## Minimum Recall
## Lagging Left Operation
## Protected or Protected/Permissive
## at Tee Intersection
## Dual–Ring Cabinet

PHASING DIAGRAM




| TABLE OF OPERATION | | | | |
|---|---|---|---|---|
| SIGNAL FACE | PHASE | | | |
| | Ø2+6 | Ø+ | Ø4 | FLASH |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: 3–Phase Operation

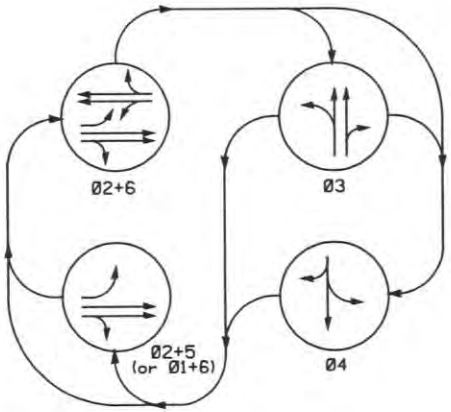
SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.2
SHEET 2 OF 2

## 4–Phase
## Minimum Recall
## Protected/Permissive Main Street
## Split–Side Street
## Dual–Ring Cabinet

PHASING DIAGRAM



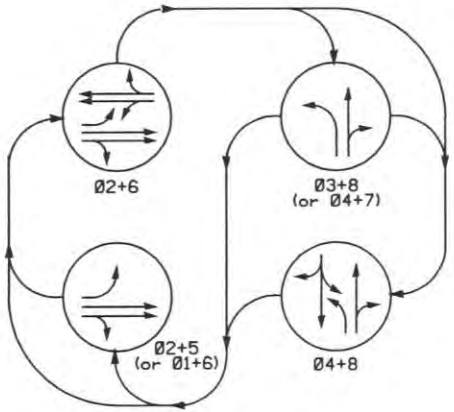

| TABLE OF OPERATION | | | | | |
|---|---|---|---|---|---|
| SIGNAL FACE | PHASE | | | | |
| | Ø + | Ø 2 + 6 | Ø 3 | Ø 4 | FLASH |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

*Use appropriate omit note(s)*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 4–Phase
## Minimum Recall
## Protected/Permissive Main Street
## Protected/Permissive Side Street
## Dual–Ring Cabinet

PHASING DIAGRAM




| TABLE OF OPERATION | | | | | |
|---|---|---|---|---|---|
| SIGNAL FACE | PHASE | | | | |
| | * | Ø 2 + 6 | ** | Ø 4 + 8 | FLASH |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* Ø2+5 or Ø1+6 (Major Street Lefts)
** Ø3+8 or Ø4+7 (Minor Street Lefts)

*Use appropriate omit note(s)*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: 4–Phase Operation

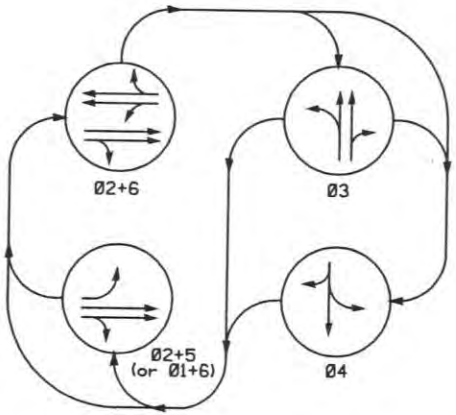
SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.3
SHEET 1 OF 3

## 4–Phase
## Minimum Recall
## Protected Main Street
## Split–Side Street
## Dual–Ring Cabinet

PHASING DIAGRAM



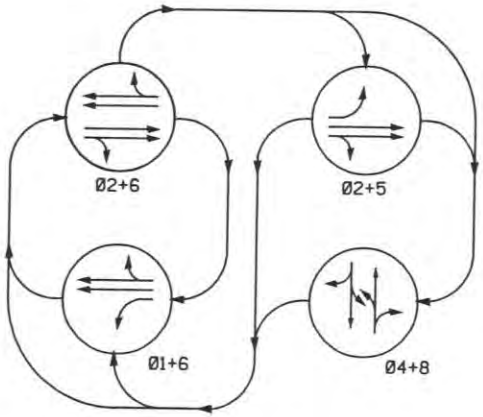

| TABLE OF OPERATION | | | | | |
|---|---|---|---|---|---|
| SIGNAL FACE | PHASE | | | | |
| | Ø + | Ø 2 + 6 | Ø 3 | Ø 4 | FLASH |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

*Use appropriate omit note(s)*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 4–Phase
## Minimum Recall
## Lead–Lag Operation
## Dual–Ring Cabinet

PHASING DIAGRAM




| TABLE OF OPERATION | | | | | |
|---|---|---|---|---|---|
| SIGNAL FACE | PHASE | | | | |
| | Ø 1 + 6 | Ø 2 + 6 | Ø 2 + 5 | Ø 4 + 8 | FLASH |
| | | | | | |
| | | | | | |
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*With older controllers, the phase numbering may need to be modified*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: 4–Phase Operation

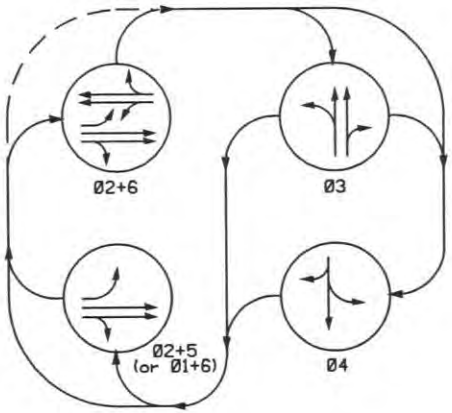
SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.3
SHEET 2 OF 3

## 4–Phase
## Soft Recall
## Protected/Permissive Main Street
## Split–Side Street
## Dual–Ring Cabinet

PHASING DIAGRAM



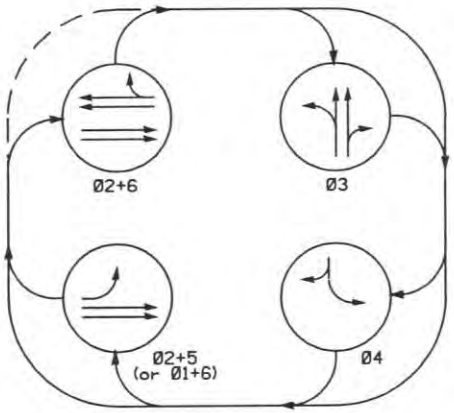

| TABLE OF OPERATION | | | | | |
|---|---|---|---|---|---|
| SIGNAL FACE | PHASE | | | | |
| | Ø + | Ø 2 + 6 | Ø 3 | Ø 4 | FLASH |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

*Use appropriate omit note(s)*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 4–Phase
## Soft Recall
## Protected Main Street
## Split–Side Street
## Dual–Ring Cabinet

PHASING DIAGRAM




*Ø3 approach is one–way only*

| TABLE OF OPERATION | | | | | |
|---|---|---|---|---|---|
| SIGNAL FACE | PHASE | | | | |
| | Ø + | Ø 2 + 6 | Ø 3 | Ø 4 | FLASH |
| | | | | | |
| | | | | | |
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| | | | | | |

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: 4–Phase Operation

SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.3
SHEET 3 OF 3

## 5–Phase
## Minimum Recall
## Protected/Permissive

PHASING DIAGRAM

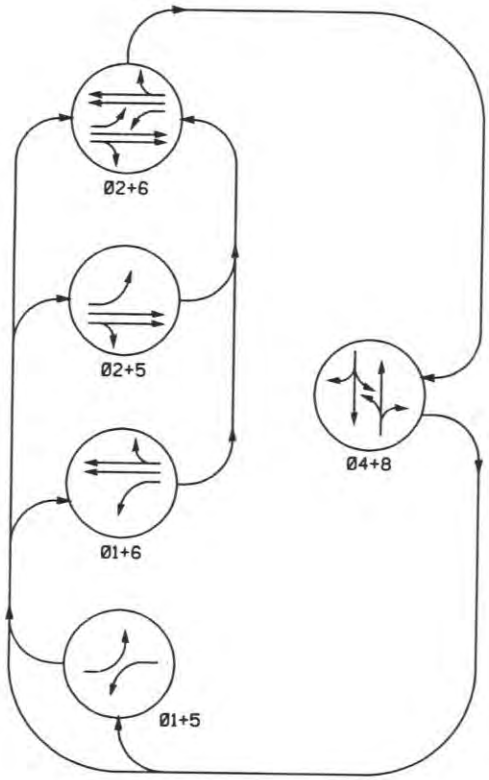


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | |
|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø4+8 | FLASH |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

*Use appropriate omit note(s)*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 5–Phase
## Minimum Recall
## Protected

PHASING DIAGRAM

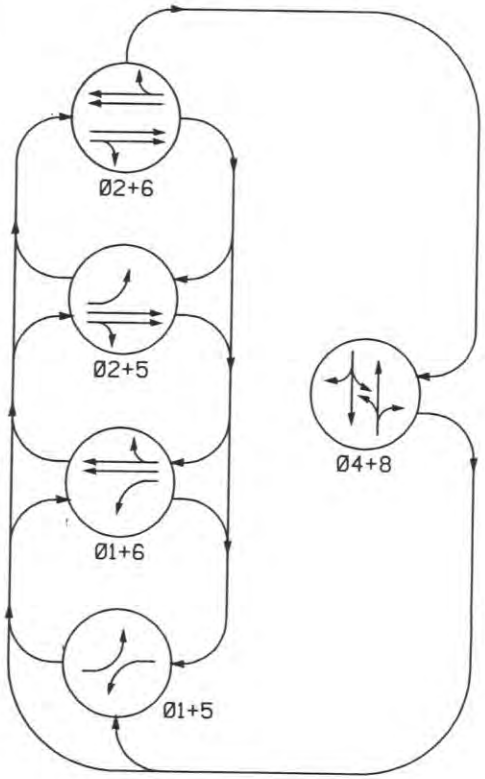


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | |
|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø4+8 | FLASH |
| | | | | | | |
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NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: 5–Phase Operation

SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.4
SHEET 1 OF 2

## 5–Phase
## Soft Recall
## Protected

PHASING DIAGRAM

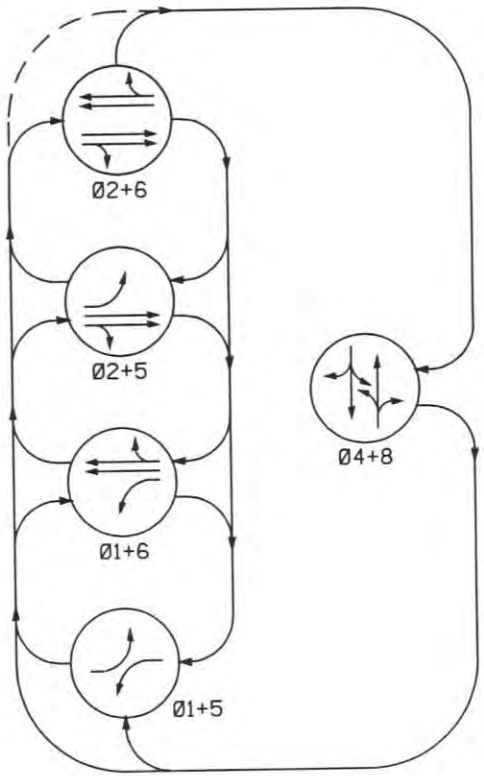


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | |
|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø4+8 | FLASH |
| | | | | | | |
| | | | | | | |
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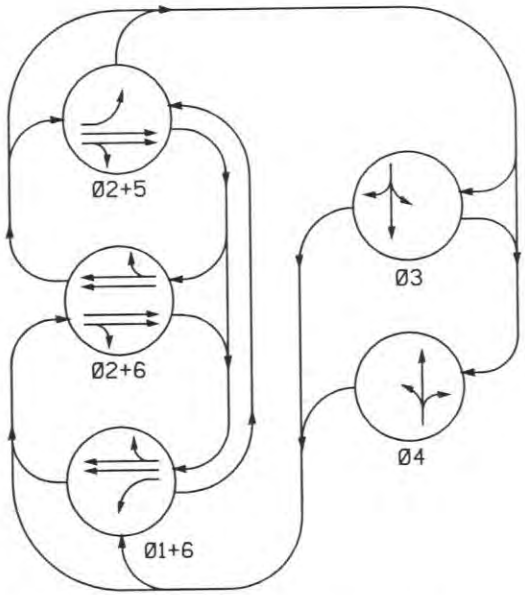
| | | | | | | |
| | | | | | | |
| | | | | | | |

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 5–Phase
## Minimum Recall
## Lead–Lag Operation
## Split Side Street

PHASING DIAGRAM




*With older controllers, the phase numbering may need to be modified*

TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | |
|---|---|---|---|---|---|---|
| | Ø1+6 | Ø2+6 | Ø2+5 | Ø3 | Ø4 | FLASH |
| | | | | | | |
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NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: 5–Phase Operation

SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.4
SHEET 2 OF 2

## 6–Phase
## Minimum Recall
## Protected/Permissive Main Street
## Split Side Street

PHASING DIAGRAM

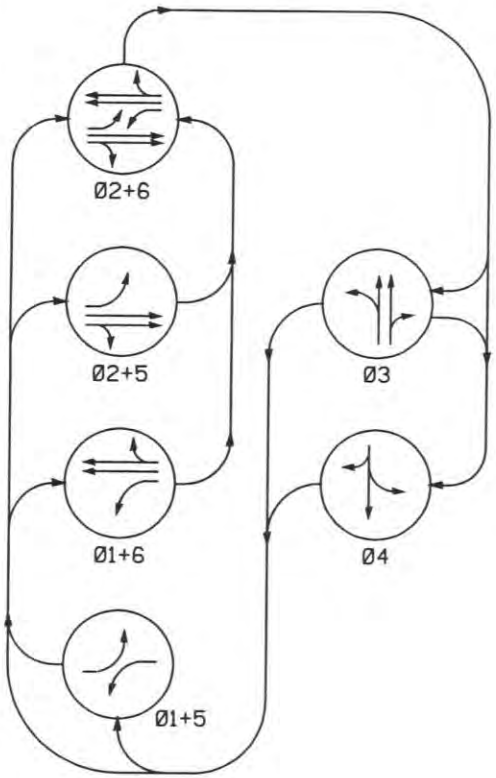


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø3 | Ø4 | FLASH |
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*Use appropriate omit note(s)*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 6–Phase
## Minimum Recall
## Protected/Permissive Main Street
## Protected/Permissive Side Street

PHASING DIAGRAM

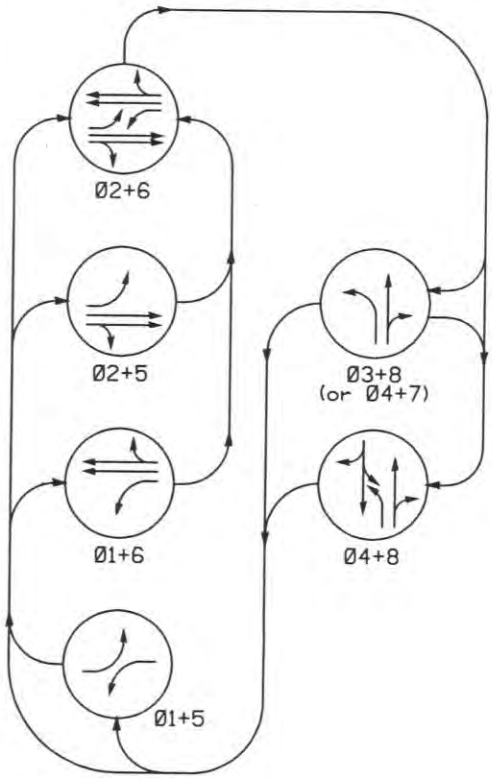


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø+ | Ø4+8 | FLASH |
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*Use appropriate omit note(s)*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: 6–Phase Operation

SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.5
SHEET 1 OF 3

## 6–Phase
## Minimum Recall
## Protected Main Street
## Split Side Street

PHASING DIAGRAM

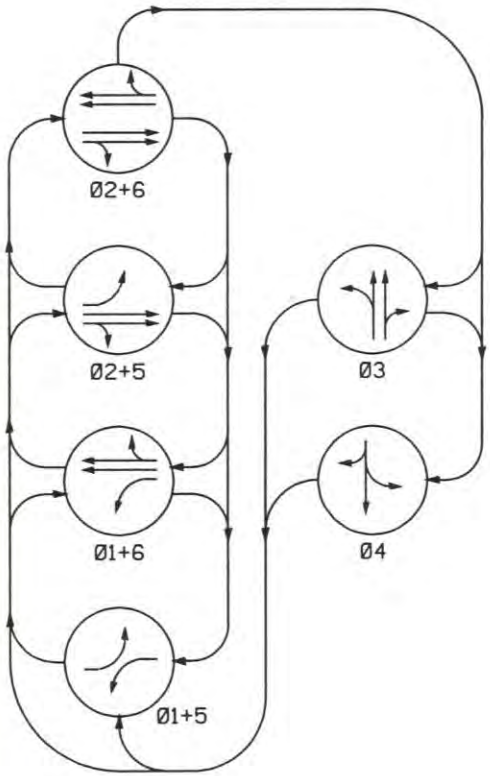


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø3 | Ø4 | FLASH |
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NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 6–Phase
## Minimum Recall
## Protected Main Street
## Protected/Permissive Side Street

PHASING DIAGRAM

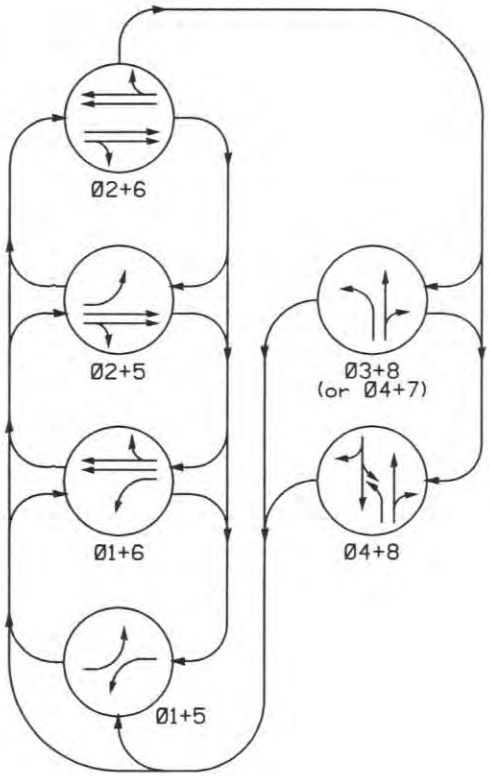


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø+ | Ø4+8 | FLASH |
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NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: 6–Phase Operation

SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.5
SHEET 2 OF 3

## 6–Phase
## Soft Recall
## Protected Main Street
## Split Side Street

PHASING DIAGRAM

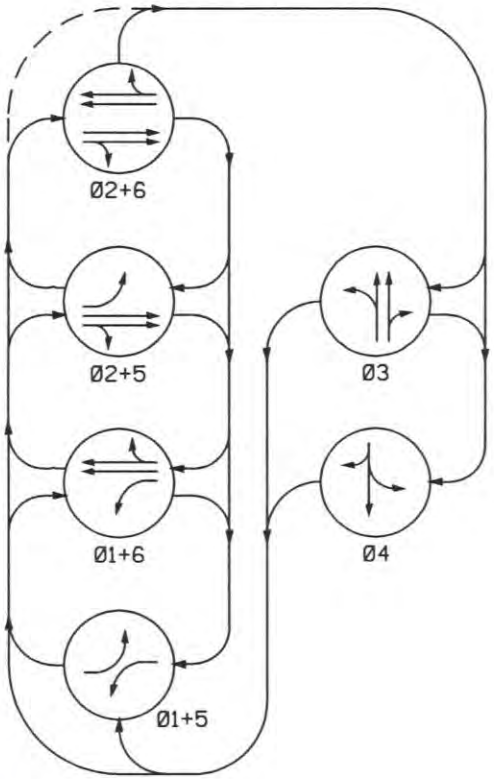


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø3 | Ø4 | FLASH |
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NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 6–Phase
## Soft Recall
## Protected Main Street
## Protected/Permissive Side Street

PHASING DIAGRAM

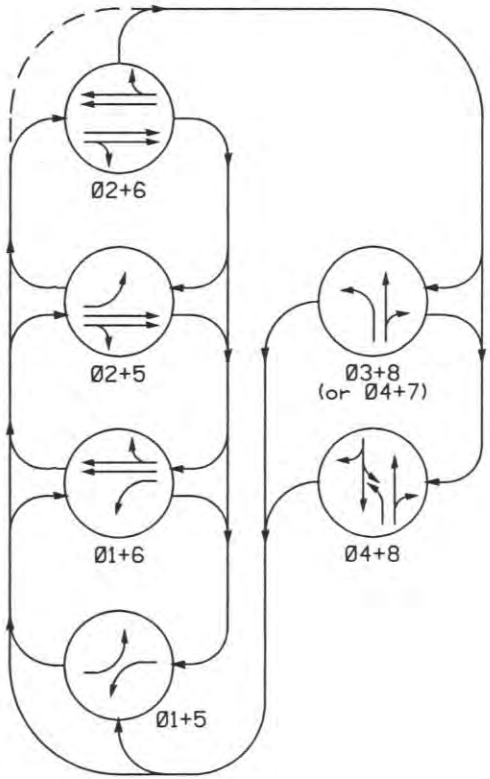


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø+ | Ø4+8 | FLASH |
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*Use appropriate omit note(s)*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: 6–Phase Operation

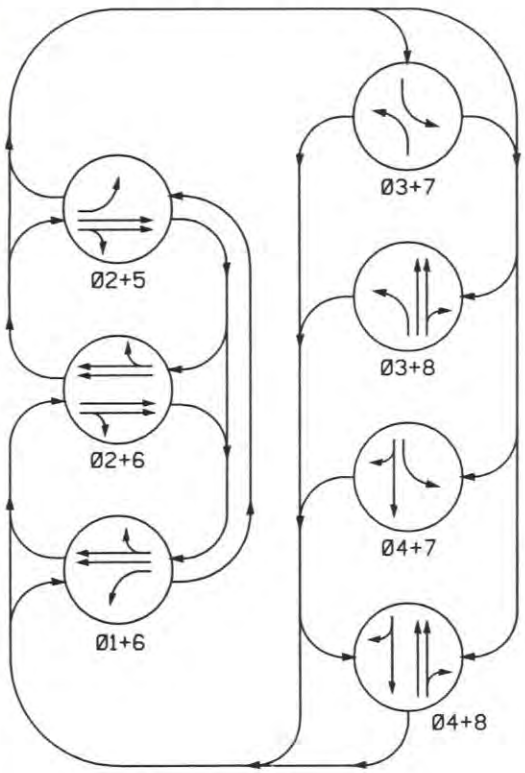
SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.5
SHEET 3 OF 3

## 7–Phase
## Minimum Recall
## Lead–Lag Main Street

PHASING DIAGRAM




| TABLE OF OPERATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SIGNAL FACE | PHASE | | | | | | | |
| | Ø1+6 | Ø2+6 | Ø2+5 | Ø3+7 | Ø3+8 | Ø4+7 | Ø4+8 | FLASH |
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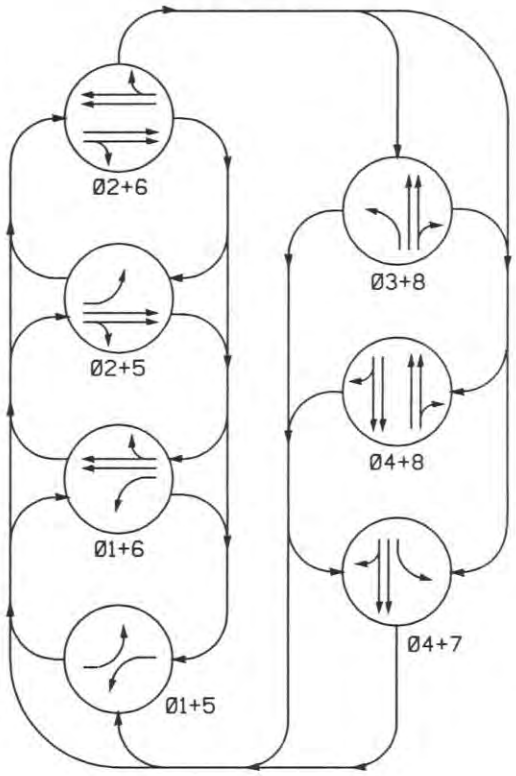
*With older controllers, the phase numbering may need to be modified*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 7–Phase
## Minimum Recall
## Lead–Lag Side Street

PHASING DIAGRAM




| TABLE OF OPERATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SIGNAL FACE | PHASE | | | | | | | |
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø3+8 | Ø4+8 | Ø4+7 | FLASH |
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*With older controllers, the phase numbering may need to be modified*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: 7–Phase Operation

SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.6
SHEET 1 OF 1

## 8–Phase
## Minimum Recall
## Protected/Permissive Main Street
## Protected/Permissive Side Street

PHASING DIAGRAM

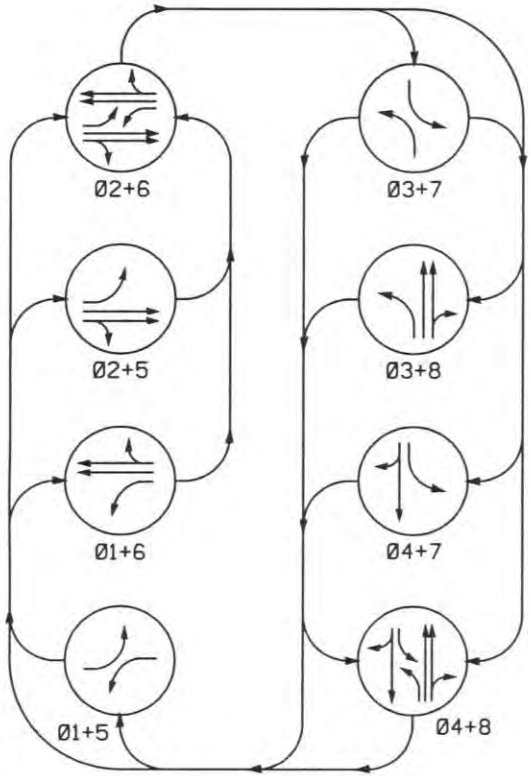


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø3+7 | Ø3+8 | Ø4+7 | Ø4+8 | FLASH |
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*Use appropriate omit note(s)*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 8–Phase
## Minimum Recall
## Protected/Permissive Main Street
## Protected Side Street

PHASING DIAGRAM

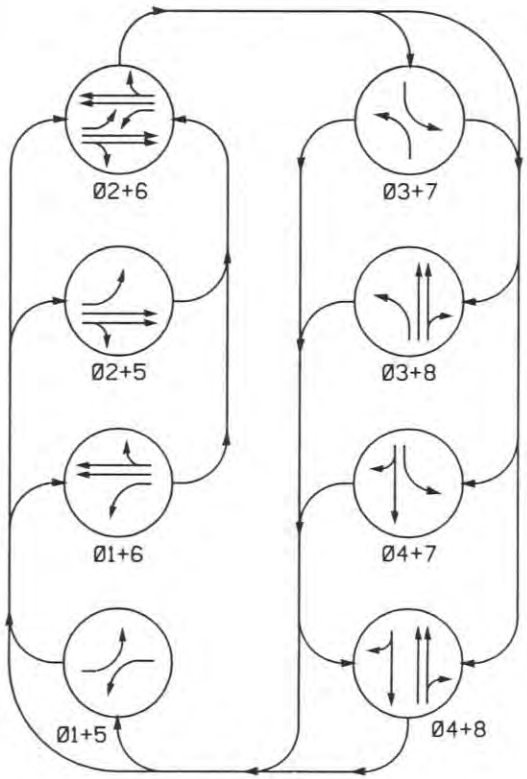


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø3+7 | Ø3+8 | Ø4+7 | Ø4+8 | FLASH |
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*Use appropriate omit note(s)*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: 8–Phase Operation

SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.7
SHEET 1 OF 3

## 8–Phase
## Minimum Recall
## Protected Main Street
## Protected/Permissive Side Street

PHASING DIAGRAM

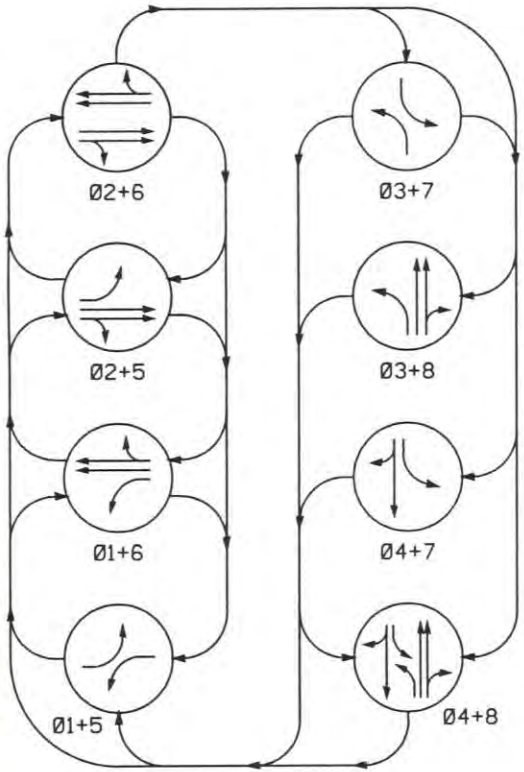


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø3+7 | Ø3+8 | Ø4+7 | Ø4+8 | FLASH |
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NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 8–Phase
## Minimum Recall
## Protected Main Street
## Protected Side Street

PHASING DIAGRAM

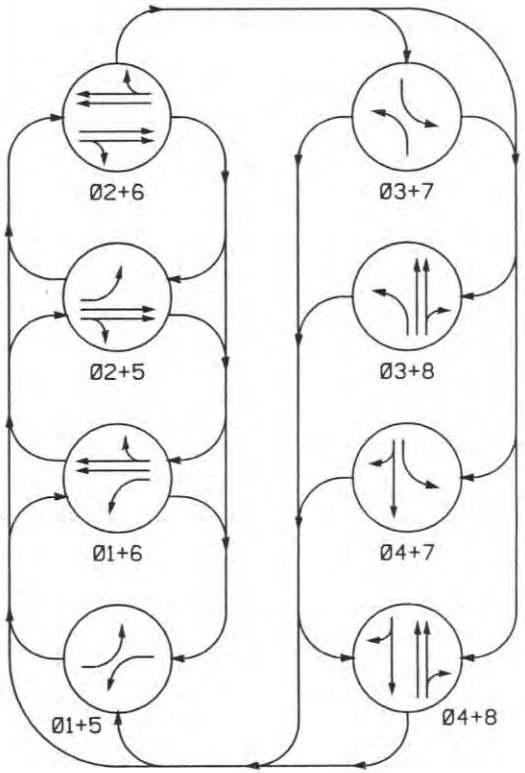


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø3+7 | Ø3+8 | Ø4+7 | Ø4+8 | FLASH |
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NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: 8–Phase Operation

SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.7
SHEET 2 OF 3

## 8–Phase
## Minimum Recall
## Protected and Protected/Permissive Main Street
## Protected and Protected/Permissive Side Street

PHASING DIAGRAM

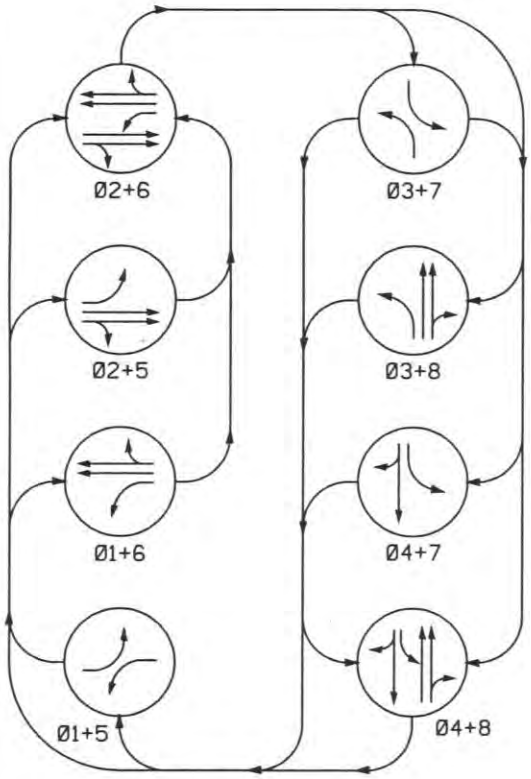


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø3+7 | Ø3+8 | Ø4+7 | Ø4+8 | FLASH |
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*Use appropriate omit note(s)*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 8–Phase
## Soft Recall
## Protected Main Street
## Protected Side Street

PHASING DIAGRAM

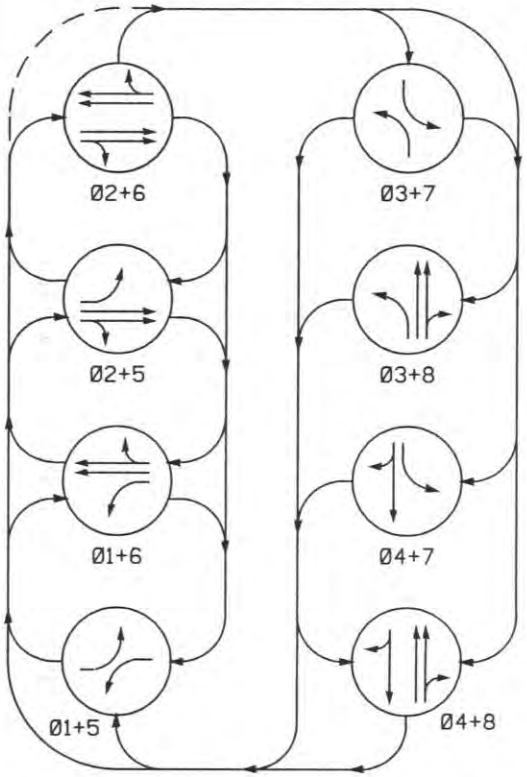


TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø3+7 | Ø3+8 | Ø4+7 | Ø4+8 | FLASH |
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NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: 8–Phase Operation

SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
2.1.7
SHEET 3 OF 3

The use of Dallas Phasing is prohibited
in the 2009 MUTCD.

This page has been removed from the Design Manual.



**Dallas Left Turn Phasing**

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

STD. NO.
**2.2**
SHEET 1 OF 1

# Red Revert Backup Protection

## Yellow Trap and Dynamic Backup Control

A "yellow trap" occurs when a traffic signal cycles directly from concurrent through phases to a fully protected phase opposing a permitted phase (also known as "backing up"). This situation is avoided in a signal design whenever possible. Typically, phase omits or forcing the signal to cycle through the side street (even if there are no vehicle calls) to serve the protected phase have been used to protect against a "yellow trap."

## Red Revert

Red revert is a feature in 2070 Oasis software that allows the signal to cycle from a permissive left turn phase on the major street to a protected phase and avoid a "yellow trap." Red revert simulates an all red "dummy" phase by clearing the through phase(s) to red for a brief interval before cycling to the adjacent protected left turn phase and then returning to green again; the opposing through phase will stay red for the duration of the protected turning phase.

The time that the adjacent through phase displays red before returning to green is a function of the red revert time. Typically the red revert time is programmed to (at least) 5 seconds to avoid the appearance of improper operation.

## Conditions for Use

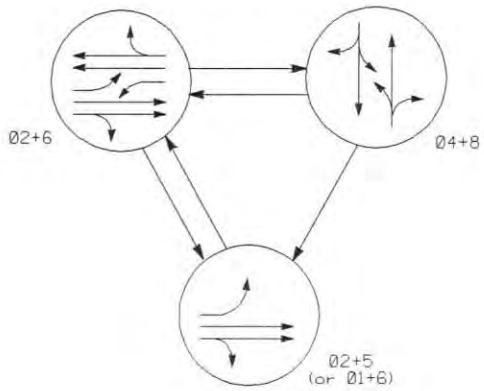
1. Used only with 2070 Oasis Software
2. Cannot be used with NEMA TS-1, TS-2, 170, or other 2070 software (such as SE-PAC, NAZTEC, or the Cary Signal System)
3. Used only on the major street (phases 2+6)
4. May be used when there is one or two protected/permissive phases (1 and/or 5) on the major street
5. Use in conjuncion with 5 section (doghouse) heads.
6. Use in place of phase omit and clearing through the side street.
7. Do NOT use with Railroad Preemption if the major street is the approach that crosses the tracks and is used in the Track Clearance Phase.

## When Used On Plans:

- Typically set red revert time for phase 2 (and/or 6) to 5.0 seconds.
- Default red revert time for all other phases is 2.0 seconds.
- Use the following note on plans:
  Enable backup protect for phase 2 (and/or 6) to allow the controller to clear from phase 2+6 to phase 2+5 (and/or 1+6) by progressing though an all red display.

## 3 Phase
## Minimum Recall
## Protected/Permissive Left One Direction
## Permissive Only Left Other Direction

PHASING DIAGRAM

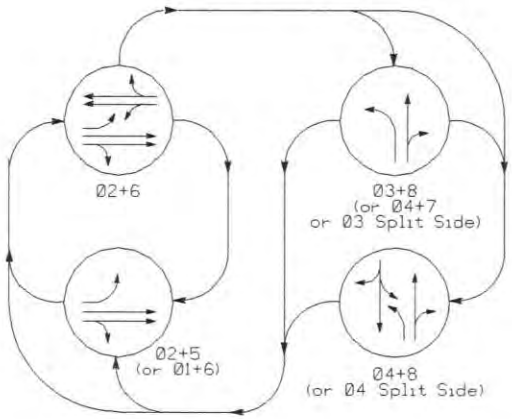



*Use Red Revert for Phase 2 (6 if 1+6 is used)*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

## 4 Phase
## Minimum Recall
## Protected/Permissive Left One Direction of Major Street
## Permissvie Left on Other Direction of Major Street
## Protected/Permissive Side Street
## OR Split Side Street

PHASING DIAGRAM




*Use Red Revert for Phase 2 (6 if 1+6 is used)*
*Use appropriate omit note(s) for side street*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: Red Revert Operation

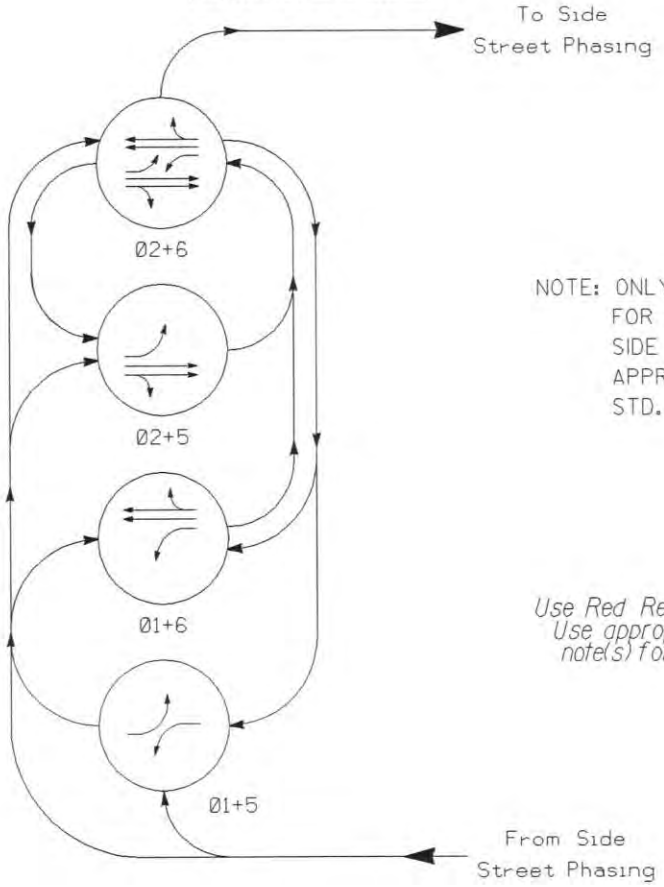
SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-09

STD. NO.
2.3
SHEET 2 OF 3

## 5–8 Phase
## Minimum Recall
## Protected/Permissive Main Street w/Red Revert

**PHASING DIAGRAM**




NOTE: ONLY PHASING DIAGRAM FOR MAJOR IS SHOWN. FOR SIDE STREET PHASING, SEE APPROPRIATE PHASING IN STD. 2.1.

*Use Red Revert for Phases 2 and 6*
*Use appropriate omit or lead/lag note(s) for side street as needed*

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: Red Revert Operation

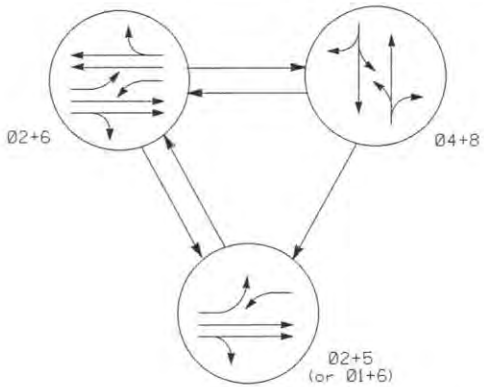
SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-09

STD. NO.
**2.3**
SHEET 3 OF 3

## 3 Phase
## Minimum Recall
## Protected/Permissive Left One Direction
## Permissive Only Left Other Direction

PHASING DIAGRAM




*Phase 5 may be lagged (Phase 1 if 1+6 is used)*

THIS ASSUMES A 4 SECTION FYA IS USED FOR THE LEFT TURN ON ONE APPROACH (PHASE 5) AND A 3 SECTION FYA IS USED FOR THE LEFT TURN ON THE OTHER APPROACH OF MAIN STREET

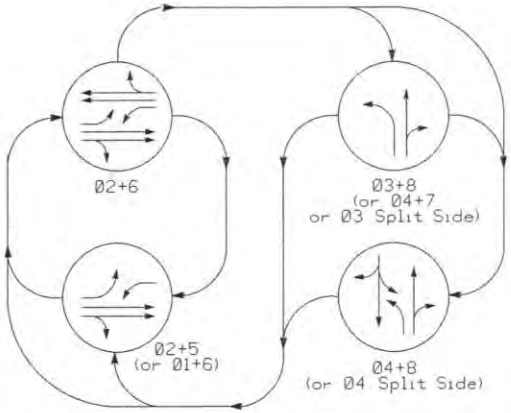
NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

**TABLE OF OPERATION**

| SIGNAL FACE | PHASE | | | |
|---|---|---|---|---|
| | Ø2+5 | Ø2+6 | Ø4+8 | FLASH |
| 51 | ← | ◄FY | ◄R | ◄Y |
| 61 | ◄FY | ◄FY | ◄R | ◄Y |

## 4 Phase
## Minimum Recall
## Protected/Permissive Left One Direction of Main Street
## Permissvie Left on Other Direction of Main Street
## Protected/Permissive Side Street
## OR Split Side Street

PHASING DIAGRAM




*Phase 5 may be lagged (Phase 1 if 1+6 is used)*

THIS ASSUMES A 4 SECTION FYA IS USED FOR THE LEFT TURN ON ONE APPROACH (PHASE 5) AND A 3 SECTION FYA IS USED FOR THE LEFT TURN ON THE OTHER APPROACH OF MAIN STREET

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

**TABLE OF OPERATION**

| SIGNAL FACE | PHASE | | | | |
|---|---|---|---|---|---|
| | Ø2+5 | Ø2+6 | Ø3+8 | Ø4+8 | FLASH |
| 51 | ← | ◄FY | ◄R | ◄R | ◄Y |
| 61 | ◄FY | ◄FY | ◄R | ◄R | ◄Y |

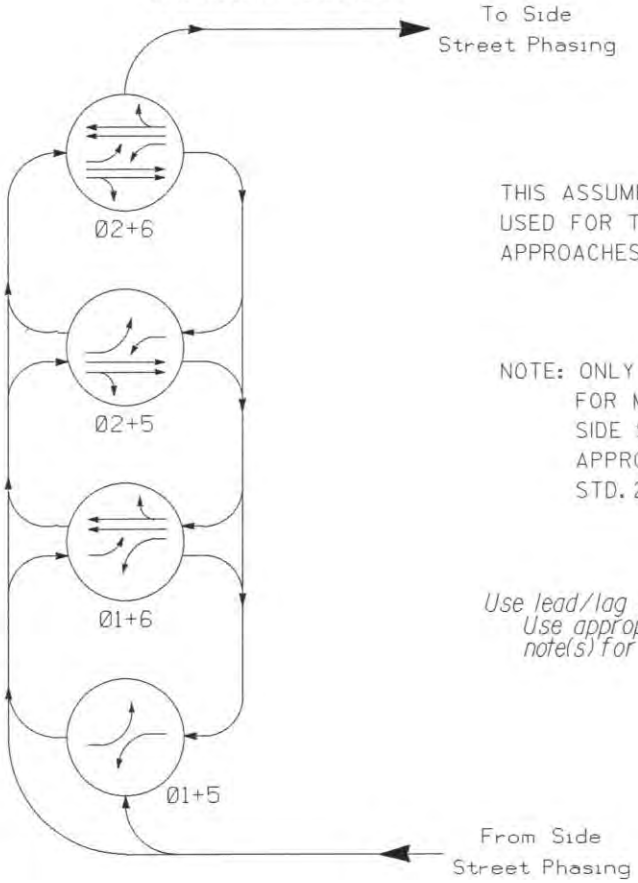
# Phasing Typicals: Flashing Yellow Arrow

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

STD. NO.
**2.4**
SHEET 1 OF 2

## 5–8 Phase
## Minimum Recall
## Protected/Permissive Main Street

**PHASING DIAGRAM**




THIS ASSUMES A 4 SECTION FYA IS USED FOR THE LEFT TURN ON BOTH APPROACHES OF THE MAIN STREET

NOTE: ONLY PHASING DIAGRAM FOR MAJOR IS SHOWN. FOR SIDE STREET PHASING, SEE APPROPRIATE PHASING IN STD. 2.1.

*Use lead/lag notes for Phases 1 and 5*
*Use appropriate omit or lead/lag note(s) for side street as needed*

**TABLE OF OPERATION**

| SIGNAL FACE | PHASE | | | | | |
|---|---|---|---|---|---|---|
| | Ø1+5 | Ø1+6 | Ø2+5 | Ø2+6 | Ø4+8 | FLASH |
| 11 | ← | ← | ~~FY~~ | ~~FY~~ | ~~R~~ | ~~Y~~ |
| 51 | ← | ~~FY~~ | ← | ~~FY~~ | ~~R~~ | ~~Y~~ |

NOTE: TRAFFIC MOVEMENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

# Phasing Typicals: Flashing Yellow Arrow

SIGNAL DESIGN SECTION
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STD. NO.
**2.4**
SHEET 2 OF 2