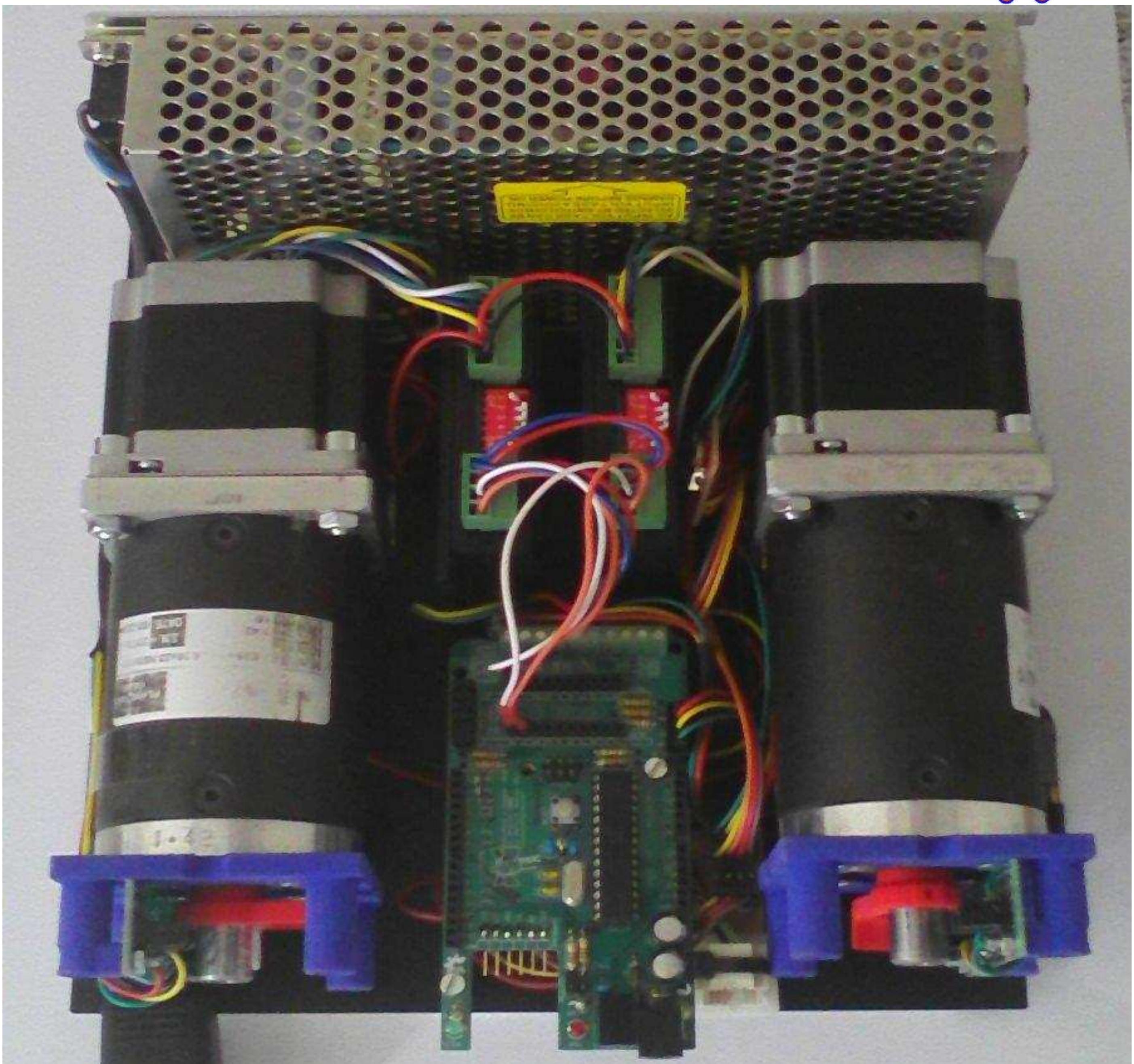
Juli 2014
41^{e} jaargang nr. 2

DE KUNSTMAAN



In dit nummer o.a.:
"Het DiSEqC Formaat
Weersatellieten in Vietnam deel 12
Arduino frequentieteller
en nog veel meer……

ISSN: 1382-8215

Dear member,

This pdf contains some translated articles of our Dutch magazine “De Kunstmaan”.
Google Translate is used; none or very few corrections are done afterwards. Results may be sometimes incorrect or hard to understand, but mostly I think it is usable.
Figures and pictures are left out. Please use the “paper” (Dutch) magazine together with these translations.

I hope these translations will help you to understand the Dutch articles. If there is a particular article for which you want a translation just let me know.

Please check also our web-site, which has now a translated version:
www.kunstmanen.net

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Foreword (page 50)

In this Kunstmaan you will find again a wide variety of articles to. The antenna rotor remains a source of inspiration for new developments and products. In particular, the mechanical character is often a stumbling block for the electronics hobbyist. Tools and experience often lacking to bring. Constructing an antenna rotor to a successful conclusion So thanks to Peter Smits, who offers to help members with the construction of an XY rotor based on a planetary gearbox.
It is possible to DiSEqC rotors, which are normally used, for television dishes for a XY-to-use arrangement. Many less DIY, useful and affordable. Rob has written a very interesting article.
The President is engaged in the Arduino recent times. So I have a GPS module purchased and put to the test. We do not have only to receive weather satellites I also have a pulse counter and a frequency counter made. Nice to have the versatility of the Arduino, and the display board of the WRX-1700 exploit. In these articles, I want to explain the operation of the sketch as much as possible because for many of us working with the Arduino and often English sketches new.
Recently I have been in China to make. A set screen printing If you need some more printing is not worth it to etch themselves. Harry thanked for preparing the files.
Of the 32 original printing of the WRX-1700 there are only about 8 so. It runs What do we do if they are printing? We still have some (used) UV916 tuners are. With a view to the future, it is not advisable to output. WRX-1700 in its current form Perhaps only a power supply board for UV916, a separate board for the HRPT decoder and a separate board for the QPSK decoder. Anyone may so put together his own receiver. What do you think?
It's been four years since I've been asked to give a presentation. GnuRadio about Martin Dudok van Heel Elephant Asia, distributor of Ettus receivers, Two years ago I had an expensive receiver Ettus purchased but all that time I have not done anything. Now you also have cheap dongles that you can use for GnuRadio did in my gnawing that I had done nothing. GnuRadio with Found some time to search and search and search. The result of my search, I presented during meibijeenkomst. It's not far that I can write an article. About Incidentally, it would be useful to include my own documentation because the information about GnuRadio fragmented, outdated, incomplete and is only suitable for DSP experts. Of course I'm exaggerating a bit, but the learning curve is very steep. This is expected to change soon because the entry is made. Quite low by cheap RTL dongles in gnuradio
On the Internet are examples of APT receivers based on these RTL dongles. Along with Harry, I have considered whether we could achieve. Direct LRIT receipt of MSG with these dongles This is partly successful, but the dish Wim diameter of 1.60 is too small. Also in Dwingeloo, we have attempted to receive the MSG despite the large dish have not been successful. Rob has written a report on our findings in this Kunstmaan.
GnuRadio can be a very valuable addition to the experimentation lustigen. So you can record a HRPT signal and "broadcast" again. Poor software you can add noise so as to control you. Receiver optimally off Because you are the recipient with the real signal regulates downward here can not test transmitter beat that! This summer I will write an article on this subject, although the weather should not throw spanner in the works.
At Eumetsat developments are ongoing. This year they stop broadcasting of the current signal, a new signal with a higher data rate is in its place. You do need. Someone new Arne wrote an article about it. Hopefully, the availability of affordable receivers in the course of time increases.
It remains for me to wish you a nice summer holiday and I hope everyone at the meeting on 13 September to welcome. Lot of reading pleasure with this Kunstmaan!

Controlling an X / Y-rotor system with DiSEqC. (page 57)

In KM No. 2 of 2011 Arne van Belle describes how an XY rotor system can make. Two Clarke-tech DiSEqC rotor The completely self-build a rotor will be too complex for many people (myself included). The rotors used by Arne are ideal:
cheap (around 60 euros per rotor)
relatively easy to adjust for use in an XY rotor to
No feedback from the current position required
the rotor to the desired position to send directly with a simple command
Calibration is performed automatically by the rotor

In the previous KM (April 2014) Fred described v. d. Bosch how he converted it. Rotors
What remains is the management. This goes through DiSEqC; see, for a description later in this KM.
Based on this format, it is in some way on and off of a 22 kHz signal. There are a number of ways to generate this; Arne mentions a simple test program [1] via the sound card delivers the signal. See Figure 1.

Fig.1. DiSEqC audio generator.
This site contains a schakelingetje that the signal can be put. The coaxial cable Use is made of a switching FET which may be difficult to obtain. However, it can also be a regular power PNP transistor; see Figure 2.
The circuit converts a power supply voltage on the rotor, via a diode. This approx 0.7 V voltage drop will occur.
Now when a 22 kHz signal is applied to the input, the BC107 will turn and thus the BD140 controlled. That the diode may or may not be short-circuited. There will be some voltage drop occur, around 0.2 V. This creates a switched output 22kHz square wave with a peak to peak voltage of 0.5 V, superimposed on the supply voltage of about 18 V. That is exactly what is needed for the DiSEqC signal. (A FET, the diode shorting harder, reducing voltage drop occurs when the FET conducts, so there is a larger peak-peak voltage. Possibly would be two diodes can be put as at a great distance in series modulation at the end failure as low to the rotors.)
If actually coax is driven thereby also the antenna signal is then some coils work should be made to disconnect the power supply and the LF to RF signal DiSEqC signal.
It is wise to take into account possible short circuit at the output. A fuse or a low resistance (eg 6.8 ohms few watts) protects the transistor / diode against this evil.

Fig. 2. Modulator DiSEqC to the power supply.

The maximum input voltage should be about 19V. The rotors each consume about 300 mA, so it is at least necessary. 600 mA An old laptop power supply is suitable. Short-circuit protection is highly recommended; shorting this diet provides about as a fireball (bit exaggerated, but it was a very fat spark. Nothing broke down, by the way.) will show that a resistor in series with the power supply can serve another purpose. Later
Unfortunately, the rotors a fixed, unchangeable address (hex 31, the origin of azimuth rotors). This means that for an XY rotor system both rotors must be driven by its own cable; Figure 2 is thus needed twice. One of the cables can also be used for the antenna signal. (Incidentally, it is not necessary to use as only one rotor is powered / driven. Coaxial cable)
Directing rotors.
For a target system requires the following:

- Program that determines the position of the satellite, and from that calculates the X / Y numbers.

- Translate that position into two DiSEqC commands
- Converting the commands in a switched 22 kHz signal (see description DiSEqC)
- Signal on the (coaxial) cable set (see Figure 2).

Attn the program: For this Xtrack ([4]) can be used.
Attn translate it into commands: Xtrack can now.
Attn convert to 22 kHz switching signal: One possibility would be to use the soundcard. With a "stereo", two parallel DiSEqC control signals can be generated, which drive the two motors by means of two times Figure 2.
Another possibility is the use of the hardware with which also the HRPT-decoder was designed. If the rotor system is used to track polar weather satellites than this decoder will anyway be necessary (see [2]). In the decoder, use is made of a GODIL module ([3]), in which an FPGA (programmable hardware) sits. In the same FPGA dual DiSEqC generator can be installed; See Figure 3. Right can be seen, the decoder print left a print with twice the converter. We now need two power supplies (19V motor control decoder and 5V power supply), but in principle could the two can be combined. Please note that there will be a switched version of the 7805 is required; a 'real' 7805 would be very hot (with cooling)!

Fig. 3. Complete hardware for HRPT decoder and rotor control.
The final output pins for the two DiSEqC signals have yet to be determined.
Of course, the FPGA has to be provided. Of a new bitfile This bit will t.z.t. file on my website. People who can not program the FPGA itself (there is a special cable + software needed) can cause it to be by myself.

Fig. 4 shows an overview of a complete system HRPT. Bottom right starting, the screen wsat ([4]) to see. This program is used to receive the bit stream decoder and convert to images, but there is now also a tracker system built which, like Xtrack also DiSEqC commands can generate. This tracker calculates the X / Y position of the satellite. These numbers are sent via USB to the HRPT-print, which generates DiSEqC signals. The 22 kHz switching signal goes through two wires to the control board left the (coaxial) cables controls and thereby rotates the rotors. Should, of course, an antenna to be mounted on the rotor. The antenna signal to the receiver (eg WRX1700, upper right), and the demodulated signal goes back to the HRPT-print, where it is processed. HRPT by the decoder Finally, the received bits go through the same USB connection back to wsat, but so to the receiving part.
There is thus required only a single program and a USB connection, both the rotor control as to get the data. Received on the PC (During the transfer of the position to the HRPT-print as nothing can be returned. That does not matter, because the decoder contains a buffer that stores the received bits here until the USB port free again.

Fig. 4. Summary of a complete HRPT system.
Control.
The quantity of positions per unit of time to be sent to the rotor is adjustable in the software. This can eg every 3 second. At the beginning, when the rotor from its "storm mode" (antenna straight

upwards), it will take some time until the correct position is reached. Meanwhile, new positions are already sent to the rotor. That in itself is no objection, but on receipt of a new position, the rotor will stop and then go again. This can be prevented by turning the antenna. Well in advance of the start of the arrival already in the correct position However, it is also possible to send to the software as to whether or not (yet) for rotation of the rotor, so that the sending of new positions can be stopped. Any information back This can be done easily. With the help of the aforementioned "protection resistor" See Figure 5.
In the diet is a resistance of 6.8 ohms included. If the engine is running then the resistance is approximately 2V stand. The transistor will open, and the extra output is about 5V. Then it goes to the GODIL far, where it comes in a status register, which can be read back via the USB connection. This has not been tested, but could be with this provision. Already taken into account in the construction
As for the 6.8 ohm quite type is taken, he does not light up immediately with an unexpected short circuit. The maximum short circuit current is therefore limited to approximately 2A.
A further enhancement would be to regulate the power supply voltage so that the motor speed is running at a large change in position slowly and to a small change.
Finally, remember that if there is used which is then DiSEqC an LNA in the antenna can give as driven rotor and LNA (including antenna signal) are sent via the same cable problems. The polarization is then switched to the height of the power supply (see article DiSEqC) above, which gives limits to the rotor power supply. In addition, no continuous 22 kHz signal is applied, which means that any LNA-with-DiSEqC sits on the low band. For our applications, this will not be a problem; LNA which are adjustable via DiSEqC i.h.a. 12 GHz LNA that are not useful for our purposes.

Fig. 5. Customized DiSEqC generator with current sensor.
N.a. The transistors are not critical.

- BC107: or "approximately" equivalent:
- Vce> = 30V
- hfe> = 100

- BD140: or "approximately" equivalent:
- Vce> = 30V
- hfe> = 40
- Ic> = 1A

[1] http://www.juras-projects.org/eng/software.php
[2] A new HRPT-decoder. KM 2011, No. 1 and 2.
See also http://www.alblas.demon.nl/wsat/hardware/hardware_frm.html
[3] GODIL: http://shop.trenz-electronic.de/catalog/product_info.php?products_id=635
[4] Xtrack, wsat: http://www.alblas.demon.nl/wsat/software

The DiSEqC format (page 62)

DiSEqC stands for Digital Satellite Equipment Control. It is a way to control, such as all-wheel-related devices via coaxial cable:

- down converter switching between low and high band
- polarization
- rotors
- antenna Switches

Because the commands are sent via the coaxial cable need be drawn. No extra wires The coaxial cable is then therefore used for three things:

- antenna Signal
- Power to all devices that hang on the coaxial cable (including rotors)
- Beam control signals

There are basically two kinds of control signals. The first ("analog") is very simple:

- switching polarization:
  vertically when the power is on the coaxial cable between 14 and 15 V
  horizontally when the power is on the coaxial cable between 16 and 18V
- Frequency band:
  high band (11,7-12,75 GHz): 22 kHz signal on the coaxial cable
  low band (10,7-11,7 GHz): no 22 kHz signal

This method does not need complex circuitry.
With the second (digital) method are much more commands. This is a serial data stream put on the coaxial cable. The decoding of this data flow is, of course, be more complex than the simple detection of a voltage level or the presence of 22 kHz at the first-mentioned method.
The two methods can be used at the same time; they "bite" each other. Moreover, the digital code also contains commands for polarization and frequency band selection.
The digital bits are transmitted by a 22 kHz signal to switch on and off:

- logic '0 ': 1 ms 22 kHz (= 22 periods) followed by 0.5 ms rest
- logic '1 ': 0.5 ms 22 kHz (= 11 periods) followed by 1 ms rest

The amplitude of the 22 kHz should be approximately 0.5 Vpp. See Figure 1.

Fig. 1. A logic '0 'followed by a '1' in DiSEqC.

The bits are in groups of 8 (ie one byte) is sent; in each byte is an parteitsbit added. This makes it possible to detect a bit error on the reception side; the command will be ignored. The parity bit is such that the number of ones is always odd in 9 bits. So if a byte '00100001 'is (2 ones) than the added parity bit will be '1' are (total 3 ones); a byte "11100011" (5 ones) pariteisbit it will be '0 (total number of ones is 5, so odd).
A feedback signal is also possible that the status of a device may be requested, or an error message may be returned.
A message contains 3 to 5 bytes (each byte always followed by a pariteistbit):

- start-byte
- address
- command
- optional data byte 1
- optional data byte 2

Between two posts at least 6 ms should be resting.

Start byte

This is designed to give "to capture", so that the next incoming bits may be counted down. Precisely the time the receiver In fact, the first nibble (first 4 bits) the start command, followed by some information about the type of message.

Hex.	Binair	Betekenis
E0	1110 0000	Command, there is no response expected
E1	1110 0001	Idem, repeat the previous command
E2	1110 0010	Command, it will be expected to answer
E3	1110 0011	Idem, repeat the previous command
E4	1110 0100	reply slave, OK, no errors
E5	1110 0101	reply slave, command not supported
E6	1110 0110	reply slave, parity error
E7	1110 0111	reply slave, command unknown

The first four, E0 / m E3, the starting byte of a "master". The receiving "slave" can return an answer (eg confirmation of receipt, or an error); that the codes E4 t / m E7.

Address.

To transmit a command to the desired device address is required. A few examples:

Hex.	Binair	destination
20	0010 0000	low frequency band
21	0010 0001	vertical polarization or right circularly
24	0010 0100	high frequency band
25	0010 0101	horizontal polarization and left circular
30	0011 0000	same command to all rotors

31	0011 0001	azimuth rotor
32	0011 0010	elevation rotor

Commands.

I will limit myself to some commands for rotor control. Thus this part of the addresses 30, 31 and 32 (hexadecimal). Some commands hear one or two additional data bytes.

Hex.	Binair	meaning	extra byte 1	extra byte 2
68	0110 1000	rotary engine to east	number of steps (optional)	
69	0110 1001	rotary engine to west	number of steps (optional)	
60	0110 0000	Stop		
6E	0110 1110	go to position x.x	Position: 2 bytes	

The last command is interesting, if supported. This rotor can be turned directly to a specific position. The two extra bytes form a 16-bit number, which indicates the desired position directly in eg 16 steps per degree.

Examples of commands.

to be transmitted bytes	In bits, incl. paritybit	action
E1 31 68	[1110 0001 1] [0011 0001 0] [0110 1000 0]	azimuth rotor to east
E1 30 60	[1110 0001 1] [0011 0000 1] [0110 0000 1]	Stop all rotors
E1 31 6E D0 A0	[1110 0001 1] [0011 0001 0] [0110 1110 0] [1101 0000 0] [1010 0000 1]	rotor azimuth at 10 degrees East (16 steps per degree)

The transmission of a command is rather slow; 1 bit lasts 1.5 ms, so 5-bytes with parity bits takes 5x9x1, 5 = 67.5 ms. Along with the rest of 6 ms between two commands is that almost 75 ms. If two rotors are driven at the same time than a maximum of about 6 times per second, so there may be a new position to be passed. More than fast enough for our applications.

literature:
http://www.eutelsat.com/en/support/technical-support/diseqc.html
Bus Specification document