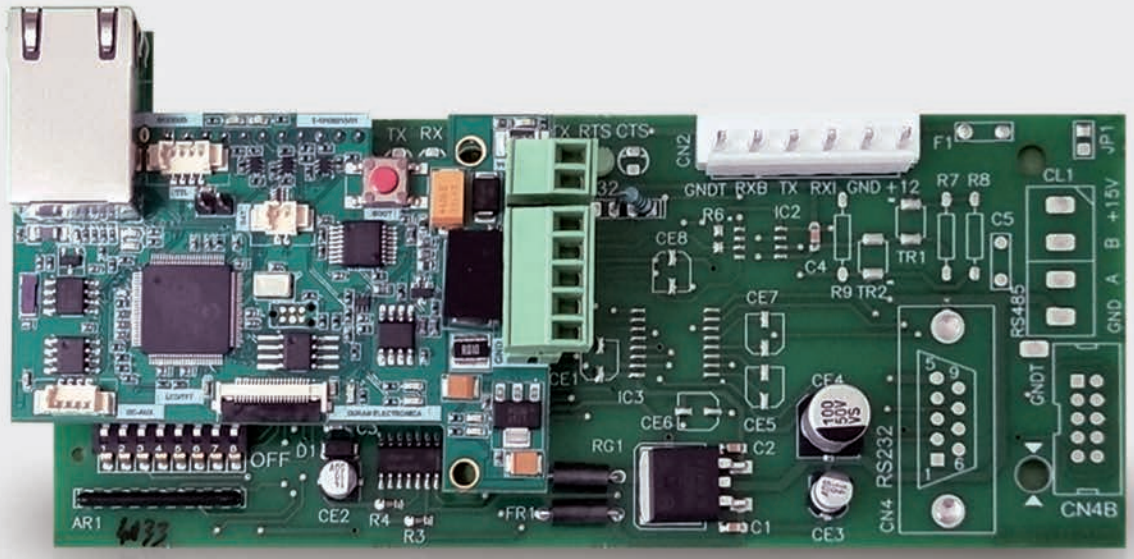
USER MANUAL



INTEGRA II MODBUS TCP-RTU

INTEGRATION MODULE FOR DURGAS CONTROL PANELS
FROM 1 TO 4 ZONES

DURAN® electrónica

bsi ISO 9001 Quality Management Systems CERTIFIED
FS82426

CONTENTS

INTRODUCTION

DURGAS Gas control panels enable measuring the gas concentration in a zone on the basis of a determined scale established by the type of detector used. To perform this task, measurements are taken with a frequency of 1 second.

All control panel data (once the first status is received from the different detectors) are stored in the memory (together with the time) and they are continuously accessible within a period of milliseconds.

It is also possible to change the values of a specific control panel to give determined responses.

To do this, certain zones of the control panels can be rewritten by protocol, performing the action within a period of 1 second approximately and confirming if the action has taken place or not.

Control panel structure

- Zones (Up to 4).
- Each zone can be divided into up to 4 groups, with independent operations.
- Each group may have up to 4 connected detectors of the same or different gases (16 in total)

ATTENTION: With the INTEGRA II module fitted, the control panel's earth fault is disabled. The read mode of the zones must be SEQUENTIALLY programmed.

MODBUS MODULE:

The **INTEGRA II MODBUS** of the **DURGAS** control panel allows access to the control panel's internal data for each detector, in addition to commanding a series of commands over the control panel, certain detectors and/or groups. To be able to do this, two access protocol types are offered, both MODBUS-based.

It offers the following connectivity to this effect:

- Ethernet IP4 port based on modbus RTU protocol, through the 10/100 ethernet connector. The maximum speed supported is 100Mb. It only allows one connection per time (Modbus) and this can be 'read' or 'write', according to the registers accessed. In this way, until the previous transaction has finished giving a modbus error or by means of a Timeout, it is not possible to interrogate / command the control panel again. The refresh/request rate is 100ms and allows the request of up to 64 values (registers) at the same time.

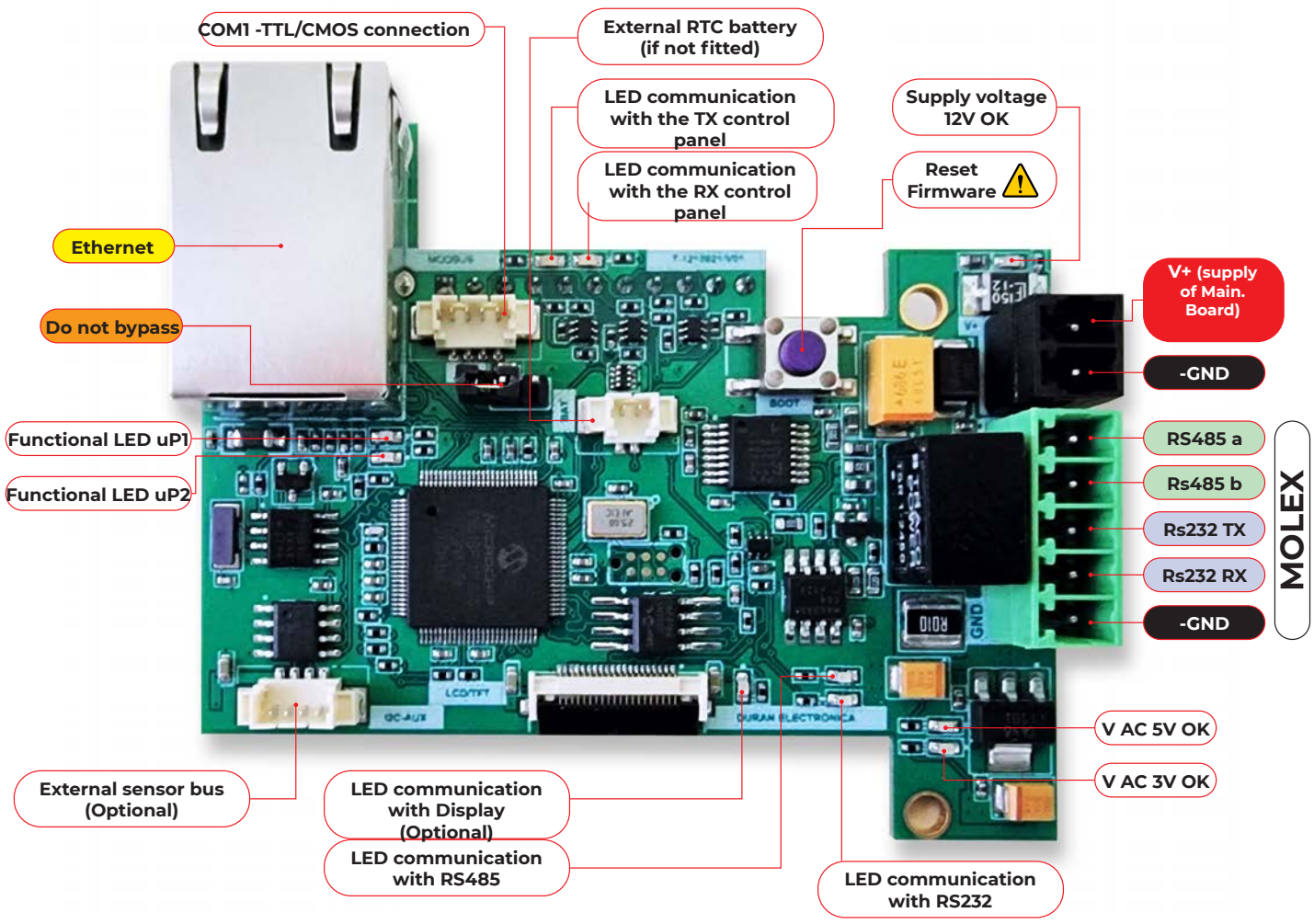
- By default, the IP address is **192.168.1.90:502. This IP address must be changed by the user, adapting it to their network requirements, and different for each control panel connected in the line.**

> Multiple communications port: Front Molex. It allows the connection either by RS232 / RS485 protocol of the same information obtained through ethernet, and with the transmission speed/rate. In this case, it only allows the reading of 16 values per Time (registers) that will correspond to a detector bank of a specific area. Port 232 and 485 can be used at the same time, but if they are not interrogated at the same time, since the resource is unique it will not function correctly. It is best to use modality 232 or 485 and keep to that.

> In the case of 485 ports, it is possible to put them in 2-wire cascade, since each control panel will be assigned a single address.

> The speed is: 9,600 baud -N -8bit-1bit-stop (No parity)

MODULE FEATURES:



IDENTIFICATION OF LEDS AND OUTPUTS.

The module works at 12V supplied by the control panel, although it has a DC/DC 9-36 converter to generate the internal voltages of 5 and 3.3 V.

It incorporates a CR1216 type battery. To maintain the clock data.
The maximum consumption does not exceed (except in the case of use of a display) 5W.

Both Ethernet connection / and 232 and 485 are protected. The TTL/CMOS output can be used and is also protected, but they work on the same port as 232/485.

When the system starts, the LED supply voltage (12V) shall go green automatically. If the system is correct the 5V and 3V LEDs will immediately light up (absence of short-circuits).

The start-up takes 500ms. During the first 500ms functional LEDs uP1 and uP2 flash simultaneously with a cadence of 100ms indicating that the system is in BootLoader mode and, therefore, with the suitable software it is capable of updating the firmware to a more modern version.

If the firmware is correct, the cadence will change 1 second. From that time, data can be requested from the control panel both by Ethernet and the serial port.

The module receives data from the control panel approximately every second. At the start-up the data it contains are empty **(0xffff value)** and they will be filled as they receive data from one of the zones.

Likewise, it is possible to send the execution commands (write) at any moment. Although they will only be executed every second (revision by the control panel). It indicates by means of registers (that we will see later on) if the last command has been executed or is still in waiting.

INTERCONNECTION PROTOCOL:

The protocol used for the connection between the control panel and an external element is the MODBUS standard in its TCP-RTU variant. This means that the connectivity with the control panel is always performed at network level via a CAT5 ethernet cable and minimum connectivity of 10Mbs. Each control panel will, therefore, have a unique IP (by default **192.168.1.90/24**on a**TCP 501** port. Of course, the system allows the output to Internet and for this it has a default Gateway **(192.168.1.1)** and a primary DNS (specified in the form of IP address).

All these values can be configured by the user through a website.

If we press the Reset button for 5s the data restarts (IP address by default and password).

It also offers a Telnet connection **(Port 23)** to be able to DEBUG the control panel. This can also be performed through the 232/485/TTL connections that offer the same output, (if it is programmed to said effect), and the Serial MODBUS option if it is not programmed. In this last case, the Debug can only be performed through the TELNET connection.

The system also incorporates a real-time RTC clock (with an accuracy of +-1s monthly) to be able to associate the hours at which the last data were received.

The TCP connection of the control panel is established in **"Server"** mode. In other words, a client (and only 1) can be connected to it. Unlike the other MODBUS-RTU protocols, the connection shall remain open as long as:

> The client does not close it specifically.
> It shall auto-close if there is no request from the client in 20 seconds.

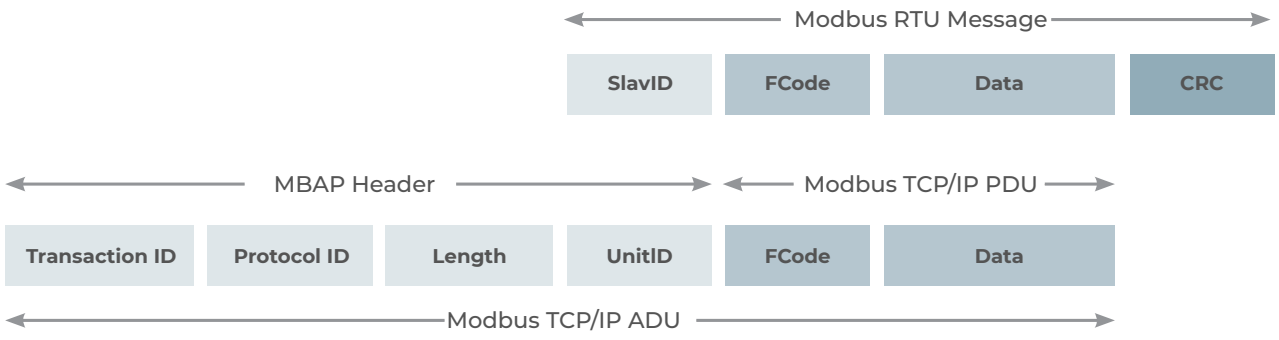
The control panel allows the transfer of a complete data block of up to 64 values at the same time, which allows covering all the values of the Zones-Groups-Detectors of a certain control panel.

MODBUS TCP-RTU PROTOCOL STRUCTURE:

The RTU-TCP modbus protocol is widely used in industry. As it is based, in this case, on TCP, it allows the continuous capture of data without repetitions and in a single logic block. This allows avoiding the problem of "races" to achieve data. Furthermore, as the TCP connection entails the concept of connection and closure, it makes the communication and obtaining coherent data in a single block more robust.

Modbus models the data in the form of "bits" and "WORDS – 2Bytes" "registers" The bits serve to detect the connection/disconnection status of a peripheral. The Bytes (WORDS) allow the modelling of values (with or without sign). A series of memory positions are formed that may be accessed for read or write from the pertinent functions.

The frame format (transfer) of MODBUS-RTU is:



As we see, the frame is divided into 2 parts: A header (TCP) and a data unit. Two fields stand out in the header:

<Transaction Id> 2 Bytes	» given by the client in the request and returned by the modbus to indicate the unique function number.
<Protocol ID> 2 Bytes	» Always 0 (reserved for future implementations)
<Length> 2 Bytes	» Number of bytes in the frame taking away the first 2 fields.
<UID> 1 Byte (Unique)	» To identify different control panels stacked in a single TCP connection.
<FCODE> Function number (1Byte)	» Operation to perform
<FLEN> Number of data to return	» (within data section)

<Data> Blocks of 2 Bytes (1 Block per value), if what we request are registered, or blocks of 8 bits (stacked in bytes) we ask that the entries are discrete.

EXAMPLES OF MODBUS TCP PROTOCOL:

Data request:

00 46 00 00 00 06 01 03 00 65 00 40

Transaction ID

Always 00

Data Bytes number

01 Control panel number

03 Register Read command

00 65 Initial register 101

00 40 Total registers to read

Response (If data exist)

00 46 00 00 00 06 01 03 80 00 00 00 01 00 00 00 00 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF (Data)

80 total of data sent (in the case of registers they would be a total of registers requested x 2)

In the case of Binary Data, it would be the total of data Bytes (number of 1-0 entries rounded off to the Byte)

Timeout (2000ms maximum)
Error (Existing Registers)

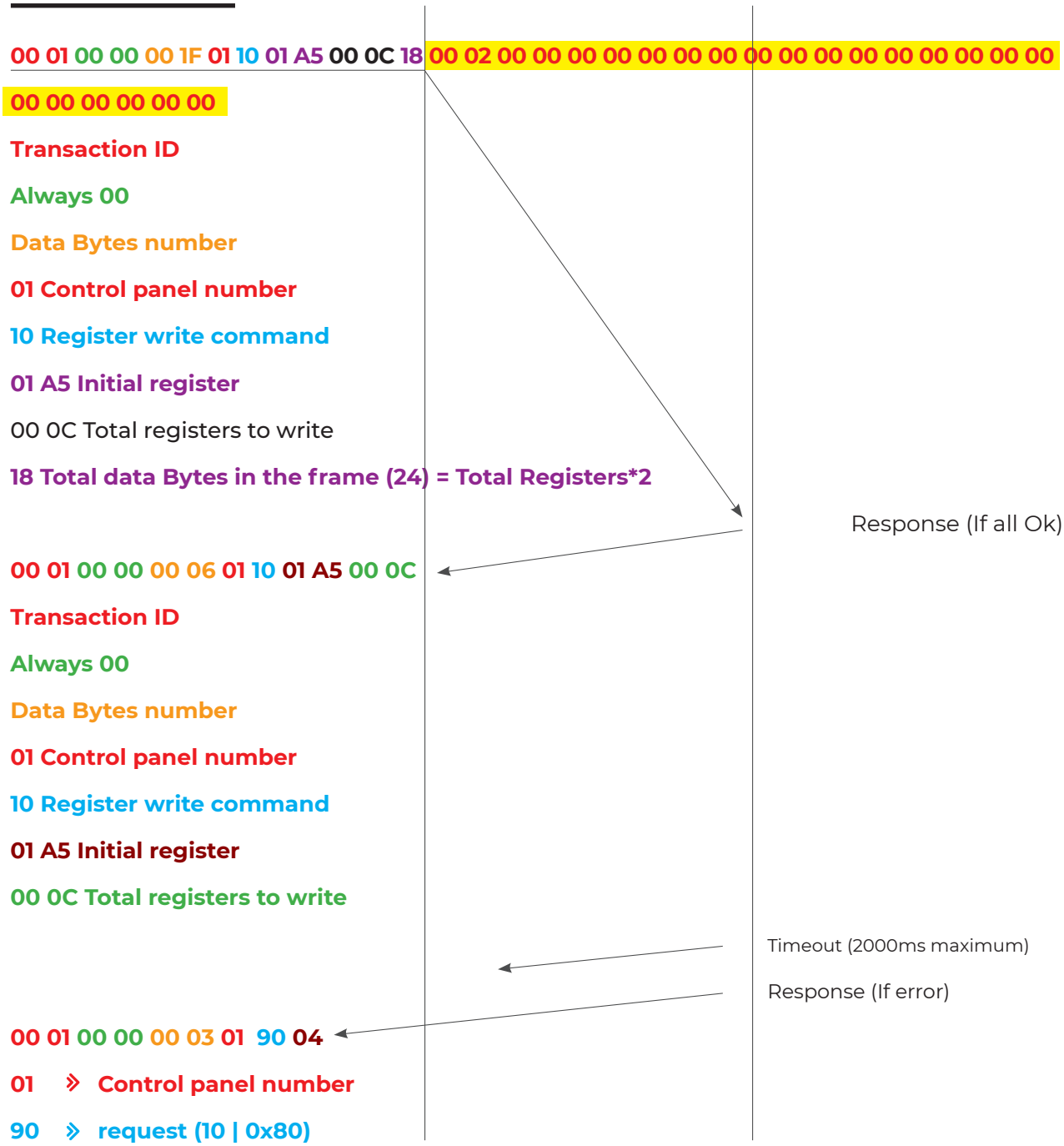
00 46 00 00 00 03 01 83 04

01 » **Control Panel Number**

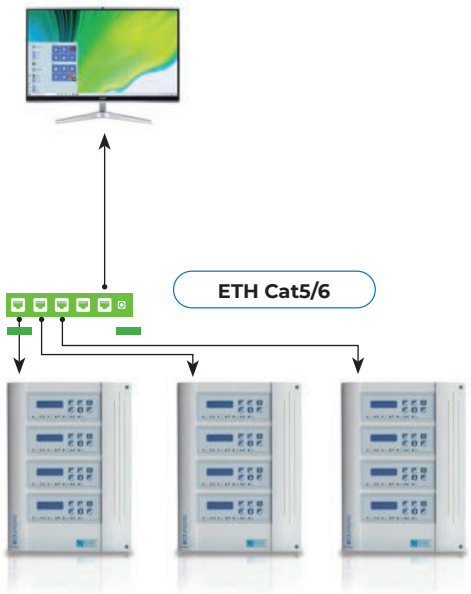
83 » **request (03 | 0x80)**

04 » **error code (Data does not exist)**

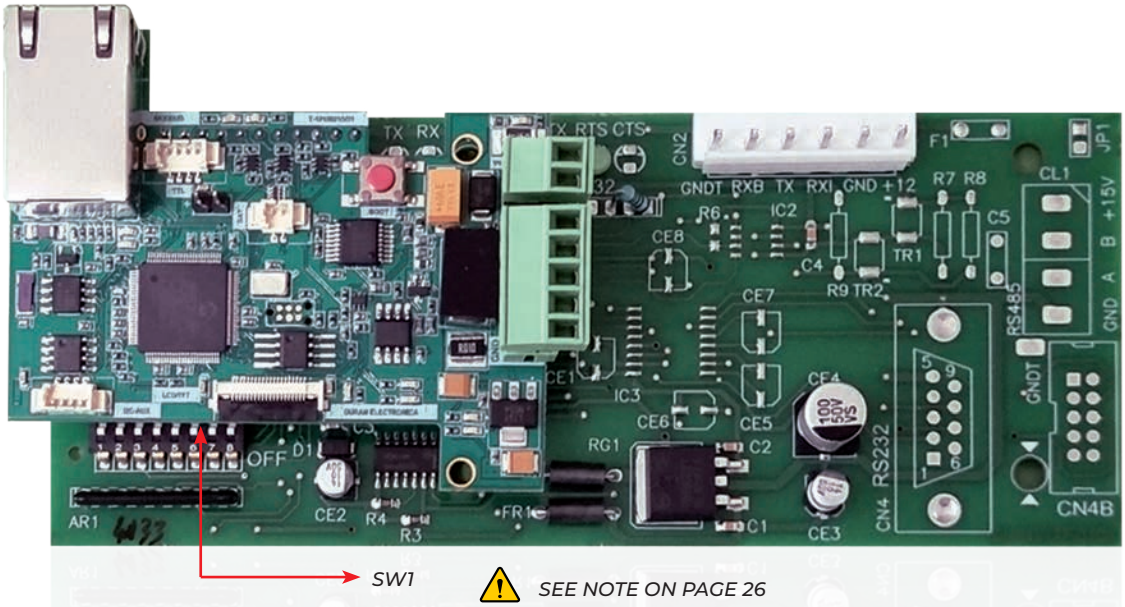
Data writing:



EXAMPLE OF MODBUS TCP ETHERNET CONNECTION:



UP TO 256 4-ZONE CONTROL PANELS AND 16,384 DETECTORS.



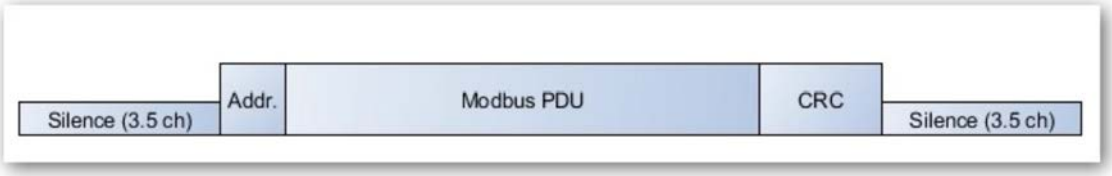
COMPLETE CIRCUIT OVERVIEW.

MODBUS RTU PROTOCOL:

The RTU modbus protocol is a variation of Ethernet, but adapted to serial communication, either 232 or 485. The communication via 232 is not recommended for distances over 50-100m. 485 communications allow distances of up to 1200m and 16. In this case, unlike the TCP system, a unique control panel number per software has to be assigned to it (configuration page) which must be unique (1-255) within the Bus.

As in the case of Ethernet, it only allows the existence of one Master station per time.

The Modbus 232/485 transfer format is as follows:



As we see, in serial Modbus transfer, the protocol is simpler than its TCP equivalent. It dispenses with the header and starts the frame with the ID of the control panel we are going to. The other data are handled similarly to that of Modbus TCP. Furthermore, a final CRC is added to it since as it is not based on a protocol with self-correction like TCP it is necessary to verify the integrity of the data. This CRC is calculated based on the formula of appendix 1 written in C on all the frame except the actual CRC.

Thus, the frames remain as follows:

- Register write frame.

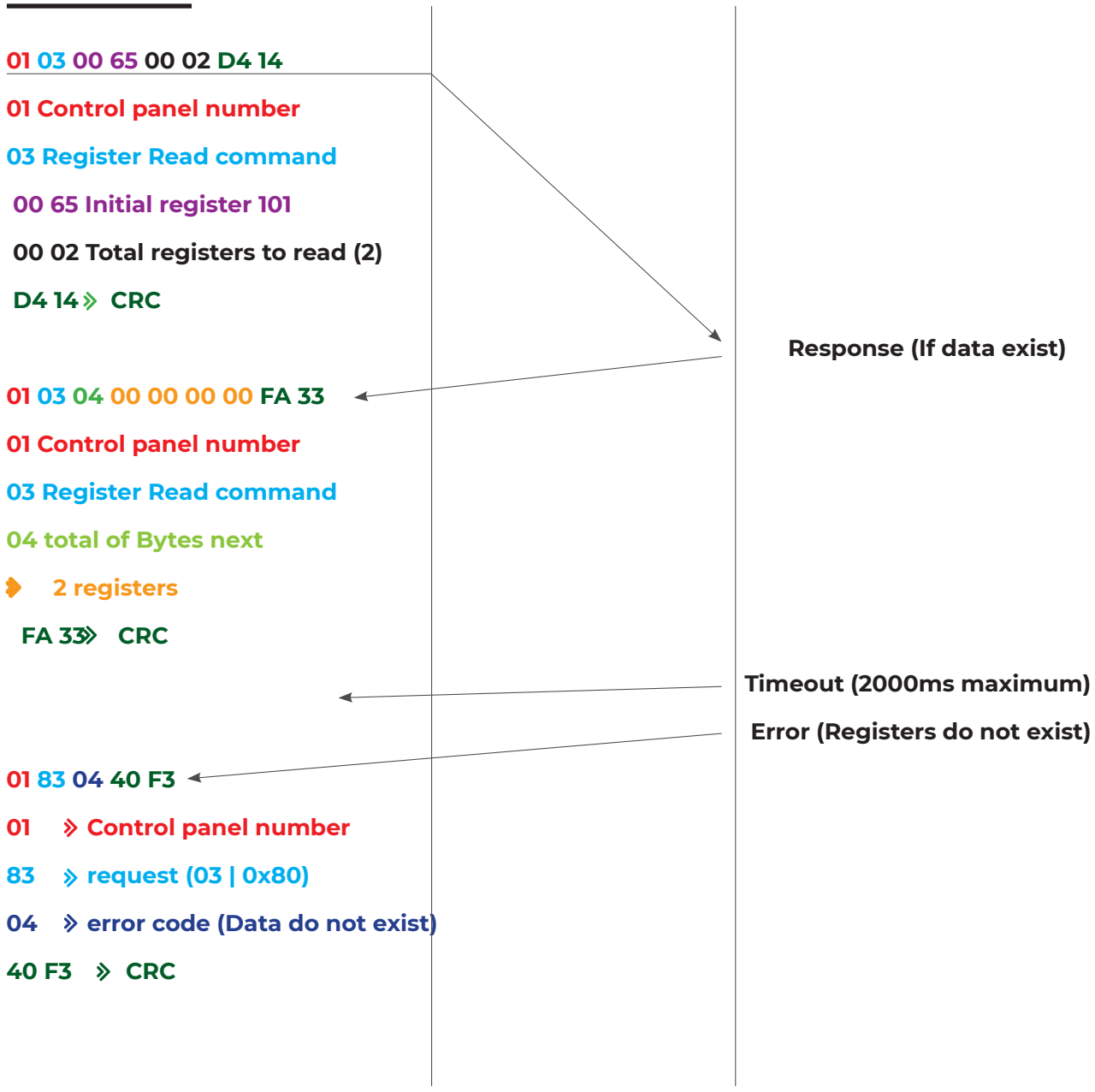
<UID>	1 Byte (Unique)	» Control panel number.
<FCODE>	1 Byte	» Operation to perform (03).
<START>	2 Byte	» Start register.
<LENGTH>	2 Bytes	» Number of registers.
<CRC>	2 Bytes	» CRC Pole 16

- Register write frame.

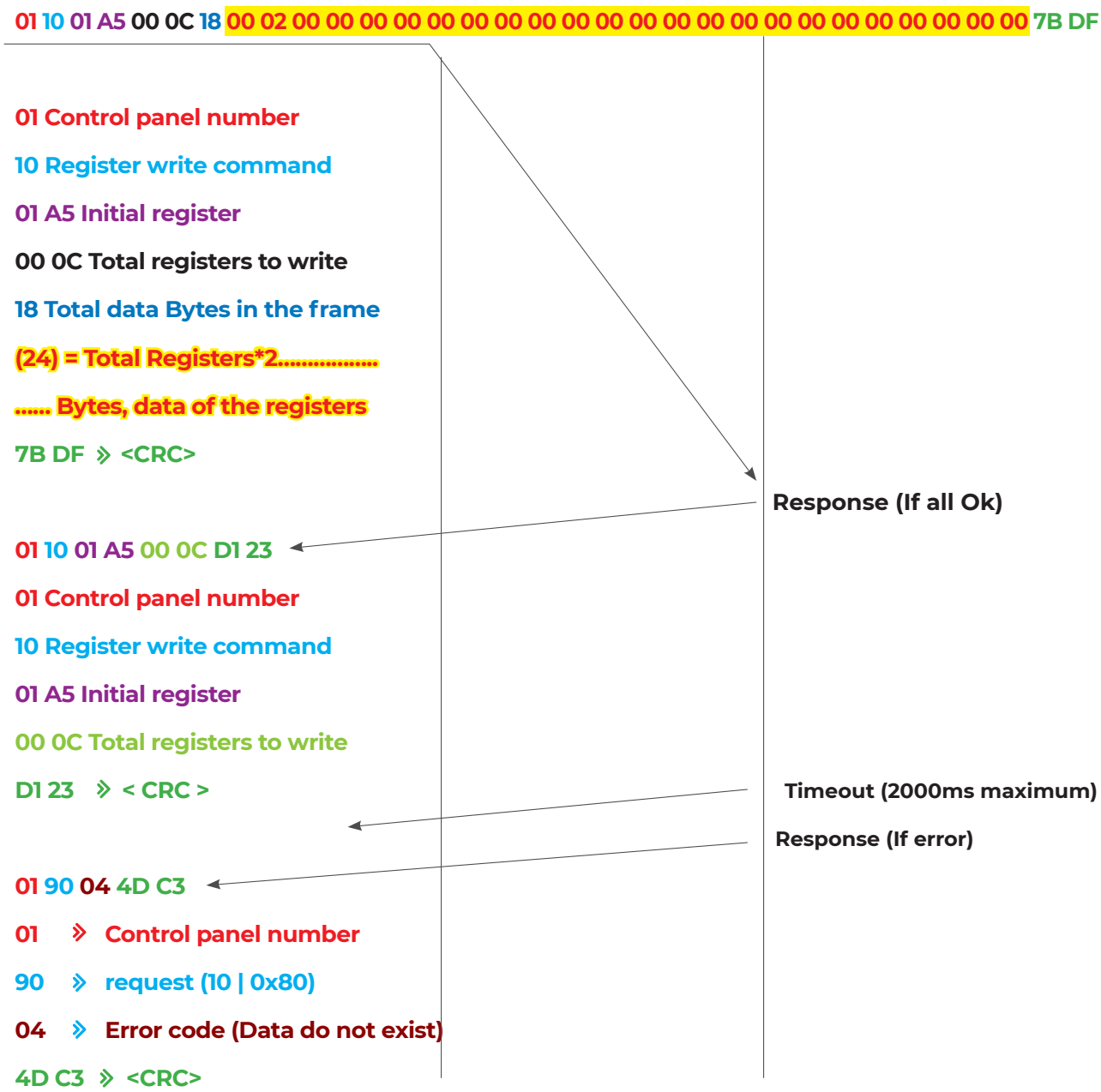
<UID>	1 Byte (Unique)	» Control panel number.
<FCODE>	1 Byte	» Operation to perform (10).
<START>	2 Byte	» Start register.
<LENGTH>	2 Bytes	» Number of registers.
<N BYTES>	1 Byte	» Total bytes to write.
..... (each register is 2 Bytes)		N = Registers*2.
<CRC>	2 Bytes	» CRC Pole 16.

EXAMPLES OF MODBUS RTU PROTOCOL:

Data request:

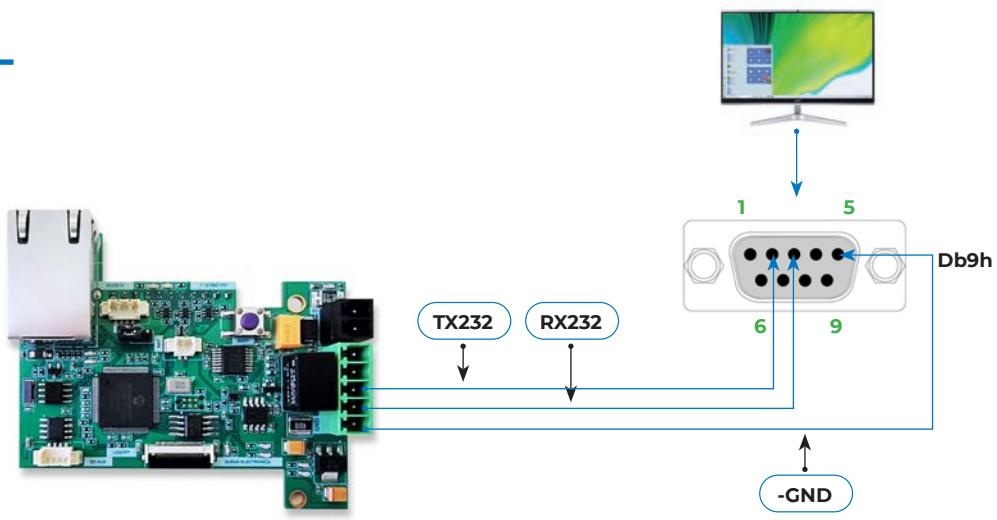


Data writing:

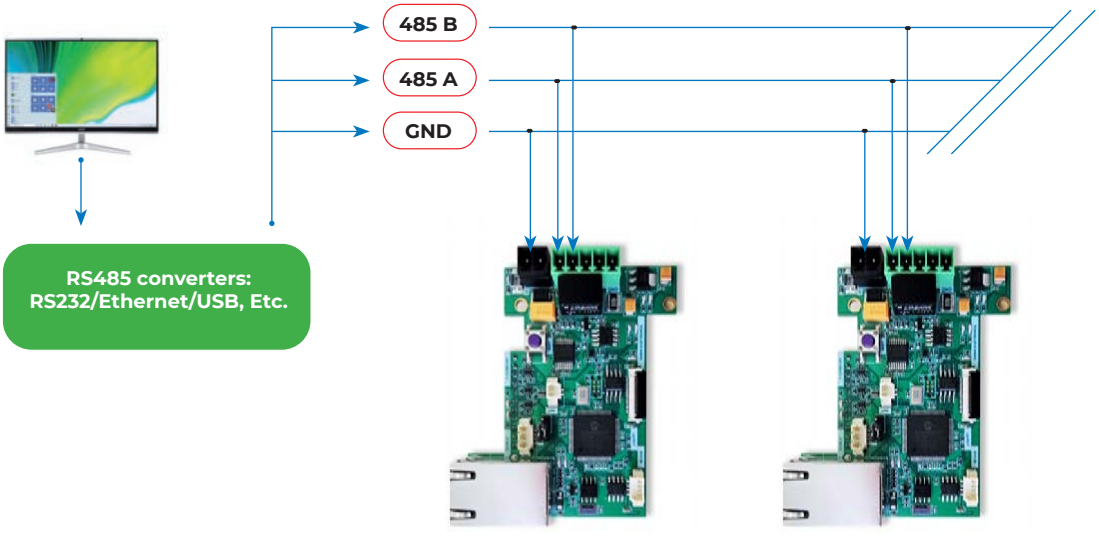


EXAMPLE OF MODBUS RTU CONNECTIONS:

RS232:



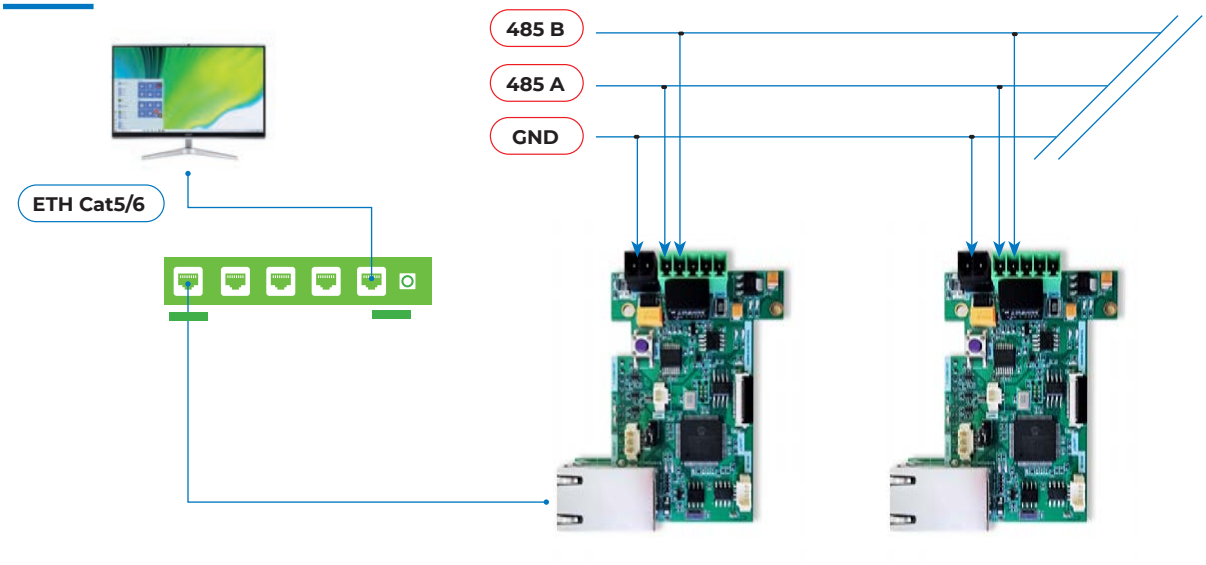
RS485:



CONTROL PANEL 1,2.....256

RS485 DAISY CHAINED MODE:

RS485:



CONTROL PANEL 1,2.....16

IMPLEMENTATION IN THE CONTROL PANEL (REGISTER MAP)

The values implemented in the control panel modbus map are:

Digital inputs:

DI 1 » **Special. It indicates if the control panel is online (receiving data from detectors or off line. It goes to zero if a certain time passes without receiving any data.**

DI 2 » **Special. It indicates if the control panel is connected to the AC power supply line.**

DI 3 » **Special. It indicates if the control panel has battery fault.**

DI 10 Z1-Rest	(1/0)	20-Z2-Rest	(1/0)	30:Z3-Rest	(1/0)	40:Z4-Rest	(1/0)
DI 11: Z1-Poring	(1/0)	21-Z2-Poring	(1/0)	31-Z3-Poring	(1/0)	41-Z4-Poring	(1/0)
DI 12: Z1-ZoneOff	(1/0)	22-Z2-ZoneOff	(1/0)	32-Z3-ZoneOff	(1/0)	42:Z4-ZoneOff	(1/0)
DI 13: Z1-Fault	(1/0)	23-Z2-Fault	(1/0)	33-Z3-Fault	(1/0)	43-Z4-Fault	(1/0)
DI 14: Z1-PorUsr	(1/0)	24-Z2-PorUsr	(1/0)	34-Z3-PorUsr	(1/0)	44-Z4-PorUsr	(1/0)
DI 15: Z1-FaultGr	(1/0)	25-Z2-FaultGr	(1/0)	35-Z3-FaultGr	(1/0)	45-Z4-FaultGr	(1/0)

That is registers from 0 to 45. They may be requested in a single transaction.
They indicate their status for each zone (Z1-Z4). Read function 02 (read discrete input) is implemented

- **Rest**: (All OK)
- **Poring**: Engineer programming: Values of detectors / Gases may change
- **PorUsr**: User programming: Values of detectors / Gases may change
- **Fault**: The zone has a fault in the detectors
- **FaultGr**: Fault in one of the Groups of the zone
- **ZoneOff**: The zone is disconnected, it will not receive any value from it

Analog inputs: (Read-only) 03 » Read Holding Registers. They are occupied by values of 2 Bytes of read-only. They correspond to the values of the detectors and their status. They range from 101 to 356 in blocks of 4. They are established as follows:

101-104: Zone 1 Detector	**1-measurement**	**Group (1-4)**	**Status (0-9)**	**Types of Gas (0-11)**
105-108: Zone 1 Detector	**2-measurement**	**Group (1-4)**	**Status (0-9)**	**Types of Gas (0-11)**
.....				
161-164: Zone 1 Detector	**16-measurement**	**Group (1-4)**	**Status (0-9)**	**Types of Gas (0-11)**
165-164: Zone 2 Detector	**1-measurement**	**Group (1-4)**	**Status (0-9)**	**Types of Gas (0-11)**
169-172: Zone 2 Detector	**2-measurement**	**Group (1-4)**	**Status (0-9)**	**Types of Gas (0-11)**
.....				
225-228: Zone 2 Detector	**16-measurement**	**Group (1-4)**	**Status (0-9)**	**Types of Gas (0-11)**
229-232: Zone 3 Detector	**1-measurement**	**Group (1-4)**	**Status (0-9)**	**Types of Gas (0-11)**
233-236: Zone 3 Detector	**2-measurement**	**Group (1-4)**	**Status (0-9)**	**Types of Gas (0-11)**
.....				
289-292: Zone 3 Detector	**16-measurement**	**Group (1-4)**	**Status (0-9)**	**Types of Gas (0-11)**
293-296: Zone 4 Detector	**1-measurement**	**Group (1-4)**	**Status (0-9)**	**Types of Gas (0-11)**
297-300: Zone 4 Detector	**2-measurement**	**Group (1-4)**	**Status (0-9)**	**Types of Gas (0-11)**
353-356: Zone 4 Detector	**16-measurement**	**Group (1-4)**	**Status (0-9)**	**Types of Gas (0-11)**

Each zone has 4x16=64 Values and the total of an entire control panel 256 values that may be requested in groups of 64 (The whole zone) and a minimum of four (all the values of a detector).

Value

0xffff	No data
0xfffe	Detector error status
0xfffd	Detector in Saturation status
0 < 0xfff0	**Current value of the Gas (Depending on the type of gas they will be the Units, and the decimals will always be absorbed), i.e. multiplied by 100.**

Group: group of the zone (1-4) to which that detector belongs.

Detector status:

0- Rest
1- Vent1
2- Vent2
3- Alarm
4- Saturation
5- Detector error
6- General error
7- Detector inhibited

TYPES OF GASES AND MEASUREMENTS:

CURRENT GASES			FREONS 0-2000 ppm			FREONS 0-100% LFL	
00=CO ppm	08=CO_2 ppm	16=	24=R507	32= R448a	40= R452a	48=R32	56=
01=NO_2* ppm	09=HCN* ppm	17=	25=R134a	33= R227ea	41=	49=R1234yf	57=
02=O_2** %	10=HCL* ppm	18=	26=R404a	34=R1233zd	42=	50=R1234ze	58=
03=H_2S* ppm	11=EXP %	19=	27=R407a	35= R513a	43=	51=R452b	59=
04=SO_2* ppm	12=N_2O ppm	20=	28= R407f	36= R422d	44=	52=R454A	60=
05=Cl_2* ppm	13=Rn*	21=	29= R410a	37= R125	45=	53=R454B	61=
06=NO* ppm	14=CH_2O**	22=	30= R449	38= SF6	46=	54=R454C	62=
07=NH_3* ppm	15=O_3**	23=	31= R417a	39= R143a	47=	55=	63=

EXP= All explosive gases L.E.L. (Lower Explosive Limit)

L.F.L= Lower Flammability Limit.

4-20mA= All the gases of the list in this format.

*= Gases with decimals.

**= Gases with two decimals.

RANGES AVAILABLE PER GAS:

Ammonia NH_3	0-20 ppm 0-50 ppm 0-100 ppm	Carbon monoxide CO	0-300 ppm
Hydrogen sulphide H_2S	0-20 ppm 0-50 ppm 0-100 ppm	Carbon dioxide CO_2 .	0-5,000 ppm 0-10,000 ppm 0-20,000 ppm
Hydrocyanic acid HCN	0-20 ppm 0-50 ppm 0-100 ppm	Nitrogen dioxide NO_2	0-20 ppm 0-50 ppm 0-100 ppm
Hydrochloric acid HCl	0-20 ppm 0-50 ppm 0-100 ppm	Sulphur dioxide SO_2	0-20 ppm 0-50 ppm 0-100 ppm
Explosive gases EXP	0-100% L.E.L	Chlorine CL_2	0-10 ppm 0-20 ppm 0-50 ppm
Nitrogen oxide N_2O	0-1000 ppm	Nitrogen monoxide NO	0-20 ppm 0-50 ppm 0-100ppm
Toxic A1 freons	0-2000 ppm	EXP A2L freons	0-100% L.F.L.
Ozone O_3	0-10 ppm	Formaldehyde CH_2O	0-5 ppm
Radon Rn	3.7-3700 Bq/m³		

Analog Inputs (Read-only) 03 » Read Holding Registers. Values from 401-416 (They can also be requested in a single block, read-only, in TCP or in 2 blocks in serial port). This group of values makes reference to a group's (1-4) ventilation status within each zone.

Ventilation status of each group:

register: 401 ->Z1-G1-Status-0/7
register: 402 ->Z1-G2-Status-0/7
register: 403 ->Z1-G3-Status-0/7
register: 404 ->Z1-G4-Status-0/7

register: 405 ->Z2-G1-Status-0/7
register: 406 ->Z2-G2-Status-0/7
register: 407 ->Z2-G3-Status-0/7
register: 408 ->Z2-G4-Status-0/7

register: 409 ->Z3-G1-Status-0/7
register: 410 ->Z3-G2-Status-0/7
register: 411 ->Z3-G3-Status-0/7
register: 412 ->Z3-G4-Status-0/7

register: 413 ->Z4-G1-Status-0/7
register: 414 ->Z4-G2-Status-0/7
register: 415 ->Z4-G3-Status-0/7
register: 416 ->Z4-G4-Status-0/7

0- Automatic
1- Stop
2- Manual
3- Vent1
4- Vent2
5- Prealarm status.
6- Gas Off (explosive gases)
7- Cyclic ventilation

CONTROL PANEL COMMANDS:

It is possible to vary some statuses of the control panels. To do this, two value blocks are used:

417-420 Analog Inputs (03) – Read-only that indicates the execution status of a command.

Registers from 421-432 according to the following map to command the control panel. These registers are 'read' (03) or 'write' (10 Write Multiple Register) Every time that these last registers are written, a command is sent to the control panel that will be executed in the next available second. When writing the command, the command register of the corresponding group is placed to 1 and shall remain at that value until it has been read and processed by the control panel.

The data of each zone are stacked in 3 WORD groups. Therefore, to vary the values either write the 3 command data of the zone at the same time or those of all the zones (3x4=12 values). Otherwise, the control panel will not accept the values and shall return a modbus error.

Example:

Zone1
register 417=> Command execution status

register 421-422-423 => Z1: Groups + Ventilation type | Binary 0-16 Detectors

Zone2
register 418=> Command execution status
register 424-425-426 => Z2: Groups + Ventilation type | Binary 0-16 Detectors

Zone3
register 419=> Command execution status

register 427-428-429 => Z3: Groups + Ventilation type | Binary 0-16 Detectors

Zone4
register 420=> Command execution status
register 430-431-432 => Z4: Groups + Ventilation type | Binary 0-16 Detectors

To program we will use the following table:

0	0	No instruction.
0	1	OFF zone
0	2	ON zone
Groups	3	AUTO ventilation type
Groups	4	STOP ventilation type
Groups	5	MANUAL ventilation type
0	6	Inhibit acoustics
Groups	7	EXP alarm reset (explosive gases)
0	8	Inhibit detector + Detector No.
0	9	Activate detector + Detector No.
0	A	Activate acoustics
	B-F	Reserve of 5 codes, from B to F

In the first register of the zone (Pe 421) we will place the affected groups within that area to perform that operation, so, for example, if it affects group 4 and 2 the value would be:

00000000 00001010

In 422 we will place the operation to perform (according to the table combination)
In 423, we will place the affected detectors (also in binary from 1-16). Thus, for example, detector 1 and 2 would be coded as 00000000 00000011

THE FOLLOWING WOULD BE EXAMPLES;

A): Pass to stop in zone 1 groups 2 and 4

421 00000000 00001010

422 00000000 00001000 (Stop)

423 not used in this packet, since it is a group command

B): Inhibit detector 1,2 and 16

In this case, it is a detector command, not group so the result would be:

421 00000000 00000000 (Group is placed at 0)

422 00000000 00001000 (Inhibit command)

423 10000000 00000011 (Affected detectors)

TCP API WEB PROTOCOL:

The control panel allows, in addition to the modbus protocol, the reading of the values through a web API system. Using this procedure it is possible to include the values of each detector on a WEBSITE or read them remotely.

Each value is read by means of a "GET" command performed against the control panel and whose value is immediately returned (not less than 2 seconds). The different WEB APIS are established as follows:

- Global power status:
  GET //direccion:80/? MyDT.cgi? DATA=SO

- Zone status:
  GET //direccion:80/? MyDT.cgi? DATA=VX X=1 to 4

- Status of a device of one Zone (Values, Gas, Status)
  GET //direccion:80/? MyDT.cgi? DATA=ZXYY X = 1-4 (Zone)
  Y=01-16 Device)

- Ventilation status of a Group in one zone:
  GET //direccion:80/? MyDT.cgi? DATA=GXY X = 1-4 (Zone)
  Y = 1-4 (Group)

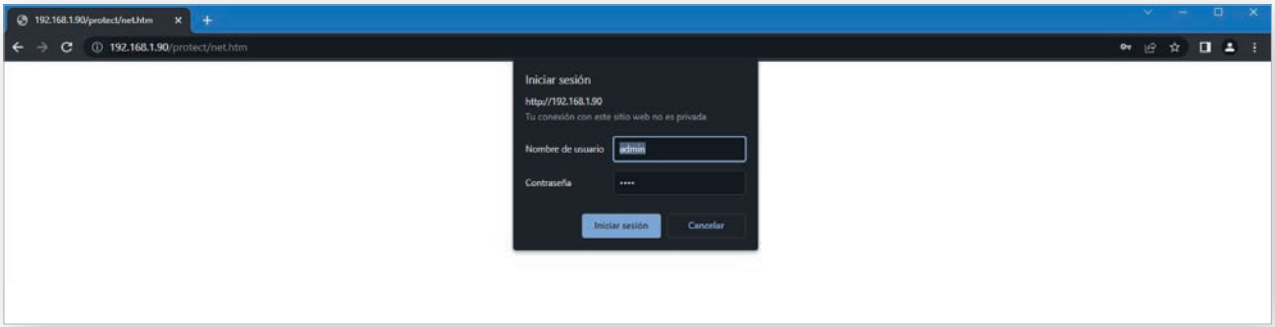
SYSTEM PROGRAMMING:

The system is programmed from a website in the IP address by default **192.168.1.90** – through the configuration website, Fig. 1, enter the new IP address that you like. From this time the communication with the control panel shall be through the chosen IP. Furthermore, for communication in the serial variant each control panel must have a unique ID (independent of the IP address).

If, in contrast, you want to use the DHCP protocol as the new IP address assigned is not known, it is possible to download the **DuranFlash.rar** file from us, extract it and run the **DuranFlashLoader.exe** program, the new IP address will appear, **Fig.1 pag.20**

Main page:

Type of product, firmware version number, its creation date.



Login: Username **admin** / Password: **DURAN** (by default)

Configuration page:

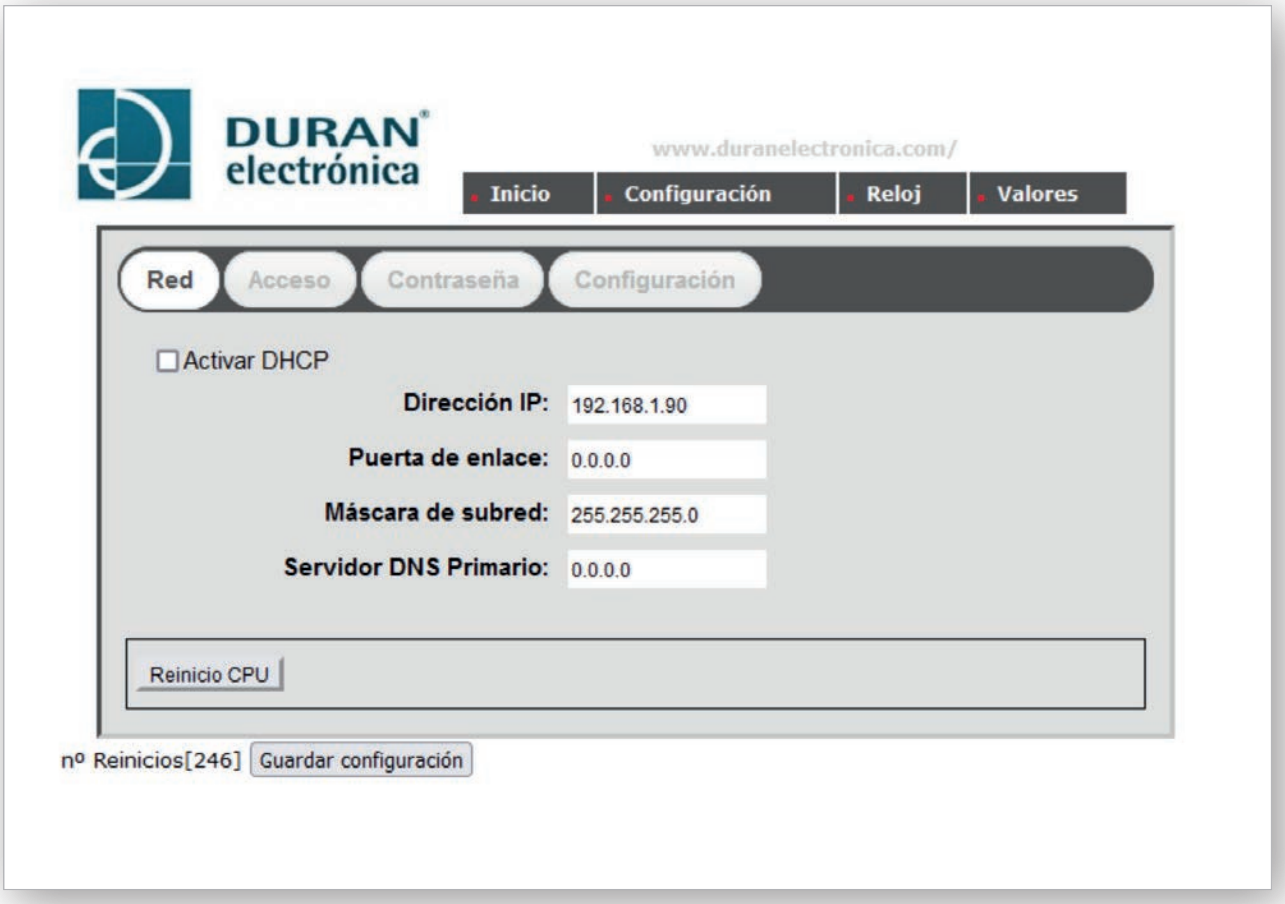
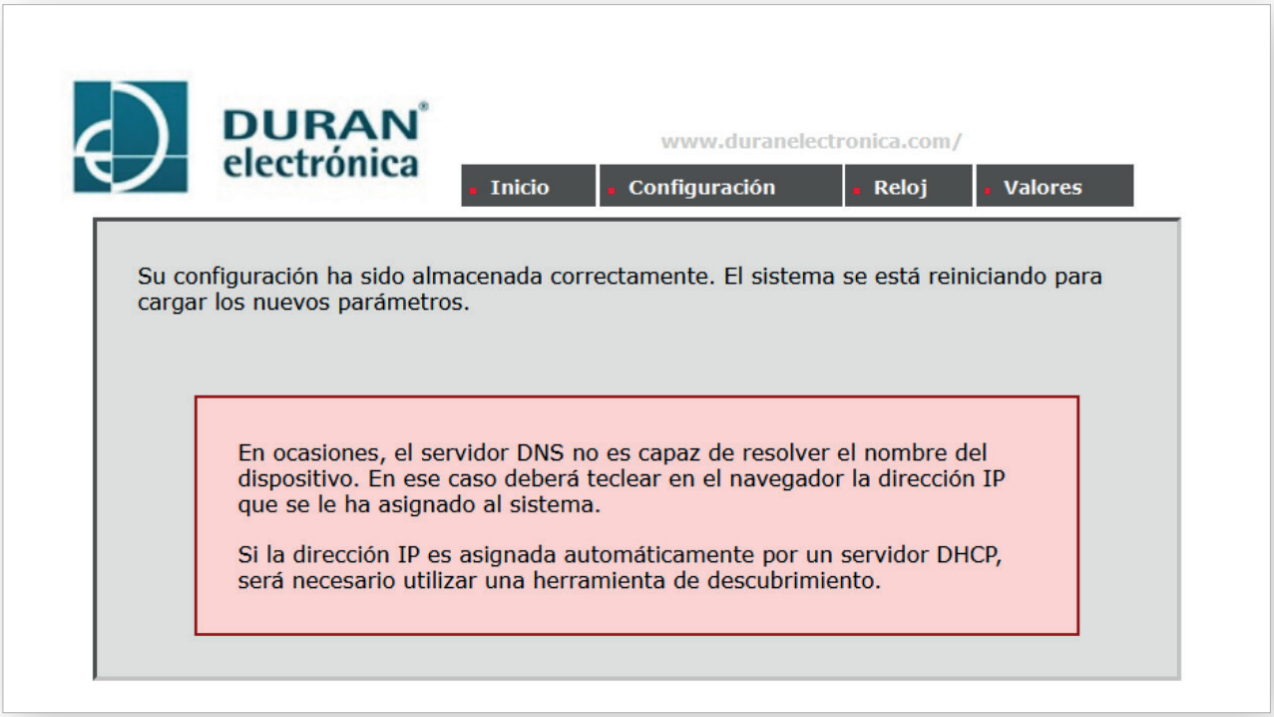
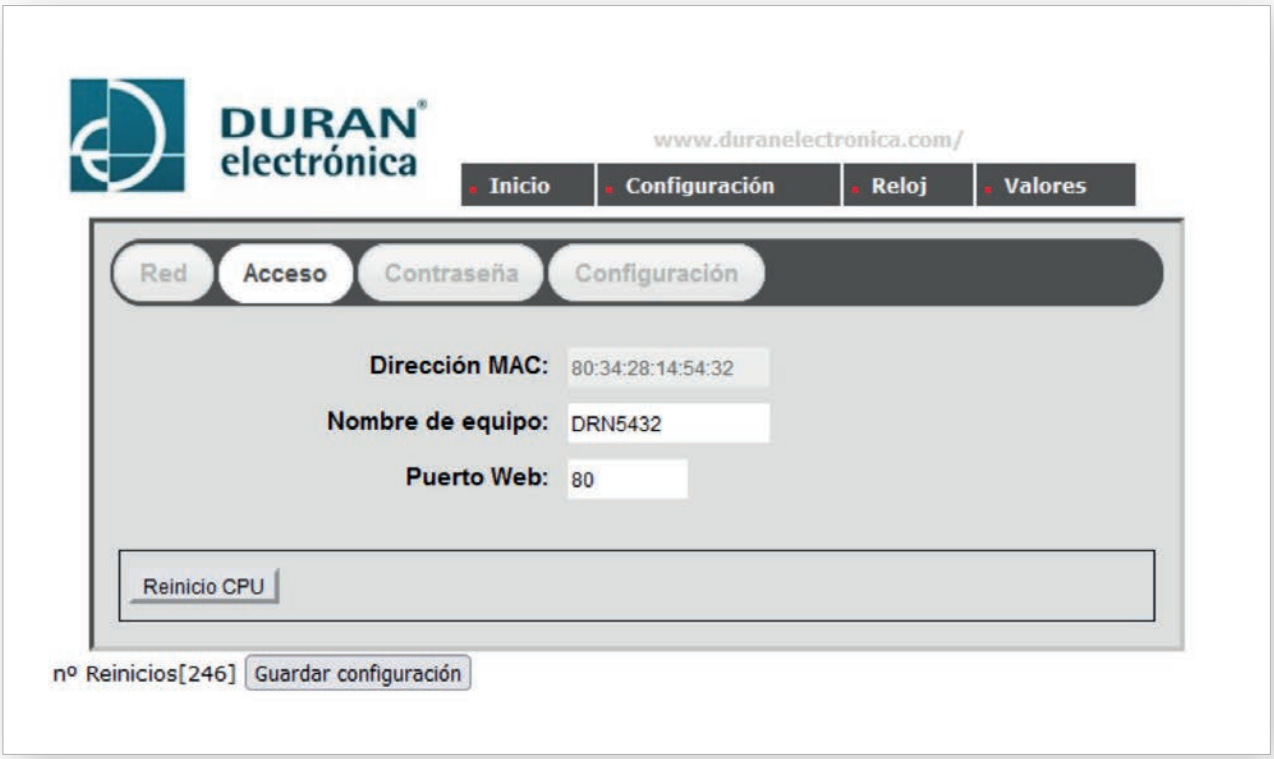


Fig.1

IP (or DHCP) address / Gateway / Mask
DNS: reserved for future versions of other protocols.
CPU restart: remote restart by change, for example, of firmware
Number of restarts (increases each time the system starts-up)
Save configuration » Save changes and restart.



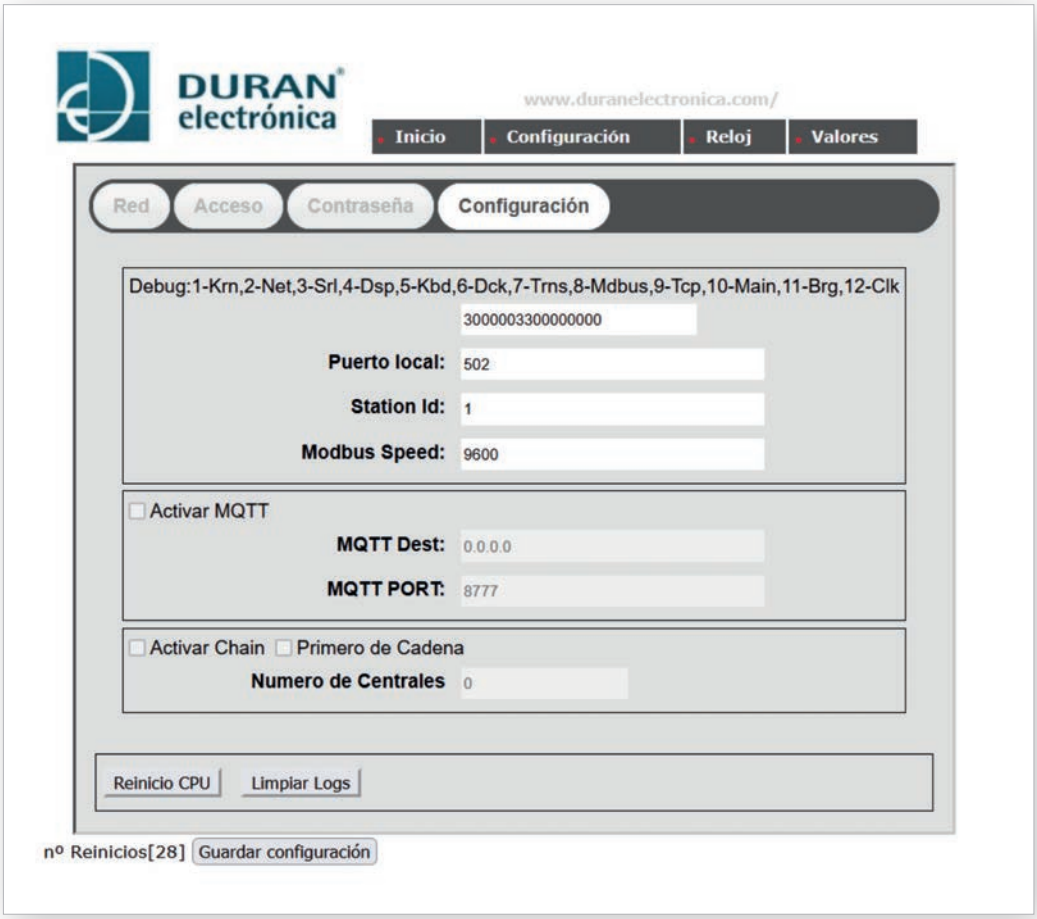
Access data and SMB:



Name: Used for SMB discovery protocols.
Http port (80) for transfer of NATS.

Change of password to access the configuration:

Default values:



- Debug Activate/Deactivate. Each number is a subsystem (0-1-2-3) as maximum it indicates the LOG level (0 less detailed – 3 more detailed). The type of commands it applies to is indicated in the top part.

- Server port for Modbus

- Station number.
  - o In TCP it is not used, since it is understood that each station is in a unique IP address.
  - o In RTU (Serial) it is necessary to be able to speak with the specific station (0-255) since several may share BUS 485. Careful, this number is independent of the number of the control panel configured by switch

SW1 configuration: LOWER BOARD

1	2	3	4	Nr of Control Unit	5	Output
On	On	On	On	1	On	RS232
Off	On	On	On	2	Off	RS485
On	Off	On	On	3		
Off	Off	On	On	4		
On	On	Off	On	5		
Off	On	Off	On	6		
On	Off	Off	On	7		
Off	Off	Off	On	8		
On	On	On	Off	9		
Off	On	On	Off	10		
On	Off	On	Off	11		
Off	Off	On	Off	12		
On	On	Off	Off	13		
Off	On	Off	Off	14		
On	Off	Off	Off	15		
Off	Off	Off	Off	16		

SW6, SW7 & SW8 ARE NOT USED

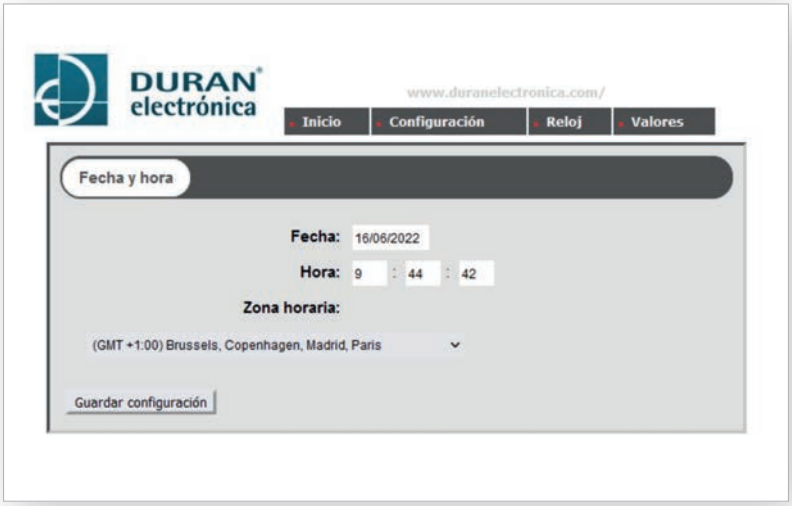
LED TEST INDICATIONS:

RED: module not synchronised
FLASHING GREEN: station data reception

- Modbus speed: (default: 9600). Possible values:
  - 1200,2400.4800,9600,32767,56700,115200
- Activate sending of Values to MQTT server without username, password or TLS
  - Place IP address of the Destination MQTT server
  - MQTT server type (Always TCP type)
- Activate daisy-chained nodes. In this case, the first station is communicated by TCP Modbus and it is connected with the others through BUS 485, obtaining the values thereof and recording them in Local. It is necessary to indicate:
  - If the Chain-type system is active (Since 485/232 communications that are used for data transfer change and they no longer support modbus.
  - Indicate what station is the first of the chain (which offers its TCP modbus connection)
  - The ID of the first station does not matter
  - The following stations (slave) have to be numbered as 1,2,3,4 until the total permitted number – 15 maximum
- **Clean LOGS:**

Clean by default the history of the values of all stations stored in the current one

Update date and time:

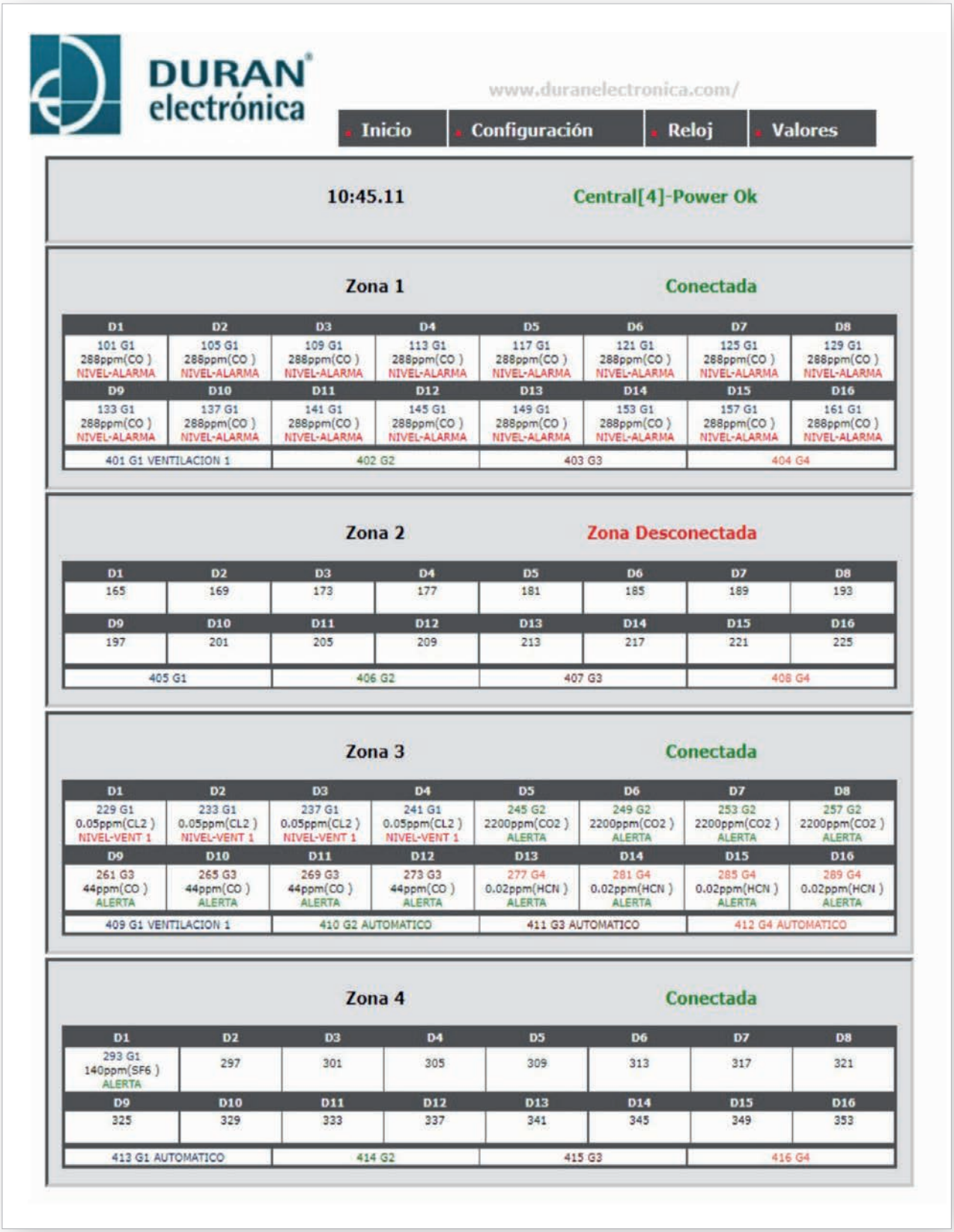


Values:

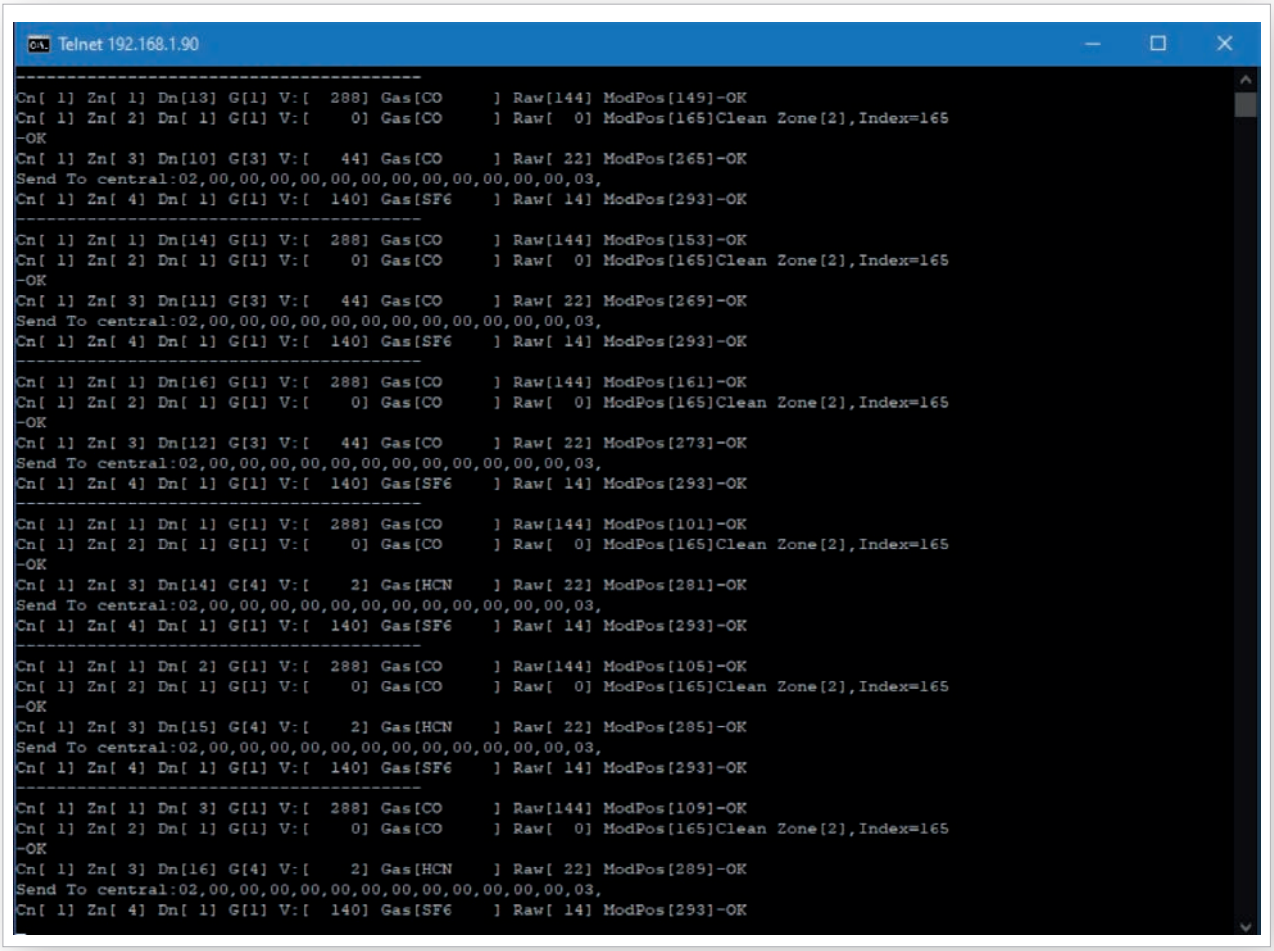
We will obtain a **“photo” (see page 28)** of the general status of the control panel, every value updatable every second. In it, the modbus indices of each Gas, and the status of reading, values and type of gas of each device will appear (Ordered by zone)

In each zone it will also indicate the status of the groups (1-4 according to configuration) and the function that they are performing at that time.

For each zone we will also obtain the Zone status (Digital Inputs) and, finally, on a global level, the status of the network and that of the battery if it is fitted.



NOTE: It is also possible to see the status of the control panel through Telnet.



FIRMWARE UPDATE:

The modbus module allows access to the control panel firmware update, allowing error corrections and improvements over time. The update can be performed without dismantling the control panel **(provided that it is connected in network)**. To do this, two files are necessary, which can be downloaded from our website.
https://**www.duranelectronica.com/docs/DURANMODBUSV02.rar** Download the DuranFlash. rar file extract it and you will find the necessary files inside.

DURANXXXX. DDMMYY. HEX » Firmware XXXX Version / Day, Month year.

DURAN XXXX.DDMMYY. BIN » Website, table values, etc.

To update the firmware, run the downloaded file **DuranFlashLoader.exe.**

Once launched, **fig.2**, we will select configuration, Firmware selection, and we will select the ". **Hex"** file, which we will load **Fig.3.**

In that same window we will include the password (if it has not been changed it is **DURAN**), and in the number, the latest version (e.g. 2). Once the values are accepted, with the right button over the control panel, a submenu will appear (**fig.4**) where we have to indicate the option "**Send Firmware**". If all is correct, the control panel will be updated and the new code will be executed. It is important not to disconnect the system from the power supply whilst the update is taking place.

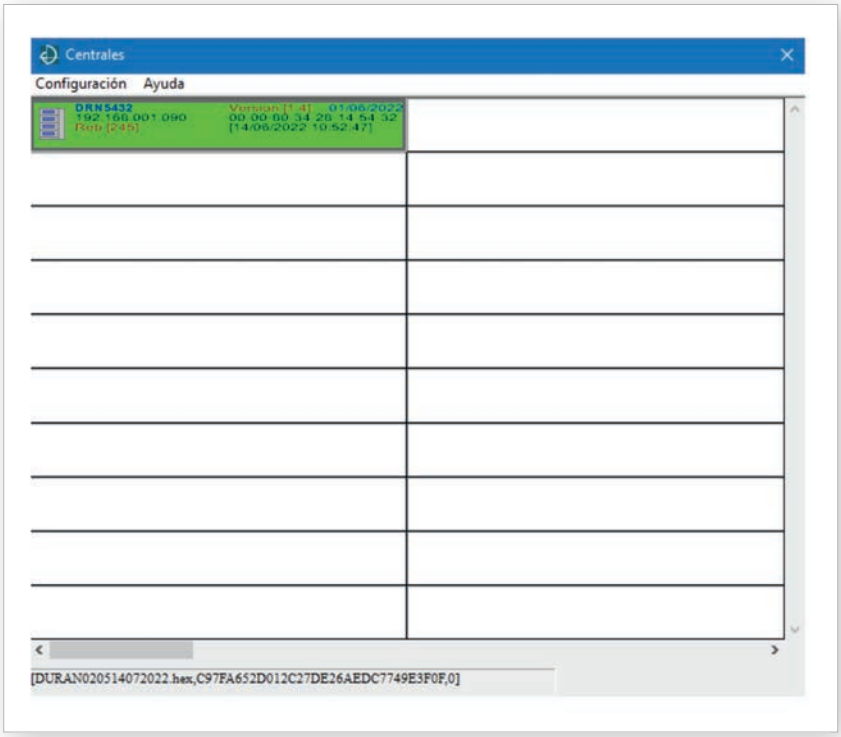


Fig.2

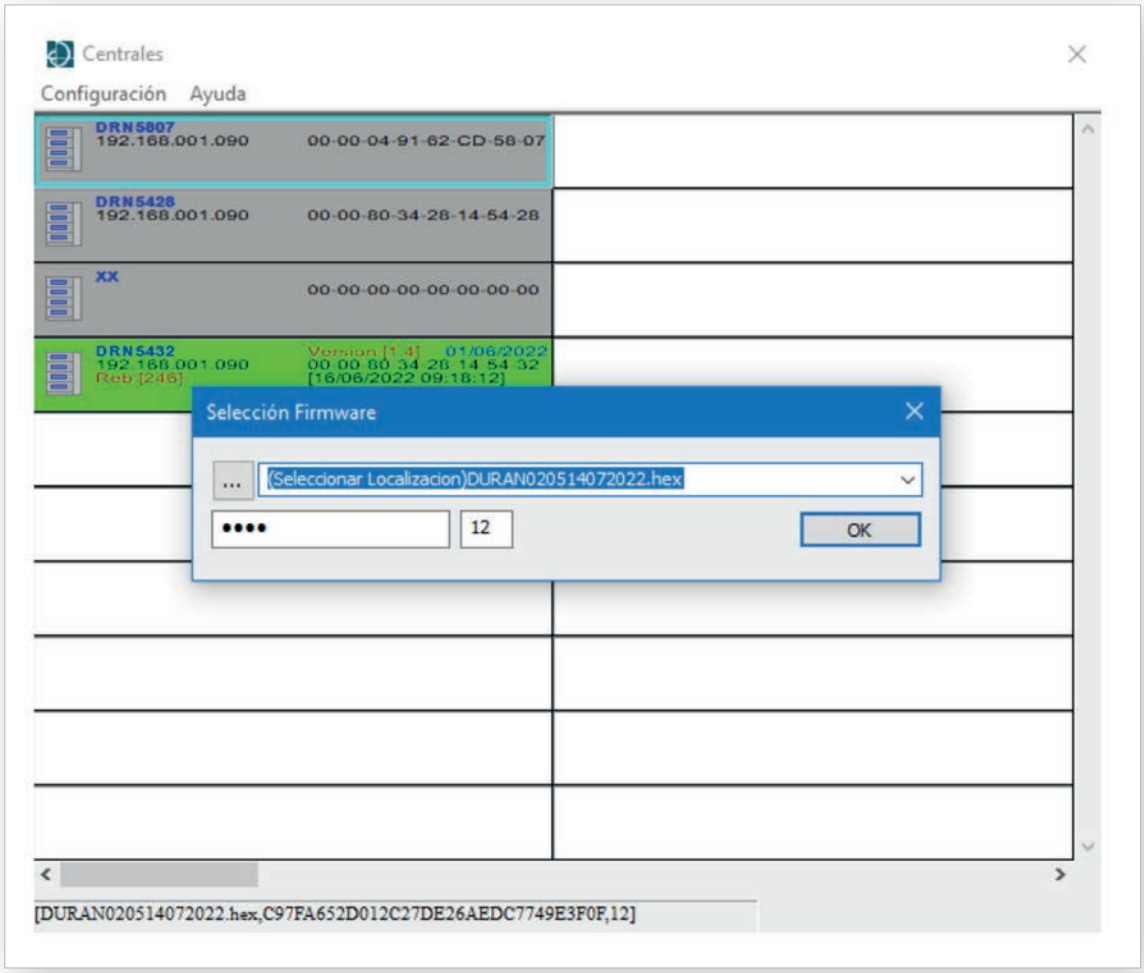


Fig.3 *Select location of the extracted file.*

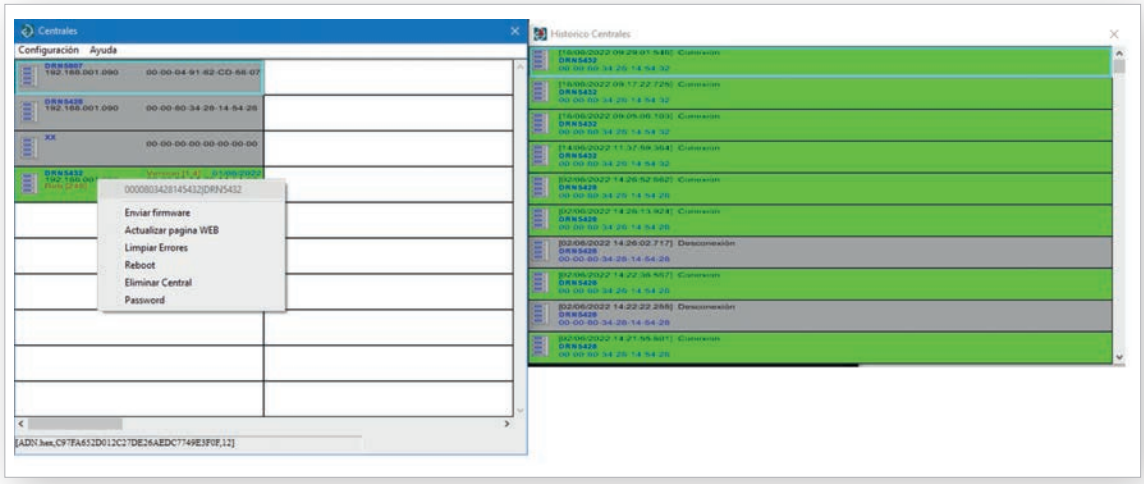
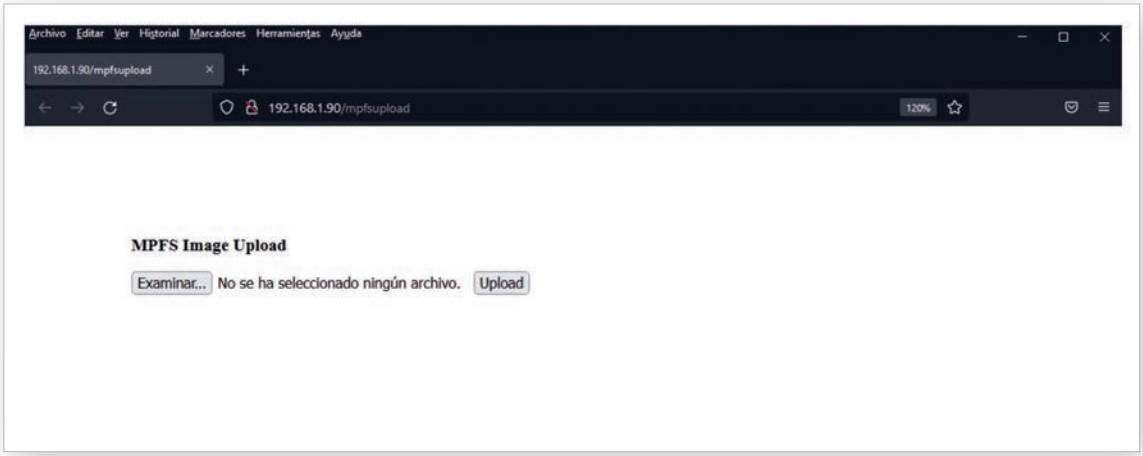


Fig.4 *Send firmware.*

Finally, it is necessary to upload to the website. To do this, we will select the Update Website option: we will reach the following page.



In examine, we will select the "**.bin**" image and one second later we will click on the Upload key. When the website automatically changes, the system will be updated, **(see fig. 5).**

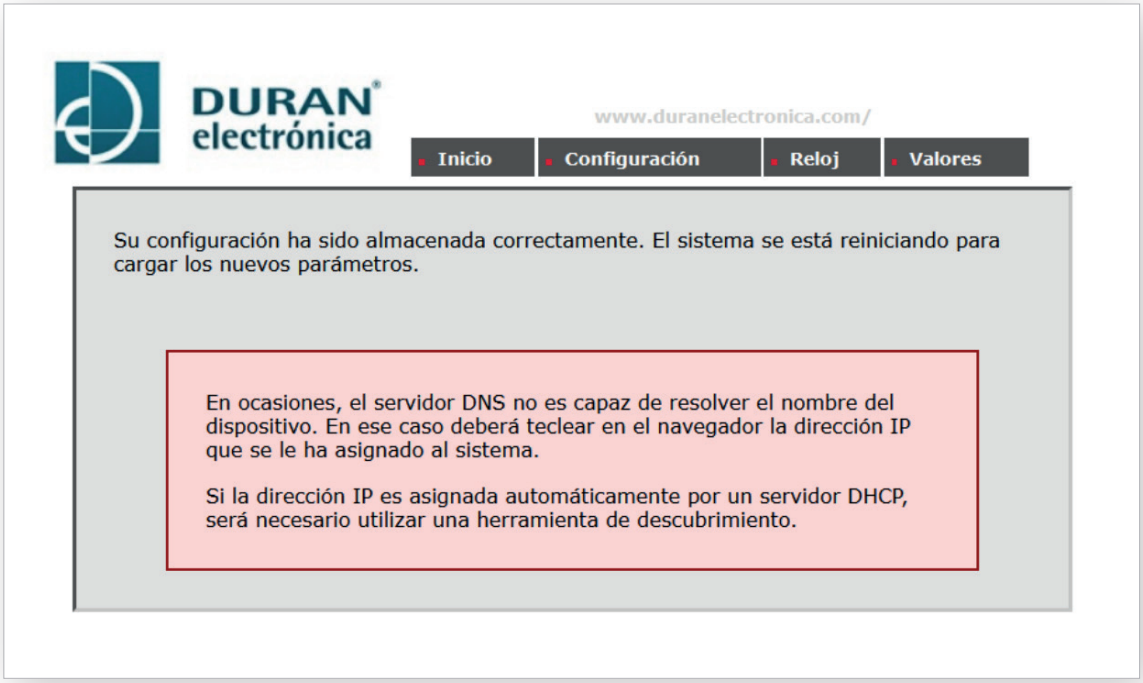


Fig.5, ***If the update is correct the following message will appear.***

APPENDIX 1: CRC CALCULATION.

(**This code can be downloaded from www.duranelectronica.com**)

```
typedef WORD unsigned short   // 16 Bits
typedef BYTE unsigned char    // 8 Bits

/*----------------------------------------------------------------------*/
/*   CRC For serial Modbus                                              */
/*----------------------------------------------------------------------*/
WORD ModBusCalcCrc (auto BYTE * Frame, auto WORD Sz)
{   WORD TCPCRC     = 0xffff;
    WORD POLYNOMIAL = 0xa001;
    BYTE i, j;

    for (i = 0; i < Sz; i++)
    {   TCPCRC ^= Frame[i]            ;
        for (j = 0; j < 8; j++)
        {   if ((TCPCRC & 0x0001)! = 0)
            {   TCPCRC >>= 1          ;
                TCPCRC ^= POLYNOMIAL    ;
            }
            Else
            {   TCPCRC >>= 1          ;
        }
    };                  return TCPCRC;
}
```

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