

SELECTION OF COAXIAL SWITCHES

A. R. Thompson
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Mechanical coaxial switches are used for selecting IF and local oscillator (LO) signals within the VLBA racks and modules. Frequency ranges are up to 1 GHz for IF signals and 16 GHz for LO signals. Compared with diode switches, mechanical switches generally have lower insertion loss, wider frequency bandwidths, and are less expensive. Diode switches allow higher switching rates, but high rates are not required for the present purposes. Experience with mechanical switches in the VLA shows that reliability is acceptable, but some replacements must be expected as years go by. (This statement applies to switches operated at ambient temperature: cryogenically cooled mechanical switches have been less reliable.) To facilitate maintenance, all coaxial switches mounted in the backplane wiring of the racks (these are presently confined to rack B) can be replaced without soldering connections. Each of these switches is mounted on a small aluminum panel that is held in place by four screws, and the leads for the activating currents can be disconnected at a nine-pin D connector. In addition, each type of switch (SPDT, 1x4, 1x6, and transfer) is available from several manufacturers in forms that are both mechanically and electrically interchangeable. The corresponding part numbers are given in Table 1. Currents required to activate the switches in Table 1 vary, but are all within the range of the circuits in the Switch Driver Module (L107).

All of the units listed in Table 1 have a specified reliability of 10^6 cycles. However, if it becomes necessary to replace many of the switches, the question of possible differences in reliability of different manufacturers' units is likely to be raised. The use of units by more than one manufacturer in the initial construction would enable some experience on this question to be gathered. Thus, it is proposed that we obtain new price quotations from each manufacturer for each major purchase (i.e. quantities for two or three antennas), and if necessary choose the next-to-lowest bidder on some occasions to avoid using a single source for any type. For the first two antennas the switches used were chosen for minimum cost and were by RLC for the transfer type and Transco for the others.

The switches in Table 1 all use SMA (female) for the coaxial terminals, 28 volts for the activation signal, and do not include indicator terminals. The 1x4, 1x6 and transfer models are non-latching and since these switches are mostly used in the backplane wiring of rack B, the change in heat dissipation when a switch is activated should not cause noticeable effects. In contrast, the SPDT switches are largely used in modules which

contain filters, etc. for which the temperature stability is more critical. The SPDT switches in Table 1 incorporate the 'cutthroat' or 'self-deactivating' type of latching action. The cutthroat feature simplifies the driving circuitry, and since the applied voltage remains on the switch terminals the switch will be automatically reactivated if for some reason it becomes accidentally unlatched. The spacing of the mounting holes of the SPDT in Table 1 is 0.44 inches. This spacing corresponds to 'inboard' mounting as described in some of the catalogs: the spacing for the alternative 'outboard' mounting has at least two different values (1.18 and 1.31 inches) amongst the various manufacturers, which results in more limited interchangeability.

When appropriate, switches listed in Table 1 should be chosen to help limit the number of types of VLBA spares to be stocked. This does not include the SPDT coaxial switches used in the 2-16 GHz Synthesizer Modules (L104) for which indicator contacts are required. The design of this module makes use of indicator contacts to adjust the tuning characteristic when the frequency doubler is used. The present discussion also does not include switches for the baseband signals.

Table 1. Mechanical Coaxial Switches for the VLBA.

	1 x 4	1 x 6	Transfer ¹	SPDT
Transco	144C70600	146C70600	710C70100	909C70100
RLC	SR-4C-D	SR-6C-D	SR-TC-R-D	SR-2Minin-D-L
Dynatech	Q4-413K30	Q6-413K30	-	D3-413D39
K and L	4-MP-28-F-0	6-MP-28-F-0	TS-28-F-0	MS-28-L-0
Teledyne	-	-	-	CS33S6D ²

¹ Check that normally-open and normally-closed positions are not interchanged when substituting a unit by a different manufacturer.

² Specify 0.44 inch mounting hole spacing (inboard mounting).