iTach Flex TCP API Specification

Version 1.2

INDEX

1. ITACH FLEX DISTRIBUTED DESIGN CONCEPT

The iTach Flex's low impact, multifunctional design provides a variety of capabilities. Each iTach Flex contains power and network connections as well as a 4 conductor 3.5mm jack (female) which by way of peripherally connected Flex Link cables provides many different functions including: Relay, Contact Closure, Infrared (IR), Serial communications (RS232), multiple IR via the IR Tri-port cable, and IR Blaster.

I/O Connectors:

The iTach Flex Link Port is a 4 conductor 3.5mm I/O connector. Settings such as RS232 connection settings (baud, parity etc.) must be configured through the unit's web interface or by way of TCP commands.

2. CONFIGURING THE ITACH FLEX IP ADDRESS

The WiFi iTach Flex can be configured in a few different ways. In order to configure the unit wirelessly, a wireless device such as a laptop or iPad must be used to connect to the unit's adhoc network. The iTach Flex's default address is 192.168.1.70 when in adhoc mode. Once connected, a web browser pointed to the IP address of the unit will allow you to configure the unit's settings.

iTach Flex WiFi units also support WiFi Protected Setup (WPS), which is triggered by holding down the button located on the side of the iTach Flex for three seconds and releasing (the LED will blink quickly to confirm WPS mode) or by using the WPS button located inside the embedded web configuration pages of the Flex WiFi. The TCP/IP connected iTach Flex is set by default to use DHCP to automatically obtain an IP address from the router. To determine the IP address of an iTach Flex using

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DHCP, run iHelp found at www.globalcache.com/downloads. Within moments of network negotiation, the iTach Flex will announce its IP address, firmware revision, and MAC ID via a network wide beacon broadcast, which iHelp displays. The iTach Flex will also periodically announce its IP address at intervals every 10 seconds while powered up to maintain up-to-date iHelp display information. The iHelp display may be refreshed from right click options in iHelp.

3. DISCOVERY BEACON

The iTach Flex features a beacon message that can assist in locating iTach Flex units on the network. The beacon is a UDP packet sent to the multicast IP address 239.255.250.250 on UDP port number 9131. Any system listening to this address and port will receive the periodic beacon message. The message is sent shortly after power on and then at intervals of 10 seconds thereafter.

The beacon message has the following format: (field values are for example only)

AMXB<-UUID=GlobalCache_000C1E024239><-SDKClass=Utility>
<-Make=GlobalCache><-Model=iTachFlex><-Revision=710-2000-01>
<-Pkg_Level=GCPK004><-Config-URL=http://192.168.1.100.><-PCB_PN=025-0026-06>
<-Status=Ready>

Model can be: |iTachFlexEthernet|iTachFlexEthernetPOE|iTachFlexWiFi|

The UUID value contains the unique MAC address of the iTach Flex which is also the name registered with the DHCP server.

Ethernet (TCP/IP) communicates by way of an RJ45 100/10 Mbit/s connection, and WiFi is a standard 802.11g wireless interface.

4. COMMAND AND DATA STRUCTURE

Communication with the iTach Flex is accomplished by opening a TCP socket on Port 4998. All commands and data, with the exception of serial (RS232) data, are communicated through Port 4998. Port 4998 is used for such things as iTach Flex status and IR data. All information, with the exception of serial data, is communicated by comma delimited ASCII text strings terminated by a carriage return (↵).

Serial data is communicated via TCP port 4999, and is not interpreted or altered by the iTach Flex before being sent via the serial connection.

5. COMMAND SET

Commands are initiated by short ASCII string representing the command type. Typically, physical address and data information will follow. The structures of iTach Flex commands are described in the following sections. Text enclosed in brackets (<text>) must be substituted by its ASCII definition. Multiple ASCII choices are divided by separator (|) characters.

Note: Commands **are** case sensitive.

Example: The network settings are queried with the get_NET command:

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get_NET,<connectoraddress>↵
where:
<connectoraddress> is 0:1 (network module address)
The command ASCII string sent to the iTach Flex is:
get_NET,0:1↵

Note: get_NET command is documented fully in section **5.1** below.

5.1 GENERAL COMMANDS

getdevices

This iTach Flex command is used to determine installed modules and capabilities. Each module responds with its address and type. This process is completed after receiving an endlistdevices response.

Sent to iTach Flex:

getdevices↵ (query for modules and capabilities)

device

Sent from each iTach Flex module in response to getdevices:

device,<moduleaddress>,<moduletype> (one sent for each module)
where for iTach Flex products;
<moduleaddress> is |0|1|
<moduletype> is |WIFI|ETHERNET|IR|SERIAL|IR_BLASTER|IRTRIPORT|
|IRTRIPORT_BLASTER|

All modules are included in the response followed by endlistdevices↵
The following are the possible iTach Flex responses to a getdevices command.

device,0,0 WIFI↵device,1,1 IR↵endlistdevices↵	for WiFi with IR mode
device,0,0 WIFI↵device,1,1 SERIAL↵endlistdevices↵	for WiFi with SERIAL mode
device,0,0 ETHERNET↵device,1,1 IR↵endlistdevices↵	for IP with IR mode
device,0,0 ETHERNET↵device,1,1 SERIAL↵endlistdevices↵	for IP with SERIAL mode

getversion

The module version number may be obtained from any or all modules in an iTach Flex.

Sent to iTach Flex:

getversion↵

Sent from iTach Flex in response to getversion:

<textversionstring>↵

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Phone: 541-899-4800
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where:
<textversionstring> is the version number ASCII string

get_NET

This command will retrieve the current network settings and return a comma delimited string with the network settings.

Sent to iTach Flex:

get_NET,0:1↵

Sent from iTach Flex in response to get_NET command:

NET,0:1,<configlock>,<ipsettings>,<ipaddress>,<subnet>,<gateway>↵

where;
<configlock> |LOCKED|UNLOCKED|
<ipsettings> |DHCP|STATIC|
<ipaddress> is the assigned network IP
<subnet> is the unit's subnet mask
<gateway> is the current network gateway

Errors

An ERR response will be sent by the iTach Flex when a command is not understood. This can happen if, for example, a connector is set up as a digital input and the command requested is sendir.

Sent from iTach Flex in response to unknown commands:

ERR [error code]↵

Note: Definitions are contained in the **Error Codes** table in section **6**.

5.2 SERIAL CONNECTION

iTach Flex serial RS232 (which requires the Flex Link Serial Cable) is bi-directional RS232 communication. Parity, hardware flow control, and baud rate are set through the iTach Flex internal web page or via configuration command, with baud rate enabled up to 115200 baud.

All serial data is passed through without interpretation or conversion via an assigned, unique IP port. The iTach Flex serial connector mode is assigned to IP Port 4999.

If a serial connector is not configured correctly, buffer overflows (indicating data loss), or parity errors will occur. Any errors will be captured and presented on the Global Port web page to aid in proper setup. Settings such as Serial Multiconnection Mode are only accessible from the Serial web page.

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5.2.1 SERIAL COMMANDS

The below serial commands are only active if the unit is in the RS232 communication mode. Any of these commands sent to a iTach Flex not in RS232 mode will result in an error response.

set_SERIAL

This command allows for configuration of the iTach Flex serial.

Sent to iTach Flex:

set_SERIAL,1:1,<baudrate>,<flowcontrol>,<parity>↵

where:
1:1 is the iTach Flex serial connector's address
<baudrate> is |115200|57600|38400|19200|14400|9600|4800|2400|1200|600|
<flowcontrol> is |FLOW_HARDWARE|FLOW_NONE|
<parity> is |PARITY_NO|PARITY_ODD|PARITY_EVEN|

Example:

set_SERIAL,1:1,38400,FLOW_HARDWARE,PARITY_NO↵

This command string will set the iTach Flex serial connector to operate at 38400 baud with hardware flow control and no parity.

get_SERIAL

This command will retrieve the current iTach Flex serial settings.

get_SERIAL,1:1↵

SERIAL

Sent from iTach Flex in response to set_SERIAL and get_SERIAL.

SERIAL,1:1,<baudrate>,<flowcontrol>,<parity>↵

5.2.2 RS232 MULTIPLE CONNECTION MODE

This mode enables eight simultaneous TCP sockets to iTach Flex port 4999. In this mode, each socket can transmit data out the serial connector on a packet-by-packet basis. Each packet received for port 4999 will be transmitted completely before another packet (from the same or different socket) is transmitted out the serial connector. This ensures complete commands can be received and understood by the serially-connected device. The only requirement is for each entire command(s) to be sent in one TCP packet. All serial data received by the serial connection is transmitted to all OPEN TCP sockets on port 4999, allowing each connected application to maintain and update serial device status. This mode can only be enabled or disabled from the **Serial** settings web page.

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Fax: 541-899-4808

5.3 RELAY

iTach Flex relays are activated by sending a <1> state (close contacts), and deactivated by a <0> state (open contacts). Relay states are not preserved through a power cycle and all relays will go back to their inactive (open) state until a <1> state is restored via command.

5.3.1 RELAY COMMANDS

setstate

Relay state is set as follows:

setstate,1:1,<outputstate>↵	for relay port 1
setstate,1:2,<outputstate>↵	for relay port 2
setstate,1:3,<outputstate>↵	for relay port 3
setstate,1:4,<outputstate>↵	for relay port 4

where;

<outputstate> is |0|1| (<0> is open, <1> is closed)

Sent from iTach Flex in response to setstate:

state,1:1<0|1>↵	for relay port 1 state
state,1:2<0|1>↵	for relay port 2 state
state,1:3<0|1>↵	for relay port 3 state
state,1:4<0|1>↵	for relay port 4 state

getstate

Relay state is read/queried as follows:

Sent to iTach:

getstate,1:1↵	for Relay port 1 state
getstate,1:2↵	for Relay port 2 state
getstate,1:3↵	for Relay port 3 state
getstate,1:4↵	for Relay port 4 state

Response from iTach:

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Jacksonville, Oregon 97530
Phone: 541-899-4800
Fax: 541-899-4808

where;

<outputstate> is |0|1| (<0> is open, <1> is closed)

5.4 IR

iTach Flex units can be used to emulate any standard IR signal for controlling IR devices. ITach Flex IR related commands are detailed below.

5.4.1 IR COMMANDS

set_IR

This command allows configuration of each Flex Link Port to the desired mode of operation. The possible modes are IR output, Tri-port IR, Tri-port blaster, and IR blaster. The IR blaster is supported on the individual Flex Link Port as well as the third Tri-port connector.

Sent to iTach:

set_IR,1:1,<mode>↵

where:
<mode> is |IR|SERIAL|IR_BLASTER|IRTRIPORT|IRTRIPORT_BLASTER|

Example:

set_IR,1:1,IR↵

This will set the connector to single IR emitter mode.

Sent from iTach in response to the above example:

IR,1:1,IR↵

Note: IR Tri-port cables multiplex the Flex Link Port into three connectors which are accessed and controlled by altering the connector address. The three connectors on a Tri-port cable are addressed <1:1>, <1:2> and <1:3>.

get_IR

This command will retrieve the current mode setting for a designated connector.

Sent to iTach:

get_IR,1:1↵ for the 1st Flex Link Port

This will set the Flex Link Port to Serial RS232 mode.

Sent from iTach in response to get_IR query:

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IR,1:1,<IR|SERIAL|IR_BLASTER|IRTRIPORT|IRTRIPORT_BLASTER>↵

stopir

A stopir command is used to halt IR transmission. Any remaining <repeat> counts will be discarded. A stopir command sent to a connector configured as an input will return an error message. An IR transmission halted with the stopir command will return a stopir response. Furthermore, if an IR command is halted before its completion by another connection, the originating IR connection and the connection sending stopir will both receive a stopir response. If stopped, the originating connection will not receive a completeir response.

Sent to iTach Flex:

stopir,1:1↵ to stop the IR transmission

Sent from iTach Flex in response to stopir command:

stopir,<connectoraddress>↵

where;
<connectoraddress> is as defined in stopir command

A stopir command always returns a stopir response regardless if the connector is idle or an IR transmission is actually halted. A stopir response means only that the stopir command was successfully sent to the iTach Flex, and any transmission has been halted.

busyIR

A busyIR response occurs when an IR command is received by an iTach Flex connector that is already sending an IR transmission. If multiple IP connections are present (i.e. from multiple iPhone users) there is a possibility of an IR transmission not being transmitted. This occurs when an IR command is sent to the same IR connector from another IP connection, and will cause a busyIR response.

A busyIR response does not occur if the two IR commands are executed on different IR connectors.

Sent from iTach Flex in response to an attempt to interrupt IR transmission by another IP connection or socket:

busyIR,1:1,<ID>↵

where:
<ID> is |0|1|2|…|65535| (ID is specified in sendir command)

Note: The busyIR response is returned to the originator of the unexecuted IR command. A command to stopir will only return the stopir response. At no time will a command of stopir return a response of busyIR.

5.4.2 IR STRUCTURE

An IR, or infrared transmission, is created by sending an IR timing pattern to the iTach Flex. This pattern is a collection of <on> and <off> states modulated with a carrier frequency (ƒ) which is present during the <on> state. A carrier frequency is typically between 35 to 45 KHz with some equipment manufacturers using as high as 500 KHz. The length of time for an <on>

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Jacksonville, Oregon 97530
Phone: 541-899-4800
Fax: 541-899-4808

or <off> state is calculated in units of the carrier frequency period. For example, an <off> value of 24 modulated at 40 KHz produces an <off> state of 600µS, as calculated below.

A period is 1 /ƒ or 1/40000 or .000025 seconds or 25µS,
and a value of 24 periods is 600µS

Figure 5.4.1 illustrates an IR timing pattern that would be created for the value shown below. IR timing patterns typically have a long, final <off> value (or rest state) to ensure the next IR command is interpreted as a separate IR transmission.

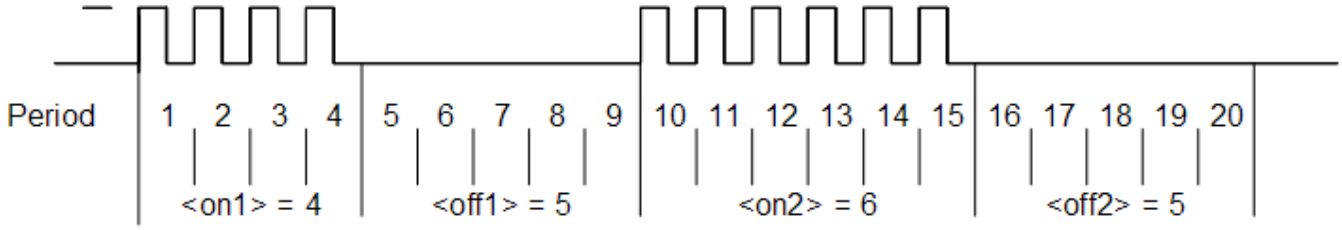

Figure 5.4.1

5.4.3 SENDING IR

Control of IR devices is accomplished through use of the sendir command. Since IR commands may take up above 100mS to complete, the iTach Flex provides a completeir acknowledgment to indicate when it is ready to accept the next IR command.

sendir

Sent to iTach Flex:

sendir,1:1,<ID>,<frequency>,<repeat>,<offset>,<on1>,

<off1>,<on2>,<off2>,….,<onN>,<offN>↵ (where N is less than 260 or a total of 520 numbers)

where;
<ID> is |0|1|2|…|65535| [1] (for the completeir response, see below)
<frequency> is |15000|15001|….|500000| (in hertz)
<repeat**>** is |1|2|….|50| [2] (the IR command is sent <repeat> times)
<offset> is |1|3|5|….|383| [3] (used if <repeat> is greater than 1, see below)
<on1> is |1|2|…|65635| [4] (number of pulses)
<off1> is |1|2|…|65635| [4] (absence of pulse periods of the carrier frequency)

[1] The <ID> is an ASCII number generated by the sender of the sendir command, which is included later in the completeir command to confirm completion of each respective sendir transmission.

[2] The <repeat> is the number of times an IR transmission is sent, if it is not halted early via a *stopir* or another IR command (see section 5.4). Values above 20 are accepted, but IR commands are sent only the maximum 20 times. In all cases, the preamble is only sent once (see <offset> below).

[3] An <offset> applies when the <repeat> is greater than 1. For IR commands that have preambles, an <offset> is employed to avoid repeating the preamble during repeated IR timing patterns. The <offset> value indicates the location within the timing

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Jacksonville, Oregon 97530
Phone: 541-899-4800
Fax: 541-899-4808

pattern to start repeating the IR command as indicated below. The <offset> will always be an odd value since a timing pattern begins with an <on> state and must end with an <off> state.

<offset> odd value	Repeat start locations	<offset> even value	should not point here	
1	<on1>	2	<off1>	no preamble
3	<on2>	4	<off2>	
….	….	….	….	
n-1	<on((n/2)-1	n	off(n/2)> where n is an even number	

(4) Since IR transmissions end in an <off> condition, there must be an equal number of <on> and <off> states. Also, every <on> and <off> state must meet an 80µS minimum time requirement for the iTach Flex to work properly.

Example: With a carrier frequency of 48 KHz, the minimum value for <on> and <off> states is calculated below.

$$<off>_{min} = <on>_{min} \geq 80\mu S * f = 80\mu S * 48KHz = 3.84$$

For proper iTach Flex operation, all <on> and <off> values in the timing pattern must be 4 or higher.

All of the conditions above must be met for valid sendir commands. When a variable is missing or outside the accepted range, an error will be sent by the iTach Flex. As an exercise, the sendir commands below will trigger an iTach Flex unknowncommand response.

sendir,10:3,3456,23400,1,1,24,48,24,960↵ iTach Flex module 10 does not exist

Response: ERR,03↵

sendir,1:1,23333,40000,2,3,24,48,24,48,960↵ not an equal number of <on> and <off>

Response: ERR,IR6↵

sendir,1:1,0,40000,2,2,24,48,24,960↵ <offset> is an even number

Response: ERR,IR4↵

IR compressed format assigns the first 15 *unique* <on><off> pairs capital letters (i.e. A,B,C, etc.) to represent them. In the event that a pair is used in many places inside an IR command, commands can be written with the capital letter in place of the designated pair without being offset by commas.

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Jacksonville, Oregon 97530
Phone: 541-899-4800
Fax: 541-899-4808

Example: The simple IR command

sendir,1:1,2445,40000,1,1,4,5,4,5,8,9,4,5,8,9,8,9↵

can be shortened with this feature: ("4,5" is assigned A, and "8,9" is assigned B)

sendir,1:1,2445,40000,1,1,4,5A8,9ABB↵

Both commands are syntactically correct, are accepted by the iTach Flex, and will transmit an identical IR command.

completeir

All successful sendir commands are acknowledged with a completeir response from the iTach Flex after completion of the IR transmission. The completeir response associates with the sendir command through an <ID>. When utilized, the <ID>s can provide a unique identifier to determine which IR transmission has completed.

Sent from iTach Flex in response to successful sendir:

completeir,1:1,<ID>↵ for the iTach Flex IR connector

where;

<ID> is |0|1|2|…|65535| (ID is specified by originating sendir command)

Example: A few simple IR commands are shown below:

The following will send the IR timing sequence illustrated in figure 4.2a to the IR connector on the iTach Flex shown in Figure 1.

Sent to iTach Flex:

sendir,1:1,2445,40000,1,1,4,5,6,5↵

Sent by iTach Flex in response to sendir:

completeir,1:1,2445↵

In the next example, the following two IR commands will send the same IR timing pattern.

Below are two ways to send the same simple IR timing pattern of 24,12,24,960 four times with a preamble of 34,48:

sendir,1:1,4444,34500,1,1,34,48,24,12,24,960,24,12,24,960,24,12,24,960,24,12,24,960↵
sendir,1:1,34,34500,4,3,34,48,24,12,24,960↵

Acknowledgments for above IR commands are:

completeir,1:1,4444↵
completeir,1:1,34↵

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Jacksonville, Oregon 97530
Phone: 541-899-4800
Fax: 541-899-4808

Although the same command is sent four times by both sendir commands, the <ID>s are different, and therefore cannot be considered the same command. The second IR command structure is the recommended method, avoiding long commands and allowing repetition of the command to be halted if requested.

5.4.4 SMOOTH CONTINUOUS IR COMMANDS

A general discussion is necessary to better understand how smooth continuous IR commands are executed by the iTach Flex. This desirable feature is utilized for smooth volume control or repeating an operation without the appearance of choppy actions. The approach of sending an IR command with very large repeat counts and stopping it upon request will work, but can lead to undesirable incidents. Consider the scenario of large repeat count IR command for raising the volume in a smooth fashion. The command works properly until the connection is broken. A repeating IR command is sent, volume continuously increases, then the controlling iPhone is unexpectedly dropped. The volume continues to rise (possibly damaging equipment) until a stopir command is ultimately received.

The iTach Flex solution is to limit the repeat count. Hence, to create a smooth IR operation, the iTach Flex resets the IR repeat count each time the identical IR command (from the same IP connection) is resent. This method will **not** interrupt and restart the IR command, but reset the IR repeat count back to the original value.

Example: If the IR repeat count is set to 5, and the IR command has transmitted 3 times, receipt of the same command causes the repeat count to be reset back to 5. This process can continue indefinitely while a volume button is held down to create a smooth operation. However, at no time can the command repeat more than 5 times after the button is released or an IP connection is inadvertently lost, preventing a potentially serious issue.

By selecting an appropriate <repeat> value, the need for a stopir command is eliminated. In this example the volume continues to increase smoothly by retransmitting repeated IR commands due to the volume button being pressed. As long as the next repeated IR command is received before the previous command finishes, smooth operation is realized. By choosing a low repeat value, the volume increase will stop when the volume button is released. Also, proper IR operations happen even with unintended network delays due to traffic or WiFi connectivity. In this unlikely event, only small hesitations will be experienced during IR operation.

In the event that the identical command is not received before the original command is finished, the command will be registered as a brand new command, and is sent as such. The command in question will operate functionally the same, but delays between commands may be evident when used in this way. Increasing the <repeat> value will likely eliminate these discrepancies.

5.4.5 IR LEARNING

Each iTach Flex unit contains an on-board IR learner, which is located inside the small hole located at the top center of your iTach Flex. IR Learner Mode is enabled by implementing the get_IRL command.

get_IRL

Sent to iTach Flex:

```
get_IRL↵
```

Sent from iTach Flex in response to get_IRL:

160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
Fax: 541-899-4808

IR Learner Enabled↵

Once enabled, the iTach Flex sends an uncompressed Global Caché format sendir command, terminated by a carriage return, through TCP packets via port 4998. Although the iTach Flex family of products supports up to eight simultaneous connections, the captured command will only be sent to the connection that initiated learner mode. Learner mode is disabled when iTach Flex units receive any command, or when stop_IRL is sent.

stop_IRL

Sent to iTach Flex:

stop_IRL↵

Sent from iTach Flex in response to stop_IRL:

IR Learner Disabled↵

6. ERROR CODES

The chart below provides a list of error messages returned by the iTach Flex from port 4998 and the explanation of each message. Messages are returned in the aforementioned syntax.

Error Message	Explanation
ERR 001	Invalid command. Command not found.
ERR 002	Bad command syntax used with a known command.
ERR 003	Invalid connector address (does not exist).
ERR 004	No carriage return found.
ERR 005	Command not supported by current Flex Link Port setting.
ERR 006	Settings are locked.
IR Error Codes	Explanation

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Jacksonville, Oregon 97530
Phone: 541-899-4800
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ERR IR001	Invalid ID value.
ERR IR002	Invalid Frequency
ERR IR003	Invalid Repeat
ERR IR004	Invalid Offset
ERR IR005	Invalid IR Pulse Value
ERR IR006	Odd amount of IR pulse values (must be even)
ERR IR007	Maximum pulse pair limit exceeded
Serial Error Codes	Explanation
ERR SL001	Invalid Baud Rate
ERR SL002	Invalid Flow Control Setting
ERR SL003	Invalid Parity Setting

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