

# **CONNECT SYSTEMS INCORPORATED**

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## **FLEX SERIES UNIVERSAL CONTROLLER**

### **SIMPLEX REPEATER**

**With Motorola and Plectron Two Tones**

**or**

**Model 19**

**User's Instruction Manual**

Made in U.S.A.

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## GENERAL DESCRIPTION

The FLEX Series Universal Controller SIMPLEX REPEATER by Connect Systems Inc. is an economical controller capable of repeating up to 120 seconds of audio before it repeats the information received.

Using external two tone decoders, the system can not only repeat the voice message, it can also regenerate the same two tone or another two tone using either Motorola or Plectron tones or it can just store the tones and play back the tones along with the voice.

The choice between tone regeneration of Motorola and Plectron Tones or store and playback the tones (Model 19) is accomplished by means of a jumper on the PCB. If Jumper 10 (JP10) is removed, then the system will regenerate the Motorola or Plectron tones. If Jumper 10 (JP10) is inserted, the system will just store the tones and play back the tones along with the voice similar to the Zetron Model 19.

To accommodate the many programmable features, the system allows the user to program the system via a telephone plugged in the back of the unit, through the telephone line, over the air, or through a computer.

Powerful built in standard features make the FLEX Series Universal Controller SIMPLEX REPEATER the best deal going in SIMPLEX REPEATERS today!

## SETTING EVERYTHING BACK TO FACTORY DEFAULT

If for some reason it is necessary to set the system back to factory default, plug a telephone into the programming jack in the back of the unit and enter the command "\*\*\*123456\*\*". If the system is enabled to accept programming command from other sources such as over the radio, this command is valid from those sources too. You cannot disable the factory reset from working over the local programming jack.

## GETTING INTO PROGRAMMING MODE

This product allows the user to unconditionally get into programming mode by pressing ##123456# from the telephone attached to the programming jack in the back of the unit. Because the user has physical access to the unit at this time, security codes is not an issue. Remote access requires the use of a security code programmed in the unit.

## DIFFERENT PROGRAMMING AREAS USED

This product uses the following programming areas:

Global  
Voice

## GETTING ADDITIONAL INFORMATION

The web site at [www.connectsystems.com](http://www.connectsystems.com) has a user programming manual and a hardware reference manual. These manuals should be used in conjunction with this manual.

## DIAGNOSTIC MODES

There is one special diagnostic modes for this product.

### Diagnostic Mode 1

By putting a jumper into JP9, the system will allow the user to determine the value to set the SENSE and COS inputs as well as adjust the squelch pot if COS is not used. When in this mode, the display will look as follows:

```
-----  
|S|Q|U|E| | |C|O|S| | |S|E|N|S|E|  
-----  
|O|F|F| | | |1|3|7| | | |2|3|5| |  
-----
```

The user then generates a high and low value for either the COS or Sense input and watches the display. The value for the trigger voltage for the appropriate parameter is a value between the two points.

The squelch pot is used for proper adjustment of the "SQUE". The results will be either on or off.

## GLOBAL PARAMETERS

TO PROGRAM

|  
V

TO DISPLAY

|  
V

### Programming Parameters

#### TELCO PROGRAMMING

\*0000#01#J#

\*0000#01\*

J = 0 = Disabled      J = 1 = Enabled  
Not supported

Default = 1

#### RADIO PROGRAMMING

\*0000#02#J#

\*0000#02\*

J = 0 = Disabled      J = 1 = Enabled  
When enabled, the controller will allow the parameters to be programmed by radio. If disabled, the controller will ignore any attempt to program the parameters via radio.

Default = 1

#### PHONE PROGRAMMING

\*0000#03#J#

\*0000#03\*

J = 0 = Disabled      J = 1 = Enabled  
When enabled, the controller will allow the parameters to be programmed by a telephone plugged into the programming port in the back of the controller. If disabled, the controller will ignore any attempt to program the parameters via a telephone plugged into the back of the controller.

Default = 1

#### COMPUTER PROGRAMMING

\*0000#04#J#

\*0000#04\*

J = 0 = Disabled      J = 1 = Enabled  
When enabled, the controller will allow the parameters to be programmed by a telephone plugged into the programming port in the back of the controller. If disabled, the controller will ignore any attempt to program the parameters via a telephone plugged into the back of the controller. This feature will be supported starting July 2005.

Default = 1

#### PROGRAMMING MODE ACCESS CODE \*0000#05#NNNNNN#

\*0000#05\*

NNNNNN = 000000 - 999999

Default 123456

Code must be precisely six digits. This code is used to enter the programming mode from all sources.

### Simplex Repeater Parameters

#### MAXIMUM REPEAT TIME

\*0000#06#MM#

\*0000#06\*

MM = 5 - 120 in 1 second increments  
Maximum length of the message. This is the total length of the message allowed that will be repeated

Default = 120

#### VALID MESSAGE TIME

\*0000#07#MM#

\*0000#07\*

MM = 10 - 99 in 100 mS increments

Default = 10







## Two Tone Parameters

### TWO TONE TABLE

**\*0000#24#J#**

**\*0000#24\***

J = 0 = Motorola table, J = 1 = Plectron table Default = 0  
This allows the user to select either the Motorola or Plectron Tones. This feature is not used if set for Model 19 operation.

### RECORD DELAY

**\*0000#25#MM#**

**\*0000#25\***

MM = 0 - 99 in 100 mS increments Default = 0  
This is the time after the first two tone decode is asserted that the system will start recording. This is to allow the two tone to be finished sending before the system starts the recording. If the value is zero, then the system will only start recording voice after the sense input has gone true and when the COS goes from true to false to true again. This feature is not used if set for Model 19 operation.

### READY DELAY

**\*0000#26#MM#**

**\*0000#26\***

MM = 0 - 99 in 100 mS increments Default = 20  
This is the time after the two tone has generated its tone that the system expects to see a valid voice message. If the value of this parameter is zero, then there is the assumption that this program will only generate two tone and not record any voice. If there is no voice within the specified time, then the system ignores future transmissions until it sees another valid two tone decode. If set for Model 19, then this parameter determines the time the system will start recording from a valid COS or Internal Squelch indication.

### NUMBER OF TONES

**0000#27#M#**

**\*0000#27\***

M = 0 - 2 Default = 1  
This parameter allows the user to hook up either one or two external Two Tone decoders to the system. If only one decoder is hooked up, it must go on the sense input. If there are two decoders hooked up, then the second one must go on the COS input and the internal squelch must be used. If the value is zero then two tones are not used. This feature is not used if set for Model 19 operation.

### SENSE POLARITY SELECT

**\*0000#28#J#**

**\*0000#28\***

J = 1 = positive, J = 0 = negative Default = 1  
If set for a positive voltage, then any voltage above the Sense Trigger Voltage will set Sense input true. If set for a negative voltage, then any voltage below the Sense trigger voltage will set Sense true. There is a one half volt hysteresis built in.

### SENSE TRIGGER VOLTAGE

**\*0000#29#MMM#**

**\*0000#29\***

MMM = 0 - 255 Default = 128  
This is the trigger point that will cause the Sense to be active. See application note to determine how to calculate the sense trigger voltage.



**TWO TONE GROUP SELECTION TABLE WITH PLECTRON TONES**

1 <sup>st</sup> & 3rd digit										
digit	0	1	2	3	4	5	6	7	8	9
2nd & 4th digit	PLECT	PLECT	PLECT	PLECT	PLECT	PLECT	MOT GP6	MOT GPA	MOT GPB	MOT GPC
0	282.2	435.3	672.0	1036.0	1598.0	2465.0	1122.5	682.5	652.5	667.5
1	294.7	454.6	701.0	1082.0	1669.0	2575.0	1153.4	592.5	607.5	712.5
2	307.8	474.8	732.0	1130.0	1743.0	2688.0	1185.2	757.5	787.5	772.5
3	321.4	495.8	765.0	1180.0	1820.0	2807.0	1217.8	802.5	832.5	817.5
4	335.6	517.8	799.0	1232.0	1901.0	2932.0	1251.4	847.5	877.5	862.5
5	350.5	540.7	834.0	1287.0	1985.0	3062.0	1285.8	892.5	922.5	907.5
6	366.0	564.7	871.0	1344.0	2073.0	3197.0	1321.2	937.5	967.5	952.5
7	382.3	589.7	910.0	1403.0	2164.0	3339.0	1357.6	547.5	517.5	532.5
8	399.2	615.8	950.0	1465.0	2260.0	3487.0	1395.0	727.5	562.5	577.5
9	416.6	643.0	992.0	1530.0	2361.0	903.2	1433.4	637.5	697.5	622.5

As an example, lets assume we want the tone to be 517.8 Hz and the second tone to be 1321.2 Hz. The first tone has the location 1,4 and the second tone has the location 6,6. The value for TWO TONE ON COS or TWO TONE ON SENSE would be 1466

## **OPERATION**

### **Simplex Repeater Without Two Tone**

A simplex repeater is a device that allows a radio to repeat the information on the channel using a single frequency verses the conventional repeater which must use two separate frequencies.

The user can set the system to be active using an external COS signal or an Internal Squelch. If using an internal Squelch, the Audio In from the Flex Series Controller must be connected to the discriminator of the radio.

When an active signal is received as indicated by the COS or Squelch and the signal is active for the COS ACQUISITION TIME, the system will start recording. The recording will stop when the COS or Squelch is inactive for the COS RELEASE TIME or the MAXIMUM REPEAT TIME is exceeded. Assuming the message is longer than the VALID MESSAGE TIME, the repeater will then go into the playback mode.

On playback, the system first asserts the PTT and waits for the TURN ON DELAY before the voice message is sent out. After the voice message is sent out, the system will turn off the PTT. The TURN OFF DELAY parameter defines how long the PTT will stay on after the voice message is sent.

### **Two Tone Message Without Voice**

Two use the system to generated a two tone page, an external two tone decoder is attached to the Sense input or the COS input, or both.

If the system is activated by a signal on the Sense Input, then the TWO TONE ON SENSE parameter will be used to define which two tone page is used. If the system is activated by a signal on the COS input, then the TWO TONE ON COS parameter will be used to define which two tone page is used. Whichever Input is activated first is the one which will define which two tone parameter to use.

Once the input is asserted, the system will start the RECORD DELAY timer. After that timer has expired, the system will then turn on the PTT and start generating the two tone page after the PTT TURN ON DELAY. After the two tone page has been sent, the system will turn off the PTT after the PTT TURN OFF DELAY.

### **Two Tone Message With Voice**

After a valid input is asserted indicating that a two tone page has been decoded, the repeater will do nothing for the RECORD DELAY time. This is to make sure the two tone page that has been sent and decoded has finished sending.

The system then expects a voice message within the READY DELAY time. If no message has been sent within the READY DELAY time, the system will then reset itself waiting for another two tone decode. Once there is a valid voice message the system will start recording. If the length of the voice message is less than the VALID MESSAGE TIME, the system will reset itself and wait for another two tone decode.

After the voice message has been received, the system then goes into the transmit mode. The system starts by turning on the PTT and waiting for the TURN ON DELAY. After the TURN ON DELAY the system sends the two tone page followed by the voice message followed by a TURN OFF DELAY followed by the PTT turning off. At that point the record-playback cycle can start again.

### **Model 19 Operation**

The model 19 operation is similar to the way Zetron's model 19 works. The system starts recording when COS has been active the Ready Delay Time (Parameter 26). The system will play back what was recorded if and only if a valid sense input was detected before the Maximum Repeat Time has been exceeded (Parameter 06) and the actual record time is greater than the Valid Message Time (Parameter 07). This allows the system to record not only the voice but also the two tones (or any other tones).

This version has the advantage in that it can record an unlimited amount of two tones and has the disadvantage in that the tones are not regenerated.

## **CIRCUIT DESCRIPTION AS RELATING TO THE SIMPLEX REPEATER**

The voice from the radio passes through U5A and U5B where it is amplified and through the high pass filter U10A, U10B, and U10D where it then goes to the A/D converter on the microprocessor. The signal is then outputted to the D/A converter to the telephone where it goes through the hybrid transformer and to the voice storage chip where the voice is recorded. Because the telephone line is disconnected from the hybrid transformer at this time, the hybrid transformer is unbalanced allowing the signal to go from the telephone output back to the telephone input with very little transhybrid loss.

On playback the microprocessor reads the voice storage chip through another A/D converter where it then is outputted to the D/A converter which is then amplified and outputted to the transmitter.

Tones if used, are generated by a software algorithm along with the D/A converter.

## LIMITED WARRANTY

Connect Systems Inc. (CSI) hereby warrants our products to be free from defective workmanship for a period of one year and defective parts for a period of one year from date of sale to the initial end user. This warranty applies only to the original consumer/end user purchaser of each FLEX SERIES CONTROLLER. During the first year of warranty, CSI will repair any of its products at no charge providing the defective unit is shipped prepaid and service is performed by CSI. Conventional prevailing labor and shipping charges will apply following the end of the first year. CSI, at its sole discretion, will replace defective parts on an exchange basis for the first year of ownership by the original purchaser. All shipping cost are the responsibility of the customer.

### **What is not covered by this limited warranty:**

This warranty shall not apply, if, in our judgment the defects are caused by misuse, lightning strikes, customer modification, water damage, negligent use, improper installation, overloads caused by external voltage fluctuations, use of unregulated power supply, damage caused by transit or handling or an abusive treatment not in accordance with ordinary product use or the product serial number has been removed, altered, or defaced. **Specific Exclusion:** This warranty specifically excludes lightning protection devices (MOVs and phone line fuses) and transistors in the PTT (Push to Talk) circuitry. These components can only fail from external abuse.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, STATEMENTS OR REPRESENTATIONS, AND UNLESS STATED HEREIN, ALL SUCH WARRANTIES, STATEMENTS OR REPRESENTATIONS MADE BY ANY OTHER PERSON OR FIRM ARE VOID. ALL IMPLIED WARRANTIES IN CONNECTION WITH THE SALE OF THIS EQUIPMENT, INCLUDING THE WARRANTY OF MERCHANTABILITY, SHALL BE OF THE SAME DURATION AS THE WARRANTY PERIOD STATED ABOVE. SOME STATES DO NOT ALLOW LIMITATIONS OF HOW LONG AN IMPLIED WARRANTY LAST, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU. IN THE EVENT OF PRODUCT FAILURE WHICH PROVES TO BE CAUSED BY A DEFECT IN WORKMANSHIP OF MATERIALS, YOUR SOLE REMEDY SHALL BE THE REPAIR OF THE DEFECT BY CSI OR ITS APPOINTED REPAIR STATION AS STATED IN THIS WARRANTY, AND UNDER NO CIRCUMSTANCES SHALL CSI BE LIABLE FOR ANY LOSS OR DAMAGE, DIRECT, INCIDENTAL, OR CONSEQUENTIAL, ARISING OUT OF THE USE, OR INABILITY TO USE, THIS PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

If your new CSI product shall ever fail, contact Connect Systems Inc. Customer Service Dept. for repair and warranty information at (805) 642-7184

Note: Connect Systems Inc. reserves the right to render a modest service charge when returned units are found to be free of parts or workmanship defect(s) (i.e. operating to factory specification) within the first year of warranty. Such units will be returned freight collect to the sender, including the appropriate service charge.



## APPENDIX A

### FCC NOTICE TO USERS

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1. This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference which may cause undesirable operation.
2. This equipment generates and uses radio frequency energy and if not installed and used properly, i.e. in strict accordance with the service manual, may cause interference to radio or television reception. It has been tested and found to comply with the limits for a Class B computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a residential installation.
3. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
  - a. Reorient the receiving antenna.
  - b. Relocate the equipment with respect to the receiver.
  - c. Move the equipment away from the receiver.
  - d. Plug the equipment into a different outlet so that equipment and receiver are on different branch circuits.
  - e. Ensure that card mounting screws, attachment connector screws, and ground wires are tightly secured.
  - f. If cables not offered by this company are used with this equipment, it is suggested that you use shielded, grounded cables with in line filters, if necessary.
  - g. If necessary consult your dealer service representative for additional suggestions.
4. The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interference.

## REVISION HISTORY

March 23, 2005 (Version 1.00) First production Release of combination Motorola Tones, Plectron Tones, and Model 19.