



## 10G XFP DWDM Transceiver

**Hot Pluggable, Duplex LC, 100GHz DWDM EML, SMF 80KM, DDM**

**Part Number: FXFP-H7-Dxx-80D**



### Overview

FXFP-H7-Dxx-80D Small Form Factor Pluggable XFP transceivers are compliant with the current XFP Multi-Source Agreement (MSA) Specification. The high performance cooled DWDM EML transmitter and high sensitivity APD receiver provide superior performance for 10GBASE-ZR/ZW applications up to SMF 80km optical links.

### Applications

- 10GBASE-ZR/ZW Ethernet @10.3125G
- Fiber Channel 1200-SM-LL-L 10GFC @10.51875G
- SONET OC-192 & SDH STM-64 @9.953G
- CPRI Option #8 @10.1376G
- OTN OTU2 @10.7G, OTU2e @11.09G, OTU2f @11.32G
- 10G DWDM Networks

### Features

- Compliant with IEEE802.3ae 10GBASE-ZR/ZW
- Compliant with CPRI Option 8
- Compliant with INF-8077i XFP MSA
- Data Rate 9.953Gb/s to 11.32Gb/s
- Hot Pluggable XFP footprint
- 100GHz ITU Grid, cooled C-Band DWDM EML laser transmitter
- APD receiver
- Duplex LC connector
- No Reference Clock required
- 2-wire interface for management and diagnostic monitor
- Dual +3.3V and 5.0V power supply
- Link distance 80km over SM fiber
- Maximum Power consumption 3.5W
- RoHS Compliant

### Laser Safety

- This is a Class 1 Laser Product complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.
- Caution: Use of control or adjustments or performance of procedure other than those specified herein may result in hazardous radiation exposure.



## Absolute Maximum Ratings

| Parameters                | Symbol           | Min. | Max. | Unit |
|---------------------------|------------------|------|------|------|
| Storage Temperature       | T <sub>ST</sub>  | -40  | +85  | °C   |
| Storage Relative Humidity | RH               | 5    | 95   | %    |
| Supply Voltage 3.3V       | V <sub>CC3</sub> | -0.5 | +4.0 | V    |
| Supply Voltage 5.0V       | V <sub>CC5</sub> | -0.5 | +6.0 | V    |

## Recommended Operating Conditions

| Parameters                              | Symbol           | Min.  | Typ. | Max.  | Unit |
|-----------------------------------------|------------------|-------|------|-------|------|
| Case Operating Temp. (FXFP-H7-Dxx-80D)  | T <sub>OP</sub>  | 0     | -    | +70   | °C   |
| Case Operating Temp. (FXFP-H7-Dxx-80Di) | T <sub>OP</sub>  | -40   | -    | +85   | °C   |
| Supply Voltage 3.3V                     | V <sub>CC3</sub> | +3.13 | +3.3 | +3.47 | V    |
| Supply Voltage 5.0V                     | V <sub>CC5</sub> | +4.75 | +5.0 | +5.25 |      |
| Supply Current ( V <sub>CC3</sub> )     | I <sub>CC3</sub> | -     | -    | 500   | mA   |
| Supply Current ( V <sub>CC5</sub> )     | I <sub>CC5</sub> | -     | -    | 250   | mA   |
| Power Consumption                       | P                |       |      | 3.5   | W    |

## Transmitter Electro-optical Characteristics

V<sub>CC</sub> = 3.13V to 3.47V, V<sub>CC5</sub> = 4.75V to 5.25V,

T<sub>OP</sub> = 0 °C to 70 °C(FXFP-H7-Dxx-80D); T<sub>OP</sub> = -40 °C to 85 °C(FXFP-H7-Dxx-80Di)

| Parameters                             | Symbol             | Min.                | Typ.           | Max.                | Unit  | Note |
|----------------------------------------|--------------------|---------------------|----------------|---------------------|-------|------|
| Operating Data Rate                    | DR                 | 9.953               | 10.3125        | 11.32               | Gb/s  |      |
| Optical Launch Power                   | P <sub>o</sub>     | 0                   |                | +5                  | dBm   | 1    |
| Optical Center Wavelength              | λ <sub>c</sub>     | λ <sub>c</sub> -0.1 | λ <sub>c</sub> | λ <sub>c</sub> +0.1 | nm    |      |
| Spectral Width (-20dB)                 | Δλ                 |                     |                | 1                   | nm    |      |
| Side Mode Suppression Ratio            | SMSR               | 30                  |                |                     | dB    |      |
| Optical Extinction Ratio               | ER                 | 8.2                 |                |                     | dB    |      |
| Dispersion Penalty                     | DP                 |                     |                | 2                   | dB    |      |
| Optical Eye Mask                       |                    | IEEE802.3ae         |                |                     |       |      |
| Relative Intensity Noise               | RIN                |                     |                | -130                | dB/Hz |      |
| Differential Data Input Swing          | V <sub>IN</sub>    | 150                 |                | 820                 | mV    |      |
| Tx Disable Input Voltage-Low (Tx ON)   | TDISV <sub>L</sub> | GND                 |                | 0.8                 | V     |      |
| Tx Disable Input Voltage-High (Tx OFF) | TDISV <sub>H</sub> | 2.0                 |                | V <sub>CC3</sub>    | V     |      |



|                                         |                    |     |  |                  |   |  |
|-----------------------------------------|--------------------|-----|--|------------------|---|--|
| Tx Fault Output Voltage-Low (Tx Normal) | TFLT <sub>VL</sub> | GND |  | 0.8              | V |  |
| Tx Fault Output Voltage-High (Tx Fault) | TFLT <sub>VH</sub> | 2.0 |  | V <sub>CC3</sub> | V |  |

**Note1:** The optical power is launched into a 9/125μm single mode fiber.

## Receiver Electro-optical Characteristics

**V<sub>CC</sub> = 3.13V to 3.47V, V<sub>CC5</sub> = 4.75V to 5.25V,**

**T<sub>OP</sub> = 0 °C to 70 °C(FXFP-H7-Dxx-80D); T<sub>OP</sub> = -40 °C to 85 °C(FXFP-H7-Dxx-80Di)**

| Parameters                              | Symbol            | Min.                  | Typ.    | Max.             | Unit | Note |
|-----------------------------------------|-------------------|-----------------------|---------|------------------|------|------|
| Operating Data Rate                     | DR                | 9.953                 | 10.3125 | 11.32            | Gb/s |      |
| Receiver Sensitivity                    | SEN               |                       |         | -23              | dBm  | 1    |
| Maximum Receive Power                   | PRX-MAX           | -7                    |         |                  | dBm  | 1    |
| Optical Center Wavelength               | λ <sub>c</sub>    | 1260                  |         | 1620             | nm   |      |
| LOS De-Assert                           | LOS <sub>D</sub>  |                       |         | -24              | dBm  |      |
| LOS Assert                              | LOS <sub>A</sub>  | -34                   |         |                  | dBm  |      |
| LOS Hysteresis                          | LOS <sub>HY</sub> | 0.5                   |         | 5                | dB   |      |
| Differential Data Output Swing          | V <sub>OUT</sub>  | 300                   |         | 850              | mV   |      |
| Receiver LOS Signal Output Voltage-Low  | LOS <sub>VL</sub> | GND                   |         | 0.5              | V    |      |
| Receiver LOS Signal Output Voltage-High | LOS <sub>VH</sub> | V <sub>CC3</sub> -0.5 |         | V <sub>CC3</sub> | V    |      |

**Note1:** Measured with a PRBS 2<sup>31</sup>-1 test pattern @10.3125Gbps BER<10<sup>-12</sup>.



## Pin Assignment

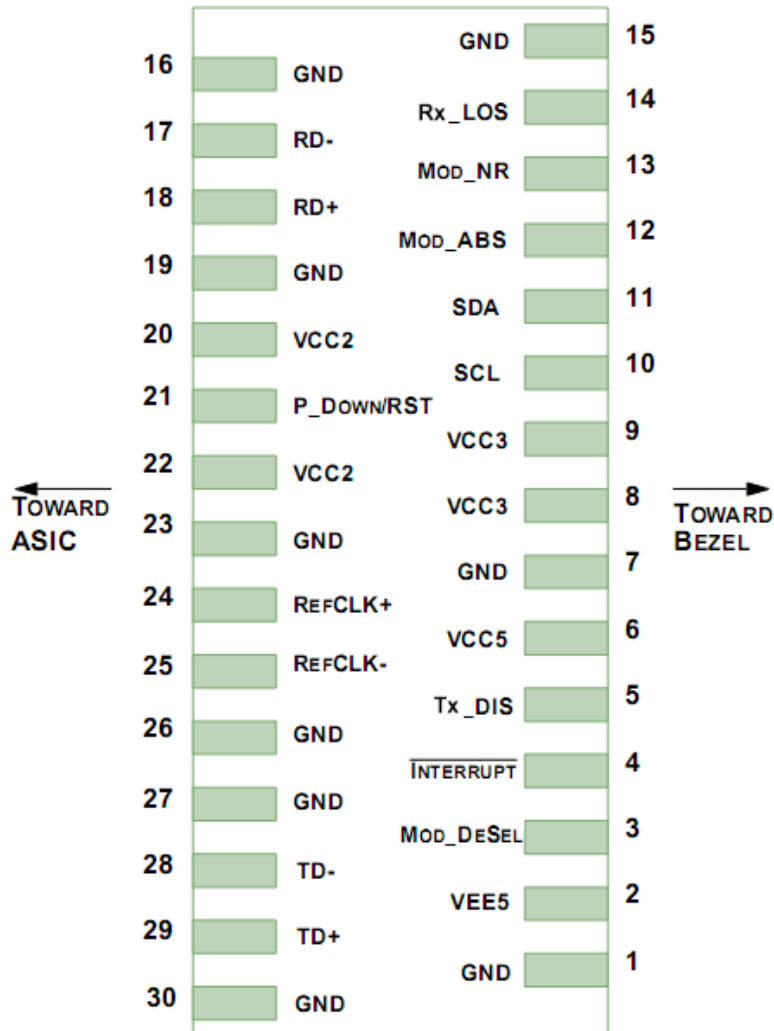


Diagram of Host Board Connector Block Pin



## Pin Description

| Pin | Name                          | Function / Description                                                                                                                                                                                                                                                     |
|-----|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | GND                           | Module Ground                                                                                                                                                                                                                                                              |
| 2   | VEE5                          | Optional -5.2V Power Supply ( Not required )                                                                                                                                                                                                                               |
| 3   | MOD-DESEL                     | Module De-select; When held low allows the module to, respond to 2-wire serial interface commands                                                                                                                                                                          |
| 4   | $\overline{\text{INTERPUPT}}$ | Interrupt (bar); Indicates presence of an important condition which can be read over the serial 2-wire interface                                                                                                                                                           |
| 5   | TX_DIS                        | Transmitter Disable; Transmitter laser source turned off                                                                                                                                                                                                                   |
| 6   | VCC5                          | +5V Power Supply                                                                                                                                                                                                                                                           |
| 7   | GND                           | Module Ground                                                                                                                                                                                                                                                              |
| 8   | VCC3                          | +3.3V Power Supply                                                                                                                                                                                                                                                         |
| 9   | VCC3                          | +3.3V Power Supply                                                                                                                                                                                                                                                         |
| 10  | SCL                           | Serial 2-wire interface clock                                                                                                                                                                                                                                              |
| 11  | SDA                           | Serial 2-wire interface data line                                                                                                                                                                                                                                          |
| 12  | MOD_ABS                       | Module Absent; Indicates module is not present. Grounded in the module                                                                                                                                                                                                     |
| 13  | MOD_NR                        | Module Not Ready; Indicating Module Operational Fault                                                                                                                                                                                                                      |
| 14  | RX_LOS                        | Receiver Loss of Signal indicator                                                                                                                                                                                                                                          |
| 15  | GND                           | Module Ground                                                                                                                                                                                                                                                              |
| 16  | GND                           | Module Ground                                                                                                                                                                                                                                                              |
| 17  | RD-                           | Receiver inverted data output                                                                                                                                                                                                                                              |
| 18  | RD+                           | Receiver non-inverted data output                                                                                                                                                                                                                                          |
| 19  | GND                           | Module Ground                                                                                                                                                                                                                                                              |
| 20  | VCC2                          | +1.8V Power Supply ( Not required )                                                                                                                                                                                                                                        |
| 21  | P_Down/RST                    | Power Down; When high, places the module in the low power stand-by mode and on the falling edge of P_Down initiates a module reset<br>Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle. |
| 22  | VCC2                          | +1.8V Power Supply ( Not required )                                                                                                                                                                                                                                        |
| 23  | GND                           | Module Ground                                                                                                                                                                                                                                                              |
| 24  | REFCLK+                       | Reference Clock non-inverted input, AC coupled on the host board ( Not required )                                                                                                                                                                                          |
| 25  | REFCLK-                       | Reference Clock inverted input, AC coupled on the host board ( Not required )                                                                                                                                                                                              |



|    |     |                                     |
|----|-----|-------------------------------------|
| 26 | GND | Module Ground                       |
| 27 | GND | Module Ground                       |
| 28 | TD- | Transmitter inverted data input     |
| 29 | TD+ | Transmitter non-inverted data input |
| 30 | GND | Module Ground                       |

**Note1:** Module circuit ground is isolated from module chassis ground within the module.

**Note2:** Open collector; should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15V and 3.6V.

**Note3:** A Reference Clock input is not required.

## Digital Diagnostic Functions

As defined by the XFP MSA, Ficer's XFP transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

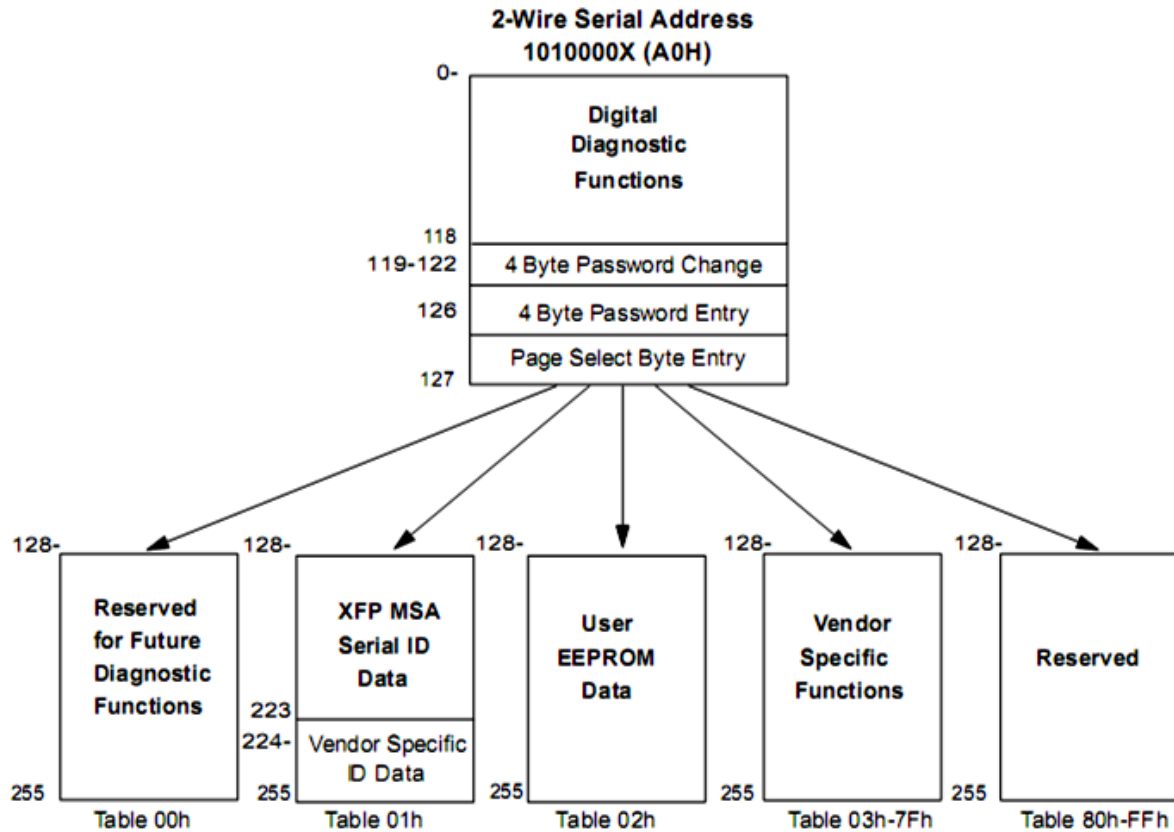
It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Controller (DDC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the XFP transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the XFP transceiver. The serial data signal (SDA pin) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

For more detailed information including memory map definitions, please see the XFP MSA Specification.



## Digital Diagnostic Memory Map

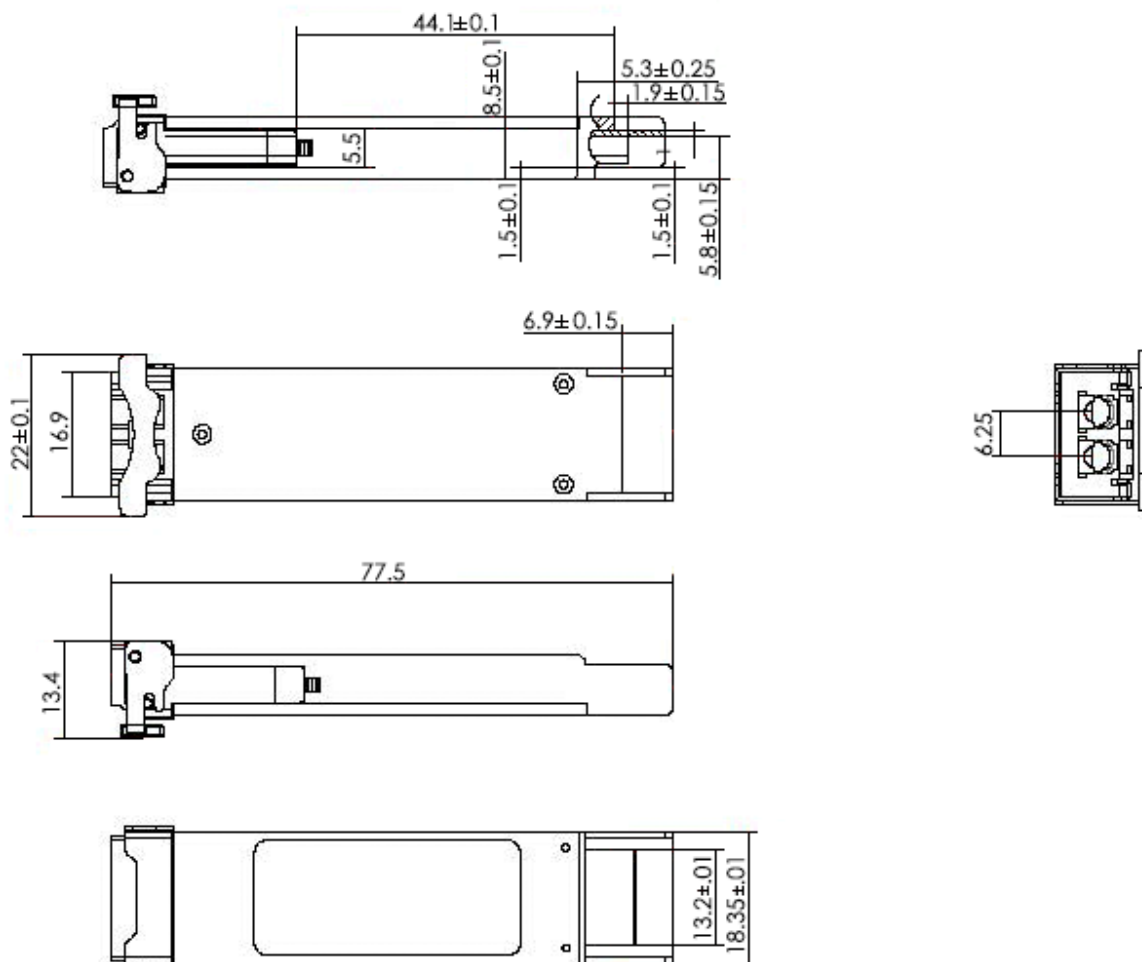


## Digital Diagnostic Monitoring Characteristics

| Parameter                 | Accuracy | Unit | Note                 |
|---------------------------|----------|------|----------------------|
| Temperature               | ±3       | °C   | Internal Calibration |
| Supply Voltage            | ±0.1     | V    | Internal Calibration |
| Tx Bias Current           | ±5       | mA   | Internal Calibration |
| Tx Output Power           | ±3       | dB   | Internal Calibration |
| Rx Received Optical Power | ±3       | dB   | Internal Calibration |



## Mechanical Dimensions



(All Dimensions are  $\pm 0.20\text{mm}$  Unless Otherwise Specified, Unit: mm)

## Ordering Information

| Part No.         | Tx                             | Rx          | Link        | DDM | Temp.    |
|------------------|--------------------------------|-------------|-------------|-----|----------|
| FXFP-H7-Dxx-80D  | 100GHz ITU Grid<br>C-Band DWDM | 1260nm      | SMF<br>80km | Yes | 0~70°C   |
| FXFP-H7-Dxx-80Di |                                | ~<br>1620nm |             |     | -40~85°C |

ps: xx=DWDM Channel Number. Please refer to appendix A for more detail.

**Note:** Distances are indicative only. To calculate a more precise link budget based on specific conditions in your application, please refer to the optical characteristics.





## Appendix A: 100GHz ITU Grid DWDM Central Wavelength Table

| Channel | Central Wavelength(nm) | Frequency (THZ) |
|---------|------------------------|-----------------|
| CH61    | 1528.77                | 196.1           |
| CH60    | 1529.55                | 196.0           |
| CH59    | 1530.33                | 195.9           |
| CH58    | 1531.12                | 195.8           |
| CH57    | 1531.90                | 195.7           |
| CH56    | 1532.68                | 195.6           |
| CH55    | 1533.47                | 195.5           |
| CH54    | 1534.25                | 195.4           |
| CH53    | 1535.04                | 195.3           |
| CH52    | 1535.82                | 195.2           |
| CH51    | 1536.61                | 195.1           |
| CH50    | 1537.40                | 195.0           |
| CH49    | 1538.19                | 194.9           |
| CH48    | 1538.98                | 194.8           |
| CH47    | 1539.77                | 194.7           |
| CH46    | 1540.56                | 194.6           |
| CH45    | 1541.35                | 194.5           |
| CH44    | 1542.14                | 194.4           |
| CH43    | 1542.94                | 194.3           |
| CH42    | 1543.73                | 194.2           |
| CH41    | 1544.53                | 194.1           |
| CH40    | 1545.32                | 194.0           |
| CH39    | 1546.12                | 193.9           |
| CH38    | 1546.92                | 193.8           |
| CH37    | 1547.72                | 193.7           |
| CH36    | 1548.51                | 193.6           |
| CH35    | 1549.32                | 193.5           |
| CH34    | 1550.12                | 193.4           |
| CH33    | 1550.92                | 193.3           |
| CH32    | 1551.72                | 193.2           |
| CH31    | 1552.52                | 193.1           |
| CH30    | 1553.33                | 193.0           |
| CH29    | 1554.13                | 192.9           |
| CH28    | 1554.94                | 192.8           |
| CH27    | 1555.75                | 192.7           |
| CH26    | 1556.55                | 192.6           |
| CH25    | 1557.36                | 192.5           |
| CH24    | 1558.17                | 192.4           |
| CH23    | 1558.98                | 192.3           |
| CH22    | 1559.79                | 192.2           |
| CH21    | 1560.61                | 192.1           |
| CH20    | 1561.42                | 192.0           |
| CH19    | 1562.23                | 191.9           |
| CH18    | 1563.05                | 191.8           |
| CH17    | 1563.86                | 191.7           |