

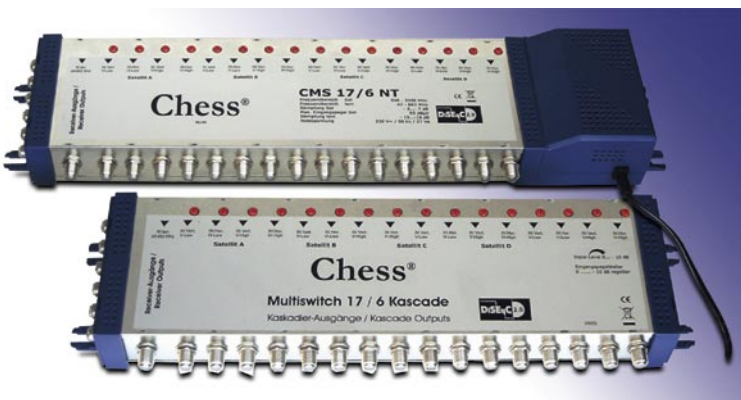
Max Communication Chess Multiswitches 17/6 NT & 17/6 K

Distribution solution for a family house or a block of apartments

Multiswitches are very useful devices when you need to distribute satellite signal to several rooms while keeping a number of dishes to a reasonable minimum. Depending on model, they allow you to

distribute the signal from either a single dish or a few dishes to several receivers. Max Communications has provided us with two types of multiswitches that can cooperate with each other.

from -20 through + 60° C - so this should not pose a problem for them. Keep in mind, though, that they are not to be operated outdoors.



Chess 17/6 NT

The Chess 17/6 NT is designed to deal with 4 dishes equipped with Quatro LNB's. That gives us 16 inputs. An important advantage of the system with a multiswitch is that only one coaxial cable is required between the switch and a receiver. Since almost everybody wants to receive terrestrial transmission along with the satellite channels, multiswitches are designed to transfer also terrestrial signal down the same cable. Input number 17 is dedicated to

connect the terrestrial antenna. As you can probably figure out, this model has 6 outputs. So, you can connect up to 6 satellite receivers. A living room, a study plus 4 bedrooms - very good solution for a family house.

You will be able to receive any channel from anyone of the four satellites independently of what is being received on the set-top-boxes in other rooms. There's only one condition: your receivers must be compatible with DISEqC. Otherwise, they will not be able to switch among satellites - only

satellite "A" will be available to them. Of course, we are speaking here about reception in Ku-band, as the Quatro LNB implies.

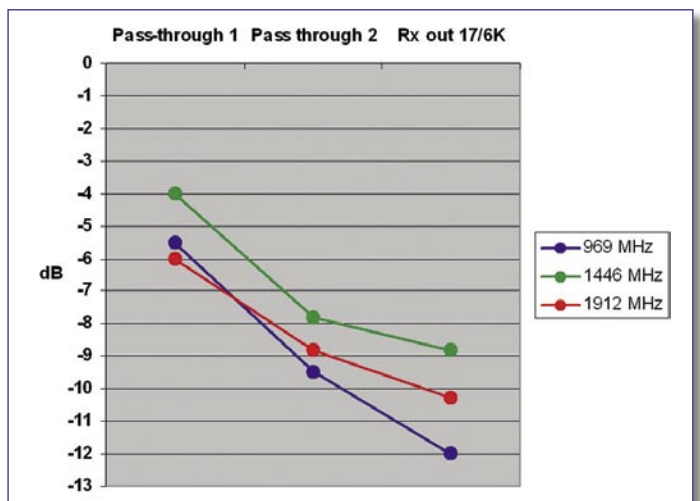
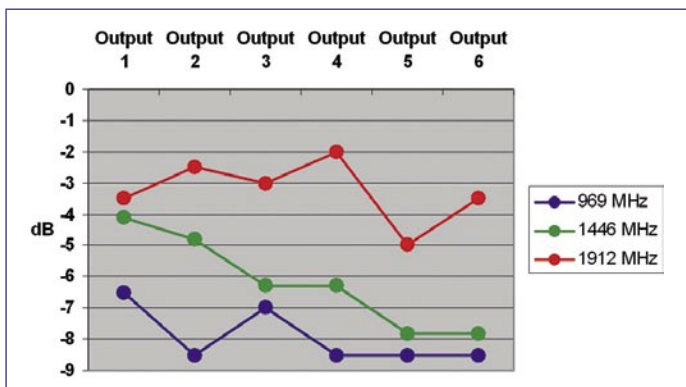
Except for the 17 inputs and 6 outputs, the multiswitch additionally has 17 cascade (pass-through) outputs. They are used to connect Chess 17/6 K unit. Chess 17/6 K is an extension device that when connected to the base model increases the number of outputs from 6 to 12. According to the manufacturer, by cascading more 17/6 K's, you may get 18, 24 or even 30 outputs. Such system can distribute satellite signal in a block of apartments.

In most cases, a multiswitch will be put close to the roof of the building where the temperature can vary significantly. The units described in this report can operate in the temperature range

In the Practice

Time to take a few measurements of Chess 17/6 NT. Every satellite input coming from Quatro LNB is somewhat attenuated by the multiswitch. According to specification, before it reaches the receiver it is down by 5 dB ± 2 dB. We obtained in our measurements results from -2 through -8.5 dB depending on the receiver output used and the input frequency (see figure 1).

But how does the multiswitch influence the quality of signal? We measured the C/N ratio before and after the multiswitch for 2 different signals. For the receiver output, we observed that it went down 0.8 dB from 10.3 to 9.5 dB. For the pass through output C/N degraded from 11.5 to 11.0 dB. It is negligible for strong signals (e.g. those from Astra or Hotbird in Europe) but may pose prob-

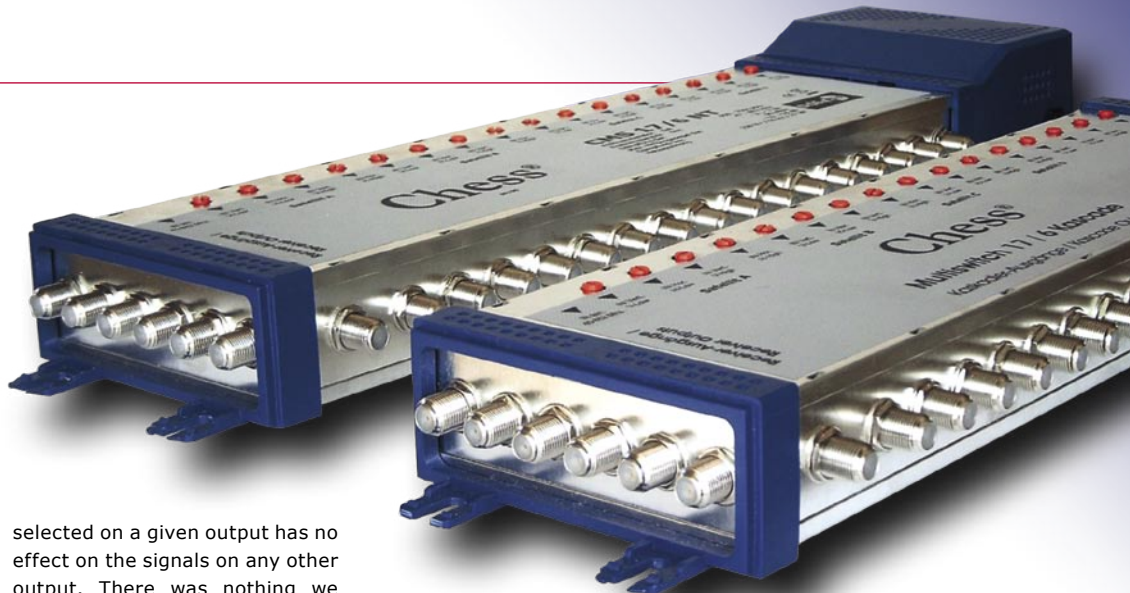


lem for weak satellites. However, one can not expect here a miracle. Distributing weak signals (or signals with low C/N ratio) will always be a problem for any switch, splitter or cabling. Chess multiswitches are not at all bad in this respect.

The multiswitch is marked as DiSEqC 2.0 compatible. It means that it should work with a receiver using DiSEqC 1.0 to choose a satellite. We tried it and the system was working flawlessly. "Toneburst" switching also worked but one could select only satellite A or B with this simple method.

The terrestrial signal is significantly attenuated when combined with the IF signal inside the multiswitch. The loss of 16 dB \pm 2 dB means that you must use a 20dB amplifier between the terrestrial antenna and the switch to compensate for the loss. This is something you must take into account when designing the whole antenna system. Our tests have revealed differences in the frequency response of the 6 receiver outputs for the terrestrial signal. Some of them had almost perfectly flat response (1-2 dB ripple or so) in the whole 47-862 MHz range but the others had larger peaks and dips. The worst passband ripple we measured was almost 10 dB on one of the receiver outputs. Specification permits only \pm 2 dB. That means that in some situations, you will be able to notice a difference of the terrestrial TV quality depending on the receiver output being used.

We checked if the signal present on one input can induce some interference on the other inputs and did not find anything wrong here. The same applies to the receiver outputs. The signal



selected on a given output has no effect on the signals on any other output. There was nothing we could observe or measure. So the isolation among the inputs/outputs is quite satisfactory.

Cascading Multiswitches

After measuring the single switch, the next necessary step was to connect another switch Chess 17/6 K to the system to increase the number of receiver outputs to 12. However, before that, we checked the IF pass through loss. We have got values from 5.5 dB for 969 MHz and 6.0 dB for 1912 MHz. For the 17/6 K, we got 4.0 dB and 3.8 dB for 969 and 1912 MHz respectively. If you compare them with the specified values, you will see that the manufacturer was too optimistic here. Total signal attenuation at the 17/6 K connected in a cascade with a 17/6 NT is presented in figure 2. Pass-through 1 is the output of 17/6 NT being at the same the input for 17/6 K. Pass-through 2 is the output of 17/6K for the following multiswitch. Rx out is the signal level at one of the receiver's outputs of 17/6 K.

As you can see, the signal passed through by the 17/6 NT to 17/6 K is attenuated. If you want to cascade multiswitches,

you should insert amplifiers between the LNB's and the base multiswitch inputs. Usually, 20 dB amplifiers are added here. In a cascaded network, you will need to use the attenuators built-in in every IF input to equalize the outputs from the different multiswitches. Without the attenuators, the multiswitch closest to the LNB will always provide the output of the highest level, and every next multiswitch a few dB weaker signal. So our next job was to measure if we really have 10 dB of attenuation adjustment available as specified. Our measurements revealed the adjust-

ment range is even slightly higher – about 11.5 dB.

Conclusion

The bold manufacturer's statement about getting 24 or even 30 receiver outputs with Chess 17/6 NT and a number of 17/6 K's seems to be quite feasible if you install additional 20dB amplifiers between LNB's and the first multiswitch. However due to high pass-through losses for the terrestrial signal, we would recommend not to use the cascade outputs for distributing this signal but install additional splitter and route the signal individually to every multiswitch terrestrial input.

Expert conclusion

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Excellent isolation between different inputs and outputs keeps interference below the reception threshold. Low noise. Low current drawn from a receiver – below 20 mA.

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Signal losses are slightly higher than specified. No built-in amplifiers – you must buy them separately. Flatness of the frequency response for the terrestrial band leaves something to be desired for some outputs. Significant pass-through attenuation for the terrestrial signal makes cascading this signal rather impractical.



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TECHNIC DATA

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Models	Chess 17/6 NT and 17/6 K
Description	Chess 17/6 NT - multiswitch with the embedded power supply. Chess 17/6 K - extension to NT with additional 6 receiver outputs
Inputs	16 satellite + 1 terrestrial
Receiver outputs	6
Cascade outputs	17
Input frequency	950-2150 MHz (Sat.) and 47-862 MHz (Terr.)
IF tap loss	5 dB \pm 2 dB
IF input attenuation adjustment range	0 ... 10dB
IF pass-through loss	1.5 dB for 950 MHz, 3.5 dB for 2300 MHz
Terrestrial tap loss	16 dB \pm 2 dB
Terrestrial pass-through loss	5 dB
Isolation between satellite inputs	> 30 dB
Isolation between satellite and terrestrial inputs	> 35 dB
Current drawn from receiver	60 mA max.
Embedded power supply (NT model only)	12V/1600 mA
Polarization switching voltage	14.5-15.5 V
Band switching frequency	22 kHz \pm 4 kHz
Operating temperature range	-20... + 60° C/dry indoor use