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SIGNATURES

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Revision History

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Rev.** |  | **Date** |  | **Initials** |  | **Description** |
| 0.1 |  | 21-Sep-2006 |  | UH |  | Initial draft |
| 0.2 |  | 05-Oct-2006 |  | UH |  | Revise narrative based on feedback |
| 0.3 |  | 15-Jan-2007 |  | KK |  | Updated blade family table, 2.3c checksum description, 2.2e was d, 2.2g was e, added 2.2d and f |
| 0.4 |  | 16-Apr-2008 |  | DAT |  | The blade IDs sent to the DYONICS 25 by the DYONICS II shaver were updated to match those sent by the DYONICS Power |
| 0.5 |  | 02-May-2008 |  | KW |  | Updated signatory, Added System Specification Reference. |
| 0.6 |  | 06-Apr-2009 |  | KW |  | Reference DYONICS II EIP System Specification |
| A |  | 16-Oct-2009 |  | DAT |  | Initial Release |
| A.1 |  | 05-Apr-2016 |  | SW |  | Updated and revised document |
| B |  | 08-Mar-2017 |  | SW |  | Removed TBD and updated revision |
| B.1 |  | 09-Jul-2019 |  | DAT |  | Removed references to Old shaver and Old Pump  Replaces New Shaver and New pump with DII and D25 |
| C |  | 24=Sep-2019 |  | DAT |  | Updated to Revision C |

Glossary

DII – Refers to DYONICS POWER II Control System

D25 – Refers to DYONICS 25 Fluid Management system or subsequent pumps

References

15003857 – DYONICS D25 System Controller Software Requirements Specification

15004006 - DYONICS 25 System Controller Hardware Specification

15000694 – DYONICS II EIP System Specification

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# Overview

This document describes the protocol used for communication between shaver and pump devices.

# Protocol Elements

## Physical Layer

1. The physical layer used for the communication is the industry standard full-duplex RS232 bus used for point to point communication.
2. At the two ends of the bus are a shaver and a pump device.
3. Pin-outs, connectors, electrical levels and cables are specified in the DYONICS 25 System Controller Hardware Specification, or the DYONICS II EIP System Specification.

## Communication

1. 8 bit bytes are sent over the bus using no parity and one stop bit (8N1) at 1200 baud.
2. Each packet on the bus comprises multiple bytes.
3. The DII send packets:

* whenever a state change relevant to packet data happens
* whenever a pump packet is received

1. The DII sends 0xFF periodically approximately every ~600 ms.
2. The D25 sends packets periodically approximately every ~200 ms
3. Connection status timeouts are handled in a device specific manner.

## Pump Packet Format

1. A pump packet consists of three bytes, shown below in hex:

* C5 <PumpState> <CK>

1. <PumpState> is further encoded as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Bit(s)** | **Description** | **Encoding** | |
| 7 | Request for status (both pumps) | 1 | |
| 6 | Pump running indicator for new pumps | 0 | pump is off, |
| 1 | pump is on |
| 5-1 | Reserved | Always ‘0’ | |
| 0 | Pump | 0 | Reserved |
| 1 | Pump |

1. <CK> is the 8-bit twos complement checksum of the first two bytes.

## Shaver Packet Format

1. Shaver packets have either 6 or 7 bytes, in the following format (hex):

* <Prelude> <SpeedLow> <SpeedHigh> <BladeShaverState> <BladeFamily> [<PumpCommand>] <CK>
* <Prelude> is 18 for a DII connected to the DYONICS 25.
* <SpeedLow> and <SpeedHigh> are binary encoded LS and MS bytes, respectively, of the actual blade speed (as opposed to set speed). The encoding is in units of time (in milliseconds) if the MS bit of <SpeedHigh> is 1, otherwise it is in units of RPM.
* <BladeShaverState> is encoded as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Bit(s)** | **Description** | **Encoding** | |
| 7 | Reserved | 0 | |
| 6-4 | Shaver Type | 0 | DII |
| 1 | Reserved |
| 2 | Reserved |
| 3 | Reserved |
| 4 | Reserved |
| 5 | Reserved |
| 6 | Reserved |
| 7 | Reserved |
| 3-2 | Reserved | 0 | |
| 1-0 | Blade Direction | 0 | Off |
| 1 | Forward |
| 2 | Reverse |
| 3 | Any oscillate mode |

* <BladeFamily> encodes the type of blade connected, as follows:

|  |  |  |
| --- | --- | --- |
| **Value** | | **Maximum Blade Speed** |
| **Decimal** | **Hex** | **RPM** |
| 16 | 0x10 | 5000 |
| 17 | 0x11 | 3000 |
| 18 | 0x12 | 8000 |
| 19 | 0x13 | 10000 |
| 20 | 0x14 | 5000 |
| 21 | 0x15 | 3000 |
| 22 | 0x16 | 8000 |
| 23 | 0x17 | 10000 |
| 255 | 0xFF | Other |

* <PumpCommand> is enables the DII (or its accessories) to provide commands to send to a connected D25. It is encoded as follows:

|  |  |  |
| --- | --- | --- |
| **Value** | **<PumpCommand>** | **Description** |
| 0 | REMOTE\_NO\_ACTIVITY | No action |
| 1 | REMOTE\_INCREASE\_SET\_PRESSURE | Increment pressure, go into pressure change mode |
| 2 | REMOTE\_DECREASE\_SET\_PRESSURE | Decrement pressure, go into pressure change mode |
| 3 | REMOTE\_STOP\_SET\_PRESSURE | Stop the pressure change mode |
| 4 | REMOTE\_INCREASE\_FLOW\_LIMIT | Increment flow limit, go into flow limit change mode |
| 5 | REMOTE\_DECREASE\_FLOW\_LIMIT | Decrement flow limit, go into flow limit change mode |
| 6 | REMOTE\_STOP\_FLOW\_LIMIT | Stop the flow limit mode |
| 7 | REMOTE\_START\_PUMP | Start pump |
| 8 | REMOTE\_STOP\_PUMP | Stop pump |
| 9 | REMOTE\_START\_LAVAGE | Start Lavage |
| 10 | REMOTE\_STOP\_LAVAGE | Stop Lavage |
| 11 | REMOTE\_TOGGLE\_LAVAGE | Toggle state of lavage |

* <CK> is the 8-bit twos complement checksum of the preceding bytes