PROTOCOL B

COMMUNICATIONS PROTOCOL OF THE TRAFFIC REGULATOR OF BARCELONA

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1. Purpose and field of application

This report contains the minimum specifications that Traffic Regulators must meet in order to communicate properly in Centralised Traffic Systems. The Network Manager task is on the computer, so it will not be the subject of this proposal.

2. Structure of the document

This document is divided into two parts: the first describes the specifications applicable to any equipment that connects to the communications network. The second describes the specifications applicable to the traffic regulator.

At the physical level, two modes of communication are defined:

- Serial line.
- Ethernet.

These two modes of communication establish a different treatment at the physical and data link levels.

3. General specifications applicable to any node of the communications network

This section establishes the common behaviour of all equipment connected to the communications network.

3.1 Functionality

This section is included to facilitate the interpretation of the protocol. It is not intended to be a functional specification and should not be construed as a complete and exhaustive specification of requirements.

3.1.1 Communications

Network structure

Physical and logical

identification Channels

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3.1.1.1 Structure of the communications network

The communications adopt a star structure. There can be up to 4 levels. Levels are identified by the following names: HOST, CENTRAL, REGULATOR, AND SUB-REGULATOR.

The nodes of each level are connected to a top-level node (except the HOST level nodes) and can have several lower-level nodes connected (except the SUB-REGULATOR level nodes).

3.1.1.2 Physical and logical identification

Each node in the network has two identifications: logical and physical identification.

Logical identification is part of the configuration of the equipment, regardless of its position in the communications network. It is encoded with a 16-bit integer with valid values between 1 and 32767.

Physical identification identifies the node's position in the network. It is assigned when the node is connected to the network (see 3.1.1.4).

It is encoded with a 16-bit integer divided into 4 fields:

- Host ID
- Subcontroller Identifier Bits 14-15 Valid Values 0-2
- Central Plant Identifier Bits 8-13 Valid Values 1-62
- Regulator Identifier Bits 0-5 Valid Values 1-62

Bits 7-8 Valid Values 1-2

In the physical node identification of a given level, the fields corresponding to the lower levels are worth 0. For example, in a CENTRAL level node, the regulator ID and subcontroller fields are worth 0.

When a node is not identified, the identifiers of the top-level fields are encoded with all bits to '1'. The identifier corresponding to your level is a configuration parameter. All equipment must have a preset level (which can be modified when connecting to the network). For example: the identification of an isolated regulator could be HOST 3, CENTRAL 63, CONTROLLER 1, SUBCONTROLLER 0.

3.1.1.3 Communications test

A node in the network knows the status of its communication links with other nodes through the communications test.

From the point of view of communications testing, there is an active and a passive node. The active node periodically transmits a TOK or TML frame. The passive node responds to any of them with TRT. The frame transmitted is TOK if the answer to the previous test was received correctly. If there was no response or it was not received correctly, the TML frame is transmitted.

There are two types of communications tests: the active test and the passive test. The active test is the one performed by a node on its links with the adjacent nodes of the lower level. While the passive test is performed by a node in its link with its top node.

3.1.1.3.1 Active test

- Performed by an active node
- It is performed every 4 seconds. Every 4 seconds the corresponding communications test frame is transmitted and the test result is evaluated as follows:
  - It is considered correct if the response corresponding to the previous shipment has been received
  - It is considered incorrect if no response has been received or if the answer is not correct.
- Link communication status is updated based on the test result as stated in 3.1.1.3.3 with NT = 3.
- If after the update the status of the link becomes good and it is not due to communication recovery, the identification process begins
- If after the update the status of the link goes bad and it is not due to false communication recovery, the link loss is notified to the manager with the network maintenance frame CC_ENL_OF.

3.1.1.3.2 Passive testing

The characteristics of the passive test are as follows:

- Performed by a passive node
- It is performed every 5 seconds. Every 5 seconds it is checked whether a communications test frame has been received since the previous check and the test result is evaluated as follows:
  - It is considered correct if the TOK frame has been received
  - Considered incorrect if TML frame has been received or no test frame has been received
- Link communication status is updated based on the test result as indicated in 3.1.1.3.3 with NT = 5.

3.1.1.3.3 Updating the Link Communication Status

The possible link statuses are: unknown, good, bad, counting errors and counting no errors.

- The initial state of the link is unknown
- After successful NT tests the state passes to good through the intermediate state **counting not mistakes.**

- If an incorrect test occurs while counting no errors , the status returns to **unknown**
- Being in good state, it goes to bad state after incorrect NT tests through the intermediate state counting errors.
- If a correct test is produced while counting errors, it is correct again.
  by communication recovery
- Being in bad state, it goes to good state after NT correct tests through the intermediate state counting no errors.
- If an incorrect test occurs while in the counting state of no errors, it returns to the wrong state due to false recovery

3.1.1.4 Identification process

Each node in the network is responsible for keeping the information about the down-level nodes to which it is connected up to date for two reasons: firstly, to be able to notify the Network Manager of any changes so that it can keep the network structure up to date. Secondly, to be able to direct a plot that is not for him towards his destiny. This is possible thanks to the identification process Through the identification process, two nodes exchange information regarding their identification, type and version of equipment.

The process can be triggered for several reasons:

- Start-up of a team
- Connection Establishment (a link becomes OK)
- Change in logical identification

The identification process is carried out by means of identification frames. There are several types of identification frames:

- QUIEN_SOY is used by a node to ask its top node to identify it
- ERES_FISICO is used by a node to assign the physical address to a sub-node and to let it know the physical address of the node that hosts the Network Manager
- SOY_LOGICO is used by a node to communicate its logical identification, computer type, and version

3.1.1.4.1 Subnode Identification Process

The frames exchanged between the upper and lower nodes of a link are as follows:

- Subnode-initiated

SUPERIOR	SUBNODE
	<= QUIEN_SOY => <=
ERES_FISICO	**SOY_LOGICO**

- Initiated by the top-level node

SUPERIOR	SUBNODE
ERES_FISICO	**=> <= SOY_LOGICO**

Once the identification process is complete, the top-level node time-stamps the lower-level node and informs the network manager by CC_ENL_INI or CC_ENL_ON (see 3.1.1.7).

It is used CC_ENL_ON when identification occurs by re-establishing communication with a node that had previously communicated. In any other case, CC_ENL_INI is used.

3.1.1.5 Routing.

Frame routing is done according to the physical address of the destination node that is specified in the frame header. Every node in the network participates in the process of routing the frames. When a node receives a frame subject to routing, the following rules apply:

- If the physical address of the destination matches the physical identification itself, the frame is sent to the channel that specifies the frame as the destination channel if it is an information frame or communications error frame. If it is a network maintenance frame, it is sent to the corresponding channel to the node's communications manager (CANAL_GCOM).
- If the physical address of the destination is lower than the self-level, and the fields of the destination address up to the self-level match, the link status corresponding to the subnode is obtained according to its physical address. If the state is correct, the frame is transmitted through that link. If the status is not correct, the source node is reported using a communication error frame if applicable (see
  3.2.1.2.2.2 Communication error frames).
- If no link has been located through which the frame can be sent, it is sent through the top link.
- If no link has been located over which the frame can be sent, the source node is informed by a communication error frame if applicable (see
  3.2.1.2.2.2 Communication error frames).

3.1.1.6 Channels

In a node there can be several origins or destinations, they are the communication channels. They are identified by a number from 0 to 31. There are some channels that are preset, they are the following:

- CANAL_CONS This is the channel associated with the local terminal. The information entered by the user through the local terminal is sent to the shell in a frame with CANAL_CONS source channel and destination channel CANAL_ICOM.
- CANAL_ICOM It is the channel associated with the command interpreter. Any frame that arrives on this channel is processed by the command interpreter, so it is assumed to be a command.
- CANAL_GCOM This is the channel associated with the communications manager. Any control message destined for a node is implicitly directed to this channel.
- CANAL_DET This is the channel associated with detector management. The controller only sends through this channel, through which it will only receive communications error frames (if requested) corresponding to the frames it sends.
- CANAL_ALAR This is the channel associated with alarm management. The controller only sends through this channel, through which it will only receive communications error frames (if requested) corresponding to the frames it sends.

3.1.1.7 Network maintenance.

Physical ID is dynamically assigned to a node when communication is established. Whereas logical identification, which is what actually identifies the node, is a property of the node. In order to communicate with a node, it is necessary to know its physical address, since routing is based on physical addresses.

The Network Manager is responsible for keeping the logical-to-physical identification assignment for each node up to date, as well as the network structure. Every network node must notify the Network Manager of changes to its links. These notifications are made through network maintenance frames.

- CC_ENL_INI first connection between the source node and the one indicated in the data
- CC_ENL_ON Restoration of communication between the source node and the node indicated in the data
- CC_ENL_OF loss of communication between the source node and the node indicated in the data

See in 3.2.1.2.2.1 Network maintenance frames for the format of the frames.

3.1.1.8 Response test

The Response Test is a periodic procedure that is repeated every nº_periodos *5, with nº_periodos being a value between 1 and 16 (nº_periodos is received in the response test frame), which allows us to know the operating status of a node.

A node begins to do the response test to its subnodes upon receiving the first response test frame.

When a node receives a response test frame, it constructs a message to the node's own shell. The response to the test (see 3.2.1.2.1.2 Response Test Frames) is generated based on the response of the command interpreter. The operation of the Response Test in the node that does it is as follows:

- If the sub-node has an INCORRECT Communications Test, then the Response Test is not performed on that node.
- If the subnode has a CORRECT Communications Test, then it depends on the error code received in the Response Test and the value of the last Test that was performed:
    - A RTST_CORRECTO test state with an identical previous state does not alter anything.
    - A test state RTST_CORRECTO with any previous different state, causes the identification procedure to be performed, after which a node is always left with a correct response test state.
    - Two RTST_TO_EQ test states with a previous correct status cause a change to 'low' status that will be notified to the Network Manager
    - Any incorrect test status, other than RTST_TO_EQ, causes a change to 'low' status which will be notified to the Network Manager.
    - Any incorrect test status with the decommissioning node causes a new notification to the Network Manager.

3.1.1.9 Equipment testing

The equipment test is a test that each node in the network periodically performs on the lower level nodes. Its purpose is to verify that these nodes have enabled, at least, the sending of alarms. This test is only activated if the test is received. The testing period is 5 minutes.

When the node that is doing the test receives the response from a subnode, it checks if the alarm enabling status received is the same as yours. In case of non-match, an '@' alarm is generated with two bytes of data containing the logical identification of the node that has generated the response.

When testing a traffic controller, you should also check the status of enabling state change submissions.

See frame format in 3.2.2.1.3 Equipment test frame.

3.1.1.10 System Test

Nodes from several systems can coexist in the communications network. The nodes of each system must know when their control system is running. To this end, the control system periodically sends a system identification message. If this message is not refreshed within the expected time, the node generates a TO alarm. This alarm may produce the corresponding action depending on the type of node. A node is responsible for responding to the test.

3.1.1.10.1 See frame format in 3.2.2.1.3 Equipment test frame

FORMAT:

1 byte 0xD4

1 byte 0x45

ANSWER:

Enabled Shipments Mask.

Reaction to the absence of a control system.

3.1.2 Event Notification

A mechanism is established for a node to report events that are of interest. An event is identified by an event code that is made up of the event type and event subtype.

Each type of equipment defines its own events. An event common to all types of equipment is established: the alarm event.

There are two concepts in relation to event notification: activation and enablement.

- When sending messages of a certain type is enabled, messages leave the node when they are generated.
- When sending is enabled (but not enabled) messages are kept in memory. It will be sent after authorization.

Each event type can be activated or enabled independently, but it simultaneously affects all subtypes of an event type.

The destination of the notification frame is specified for each type of event. Typically, the origin of the frame that enables the shipment is taken as the destination.

There are commands to generically trigger or enable any type of event, although for most events there are specific commands for the team to report the event that implicitly enables sending. For example, the history query order activates alarm notification, and the deletion of history enables it (see 3.2.2.3 Handling spontaneous messages).

Each event subtype defines the data that is meaningful to it, but all of them have to carry the event code and logical identification of the source node.

3.1.3 Alarm management

We can classify alarms into counting alarms and temporary alarms. Counting alarms simply say that something has happened, for example a reset. Temporary alarms refer to events that have a beginning and an end, and at a certain moment they will be active or inactive.

Counting alarms record the date and time when they occurred, and temporary alarms the start and end date and time.

Some alarms may have additional data, such as the temperature alarm, which indicates the temperature that triggered the alarm.

Some alarms should be grouped together, for example communications alarms, and within this type of alarm we can have time-out alarms, byte alarms (parity,...), etc., are sub-alarms.

Alarms are named by letters. The name of a first-level alarm is one letter, a sub-alarm is named with two letters, the first letter is always the name of the alarm that groups them together.

There is an expanded format of alarms. In the extended format, the alarm name can be up to 4 characters long, as well as the sub-alarm name.

The treatment of an alarm can be divided into several processes:

- o Annotation in the alarm buffer. For each sub-alarm, at least four different occurrences are recorded, if it is temporary, the beginning and end are recorded. As new alarms are produced, the oldest ones are lost.
- o Annotation in the history. Each time an alarm occurs (or temporary alarm end) the date, time, activation/deactivation and additional data are recorded in the alarm history.
- o Sending the alarm message. A message is generated to notify the alarm manager of the anomaly in the control system. This message will only be processed if it is activated o r enabled the sending of alarms (type 0 of spontaneous message).

3.2 Protocol Specification

3.2.1 Types of Frames

Frames that swap two nodes can be of several types:

- Communications test frames. They are used in the communications test. They consist of a single byte.
- Data frames. They are bounded by STX and EOF. They carry a two-byte CRC.
  - o Plots without direction. The destination node is always the receiving node. Identification frames. They are used in the identification process.

Response test frames. They are used in the response test.

- o Plots with routing. They have a 7-byte header. Network maintenance plots. Information Frames

- Flow control frames. They are used in serial protocol for the flow control of data frames.

A of them is detailed below

3.2.1.1 Communications test frames

These frames are used to check the communication status of a link between two nodes. They consist of a single byte.

- TOK 0x01 is transmitted by an active node if it has received a response to the previous test.
- TML 0x06 is transmitted by an active node if it has not received a response to the previous test.
- TRT

0x07 is transmitted by the passive node when it receives TOK or TML.

See usage in 3.1.1.3.

3.2.1.2 Data frames

The format of the data frames is as follows:

1 byte	STX bytes of data (n
n bytes	>= 1)
2 bytes	CRC
1 byte	EOF

Data frames always have at least one byte of data. Bit 6 of the first byte indicates whether it is a frame destined for the receiver of the frame (bit 6 = 1), or is a frame subject to routing (bit 6 = 0).

Data bytes and CRCs are encoded to prevent a protocol reserved byte from being transmitted between an STX and an EOF. The reserved bytes are the characters ASCII STX, ETX, EOT, ENQ, DLE, XON, XOFF, ETB, EOB, EOF, ESC and CR, and the corresponding to the TOK, TML and TRT communications test.

When a byte to be transmitted coincides with one of the reserved bytes, a DLE byte is inserted and the byte to be transmitted + 0x40 is added.

Decoding occurs on receive, which consists of deleting the received DLE and subtracting 0x40 to the next byte.

In transmission, the CRC is calculated before encoding, and in reception it is first decoded and then the CRC is calculated.

The CRC is calculated using the polynomial x 16 +x 15 +x 2 +1 with the following characteristics:

- Initialized to 0.
- In transmission, the CRC is calculated with two more bytes with a value of 0.
- On receive, the CRC of the data bytes and the two bytes of received CRC are calculated. If the resulting CRC is 0, the message received is correct.

3.2.1.2.1 Routing frames

3.2.1.2.1.1 Identification frames

Format: It is a data frame with the following Data field: Byte 0:

Bit 7:	if 1 -> *the identification refers to the sender*
Bit 6:	*1*
5.4 bit:	*0*
Bit 3:	The identification of the message is logic.
Bit 2:	Request for identification.
1.0 bits:	level (Computer=0, central=1, regulator=2, Subcontroller=3)

Bytes 1..n: Depending on the case.

The types of identification frames are as follows:

- Frame QUIEN_SOY: (origin = lower level)

  Byte 0: 0x44+level
- Frame ERES_FISICO: (if nodes of different source level = higher level)

  Byte 0: 0x40+level Bytes 1.2: Physical identification of the destination node of the message Bytes 3.4: Physical identification of the node on which the Network Manager resides
- Frame SOY_LOGICO: (if nodes of different source level = lower level)

  Byte 0: *0xC8+level* **Logical ID Node version**

  Bytes 1.2: **date. Byte 5:**

  Bytes 3.4:

  Node type.

See usage in 3.1.1.4 Identification Process

3.2.1.2.1.2 Response test frames

Format:

Byte 0 : TEST_RESP | (n_periodos-1)

The time is n_periodos *in periods of 5 seconds until the next test is carried out. (rank = 1.. 16,* the equivalent time being 5..80 seconds).

Answer:

Byte 0: STX

Byte 1 : R_TEST_RES | código_error

Byte 2.3: CRC

Byte 4: EOF

'código_error' being *one of the following:*

RTST_CORRECTO :	Answer test performed correctly
RTST_NO_RESP :	It is generated on the node that does the test when the node Destination does not respond to the response test
RTST_OCUPADO:	It is generated on the node that receives the test when it receives a second test message before it has generated the answer to the previous one.
RTST_NPAO:	It is generated in the node that receives the test when the that the command interpreter cannot process the Third Attempt The shell request because it is processing another command.
RTST_TO_ICOM	It is generated on the node that receives the test when the Shell Not Responding
RTST_ER_ICOM	It is generated on the node that receives the test when the Shell responds with error
RTST_ER_DISTRI:	It is generated on the node receiving the test when there is an error in routing the message to the command interpreter
RTST_TO_EQ:	It is generated on the node that does the test when the node Destination does not respond to the equipment test

Use: see point 3.1.1.8. Response test.

3.2.1.2.2 Routing frames

Routed frames have a 7-byte header and a variable-length information field. The format of the header is as follows: Byte 0: Channel Destination Bit 7: 0 send, 1 response Bit 6: 0 indicates frame with routing

Bit 5: 0 for information frames, 1 for maintenance frames Network

4..0 Bits: Target channel for information frames, Message Code for network maintenance frames

Byte 1: Source Channel

Bit 7: if 1 -> *frame that continues in a subsequent frame (broken message)*

Bit 6: if 1 -> *answer with error*

Bit 5: if 1 -> *if [Byte 0 - Bit 7]* = 0 -> the source expects response

if [Byte 0 - Bit 7] = 1-> response with communication error Bits 4..0: source channel number (0..31) Byte 2..3: Physical Identification of the destination node Byte 4..5: Physical identification of the source node Byte 6:

Counter

3.2.1.2.2.1 Network maintenance frames

The types of network maintenance frames are as follows:

CC_TABS (Table of physical identifiers of the subnodes of the indicated node)

In situations where multiple communication establishments may occur, this frame replaces the sending of several frames CC_ENL_INI.

This can occur after a node reset, or after the node is identified.

The CC_TABS and CC_TABSVER frames are equivalent to a CC_ENL_INI frame for each of the subnodes of those for which they carry information. Information: Bytes 0..n: Identification Block of the subnode connected to its own (as many as subnodes have connected). Being the Identification Block of the subnode Byte 0: Byte of the lowest weight in the Physical Identification of the subnode the one with the highest weight coincides with the origin of the message) Bytes 1.2: Logical identification of the subnode

CC_IDFIS (Request to the Network Manager for the physical identification corresponding to a logical identification)

Information: Bytes 0.1: Logical identification of the node The response has the same format only that the information contains: Bytes 0.1: a) Physical identification of the node (if it is communicating)

b) -1 *(if the node with the given logical identification does not exist)*

c) -2 *(if the node does not communicate at this time)*

CC_TABSVER (Table of type and versions of the subnodes of the indicated node)

The network manager sends a CC_TABSVER frame with no bytes of information to a node to query the version table of its subnodes. The receiving node responds with a response frame CC_TABSVER with the requested information. Information: Bytes 0..n: Version block of the subnode connected to its own (as many as subnodes have connected).

Being the Version Block of the subnode Byte 0: Byte of the lowest weight in the Physical Identification of the subnode (the one with the highest weight coincides with the origin of the message) Bytes 1.2: Date of the version of the Byte 3 node:

Node Type

CC_P_TABS (Request from the table of physical identifiers of the subnodes of the indicated node by the Network Manager task)

It does not carry information. The receiving node generates the sub-node table message (CC_TABS in response).

CC_P_TABL (Request from the indicated node side table by the Network Manager task)

It does not carry information. Generates the message from the side table of the message's destination node (CC_TABL as a response.

3.2.1.2.2.2 Communication Error Frames

These frames are generated by a node when it detects an error when trying to send a routed frame to its destination. The information field carries a single byte with the code of the detected error. The header has the following format: Byte 0: Destination Channel

Bit 7:	1 indicates answer
Bit 6:	0
Bit 5:	0
4..0 Bits:	Source channel copy of the original frame (bits 4..0, byte 1)

Byte 1: Source Channel

Bit 7:	0 -> indicates non-match message
Bit 6:	1 -> Answer with Error

Bit 5: 1->response with communication error 4..0 bits:

Byte 2..3: Identifier of the link through which the original frame was attempted to be sent when the error occurred Copy of bytes 4 and 5 (address of the source node) in the original frame Physical identification of the node itself copy of the Counter field in the original frame

Byte 4..5:

Byte 6:

3.2.1.2.2.3 Information Frames

All the orders that a node receives and sends circulate encapsulated in information frames.

When a node receives a command (bit 7 of byte, 0 of the header = 0) it processes it and can result in a response. The header of the frame with the response message is made as follows: Byte 0: Destination Channel

Bit 7:	1 indicates answer
Bit 6:	0->frame with routing
Bit 5:	0->information frame
4..0 Bits:	Source channel copy of the original frame (bits 4..0, byte 1)

Byte 1: Source Channel

Bit 7:	0/1 -> according to
Bit 6:	1 -> Answer with Error
Bit 5:	0 -> is not a response with communication error
4..0 Bits:	Source channel of the response frame

Byte 2..3: copy of bytes 4 and 5 (address of the source node) in the original frame Byte 4..5: Physical identification of the node itself Byte 6: copy of the Counter field in the original frame If an error is detected during the order process, an error response frame is generated by setting bit 6 of byte 1 of the header to 1.

The format of the information field in the response frames and failed response are specific to each order.

See 3.2.2 for binary commands common to all computers, in 4.2.1 for traffic controller-specific binary commands, and in 4.2.2 for traffic controller ASCII orders.

3.2.1.3 Flow Control Frames

Flow control frames are only used when the link is by serial line. When the link is over TCP it is not necessary since TCP ensures the integrity of the data. This point only applies to serial links.

All data frames must be confirmed or rejected to the sender within one second of the EOF transmission.

When the sender receives a reject frame, it will forward the data frame. This process will be repeated up to a maximum of 3 times. If retries are timed out without sending the frame, and the frame is a frame with send routing (not a response) and the source is waiting for a response, the node will construct a communications error frame and send it to the source node of the frame that caused the failure.

If after 1 second from the broadcast of a frame the sender has not received confirmation or rejection, it will issue a check frame. This process can be repeated up to 3 times as long as no response is received. If the retries are exhausted, the node will send a communication error frame, if applicable (see previous paragraph).

The receiving node of a data frame must send a confirmation or rejection frame depending on whether the received frame check is successful or not.

The receiving node of a check frame must forward the last flow control frame emitted, or a reject frame if it had not emitted one.

3.2.1.3.1 Confirmation frame

There are two types of commit frames: even commit and odd commit. An unrouted data frame is always committed to an even commit frame.

Routed data frames for the same message (a long message that does not fit into a single frame) are alternately committed with even commit frames and odd commit frames, starting with an even commit frame.

Frame Confirmation Pair Format:

Byte 0: ESC
Byte 1: ACK0

Application:

It is emitted by a node when it receives a non-routed frame or a frame with successful pair routing, or when it receives an acknowledgment frame and has previously received a non-routed frame or a frame with successful pair routing.

Frame of Confirmation Odd Format:

Byte 0: ESC
Byte 1: ACK1

Application:

It is emitted by a node when it receives a frame with a correct odd routing, or when it receives a commit frame and has previously received a frame with a correct odd routing.

3.2.1.3.2 Rejection Frame

Format:

Byte 0: ESC Byte 1:

NAK

Application:

It is emitted by a node when it receives an incorrect data frame, or when it receives a check frame and has previously received an incorrect data frame or has not received a data frame in the last 2 seconds.

3.2.1.3.3 Verification Frame

Format:

Byte 0: ESC Byte 1:

WHAT

Application:

It is issued by a node that has emitted a data frame that has not been confirmed or rejected.

3.2.2 Kernel binary orders common to all From Communications, computers

Binary orders are encapsulated in information frames. The format that is specified Then, for each order, define the bytes that make up the frame information field.

In binary messages, the date is expressed in Julian days (since 1-1-1980) and the time in tenths of a second.

Times are expressed in tenths of a second (phase durations, cycle, offset, etc.)

3.2.2.1 Time keeping

3.2.2.1.1 Time Query

FORMAT:

1 byte 0xbf

1 byte 0x46

ANSWER:

2 bytes Date Time in tenths of a
4 bytes second

3.2.2.1.2 Setting the Time

FORMAT:

1 byte 0xc6
1 byte 0x20 date time in tenths of a second
2 bytes
4 bytes

ANSWER:

Message without information

3.2.2.1.3 Equipment test frame

FORMAT:

1 byte 0xD4
1 byte 0x45

ANSWER:

Enabled Shipments Mask.

3.2.2.2 Reaction to the absence of a control system

FORMAT:

1 byte 0xfe
1 byte 0 time to new message (in minutes)
1 byte

ANSWER:

Message without information

3.2.2.3 Handling spontaneous messages

All spontaneous messages have in common the structure of their first bytes of information:

1 byte message type and subtype 0-3 bits
message subtype 4-7 bit message type

2 bytes logical identification of the node

Spontaneous Sends Summary Table

Type		Implicit activation	Implicit Enablement
0	Alarms	Historical query (0xC8.0x50)	Deleting History (0xC8.0x42)
1	Detectors	Request for Detector Data (0x82)	Request for Detector Data (0x82)
2	Position	Request for Notification of Position Changes(0xD0)	Request for Notification of Position Changes(0xD0)
3	Status	Request for Notification of Status Changes (0xC5)	Request for Notification of Status Changes (0xC5)
4	Reserved		
5	Changes in detectors	Request for notification of changes in detectors in real time (0xC4)	Request for notification of changes in detectors in real time (0xC4)
6	Group change	Request for notification of changes in groups (0xD6)	
7	Miscellaneous changes	Miscellaneous Change Notification Request (0xC7)	
8	Reserved for management of preference to public transport		
9	Free		
10	Free		
11	Free		
12	Free		
13	Free		
14	Free		

3.2.2.3.1 Enabling Message Sending

FORMAT:

1 byte 0xc8

1 byte 0x41

1 or 2 bytes mask types of sends

interpretation of the mask of 1 byte bit 0

Alarms Bit 1 Bit 2

Detectors Position

Change Bit 3

Changes of state bit 4 bit 5

Reserved Real-Time

Detectors 6 Bit 7 Bit

Group Change

1 enable, 0 disable mask. Shipments with a 1 in the

Interpretation of the 2-byte mask (as a 16-bit integer) bit 0

Alarms Bit 1 Bit 2

Detectors Position

Change Bit 3

Changes of state bit 4 bit 5

Reserved Real-Time

Detectors 6 Bit

Change in group bit 7

Various Changes 8 Bit

Reserved for management of preference to public transport free bits 9..14 for future applications 15 bit 1 enable, 0 disable mask.

Shipping with a 1 in the

To enable messages with code less than 7 you can use the mask with one or two bytes.

ANSWER:

Message without information.

3.2.2.3.2 Enabling Message Sending

FORMAT:

1 byte	0xc1
1 byte	0x41 shipping mask. As in the
1 byte	habilitation.

ANSWER:

Message without information.

3.2.2.4 Alarm management frames

3.2.2.4.1 Sending Alarm Notification

The destination of an alarm message is computer 0, channel 4. The format of the message is as follows:

1 byte 0 alarm send ID

2 bytes logical identification

1 byte alarm name

1 byte subalarm name

1 byte bit 7 indicates deactivation/activation

2 bytes date

3 bytes hour... alarm data. It depends on each alarm

The format of the message when using the extended format is as follows:

1 byte 0 Alarm Sending ID Logical ID

2 bytes

4 bytes alarm name. The first byte carries the 7 bit to 1 to indicate extended format

4 bytes subalarm name The first byte carries the 7 bit to 1 to indicate extended format

1 byte 3 bytes hour bit 7 indicates deactivation/activation ... alarm data. It

2 bytes date

depends on each alarm

3.2.2.4.2 Deleting Alarms

Initializes alarm buffers and updates alarm status.

FORMAT:

1 byte	0xc2
1 byte	0x41

ANSWER:

Message without information.

3.2.2.4.3 Consultation of the alarm history

Returns active alarms and history from the specified instant. Enable alarm sending.

FORMAT:

1 byte 0xc8

1 byte 0x50

2 bytes date

3 bytes time

ANSWER:

1 byte Data Length of First Active Alarm

1 byte (4 bytes with the first bit 7 = 1 in extended format) alarm name

1 byte (4 bytes in extended mode) Sub-alarm name 0x80 activation date

1 byte Activation time Alarm data plus active alarms Data length of the

2 bytes last active alarm

3 bytes

... ...

1 byte

1 byte (4 bytes with the first bit 7 = 1 in extended format) alarm name

1 byte (4 bytes in extended mode) subalarm name

1 byte 0x80

2 bytes activation date

3 bytes hour of activation...

alarm data 0, indicates end of active alarms data

1 byte length of the first alarm in the history

1 byte

1 byte (4 bytes with the first bit 7 = 1 in extended format) alarm name

1 byte (4 bytes in extended mode) subalarm name

1 byte bit 7 indicates alarm activation or deactivation, the rest are ignored

2 bytes activation date

3 bytes hour of activation...

alarm data...

		More alarms
	1 byte	0 indicates end of history
	1 byte	0 indicates end of history
	1 byte	0 indicates end of history

	Alarm	Type	Data
@	Failure in equipment tests	C	2 bytes with the logical identification of the computer that failed the test
A	Tension	T	2 bytes voltage in dV that has triggered alarm
B	Contactor	T	
Cs [1]	Color	T	2 byte output status
Dd [2]	Scheduled Demand	T	
EA	Aborted task	C	4 bytes 4 ASCII characters with the name of the task that detected the anomaly 4 32-bit integer bytes with an identifier to locate the error 2 integer 16-bit bytes with error code
EE	Internal anomaly	C	
ET	Stranded in one position	C	
F	Incorrect or uninitialized date	T	
GS [1]	Group Output Replaced	T	2 bytes Output replacing this 1
H	Incorrect or uninitialized time	T	
I	Incompatibility	C	2 bytes bits 0-7 group - 1

1 The name of the subalarm encodes the output as follows: 0-4 bits group number-1 bits 5-6 color 0 red, 1 amber, 2 green bit 7 1 for group 1 red

2 Subalarm name encodes demand: 0-6 bits demand number -1 bit 7 1 for demand 1

			8-15 bits group - 1
IFF	A current above the leakage level has been detected	T	2 bytes current measured
IFA	A current above the fault level has been detected	T	2 bytes current measured
KG	Pilot by Guard Key	T	
KH	Emergency Sequence	T	
KM	Manual	T	
KP	Open door	T	
KR	All Red Sequence	T	
KS	Synchronism	T	
KT	Keyboard	C	2 bytes number of orders entered
KU	Priority vehicles	T	
LS [1]	Molten lamp	T	2 bytes molten power (watts)
M	There are messages to be read	C	
N	Temperature	T	2 bytes temperature that triggered alarm
R	Reset	C	
S	Drop voltage failure	T	
SAIB	Low battery	T	1 byte % charge
Q	In download (no network)	T	
AAA	Voltage below the minimum operating level.	T	2 bytes voltage in dV that has triggered alarm
DFF	Discharger out of operation.	T	
MDA	Open circuit breaker-differential.	T	
RMT	Regulator in test mode.	T	
AAS	Voltage on out-of-range outputs.	T	2 bytes voltage in dV that has triggered alarm
VTO	The maximum validation time has expired.	C	
TB	Byte error	C	
TC	Loss of communication	C	
TO	The control system does not	C	

	communicates		
V	There is data pending validation	T	
X	Corrupted crossover data	C	

3.2.2.4.4 Deleting the alarm history

Delete the alarm history up to a certain moment. Optionally allows you to enable the sending of alarms.

FORMAT:

1 byte 0xc8

1 byte 0x42 date. The heaviest bit indicates whether alarm

2 bytes sending should be enabled.

3 bytes hour

ANSWER:

Message without information.

4. Specifications applicable to the traffic controller

4.1 Functionality

4.1.1 Operating States

The regulator can be in one of the states listed below. After a reset, the controller enters the programmed state with the E INI command (see 4.2.2.41). The current state can be changed with order E (see 4.2.2.41) or with the binary plan selection order (see 4.2.1.4).

- Remote control by plan selection. **The regulator executes the plan indicated by the control system. This plan can be one of those programmed by the regulator, or a plan prepared by the control system.**
- Local time control. **Plan selection is made based on a weekly schedule and calendar. The calendar takes precedence over the time table, and specific changes can be made to different days or ranges of days.**

- Intermittent. **The regulator sets the pilot position** and stays in it. This position is programmable.
- Off. **All group departures are off.**
- Disconnected. **The group outputs are off and the contactor is disconnected.**

4.1.2 Types of plans

Controller can execute different types of plans. It supports up to 8 different structures, and in each structure up to 32 phases. It allows the following types of plans:

- Fixed times. **The sequence of phases and the duration of the phases is fixed.**
- Acted upon. **The sequence of phases and the duration of the phases is demand-driven. The structure can be defined as alternative sequences based on a demand. Each sequence can contain alternate sequences.**
- Semi-acted. **When operating as a semi-actuated, the regulator can be coordinated with other crossovers to become part of a green wave. There is a main phase that comes out at the beginning of each cycle, the rest of the sequence depends on demands.**

Plans 1 through 8 programmed with order P (see 4.2.2.72) define the structures, time tables, and transition tables used in order PS (see 4.2.2.71) and in binary orders of plan 0 (see 4.2.1.3) and plan in progress (see 4.2.1.5).

4.1.3 Normal and extended mode

In normal mode, positions programmed with the G command (see 4.2.2.44) are used for both stable and transient positions. Up to 32 positions can be programmed.

Extended programming allows this limitation to be overcome, using the positions defined with order G for stable phases. Transient positions are defined with the TR command (see 4.2.2.82), and the T command changes syntax (see 4.2.2.83).

In extended mode it is possible to define special transitions that will be applied in plan changes that involve structure changes (see 4.2.2.80).

4.1.4 Alarm processing

In the regulator you can configure that when an alarm occurs an action is executed. It can be configured by type of alarm, and the action consists of executing a change of state, with the possibility of retry and switching to disconnected if the alarm persists. When an alarm occurs that has associated action without retry, the new state will remain until the controller receives a new state change command.

If it has a scheduled retry, it will remain in the alarm state for 5 seconds, and after this time it will return to the pre-alarm state. If this is repeated three times in less than 2 minutes, the third time it will be 2 minutes in the state associated with the alarm action and from there the process is repeated.

If it has been set to switch to disconnected, it is checked that the alarm that caused it does not remain in the state set by the alarm action. If it remains, or a new one of the same type is detected, the controller executes a switch to a disconnected state and stops retries.

See 4.2.2.1.

4.1.5 Treatment of detectors

On the basis of the detector inputs, the controller produces logic detectors and demands, and on the other hand makes measurements of traffic parameters such as intensity, occupancy time and speed. This data will be communicated to the control system if requested.

4.1.5.1 Types of detectors

- Physical detectors. **The status of the physical detectors follows the status of the detector inputs. The only treatment that is done is to invert the input or force its state (see 4.2.2.30 and 4.2.2.32).**

- Logic detectors. **Logic detectors are generated by software processing of physical detectors, and taking into account other events.**

  Dual speed detector is obtained from two physical detectors. It measures the speed of a vehicle, and is activated when the measured speed exceeds a certain value (see 4.2.2.37).

  Simple speed detector. It is obtained from a single detector and an estimated average length of the vehicles passing through it (see 4.2.2.37).

  Queue detector. This detector is activated when a queue is detected with a detector. The average occupancy time of the last detected vehicles is taken into account (see 4.2.2.18).

  Phase detector. It is activated while a phase is active. (see 4.2.2.25)

  Group detector. It is activated when a traffic light group has a certain appearance, or when an output of a group is in a state (see 4.2.2.26).

  Detector detector. It is activated while a detector is active (see 4.2.2.23).

  Demand detector. It is triggered while a demand is active (see 4.2.2.24).

  A ny logic detector can be delayed and timed (see 4.2.2.38 and 4.2.2.36).

- Detector memory. **Each logic detector has an associated memory. This memory is activated when its detector is activated, and is erased when entering or exiting a phase (**

  4.2.2.33) or when a claim is activated or deactivated (4.2.2.35).

- Lawsuits. **Demands are logical functions of logic detectors and/or their memories. For each defined demand, the status of the direct demand and the memorized demand is calculated. The memorized demand is calculated from the logic detectors and memories from which it has been defined, while the direct memory is calculated only from the logic detectors (see 4.2.2.19).**

USAGE	DIRECT DEMAND	MEMORIZED DEMAND
Sequence selection.		X
Extensions.		X
Emergency.	X	
Ignition of outputs.	X	X
Alarm on demand.	X	

4.1.5.2 Detector Data

From the detector inputs, the controller calculates various parameters. Intensity (in vehicles/hour) and occupancy time (in %) are obtained for all inputs. When you define speed detectors, both single and double, you also have speed. This data is available in different ways:

- Cumulative. **The regulator accumulates measurements and gives the average corresponding to each entry. You can consult the current or previous interval (see 4.2.2.17).**
- Most recent. **A query can be made of the last 'n' seconds or the last cycles (see 4.2.2.22).**
- Real-time data delivery. **The controller accepts configuration commands from the control system, so that it sends it the data of the requested detectors and with the characteristics of the appropriate time and integration period (see 4.2.1.1 and** 4.2.1.2).
- Real-time change submission. **The controller accepts configuration commands from the control system, so it sends the requested detector status changes (see 4.2.1.7).**

4.1.6 Emergency management

The controller can handle emergency sequences, so that when a demand is triggered, a special sequence is triggered. It supports two different sequences, Level 1 and Level 2, with Level 2 taking precedence over Level 1.

The entry into the emergency sequence occurs by the activation of a demand. A return to the normal plan can occur in several ways:

- Return to a specific phase: when leaving the emergency sequence, it goes to a specified phase of the plan and from there the normal execution of the plan continues, correcting the possible phase error generated.
- Return to the beginning of the cycle: when leaving the emergency sequence it goes to the main phase and from there the normal execution of the plan continues, correcting the possible error of lag generated.
- Return to the coordinating plan: returns to the corresponding point in the cycle according to the current moment.

See 4.2.2.84.

4.1.7 Direct Output Control

Non-traffic exits can be activated in different ways:

- By direct order of the control system. (See 4.2.2.55)
- By scheduling on the timetable. (See 4.2.2.49)
- By activation of a lawsuit. (See 4.2.2.31)

4.2 Protocol Specification

4.2.1 Particular binary orders of the regulator

The binary orders of the regulator are encapsulated in information frames. The format specified below for each order defines the bytes that make up the frame information field.

4.2.1.1 Detector Tables

Assign detectors for intensity and occupancy time measurements to an ICC group. As far as the regulator is concerned, a CCI is a set of detectors that collect data with the same integration period.

FORMAT:

1 byte 0x81

1 byte action. There may be the following actions:

0 Assign detectors to CCI group. You have additional data

1 byte CCI group number

4 byte mask detectors — indicates the detectors that are assigned to this CCI. A bit to 1 indicates assign detector. It is interpreted as an integer of 32 bits. Bit 0 corresponds to detector 1.

1 ...

1 byte CCI group number

4 -byte detector mask clears data from a CCI group. It has additional data:

1 byte CCI group number to be deleted

2 Clears all detector data and cancels scheduled shipments

ANSWER:

- Message without information if correct
- 1 byte error code. Possible errors are:

1 group does not exist (delete action)

2 full group table

2 detector associated with another CCI (only in case of

4 bytes error 9) mask of incorrect detectors

4.2.1.2 Request for Detector Data

It causes detector data to be sent from an instant, with a certain interval.

FORMAT:

1 byte 0x82

1 byte CCI group time of first send in tenths of a

3 bytes second interval in seconds

1 byte

ANSWER:

- Message without information if correct
- 1 byte 1. The indicated group is not scheduled

At the end of each interval, the controller will send the accumulated data during that interval. The destination is taken from the source of the detector data request message

SHIPPING:

1 byte 0x10 Logical identification of the

2 bytes group number group number at

1 byte the start of the interval

3 bytes

2 bytes for each detector assigned to the CCI in the detector tables message, sorted by detector number. These bytes are interpreted as follows:

1 byte Bit 7 indicates queue bits 0-6 occupancy

time (in %) Number of vehicles detected in

1 byte the range

4.2.1.3 Plan 0

Interpretation of Plan 0 or Enrolled Plan

FORMAT:

1 byte 0x83 reference in tenths of a second from 0 am on Monday.
3 bytes Indexes to tables and attributes bits 12-15 Local plan
2 bytes number with structure for 0-bit plan 8-11 Local plan number with transitions for 0-bit plan 4-7 Local plan number with minimum times for plan 0 bit 3 bit 2

Coordinated Plan Manual Advance
Allowed Bit 1
0 (reserved) 0 bit
0 (reserved) cycle offset duration of the first phase of the
2 bytes sequence (in order of appearance in the sequence)
2 bytes
2 bytes...

2 bytes Duration of the last phase of the sequence (in order of appearance in the sequence)

ANSWER:

- Message without information if correct
- 1 byte error code. Possible errors are:

1 insufficient time in phase f of plan 0 incorrect cycle in plan
2 0 insufficient time in phase f of plan 0 (US) phase f does
3 not exist in plan 0 (UC) insufficient time in phase f of plan 0
4 (OS) incorrect number of times in plan 0 does not exist
5 table of structures n
6
7

8 There is no transition table n

9 There is no time table n

10 non-validated data

11 Transition from F1 to F2 not defined

1 byte stage (f or f1) (ASCII code) or table (n) in which the error was detected. Only if the error refers to a stage or table.

1 byte Stage (F2) (ASCII code) at which the error was detected. Only in error 11.

4.2.1.4 Plan Selection

This message selects both the state of the controller and the traffic plan when it is in the state of external plan selection.

FORMAT:

1 byte 0x84 state. It is coded as follows:

1 byte

0	Disconnected
1	Off
2	flashing
3	Internal Plan Selection
4	On-demand plan switching
6	External Plan Selection (Centralized)

8 control at the end of phase plan (only valid in state E

1 byte and O) reference. If it is – 1, the one received in the

3 bytes last plan 0 message will be taken

ANSWER:

Message without data.

4.2.1.5 Ongoing plan

Returns the data for the ongoing plan.

FORMAT:

1 byte 0x85

ANSWER:

1 byte 0 the rest as in plan 0

message

4.2.1.6 Status of Direct Command Groups

Message to check the status of direct control groups.

FORMAT:

1 byte 0x8a

ANSWER:

2 bytes for each group Output Status: 0-4 bit 5-6 bit 7 bit 8-9 bit 10 bit 11-12 bit 13 bits

Group Number-1 Red Output Status Red Output with Color Error Amber Output Status Amber Output Status Green Output Status Green Output with Color Error Bits 14-15 0 Interpretation of Output Status:

0	Off
1	Ignition
2	Intermittent
3	Rapid Flashing

4.2.1.7 Request notification of changes in detectors in real time

FORMAT:

1 byte	0xc4 indicates physical (0) or logical (1) detectors mask with the
1 byte	detectors from which changes must be notified. It is interpreted as
4 bytes	a 32-bit integer. A bit to 1 indicates notification of changes in the corresponding detector. Bit 0 corresponds to detector 1. If the mask is worth 0, the shipments are canceled.

ANSWER:

1 byte possible values:

0	no error the order could not be served because the controller
1	was busy this notification was requested by another node
	incorrect query format order not recognized current status of
2	the detectors (if there was no error)
7	
13	

4 bytes

Each time the status of one of the selected detectors changes, a message is sent in the following format:

SEND: The destination of this message is the source of the request

1 byte	0x50 controller logic identification detector
2 bytes	information: 0-4 bits detector number - 1 bit 6 0 for
1 byte	physical detection, 1 for logical bit 7 0 switch to OFF,
	1 switch to ON

4.2.1.8 Request for Notification of Status Changes

This message returns the current state of the controller and causes real-time sending of state changes.

FORMAT:

1 byte	0xC5

ANSWER:

1 byte	status, with the same meaning as in the plan selection order

1 byte change source

'A' state change generated from an initial 'I' alarm 'H'
hourly table 'C' calendar 'S' calibration 'T' local
terminal 'E' other node 'K' on-demand change
status+0x20 status replenishment after alarm change
date

2 bytes
3 bytes Time

Each time the state of the controller changes, a message is sent in the following format: SENT: The destination of this message is the source of the request.

1 byte 0x30
2 bytes logical identification
1 byte state
1 byte change source
2 bytes date
3 bytes hour

4.2.1.9 Request for notification of position changes

This message returns the current state of the outputs, and causes the sending of their new state to each change. Changes continue to be sent until the time out expires, if you want to keep the sends for a longer time, the message is sent again before the timing expires.

FORMAT:

1 byte 0xd0 time out in minutes. This parameter is optional, if it is
1 byte not specified a time out of 10 minutes is generated

ANSWER:

Message with group status if correct

1 byte group color code 1...

1 byte color code of the last group

1 byte if there is an error. The possible values are:

1 The order could not be fulfilled because the regulator was busy
2 This notification has been requested by another node
7 Incorrect query format
13 Unrecognized

order Each time a change in position occurs, the slider sends a message in the following format:

SEND: The destination of this message is the source of the request

1 byte 0x20

2 bytes logical identification

1 byte group color code 1...

1 byte Color code of the last group

See color coding in 4.2.2.44.

4.2.1.10 Request for notification of changes in groups

This message returns the current state of the direct control groups, and causes their new state to be sent to each change. Changes continue to be sent until the time out expires, if you want to keep the sends for a longer time, the message is sent again before the timing expires.

FORMAT:

1 byte 0xC7 time out in minutes. This parameter is optional, if it is

1 byte not specified a time out of 10 minutes is generated

ANSWER:

Message with groups status if correct The response format is as in 4.2.1.6

1 byte if there is an error. The possible values are:

- 1 The order could not be fulfilled because the regulator was busy
- 2 This notification has been requested by another node
- 7 Incorrect query format
- 13 Order not recognized

SEND: The destination of this message is the source of the request

1 byte 0x60

2 bytes logical identification

2 bytes per pool in the same format as in 4.2.1.6

4.2.1.11 Request for Notification of Miscellaneous Changes

This message returns information about the status, plan, phase, and position. A notification message is sent whenever any of the selected parameters in the mask change.

FORMAT:

1 byte 0xD6 change mask that causes the send. If it is worth 0, it
1 byte indicates cancel.

Bibit status
Bit Plan 2
Phase Bit 3 Time Out position in minutes. This parameter is optional, if it is not specified a time out of 10 minutes is
1 byte generated. If it is worth 0xfe there is no time out.

ANSWER:

Message with the following information

1 byte state: 7-4 bits change source
3-0 bits state

1 byte
4-0 Bits Plan Bits 7-5 Structure-1 (From 0 to 7) Transition Phase 0xff
1 byte Indicates Stable Position
1 byte
1 byte
3 bytes hour

If there is a change of plan 0, the following is added:

4 bytes reference
2 bytes Indexes to tables and attributes: 12-15 bits, 8-11 bits, 4-7 bits

Structure table number Transitions table number Bit 3 beat table number

Coordinated plan

Manual advance Priority vehicles bit 2
Non-demanded phases cycle lag bit 1
duration of the first phase ... bit 0

2 bytes
2 bytes
2 bytes

2 bytes duration of the last phase all times are in tenths of a second.

In case of error

1 byte error code the order could not be served because the
1 controller was busy this notification was requested by another node incorrect query format order not recognized
2 the destination of this message is the source of the request
7
13

SHIPPING:

1 byte bytes 0x70 logical identification follows the
2 bytes same information as in the response
N

4.2.2 Particular ASCII Regulator Orders

There are different types of commands or commands with the following classification:

- Programming orders.

  Through the programming orders we inform the regulator of the parameters of the crossing that is going to be regulated, traffic plans, etc. To know the values that the regulator has, just put a question mark (?) in front of the command, and the regulator will respond with the values that it had programmed.

- Control orders.

  If these commands are issued from the local terminal, a local tampering alarm is generated.

- Information orders.

  Most orders generate some sort of information. The programming ones report on the current value of the parameters, the control ones give information on the operation of the regulator. Both have in common that in addition to generating information, they serve other purposes.

Order	Programming	Control	Information
!	•		
#			•
%	•		
+	•		
AACTIVATES			•
AA		•	
AC			•
ALARMS			•
AV		•	
BA		•	
DELETE		•	
C			•
CANCEL		•	
CC			•
CF	•		
D			•
DA			•
DC	•		
DD	•		
Mexico City			•
DH	•		
DI			•

DLA	•		
DLD	•		
DLF	•		
DLG	•		
DLM	•		
DL			•
DM			•
DN	•		
DO	•		
DP	•		
DR	•		
DS	•		
DRD	•		
DT	•		
DV	•		
DW	•		
EC		•	
ERRCOM			•
E		•	
DATE		•	
GB	•		
G	•		
HA		•	
HB		•	
Hard carry	•		
HP			•
H	•		
ID	•		
IDPHYSICS			•
IDLOGIC	•		
I	•		
JR	•		
J		•	
LC		•	
LF			•
LM			•
LW			•
LR	•		
LT	•		
MA		•	
NG	•		
N	•		
Or	•		
HEY	•		
OS	•		

PC			•
PING		•	
PI	•		
PO			•
PS	•		
P	•		
WATCH		•	
RESET		•	
RF			•
SESSION		•	
YES			•
S		•	
TD			•
TE	•		
IT			•
TR	•		
T	•		
UC	•		
EU	•		
US	•		
V	•		
X		•	
ZC	•		
GPS			•
DCF	•		
UPS		•	
DST	•		
LR	•		
CONSUMPTION	•		
IFUGA	•		•
TEST		•	•
ILR	•		

4.2.2.1 Order !

!: Action of the alarms

Syntax : !a e[R|-] | !a DEL

a = Name of an alarm

e = Name of a state

- = Retry

R = Retry with disconnected step

?! [a]

If an alarm is specified, displays the scheduled action, if not, lists all alarms.

The controller can be forced to go to a certain state when an alarm occurs. With this command, each alarm is assigned to desired action. See 3.2.2.4.3 for possible alarms and 4.2.2.41 for the status codes that can be associated with them.

If the R appears after the state, the regulator will retry to return to the initial state. If the alarm occurs again, it will try again. This up to 3 times, then it will remain in the state associated with the alarm for 2 minutes, and the sequence will start again. If after executing the state change the alarm remains, it will go to a disconnected state indefinitely. If '-' is put instead of 'R' the operation is the same except that it does not go off even if the alarm remains. (see 4.1.4)

Examples:

! I A

If an incompatibility is detected, it switches to shutdown.

! R DEL

Cancels the assignment for the reset alarm.

! C IR

Assigns the flashing amber state to the color alarm, with the option to retry.

?!

Answer:

! I A, C IR

The incompatibility alarm turns the color alarm off, it goes to flashing state.

4.2.2.2 Order

#: Displays the software version Syntax:

? # [+]

+ displays the creation date and version of the POS386

Examples: ? #

Answer:

CITY CD 1.09.28 (1 070926)

4.2.2.3 Order %

%: Correction thresholds Syntax:

% e a %+ [A | c] ?%[+]

e = percentage by which a phase can be lengthened during offset correction

a = percentage by which a phase can be shortened during offset correction

A = Offset correction in automatic mode

c = threshold for phase correction by lengthening

Defines the time frame in which a phase can be lengthened or shortened during the offset adjustment period as the percentage to be applied to the nominal duration of the phase defined in the order P. It also configures the criteria to decide whether to correct by lengthening or shortening phases, which can be automatic or by threshold.

When setting automatic, the slider calculates the time it will take to correct the offset by shortening and lengthening, and chooses the one that gives the lowest result.

When configured by threshold, the regulator will correct by shortening when the error is less than a % of the cycle, and lengthening otherwise.

This command is pre-programmed by 40% to shorten and 60% to lengthen a phase and the times are shortened or lengthened by up to 25% to correct the offset.

Examples: % 50 60

The phase duration will be shortened by 50% or lengthened by 60% during the offset correction. If it is being corrected for phase shortening and the resulting time is less than the minimum time of that phase, the minimum time will be taken into account.

?%

Answer:

% 30

4.2.2.4 Order +

+: Programming of extension times

Syntax: **+f t1 [t2] ? + [rf]**

f = Phase

t1 = Extension Time

T2 = Time limit to produce extension

rf = Phase Range

The values of t1 and t2 can have a decimal

Examples:

+B 10 L5 +A 10 L6

? +

Answer:

+B 10 L 5

? +A

Answer:

+A 10 6

4.2.2.5 AACTIVE Order

AACTIVE: Displays active alarms. Syntax:

? AAC [a]

a: Name of an alarm.

Examples:

? AAC

Answer:

J1R J2R J3R J4R J5R J6R J7R J8R

The alarms that are active are the red ones in groups 1 to 8.

4.2.2.6 Order AA

AA: Order to query/modify the mask of activated shipments Syntax :

AA { 0 | 1 } bit ? AA

Examples: ?

AA

Answer:

000000000000000

4.2.2.7 AC Order

AC: Communication Error Counters Syntax:

? AC

AC DELETE

Examples: ? AC

Answer:

Channel Error First Last

** **@ 1 Loss of Communication 5/28-09-07 11:55:19 5/28-09-07 11:55:19**

4.2.2.8 ALARM Order

ALARMS: Shows the alarms We can do a general interrogation, which tells us quickly if there is an alarm and what type it is, or a question about a certain type of alarm. Even if at any given time there is no alarm, we can always consult it, as the last one of each type is recorded. The time of the last alarm is always displayed, and depending on the type of alarm, more additional information is available.

Syntax: ? A [-] [name] ? A **is the general form of interrogation. The regulator responds to it with a list of alarms that are available at the moment. See the different types of alarms in 3.2.2.4.3. There are two types of alarm: transient and permanent. The transitory ones disappear when consulted. Permanent ones do not disappear until the cause that generated them ceases to exist. Alarms F, H and C are permanent. The K is also permanent except when it is due to orders executed from the terminal. The rest of the alarms are transient.**

? A a is one of the alarms on the list above. This is the way to interrogate one of the alarms. E, K, and T alarms can have several causes:

Alarm E:

A You have aborted an assignment.

E Error in a real-time executive call.

T It has run aground in one phase.

Alarm K:

G Occurs when the Guard Key is activated.

H It is activated for the duration of the emergency sequence.

M Activates while the slider is in manual control.

P The cabinet door is open.

R Red-red driven.

T A control order has been given from the local terminal.

U The priority vehicle system is activated.

Alarm T:

B A byte with framming or overrun error has been received.

OMore than 10 minutes have passed without communicating with the headquarters. This alarm only occurs when the regulator works by remote control and the order has been received from the control panel.

C Communication has been lost at the central

Some alarms give more information:

C Indicates the colors and the group in which the error has been detected.

D Indicates the demands that have caused the alarm.

I Indicates the groups in which the anomaly has been detected.

L Memorizes the group outings for which the warning threshold has been exceeded.

S Indicates the time of the power cut and the time it has lasted.

Examples: ? A

Answer:

R I C

? A

Answer:

They have disappeared, because they have been rectified.

? A C

Answer:

C1R C2A

Group 1 red is incorrectly off, group 2 amber is incorrectly lit

? A I

Answer:

I 1-2 3/12:25:33

There has been incompatibility between groups 1 and 2. Group 1 is the one that is incorrectly turned on.

? A K

Answer:

K M T 3/12:30:01

The controller is in local control and some command has been entered from the local terminal.

? A L

Answer:

L 1R 1.8, 2V 2.1 3/12:32:23

? A R

Answer:

R 4/12:43:52

? A T

Answer:

T B 3/06:23:45

? A S

Answer:

S 1 1:31:12 2/15/1996 1/12:30:02

The last power cut was on February 15 at half past twelve, and lasted 1 day, 1 hour, 31 minutes, 12 seconds.

4.2.2.9 AV Order

AV: Advances to the next phase when in manual control

Syntax: **AV**

4.2.2.10 BA Order

BA: Complete Erase of Communication Error Counters Syntax:

BA

4.2.2.11 DELETE Order

DELETE: Order to clear the current schedule Syntax: DELETE [ALL|ALARMS]

With BORRA TODO**, a program starts from the beginning. Leaves parameter memory "empty". The only parameter that does not initialize is the subunit parameter. Some initialize them: Node number: Initialized to 1.**

Detectors: All detectors are defined as simple detectors.

Demands: demand 1 is defined as DD1 1, demand 2 as DD2 2, and so on until demand 32.

Alarm Actions: Alarm actions are initialized as follows: "! X
D, B A-, C IR, I AR, ET IR, TO H, TS H, TC H".

Voltage alarm thresholds: initialized at 192 and 253 volts. Fan Activation Thresholds: 50 degrees initialized. Fan Activation Thresholds: 50 degrees initialized.

Automatic transition by default: it is initialized to two positions of 3 seconds each.

These assignments can be modified.

DELETE has the same effect as DELETE ALL except that some parameters retain the value prior to entering the command. These parameters are: the type of communication, the communications port, communication speed, IP address, node number, logical identification and crossing identification.

Examples:

DELETE EVERYTHING

DELETE ALARMS

With this command, delete the alarm log.

4.2.2.12 Order C

C: Order to interrogate the colors The slider informs us about the status of the groups and the color they present at the moment.

Syntax: **? C g1g2 ... G10 GN can take one of the following**
Answer: **values:**

- A period (.) indicates that this group has not been programmed.
- An asterisk (*) means that there is some error in this group.
- GX is the color code presented by the corresponding group at the time of the query.

Examples: ? C

Answer:

VAR*FF. . . . .

The controller only has 6 groups programmed. Group 4 has a problem (e.g. a colour fault has been detected).

4.2.2.13 Order CANCEL

CANCEL: Cancels data modification session.

When starting a session (ses) to modify different parameters it is possible to save the set changes (x) or cancel them with the cancel command.

Syntax: **CANCEL**

Cancel Data Modification Session

4.2.2.14 CC Order

CC: Communication Channel Tables Syntax:

? CC [set]

The set is given as follows: -3,5,7-9,12-

(the value 0 (@) is for the top node)

Communication states:

NOT BAD: Communication has not been established.

YES: Communication has been established.

NOT WITHOUT ERRORS: Communication has been established without errors and will be passed to YES.

NOT WITH ERRORS: Communication is established but with errors.

DISCONNECTION: No communication has been established.

Examples: ? CC

Answer:

Canal Comunica

TestResp

************************ **@ NO**

mal

4.2.2.15 CF Order

CF: Command to program the configuration With this command, some parameters of the controller are defined, such as: the enabling of the extended mode, the synchronism origin and the origin of the time base.

Syntax: **CF [A S|N] [S I|E|C]** Extended Mode: internal, external, or depending on the status of communications, Time Base, Oscillator or Network

[X O|R]

? CF [A] [S] [X]

Examples:

CF A S

Turn on Extended Mode

? CF

Answer:

CF A S CF X O

4.2.2.16 Order D

D: Active and memorized demands List the active demand that the computer is executing, as well as the demands that it has in memory, which will remain until there is a deletion of them.

Syntax: **? D[rn]**

rn= range of detectors, it can be a list of detectors, or a group of detectors defined by the first and last separated by a hyphen.

Example: ? D

Answer:

ACTIVE DEMANDS = 15

MEMORIZED DEMANDS = 1,5,7

4.2.2.17 DA Order

DA: Cumulative Detectors List the accumulated data from the measurement detectors. It defines the rd detector as a measurement detector, which will give us the data in vehicles hour (intensity) and in % (occupancy time) in the case of simple detectors, now if it is a speed detector instead of giving occupancy time, it will give us average speed (in Km/h). Optionally, the accumulators can be reset and the accumulation start time can be updated with order B.

Syntax: **?DA [A] [B] [rd] rd =**

Detector range A =

previous interval

B = If it appears, the interval is restarted

Note: If rd is not indicated, the statistical detectors defined with the DE command are used.

Output format: DA f h d (n i o)...

f = Interval Start Date

h = Interval Start Time

d = Interval Duration

n = detector number

i = intensity in vehicles/hour

o = occupancy time in so many times

1000 If a detector is of speed, n is written followed by 'V' and instead of occupancy the average speed appears.

Examples:

- **DA 5,8,9**

Answer:

DA 3/8/1995 16:59:00 0:16:25 (5 70 6.1) (8 784 47.0) (9 976 12.7)

The cumulative data up to 16:59:00 on 8/3/1995 over a period of 16 minutes and 25 seconds are:

Detector 5: Intensity=70 vehicles/hour Occupancy time=6.1%

Detector 8: Intensity=784 vehicles/hour Occupancy time=12.7%

Detector 9: Intensity=976 vehicles/hour Occupancy time=47%

? DA B 5.8

Answer:

DA 3/8/1995 17:01:15 0:00:25 (5 0 0.0) (8 0 0.0) (9 976 12.7)

We put an end to the current interval and open a new one by putting steel on the data of the affected detectors (5,8).

4.2.2.18 DC Order

DC: Definition of queue detectors

Syntax: DCn t [m [td]] ? DC [rd]

t = average occupancy time to queue (in seconds).

m = number of vehicles to make the average.

TD = Time to deactivate the queue if no vehicles pass. rd = Detector Range

Examples: ? DC

Answer:

DC2 7.0

Tail detector 2 will be activated when presence of more than 7 secs is detected.

4.2.2.19 DD Order

DD: Definition of demands Syntax: DDn expression ? DD [rd] [S] n = demand number rd = range of demands If S appears , it shows the simplification obtained from the expression

The expression must respond to grammar: expression = product | expression 'or' product product = factor | product 'y' factor = terminal | '-' factor | '('expression')' terminal = detector | detector 'L' detector = integer from 1 to 32

Examples: ? DD

Answer:

DD5 2 & -3 or 4L

There will be logical demand 5 when the memory of detector 2 is activated and that of detector 3 is not, or when detector 4 is detecting presence.

4.2.2.20 DF Order

DF: Status of Physical Detectors Syntax:

? Mexico City

Examples: ? Mexico City

Answer:

DF 11000000

Physical detectors 1 and 2 are detecting presence.

4.2.2.21 DH Order

DH: Demands with alarm Syntax: DH rd | DHn

DEL | DH OF

? DH Examples:

DH 10.15 ? DH

Answer:

DH 000000000 01000010 00000000 000000000

Demands 10 and 15 will generate alarm D when triggered.

4.2.2.22 DI Order

DI: Detector Memory Status Syntax:

? DI [rd] (t | Cn) rn =

Detector Range

t = Time in seconds. Data from the last 6 minutes Cn =

Number of cycles are recorded

Output format: DI t+r (n i o)...

t = Time used (less than or equal to the time indicated)

r = Delay entered in accounts

n = detector number

i = intensity in vehicles/hour

o = occupancy time in so many per 1000

4.2.2.23 DLA Order

DLA: Detector-activated detector Syntax:

LAn na

n = Detector number

na = Associated detector number

? DLA [rd] rd = detector

range

Examples:

DLA 1 2
When detector 2 is activated, detector 1 will be activated.

4.2.2.24 DLD Order

DLD: Demand-Activated Detector

Syntax: **DLDn d[L]**

n = Detector number

d = demand

L **indicates direct demand**

? DLD [rd]

RD = Detector Range

Examples:

DLD 3 5
Detector No. 3 will be activated when demand No. 5 does.

4.2.2.25 DLF Order

DLF: Phase-activated detector

Syntax: **DLFn [+] f**

n = Detector number

f = phase

? DLF [rd]

RD = Detector Range

Example:

DLF 1 + D
Detector No. 1 will be activated when the green time of phase D is running.

4.2.2.26 DLG Order

DLG. Group-activated detector. The detector n is activated depending on the status of the outputs

Syntax: **DLGn g s e**

DLGn g = eee

DLGn g = c

? DLG [rd]

n = Detector number

g = Group number

s = State: V = green, A = amber, R = red

e = Color status: 0 = off, 1 = on, 2 = flashing, 3 = fast flashing

eee = Status of the three colors in the RAV order

c = Group Color Code

Example:

DLG2 5 V 1
Detector No. 2 will be activated as long as the green detector of group No. 5 does.

DLG2 5 = 010

Detector No. 2 will be activated as long as the amber of group No. 5 does

Qb2 5 = A

Detector No. 2 will be activated as long as the amber of group No. 5 does

4.2.2.27 DLM Order

DLM: Manual Detector Syntax:

DLMn [t]

n = Detector number

t= detection time (default 600 tenths)

? DLM [rd] rd = detector range The detector is activated and deactivated with the DL command. If the detector is not deactivated, it will be active for a maximum of time t, after which it will be automatically deactivated.

Example:

DLM3 10.0

Detector No. 3 will be activated for a maximum of 10 seconds.

4.2.2.28 DL Order

DL: Logic Detectors

Syntax: **DLn {0 |1}**

? DL

Examples:

DL 3 1

Manual detector 3 is activated.

? DL

Answer:

DL 11010000

There is demand for detectors 1, 2 and 4.

4.2.2.29 MTF Order

DM: Detector Memory Status Syntax:

? DM

Examples: ? DM

Answer:

DM 00110100

There is pending demand in detectors 3, 4 and 6.

4.2.2.30 DN Order

DN: Detectors with Denied Demand

Syntax: DN rd | DNn DEL | DN DEL

? DN

rd = Detector Range

DNn DEL: Cancels the previous request.

Inverts (denies) the status of the detectors. This allows detectors that in the absence of demand to be active as passive detectors

Examples:

DN 1-3 ? DN

Answer:

DN 11100000 00000000 000000000

Detectors 1, 2 and 3 are active at rest.

4.2.2.31 Order DO

DO: Commands to execute when there is detector
demand Syntax: DOn[L] [[-]f] (command) ? DO [rd]

n = Demand number
L = Indicates that demand is taken into account and not memory
f = The order will be executed within phase f
- = Order is executed outside of the phase
rd = Detector Range

Examples:

DO9 C (J9 R 1)

When demand 9 is triggered during phase C, the red of group 9 will light up.

DO2 B (J3=001)

If there is demand 2 during phase B, the green of group 3 will be lit.

4.2.2.32 Order DP

DP: Detectors with permanent demand Syntax:

Death Prophet rd
DPn OF THE DP OF THE ? DP

Forces the status of detectors specified by the rn range as detectors with permanent demand.

Examples:

DP 2

Detector 2 will provide permanent demand.

? DP

Answer:

DP 01000000 000000000 000000000

4.2.2.33 Order DR

DR: Programming the phases that clear the memory of the detectors Syntax :

DRn [[-]f]

DRn DEL

n = demand number

f = phase that will clear the memory of the detector n Causes the phase f to clear the demand memory of the detector n if there are no outstanding extensions. Multiple phases can be defined for the same detector using multiple commands. If "-" appears, the detector memory is cleared at the beginning of the phase.

Examples:

DR1 A

The memory of detector 1 is erased by phase A.

DR1 -A

The memory of detector 1 is erased when entering phase A.

DR1 OF

The memory of detector 1 will not be erased by any phase.

? DR

Answer:

DR1 A

4.2.2.34 DS Order

DS: Definition of simple detectors / Statistical detectors List the simple detectors (they are not speed detectors, nor queue detectors). It allows us to define as a simple detector a logical detector that we had previously defined. Syntax: ? DS [rn] | DS n

rn= range of detectors, it can be a list of detectors, or a group of detectors defined by the first and last separated by a hyphen.

n = Detector number

Examples:

DS 1-2

Answer:

DS 1 0.0, 0.0

DS 2 0.0, 0.0

4.2.2.35 DRD Order

DRD: Programming of Demands That Clear Detectors Memory Syntax :
DRD n [[+]d] DRD n DEL

n = detector number

d = demand that will erase the memory of the detector n

? DRD [rd] rd = detector range If + appears, memory is cleared when demand is turned off

Examples:

DRD 1 3

Demand 3 will clear the memory of detector 1

? DRD

Answer:

DRD1 3

4.2.2.36 DT Order

DT: Programming the timing of the detectors Syntax :

? DT [rd]

RD = range of detectors, can be a list of detectors, or a group of detectors defined by the first and last separated by a hyphen.

Examples:

? T2D

Answer:

T2D 40

The timing of detector 2 is 4 seconds.

? DT

Answer:

T3 V2 20

Detector 3 timing is the time it takes for the last vehicle that has passed through speed detector 2 to travel the distance of 20m.

4.2.2.37 DV Order

Syntax: **?DV [rn]**

DV: Definition of Speed Detectors

Syntax: **DVn d l1 l2 v [vu]** Double detector.

DVn L l1 l2 v [vu] Simple detector.

? DV [rd]

n = Detector number

d = second detector

L1 = Width of the coil in meters (one decimal)

L2 = distance between the starts of turns in meters (one decimal) or estimated length of vehicles for speed calculation with one loop.

v = maximum speed in km/h.

vu = threshold speed in km/h.

RD = range of detectors, can be a list of detectors, or a group of detectors defined by the first and last separated by a hyphen.

Examples: ?DV

Answer:

DV2 4 2 3 60

Detector 2 pairs with detector 4 to function as a speed detector. The coils are 2 m wide and are placed at a distance of 3 m. The maximum speed on that section is 60 km/h.

4.2.2.38 DW Order

DW: Programming the extension time of the detectors Syntax :

? DW [rn]

rn= range of detectors, it can be a list of detectors, or a group of detectors defined by the first and last separated by a hyphen.

Examples: ? DW

Answer:

DW3 40

Detector 3 has a delay of 4 seconds.

4.2.2.39 EC Order

EC: Adds or removes the echo (Normal or medium intensity) Syntax: EC 0 | 1 | LOCAL

? EC [LOCAL]

4.2.2.40 ERRCOM Order

ERRCOM: Displays the communication errors produced Syntax:

ERRCOM GOOD? ERRCOM

[BOR] [O | regs]

O = Computer Errors

regs = set of regulators

With the BOR parameter, the error counter is set to 0
The set is given as follows: -3,5,7-9,12- Without parameter, all those that have an error are displayed

Examples:

? ERRCOM

Answer:

RW: NO 1 28/09/07 70:59:50.4

4.2.2.41 Order E

With this command we can change the state of the regulator.

Syntax: **E e**

And INI e

? E [+]

? AND INI

e = State Name

+ = shows the origin and instant of the change

List of state codes:

e= is a status code. The possible states are:

E remote control by plan selection.

H local control due to time change of plans.

I intermittent.

A off.

D disconnected.

Examples:

E A

Switches to off state.

? E

Answer:

E A

4.2.2.42 Order DATE

DATE: Modifies the date and/or time The controller maintains a calendar internally, which is used to activate plans on certain dates.

Syntax: F [date] [time]

The format of the date and time is: dd/mm/yy[aa] hh:mm[:ss] At least one parameter must be and the order is indistinct

? F [A | I]

With 'A' it shows the absolute time and with 'I' the start time

Examples:

F 10/2/97 F 10/2/97 15:35:40

? F

Answer:

F 2/10/97 15:36:10,12

4.2.2.43 GB Order

GB: Low groups (no load) If

a colour alarm is detected in any of these outputs, it is not taken into account. Syntax: GBn [R | A | V]

GBn [R | A| V] OF THE GB OF THE ? GB [rn]

rn = Group Rank

n = Number of the group to which reference is made.
R = Red Group
A = Amber group
V = Green group

Examples:

GB 3

Cancels the entire group 3.

GB2 A

Cancel the amber exit from group 2.

GB DEL

Cancel all withdrawals.

GB 3 OF

Group 3 is registered.

? GB

Answer:

GB2 TO GB 3 RAV

4.2.2.44 Order G

G: Define the colors that the groups will represent for each phase. There can be a maximum of 32 groups.

Syntax: **Gn [V | P | S] cf[-cf] [cf[-cf]] ...**

n = is the number of the group to which the order refers.

V, P, S= indicate that the group is vehicle, pedestrian or special. If nothing is put in, it is assumed that it is a group of vehicles.

c= is a color code described below.

f= is the phase or position to which the color code C corresponds . When a group is going to present the same color for a set of correlative phases, it is not necessary to name them all, just put the first and the last separated by a hyphen.

? G[rn]

rn= range of groups to be listed.

List of color codes:

- **D** off.
- **V** green.
- **A** amber.
- **R** red.
- **N** green/amber.
- **S** amber/red.
- **C** flashing green (slow).
- **F** flashing amber (slow).
- **B** flashing red (slow).
- **P** Flashing Green Fast
- **H** flashing red (fast).
- **I** flashing green (fast) / flashing amber (slow).
- **J** flashing green/amber (slow).
- **G** flashing amber (slow) / red.
- **E** flashing green (fast) / flashing amber (fast).
- **K** flashing green / flashing amber (alternating slow).
- **Z** flashing amber / flashing red (alternating slow).

Examples:

G1 RA-RC VD AE

Group 1 will be red in phases A, B and C, green in D and amber in E. It is a group of vehicles.

G2P VA-VB PC RD-RE

Group 2 is pedestrians. It will be green during phases A and B, flashing fast green during phase C and red in phase D and E.

? G1-2

Answer:

A B C D E F G H I J K L M N O P R S T U W X Y Z # $ % & @ * G1V R R R V A

G2V V V P R R

Lists the color assignment for groups 1 and 2.

4.2.2.45 HA Order

HA: Command to query/modify the mask of enabled submissions

Syntax: HA { 0 | 1 } bit ?HA

Examples: ?HA

Answer:

000000000000000

4.2.2.46 HB Order

HB: Deletion of the alarm history Syntax :

HB from ? HB

The parameter from corresponds to the time of deletion: d/m/a h:m:s.d If the time is not indicated, the beginning of the day is taken and if the day is not indicated, the day is taken with the question mark shows the last deleted instant

Examples:

HB 10/01/2007 08:00:00 AM

4.2.2.47 HC Order

This order is very similar to order H. The difference is that instead of defining a weekly table, it is a calendar. It only applies when the controller is operating in local control. Changes defined with this order take precedence over order H. A plan that has been set by this order remains: until it is cancelled, until a new change generated by this order, or until 24 hours.

Syntax: **HC Date Time (Order S) [Duration] HC Date Time (RET)**

Returns to Weekly Program HC Date Time (AR) Cancels Repeat

HC Date [Time] (DEL) Deletes the schedule from the HC DEL table

Deletes all schedules ? HC [date [time]]

date (dd[/mm[/yyy]]= indicates the days to which the following order S is to be applied. If the year is not specified, it is assumed that the order refers to all days of the year. If the month is left blank, the current month is taken.

hh:mm = is the time at which the new plan should come in.

action = represents an S, E, J, or EC command.

duration = indicates the consecutive days to which this order will apply.

You can put several changes on the same line.

You can cancel the entire schedule for a day or just a certain change.

To return to the weekly plan control, we replace the S order with RET. If no HC order is entered with RET, this plan will be valid until the end of the day.

An HC order with AR overrides the recurrence of any order with duration from the indicated time.

Examples:

HC 3/19/1996 12:00 PM(S1! 1/00:00:00) 3:00 PM(S2) 5:30 PM(S3! 2/12:30:00)

HC 3/19 3:00 PM

Cancel the change scheduled for St. Joseph's Day at 3.

HC 4 OF

Delete all the schedule for the 4th of the current day.

HC 3/20 4:00 (RET)

On March 20 at 4 a.m., he returns to plan control according to the schedule of time changes.

? Hard carry

Answer:

HC 3/19/1996 12:00 PM(S1! 1/00:00:00) 5:30 PM/S3! 2/12:30:00)

4.2.2.48 HP Order

HP: Querying the alarm history

Syntax: ? HP [- | home]

The start parameter corresponds to the start time of the list: d/m/a h:m:s.d If the start is '-" **all those saved at that time are shown If no start is indicated it is shown from the date that has been deleted If the time is not indicated, the start of the day is taken and if the day is not indicated, the day is taken today.**

Examples:

? HP

Answer:

Active Alarms:

J1R 10/1/2007 16:41:52.1

J3R 10/1/2007 16:41:49.2

J4R 10/1/2007

16:41:41:44.1 J6R

10/1/2007 16:35:46.9 J1A

10/1/2007 16:41:37.4 J2A

10/1/2007 16:35:45.9 J3A

10/1/2007 16:41:37.5 J4A

10/1/2007 16:41:37.1 J5A

10/1/2007 16:35:46.4 J6A

10/1/2007 16:35:45.9 J1V

10/1/2007 11:04:24.8 J2V

10/1/2007 11:04:24.8 KP

9/26/2007 9:58:57.8

4.2.2.49 Order H

H: Scheduling the Time Change Table With this command, plan changes are scheduled for when the controller operates in local control by plan time control. In this state, the plan that is being executed is determined by the local time and the table that is defined with this command. Syntax: H rd hh:mm (ordS | DEL) [hh:mm (ordS | DEL)] ... H RD DEL

H OF ? H [rd [hh:mm]]

RD = indicates the days of the week to which the following order is to be applied. Monday is 1, Tuesday 2, and so on. You can put a list of numbers separated by commas, a range of days.

hh:mm = is the time at which the new plan should come in.

action = represents an order S, E, J, or EC.

Ref = Reference for change of plan day week / hh: mm: ss.

Examples:

H 1-5 12:00 (S1 ! 1/00:00:00) 15:00 (S2) 17:30 (S3 ! 2/12:30:00)

Schedule plan changes Monday through Friday. At 12 noon plan 1 will enter, at 3 p.m. plan 2 and

H4 15:00 DEL

Cancel the change scheduled for Thursday at 3.

H4 OF

Delete all Thursday programming.

? H

Answer:

1...... 00:00(S1 1/0:00:00)

4.2.2.50 Order ID

ID: Identifier of the junction This command is used to identify each of the controllers. To find out the number of the regulator, corresponding central unit, junction number and intersection name:

Syntax: **ID 1 n1 n2 n3**

ID 2 line

?ID

? ID1

? ID2

Examples:

ID1 01 24 02

ID2 CRUCE C/RUZAFA - GENERAL SAN MARTÍN

?ID

Answer:

ID1 01 24 02 ID2 CRUCE C/ RUZAFA - GENERAL SAN MARTÍN

4.2.2.51 IDPHYSICAL Order

IDPHYSICS: Physical identification of the equipment Syntax: ? IDPHYSICS

The IDFÍSICA is formed by the concatenation of the following identifiers separated by ':'. HOST: CENTRAL: REGULATOR: SUB-REGULATOR

Examples:

? IDPHYSICS

Answer:

IDF = *:*:1

The controller has node number 1 and does not have the exchange or host identified. Physical identification does not refer to lower levels.

4.2.2.52 IDLOGICAL Order

IDLOGICA: Logical identification of the equipment Syntax:

IDL n n =

identification number

Examples:

IDL 1? IDL

Answer:

IDL 1

4.2.2.53 Order I

I: Incompatibility programming With this order, the controller is informed of the groups that cannot be in green simultaneously.

Syntax: I n m [m1 m2 ... MK] |I [n [m]] DEL ? I [rn]

rn= range of groups.

Group n is incompatible with m, m1, m2 ... mk. **The programming is symmetrical: if we say that the group** n is incompatible with the m, the incompatibility of the m with the n is automatically programmed as well.

You can cancel incompatibilities that have already been scheduled: all of them, those of a group, or that of one group with another.

Examples:

I 1 3 4

Group 1 is incompatible with Group 3 and 4.

I 1 4 DEL

Cancels the incompatibility of group 1 with group 4.

? I

Answer:

I 1 3 4

It lists the incompatibilities of group 1 with group 3 and 4.

4.2.2.54 JR Order

JR: Standby state of the power outputs (when there is no demand from the detector associated with the DO command) Syntax:

JR g = eee ? JR [rg] g = Group Number

eee = Status of the three colors in the order RAV rg = group rank

Examples:

JR 4=010

? JR

Answer:

JR4=010

4.2.2.55 Order J

J: Control of power outputs It is possible to act directly on the outputs of the groups not reserved for traffic control. These orders are rejected if they are addressed to one of these groups. Syntax: J g s e | J g = eee | J g = c:

g = Group number

s = State: V = green, A = amber, R = red

e = Color state: 0 = ap, 1 = enc, 2 = int, 3 = int. rap

eee = Status of the three colors in the RAV order

c = Group Color Code

? J [rg]

rg=range of groups

Turn group g outputs on or off . If e is used , s selects a particular output (V= green, A= amber, R= red), and e **is the state for that output (0= off, 2= flashing, 3= flashing fast). Another option is to directly put the status of the three outputs of**

the group (in the RAV order), we can also indicate the status of the three outputs with the color code.

Examples:

J 7 V 1

Turn on the green start of group 7.

J 8 = 110

Turn on the red and amber of the group and turn off the green.

>J 6= F

Turn off the red and green, and turn the amber on flashing.

? J

If in a regulator of 8 groups we have programmed NG 6.

Answer:

J7 = 001 J8 = 110

We get the status of groups 7 and 8.

4.2.2.56 LC Order

LC: Consumption Calibration Memorizes the current consumption of the specified groups as the reference power for the burnt out detection system.

Syntax: **LC [cg]**

CG Set of groups to be calibrated

? LC [E] [cg] [C|T]

cg = group set

E = indicates ECO

C = show compensated power

T = show tension

Examples:

LC

? LC2

Answer:

LC2 R= 2.0, A= 1.2, V= 3.0 ?

LC

Lists the calibration values for all groups.

Answer:

LC1 R= 3.0, A= 2.0, V= 2.1

LC2 R= 2.0, A= 1.2, V= 3.0

4.2.2.57 LF Order

LF: Temperature and voltage reading This order is used to obtain the values of the supply voltages and the temperature of the cabinet.

Syntax: **? LF [T |V]**

V = reading of the alternating voltage.

T= temperature reading.

Examples: ? LF

Answer:

LF V 214 LF T 27

? LF T

Answer:

LF T 27

? LF V

Answer:

LF V 214

4.2.2.58 LM Order

LM: Consumption reading With this order, the last consumption reading of each output is obtained. Syntax:

? LM [rn] [T]

rn= range of outputs, can be one or a list of these, defined by the first and last separated by a hyphen.

T = show tension.

Examples:

? LM1

Answer:

LM1 R= 0.0, A= 4.7, V= 7.3

? LM1 T

Answer:

LM1 R= 0.0 (40V), A= 4.7 (40V), V= 7.3 (40V)

4.2.2.59 LW Order

LW: Consumption reading

Syntax: **LW [E] U uw**

LW [E] U [Gg] [R uw] [A uw] [V uw]

LW [E] U [Gg] [R] [A] [V] DEL

? LW [E] U [cg]

E = ECO indicates

g = Group

cg = group set

uw = Alarm Power Threshold

w = Charging, in watts, connected to the output

Examples:

LW U 14

Program the general threshold.

LW U V17

It sets the threshold for greens.

LW U G2 R20

Program the threshold for the red of group 2.

? LW U 1-4

Answer:

LW U G1 R14 A14 V17

LW U G2 R20 A14 V17

LW U G3 R14 A14 V17

LW U G4 R14 A14 V17

4.2.2.60 LT Order

LT: Programming Temperature Alarm Thresholds and Fan Activation Defines the temperature at which the over-temperature alarm will be triggered and the fan will be activated.

NOTE: By default it has been programmed 60º.

Syntax: **LT is LT V toff ton**

ta = temperature threshold for alarm

toff = temperature threshold to deactivate fan

ton = temperature threshold to activate fan

?LT [V]

Examples:

LT 50

Alarm G will be generated when 50 degrees are exceeded.

?LT

Answer:

LT 50

?LT V

Answer:

LT V 38 45

4.2.2.61 MA Order

MA: Command to enable/disable manual control Syntax:

More	Activate manual control
more	Turn off manual control
more	Returns current state
bad?	
MA	

Examples:

MA N

? MA

Answer:

AUTOMATIC

4.2.2.62 NG Order

NG: Reserve groups 1 through n for traffic control.

Syntax: **NG n? NG**

n = group numbers.

Examples:

NG 6

Groups 1 through 6 are reserved for traffic control, while groups 7 and 8 can be commanded by order J (assuming an 8-group regulator).

? NG

Answer:

NG 6

4.2.2.63 Order N

N: Node number This command defines the node number to which the controller will respond when the multipoint control panel wants to communicate with it. This parameter is not cleared with the DELETE command .

Syntax: **N n**

n= is the node number.

? N

Returns the node number.

Examples:

N 2

? N

Answer:

N 1

4.2.2.64 Order O

Or: Programming of the default phase When there is no demand for any phase in an actuated control, it can be made to remain in the last phase until there is demand for some other, or to move to a predetermined phase. With this order we define this phase. If this order is not used, the regulator will remain in the last phase that has had demand or in the last phase of the sequence that has forced the last demand.

Syntax: **O [+|-]f[+|-]**

OR OF ? Or

f= is the default phase. If the + sign appears in front of the phase, you do not need to define the transition to this phase. An amber position and optionally a clearance position are automatically inserted. The same applies to the + sign behind the phase: a transition will be inserted between the default phase and the target phase. The automatic transition only applies to phase changes that do not have a defined transition. If the - sign appears in front of or behind the phase, it indicates that there is no transition to the phase's in or out.

Examples:

Or H

When there is no demand, it will move to phase H

Or H+

It will insert an automatic transition when exiting the phase if the transition between the H phase and the new phase is not defined.

? Or

Answer:

Or H+

4.2.2.65 OE Order

OE: Scheduling the Transition from Input to the Default Phase Syntax:

OE [t1 [t2]] ? HEY

Defines the times of the default phase-in transitions. T1 is the duration of the amber position. If t2 is specified , there will be a punt position of duration t2 tenths of a second.

4.2.2.66 OS Order

OS: Scheduling the Transition from Output to the Default Phase Syntax:

OS [t1 [t2]] ? OS

Define the exit transition times. t1 and t2 have the same meaning as in OE.

In case the target phase has been defined with automatic transition, the transition that takes effect is the one defined by OS.

Example:

OS 3 2

The exit transition is formed by the amber position that lasts 3 sec. and the clearance position that lasts 2.

? OS

Answer:

OS 3 2

4.2.2.67 PC Order

PC: Viewing the Ongoing Plan Syntax:

? PC Examples: ? PC

Answer:

P 1 G 0.0 +A20.0 +B20.0 +C20.0

4.2.2.68 PING Order

PING: Sends an ICMP message to an IP
address Syntax: PING destination [tout [times]]
? PING

The tout **is indicated in seconds (default 3) If times is 0 question continuously (default 5) Pressing a key ends the command With the** ? shows your own IP

Examples:

PING 172.31.11.15

Answer:

Response in 7 msec.
Response in 5 msec.
Response in 22 msec.
Response in 6 msec.
Response in 8 msec.

? PING

Answer:

HOST = city.city.es IP = 172.31.14.14

4.2.2.69 PI Order

PI: Program the pilot position Define the starting position and its minimum time. Syntax:

PI p t
? PI

p = is the position of pilot.
t= is the minimum time.

Examples:

PI TO 5

The rider position is A and will last at least 5 seconds.

? PI

Answer:

PI TO 5

4.2.2.70 PO Order

PO: Display of the current position and its duration Syntax: ? PO

The answer can be a position name. (AA or RA for Auto Amber and Auto Red positions.)

Examples: ? PO

Answer:

PO A

? PO

Answer:

For RA

4.2.2.71 PS Order

PS: Programming a simplified plan Syntax:

PSn e [G] [D] [C=c] [R] [U] [A] tl

PSn DEL

n = Plan Number

e = structure on which the plan is based

G = Manual control allowed

D = Attenuated intensity

c = Cycle Length for Semi-Acted Plans

R = Allows non-demanded phases to leave at the end of the cycle

U = Supports urgent detector demands

A = Total Actuated Regulator

t = Offset in seconds with one decimal place

l = sequence time list

?PS[rp]

rp = Plan Range

Examples:

? PS

Answer:

P 1 1 1.0 25.0

4.2.2.72 Order P

Q: Scheduling a plan With this order, a traffic plan is defined, i.e.: structure, offset, cycle, distribution. The regulator can have from 0 to 8 plans. Plan 0 is special, it is the so-called "enrolled"
and saved in RAM. The write is in the Compact Flash and there must be another plan (from 1 to 8) programmed with the desired structure.

Syntax: **Pn [G] [C=c] [R] [A] t sequence**

Pn DEL ? P [rp]

RP= Plan Range

n= is the plan number that is defined. If n = 0 refers to the Christ plan.

G= indicates that manual control is allowed during this plan.

c = sets cycle c seconds in a semi-acted plan. It only makes sense in a semi-acted plan.

R = allows non-demanded phases to come out at the end of the cycle

A= the controller is fully operated.

t= is the offset in seconds with one decimal. If the offset appears, the A cannot appear .

sequence= it is made up of several phases. A phase is defined as follows:

Phase: [n] [-|+] F T

n = if it appears it indicates that phase f is acted upon by demand n.

- = means that this phase of a stable one is reached directly, without transition.

+ = indicates that the transition to this stage should be inserted automatically by the slider.

This transition is composed of an amber position and optionally a clearance position. The duration of these positions is fixed with order T.

f= is to the name of the phase.

t= is the duration (maximum, if the phase is acted upon) of the phase in seconds.

The time of the phase includes both the time of "green" and the time of the transitions entering the phase, whether from another phase of the plan, from the initial sequence (for the main phase), from an emergency sequence or from the lack of rest.

Sequence definition:

sequence = elemento_secuencia | sequence elemento_secuencia elemento_secuencia = phase | secuencia_demandada secuencia_demandada = identificador_demanda '('sequence')' | identificador_demanda '('sequence')' '('sequence')';

phase = fase_base | fase_trans | fase_actuada; fase_actuada = identificador_demanda fase_trans | identificador_demanda fase_actuada; fase_trans = sign fase_base sign = '-' | '+' fase_base = identificador_fase duration

identificador_demanda = integer in the range [1-32]; identificador_fase =

'A' | 'B' | 'C' | 'D' | 'E' | 'F' | 'G' | 'H' | 'I' | 'J' | 'K' | 'L' | 'M' | 'N' | 'O' | 'P' | 'Q' | 'R' | 'S' | 'T' | 'U' | 'V' | 'W' | 'X' | 'Y' | 'Z' | '#' | '$' | '%' | '&' | '@' | '*'; duration = number with one decimal;

Examples: A10

Phase A has a fixed duration of 10 seconds and there is no transition.

2A10

The phase is acted out (demand 2), and has a maximum duration of 10 seconds.

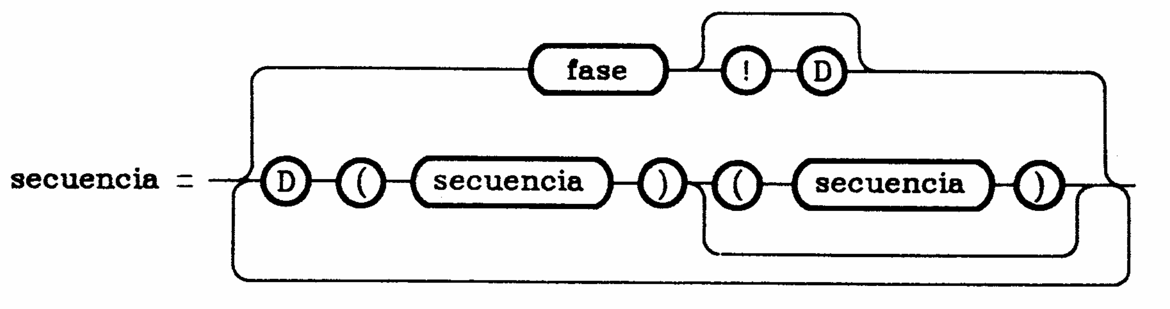
2+A30

Performed with automatic transition and maximum duration of 30 seconds. A sequence is made up of several phases and/or sequences. In an unacted plan, the relationship between the phases is linear, in the sense that after one there is always another pre-established one. In an acted plan this ceases to be true. When the CITY operates in actuated mode, it can output one sequence or another depending on the status of a demand.

n (sequence 1) (sequence 2): if demand n is active , sequence 1 is executed, if not, sequence 2 is executed.

Another element, which appears in pedestrians, is the !. When after a phase the exclamation mark appears followed by a demand number, it means that the execution of the plan stops at this point until said demand is activated, then the execution of the plan resumes.

Summary of the Sequence Syntax:



P1G 20.5 A35 B30

Plan number 1. Manual advance is allowed. 20.5 second offset. Phase A appears with a duration of 35 sec. and then B with 30 sec. The cycle is 35 + 30 = 65 seconds.

P2G 0 A37 !2 B30

Phase A appears for 37 seconds, after which it waits for demand from detector 2. When this happens, phase B enters with a duration of 30 seconds.

P3D 30 A30 2(2B40)

Semi-Actuated Mode. Phase B comes out if there is demand from detector 2 and is also acted on by the detector itself. If there is no demand for 2, phase B does not appear, and in its place phase A continues to come out.

P4 A A30 B10 1(C25) (D20)

Acted in full. Phase A appears for up to 30 seconds, then phase B appears for 10 seconds. If there has been demand for 1, phase C would come out, otherwise D would come out.

P5 A 1(2A30 3(B20) 4(D20) (E15)) (F40)

Plan 5 in total acted. If there is demand for detector 1, phase A enters with extensions of detector 2. Then, if there is demand in 3, phase B enters with a duration of 20 seconds. At the end of phase B, D or E is executed according to detector 4. If there has been no demand for 1, all of the above does not occur and phase F appears with a duration of 40 seconds.

P3 OF

Delete the plan 3.

? Q3

Answer:

P3 D 30.00 A30 2(2B40)

Plan Ready 3.

? P1-2

Answer:

P 1 G 20.5 A35 B30

P 2 G 0 A37 !2 B30

List plans 1 and 2.

? P

Answer:

P 1 G 20.5 A35 B30

.....

P 8

List all plans.

4.2.2.73 Order CLOCK

CLOCK: Modification of the date with the day of the week Sets the time and day of the week. When used for the first time after connecting the regulator, it clears all alarms.

Syntax: **R f/h:m:s[,d] ? R**

f= is the day of the week: 1 Monday, 2 Tuesday, etc. It is optional, if the date is used, the day of the week is calculated from the date. If the date is current and d is not correct, an error occurs.

d= are tenths of a second

Examples:

R 3/19:55:00

? R

Answer:

R 3/19:55:45,29

4.2.2.74 RESET Order

RESET: Causes a reset of the controller Causes the reboot of the computer. It is equivalent to disconnecting and reconnecting. Turn off the lamps and after a second or two restart.

Syntax: **RESET [n | A | B]**

n = subnode number

Examples:

RESET

4.2.2.75 RF Order

RF: Reports references for internal synchronism. It also gives the date and time of modification of plan 0.

Syntax: **? RF**

Examples: ? RF

Answers:

1/0:00:00 Plan Reference 0

1/0:00:00 Plan in Progress

Reference

4.2.2.76 Order SESSION

SESSION: Log in to modify data. It is closed when validating (order X) or canceling (canceling order).

In order for a schedule order to be accepted, a recording session must have been opened with the SESSION command. The session can be closed for several reasons:

- By time: if the established time has expired since the last order entered. Changes are lost
- by the CANCEL command. the changes introduced are lost
- by order X. the data is validated and if it is correct, the session is closed and the data is accepted. (Otherwise, the session remains open.)

Syntax: **SESSION**

Examples:

SESSION

4.2.2.77 SI Order

Allows you to force the synchronism origin. In consultation, it indicates the instant of the last synchronism and its origin, as well as whether it is forced.

Syntax: SI I|E|LOCAL ?YES

I: internal synchronism force E: external synchronism

force LOCAL: removes the force on the synchronism

type

Examples: ?SI

Answer:

SI I|E [F] 14:04:00

4.2.2.78 Order S

S: Forces a plan change It only takes effect if the controller status is Remote Control for Plan Change. It is also used as part of the H and HC orders.

Syntax: **Sn [!] [d/hh:mm:ss]**

n= is the number of the new plan. When n = 0 refers to the enrolled plan.

! = if it appears indicates that the plan change starts immediately. If the change of plan is not put in place, it will begin at the end of the current cycle.

d/hh:mm:ss = is the reference for the new plan. If it doesn't appear, the new plan will have the same reference as the current one.

? S [X] [+]

Answer: n[-m] E | H [G] d/hh:mm:ss

n= is the ongoing plan.

m = when it appears, it means that a change of plan is being made. m is the new plan.

E or H = inform whether it is in remote control or in local control.

G = if it appears indicates that it is in manual control.

d/hh:mm:ss = is the current reference.

X = indicates that an extended response is desired. When this happens, information is added about the current time, the phase you are currently running, and the time that has elapsed since your entry.

Examples:

S2! 1/13:34:00

? S

Answer:

1 HG 3/16:45:45

? S

Answer:

1-3 EG 3/20:08:34

? SX

Answer:

1 HG 3/19:45:32 3/19:45:40 B21.5

Plan 1 is being implemented. The regulator is in local control. Follow the reference and time. The current phase is phase B and 21.5 seconds have elapsed since its start. This time includes the duration of the transition from entry to phase B.

4.2.2.79 TD Order

TD: Query tables of detectors by CCI group Syntax:

? TD

Examples:

? TD

Answer:

TD 1 11111100 000000000 000000000 10:41:00.00 80 12:47:40.00

The controller has been configured to send data from detectors 1 to 6, corresponding to GCCI 1 from 10:41:00 with a period of 80 seconds. The current period started at 12:47:40

4.2.2.80 TE Order

TE: Programming the transitions between structures Syntax: TEe1e2

nt t [t]... trans. E1 to E2 (in extended mode)

TEe1e2 OF THE TEA OF THE TEA

E1,E2 = Number of source and destination

structures T = Position duration time

nt = transition number

It is only valid in extended mode.

Examples:

TE1 2 1 3 3

4.2.2.81 IT Order

IT: Connected Equipment Tables Syntax:

? IT [Set]

The set is given as follows: -3,5,7-9,12-

(the value 0 is for the top node)

Displays the status of communications, physical identification, and logical identification of the equipment.

Examples:

? IT

Answer:

Physical ID: *:*:1 Logical ID: 1131 Channel Comunica

IdLogica IdFísica Version

****

@ NO -1 0

4.2.2.82 TR Order

TR: Defining the colors of the groups for each transition

Syntax: TRn [Gng] c1c2... cn ... [[Gng] c1c2... cn]

TRn OF ?TR [n] n = Transition number

ng = Group number (if not specified it starts with 1 and continues sequentially)

c1... cn = Color code for position 1 to n

Examples:

TR1 RR RR RR RR VV FF VV VV VV RR VV VV VV AR VV RR VV ZZ PR RR RR VV VV RR RR JJ RR GG VV RR

4.2.2.83 Order T

T: Programming of the transitions With this order, the transitions between two stable phases and the input transition are defined. Each transition can consist of 15 positions. In the parameter validation phase, an error will occur if not all the transitions that can occur have been defined, except for those phases for which automatic transition has been defined in the P command. Syntax: T f1f2 [ft ... [ft]]

T f1f2 tr [t ... [t]]

T f1f2 DEL

T + f t1 [t2]

T +f DEL

T f+ t1 [t2]

T f+ DEL

T + t1 [t2]

T + DEL

T INI [ft... [ft]]

T INI tr [t ... [t]]

T INI DEL ? T [f1f2] | ? T +a | ? T +

| ? T INI

F1= represents the origin phase of the transition.

F2= is the target phase.

f= is the transient position (up to 15 positions).

t= is the duration of the position.

Tr = transition number

T + f= defines the automatic transition from entry to the stable phase f. t1 is the duration of the amber position, if t2 exists there is a clearance position of duration t2 seconds.

T f+= defines the automatic transition from output to stable phase f

If at any given time several of the defined transitions can be applied, it will have priority **T f1f2, if it is not defined , T+f** will be applied, and finally T+.

T INI= defines input transition.

Examples:

T AD B3 C4

The transition between phases A and D is formed by phases B with a duration of three seconds, and phase C lasting four seconds.

T AD 1 3 4

The transition between phases A and D (in extended mode) is transition 1, the first position lasting three seconds, and the second position lasting four seconds.

T + 3 2

The duration of the automatic amber position is 3 seconds, and the red position is 2 seconds.

T INI P3 R3

The input transition is composed of the P position with a duration of 3 seconds, followed by the R, which will last another 3 seconds.

? T

Answer:

T AD B3 C4

The transition between phase A and D is formed by position B with a duration of 3 seconds y position C that will last 4.

? T DF

Answer:

T DF E3

? T+

Answer:

T + 3 2

? T INI

Answer:

T i ini P3 Q3

4.2.2.84 UC Order

UC: Programming of emergency phases Syntax: UCd [n] [!]
[[+|-]et ...] f [[+|-]st...] [([-]a|+)] ? UC [n]

d= demand number

n = sequence level (1 or 2)

!= forces immediate entry of the sequence

+|- = automatic or non-transition transition

e = input phase

f = name of the emergency phase

s = exit phase

t = duration of the phase

- = no exit transition

a = Phase Destination at the Exit of the Emergency

+ = returns to the principle of the coordinated cycle

UC= defines the emergency phase as f, and associates it with demand d. Optionally, one or more entry phases can be defined and duration t and one or more exit phases of the emergency phase itself. Transitions between such phases can be specified with the command T, or by putting a **+** or - sign in front of the phase name to indicate automatic transition or no transition. Each emergence sequence can consist of up to 7 phases (plus 15 transition positions between phases).

n = is the level of the sequence. There are two levels of sequence, level 2 takes precedence over level 1. If the level is not specified, it is assumed to refer to level 1. If the !sign appears, the entry into the emergency sequence takes place immediately, regardless of whether or not the minimum time of the current phase has elapsed. At the end of the sequence, the regulator will return to the phase it would have been in if the emergency had not occurred. If instead we want it to go to a certain phase of the plan, we put the name of the phase in parentheses. If we want it to return to the beginning of the coordinated cycle, we put a + sign in parentheses.

? UC= List the emergency phases. If n is specified, only the one associated with demand n is listed .

Examples:

UC5 2 K

It defines the K phase of emergency and associates it with detector 5.

UC8 L

Phase K takes precedence over L in case of simultaneous demand.

UC4 C20 K J15

The emergency phase is the K, which will be preceded by the C with a duration of 20 seconds and at the end the J will appear for 15 seconds.

? UC

Answer:

UC5 K UC8 L

? UC5

Answer:

UC5 K

4.2.2.85 EU Order

UE: Defines the duration of the transition from input to the emergence sequence. Syntax:

UEf t1 [t2] ? EU [f]

f = name of the emergency phase

T1 = Amber Time

T2 = Clearance Time

? UE= lists the duration of the input transition. If you specify f list only those of the phase **f.**

Examples:

UEK 3

The duration of the transition from input to the K phase is 3 seconds

? UEK

Answer:

UEK 3

4.2.2.86 US Order

US: Defines the duration of the exit transition of the emergency sequence. Syntax:

USf t1 [t2] ? US [f]

f = name of the emergency phase

T1 = Amber Time

T2 = Clearance Time

? US= lists the duration of the exit transition. If f is specified, it lists only those of phase f.

Examples:

? USK 4

The duration of the K-phase exit transition is 4 seconds.

? USK

Answer:

USK 4

4.2.2.87 Order V

V: Programming the minimum green times Defines the minimum duration of a stable phase. Whenever a phase comes out, it will have at least this duration. The minimum time shall be between 0 and the maximum duration of the phase specified in order P.

Syntax: **Vf t**

f = Phase

t = Minimum Green Time

? V [f]

rf = Phase Range

Returns the minimum times programmed for each phase, or for phase f.

Examples:

VA 10

? VA

Answer:

VA 10

4.2.2.88 Order X

X: Data Validation This command is used at the end of controller programming or after a modification. When this order is given, the consistency of the new data is verified with those already memorized, if they are correct, they are passed to the working memory and recalculated to the checksum of said memory. If the new data affects the current plan, a plan change sequence is initiated.

Syntax: **X**

Examples:

X

4.2.2.89 ZC Order

ZC: Programming of the type of control panel With this command we configure the communications. In order for these orders to be executed, the equipment must be reset after validation.

Syntax:

ZC tipo_de_central [channel] [speed] | [ip] ? ZC

The valid exchange types are:

CMCB: communication with serial protocol B.

TCP CMCB: B-Protocol over TCP Communications

WITHOUT CENTRAL: autonomous regulator.

Examples:

ZC CMCB

ZC TCP CMCB 192.168.0.25

The communication will be via TCP and the IP address of the controller will be 192.168.0.25.

ZC MP CMCB COM4 2400

The communication will be by serial multipoint center and the speed will be 2400 bps.

? ZC

Answer:

ZC MP CMCB COM4 2400

4.2.2.90 GPS Order

Querying GPS status

Syntax: **? GPS**

Answer:

- GPS NO: **There is no GPS.**
- dd/mm/yyyy hh:mm:ss ttt.cc **Last date and time received since** y time **receipt (seconds to two decimal places)**

4.2.2.91 DCF Order

Querying the status of the DCF77 receiver

Syntax: **? DCF**

Answer:

- DCF NO: **There is no Receiver.**
- dd/mm/yyyy hh:mm:ss ttt.cc **Last date and time received since** y time **receipt (seconds to two decimal places)**

4.2.2.92 UPS Order

UPS Interface and Status

Syntax: UPS interface interface: CLP | RS232

Syntax: ? UPS

Answer:

- UPS interface.

  Interface: CLP | RS232

Syntax: UPS E mode (not valid in CLP interface) mode: NORMAL | BYPASS

Syntax: ? UPS E

Answer:

- UPS AND NO: **There is no UPS.**
- UPS E mode [bb] **Operating mode and % battery charge**

  mode: NORMAL | LOCAL |BYPASS

4.2.2.93 DST Order

Loading the Daylight Saving Time Calendar

Syntax: DST NO DST CE DST d/m h d/m h

? DST

NO = non-active time change

CE = time change according to European Community directive = d day of the month = m month

h = time

4.2.2.94 LR Order

Order to set the brightness reduction

Syntax: LR LAT lat LR LON llon LR OR offsetOrto LR OC offsetDusk

LR ZH z? LR [LON] [LAT] [OR] [OC]
[ZH]"

lon = longitude in sexagesimal degrees (negative for O)
lat = latitude in sexagesimal degrees (negative for S) offset
offsetOrto = to be applied at the time of the sunrise in minutes
offsetTwilight = offset to be applied at the time of sunset in minutes
z = Time zone

4.2.2.95 CONSUMPTION Order

Set up groups that have extra power

Syntax: CONSUMPTION g [R][A][V] c
¿? CONSUMPTION [g[R][A][V]]

g = Group Outputs with possible additional
R, A, V = consumption Maximum additional
c = consumption per output in watts

4.2.2.96 IFUGA Order

Leakage currents

Syntax: IFUGA U ufuga uaveria
? Ifugue U? IFUGA [cg]

Escape = leakage alarm threshold (mA) fault alarm threshold
Random = (mA) set of groups on which the current is queried
cg =

4.2.2.97 TEST Order

Programming the Test Mode of the Regulator.

Syntax: TEST ON|OFF Syntax: Answer :

? TEST TEST
ON|OFF

4.2.2.98 ILR Order

Programming of Slow and Fast Intermittency Times.

Syntax: ILR t_l_on t_l_off t_r_on t_r_off t_l_on, t_l_off, t_r_on and t_r_off are the slow and fast turn signals on and off times in tenths of a second. Syntax: Answer :

? ILR
ILR t_l_on t_l_off t_r_on t_r_off

5. Annexes

5.1 Codeable Control Codes

TOK = 0x01
STX = 0x02 ETX
= 0x03 EOT =
0x04 TML =
0x06 TRT =
0x07 CR =

0x0D
DLE = 0x10 XON
= 0x11 XOFF =
0x13 NAK = 0x15
ETB = 0x17 EOB
= 0x18 EOF =

0x1A
ESC = 0x1B
ACK0 = 0x30 ACK1 = 0x31

5.2 Coding Communication Channels

CANAL_CONS	0
CANAL_ICOM	1
CANAL_GCOM	2
CANAL_DET	3
CANAL_ALAR	4

5.3 Network Maintenance Message Codes

CC_ENL_INI =	Initial connection of a node to its own	0x00
CC_ENL_ON =	New connection of a node to its own	0x01
CC_ENL_OF =	Disconnecting a node from its own	0x02
	Reserved	0x03
CC_BAJA =	Node decommissioning note due to 0x04 test errors Answer	
CC_TABS =	Table of Physical Identifiers of the indicated node subnodes	of the 0x06
CC_TABL =	Table of sides of the indicated node	0x07
CC_IDFIS =	Request to the Network Manager task of the 0x08 ID Physical Identification Corresponding to a Logical Identification	
CC_P_TABS =	Request for the table of physical identifiers of the 0x09 subnodes of the node indicated by the Manager task Network	
CC_P_TABL =	Request for the node side table indicated by 0x0A part of the Network Manager task	
CC_IDLAT =	Request for identification of a side node of the 0x0B node indicated by the Network Manager task	
CC_TABSVER=	Node Type and Version Table 0x0C indicated	

5.4 Response Test Codes

TEST_RESP =	Sending the Response Test Response	0x50
R_TEST_RES=	Header to the Response Test	0xD0

5.5 Return Codes In The Response Test

RTST_CORRECTO =	Answer test performed correctly The	0 test
RTST_NO_RESP =	node in question does not respond to the Answer: The node in question	of 1
RTST_OCUPADO =	is occupied	2

RTST_NPAO =

RTST_TO_ICOM

RTST_ER_ICOM

RTST_ER_DISTRI =

RTST_TO_EQ =

The node in question cannot serve the command in 3 at this time The shell does not respond 4 The shell responds with error 5 Error in routing the message 6 There is no response to the computer test 7

5.6 Node Types

0	Unknown
1-19	Reserved
20	Traffic regulator
80	Reserved

5.7 Glossary

Term	Definition
Alarm	Event detected in the regulator and capable of being notified.
Composite Alarm	It's a group of simple alarms. It is activated when any of the alarms that make it up are activated
Counter alarm	It indicates the occurrence of an event.
Simple Alarm	It corresponds to a specific event.
Temporary alarm	It corresponds to an event that has a beginning and an end. At any given time, this alarm may be active or inactive.
Cycle	The time elapsed from the change of a traffic light group to the repetition of that situation after a complete sequence.
Demand	A logical function of the state of logic detectors and their memories.
Memorized Demand	See demand.
Direct demand	It is obtained with the same equation as the memorized one, but replacing the memory of detectors with the state of the logic detectors.
Detector	All-or-nothing digital signal.
Speed Detector	A logic detector that calculates a vehicle's speed based on the time between the activation of two physical detectors.
Queue detector	A logic detector that is activated based on the occupancy time measured in a physical detector.
Demand detector	A logic detector that is activated when a lawsuit is triggered.
Detector Detector	A logic detector that is activated when another logic detector is activated.
Phase detector	A logic detector that is activated when entering or exiting a phase.
Group Detector	A logic detector that is triggered when a group or an output of a group enters or exits a state.
Physical detector	External entrance. It is usually used as a vehicle detector or pedestrian push button input.
Logic detector	A detector made internally in the regulator from external signals or internal events.
Remote Detector	A logic detector that is activated when a demand from another controller is triggered.

Structure	Pre-arranged succession of phases depending on demands.
Phase	State or succession of states that supports a main configuration of circulation currents within a cycle.
Acted phase	Phase of variable duration. A minimum time is established, after which extensions caused by a demand are added, until the time established in the plan is reached.
Fixed Time Phase	The duration of the phase is always the same, and is established in the plan.
Node Version Date	Date in Julian days, from 1-1-1980. Data size 2 bytes.
Network Manager	It is the main node of the communications network in which all the information about the network is concentrated. In this node there will be a task with the same name to which the messages for the maintenance of the network structure will be directed.
Group	A set of three outputs (Red, Amber and Green) that the regulator handles simultaneously.
CCI Group	Coordination group of identical cycle. As far as the regulator is concerned, it only affects the assignment of detectors.
Physical Identification	It is the identifier associated with a node in which its physical location in the network is reflected, according to the network level to which it belongs. Data size 2 bytes. Data fields: (the corresponding data fields will be reflected in bits) Bit 15 bit 0 Hhccccccssrrrrrr Being: Computer Level Æ hh: (2 bits) Computer number (0... 2) Central level Æ cccccc: (6 bits) central no. (1... 62) Regulator Level Æ rrrrrr: (6 bits) regulator number (1... 62) Sub-regulator level Æ ss: (2 bits) sub-controller number (1... 2) A physical ID is associated with a level when the values of the lower levels are zero.
Logical Identification	A unique numeric identifier for a computer on the network. Data size 2 bytes. Range: 1... 32767 (0 = Empty Logical ID)
IDL	Logical identification.

Incompatibility	Impossibility of granting the right of way to two movements whose itineraries intersect.
Intensity	Number of vehicles detected at a point in an hour.
Detector memory	It is activated when the logic detector is activated. It can be deactivated by a phase or by a demand.
Network Node	A network node is considered to be any communications computer in the Control Room, as well as the Headquarters, regulators and sub-regulators
Plan	Defines a traffic strategy for a crossing to be executed by the throttle. It is composed of structure, phase, cycle and distribution or duration of the phases.
Plan acted	Non-coordinated plan, whose structure may have sequences controlled by demand and phases acted upon.
Coordinated plan	Plan with a non-zero cycle, capable of being coordinated with other neighboring crossings to form a green wave.
Fixed time plan	Coordinated plan, with a linear structure and with all its phases fixed.
Semi-Actuated Plan	Plan acted with some restrictions: coordinated, with a main phase, which appears at the beginning of each cycle.
Position	Status of all traffic groups at any given time.
Stable position	A position that defines the main movement of vehicles in a phase.
Transient Position	A position that defines the permitted movement of vehicles between two phases.
Identification Process	A procedure by which two adjacent nodes identify each other. As a result of this process, the Network Manager task is notified of the event that occurred on the network. In nodes of different levels, it is always the node of the higher hierarchical level that begins the identification process, which basically consists of providing physical identification to the subnode in exchange for knowing the logical identification of the latter. This information will be packaged into a network maintenance message that will be forwarded to the Network Manager task. In nodes of the same level, a query of the physical identification of the other node occurs, spontaneously communicating its own logical identification. This information will be packaged on each node in a network maintenance message that will be forwarded to the task *Network Manager.*
Range	When a range appears in the syntax of a command, it refers to a set of values defined by values and comma-separated pairs of values. For example, 1,3,5-7 is equivalent to 1,3,5,6,7

Communications Network	The one formed by all the nodes of the network. It is a hierarchical network, divided into four levels, which from highest to lowest are: Computer Level, Central Level, Regulatory Level and Subregulatory Level.
Synchronism Reference	Instant of origin of synchronism. If the synchronism is external, it is determined by the arrival of a pulse by an external signal. If the synchronism is internal, it is an instant of the week.
Delay	The time elapsed between the activation of the physical and logical detectors.
Sequence	See Structure.
Synchronism	Internal or external signal used by regulator to maintain programmed offset
Subnode	A subnode is considered to be a node connected to a higher level node.
Task	Preset sequence of operations
Timing	Time in which the activation of the logical detector is prolonged with respect to the physical detector.
Communications Test	Periodic procedure that allows you to know the state of communication with an adjacent node at any time, detecting the loss and recovery of communication with that node. Three consecutive successful communications tests when there is no communication provide a communication re-establishment, which will trigger the beginning of the identification process. Three consecutive failed communications tests when communication exists provide a loss of communication, which will result in a network maintenance message that will be forwarded to the Network Manager task.
Response Test	Periodic procedure that allows you to know the operating status of a node. It is a test that a node performs on all its subnodes to detect any anomaly in their operation. In this case, the node is marked as decommissioned and the Network Manager task is notified . If the node does not communicate, the response test is not performed. A successful response test when the subnode was in a low state causes a subnode identification process that will leave it in a correct response test state. Depending on the error code obtained in the response test, the node will be moved to a state of deregistration in one period or three.
Extension Time	Temporary increase granted to a phase when there is a demand.
Occupancy Time	The time during which a vehicle is continuously present within the detection zone.

Maximum Time	Maximum limit to the presence of a phase with duration dependent on some actuation.
Minimum Time	Guaranteed exit time from a stable phase, in all circumstances
Node Type	An enumerator that identifies a node by its functionality. Data size 1 byte
Special Transition	Transition used between plan changes.
Transition	Sequence of transient positions.
Automatic Transition	Transition calculated by the controller based on the source and destination phases.