ICS
REPEATER
CONTROLLERS

BASIC CONTROLLER
USER MANUAL FOR
FIRMWARE 1.17

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General Description of the ICS Basic Repeater Controller

Here at ICS we strive to make products that have new and innovative easy to use features at a reasonable cost with excellent quality. We believe the Basic is such a product. The Basic has such innovative features with the ICS operating system such as a full-featured control receiver input (has priority), programming with actual values (i.e. Volts, Hertz, Seconds, wpm) and a new very easy to use 2 level command access feature, which has over 35 functions available. The Basic also has a Setup mode (programming mode), which gives you direct access to all the 2 digit functions. When designing the Basic we worked hard to provide a product that is easy to use, durable and of excellent quality. We also watched the cost. We believe in providing an innovative high quality product at a reasonable cost.

The Basic has many unique features. One such feature is the control receiver input. This input is unique in that it provides a level of control normally only provided with more expensive controllers. The control that a control receiver gives you is required for automatic control. The control receiver COS can be set to switch between 1 and 9 volts and the polarity can be set as well. When the control COS becomes active, all the other COS signals are ignored and the Basic only listens to the control receiver for DTMF codes. This allows for total control with the control receiver input.

The ever growing set of easy to use features in the ICS operating system can be accessed by a secure Setup mode (if DTMF access to Setup mode is allowed at all it can setup to take 10 digits to access this level), a Control operator mode and a User mode. If desired the Setup mode can be accessed only by a hardware jumper. This provides the highest level of security. In the Setup mode all the commands are accessible by DTMF using their 2 digit function codes. This makes the setup easy. The User and Control operator modes use from 1 to 5 digit DTMF codes to access these same functions if set up to do so. From 0 to 20 DTMF command codes can be set up in the User and Control operator modes allowing easy setup, total flexibility and an extremely secure system for controlling the repeater and its functions.

It can be difficult at times to work on a repeater without knowing what the incoming and outgoing signals are doing. Connecting voltmeters, scopes and other monitoring equipment can sometimes be difficult. We have provided several LEDs to help with the setup of the repeater. The Basic has 5 of them. Most of the input and output signals are indicated. The controller will also indicate when it recognizes a DTMF digit. When not being used the LEDs can be disabled with a jumper. We have found these indicators to be a big help when working on repeaters.

The inputs and outputs of the Basic repeater controller are very simple to use. All connections are made through a standard DB-9M connector. There are 2 COS inputs, 1 CTCSS input and an open collector type PTT output. The inputs include a control receiver COS input, a CTCSS input and a COS input for the repeater's receiver. The COS inputs can be set to switch between 1 and 9 volts and the polarity is easily selectable on the COS inputs. You may select between the repeater's receiver and the CTCSS input for the active receiver status. This allows for the switching back and forth between carrier squelch and CTCSS (you will need an external 3rd party CTCSS board) for the receiver's active signal. The Basic controller can also be setup to require both the COS and the CTCSS inputs to be active for the repeater receiver port for an active receiver status (AND function).

QUICK CONNECT FOR THE CONTROL RECEIVER

NOTE: *You do not need to use this input; it is optional. It is only for use with a separate control receiver. If you do not plan to use a separate control receiver then please skip this section. The repeater receiver port has access to all the same control functions (the control receiver has priority). Do not connect the repeater receiver to this input or anything else if you are not going to use a separate control receiver.*

1. You should have a control receiver COS and audio signal already wired to the proper connections according to the plug layout in this manual before you start. These signals should be suitable to drive a 100K ohm load. The audio for the repeater's receiver is switched to the DTMF decoder so you may use unsquelched audio from the repeater's receiver but not on the Basic controller's control receiver audio input. If unsquelched audio is used on the control receiver input the controller will decode them but it could interfere with the DTMF tones from the repeater's receiver.

2. Make sure the repeater's transmitter is disconnected or disabled.

3. Check to see what the control receiver's COS <u>on</u> and <u>off</u> voltages are and write them down. The difference between them should be at least 1V and can be somewhat less if the COS voltages and your power supply voltage are very stable.

4. Turn the power off.

5. If the COS goes positive when the receiver is activated make sure the jumpers in JP3 and JP4 have their skinny parts both faced towards potentiometers R29 and R37 (see figure 3). This is the position for a positive going COS polarity. The jumpers are in the positive COS position when they are shipped from the factory. For a negative polarity COS the jumpers go across from JP3 to JP4. (NOTE: The jumpers in positions JP3 and JP4 can always be turned 90 degrees for the opposite COS polarity.)

6. Turn the power on.

7. Monitor the voltage on U3 pin 3 for a positive COS or U3 pin 2 for a negative COS.

8. Adjust R7 (CONTROL RX COS LEVEL pot) until the voltage reading is in the middle of the measured COS voltage from step 3. If a battery is being used, the COS voltage changes during battery discharge should also be taken into consideration when setting up this adjustment.

9. Next, if you have a scope available, monitor the signal on R20 on the left side of the resistor, make sure that when you are looking at the Basic board the DB-9M connector is facing left (see figure 1).

10. Send a DTMF digit through the control receiver and hold it.

11. Set R19 (CONTROL RX AUDIO pot) until you get about a 200mVpp reading. You should now see the VALID DTMF LED lit up without flickering.

12. If you do not have a scope available start by sending a DTMF digit tone through the control receiver.

13. Adjust R19 (CONTROL RX AUDIO pot) until you see the VALID DTMF LED light up. Try to find a center point so you are not on the edge of operation. There should be no flickering of the VALID DTMF LED.

QUICK CONNECT FOR THE REPEATER RECEIVER

NOTE: If your receiver's COS reaches 3.5V or more when the receiver is active and your receiver's COS reaches 1.5v or less when the receiver is not active, your controller COS voltage does not need to be changed. If so, then skip steps 4 and 5.

1. The Basic controller comes with de-emphasis on the repeater's receiver. If you do not want the audio to be de-emphasized you will need to clip out C13 (see figure 2). The Basic controller will then have "straight through audio". Remove C13 for speaker or flat audio; keep C13 for discriminator audio.

2. You should have the repeater receiver COS and audio signal already wired to the proper connections according to the plug layout in this manual before you start. These signals should be suitable to drive a 100K ohm load.

3. Make sure the repeater's transmitter is disconnected or disabled or connected to a dummy load.

4. Check to see what the repeater receiver's COS <u>on</u> and <u>off</u> voltages are and write them down. The difference between them should be 1v or so but can be somewhat less if the COS voltages are very stable. If a battery is being used, the COS voltages during battery discharge and its affect on the COS voltages should also be taken into consideration when adjusting these settings.

5. The controller's factory default COS <u>on</u> voltage is 2.5v and its COS <u>off</u> voltage is 2.4v. With the controller's COS voltages set at these levels, the controller will be positive acting and will switch on and off at 2.5v and 2.4v. If your receiver's COS <u>off</u> voltage is at least 1v below the controller's factory default COS <u>off</u> voltage set point, and your receiver's COS <u>on</u> voltage is at least 1v above the controller's factory default COS <u>on</u> voltage set point, you do not need to adjust the controller's COS voltage set points. For more information please see the section on <u>the Basic controller's voltage programmable COS input</u>.

6. Next, if you have a scope available, monitor the signal on R20 on the left side of the resistor, make sure that when you are looking at the Basic board the DB-9M connector is facing left (see figure 1).

7. Send a DTMF digit through the repeater receiver and hold it.

8. Set R29 (RX AU LEVEL pot) until you get about a 200mVpp reading. You should now see the VALID DTMF LED lit up without flickering.

9. If you do not have a scope available start by sending a DTMF digit tone through the repeater's receiver.

10. Adjust R29 (RX AU LEVEL pot) until you see the VALID DTMF LED light up. Try to find a center point so you are not on the edge of operation. There should be no flickering of the VALID DTMF LED.

11. Care should be taken when adjusting the repeater's audio in level with R29 (RX AU LEVEL pot) so the DTMF decoder gets a signal that will allow a reliable decoding of any DTMF digits from the repeater's receiver.
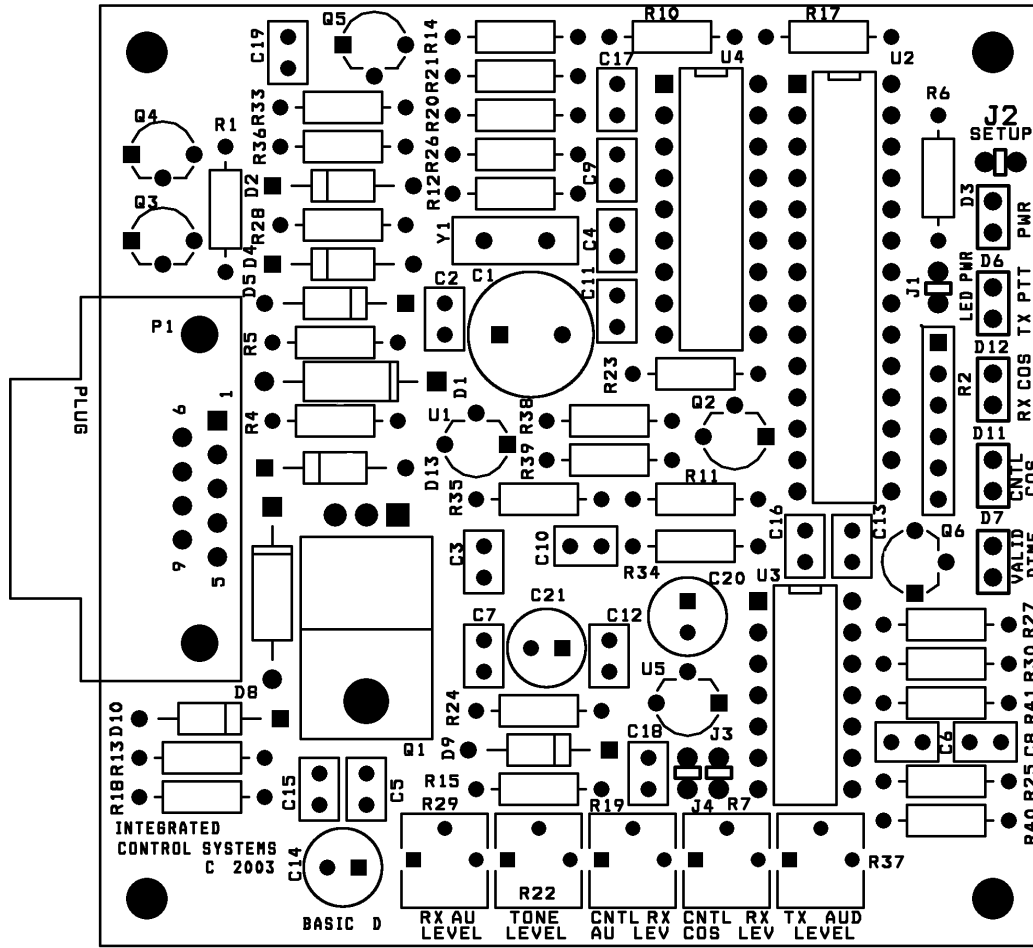
FIGURE 1
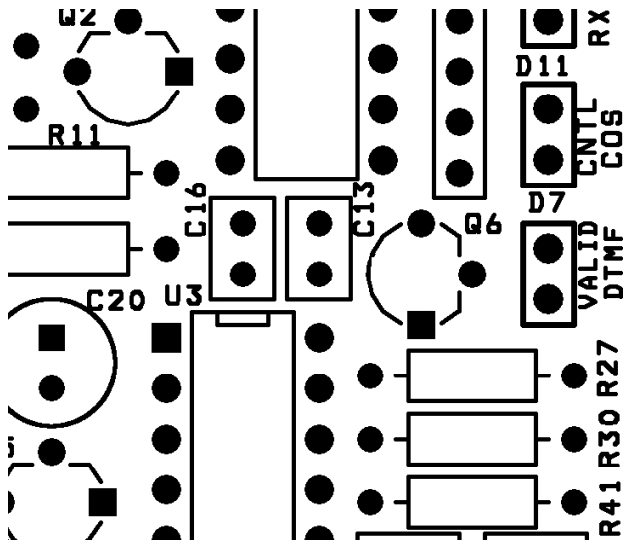
FIGURE 2
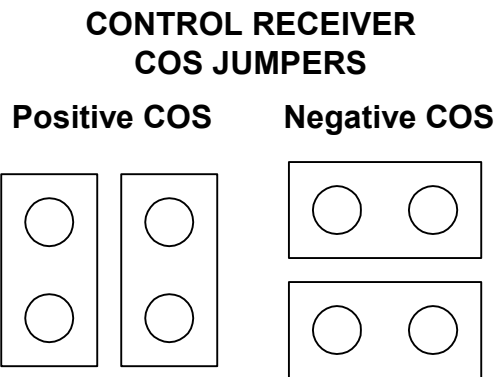
FIGURE 3

DB 9 CONNECTOR PINOUTS

Pin	Description
1	GROUND
2	+13.8VDC INPUT
3	TRANSMITTER PUSH TO TALK OUTPUT (OPEN COLLECTOR)
4	CONTROL RECEIVER AUDIO INPUT
5	TRANSMITTER AUDIO OUTPUT
6	REPEATER RECEIVER AUDIO INPUT
7	CONTROL RECEIVER COS INPUT
8	REPEATER RECEIVER COS INPUT
9	REPEATER RX 3RD PARTY CTCSS BOARD INPUT

SPECIFICATIONS

SUPPLY VOLTAGE	13.8V
IDLE CURRENT	18mA @13.8V, LEDs disabled
MAXIMUM CURRENT TX OUTPUT	1A
VOLTAGE ON THE REPEATER RECEIVER AUDIO INPUT	20mVpp to 10Vpp
VOLTAGE ON THE CONTROL RECEIVER AUDIO INPUT	20mVpp to 10Vpp
MAX VOLTAGE ON TRANSMITTER AUDIO OUTPUT	9Vpp
INPUT VOLTAGE ON THE REPEATER RECEIVER COS	0 to 30V 1 to 9V readable
INPUT VOLTAGE ON THE CONTROL RECEIVER COS	0 to 30V 1 to 9V readable
INPUT IMPEDANCE ON REPEATER RECEIVER AUDIO	~100K
INPUT IMPEDANCE ON CONTROL RECEIVER AUDIO	~100K
TRANSMIT AUDIO OUTPUT IMPEDANCE	> 300 ohms

The IDer

The IDer has two timers and two modes. The timers are the pending ID timer and the polite ID timer. The modes are Normal mode and Beacon mode. Each of these is described in more detail below.

The Pending ID Timer

The pending ID timer (see function # 49) times the time from one ID to the next ID. When the IDer stops the pending ID timer restarts. An ID will not occur while the pending ID timer is running. If a receiver becomes active while the pending ID timer is running the IDer's 'need to id' flag will be set. When the pending ID timer times out, if the 'need to id' flag is set the IDer will send the ID.

The Polite ID Timer

The polite ID timer (see function # 48) is used to keep the IDer from IDing when someone is using the repeater. The polite ID timer is started when both a 'valid RX' signal is present and the polite ID timer times out. If the receiver is active when the polite ID timer times out the IDer will send the ID even though the receiver is still active. If the receiver goes off, the ID will be sent immediately afterward.

The Beacon Mode

The Beacon mode (see function # 68) is used to force the IDer to send an ID every time the pending ID timer times out. The time between IDs is the time the pending ID timer is set to. The pending timer also functions when in Beacon mode.

IDer Callsign Entry and Storage

The callsign is entered in using the ENTER NEW ID function (see function # 55) using Morse code (See the Morse code table at the end of the manual). The call sign is entered in Dits, Dahs and Spaces. It is a good idea to write down the Dits, Dahs and Spaces ahead of time when programming a callsign. When programming a callsign, on your keypad, use '0' for spaces, use '1' for dits and use '2' for dahs.

EXAMPLE:

Program 'ka9pmm' - again use 1 for the dits, 2 for the dahs and 0 for the spaces.

K – dah + dit + dah + space = 2120
A – dit + dah + space = 120
9 – dah + dah + dah + dah + dit + space = 222210
P – dit + dah + dah + dit + space = 12210
M – dah + dah + space = 220
M – dah + dah = 220

Put them together: 2120120222210012210220220

From Setup mode do the following:

1. Key up
2. Enter the function 'ENTER NEW ID' (code # 55)
3. Un-key
4. The controller responds with the Morse code 'M' – ready for more
5. Key up
6. Enter the digits "212012022221012210220220"
7. Un-key
8. The controller responds with the Morse code 'K' – ok or command accepted

If you do a 'FORCE ID' (function # 34) you will hear the call sign you just entered.

DTMF Command Line Programming

The DTMF command line feature (see function # 57) allows you to select a DTMF code (1 to 5 digits) that will activate any one of the 2 digit functions in the function list. The DTMF command lines are used in the User mode and Control op modes to give access to the functions using the codes you have setup.

The Basic has 20 command line memories. Each memory contains the 1 to 5 DTMF digits, an indication whether this DTMF command line can be used in the User and Control op modes or just in the Control op mode and finally the selected function.

EXAMPLE:

Set up the controller to perform FORCE ID (function # 34) using the DTMF code '63#4A' and store this in the DTMF command line memory position '3'.

1. You first need to be in the Setup/program mode
2. Key up
3. Enter the function 'Enter DTMF command line' (function # 57)
4. Un-key
5. The controller should now send the 'M' in Morse code indicating it is ok to enter more information
6. Key up
7. Enter the DTMF command line memory, in this example it is '3' – Enter 3 (DTMF memory number)
8. Un-key
9. The controller should now send the 'M' in Morse code indicating it is ok to enter more information
10. Key up
11. Enter the DTMF code to be used in this DTMF command line memory – Enter 63#4A (DTMF code)
12. Un-key
13. The controller should now send the 'M' in Morse code indicating it is ok to enter more information
14. Key up
15. Enter the 2 digit Function number to be activated in this DTMF command line – Enter 34
16. Un-key
17. The controller responds with the Morse code 'K' – ok or command accepted

To verify everything got entered in correctly take off the Setup jumper which will take you back to either User mode or Control op mode (depending on which one you were in).

Now key up and enter the DTMF code we entered in step number 11 (63#4A), un-key and you should hear the controller send the ID.

If you wanted this command to be available only when in Control op mode, precede the function number entered in step 15 above with the value "16" making the data entered for that step "1634" instead of "34". DO NOT UNKEY the radio while you enter all four digits in this step.

Setup Mode

Setup mode is used for setting up or programming the controller. All the two digit commands can be accessed directly with their 2 digit function numbers. In Setup mode you can easily setup or program the features since all the functions are available. In Setup mode all the functions are accessed using DTMF by their function codes.

There are two ways to access Setup mode. The first way to access Setup mode is to use the setup jumper on the controller board. When the setup jumper is put into place the controller will go into Setup mode. If the jumper is removed the controller will exit Setup mode.

The second way to access Setup mode is to use the Setup function commands. There is a Setup mode function to enter (function # 39) and exit Setup mode (function # 40). To enter Setup mode from the User or Control op mode you need to have a DTMF command line memory programmed with the Enter Setup mode function code in it. You enter in your previously programmed DTMF code for the DTMF command line and you will be in Setup mode.

To leave Setup mode use the Exit setup mode function (function # 40). The Exit setup command will cause the controller to leave Setup mode, even if the setup jumper is in place. If the Setup jumper is in place and the Exit setup mode function is used to cause the controller to leave Setup mode and the setup jumper is removed and replaced or the power is turned off and on the controller will return to Setup mode.

User Mode

User mode is intended for use by the average user. In User mode the only way to access the functions is to use preprogrammed DTMF codes that have been programmed into DTMF command line memories (see function # 57) and only the DTMF command line memories that have not been restricted to Control op mode only. None of the functions are directly accessible in User mode.

Control Op Mode

In Control op mode the only way to access the functions is to use preprogrammed DTMF codes that have been programmed into DTMF command line memories (function # 57). In Control op mode all of the preprogrammed DTMF codes are operational. There is a feature that will allow you to restrict DTMF codes to only be active in Control op mode (function # 41).

The Basic Controller's Voltage Programmable COS Input

The controller's COS input is used to tell when the repeater's receiver is active. The COS signal (also known as COR or CAS) is obtained from the receiver. For the Basic controller the levels and polarity can be set. You should have at least 1.5 to 2v of change (or range) in the COS voltage.

The Basic's COS input factory default is positive polarity using a trigger point of 2.5v. If your supplied COS input voltage is below 2V for <u>off</u> and above 3v for <u>on</u> your do not need to make any adjustments to these parameters. The default settings are 2.5v <u>on</u> and 2.4v <u>off</u>.

The Basic has two functions that allow you to tell the Basic how to respond to your COS signal. These two functions are SET RX ON VOLTAGE (function # 59) and SET RX OFF VOLTAGE (function # 58). If the Basic controller is set with its <u>on</u> voltage less than its <u>off</u> voltage, the Basic will consider that a negative acting COS. If the Basic controller is programmed with its <u>off</u> voltage less than its <u>on</u> voltage, the Basic will look for a positive COS.

The controller's <u>on</u> and <u>off</u> voltage set points make up a window (see example). The window can be set for whatever range you wish.

EXAMPLE 1:

The receiver's COS signal is <u>on</u> at 4.5v and <u>off</u> at 1.5v.

If the controller's COS voltages have not been changed from the factory settings do not change anything. The COS range is sufficient and the COS <u>on</u> and <u>off</u> voltages are far enough away from the controller's default/preprogrammed <u>on</u> and <u>off</u> voltages.

You will want to make sure the controller's <u>on</u> and <u>off</u> voltages are set at least 0.5v away from the receiver's <u>on</u> and <u>off</u> COS voltages.

EXAMPLE 2:

The receiver's COS signal is <u>on</u> at 3.0v and <u>off</u> at 9.5v (negative polarity COS).

A window needs to be setup. This window will consist of an <u>on</u> and <u>off</u> voltage for the controller's COS settings. The receiver's COS voltages range from 3.0v to 9.5v. The receiver's COS window is then 9.5v on the top and 3.0v on the bottom.

The controller's COS voltage window must be smaller and inside of the receiver's COS window. The controller's top and bottom COS voltage settings should be at least 0.5v, if not 1.0v away from the receiver's top and bottom voltages. The controller's COS voltage set points can be as close as 0.1v to each other.

For our example we are going to set the controller's COS <u>on</u> voltage 4.0v and the <u>off</u> voltage at 8.5v. This gives us a 1.0v clearance from the repeater's COS <u>on</u> and <u>off</u> voltages. Using 4.0v and 8.5v for the controller's <u>on</u> and <u>uuuu</u> COS voltages will create a controller COS window well within the receiver's COS window of 3.0v to 9.5v.

To setup the controller's COS voltage setting window, the controller's upper and lower COS voltage settings must be set using function # 59 and function # 58.

To set the <u>on</u> voltage of 4v (bottom of the controller's COS window), use function # 59.

1. Make sure you are first in setup mode
2. Enter the 2 digit command for the function SET RX COS VOLTAGE ON LEVEL (function # 59)
3. Un-key
4. The controller sends the ENTER NEXT DATA indication (Morse code 'M' for 'ready for More')
5. Key up
6. Enter '4'
7. Un-key
8. The controller sends the COMMAND ACCEPTED indication (Morse code 'K' for 'OK')

To set the <u>off</u> voltage of 8.5v (top of the controller's COS window), use function # 58.

1. Make sure you are first in setup mode
2. Enter the 2 digit command for the function SET RX COS VOLTAGE ON LEVEL (function # 58)
3. Un-key
4. The controller sends the ENTER NEXT DATA indication (Morse code 'M' for 'ready for More')
5. Key up
6. Enter '8*5' (here we use the star key '*' for the decimal point)
7. Un-key
8. The controller sends the COMMAND ACCEPTED indication (Morse code 'K' for 'OK')

The controller's COS settings will not change until you reset the controller. You will need to either power down and power back up or use the reset function (function # 36).

EXAMPLE 3:

If the controller COS voltage settings are still set at the factory defaults (2.5v <u>on</u> and 2.4v <u>off</u>, positive acting) and these voltages are ok except that that the receiver's COS is negative acting, only one change is necessary. One way to change the polarity is to change <u>one</u> of the controller's COS set points.

When the controller's COS set points are set to the defaults, the <u>on</u> voltage is 2.5v and the <u>off</u> voltage is 2.4v. This means the controller will say the receiver is active when it sees the receiver's COS voltage in the controller's COS window (see example 2) and then the receiver's voltage goes past the controller's COS <u>on</u> voltage set point.

This works the same with the controller's COS <u>off</u> voltage. When the receiver's COS voltage is in the controller's COS window and the receiver's COS voltage goes past the controller's COS <u>off</u> voltage set point the controller will consider the receiver inactive.

With that in mind if you were to move the controller's COS <u>on</u> set point to 2.3v now when the receiver's COS voltage is in the controller's COS window and decreases and goes past the controller's <u>on</u> voltage set point the controller will now consider the receiver to be <u>on</u>. The controller is now looking for a negative acting COS signal from the receiver. With the controller's COS <u>on</u> set point at 2.5v the controller was looking for a positive COS.

By moving the controller's COS <u>on</u> voltage set point from above the controller's COS <u>off</u> voltage set point to below the controller's <u>off</u> set point, the controller changes from looking for a positive acting COS to looking for a negative acting COS from the receiver.

The Basic Controller's Control Receiver Input

The Basic repeater controller's control receiver is a feature normally only found on expensive high-end controllers. The control receiver and repeater receiver inputs are exactly the same as far as DTMF control except the control receiver input will have priority over the repeater's receiver. Also the control receiver will not pass audio to the transmitter audio output.

When the Basic's control receiver is active the Basic's repeater receiver input will not act on DTMF tones sent to it. Otherwise both of the receiver inputs will act on the DTMF tones the same way.

Both the control receiver COS trigger voltage and COS polarity are programmable. To change the control COS input to the opposite polarity just remove the two jumpers from J3, rotate them 90 degrees and put them back on.

The trigger voltage can be set using R19 (CNTL RX AU LEV pot). When setting the controller receiver COS pot you should monitor the voltage on pin 3 of U3 for a positive acting COS or pin 2 of U3 for a negative acting COS.

The pot should be set so the measured voltage is in the center of the high and low COS voltages from your control receiver.

The Basic Controller's Receiver CTCSS Input

The Basic repeater controller's CTCSS input is provided to allow the use of a CTCSS decoder with the Basic controller. The CTCSS input can be remotely enabled or disabled with DTMF codes (see function # 64). The CTCSS input can also be 'ANDED' with the COS input (see command # 65).

The CTCSS input was designed to be used with a Com-Spec TS-64 or TS-32 although the CTCSS input can be used with other CTCSS boards as well. If you use a TS-64 or a TS-32 board on the CTCSS input, you should install a 1k resistor from +12v to the CTCSS input. This is necessary because the TS-64 and TS-32 boards have an open collector output and will only pull an output to ground.

Courtesy Tones

The Basic has two courtesy tones. They are as follows:

Setup mode – When in Setup mode the controller will send 3 beeps or a Morse code 'S' for Setup mode.

Control op or User mode - When in Control op or User mode the controller will send a single beep.

Data Entry

The Basic controller can use all 16 of the available DTMF codes. These are:
1, 2, 3, 4, 5, 6, 7, 8, 9, 0, *, #, A, B, C, D.

All of the function numbers are two-digit numeric values. There is nothing that requires the letters A, B, C, D or the star or pound sign.

All 16 of these codes can be used in the programmed DTMF command codes.

When entering numeric values such as voltages or seconds you can enter decimal values using the '*' key as a decimal point.

EXAMPLE:

To setup the controller's COS voltage setting window the controller's upper and lower COS voltage settings must be set using the function # 59 and function # 58.

To set the <u>on</u> voltage of 4.52v (bottom of the controller's COS window), use function # 59.

1. Make sure you are first in setup mode
2. Enter the 2 digit command for the function SET RX COS VOLTAGE ON LEVEL (# 59)
3. Un-key
4. The controller sends the ENTER NEXT DATA indication (Morse code 'M' for 'ready for More')
5. Key up
6. Enter '4*52'
7. Un-key
8. The controller sends the COMMAND ACCEPTED indication (Morse code 'K' for 'OK')

In the above example if you would have wanted to enter 4.5v you could have entered just '4*5'. Other examples would be setting the hang time to 0.6s; you could enter '0*6' or just '*6'. Leading zeros before the decimal are not necessary.

There are three possible responses to data or command being entered.

1. A Morse code 'M' (DAH DAH) for 'ready for more data' (See above example).

2. A Morse code 'K' (DAH DIT DAH) for 'OK' or command accepted (See above example).

3. A Morse code 'B' (DAH DIT DIT DIT) for 'BAD' for bad entry.

List of Defaults (factory defaults)

(See 'Set factory defaults' function # 47)

Pending ID time   Default = 6 minutes
Polite ID time   Default = 3 minutes
Tone (CW) Frequency   Default = 1000 Hz
IDer WPM (words per minute)   Default = 10 wpm
IDer   Default = Active
Transmitter time out time   Default = 10 minutes
Transmitter hang time   Default = 3 seconds
Courtesy tone   Default = Active
Setup mode   No Default – depends on Setup jumper
Control operator mode   Default = Not active
User mode   Default = Active (User codes are active in Control op mode)

Defaults for Statuses

(See 'Save statuses' function # 62 and the section on 'Save statuses' in the table of contents)

Transmitter PTT   Default = On
IDer   Default = On
Courtesy tone   Default = On
Repeater receiver COS input   Default = Active
Repeater receiver CTCSS input   Default = Not active
Repeater receiver 'AND' mode   Default = Not active
Repeater receiver COS on voltage   2.5v; the controller considers the receiver on at 2.5v or more
Repeater receiver COS off voltage   2.4v; the controller considers the receiver off at 2.4v or less
DTMF muting   Default = Active
Beacon mode   Default = Not Active
Control RX disables repeater RX   Default = Active

COMMAND LIST FOR THE ICS BASIC REPEATER CONTROLLER

32	ENABLE TX
33	DISABLE TX
34	FORCE ID
35	ACTIVATE KEYPAD TEST
36	WARM RESET
37	COURTESY TONE ENABLE
38	COURTESY TONE DISABLE
39	ENTER SETUP MODE
40	EXIT SETUP MODE
41	SET CONTROL OPERATOR MODE
42	CLEAR CONTROL OPERATOR MODE
43	ENABLE IDER
44	DISABLE IDER
45	TURN ON TEST TONE
46	TURN OFF TEST TONE
47	SET PARAMETERS TO THE FACTORY DEFAULT
48	SET POLITE ID TIME
49	SET PENDING ID TIME
50	SET WORD PER MINUTE RATE
51	SET HANG TIME
52	SET TX TIMEOUT TIME
53	CLEAR ALL DTMF COMMAND LINES
54	CLEAR ONE DTMF COMMAND LINE
55	ENTER NEW ID
56	PROGRAM NEW CW FREQUENCY
57	ENTER DTMF COMMAND LINE
58	SET RX COS VOLTAGE OFF LEVEL
59	SET RX COS VOLTAGE ON LEVEL
60	TX FORCE ON
61	TX FORCE CLEAR
62	SAVE STATUSES
63	USE RX COS INPUT ONLY
64	SWITCH TO RX CTCSS INPUT ONLY
65	SET RX COS AND CTCSS TO AND
66	DTMF MUTING ON
67	DTMF MUTING OFF
68	BEACON MODE ON
69	BEACON MODE OFF
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71	CNTL_RX_DISABLE_RPTR_RX_DISABLE
72	ENABLE DTMF CONTROL WITH NO COS
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Definition of Terms Used

1. Key up – To activate the Control or Repeater's receiver COS
   (The repeater's receiver needs to be allowed to do DTMF control)

2. Un-key – To deactivate the Control or Repeater's receiver COS

3. COS – Carrier Operated Signal – a signal that indicates when the receiver is active

4. COMMAND ACCEPTED indication – The controller sends a CW letter "K" for "OK"

5. ENTER NEXT DATA code – The controller sends a CW letter "M" for "ready for MORE information"

6. TX – Repeater's transmitter

7. RX – Receiver

For more information please see the glossary near the end of this manual.

FUNCTION: ENABLE TX

FUNCTION CODE: 32

PURPOSE: Enables the TX output

HOW TO USE:

1. Key up
2. Enter the ENABLE TX function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The TX output is now enabled

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: DISABLE TX

FUNCTION CODE: 33

PURPOSE: Disables the TX output

HOW TO USE:

1. Key up
2. Enter the DISABLE TX function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The TX output is disabled

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: FORCE ID

FUNCTION CODE: 34

PURPOSE: To force the controller to send the CW ID

HOW TO USE:

1. Key up
2. Enter FORCE ID function code
3. Un-key
4. When the command is accepted the controller will send the preset CW ID

When the controller sends a forced ID the ID interval timer is not reset.

FUNCTION: ACTIVATE KEYPAD TEST

FUNCTION CODE: 35

PURPOSE: Allows testing of user's radio touch pad

HOW TO USE:

1. Key up
2. Enter the ACTIVATE KEYPAD TEST function code
3. Un-key
4. The controller sends the ENTER NEXT DATA indication
5. Key up
6. Push the digit to be tested
7. Un-key
8. The controller will report which digit it heard in CW

The controller will wait for another DTMF digit to be sent. If you wish to cancel the function, key up without sending a DTMF digit and un-key. The controller will cancel the keypad test and no courtesy tone will be sent.

FUNCTION: WARM RESET

FUNCTION CODE: 36

PURPOSE: Resets all statuses to power up condition

HOW TO USE:

1. Key up
2. Enter the WARM RESET function code
3. Un-key
4. There will be no direct acknowledgement from the controller

When you un-key after entering the WARM RESET code the transmitter will drop immediately as the controller does a reset and does not remember that the receiver was active.

FUNCTION: COURTESY TONE ENABLE

FUNCTION CODE: 37

PURPOSE: Enables all of the courtesy tones

HOW TO USE:

1. Key up
2. Enter the COURTESY TONE ENABLE function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. All the courtesy tones will enabled

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: COURTESY TONE DISABLE

FUNCTION CODE: 38

PURPOSE: Disables the all of the Courtesy tones

HOW TO USE:

1. Key up
2. Enter the COURTESY TONE DISABLE function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. All the Courtesy tones will be disabled

This function does not affect the acknowledge codes. The Setup mode and normal courtesy tones will be disabled. The COMMAND ACCEPTED and ENTER NEXT DATA indications will still operate.

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: ENTER SETUP MODE

FUNCTION CODE: 39

PURPOSE: Puts the controller into the Setup mode

HOW TO USE:

1.   Key up
2.   Enter the ENTER SETUP MODE function code
3.   Un-key
4.   The controller sends the COMMAND ACCEPTED indication
5.   The controller will be in the Setup mode

Entering the Setup mode with this command will occur regardless of the position of the setup jumper.

FUNCTION: EXIT SETUP MODE

FUNCTION CODE: 40

PURPOSE: Takes the controller out of the Setup mode

HOW TO USE:

1.   Key up
2.   Enter the EXIT SETUP MODE function code
3.   Un-key
4.   The controller sends the COMMAND ACCEPTED indication
5.   The controller will not be in the Setup mode

Exiting the Setup mode with this command will occur regardless of the position of the setup jumper.

FUNCTION: SET CONTROL OPERATOR MODE

FUNCTION CODE: 41

PURPOSE: Puts the controller in the Control operator mode

HOW TO USE:

1. Key up
2. Enter the SET CONTROL OPERATOR MODE function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The controller will be in the Control operator mode

If the Control operator mode is enabled during the Setup mode it will have no effect until exiting the Setup mode. Upon exiting the Setup mode the controller will be in Control operator mode. The controller can be both in Setup mode and Control operator mode at the same time but the Setup mode has priority.

FUNCTION: CLEAR CONTROL OPERATOR MODE

FUNCTION CODE: 42

PURPOSE: Takes the controller out of the Control operator mode

HOW TO USE:

1. Key up
2. Enter the CLEAR CONTROL OPERATOR MODE function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The controller will not be in the Control operator mode

If the Control operator mode is enabled during the Setup mode it will have no effect until exiting the Setup mode. Upon exiting the setup mode the controller will still be in Control operator mode. The controller can be both in Setup mode and Control operator mode at the same time but the Setup mode has priority.

FUNCTION: ENABLE IDER

FUNCTION CODE: 43

PURPOSE: To turn on the IDer

HOW TO USE:

1.   Key up
2.   Enter the ENABLE_IDER function code
3.   Un-key
4.   The controller sends the COMMAND ACCEPTED indication
5.   The controller's IDer will now be enabled

If the IDer was not enabled on power up the Save statuses function will need to be run. This will store the new IDer status along with the others. This needs to be done or the IDer status will return to the way it was the last time the controller was powered up.

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: DISABLE IDER

FUNCTION CODE: 44

PURPOSE: To turn off the IDer

HOW TO USE:

1.   Key up
2.   Enter the DISABLE_IDER function code
3.   Un-key
4.   The controller will send the COMMAND ACCEPTED indication
5.   The controller's IDer will now be disabled

If the IDer was enabled on power up the Save statuses function will need to be run. This will store the new IDer status along with the others. This needs to be done or the IDer status will return to the way it was the last time the controller was powered up.

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: TURN ON TEST TONE

FUNCTION CODE: 45

PURPOSE: To provide an audio test signal from the controller

HOW TO USE:

1. Key up
2. Enter the TURN ON TEST TONE function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The controller will send a continuous tone at the frequency that is currently set

This function will not cause the transmitter to stay on. It only provides the tone from the tone output. The transmitter can be locked on by using the TX FORCE ON function (see function # 60).

FUNCTION: TURN OFF TEST TONE

FUNCTION CODE: 46

PURPOSE: To turn off the test tone signal from the controller

HOW TO USE:

1. Key up
2. Enter the TURN OFF TEST TONE function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The controller will stop sending the test tone

FUNCTION: SET PARAMETERS TO THE FACTORY DEFAULT

FUNCTION CODE: 47

PURPOSE: To give the user a way to reset to the factory defaults

HOW TO USE:

1. Key up
2. Enter the SET PARAMETERS TO THE FACTORY DEFAULT function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The Parameters are now set to the Factory Default

See the factory defaults section listed in the table of contents for a list of the factory defaults.
This function resets all the parameters including the 'Save statuses' defaults.
This function does not change the ID.

FUNCTION: SET POLITE ID TIME

FUNCTION CODE: 48

PURPOSE: To allow changes to the time the IDer will wait for RX COS to become inactive

HOW TO USE:

1. Key up
2. Enter the SET POLITE ID TIME function code
3. Un-key
4. The controller sends the ENTER NEXT DATA indication
5. Key up
6. Enter the time in seconds for the polite ID time
7. Un-key
8. The controller sends the COMMAND ACCEPTED indication
9. The new time value is stored

The time range is from 30 seconds to 2500 seconds. If a value is entered outside these limits the controller will not save the entered value; it will give the ERROR indication (B in CW) and the function will be ended. This function has an accuracy of 10 seconds.

FUNCTION: SET PENDING ID TIME

FUNCTION CODE: 49

PURPOSE: To set the time the IDer will wait before it tries to ID

HOW TO USE:

1. Key up
2. Enter the SET PENDING ID TIME function code
3. Un-key
4. The controller sends the ENTER NEXT DATA indication
5. Key up
6. Enter the time in seconds for the pending time
7. Un-key
8. The controller sends the COMMAND ACCEPTED
9. The new time value is stored

The time range is from 30 seconds to 2500 seconds. If a value is entered outside these limits the controller will not save the entered value; it will give the ERROR indication (B in CW) and the function will be ended. This function has an accuracy of 10 seconds.

FUNCTION: SET WORD PER MINUTE RATE

FUNCTION CODE: 50

PURPOSE: Changes the word per minute rate for the CW output

HOW TO USE:

1. Key up
2. Enter the SET WORD PER MINUTE RATE function code
3. Un-key
4. The controller sends the ENTER NEXT DATA indication
5. Key up
6. Enter the time in seconds for the new wpm rate
7. Un-key
8. The controller sends the COMMAND ACCEPTED indication
9. The word per minute value is changed

The time range is from 5 wpm to 20 wpm. If a value is entered outside these limits the controller will not save the entered value; it will give the ERROR or BAD VALUE indication (B in CW) and the function will be ended.

FUNCTION: SET HANG TIME

FUNCTION CODE: 51

PURPOSE   Sets the time the transmitter stays on after the received signal ceases

HOW TO USE:

1. Key up
2. Enter the SET HANG TIME code
3. Un-key
4. The controller sends the ENTER NEXT DATA code
5. Key up
6. Enter the hang time in seconds
7. Un-key
8. The controller sends the COMMAND ACCEPTED indication
9. The new hang time value is stored

The range of the timer is from 0 seconds to 25 seconds as of software version 1.17. If a value is entered outside these limits the controller will not save the entered value; it will give the ERROR or BAD VALUE indication (B in CW) and the function will be ended.

Before software version 1.17 the minimum time was 0.1 seconds.

FUNCTION: SET TX TIMEOUT TIME

FUNCTION CODE: 52

PURPOSE   Sets the time the transmitter is allowed to be active after it comes on

HOW TO USE:

1. Key up
2. Enter the SET TX TIMEOUT TIME function code
3. Un-key
4. The controller sends the ENTER NEXT DATA code
5. Key up
6. Enter the timeout time in seconds
7. Un-key
8. The controller sends the COMMAND ACCEPTED indication
9. The new timeout time value is stored

Sets the maximum time the transmitter remains on after the transmitter goes on and resets when the COS drops.

The time range is from 0 seconds to 2500 seconds in 10 second increments as of software version 1.17. If a value is entered outside these limits the controller will not save the entered value; it will give the ERROR or BAD VALUE indication (B in CW) and the function will be ended. This function has an accuracy of 10 seconds.

The time range before version 1.17 of the software was 30 seconds to 1200 seconds.

FUNCTION: CLEAR ALL DTMF COMMAND LINES

FUNCTION CODE: 53

PURPOSE: To clear all DTMF command lines

HOW TO USE:

1. Key up
2. Enter the CLEAR ALL DTMF COMMAND LINES function code
3. Un-key
4. The controller will send the COMMAND ACCEPTED indication
5. All of the DTMF codes are now cleared from the controller's EEPROM

If it is only necessary to clear one or a few DTMF lines the CLEAR ONE DTMF COMMAND LINE function (function # 54) should be used.

FUNCTION: CLEAR ONE DTMF COMMAND LINE

FUNCTION CODE: 54

PURPOSE: To clear only one DTMF command line

HOW TO USE:

1. Key up
2. Enter the CLEAR ONE DTMF COMMAND LINE function code
3. Un-key
4. The controller sends the ENTER NEXT DATA indication
5. Key up
6. Enter the memory number of the DTMF line to clear
7. Un-key
8. The controller will send the COMMAND ACCEPTED indication
9. The DTMF codes in the selected memory are now cleared from the EEPROM

If it is desired to clear all of the DTMF command lines from the EEPROM the CLEAR ALL DTMF COMMAND LINES function (function # 53) may be used.

FUNCTION: ENTER NEW ID

FUNCTION CODE: 55

PURPOSE: To set the information the IDer sends

HOW TO USE:

1.   Key up
2.   Enter the ENTER NEW ID function code
3.   Un-key
4.   The controller sends the ENTER NEXT DATA indication
5.   Key up
6.   Hold the key while entering in a series of 0's, 1's and 2's.
7.   The 0's will enter a space, the 1's will enter a DIT and the 2's will enter a DAH
8.   When all the information is entered, un-key
9.   The controller sends the COMMAND ACCEPTED indication
10. The new ID is stored

There is enough room to store as much as two call signs. If the controller did not like the information it received the controller will not save the entered data and it will give the ERROR or BAD VALUE indication (B in CW) and the function will be ended.

FUNCTION: SET NEW CW FREQUENCY

FUNCTION CODE: 56

PURPOSE: To set the frequency at which the controller sends any tone

HOW TO USE:

1.   Key up
2.   Enter the SET NEW CW FREQUENCY function code
3.   Un-key
1.   The controller sends the ENTER NEXT DATA indication
4.   Key up
5.   Enter the new frequency for the controller to send (from 700 Hz to 1500 Hz)
6.   Un-key
7.   The controller will send the COMMAND ACCEPTED indication
8.   The tone frequency will be set

The frequency range is from 700 Hz to 1500 Hz. If a value is entered outside these limits the controller will not save the entered value; it will give the ERROR indication (B in CW) and the function will be ended.

FUNCTION: ENTER DTMF COMMAND LINE

FUNCTION CODE: 57

PURPOSE: To enter a DTMF code that when entered will do a function

HOW TO USE:
1. Key up
2. Enter the ENTER DTMF COMMAND LINE function code
2. Un-key
3. The controller sends the ENTER NEXT DATA indication
4. Key up
5. Enter the DTMF line memory number 0 to 19 (A total of 20 DTMF memories)
6. Un-key
7. The controller sends the next ENTER NEXT DATA indication
8. Key up
9. Enter the DTMF digits for the DTMF code, do NOT un-key while entering the 1 to 5 DTMF digits
10. Un-key.
11. The controller sends the next ENTER NEXT DATA indication
12. Key up, do NOT un-key for the following steps
13. If this DTMF command line is to be used only at the Control operator's level (and only if) enter in "16"
14. Do NOT un-key yet
15. Enter the Function Number for this DTMF command line to do
16. Ok, NOW un-key
17. The controller sends the COMMAND ACCEPTED indication
18. The new DTMF command line is now stored in EEPROM
If the controller did not like the information it received the controller will not save the entered data and it will give the ERROR or BAD VALUE indication (B in CW) and the function will be ended. This can occur from step 4 to step 18.

FUNCTION: SET RX COS VOLTAGE OFF LEVEL

FUNCTION CODE: 58

PURPOSE: Sets the RX voltage which when reached the control will consider the COS to be OFF

HOW TO USE:

1. Key up
2. Enter the SET RX COS VOLTAGE OFF LEVEL function code
3. Un-key
4. The controller sends the ENTER NEXT DATA indication
5. Key up
6. Enter the COS voltage (1v to 9v) that when reached the controller should consider the RX COS to be OFF
7. Un-key
8. The controller sends the COMMAND ACCEPTED indication
9. The new RX COS voltage off level is stored in EEPROM
10. A cold or warm reset will be necessary to have the newly stored value used for RX COS

The COS voltage entered can be from 1V to 9V and can be entered down to 0.01V. The accuracy of this function is about 0.2V. If the COS voltage the controller receives is not in the 1V to 9V range the controller will not save the entered data and it will give the ERROR or BAD VALUE indication (B in CW) and the function will be ended.

Please see the section on setting the controller's COS voltages. For a page number please refer to the table of contents on page 1 of this manual.

FUNCTION: SET RX COS VOLTAGE ON LEVEL

FUNCTION CODE: 59

PURPOSE: Sets the RX voltage which when reached the control will consider the COS to be ON

HOW TO USE:

1. Key up
2. Enter the SET RX COS VOLTAGE ON LEVEL function code
3. Un-key
4. The controller sends the ENTER NEXT DATA indication
5. Key up
6. Enter the COS voltage (1v to 9v) that when reached the controller should consider the RX COS to be ON
7. Un-key
8. When the controller sends the COMMAND ACCEPTED indication
9. The new RX COS voltage on level is stored in EEPROM
10. A cold or warm reset will be necessary to have the newly stored value used for RX COS

The COS voltage entered can be from 1V to 9V and can be entered down to 0.01V. The accuracy of this function is about 0.2V. If the COS voltage the controller receives is not in the 1V to 9V range the controller will not save the entered data and it will give the ERROR or BAD VALUE indication (B in CW) and the function will be ended.

Please see the section on setting the controller's COS voltages. For the page number please refer to the table of contents on page 1 of this manual.

FUNCTION: TX FORCE ON

FUNCTION CODE: 60

PURPOSE: Forces TX on

HOW TO USE:

1. Key up
2. Enter the TX FORCE ON function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. TX will be locked on

The TX FORCE ON will be cancelled when either the TX FORCE CLEAR is used or when the TX timeout timer times out.

FUNCTION: TX FORCE CLEAR

FUNCTION CODE: 61

PURPOSE: Cancels the command TX FORCE ON

HOW TO USE:

1.   Key up
2.   Enter the TX FORCE CLEAR function code
3.   Un-key
4.   The controller sends the COMMAND ACCEPTED indication

If the TX FORCE ON command is active, the TX FORCE ON command will now be canceled.

FUNCTION: SAVE STATUSES

FUNCTION CODE: 62

PURPOSE: To allow the user to make selected statuses permanent

HOW TO USE:

1.   Key up
2.   Enter the SAVE STATUSES function code
3.   Un-key
4.   The controller sends the COMMAND ACCEPTED indication
5.   The controller's selected statuses will now be stored in EEPROM

The statuses need to be changed before using Save statuses. Save statuses just stores them the way it finds them in the controller's temporary RAM memory.

This command will put the value of the statuses listed below in EEPROM memory so they are as currently in RAM when the controller is powered up again. If the Save statuses function is not used and any of these values are changed the values will go back to what they were before power up.

Please see the section on the factory defaults which lists the statuses that are affected by the 'Save statuses' function and includes the defaults for the 'Save statuses' function. For the page number please refer to the table of contents on page 1 of this manual.

FUNCTION: USE RX COS INPUT ONLY

FUNCTION CODE: 63

PURPOSE: Changes the COS input to use only the repeater receiver COS input for its signal

HOW TO USE:

1. Key up
2. Enter USE RX COS ONLY function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The RX COS is now the Main COS

This function switches which input the software looks to for a receiver active condition to just the repeater receiver COS input.

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: SWITCH TO CTCSS INPUT ONLY

FUNCTION CODE: 64

PURPOSE: Changes the CTCSS input to use only the CTCSS input for its signal

HOW TO USE:

1. Key up
2. Enter SWITCH TO CTCSS INPUT ONLY function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The repeater receiver CTCSS is now active

This function switches which input the software looks to for a receiver active condition to just the repeater receiver CTCSS input.

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: SET RX COS AND CTCSS TO AND

FUNCTION CODE: 65

PURPOSE: Changes the COS input to use the Repeater COS <u>and</u> the CTCSS inputs for its signal

HOW TO USE:

1. Key up
2. Enter the SET RX COS AND CTCSS TO AND function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The controller is now in COS AND mode

This function when enabled will set the receiver COS to require both the main COS input <u>and</u> the CTCSS input to be active (AND condition) before an active receiver status is recognized by the controller.

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: DTMF MUTING ON

FUNCTION CODE: 66

PURPOSE: Enables DTMF muting

HOW TO USE:

1. Key up
2. Enter the DTMF MUTING ON function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The controller will now mute the DTMF tones when detected

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: DTMF MUTING OFF

FUNCTION CODE: 67

PURPOSE: Disables DTMF muting

HOW TO USE:

1. Key up
2. Enter the DTMF MUTING OFF function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The controller will now no longer mute DTMF tones

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: BEACON MODE ON

FUNCTION CODE: 68

PURPOSE: Sets the IDer to operate in 'Beacon Mode'

HOW TO USE:

1. Key up
2. Enter the BEACON MODE ON function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The controller is now in Beacon mode

The power up status of this function can be changed using the 'Save statuses' function # 62.

In Beacon mode the IDer will ID whether or not the controller is activated. The time between IDs will be what the ID Interval timer (see function # 49) is set to. If the receiver input is active when the pending ID timer times out the polite ID timer (see function # 48) will be started. The IDer will hold off IDing until the polite ID timer times out or the receiver is no longer active.

FUNCTION: BEACON MODE OFF

FUNCTION CODE: 69

PURPOSE: Sets the IDer back to normal mode – disables the Beacon function

HOW TO USE:

1. Key up
2. Enter the BEACON MODE OFF function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The controller is now not in Beacon mode

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: CNTL_RX_DISABLE_RPTR_RX_ENABLE

FUNCTION CODE: 70

PURPOSE: This function allows the control receiver to disable the repeater receiver

HOW TO USE:

1. Key up
2. Enter the CNTL_RX_DISABLE_RPTR_RX_ENABLE function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The control receiver will now disable and mute the repeater receiver when the control receiver is active

To make this function permanent the 'Save statuses' function # 62 must be used.

The controller will mute the repeater receiver audio, disable the repeater receiver COS input and any DTMF tones coming in on the repeater receiver will be ignored when the control receiver becomes active (control receiver COS becomes active).

When the control receiver becomes non-active a 3 second timer will be started. During this 3 second time the controller will still consider the control receiver to be active. The repeater receiver COS and audio will remain disabled during this time.

By default the control receiver disable repeater receiver is enabled.

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: CNTL_RX_DISABLE_RPTR_RX_DISABLE

FUNCTION CODE: 71

PURPOSE: This function allows the control receiver and the repeater receiver to operate at the
                             same time

HOW TO USE:

1. Key up
2. Enter the CNTL_RX_DISABLE_RPTR_RX_DISABLE function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The control receiver and main receiver are now active

To make this function permanent the SAVE STATUSES function (function # 62) must be used.

When the control receiver becomes non-active a 3 second timer will be started. During this 3 second time the
controller will still consider the control receiver to be active. The repeater receiver's DTMF tones (not the audio or
COS) will remain disabled during this time.

By default the control receiver disable repeater receiver is enabled.

The power up status of this function can be changed using the 'Save statuses' function # 62.

FUNCTION: ENABLE DTMF CONTROL WITH NO COS

FUNCTION CODE: 72

PURPOSE: This function allows DTMF codes to be evaluated when the COS is not active

HOW TO USE:

1. Key up
2. Enter the ENABLE DTMF CONTROL WITH NO COS function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The DTMF control with no COS function is now active

This function allows DTMF control without having to toggle the COS input. After the controller hears the last DTMF
digit it will start a 2 second timer. If the controller does not hear another DTMF digit before the 2 second timer times
out the controller will evaluate the DTMF code.

The default status for this function is enabled.

The power up status of this function can be changed using the 'Save statuses' function # 62.

This function was added with version 1.13.

FUNCTION: DISABLE DTMF CONTROL WITH NO COS

FUNCTION CODE: 73

PURPOSE: This function requires DTMF codes to be evaluated with a COS active to not
                         active transition

HOW TO USE:

1. Key up
2. Enter the DISABLE DTMF CONTROL WITH NO COS function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The DTMF control with no COS function is now disabled

This function disables the DTMF control with no COS. When the disable DTMF control with no COS function is
used the controller will ignore all DTMF digits sent when the COS is not active. After using this function the DTMF
codes will need to be entered with the COS active and the COS will have to become inactive after each code sequence
for the sequence to be evaluated.

The power up status of this function can be changed using the 'Save statuses' function # 62.

This function was added with version 1.13.

FUNCTION: ID CANCEL ENABLE

FUNCTION CODE: 74

PURPOSE: This function is used to enable ID canceling

HOW TO USE:

1. Key up
2. Enter the ID CANCEL ENABLE function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The ID will be canceled if a COS becomes active

The ID cancel will stop the ID anytime an enabled receiver is determined to be active. The controller will
immediately try to ID again when there is not an enabled receiver active. When this is enabled the ID will not occur
when the controller is activating the push to talk. In order for the IDer to stop trying to ID the full ID must be sent.

This feature is by default disabled.

To keep the current setting of this function you must use the 'Save statuses' function # 62. This will insure the current
status of this setting will be maintained upon power up and reset.

This feature is available starting with version 1.15 of the Basic controller software.

FUNCTION: ID CANCEL DISABLE

FUNCTION CODE: 75

PURPOSE: This function is used to disable ID canceling

HOW TO USE:

1. Key up
2. Enter the ID CANCEL DISABLE function code
3. Un-key
4. The controller sends the COMMAND ACCEPTED indication
5. The ID will not be canceled if a COS becomes active

To keep the current setting of this function you must use the 'Save statuses' function # 62. This will insure the current status of this setting will be maintained upon power up and reset.

This feature is available starting with version 1.15 of the Basic controller software.

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Glossary of Common Terms

AND mode – The controller requires both an active CTCSS input and an active receiver COS input to have an active receiver status (see function # 65).

beacon mode – When the controller is in Beacon mode the IDer will ID every time the pending ID timer times out (see function # 68).

CAS – Carrier activated signal, similar to COR and COS. It indicates the receiver is active.

Control op mode – Used to allow access to restricted DTMF commands that are in a DTMF command memory (see function # 41).

control receiver – A second receiver input that is used for control. It has priority over the repeater receiver.

COR – Carrier operated relay, similar to CAS and COS. It indicates the receiver is active.

COS – Carrier operated signal, similar to CAS and COR. It indicates the receiver is active.

COS polarity – The polarity (direction) which the COS voltage goes when the receiver becomes active.

courtesy tone – The tone the controller creates after the receiver becomes inactive.

CTCSS – A sub-audible tone sent with a transmitted signal.

de-emphasis – The process of taking an emphasized signal typically from the receiver discriminator and returning it to a standard level audio format.

defaults – The condition controller's parameter settings were in from the factory.

discriminator audio – The audio in a receiver before the audio amplifier. This audio is typically emphasized.

DTMF codes – A series of DTMF digits used to activate a command in a DTMF command line.

DTMF command line – A DTMF code, a require or do not require control operator mode and the command to execute if the DTMF code and if the control operator mode requirement is there that the controller is in control operator mode.

DTMF memory – A DTMF memory is where a DTMF memory is stored. The Basic controller has 20 DTMF memories.

DTMF memory number – The number of the controller's DTMF memory that contains the DTMF command lines.

DTMF muting – The action of the controller muting the receiver audio when the controller hears DTMF tones from the receiver.

<u>hang time</u> – The amount of time to keep the transmitter on after the receiver becomes inactive.

<u>ID</u> – identification.

<u>IDer</u> – The part of the controller that sends the identification and determines when to identify.

<u>key up</u> – Activate the receiver connected to the controller. This is intended to activate the COS / CTCSS input(s) in such a way that the controller will consider the receiver active.

<u>open collector</u> – The way an output is setup. With an open collector output a ground is provided when the output is active, when the output is not active the output is open or has infinite resistance. The term open collector specifically refers to a bipolar transistor but, although not a proper usage, it can also refer to an open drain type output.

<u>open drain</u> – The way an output is setup. With an open drain output a ground is provided when the output is active, when the output is not active the output is open or has infinite resistance. The open drain term refers to a FET or MOSFET type transistor.

<u>pending time</u> – The time between ID's, the time the controller waits before allowing another ID from occurring.

<u>polite time</u> – The time the controller will wait to send an ID if it is time to identify and the receiver is busy.

<u>PTT</u> – Push to talk, the signal line from the controller, which when activated (typically active is ground), causes the transmitter to operate.

<u>RX</u> – receiver.

<u>statuses</u> – A group of settable parameters that can be set and changed back when a reset or power cycle occurs. The statuses can be made permanent by using the 'Save statuses' function.

<u>TX</u> – transmitter.

<u>un-key</u> – Deactivate the receiver connected to the controller. This is intended to deactivate the COS and/or CTCSS input(s) in such a way that the controller will consider the receiver to be inactive.

<u>unsquelched audio</u> – audio from the receiver which is not turned off when the receiver is not active.

<u>User mode</u> – The mode where the DTMF codes that do not need to be secure are available.

<u>warm reset</u> – Resetting the controller without cycling power.

ICS BASIC REPEATER CONTROL CODES

Memory #	DTMF Codes	Control Op ?	Function Code	Function Description
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				

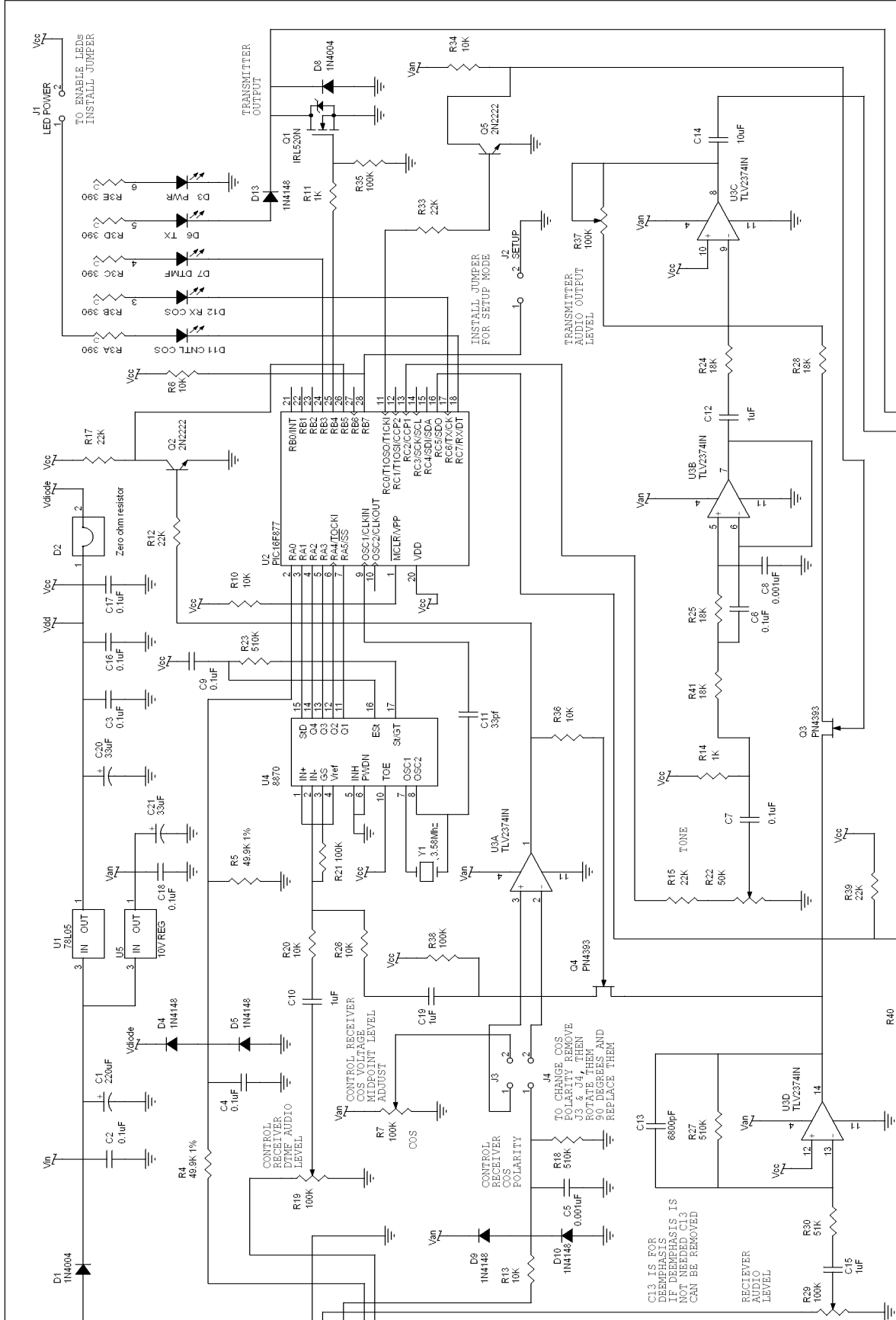# INTEGRATED CONTROL SYSTEMS (ICS) LIMITED WARRANTY

All of our products are protected by a limited 1 year warranty. This warranty begins on the day we ship the product. It ends 1 year from the date of shipping.

This warranty covers failure due to defective components or workmanship for the period of one year from ship date.

This warranty does not include damage due to acts of God (such as lightning damage), incorrect connections or improper voltage or signals or current draw to or from the product. This includes (but is not restricted to) connecting up the product backwards or applying excessive voltages or current to the products.

This warranty on one of our products will be voided if the product is modified or repaired in any way without permission from ICS.

Line no	Qnty	Discription	Component numbers	ICS number	Manufacturer Name	Manufacturer no.	Distributor Name	
1	9	0.1uF MLC cap 0.100 lead 100V XR7 BC	C2 3 4 6 7 9 16 17 18	1	BC Components	K104K15X7RF5TL2	Digikey	BC1084CT-ND
2	2	0.001uF	C5, 8	61	BC Components	K223K15X7RF5TL2	Digikey	BC1072CT
3	1	220uF Electrolytic 63V	C1	3	Panasonic	ECA-1JM221	Digikey	P5194-ND
4	1	6800pF	C13	4	BC Components	K682K15X7RF5TL2	Digikey	BC1077CT
5	1	33pF MLC cap 0.100 lead 50V COG	C11	5	BC Components	K330J15COGF5TL2	Digikey	BC1007CT-ND
6	4	1uF	C10, 12, 15, 19	9	BC Components	K105C02Y5VF5TL2	Digikey	BC1162CT
7	2	33uF	C20, 21	20	Panasonic	ECA-1JM330	Digikey	P5191
8	1	390 ohm SIP 6 pin	R2	50	Yageo	4606X-101-391	Digikey	4606X-1-391
9	11	10K 5% carbon resister	R6 10 13 20 24 25 26 28 34 36 41	8	Yageo	CFR-25JB-10K	Digikey	10KQBK-ND
10	2	1K 5% carbon resister	R11 14	38	Yageo	CFR-25JB-1K0	Digikey	1.0KQBK-ND
11	1	10uF	C14	29	Panasonic	ECE-A1HN100U	Digikey	P1280
12	4	100K pot	R7, 19, 29, 37	49	Bourns	3362P-1-104	Digikey	3362P-104LF-ND
13	3	510K	R18 23 27	7	Yageo	CFR-25JB-510K	Digikey	510KQBK-ND
14	1	50K pot	R22	12	Bourns	3362P-1-503	Digikey	3362P-503LF-ND
15	3	100K 5% carbon resistor	R21 35 38	13	Yageo	CFR-25JB-100K	Digikey	100KQBK-ND
16	1	51K	R30	6	Yageo	CFR-25JB-51K	Digikey	51KQBK-ND
17	2	49.9K ohm 1% resistor	R4, 5	51	Yageo	MFR-25FBF-49K9	Digikey	49.9KXBK
18	6	22k 5%	R12 15 17 33 39 40	11	Yageo	CFR-25JB-22K	Digikey	22KQBK-ND
19	1	0 ohm reisistor	D2	100	Panasonic	ERD-S2T0V		
20	1	1N4004	D8	17	General Semi	1N4004	Digikey	1N4004GICT-ND
21	5	1N4148	D4, 5, 9, 10, 13	18	General Semi	1N4148	Digikey	1N4004DITR-ND
22	5	LED 3mm red	D3, 6, 7, 11, 12	19	Lite-on	160-1139	Digikey	160-1139-ND
23								
24	1	IRL 520N Power transister logic input	Q1	21	International Rectifier	IRL520NPBF	Digikey	IRL520NPBF-ND
25	1	5v reg Nat semi 78L05	U1	39	STMicroelectronics	L78L05ABZ	Digikey	497-1009-ND
26	1	PIC 16F876A 4Mhz	U2	23				
27	1	TLV2374IN	U3	34	Texas Instruments	TLV2374IN	Digikey	296-12221-5-ND
28	3	2N2222	Q2, 5, 6	25	Fairchild Semi	PN2222ABU	Digikey	PN2222AFS-ND
29	1	8870 Tone Decoder	U4	26	Zarlink	MT8870DE	Avnet 22 per order	MT8870DE
30	1	3.58Mhz Crystal	Y1	27	ECS	ECS-35-17-4	Digikey	X079-ND
31	1	DB9 Female	P1	48	Norcomp	182-009-112-531	Digikey	182-09ME-ND
32	1	10V reg 150mA	U5	59	Texas Instruments	TL750L10CLPR	Digikey	296-8007-1-ND
33	1	PC Board		44				
34	2	PN4393	Q3, Q4	36	Fairchild	PN4393_D27Z		
35	5	Jumper 2 pos header		30	Molex	22-03-2021	Digikey	WM4000
36	5	Jumper 2 pos jumper	J1, 2, 3, 4	31	Amp	382811-8	Digikey	A26228
37								
38	1	Socket 28 pin		32	Mill Max Manufacturing	110-99-328-41-001	Digikey	ED3128
39	1	Socket 18 pin		33	Mill Max Manufacturing	110-99-318-41-001	Digikey	ED3118
40	1	Socket 14 pin		34	Mill Max Manufacturing	110-99-314-41-001	Digikey	ED3114
41								
42	1	Screw 4-40 x 1/2"						
43	1	Nut 4-40						
44								

REPEATER CONTROLLER SCHEMATIC

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REPEATER CONTROLLER SCHEMATIC

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