UNIQUE IDENTIFICATION SIGNALS FOR CCIR 625

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When an AMTOR master (CCIR 476) calls an AMTOR slave, it uses a 4-character identification. Since the AMTOR alphabet is based on the RTTY code, these four characters can only be uppercase alphas [A...Z]. But an amateur call sign can be from 3 to 6 characters, of which at least one is a number. The amateur community is using some workable algorithms to map callsigns to these 4 characters; unfortunately there is no way to map these 4 characters back to a unique callsign.

When CCIR 625 was added to AMTOR, the number of identification signals expanded to 7. However, because of a checksum calculation that is used during the initial connection, the 7 characters can only be a subset of the uppercase alphabet. Because the checksum uses a modulo-20 addition, only 20 alphas can be used out of the 26:

[ABCDEFIKMOPQRSTUWZ]

Again, some algorithms are being used to convert amateur callsigns to 7 character identifications. One way is to map the 6 invalid alphas and 10 digits to the 20 valid alphas. But the mapping is not unique when trying to convert back. The algorithm is workable in that it is unlikely that two call signs which would have the same 7-character identification would be on the same frequency at the same time.

CCIR 491-1 Annex II shows an algorithm to convert a g-digit number to 7-identification characters. The identification characters can then be converted back to the same g-digit number. The algorithm basically takes the g-digit number and divides it successively by 20, mapping the remainders [O... 19] to the 20 alpha characters in the order [VXQKMPCYFSTBUEOIRZDA]. Note that the number of valid identifications (20*20*20*20*20*20*20 = 1,280,000,000) is greater than 999,999,999. This shows that there are some valid 7-character identifications that will not map to the g-digit formats.

An amateur call sign can be from 3 to 6 characters long. Let us extend all callsigns to 6 characters by padding spaces on the right such as "WØXI ". A brief examination of call signs will show that there can only be uppercase alphas and numbers in the first three positions and that there can only be uppercase alphas or spaces in the last three positions. Of course, there is no such valid call sign as “555 I ", but as you will see, there is no need to make the algorithm more complex. There is therefore, the possibility of 36 symbols [A...Z0...9] in the first 3 character positions and 27 symbols [A...Z] in the last 3 character postions. Since invalid call signs are included, the number of valid callsigns is less than 36*36*36*27*27*27 =918330048. A proper algorithm will convert an amateur call sign to a g-digit number which can be converted to a unique 7-character identification. The reverse process will take that 7-character identification and convert it back to a unique call sign.

Kantronics KAM has been using such an algorithm for some time. Consider the call sign to be a six-character string, c[0] through c[5]. For example, WØXI becomes c[0] = 'W', c[1] = 'O', c[2] = 'X', c[3] = 'I', c[4] = ' ', and c[5] = ' '. Each character c[i] must be converted to a number n[i]. Since the first three characters can be numbers or letters, a different conversion is used for them compared to the last three characters. For the first three characters, 'A' =0, 'B' = 1, ... 'Z' = 25, '0' = 26, '1' = 27, ... '9' = 35. For the last three characters, since they can only be letters or space, 'A' =0, 'B' = 1, ... 'Z' = 25, ' ' = 26. In a programming language, this could be expressed as:

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if(i < 3)
        {
        if(c[i] > = 'A' && c[i] < = 'Z') n[i] = c[i]-'A';
        else n[i] = 26 + c[i]-'0';
        }
else
        {
        if(c[i] > = 'A' && c[i] < = 'Z') n[i] = c[i]-'A';
        else n[i] = 26;
        }
```

The 9 digit identity number N can now be computed using the formula:

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N = ((((n[5]*27 + n[4])*27 + n[3])*36 + n[2])*36 + n[1])*36 + n[0];
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CCIR 491-1 would convert N into the 7-character identification. At the other end of the link, CCIR 491-1 would convert the 7-character identity back to the same g-digit identity N. From N, n[i] can be obtained by successive divisions with remainders as follows.

N/36 = N1	with n [0] remainder,
N1/36 = N2	with n [1] remainder,
N2/36 = N3	with n [2] remainder,
N3/27 = N4	with n [3] remainder,
N4/27 = n[5]	with n [4] remainder.

Table lookup will get back c[i], mindful of the differences between the first three and the last three characters.

Note that not every g-digit identity can be converted to a callsign. Even if it can be converted, it may not be a valid call. Since a standard similar to this algorithm has never been specified, the 7-character identity can be anything. Every call sign can be mapped uniquely to a 7-character identity, but every 7-character identity can not be mapped uniquely to a call sign.

This algorithm does provide a unique 7-character identity for any amateur call sign. The only drawback may be that someone monitoring the channel in a 'dumb' listen AMTOR mode would not be able to do the conversion in his head; WK5M would appear as 'OCIFRDC'. However, a 'smart' listen AMTOR mode might be able to do the translation for the listener. And besides, WK5M will still respond to a call directed to 'OCIFRDC'.

Kantronics considers this algorithm to be in the public domain; anyone may use it.