



Instruction for wire connection

NOTE: Without especially explanation, the high logic level is +15VDC, the low logic level is 0VDC.

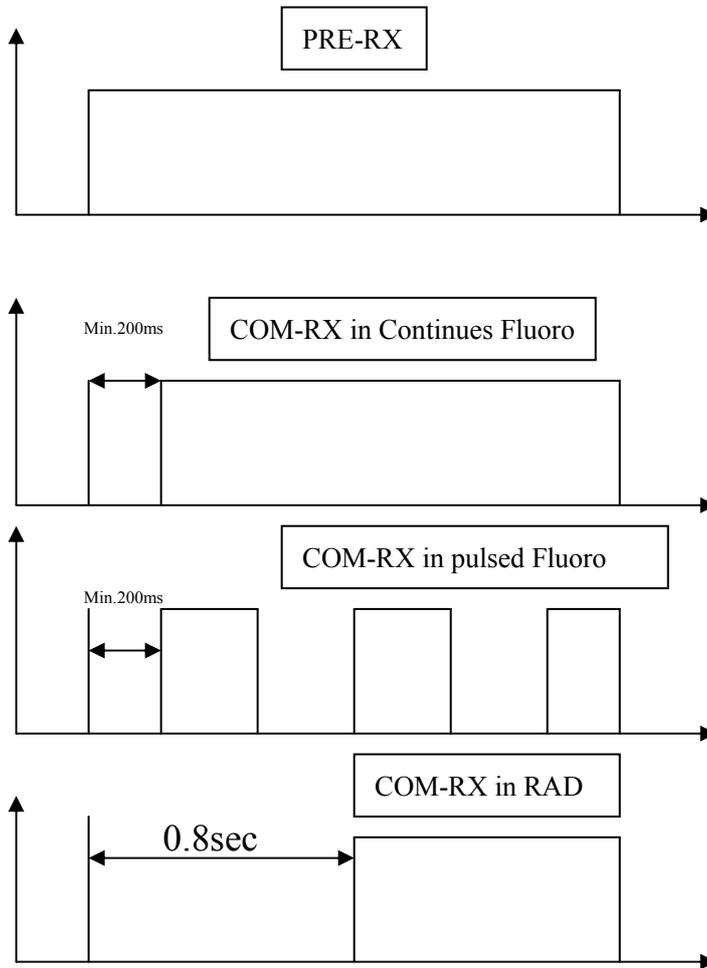
1. On the block drawing, wires X、 Y must use the cable with metallic shield. Two $8 \times 0.5\text{mm}^2$ cables are recommended. When making the connection of X、 Y, use 4 wires of each cable making as “X”, another 4 wires of each cable as “Y”. The metallic shield must connect to the ground terminal of monoblock.
2. The signal kV+, kV-, mA+, GND connect to the CP2 connector on S19 board must have metallic shield, and the metallic shield must connect to the ground terminal of the monoblock..
3. The cable connected to mains should be $2 \times 2 .5\text{mm}^2$. The relay K should be energized and short cut the 2 resistances in 15sec when switch on the system, or to be activated immediately when PRE-RX signal presented.
4. Apply +/- 15VDC to CP1-1 (+15Vcc)、 CP1-2 (0Vcc GND)、 CP1-3 (-15Vcc) on S19 board. The max. current is less than 200mA.
5. CP1-4 kV>85% (S19 board), output signal, active high. This signal present when the actual kV measured is higher than 85% of set kV. This signal can be to trigger the timer of mAs calculation. (in radiographic mode.) or to signaling the presentation of X-ray.
6. CP1-5 PRE-RX (S19 board), input signal, active high. It should be given by control electronics. The inverter will be in preparation status when this signal is present. In radiography mode, the first click of the hand switch should give this signal.
7. CP1-6 INV FAULT (S19 board), output signal, active high. This signal is used to inform the control electronics if the inverter is worked properly or not.
8. CP1-7 + VC($12 \div 24\text{Vcc}$) (S19 board), is used to adapt the logic level of existing control electronics. When develop the control electronics exclusively for IMD generator, it is recommended to connect to CP1-1 (+15V), and CP1-8 is connected to CP1-2.(0V)
9. CP1-9 COM-RX (S19 board), input signal, active high. When this signal is presented, the inverter will trigger the power parts to emit X-ray according to the setting parameters. This signal must be presented at least 200ms later than PRE-RX. In radiography mode, this signal should be presented after the second click of the hand switch.
10. CP1-10 SET kV($1\text{V}=20\text{kV}$) (S19 board), input signal. Analog signal. The control electronics should give this signal to inverter according to the selected X-ray parameters. The wire for feeding this signal to inverter should be shielded.



11. CP1-11 mA FLOUR(1V=1mA) (S19 board), output analog signal. It shows the actual tube current in fluoroscopy.
12. CP1-12 mA RAD(1V=10mA) (S19 board) output analog signal. It shows the actual tube current in Radiography.
13. CP1 (S15 board), 130VAC input. It should be supplied from an isolated transformer. AC noise filters should be implemented both in the primary and secondary of this isolated transformer. These two AC noise filters should never be grounded, even the shell. The capacity of the isolated transformer should be no less than 135VA.
14. CP2-1 +15VA、CP2-2 0VA 、CP3-3 -15VA (S15 board) connect to +15 VDC、-15VDC power supply. Max. current. <200mA
15. CP4-1、CP4-2 (S15 board), connect to +24 VDC power supply.
CP4-3, CP4-4 are not used.
CP4-5 FG/FP (S15 board) input signal, is used to select focus. FP: small focus. When connect to ground (low level 0V), small focus is selected. FG: large focal. When connect to High (+24V), the large focus is selected. CP4-6 FILAMENT OK, output signal. Active high (+24V). It is presented when the filament heating is working correctly.
CP4-7 should connect to the 0V of the +24VDC power supply.
16. CP5 SET I FIL(+), SET I FIL(-) (S15 board) input analog signal. 1V = 100mA. This analog signal should be give by control electronics according to the selected X-ray parameters. The relation of control is: 1V on the SET I FIL(+), SET I FIL(-), you get 100mA on the primary windings of filament transformer, and 610mA on the secondary windings, that means through the filament. These wires should be shielded.
17. CP6 (S15 board), 1- FG (large focus), 2- C (common), 3- FP (small focus). Connect to the S17(or S117) board on the monoblock. Cable with metallic shield should be used.
18. CP1-1 RAD PREP(+24VDC), CP1-2 0VDC, CP1-3 FLUORO(+24VDC) (S20 board). Input signal. Active high. Signal RAD PREP for RADIOGRAPHY, while FLUORO is for FLUOROSCOPY. CP1-4, CP1-5, CP1-6 are the feed back signal to control electronics. It informs the control electronics if there's current presence or lack in the stator. CP1-4 and CP1-6 are normal closed (NC), and CP1-4 and CP1-5 are normal open (NO).
19. Terminal TB1(L,N) on S21B board connect to 220VAC mains. TB2 connect to a phase-shift capacitor (30 μ F 450V). TB3-1、TB3-2、TB3-3 on S21B board connect to terminal C, P, S on the S17 of monoblock.

Explanation about signals of PRE-RX、COM-RX

The sequence of signals: PRE-RX, COM-RX



Rotating anode monoblock, anode rotating from 0 to maximum speed is about 0.8sec. When in Fluoroscopy mode, the anode is not necessary to reach the max. speed. In order to reduce the heat generated by stator, it is suggested to launch the rotating anode for 15sec every minute.

The inverter doesn't care if it is in FLUOROSCOPY or RADIOGRAPHY. The principle of operation is the same. When release an exposure, first apply the SET KV to inverter, then present PRE-RX, after at least 200ms, give COM-RX. Of course, during this period, the control electronics should check if the anode rotating is ok, the filament heating is ok, etc. When terminate an exposure, the COM-RX must be terminated before PRE-RX, or, at least the same time as PRE-RX. (never after.)

In case of pulsed fluoroscopy, when the X-ray command is provided by external control device (hand switch or foot pedal), PRE-RX should be always sent first to inverter and kept high till the X-ray is terminated by external control device (hand switch or foot pedal), then the COM-RX will be sent to inverter in pulsed form according to the set pulse rate. The time shift between PRE-RX and first COM-RX pulse should be always min. 200ms as described in the previous paragraph.



NOTES:

1. If it need to test the IGBT trigger signal on S18 board, always remember dismantle the mains V1、V2(220VAC) and make sure if the voltage on capacitors C1 and C2 are 0V.
2. The potentiometers P1 and P2 on S19 board are only adjusted in factory. The potentiometer P3 allows adjustment of the fluoroscopy offset. This adjustment is done in factory, but a further check is required during installation. The adjustment is as follows: connect the probes of a digital multimeter between TP5 and TP11; switch on the system, waiting for several minutes, adjust P3 until the readout on multimeter is 0Vdc (+/-10mV).
3. For using stationary anode X-ray tube monoblock, for max. kV safety, always remember dismantle the jumpers J2A and J2B.
4. The jumper JP1 on S15 board is normally set on a-c to accept the SET I FIL signal from control electronics, but for testing purpose, it could also be set to c-b, then the potentiometer P1 could be used for manual adjust the filament heating level. Potentiometer P2 and P3 are using for setting the max. current for large and small focuses. The max. primary current for the large filament is 900mA and the max. primary current for the small filament is 800mA, on capacitor C44 you can measure the voltage, the correspondent value should be 4.5V and 4V.
5. For RADIOGRAPHY, pre-heating for the filament is required. The pre-ignition voltage of SET I FIL on S15 board for the rotation anode X-ray tube is about 3.5V, for the fixed anode X-ray tube it is about 3.8V.

The AC Noise Filter

1. It is recommended to implement an AC noise filter (30A) between the mains and inverter.
2. 130VAC for S15 board should be supplied from an isolated transformer. AC noise filters should be implemented both in the primary and secondary of this isolated transformer. These two AC noise filters should never be grounded, even the shell.

SEASONING OF THE X-RAY TUBE

In Fluoroscopy Mode:

| | | | |
|------|--------|------|---------------------------|
| 60kV | 2mA | 5min | keep a pause of 5min |
| kV+5 | mA+0.1 | 5min | keep a pause of 5min |
| kV+5 | mA+0.1 | 5min | keep a pause of 5min..... |



INSTRUCTION ON USING MONOBLOCK

Until kV to 120kV, max mA to 3mA. During formation, be careful with the monoblock's temperature, if it is very hot please extend the waiting time properly. Always use oscilloscope to monitor TP3 (real kV) and TP5 (real Fluoro. mA) on S19 board during formation. If any discharge happened during seasoning, LD4 on S19 board may light up, stop X-ray, wait for 5 minutes, start fluoroscopy again from previous value.