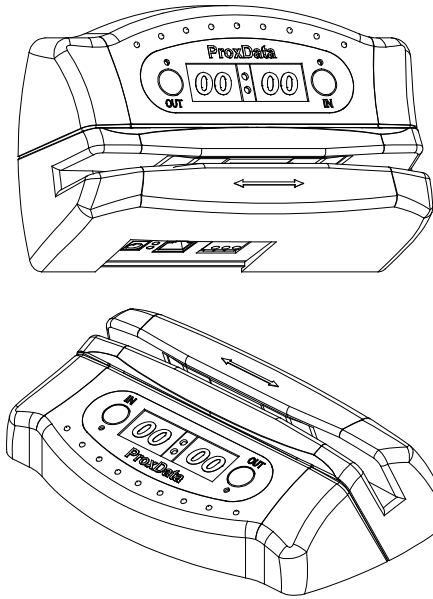
TR515

Time Recorder



V1.5-4

PROMAG

Attention! Firmware Management mode (FMM)

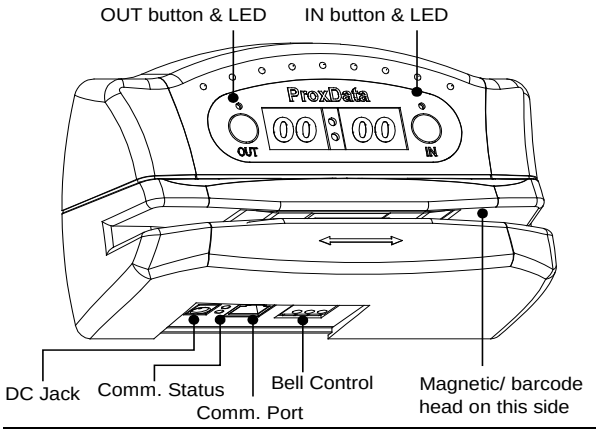
The TR515 has two different modes of operation. Normal mode provides regular device functionality. Firmware Management mode (FMM) is provided for internal firmware checkup and upgrades (see Section 5).

The Normal mode is entered by powering the TR515 up while *not* pressing the IN button. Switching the TR515 on while holding the IN button or both IN and OUT buttons down forces the unit into the FMM. The FMM mode of operation cannot be exited other than by switching the TR515 off and back on again.

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1. Installing the TR515



Wall-mount and desktop operation

The TR515 can be used either as a wall-mount (default, see Figure above) or desktop device. Machine needs to be rotated 180 degrees when used on a desk. For this reason, the TR515 comes with two different LED plates (with their artworks rotated 180 degrees with respect to each other). Machine's LED can also display time and other data in a "normal" (wall-mount), or desktop fashion. There is an orientation setting provided that allows you to select display mode (see Section 4).

1. RS-232/485 Interface Versions

The TR515Sx supports two different interfaces: RS232 for single-terminal communications and RS485 for multi-terminal communications. Only one TR515Sx can be attached to the PC's serial port using the RS232 interface. Up to 32 units can be interconnected using the multi-terminal RS485 communications.

RS232 arrangement is simple: just plug the RS232 cable (supplied) into the TR515Sx and connect the other side to the PC's serial port.

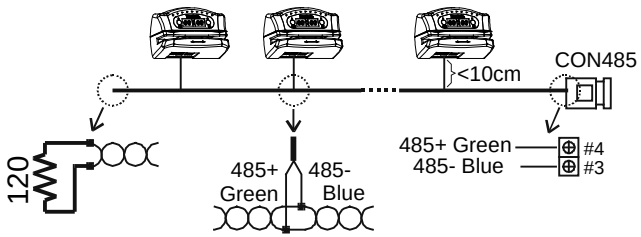
Using RS485 requires a special adaptor- CON485 (must be purchased separately). CON485 is a "smart" RS232→ RS485 converter that allows for higher data transfer rates between the PC and TR515Sx.

The RS485 network is of "bus" type- all TR515Sx are connected in parallel on a so-called twisted pair bus. The most suitable cable for the bus is the one normally used for Ethernet

communications (twisted pair Cat. III or V). You only need to use one twisted pair of wires inside the cable.

Note: depending on the cable type, up to 4 twisted pairs may be available, it doesn't matter which one you use, just make sure that you are using *both* wires of the *same* wire pair.

To connect the TR515Sx to the twisted pair bus, cut the RS232 cable supplied with each TR515Sx and locate 2 wires inside: Orange and Green. Attach each wire to one of the wires on the twisted pair bus. *Mind the polarity! Orange and Green wires cannot be switched*. It is recommended that you keep the length of each "bus stem" (i.e. the cable that is used to attach a certain TR515Sx to the bus) as short as possible, ideally under 10 cm (see the drawing below).



One side of the bus must be attached to the CON485: Orange connects to pin #3, Green connects to pin #4.

Another side of the twisted pair bus must be properly *terminated*. This is especially important for long buses. Standard termination resistor value is 120 Ohm.

Note: It is not always necessary to have the termination resistor. It really depends on the actual wiring and connection circumstances.

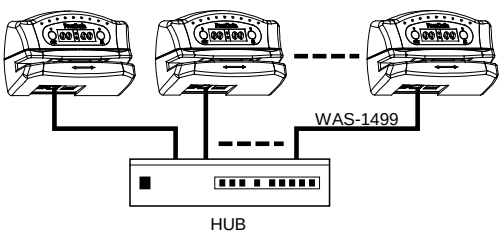
Before testing the network, make sure that all Terminals and the CON485 are powered and that the CON485's baud rate selector is in the 19200 position (selector must be set prior to powering the CON485 up).

TR515SX's interface connector pin assignment can be found in Appendix B.

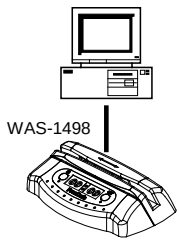
2. Ethernet Interface Versions

The TR515Ex is designed to attach directly to the RJ45 10BaseT Ethernet connector. Standard magnetic circuitry (YCL part 20F001N) has been included onboard to provide a "glueless" interface to the Ethernet network.

Most Ethernet installations require cables of substantial and variable length, so you will probably need to make your own cables. For testing purposes PROMAG supplies two kinds of Ethernet cables: device-to-hub (WAS-1499) for connections through a standard Ethernet hub, and device-to-device (WAS-1498) for connections without a hub (i.e. directly from one Ethernet device to another).



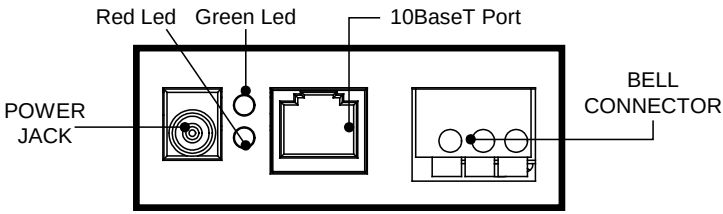
TR515 to HUB



TR515 to PC

Summary of Status LED signals

In the Serial Programming mode	Green and Red LEDs are blinking (Green-Red-Green...)



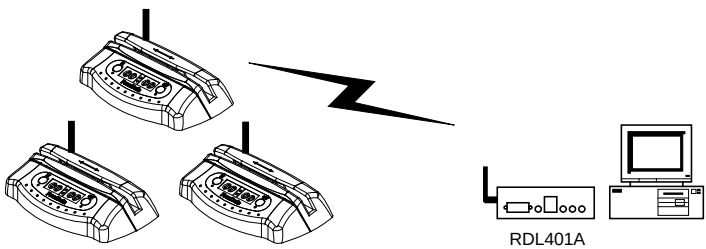
TR515 CONNECTOR AND STATUS

TR515EX's interface connector pin assignment can be found in Appendix B.

3. Wireless Interface Versions

The TR515Wx designed to operate in the 433MHz ISM (Industrial, Scientific and Medical) frequency band. It features Frequency Shift Keying (FSK) modulation and demodulation capability.

You must purchase a Master station RDL401A to connect with PC



Wireless Communication

Understanding machine numbers

For single-terminal RS232 communications, you needn't specify your TR515's machine number.

For multi-terminal RS485 communications you must make sure that all Terminals on the network have unique machines numbers. Machine number is a network address that uniquely identifies the Terminal on the network. Having two different Terminals on the network set up to the same machine number will result in the inability to communicate with both Terminals.

Machine number can be in the 0 to 255 range (00-FF Hex). 0 is a universal machine number- any Terminal responds to it regardless of this Terminal's actual machine number setting. Machine number of 0 can be used for RS232 communications- you only have a single Terminal in this case, so you can address it with the universal number.

For multi-terminal RS485 communications, you'll need to assign a unique (and non-zero!) machine number to each Terminal on the network.

Assigning machine numbers

The TR515 offers a fast and convenient way of assigning machine numbers in the range from 0 to 10. To assign a new machine number:

- Power the Terminal down (unplug the power cord)
- Press and hold the OUT button
- Power the Terminal up while continuing to hold down the OUT button
- After 2-3 seconds, the Terminal will beep and display its current machine number, for example:



- While still keeping the OUT button pressed, push the IN button (several times if necessary) to change the machine number to the desired value
- When the desired machine number is displayed, release the OUT button- the Terminal will resume normal operation

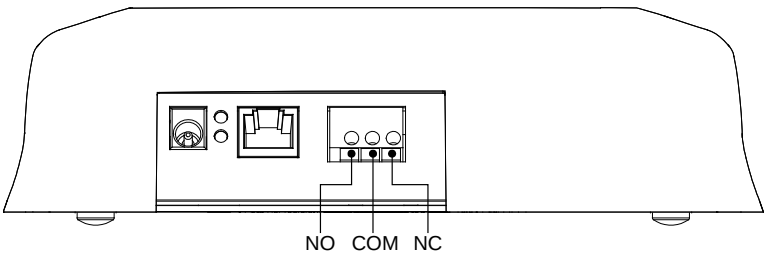
This method allows you to set the numbers in the 0-10 range only (which would actually cover most of the actual installation requirements). If you need to set the machine number to, say, 25, then you will have to follow this procedure:

- Connect the TR515 to the PC using cable- Ethernet (TR515Ex) or RS232 (TR515Sx)
- Launch the *TR515 Tool* software and select the Terminal #0 (i.e. use the universal machine number to address the Terminal)
- Use the "Set M#" button to set the new machine number for this Terminal
- Unplug the cable and put the Terminal back on the Ethernet or RS485 network.

Note: machine number is displayed briefly at the Terminal power-up (even if you don't push the OUT button).

Bell relay

The TR515 features a built-in bell relay. The relay is capable of controlling a low-power external bell. There are two modes for bell schedule, one is Everyday mode another is Week mode. There is only one table in Everyday mode, a daily bell schedule of up to 32 different bell times can be defined in Everyday mode. Seven bell schedule tables can be defined from Sunday to Saturday in Week mode, and each table also has up to 32 different bell times can be defined.



Relay connector is located at the metal back plate. Figure above shows connector position and pin assignment. Both Normally Closed (N.C.) and Normally Opened (N.O.) contacts are provided.

Locking event selection (IN or OUT)

By default, the TR515 allows the User to choose the desired event (IN or OUT) prior to reading the ID-card. There is a setting provided that allows event selection to be fixed either at IN or OUT (see Section 4). This arrangement may be desirable in case several TR515s are used, with some machines installed at the entrance and serving for registering IN events, and some machines installed at the exit and serving for OUT registration only. Fixing the event prevents the User from choosing an alternative event at the moment of reading ID-card.

There is another setting provided that allows event selection to be set either at IN or OUT depends on a pre-scheduled event table. The pre-scheduled event table features up to 32 entries. There are two fields of each pre-scheduled event table entry: 'time' field and corresponding event-mode 'IN/OUT' field. When time reaches the scheduled time, the TR515 will automatically switch event selection at IN or OUT by your setting in pre-scheduled event table.

2. Using the TR515

Clocking in and out

To register an event (IN or OUT), please push the appropriate button and has your ID-card to be read. For the TR515R (RFID version), the card is read by bringing it close to the reader (< 8 cm). For the TR515M, TR515B, and TR515F (Magnetic, Visible Barcode and IR Barcode respectively), the card is read by swiping it in either direction along the reader slot. For the machine orientation shown on figure of page 1, magnetic (barcode) stripe of the ID-card must face downwards.

Note 1: the TR515 can be programmed to fix event selection to IN or OUT only- in this case event selection won't work!

Note 2: for automatically activation at IN or OUT event, the TR515 provides a pre-scheduled event table for user to arrange time and event for activation IN or OUT event; in this mode, user can directly register ID-card in a scheduled event, or also can register an event by manually push the appropriate button, in this way, TR515 will go back to scheduled event (IN or OUT) when finish the card reading. If user does not has his ID-card to be read after press a button, TR515 will automatically go back to scheduled event after reach at 'Time-out' time- 5 seconds.

The last four digits of the ID-card's ID-code are displayed on the LED when the ID-card is read. "Err" is displayed and meanwhile beeps three times in case of read error:



Memory full status

When the database memory is full, new records cannot be added. Reading an ID-card will produce a long beep and a "FULL" message:



Error conditions

The TR515 can detect and notify you of a number of different error conditions. Please refer to Appendix A for complete list of all possible errors.

Normal operation of the TR515 is suspended upon encountering an error condition other than "card read error". New records cannot be added to the database in this situation. Communications with the TR515 from the PC side is still possible, however. This gives you an opportunity to access the TR515 online and attempt to correct the problem.

3. Communications protocol

The TR515 communications protocol is based on the GNET protocol specification. Communications parameters are 19200-8-N-1.

Communications between the TR515 and the PC takes place in the form of commands sent by the PC and replies from the TR515. Commands and replies are packets of data. Each packet begins with an STX (02H) character and ends with CR (0DH) character. Selected commands and replies include a checksum field as an additional safety measure. All characters between the STX and the CR characters must be in the 20H...7FH range.

The STX character of a command packet is followed by a one-character command code. The STX character of a reply packet is followed by a one-character reply code. Both command and reply packets may contain some relevant data after the command (reply) character:

STX	Cmd/Rpl							C1	C2	CR
02H	code	Data (if any)						Checksum*		0DH

Checksum field is **not included into certain commands and replies*

All available commands are described later in this Section. Of reply codes, only two are possible: 'A' (completed successfully) and 'N' (some error was encountered). Depending on the command given to the TR515, reply packets with reply code 'A' may contain some data (as shown on the Figure above). Reply packets with the reply code 'N' always contain a 2-digit error code that can be used to analyze the source of a problem.

The checksum is an 8-bit sum of all characters between the STX and CR, represented as a 2-character HEX string. For an example packet below, the checksum is calculated as follows. The data part of the packet is "A1XYZ". The sum of these character codes is: 41H+31H+58H+59H+5AH=17DH. Eight least significant bits contain 7DH. The string representation of this value is "7D" (i.e. 2 ASCII characters- '7' and 'D').

STX	A	1	X	Y	Z	7	D	CR
02H	41H	31H	58H	59H	5AH	37H	44H	0DH
	Packet portion the checksum is calculated on					Checksum		

Table below lists all possible error codes:

04	Illegal (invalid) command (command code or data is wrong)
06	Record number is out of range (requested record doesn't exist)
07	Command failed (hardware problem or invalid internal data)
08	Log (data) memory is full (this message reply in Extended mode)
09	Command is denied by terminal (cannot process this command at the moment)

Summarized below are all supported commands. Command characters are found in the "CC" column, their corresponding ASCII codes- in "Hex". "CS" lists commands that require the checksum in the command packet ("C") or reply packet ("R"). "Error code" column lists errors that may result from each command execution:

C. C.	Hex	Description	CS		Errors			
			C	R	4	6	7	9
'D'	44H	Select designated terminal	Note 1					
'I'	49H	Set new machine number			+		+	
'Y'	59H	Get machine number					+	
'S	53H	Set date/time			+		+	
'T'	54H	Get date/time					+	
'V'	56H	Get firmware version						
'R'	52H	Initialize the terminal						+
'C'	43H	Set group-1 registers (see group-1 table)			+		+	
'B'	42H	Get group-1 registers (see group-1 table)		+	+		+	
'P'	50H	Set group-2 registers (see group-2 table)			+		+	
'Q'	51H	Get group-2 registers (see group-2 table)		+	+		+	
'J'	4AH	Set group-3 registers (see group-3 table)			+		+	
'K'	4BH	Get group-3 registers (see group-3 table)		+	+		+	
'N'	4EH	Get number of records		+			+	
'G'	47H	Get specified record		+	+	+	+	
'W'	57H	Get total capacity of database (in records)		+				
'E'	45H	Initialize the database						+
'M'	4DH	Prepare for database recovery						+
'L'	4CH	Enable/Disable real-time data transmission			+		+	
'O'	4FH	Get real-time data transmission function status					+	
'Z'	5AH	Perform self-test**	Note 2					

Note 1. D-command never returns error message even if the data supplied in the command packet is incorrect. Invalid command packet makes it impossible to determine which terminal is being addressed and, therefore, which one should reply with an error code; when terminal is selected, it reply 'A'.

Note 2. Self-test takes place on the next power-up, not immediately. Terminal will deny this command when all data have not sent out completely yet in real-time data transference mode.

The TR515 have 3 group registers. Group-1 is for accessing registers for "LED mode", "bell duration", "32 entries of bell table times field (Everyday mode)", "32 entries of bell table enable/disable field (Everyday mode)", "event lock mode", "Relay function", "event table times field (32 entries)", "event table enable/disable field (32 entries)", and "bell table mode (Everyday or Week)", "Daylight Saving Time", "Enable/Disable Daylight Saving Time function", "Door lock duration", "Prefix to match", "From Character", "Number of characters". Group-2 is for accessing registers of "7x32 entries for bell table time field (Week mode, from Sunday to Saturday)". Group-3 is for accessing registers of "7x32 entries of bell table enable/disable field (Week mode, from Sunday to Saturday)".

Extended command-set (for Real-time Access Control function):

Summarized below are all supported extended commands using in extended mode. Command characters are found in the "CC" column (all extended commands are lower case), their corresponding ASCII codes- in "Hex". "CS" lists commands that require the checksum in the command packet ("C") or reply packet ("R"). "Error code" column lists errors that may result from each command execution:

C. C.	Hex	Description	CS		Errors			
			C	R	4	8	7	9
'i'	69H	Log into Extended mode						+
'o'	6FH	Log out from Extended mode						
's'	73H	Get current login status		+				
'n'	6EH	Terminal sends captured-data to Host		+		+		
'r'	72H	Host requires Terminal to resend the captured data		+			+	+
'a'	61H	Host acknowledges that data has received successfully						
'd'	64H	Host sends "4 digits" message to display			+			+
'l'	6CH	Host sends the "Relay activation" duration.			+			+

		(The command 'l' is lower case of 'L')						
'p'	70H	Set punch times			+		+	
'u'	75H	Get punch times					+	

Following is the detailed command description. Command and reply packets are shown without STX, Checksum and CR characters.

Select designated terminal ('D', 44H)

Possible error codes: none

Command	D*NN*
Reply	A*NN*,TR51x

NN is a machine (terminal) number in Hex form (00H-FFH), 00H is a "universal" number (see below for details).

'D' is a special command. It is used to select a particular TR515 terminal. All terminals power up in a "deselected" state. Each terminal ignores all incoming commands until it receives the D-command whose *machine number* is either equal to the machine number of this terminal, or 00. After that, the terminal switches into "selected" state and responds to all subsequent commands until new D-command with a different machine number is issued. Thus, the D-command should always be used to initiate communications between the host and the designated TR515.

Note: the TR515 never returns any error codes in reply to this command. This holds true for both "illegal command" error and "Command failed" error. The former is not responded to, because when there is some discrepancy in the format of the D-command issued by the Host (which can only be in the Machine Number field), no particular terminal can be "sure" that it is being addressed. Therefore, no terminal on the network assumes responsibility for sending a reply. "Command failed" situation can only arise because of incorrect machine number setting value in the TR515 memory. In this case, the terminal will be unable to compare its internal machine number with the one supplied in the D-command. Hence, the Terminal will not be able to make sure that it is being addressed.

Since 00 is a universal machine number, it works with any terminal. Use it only when you have a single terminal connected to the host. Universal machine number also comes handy during initial terminal setup (to assign a unique machine number to the terminal prior to placing it on a multi-terminal network).

The terminal replies with its actual machine number even if you address it using 00. The only exception is when the terminal is unable to retrieve its own machine number due to some internal

malfunction. Reply will contain 00 instead of an actual machine number in this case.

Set new machine number ('I', 49H)

Possible error codes: 04, 07

Command	I*NN*
Reply	A

NN- machine number in Hex form (00H-FFH), 00 should never be used on a multi-terminal network because this is a universal number (see D-command description for details).

This command is used to assign a new machine number to the terminal. Machine numbers provide a way to distinguish between the terminals on a multi-terminal network. See D-command description for more details.

Get machine number ('Y', 59H)

Possible error codes: 07

Command	Y
Reply	A*NN*

NN- machine number in Hex form (00H-FFH)

This command is used to retrieve the terminal's machine number. Machine numbers provide a way to distinguish between the terminals on a multi-terminal network. See D-command description for more details.

Set date/time ('S', 53H)

Possible error codes: 04, 07

Command	S*YYYYMMDDhhmmss*
Reply	A

YYYY-year, *MM*- month, *DD*-date, *hh*-hour, *mm*-minutes, *ss*- seconds

This command is used to set the TR515's internal clock. Date/time supplied must be valid. Incorrect data (like 31st of February) will be rejected (error 04).

Get date/time ('T', 54H)

Possible error codes: 07

Command	T
Reply	A*YYYYMMDDhhmmss*

YYYY-year, *MM*- month, *DD*-date, *hh*-hour, *mm*-minutes, *ss*- seconds

This command is used to get the TR515's current date and time.

Get firmware version ('V', 56H)

Possible error codes: none

Command	V
Reply	A*version_string*

Version_string length is guaranteed to not exceed 61 character, all character codes are guaranteed to be in the 20H…7FH range

This command can be used to verify the TR515's internal firmware version. Although version string can be any ASCII string, the following format is adopted:

"V*X.XX cc…….c*", where "V*X.XX*" is a version number (i.e. "V1.92") and "*cc…c*" is a comment string. Comment string is separated from the version number by a single space character. Version number will never have any spaces in it.

Initialize the terminal ('R', 52H)

Possible error codes: 09

Command	R
Reply	A

This command is used to initialize the TR515. *Initialization takes place on the next power-up, not immediately*. Upon initialization, all setting values are restored to their factory defaults. TR515's internal date and time are also checked and, if contained garbage, initialized to 1999/01/01 and 00:00:00 respectively. The database data is *not* erased, this must be done using

the E-command.

When real-time data transmission function is enabled (please see L-command for detailed description) and sending data to host is in progress, then R-command will be denied temporarily until all data sending finish.

Note: When first time turn power-up for TR515 after received 'R' command, it will take 25 seconds to restore all factory defaults, in the meanwhile LED will display "INIT"; please wait for this initialization procedure to complete:



Set group-1 registers ('C', 43H)

Possible error codes: 04, 07

Command	C*RR*,*reg_data*
Reply	A

RR- register number (group-1) in Hex form (00H…FFH); *reg_data*- the data for the register to be set

This command is used to set one of the TR515 "group-1 registers". Registers are actually functioning parameters (Settings). Complete description of all available registers can be found in Section 4.

Get group-1 registers ('B', 42H)

Possible error codes: 04, 07

Command	B*RR*
Reply	A*reg_datacc*

RR- register number (group-1) in Hex form (00H…FFH), *reg_data* is the data stored in the register, *cc*- checksum

This command is used to retrieve the data contained in the designated "group-1 registers". Registers are actually functioning parameters (settings). Complete description of all available registers can be found in Section 4.

Set group-2 registers ('P', 50H)

Possible error codes: 04, 07

Command	P*RR,reg_data*
Reply	A

RR- register number (group-2) in Hex form (00…FFH), *reg_data* is the data for the register to be set

This command is used to set one of the TR515 "group-2 registers". Registers are actually functioning parameters (Settings) with respect to access bell table's 'time' field (7x32 entries) from Sunday to Saturday. Complete description of all available registers can be found in Section 4.

Get group-2 registers ('Q', 51H)

Possible error codes: 04, 07

Command	Q*RR*
Reply	A*reg_datacc*

RR- register number (group-2) in Hex form (00H…FFH), *reg_data* is the data stored in the register, *cc*- checksum

This command is used to retrieve the data contained in the designated "group-2 registers". Registers are actually functioning parameters (settings) with respect to access bell table's 'time' field (7x32 entries) from Sunday to Saturday. Complete description of all available registers can be found in Section 4.

Set group-3 registers ('J', 4AH)

Possible error codes: 04, 07

Command	J*RR,reg_data*
Reply	A

RR- register number (group-3) in Hex form (00…FFH), *reg_data* is the data for the register to be set

This command is used to set one of the TR515 "group-3 registers". Registers are actually

functioning parameters (Settings) with respect to access bell 'enable/disable' field (7x32 entries) from Sunday to Saturday. Complete description of all available registers can be found in Section 4.

Get group-3 registers ('K', 4BH)

Possible error codes: 04, 07

Command	K*RR*
Reply	A*reg_datacc*

RR- register number (group-3) in Hex form (00H…FFH), *reg_data* is the data stored in the register, *cc*- checksum

This command is used to retrieve the data contained in the designated "group-3 registers". Registers are actually functioning parameters (settings) with respect to access bell 'enable/disable' field (7x32 entries) from Sunday to Saturday. Complete description of all available registers can be found in Section 4.

Get number of records ('N', 4EH)

Possible error codes: 07

Command	N
Reply	A*NNNNcc*

NNNN- number of records in Hex form; *cc*- checksum

This command can be used to retrieve the number of records currently found in the database. Leading zeroes are not omitted, so reply string length is always the same.

Get specified record ('G', 47H)

Possible error codes: 04, 06, 07

Command	G*NNNN*
Reply	A*NNNN,ccc…c,E,YYYY/MM/DD,hh:mm:sscc*

NNNN- record number (starting from 0000) in Hex form, *ccc…c*- ID-code, *E*- event (0: OUT, 1: IN), *YYYY*- year, *MM*-month, *DD*-date, *hh*-hour, *mm*- minute, *ss*- second, *cc*- checksum

This command is used to retrieve the database record with a specified number. Record number must be supplied in Hex format, leading zeroes must be preserved or error 04 will be returned. Record numbers start from 0000. Specifying record number beyond N-1 (where N is the number of records in the database returned by the N-command) will cause error 06.

When use this command to retrieve database, TR515 will automatically lock itself, this means it will reject card reading until database stop retrieving, then user's card can be read again; in the meantime, LED will display 'busy' as following:



This auto-lock function prevent data is deleted inadvertently for some application. Some application Polling database use command 'N' to get number of records then use command 'G' to retrieve the records, at last use command 'E' to erase database. But during retrieve the records some user's card may be read into database again, think of this, user's application does not know these cards have read into database, application retrieves records but does not include these new read-in records, when it erases database, these new read-in records will be erased as well, this will cause lose data. Now the new auto-lock function will prevent data was deleted inadvertently; when application stops database retrieving, TR515 will wait 3 seconds for receiving command 'E', if 'E' command has received, TR515 erases database then unlock itself, user's card can be read again; or until 3 seconds Time-out TR515 still has not received 'E' command, however, it will unlock itself but does not erase database.

Returned data string contains the record number, ID-code of the ID-card that was used to create this record, event code (i.e. which button was pressed), and the date and time of record creation.

The TR515 verifies all database records before sending them out to the PC. This is done because the FLASH memory may actually contain a garbage data. There is a special M-command that lets you initialize the database in such a way that it appears to be 100% full (you can "recover" entire database memory contents then). Naturally, some database records may turn out to contain invalid data.

Database record validity is verified on a field-by-field basis. Should the field turn out to be invalid, its contents are substituted for a "safe" default data:

- ID-code. If ID-code turns out to contain illegal characters (i.e. with codes outside of

20H-7FH range), then these characters are substituted for "_". If ID-code length is outside of valid margins* then entire ID-code is substituted for the following code: "0000000000" (ten '0' characters)

- Date. If the date is invalid (i.e. December, 32nd) then default date (1999/01/01) is used
- Time. If the time is invalid (i.e. 24:00:00) then default time is used
- Event. if Event code exceeds 1, then this field is substituted for "0".

*Note: for JIS-II code, the valid length of ID-code is "1<= margin <=69"; for Track1 code, the valid length of ID-code is "1<= margin <=76"; for Track2 code, the valid length of ID-code is "1<= margin <=37".

Get the total capacity of database (number of records in the LOG) ('W', 57H)

Possible error codes: none

Command	W
Reply	A*NNNNcc*

NNNN- the total capacity of database in Hex form; *cc*- checksum

This command can be used to retrieve the total capacity of database (the total number of records in the database). Leading zeroes are not omitted, so reply string length is always the same.

Initialize the database ('E', 45H)

Possible error codes: 09

Command	E
Reply	A

Executing this command initializes the database. This command can be used to delete all database data and restore the database functionality in case of database malfunction.

E-command doesn't really delete the data itself- just some internal database housekeeping is initialized. The data can still be (partially) recovered using an M-command.

When real-time data transmission function is enabled (please see L-command for detailed description) and sending data to host is in progress, then E-command will be denied temporarily

until all data sending finish.

Prepare for database recovery ('M', 4DH)

Possible error codes: 09

Command	M
Reply	A

This command alters the database in such a way that it appears to be 100% full. The M-command, therefore, can be used for data recovery purposes. For example, if E-command is executed accidentally while TR515 had some useful data inside, then M-command can be used to download entire database memory contents. Naturally, this recovered data may not be consistent. Some records may contain "garbage" data (more on this in G-command description), newer records may overlap older ones, etc.

When real-time data transmission function is enabled (please see L-command for detailed description) and sending data to host is in progress, then M-command will be denied temporarily until all data sending finish.

Enable/Disable real-time data transmission function ('L', 4CH)

Possible error codes:04, 07

Command	L*SS*
Reply	A

SS- real-time data transmission function status in Hex form (00: disabled, 01: enabled)

The L-command is use to enable or disable real-time data transmission function. The default factory setting is 00 (disabled).

When real-time data transmission function is enabled, the TR515 will get one record data from database (begin after from the last time sent out record) and send this data to host. And then, wait 5 seconds for host reply "ACK" message. If TR515 receive "ACK" message from host immediately, it will get and send next record data to host in every one second interval. If TR515 does not receive "ACK" message from host within 5 seconds, it will resend the same data again in every 5 seconds interval until received "ACK" message.

The "ACK" message- "a" command is send from host to acknowledge that data had been received successfully, please see the "Extended command-set"- a-command for detailed

description.

If database already have some data before enable real-time data transmission function, then TR515 will get and send the current read-in data not start from the beginning of database.

Get real-time data transmission function status ('O', 4FH)

Possible error codes: 07

Command	O
Reply	ASS

SS- real-time data transference function status in Hex form (00: disabled, 01: enabled)

This command gets the current real-time data transmission function status. 00: real-time data transmission function is disabled. 01: real-time data transmission function is enabled.

Perform self-test ('Z', 5AH)

Possible error codes: 09

Command	Z
Reply	*This command is never replied to*

This command is used to force the TR515 into a special Test mode. *Self-test takes place on the next power-up, not immediately*. Details of TR515's operation in the Test mode are provided in Section 6. Note, that Test mode destroys database memory contents in such a way that the data cannot be recovered even with the M-command.

When real-time data transmission function is enabled (please see L-command for detailed description) and sending data to host is in progress, then Z-command will be denied temporarily until all data sending finish.

Note: When turn power-up at first time for TR515 after self-test, it will take 25 seconds to restore all factory defaults, please wait for this initialization procedure; the LED will display "INIT" while initialization is in progress:



Extended command-set description:

Log into Extended mode ('i', 69H)

Possible error codes: 09

Command	i (the lower case of 'I')
Reply	A

This command logs the TR515 into Extended mode whatever TR515 is currently in Extended mode or not, but if TR515 is enabled in real-time data transmission mode, the i-command will be denied. If you want to use other extended commands TR515 should be logged into Extended mode first. In Extended mode, then TR515 can send the captured data to Host in Real-time.

Log out from Extended mode ('o', 6FH)

Possible error codes: none

Command	o (the lower case of 'O')
Reply	A

This command logs the TR515 out from Extended mode. When TR515 has logged out from Extended mode, TR515 cannot use extended commands anymore except commands 'i', 'o', and 's'.

Get login status ('s', 73H)

Possible error codes: none

Command	s (the lower case of 'S')
Reply	A*MMcc*

MM- login status (00: logged out extended-mode, 01: logged in extended-mode), *cc*-checksum

This command gets the current login status of TR515. Use this command to check if TR515 is in Extended mode or not before use other extended commands.

Terminal sends captured data to Host ('n', 6EH)

Possible error codes: 8

Command	n*NNNN,ccc…c,E,YYYY/MM/DD,hh:mm:sscc*
Reply	A

NNNN- record number in Hex form, *ccc…c*- ID-code, *E*- event (0: OUT, 1: IN), *YYYY*- year, *MM*-month, *DD*-date, *hh*-hour, *mm*- minute, *ss*- second, *cc*- checksum

This command is used to send the currently captured record to Host in extended mode or real-time data transmission function is enabled. The returned record number is supplied in Hex format. The TR515 also stores this captured record into its database memory.

Host should acknowledge that the captured record has received successfully by command 'a' (61H), or requires TR515 to send the captured record again by command 'r' (72H) when data receiving failure (only in extended mode).

Returned data string contains the record number, ID-code of the ID-card that was used to create this record, event code (i.e. which button was pressed), and the date and time of record creation.

The TR515 verifies the currently captured record before sending it out to the Host.

Captured record validity is verified on a field-by-field basis. Should the field turn out to be invalid, its contents are substituted for a "safe" default data:

- ID-code. If ID-code turns out to contain illegal characters (i.e. with codes outside of 20H-7FH range), then these characters are substituted for "_". If ID-code length is outside of valid margins then entire ID-code is substituted for the following code: "0000000000" (ten '0' characters)
- Date. If the date is invalid (i.e. December, 32nd) then default date (1999/01/01) is used
- Time. If the time is invalid (i.e. 24:00:00) then default time is used
- Event. If Event code exceeds 1, then this field is substituted for "0".

Note: for JIS-II code, the valid length of ID-code is "1<= margin <=69"; for Track1 code, the valid length of ID-code is "1<= margin <=76"; for Track2 code, the valid length of ID-code is "1<= margin <=37".

Host require sending captured data again ('r', 72H)

Possible error codes: 07, 09

Command	r (the lower case of 'R')
Reply	n*NNNN,ccc…c,E,YYYY/MM/DD,hh:mm:sscc*

NNNN- record number in Hex form, *ccc…c*- ID-code, *E*- event (0: OUT, 1: IN), *YYYY*- year, *MM*-month, *DD*-date, *hh*-hour, *mm*- minute, *ss*- second, *cc*- checksum

If data receiving is failure host can require TR515 to resend currently captured record by this command. And then TR515 will resend the currently captured record by 'n' (6EH) command again, see 'n' (6EH) command description for details.

If TR515 is not in extended mode, this command will be denied.

Host acknowledges data received successfully ('a', 61H)

Possible error codes: none

Command	a (the lower case of 'A')
Reply	

Whatever in extended mode or real-time data transmission function is enabled, host must send this command to TR515 to acknowledge that data has received successfully. After send the captured data to host, TR515 will wait host to send this command for 5 seconds, during this 5 seconds TR515 will reject any card reading in extended mode. Therefore, host shall acknowledge this command as soon as possible.

Host sends "4 digits" message to display ('d', 64H)

Possible error codes: 04, 09

Command	d*NNNNss*
Reply	A

NNNN- 4 digits message (0000-9999) in string type, *ss*- message display duration in seconds (01-99), also string type.

This command is used to display 4 digits message on TR515's LED display for a duration time. The message code and its meaning is defined by user, only numeric can be defined, do not define alphabet. The code range is from 0000 to 9999 in string type.

If TR515 is not in extended mode, this command will be denied.

Host sends "relay activation" duration ('l', 6CH)

Possible error codes: 04, 07, 09

Command	l*NN*
Reply	A

NN- relay activation duration in 01-99 (string type) seconds, 00 should never be used as duration.

This command 'l' (lower case 'L') is used to assign relay activation duration in seconds. When relay is used to control Bell, send this command to TR515 will get error code- "command failed".

If TR515 is not in extended mode, this command will be denied.

Set punch times ('p', 70H)

Possible error codes: 04, 07

Command	p*NN*
Reply	A

NN- punch times in Hex form (00H-0AH), 00: disable, 01-0A: legal value for punch times.

For some unknown reason device may be disconnected from network, and device will lose control by Host. For use device as stand alone work, user can has his card to be read in several times then device will auto log-out from Extended mode. The 'p' command sets punch times in range 01 to 10 (01-0A in Hex format), and 00 will disable this auto switching to log-out mode function.

Get punch times ('u', 75H)

Possible error codes: 07

Command	u
Reply	A*NN*

NN- punch times in Hex form (00H-0AH)

This command is used to retrieve the device's punch times. Punch times provide a way to use device as stand alone work when device was lost control from network. User has his card to be read in this defined "punch times" then device will be continue used in stand alone work (disconnection from network).

4. Registers

The TR515 feature 3 groups of programmable "registers". Basically, registers are the TR515's functioning parameters (Settings). Group-1 registers can be written to using the C-command, and read from using the B-command; Group-2 registers can be written to using the P-command, and read from using the Q-command; Group-3 registers can be written to using the J-command, and read from using the K-command (see Section 3 for details).

Table below lists all available group-1 registers:

00H	LED display mode (0: wall-mount, 1: desktop)
01H	Bell duration in seconds (00H-FFH)
02H-21H	Bell table, times (total of 32 registers)
22H-41H	Bell table, enable/disable (total of 32 registers)
42H	Event selection mode, free (IN or OUT), IN only, OUT only or scheduled
43H	Relay function (0: for Alarm, 1: for Door unlock)
44H-63H	Event table, times (total of 32 registers)
64H-83H	Event table, event selection (IN: 1, OUT: 0)
84H	Bell table mode, Everyday or Week (Everyday: 0, Week: 1)
85H-86H	Daylight Saving Time (start-date ~ end-date)
87H	Enable or Disable Daylight Saving Time function
88H	Door unlock duration in seconds (00H-FFH)
89H	Prefix to match (0-16 characters)
8AH	From character (extract from a character position in the ID-code, this setting is from 1 to 37)
8BH	Number of characters (extract a portion of code from ID-card, this setting is from 1 to 37)
8CH	Allow or disallow record duplication (1:allow, 0:disallow)
8DH-92H	Unexpected ID-code (0-37 characters)

Table below lists all available group-2 registers:

00H-1FH	Bell table of Sunday, 'time' field (32 registers)
20H-3FH	Bell table of Monday, 'time' field (32 registers)
40H-5FH	Bell table of Tuesday, 'time' field (32 registers)

60H-7FH	Bell table of Wednesday, 'time' field (32 registers)
80H-9FH	Bell table of Thursday, 'time' field (32 registers)
A0H-BFH	Bell table of Friday, 'time' field (32 registers)
C0H-DFH	Bell table of Saturday, 'time' field (32 registers)

Table below lists all available group-3 registers:

00H-1FH	Bell table of Sunday, 'enable/disable' field (32 registers)
20H-3FH	Bell table of Monday, 'enable/disable' field (32 registers)
40H-5FH	Bell table of Tuesday, 'enable/disable' field (32 registers)
60H-7FH	Bell table of Wednesday, 'enable/disable' field (32 registers)
80H-9FH	Bell table of Thursday, 'enable/disable' field (32 registers)
A0H-BFH	Bell table of Friday, 'enable/disable' field (32 registers)
C0H-DFH	Bell table of Saturday, 'enable/disable' field (32 registers)

LED display mode (group-1 register 00H)

Set — Possible error codes: 04, 07

Command	C00,*MM*
Reply	A

Get — Possible error codes: 04, 07

Command	B00
Reply	A*MMcc*

MM- display mode (00: wall-mount operation, 01: desktop operation), *cc*-checksum

This group-1 register is used to set the LED display mode. Because TR515 can be used both as a wall-mount and as a desktop device, the LED data must be displayed in either orientation. Setting register to 00 (default) adjusts LED picture for wall-mount operation. Setting the register to 01 rotates the image so that it appears correctly when operating as a desktop device. Note: the mode parameter must be supplied as a 2-digit number, i.e. "00" or "01". Supplying just one digit will generate error 04.

Bell duration (group-1 register 01H)

Set Possible error codes: 04, 07

Command	C01,*DD*
Reply	A

Get Possible error codes: 04, 07

Command	B01
Reply	A*DDcc*

DD- Bell duration in seconds, in Hex format (00H-FFH), *cc*- checksum

The TR515 features a relay that can be used for external bell control. Bell schedule can be programmed using bell table group-1 registers (02H-21H, 22H-41H). This register specifies the number of seconds the bell will be activated for each time it is enabled.

Note: the DD parameter must always be a 2-digit number (i.e. "3A"). Supplying just one digit will generate error 04.

Bell table (Everyday mode), times (group-1 registers 02H-21H)

Set Possible error codes:04, 07

Command	C*RR,hhmm*
Reply	A

Get Possible error codes: 04, 07

Command	B*RR*
Reply	A*hhmmcc*

RR- register number (group 1) in Hex form (02-21H), *hh*- hour, *mm*-minutes, *cc*- checksum

The TR515 features a relay that can be used for external bell control. There are two bell modes are set by group-1 register 84H: Everyday mode and Week mode, Everyday mode has only one table setting for everyday use, Up to 32 different ring times can be specified in the table which the bell will be activated. Each *bell table entry* consists of two fields: 'time' field (string format, set through these 32 group-1 registers) and a corresponding 'enable/disable' field (set through group-1 registers 22H-41H).

Bell table (Everyday mode), enable/disable (group-1 registers 22H-41H)

Set — Possible error codes:04, 07

Command	C*RR,SS*
Reply	A

Get — Possible error codes: 04, 07

Command	*BRR*
Reply	A*SScc*

RR- register number (group 1) in the Hex form (22H-41H), *SS*- state (00: disabled, 01: enabled), *cc*- checksum

The TR515 features a relay that can be used for external bell control. In Everyday mode only one bell table can be set for everyday use. Up to 32 different bell times can be specified for which the bell will be activated. Each *bell table entry* consists of 2 fields: 'time' field (string format, set through group-1 registers 02H-21H) and a corresponding 'enable/disable' field (set through these group-1 registers).

Example: programming a bell table entry for 12:00:00

First, set the desired time; select a time register that you haven't used yet (i.e. 05H). Set the time using the following command: "C05,1200". Next, enable this time through a corresponding enable/disable register. The corresponding enable/disable register for time register 05H is 25H (time registers start from 02H, enable/disable registers start from 22H, we use the 4th register of each group). Enable command looks like this: "C25,01".

Event selection mode (group-1 register 42H)

Set — Possible error codes: 04, 07

Command	C42,*EE*
Reply	A

Get — Possible error codes: 04, 07

Command	B42
Reply	A*EEcc*

EE- event selection mode (00: free selection by the User, 01: fix to OUT, 02: fix to IN, 03: scheduled selection), *cc*- checksum

This setting allows User to set the TR515 at one of 3 event selection modes: set the event at Manual mode (IN or OUT by user selection), set event selection mode at fix to IN only or OUT only, or set at scheduled selection mode. Fixing event may be desirable in case several TR515s are used, with some machines installed at the entrance and serving for registering IN events, and some machines installed at the exit and serving for OUT registration only. TR515 features scheduled selection mode, which allow user to arrange event activation in a scheduled time, event schedule table's 'time' field set by group-1 registers 44H-63H, event schedule table's 'IN/OUT' field set by group-1 registers 64H-83H.

Relay function (group-1 register 43H)

Set — Possible error codes: 04, 07

Command	C43,*LL*
Reply	A

Get — Possible error codes: 04, 07

Command	B43
Reply	A*LLcc*

LL- relay function (00: for Alarm, 01: for Door Lock), *cc*- checksum

The TR515 features a relay that can be used for external bell or door activation control. And it also has corresponding duration setting for bell or door activation individually. See register 01 for bell duration setting; register 88H for door unlocking duration setting.

Event table, times (group-1 registers 44H-63H)

Set — Possible error codes:04, 07

Command	C*RR,hhmm*
Reply	A

Get — Possible error codes: 04, 07

Command	*BRR*
Reply	A*hhmmcc*

RR- register number (group-1) in Hex form (44H-63H), *hh*- hour, *mm*-minutes, *cc*- checksum

The TR515 features an event schedule table. Up to 32 different scheduled times can be specified for which the event selection will be activated. Each *event table entry* consists of two fields: 'time' field (string format, set through these 32 group-1 registers) and a corresponding event selection 'IN/OUT' field (set through group-1 registers 64H-83H).

Event table, selection mode- IN/OUT (group-1 registers 64H-83H)

Set — Possible error codes:04, 07

Command	C*RR*,*SS*
Reply	A

Get — Possible error codes: 04, 07

Command	*BRR*
Reply	A*SScc*

RR- register number (group-1) in the Hex form (64H-83H), *SS*- state (00: OUT, 01: IN, Others: disable this register), *cc*- checksum

The TR515 features an event selection table. Up to 32 different scheduled times can be specified for which the event selection will be activated. Each *event table entry* consists of 2 fields: 'time' field (string format, set through group-1 registers 44H-63H) and a corresponding event selection 'IN/OUT' field when you set value not 00 or 01, this entry will be disabled (set through these group-1 registers).

Bell table mode (group-1 register 84H)

Set — Possible error codes: 04, 07

Command	C84,*MM*
Reply	A

Get — Possible error codes: 04, 07

Command	B*84*
Reply	A*MMcc*

RR- register number (group-1) in the Hex form 84H, *MM*- bell table mode (00: everyday mode, 01: 01week mode), *cc*-checksum

This group-1 register is used to set the bell table mode. TR515 have two bell table modes: Everyday mode and Week mode, Everyday mode has only one bell table which have 32 different bell times can be specified for everyday to activate the bell. Week mode have 7 tables express from Sunday to Saturday, each table have 32 different bell times and can be specified for the day of week to activate the bell.

Daylight saving time (group-1 registers 85H-86H)

Set — Possible error codes:04, 07

Command	C*RR,MMDD*
Reply	A

Get — Possible error codes: 04, 07

Command	*BRR*
Reply	A*MMDDcc*

RR- register number (group-1) in Hex form (85H-86H), *MM*- month, *DD*-date, *cc*- checksum

The TR515 provides Daylight Saving Time function. The start-date (string type) of daylight-saving-time function is set by group-1 register 85H, and the end-date (string type) is set by group-1 register 86H. When time reaches at 2:00:00 AM of the start-date, time will change from 2:00:00 AM to 3:00:00 AM. When time reaches at 2:00:00 AM of the end-date, time will change from 2:00:00 AM to 1:00:00 AM. After finishing the start-date and end-date setting, don't forget to enable Daylight Saving Time function by setting group-1 register 87H as 01, then the function will work immediately. If set the start-date same as end-date, the Daylight Saving Time function will be automatically disabled by TR515 itself but content of register 87H will not be changed. If set the date of start-date behind end-date TR515 will consider the start-date as next year date.

Note: February 29 will be denied to set as start-date or end-date by TR515.

Daylight Saving, enable/disable (group-1 register 87H)

Set — Possible error codes:04, 07

Command	C87,*SS*
Reply	A

Get — Possible error codes: 04, 07

Command	B87
Reply	A*SScc*

SS- state (00: disabled, 01: enabled), *cc*- checksum

The Daylight Savings Enable/Disable register is use to enable or disable Daylight Saving Time function. The default factory setting is 00 (disabled).

Note: when start-date and end-date were set as same date, TR515 will automatically disable Daylight Saving Time function.

Door unlock duration (group-1 register 88H)

Set Possible error codes: 04, 07

Command	C88,*DD*
Reply	A

Get Possible error codes: 04, 07

Command	B88
Reply	A*DDcc*

DD- Door unlock duration in seconds, in Hex format (00H-FFH), *cc*- checksum

The TR515 features a relay that can be used for external bell or door lock activation control. This register specifies the number of seconds for the Door lock relay activation duration. Please see register 01 for the Bell relay activation duration.

Prefix to match (group-1 register 89H)

Set Possible error codes: 04, 07

Command	C89,*prefix_string*
Reply	A

Get Possible error codes: 04, 07

Command	B89
Reply	A*prefix_stringcc*

prefix_string is the string of prefix to be set (0-16 digits long), *cc*- checksum

Prefix to match allows you to restrict the User ID-cards accepted by the TR515 to cards whose leading ID-code characters match those of the prefix string. This way you can setup the system to accept only certain ID-Cards. You can even implement a simple access control function (using the TR515 as a Control Terminal).

The prefix can be from 0 to 16 digits long. Entering a string with 0(none) character disables prefix checking- any readable User Card will be accepted. If the Prefix String is set, the TR515 will compare each User Card with this String and reject the Cards that do not match, for example:

If Prefix to match is set to "123" then the TR515 will accept Cards such as "1234", "123679", "123". The terminal will reject the Cards with codes like "14377" and "12".

Default value for this setting is "" (empty string), i.e. prefix matching is disabled.

From Character (group-1 register 8AH)

Set — Possible error codes: 04, 07

Command	C8A,*NN*
Reply	A

Get — Possible error codes: 04, 07

Command	B8A
Reply	A*NNcc*

NN- a character position in the ID-Code counting from 1 in Hex form (range: 01H-25H), *cc*-checksum

From Character, together with Number of characters setting allows you to extract and store into the database a portion of code from the User UD-Card instead of the entire ID-Card code. This way you can adjust the format of the data generated by the TR515 to the requirements of some specific PC software. You can also use this setting to "hide" a certain portion of the ID-Cards code. This is useful for simple access control function implementation.

From Character defines a character position in the ID-Code (counting from 1), starting from which the portion of an ID-code will be extracted. The valid range for this setting is from 1 to 37. The TR515 will reject any User Card with the ID-code with the number of characters in it smaller than current From Character value.

Example: Supposing that From Character=3 and Number of characters=2. Then, ID-code "123456" will be truncated to "34", ID-code "123" will become "3", and ID-code "12" will be rejected.

Default value for this setting is 1.

Number of Characters (group-1 register 8BH)

Set — Possible error codes: 04, 07

Command	C8B,*NN*
Reply	A

Get — Possible error codes: 04, 07

Command	B8B
Reply	A*NNcc*

NN- the length of the position of code that will be extracted (in Hex form, range: 01H-25H), *cc*- checksum

Number of Characters, together with From Character setting allows you to extract and store into the database a portion of code from the User UD-Card instead of the entire ID-Card code. This way you can adjust the format of the data generated by the TR515 to the requirements of some specific PC software. You can also use this setting to "hide" a certain portion of the ID-Cards code. This is useful for a simple access control function implementation.

Number of Characters defines the length of the portion of code that will be extracted from the ID-code starting from the From Character position. The valid value range for this setting is from 1 to 37. Actual number of extracted characters can be smaller than that defined by the Number of Characters Setting. This happens when (From Character + Number of characters – 1) > length of ID-code. Examples:

If From Character=2 and Number of Characters=3 then ID-code "12345" will produce "234", and ID-code "123" will result in "23" only.

Default value for this Setting is 37.

Allow/disallow record duplication (group-1 register 8CH)

Set — Possible error codes: 04, 07

Command	C8C,*MM*
Reply	A

Get — Possible error codes: 04, 07

Command	B8C

Reply	A*MMcc*

MM- allow/disallow record duplication (00: disallow, 01: allow), *cc*-checksum

This group 1 register is used to set "allow" or "disallow" record duplication. When set in "disallow" mode TR515 will check if ID-code and IN/OUT selection is same as previous record in one minute, if same, the warning message is indicated by a long beep and "DUPL" displayed by the LED:



Unexpected ID-code (group-1 registers 8DH-92H)

Set — Possible error codes: 04, 07

Command	C*RR*,*unexpected_ID-code_string*
Reply	A

Get — Possible error codes: 04, 07

Command	B*RR*
Reply	A*unexpected_ID-code_stringcc*

RR- register number (group-1) in Hex form (8DH-92H), *unexpected_ID-code_string* is the string of unexpected ID-code to be set (0-37 digits long), *cc*- checksum

Sometimes TR515 may get unexpected ID-code that caused by noise signal. After downloading database, you will find unexpected ID-code in database. You can set the unexpected ID-code string into TR515 to avoid it. Once unexpected ID-code strings are set, TR515 will compare every ID-code read-in with those unexpected ones that are set and reject the ID-codes that match.

TR515 allows you to set 6 unexpected ID-code strings. The length of unexpected ID-code string can be 0 to 37 digits. The string 0 character (empty) will disable the check of unexpected ID-code. Default value for this setting is "" (empty string), i.e. unexpected ID-code matching is disabled.

Bell table (Week mode), times (group-2 registers 00H-DFH)

Set Possible error codes:04, 07

Command	P*RR,hhmm*
Reply	A

Get Possible error codes: 04, 07

Command	*QRR*
Reply	A*hhmmcc*

RR- register number (group-2) in Hex form (00-DFH), *hh*- hour, *mm*-minutes, *cc*- checksum

The TR515 features a relay that can be used for external bell control. Up to 7x32 different bell times can be specified for one week to activate the bell. These 7x32 bell times are programmed into 7 tables from Sunday to Saturday, group-2 registers 00H-1FH program for Sunday table, group-2 registers 20H-3FH program for Monday table, group-2 registers 40H-5FH program for Tuesday table, group-2 registers 60H-7FH program for Wednesday table, group-2 registers 80H-9FH program for Thursday table, group-2 registers A0H-BFH program for Friday table, and group-2 registers C0H-DFH program for Saturday table. Each table has 32 bell table entries, each *bell table entry* consists of 2 fields: 'time' field (string type, set through these group-2 registers 00H-DFH) and a corresponding 'enable/disable' field (set through group-3 registers 00H-DFH).

Bell table (Week mode), enable/disable (group-3 registers 00H-DFH)

Set Possible error codes:04, 07

Command	J*RR,SS*
Reply	A

Get Possible error codes: 04, 07

Command	*KRR*
Reply	A*SScc*

RR- register number (group-3) in the Hex form (00H-DFH), *SS*- state (00: disabled, 01: enabled), *cc*- checksum

The TR515 features a relay that can be used for external bell control. Up to 7x32 different bell times can be specified for one week to activate the bell. These 7x32 bell times are programmed into 7 tables from Sunday to Saturday, group-3 registers 00H-1FH program for Sunday table, group-3 registers 20H-3FH program for Monday table, group-3 registers 40H-5FH

program for Tuesday table, group-3 registers 60H-7FH program for Wednesday table, group-3 registers 80H-9FH program for Thursday table, group-3 registers A0H-BFH program for Friday table, group-3 registers C0H-DFH program for Saturday table. Each table has 32 bell table entries, each *bell table entry* consists of 2 fields: 'time' field (string type, set through group-2 registers 00H-DFH) and a corresponding 'enable/disable' field (set through these group-3 registers 00H-DFH).

5. Firmware Management mode

The TR515 also features new Firmware Management mode (FMM). FMM allows you to quickly upgrade your TR515's internal firmware and also check validity of the currently loaded firmware. Contact your dealer for the most recent firmware upgrade files.

FMM itself has two sub-modes of operation: FMM/download mode and FMM/check mode. FMM/download is entered by keeping the IN button pressed while the TR515 is powering up. FMM/check mode is entered by holding both IN and OUT buttons pressed while the TR515 is powering up.

Downloading new firmware (FMM/download)

To upgrade the firmware, you will need a new firmware file and a terminal software for PC capable of transferring files using Xmodem protocol (Checksum version).

All TR515 firmware files have a fixed size of exactly 64K (65536 bytes)

The list of popular and widely available terminal programs includes HyperTerminal for Windows, QModem, and Term95. Procedure below assumes the use of HyperTerminal which is a part of a standard Windows-95/98 distribution.

To upgrade the TR515Ex (Ethernet port version) internal firmware, please refer to document "Download_FRM_via_Ethernet_V1.0".

To upgrade the TR515Sx (RS232 serial port version) internal firmware, please follow the below steps:

- Switch the TR515 off
- Make sure that the TR515 and the PC are interconnected with a serial cable
- Launch HyperTerminal and configure it as follows:
  - When Connection Description dialog opens, type any string (1 character minimum) and press OK
  - When Connect to dialog opens, select an appropriate COM port from the Connect Using drop-down box (for example, "Direct to COM1")
  - When COM*x* Properties dialog appears, set communications parameters as follows: Bits per second: 19200, Data bits: 8, Parity: None, Stop bits: 1, Flow control: None
  - The HyperTerminal's main window will appear
- Choose Transfer→Send file from the Main menu- the Send file dialog will appear
- In the Send file dialog, select the file you want to download and choose Xmodem protocol from the Protocol drop-down box

- The Xmodem file send for dialog will be displayed
- Press and hold the IN button, then power up the TR515 while still keeping the IN button pressed. The unit will generate a long beep and display "FLLD" (FLASH Load):



- When receiving the file, the TR515 will blink its IN LED (the LED is on while the TR515 is receiving or expecting to receive a block of data from the PC; the LED is off while the TR515 is programming the data received into its internal FLASH memory)
- Once the downloading is finished, the TR515 will execute one long beep and display "DONE":



- You may start using the newly downloaded firmware after switching the unit off and back on again.

Note: TR515 will set default value for all internal registers when turn power-up TR515 at first time after downloaded firmware. This initialization procedure will take 25 seconds and LED will display "INIT" in the meanwhile:



A number of errors may occur during the download. Errors are displayed in the "ERR*x*" format, where *x* is the error number, for example:



In addition, the TR515 generates a beep pattern comprised of a long beep followed by one or several short beeps. The number of beeps corresponds to the error number.

All possible download-related error codes are listed in the table below:

Err1	Communications error (invalid data received from the PC). The most probable cause of this error is incorrect communications parameters you've set in the HyperTerminal
Err2	The download file is too big (exceeds 64K). All TR515 firmware files must be exactly 64K in size. Make sure you are trying to downloading a correct one
Err3	FLASH memory failure. This normally indicates a serious internal malfunction

The LED display is turned off after displaying the message for some time.

Finally, there is a timeout error that occurs when you start the download but PC doesn't send any data (or the TR515 cannot receive the data sent by the PC). This happens when you either set communications parameters of the HyperTerminal incorrectly or if you switch the TR515 on (with the IN button pressed) before starting the XMODEM on the PC side (it should always be *the other way around*: start XMODEM first, then switch the TR515 on).

The timeout error is indicated by a long beep and four dashes displayed by the LED:



Checking existing firmware (FMM/check)

To check if the currently downloaded application firmware is valid:

- Switch the TR515 off
- Press and hold both IN and OUT buttons, then switch the TR515 back on (while keeping both buttons pressed). The unit will generate a long beep and display "FLCH" (FLASH check):



- Memory checkup takes about 5 seconds to complete. OUT LED is on while check is in progress. Upon test completion, the TR515 will either display "DONE" in case the FLASH memory contains a valid program, or "Err4" if internal program code is invalid.

6. Test mode

The TR515 provides a hardware Test mode that can be initiated by issuing a Z-command (see Section 3).

Warning! Hardware test destroys the database contents (not just deletes it logically), so the data cannot be recovered even using the M-command! The test mode also sets a so-called Reset flag: the TR515 will be completely reinitialized on the next power-up after the test.

Once initiated, the Test mode cannot be exited other than by switching the TR515 off.

The Test mode is comprised of two phases. Phase 1 performs automated SRAM, RTC (real-time clock) and FLASH memory tests. Phase 2 consists of manual button and reader tests.

Phase 1 begins immediately upon entering the Test mode. The LED displays "TEST" at this time:



A number of errors can occur during this portion of the test: All errors are displayed in the "ERR*x*" format, where *x* is the error number, for example:



All possible errors are listed in the table below:

Err1	SRAM test failure
Err2	RTC test failure
Err3	FLASH test failure

Upon successful completion of the automated tests, the TR515 will beep and display "b1-5" (OUT LED will be switched on):



This means that the manual test phase has commenced. This phase consists of three steps: OUT button test, IN button test, and reader test. Each step must be repeated five times.

Press the OUT button and notice that "b1-5" changes to "b1-4", "b1-3", etc.

When you press the OUT button for the fifth time, the display will change to "b2-5" and the IN LED will be switched on. Press the IN button five times to finish this test step.

The display reads "rd-5" at the beginning of the reader test. Read any ID-card five times to pass this portion of the test.

When all manual tests are finished, the TR515 will generate a long beep and display "PASS":



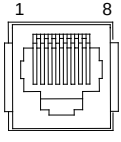
This indicates that the test sequence has been completed successfully. You can still continue testing the buttons and the reader at this point. The TR515 will behave as if in the Normal Mode of operation, but no records will be added to the database.

Appendix A. Possible Errors

This Section lists all possible error messages that may be generated during the TR515's normal operation. The table below does not apply to the Test and FMM modes of the TR515 (see Sections 5 and 6 respectively for complete details on errors generated in these modes).

LED	Error	Description/ Remedy
Err	Read error	ID-card read error. Read the card again
FULL	Database full	The database is full and new record cannot be added.
Er r4	Error 4	Incorrect setting value. Reinitialize the TR515 by issuing the R-command
Er r5	Error 5	The database is corrupted. First, try to power the TR515 off and back on again. If this doesn't help, initialize the database using the E-command or recover the database using the M-command
Er r6	Error 6	Time/date is not set. Use the S-command to correct the problem or reinitialize the TR515 using the R-command

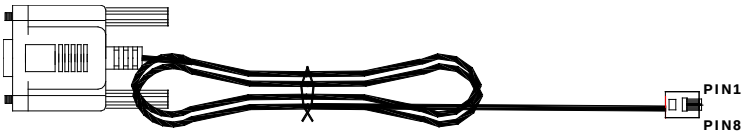
Appendix B. Interface connector pin assignment



	Ethernet	*Wireless/RS-232/RS-485*
#1	TX+	
#2	TX-	RS232, TX (PC output)
#3	RX+	
#4		RS232, RX (PC input)
#5		RS485, (+)
#6	RX-	Ground
#7		RS485, (-)
#8		

Appendix C. Cable

1. WAS-1436 (For TR515WX/TR515SX RS-232)



WAS-1436 : LENGH - 2000 mm , WIRE - 8P8C / AWG #28

WAS-1436		
DB 9P FEMALE PIN	COLOR	RJ-11 8P8C PIN
7	**GRAY**	**1**
2	**ORANGE**	**2**
8	**BLACK**	**3**
3	**RED**	**4**
NC *	**GREEN**	**5**
5	**YELLOW**	**6**
NC *	**BLUE**	**7**
NC *	**BROWN**	**8**

* NC - No Connect

2. WAS-1467 (For TR515SX RS-485)

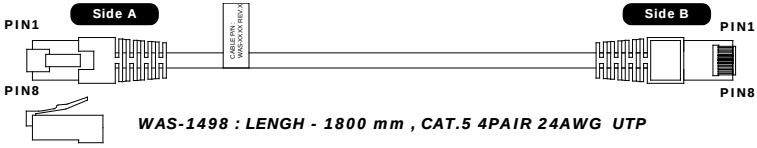


WAS-1467 : LENGH - 2000 mm , WIRE - 8P8C / AWG #26

WAS-1467		
RJ-11 8P8C PIN	COLOR	WIRE
1	**GRAY**	**CUT***
2	**ORANGE**	**CUT***
3	**BLACK**	**CUT***
4	**RED**	**CUT***
5	**GREEN**	**5**
6	**YELLOW**	**CUT***
7	**BLUE**	**7**
8	**BROWN**	**CUT***

* CUT - Cut wire

3. WAS-1498 (For TR515EX TO PC)

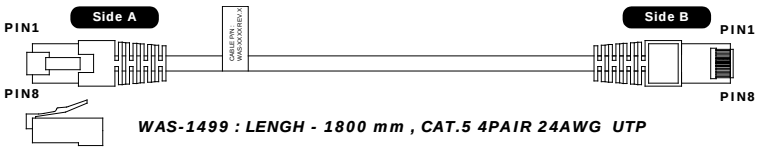


WAS-1498 : LENGH - 1800 mm , CAT.5 4PAIR 24AWG UTP

WAS-1498		
Side A	COLOR	Side B
*1	WHITE	3
*2	ORANGE	6
*3	WHITE	1
4	BLUE	4
5	WHITE	5
*6	GREEN	2
7	WHITE	7
8	BROWN	8

* (1,2) and (3,6) must share the same twisted pair

4. WAS-1499 (For TR515EX TO HUB)



WAS-1499 : LENGH - 1800 mm , CAT.5 4PAIR 24AWG UTP

WAS-1499		
Side A	COLOR	Side B
*1	WHITE	1
*2	ORANGE	2
*3	WHITE	3
4	BLUE	4
5	WHITE	5
*6	GREEN	6
7	WHITE	7
8	BROWN	8

* (1,2) and (3,6) must share the same twisted pair

Appendix D. Specifications

Display:	4 x 7-segment Blue Light LED
Magnetic card reader:	ISO Track 2, 75 bpi
Barcode reader:	Visible or IR, numerical Code39
RFID card reader:	125KHz, ASK, 64bits, Manchester encoding
RFID reading range, ISO card-sized tag	8 cm
HID reader: (only reads Card number)	Wiegand 26/30/34/35/37
Mifare reader:	Reading U-ID or Sector data
Database capacity	App. 8164 records / 4082 records**
Supported interfaces	Ethernet / Wireless / RS232 / RS485*
Wireless Communication	315.16/433.92Mhz or 433.92/434.33Mhz
Communications parameters	19200-8-n-1
Bell control relay	1A, 12V max
Physical dimensions	185(L) x 110(W) x 51(H) mm
Installation	Wall-mount or desktop
Power supply	DC 9V, 500mA
Power supply from PoE (TR515Ex-20 only)	Fully IEEE 802.3af compliant ***
Operating temperature range	0-55 C^{o}
Operating humidity	5-95%

** Requires a special adaptor (CON485, purchased separately.)*

*** If ID-code is Track 1 or JIS-II code, database capacity is 4084 records.*

**** Also accept power from auxiliary sources such as 12V ac adapter when PoE network power is unavailable.*

Appendix E. Ordering Information

Ethernet Interface

TR515EM	Time Recorder with Magnetic Card Reader
TR515ER	Time Recorder with RFID Card Reader
TR515EB	Time Recorder with Barcode Card Reader (visible)
TR515EF	Time Recorder with Barcode Card Reader (infrared)
TR515EH	Time Recorder with HID Card Reader

Wireless Interface

TR515WM	Time Recorder with Magnetic Card Reader
TR515WR	Time Recorder with RFID Card Reader
TR515WB	Time Recorder with Barcode Card Reader (visible)
TR515WF	Time Recorder with Barcode Card Reader (infrared)

TR515WH	Time Recorder with HID Card Reader

RS-232/485 Interface

TR515SM	Time Recorder with Magnetic Card Reader
TR515SR	Time Recorder with RFID Card Reader
TR515SB	Time Recorder with Barcode Card Reader (visible)
TR515SF	Time Recorder with Barcode Card Reader (infrared)
TR515SH	Timer Recorder with HID Card Reader

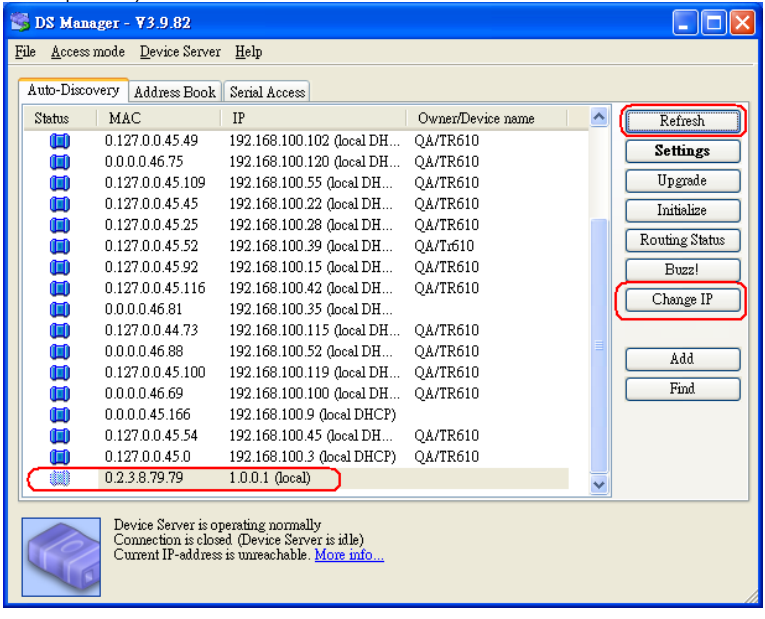
Appendix F. Installation

Please install DISK5151 Software before using TR515 series. DISK5151 includes [DS Manager] and [TR515 Application Program]. Setting procedure is as follows.

1. Ethernet Interface TR515:

Hub to TR515E (using cable WAS-1499)

1. Open the program DS Manager. It will automatically detect the IP Address of the TR515 on line.
   (The default IP address is 1.0.0.1, if it doesn't show up in the IP list window, it may blocked by Firewall, you should disable the firewall protection function temporarily, then click [Refresh] for show all IP in IP list window. For DS Manager cannot detect the IP address in use currently on the LAN, please make sure the IP address you set is not in use to avoid duplication.)

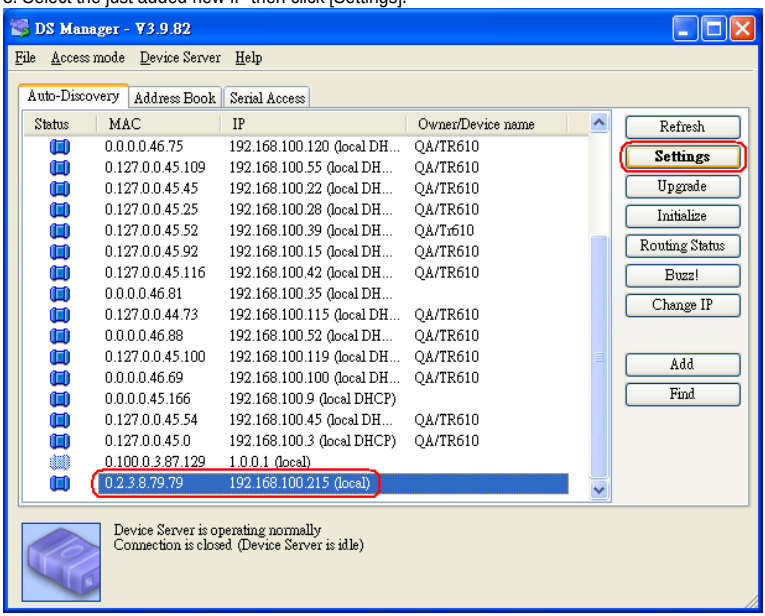


2. Click [Change IP] to change the IP address to be used by TR515, and then click [OK].

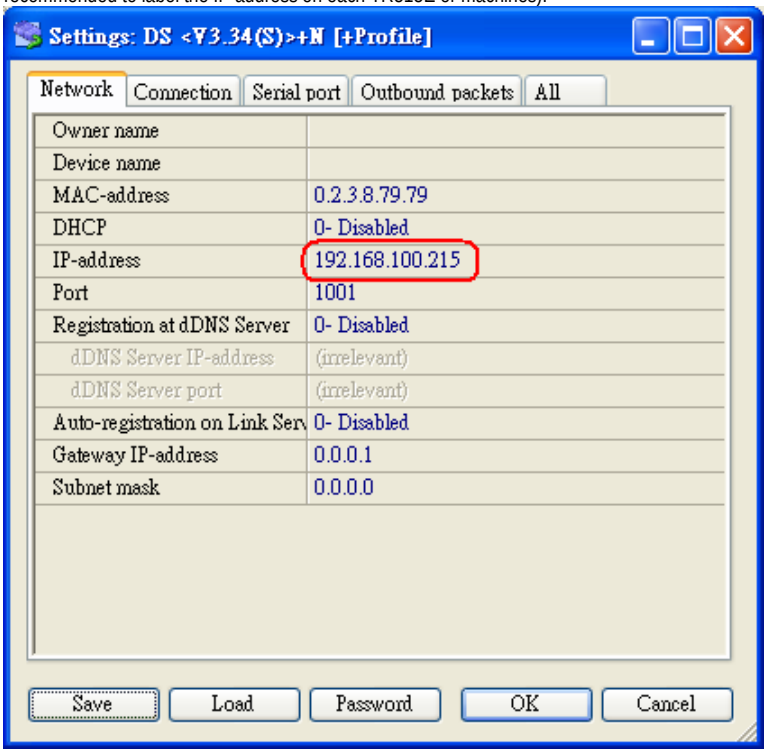
P.S. The IP address must not be the existing one.



3. Select the just added new IP then click [Settings].

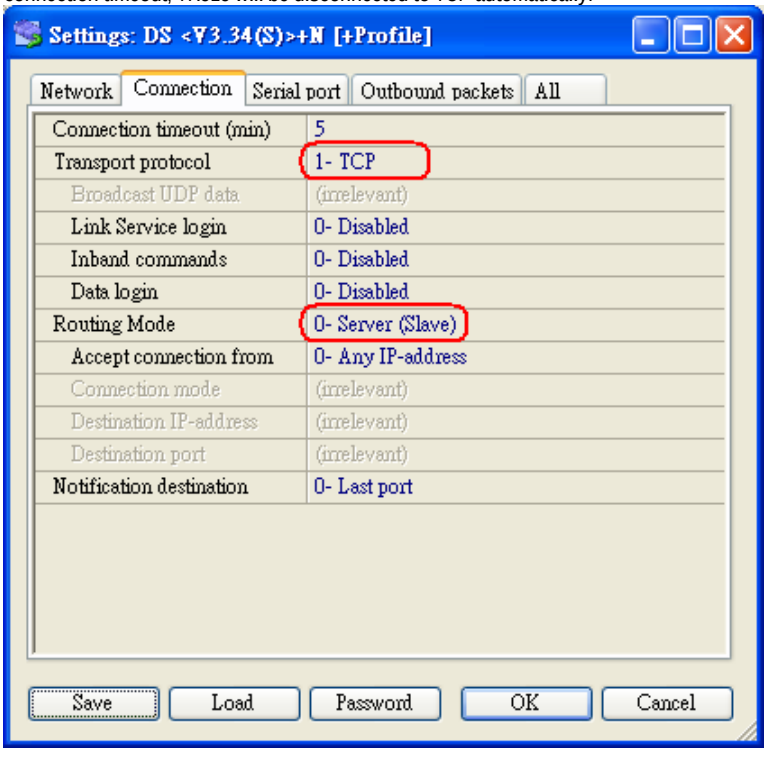


4. Check if IP address is you just typed. (When using multiple TR515E or machines, it is recommended to label the IP address on each TR515E or machines).

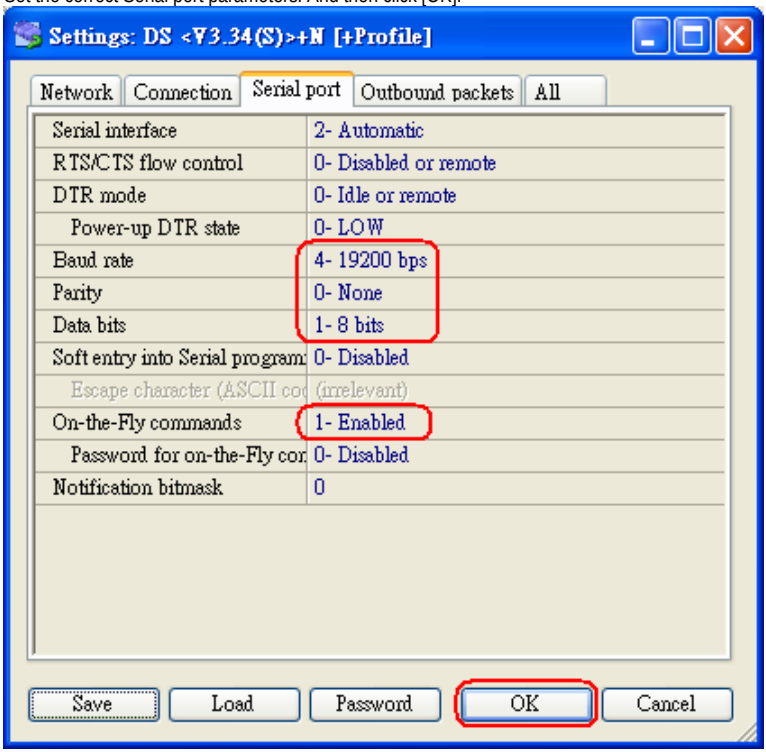


5. Select Transport Protocol: TCP. Select Routing mode: Slave. Setting the Period of TCP Connection Timeout for TR515E (0~255 minutes).

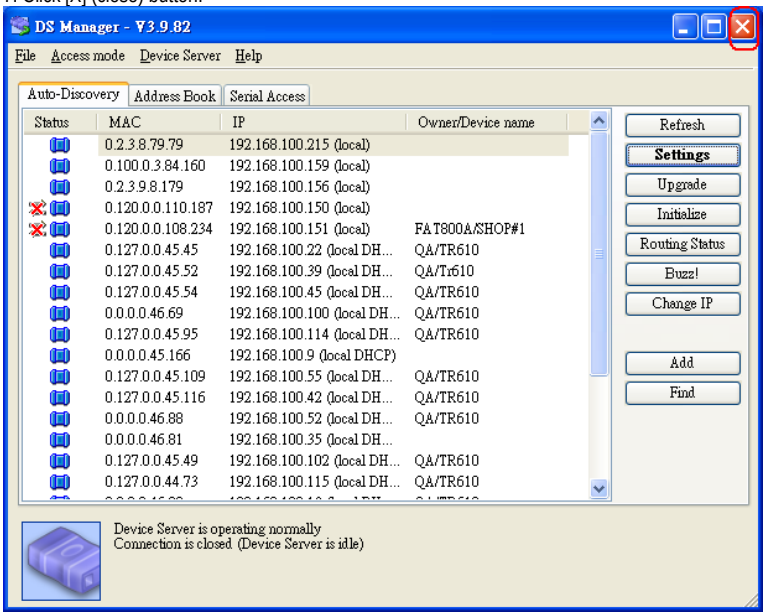
Remark: If users do not have any communication with TR515E during the period of TCP connection timeout, TR515 will be disconnected to TCP automatically.



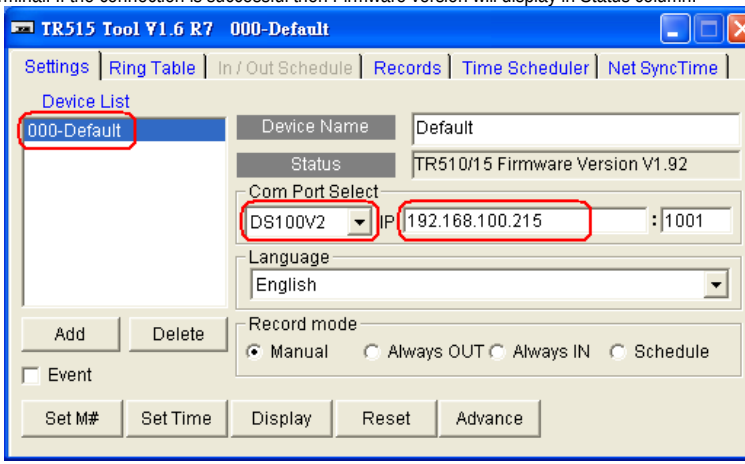
6. Enable [On-the-Fly commands], this helps TR515E to remote control the serial parameters. Set the correct Serial port parameters. And then click [OK].



7. Click [X] (close) button.



8. Open the Application Program of TR515. Input the IP address of the on-line TR515 and select Com Port as [DS100V2]. Then double click [000-default] to complete the connection with TR515 terminal. If the connection is successful then Firmware version will display in Status column.

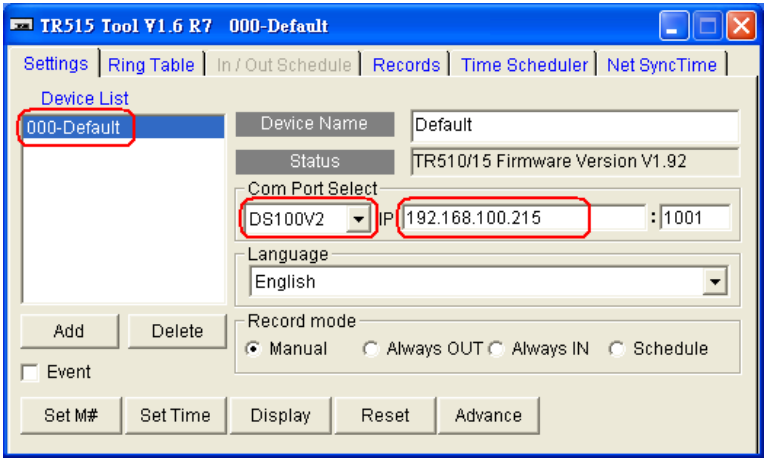


PC to TR515 (using cable WAS-1498)

1. Please refer to above procedure (1~7) for settings.

2. Open the Application Program of TR515. Input the [IP address] of the on-line TR515 and select [Com Port] as [DS100V2]. Then double click [000-default] to complete the connection with TR515 terminal. If the connection is successful then Firmware version will display in Status column.

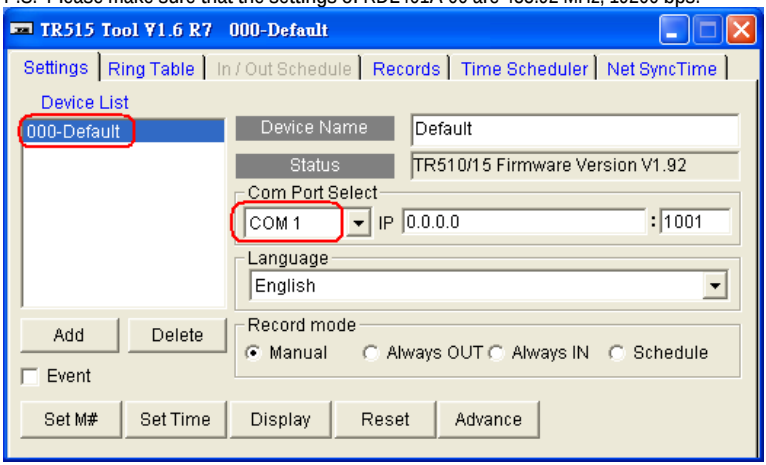
P.S. The IP address of PC and TR515E must be within one domain to ensure the Connection.



2. Wireless Interface TR515:

1. Open the Application Program of TR515. Select the [Com Port] of the on-line TR515. Then double click [000-default] to complete the connection with TR515 terminal. If the connection is successful then Firmware version will display in Status column.

P.S. Please make sure that the settings of RDL401A-00 are 433.92 MHz, 19200 bps.



*Notice for Operation

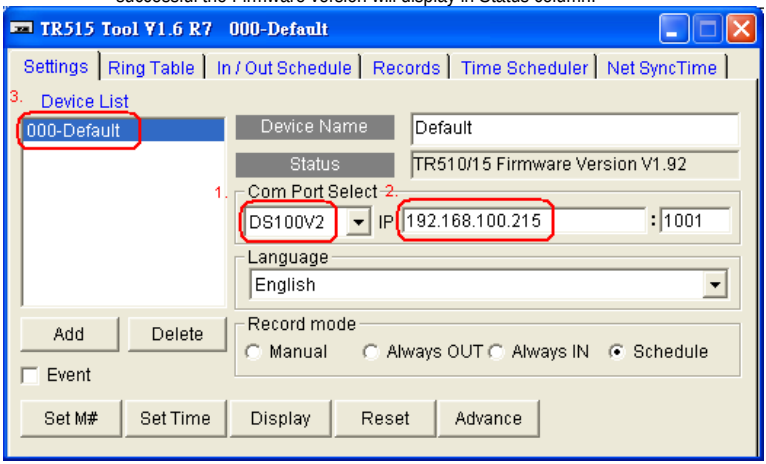
A. ID [000-default] can be set to any TR515 on line. However, when there are multiple TR515 on line, the machine ID cannot be [000-default]. Each TR515 must have its own ID number other than [000-default].

B. [Time Scheduler] will not work when the machine ID is [000-default]. It will be enabled when other ID code is selected.

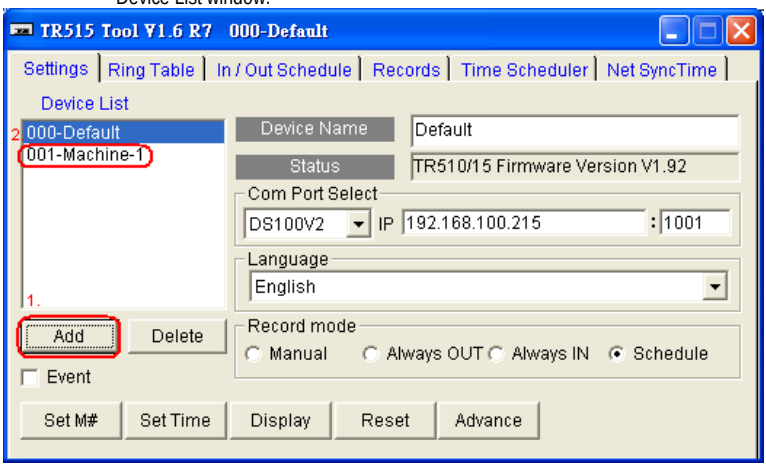
C. Use [000-default] to assign the new ID. After setting, use the new ID to complete the connection.

Adding new Machine ID:

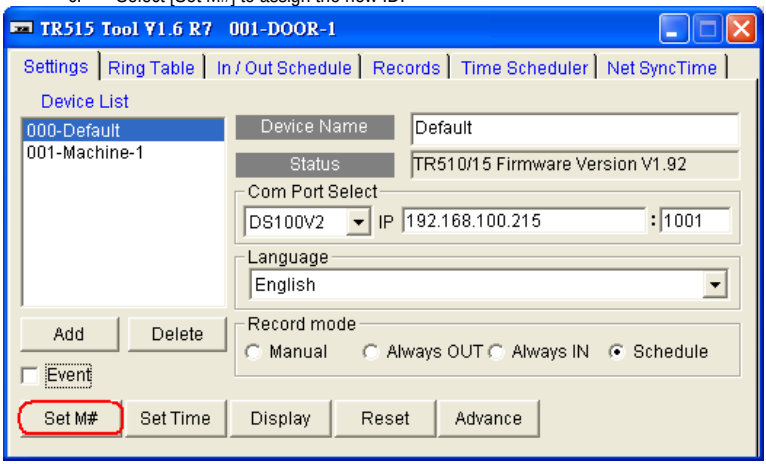
a. For example, if we want to set machine ID [001] for a TR515 terminal which IP address is 192.168.100.215, then please select the Com Port [DS100V2] and input IP address [192.168.100.215] then click [000-Default]. If the TR515 connection is successful the Firmware version will display in Status column.

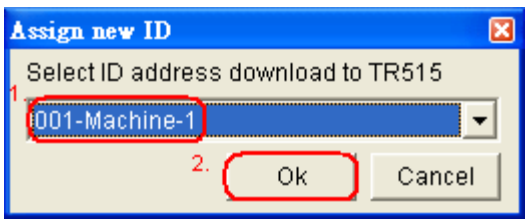


b. Click [Add] to increase a new Machine ID. The [001-Machine-1] will show up in Device List window.

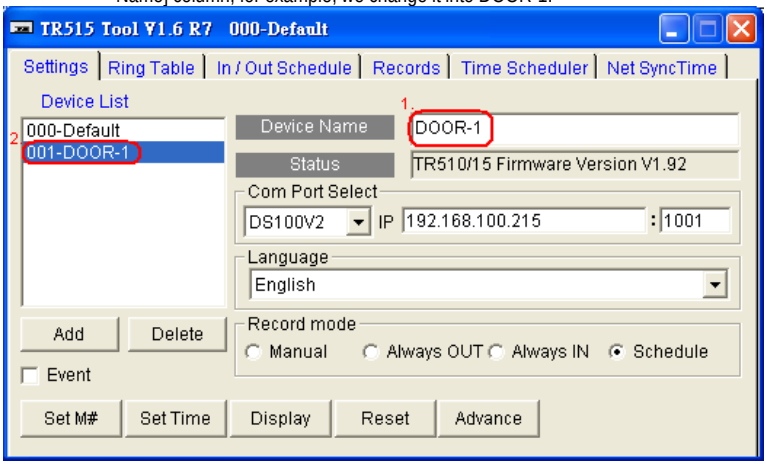


c. Select [Set M#] to assign the new ID.

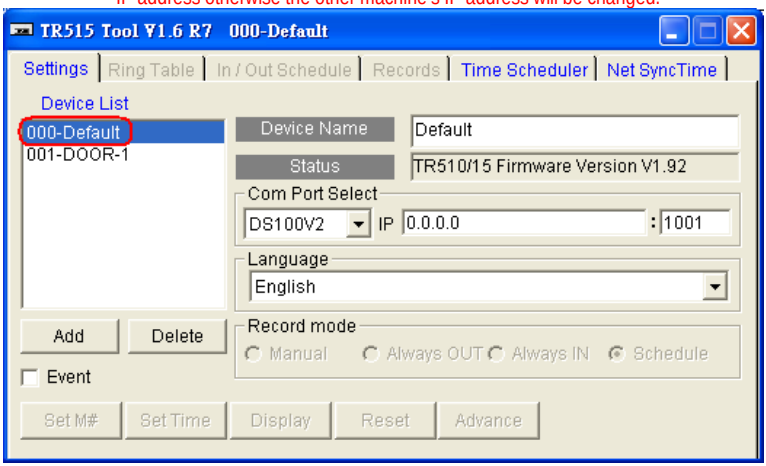




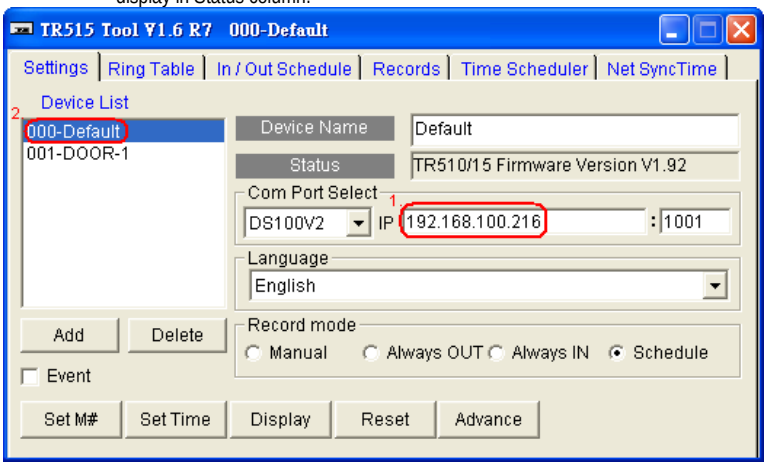
d. Now the machine ID is [001]. The correspondent name can be modified at [Device Name] column, for example, we change it into DOOR-1.



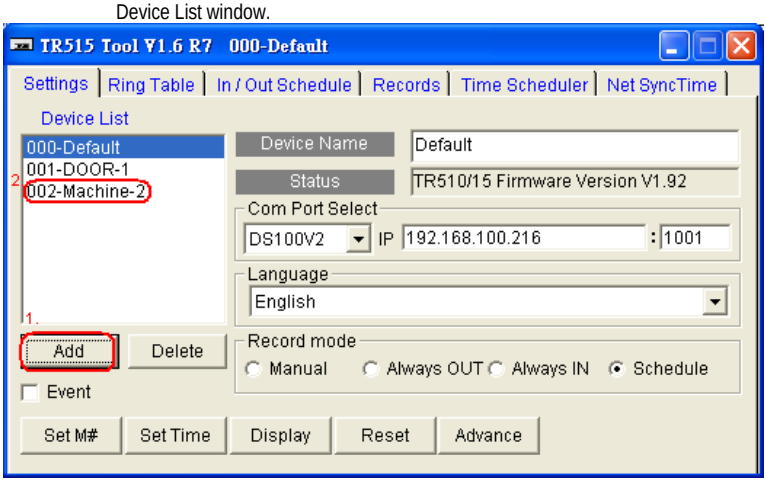
e. To add another new Machine ID, please follow the installation procedure 1~8 above (using DS Manager) to set a new IP address for New Device. And then move the cursor to [000-default] to set the IP address in program TR515 Tool for the New Device. Note: Cursor must be at [000-default] position before setting the IP address otherwise the other machine's IP address will be changed.



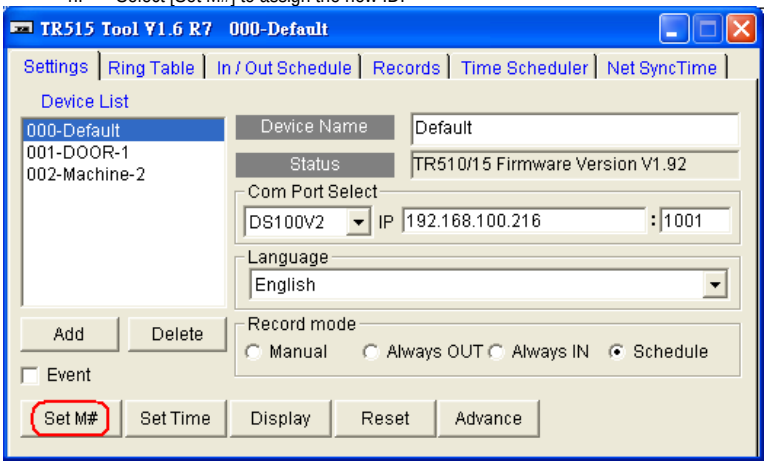
f. For example, now we want to set Machine ID [002] for another one TR515 which IP address is 192.168.100.216. Please input IP address [192.168.100.216] then click [000-Default]. If the TR515 connection is successful the Firmware version will display in Status column.

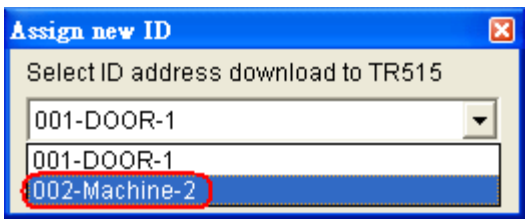


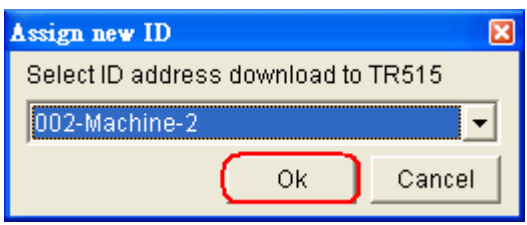
g. Click [Add] to increase a new Machine ID. The [002-Machine-2] will show up in Device List window.



h. Select [Set M#] to assign the new ID.







i. You can double click [002-Machine-2] to complete and check the connection to New Device. If the TR515 connection is successful the Firmware version will display in Status column.

