

Arcom RC-210 Announcement Architecture Development

Wesley Cardone – November 14, 2023

This is a preliminary writeup on a method to develop intricate and interconnected and dependent announcements for the Arcom RC-210 repeater controller. This document is much less than a first draft. It is, in fact, somewhat incomplete and is still in the process of development. But the meat is there.

WHY HAVE ANNOUNCEMENTS?

Sometimes questions are better answered with questions. Thus:

- Why have event announcements?
 - What events are there to tell people about?
 - What help is needed for an event?
 - Who is benefiting from events?
 - Why should people benefit from anything at all?
 - Why would someone want to know about an event?
 - Why would someone donate their time?
- What benefit is there in informational announcements?
- Why have announcements that are informative to the amateur community?
- The list goes on...

Announcements are a means to get the word out in a hurry in a brief form. Announcements do not necessarily even have to be a complete sentence. When put out on a community repeater resource the announcement can be heard from a wide audience that will in probably every case have their minds on other things.

THE OVERALL PROCESS IN PREPING THE CONTROLLER

For any one announcement, there are seven of the controller's microprocessor resources that are required:

- One Message Macro
- Three Command Macro registers
- Three Setpoint registers

For purposes of this paper, it is important to recognize the existence of two announcement devices: 1. Instantiation; and 2. Activation. An instantiation device may be thought of as an announcement instance. It either defines what the announcement is or its nature. An activation device may be thought of as a gate-keeper opening the gate for the announcement to proceed at its own pace.

There are two modes of announcement media: 1. A vocabulary of about 250 words to choose from of computer words strung together to formulate sentences; and 2. Digital voice recordings. The announcement media reside in message macro (MMAC) registers that may be called on by a Command Macro (CMAC). A CMAC register will include deployment instructions and directions regarding how and where the announcement will be deployed. A CMAC register, thus described, is termed an "instantiation CMAC." That CMAC register resource, from that point, becomes an instance of the announcement.

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An instantiation CMAC has no ability to execute on its own but must be called by an instantiation Setpoint. It is the instantiation setpoint that introduces the temporal element whereby an announcement becomes periodic in time. But even so, the setpoint may be thought of as a bull in its pen waiting for someone to open the gate.

Setpoints serve to enable (RESUME) and disable (SUSPEND) instantiation setpoints and therefore are assigned by pairs. For any one instantiation setpoint, there will exist four activation devices: two CMAC and two Setpoint registers. The CMAC register pair will have RESUME/SUSPEND executables pointed toward their related instantiation Setpoint.

There exist messages which are either recordings (DVRx slots) or computerized vocabulary words. Command macro registers (CMAC) are able to call these recordings and play them to an output. For purposes of this paper, these are identified as instantiation CMAC registers and contain the code that, when the CMAC is executed, performs the announcement.

Any one of these CMAC registers is called by an instantiation setpoint. But when called by an instantiation setpoint it still doesn't do anything. That instantiation must first be enabled or RESUMEd. Once resumed, the instantiation setpoint can continue in its periodic execution mode until it is SUSPENDEd.

THREE CLASSES OF COMMAND MACROS DISTINGUISHED

The RC-210 contains three classes of command macros distinguished by the number of commands each is capable of.

Macro Range	Size
• 1 to 40	15 slots
• 41 to 90	6 slots
• 91 to 105	20 slots

In order to optimize our use of the controller resources, we need to consider how many executables any one command macro will be called upon to accept. In the present case, none of our command macros will need to hold more than six executables so we will want to assign all of our command macros to the group from 41 to 90.

We START THE ANNOUNCEMENT REQUIREMENTS

We are given a list of announcement requirements such as the list below. Typically these will have the critical elements which include: 1. The text of the announcement itself; 2. Its periodicity such as 2nd Tuesday; 3. The repetition and in what groups; and 4. The time of day.

In the list below we are given the important information. But what is missing we must fill in by executive decision. These "omissions" are not typically actual omissions but items not thought of. Unfortunately, the controller deals in absolutes and there are some things that, though minor, are required. We must supply at what minute of any hour an hourly message must play, in this case.

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- Announcement 1: The CARC meets tonight and is followed by a net at 8:30PM
 - Plays hourly,
 - 2x in the morning and
 - 2x in the evening
 - on the 2nd Tuesday in the month.
- Announcement 2: The CARC meets each 2nd Tuesday of the month and is followed by a net at 8:30 PM.
 - Plays hourly,
 - 2x in the morning
 - 2x in the evening
 - every day of the week
 - but is preempted by announcement #1 when appropriate.
- Announcement 3: The CARC hosts a net on this repeater tonight at 8:30PM and is open to all licensed amateurs.
 - Plays hourly
 - 2x morning hours
 - 2x evening hours
 - On Tuesdays
 - Is preempted by the above when appropriate.
- Announcement 4: Today is TGIF!
 - Plays hourly
 - 4x morning hours
 - On Fridays
 - No preemption. Is to play alongside other announcements.
- Announcement 5: Assigned on a needed basis
 - Plays hourly
 - 24x per day
 - Every day
 - At a minutes-after-the-hour other announcements do not use.
 - Is, therefore, not preemptable
 - Has an assigned DVRx slot
 - Announcement will
 - play when DVRx slot is occupied
 - be silent when DVRx slot is empty

WHAT THE ABOVE ENUMERATION MEANS

Announcements 1, 2, and 3 are a logical group of announcements serving as one apparent announcement that changes its content dependent on which day it currently is. This group of announcements exists as a hierarchy. Thus we see announcement 2 existing at the bottom of the hierarchy which plays hourly day in and day out, Sunday through Saturday, 365 days a year (unless preempted). This announcement will have supplemental programming such that it will silence itself on all Tuesdays “stepping aside” to make room for one of the two other announcements that share its hierarchy.

Announcement 1 is designed to play on all Tuesdays when announcement 2 has stepped aside (been preempted) for it. But announcement 1 is also designed to step aside on every 2nd Tuesday when announcement 3 will be stepping up to the plate.

Announcement 4 is a standalone announcement. It plays in its own and may even share the exact time slot as the group of three above. If sharing the same time slot the two announcements will simply both

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play back-to-back. The first to play is dependent on which announcement was defined first in terms of microprocessor resources.

Announcement 5 is like announcement 2 in that it will play 365 days a year without preemption. Its instantiation will be enabled at machine boot-up such that it will never be silenced except by the absence of a recording. In this way the repeater controller permissions can be manipulated in such a way that a named group of club members can make a recording over the air and that recording will then start repeating itself hourly until that recording is erased.

STEP 1 IS TO DEFINE THE LOGICAL STRUCTURE

Figure 1 illustrates an announcement hierarchy. At the bottom of the heap is the DVR2 announcement of a "...meeting each 2nd Tuesday..." This one plays every day of the week unless preempted. It is preempted on Tuesdays by the DVR3 "...net tonight..." which plays only on Tuesdays. Preempting everything is the DVR1 "Meeting tonight..." announcement. This one only plays one day of the month. The DVR4 announcement can play anywhere Friday mornings with no need for preemption.

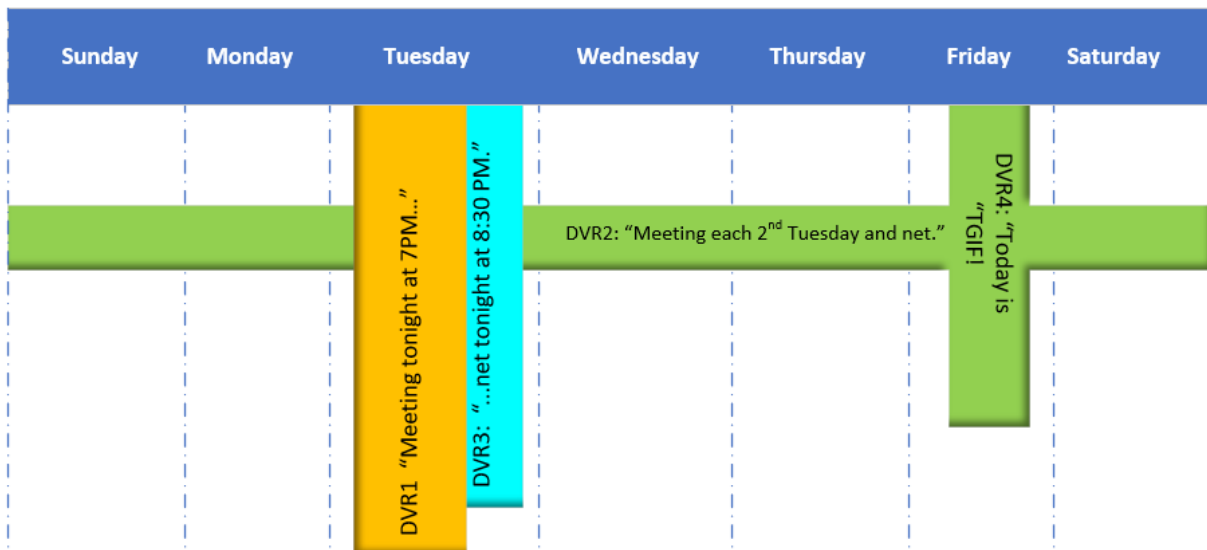


Figure 1 Shown here is an illustration of the required announcement architecture.

The logical structure consists of instantiations and activations. An instantiation may be thought of as an instance of an announcement. It is an identity much like all of us have names. There are Command Macro (CMAC) instances and there are Setpoint instances. These two are logically linked together with the setpoint instantiation calling the CMAC instantiation. The distinction between these two is that the CMAC instance has no temporal dimension. It is the setpoint instance that introduces periodicity and time.

A second element of the logical structure is the activation registers. Both CMAC and Setpoint registers have activation elements though the activation setpoints merely call the CMAC activations. Activation CMAC registers may be thought of as extensions of activation setpoint registers. Together, they form an activation device.

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The voice recorded message, announcement-by-announcement, is assigned an enumerated DVR register. It then becomes a resource that the controller can address.

As a first step, the instantiations are made in the worksheets. In the Command Macro (CMAC) worksheet, an instantiation register will have a setpoint register listed that it is called by and the worksheet for that CMAC register will show the DVR register representing the announcement currently being added to the set of worksheets.

We start by executing paragraphs 1 through 6 of ordered operations in the list below for announcement #1—“CARC meets tonight...” Figure 2, (Memory Macro registers 1, 2, and 3) shows the addition of the message text which has been allocated to DVR1.

The CMAC allocations of 41, 42, and 43 are shown in Figure 9.

The setpoint assignments of sp(1) (calling CMAC-41), sp(2) (calling CMAC-42), and sp(3) (calling CMAC-43) are shown in Figure 3.

We repeat these operations for announcement 2 resulting in CMAC assignments of 44, 45, and 46 (Figure 9). Resulting Setpoint assignments were registers 4, 5, and 6. See Figure 3.

We repeat these operations for announcement 3 resulting in CMAC assignments of 7, 8, and 9 (Figure 9). Resulting Setpoint assignments were registers 7, 8, and 9. See Figure 3.

Message Macro Definition Table		
Message Macro # or DVR	Function Codes <i>(optional)</i>	Content
DVR1		The Chelsea amateur Radio Club meets tonight at 7PM and is followed by a net at 8:30PM. All licensed amateurs are invited to attend.
DVR2		The Chelsea Amateur Radio Club meets each 2 nd Tuesday of the month at 7PM and is followed by a net at 8:30PM. All licensed amateurs are invited to attend.
DVR3		Please join the Chelsea Amateur Radio Club net tonight at 8:30PM. All licensed amateurs are invited to attend.
DVR4		Today is TGIF!

Figure 2 The Message Macro Definition Worksheet has been filled out following steps 1 and 2 in the ordered list of operations concerning announcement #3.

LOOKUP THE CONTROLLER CODES

We have now completed the development of the logical structure architecture for the announcement plan. With this structure and framework in place, it is now possible to look up the controller codes that go into the function calls. This paper’s objective does not include explaining details the controller codes so we will be satisfied with a brief explanation for each. The various codes can be looked up in the controller [Operations and Programming manual](#).

The instantiation CMAC registers 41, 44, and 47 call the DVR registers which hold the voice recordings. An instantiation register must first be given a code telling it that what follows is going to be speech out to

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a named port. It may also need to be told to output the designated CTCSS sub-audible tone with it. And finally, it must be told what DVR register to play.

The CMAC activation registers having the RESUME and SUSPEND executives operate on a named setpoint and must be told to which setpoints they are to direct their actions. It is for this reason that we included descriptive text in the CMAC worksheet telling us which setpoint registers were applicable to what CMAC activation registers.

But even with that added, it is missing something. It does not have a temporal dimension. That will be the next (and intuitive) step.

THE TEMPORAL DIMENSION IS ADDED

In describing the following temporal programming, we refer to each DVR as if it were being operated on rather than its associated setpoint. As humans we think in terms of what we see and hear. We know what an audio recording (DVR) is but come up a little vague on what a setpoint is. For this reason, we use this inaccurate (but descriptive) terminology of, for example, resuming a DVR.

Looking at the Setpoint Definition worksheet and the Setpoint(1) register (see Figure 3), we see the instantiation setpoint for the DVR1 recording. Referring to the directives, we are told that this announcement must play hourly, and only on the 2nd Tuesday in the month. We chose to have the announcements play at 25 minutes after the hour because this will facilitate one final announcement going out 5 minutes before a net begins.

For the second instantiation setpoint, setpoint(4), we see that this is applicable to the announcement of DVR2. This is to play hourly on every day of the week. As with the DVR1 announcement, we choose the hourly announcement to go out 25 minutes after the hour. And finally we have the DVR3 announcement that plays hourly on Tuesdays at 25 minutes after the hour.

Addressing the activation setpoints, the first on the list is at setpoint(2) which is applicable to DVR1. The resuming action has two phases: 1. In the morning; and 2. In the evening. For the morning report we can specify that on the 2nd Tuesday of each month, at 7:22 AM, this setpoint will call its designated CMAC register causing a RESUME executive on setpoint(1). From that point forward, the DVR1 announcement will occur every hour on the 25-minute mark. Therefore, given the above programming, we will have an announcement at 7:25 AM and 8:25 AM and so on and so forth. It is noteworthy to point out, however, that while we specified every 2nd Tuesday, we could have specified every day since the instantiation setpoint it resumes only plays on the 2nd Tuesday. The author believes it is better to stick with a “2nd Tuesday” specification for an orderly statement of processing.

WE GET SUSPENDED!

But we only wanted 2 morning messages. This means that we must execute a SUSPEND on setpoint(1) sometime after 8:25 AM but not later than 9:24 AM. We therefore specify for setpoint(3) that it execute on the 2nd Tuesday of each month at 8:30 AM.

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But what about the two evening announcements for DVR1? At this time we do not have the logical structure to make that possible. What we will therefore do is allocate the next two available setpoint registers to that task. That will be setpoint(10) and setpoint(11). In logical structure, these will be duplicates of setpoints 2 and 3. They will appear exactly as setpoints 2 and 3 in the worksheet except for their temporal assignments. We will “open the flood-gate” at 6:22 PM so that the announcement will play hourly starting from 6:25 PM.

But the requirements play specifies that the hourly DVR1 announcements must cease with its 8:25 PM playing. The activation setpoint(11) will need to run not earlier than 8:26 PM and not later than 9:24 PM. For this we chose to execute setpoint(11) two minutes after the last announcement—8:27 PM.

The DVR2 announcement plays hourly every day of the week at 25 minutes after the hour unless preempted. For this one, as was the case for DVR1, we also need a supplemental activation pair. For this we copy the setpoint 4 and 5 parameters to the next available setpoints, 12 and 13. Likewise, the same is true for DVR3 such that we allocate setpoints 14 and 15 for that. See Figure 3.

PREEMPTION INTRODUCED

We introduce a nasty concept not yet addressed—preemption. We identify preemption as “nasty” in that while perfectly logical, it boggles the human imagination. Consider a base announcement that plays every day. Then consider a second announcement which must play in the first announcement’s time slot. The simplest way to accomplish this electronically is to tell the first announcement it is to play every day and not worry about when to stop until told to do so. But a day comes when it needs to “step aside” making room for a temporary replacement announcement. When that day comes, the first announcement will resume, as per its daily schedule, a few minutes before it is otherwise scheduled to play. But then another setpoint recognizes that this particular day is special and suspends that first announcement but only after it has been resumed but before it is otherwise scheduled to play. While all this has been happening, this first announcement’s replacement announcement has been processed independent of this first announcement and is presumably ready for action at its prescribed time.

The DVR2 announcement plays every day of the week but is preempted by DVR3 every Tuesday. Thus, setpoint(5) resumes the DVR2 announcement at 7:20 AM according to its daily schedule. But if this day is a Tuesday, then it is suspended by setpoint(17) one minute later. Note that while all this was happening on this 2nd Tuesday, the DVR1 announcement was being deployed independently by setpoint(2).

It is helpful for us to append descriptive text to the instantiation setpoint(7) of DVR3 saying that it preempts DVR2.

The preemption of DVR3 by DVR2 will require an additional pair of SUSPEND executives—one for the morning, sp(19), and the other for the evening round, sp(20). It is especially noteworthy that the DVR2 scheduling is independent of DVR3. Think of this as DVR2 being a speeding locomotive train that DVR3 needs to step out of the way for.

A HIEARCY OF SUSPENSIONS

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But there is an ordered hierarchy of preemption in this case. Setpoint(1), playing DVR1, preempts everybody every 2nd Tuesday of the month having the highest priority of all the announcements.

To best view the preemptions relation to each other, it is best to work from the bottom up. The DVR2 announcement plays when everybody else is silent but yields each Tuesday. On Tuesdays, the DVR2 announcement silences itself making room for the other two announcements.

Working our way up from the bottom we consider the DVR3. This one only activates itself each Tuesday but must yield on the 2nd Tuesday of the month.

But the mode of preemption requires special understanding. The actual act of preemption is facilitated by the lower-level announcements so as to “make way” for the higher priority announcement. For example, the DVR2 announcement “knows” that it must silence itself.

Setpoint Definition Table					
Setpoint #	CMAC it Calls	Periodicity	Hour	Minute of the Hour (0-59)	Discussion
1	41	2 nd Tuesday	99	25	DVR1—Meeting tonight followed by net at 8:30PM
2	42	2 nd Tuesday	07	22	Resume DVR1 sp(1)
3	43	2 nd Tuesday	08	30	Suspend DVR1 sp(1)
4	44	Everyday	99	25	DVR2—Meeting each 2 nd Tuesday and net—Daily
5	45	Everyday	07	20	Resume DVR2—preempted on all Tuesdays sp(4)
6	46	Everyday	08	30	Suspend DVR2 sp(4)
7	47	Tuesdays	99	25	DVR3—Net tonight at 8:30PM – preempts DVR2
8	48	Tuesdays	07	21	Resume DVR3—preempted on 2 nd Tuesdays sp(7)
9	49	Tuesdays	08	30	Suspend DVR3 sp(7)
10	42	2 nd Tuesday	18	22	Resume DVR1 sp(1)
11	43	2 nd Tuesday	20	27	Suspend DVR1 sp(1)
12	45	Everyday	18	20	Resume DVR2—Evening—preempted on all Tuesdays sp(4)
13	46	Everyday	19	27	Suspend DVR2 sp(4)
14	48	Tuesdays	18	21	Resume DVR3—preempted on 2 nd Tuesdays
15	49	Tuesdays	20	27	Suspend DVR3 sp(7)
16	51	Friday	99	26	DVR4—today is TGIF!
17	46	Tuesday	07	21	Suspend DVR2—preempted on all Tuesdays sp(4)
18	46	Tuesday	18	21	Suspend DVR2 sp(4)
19	49	2 nd Tuesdays	07	22	Suspend DVR3—preempted on 2 nd Tuesdays sp(7)
20	49	2 nd Tuesdays	18	22	Suspend DVR3 sp(7)
21	52	Friday	06	16	Resume DVR4 sp(16)
22	53	Friday	09	30	Suspend DVR4 sp(16)
23					
24	68	4 th Thursday	99	02	Designated holiday announcement—2 minutes after the hour
25	69	4 th Thursday	00	01	Resume sp(24)
26	70	4 th Thursday	23	59	Suspend—Not needed if running until day’s end. Sp(24)
27					
28	55	Everyday	99	03	DVR8 – resumed by CMAC(1) at bootup, plays if DVR8 has a recording.
29					
30					

Figure 3 Shown here is the Setpoint worksheet after it has been completely populated for the assigned set of announcements. The instantiation setpoints are circled. It is the instantiation setpoints that must be resumed and suspended.

WE FORGOT SOMEBODY

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Let us suppose that for whatever reason, that we completely forgot to program into the architecture the DVR4 announcement of “Today is TGIF!” There is the option to go through the ordered list of operations starting from the ground up. The benefit of doing this depends on the nature of the announcement. If the announcement has inter-dependencies, it might be better to push it into the worksheets by means of the ordered operations. However, no matter how complicated the forgotten message architecture is, it is certainly possible to “wing it” by just writing it into the worksheets. The worksheet array is the backbone of this announcement development protocol. But in any case, for a simple stand-alone announcement such as the missed DVR4 announcement, it would make sense to “wing it.”

When we wing it, we keep in mind that there are two fundamental aspects of any announcement: 1. Instantiation; and 2. Activation. Carrying that further, these two foundational elements are found in both the CMAC and Setpoints worksheets. The CMAC worksheet has one instantiation and two activations. Likewise, the Setpoints worksheet has these as well in the same numbers. Note that while there may in some cases be no need for the SUSPEND end of the activations, it is still a good practice to write these into the architecture. If it is not needed you will spot it later on and have the option to make that register available for other operations.

Command Macro Definition Table			
Command MACRO #	Setpoints <i>if applicable</i>	Function Call	Description
1		877	Initialization macro RESUME sp(28)
2			
3			
4			
5			
6			
7			
8			
9			
10			
41	1	162 126	DVR1—The CARC meets tonight followed by a net.
42	2	850	RESUME sp(1) DVR1
43	3	810	SUSPEND sp(1) DVR1
44	4	162 127	DVR2—The CARC meets each 2 nd Tuesday and...
45	5	853	RESUME sp(4) DVR2
46	6, 17	813	SUSPEND sp(4) DVR2
47	7	162 128	DVR3—Please join the CARC net tonight.
48	8	856	RESUME sp(7) DVR3
49	9, 19	816	SUSPEND sp(7) DVR3
50			
51	16	162 129	DVR4—Today is TGIF
52	21	865	RESUME sp(16) DVR4
53	22	825	SUSPEND sp(16) DVR4
54			
55	28	162 133 162 135 162 136 (different options) 162 137 162 138 162 139	DVR8 – plays if DVR8 has a recording DVR10—Volunteers needed Manchester Canoe Race DVR11—Volunteers needed Manchester Chicken Broil DVR12—Volunteers needed Chelsea Community Fair Parade DVR13—Veterans Day DVR14 –Thanksgiving Day announcement
56			
57			
58	<i>unassigned</i>	162 139	DVR14 – Thanksgiving Day announcement.
59			
60	<i>unassigned</i>	162 134	DVR9—Visit WD8IEL.com for details
61			
62	<i>unassigned</i>	162 135	DVR10—Volunteers needed Manchester Canoe Race
63			
64	<i>unassigned</i>	162 136	DVR11—Volunteers needed Manchester Chicken Broil

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65			
66	<i>unassigned</i>	162 137	DVR12—Volunteers needed Chelsea Community Fair Parade
67	<i>unassigned</i>	162 138	DVR13—Veterans Day
68	24	162 139	DVR14 –Thanksgiving Day announcement
69	25	873	RESUME sp(24) DVR13
70	36	833	SUSPEND sp(24) DVR13—Suspend likely not needed
71			

Figure 4 The command macro register worksheet is shown here fully configured to meet the announcement specifications and requirements. Note that CMAC(55) is designed to facilitate announcement options. Any one of the Function Call lines may exist. We avoid the use of resource rich CMAC registers 1 through 40 if possible using only 41 through 80.

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Digital Voice Recorder (DVR) Track List		
Track No.	Function Codes <i>(optional)</i>	Content
DVR1		The Chelsea amateur Radio Club meets tonight at 7PM and is followed by a net on this repeater at 8:30PM.
DVR2		The Chelsea Amateur Radio Club meets each 2 nd Tuesday of the month at 7PM and is followed by a net on this repeater at 8:30PM.
DVR3		Please join the Chelsea Amateur Radio Club net tonight at 8:30PM.
DVR4		It's TGIF at WD8IEL!
DVR5		
DVR6		
DVR7		
DVR8		Will play when there is a recording in this track.
DVR9		Please visit the CARC website, WD8IEL.com, for details.
DVR10		Volunteers are needed for the upcoming Manchester Canoe Race.
DVR11		Volunteers are needed for the upcoming Manchester Chicken Broil to help with traffic control.
DVR12		Volunteers are needed for the upcoming Chelsea Community Fair parade to help with traffic control.
DVR13		WD8IEL and the Chelsea Amateur Radio Club recognize the sacrifices of our veterans.
DVR14		The Chelsea Amateur Radio Club gives thanks this Thanksgiving Day for the manifold blessings bestowed upon us by God.
DVR15		This July 4 th recognize how great this country is and how blessed we are to be under her wing.

Figure 5 Shown here are the Digital Voice Recorder track assignments

Message Macro Definition Table		
Message Macro #	Function Codes <i>(optional)</i>	Content
1	W D E I G H T I E L	
2		
3		
4		
5		
6		
36		
37		
38		
39	REPEATER TIMEOUT	
40	REPEATER TIMEOUT CANCEL	
41		

Figure 6 Shown here are the Message Macro assignments.

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BUILD THE INSTANTIATIONS AND ACTIVATIONS INTO THE ARCHITECTURE

Both worksheets will need instantiations so find available registers and write these in. The next available CMAC register is CMAC(51). All that we know at this time is that it will instantiate DVR4 so we write that in.

Looking in the Setpoints worksheet at Figure 3 we see that there is an available setpoint(16) which we will claim for the use of DVR4. While we now know quite a bit more information about the overall DVR4 deployment, don't be tempted to get distracted with that temporal stuff. The important thing right now is that Setpoint(16) will instantiate DVR4 in collusion with CMAC(51). Write that information down in the Discussion column.

You also know that there needs to be two activation setpoint registers so you allocate those at this time. A good logical choice would be Setpoint(21) and Setpoint(22). We also know that these activation setpoints will be operating on the companion instantiation setpoint(16) register. Reserve these allocations by writing in the Discussion column the "Resume DVR4 sp(16)" and "Suspend DVR4 sp(16)" text.

The important architectural piece of information that we know about now is that it will be Setpoint(16) that calls CMAC(51). Go back to the CMAC worksheet and write in the activation pair. A logical choice would be to choose CMACs 52 and 53. Having allocated the setpoint instantiation register, you now know what setpoint these activations will be active on—Setpoint(16). In the description column for these registers write in the activation reservations you are making showing for these two new allocations:

Register #	Setpoint	Description
CMAC(52):	21	RESUME sp(16) DVR4
CMAC(53):	22	SUSPEND sp(16) DVR4

Having done all that, you are ready to write in the code and temporal assignments.

A MODE OF DOUBLE-CHECKING OUR ASSIGNMENTS

While we have thus far developed a reliable announcement architecture, it is still virtually impossible to get all of the intertwined assignments correct. But even if done correctly in one case, another case will succumb to an error somewhere. The permutations on opportunities for something to go

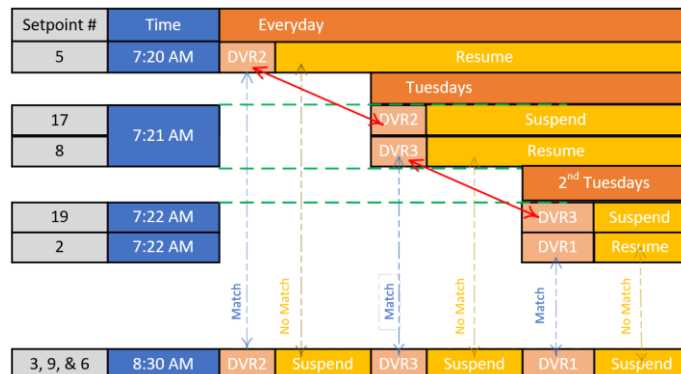


Figure 7 Construct the setpoint architecture in a chronological format as shown here. This is a representation of the morning architecture.

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wrong stagger the imagination. A double-check system is therefore required.

It is recommended to construct a graphical representation of the setpoint architecture in a chronological form. See Figure 7 and Figure 8 where the primary sort is by time of day arranged along a vertical axis. A secondary sort is along the horizontal showing the periodicity relevance to the day of the week. “Everyday” is all inclusive and thus occupies the entire horizontal axis. Tuesdays are occurrences of everyday and thus occupy a portion of the horizontal axis. And finally, 2nd Tuesdays occupy a very small portion of the horizontal axis since they occur infrequently.

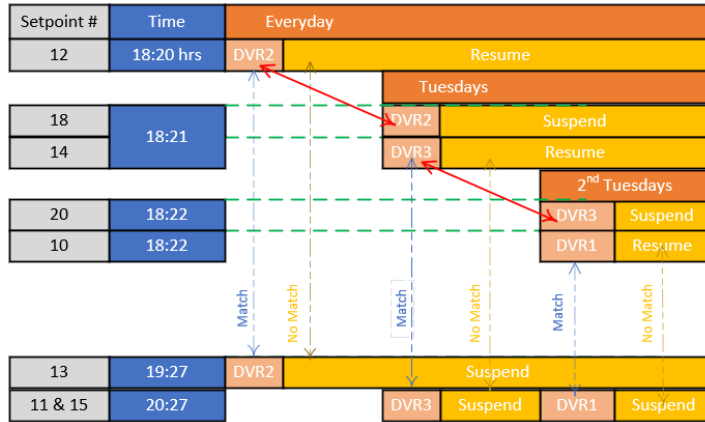


Figure 8 Construct the setpoint architecture in a chronological format as shown here. This is a representation of the evening architecture.

We are able to list each activation by instance. For example, in consideration of everyday, the DVR2 recording (“Meeting each 2nd Tuesday...”) will play each day of the week, 365 days a year, unless preempted. But then we specify Tuesdays. On Tuesdays “the gate” for DVR2 will open as with every day at 7:20 AM. But then one minute later two things happen simultaneously. DVR2 is suspended while at the same time DRV3 (“Net tonight...”) has its gate opened (resumed). DVR2 has been preempted by DVR3.

48	8	856			RESUME sp(7) DVR3
49	9	816			SUSPEND sp(7) DVR3
50					
51	16	162 129			DVR4—Today is TGIF
52	21	865			RESUME sp(16) DVR4
53	22	825			SUSPEND sp(16) DVR4
54					
--					

12	45	Everyday	18	20	Resume DVR2—Evening—preempted on all Tuesdays sp(4)
13	46	Everyday	19	27	Suspend DVR2 sp(4)
14	48	Tuesdays	18	21	Resume DVR3—preempted on 2 nd Tuesdays
15	49	Tuesdays	20	27	Suspend DVR3 sp(7)
16	51	Friday	99	26	DVR4—today is TGIF!
17	46	Tuesday	07	21	Suspend DVR2—preempted on all Tuesdays sp(4)
18	46	Tuesday	18	21	Suspend DVR2 sp(4)
19	49	2 nd Tuesdays	07	22	Suspend DVR3—preempted on 2 nd Tuesdays sp(7)
20	49	2 nd Tuesdays	18	22	Suspend DVR3 sp(7)
21	52	Friday	06	16	Resume DVR4 sp(16)
22	53	Friday	09	30	Suspend DVR4 sp(16)
--					

Figure 9 Shown here is the modified architecture for the CMAC and Setpoint worksheets having appended the DVR4 announcement. Notice the value of noting in text that CMAC(12) is called by setpoint(16).

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Setpoint(8) will resume DVR3 (“Net tonight...”). But if the day happens to be the 2nd Tuesday of the month, DVR1 (“Meeting tonight...”) will preempt both. Follow the logic of why this happens. This 2nd Tuesday of the month is also a Tuesday and a day of the week all at the same time. Therefore, we will see a complete set of resumptions and suspensions leaving DVR1 as the only player on the field.

When setting up the chronological flow in this way we will also observe a symmetry in vertical pairs. The innermost two DVR instances must match. Likewise, for that pair, the corresponding activations must NOT match. One will be a resume and the other a suspend.

THE ORDERED LIST OF PROGRAMMING OPERATIONS

1. Obtain recorded computer WAV file containing the announcement.
2. In the Message Macro Definition worksheet
 - a. list that WAV file as being assigned to a DVR register.
 - b. Write in the Content column for the DVR listing an abbreviated text representing the announcement.
 - c. This announcement shall be referred to henceforth as DVR#.
3. Suggest you have a straight-edge to help with row reading in the worksheets.
4. Assign instantiation resources
 - a. On the CMAC worksheet
 - i. Pick an available CMAC register: __41,__44,__47_____
 - ii. This will be an instantiation CMAC register naming a DVR to be played.
In the Description column, name the DVR register
holding the ancmt: __DVR1, _DVR2, ___DVR3,_____
 - b. On the Setpoint worksheet
 - i. Pick an available Setpoint register: __41,__44,___47,_____
 - ii. In that Setpoint register row,
 1. name the CMAC in the “CMAC it calls” column that you reserved above in paragraph 4.a.i.: __41,__44,__47,_____
 2. In the “Hour” column write in “99” meaning this is to be an hourly announcement.
 3. In the Discussion column name resource holding the ancmt as was noted in paragraph 4.a.ii: __DVR1, __DVR2,___DVR3,_____
 - c. Back to the CMAC worksheet
 - i. For the instantiation CMAC register named in paragraph 4.a.i above,
 1. Identify the setpoint register (see paragraph 4.b.i) that will be calling it.: _41,__44, ___47,_____
 2. Write this number in the Setpoints column.
5. Assign Activation registers—for all register assignments recommend simply using the next available one.
 - a. In the CMAC worksheet
 - i. Pick an available CMAC register in the CMAC worksheet:>__42,__45,___48,_____

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- ii. This will run a RESUME executable operating on the the setpoint named in paragraph 4.b.i above. We write in descriptive text in the “Description” column for that register in the worksheet. The descriptive text should clue you in that
 1. this will call a CMAC having a RESUME executable,
 2. and a clue as to what the announcement will be that you will personally recognize.
 3. Example: “Resume DVR1”
- iii. Pick the next available CMAC register: 43, 46, 49
- iv. This will run a SUSPEND executable operating on the same setpoint(x) register of paragraph 4.b.i. The descriptive text should clue you in that
 1. this will call a CMAC having a SUSPEND executable,
 2. that the SUSPEND executable will operate on setpoint register, the same setpoint register as the companion RESUME executable will operate on.
 3. and a clue as to what the announcement will be that you will personally recognize.
 4. Example: “Suspend DVR1”
- b. In the Setpoints worksheet for activation registers
 - i. Pick an available Setpoint register in the Setpoints worksheet. 2, 5, 8
 - ii. In this setpoint row, for the “CMAC it Calls” column, identify the CMAC it will be calling: CMAC(para 5.a.i): 42, 45 , 48 ,
 - iii. Notations for the Description column
 1. This is to call a CMAC running a RESUME executable so write that in the Description column.
 2. Also, name the DVR slot this is applicable to
 3. Example: Resume DVR1”
 - iv. Pick the next available Setpoints register in the Setpoints worksheet.: 3, 6, 9
 - v. This will be calling the CMAC reserved above paragraph 5.a.iii.: 43, 46, 49
 - vi. In that row’s “CMAC it Calls” column, write the CMAC number named in paragraph 5.a.iii above.
 - vii. Notations for the Description column
 1. This is call a CMAC having a SUSPEND executable so write that in the Description column.
 2. Also, name the DVR slot this is applicable to. It will be identical to its companion RESUME executable.
 3. Example: SUSPEND DVR1”
6. In the CMAC worksheet, Fill in the Setpoints column the setpoint register that will be calling that CMAC register.
 - a. For the CMAC register named in paragraph 5.a.i, it will be called by the setpoint register named in paragraph 5.b.i. Use this information to fill in this CMAC’s “Setpoints” column.
 - b. For the CMAC register named in paragraph 5.a.iii, it will be called by the setpoint register named in paragraph 5.b.iv.

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Command Macro Definition Table			
Command MACRO #	Setpoints <i>if applicable</i>	Function Call	Description
1			initialization
2			
3			
4			
5			
6			
7			
8			
9			
10			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
50			
61			
62			
63			
64			
65			
66			
67			
68			
69			
70			
71			

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Setpoint Definition Table					
Setpoint #	CMAC it Calls	Periodicity	Hour	Minute of the Hour (0-59)	Discussion
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

