

REI2

Transmission protocol



TIMING AND SPORT

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Transmission protocol

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1. Principle of functioning

There are three basic functioning modes:

- 1) Off-line data transmission
- 2) On-line data transmission
- 3) Interactive PC-REI2 communication

1.1. Off-line data transmission

Off-line data transmission consists of the transference of data during a timing session after an interval of time. Naturally the timekeeper must enter the relative 'menu' on REI 2 to request data transmission.

The transfer of various types of data can be chosen:

- Net times
- Event times
- Non-starters
- Non-finishers
- Disqualified
- Speed

Each item can be filtered on the basis of a run, group or particular time interval (i.e. downloads all the event times of run 2 of those in group 3 between 12:00:00.0000 and 13:00:00.0000).

The protocol used for data transmission from REI2 to PC is *Extended REI2 protocol* (see description below) with the mode flag equal to 'F'.

1.2. On-line data transmission

On-line data transmission consists of the transmission from REI2 to PC of the whole operation of acquisition, correction and annulment of times performed by the timekeeper on the machine (in practice, all the information given on the printout is transmitted). Once enabled, transmission takes place completely autonomously each time a time is acquired or modified. Each record transmitted is identified by a counter (from 0 to 99999 with *wrap-around*), which goes up automatically.


Also in this case, the protocol used for transmission is *Extended REI2 protocol* (see description below) with the mode flag equal to 'O'.

It is also possible to activate an output on the serial line corresponding to the output of the main displayboard, with intervals which can be set; in this case the transmission protocol used for transmission is *Reduced REI2 protocol* (see description below).

1.3. Interactive PC-REI2-PC communication

The requests the PC can forward to REI2 can be subdivided into four types:

- 1) 'Static' requests
- 2) 'Dynamic' requests
- 3) Status requests

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4) Break requests

Each request made by the PC to REI2 is identified not only by the type of request but also by a 5-figure identification number. The number concerned is used by the reply in such a way that the pairing is unique.

1.3.1. 'Static' request

A static request is made each time the PC needs to access one or more elements of the stopwatch's database. The '**Static**' request, protocol allows you to filter the elements of the database according to the requirements of the moment. The possibility of obtaining running times in reply is not provided for in this type of request.

The '**Static**' request protocol also offers the possibility of making requests to which the stopwatch must reply with a number of records. (for example, a request for all the NPs of run 1). In this case the identification number given in the replies remains the same for all the replies corresponding to the same request.

The reply to a static request is in conformity with the *Extended REI2 protocol*. The reply to a '**Static**' request differs from autonomous on-line and off-line transmission in the initial protocol identification character.

1.3.2. 'Dynamic' request

A 'dynamic' request allows you to activate running times on the specified serial line with the possibility of defining the time interval between one transmission and the next (from 1/100s a 999,99s, in steps of 1/100s) .

To guarantee maximum flexibility of use, the stopwatch puts in line a Tout running time specified as follows:

$$T_{out} = T_{now} - T_{ev} - T_{aux}$$

where

T_{now} = present time of the machine (real time, as at initial synchronisation)

T_{ev} = event time. The event time should be specified as type of event, competitor number and run. It is also possible not to specify this parameter (simply by assigning 0 to the athlete's number). In this case, REI2 assumes $T_{ev}=0$.

T_{aux} = generic time, communicated to REI2 by the PC. It is also possible to specify a negative sign for T_{aux}

T_{aux} = therefore allows you to 'shift' the running time of a competitor as desired by a fraction of a second. This is particularly useful during showing on TV.

REI2 can manage a maximum of 2 running times simultaneously.

The output of running times occurs in accordance with the '**Dynamic**' reply protocol.

1.3.3. Status request

A status request allows you to obtain information regarding the settings parameters of the machine (status of lines, line disactivation times, program set, etc.).

The request contains a code relative to the parameter you wish to check. The reply takes place in accordance with the *Status reply* protocol and although maintaining the same structure and dimension, can present differences depending on the parameter requested.

1.3.4. Request for break, transmission suspension/resumption, record repetition

A break request allows you to annul the reply to a particular static request. The reply to be interrupted is identified by its identification number. A reply to the break request is not required.

This command can be particularly useful for interrupting transmission after a static request for which there is more than one reply record.

The request for suspension and resumption of the communication makes it possible to implement a SW Xon/Xoff protocol. During suspension, the items of information are put in a queue. If the queue is full, the following records are lost. This possibility can easily be identified subsequently through requests which receive no reply or discontinuity in the incremental identification number for on-line information.

Any replies to requests which are lost can be recovered by repeating the request.

Lost on-line transmission records can be recovered by sending a request for repetition of the record.

1.3.5. Error in the request

If a request contains a syntactic error or cannot be interpreted correctly by REI2, a general error code of the consecutive number of the request in which the error was found is sent back.

1.4. *Insertion of time events*

The request for insertion of time events, available from software version 1.07 on, allows insertion and annulment of time events and insertion of NP and NA indications in the REI2 database using a serial connection. The protocol specifications are given in chap. 4.3 Event transmission from PC to REI2 on p.35. The physical channel assigned to insertion from PC is 900.



REI2 does not do any kind of check on the congruity of data sent for insertion. All checking must be made with procedures external to the stopwatch.

2. General information about the REI2- PC protocol

Some general information about the implementation of the REI2-PC protocol:

- The transmission of commands and the reception of replies contain only ASCII codes.
- Each request or reply has an initial header for each particular protocol with an ASCII control code (code character < 0x20 (space)).
- Each request or reply ends with a 'carriage return' (CR, 0x0d).
- After the initial character which identifies the protocol, each request and reply (with the exception of 'dynamic' reply) has two characters to identify the type of device (REI2) and the device's address. This function makes it possible to connect a number of devices on the same communication line.

Each request can send the reply on the same serial channel on which it was received, on one of the two channels you can choose to make available (independently of which channel is used for requests) or on both serial outputs. It is possible to pilot the displayboard output by using the dynamic request identifier "T" requested. (see chap. 4.2.2 'Dynamic' request on p.28).

3. Observations regarding connection to TV

When running times are displayed (e.g. connection to TV) it is advisable to use the tick or dynamic responses and not on-line data as the latter might have a delay of a few tenths of a second.

In the following programs different types of information can be emitted for the tick simultaneously:

- **PARALLEL SLALOM or DUAL TIMER:** if the two competitors have already started the race, it is the running time for each track. When a competitor finishes, instead of running time tick output is the gap, positive or negative, between him/her and the competitor still racing.
- **SHOW JUMPING:** as well as running time, REI2 also sends the athlete's penalty.
- **SIMPLE STOPWATCH:** after the first competitor has finished, if "Displayboard block after first finish: Active" is set, the output is the net time of the first competitor plus the gap.
- When LinkPod or EncRadio devices are used with tick output, it is advisable to enter a delay time (for LinkPod 120ms is recommended, for EncRadio 200ms) which can be set in "Serial ports setup" by pressing <ALT>+<F2>.

4. Protocol detail

This manual refers to version 1.09.2.

4.1. Data transmission from REI2 to PC

4.1.1. Extended REI2 protocol

Total 52 bytes

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
DLE	1	16,10h	Protocol identifier
Stopwatch identifier	1		R=REI2
Device address	1	32,20h (space)	Reserved for future uses
Dummy char	1	32,20h (space)	For compatibility with 'static' replies
Program in use	1		S=Single Starts G=Group starts B=Simple stopwatch P=Parallel I=Show Jumping N=Swimming T=Track Chase O=Pc OnLine
Mode	1		O=OnLine F=OffLine
Progressive counter	6		From 1 to 999999, with wrap around
Competitor N°	5	00000<= N <=59999	Zero in the case of PC OnLine without competitor number. In the case of swimming with "Ins. Pectoral " set to Yes if it is necessary to present a lane previously absent, it assumes the value of 30000 + the number of lanes
Group/Category	3	000<= Ng <=199	If the Group/Category is equal to zero or the Groups/Categories have not been defined or the information filtered by group is not being downloaded (it is not always downloaded because the competitor could belong to more than one group)
Run/Trial	3	001<= Nm <=250	For horse racing the phase 1 run can range from 1 to 99, the phase 2 run from 100 to 198

Description	N° bytes (Dec, Hex)	ASCII Code	Notes
Physical channel ¹	3	000<=	Physical channel <=999
			If the physical channel does not exist the output is “ “
			Channel Channel Description
			Main Lines
			000 Start Line
			001 Lap Line
			015 Stop Line
			016 Aux Line
			100 Start Key
			101 Lap key
			115 Stop key
			116 Aux key
			200 Auto Start
			300 Start (Manual keying in)
			301 Lap (Manual keying in)
			315 Stop (Manual keying in)
			Pod Inputs
			400..407 POD 0
			410..417 POD 1
			420..427 POD 2
			430..437 POD 3
			440..447 POD 4
			450..457 POD 5
			460..467 POD 6
			470..477 POD 7
			480..487 POD 8
			490..497 POD 9
			Inputs Via Radio
			500 RADIO START
			501 RADIO LAP 1
			502 RADIO LAP 2
			503 RADIO LAP 3
			504 RADIO LAP 4
			505 RADIO LAP 5
			506 RADIO LAP 6
			507 RADIO LAP 7
			508 RADIO LAP 8
			509 RADIO LAP 9
			510 RADIO LAP A
			511 RADIO LAP B
			512 RADIO LAP C
			513 RADIO LAP D

¹ Note: for the simple stopwatch and the parallel, the output has a different meaning:

- PARALLEL: The output data item is the progressive number of direct contests

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
	514		RADIO LAP E
	515		RADIO STOP
	600		Retrieved from Encoder ENC START
	601		ENC LAP 1
	602		ENC LAP 2
	603		ENC LAP 3
	604		ENC LAP 4
	605		ENC LAP 5
	606		ENC LAP 6
	607		ENC LAP 7
	608		ENC LAP 8
	609		ENC LAP 9
	610		ENC LAP A
	611		ENC LAP B
	612		ENC LAP C
	613		ENC LAP D
	614		ENC LAP E
	615		ENC STOP
	700		Imputed by RadioModem
	516		Serial A RADIO Inputs RADIO START
	517		RADIO LAP 1
	518		RADIO LAP 2
	519		RADIO LAP 3
	520		RADIO LAP 4
	521		RADIO LAP 5
	522		RADIO LAP 6
	523		RADIO LAP 7
	524		RADIO LAP 8
	525		RADIO LAP 9
	526		RADIO LAP A
	527		RADIO LAP B
	528		RADIO LAP C
	529		RADIO LAP D
	530		RADIO LAP E
	531		RADIO STOP
	532		Serial B RADIO Inputs RADIO START
	533		RADIO LAP 1
	534		RADIO LAP 2
	535		RADIO LAP 3
	536		RADIO LAP 4
	537		RADIO LAP 5
	538		RADIO LAP 6
	539		RADIO LAP 7
	540		RADIO LAP 8

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
			541 RADIO LAP 9
			542 RADIO LAP A
			543 RADIO LAP B
			544 RADIO LAP C
			545 RADIO LAP D
			546 RADIO LAP E
			547 RADIO STOP
Logical Channel	3		Imputed by PC 000<= Logical channel <=255 000=START 001..240= LAP n 248=REAL_START_CBASE 249=TIME_RESET_CBASE 250=Generic Lap 255=STOP 245=SHOW JUMPING INFORMATION (only if a penalty is requested)
			900 PC For simple stopwatch: SPLITs with LAP have a range from 001 to 200, SPLITs without LAP have a range from 201 to 240. If the maximum number is exceeded the previous item of data is cancelled. The finishes following the first are considered as LAP. Real time of start event in simple stopwatch mode Time of reset event on simple stopwatch when it counts down
Information	1	48, 30h 49, 31h 50, 32h 51, 33h 52, 34h 53, 35h 54, 36h 55, 37h 56, 38h 57, 39h 84,54h 65, 41h 81, 51h 80, 50h 97, 61h 83, 53h 115, 73h 75, 4Bh	0=Time of day 1=Run net time (split) 2=Total net time (split) 3=Lap net time 4=Speed 5=Time speed 6=Air Temp. 7=Snow Temp. 8=Humidity 9=Average speed (non radio) T=Average start-stop speed A= A (non-finisher) Q=SQ (disqualified) P=NP (not started) a=Annulled S=Skipped not yet assigned s=Skipped already assigned K=Manually modified time event

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
		71,47h	G=Effective time of phase is different from 0 only if the competition has two phases and phase 2 has been finished
		72,48h	H=Total time tab. A
		104,68h	h=Total time tab. C (without penalties)
		73,49h	l=Penalties imposed tab. A
		105,69h	i=Penalties imposed (seconds) tab. C
		74,4Ah	J=Penalties for exceeding maximum time, tab. A
		106,6Ah	j=Penalties in seconds for exceeding maximum time, tab. C
		112, 70h	p=Total penalties, tab. A
		107,6Bh	k=Final time tab C. (with penalties)
		117, 75h	u = Time correction
		103,67h	g= Gundersen time (active only if it refers times to the first)
		99, 63h	C= Time event substituted
		85, 55h	U= Duration of competition suspension in Show Jumping program
		87, 57h	W= Wind speed
		119, 77h	w= Wind direction
		88 ,58h	X= Brightness
		90 ,5Ah	Z= Net lap time (only for Basic Stopwatch)
Time/Speed	10		Time in ten thousandths of a second 12345678980 corresponds to 12:34:56.7890 In the case of speed, the string means 123.456kmh When the info field is equivalent to I,J,K,i,j the penalty (points or seconds) is transmitted in hundredths in the form #####.#####
Date	8		Date in the following format 23122001 corresponds to 23/12/2001 In the case of net time it is the number of days in the following format ±1234567 If a penalty comes up indicates if this is positive or negative
Dummy char	2		Free bytes for future applications
CR	1	13,0Dh	Carriage Return
LF	1	10,0Ah	Line feed

4.1.2. Reduced REI2 protocol

Total 33 bytes

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
DC4	1	20, 14h	Protocol identifier
Device address Identifier of requesting device	1	32,20h (spac)	Reserved for future uses
	1		0..9 A..z
Competitor N° Information	5		If the output is enabled by REI2 the code is 20h ' ' 00000<= N <=59999 If group time, first two characters are spaces " " (32.20h) 000<= N <= 999
	1	65, 41h	A=Run running time (split)
		66, 42h	B=Total running time (split)
		67, 43h	C=Lap running time
		68, 44h	D=Dynamic output running time
		80, 50h	P=Running penalties ²
		69, 45h	E= Gundersen running time
		84, 54h	T= Running gap positive
		83, 53h	S= Running gap negative
		97, 61h	a=Run net time (split)
		98, 62h	b=Total net time (split)
		99, 63h	c=Lap net time
		100,64h	d=Dynamic output net time
		112, 70h	p=Penalties total
		101,65h	e= Gundersen net time
		116, 74h	t= Net gap positive
		115, 73h	s= Net gap negative
Time	10		Net time in ten thousandths of a second is padded with zeros depending on the precision set 0034567800 corresponds to 00:34:56.7800
Number of days	1	43, 2Bh (48,30h) .. (57,39h)	"-" = negative number of days ³ 0..9 Number of days
		45, 2Dh	"+" = number of days of net time is greater than 9 ³
		82, 52h	R= in PARALLEL or DUAL TIMER program for RED track
Run/Trial		66, 42h	B= in PARALLEL or DUAL TIMER program for BLUE track
Lap	3		001<= Nm <=250 ²
	3		000<= Nlap <=240
Position	3		If the information does not refer to an intermediate, 000 is sent
		48, 30h (3 times)	000= Calculation of ranking disabled
		45, 2Dh (3 times)	"---" = the ranking is being recalculated
		43, 2Bh (3times)	"+++" = the position of the competitor is greater than 999
Dummy char	2		Free bytes for future applications
CR	1	13,0Dh	Carriage Return
LF	1	10,0Ah	Line feed

² For Show Jumping, the run of phase 1 can range from 1 to 99, the run of the second phase from 100 to 198

² The penalty comes up at the same time as running time

³ If a penalty comes up indicates if this is positive or negative

4.1.3. 'Static' reply

Total 52 bytes

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
DC2	1	18,12h	Protocol identifier
Stopwatch identifier	1		R=REI2
Device address	1	32,20h (space)	Reserved for future uses
Program in use	1		S=Single Starts G=Group starts B=Simple stopwatch P=Parallel I=Show Jumping N=Swimming T=Track Chase O=Pc OnLine
Mode	1		F=OffLine
Status reply	1		R: the record transmitted refers to the n _th request E: the record transmitted is the last for the n _th request Z: response not available for the n _th request
Identifier of requesting device	1		0..9 A..z
Identifier reply	5	00000<= Nresponse <=99999	Progressive number which identifies the PC request, or progressive number for information sent autonomously in on-line and off-line modes.
Competitor N°	5	00000<= N <=59999	
Group/Category	3	000<= Ng <=199	If the Group/Category is equal to zero or the Groups/Categories have not been defined or the information filtered by group is not being downloaded (it is not always downloaded because the competitor could belong to more than one group)
Run/Trial	3	001<= Nm <=250	
Physical channel ³	3	000<= Physical channel <=255	Channel Description Main Lines 000 Start Line 001 Lap Line 015 Stop Line

³ Note: for the simple stopwatch and the parallel, the output has a different meaning:

- **SIMPLE STOPWATCH:** The output data item is the number of events of the race set which have been memorised. If the event is a stop, it is the lap number
- **PARALLEL:** The output data item is the progressive number of direct contests

Description	N° bytes (Dec, Hex)	ASCII Code	Notes
	016		Aux Line
	100		Start Key
	101		Lap Key
	115		Stop Key
	116		Aux Key
	200		Auto Start
	300		Keyb Start
	301		Keyb Lap
	315		Keyb Stop
Pod Inputs	400..407		POD 0
	410..417		POD 1
	420..427		POD 2
	430..437		POD 3
	440..447		POD 4
	450..457		POD 5
	460..467		POD 6
	470..477		POD 7
	480..487		POD 8
	490..497		POD 9
Via Radio Inputs	500		RADIO START
	501		RADIO LAP 1
	502		RADIO LAP 2
	503		RADIO LAP 3
	504		RADIO LAP 4
	505		RADIO LAP 5
	506		RADIO LAP 6
	507		RADIO LAP 7
	508		RADIO LAP 8
	509		RADIO LAP 9
	510		RADIO LAP A
	511		RADIO LAP B
	512		RADIO LAP C
	513		RADIO LAP D
	514		RADIO LAP E
	515		RADIO STOP
Retrieved by Encoder	600		ENC START
	601		ENC LAP 1
	602		ENC LAP 2
	603		ENC LAP 3
	604		ENC LAP 4
	605		ENC LAP 5
	606		ENC LAP 6
	607		ENC LAP 7
	608		ENC LAP 8
	609		ENC LAP 9
	610		ENC LAP A
	611		ENC LAP B
	612		ENC LAP C
	613		ENC LAP D
	614		ENC LAP E
	615		ENC STOP
Imputed by RadioModem	700		
Serial A RADIO Inputs	516		RADIO START
	517		RADIO LAP 1
	518		RADIO LAP 2
	519		RADIO LAP 3

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
			520 RADIO LAP 4
			521 RADIO LAP 5
			522 RADIO LAP 6
			523 RADIO LAP 7
			524 RADIO LAP 8
			525 RADIO LAP 9
			526 RADIO LAP A
			527 RADIO LAP B
			528 RADIO LAP C
			529 RADIO LAP D
			530 RADIO LAP E
			531 RADIO STOP
		Serial B RADIO Inputs	532 RADIO START
			533 RADIO LAP 1
			534 RADIO LAP 2
			535 RADIO LAP 3
			536 RADIO LAP 4
			537 RADIO LAP 5
			538 RADIO LAP 6
			539 RADIO LAP 7
			540 RADIO LAP 8
			541 RADIO LAP 9
			542 RADIO LAP A
			543 RADIO LAP B
			544 RADIO LAP C
			545 RADIO LAP D
			546 RADIO LAP E
			547 RADIO STOP
		Imputed by PC	900 PC
Logical Channel	3	000<= Logical channel <=255 000=START 001..240= LAP n	<p>The SPLITs with LAP have a range from 001 to 200 (corresponding to the number of times the stop button is pressed) SPLITs without LAP have a range from 201 to 240. If the maximum number is exceeded, the previous data item is cancelled The finishes following the first are considered as LAP.</p> <p>248=REAL_START_CBASE Real time of start event in simple stopwatch mode</p>

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
			249=TIME_RESET_CBASE Time of reset event on simple stopwatch when it counts down
			250=Generic Lap
			255= STOP Time of first competitor at finish
			245= SHOW JUMPING INFORMATION (only if a penalty is requested)
Information	1	48, 30h	0=Time of day
		49, 31h	1=Run net time (split)
		50, 32h	2=Total net time (split)
		51, 33h	3=Lap net time
		52, 34h	4=Speed
		53, 35h	5=Time speed
		54, 36h	6=Air Temp.
		55, 37h	7=Snow Temp.
		56, 38h	8=Humidity
		57, 39h	9=Average speed (non radio)
		65, 41h	A=NA (non-finisher)
		81, 51h	Q=SQ (disqualified)
		80, 50h	P=NP (not started)
		97, 61h	a=Time event deletion
		110, 6Eh	n=Deletion of a previous non-finisher
		113, 71h	q=Deletion of a previous disqualified athlete
		112, 70h	p=Deletion of a previous non-starter
		83, 53h	S=Skipped not yet assigned
		115, 73h	s=Skipped already assigned
		75, 4Bh	K=Manually modified time event
		82,52h	R=Present position
		84,54h	T=Start-stop
		71,47h	G=Effective time of phase is different from 0 only if the competition has two phases and phase 2 has been finished
		72,48h	H=otal time tab. A
		104,68h	h=Total time tab. C (without penalties)
		73,49h	l=Penalties imposed tab. A
		105,69h	i=Penalties imposed (seconds) tab. C
		74,4Ah	J=Penalties for exceeding maximum time, tab. A
		106,6Ah	j=Penalties in seconds for exceeding maximum time, tab. C
		112, 70h	p=Total penalties, tab. A
		107,6Bh	k=Final time tab C. (with penalties)
		103,67h	g= Gundersen time (active only if it refers times to the first)
		99, 63h	u= Time event substituted
		87, 57h	W= Wind speed
		119, 77h	w= Wind direction
		88 ,58h	X= Brightness
Time/Speed	10		Time in ten thousandths of a second 12345678980 corresponds to 12:34:56.7890 In the case of speed, the string means 123.456kmh

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
Date	8		Date in the following format 23122001 corresponds to 23/12/2001 In the case of net time it is the number of days in the following format ±1234567
Dummy char	2		If a penalty comes up, indicates if this is positive or negative Free bytes for future applications
CR	1	13,0Dh	Carriage Return
LF	1	10,0Ah	Line feed

4.1.4. Error reply

Total bytes: 10

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
ETB	1	23,17h	Protocol identifier
Stopwatch identifier	1		R=REI2
Device address	1	32,20h (space)	Reserved for future uses
Identifier of requesting device	1		0..9 A..z
Identifier requested	3		000<= Nrequest <=999 Progressive number which identifies the PC request The reply is indicated by the same number If an error has occurred before reception of the request code, 000 is shown
Type of error found	1	48,30h 49,31h 50,32h 51,33h 52,34h 53,35h 54,36h 55,37h 56,38h 57,39h 66, 42h 67, 43h 68, 44h 69, 45h 70, 46h 71, 47h 72, 48h 73, 49h 74, 4Ah 75, 4Bh 76, 4Ch 77, 4Dh	0=request identifier 1=type of information 2=competitor number 3=logical channel 4=run 5=group 6=time 7=date 8=periodicity 9=serial output B=periodicity C=status code D=identifier of requesting device E=identifier stopwatch F=time sign G=device address H=dynamic request error A I=dynamic request error B J=competitor number reference for dynamic stop K=logical channel reference for dynamic stop L=run reference for dynamic stop M= start lists
CR	1	13,0Dh	Carriage Return
LF	1	10,0Ah	Line feed

4.1.5. REI2 status reply

Total bytes: 24

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
CAN	1	24,18h	Protocol identifier
Stopwatch identifier	1		R = REI2
Device address	1	32,20h (space)	Reserved for future uses
Identifier of requesting device	1		0..9 A..z (' ' = no requesting device)
Identifier requested	4		0001<= Nrequest <=0999 Progressive number which identifies the PC request If the first byte is equal to E, it identifies the end of the information requested. For example, E123 identifies that the replies sought by request 123 have finished
Status code requested	4		0000= Net times (total, runs, lap) 1000= Precision set 2000= Status of main lines 3000= Status of pod lines 4000= Runs excluded from total time calculation 5xxx= Logical channel xxx disactivation times 6000= Main lines N/O N/C configuration 7000= Dynamic outputs status 8000= Software configuration 9999= Device basic information
Information requested	10		Contains case by case the value of the data requested. See chap. 4.1.6 REI2 status reply codes on p. 22
CR	1	13,0Dh	Carriage Return
LF	1	10,0Ah	Line feed

Bytes 1..9	Data	<p>'5' = Points race with eliminations</p> <p>'1' = Phase 1 Table ⁽⁴⁾ : 'A' 'C'</p> <p>'2' = Phase 2 Table ⁽⁴⁾ : 'A' 'C'</p> <p>'3' = Phase 1 Maximum T ⁽²⁾ '4' = Phase 1 T Limit ⁽²⁾ '5' = Phase 2 Maximum T ⁽²⁾ '6' = Phase 2 T Limit ⁽²⁾ '7' = Penalty ranking ⁽⁴⁾ : '0' = Ascending '1' = Descending</p> <p>'8' = 1° if having 0 penalties ⁽⁴⁾ : '0' = No '1' = Yes</p> <p>'9' = Points precision ⁽⁴⁾ : '0' = Unit '1' = Hundredths '2' = Thousandths</p> <p>'A' = Race number</p> <p>⁽¹⁾ = Time in thousandths of a second format HH:MM:SS.dcm (12:34:56.789 is 123456789)</p> <p>⁽²⁾ = Time in thousandths of a second format SSSSSS.dcm (12345.678 is 012345678)</p> <p>⁽³⁾ = Decimal into thousandths (12345.678 is 012345678)</p> <p>⁽⁴⁾ = Padded string right alignment spaces ('MGATE' is ' MGATE')</p>
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**Request
9999=Basic
Configuration of
device**

Byte 0:	Type of device (R=Rei2)	
Byte 1:	Address	
Byte 2:	Program set	
	SINGLE STARTS	0
	GROUP STARTS	1
	SIMPLE_STOPWATCH	2
	PARALLEL	3
	SHOW JUMPING	4
	SWIMMING	5
	TRACK CHASE	6
	PC_ONLINE	7
	None	9
Byte 3:	Program configuration	
	To be defined	
Byte 4:	Number of devices connected to REI2NET	
Bytes 5..8	Serial number	

Byte 9 not used

4.2. Data transmission from PC to REI2

4.2.1. 'Static' request

Total 24 bytes

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
DC1	1	17,11h	Protocol identifier
Stopwatch identifier	1		R = REI2
Device address	1	32,20h (space)	Reserved for future uses
Identifier of requesting device	1		0..9 A..z
Identifier requested	3		000<= Nrequest <=999 Progressive number which identifies the PC request The reply is marked by the same number
Competitor N°	5		00000<= N <=59999 00000= Sends the type of information wanted for all the numbers which satisfy the request In the case of a group start, if you are searching for a start you must specify the group number
Information	1	48, 30h 49, 31h 50, 32h 51, 33h 52, 34h 53, 35h 54, 36h 55, 37h 56, 38h 57, 39h 65, 41h 81, 51h 80, 50h 97, 61h 83, 53h 115, 73h 84,54h 75, 4Bh 76,4Ch 116,74h 82,52h 42,2Ah 71,47h 72,48h 104,68h 73,49h 105,69h 74,4Ah	0=Time of day 1=Run net time (split) 2=Total net time (split) 3=Lap net time 4=Speed 5=Time speed 6=Air Temp. 7=Snow Temp. 8=Humidity 9=Average speed (non radio) A=NA (non-finisher) Q=SQ (disqualified) P=NP (not started) a=Annulled S=Skipped not yet assigned s=Skipped already assigned T=Average start-stop speed K=Manually modified time event L=Last lap of competitor set t=All laps of competitor set R=Present position *=All time events, including NA,SQ,NP, skipped G=Effective time of phase is different from 0 only if the competition has two phases and phase 2 has been finished H=Total time tab. A h=Total time tab. C (without penalties) l=Penalties imposed tab. A i=Penalties imposed (seconds) tab. C J=Penalties for exceeding maximum time, tab. A

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
		106,6Ah	j=Penalties in seconds for exceeding maximum time, tab. C
		112, 70h	p=Total penalties, tab. A
		107,6Bh	k=Final time tab C. (with penalties)
		117, 75h	U= Time correction
		103,67h	g= Gundersen time (active only if it refers times to the first)
		87, 57h	W= Wind speed
		119, 77h	w= Wind direction
		88, 58h	X= Brightness
		108, 6Ch	l= All time events not yet sent
		98, 62h	b= All time events not yet sent (waiting for acknowledge)
		99, 63h	c= All net run times not yet sent (waiting for acknowledge)
		100, 64h	d= All total net times not yet sent (waiting for acknowledge)
		113, 71h	q= acknowledge of last static request with type of information "b", 'c', or 'd'
Logical channel	3		000<= Logical channel <=255 000=START 001..240= LAP n 248=REAL_START_CBASE ⁴ 249=TIME_RESET_CBASE ⁵ 251=All events 255= STOP
Run	3		0<= Nm <=250 ⁶ 0= all runs
Group	3		0<= Ng <=199
Output	1		If the Group/Category is equal to zero, this means all the groups Serial port on which response is sent S=same serial port as request A=serial port A B=serial port B T=both ports
CR	1	13,0Dh	Carriage Return

⁴ Real time of start event in basic stopwatch mode

⁵ Time of reset event in basic stopwatch when it counts down

⁶ For Show Jumping the phase 1 run can range from 1 to 99, the second phase run from 100 to 198

4.2.2. 'Dynamic' request

Total 46 bytes

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
DC1	1	19,13h	Protocol identifier
Stopwatch identifier*	1		R = REI2
Device address*	1	32,20h (space)	Reserved for future uses
Identifier of requesting device	1		0..9 A..z
Identifier requested*	1		A= activation dynamic output 1/ tick A B= activation dynamic output 2 / tick B a= disactivation dynamic output 1/ tick A b= disactivation dynamic output 2 / tick B T= activation of data output of competitor specified on displayboard ⁷ t= disactivation of data output of competitor specified on displayboard
Competitor N°*	5		1<= N <=59999 0= generic time request: Tev=0 Taux=0 60000=tick activation request
Logical channel	3		Logical channel of reference for Tev time 0=START 1..240= LAP n 250=Generic Lap 255= STOP
Run	3		0<= Nm <=250 ⁸ 0=present run
Competitor N° of Stop ref.	5		1<= N <=59999 60000= time reference disactivation
Logical channel of Stop ref.	3		Logical channel of stop reference 0=START 1..240= LAP n 250=Generic Lap 255= STOP
Run of Stop ref.	3		0<= Nm <=250 ⁹ 0=present run
Sign	1		Taux time sign (0=positive, 1=negative)
Time	10		Taux time in ten thousandths of a second padded with zeros depending on the precision set 0034567800 corresponds to 00:34:56.7800
Date	1	(48,30h) .. (57,39h)	0..9 Number of days
Periodicity*	5		Period in hundredths of a second 12345 corresponds to 123.45 seconds
Output*	1		Serial port on which response is set S=same serial port as request A= serial port A B= serial port B T= both ports

⁷ The competitor is shown on the displayboard until the function is disabled, regardless of operations made on REI2.

⁸ For Show Jumping the phase 1 run can range from 1 to 99, the phase 2 run from 100 to 198

⁹ For Show Jumping the phase 1 run can range from 1 to 99, the phase 2 run from 100 to 198

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
CR*	1	13,0Dh	Carriage Return

4.2.3. Request for break, suspension and resumption of transmission, record repetition

Total bytes: 9

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
NAK	1	21,15h	Protocol identifier
Stopwatch identifier	1		R = REI2
Device address	1	32,20h (space)	Reserved for future uses
Identifier of requesting device	1		0..9 A..z
Operation specifier	1		C: interrupts the reply to the PC request xxx
Identifier requested	3		001<= Nrequest <=999
CR	1	13,0Dh	Carriage Return

Break request mode of use:
If the break request is sent before the relative static request -> nothing happens
If the static request has finished sending the data -> the break request has no effect
If the break request is sent after the relative static request -> the static request is immediately blocked

4.2.4. Status request

Total bytes: 13

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
SYN	1	22,16h	Protocol identifier
Stopwatch identifier	1		R = REI2
Device address	1	32,20h (space)	Reserved for future uses
Identifier of requesting device	1		0..9 A..z
Identifier requested	3		001<= Nrequest <=999 The reply is indicated by the same number
Information requested	10		Contains case by case the value of the data requested
Code of status requested	4		0000= net times (totals, runs,lap) 1000=Precision set 2000=Status of main lines 3000=Pod lines status 4000=Runs excluded from calculation of total time 5xxx= Logical channel disactivation times xxx 6000= N/O N/C configuration of main lines 7000= Dynamic outputs status 8000= Software configuration 9999=Basic device information
Output	1		Serial port on which response is set S=same serial port as request A= serial port A B= serial port B T= both ports
CR	1	13,0Dh	Carriage Return

4.2.5. Sending status modification

Byte total: 22

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
SYN	1	16,10h	Protocol identifier
Stopwatch identifier	1		R = REI2
Device address	1	32,20h (space)	Reserved for future uses
Identifier of requesting device	1		0..9 A..z
Request identifier	3		001<= Nrequest <=999 The reply is indicated by the number itself
Status code requested	4		0000= Net times (total, runs, lap) 1000= Precision set 2000= Logical channel for main lines 4000= Selection of runs for total time calculation 5000= Logical channel xxx disactivation times 6000= Main lines N/O N/C configuration 8000= Software configuration
Information	10		Contains case by case the value of the requested data
CR	1	13,0Dh	Carriage Return

4.2.6. Codes for sending status modification

Code 0000= net times (total, runs, lap)

Byte 0:

0= total net times
1= run net times
2= lap net times

Bytes 1..9 not used

Code 1000=Precision set

Byte 0:

0= 1s
1= 0.1s
2= 0.01s
3= 0.001s
4= 0.0001s

Byte 1:

Rounding off

0..9

Byte 2:

Truncation

0= No

1= Yes

Bytes 3..9 not used

Code 2000= Main lines logical channel

Bytes 0..2 physical channel of reference

Bytes 3..5 Logical channel set

Bytes 6..9 not used

Code 4000=Selection of Runs for total time calculation

Bytes 0..2

Selection of run for total time calculation

Byte 3

0= Disables

1= Enables

Bytes 4..9 not used

Code 5000= Disactivation times

Bytes 0..2 logical channel of reference

Bytes 3..7 Disactivation time in thousandths of
a second (12345 is 12.345 s)

Bytes 8..9 not used

Request 6000= N/O	0= N/O
N/C configuration	1= N/C
of main lines	

Byte 0: Configuration of START line

Byte 1: Configuration of LAP line

Byte 2: Configuration of STOP line

Byte 3: Configuration of AUX line

4.3. Event transmission from PC to REI2

4.3.1. Time insertion

Enabled only for Single/Group starts and PC-Online programs

Total bytes 37

Description	N° bytes	ASCII Code (Dec, Hex)	Notes
ETB	1	23, 17h	Protocol identifier
Stopwatch identifier	1		R = REI2
Device address	1	32,20h (space)	Reserved for future uses
Information	1	48,30h 65,41h 80,50h 97,61h	0= Chronological time A = NA (not finished) P = NP (not started) a = Annulled
Competitor N°	5		00001<= N <=59999
Logical channel	3		000<= Logical channel <=255 000=START 001..240= LAP n 255= STOP
Physical channel	3		900 PC
Run	3		0<= Nm <=250 ¹⁰
Time	10		Time in ten thousandths of a second padded with zeros according to the precision set 0034567800 corresponds to 00:34:56.7800
Date	8		Date in the following format 23122001 corresponds to 23/12/2001 In the case of net time it is the number of days in the following format ±1234567 If a penalty comes up, indicates if this is positive or negative
CR	1	13,0Dh	Carriage Return

¹⁰ For Show Jumping the phase 1 run can range from 1 to 99, the phase 2 run from 100 to 198

4.4. *Printout transmission from PC to REI2*


For sending strings to the REI2 printer.

Description	N° byte	Codice ASCII (Dec, Hex)	Notes
STR	1	25, 19h	Protocol identifier
	...		Text
CR	1	13,0Dh	Carriage Return
LF	1	10,0Ah	Line feed

5. Modification history

The following table summarises the main modifications made to the present document.

Program version	Chapter	Page	Description of intervention
1.03			Specific protocol updates, change in order of chapters.
1.07	1.4	6	New function Insertion of time events
1.07	2	7	Inserted in chap. General information about the REI2- PC protocol indications for displayboard piloting.
1.07	4.3	35	Insertion of specifications for Event transmission from PC to REI2
1.07.9	1.4	6	Running time explanation added
1.08.4	4.1.2	14	Group time explanation added
1.08.5	4.2.5 e 4.2.6	32 - 33	Status modification functions and results.
1.08.6			No substantial modification.
1.09.2			New information.
1.09.5			Removed references AUX channel 254
1.09.5	4.3.1	35	Fix length error in Time insertion

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The software and manuals are available in the following languages: Italian, English, German and French.

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