# WAVE CENTRAL CAMERA CONTROL SERIAL FIBER SYSTEM

450 MHz RF camera control link

Manufacturer's
Remote Control Panel
(customer supplied)

Axis Paint Transmitter
ODU (450 MHz)

Serial Data (RS 485)

Serial Data (Cat5)

Serial Data (Cat5), up to 100'

Fiber – 'SC' Connectors

Axis Paint Hub IDU

Serial Fiber Tx
(SC Fiber
Connections)

Serial Fiber Rx
(SC Fiber
Connections)
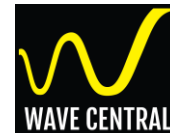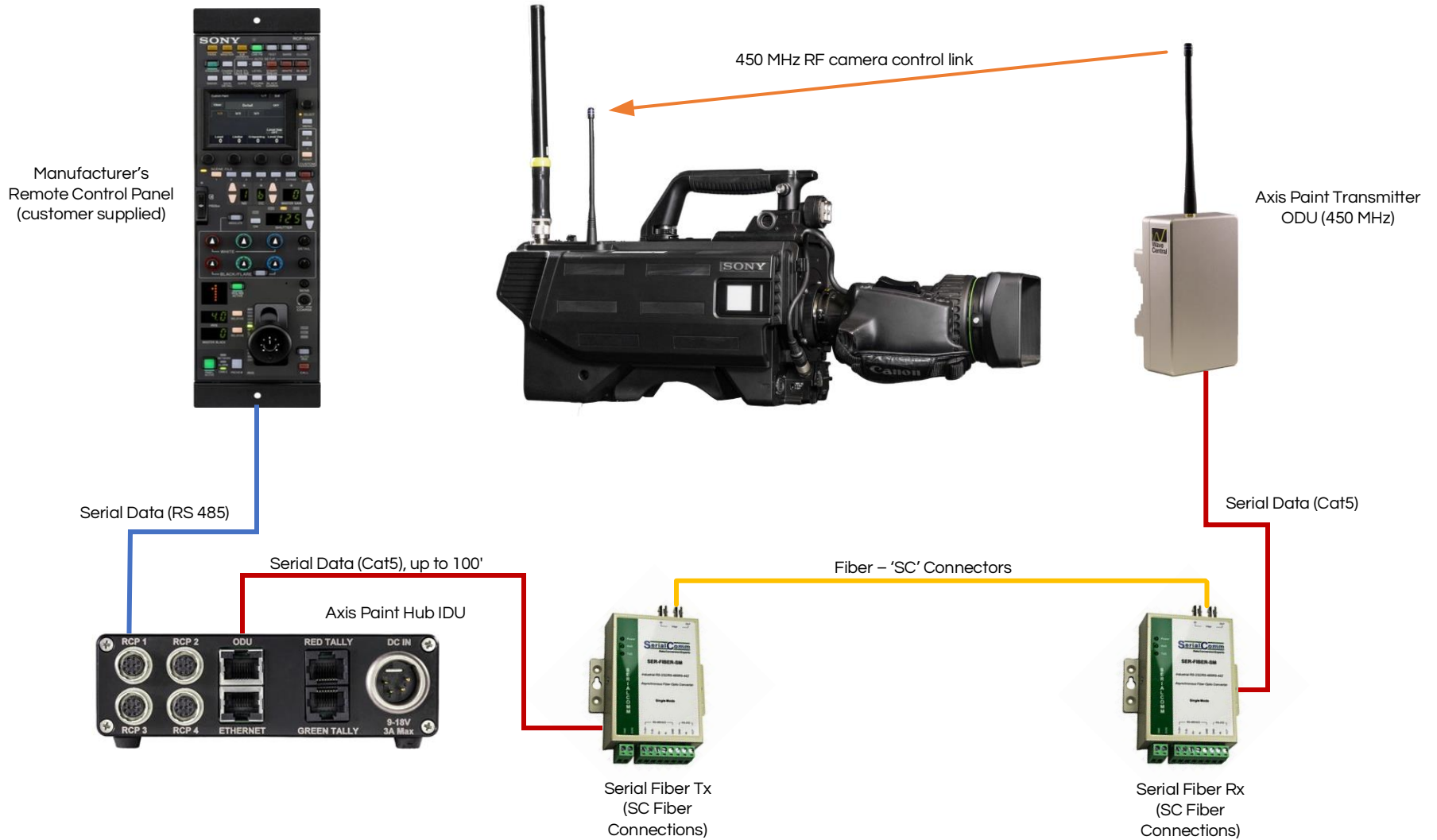
| Project: | Signal flow diagram: Serial Fiber Camera Control System | |
|---|---|---|
| Wave Central | | Date: 11/02/2020 |
| Quote Number: | Rev# V1 | Salesman: Deryk Thompson |

| Down Converter Gain in dB's | 30 | dB | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | Cable Loss in dB/100ft | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 | Freq Mhz |
| **Belden 1694A** | 2.0 | 2.8 | 3.3 | 3.8 | 4.3 | 4.7 | 5.1 | 5.5 | 6.0 | 6.4 | **dB/100Ft** |
| **Max Cable Length** | 1538.5 | 1071.4 | 923.1 | 789.5 | 697.7 | 638.3 | 588.2 | 545.5 | 500.0 | 468.8 | **Feet** |
| **Belden 9913** | 1.3 | 1.8 | 2.3 | 2.7 | 3.0 | 3.3 | 3.6 | 3.9 | 4.2 | 4.5 | **dB/100Ft** |
| Max Cable Length | 2307.7 | 1666.7 | 1333.3 | 1111.1 | 1000.0 | 909.1 | 833.3 | 769.2 | 714.3 | 666.7 | **Feet** |
| **LMR-200** | 3.2 | 4.6 | 5.7 | 6.6 | 7.3 | 8.1 | 8.7 | 9.3 | 9.9 | 10.5 | **dB/100Ft** |
| Max Cable Length | 937.5 | 652.2 | 526.3 | 454.5 | 411.0 | 370.4 | 344.8 | 322.6 | 303.0 | 285.7 | **Feet** |
| **LMR-400** | 1.2 | 1.8 | 2.2 | 2.5 | 2.9 | 3.2 | 3.4 | 3.7 | 3.9 | 4.1 | **dB/100Ft** |
| Max Cable Length | 2500.0 | 1666.7 | 1363.6 | 1200.0 | 1034.5 | 937.5 | 882.4 | 810.8 | 769.2 | 731.7 | **Feet** |
| **LMR-600** | 0.8 | 1.2 | 1.5 | 1.7 | 1.9 | 2.1 | 2.3 | 2.4 | 2.6 | 2.7 | **dB/100Ft** |
| Max Cable Length | 3750.0 | 2500.0 | 2000.0 | 1764.7 | 1578.9 | 1428.6 | 1304.3 | 1250.0 | 1153.8 | 1111.1 | **Feet** |
| **Andrews FSJ1-50(1/4"SF)** | 1.9 | 2.6 | 3.3 | 3.9 | 4.4 | 4.9 | 5.4 | 5.8 | 6.2 | 6.6 | **dB/100Ft** |
| Max Cable Length | 1621.6 | 1145.0 | 909.1 | 765.3 | 681.8 | 613.5 | 558.7 | 519.0 | 485.4 | 455.2 | **Feet** |
| **Andrews FSJ4-50(1/2"SF)** | 1.1 | 1.5 | 1.8 | 2.2 | 2.4 | 2.7 | 3.0 | 3.2 | 3.4 | 3.6 | **dB/100Ft** |
| Max Cable Length | 2857.1 | 2000.0 | 1639.3 | 1388.9 | 1229.5 | 1115.2 | 1016.9 | 949.4 | 890.2 | 838.0 | **Feet** |
| **Andrews LDF2-50A(3/8")** | 1.1 | 1.5 | 1.8 | 2.2 | 2.4 | 2.7 | 2.9 | 3.1 | 3.3 | 3.5 | **dB/100Ft** |
| Max Cable Length | 2857.1 | 2000.0 | 1639.3 | 1376.1 | 1239.7 | 1123.6 | 1023.9 | 961.5 | 906.3 | 857.1 | **Feet** |
| **Andrews LDF4-50A(1/2")** | 0.7 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 1.9 | 2.1 | 2.2 | 2.3 | **dB/100Ft** |
| Max Cable Length | 4411.8 | 3061.2 | 2500.0 | 2112.7 | 1886.8 | 1714.3 | 1562.5 | 1456.3 | 1363.6 | 1282.1 | **Feet** |
| **Andrews LDF5-50A(7/8")** | 0.4 | 0.5 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.2 | 1.3 | **dB/100Ft** |
| Max Cable Length | 8108.1 | 5555.6 | 4545.5 | 3846.2 | 3409.1 | 3092.8 | 2803.7 | 2608.7 | 2439.0 | 2290.1 | Feet |

## BW = 8 MHz

| Modulation System | Code Rate | Guard Interval | | | |
|---|---|---|---|---|---|
| | | 1/32 | 1/16 | 1/8 | 1/4 |
| IF = 9.142857 MHz | | Flo = 60.857143 MHz | **BW = 8 MHz** | | |
| Clk=36.571429 Mbit/s | | Data Rate (Mbit/s) | | | |
| QPSK | 1/2 | 6.032086 | 5.854671 | 5.529412 | 4.976471 |
| | 2/3 | 8.042781 | 7.806228 | 7.372549 | 6.635294 |
| | 3/4 | 9.048128 | 8.782007 | 8.294118 | 7.464706 |
| | 5/6 | 10.053476 | 9.757785 | 9.215686 | 8.294118 |
| | 7/8 | 10.55615 | 10.245675 | 9.676471 | 8.708824 |
| 16-QAM | 1/2 | 12.064172 | 11.709342 | 11.058824 | 9.952942 |
| | 2/3 | 16.085562 | 15.612456 | 14.745098 | 13.270588 |
| | 3/4 | 18.096256 | 17.564014 | 16.588236 | 14.929412 |
| | 5/6 | 20.106952 | 19.51557 | 18.431372 | 16.588236 |
| | 7/8 | 21.1123 | 20.49135 | 19.352942 | 17.417648 |
| 64-QAM | 1/2 | 18.096258 | 17.564013 | 16.588236 | 14.929413 |
| | 2/3 | 24.128343 | 23.418684 | 22.117647 | 19.905882 |
| | 3/4 | 27.144384 | 26.346021 | 24.882354 | 22.394118 |
| | 5/6 | 30.160428 | 29.273355 | 27.647058 | 24.882354 |
| | 7/8 | 31.66845 | 30.737025 | 29.029413 | 26.126472 |

## BW = 7 MHz

| Modulation System | Code Rate | Guard Interval | | | |
|---|---|---|---|---|---|
| | | 1/32 | 1/16 | 1/8 | 1/4 |
| IF = 7.999999875 MHz | | Flo = 62.000000125 MHz | **BW = 7 MHz** | | |
| Clk=32.0000 Mbit/s | | Data Rate (Mbit/s) | | | |
| QPSK | 1/2 | 5.27807525 | 5.12283713 | 4.8382355 | 4.35441213 |
| | 2/3 | 7.037433375 | 6.8304495 | 6.45098038 | 5.80588225 |
| | 3/4 | 7.917112 | 7.68425613 | 7.25735325 | 6.53161775 |
| | 5/6 | 8.7967915 | 8.53806188 | 8.06372525 | 7.25735325 |
| | 7/8 | 9.23663125 | 8.96496563 | 8.46691213 | 7.620221 |
| 16-QAM | 1/2 | 10.5561505 | 10.2456743 | 9.676471 | 8.70882425 |
| | 2/3 | 14.07486675 | 13.660899 | 12.9019608 | 11.6117645 |
| | 3/4 | 15.834224 | 15.3685123 | 14.5147065 | 13.0632355 |
| | 5/6 | 17.593583 | 17.0761238 | 16.1274505 | 14.5147065 |
| | 7/8 | 18.4732625 | 17.9299313 | 16.9338243 | 15.240442 |
| 64-QAM | 1/2 | 15.83422575 | 15.3685114 | 14.5147065 | 13.0632364 |
| | 2/3 | 21.11230013 | 20.4913485 | 19.3529411 | 17.4176468 |
| | 3/4 | 23.751336 | 23.0527684 | 21.7720598 | 19.5948533 |
| | 5/6 | 26.3903745 | 25.6141856 | 24.1911758 | 21.7720598 |
| | 7/8 | 27.70989375 | 26.8948969 | 25.4007364 | 22.860663 |

## BW = 6 MHz

| Modulation System | Code Rate | Guard Interval | | | |
|---|---|---|---|---|---|
| | | 1/32 | 1/16 | 1/8 | 1/4 |
| IF = 6.85714275 MHz | | Flo = 63.14285725 MHz | **BW = 6 MHz** | | |
| Clk=27.428571 Mbit/s | | Data Rate (Mbit/s) | | | |
| QPSK | 1/2 | 4.5240645 | 4.48248248 | 4.2334561 | 3.81011061 |
| | 2/3 | 6.03208575 | 5.854671 | 5.5294118 | 4.9764705 |
| | 3/4 | 6.786096 | 6.58650525 | 6.2205885 | 5.5985295 |
| | 5/6 | 7.540107 | 7.31833875 | 6.9117645 | 6.2205885 |
| | 7/8 | 7.9171125 | 7.68425625 | 7.2573533 | 6.531618 |
| 16-QAM | 1/2 | 9.048129 | 8.7820065 | 8.294118 | 7.4647065 |
| | 2/3 | 12.0641715 | 11.709342 | 11.058824 | 9.952941 |
| | 3/4 | 13.572192 | 13.1730105 | 12.441177 | 11.197059 |
| | 5/6 | 15.080214 | 14.6366775 | 13.823529 | 12.441177 |
| | 7/8 | 15.834225 | 15.3685125 | 14.514707 | 13.063236 |
| 64-QAM | 1/2 | 13.5721935 | 13.1730098 | 12.441177 | 11.1970598 |
| | 2/3 | 18.0962573 | 17.564013 | 16.588235 | 14.9294115 |
| | 3/4 | 20.358288 | 19.7595158 | 18.661766 | 16.7955885 |
| | 5/6 | 22.620321 | 21.9550163 | 20.735294 | 18.6617655 |
| | 7/8 | 23.7513375 | 23.0527688 | 21.77206 | 19.594854 |

## BW = 10 MHz

| Modulation System | Code Rate | Guard Interval | | | |
|---|---|---|---|---|---|
| | | 1/32 | 1/16 | 1/8 | 1/4 |
| IF = 11.42857125 MHz | | Flo = 58.57142875 MHz | **BW = 10 MHz** | | |
| Clk = 45.71428625 Mbit/s | | Data Rate (Mbit/s) | | | |
| QPSK | 1/2 | 7.5401075 | 7.31833875 | 6.911765 | 6.22058875 |
| | 2/3 | 10.05347625 | 9.757785 | 9.21568625 | 8.2941175 |
| | 3/4 | 11.31016 | 10.9775088 | 10.3676475 | 9.3308825 |
| | 5/6 | 12.566845 | 12.1972313 | 11.5196075 | 10.3676475 |
| | 7/8 | 13.1951875 | 12.8070938 | 12.0955888 | 10.88603 |
| 16-QAM | 1/2 | 15.080215 | 14.6366775 | 13.82353 | 12.4411775 |
| | 2/3 | 20.1069525 | 19.51557 | 18.4313725 | 16.588235 |
| | 3/4 | 22.62032 | 21.9550175 | 20.735295 | 18.661765 |
| | 5/6 | 25.13369 | 24.3944625 | 23.039215 | 20.735295 |
| | 7/8 | 26.390375 | 25.6141875 | 24.1911775 | 21.77206 |
| 64-QAM | 1/2 | 22.6203225 | 21.9550163 | 20.735295 | 18.6617663 |
| | 2/3 | 30.16042875 | 29.273355 | 27.6470588 | 24.8823525 |
| | 3/4 | 33.93048 | 32.9325263 | 31.1029425 | 27.9926475 |
| | 5/6 | 37.700535 | 36.5916938 | 34.5588225 | 31.1029425 |
| | 7/8 | 39.5855625 | 38.4212813 | 36.2867663 | 32.65809 |