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Revision History

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Rev.** |  | **Date** |  | **Initials** |  | **Description** |
| 0.1 |  | 070110 |  | KK |  | Initial release |
| 0.2 |  | 070207 |  | KK |  | Updated after dry run |
| 0.3 |  | 090406 |  | KW |  | Blanked out for next run |
| 0.4 |  | 091026 |  | DAT |  | Added Protocol to the Document Title |
| A |  | 091026 |  | DAT |  | Initial Release |
| A.1 |  | 160824 |  | KW |  | Updated |
| B |  | 170313 |  | SW |  | Revised from A.1 to Rev B |
| B.1 |  | 09-Jul-2019 |  | DAT |  | Updated Document Format, Updated to 15000285 Rev B.1 |
| B.2 |  | 16-Aug-2019 |  | DAT |  | Update after review |
| C |  | 24-Sep-2019 |  | DAT |  | Update to Revision C |

Glossary

Shaver – Refers to DYONICS POWER II Control Unit

Pump – Refers to DYONICS 25 Fluid Management Control Unit

References

15000285 Shaver Pump Interface Protocol

EQUIPMENT

| **Equipment** | **Part Number** | **Serial Number** | **Software Version** |
| --- | --- | --- | --- |
| DYONICS 25 FMS | 7211010 |  |  |
| DYONICS POWER II | 72200873 |  |  |
| PowerMax Elite | 72200616 |  | N/A |
| Bernstien Footswitch | 7205396 |  | N/A |
| Low Profile Footswitch | 7205397 |  | N/A |
| DYONICS POWER II Footswitch | 72201092 |  |  |
| EZ-TAP and EZView |  |  |  |

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# Scope

This document tests the RS-232 communications between shaver and pump devices using protocol 15000285. Testing is confined to qualifying the data and packet formats, packet field contents, and transmission initiation. Subsequent device responsive actions are tested elsewhere. These tests focus on the compatibility of the DYONICS POWER II Shaver Control Unit and the DYONICS 25 Fluid Management System Control Unit.

# Protocol Elements

The following tests require a DYONICS POWER II connected to a DYONICS 25 via the S&N communication cables and EZ-Tap Pro. The EZ-TAP Pro is connected via a USB cable to a PC running EZ-View. Additionally, connect a footswitch and an MDU to the shaver. The EZ-TAP Pro in combination with the EZ-View application running on a PC provides the ability to confirm the packet content between the shaver and the pump as well the timing of the messages. The table, below, defines the equipment configurations to be used by number for the following tests. These numbers appear in the test’s configuration column.

|  |
| --- |
| Equipment Configuration |
| DYONICS POWER II Shaver / DYONICS 25 Pump / PowerMAX Elite/ Footswitch\* |

\* Any footswitch unless specified in configuration column.

In order to save time, the tests performed in sections 2.2, 2.3 and 2.4 that require the same test configurations as indicated in section 2, can be tested at the same time. Note: whenever using the New Shaver, ensure the mapping of the footswitch and pump interface to the correct port; and the footswitch mode to “on/off”.

EZ-TAP Pro

Shaver

Pump

PC

Footswitch

MDU

Port 2

Port 2

Port A

Tube Set

Figure Equipment Connection Diagram

Figure DB-9 Connector Board

## Physical Layer

|  |  |
| --- | --- |
| Action | Result (P/F) |
| 1. Verify that the physical layer used for the communication is the industry standard full-duplex RS232 bus used for point to point communication. | **P**  **F** |
| 1. Verify that at the two ends of the bus are a shaver and a pump device. | **P**  **F** |
| 1. Verify that the pin-outs, connectors, electrical levels and cables are specified in the product specifications. | **P**  **F** |

## Communication

Power on the DYONICS POWER II

Set the DYONICS POWER II to System Defaults and then reenable hand controls via the following front panel key presses: ***Settings System -> Information -> System Reset -> Yes -> Done -> Footswitch -> Hand Control Override Off -> Set -> Done***.

Install a tube set into the DYONICS 25 FMS.

Power on the DYONICS 25 FMS.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. – b. Verify data and packet format | | | | |
| Action | Configuration | Expected Result | Result | Pass / Fail |
| i. Press a pedal on the footswitch and verify the 8N1 1200 baud multi-byte serial data format from the shaver. | 72201092 DII footswitch | Shaver port A - 1200 8N1 packet |  | **P**  **F** |
| Shaver port B - 1200 8N1 packet |  | **P**  **F** |

Prior to execution of each Action in section *c. Verify shaver data transmission occurs as intended* use the shaver front panel to assign the Footswitch and the Pump to the Shaver port under test using the following button sequence:

Shaver Port A: ***Settings -> Footswitch -> Port A -> Set -> Pump Interface -> Port A -> Set -> Done***.

Shaver Port B: ***Settings -> Footswitch -> Port B -> Set -> Pump Interface -> Port B -> Set -> Done***.

| c. Verify shaver data transmission occurs as intended | | | | |
| --- | --- | --- | --- | --- |
| Action | Configuration | Expected Result | Result | Pass / Fail |
| i. Press each pedal /button on the footswitch and verify Shaver Tx  Note: hand control override = OFF | 7205396 Bernstein footswitch | Shaver port A |  | **P**  **F** |
| Shaver port B |  | **P**  **F** |
| 7205399 Low profile on/off footswitch | Shaver port A |  | **P**  **F** |
| Shaver port B |  | **P**  **F** |
| 7205397 Low profile variable speed footswitch | Shaver port A |  | **P**  **F** |
| Shaver port B |  | **P**  **F** |
| 72201092 DII footswitch | Shaver port A |  | **P**  **F** |
| Shaver port B |  | **P**  **F** |
| ii. Press speed up and speed down on the GUI while in forward mode and verify Shaver Tx | 72201092 DII footswitch | Shaver port A |  | **P**  **F** |
| Shaver port B |  | **P**  **F** |
| iii. Press speed up and speed down on the GUI while in reverse mode and verify Shaver Tx | 72201092 DII footswitch | Shaver port A |  | **P**  **F** |
| Shaver port B |  | **P**  **F** |
| iv. Press up and down on the GUI while in oscillate mode 1 and verify Shaver Tx | 72201092 DII footswitch | Shaver port A |  | **P**  **F** |
| Shaver port B |  | **P**  **F** |
| v. Press up and down on the GUI while in oscillate mode 2 mode and verify Shaver Tx | 72201092 DII footswitch | Shaver port A |  | **P**  **F** |
| Shaver port B |  | **P**  **F** |
| vi. Insert and remove all blade codes in the MDU and verify Shaver Tx | 72201092 DII footswitch | Shaver port A |  | **P**  **F** |
| Shaver port B |  | **P**  **F** |
| vii. Insert and remove the MDU and verify Shaver Tx | 72201092 DII footswitch | Shaver port A |  | **P**  **F** |
| Shaver port B |  | **P**  **F** |
| Note: for next 3 tests hand control override = OFF | | | | |
| viii. Insert the MDU, Press each hand control button twice and verify Shaver Tx for each press | 72201092 DII footswitch | Shaver port A |  | **P**  **F** |
| Shaver port B |  | **P**  **F** |
| ix. Individually press and hold the forward and reverse buttons for ~5 sec. each and verify Shaver Tx period is < 250 msec | 72201092 DII footswitch | Shaver port A |  | **P**  **F** |
| Shaver port B |  | **P**  **F** |
| x. Press and hold the oscillate button for ~5 sec and verify Shaver Tx initially, after 1 sec and upon release | 72201092 DII footswitch | Shaver port A |  | **P**  **F** |
| Shaver port B |  | **P**  **F** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| d. Verify shaver data transmission occurs as intended | | | | |
| Action | Configuration | Expected Result | Result | Pass / Fail |
| i. Verify the shaver periodically sends 8N1 1200 baud 0xFF serial data byte and the pump responds appropriately | 72201092 DII footswitch | Shaver sends 1200 8N1 packet every ~1 sec with no response from pump |  | **P**  **F** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| e. Verify pump data transmission occurs as intended | | | | |
| Action | Configuration | Expected Result | Result | Pass / Fail |
| i. Verify the pump periodically sends 8N1 1200 baud multi-byte serial data packets and the shaver responds | 1. 72201092 DII footswitch | Pump sends 1200 8N1 packet every ~200 ms followed by shaver sending 1200 8N1 packet |  | **P**  **F** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| f. Verify shaver handles connection timeouts as intended | | | | |
| Action | Configuration | Expected Result | Result | Pass / Fail |
| i. Verify the shaver removes the pump icon from the display after disconnection of the DB9 Cable to the pump | 1. 72201092 DII footswitch | The Shaver removes the pump icon from the display to indicate loss of communication to the pump. |  | **P**  **F** |
| ii. Verify the shaver periodically sends 8N1 1200 baud 0xFF serial data byte and the pump responds appropriately | 1. 72201092 DII footswitch | Shaver sends 1200 8N1 packet every ~1 sec. |  | **P**  **F** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| f. Verify pump handles connection timeouts as intended | | | | |
| Action | Configuration | Expected Result | Result | Pass / Fail |
| i. Verify the pump removes the handpiece icon from the display after disconnection of the DB9 Cable to the shaver | 1. 72201092 DII footswitch | The Pump blinks then removes the handpiece icon from the display to indicate loss of communication to the shaver. |  | **P**  **F** |
| i. Verify the pump periodically sends 8N1 1200 baud multi-byte serial data packets and the shaver responds | 1. 72201092 DII footswitch | Pump sends 1200 8N1 packet every ~200 ms followed by shaver sending 1200 8N1 packet |  | **P**  **F** |

## Pump Packet Format

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. – c. Verify pump packet format | | | | |
| Action | Configuration | Expected Result | Result | Pass / Fail |
| i. Start pump and confirm packet content | 1. | 0xC5  <PumpState> = 0xC1  <CK> = 0x7A |  |  |
| ii. Stop pump and confirm packet content | 1. | 0xC5  <PumpState> = 0x81  <CK> = 0xBA |  |  |

## Shaver Packet Format

| a. Verify new shaver packet format | | | | |
| --- | --- | --- | --- | --- |
| Action | Configuration | Expected Result | Result | Pass / Fail |
| i. Put shaver in forward, set speed = 1500, press forward footswitch pedal. Confirm packet content | 1. | <Prelude> = 0x18  <SpeedLow> = 0xDC  <SpeedHigh> = 0x05  <BladeShaverState> = 0x01  <BladeFamily> = 0x10  <PumpCommand> = 0x00  <CK> = 0xF6 |  |  |
| ii. Put shaver in oscillate mode 2, set rate = 5, press oscillate footswitch pedal. Confirm packet content | 1. | <Prelude> = 0x18  <SpeedLow> = 0x2C  <SpeedHigh> = 0x81  <BladeShaverState> = 0x03  <BladeFamily> = 0x10  <PumpCommand> = 0x00  <CK> = 0x28 |  |  |
| iii. Put shaver in forward, set speed = 1500, press lavage footswitch button. Confirm packet content | 1. 72201092 DII footswitch | <Prelude> = 0x18  <SpeedLow> = 0x00  <SpeedHigh> = 0x00  <BladeShaverState> = 0x00  <BladeFamily> = 0x10  <PumpCommand> = 0x0B  <CK> = 0xCD |  |  |

# Summary

## Notes

## Overall Pass / Fail Status

|  |  |
| --- | --- |
| Overall Pass / Fail Status |  |
| Date |  |
| Signature |  |
| Printed Name |  |
| Department |  |
| Title |  |