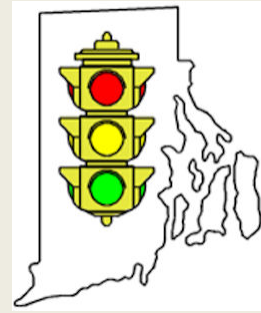


Agenda



Morning

Traffic Terminology

TS2 Cabinet Components and Operation

Traffic Signal Phasing

Traffic Signal Ring Structure

Understanding a Signal Plan

Controller Programming

Chuck Bluto

Chuck Bluto

Jim Decker

Jim Decker

Gary Maccarone

Gary Maccarone

Afternoon

Basic Coordination

Basic Time of Day

Basic Preemption/Priority

Event/Alarm Log

Troubleshooting

Gary Maccarone

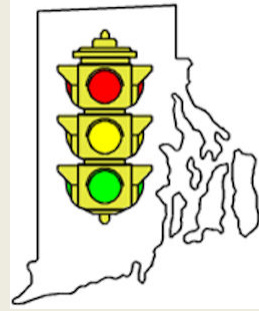
Gary Maccarone

Chuck Bluto

Jim Decker

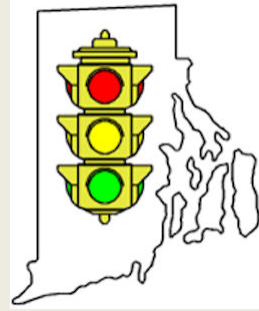
Jim Decker

Topics



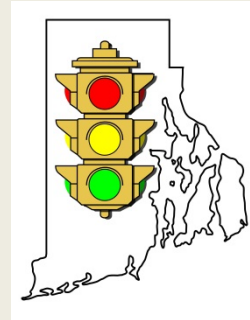
- Traffic Signal Phasing
- Traffic Signal Ring Structure
- Traffic Signal Overlaps

Traffic Signal Phasing

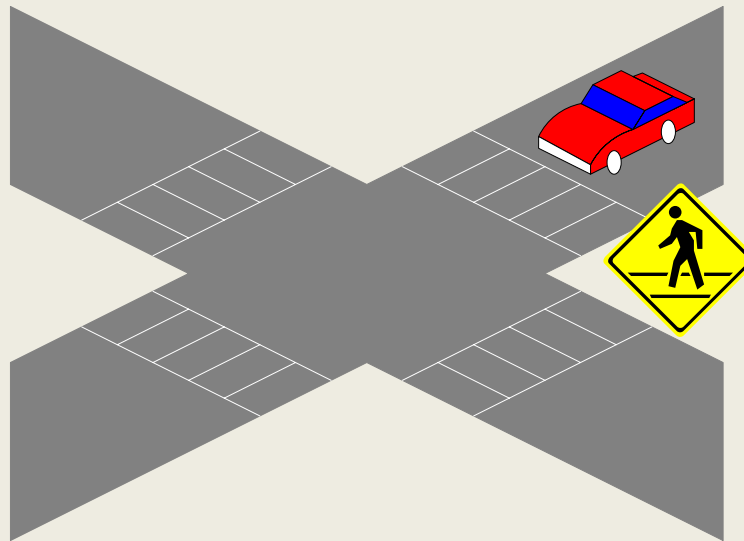


- Definition of a Phase
- Phase Outputs
- Phase Inputs

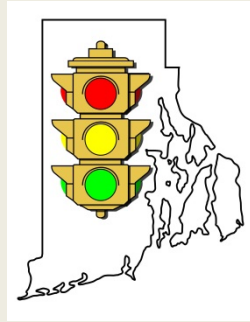
Traffic Signal Phasing



- What is a Phase?
 - A phase is a movement of vehicle or pedestrian traffic.

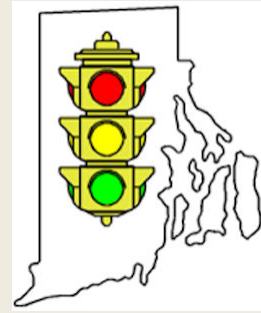


Traffic Signal Phasing



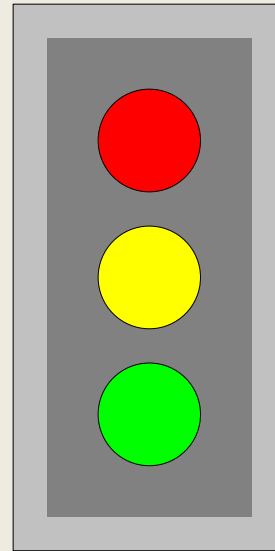
- What is a Phase?
 - A Phase consists of three parts: Outputs, Inputs, and Timing intervals.
 - A Phase has a place in the ring structure of a controller unit.

Traffic Signal Phasing

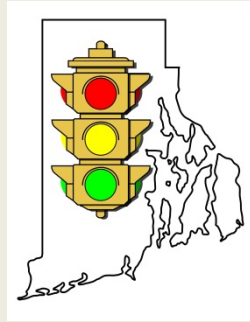


Outputs

- A Phase provides output displays for Vehicle & Pedestrian Signals
- A Phase provides status information for controller unit sequencing



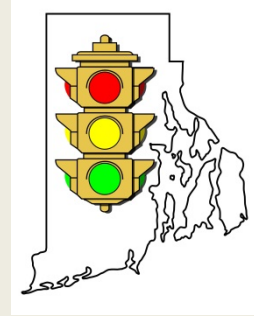
Traffic Signal Phasing



Inputs

- A Phase provides inputs for vehicle and pedestrian actuation
- A Phase also provides inputs for modifying its sequence and timing behavior

Traffic Signal Phasing

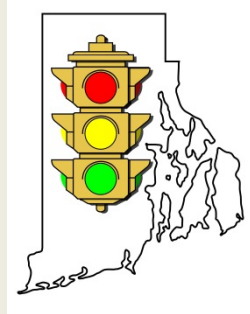


Timing

- A Phase provides “green” timing for vehicle and pedestrian movements
 - Vehicle timing includes minimum, passage, maximum, and volume density
 - Pedestrian timing includes walk, advance walk, and delay walk timing
- A Phase also provides clearance timing for vehicle and pedestrian movements
 - Clearance timing includes yellow, red, and don’t walk timing

Traffic Signal Phasing

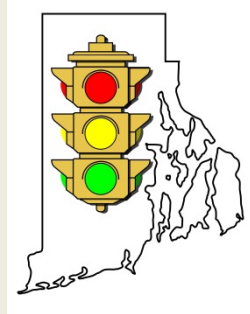
Timing



- Walk time – This is the time given to the “Walk” indication on the pedestrian signal. This is not necessarily the time required to cross the street.

Traffic Signal Phasing

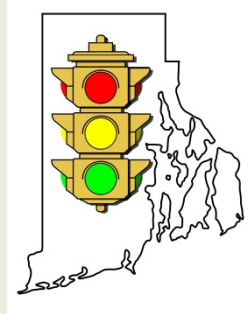
Timing



- Pedestrian Clearance Time – This is the time given to the flashing “Don’t Walk” indication on the pedestrian signal. This is usually the time required for an “average pedestrian” to cross the particular street.

Traffic Signal Phasing

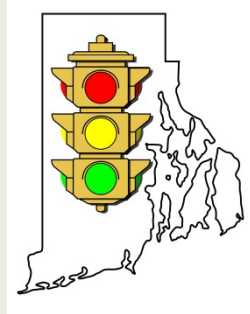
Timing



- Minimum Green Time – The time that must be met for any particular phase before that phase will stop timing the green interval and move to the yellow interval of that phase's timing.

Traffic Signal Phasing

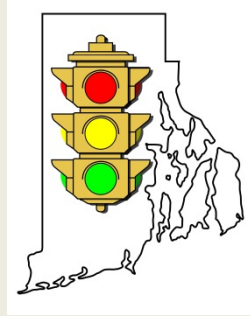
Timing



- Passage time—Time given to a lack of detection on a phase that when met will cause the controller to stop timing the green interval of the phase and move to the clearance interval.

Traffic Signal Phasing

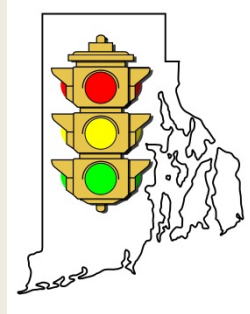
Timing



- Maximum Time 1 – This is the maximum time the controller will time a green interval, at which time the controller will exit the green and move to the yellow interval.

Traffic Signal Phasing

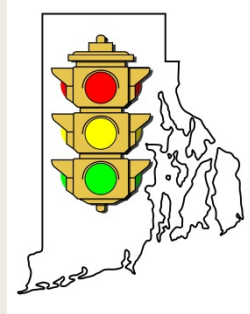
Timing



- Maximum Time 2 – This is a second maximum time which can be selected either remotely or through TBC functions.

Traffic Signal Phasing

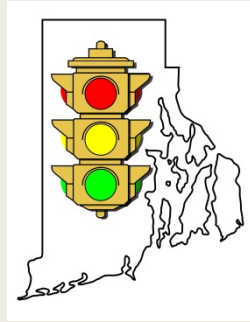
Timing



- Alternate Maximums– These are additional maximum times which can be selected through TBC functions.
- Maximum 3,4,5
- Dynamic Maximums 3,4,5

Traffic Signal Phasing

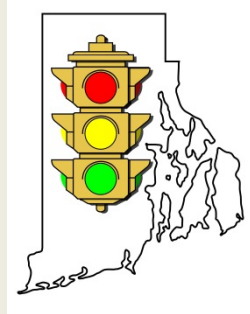
Timing



- Yellow Clearance Time– This is the time for the yellow interval.

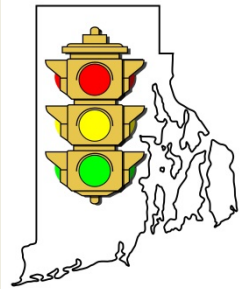
Traffic Signal Phasing

Timing



- Red Clearance Time— This is the time for the red clearance interval.

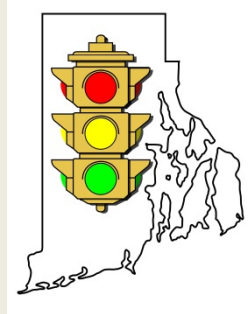
Traffic Signal Phasing



Recall

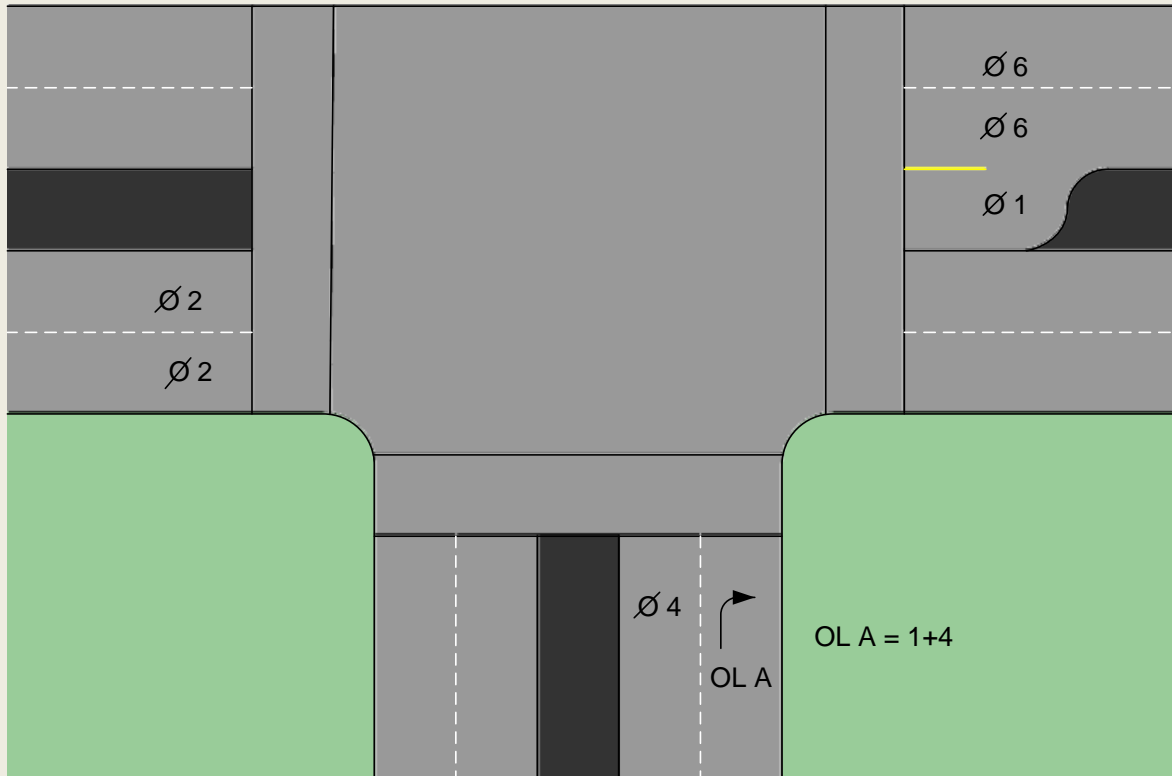
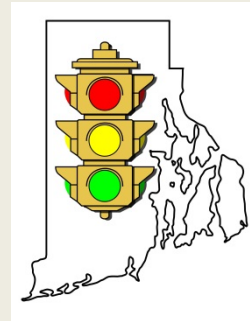
- A term used that indicates that the controller will service a phase whether or not detection is being supplied from detectors. This allows the controller to cycle in the absence of detection. There are several different types of recalls.
 - Min Recall – Tells the controller only to time to MGRN.
 - Max Recall – Tells the controller to time to a Max time set.
 - Non Act – This is a recall back to a non-actuated phase. Some phases have detection or are ‘actuated’, some phases do not have detection and are called ‘non-actuated’.
 - Soft Recall – This is a call back to the coordinated phase only if there is an absence of calls on the side street. This has specific applications.
 - Pedestrian Recall – A call to an actuated pedestrian movement.
 - Non Act Pedestrian Recall – A recall to a non-actuated pedestrian movement.
 - Non Act + Pedestrian Recall – A recall to a non-actuated pedestrian movement allowing maximum walk time within the available phase maximum time.

Traffic Signal Overlaps

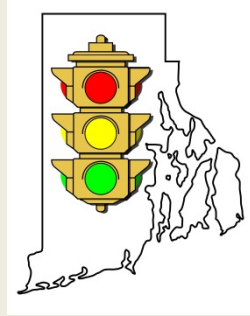


- What is an Overlap?
 - An Overlap is a movement of vehicles or pedestrians comprised of one or more phases
 - Overlaps are defined by parent phases and have no place in the ring structure
 - Overlaps may have fixed timing for delayed clearances
 - Overlaps are generally identified using letters, while phases are identified using numbers

Traffic Signal Overlaps

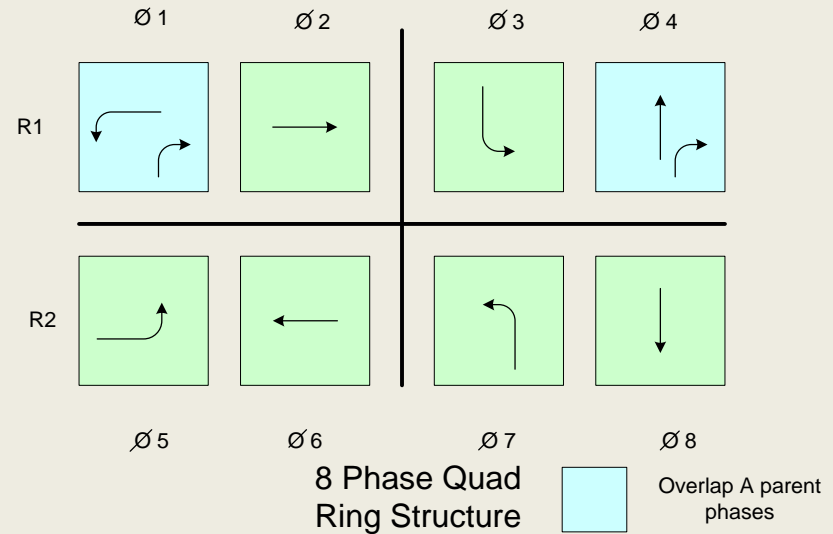
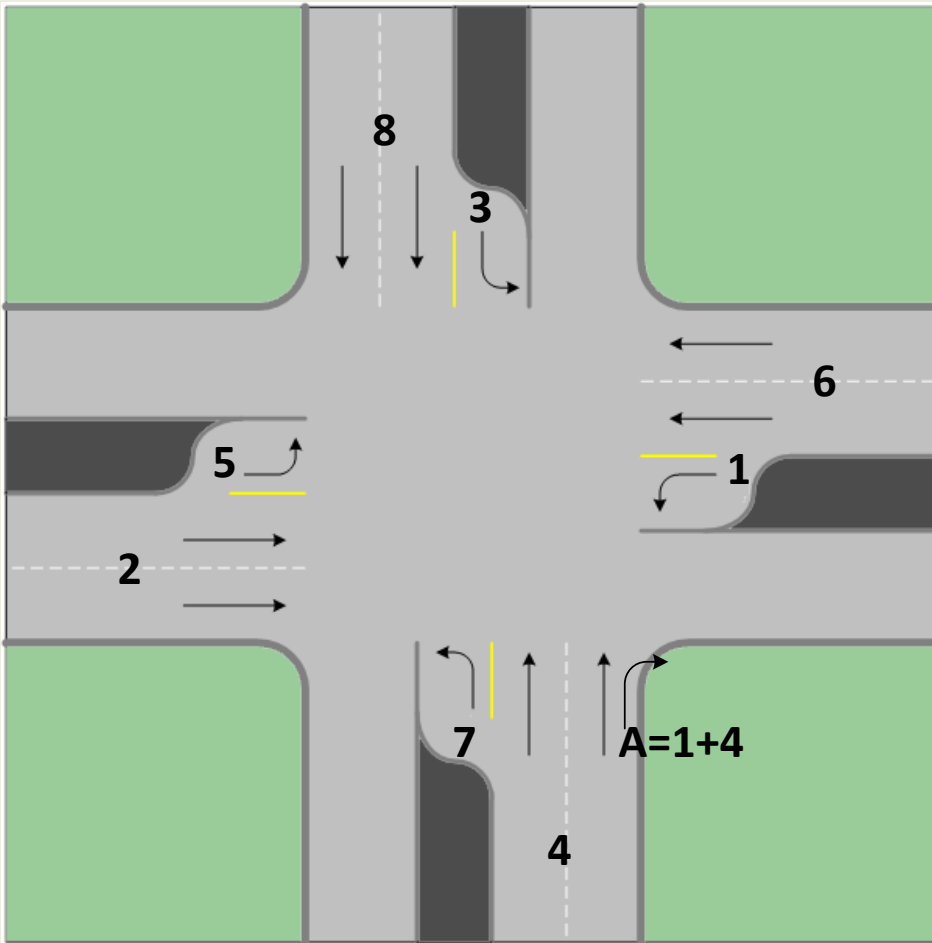
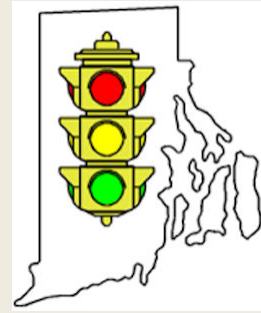


Traffic Signal Overlaps

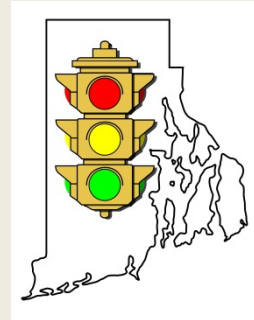


- Overlaps
 - The parent phase may exist just for the purpose of driving the overlap. Termed a “Dummy Phase”.
 - Phases must not have a concurrent phase that would be conflicting to the Overlap movement. In this example even though phase 7 would not conflict with the right turn of Overlap A, Phase 3 (a concurrent movement) would. Phase 4 is OK, phase 3 and 8 are concurrent and don't conflict with the right turn.

Traffic Signal Overlaps

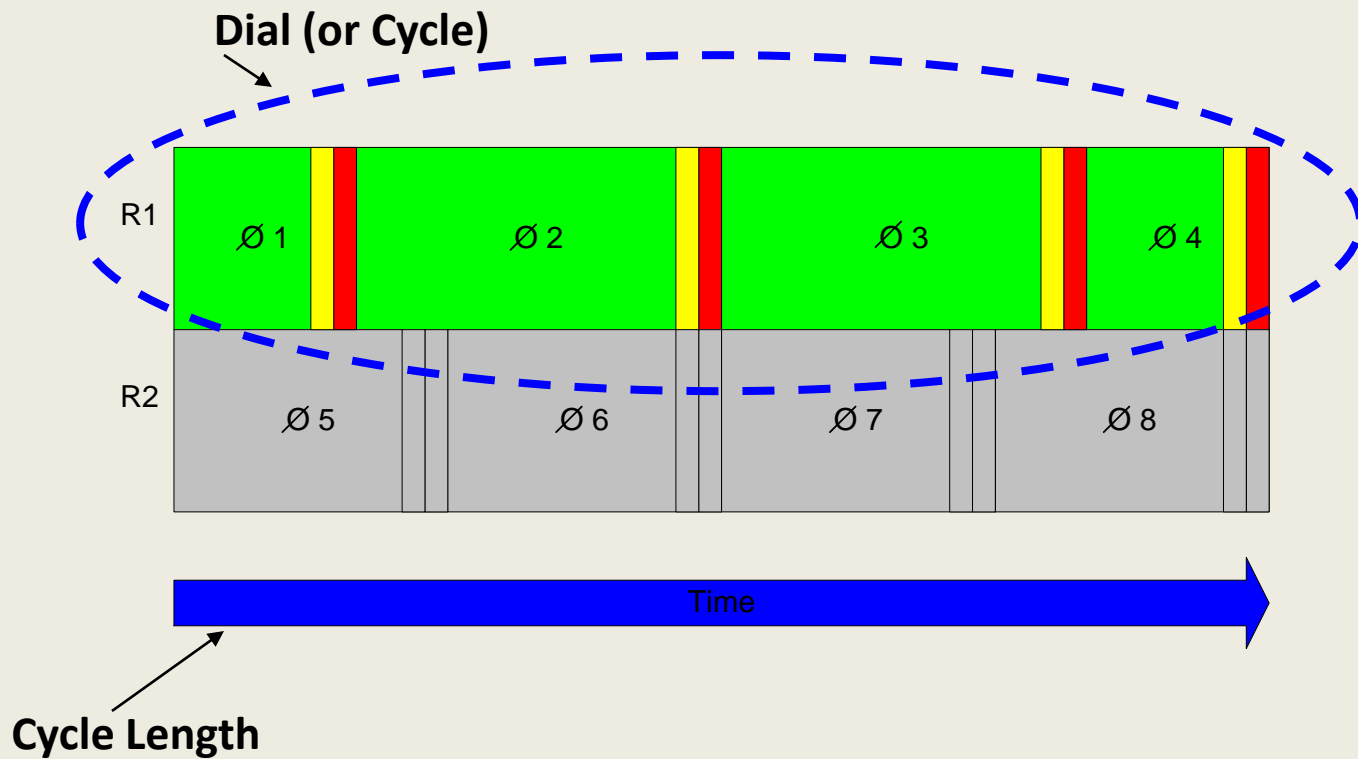
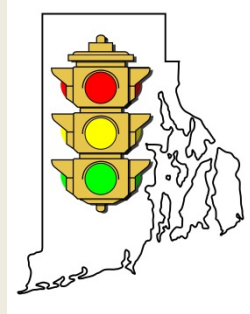


Ring Structure

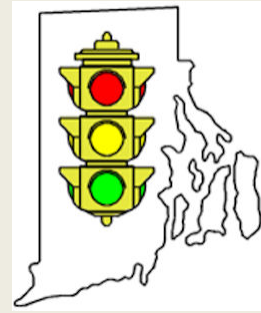


- What is a Ring?
 - A ring consists of two or more sequentially timed and individually selected conflicting phases so arranged as to occur in an established order
 - Multiple rings may run concurrently in a traffic controller

Ring Structure

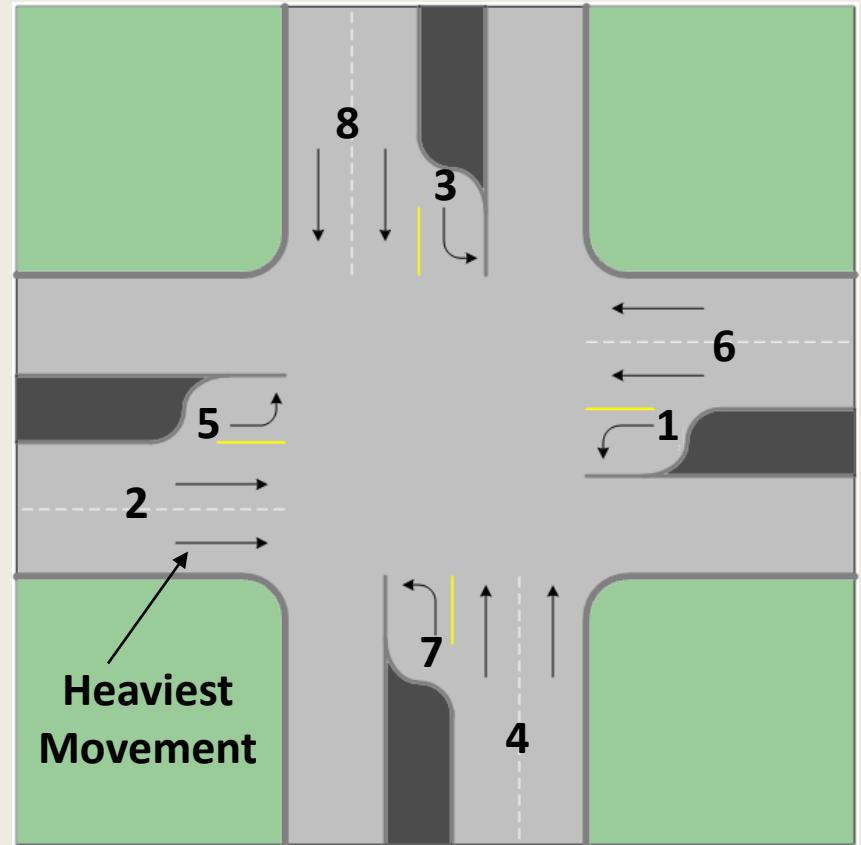


Ring Structure

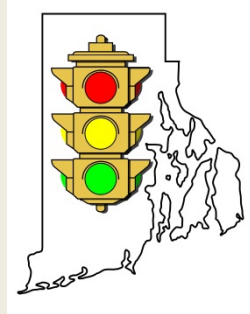


- Through Movements
 - Even numbers starting with heaviest movement
- Left Turn Movements
 - Odd numbers one less than opposing through movement designation

NEMA Phasing
Convention

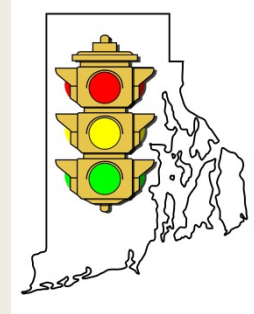


Ring Structure



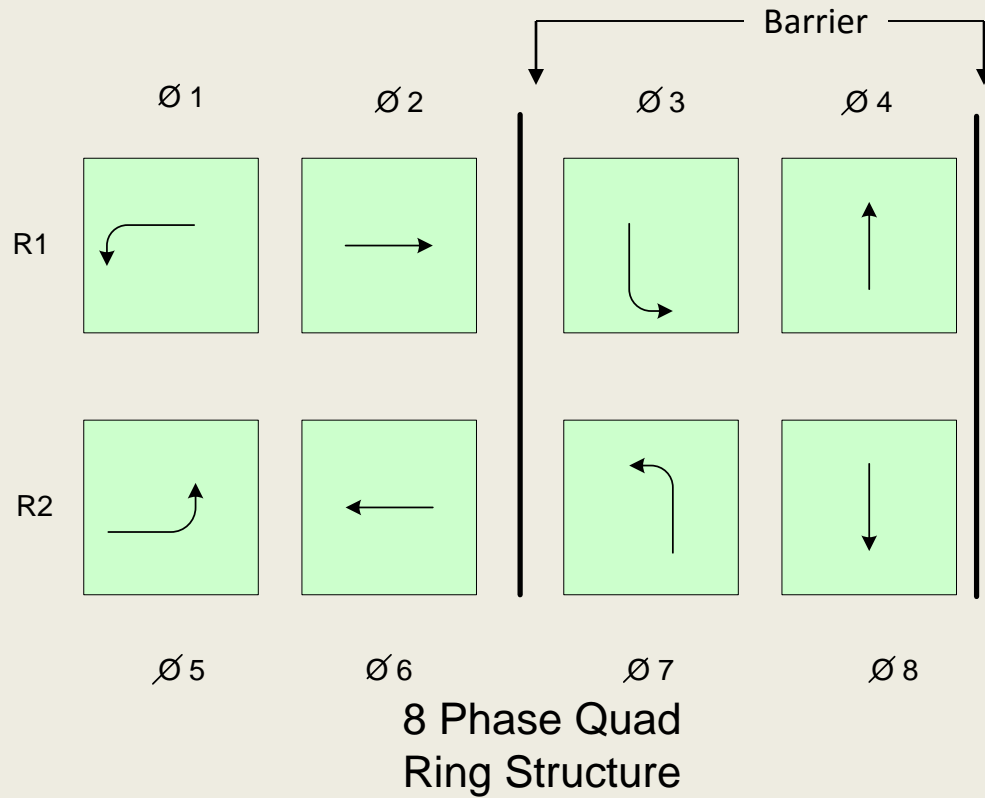
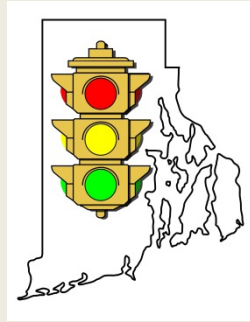
- Ring Structures
 - The configuration of the phases for the Intersection is based upon the Intersections ring structure.
 - The separation of concurrent phases is designated by the ring barrier.

Ring Structure

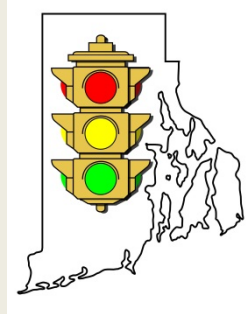


- Barrier
 - A barrier is a reference point in the sequence of a multi-ring Controller Unit at which all rings are interlocked. Barriers assure there will be no concurrent selection and timing of conflicting phases for traffic movement in different rings.

Ring Structure

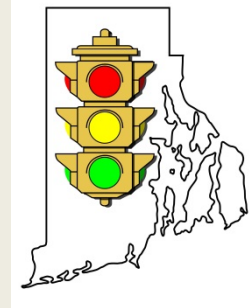


Ring Structure



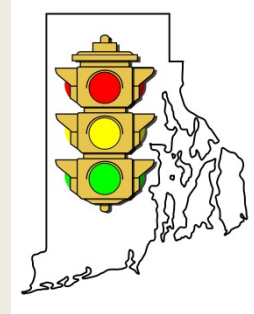
- Phases are identified within the ring structure as being Concurrent or Non-Concurrent phases.

Ring Structure



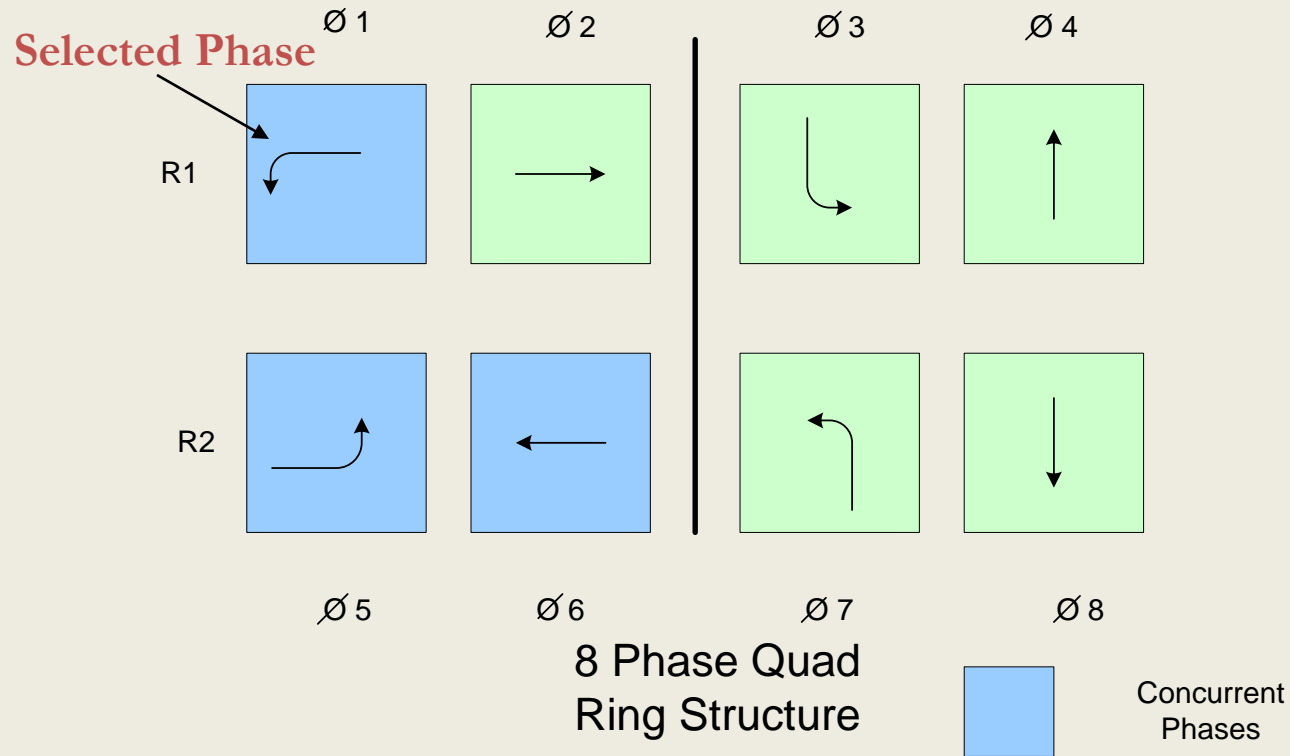
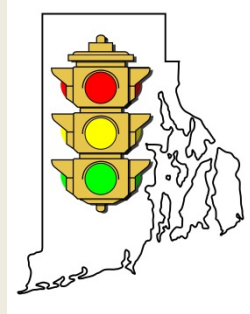
- Each phase can time with other phases in the other ring, and on the same side of the barrier, but can not time with any phase within its own ring, (i.e. 1 can time with 5 and 6, but not with 2, 3, 4, 7 or 8). If any other combination occurs, this is called a conflict.

Ring Structure

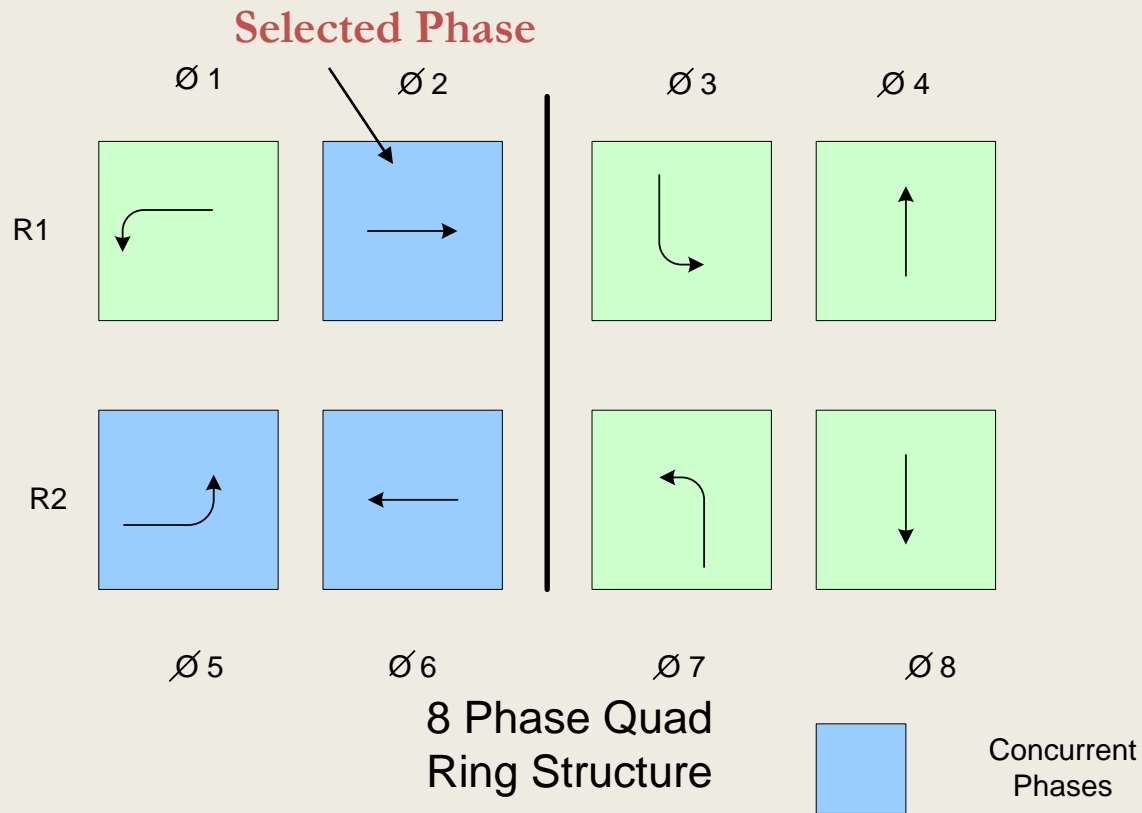
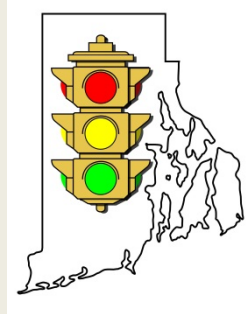


- The following diagrams identify Concurrent and Non-Concurrent phases within a standard 8 phase quad based on a selected phase.

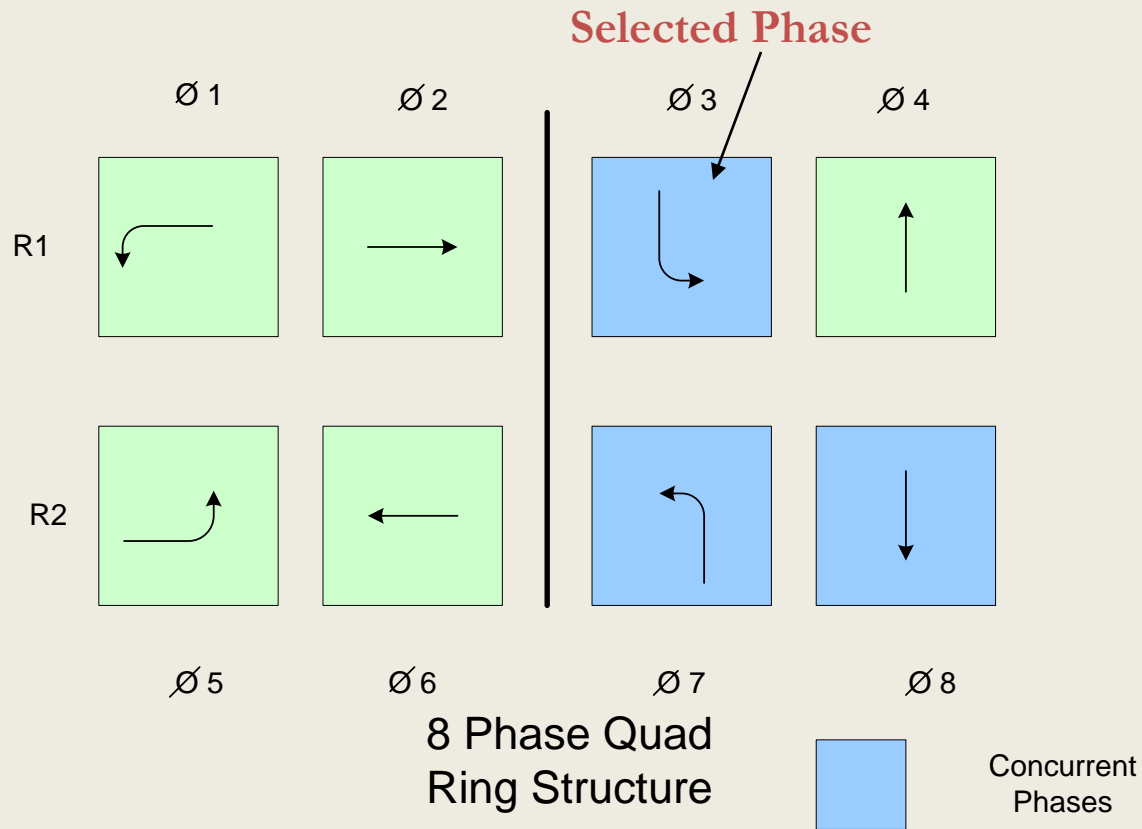
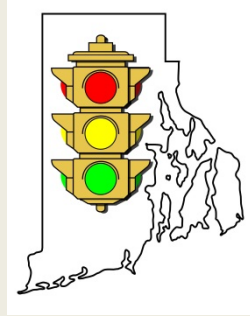
Ring Structure



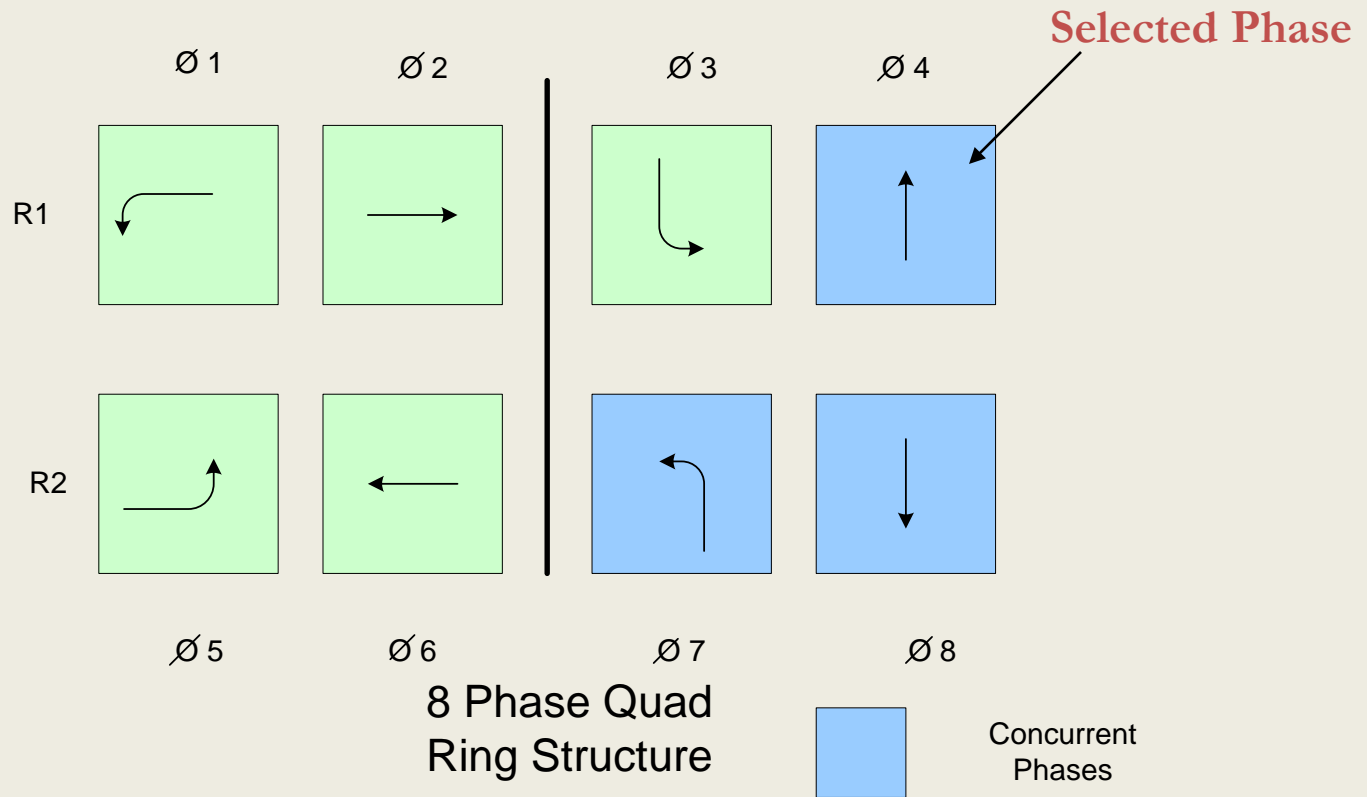
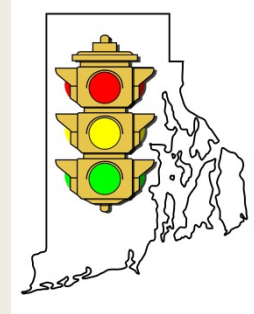
Ring Structure



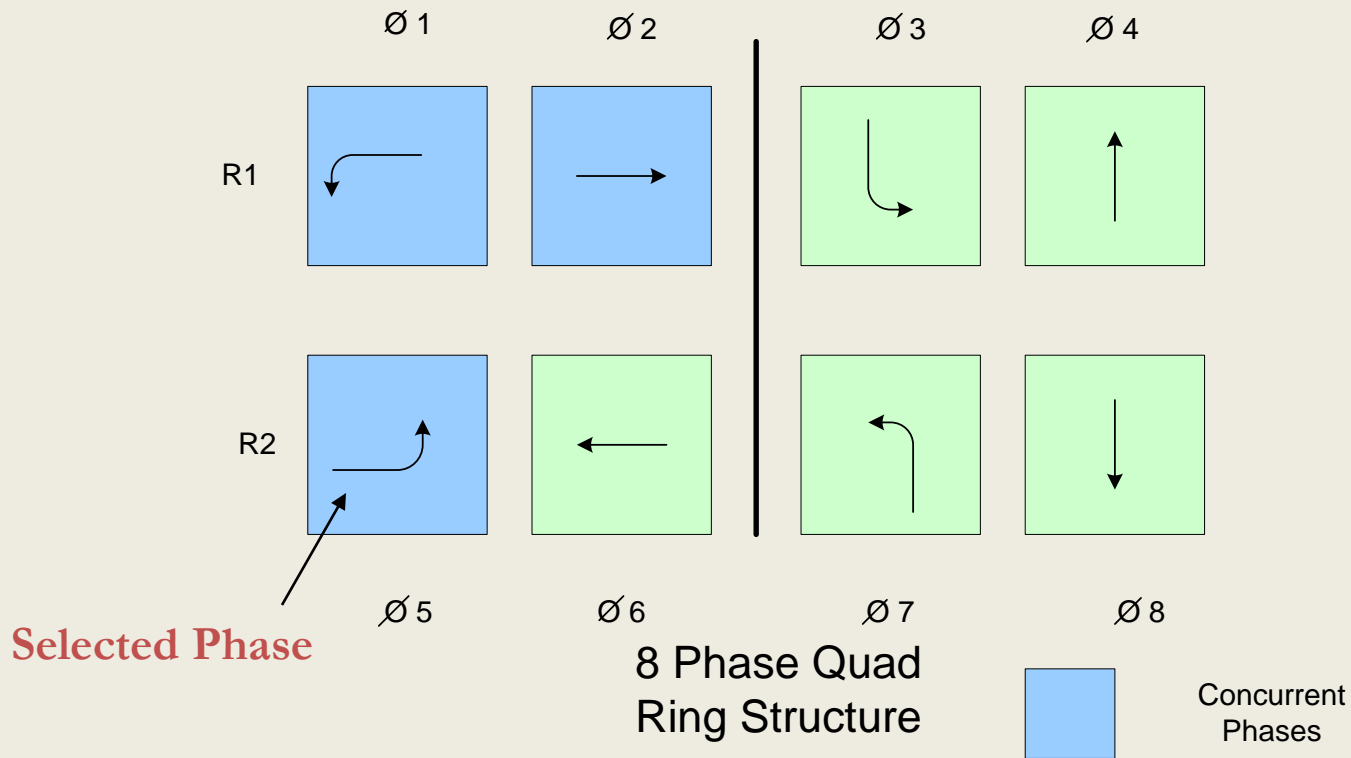
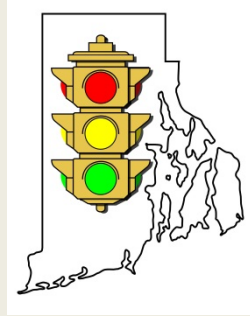
Ring Structure



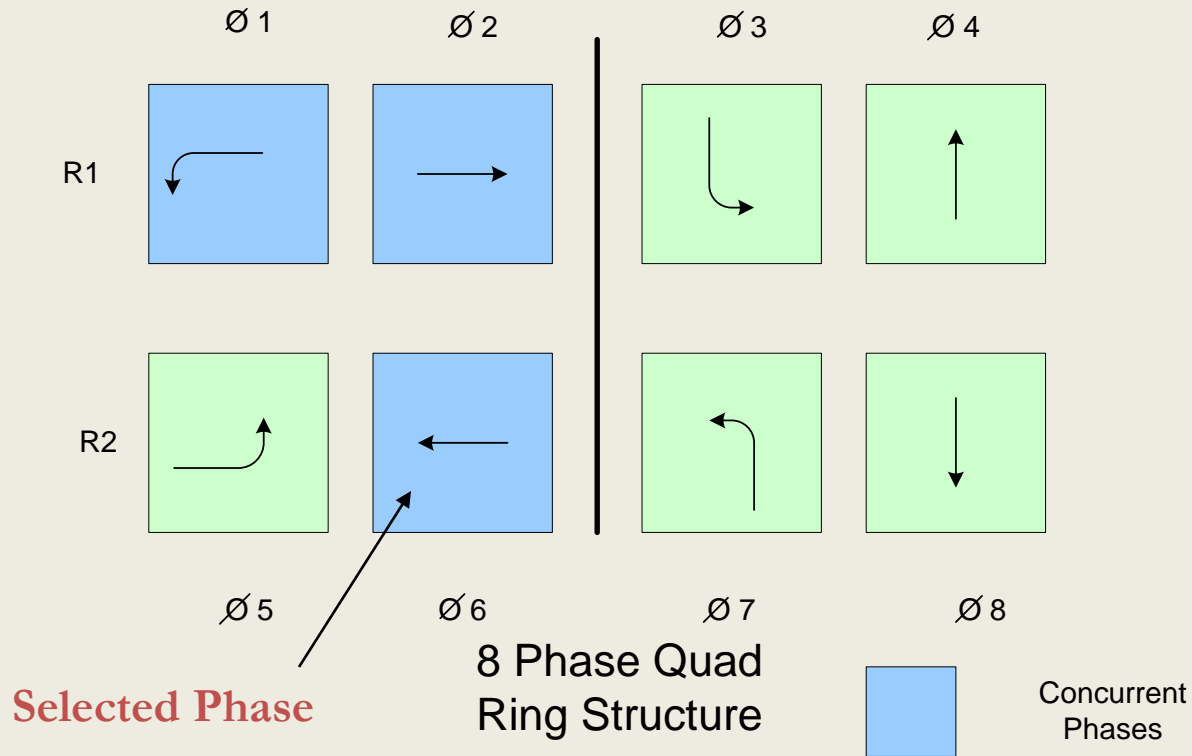
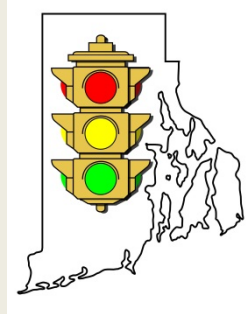
Ring Structure



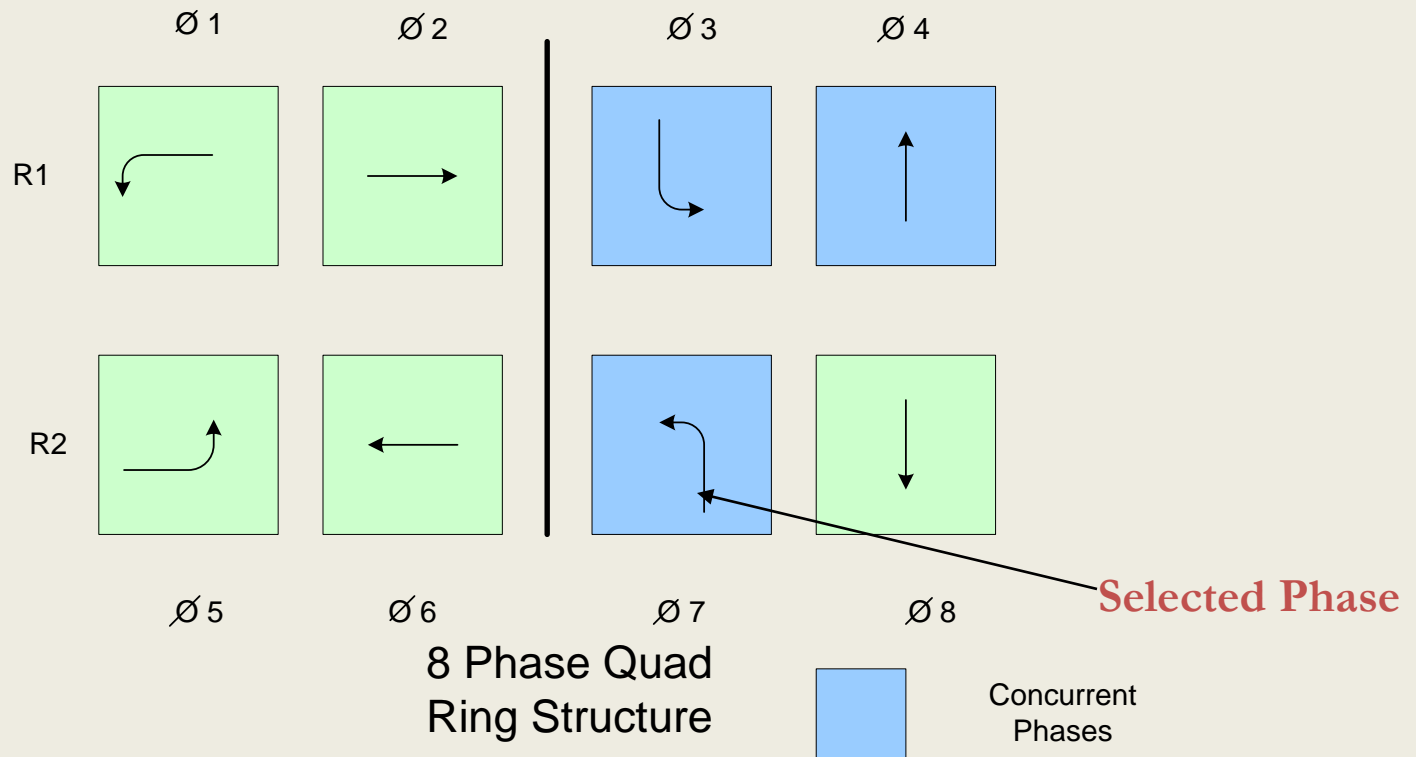
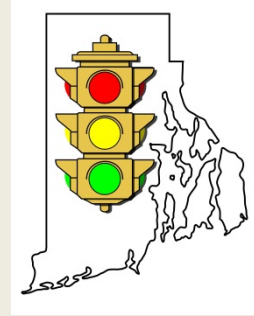
Ring Structure



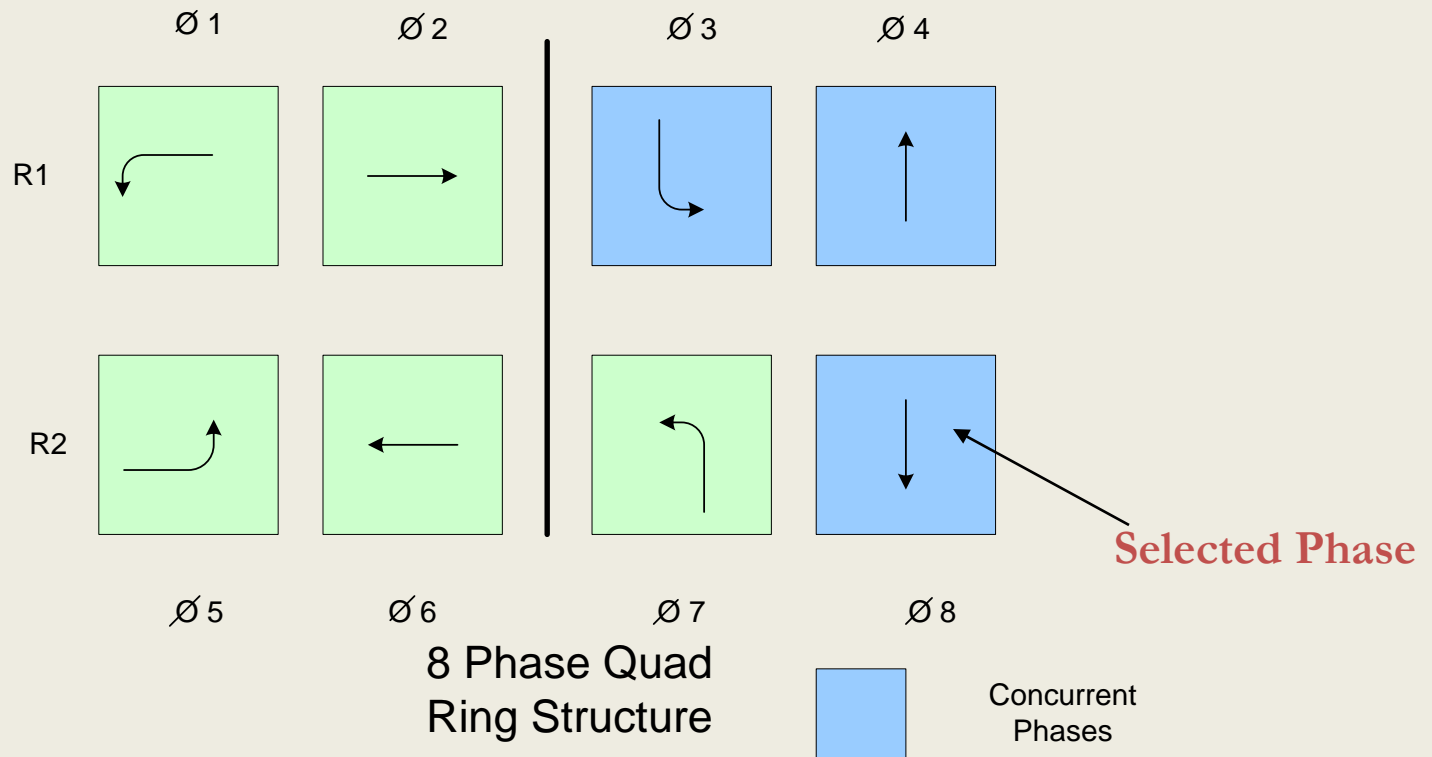
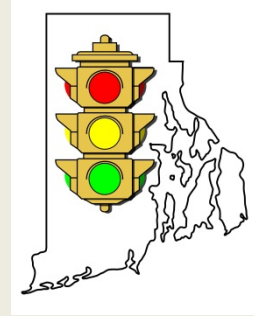
Ring Structure



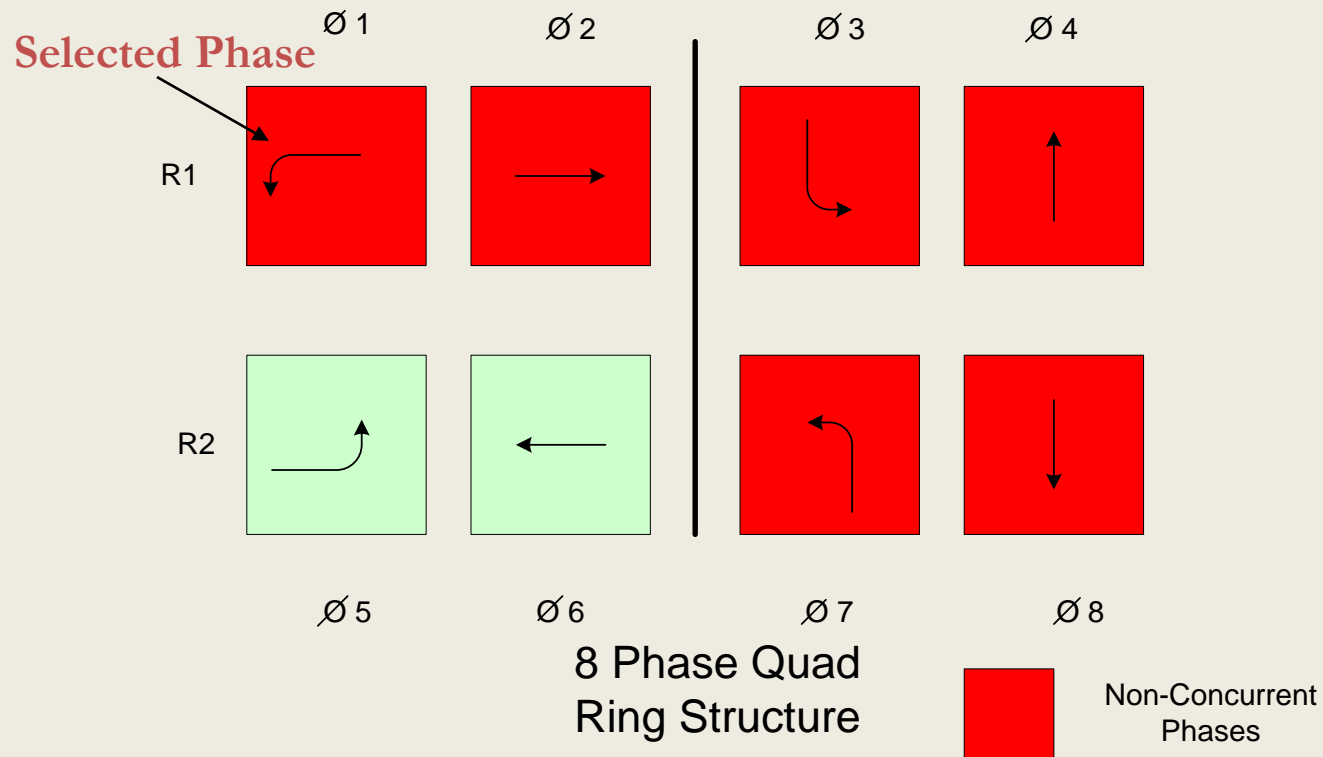
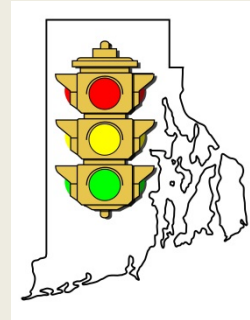
Ring Structure



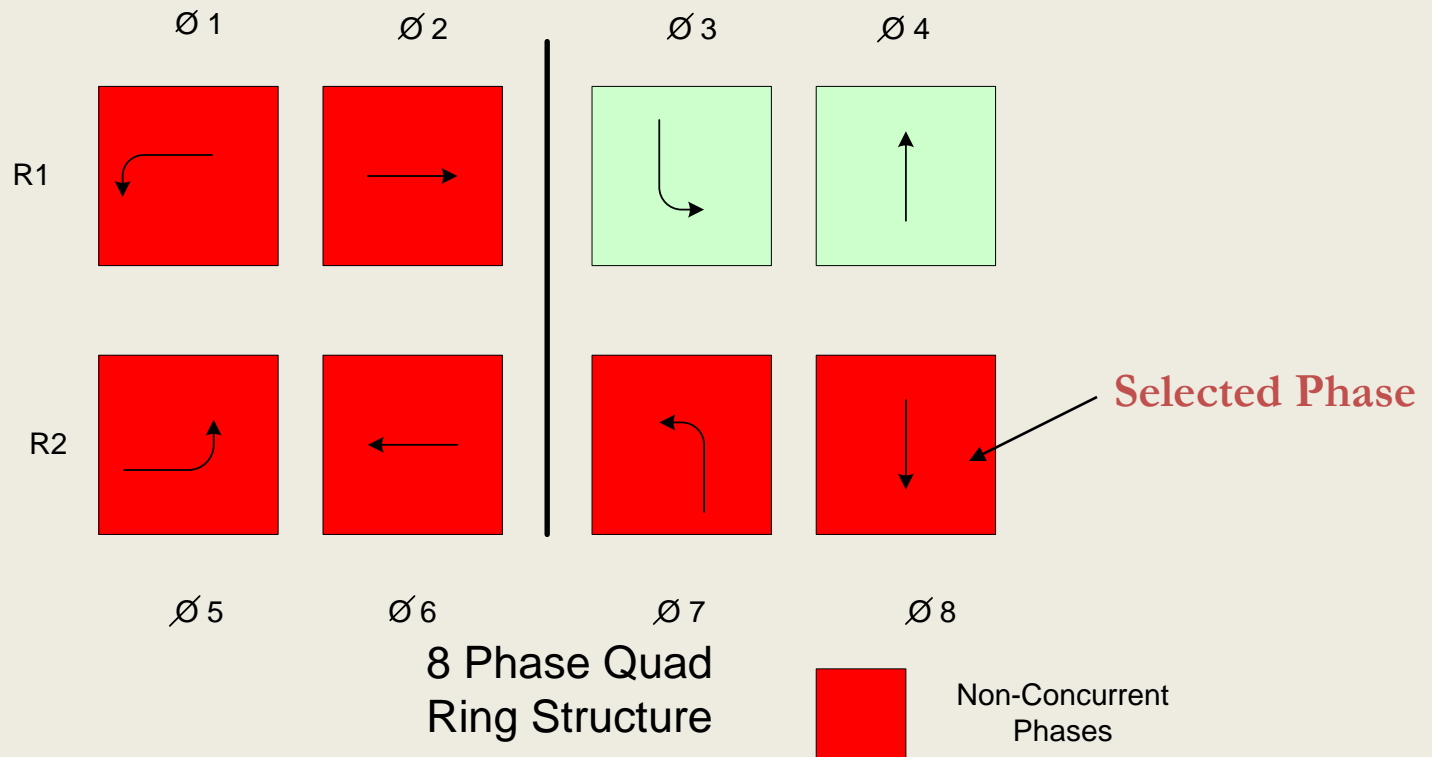
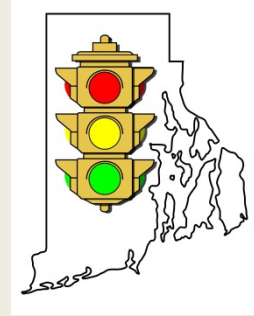
Ring Structure



Ring Structure



Ring Structure



Time

Phase One



Phase Two



Phase Three

Phase Five



Phase Six



Phase Seven



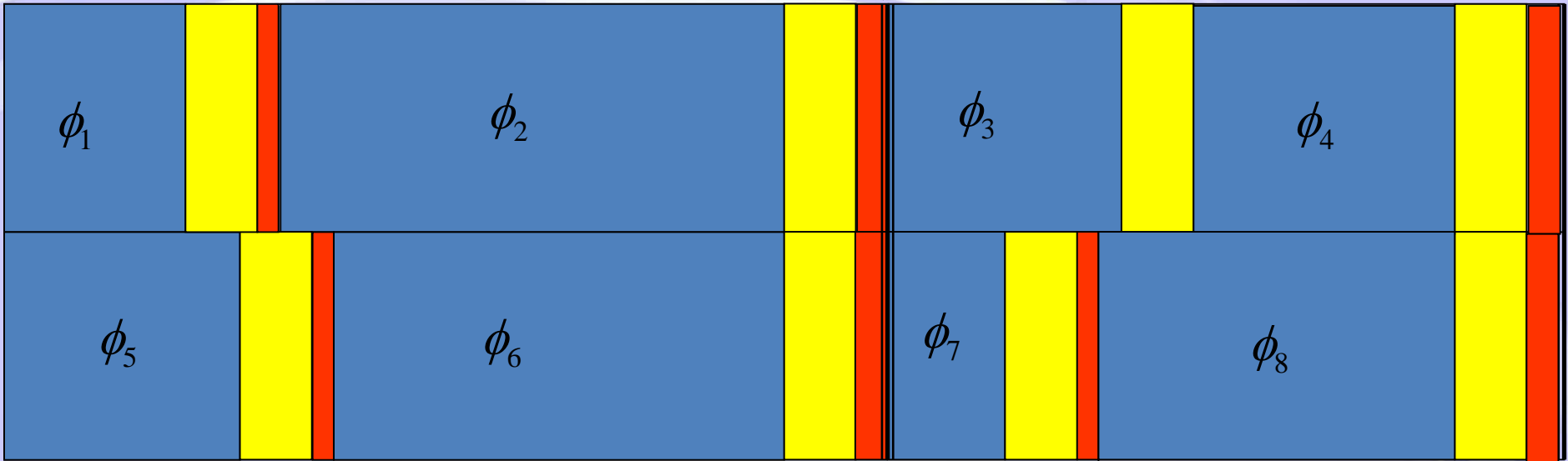
Output Signal

PHASING DIAGRAM

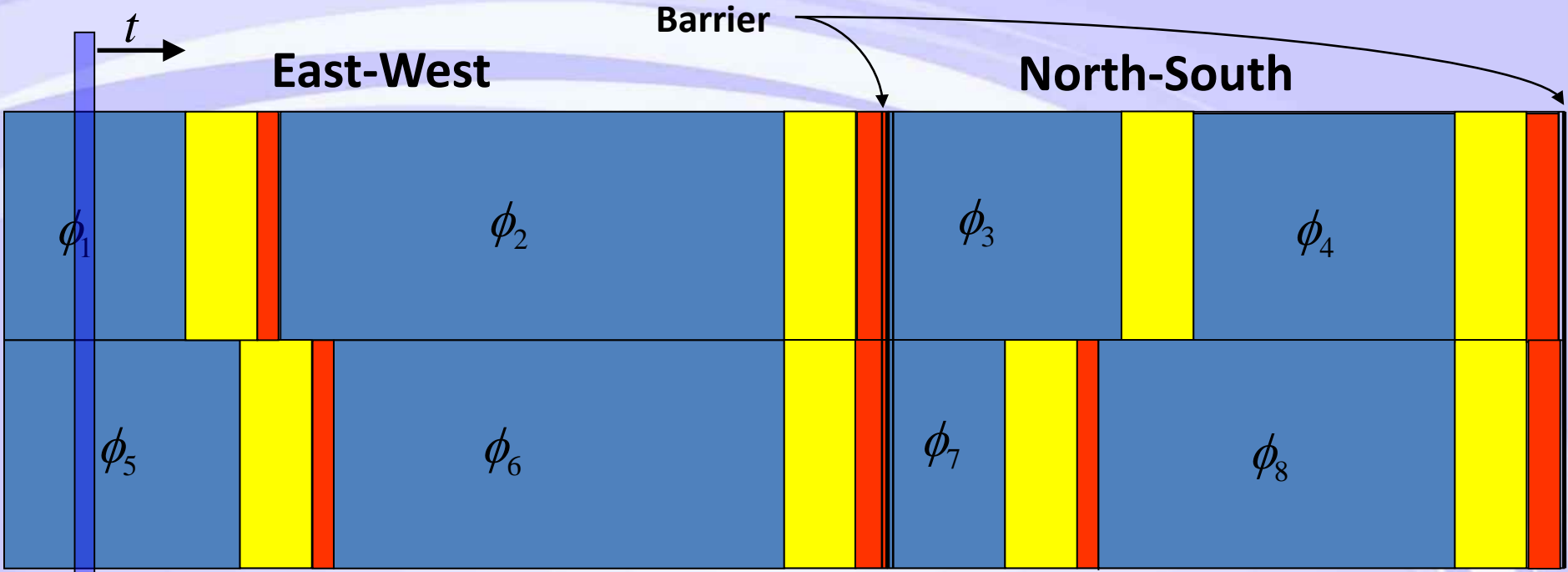
East-West

Barrier

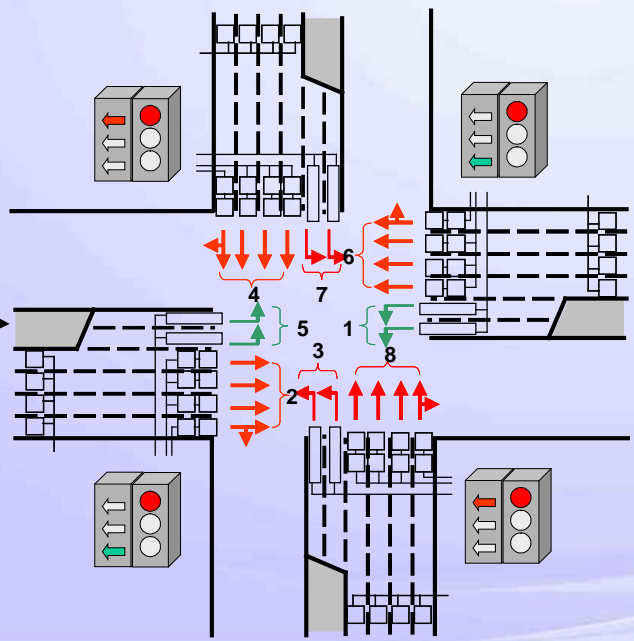
North-South



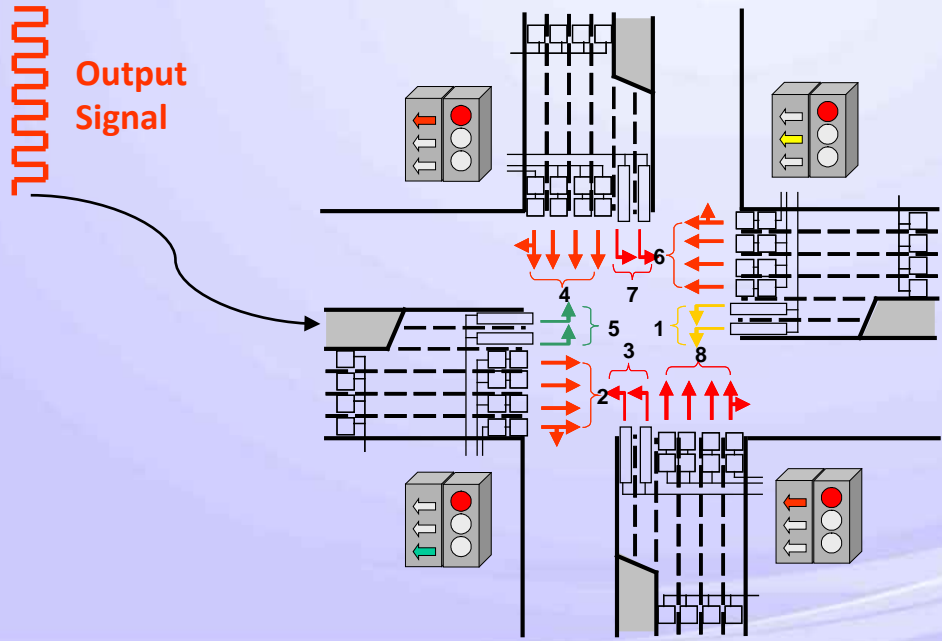
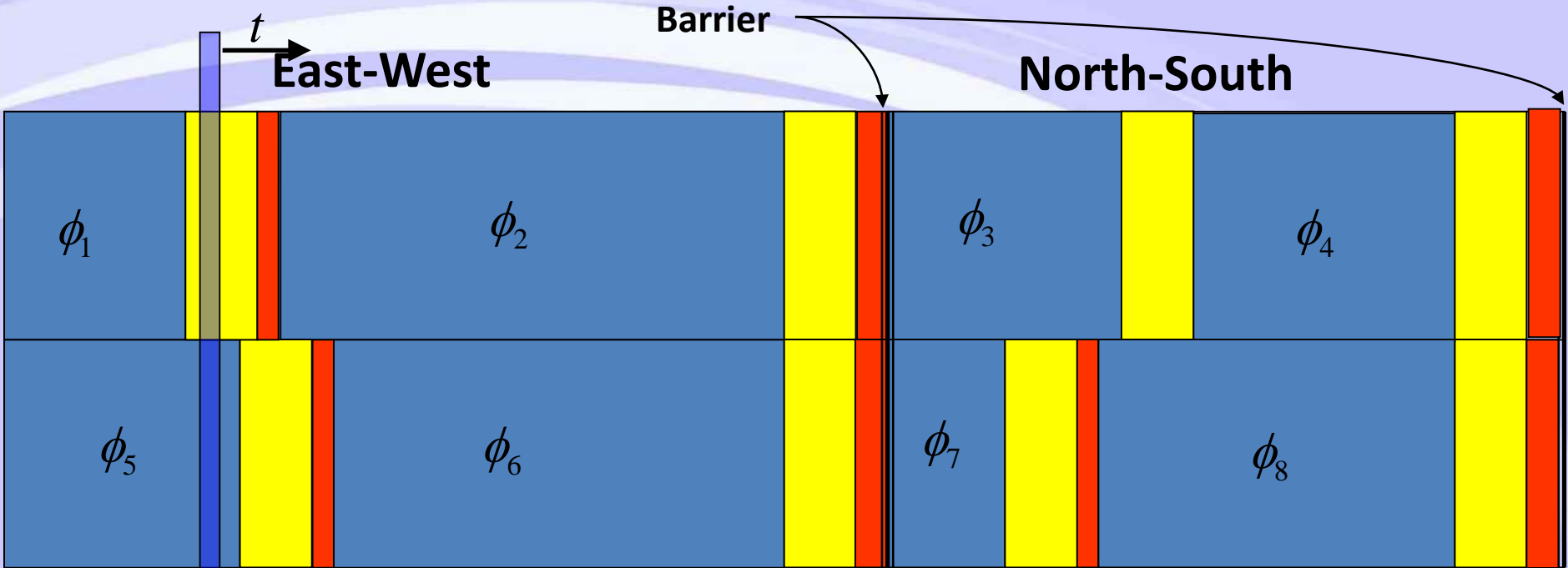
PHASING DIAGRAM



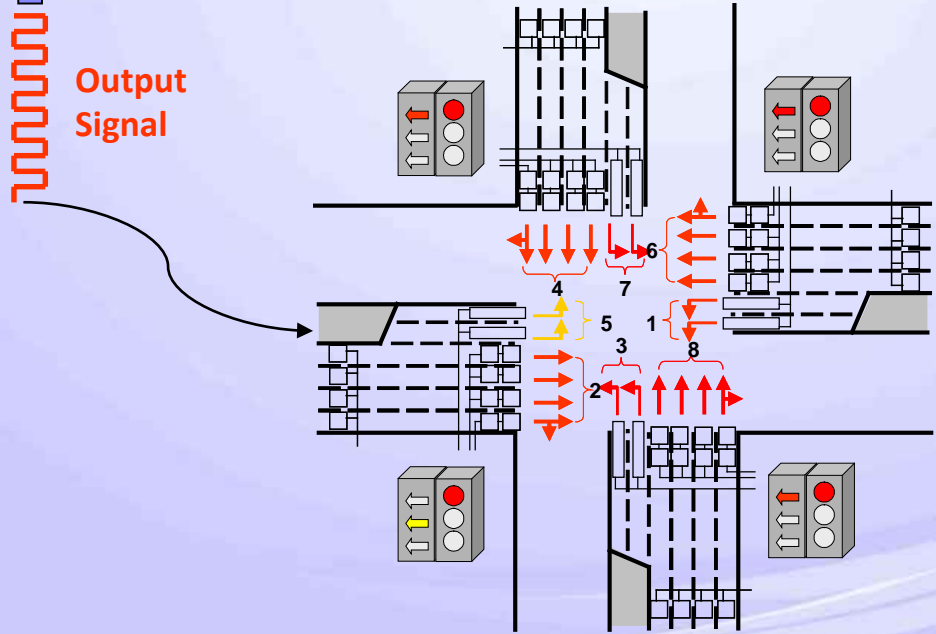
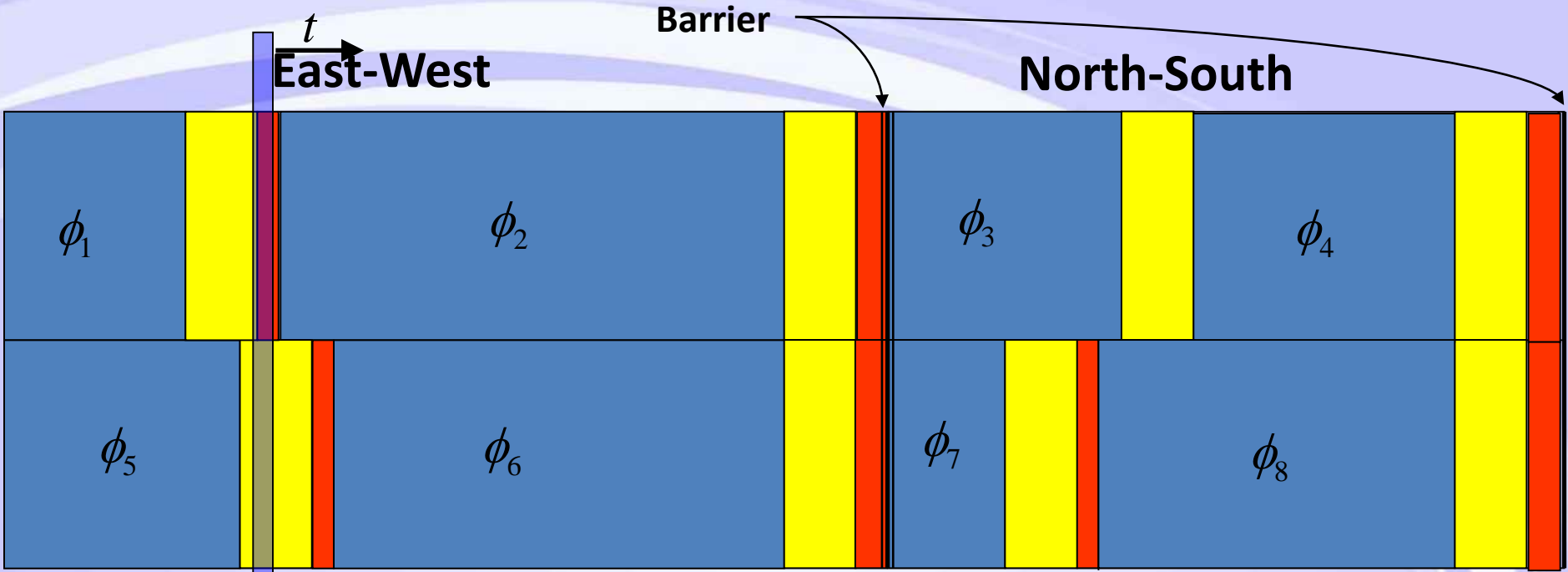
Output Signal



PHASING DIAGRAM



PHASING DIAGRAM



Output Signal

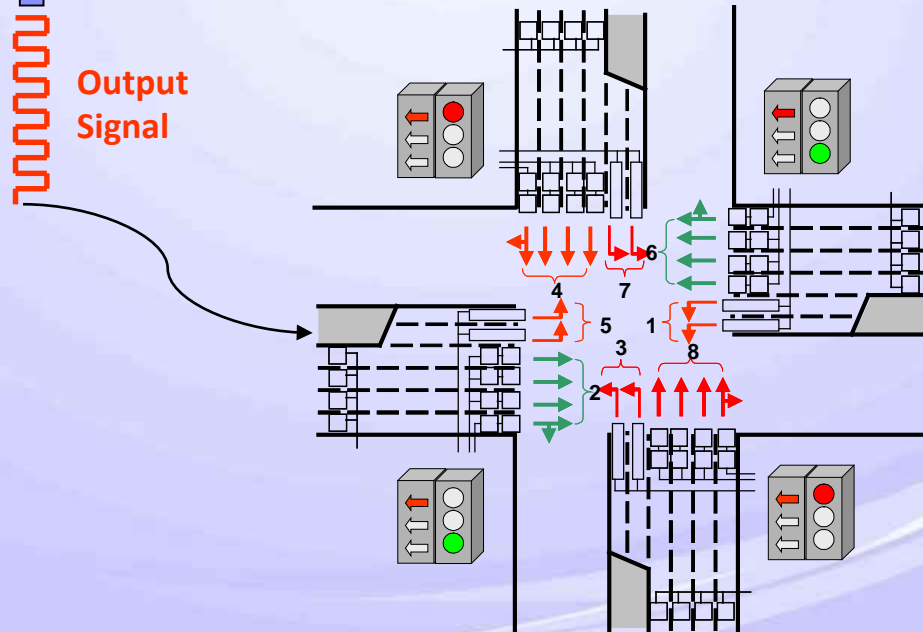
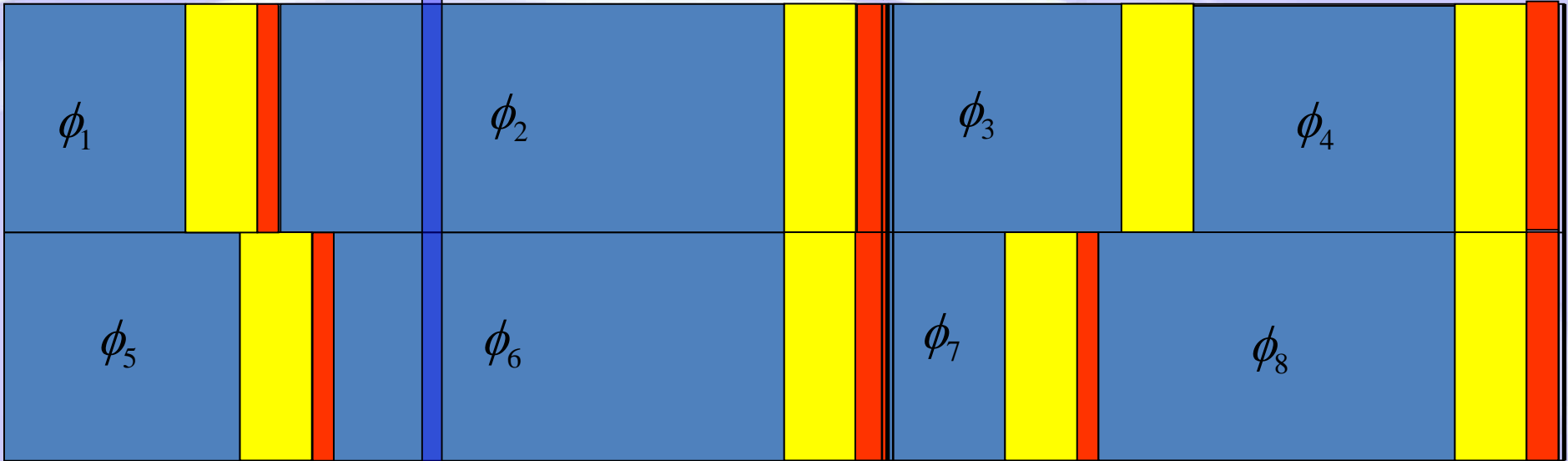


PHASING DIAGRAM

East-West t

Barrier

North-South



PHASING DIAGRAM

East-West

North-South

Barrier

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ϕ_1

ϕ_2

ϕ_3

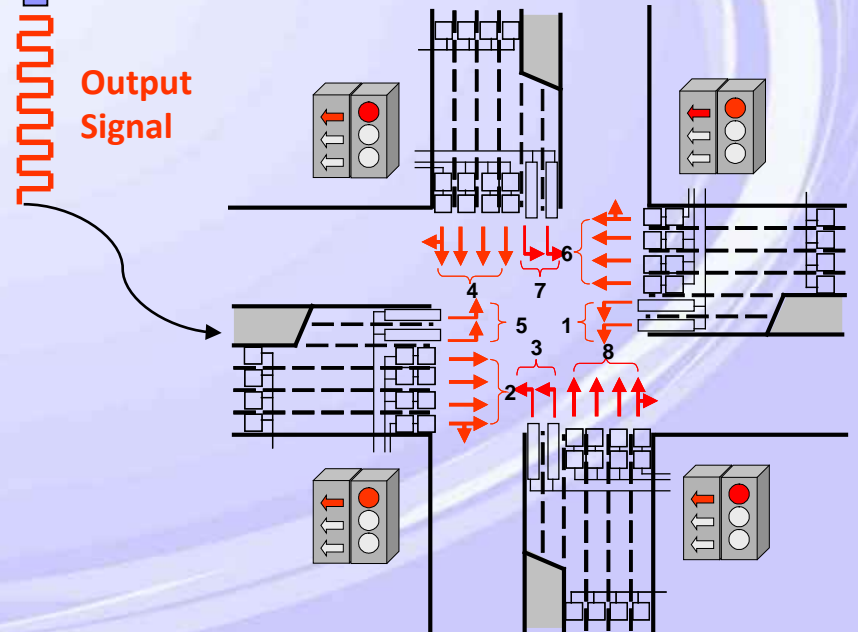
ϕ_4

ϕ_5

ϕ_6

ϕ_7

ϕ_8

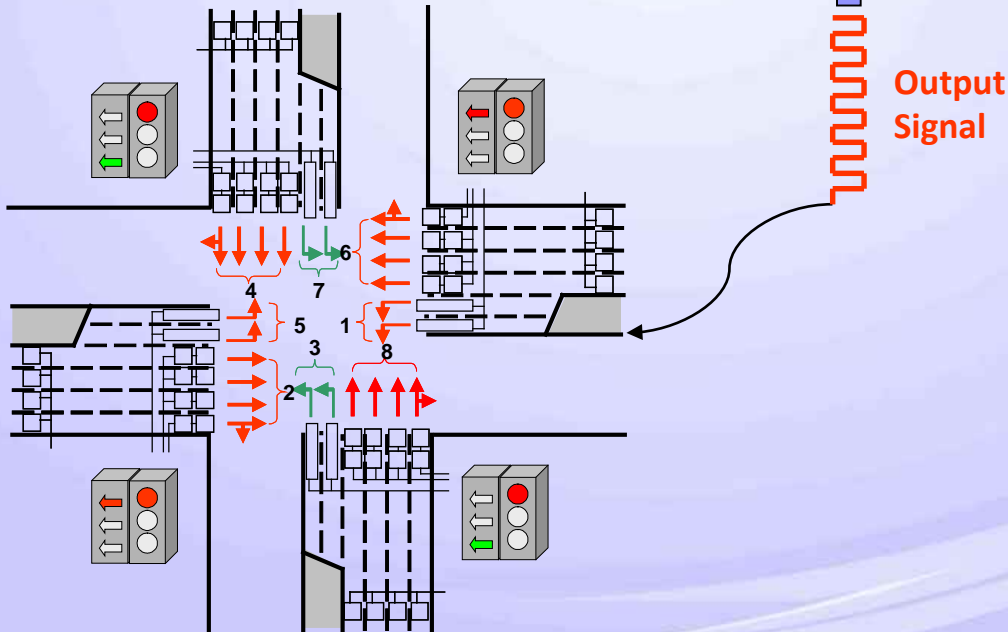
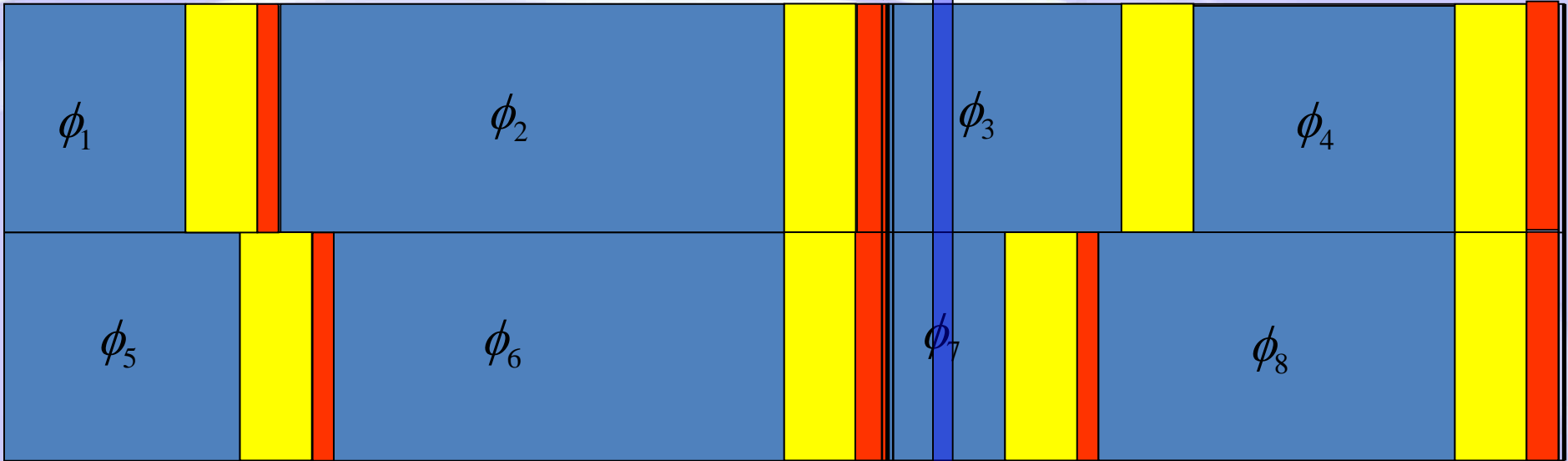


PHASING DIAGRAM

East-West

Barrier

North-South



ITS

PHASING DIAGRAM

East-West

Barrier

North-South

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ϕ_1

ϕ_2

ϕ_3

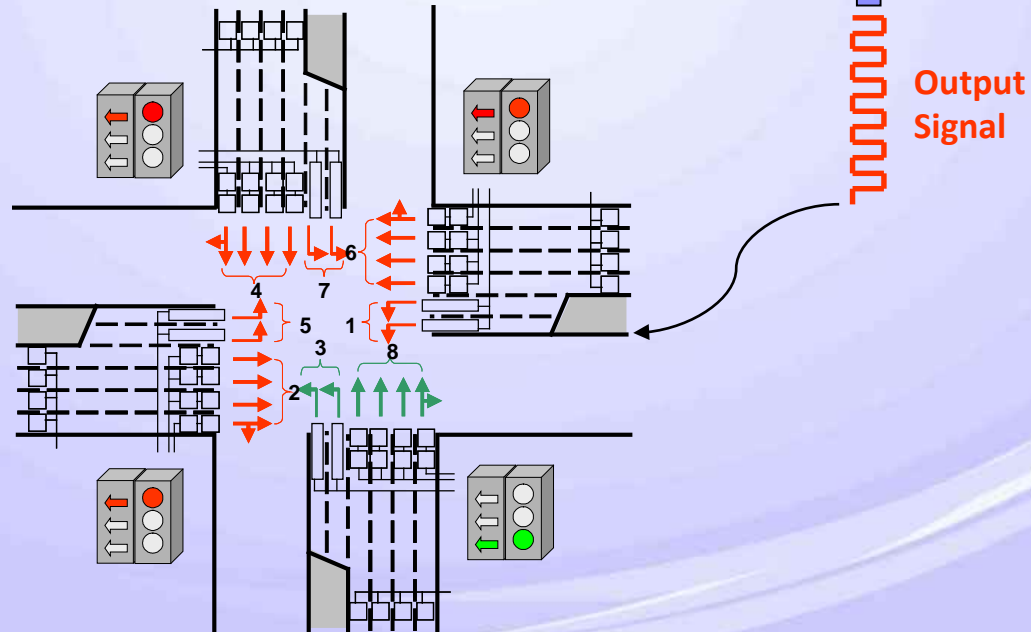
ϕ_4

ϕ_5

ϕ_6

ϕ_7

ϕ_8



ITS

PHASING DIAGRAM

East-West

North-South

Barrier

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ϕ_1

ϕ_2

ϕ_3

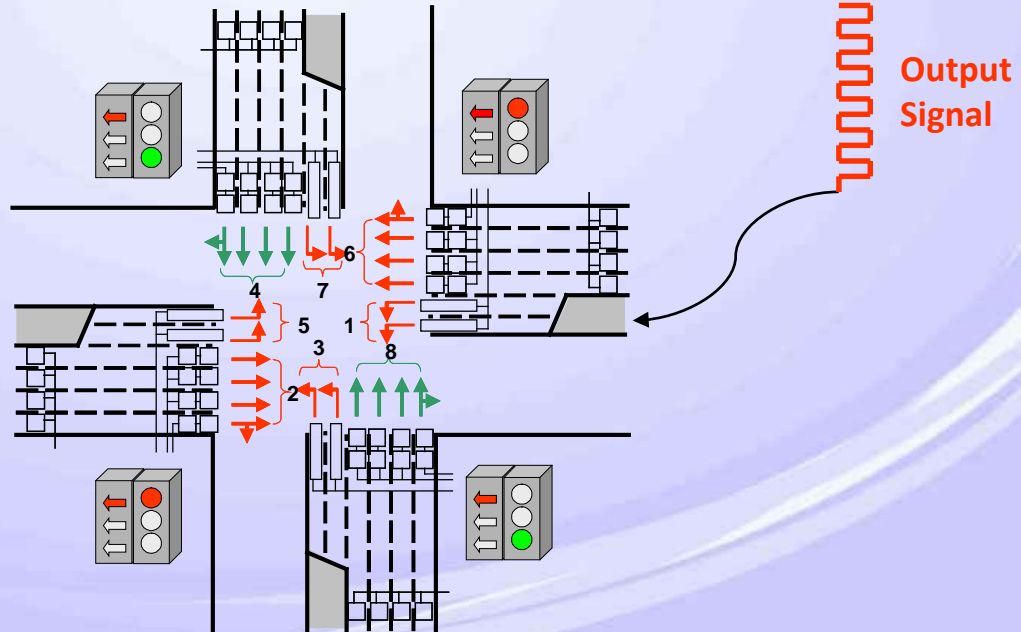
ϕ_4

ϕ_5

ϕ_6

ϕ_7

ϕ_8



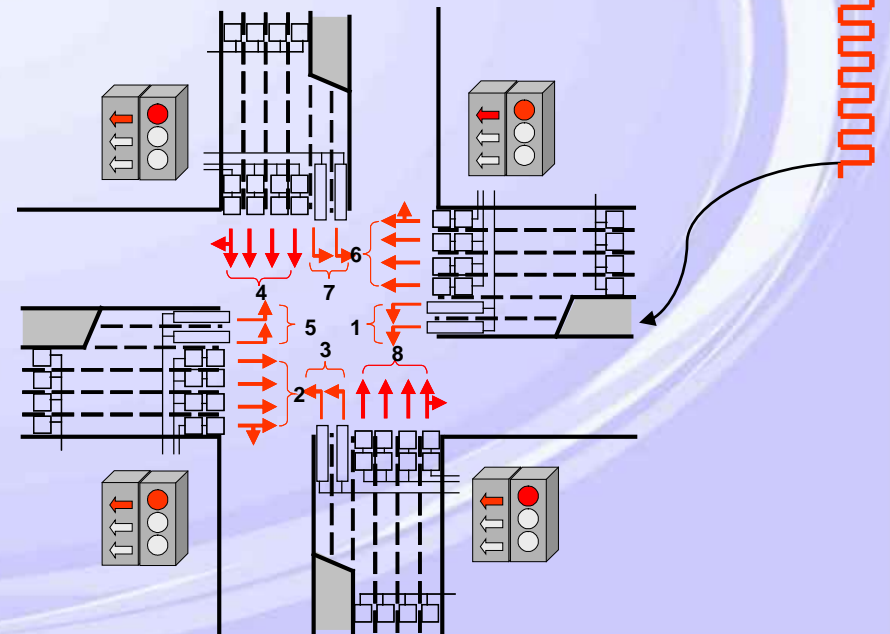
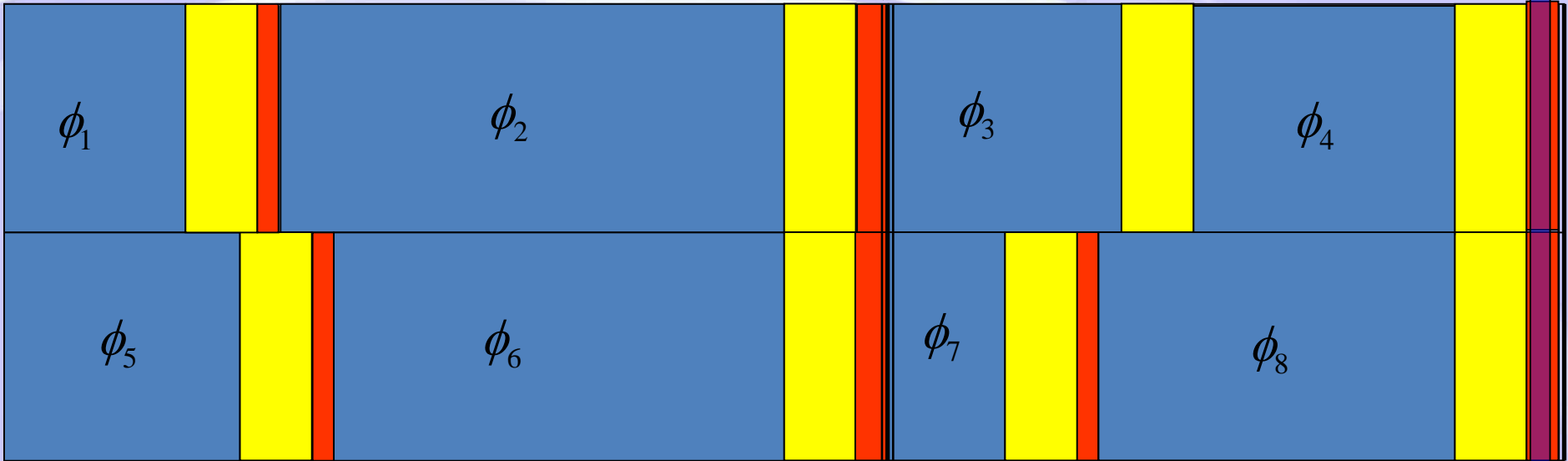
ITS

PHASING DIAGRAM

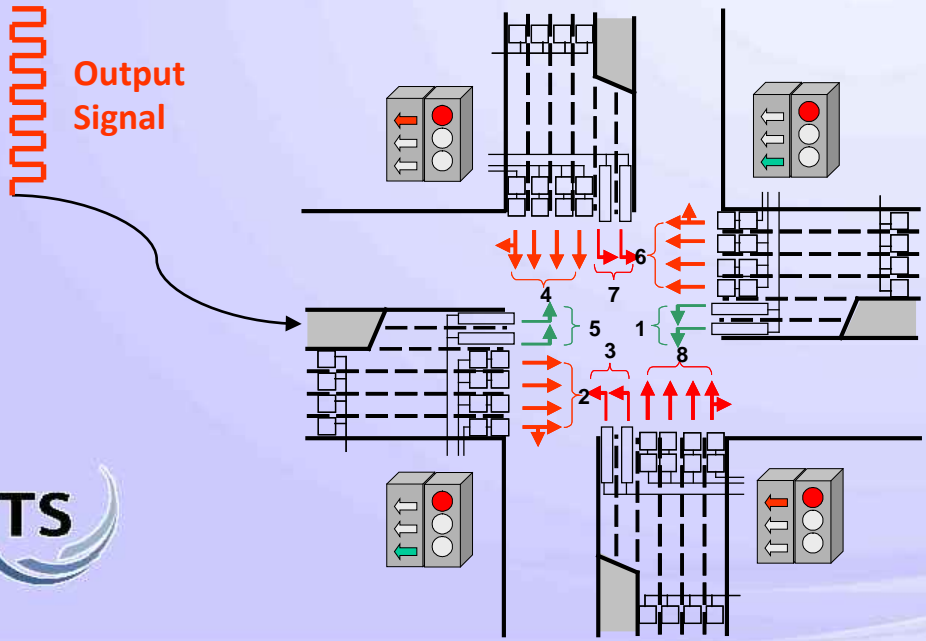
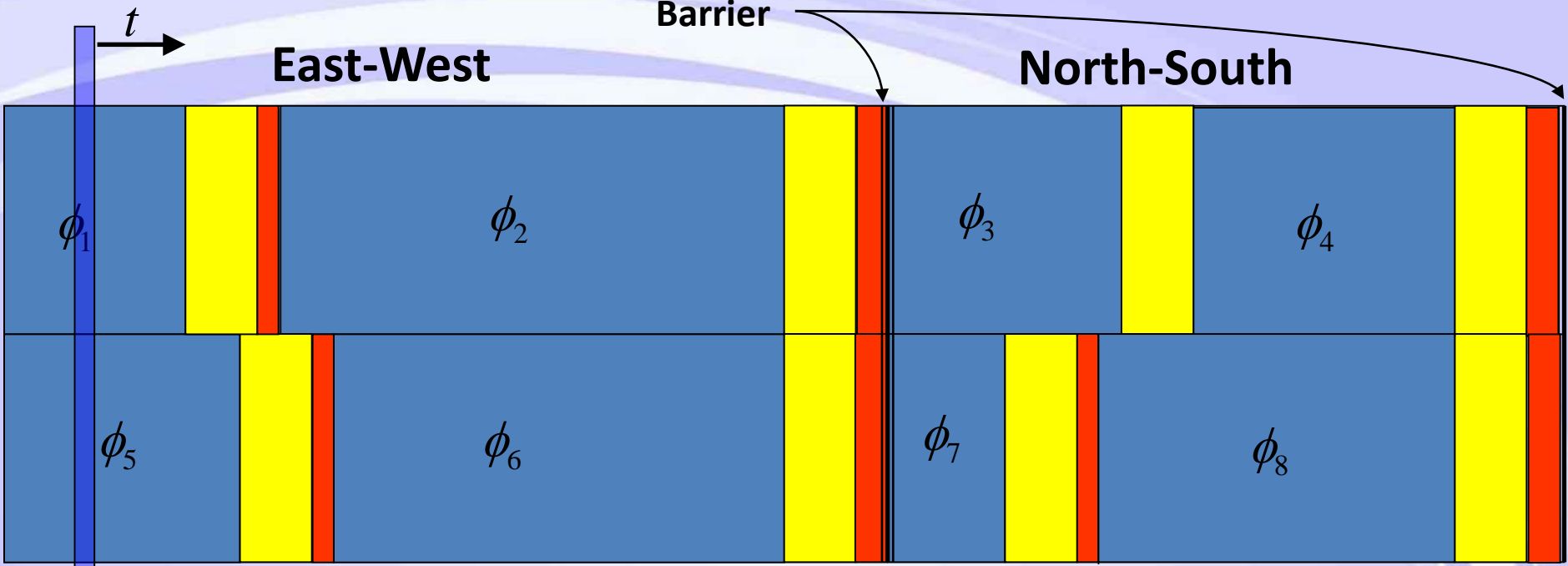
East-West

North-South

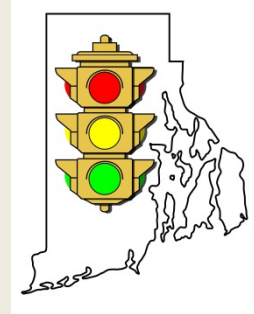
Barrier



PHASING DIAGRAM



Coordination

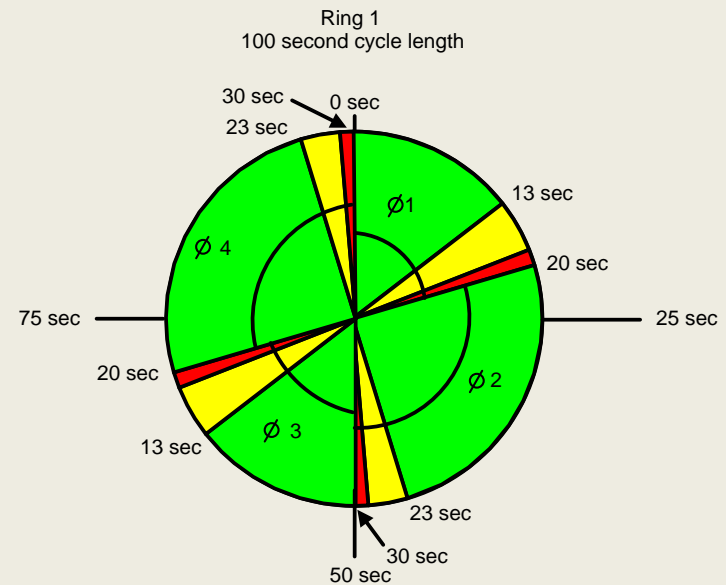


- Cycle

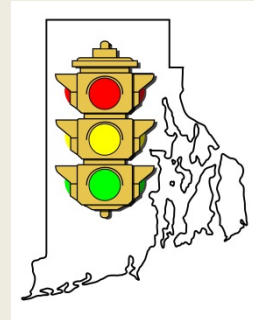
- A signal cycle is one complete rotation through all of the phases in a ring. In general, every legal vehicular or pedestrian movement receives a “green” indication once within each cycle, although there are some exceptions to this rule.
- Cycle Length – The cycle length is the time that it takes a signal to complete one full cycle of indication.

Coordination

- Diagram of Ring 1 with 100 second cycle length.
- For an 8 phase quad, Ring 1 and Ring 2 would overlap one on top of the other.



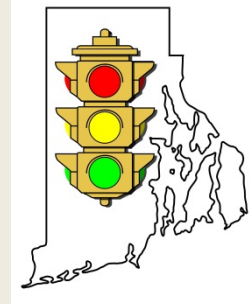
Coordination



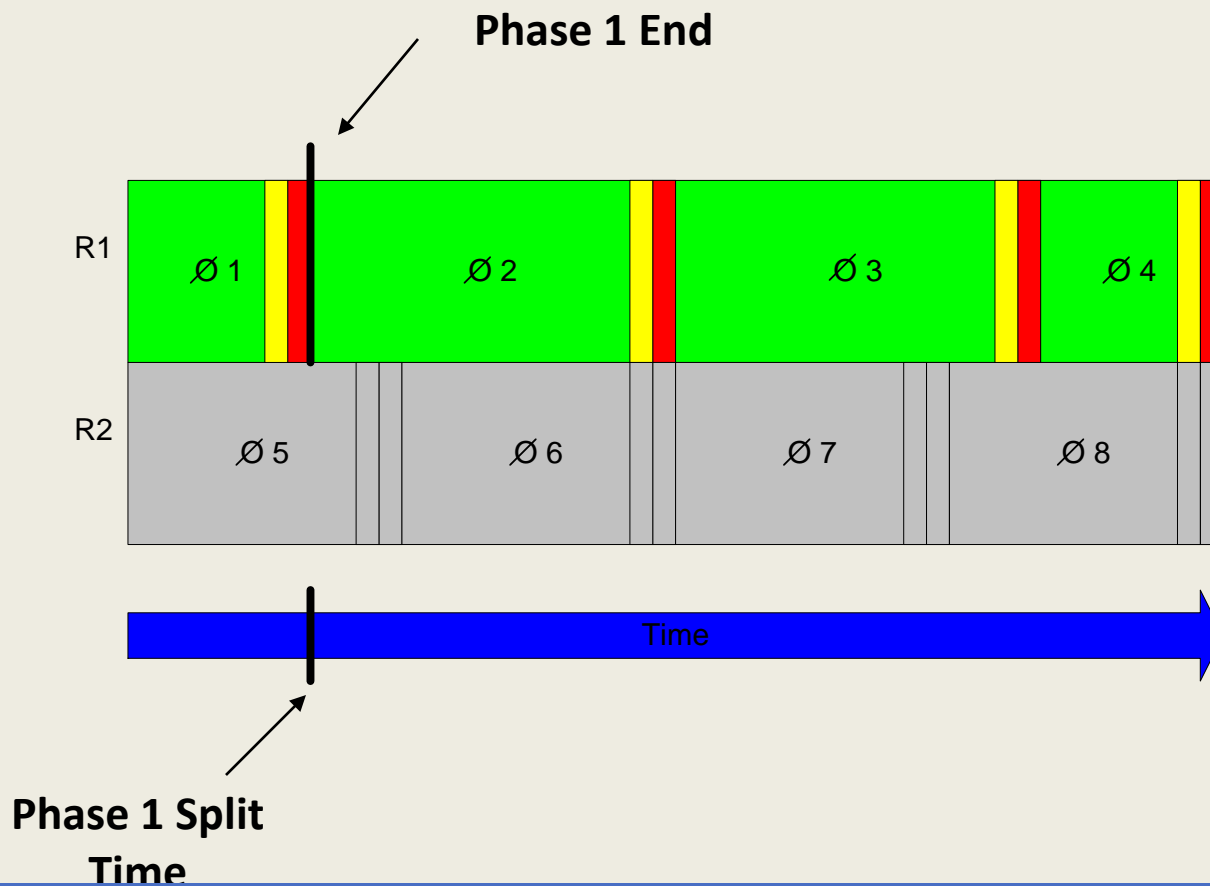
Split

- The segment of the cycle length allocated to each phase or interval that may occur. In an actuated controller unit, split is the time in the cycle allocated to a phase.
- Green time + clearance intervals (yellow and red).

Coordination

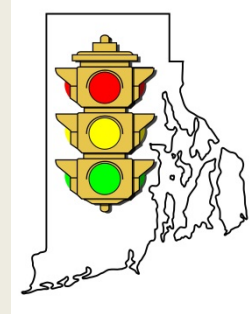


Split

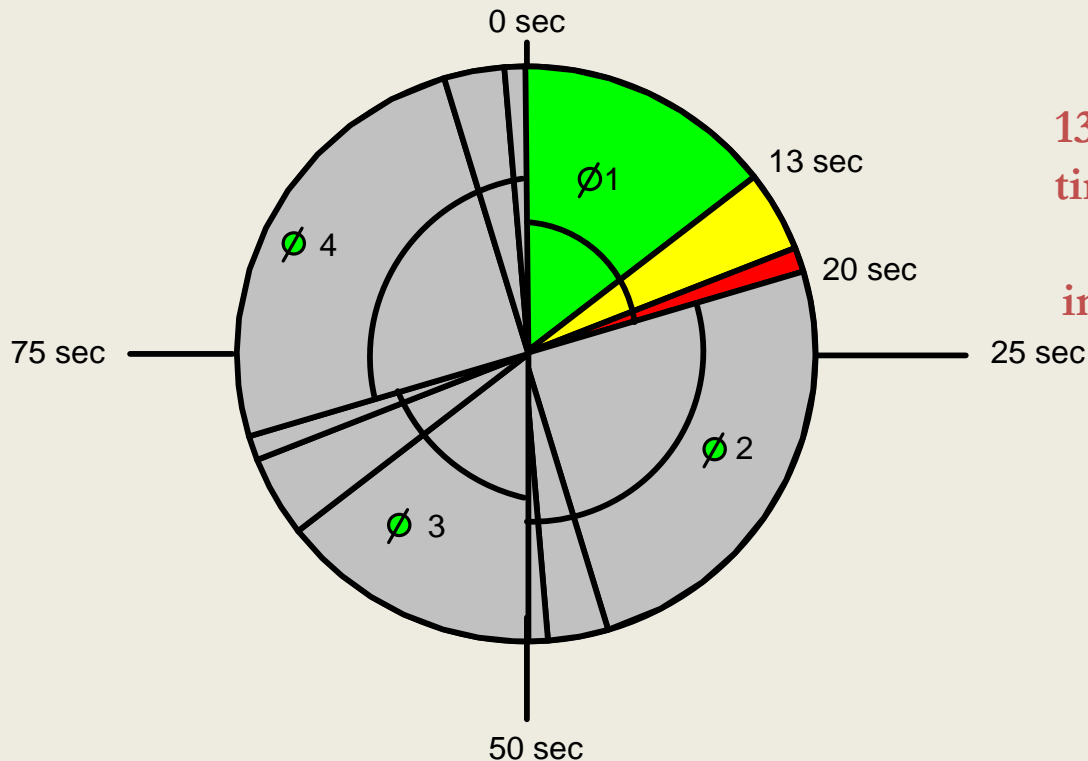


Split Coordination

Split



- Illustration of Phase 1 with a split time of 20 seconds.

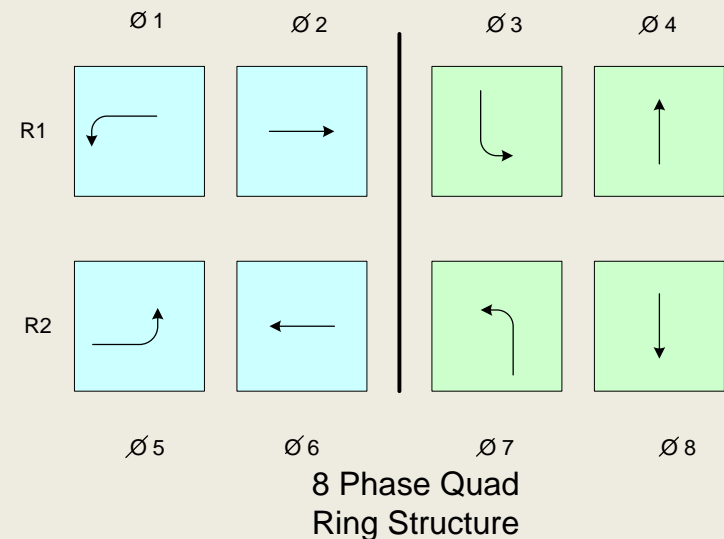


13 second green
time + 7 second
clearance
interval (yellow
and red).

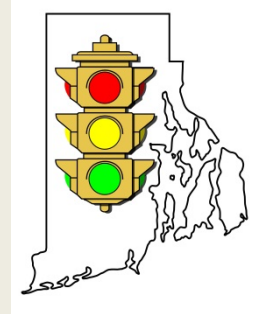
Coordination

Split

- Split times should run such that time between barriers is equal from ring to ring.
- Sum of phase 1 and 2 should be the same as the sum of phases 5 and 6 because they are on the same side of a barrier in different rings.

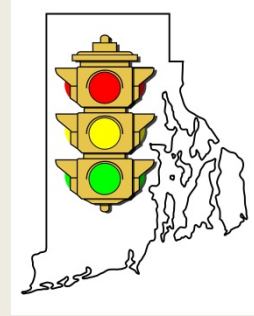


Coordination



- Offset
 - Offset is the time relationship, expressed in seconds or percent of cycle length, determined by the difference between a defined point in the coordinated green and a system reference point.
 - Offset values assist in coordinating Intersections along an arterial by creating a “Green Band”.

Coordination



- Offset

- In coordinated operation, every intersection will reference a background clock representing the cycle length.
- The moment in time in which the green for the coordinated phase begins (or ends) is the determined by the value of the offset.